

Henry Morton

MORTON MEMORIAL

A HISTORY OF THE

STEVENS INSTITUTE OF TECHNOLOGY

WITH

BIOGRAPHIES OF THE

TRUSTEES, FACULTY, AND ALUMNI

AND A RECORD OF THE ACHIEVEMENTS

OF THE

STEVENS FAMILY OF ENGINEERS

EDITED BY

FRANKLIN DE RONDE FURMAN, M.E.

PROFESSOR OF MECHANICAL DRAWING AND DESIGNING

WITH AN INTRODUCTION BY

ALEXANDER CROMBIE HUMPHREYS, M.E., Sc.D., LL.D.

PRESIDENT OF STEVENS INSTITUTE OF TECHNOLOGY

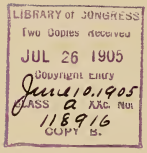


HOBOKEN, N. J.

STEVENS INSTITUTE OF TECHNOLOGY

1905

T:71
.S2515



Copyright, 1905, by
The Alumni Association of the Stevens Institute
of Technology

TO THE MEMORY OF

HENRY MORTON, PH.D., SC.D., LL.D.

FIRST PRESIDENT OF STEVENS INSTITUTE OF TECHNOLOGY

1870–1902

RESOLUTIONS ADOPTED BY THE BOARD OF TRUSTEES OF STEVENS INSTITUTE OF TECHNOLOGY

"With profound sorrow the Trustees record the death of Henry Morton, the first and only President of the Stevens Institute of Technology.

"It is not possible to convey our sense of the great loss which we have sustained in his death. The full measure of his devotion to the Institute cannot be expressed in words.

"His gifts of money for its welfare were generous, but the crowning gift was himself,— heart, mind, and strength. Its fame was his highest ambition; its success his greatest happiness in life; it stands a monument to his memory, more enduring than 'marble or the gilded monuments of princes.' He brought it up from a doubtful experiment in education to an assured position of renown at home and abroad. On its roll of honor his name stands first, and on his students he has left the impress of his faithful industry in the pursuit of truth, his conscientious devotion to high scientific ideals and his sincere personal interest in their success.

"The sons of Stevens will rise up and call him blessed."

S. B. DOD,
President of the Board of Trustees.

Hoboken, N. J., May 12, 1902.

Preface

In connection with the exercises of the Twenty-fifth Anniversary of the Stevens Institute of Technology, held in February, 1897, President Morton planned a souvenir book to include a full and complete account of the banquet and of the exhibition of the work of the Alumni, a very brief history of the Institute, biographies of the Trustees and Faculty, detailed accounts of the professional work of the Stevens Graduates, and numerous extracts from original documents concerning the pioneer engineering work of John, Robert L., and Edwin A. Stevens.

The purpose and plan of the book having been established, a publication committee, consisting of Professor Adam Riesenberger, M.E., '76, Mr. Johannes H. Cuntz, M.E., '87, and Mr. Rudolph V. Rose, M.E., '97, the latter then an undergraduate, was appointed in 1896 to assist President Morton. The efforts of the committee were directed chiefly to obtaining the records of the Alumni; and this work, upon the graduation of Mr. Rose a few months later, and the absence of Mr. Cuntz, fell almost entirely upon Professor Riesenberger. He continued until the spring of 1898, when he had completed the records of the technical work of all those who had been graduated with the earlier classes down to and including the Class of 1896.

Meanwhile, President Morton was giving his time to the collection of data for the other portions of the book as outlined above. He was also attending to the preparation of many illustrations, personally employing prominent artists, either to produce original pictures, or to touch up photographs from which half-tone plates were subsequently made. The money spent in this way amounted to more than $1,500. The collection of data regarding the engineering achievements of the Stevens family was by far the most voluminous part of the work undertaken by President Morton.

During the fall of 1900 President Morton called upon the writer to assist him, and the work of compiling and arranging these data, as presented in Part II of this book, was begun. Upon the completion of this task in 1901, the technical records of the graduates down to and including the Class of 1896 were supple-

mented by bringing them to date; and notices of those graduating since 1896 were prepared. In March, 1902, this work was completed, and President Morton, who had continued to devote himself to various features of the book, felt for the first time that it had reached the standard he originally set. But it was too late for him to see the book completed. His death occurred on the 9th of May.

Among the papers left by President Morton were found numerous documents relating to the book, and considerable time was expended in reviewing these and in selecting and adding desirable material thus found. This work was completed in January, 1903.

During the years that the book had been in preparation, six classes had been graduated, and the number of the Alumni had increased 43 per cent. The records of these new men added largely to the size of the book, and this, together with the accumulated material for other portions of the work, carried it far beyond the scope of the original plan. Furthermore, much of the material which had been prepared several years before had lost a considerable portion of its interest. It therefore became impracticable to issue the book under the old plan as a Twenty-fifth Anniversary Volume.

New plans were considered, and in March, 1903, it was decided by the Executive Committee of the Alumni Association to give the book its present character as a memorial to the late Dr. Morton, commemorating the initial period of the Institute's history, during which he served as its President. Much more space in the new book was allotted to the history of the Institute, and less to the Twenty-fifth Anniversary celebration, complete accounts of which are recorded in the "Stevens Institute Indicator" for April, 1897. The sections relating to the engineering work of the Stevens family and the biographies of the Trustees and Faculty remain essentially as originally planned. The professional records of the Alumni were largely condensed where detailed descriptions of a technical nature appeared, and were generally rewritten and rearranged in conformity with the new plan; the space thus saved being devoted to portraits and the presentation of such facts as are usually found in biographies. As soon as the revision of the data for the Alumni records was completed, the new manuscripts were sent for correction and approval to the graduates or to the relatives of those deceased; accompanying each manuscript was a circular letter setting forth the new plan and the reasons for its adoption. In all, 987 letters covering the classes from the beginning (1871) to 1902 inclusive, were sent out. An unexpectedly large number of favorable and generous replies were promptly received from 75 per cent of these,

about 80 per cent of whom, in turn, subscribed for one or more copies of the book. Such a response is, we believe, unsurpassed in the annals of an educational institution, and is highly gratifying as an indication of the interest which the Alumni of Stevens Institute take in their Alma Mater.

Since the earlier forms of this book went to press, several notable additions and changes pertaining to the Institute's history have been made. Chief among these is the purchase by the Institute, through the liberal co-operation of Mrs. Lewis H. Hyde (formerly Mrs. John Stevens), of four and a half acres from the estate known as Castle Point. This property includes all that part extending southward from a continuation of Seventh Street to the old Institute grounds, and runs eastward to the high bank along the Hudson River. These newly acquired grounds, with a rising elevation, command a splendid view of New York city and harbor, and afford an unrivalled location for a campus.

The construction of the Morton Laboratory of Chemistry (illustrated on page 17 from an advance drawing) will be begun early in 1905. It will be located, however, on the plot of ground at the corner of River and Sixth Streets, directly in front of the residence of the late Dr. Morton, instead of on the main block of land as represented in the picture. This new location, in addition to being most appropriate, was made necessary by the recent rapid growth of the Institute and the consequent provision for possible future extension of the Carnegie Laboratory of Engineering.

President Humphreys, in addition to his endowment, in 1902, of a scholarship in memory of his son Harold (as mentioned on page 17 of this book), has further contributed $5,000 to create a scholarship dedicated to the memory of his younger son, Crombie Humphreys.

Among the customs of the Institute we welcome the advent of the traditional cap and gown, worn, for the first time, at the last commencement exercises, by the faculty, guests, and members of the graduating class. The regulation costume fitting the Stevens degree of Mechanical Engineer consists of the Bachelor's gown and hood, and the cap. The hood is lined with silk in the Stevens colors of red and gray, and trimmed with orange velvet. This latter color was adopted by Stevens to symbolize the profession of Engineering, which heretofore had not been represented by a distinguishing color in the academic costume. Those of the alumni who are members of college faculties are entitled to substitute the Master's for the Bachelor's gown and hood.

In presenting the biographical sketches of the Alumni every effort has been

made to give each one uniform treatment along the following lines: Name in full; portrait; place and date of birth; parents' names; brief note of ancestry and of any circumstances of general interest in early life and education; record of professional work, including list of positions held with titles and dates, and also a brief description of the nature of the employment, or of any special or exceptional work accomplished, with illustrations of the same; names and dates of patents taken out, with short descriptions; titles and dates of books published, of papers presented to engineering or prominent societies, and of articles contributed to technical or other journals; names of engineering societies, clubs, fraternities, commissions, etc., in which membership is or has been held; and, if married, the date of the marriage, the wife's name, and the names of the children.

Every effort has been made to have the information in this book accurate and up to date, and it is believed that it is as nearly so as is possible in a work of this kind. After the biographies had been set up in type, proof-sheets were sent out to every alumnus before going to press, for the verification of names, dates, etc., and for the addition of such facts as were necessary to complete each sketch. In this connection the editor wishes to emphasize the fact that the spellings of christian names, which in some cases may be found to be at variance with standard methods, have been carefully verified. No pains have been spared in securing data and in verifying doubtful points in general. Of special value to the writer in compiling this volume has been the experience obtained some years ago as Corresponding Secretary of the Alumni Association, and later as editor of the "Stevens Institute Indicator."

In concluding this preface the writer desires to thank those who, by their contributions or their counsel, have assisted in the preparation of this book. Among these should be mentioned President Alexander C. Humphreys, M.E., Sc.D., LL.D.; Professor Adam Riesenberger, M.E.; Professor Edward Wall, A.M.; Mr. Harry W. Johnson, M.E.; Mr. Elford E. Treffry; Mr. William A. Macy, secretary of the Hoboken Land & Improvement Company; and Col. George Harvey, president of Harper & Brothers.

FRANKLIN De RONDE FURMAN.

Hoboken, N. J., January, 1905.

Introduction

In complying with the request of the Editor to write an Introduction to this historical sketch of the Stevens Institute of Technology and its people I wish first to emphasize the peculiar appropriateness of offering this volume as a memorial of the man who unsparingly devoted thirty years of his life to the Institute's service.

The Editor has explained that, at first, this work was intended to commemorate the Institute's Twenty-fifth Anniversary. The original conception was a modest one, but under Dr. Morton's enthusiastic direction and generous support the scheme was so broadened and enriched that the great amount of detail work caused the date of publication to be postponed from year to year. This delay, however, was found to be a blessing in disguise, when, shortly after Dr. Morton's untimely death, it was realized that the project over which he had so lovingly labored could be developed into a record of the thirty years of his presidency. Our gratitude is due to the Editor for suggesting this change and carrying the work to so successful an issue.

Dr. Morton particularly desired that the book, as originally outlined, should show that not only " Stevens " men, but our country and the world at large, rest under a great debt to our founder and his father and brother. The record of the Stevens family of engineers which follows in Part II,— made up of an article by T. C. Martin, E.E., prepared at the instance of Dr. Morton; addresses at the Twenty-fifth Anniversary Banquet, made by Abram S. Hewitt, Admiral Melville, and Dr. Watkins; a brief biographical record of the Stevens family; and a classified record of the engineering work of John, Robert L., and Edwin A. Stevens,— should serve Dr. Morton's long-cherished purpose of paying a more adequate tribute to the pioneer engineering achievements of the members of this remarkable family. The members of the engineering profession know in an indefinite way, largely from fragmentary articles that have appeared from time to time, and from special and often obscure references in technical literature, that John Stevens and his two sons did much for engineering science; let them read this record and learn more fully of the truth.

Pioneers in railroading, steamboat engineering, and modern naval construction; inventors of the T-rail, the railroad spike, the "sleeper" method of track-construction, and elongated shells for cannon; designers of the present form of ferry boats and ferry slips, and of the yacht "Maria," the fastest yacht of her day and victor over the "America"; and the fathers of a great class of minor though important utilities exemplified in the pilot-house and the two-horse dumping-wagon, — their inventions and improvements are now benefiting thousands who accept these benefits without knowledge of or gratitude to their benefactors.

It was eminently appropriate that Stevens Institute should have been founded through the liberality of an active member of this Family of Engineers, and that its buildings should be erected upon ground where some of their epoch-making experiments were conducted. This alone should be an inspiration, continually renewed, to those charged with the responsibility of maintaining the good name of "Stevens."

Edwin A. Stevens died in 1868, and by his will left a block of land in Hoboken, a building-fund and an endowment-fund, and directed that his executors should erect on this land "an institution of learning for the benefit of the youth residing from time to time in the State of New Jersey." The work of the Stevens Institute began in 1870 under the guidance of Mrs. E. A. Stevens, William Shippen, and S. Bayard Dod, who constituted the first Board of Trustees.

Upon Mr. Dod chiefly devolved the duty of determining what the character of the new institution should be. After full consideration and against the advice of educators and practical men, it was decided to organize a school of *Mechanical* Engineering, a line in which Edwin A. Stevens, his father, and his brother, had so efficiently labored. There had already been established schools of engineering differentiated in favor of the Civil or the Mining branches of Engineering, but so far it had been contended that Mechanical Engineering should be taught only in the shops. This seems to-day to be remarkable when we reflect that all successful engineering is based upon the same fundamentals of mathematics and natural science combined with practice in the field, the mine, the factory, and in business.

While their plans were still in a nebulous condition the trustees called to their assistance, as President of the new institution, not an engineer, not even an experienced educator, but a young man trained for the law who through natural inclination and opportunity had been led into the paths of science. Henry Morton grasped the idea, quickly gave it definite form, and, displaying his executive capacity, promptly called to his support a Faculty small in number, but singularly well

qualified to develop and carry out a new line of educational work. And let it not be forgotten that the plan outlined in 1870 in its main feature — the co-ordination of theory and practice — has been retained to the present time and remains the backbone of the Stevens educational scheme.

Concerned with practical things, as I have been all my working life, it seems to me nothing short of marvelous that a man educated as was Henry Morton should have been found capable of initiating a course of instruction so essentially practical. Morton was a firm believer in the employment of the imagination in the development of scientific truths; he, himself, was unusually qualified in this regard, and his record as the first president of Stevens Institute demonstrated that he was able to carry his powers of imagination into the realm of practical things. He was that rarity,— a genius endowed with balance of character.

Shortly after Dr. Morton's death I was called upon to write of his life for the "Stevens Institute Indicator." I undertook the work with many misgivings, for I keenly appreciated my inability to do justice to so many-sided and brilliant a personality. Since then I have had some two years of experience as the head of the institution he created, and in this position I have been led more keenly to appreciate my insufficiency as his biographer. But in this volume we have the history of Stevens Institute for the thirty years of his stewardship, and in the records of the thousand Alumni can be read how faithfully and efficiently this stewardship was administered for the benefit of his fellows and in the service of his Master.

President Morton's wonderful capacity for the rapid acquisition of exact knowledge in every branch of science, combined with a like ability accurately to appraise the value of evidence, enabled him early in life to earn an unrivalled reputation as a scientific expert in patent causes. His extra labors in this field enabled him to meet from time to time the Institute's most pressing pecuniary needs. And we may believe that it was Andrew Carnegie's sympathetic appreciation of Dr. Morton's qualities of head and heart that influenced him to build and endow the Carnegie Laboratory of Engineering.

Henry Morton gave his great ability, his substance, and — yes — his very life to Stevens Institute; for I am convinced that in large measure it was the worry occasioned by the insufficiency of the Institute's endowment, made apparent by the growth due to his successful administration of its affairs, that finally broke down his frail body, never strong enough to keep pace with the demands of his great heart and intellect.

I feel that this volume, with its record of the Stevens Family, President Morton, the Faculty, the Trustees, and the Alumni, should serve as an inspiration and encouragement to continue Henry Morton's work; and above all I hope that it will serve still more closely to unite the Alumni in the service of their Alma Mater. The Institute has many loyal sons; may this volume go out to strengthen them in their love for "Stevens" and to quicken the loyalty of those who are now but lukewarm. The educational bounty which we have received let us in turn extend to others in need.

ALEXANDER C. HUMPHREYS,

President of Stevens Institute of Technology.

Contents

PAGE

PREFACE ix
INTRODUCTION BY PRESIDENT HUMPHREYS xiii
LIST OF ILLUSTRATIONS xix

I

HISTORY OF THE INSTITUTE

INTRODUCTION 1
ORGANIZATION 2
THE ORIGINAL FACULTY 6
FORMAL OPENING 6
ORIGINAL EQUIPMENT AND COURSE OF STUDY 7
EARLY SCIENTIFIC AND POPULAR LECTURES 9
GROWTH OF THE INSTITUTE:
- GOVERNMENT 11
- FINANCE 13
- ADVANCEMENT IN THE COURSE OF STUDY 17
- SCHOLARSHIPS AND PRIZES 25
- ATTENDANCE 27
- THE FACULTY 29
- ALTERATIONS TO MAIN BUILDING, AND NEW BUILDINGS . . . 35

STEVENS SCHOOL 40
THE TWENTY-FIFTH ANNIVERSARY CELEBRATION OF THE FOUNDING OF THE INSTITUTE:
- THE BANQUET 41
- EXHIBITION OF THE WORK OF THE FACULTY AND ALUMNI . . 46

DEDICATION OF THE CARNEGIE LABORATORY OF ENGINEERING . . 55
INAUGURATION OF PRESIDENT HUMPHREYS 61

PAGE

THE ALUMNI ASSOCIATION 62
"STEVENS INSTITUTE INDICATOR" 65
STUDENT ENTERPRISES:
SOCIAL LIFE 66
ENGINEERING SOCIETIES 68
ATHLETICS 69
PUBLICATIONS 72
MUSICAL CLUBS 74
MISCELLANEOUS CLUBS AND COLLEGE CUSTOMS 75

II

THE STEVENS FAMILY

A FAMILY OF ENGINEERS 81
REMINISCENCES 95
RECOGNITION OF THE ENGINEERING ACHIEVEMENTS OF JOHN, ROBERT L., AND EDWIN A. STEVENS 99
BRIEF BIOGRAPHICAL RECORD 103
CLASSIFIED RECORD OF ENGINEERING WORK:
INTRODUCTION AND DEVELOPMENT OF THE STEAM-ENGINE FOR BOAT-PROPULSION 106
EARLY DAYS OF THE LOCOMOTIVE AND THE STEAM RAILROAD 111
INVENTION OF THE T-RAIL AND SPIKE 117
INVENTION OF THE ELONGATED SHELL FOR CANNON 121
THE STEVENS BATTERY 122
MISCELLANEOUS INVENTIONS 136
SUMMARY OF ENGINEERING WORK 143

III

BIOGRAPHIES

THE TRUSTEES 147
THE FACULTY. 165
THE ALUMNI 286

List of Illustrations

	Page
Henry Morton	Frontispiece
Edwin A. Stevens	1
Stevens Institute of Technology	3
Old Engineering Lecture Room	5
Old Lecture Hall	10
Old Workshop	12
Carnegie Laboratory of Engineering	15
Morton Laboratory of Chemistry (proposed)	17
Ground Floor of the Carnegie Laboratory of Engineering	19
Old Wood-Turning Room	21
Electrical Instrument Laboratory	23
One of the Enlarged Drawing-Rooms	33
New Wood-Working Room in East Basement	34
New Machine-Shop in West Basement	35
Forge and Molding-Room, with Foundry	35
New Auditorium in Central Wing of the Main Building	36
Stevens Institute, Showing Main Building with Terrace Removed, and Carnegie Laboratory of Engineering	37
Dynamo-Room in Electrical Laboratory	39
Exhibitions of Work at Twenty-fifth Anniversary:	
Exhibits in the Physical Laboratory,— Two Views	47, 49
Descriptive Geometry Models	50
Luminous Electric Tubes	51
Exhibits in the Library	53
Andrew Carnegie	56
Silver Box Containing a Piece of the Stevens or T-Rail of 1831	57
Allis-Corliss Cross Compound Engine in Carnegie Laboratory	59
Models of Bessemer Converter, Ingot Molds, Open-Hearth Furnace, and Blast Furnace	60
Colonel John Stevens	82

Page

Original John Stevens Boat-Engine of 1804 85
The Locomotive "John Bull" 86
The "Phœnix," the First Sea-Going Steamship 87
The Yacht "Maria" Rigged as a Sloop 89
Edwin A. Stevens 90
The Stevens Battery Shelling an Enemy's Fleet in the Bay of New York . . 93
The Stevens Battery Drawing Back After Ramming a Frigate 94
Castle Point Homestead in 1802 103
Colonel John Stevens 104
Castle Point Homestead in 1904 105
First Train on the Camden and Amboy Railroad 113
Experimental Locomotive on Private Track, Hoboken, N. J., 1826 115
Robert L. Stevens 117
Facsimile of Original Sketch of Cross-Section, Side-Elevation, and Ground-Plan of the First T-Rail 118
Facsimile of Bill for Altering Rolls Damaged in Making the First T-Rails . . 120
The Stevens Battery in Her Dry Dock 123
The Stevens Battery, Plan, Elevation, and Cross-Section 126
The "Naugatuck" 127
The Yacht "Maria" Rigged as a Schooner 139
Race Between Yachts "America" and "Maria" 140
The "Philadelphia," or "Old Sal" 141
Reduced Copy of Page 66 of "The Rosetta Stone Report" 167
Lecture by Henry Morton in Academy of Music, Philadelphia 169
Burning a Sword During the Course of a Lecture 171
Solar Eclipse, August 7, 1869. 173
Henry Morton 175
The Living Hand on the Screen 187
Illustration for a Humorous Poem. 191
Chromatic Photometer 205
Acoustic Experiment 207
Adjustable Model Showing Six Geometrical Surfaces 220
The Battle Between the "Monitor" and the "Merrimac" 221
Model Showing Intersecting Cones 222
Recording Instruments for Pressure, Temperature, and Electricity . 266, 267, 268

THE TRUSTEES

	Page		Page
Mrs. E. A. Stevens	147	Alexander T. McGill	154
William W. Shippen	147	Edwin A. Stevens	155
Samuel Bayard Dod	147	Richard Stevens	156
Henry Morton	150	Henry R. Towne	157
Andrew Carnegie	151	Alfred R. Wolff	159
Alexander C. Humphreys	152	George B. M. Harvey	161
Charles Macdonald	153		

THE ALUMNI TRUSTEES

A. P. Trautwein	158	L. H. Nash	160
William Kent	158	J. W. Lieb, Jr.	160
William Hewitt	158	G. J. Roberts, Jr.	162
E. B. Wall	158	A. S. Miller	162
Durand Woodman	158	W. L. Lyall	162
F. E. Idell	160	C. H. Page, Jr.	162
G. M. Bond	160	E. A. Uehling	162
H. deB. Parsons	160		

THE FACULTY

Henry Morton	164	T. B. Stillman	254
A. C. Humphreys	194	D. S. Jacobus	257
A. M. Mayer	203	Adam Riesenberger	263
R. H. Thurston	210	C. A. Carr	264
Edward Wall	218	W. H. Bristol	265
C. W. MacCord	219	A. F. Ganz	270
A. R. Leeds	223	F. DeR. Furman	272
C. F. Kroeh	229	S. D. Graydon	274
De Volson Wood	234	F. L. Pryor	275
W. E. Geyer	239	F. L. Sevenoak	276
J. E. Denton	241	E. R. Knapp	277
J. B. Webb	245	W. J. Moore	279
Coleman Sellers	250	C. O. Gunther	279

THE FACULTY—Continued

	Page		Page
F. J. Pond	280	L. A. Martin	283
C. B. LePage	281	H. W. Johnson	283
W. A. Shoudy	282	F. M. Hummel	284

Portraits of the Alumni and Illustrations of Their Work, Arranged in Alphabetical Order 287–630

Portraits of Associate Members of the Alumni Association, and Illustrations of Their Work 631–634

The Class of 1903 636

The Class of 1904 640

I

History of the Institute



Edwin A Stevens

I

History of the Institute

INTRODUCTION

THE official history of the Stevens Institute of Technology dates from April 15, 1867, when Mr. Edwin Augustus Stevens, in his will, bequeathed a block of land adjoining the family estate at Castle Point, Hoboken, N. J., $150,000 for the erection of a building, and $500,000 as an endowment, for an "institution of learning."

Although unexpressed in his will, it is known that Mr. Stevens had in mind an institution devoted to the advancement of the mechanic arts, to which he had contributed in no small degree. He was the surviving member of a family trio — father and two sons — of pioneer engineers whose achievements gave the first great impetus to mechanical engineering in America. Of the remarkable work accomplished by these three men, the world at large knows but little, doubtless owing to their modesty and to their absolute independence of public support, which permitted them to carry on quietly and unobservedly the construction of steam engines and machinery at a time when such devices were little known and were looked upon with distrustful eyes. And then, when these men demonstrated, by actual operation, the success of their work, there were none whose financial interest prompted them to herald the news far and wide. In those days there were no great newspapers, no telegraphs, no railroads, no steamboats.

Before the close of the eighteenth century, Col. John Stevens was engaged in constructing a private steamboat which he operated on the Hudson River in 1804, three years before Fulton's "Clermont" was employed as a commercial enterprise. In 1808 he placed in commission the "Phœnix," which, in its trip from Hoboken to Philadelphia under the supervision of his son Robert Livingston Stevens, was the first steamboat to brave the ocean. While the construction of the Erie Canal was under discussion by the legislators of New York State in 1812, Col. John Stevens earnestly petitioned them to construct a railroad instead of the canal, and ventured to predict that an average speed of thirty miles per hour could be attained, and that sixty miles might be. Twenty years later he built as a private venture, on his own estate in Hoboken, the first locomo-

tive and railroad track in America. This was soon followed by the construction of the Camden & Amboy railroad, now a part of the Pennsylvania System.

During the war with England, in 1813, Robert L. Stevens invented the elongated shell to be fired from cannon, the secret of which he disposed of to the United States government. In 1814 Col. John Stevens projected a circular iron fort to be revolved by steam, and under his direction his son Edwin Augustus carried on experiments to determine the results of firing cannon against iron plating. As a result, the brothers Edwin and Robert conceived the plan of applying iron plating to war-vessels, and in 1841 entered into negotiations with the United States for the first armor-plated battle-ship.

Such were the great inventions and enterprises of the Stevens family of engineers. In the development of their plans, however, it was necessary to invent many matters of detail in themselves of no small importance. Thus, when John Stevens invented the tubular boiler and applied the principle of the screw to propeller-blades, there was no patent protection in this country, and so, on his petition, the patent law of April 10, 1790, was passed. In connection with the work of railroad development Robert L. Stevens invented, in 1830, the T-rail which is now in universal use for track-construction on steam roads. Not only these, but many other inventions, could be credited to the Stevens family of engineers at this point; but that would not be in line with the purpose of this section of the volume, which is to relate the history of Stevens Institute.

In this brief mention of the work of these three men, the curtain has been drawn for a vision of the real beginning of the history of the Stevens Institute of Technology,— unofficial, of course, but history none the less, for it reveals the solid foundation on which rests the name of Stevens.

In this firm substructure the Stevens man will ever take the deepest pride. The prestige not only of a great name in his profession, but of a name that must be for ever associated with the earliest engineering achievements, is his.

Technical literature contains no theme of more surpassing interest than, collectively, do numerous family records, commercial papers, and government documents relating to the work of John, Robert L., and Edwin A. Stevens. These muniments, now widely distributed and in the aggregate voluminous, have been assembled, and extracts made for incorporation in this volume. Those who desire to pursue further this portion of the Institute's early tributary history will find the material in Book II.

ORGANIZATION

The death of Mr. Edwin A. Stevens occurred in 1868. His will provided that within two years after his decease his executors should erect a suitable building "of some substantial but economical material," and that they should within

three years " establish the institution for the benefit, tuition, and advancement in learning of the youth residing, from time to time hereafter, within the State of New Jersey."

The executors of his will were also appointed Trustees of the new institution. They were : Mrs. Edwin A. Stevens, his wife ; Mr. W. W. Shippen, his friend and co-worker in his later years; and Mr. S. B. Dod, his brother-in-law.

Soon after the death of Mr. Stevens the executors began the fulfillment of their trust. They decided that the new institution should be a school of technol-



Stevens Institute of Technology

ogy, and accordingly an act incorporating the Stevens Institute of Technology was approved February 15, 1870.

Plans for the building were drawn by Mr. R. M. Upjohn, a prominent New York architect. They called for a more pretentious building than the one constructed, including a spire rising fifty feet above the present tower, as well as two smaller spires thirty-five feet high, one at each of the rear corners of the main building, directly over the side entrances: but for economy's sake and other reasons these ornaments were dispensed with, as was also the east wing, which, however, was added a year later to make room for the Stevens High School, which was then organized by the Trustees.

During the summer of 1870 Professor Henry Morton, who then occupied the Chair of Chemistry at the University of Pennsylvania, and who was at the

same time secretary and editor of the "Journal of the Franklin Institute," was selected as President of the new institution.

With absolutely no precedent for a course of study in mechanical engineering, Mr. Dod and President Morton engaged upon the preparation of a general plan which was adopted at the start, and has endured without essential change to the present day. The subjects of Electrical Engineering and Business Engineering, which have developed in recent years, have been added, and the original subjects pruned and grafted to meet advancing requirements; but the general plan as stated in the first Catalogue, or Announcement, in 1871, remains substantially as the foundation for the present course. That this can be said after a test of thirty-three years speaks well for the wisdom and foresight shown in the preparation and adoption of the original plan, which was as follows:

"It was determined, as has been stated, to create a school of mechanical engineering, and as this was to be of a high educational order, and to involve a general and not a merely industrial training, it was thought best to give to the new Institute the title of 'Technology,' and thus, in memory also of its munificent founder, it is called The Stevens Institute of Technology.

"The plan of instruction to be pursued is such as may best fit young men of ability for leading positions in the department of mechanical engineering, and in the pursuits of scientific investigation, from which this and all the sister arts have derived, and are daily deriving, such incalculable benefits.

"With this view it is intended,—

"1st. To afford a thorough training in the elementary and advanced branches of mathematics in so far as these are useful means of investigation and of work, and not themselves the ends and objects of labor.

"2d. To give a thoroughly practical course of instruction in physics, by means of physical laboratories, in which the students will be taught to make, and caused to make for themselves, experimental researches as to the laws of nature bearing upon the subjects of their special study. Thus the student will be made to develop for himself the laws of flexure of beams variously supported, of torsional, compressive, or tensile strain, and the relations of strength to form and nature of material; doing all this by means of apparatus which will be put into his own hands, and which he will be taught to use.

"Or, again, he will be instructed in the relations of temperature to tension of vapor, of specific and latent heat, of radiation and absorption of heat, and the like; not by lessons learned from a book, or a preceptor alone, but by experiments conducted by himself and with instruments actually in his own hands.

"By such means as this, not only will the facts and laws be impressed in a manner which no other process can approach, but a training will be given in methods of investigation which will be invaluable for the master of the always new and varied problems of actual work.

"3d. The subject of mechanical engineering, in reference to the theory and practice of construction of machines, will form, like the others, a distinct department under the charge of a special Professor, experienced in the practical relations of his subject, and enabled to devote his entire attention to this branch.

"4th. The subject of mechanical drawing, which may well be called the language of engineering, comprising the use of mathematical instruments and water-colors, elemen-

tary projection and perspective, with descriptive geometry, including orthographical, isometric, and spherical projection, will likewise form a separate department, to which a large amount of time and attention will be devoted.

"5th. The subjects of chemistry and metallurgy will likewise be thoroughly taught, with all the modern appliances of working laboratories, etc., as will be seen on reference to the plans of the various stories of the building. . . .

"The reduction and working of the useful metals will be included in this depart-



Engineering Lecture Room

ment, and will be practically illustrated by means of a series of metallurgical furnaces constructed for this purpose.

"6th. The French and German languages will be an essential part of the course of instruction, since they are of incalculable value to the engineer and man of science, as the vehicles of a vast amount of new information in his special subjects, and also as affording that kind of mental culture which mathematical and physical science, if followed exclusive, would fail to supply.

"7th. A department of belles-lettres will also be included, and will furnish the means of acquiring that cultivation of literary taste and the facility of graceful use of language, both in speaking and writing, which is as desirable in the engineer and man of science as in the classical student."

THE ORIGINAL FACULTY

During the time that the plans were thus being matured and the building under construction, the Trustees, again assisted by President Morton, were selecting the following Faculty. Their previous positions are given in parentheses following the names:

Henry Morton, Ph.D. . . . . *President*
(Professor of Chemistry, University of Pennsylvania; and Secretary, and Editor of the "Journal," of the Franklin Institute)

Alfred M. Mayer, Ph.D. . . . . *Professor of Physics*
(Professor of Physics and Astronomy, Lehigh University)

Robert H. Thurston, C.E. . . . . *Professor of Mechanical Engineering*
(Engineer Officer, United States Navy, detailed as Professor of Natural and Experimental Philosophy at the United States Naval Academy)

Lieut.-Col. H. A. Hascall . . . . . *Professor of Mathematics*

Charles W. MacCord, A.M. . . . . *Professor of Mechanical Drawing*
(Chief Draughtsman for Captain John Ericsson)

Albert R. Leeds, A.M. . . . . *Professor of Chemistry*
(Professor of Chemistry in Philadelphia Dental College, followed by study and research at the University of Berlin)

Charles F. Kroeh, A.M. . . . . *Professor of Languages*
(Professor of French and German, Lehigh University)

Rev. Edward Wall, A.M. . . . . *Professor of Belles-Lettres*
(Engaged in the Ministry)

Owing to ill health Prof. Hascall taught only a few months, and was succeeded at the end of the first year by Prof. De Volson Wood, who was the first to carry out a plan for the Department of Mathematics, and who might therefore be said to be practically its first Professor. Prof. Wood came from the University of Michigan, where he had occupied the Chair of Civil Engineering.

FORMAL OPENING

The summer of 1871 found all the essential preliminary arrangements practically completed, and on the third Wednesday of September of that year the doors of Stevens Institute were first thrown open for the reception of students. During the first year 21 students were in attendance,— 2 Juniors, 3 Sophomores, and 16 Freshmen.

In June, 1873, the Institute graduated its first class, which consisted of but one member, Mr. J. Augustus Henderson, who thus became the first to receive the legal degree of Mechanical Engineer. After graduation Mr. Henderson was in the iron shipbuilding business in this country and in Russia, and later in the United States Navy, from which he is now retired, living at State College, Center County, Pa.

ORIGINAL EQUIPMENT AND COURSE OF STUDY

That the plan for the course of study might be carried out in the most efficient manner, no effort was spared in securing a complete equipment of apparatus to exemplify the teaching of the theoretical part of the course.

The equipment of the Physical Laboratory was unusually complete, and, it is believed, second to none in the country at that time. It included valuable instruments for illustrating actions in molecular physics, elementary mechanics, acoustics, heat, electricity, and optics, most of which came from Salleron, of Paris, Koenig, Simon, Béclard, Graham, Bunsen, Ritchie, and others ; a chronoscope from Hipp, of Neuchâtel, sufficiently delicate to measure the one-thousandth part of a second and demonstrate the law of falling bodies at a height of 18 inches; many instruments used in the classical researches of Dalton, Gay-Lussac, Dumas, and Regnault; an electro-magnet weighing nearly a ton, and containing in its eight spools some 2,000 feet of wire one fifth of an inch in diameter,— the largest then in existence; also the then famous collection of optical instruments purchased from the estate of Charles N. Bancker, of Philadelphia. This latter collection covered the whole range of optical discovery, and was said by Abbé Moigno ("Cosmos," 1859, p. 557) to be "the most numerous and brilliant that exists in the world."

The Department of Chemistry started with a large collection, including a cabinet of minerals, rocks, fossils, and models of crystals, comprising in all about 5,500 specimens ; a cabinet of ores and metallurgical products; a cabinet of chemical substances arranged according to their chemical relationships; cabinets of applied and industrial chemistry; and a museum of apparatus pertaining to chemical physics and applied chemistry.

The Department of Mechanical Drawing was equipped with a set of models of geometrical surfaces by Olivier, of Paris; a set of models of problems in descriptive geometry from Schröder, of Darmstadt; and a large collection of drawings.

The executors of the Stevens Estate and a large number of individuals and prominent engineering firms are recorded as having shown their interest in the proposed work of the new institution by making interesting and useful and in many cases valuable contributions of engines, machinery, engineering apparatus, iron and steel samples, etc., to the Engineering Department. These contributions were frequently augmented from government and commercial and private sources, so that in a few years the practical equipment of this Department was unusually complete.

This entire equipment served as a valuable supplement to the detail of the curriculum, a brief statement of which is given in a later subdivision on the "Advancement in the Course of Study" (p. 17). For the present purpose it is sufficient to outline the foundation on which the Trustees and the President had

planned their future work in the class-room, laboratory, and shop. This is revealed in the "Requirements for Admission" as they appeared in the first Catalogue, or Announcement, which was issued in the year 1871, from which the following is quoted:

"Candidates for admission to the first year of the course should not be less than sixteen years of age, and must be prepared to pass a satisfactory examination in English grammar, geography, arithmetic, algebra — including quadratic equations, plane geometry, as given in Davies's 'Legendre,' plane trigonometry — solution of plane triangles.

"Candidates for admission to the higher classes must be prepared to pass a satisfactory examination in the studies previously pursued by the classes which they propose to enter.

"Advanced students and men of science desiring to avail themselves of the appliances of the laboratories of Stevens Institute, to carry on special investigations, may make arrangements to that end with the President."

It may be of interest briefly to compare these requirements with those of the present day, as set forth in the Institute Catalogue of 1903–04. The terms of admission to the Freshman class in 1903 were that the candidate should be seventeen years of age and pass satisfactory examinations in arithmetic, algebra —"all the matter contained in any good University 'Algebra,' not including the solution of equations higher than the second degree nor the general theory of equations"; all of plane, solid, and spherical geometry; all the fundamental formulæ of plane trigonometry; English classic literature; American history; mechanics, hydrostatics, and pneumatics in physics; and "as much of chemistry as is contained in the first eleven chapters, and in chapters 15, 16, and 17, of Newth's 'Elementary Inorganic Chemistry'."

From the start there has been but one regular course of study, and this leading only to the degree of Mechanical Engineer. During the early history of the Institute, however, when there were accommodations for more than the number of regular students then in attendance, special students were received, and graduates from other institutions were allowed to pursue a special course of study in either the Physical or Chemical Laboratory, or both, at the satisfactory conclusion of which the Institute gave the degree of Bachelor of Science or of Doctor of Philosophy. Although a number of special students availed themselves of the opportunity thus offered for a special training in physics or chemistry, only seven received degrees, as follows:

William E. Geyer, B.S., 1877, Ph.D., 1880
John F. Kelly, B.S., 1878, Ph.D., 1897
Brown Ayres, B.S., 1878, Ph.D., 1888
William M. Dougherty, B.S., 1878
Wilbur V. Brown, B.S., 1880, Ph.D., 1888
Durand Woodman, B.S., 1880, Ph.D., 1887
Thomas B. Stillman, Ph.D., 1883

All other graduates of the Institute have the degree of Mechanical Engineer.

At different times the Institute has conferred honorary degrees as follows:

Doctor of Philosophy

Prof. Henry Wurtz, 1877
Prof. John P. Rice, 1880
Prof. Samuel P. Langley, 1881
Prof. A. A. Michelson, 1887

Doctor of Engineering

E. D. Leavitt, Jr., 1884
R. H. Thurston, A.M., LL.D., 1885
Coleman Sellers, 1888
Francis B. Stevens, 1890
Rear-Adm. George W. Melville, U.S.N., 1896
J. Elfreth Watkins, 1900

Honorary Degree of Electrical Engineer

John W. Howell, 1899
Joseph Wetzler, 1899

Honorary Degree of Mechanical Engineer

Clarence A. Carr, 1884
Frank M. Leavitt, 1899
Walton Clark, 1903

EARLY SCIENTIFIC AND POPULAR LECTURES

At the time of the opening of the Institute lectures were given weekly during the college year for several years, in addition to the regular collegiate course. These courses of lectures were divided into two classes, Popular and Technical, which were open not only to the students but to the general public on the purchase of tickets. These lectures were held in the evenings in the large lecture hall, which had a seating-capacity of over 600. This hall was situated in the central wing of the main building, where the machine-shop was located for many years. To quote from the Catalogue of 1871:

"The Popular course will be composed of lectures on such general subjects as would be likely to interest the public at large; and the Technical course will consist of lectures by experts in various branches bearing on the general objects of this school. and presumably of interest chiefly to engineers and men of science."

Popular Course

Prof. G. F. Barker, M.D., of New Haven. On Spectrum Analysis. Four Lectures.
Prof. Stephen Alexander, LL.D., of Princeton. On the Nebular Hypothesis. Two Lectures.
Prof. A. M. Mayer, Ph.D., of the Stevens Institute. On Magnetism. Two Lectures.
Prof. A. R. Leeds, A.M., of the Stevens Institute. On Chemistry. Two Lectures.
Prof. Chandler, Ph.D., of Columbia College. On Water. One Lecture.
Pres. Henry Morton, Ph.D., of the Stevens Institute. On the Eye and Vision, and on Polarized Light. Two Lectures.

Technical Course

Mr. A. S. Holley, C.E., of Troy, N. Y. On Bessemer Works. Two Lectures.

Mr. Coleman Sellers, C.E., of Philadelphia, Pa. On Transmission of Motion.

Prof. J. E. Hilgard, U. S. Coast Survey, Washington, D. C. On Methods of Precision in Weighing and Measuring. One Lecture.

Prof. R. H. Thurston, M.E., of the Stevens Institute. On the History of the Modern Steam Engine and the Direction of Its Future Development, and on the Relations of the School to the Workshop. Two Lectures.



Old Lecture Hall

GROWTH OF THE INSTITUTE

GOVERNMENT

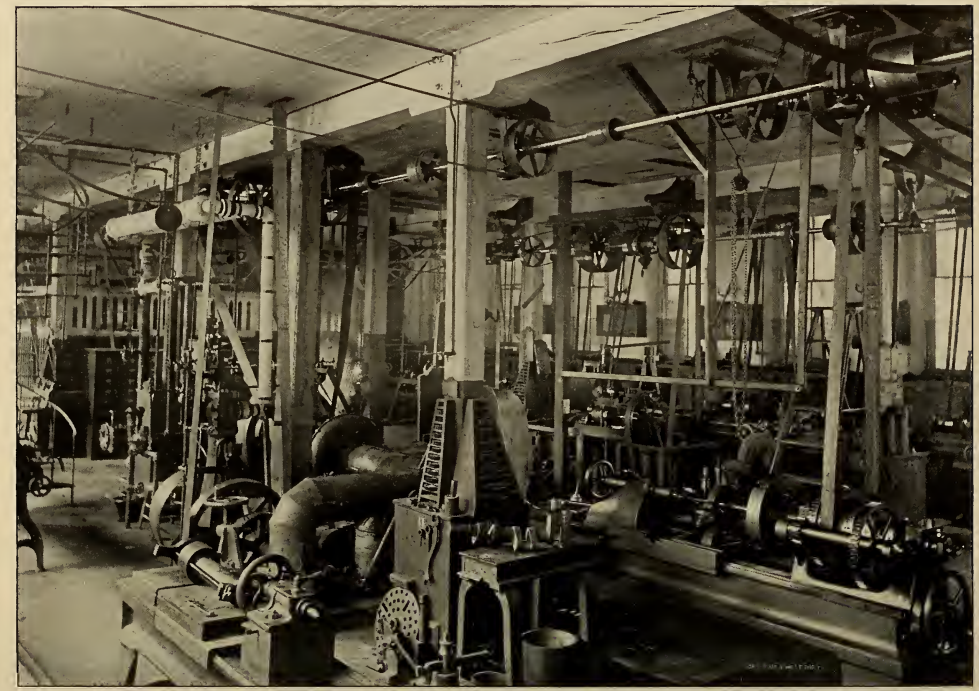
The Stevens Institute of Technology is governed by a Board of Trustees which originally consisted of the three members appointed by Mr. Edwin A. Stevens in his will. They were, as already stated, Mrs. Martha B. Stevens, Mr. William W. Shippen, and Mr. Samuel B. Dod, who conjointly managed the affairs of the Institute for sixteen years until the death of Mr. Shippen, which occurred in 1885, when President Henry Morton, Ph.D., was elected to fill the vacancy.

During the year 1886 the Alumni Association, which had then been in existence for more than ten years, and which was not without influence in the affairs of the Institute, resolved that it was important to the best interests and the most satisfactory growth of the Institute "to have representation by one of its members, who was to be known as the Alumni Trustee, in the government of the institution," and embodied this resolution in a memorial to the Board of Trustees, which promptly expressed its approval. According to the conditions of its charter it was necessary for the Board of Trustees to elect its own members, and the Alumni Association was therefore instructed to present two or more names to the Trustees for their action. This was done, with the result that Mr. Alfred P. Trautwein, M.E., of the Class of 1876, was selected in 1887 to serve as Alumni Trustee for a term of three years, at the expiration of which time Mr. William Kent, M.E., '76, was elected to succeed him.

In the year 1891 the Board of Trustees deemed it expedient still further to increase its membership, and accordingly five new permanent Trustees were then elected, as follows: Messrs. Andrew Carnegie, Alexander C. Humphreys, M.E., and Charles MacDonald, C.E., of New York city; Alexander T. McGill, Chancellor of New Jersey, Jersey City; and Col. Edwin A. Stevens, of Hoboken.

In December of 1891 the Trustees granted to the Alumni Association two additional representatives on their Board, making three in all.

The two Alumni Trustees then elected were Mr. William Hewitt, M.E., '74, for two years, and Mr. Alfred R. Wolff, M.E., '76, for three years, provision having been made that in the future there should always be three Alumni Trustees to serve three years each, one being elected each year. In 1893 Mr. Kent was succeeded by Mr. Edward Wall, M.E., '76, who died the following year; Mr. Durand Woodman, Ph.D., '80, being elected to fill the vacancy. At the same time Mr. Frank E. Idell, M.E., '77, was elected for a full term; and since then Mr. George M. Bond, M.E., '80; Mr. Harry de B. Parsons, M.E., '84; Mr. Lewis H. Nash, M.E., '77; Mr. John W. Lieb, Jr., M.E., '80; Mr. George J. Roberts, M.E., '84; Mr. W. L. Lyall, M.E., '84; Mr. Alten S. Miller, M.E., '88; Mr. Carter H. Page, Jr., M.E., '87, and Mr. Edward A. Uehling, M.E., '77,— have been elected.



The Old Workshop in the Central Wing, now Occupied as an Auditorium

In 1899 the Board of Trustees lost by death Mrs. Martha B. Stevens, and in 1900 Chancellor Alexander T. McGill.

Mr. Richard Stevens, a son of the founder, was elected a member of the Board of Trustees in 1896, and Mr. Henry R. Towne, senior member of the Yale & Towne Manufacturing Co., in 1900. In the latter year Mr. Alfred R. Wolff, M.E., of the class of '76, was elected a permanent trustee. Col. G. B. M. Harvey is the latest member of the Board of Trustees, having been elected in February, 1903. In June, 1903, Mr. MacDonald resigned.

The officers of the Board of Trustees at the present time are: Mr. Samuel Bayard Dod, President; Mr. Andrew Carnegie, Vice-President; Col. E. A. Stevens, Treasurer; President Alexander C. Humphreys, M.E., Sc.D., LL.D., Secretary.

FINANCE

The founding of the Institute was, as has been stated, the result of the bequest, by Mr. Edwin A. Stevens, of a block of land, a building fund of $150,000, and an endowment fund of $500,000.

The $500,000 endowment fund was depleted at the outset to the extent of $45,000, levied by the United States government as a "collateral inheritance tax." This tax was the result of Congressional legislation passed, along with many other special taxes, to replenish the coffers of the United States government, which had been very much diminished by the Civil War. The Trustees of the Institute promptly paid their assessment, which amounted to a little more than the above-mentioned sum, early in the year 1869. Not more than six or seven months after this, all those who had delayed, or who had not made payment, as well as all others, were exempted from this tax. Under these circumstances the Trustees made a number of attempts, and brought to bear the influence of prominent men at Washington, to have this much-needed money refunded, but without avail.

The income from the endowment fund, and a tuition fee of $75 a year from each student, were the means at first available to maintain the Institute.

But the development of the course of instruction upon the high educational plane which had been mapped out involved the expenditure of large sums of money for maintenance and operation of machinery and apparatus, for which the income derived from the above sources was soon found inadequate.

For this reason the tuition fee was increased in 1875 to $150 per annum;[1] and with this addition to the receipts, the requirements of the Institute were satisfactorily met for a number of years.

When, however, in 1881, the need of better facilities in the shop-work course became pressing, there were no funds available for the purpose. At this time President Morton came to the assistance of the Board of Trustees by con-

[1] This tuition fee of $150 is for students residing in the State of New Jersey. Non-residents are charged $75 extra under a clause in Mr. Stevens's will.

tributing the sum of $10,500 toward fitting up the workshop in the middle wing of the building.

In 1883 the Department of Applied Electricity was established, toward which President Morton contributed $2,500 for electrical apparatus, and additional amounts to defray the running expenses for two years. In 1889 he endowed the Chair of Engineering Practice, contributing for the purpose the sum of $10,000. In 1892 President Morton supplemented this contribution with another of $20,000 for the same purpose, with the proviso that the income be applied to the Alumni Building Fund until the amount required for the Alumni Building is complete.

At the time of the Twenty-fifth Anniversary of the Institute in 1897 President Morton presented to the Trustees, for the Alumni Building Fund, securities which were sold the next year for $24,000; and during 1900–01, at a cost of $15,000, he erected, in connection with the Carnegie Laboratory of Engineering, a boiler-house to supply steam for the entire group of buildings.

In 1901 President Morton placed in the hands of the Trustees $50,000, in five per cent first-mortgage bonds, as an endowment fund, primarily for the care and maintenance of the proposed Alumni Building, for which $60,000 had then been collected. To this was added, at President Morton's suggestion, the $30,000 before given by him for the founding of a Chair of Engineering Practice, the entire fund being designated, by a resolution of the Trustees, as "The Henry Morton Endowment Fund." President Morton also suggested that the income from this fund, if at any time no longer required for the maintenance of the Alumni Building, should be converted into a Retiring Pension Fund for Instructors incapacitated while in the employment of the Institute.

In addition to the above gifts President Morton frequently contributed smaller sums for apparatus and machinery to be used for purposes of instruction. His gifts in the aggregate amounted to $145,000.

It should be here recorded that the Alumni of the Institute recognize that to President Morton is due no small share of the credit for the success of the institution, both for the able manner in which he performed the duties of his office, and for his generous contributions made at what may be considered critical periods of the Institute's existence.

Upon the occasion of the Twenty-fifth Anniversary Mrs. Martha B. Stevens, widow of Mr. E. A. Stevens, the founder of the Institute, gave a plot of ground consisting of two lots, with a house valued at $30,000. This property was occupied by President Morton as his residence up to the time of his death.

On June 20, 1899, President Morton received a letter from Mr. Andrew Carnegie, dated Skibo Castle, Dornoch, Scotland, May 20, in which he stated:

"It would give me the very greatest pleasure to devote $50,000 to the building of the Engineering Laboratory as you suggest.

"We owe much to Stevens, for many valuable men have come to us from it."

The Trustees acted on this letter at once, and by the following August three sets of plans were prepared and submitted to Mr. Carnegie, who chose the one whose exterior view is illustrated on this page. The architectural design is based upon a simplified Roman arcade placed upon a basement and surmounted by a Corinthian entablature. The interior of the building is of steel construction, and it is fireproof throughout. Owing to a rise in the cost of building material, Mr. Carnegie increased his gift to $65,000, and on June 7, 1900, ground was broken for the new Laboratory. Although practically completed in the fall of



Carnegie Laboratory of Engineering

1901, it was not fully equipped until February 6, 1902, when the dedicatory exercises took place, Mr. Carnegie presenting the keys of the building to Mr. Dod, the President of the Board of Trustees. The next morning Mr. Carnegie directed that a check for $100,000 be sent to President Morton "on account of endowment of the Carnegie Laboratory of Engineering." After the inauguration of President Humphreys in February, 1903, Mr. Carnegie completed the endowment of the Carnegie Laboratory of Engineering by an additional gift of $125,000 in bonds of the Pittsburg, Bessemer, & Lake Erie Railroad Co., thus making a total endowment of $225,000.

Early in the 'nineties the Alumni Association started a fund for the erection of a building for the departments of Physics and Chemistry. Upon the death of Professor Mayer, in 1897, the work of the Department of Physics was divided between the Department of General Physics and the Laboratory of Engineering Physics, which last replaced the former Physical Laboratory.

In 1901 a Laboratory of Engineering Physics was provided by Mr. Carnegie's gift, as mentioned above, and then it was decided to devote the money collected in the Alumni Building Fund to the erection of a Chemical building alone. This fund, amounting to about $60,000 in 1901, consisted largely of the above-named benefactions by President Morton. It remained at this figure until the fall of 1902, when, through the efforts of President Humphreys, it was increased to $90,000, entirely by further subscription from the Alumni. Subscriptions are still coming in, and the sum of $120,000 is hoped for. The general features of the exterior design for the building, which will be called the Morton Laboratory of Chemistry, are shown in the accompanying illustration.

In February, 1903, Col. Edwin A. Stevens and Mr. Robert L. Stevens, both sons of the founder of the Institute, jointly gave a tract of land, 196 × 100 feet, close to the Institute grounds, for the erection of a dormitory thereon. Although not yet actually in hand, President Humphreys has secured provisional subscriptions from friends of the Institute for the erection of the dormitory building, or rather buildings, as the construction is to be carried on as demand arises; and when all is completed there will be a large building with several wings.

By the will of Dr. Jacob Vreeland, of Poughkeepsie, the Institute received, in 1888, the sum of $11,000 to hold in trust, the income to be used in "assisting indigent and deserving young men to acquire a liberal education at said Institute." Students receiving this assistance are, by the terms of the will, required to give bonds for their indebtedness payable within a reasonable time after leaving the Institute, which payment, with accrued interest, shall be added to the fund. Little was known concerning Dr. Vreeland or how he came to look upon the Institute and to regard its course as a desirable endowment for deserving young men of talent.

Under the arrangements for the endowment of scholarships, accepted by the Trustees, the American Railway Master Mechanics' Association contributed $8,000 in 1891, thus establishing four scholarships which are open only to sons of members of said society.

A scholarship confers the privilege of attending the entire course of the Institute for four years free of all charge for tuition, provided, of course, the student holding the scholarship keeps up in all cases with the standard of proficiency and good conduct required.

The Morton Scholarship was established in 1882 by a gift of $2,500 from President Morton.

On March 17, 1902, Mr. Alexander C. Humphreys, M.E., of the Class of 1881, now President Humphreys, gave $5,000 to the Institute as an endowment for a scholarship in memory of his son Harold, who was drowned in the river Nile, between Assouan and Luxor, February 12, 1901, while endeavoring to save his brother from a similar fate. Harold Humphreys was a member of the Class of



Morton Laboratory of Chemistry (as planned), Showing Carnegie Laboratory of Engineering and West Side of Main Building

1899 and was the first son of a graduate of Stevens to take a degree from the Institute. He was on his wedding tour when the sad accident occurred. The younger brother, Crombie, aged 7, was also drowned. This scholarship will be known as the Harold Humphreys Scholarship.

ADVANCEMENT IN THE COURSE OF STUDY

The subjects in the course of study, as arranged under the general plans adopted at the opening of the Institute as already referred to, included briefly algebra; geometry; analytical geometry; trigonometry; differential and integral

calculus; analytical mechanics; resistance and properties of materials; theory of bridge-building; machine and engine design; elementary drawing; descriptive geometry; shades and shadows; kinematics; elements of mechanism; general properties of matter; pneumatics and general laws of vibratory motions and acoustics; heat, and laws of action of heat engine, and meteorology; light; magnetism; electricity; experimental investigations in the Physical Laboratory; chemistry of non-metallic elements; stoichiometry; chemistry of metals; laboratory exercises; quantitative analysis organic chemistry; determination of minerals in laboratory; crystallography; metallurgy; composition and rhetoric; English language; English literature and history; French and German, with Spanish, Italian, or Portuguese elective; inspection trips to manufacturing establishments; and a graduating thesis consisting of a written report of some technical investigation, affording an opportunity for the practical application of the theoretical principles studied at the Institute.

These subjects have, in general, been constantly followed up and developed, and the course at the present day has the same high efficiency that it has always had. Nothing would demonstrate this better than a complete account of the work now being done in each Department, but in view of the fact that this is ever changing and always accessible in the latest Institute Catalogue, no attempt is here made to give more than a brief historical account of the more important steps in the advancement of the course of study.

The first notable progress made was the establishment of a Mechanical Laboratory in 1875. It was equipped with testing-machines and a large amount of other apparatus employed for testing purposes which was subsequently greatly increased by purchases of apparatus made with the proceeds from amounts received for tests. These tests were conducted for a clientage which included many manufacturers of machinery and of the various materials of engineering; for the United States government, which submitted for test material used in the construction of its public buildings; for several of the railroads of the country, etc. Students assisted largely in conducting these tests, and thus obtained a practical experience of value in connection with their regular study.

This feature of the Institute's work has always been maintained, and has been and is the means of keeping the Faculty and students — the latter by actual participation and by lectures from those of the Faculty engaged on the work — in direct contact with the outside engineering and business world, which is constantly offering important engineering problems for solution.

For a number of years previous to 1881 the shop-work course was arranged so that, after a prescribed set of exercises in carpenter-work and wood-turning, millwrighting and steam-fitting, machinist-work, blacksmithing, molding, founding, and pattern-making had been performed by a class, the students were permitted to complete the course by constructing some machine.

Thus the Class of 1876 built a Thurston autographic testing-machine,

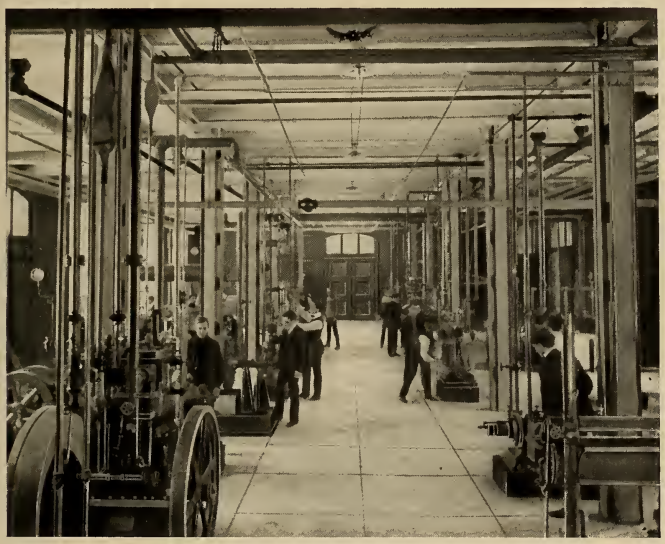
several important features of the design having been previously planned in the drawing-room.

The Class of 1877 built a lubricant testing-machine.

A part of the Class of 1878 assisted in the design and construction of a large oil-tester, while other portions of the class designed and constructed a Prony dynamometer, a small horizontal engine, and a small oscillating engine.

The Class of 1879 built an autographic transmitting dynamometer.

The Class of 1880 assisted in the construction of a 3½-horse-power compound condensing engine.



Ground Floor of the Carnegie Laboratory of Engineering

The construction of a machine as a final exercise in the shop was thereafter discontinued. Subsequent classes devoted the time which had been so spent to the performance of more extended series of exercises in the various branches of the shop course.

About the time this change took effect, the shop course was also considerably extended, and a course in experimental mechanics inaugurated.

This course included, as then planned, a series of sixteen experimental exercises comprising, among others, a test of the evaporative power of boilers;

experimental determination of the total heat of combustion of coal used in boiler tests, and comparison of this heat with that computed from the analysis of the coal; measurement of the friction of steam flowing through pipes; comparison of efficiency of steam pump and injector.

ORDER OF EXERCISES IN EXPERIMENTAL MECHANICS, CLASS OF 1902

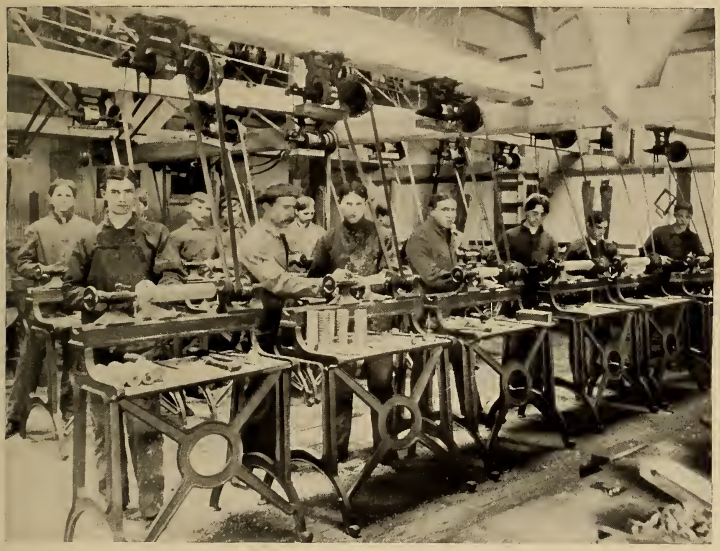
Supplementary Term, June and July, 1901. Nos. 1 to 18 refer to groups of students

SUBJECT	INSTRUCTOR	TIME OF TESTS	JUNE								JULY										
			T 20	F 21	S 22	M 24	T 25	W 26	T 27	F 28	S 29	M 1	T 2	W 3	F 5	S 6	M 8	T 9	W 10	T 11
Elasticity of Timber and Metals	Scott . .	9:00 to 10:30																		
Physical Test of Lubricating Oils	Scott . .	10:30 to 11:30																		
Safety Valves	Scott . .	11:30 to 12:30	1	10		2	11		3	12	4 13	5	14	6	15	7	16	8	17	9	18
Condensation of Steam in Coils	Scott . .	1:30 to 2:30																			
Friction Test of Lubricating Oils	Scott . .	2:30 to 3:30																			
Radiation of Pipes	Scott . .	3:30 to 5:00																			
Hot Air Engine	Meeks . .	9:00 to 10:30																			
Westinghouse Air Brake	Meeks . .	10:30 to 11:30																			
Test of Thermometers and Indicators	Meeks . .	11:30 to 12:30																			
Ejector	Meeks . .	1:30 to 2:30	2	11		3	12		4	13	5 14	6	15	7	16	8	17	9	18	1	10
Exhaust Injector	Meeks . .	2:30 to 3:30																			
Injector	Meeks . .	3:30 to 4:30																			
Refrigeration by Means of Air	Meeks . .	4:30 to 5:30																			
Jet Condensing Engine Test	Parker .	9:00 to 12:30																			
Simple Engine Test	Parker .	1:30 to 2:00																			
Centrifugal Fan	Parker .	2:00 to 2:30	3	12		4	13		5	14	6 15	7	16	8	17	9	18	1	10	2	11
Baker Blower	Parker .	2:30 to 4:00																			
Jet Blower	Parker .	4:00 to 5:00																			
Test of Boilers	Layat . .	7:30 to 5:30	4	13		5	14		6	15	7 16	8	4	9	18	1	10	2	11	3	12
Gas Analysis, etc.	Layat . .		9	18		1	10		2	11	3 12	17	13	5	14	6	15	7	16	8	17
Friction of Belting	Siegele .	9:00 to 10:00																			
Buckeye Engine; Non-Condensing	Siegele .	10:00 to 12:30	5	14		6	15		7	16	8 17	9	18	1	10	2	11	3	12	4	13
Buckeye Engine; Surface-Condensing	Siegele .	1:30 to 4:00																			
Gas Engine	Siegele .	4:00 to 5:00																			
Steam Pump	Wolff . .	9:00 to 10:30																			
Flow of Steam Through Orifices	Wolff . .	10.30 to 11:30																			
Friction of Vertical Engine	Wolff . .	11:30 to 12:30	6	15		7	16		8	17	9 18	1	10	2	11	3	12	4	13	5	14
Corliss Valve Gear	Wolff . .	1:30 to 2:30																			
Steam Turbine	Wolff . .	2:30 to 3:30																			
Rotary Engine	Wolff . .	3:30 to 5:00																			
Flow of Water Through Orifices	Chasteney	9:00 to 10:30																			
Flow of Water Through Pipes	Chasteney	10:30 to 11:30																			
Calibration of Pitot Tubes	Chasteney	11:30 to 12:30																			
Hydraulic Ram	Chasteney	1:30 to 2:30	7	16		8	17		9	18	1 10	2	11	3	12	4	13	5	14	6	15
Reaction of Water Jet	Chasteney	2:30 to 3:00																			
Pelton Wheel	Chasteney	3:00 to 4:00																			
Centrifugal Pump and Weir	Chasteney	4 00 to 5:00																			
Webb Dynamometer	Ellsworth	9:00 to 10:00																			
Dynamometers	Ellsworth	10:00 to 11:30																			
Test of Steam Radiator	Ellsworth	11:30 to 12:30	8	17		9	18		1	10	2 11	3	12	4	13	5	14	6	15	7	16
Metal Test	Ellsworth	1:30 to 4:00																			
Air Compressor	Ellsworth	4:00 to 5:00																			

The time required for these exercises and for the more extended series of exercises in shop-work was obtained by adding to the course — which had until then consisted of three regular terms — a "preliminary term" of one month. During this month the Sophomore and Junior classes were engaged eight hours a day in the shop, and the Senior class for the same period each day in the performance of exercises in experimental mechanics.

Prof. James E. Denton, to whom the credit is due for developing this important branch of the Institute work, was at this time admitted to the Faculty.

This work in experimental mechanics, organized in 1881, was the first instance on record in which any institution of learning had attempted to give a systematic course of experimental exercises illustrating the application of the principal formulæ met by students in their theoretical engineering studies. From 1881 until 1890 this work was performed during the latter part of August and September, ending just before the opening of the Institute. From the latter date until 1903 it was conducted during June and July, beginning a few days after Commencement. With the advantages offered by the Carnegie Laboratory and



Old Wood-Turning Room

the rearrangement of the roster these exercises are now carried on during the three regular terms. The exercises in this course now number forty-two, as tabulated on the preceding page.

The inspection trips devised at the beginning of the Institute's course with a view to keeping the student in touch with the practical world and to develop his power of observation, have been continued under the guidance of one or more of the Professors on each trip.

In 1880 the first distant inspection tours were made by the Class of 1881 to Providence, Lowell, and Boston to the eastward, and Pittsburg, Johnstown,

Altoona, and Philadelphia to the westward. Similar inspection trips have been conducted each year since, with slight variations as to the places visited, such as Hartford, Springfield, Lynn, and Fall River on the eastward trip, and Schenectady, Niagara Falls, and Bethlehem, Pa., on the westward trip.

A course of marine engineering was established under the direction of Mr. Clarence A. Carr, Assistant Engineer in the United States Navy, in 1882, with a view to broadening the course of engineering. The course of study was designed to set forth the scientific principles of the propulsion of a ship by steam power, and the practical rules which regulate the construction of her engines. When Prof. Carr left in 1885 this course lost its identity, being merged with the Department of Experimental Mechanics and Shop-Work.

In 1883 a Department of Applied Electricity was established. The work of this Department has constantly and rapidly developed, keeping pace with the vast strides that have been made in the practical application of electricity as a motive power. In 1903 the name was changed to the Department of Electrical Engineering. The work of this course begins with —

—"a study of electrical measurements during the first term of the third year. During the second and third terms continuous currents and continuous-current machinery are studied. The fourth year is devoted to alternating currents and to alternating-current machinery. A course of lectures is given on the mathematical theory of alternating currents, and both the analytical and the graphical methods are taught. The students are prepared for this course by special instruction in complex quantities and in differential equations, given in the Department of Mathematics. The theoretical work in electricity is supplemented by systematic laboratory practice in the electrical laboratory and in the dynamo-room, which are provided for this purpose with a large variety of apparatus and machinery."

The laboratory course consists of thirty-nine distinct exercises calling for experiments, and the obtaining of data from which calculations are made and tabulated as in regular professional practice.

While there is no separate course in electrical engineering a thorough training in electricity is given in conjunction with the course in mechanical engineering. The advisability of establishing a separate course has been carefully considered, and the conclusion reached that everything taught in the mechanical course is of direct value to the practising electrical engineer. The regular course in engineering is therefore broadened to include the necessary instruction in electricity. The correctness of this plan is abundantly shown by the ability of our graduates to secure engagements in electrical establishments and by the number of such graduates now in prominent positions.

In 1886 the importance of a more extended course in analytical chemistry, adapted to the special wants of the mechanical engineer, was recognized by the establishment of the Department of Analytical Chemistry, the work of which was accomplished entirely by laboratory practice.

Qualitative analysis was taken up during the second year; and in the third year, after preliminary work in quantitative analysis, the determination of the percentages of the principal ingredients in the following substances comprised the regular laboratory work, namely, iron ore, copper ore, limestone, manganese ore, coal, alloys, lubricating oils, furnace gases, iron pyrites, and steel and cast iron.

The second year was chiefly occupied with the subject of fuels, their composition, preparation, and calorific powers — gases for illuminating and heating;



Electrical Instrument Laboratory

then the fluxes, minerals, and ores used in iron, copper, lead, zinc, and tin smelting. The properties of the metals commonly used, and the influence of impurities upon their strength and durability, were studied so far as the practical needs of the engineer are concerned. Finally, the description and management of furnaces, together with the chemical phenomena of smelting and extraction of ores, was taken up. These exercises were the foundation for the present laboratory course, which is now conducted as a part of the Department of Engineering Chemistry, established, after the death of Dr. Leeds, by merging the departments of Chemistry and of Analytical Chemistry.

In 1888 the course was further improved by the addition of the Department of Engineering Practice, in which the student was given instruction as to shop practice, management of workmen, etc. Dr. Coleman Sellers, who was appointed to the new Chair, imparted this instruction in a series of lectures containing suggestions based upon his many years of practical experience in the building of machine tools, locomotives, etc.

Prof. Sellers delivered his first lecture May 16, 1888. With the exception of one year, 1890, when he was in Europe in connection with the International Committee appointed to utilize the power of Niagara Falls, Prof. Sellers continued to deliver a series of lectures each year until 1894. The following are the titles of some of the lectures delivered by him: "Drawing-Room Practice"; "Transmission of Motion"; "Observations Made in Europe on the Question of Water-Wheels"; "Utilization of the Power of Niagara"; "Transmission of Power by Compressed Air"; "The Machine-Shop"; "Ball Bearings"; "Artificial Molding Sand"; "Personal Conduct"; "Value of Practice in Mathematics and Use of Exact Expressions"; "Broadening the Field of Study Is Widening the Path of Life."

In this connection the London "Engineer" of July 15, 1892, in an article regarding Stevens Institute, states that —

—"the practical character of the training given is assured by the choice of the Professors. Thus, when we mention the name of Dr. Coleman Sellers as one of the lecturers on mechanical engineering, many experienced engineers will envy the students of this fortunate institution their great advantages in having as a teacher a man of such varied and extensive practical experience."

From time to time during the course special lecturers have been secured to address the students on engineering topics connected with their regular work.

In 1888 Mr. G. L. Strong, of the Strong Locomotive Works, and Mr. J. M. Allen, President of the Hartford Steam Boiler Inspection & Insurance Co., delivered lectures. Mr. C. J. Field, M.E., has lectured several times, first in 1892 on electric railroad equipment. In recent years Mr. J. W. Lieb, Jr., M.E., has lectured quite regularly to each Senior class on electrical subjects. Mr. W. D. Forbes, Col. E. A. Stevens, and Col. H. G. Prout have also given the undergraduates the benefit of their engineering experience. These lectures, along with others that have been delivered, but, unfortunately, not recorded, have been more or less informal, having been brought about by the efforts of a Department or by the Engineering Society.

In 1896 and 1897 an official course of lectures on patent law was delivered to the Senior class by Mr. Richard A. Dyer, of the firm of Dyer & Driscoll, of New York, and also during the latter year a course of lectures on business methods was added. The latter dealt with the subjects of double-entry bookkeeping, banks and banking, and with the more general question of the engineer in his business as distinct from his professional relations.

These lectures, introduced by Mr. A. C. Humphreys, were designed to impart to the student a knowledge of those business methods which are essential to success in engineering work and in all lines of manufacture. They were as follows: "Double-Entry Bookkeeping" by Mr. George Turnbull, Vice-President of the Guaranty Trust Co. of New York; "Banks and Banking" by Mr. W. Sherrer, Manager of the New York Clearing-House. For several years preceding 1903 the services of Mr. T. C. Roberts, an expert accountant, were secured to give instruction in business methods and bookkeeping. The above-mentioned lectures and instruction led to the establishment of the Department of Business Engineering as a regular feature of the Institute's course in 1903, President Humphreys then taking personal charge of the Department.

The development of the new features in the course of study as outlined above has been made possible in many instances by timely gifts of necessary funds and apparatus by friends of the Institute.

First and foremost in supplying the smaller needs of the Institute, as he was in supplying the larger, as already mentioned under the title "Finance," comes our late President, Henry Morton. From him and from others, including individuals largely numbered among our Alumni, business houses, and graduating classes, have come valuable apparatus.

The gifts from the graduating classes have been made by each man of the class contributing the deposit money left with the Treasurer at the time of entering the Institute. These gifts have proved opportune and valuable in carrying on the Institute's work, and are as follows:

Class of 1886, a Kelvin balance.

Class of 1895, a 10-kilowatt Westinghouse two-phase converter and a 20-horse-power high-speed Payne engine.

Class of 1896, a 2-horse-power S. K. C. two-phase induction motor.

Class of 1897, aided by the Trustees and Faculty, Nash gas engine, directly connected to a 15-kilowatt electric generator.

Class of 1898, two 5-kilowatt alternators.

Class of 1899, a 10-horse-power Crocker-Wheeler motor-generator.

Class of 1900, two 4-kilowatt phase changing transformers and one 7½-horse-power three-phase General Electric induction motor.

Class of 1901, metal-testing machine having a capacity of 100,000 pounds.

Class of 1902, and W. D. Forbes & Co., Hoboken, N. J., Forbes engine compound high-speed, directly connected to a 25-kilowatt Sprague electric generator.

Class of 1903, a large slate switchboard.

SCHOLARSHIPS AND PRIZES

In order to encourage ambitious young men who desire to pursue a course of study at the Institute, scholarships have been established at various times.

A scholarship confers the privilege of attending the entire course of the

Institute for four years, free of all charge for tuition, provided, of course, that the student holding the scholarship keeps up, in all cases, with the standard of proficiency and good conduct required.

The "Stevens School Scholarships," of which there are four, one being given each year to the graduate of the Stevens School who passes the best examination at the end of the Spring Term, were established in 1877. At the same time three scholarships were founded for the benefit of the students of the public schools of Hoboken. In 1893 these three scholarships were made to include the Hoboken Academy, and in 1895 were further extended to include all the public schools in the county, providing the scholarships were not filled by students of the Hoboken schools. They have since been known as the "Hudson County Schools Scholarships."

In addition to these scholarships six others have been established through the contributions already mentioned on p. 16. They are known as the "Morton Scholarship"; "The American Railway Master Mechanics' Association Scholarships," of which there are four; and the "Harold Humphreys Scholarship."

Prizes have also been awarded by those interested in the various lines of the Institute's work, the first being that which is known as the Priestley Prize, in honor of the renowned discoverer of oxygen, and instituted in the year 1877 by means of funds contributed by Mr. W. W. Shippen, Mr. S. B. Dod, President Henry Morton, and Prof. A. R. Leeds. "The income, amounting to $25, is annually bestowed as a prize on the student who has most distinguished himself in the Department of Chemistry." This prize has been awarded to the following persons:

John F. Kelly, '78
William E. Jacobs, '79
Durand Woodman, '80
Edward E. Magovern, '81 [1]
Wilmer G. Cartwright, '82
John B. Adger, '83
James Beatty, Jr., '84
Otto Pfordte, '85
J. Lester Woodbridge, '86
John A. McCulloch, '86
William E. Quimby, '87
John Lyman Cox, '87
Arthur A. Fuller, '88
Alfred G. Mayer, '89
Henry Torrance, Jr., '90
Johann M. Hansen, Jr., '91
Geo. W. Colles, Jr., '94
Charles B. Peck, '96
Henry Donald Tieman, '97
F. A. Welles, '98
G. G. Hollins, '04
R. L. Penney, '04

In 1882 Mr. William A. Macy, of Hoboken, contributed $100, the proceeds of which were to be awarded to that student, entering the Institute from the public schools of Hoboken, who had the best standing at the end of the Freshman year. In 1903 Mr. Macy increased his contribution to $250, and specified further that the prize should be awarded at the end of the Sophomore year instead of the Freshman year, provided the standing does not fall below 75. This prize was awarded to North MacLean in 1882, E. H. Kiernan in 1884, Embury MacLean

[1] The standing of Messrs. Edward E. Magovern and William T. Magruder was equal, and the award of prize, having been decided by lot, fell upon Mr. Magovern.

in 1885, W. H. Rogers, Jr., in 1889, F. C. Freeman in 1900, H. Koester in 1901, and to A. T. McAleer in 1902.

Mr. E. G. Soltman, in 1884, offered a drawing-table as a prize to the member of the Junior class whose work was of superior excellence in the Department of Mechanical Drawing. This prize was continued for five years, during which time it was awarded to Henry Abbey, '85; Edwin J. Cook, '86; W. E. Parsons, '87; Arthur A. Fuller, '88; William J. Beers, '89.

ATTENDANCE

THE following tabular statement will serve to show the growth of the Institute in point of attendance, number of graduates each year, etc. The second column includes all the Professors, Assistant Professors, and Instructors, who

TABLE SHOWING GROWTH OF INSTITUTE

College Year	Number in Faculty	Total Number of Students	Designation of Class	Numbers in the Same Class in Successive Years				Percentage of Graduates to those Entering[2]	Accessions to Advanced Classes	Percentage of Graduates Excluding Accessions[2]	Entered from Stevens School
				Freshmen	Sophomores	Juniors	Seniors				
1871-72	8	21	'73	. . . .	. . . .	2	4				
1871-72	8	21	'74	. . . .	3	3	3				
1871-72	8	21	'75	16	15	15	9	56.3	2	43.8	
1872-73	8	49	'76	27	19	19	17	59.2	4	44.4	
1873-74	8	61	'77	24	8	8	11	41.7	3	29.1	6
1874-75	8	88[1]	'78	40	34	27	22	55.0	2	50.0	9
1875-76	8	95[1]	'79	29	20	17	15	51.7	3	41.4	6
1876-77	8	79	'80	21	14	11	9	38.1	1	33.3	6
1877-78	8	89	'81	36	26	21	19	41.7	4	30.6	11
1878-79	8	76	'82	24	19	14	12	50.0	3	37.5	5
1879-80	9	74	'83	25	19	20	19	76.0	9	40.0	6
1880-81	9	100	'84	48	47	42	41	85.2	14	56.3	13
1881-82	9	132	'85	53	43	42	36	67.9	9	50.9	11
1882-83	10	152	'86	48	37	36	33	66.7	8	50.0	12
1883-84	12	178	'87	58	44	36	30	51.7	4	44.8	11
1884-85	12	168	'88	52	48	42	39	73.1	12	50.0	15
1885-86	12	176	'89	59	44	39	36	61.0	6	50.8	27
1886-87	12	174	'90	58	50	43	39	67.2	7	55.1	24
1887-88	14	185	'91	57	57	49	46	78.9	9	63.2	26
1888-89	15	196	'92	60	59	44	39	65.0	3	60.0	44
1889-90	15	204	'93	66	61	48	43	65.1	3	60.6	49
1890-91	17	211	'94	60	52	51	39	65.0	7	53.3	46
1891-92	17	210	'95	71	61	52	47	63.4	8	52.1	53
1892-93	18	264	'96	109	79	70	63	57.8	6	52.3	95
1893-94	20	256	'97	86	70	67	63	73.3	4	68.6	59
1894-95	21	263	'98	76	63	62	58	76.3	6	68.4	56
1895-96	20	263	'99	79	58	53	53	75.7	3	71.4	46
1896-97	22	261	'00	78	57	54	54	69.2	4	64.1	42
1897-98	22	230	'01	62	49	47	40	64.5	2	61.3	45
1898-99	20	214	'02	58	56	57	54	93.1	4	86.2	30
1899-00	20	223	'03	66	51	48	49	74.3	4	68.2	35
1900-01	19	241	'04	93	73	59	57	. . . .	. . . .	. . . .	44
1901-02	22	261	'05	86	64	58	. . . .	. . . .	. . . .	. . . .	39
1902-03	20	290	'06	118	85	. . . .	. . . .	. . . .	. . . .	. . . .	52
1903-04	25	346	'07	146	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	77

[1] In the year 1874-75 there were twelve "Partial Students;" that is, students who were taking special subjects, but not pursuing the course for the degree of M.E. During the year 1875-76 there were ten such students.

[2] The figures in these two columns are based on the number that were regularly graduated, and not on the number given in the "Senior" column.

have been or are engaged in class-room work. In addition to these a number of assistants have been engaged constantly since 1875 in giving manual instruction in the mechanical laboratory and workshops. Their number has grown from two in 1875 to ten at the present time (1904).

In connection with that part of the table giving the "Numbers in the Same Class in Successive Years," President Morton made some interesting deductions which were published in the "Stevens Indicator," January, 1896, p. 64, and which are quoted below:

"When the Institute opened in 1871 we had the following problem to face:

"To educate in four years, from such material as we could secure from the preparatory schools of the day, young men who, when graduated, should have information enough to make them useful in positions involving some responsibility in the machine-shops of the country.

"To accomplish this with ease to the student, it would have been necessary that he should have been considerably in advance of those entering ordinary colleges in his preparation, so that he might have time, during his four years' course, for all the technical studies required to make him a Mechanical Engineer in fact as well as in name.

"Students so far prepared, however, were not to be found except in the advanced classes of other colleges, and accordingly we were obliged to compromise matters and place our requirements for admission low enough to let in the best graduates of preparatory schools, and then do our best to carry these imperfectly prepared students through the requisite curriculum.

"The result of this, as might be expected, was that many dropped out and our percentage of graduates was low. For example, in 1877, the graduating class represented but 29 per cent of those entering in 1873. It is, however, interesting to notice that every one of those who survived this severe struggle for existence has shown himself to be a man of exceptional ability in his professional career.

"As time went on, however, a constant pressure was kept up in the direction of raising the standard of requirements for admission, and this was most effectively done by the establishment of the Stevens School as a Preparatory Department, in which students might be adequately prepared for admission to the Institute course as well as for colleges giving classical courses.

"Time was of course required both for the preparation of students entering the Stevens School and for the growth of its reputation, so that the number coming from it should constitute a sufficient proportion of our class to show its effect. Thus, though the School was opened in 1873, it was not until 1880 that it furnished a notable proportion of our entering class. In that year it sent us thirteen students, and the result at once appeared in the rise of the percentage of graduates from 40 per cent to 56 per cent.

"Again, in 1887, a fresh impulse was given to the work of the Stevens School by the erection of a new building for its accommodation, which enabled it to increase its own numbers and thus to furnish us with a larger proportion of entering students. The effect of this was seen in 1888, when we received 44 from the Stevens School, and our percentage of graduates rose to 60 per cent from about 50 per cent.

"Of course there are many other reasons, besides a failure to keep up with the studies of the course, which withdraw students from a class prior to graduation. Sickness, change of residence, financial conditions, and sometimes tempting offers of employment, have withdrawn many able and promising students before they reached the end of the course;

but as the statistics show, and as I know from numerous individual instances, the controlling element is an adequate preparation, combined, of course, with a reasonable concentration of effort and avoidance of bad influences.

"It is not necessary that a young man should be a genius to make a successful engineer. I could point out among our graduates many who were by no means brilliant scholars, but who were well prepared and faithful to their work, who are now occupying such positions as should satisfy the ambition of any reasonable man.

"There are a few other points which it may be worth while to notice. For example, the class of '95 entered in 1891, 71 strong, and at the end of their first year had lost but 10 of their number, say 14 per cent, while the next class, that of '96, entering 109 in number, lost in the first year 30, or more than 27 per cent,— in other words, nearly a double percentage.

"The reason of this is not far to seek if the facts are known.

"In 1891 the applicants for admission numbered over 100, but, our accommodation being limited, only the best among the applicants were admitted, and more than 30 were rejected, among whom were many who were sufficiently prepared to have been admitted had there been room.

"In 1892, arrangements had been made to divide the classes into two sections, and thus double our accommodations; as a result of this, of the 130 who applied and were examined all were admitted who fairly met the requirements, and there was no such preliminary sifting as had been necessary in 1891.

"The sifting in the first year, however, brought the class of '96 into the same condition of efficiency as the class of '95, and after this the losses were substantially alike in each.

"During the first ten years of the Institute there were considerable and irregular fluctuations in the average ratios of graduates and also in the actual number of students; but these fluctuations do not afford any sound basis for deduction, because they resulted in part from the small number, which gave a high proportionate value to small accidental variations, and because during this period the Institute was in a formative state as to its requirements, course, and the reputation by which desirable students were attracted. What the figures of this period do show when compared with those of later years is that there has been a decided improvement in the proportion of 'finished product' to 'raw material,' and this in spite of the fact that in consequence of the large number of engineering schools established during this quarter-century we no longer draw so many especially able students from distant points throughout the country."

THE FACULTY

For the vast detail of the course of study, as subsequently evolved and pursued, there was the original plan which has already been quoted. This plan, the execution of which has proved it to be most efficient, was carefully supervised and extended by the late President Morton.

The Department of Physics was organized in 1871 by Prof. Alfred M. Mayer, Ph.D. The Department of Mechanical Engineering was organized by Robert H. Thurston, A.M., C.E., in 1870; and as there was not at that time, or for a number of years afterward, special departments of Experimental Mechanics and Shop-Work, of Tests, and of Engineering Practice, the work in this Department covered a much more extensive field than at present.

Lieut.-Col. H. A. Hascall, who was Professor of Mathematics at West Point Military Academy, was secured early in the year 1871 to organize and take charge of the Department of Mathematics; but when the Institute opened in September, Prof. Hascall's health would not permit of his assuming the work, and Mr. Richard H. Buell, of New York, was secured as temporary Instructor. A few months later Prof. Hascall undertook to assume the duties of this Department, but was soon compelled to abandon the work, and again the Department was under temporary management until the end of the college year. During the summer of 1872 Prof. De Volson Wood, C.E., then Professor of Civil Engineering at the University of Michigan, was secured to organize and conduct the work of this Department, and at the opening of the second college year in 1872 assumed the Chair.

Prof. C. W. MacCord laid down the course in mechanical drawing. Prof. Albert R. Leeds organized the course in theoretical and practical chemistry. The course in languages was organized by Prof. Chas. F. Kroeh, and the course in belles-lettres by Prof. Edward Wall.

Additions to the Faculty, as it was thus originally constituted, were made from time to time as the course of studies was extended and modified and the attendance of students increased. These additions to the Faculty, and also the changes due to resignations and to other causes, follow herewith in chronological order.

In 1879 James E. Denton (M.E. '75) took temporary charge of the Department of Engineering, and of the Mechanical or Testing Laboratory, for more than a year during the continued illness of Prof. Thurston. At the end of Mr. Denton's temporary charge the Department of Experimental Mechanics and Shop-Work was organized in 1880 and 1881, and in 1882 he was made Professor of Experimental Mechanics and Shop-Work.

In the year 1881 Adam Riesenberger (M.E. '76) was appointed Instructor in the Department of Mechanical Drawing, and in 1887 was made Assistant Professor.

In the year 1882 Prof. Wood received the assistance of Clarence A. Carr, who then came to Stevens and established a course of Marine Enginering, of which he was Professor, besides being an Instructor in Mathematics. Mr. Carr was Assistant Engineer in the United States Navy, and took up this work under leave of absence from the Navy Department.

Owing to the advance which had been made in the application of electricity to engineering construction, a special Department of Applied Electricity was instituted in 1883 through the generosity of President Morton, and Dr. William E. Geyer was made its head.

In 1885 Prof. Thurston accepted a call from Cornell University to take charge of the Sibley College of Engineering, then organized, and Prof. De Volson Wood, who had been in charge of the Department of Mathematics and Mechanics,

was transferred to the vacant Chair of Mechanical Engineering. At this time, also, Prof. J. Burkitt Webb was appointed to the Chair of Mathematics and Mechanics which was made vacant by the transfer of Prof. Wood to the Chair of Mechanical Engineering. In 1886 William H. Bristol (M.E. '84) was appointed Instructor in Mathematics, and in 1887 became Assistant Professor.

A division of the work in the Department of Chemistry occurred in 1886, Prof. Leeds retaining the Chair of Chemistry, and Thos. B. Stillman, Ph.D., taking the Chair of Analytical Chemistry.

Prof. D. S. Jacobus (M.E. '84), who was an assistant in charge of Molding and Blacksmithing from 1884 to 1886, was made Instructor during the latter year, and in 1887 became Assistant Professor of Experimental Mechanics and Shop-Work.

The Chair of Engineering Practice was created in 1888 and was filled by Prof. Coleman Sellers, E.D., with a view to establishing a course of lectures on the Practice of Engineering to be delivered during each year, after the plan adopted in medical schools and known as clinical instruction.

In the year 1889 Johannes H. Cuntz, C.E., (M.E. '87), and William J. Beers (M.E. '89), were appointed Graduate Assistants, and they carried on the work of instruction in the departments of Drawing and Analytical Chemistry until the year 1892. Harry D. King (M.E. '92) was appointed Graduate Assistant in 1892 and occupied the position one year. In 1891 Robert M. Anderson (M.E. '87) was appointed Instructor, taking charge of the calculation of tests during the Supplementary Term, and later of other branches of the work.

In 1892, when measures were taken to relieve Prof. MacCord from giving personal attention to the lower classes, and to enable him to devote his entire attention to the two higher classes, Prof. Riesenberger was placed in full charge of the Freshman and Sophomore classes in drawing. Prof. Bristol had charge of the same classes in mathematics. On account of an increased number of students in the entering class in 1893 it was divided into two sections, Robert M. Anderson being appointed Assistant Professor of Applied Mathematics.

In 1892 Samuel D. Graydon (M.E. '75) was appointed Assistant Professor of Mechanical Drawing, and a year later, when the Freshman and Sophomore classes were divided into two sections, assumed charge of one section of each. He also assisted Prof. MacCord in the work with the two higher classes. Geo. L. Manning (M.E. '91) was appointed Assistant Professor of Physics and Chemistry, dividing his time between these two departments.

In the summer of 1893 Franklin DeR. Furman (M.E. '93) was appointed Assistant in Mechanical Drawing and was assigned to the Freshman and Sophomore classes. He also assisted Prof. Bristol for two years in the surveying exercises. In the same year Prof. Kroeh received the assistance of A. R. Lawton, A.M., who was at that time made Instructor of Languages. In 1895 Morgan E. Craft (M.E. '95) was appointed Assistant to Prof. Leeds.

For a number of years the work of the Department of Applied Electricity required the services of an assistant, and in 1892 Horace S. Verley was appointed, and was succeeded two years later by G. M. Maynard, who remained one year. In 1895 Albert F. Ganz (M.E. '95) was appointed Instructor to assist Dr. Geyer in this Department.

The deaths of Prof. Wood and of Prof. Mayer, which occurred in 1897, created vacancies in the chairs of Mechanical Engineering and of Physics. Prof. Denton was appointed to succeed Prof. Wood, with the title of Professor of Mechanical Engineering and Shop-Work. The work in Physics was, however, divided. Dr. Geyer took charge of General Physics, together with Applied Electricity, and Prof. Jacobus was appointed Professor of Experimental Mechanics and Engineering Physics. At the same time Prof. Anderson was transferred from the Department of Mathematics to the Department of Experimental Mechanics and Engineering Physics, with the title of Assistant Professor, and Frederick L. Pryor (M.E. '97) was appointed Instructor in Mathematics.

In 1897 the title of Mr. Ganz was changed from Instructor in Applied Electricity to Assistant Professor of Applied Electricity and General Physics, and W. I. Thomson (M.E. '97) was appointed Instructor in Applied Electricity.

When Prof. Anderson severed his connection with the Institute in 1898 to take up professional engineering work, he was succeeded by Mr. Pryor, who was appointed Instructor in Experimental Mechanics and Engineering Physics. In 1901 Mr. Pryor's title was advanced to that of Assistant Professor in the same Department.

In 1899 the titles of Prof. Riesenberger and Prof. Bristol were changed from Assistant Professor to Professor, and Mr. Furman was advanced from Instructor to Assistant Professor in the Department of Mechanical Drawing.

The instructorship in the Department of Languages, which became vacant in 1897, Mr. A. R. Lawton resigning, was not filled until 1899, when Mr. Charles W. Clayton was appointed.

At this time, also, a change was made in the Department of Drawing. Prof. Graydon's work with the Juniors and Seniors was assigned to Prof. Furman, who also continued to give a part of his time to the Freshman and Sophomore classes. On the other hand Prof. Graydon's entire time was then given to the Freshman and Sophomore classes. A year later the appointment of E. R. Knapp (M.E. '97) as Instructor in the Department enabled Prof. Furman to devote his time to assisting Prof. MacCord in the two upper classes.

Mr. Thomson resigned his position as Instructor in Applied Electricity in 1900, and Wm. J. Moore (M.E. '00) was appointed to fill the vacancy. In the fall of 1900 the Faculty membership was further increased: R. M. McKenzie, Ph.D., was appointed to assist Prof. Leeds in his lectures and class-room work, and Prof. Stillman in the laboratory work; and Charles O. Gunther (M.E. '00) was appointed Instructor in Mathematics to assist Prof. Bristol.

After the death of Dr. Leeds, which occurred in 1902, the departments of Chemistry and of Analytical Chemistry were combined and placed in charge of Prof. Stillman. Dr. McKenzie was advanced from Instructor to Assistant Professor of Chemistry.

In 1902 Prof. MacCord's title was changed from Professor of Mechanical Drawing to Professor of Mechanical Drawing and Designing, and Prof. Furman's title, from Assistant Professor to Associate Professor in these subjects.



One of the Enlarged Drawing Rooms

Upon the death of President Morton in 1902, Alexander C. Humphreys, (M.E. '81) was, at the request of the Faculty and Alumni of Stevens Institute, unanimously elected President of Stevens Institute of Technology by the Board of Trustees. President Humphreys entered upon his duties in September, 1902.

The lectures in Physics, which had been given by President Morton up to the time of his death, fell naturally to Dr. Geyer, who in addition to this was called upon to organize a laboratory course in Physics for the Sophomore year. In order to give the necessary attention to this work, Dr. Geyer was, at his own

request, relieved of the work in Applied Electricity, and was made Professor of Physics. Prof. Ganz was given charge of the work in the Electrical Department. In the spring of 1903 Clifford B. Le Page (M.E. '02) was engaged as Assistant in Physics to help Dr. Geyer.

In the summer of 1903 Prof. Denton was relieved of the supervision of the courses in Shop-Work, the same being assigned to Prof. Pryor. Prof. Charles O. Gunther was transferred to the Drawing Department, assisting in the work of the Freshman and Sophomore classes. Louis A. Martin, Jr., (M.E. '00), was engaged as Assistant in Mathematics. Francis J. Pond, Ph.D., was appointed Assistant Professor of Engineering Chemistry to succeed Dr. R. M.



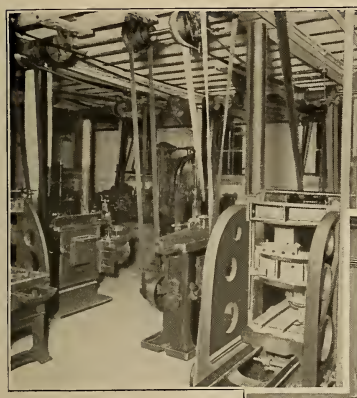
New Wood-Working Room in East Basement

McKenzie, resigned. In the fall of 1903 Prof. Pryor took temporary charge of the Department of Engineering Practice during the continued absence of Prof. Denton. At the same time William A. Shoudy (M.E. '99) was engaged as Instructor in the Department of Experimental Engineering, and H. W. Johnson (M.E. '03) as Instructor in the Department of Mechanical Drawing and Designing.

Of the assistants in the Department of Shop-Work mention should be made of those whose connection with that Department has continued for a considerable length of time. Mr. Matthew C. Lackland, who is the Supervising Mechanic of the Shops, came to the Institute in 1876. Mr. Louis T. Becker, whose

connection with the Institute has been in various capacities, entered the service of the Institute in 1873. He now has charge of the boilers, engines, etc., in the capacity of engineer. Mr. Charles Bischoff, who has charge of the instruction in carpentry, wood-turning, and pattern-making, has been an assistant in this Department for about fourteen years.

Mr. James W. Denton instructed in blacksmithing and molding for ten years up to the time of his death, which occurred in 1900. Mr. Samuel Slingerland, who is now in charge of the machine-shop, and Mr. Irwin Stephens, now in charge of blacksmithing and molding, each came to the Institute in 1892. Mr. George W. Allen has been employed as fireman since 1891. Messrs. Becker, Bischoff, Slingerland, Stephens, and Allen have also acted as assistants in conducting the Junior and Senior exercises in the Department of Experimental Mechanics.



New Machine-Shop in Basement of Main Building

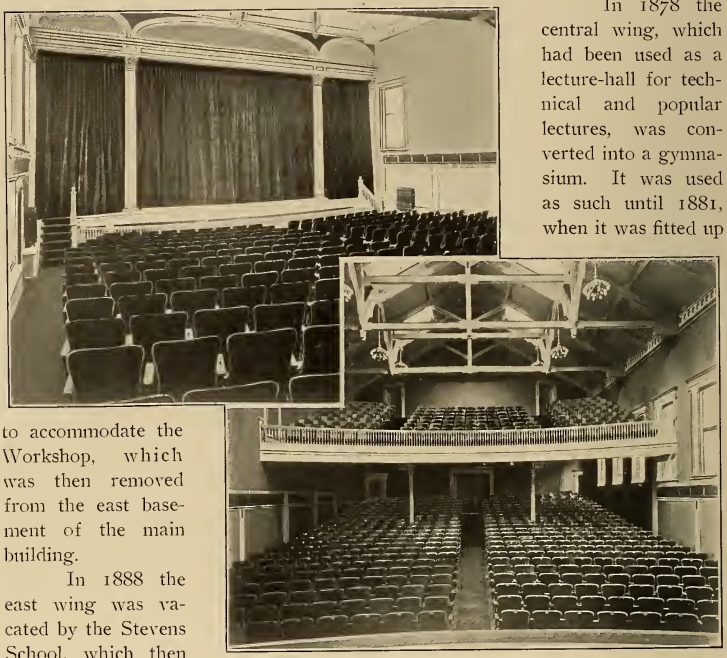


Forge and Molding-Room, with Foundry in Rear

ALTERATIONS TO MAIN BUILDING, AND NEW BUILDINGS

The original plan of the building called for a main structure 180 feet long and 44 feet deep, with three projecting wings; the entire plan being similar in form to the letter **E.** The east and west wings are each 30 feet wide and 60 and 80 feet long respectively. The central wing is 50 feet wide and 80 feet long.

The building was constructed in 1870, as planned, with the exception of the east wing, which was added in 1872 to provide room for the Stevens School then organized on its present basis. Since that date two small additions have been made to the main building and numerous alterations made in the interior, such as the rearrangement and enlargement of rooms by the removal of hallways, partitions, etc., the most important of which will be briefly referred to.



Front and Rear Views of New Auditorium, Main Building of the Institute

In 1878 the central wing, which had been used as a lecture-hall for technical and popular lectures, was converted into a gymnasium. It was used as such until 1881, when it was fitted up to accommodate the Workshop, which was then removed from the east basement of the main building.

In 1888 the east wing was vacated by the Stevens School, which then moved into its new building adjoining. The room thus secured was apportioned between the Department of Applied Electricity (two floors), whose laboratory work had been conducted in the gallery that had been built over the shop in the central wing, and the Department of Applied Mathematics (top floor). On May 1, 1888, a small fire occurred in the private laboratory of Dr. Leeds on the top floor of the west wing, but was soon extinguished by the municipal Fire Department with the assistance of the undergraduates. The loss by fire and water amounted to about $700.

In 1889 an extension (26 × 39 feet) was added to the rear of the central wing to accommodate the foundry and blacksmith work, which was then removed from the basement to make place for the installation of new engines, machinery, etc., and provide room for carrying on the students' mechanical laboratory work and the work of the Department of Tests. The second floor of the extension was occupied by Mr. Hawkridge, instrument-maker, who then moved from the second floor of the machine-shop.



The Main Building With Terrace Removed, Showing Enlarged Basement Windows for New Machine-Shop

A two-story building, costing $6,500, was erected in 1893 between the central and east wings, to accommodate the heavier apparatus of the Electrical Laboratory on the ground floor, and the Department of Languages on the second floor. The change in the latter Department, which had occupied one of the large rooms on the top floor of the main building, was made to give necessary space to the Department of Drawing, which has since utilized the entire third floor. During the summer of 1902 several partitions were removed on this floor, thus giving larger and better-lighted rooms. At the same time this entire floor was

completely equipped with adjustable fixtures and lamps for illumination by electric light.

With this brief record of alterations to the original building, met principally through the generosity of President Morton, to accommodate the growing demands, we come to the first new building, erected by the gift of Mr. Andrew Carnegie in 1901, and endowed by him, as stated on pp. 14, 15. This building was given and erected for the special purpose of a laboratory of engineering, to provide convenient and modern accommodations for a large amount of machinery and numerous engines, etc., that had been crowded in the basement of the main building.

The Carnegie Laboratory, in addition to providing for the above apparatus on the first two floors, each having a floor space of 50×97.5 feet, contains two large lecture-rooms on the third floor, being 42.6×50 feet and 50×50 feet respectively.

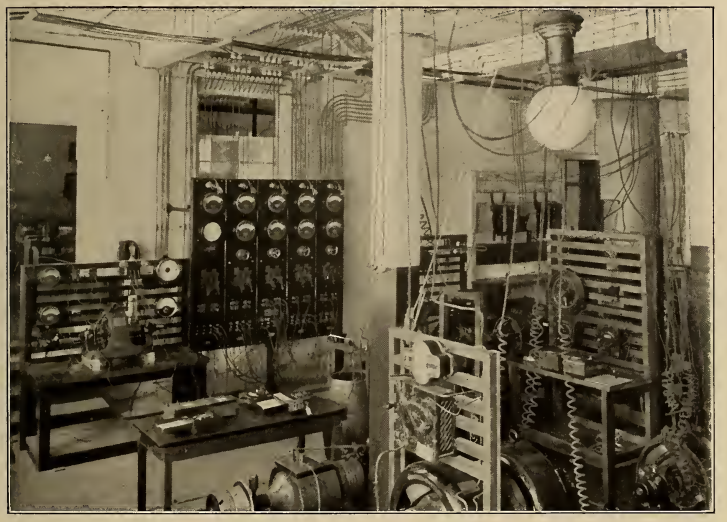
The relief afforded by the Carnegie Laboratory of Engineering, by taking from the main building and housing entirely the Department of Experimental Mechanics and Engineering Physics (now the Department of Experimental Engineering), helped largely, but not sufficiently, to overcome the crowded conditions of the main building, especially in the matter of class-rooms available for properly carrying on the standard work of the course. So serious had this problem become, that President Humphreys, upon his accession to office in the fall of 1902, felt constrained to take up the subject at once by vigorously petitioning the Alumni to complete the work undertaken by them a number of years ago in providing an Alumni Building for the Departments of Chemistry and Physics. The fund for this building, largely through the generous aid of our late President Morton, had grown to $60,000, and at the time of this publication it amounts to about $90,000, the increase being due to the efforts of President Humphreys. Plans have been decided upon, and the construction of the building will probably soon be begun.

The basement of the main building was improved in the summer of 1903, for use as a workshop, by removing the terrace in front of the Institute and enlarging the basement windows. The machinery was moved from the central wing of the main building to the new quarters, and the room occupied by the old machine-shop was entirely reconstructed as an auditorium which, with its main floor and balcony, will comfortably seat 700 people; it was planned for the purpose of accommodating mass-meetings of the students, popular or technical lectures, and meetings of technical associations convening in this section. It was used for the first time December 3, 1903, when the American Society of Mechanical Engineers held one of their regular sessions at the Institute.

In improving the basement, as mentioned above, the large west room was fitted up for the execution of a number of metal-working exercises, for which there are provided 12 lathes, 3 planers, 3 drill presses, 3 drilling-machines, 3

shapers, etc. The large east room is equipped with 24 wood-lathes, a wood-planer, a circular and a band saw, and work-benches for 24 students. The space between the metal- and wood-working rooms has been cleared and is now used as a stock and tool room.

The extension which was built to the central wing of the main building in 1889 to accommodate the foundry and forge work was refitted in the fall of 1903 by a new equipment of 10 down-draught forges in the centre of the room, operated by a motor-driven blower and exhauster. The sides of the room were arranged for conducting the exercises in molding. The course is planned so that the molding and forging exercises do not take place simultaneously. At the time these changes were made an addition was built, 25 × 17 feet, in which was



Electrical Laboratory—Dynamo Room

erected a half-ton Collieau cupola. The addition contains also a core oven and accommodations for exercises in core-making. The floor over the forge-room was equipped with vises for steamfitters and machinists, and other apparatus for the course in steamfitting and vise-work.

A new building which will be erected within a short time, as a part of the Institute property, is a dormitory on a plot of ground (196 × 100 feet) located at the southwest corner of River and Seventh streets, Hoboken. This property,

which has heretofore constituted a part of the private grounds of Castle Point, is the gift of Mr. Robert L. and Col. E. A. Stevens, as mentioned on p. 16. At present River Street ends at the high ground where this property begins, but the street will be extended and graded.

STEVENS SCHOOL

The history of the Stevens School as a useful adjunct to the Stevens Institute begins with the year 1872. At that time the requirements for entrance to the Institute were in advance of the courses in the preparatory schools from which the Institute drew its students. To meet this situation the Trustees of the latter institution assumed control of a school in Hoboken known under another name, built the east wing to the Institute, and there established the Stevens High School, which name was changed in 1888 to Stevens School.

The School occupied the east wing of the Institute until 1888, when it was removed to the large and commodious quarters in the new building which had been erected on the northeast portion of the grounds, immediately behind the Institute building. The new building was erected at a cost of $50,000. It has a frontage of 86 feet on River Street and has a depth of 69 feet. The building is constructed on what is known as the "slow-burning mill system of construction," which renders it as nearly fireproof as possible and also gives a "deadened" floor, which is so desirable in a building of this kind. The building is ventilated by means of an exhaust fan in a ventilating shaft in the roof which connects with all rooms.

Although the Stevens School is the Academic Department of the Stevens Institute, its course of study is by no means limited to the scientific branches. Its classical course is thoroughly complete, and fits young men for entrance to any university or college. Its English and scientific course is particularly designed thoroughly to prepare young men who wish to pursue a course of study at the Stevens Institute and similar scientific and technical schools, as well as to give those who desire to enter business a general education and render them more or less familiar with the elementary principles that underlie the various mechanisms and mechanical and scientific systems which are being so rapidly developed and introduced into the home and the office. The close relations of the School with the Institute give it peculiar advantages in carrying out a course of study of this kind, it having at all times access to the apparatus of the Institute for experimental work in its own laboratory.

The course of study covers a period of four years, whether it be in the English, scientific, or classical course, and such students as are of good moral character and can pass a satisfactory examination in geography, elements of English grammar, and arithmetic are allowed to enter the lowest class.

The Stevens School has won an enviable reputation for the high regard

it has for the moral and physical training as well as the mental training of the youth under its charge. The School has been a success from the start, and has enjoyed a steady and satisfactory growth from 33 at the beginning to 309 in 1904. Rev. Edward Wall, A.M., who was appointed Principal at the time of its organization, has continued in that office to the present day. In 1887 Dr. F. L. Sevenoak was appointed Assistant Principal.

THE TWENTY-FIFTH ANNIVERSARY CELEBRATION OF THE FOUNDING OF THE STEVENS INSTITUTE OF TECHNOLOGY [1]

THE twenty-fifth anniversary of the founding of the Institute was fittingly observed on February 18 and 19, 1897.

The celebration was in every sense a very gratifying success, and was the means of bringing together a larger number of the Alumni of the Institute than had been assembled upon any previous occasion. Many came from distant points to participate in the festivities and to manifest their attachment to their Alma Mater. The occasion was indeed a memorable one in the history of the Institute, and successful beyond the expectations of even those who were acquainted with the full details of the programme to be presented.

THE BANQUET

THE festivities began with a banquet at the Hotel Waldorf, New York, on Thursday evening, February 18, which was attended by nearly three hundred persons.

Many of the graduates present had not met their classmates or fellow Alumni and Professors since graduation, so that the reunion which took place in the reception-rooms for an hour or more before the assemblage sat down to the table was a very pleasant feature of the evening's entertainment.

Each guest was presented by President Morton with a handsome souvenir in the form of a pamphlet, beautifully illustrated, containing a poem, dedicated to Mrs. Martha B. Stevens, entitled "Per Aspera ad Astra," the motto of the Stevens family, which was written by President Morton for the occasion. (See page 42.) Handsome *menu* cards were provided, prepared from a design by Mr. L. D. Wildman (M.E. '90). The decorations of the banquet hall were elaborate and tasteful, and the room presented a most charming scene when the guests, a considerable number of whom were ladies, were all seated.

The speaking began a little after 10 o'clock and lasted nearly two hours.

[1] This account of the Twenty-fifth Anniversary is largely condensed from the very complete description given in the "Stevens Indicator" for April, 1897.

Mr. S. Bayard Dod, President of the Board of Trustees, presided, and introduced the speakers with remarks that were very happily chosen.

Toasts were responded to as follows:

"*Our Founder*" . . . . . Hon. Abram S. Hewitt
"*The Ironmasters of the United States*". . . . . Mr. Andrew Carnegie
"*Our Ironclad Navy*" . . . . . Commodore George W. Melville, U.S.N.
"*American Citizenship*" . . . . . Rt. Rev. Henry C. Potter
"*Railroads and Steamboats of the United States*". . Mr. J. Elfreth Watkins
"*The Alumni*" . . . . . .Mr. E. P. Roberts, M.E.
"*The Faculty*" . . . . . President Henry Morton

Mr. Hewitt, whose acquaintance with the Stevens family extended over a period of more than sixty years, having known not only "Our Founder," but also his father John and his brother Robert L., spoke more particularly of personal reminiscences, and as such his remarks form an interesting and valuable supplement to the record of the Stevens family as written by Mr. T. C. Martin, E.E., and published in Book II. Mr. Hewitt's response to the toast will be found at page 95.

Commodore, later Rear-Admiral, Melville, U.S.N., and now retired, and Mr. J. Elfreth Watkins, Curator of the National Museum at Washington, were, because of their official positions, peculiarly qualified to speak with authority of the work of the engineers of the Stevens family. Their responses to their respective toasts, so far as they relate to the Stevens family, are reproduced at pages 99, 101.

At the conclusion of the toast to "Our Founder," President Morton was called upon to read the poem mentioned above. It is presented herewith:

"Per Aspera ad Astra"

What are those stars by rugged pathway gained?
And what the road by which they are attained?
Those stars are the rewards, the crowns, the goals,
The final dwellings of heroic souls,
Of those whose life-long toil of hand and mind
Was freely given to uplift mankind,
To gather knowledge and develop arts,
To build up nations and make happy hearts,
Increasing comfort, lightening human toil,
From conquered nature winning richest spoil;
Guarding the weak from the encroaching strong,
Rewarding virtue and preventing wrong.
On such as these are starry crowns bestowed,
For such as these the stars are fit abode.

Of the rough paths which lead to such rewards
Examples every noble life affords.

The martyr gives his life, the hero bleeds,
The patriot strives with noble words and deeds,
The moral teachers and reformers give
Their lives of labor that the truth may live,
Students of nature work to age from youth
To bring to light some hidden gem of truth,
And countless laborers suffer, strive, refrain,
That from their work their fellow men may gain.

Nor need we travel far to other climes,
Or instance heroes of the classic times,
To find examples fitted to inspire
Loving respect and emulous desire.
The name of Stevens calls at once to mind
Three lives of willing labor, which combined,
Or singly, illustrate the upward road
Which straight ascends to that star-decked abode.
To affluence born, and tempted thus to give
First thought to self and but for self to live,
Each one in turn, and all, this test withstood,
And gave their means and thought to general good.

The rapid steamer joining strand to strand,
The yet more rapid train across the land,
The iron rail on which the swift trains run,
The shell adapted to the long-range gun,
The ironclad steamer ramming down the foe,
With monster cannon loaded from below,
Those links which bind the world with bands of peace,
Those arms which in the end will make wars cease,
All these and many others, which have lent
So largely to the world's development,
Grew from the Stevens' lives, so richly fraught
With liberal outlay and ingenious thought.

And at the last what can we fitly say
Of him whose latest work we hail to-day?
Who, as a closing act of such career
As we have painted, sowed the seed which here
We see developed into fields of grain
Loading with harvests many a distant plain.

Our Founder planted that which year by year
Has sent its fruitage outward far and near,
Till now there is no region where the sun,
Uprising, does not shine at least on one
Of Stevens' graduates doing useful work
In turning to good ends the powers which lurk
In force and matter, carrying far and near
The fair fame of the Stevens engineer,
And adding always to that special art
Which our good Founder had so much at heart.

For him the crowning stars long since were won,
For us they still are to be gazed upon.
Before *us* still extends the rugged road
Which must be climbed to reach the blessed abode.
On his example let us fix our eyes,
And, following in his footsteps, ever rise;
Scale each obstruction which our pathway bars,
And win at last our home among the stars.

Mr. Carnegie, in responding to his toast, "The Ironmasters of The United States," referring to the remarks of Mr. Hewitt, said in part:

"I have been thinking, while he spoke, that if he had just continued a little longer, as only his modesty prevented him from doing, he might have spoken of the monument that the Stevens family selected as the best means of perpetuating their name; and I say that the men who have selected a seat of learning — Harvard, Yale, Cornell, Cooper, Pratt, Stevens — are the men who have chosen the means which will keep them in the history of their country and of the world longer and more prominently than any other means which a man can devise.

"And more than this, they have chosen a living monument, with a soul in it,— something that continues to perform useful work, something which shows us that they desired more to benefit succeeding generations than to perpetuate their personal fame. . .

"Any celebration of this anniversary of Stevens would certainly be incomplete if a representative of the iron and steel industry were not permitted publicly to acknowledge his obligation to that Institute, to express his gratitude to its founder. You have only to look at your list of graduates and see the number that are now in charge of important enterprises, to know what Stevens has done. It is impossible to enter any of the great establishments without meeting a Stevens graduate."

President Dod, of the Board of Trustees, in announcing the toast, "The Faculty," read a letter from President Morton, in which he presented one thousand shares of Texas Pacific Railroad stock to the Alumni Building Fund. The letter is as follows:

S. Bayard Dod, Esq.,
President of Board of Trustees of the Stevens Institute of Technology.
Dear Sir,—

I send you herewith certificates for one thousand shares of stock of the Texas Pacific Railroad Co., which I desire to present to the Board of Trustees, to be held until their appreciated value, with such other funds as may be devoted to that purpose, may be adequate for the erection and maintenance of the proposed new building generally referred to as the "Alumni Building."

I have put my gift into this particular form as an example or suggestion to others having the interests of the Institute at heart, that they might, when able to do so, present to the Institute some form of property having a prospective value in advance of its market price,— such, for example, as the stock of newly organized or reorganized companies of a substantial character.

The needs of the Institute are rather for the future than the present. Her work, as heretofore and at present conducted, can be carried on with the means already in her

hands; but for the extensions which should be made in the future, in order that she should maintain her leading position, larger accommodations and increased revenue will be required.

There are also many cases in which our Alumni or others could donate to the Institute property of prospective value, where they could not withdraw from their resources cash or that which yielded immediate income.

With best wishes for the Alma Mater whose Silver Wedding we are about to celebrate, I remain,

Very truly yours,

HENRY MORTON.

President Morton, in replying to the toast, "The Faculty," said:

"Let me explain at the outset that in answering this toast for the Faculty I am speaking for an ideal body, not for myself and colleagues of the present time, but equally for the Faculty of the future and the Faculty of the past. In fact, this Faculty which I desire to represent, is, like Truth, immortal, and will exist in an ever-improving embodiment long after all its present constituents have passed away. Regarding the Faculty whom I represent in this individual and yet impersonal way, I may be allowed to say of it some things which the modesty of its members might forbid my uttering if I were assumed to speak as their mouthpiece only.

"In the first place I would say that the youth of this Faculty has been a healthy youth of struggle and effort involving something of hardship. It has not been after the manner of the *jeunesse dorée* of some institutions endowed with many millions, and needing but to express the wish for any appliance or tool, desirable for carrying on its work, in order to have it. This young Faculty has had to content itself with plain tools and rather a minimum of appliances, and has frequently provided needed tools for itself while carrying on its work. And let me say here that this statement is not limited in its application to any one individual, but it is true in proportion and degree for each and all.

"The best of workmen cannot turn out good work without any tools, and the best of tools will not make good work for the poor workman; but the good workman with the best tools will turn out a maximum of the best work with the least exhaustion of his capacity for its production.

"I by no means intend to say or suggest that our Faculty in the past and present has not had or does not have good tools. The product it has turned out speaks for that; but I do desire to place on record in this connection my conviction that the Faculty of the future, in view of the greater demands which will be made upon it, both as to the quantity and quality of its product, will need more space to work in and more appliances with which to do its work.

"I have no anxiety as to the needs of to-day, but, looking into the future, I am solicitous that timely provision should be made for its needs.

"This Faculty, beginning with eight members, now numbers twenty-two, the additions, without exception, being the intellectual children of the first eight; and though this has been a united family, with no disputes tending to make the house too small to hold it, yet it is easy to realize that, with all which has been done in the way of adding wings and new stories, the old house cannot continue for ever to accommodate its increasing population.

"As to the work done by our present twenty-five-year-old Faculty I need say nothing. If it did not speak or has not spoken for itself to-night, any words of mine would be inadequate. What I hope is that in the near future some one, or many individuals,

possessing the ability and looking at the past work of this immortal Faculty, will say in the words of the parable: 'Well done, good and faithful servant; thou hast been faithful over a few things, I will make thee ruler over many things.'

"For myself, I am well aware that the time is not distant when I must lay aside a work which has never been a labor, but always a pleasure, except on the rare occasions when I have been obliged to affect an uncongenial severity in repressing some excessive exuberance among our undergraduates; but I am solicitous that my successor should be duly equipped with the means required to meet the more stringent demands of the future."

The exercises were concluded with a song by the Stevens Glee Club, entitled "Stevens Men." The song was composed specially for this occasion, the words being written by President Morton, and the music by Dr. Frank L. Sevenoak.

EXHIBITION OF THE WORK OF THE FACULTY AND ALUMNI

A very interesting feature of the celebration of the Twenty-fifth Anniversary was the exhibition, held on Friday, February 19, in the Institute building, of machinery, apparatus, photographs, etc., which represented the work of members of the Faculty and of many of the Alumni.

The exhibits, numbering nearly one hundred installations, consisted of machines and apparatus designed or invented by the exhibitors, and where the exhibits consisted of photographs they illustrated extensive engineering works planned by and erected under the supervision of graduates of the Institute.

Examples of the literary activity of the Alumni were present in the form of technical works, numerous papers which had been presented to engineering and other societies, and of contributions to technical journals. The exhibits were distributed in the physical and electrical laboratories, in the library, machine-shop, and dynamo-room, and were of an exceedingly varied character. They represented labor in almost every branch of engineering science, and served the purpose of giving, in a striking manner, a comprehensive view of the lines of work in which the graduates are engaged, and emphasized the success achieved by them.

During the exhibition hours the building was crowded with visitors, especially where machines were in operation, and particular features were explained by the graduates or their representatives in charge.

As varied in character as the exhibits were, they did not by any means indicate all the kinds of engineering and scientific work in which the Stevens graduate is employed. Thus the work of graduates who occupy such positions as those of superintendent of motive power or master-mechanic of a railroad, or of superintendent of a manufacturing establishment, etc., could not be represented, although their work is equal in importance to any that was exhibited.

In order to give the public additional opportunities to see the exhibits, and to satisfy a very general request, it was decided to continue the exhibition on Sat-

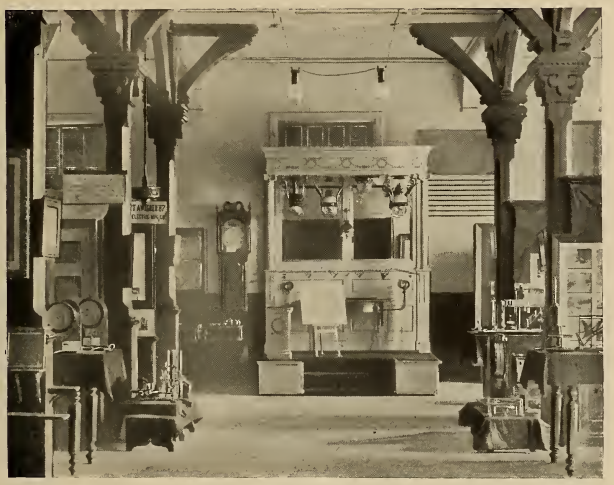
urday, February 20, and Monday, February 22. The extent and character of the exhibition may be judged from the following list of titles. Full descriptions of the exhibits were printed in " The Stevens Indicator " for April, 1897.

Ackerman, W. S. (M.E. '91).—Water-color sketch and photograph of a white-lead factory.

Alden, J. S. (M.E. '84).—Pamphlets on " Theory of Matter."

Antz, Oscar (M.E. '78).—Drawings of a compressed-air snow-flanger.

Atwater, C. G. (M.E. '91).—Photographs of coke-ovens.



Exhibition in Physical Laboratory, Looking East

Barnes, William O. (M.E. '84).—Photograph of a steel type engraving-machine.

Bond, George M. (M.E. '80).—Photo-print of a standard measuring-machine.

Braine, B. G. (M.E. '93).—Photographs of the Glasgow (Scotland) Harbor Tunnel elevators, and photographs representing track-construction, machinery-room, etc., of Lake George (N. Y.) Inclined Railway, etc.

Brinckerhoff, H. M. (M. E. '90).—Photographs of views on the Intramural Railway at the World's Fair, and on the Metropolitan West Side Elevated Railroad at Chicago.

Bristol, Prof. W. H. (M.E. '84), in conjunction with B. B. Bristol (M.E. '93).—Instruments for recording pressure, temperature, electric currents, etc., also steel belt-lacing.

Brooks, Morgan (M.E. '83).—Drawings and patents of an automatic telephone system for villages.

Burhorn, Edwin (M.E. '85).—Photographs and plans of power plants, engines, etc.

Chester, William S. (M.E. '86).—Photographs and sketches of electric motor outfits for blowing church organs, etc.

Coffey, Barton H. (M.E. '85).—Photographs of a dredging-machine.

Collins, Charles Russell (M.E. '86).—Sectional model of an oil-spraying device.

Cooke, John S. (M.E. '79), and Cooke, Fred W. (M.E. '82).—Photographs of locomotives built by the Cooke Locomotive & Machine Co.

Cuntz, Hermann F. (M.E. '93).—Tables of transverse strength of tubing as published in the catalogue of the Pope Tube Co., of Hartford, Conn.

Cuntz, J. H. (M.E. '87).—Literary work in the form of pamphlets on "Money."

Dale, O. G. (M.E. '93).—Steam-engine designed and built while a student, in operation during the exhibition.

Denton, Prof. J. E. (M.E. '75), and Jacobus, Prof. D. S. (M.E. '84).—Apparatus used by them for instruction purposes in the Department of Experimental Mechanics.

Denton, Prof. J. E., and Webb, Prof. J. B.—A friction brake specially designed for testing steam turbines. This brake has been used in testing a steam turbine running at a speed of 20,000 revolutions per minute, and was found to be perfectly reliable in its action at this high velocity.

Dixon, R. M. (M.E. '81); and Dixon, J. A. (M.E. '91); Whitney, O. C. (M.E. '92); Macdonald, J. V. (M.E. '93); Allan, Percy (M.E. '95); and Bruckner, R. (M.E. '96),—all of whom were associated with Mr. R. M. Dixon as assistant engineers at that time.—Lamps for lighting with Pintsch gas system, and model showing car equipment for heating with hot water. (See view of *Exhibition in Physical Laboratory Looking East*, at p. 47.)

Doty, Paul (M.E. '88).—Photographs of gas-works construction.

Foster, E. H. (M.E. '84).—Photograph of a special high-duty Worthington pumping-engine.

Fuller, A. A. (M.E. '88); Connet, F. N. (M.E. '89); and Jackson, W. W. (M.E. '89).—Forty photographs illustrating a 14-in. polishing-lathe, countershaft, and a universal belt-shifter (designed and patented by Mr. Connet) which shifts the belt on and off the loose pulley by successive pulls of a single rope; a venturi-meter with a recording-instrument for measuring large volumes of water.

Furman, Prof. F. DeR. (M.E. '93).—Tabulated review of standard draughting-room methods, and arrangement of elementary course in mechanical drawing.

Geyer Prof. William E. Ph.D. '77), and Ganz, Prof. A. F. (M.E. '95).—Apparatus of the Electrical Department; also special experiments.

Henning, Gustavus C. (M.E. '76).—Instruments for testing materials.

Hewitt, William (M.E. '74).—Samples of wire rope of ordinary and special constructions, produced on machines designed and patented by Mr. Hewitt.

Hickok, H. A. (M.E. '83).—A centro-lineal, a device for drawing perspective views.

Hill, George (M.E. '81).—Drawings and photographs of buildings.

Hiller, N. H. (M.E. '89).—Gauge-cocks and automatic valves for refrigerating machinery.

Howell, John W. (E.E. '81).—Exhibit showing the development of the incandescent lamp from 1880 to 1895.

Humphreys, Alexander C. (M.E. '81), and Glasgow, Arthur G. (M.E. '85).—Photographs representing a few of the water-gas plants that they have erected in America and in Europe. Also an engrossed memorial, giving a list of contracts taken and work finished, and naming the Stevens graduates who were then included in their corps of engineers as follows: Messrs. William W. Randolph (M.E. '86); Shirk Boyer (M.E. '90):

F. N. Morton (M.E. '86); F. Thuman (M.E. '90); W. H. Wade (M.E. '85); J. A. Norcross (M.E. '91); L. D. Carroll (M.E. '84); Rudolph Riege (M.E. '93); and T. H. Van der Williigen (M.E. '88).

Hupfel, Adolph G. (M.E. '93).—Model of a steam yacht built while a student.

Jackson, F. E. (M.E. '86).—X-ray apparatus as made by Aylsworth & Jackson shown in operation.

Jacobus, Prof. D. S. (M.E. '84).—Apparatus for measuring pressures up to 10,000 pounds per square inch and over; for exhibiting the distribution of moisture in a steam main; and for standardizing indicators and thermometers.

Jones, Wm. A. (M.E. '94).—Illustration and description of a 15-inch slotting-machine.



Exhibition in Physical Laboratory, Looking North

Kelly, J. F. (Ph.D., '78).—A 40-kilowatt two-phase generator with regulator head; a 2-kilowatt two-phase induction motor; a 2,000-volt static ground detector; a 10,000-volt static ground detector; and a static voltmeter,—being component parts of the Stanley-Kelly-Chesney system.

Kent, William (M.E. '76).—A transmission dynamometer; a torsion balance, pivot and truss; photographs and drawings of inventions of furnaces, engines, machines, etc. Also Kent's "Mechanical Engineer's Pocket-Book," and volume of papers presented to engineering societies, and of articles prepared for the technical press.

King, William R. (M.E. '86).—Electrical furnace in operation.

Kroeh, Prof. Charles F.—Textbooks for learning French, German, and Spanish.

Ladd, J. B. (M.E. '81).—Photographs of blast-furnace and steel-works.

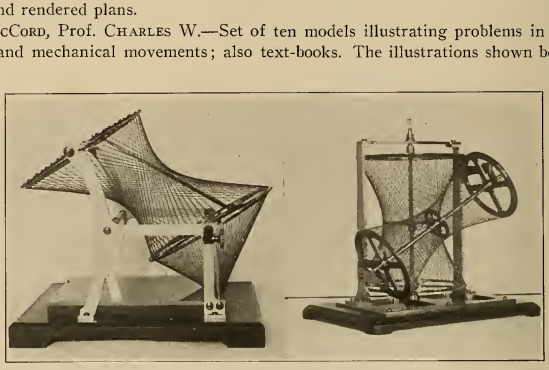
Leeds, Dr. Albert R.—Improved forms of apparatus (in operation) devised by him for the quantitative measurements of micro-organisms and bacteria in water.

Lieb, J. W., Jr. (M.E. '80).—Photographs of electric-lighting and electric-railway construction in the city of Milan, Italy.

Lozier, A. de la M. (M.E. '94).—Automatic electric sounding-machine for ascertaining the depth of water under a vessel without measuring the amount of line overboard, or without lifting the sinker to do so.

Ludlow, William O. (M.E. '92).—Number of water-color and pen-and-ink sketches, and rendered plans.

MacCord, Prof. Charles W.—Set of ten models illustrating problems in descriptive geometry, and mechanical movements; also text-books. The illustrations shown below repre-



Two of Ten Models Exhibited by Professor MacCord

sent respectively: the one on the left hand, a model of circular and elliptical hyperboloids; and the one on the right hand a model of two tangent hyperboloids of revolution.

MacGregor W. H. (M.E., '96), and Kingsford, R. T. (M.E. '96).—Apparatus for indicating a steam-engine under rapidly and constantly varying load.

Maury, Dabney H., Jr. (M.E. '84).—Photograph and blue-prints of a steel tower and tank, together with specifications for a water-works system.

Mayer, Prof. Alfred M.—Number of floating disks and rings; floating magnetic needles arranging themselves in regular geometrical figures under the influence of a magnet suspended over them; topophone for determining the direction from which a sound is coming; also a sound-mill consisting of four resonators mounted so as to revolve when plæced near a vibrating tuning-fork.

Morton, President.—Samples of salts; colored drawings of spectra and apparatus used in chemical research; apparatus used in the exhibition of phenomena of sound, light, and magnetism; paintings representing various lecture illustrations; original designs and lithographic impressions in color, in connection with his work on the translation of the hieroglyphic inscription on the Rosetta Stone and as title-pages for other compositions of his own; various volumes containing articles on scientific subjects.

Nash, Lewis H. (M.E. '77).—Twenty-horse-power Nash gas-engine, and the Crown, Gem, Empire, Nash, and Improved Gem water-meters.

Parsons, W. P. (M.E. '80).—Photographs and drawings of cotton-compressors.

Pfordte, O. F. (M.E. '86).—Samples of concentrated ores, and photographs of mining regions in Peru and Colorado.

Pierson, William D. (M.E. '94).—Continuous wire-drawing machine.

Post, Henry W. (M.E. '74).—Plans of steel construction for buildings.

Prentiss, Henry S. (M.E. '84).—Synchronized clocks.

Quimby, William E. (M.E. '87).—Screw pump in operation.

Rice, H. R. (M.E. '85).—Photographs of engines of the Rice & Sargent Co.

Roberts, E. P. (M.E. '77).—Prints, specifications, and photographs of steam and electric power, and heating and electric-lighting plants; also a Catalogue of the Correspondence School of Technology, of which Mr. Roberts was President, and Mr. Oscar Antz (M.E. '78) was Associate Instructor.



Luminous Electric Tubes

From One of the Early Lectures at Stevens Institute by President Morton

Roberts, George J. (M.E. '84).—Model of a water-gas plant, with improvements, as manufactured by the United Gas Improvement Co., of Philadelphia.

Ruprecht, Louis (M.E. '94).—Specimens of various alloys of lead, tin, antimony, copper, zinc, bismuth, nickel, etc.; such as Babbitt metals of all grades linotype metal, stereotype metal, electrotype metal, bronzes, etc.

Sague, James E. (M.E. '83).—Photographs of locomotives.

Schlesinger, Alfred H. (M E. '91).—A successful hard-rubber pump for handling corrosive liquids.

Schumacher, H. J. (M.E. '91).—Kite for experimental purposes.

Smith, H. R. (M.E. '88).—Illustrated description of an electric elevator.

Stahl, A. W. (M.E. '76).—Painting of the protected cruiser "Olympia," and two albums of photographs of the "Monterey" and the "Oregon," taken on their trial-trips (Mr. Stahl superintended the construction of these vessels): copy of a text-book on "Elementary Mechanism," written by himself and Mr. Arthur T. Woods; and a patent specification for a wave motor and a paper relating thereto.

Stillman, Prof. Thos. B. (Ph.D. '83).—Viscosimeter for oils, and a text-book on "Engineering Chemistry."

Thompson, E. P. (M.E. '78).—Books: "Roentgen Rays," and "Invention as a Science."

Torrance, Henry, Jr. (M.E. '90).—Drawings of a grain-dryer.

Uehling, E. A. (M.E. '77).—Pneumatic pyrometers and his gas composimeter, in operation; drawings and photographs of his pig-iron-molding and conveying apparatus as then in operation at the Lucy furnaces.

Uhlenhaut, F., Jr. (M.E. '88).—Map and photographs of the plant and system of the Philadelphia Traction Co.

Vail, E. L. (M.E. '76).—Photographs and etchings of original paintings. It is to be noted that Mr. Vail devoted himself to fine art immediately after graduation from the Institute, and that his success in this field is evidenced by the fact that he has been for many years *hors concours* at the French Academy, and has received the decoration of the Legion of Honor.

Van Vleck, J. (M.E. '84).—Edgewise electrical measuring instruments constructed according to his designs; also photographs and models of a triple-expansion steam-engine known as the Van Vleck engine.

Wagner, H. A. (M.E. '87).—Motors, transformers, switches, and cut-outs; switch-board volt-meter, with illuminated dial; and photographs showing views of other apparatus and of the shops of the Wagner Electric Manufacturing Co.

Webb, Prof. J. B.—A gyroscope of his own construction; a panel bridge model; a moment-of-inertia balance; and pieces of apparatus for weighing the reaction of water-jets.

Westcott, J. T. (M.E. '90).—Photographs of Birmingham Gas Works as erected by the Economical Apparatus Construction Co., of Toronto, Canada.

Wetzler, Joseph (M.E. '82).—A number of volumes of "The Electrical Engineer," of which he was editor, and several books of which he is the author.

Whigham, Wm. (M.E. '88).—Prints of a water-spray apparatus for chilling the surfaces of armor plate.

Whitney, A. R., Jr. (M.E. '90).—Photographs of the exterior and interior of the nail-manufacturing plant of the Puget Sound Wire Nail & Steel Co.; photograph of the interior of the power-plant of the Everett Railway & Electric Co.; and a photograph of the sloop yacht "Storm King," designed, modeled, laid down, and built by George E. Montandon and Mr. Whitney.

Wildman, Leonard D. (M.E. '90).—Framed pictures of various types of air- and gas-compressors manufactured by the Norwalk Iron Works Co.

Willis, E. J. (M.E. '88).—Planimeter for areas, mean pressures, and horse-power.

Wolff, A. R. (M.E. '76).—Plans and specifications for the complete steam-power, heating, and ventilating plant of the new hotel then in course of erection at 34th Street and Fifth Avenue, for Mr. Astor. It represented the largest and most costly heating and ventilating plant ever installed in any building in the world.

Wood, Prof. De Volson.—A rock-drill; also a home-made barometer.

Wood, F. H. (M.E. '93).—Photographs of a house, representing his own design.

Woodman, Durand (Ph.D. '80).—Samples of irons and steels, with analyses.

Wurts, A. J. (M.E. '84).—Marble switch-board panels; non-arcing lightning-arresters; and thirteen photographs illustrating some of Mr. Wurts's latest inventions in switch-board apparatus, and some of the experiments connected with his discovery of non-arcing metal; also the John Scott medal, presented to Mr. Wurts by the Franklin Institute in recognition of his valuable discovery and inventions in lightning arresters.



Library of Stevens Institute During the Twenty-fifth Anniversary Exhibition, Showing Models of Stevens Battery, etc., and Latest Model of Ferryboat

In addition to the exhibits contributed by the Faculty and Alumni as above enumerated, there were sent to the Institute by Col. E. A. Stevens a number of interesting models representing:

1. The Stevens Battery, as designed and partly constructed by Robert L. and Edwin A. Stevens the elder.

2. A model of the "Naugatuck," a small vessel rebuilt and fitted out by Edwin A. Stevens for use against the "Merrimac" during the war of the Rebellion.

3. A model representing the "Maria" as altered from a sloop into a schooner by Edwin A. Stevens.

4. A model on a very large scale, and complete in every detail, inside and

out (a portion of the hull being cut away to expose to view all the interior machinery), of the "Hamburg," one of the latest of the double-ended ferry-boats, with screw propellers at each end, and compound engines, designed and adopted on the New York and Hoboken ferries by Col. E. A. Stevens. In contrast to this was a model of the twin-screw boat which ran between New York and Hoboken in 1804, having been built at that date by John Stevens. This latter model was secured from the National Museum at Washington through the kindness of Mr. J. E. Watkins. The illustration on the preceding page shows these models as they stood during the exhibition in the Library. Four of them are on the table in the middle of the picture, and the large ferry-boat model is in the elevated glass case immediately beyond this table.

Mr. B. C. Ball, of the Class of 1895, exhibited a tachometer and a throttling governor. There were also several exhibits by undergraduates, as follows:

KIRKLAND, W. A., '97.—Gas engine built by him in the Institute's shops.
KORNEMANN, H. A., '99.—Dynamo and motor, built at the Institute.
PRYOR, F. L., '97.—Tandem bicycle constructed from parts purchased in the market.
STRANG, W., '98.—Dynamo built at the Institute.

An interesting exhibit was that of the Stevens Photographic Society, to which members of the Faculty, Alumni, and Undergraduates contributed. The first prize was awarded to Mr. William Ebsen, M.E., '90.

During the exhibition the rooms of the various departments of the Institute were thrown open for inspection.

In the drawing-rooms the regular work upon which students happened to be engaged at the time was displayed, as well as finished drawings representing the work of the different years of the course in this Department.

As indicated by the above brief descriptions, the exhibition was large and interesting beyond anything which could have been anticipated, though beyond doubt many more exhibits of equally high character and scientific interest would have been presented had more time been available for their preparation.

Mrs. Edwin A. Stevens received the Trustees, Faculty, Alumni, Undergraduates, and their friends, at Castle Point on Friday afternoon, February 19, from three to six o'clock. In receiving the many guests who thronged the mansion for several hours, Mrs. Stevens was assisted by Mrs. Henry Morton, Mrs. C. B. Alexander, Mrs. Albert Stevens, and Mrs. Richard Stevens.

The closing festivity was the promenade concert and dance, held at the German Club on Friday evening. The large hall there, which has a seating capacity of five hundred, was crowded, and there was an overflow into the adjoining dining-hall, so that more than six hundred people were in attendance.

The concert ended with the song, "Mechanical Engineer," by the united musical clubs and by many of the audience, and at its close the hall was cleared of chairs, and the dancing began.

Altogether the concert and dance proved to be a very great success, and formed a fitting close of the glorious celebration of the Twenty-fifth Anniversary of the founding of the Institute.

In response to a notice which was sent to the exhibitors at the Anniversary Exhibition, stating that the establishment of a permanent exhibition at the Institute was contemplated, a considerable number of donations for that purpose were received, being in some cases part, and in others all, of the exhibits shown on the above occasion.

Some of the framed photographs and drawings presented were hung upon the walls in different parts of the Institute building, and suitable provision was made for preserving and exhibiting the others.

DEDICATION OF THE CARNEGIE LABORATORY OF ENGINEERING

This building, although completed and ready for occupancy at the opening of the scholastic year in the fall of 1901, was not formally presented by Mr. Carnegie until February 6, 1902.

The presentation exercises, on account of their happy and unique features, merit more than a passing note. Mr. Carnegie's felicitous remarks entertained and greatly amused the Alumni and their guests; the latter including, among others, Mrs. Carnegie; Col. Edwin A. Stevens; Mr. and Mrs. Richard Stevens; Mrs. E. P. C. Lewis and Mrs. C. B. Alexander, both daughters of Mr. Edwin A. Stevens, the founder of the Institute; Miss Garnet; and Mr. Alexander C. Humphreys.

Mr. Carnegie's address on this occasion attracted wide attention. It may be found in full in the "Stevens Institute Indicator" for April, 1902. Brief extracts are presented herewith:

"This building seems admirably adapted to its purpose, and yet there is that flavor of artistic excellence which could not fail to impress me as I had my first view of it. . . .

"Usually when I have been brought out of my cage to perform the lion, my keeper has presented me with a time-table, telling me just where I begin to roar, and just where to come in; . . . but this time I am playing the lion run loose, broken from the cage, and have no keeper whatever. There is something charming about being perfectly at your ease and allowed to say anything that you please. Now, I wish to say this to you: My trifling gift to Stevens Institute was not a thing of chance, not a whim. No, it was conscientiously bestowed. It was given because of my experience with what Stevens was doing, because in my time I have been engaged in manufacturing. . . .

"When the Iron and Steel Institute was over here (I was chairman of the committee) I invited a party of the leaders each night to dine with us. One night, the first of all, when the principal men were there, my health was drunk—as they do in England, drink the health of everyone, and you have to get up to say something. It 's a splendid habit. I tell you the banquet that consists simply of material things and without speaking,

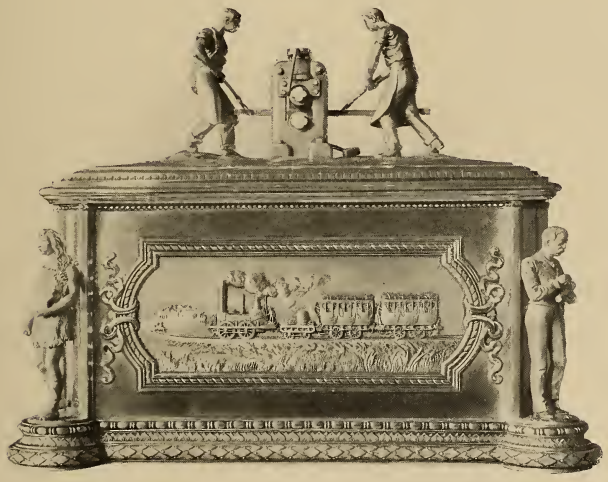


Andrew Carnegie

without brightness, well, that is a feed. It is not a banquet at all. One of them rose and said:

"'Mr. Carnegie, we have been all over your country and have seen everything; the doors were opened to everybody. It is not the good machinery that we have seen here that surprises us most and which we require most; it is not even the magnificent assortment of ore with which you are blessed. It is something more important than both these, — the class of young men that you get in this country: we know of no corresponding class in England.' That man put his finger upon the preëminent cause of our superiority.

"Therefore when your President told me about the need of a mechanical laboratory I thought I owed the Alumni of Stevens a great deal more than that laboratory, and



Silver Box Containing a Piece of the Stevens Rail of 1831

I asked him if I might be privileged to provide the funds. With that courteous grace for which he is distinguished he in the most cordial manner set me quite at ease and —— accepted my offer. . . .

"And now, Mr. President, it remains for me to present to Mr. Dod the keys of this building. I hope that there may come from its walls students that will worthily sustain the reputation of Stevens, and having done that, I, for one, have nothing more to ask."

President Morton then presented to Mr. Carnegie the section of the first T-rail, in the silver casket designed by A. D. Turner and manufactured by Messrs. Tiffany & Co. A general view of the casket is given above, and the two corner pieces not there shown are represented on the following page. Of the



Figure on Rear of Box

four figures, one represents the prehistoric blacksmith or metal-worker of the Iron or Bronze Ages; another the armorer of the Middle Ages; the third is the village blacksmith of our fathers; and the fourth represents a graduate of the Stevens Institute.

On the top of the box, as the picture shows, are figures of two men guiding a rail through the sort of "rolls" used in and for many years after 1831, and on the front, in high relief, is a picture of the first train which ran over these T-rails on the Camden and Amboy railroad, consisting of the locomotive "John Bull," built in England by George Stephenson, and a train of coach-bodies mounted on flat cars. A man on a fast horse went in front of the train to warn people off the track.



Figure on Rear of Box

On the rear side of the box, also in relief, is a picture of the Carnegie Laboratory of Engineering, and at one end is a medallion portrait of Mr. Carnegie, and at the other one of Robert L. Stevens. On the under side of the lid of the casket is inscribed the following:

> "This casket is presented to Andrew Carnegie, Esq., by the Alumni Association of the Stevens Institute of Technology, in commemoration of his gift to the Institute of the building for the Carnegie Laboratory of Engineering, and contains a portion of the first T-rail ever manufactured, the same having been rolled in 1831 at the mills of Sir John Guest, in Wales, under the personal supervision of Robert L. Stevens, who devised the rail and contracted for its manufacture in quantity for the Camden and Amboy Railroad, of which he was President and Engineer-in-Chief."

The casket also contained a facsimile of the original letters and documents relating to the invention, importation, and use of the first T-rails from which the section presented to Mr. Carnegie was taken. This section was also duly certified in a letter from Mr. Francis B. Stevens, E.D., who surveyed the Camden and Amboy railroad, on which these rails were first used in 1831.

Mr. Carnegie, in accepting the casket, said in part:

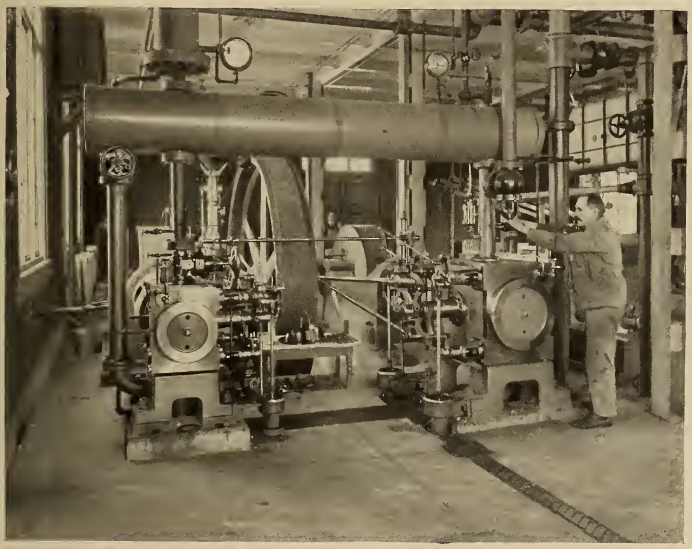
"This is another surprise — an incident. And I think that this touches me too nearly for me to feel that I can fittingly express my feelings to you for such a gift, considering this small service I have done. I bear blushingly the honors heaped upon me to-night. To think that my name and figure should ever be associated on the same casket with Mr. Stevens! . . .

"The beautiful sentiment of this piece gives to me a peculiar charm. I cannot imagine how anything could be finer, and as all my life, you may say, has been spent in iron and steel,— only in manufacturing, not in inventing,— I have no claim to anything but

knowing how to use the inventions of others, and I think my own tomb should be inscribed:

"'Here Lies a Man Who Knew how to Get Around Him Men Much Cleverer than Himself.'

"I thank you, the Alumni of Stevens, for this gift. It will pass down as an heirloom, a heritage in our family. It shall never fail to have the place of honor, and our



Allis-Corliss Cross Compound Engine in the Carnegie Laboratory
Presented by the Stevens Family

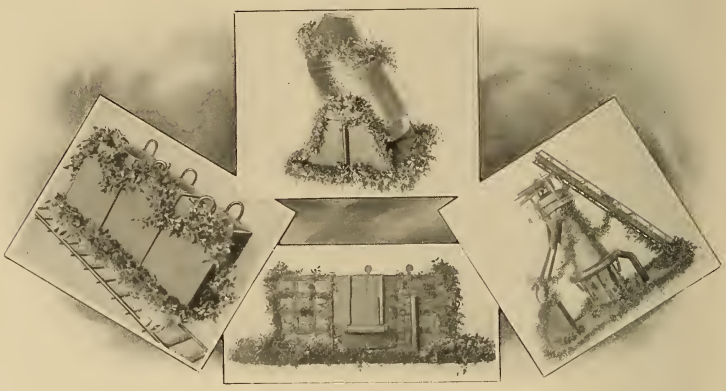
children shall be taught that what their father was proudest of was this, and perhaps a few other kindred things. They will recognize that in his day and generation he had followed, aimed to follow, those beautiful words by King Alfred, one of the greatest men who ever lived: 'Now I have tried to live my life worthily and to leave behind me for the others that come the memory of some good deed done.'

"I thank you from the bottom of my heart, gentlemen, for this unique and peculiarly touching gift which you have just bestowed upon me."

At the banquet following the presentation exercises many unique features were introduced. These included a model of a blast-furnace about six feet high, occupying the centre of the large central table. From this model was "tapped" punch in the regular manner of the modern blast-furnace into ladles operated

by working gears and mounted on trucks. The trucks were also correct working models and ran the full length of the table on miniature tracks. The blast furnace is shown in the accompanying group of illustrations, as are also several other features briefly described in the following lines.

Another model showed a Bessemer converter mounted on trunnions through which the blast-pipe led to an apparatus that had been devised to produce a "blow" throwing out flames several feet high, in which were glowing iron filings. An excellent imitation of a converter in action was thus produced. This converter, on being turned down, poured out fancy cakes.



Models of Bessemer Converter, Ingot Molds, Open-Hearth Furnace, and Blast Furnace

Still a third was a reproduction of an open-hearth furnace, lit interiorly with red electric lights, so that when the counterweighted door was raised a perfect representation of the glowing furnace was given. From this furnace came fried oysters.

Models of ingot-molds, ladles, etc., did service at the various tables as containing-vessels for various items on the *menu*. The ice-cream was served from T-rail forms of usual size in cross-section, and about eighteen inches long. A number of ordinary spike-nail kegs were filled with bread and cake in the form of railroad spikes of actual size.

All of these unique and intensely interesting features of the banquet originated with President Morton and were executed under his supervision at the Institute.

INAUGURATION OF PRESIDENT HUMPHREYS

Although President Humphreys assumed the duties of his office at the opening of the collegiate year in the fall of 1902, the formal exercises of inauguration did not take place until February 5, 1903. On that date the Trustees, Faculty, Alumni, and invited guests assembled at the Carnegie Laboratory, where Chancellor W. J. Magie, of New Jersey, administered the oath of office.

The addresses delivered on that occasion were as follows:

Address of Welcome . . . . . S. Bayard Dod, A.M.
Address on Behalf of the Faculty . . . . . Prof. Charles F. Kroeh, A.M.
Address on Behalf of the Alumni . . . William F. Zimmerman, M.E., '76.
Address on Behalf of the Universities and Colleges . Charles F. Thwing, D.D.
Address on Behalf of the Schools of Engineering . Henry S. Pritchett, LL.D.
Greeting from Rensselaer Polytechnic School . . . . . Dr. W. L. Robb.
Greeting from University of Pennsylvania . . . . . Edgar Marburg, C.E.
Address by . . . . . Andrew Carnegie.
Inaugural Address . . . . . President Alexander C. Humphreys, M.E.

In connection with the inaugural exercises a reception was tendered to President Humphreys by the Alumni Association, on the evening of the 4th of February, in the Carnegie Laboratory. On this occasion President Humphreys spoke at length on matters of interest to the Alumni. Prof. James E. Denton, of the Class of 1875, responded on behalf of the Faculty and Alumni.

On the evening of the 5th an inaugural dinner was tendered to President Humphreys at Sherry's, in New York. Over four hundred guests and Alumni were present. Toasts were responded to by the following:

Alexander C. Humphreys, M.E., *President of Stevens Institute of Technology*
Hon. Franklin Murphy, *Governor of New Jersey*
Rev. Frederick Burgess, *Bishop of Long Island*
Col. E. A. Stevens, *Trustee of Stevens Institute*
S. Bayard Dod, A.M., *President of Stevens Board of Trustees*
Robert H. Thurston, A.M., E.D., LL.D., *Director of Sibley College*
Walton Clark, *General Superintendent of United Gas Improvement Co.*
Henry S. Pritchett, LL.D., *President, Massachusetts Institute of Technology*
Capt. W. H. White, *Consulting Engineer*
R. H. Crittenden, Ph.B., Ph.D., *Director of Sheffield Scientific School*
George H. Daniels, *General Passenger Agent, New York Central Railroad*
Malcolm S. Greenough, *President, Cleveland Gas Light & Coke Co.*
Prof. Chas. F. Chandler, M.D., Ph.D., LL.D., Sc.D., *Columbia University*
Col. H. G. Prout, *Editor of "The Railroad Gazette"*
Prof. Edgar Marburg, C.E., *University of Pennsylvania*
Tracy H. Harris, *President of the Princeton Club*
Eben E. Olcott, *President of the Institute of Mining Engineers*

All the addresses at the inaugural exercises, the Alumni meeting, and the banquet are printed in full in the "Stevens Institute Indicator" for April, 1903.

THE ALUMNI ASSOCIATION

The Alumni Association of the Stevens Institute of Technology was organized July 1, 1876. its object being "to cultivate such social relations as shall tend to foster among its members a sentiment of regard for one another and of attachment to their Alma Mater, and to promote in every way the interests of the Institute."

Since its organization, one year after the first four-year class had been graduated, its membership has grown from about 25 to 711 on January 1, 1904, so that it now numbers about 73 per cent of the total number of living graduates. Of the total number of graduates 57 are deceased.

The first President of the Alumni Association was William Hewitt, M.E., '74, as will be seen from the following list, which gives the name of each succeeding President and also the year during which he served:

NAME	YEAR	NAME	YEAR
William Hewitt (M.E. '74)	1876–77	Alfred P. Trautwein (M.E. '76)	1890–91
Henry W. Post (M.E. '74)	1877–78	Edward B. Wall (M.E. '76)	1891–92
William E. Geyer (Ph.D. '77)	1878–79	Cornelius J. Field (M.E. '86)	1892–93
James E. Denton (M.E. '75)	1879–80	Harry Van Atta (M.E. '81)	1893–94
Alfred P. Trautwein (M.E. '76)	1880–81	William Hewitt (M.E. '74)	1894–95
Alfred R. Wolff (M.E. '76)	1881–82	Harry deB. Parsons (M.E. '84)	1895–96
Adolph Sorge (M.E. '75)	1882–83	Edward P. Roberts (M.E. '77)	1896–97
Roland S. Kursheedt (M.E. '80)	1883–84	John W. Lieb, Jr. (M.E. '80)	1897–98
William Kent (M.E. '76)	1884–85	Robert M. Dixon (M.E. '81)	1898–99
Alex. C. Humphreys (M.E. '81)	1885–86	Hosea Webster (M.E. '82)	1899–1900
George M. Bond (M.E. '80)	1886–87	William L. Lyall (M.E. '84)	1900–01
Alfred R. Wolff (M.E. '76)	1887–88	Carter H. Page, Jr. (M.E. '87)	1901–02
Lewis H. Nash (M.E. '77)	1888–89	William S. Ackerman (M.E. '91)	1902–03
Gustavus C. Henning (M.E. '76)	1889–90	William C. Post (M.E. '86)	1903–04

The Alumni Association has been and still is active in the interests of its Alma Mater, for whom it has instituted a number of worthy projects looking toward her further advancement.

Shortly after its organization the Alumni Association established a Beneficiary Fund, which was created by means of contributions from the members and by an appropriation from the General Fund of the Association. The Beneficiary Fund, thus early established, is still flourishing, and has for its object the assisting, financially, of such worthy and needy students as desire to complete their course of study at Stevens. This fund, however, is not one of pure charity; for it is presumed that the beneficiary, some time after graduation, will be in a position to repay his indebtedness to the Association, and he is therefore required to give a promissory note to that effect. Since the establishment of this fund twenty-one students have received assistance varying from $50 to $200. The total amount of the fund at present is $1,900.44.

In 1886 the Alumni Association took steps to raise, by subscription, the sum of $2,500 for the establishment of a Scholarship Fund, in accordance with resolutions previously passed by the Board of Trustees. But before the above sum had been secured, the urgent needs of the Institute Library manifested themselves and became paramount, and it was therefore decided to change the name of this fund to the Library Fund, the consent of the subscribers having been obtained. Out of the $914.75 which had been subscribed, the Association placed in the hands of the Institute Trustees the sum of $800 for the purchasing of standard works, among which was a complete set of the "Transactions" of the British Society of Mechanical Engineers; for the indexing and cataloguing of the Library; for binding the most important pamphlets and papers, and, in general, placing the Library in a condition of thorough efficiency. This action was supplemented by the Trustees, who altered the Library to better advantage and provided a Librarian.

At the regular meeting of the Association held in June, 1889, a Library Portrait Fund was established by subscription. By means of this fund crayon portraits of Capt. John Ericsson, Col. John Stevens, and Robert L. Stevens have been made, framed, and presented to the Institute, and now grace the Library walls. Through the efforts of the committee in charge of this fund, and the generosity of Mrs. Martha B. Stevens, the Institute was the recipient, in 1890, of a portrait of Edwin A. Stevens and a bust of Benjamin Franklin, and these also adorn the Library.

Another crayon portrait furnished through the generosity of the Alumni, although not by the above-mentioned Portrait Fund, is that of the late Edward B. Wall, of the class of '76.

During the year 1886 the Alumni Association petitioned the Board of Trustees for representation in that body, with the result that in 1887 representation by one Alumnus was granted, and upon further petition, in 1891, an additional representation of two was granted, making three in all. This generous recognition from the Board of Trustees, which was a great encouragement to the Alumni Association in the pursuance of its earnest efforts, was due in a large measure to President Morton, who had ever manifested a warm interest in the affairs of the Association and in its individual members. As an acknowledgment of this interest and of their esteem, and of gratitude for his many kindly acts, the Association decided, in 1892, to present the Institute with a life-sized portrait of President Morton. When a call was made for contributions for this purpose there was a ready response, and the sum of $1,008.50 was promptly subscribed. The portrait, which represents President Morton in his laboratory in the act of lecturing to his class, was painted by a noted artist, who, out of a warm personal friendship for Dr. Morton, executed the work at an extremely low figure, leaving a large balance in the above fund, a portion of which was used in the preparation of a souvenir book descriptive of the life work of President Morton. This large

portrait, suitably framed, was presented to the Board of Trustees by the Alumni Association in June, 1892.

Looking forward to the growing demands of the Institute, the Alumni Association, at its regular midwinter meeting in February, 1892, authorized and then entered upon the task of raising a subscription of $50,000 among the Alumni, for the erection of a building to accommodate the Departments of Physics and Chemistry. About $15,000 was subscribed by the Alumni, when the financial depression which began in 1893 interfered with further progress in the work. Some years later, when the times became propitious, President Morton, who had contributed to the fund sums in the aggregate equal to twice the amount subscribed by the Alumni, secured the good offices of Mr. Andrew Carnegie, who gave a new building, costing $65,000, and an endowment of $100,000, increased later to $225,000. Thus the immediate demands of the Institute were met, and the Alumni Building Fund remained dormant until the fall of 1902, when necessity again arose for further building accommodation. The Alumni were appealed to, and there was a ready response of over $30,000, making a total of about $55,000 contributed by the Alumni at the present time. This includes interest on the early contribution of $15,000. The total amount in the fund now is about $90,000. The difference between this and $55,000 is due to the contributions of President Morton and the interest thereon.

Not all of the good work of this Association has required the raising of funds. In order further to increase its broadening field of usefulness, the Alumni Association established in 1887 what might be well described as a professional employment association among themselves. Although this has not been maintained as such, its spirit has survived, as shown by the fact that many of the Alumni who have reached positions of influence have given employment to a large number of Stevens men. The most prominent example of this is found in the case of Mr. Alexander C. Humphreys, '81, who, as superintendent of the United Gas Improvement Co. and as a member of the firm of Humphreys & Glasgow, has employed more than fifty Stevens men. Mr. A. P. Trautwein, '76, President of the Carbondale Machine Co.; Mr. R. M. Dixon, '81, 1st Vice-President of the Pintsch Compressing Co.; and Mr. J. W. Lieb, '80, General Manager of the New York Edison Co., have also taken a large number of graduates.

Until 1888 the Alumni Association met once a year during Commencement week. In February of that year the first semi-annual or midwinter meeting of the Association was held; these meetings have since been continued chiefly as social functions, the business transactions occurring at the June meeting. In 1893 a new Constitution was adopted, to meet the changed requirements of the Association, which had grown very rapidly, and whose members were scattered over an extensive territory. One of the principal changes provided for in this Constitution was the election of officers by mail instead of by direct vote, as had previously been the custom.

"STEVENS INSTITUTE INDICATOR"

THE "Stevens Institute Indicator," now issued quarterly as a technical publication, and the official organ of the Stevens Institute of Technology, first made its appearance as the "Stevens Indicator" under date of January 15, 1884. It was founded by the Undergraduates and was published on the 15th of each month during the college year by a Board of seven editors, of whom Mr. C. W. Whiting, '84, was the first Editor-in-Chief, and to whom more than any other one person is due the credit of introducing a periodic news publication at Stevens.

At the beginning of the year 1885 a stock company obtained control of the "Indicator" and published it until the latter part of 1886, when the Alumni Association assumed its management, defined its policy, and became financially responsible for the publication. It was made a quarterly magazine, distinctively scientific in character, and was edited by a Board consisting of two Alumni and four Undergraduate members. It was thus first issued in its present character and form January 15, 1887.

The Faculty and Alumni of the Institute have been the principal contributors to the "Indicator," and to them is due in a large measure its success and the credit for the prominent position it has taken among technical college publications. Many of the articles that have appeared in its pages are valuable additions to scientific literature, and have been reprinted by the leading engineering journals of the United States and Europe.

The management of the "Indicator" since it became the official publication of the Institute in 1887 has been in the following hands:

A. P. Trautwein, M.E. '76..... Albert Spies, M.E. '81.....	January, 1887, to April, 1888, inclusive
A. P. Trautwein, M.E. '76..... Joseph Wetzler, M.E. '82.....	July, 1888, to April, 1889, "
A. P. Trautwein, M.E. '76..... Joseph Wetzler, M.E. '82..... Adam Riesenberger, M.E. '76.....	July, 1889, to October, 1890, "
Adam Riesenberger, M.E. '76..... Joseph Wetzler, M.E. '82.....	January, 1891, to January, 1892, "
Joseph Wetzler, M.E. '82.....	April, 1892, and July, 1892
Thomas B. Stillman, Ph.D. '83.....	October, 1892
Samuel D. Graydon, M.E. '75.....	January, 1893, to October, 1895, inclusive
Adam Riesenberger, M.E. '76..... Thomas B. Stillman, Ph.D. '83.....	January, 1896, to April, 1897, "
Franklin DeR. Furman, M.E. '93.....	July, 1897, to July, 1902, "
Charles O. Gunther, M.E. '00.....	October, 1902, to January, 1904 "
William A. Shoudy, M.E., '99.....	April, 1904, to ———

STUDENT ENTERPRISES

SOCIAL LIFE

Fraternities.—Among the older of our College institutions are the various chapters of the Greek-letter fraternities, of which there are nine now represented at Stevens with a membership ranging from 10 to 19 each. In 1879 the total undergraduate membership of the fraternities having chapters at Stevens was 60 per cent of the whole student body and was then at its height; in 1903 the membership had decreased to 29 per cent. Further data regarding the several fraternity chapters that have been established at Stevens is given in the following table:

Name of Fraternity	Name of Chapter	Local Chapter Founded	Discontinued	Percentage of Living Graduates, Total Number 933
Theta Xi	Gamma	1874	...	12.86
Sigma Theta Pi	Alpha	1874	1875	
Delta Tau Delta	Rho	1874	...	12.96
Alpha Sigma Chi	Gamma	1875	1879*	
Beta Theta Pi	Beta Epsilon	1879	1883	
Beta Theta Pi	Sigma	1883	...	13.08
Alpha Tau Omega	N. J. Alpha Kappa	1881	1885 } 1896 }	1.29
Alpha Tau Omega	N. J. Alpha Kappa	1890		
Chi Psi	Alpha Xi	1883	...	6.54
Sigma Chi	Alpha Delta	1883	1891	1.39
Chi Phi	Mu	1883	...	5.25
Theta Nu Epsilon	Mu	1883	...	12.97
Tau Beta Pi	Alpha of N. J.	1895	...	9.33
Phi Sigma Kappa	Iota	1899	...	1.29
Sigma Nu	Gamma Delta	1900	...	.96

* The fraternities of Alpha Sigma Chi and Beta Theta Pi united in 1879, retaining the latter name

Dances.—The first undergraduate social event in the annals of the Institute was a Stevens Ball, held in the Gymnasium Hall, January 23, 1878. It was first suggested by one of the students as a means to raise funds for the new gymnasium. This, however, was not continued as a yearly affair; but several years later, in 1885, Senior Promenades were held at the German Club, Hoboken, and at the Institute. In 1887 the Junior Ball was given for the first time in the German Club, and since then it has been held each year by the Juniors. From 1890 to 1902 inclusive it was held in different well-known halls in New York, including Sherry's, Lenox Lyceum, Jaeger's Hall, Delmonico's, etc. In 1903 it was held in the hall of the Carnegie Laboratory. Previous to 1893 the Junior Ball was given during Commencement week; then for several years it was held immediately after Lent, and for the past few years it has occurred before Lent.

Stevens Senior Socials were receptions given at short intervals, and originated with the Class of 1884. For a short time membership was limited to the Senior class; it was finally limited to the membership of several fraternities and became known simply as the Stevens Social Society. A dance is given each term

of the college year. For many years the dances were held in the hall of Stevens School, but are now given in the Carnegie building.

Receptions.—President and Mrs. Morton's annual reception to the Faculty, Alumni, and Undergraduates was one of the charms of Commencement week. This custom has been continued by President and Mrs. Humphreys, who gave their initial reception in the spacious hall of the Carnegie Laboratory, June 17, 1903.

In addition to the above-mentioned receptions connected with the Institute, many have been given to the undergraduates at different times since the organization of the Institute by the various Professors and their wives at their homes.

Several of the fraternities have also, for many years, contributed to the general social life at the Institute by giving receptions or afternoon teas to their friends.

An appreciated courtesy that has been graciously extended to the Faculty, Graduating Class, and Undergraduates, has been the use of the private grounds of Castle Point for Class Day exercises, together with the receptions given by the hostess of the Castle on these occasions.

Commencement Exercises.—Besides the social functions enumerated above, and the meeting of the Alumni Association, the Commencement week has always been a period for Class reunions and other festivities on the part of the visiting Alumni. Commencement exercises have been held in various places, including the Institute Lecture Hall, the German Club, the M. E. Church, and the Hoboken theatres.

Among those who have been selected to deliver the address to the graduating class, the following have been recorded in various publications that have been available in the preparation of this book:

Mr. James C. Bayles	1883
Mr. A. P. Boller	1887
Dr. C. E. Emery	1887
Mr. J. H. Holloway	1890
Mr. Erastus Wiman	1891
Mr. Alfred R. Wolff, M.E.	1892
Mr. Alexander C. Humphreys, M.E.	1893
Mr. Joseph Hector Fezandié, M.E.	1894
Mr. John M. Gregory, LL.D.	1895
Mr. Robert W. Hunt	1896
Mr. Henry R. Towne	1897
Col. H. G. Prout	1898
Mr. Walton Clark	1900
Mr. Arthur Graham Glasgow, M.E.	1901
Mr. Charles F. Scott	1903

The usual Commencement addresses by the students have been delivered each year as follows:

YEAR	VALEDICTORIAN	SALUTATORIAN
1876	John M. Wallis	Edward B. Wall
1877	Lewis H. Nash	Not filled
1878	Edwin L. Myers	John F. Kelly
1879	Maunsel White	Not filled
1880	Roland S. Kursheedt	Wilbur V. Brown
1881	Harry Van Atta	Edwin Tatham
1882	Roger H. Whitlock	Hosea Webster
1883	James E. Sague	Ernest N. Wright
1884	Henry R. Rea	Charles F. Parker
1885	Clayton A. Pratt	John M. Rusby
1886	C. Russell Collins	Henry B. Everhart
1887	Joseph A. McElroy	Franklin Moeller
1888	Burton P. Hall	Gordon Campbell
1889	Robert E. Wyant	Robert G. Smith
1890	Henry M. Brinckerhoff	Henry Torrance, Jr.
1891	Alexander Dow	Paul Spencer
1892	Nicholas S. Hill, Jr.	William O. Ludlow
1893	Franklin DeR. Furman	Hermann F. Cuntz
1894	Oliver Ellsworth	Joseph G. H. Cottier
1895	William H. Corbett	C. Austin Greenidge
1896	Arthur J. Wood	Walter H. Dickerson
1897	William D. Ennis	H. Donald Tiemann
1898	Frederick A. Welles	John D. Hackstaff
1899	Arthur Wilson	Alfred S. Loizeaux
1900	John C. Percy	Not filled
1901	August Siegele, Jr.	Roy S. Younglove
1902	Robert N. Inglis	George E. Hulse
1903	Harry W. Johnson	Herbert B. Van Etten

ENGINEERING SOCIETIES

The first student organization founded at Stevens for the pursuit of scientific knowledge was the Rumford Society, named in honor of the distinguished scientist, Count Rumford. At its first meeting, held May 20, 1876, two papers were presented, one on "New Jersey Zinc Ores," by W. R. Baird, '78, and one on "Duplex Telegraphy," by Brown Ayres, '78, who was the first president. During the first year twenty-seven scientific papers were read and discussed. As in the present Engineering Society, a president was elected each term. The Rumford Society was the first to undertake the indexing of the Institute library, and it also kept an indexed library of current literature of its own. It held its meetings on Wednesday evenings, and included in its membership the entire Faculty. It was discontinued in 1878.

In December, 1877, a rival organization to the above, and known as the

Philosophical Society, was established, its aims and plans being similar to those of the Rumford association. Successful meetings were held and a reading-room established; the latter was neatly furnished, and hung with framed pictures of prominent scientific men, and was supplied with current literature. Much good was accomplished, and the Society prospered for five years and was then discontinued.

The present Stevens Engineering Society was organized May 20, 1887, its object being "to aid and encourage its members in the study of engineering practice, in original research, and in the cultivation of the powers of thought and expression." The first president of this Society was C. V. Kerr, '88. It is composed of members of the Junior and Senior classes.

ATHLETICS

Viewed in a retrospective light, the average athletic achievements of Stevens men have been, under the existing conditions, very creditable, and in many instances brilliant. Courage, determination, and brains — all of which are indispensable qualities to a good athlete — are not lacking at Stevens. Physical prowess, such as is necessary in the modern college contests, is the complementary requisite to the above qualities, and is a trained function that can be, and is, acquired in most cases in our larger institutions of learning, chiefly through the aid of athletic culture properly administered under the care of a professional trainer. Although Stevens possesses a fairly well equipped gymnasium for normal practice, it is not of the professional order, and, even if it were, would be of comparatively slight service, owing to the rigorous demands made upon the time of the student in preparation for his professional career.

Our geographical location, so advantageous to one pursuing a scientific course of study, is detrimental to our athletic ventures in that many of those who might otherwise take a more active interest live at their homes, more or less remote, and are thus removed from the College environment, which is quite necessary for the maintenance and ebullition of college enthusiasm.

Football.—The sport with which Stevens has been officially identified for the longest time is football, which was established in 1873. The football team was composed of twenty men, and was known as the College Twenty in the early days when it played the American Association game. James E. Denton, '75, was the first captain to carry the football team through a playing season.

The first game played by Stevens was with the New York University in September, 1873, Stevens winning by 6 goals to 1. In the same year Stevens won two other games, and lost to Columbia by a score of 2 to 1. Stevens then had but 75 men to choose from. In the four years from 1873 to 1876 inclusive, Stevens won 12 out of 20 games and scored 63 points to her opponents 41; those opponents being the teams of the College of the City of New York, the Univer-

sity of New York, Rutgers, the New Jersey Athletic Association, Columbia University, Princeton, and Yale.

In 1877 the English Rugby game was adopted by various colleges, Stevens included, and the football team was reduced to eleven men. In that and the following year Stevens defeated Rutgers four times, Columbia and the College of the City of New York each once, and lost to Yale by 12 to 0, and to Princeton by 5 to 0. In 1879 there were fifteen members in the team, and it so remained until 1882, when it was again composed of eleven members.

The year 1883 was the banner year in Stevens football history. Eleven games were played with the leading colleges of the country; the Stevens team vanquished all its old rivals, and at the end of the season stood fourth, or next to Harvard, in football rank. During the two following years Stevens fully held her own among the colleges of her own class, and established a football record in 1885 by beating the College of the City of New York by the unprecedented score of 162 to 0. In 1886 Stevens also made a strong showing.

During the three years from 1887 to 1889 inclusive, Stevens was a member of the Eastern Intercollegiate Football Association, composed of Amherst, Trinity, Dartmouth, Massachusetts Institute of Technology, and ourselves, but was successful only in 1888, when a tie-game for the first place was lost on a technicality.

Since 1890 the team has not been regularly represented on the gridiron. In 1893 the eleven joined the Middle States Football League, composed of Lafayette, Rutgers, and Stevens, and missed winning the championship by a very narrow margin.

Lacrosse.—Lacrosse, which has brought to Stevens more athletic distinction than any other branch of college sport, was introduced in 1884 by Rollin Norris, '85. In 1885 the Stevens team joined with the University of New York, the New York Lacrosse Club, and the Williamsburg Athletic Club in forming the Metropolitan Amateur Lacrosse Association, and made a creditable showing, in addition to winning a game from Lehigh by 4 to 0.

During the following two years the team showed a steady improvement, and in 1888 succeeded in winning the championship of the Metropolitan League, composed of the College of the City of New York, the New York University, and Stevens. Outside of the League, Rutgers was defeated twice. During the same year the Intercollegiate League, comprising Princeton, Harvard, Lehigh, and Stevens, was formed; two out of the three games were very close and were decided by one goal against Stevens. During this season of 1888 Stevens scored 25 goals to her opponents' 10. The game continued a strong favorite at Stevens, and, although not so successful the following year, the team was tied for first place in the Metropolitan League in 1890, and achieved an equal success in 1891.

In 1892 the team, under the captaincy of Kingsley Martin, '92, won the championship of the Intercollegiate League, comprising Johns Hopkins, Lehigh,

and Stevens, and thereby became the champion college lacrosse team of the United States. The 1894 team, with Morris Kellogg, '94, as captain, again captured the championship from the same colleges.

Baseball.—Baseball at Stevens dates back to the beginning of the Institute's history, the first College nine being organized prior to 1873, and captained by W. F. Zimmermann, '76, who held that position several years. Although the admirers of the national game persistently and pluckily put a Stevens baseball team in the field each year, with few exceptions down to 1893 it never received enthusiastic support, and dragged along with little or no success. There were, however, two or three exceptions, one being in 1877, when 8 games out of 12 were won, and another in 1883, when this success was duplicated by the same numbers. In the latter case the opposing teams were the stronger, coming, as they did, from Williams and Lafayette colleges and from various strong athletic clubs in this section of the country; against such teams as these Stevens scored 113 points to her opponents' 82. During this brilliant period the teams were under the captaincy of E. N. Wright, '83. The teams of 1888 and 1889 were also successful, but since that time the interest in the game has so much decreased that it is not now, nor has it been since 1893, recognized by the Athletic Association as a representative Stevens game.

The Athletic Association.—This Association was organized in 1873, with Samuel D. Graydon, '75, as its first president. The first athletic meeting was a spirited affair containing eleven events, and was held October 17, 1874, at the Cricket Grounds, which had been secured for the use of the Association.

In 1877 the grounds were leveled, and a quarter-mile track was constructed. The Association has developed some excellent talent and made a number of creditable records. Among those which have stood for many years and are still good are those made by A. T. Moore, '82, in putting the shot, and in throwing the hammer, 1880; by Isaac, '88, in the 440-yard dash, 1885; by McLean, '88, in the one-mile walk, 1885; and by Wall, '76, and Zimmermann, '76, in the three-legged race at the first meeting of the Athletic Association in 1874. During the athletic games in 1902 and in 1903, Buckenham, '04, beat the record for the 100-yard dash made by Simpson, '93, in 1890, and also the 220-yard dash made by Jennings, '96, in 1894; Pratt, '04, established new records for the half-mile and mile runs (the former had been previously held by Smith, '91, since 1889, and the latter by Maury, '84, since 1884); and Weber, '06, beat the record for the broad jump, which had been held by Emmet, '91, since 1889.

Stevens holds ten points in the Intercollegiate Amateur Athletic Association of America, all won by A. T. Moore, '82, in the years 1880 and 1881.

Tennis.—A Tennis Club, organized in 1882, is still active.

Boating, Yachting, and Canoeing.—Among the earliest of sports undertaken by Stevens students was that of boating. As early as 1873 an organization had been effected, a boathouse secured, and an eight-oared gig, one of the best in

the country, received through the generosity of Mr. W. W. Shippen, of the Board of Trustees of the Institute. This organization was known as the Stevens Institute Rowing Association, and its existence was due in a great measure to the efforts of Howard Duane, '76. Two challenges, sent to the rowing club at the Rensselaer Polytechnic Institute, Troy, were declined. This was unfortunate, if not fatal, to boating interests at Stevens; for, with no other college crew of her own class against which to compete, the Association was without an incentive, and, after several years of intermittent activity, expired in 1878. The active periods were occasioned by the various class contests and by a signal victory over the strong Nautilus crew.

During the year 1893 a Canoe Club was organized with eleven members, and during the vacation of that year a cruise of 600 miles was made from Peterborough, Canada, to New York city.

The Stevens Yacht Club, which enjoyed a period of uniform prosperity for a number of years, was organized October 1, 1891, with 10 charter members. During the first year the membership grew to 24, and later increased to 44. The first fleet included 17 yachts, mainly sloops and catboats. In June, 1892, the first cruise was taken on Long Island Sound; later, summer stations were established at Greenwich, Conn., and Patchogue, L. I. The flag of the Stevens Yacht Club is a Stevens diamond in red and white on a blue pointed burgee. The club includes several distinguished names in its list of honorary members.

The Gun Club.—A Stevens Gun Club was founded in January, 1892, with 22 members. It was successfully carried on, and developed some excellent marksmen at the various "shoots" which it gave.

The Gymnasium.—In 1877 the large room that had been used as a lecture-hall and later as a machine-shop, and is now an auditorium, was fitted up as a gymnasium, and an instructor was secured; but through lack of interest and support he remained only a few months, and a few years later, in 1880, the gymnasium was dispensed with entirely. In 1888, when the new High School building was constructed, provision was made for a good-sized gymnasium in the basement. This was fitted up with lockers, etc., and has been largely used at certain seasons.

PUBLICATIONS

The "Eccentric," the "Bolt," and the "Link."—The first publication issued by the students of the Institute was the "Eccentric," which made its appearance in May, 1874. The first Board of Editors consisted of J. Hector Fezandie, Frank M. Leavitt, and G. Barry Wall, all of the class of '75. The "Eccentric," as published until the year 1879 by the Junior class, was issued annually, and contained, as do annual student publications of to-day, class histories, lists of fraternities, records of athletic and social events, and literary contributions. The

earlier annuals were less pretentious as regards their typographical features than those of later years, but in this respect only did they differ materially from the latter.

A change in the management of the "Eccentric" was made in 1879 according to a plan proposed by the fraternities. This plan was, in brief, that each of the Chapters and the non-fraternity element should select two of their number without respect to class, and that they should compose the Board of Editors. This was carried out, and the "Eccentric" of 1879 was edited by eight representatives and "Published by the Students of the Stevens Institute of Technology." In 1880 the number of representatives was decreased by four.

With the advent of several new fraternities in 1882, and because the older fraternities were unable to agree upon the admission to the Board of Editors of members of these new fraternities, another annual, aptly named the "Bolt," made its first appearance in May, 1883. The Board of Editors included five representatives, one from each of the three newly organized fraternities, one from an older fraternity that had taken issue with its younger brothers, and one from the non-fraternity or neutral body. For three years the "Bolt" was published by these fraternities assisted by the neutrals, and from 1886 to 1889 it was "Published by the Undergraduates."

In 1889 the rival publications of the "Eccentric" and the "Bolt" joined forces and issued the "Link," which has been published annually since that time by the Junior Class of the Stevens Institute of Technology.

The Editorial Board of the first "Link" was, and the succeeding Boards have been, composed of one representative from each fraternity and one from the neutrals.

In subject-matter the Institute annuals have remained about the same, as necessarily must all college annuals, the chief difference being in the literary merits and the artistic qualities of the illustrations. In both of these features the "Eccentric," the "Bolt," and the "Link" have produced articles worthy of mention here, but space forbids. There was, however, a custom inaugurated in the first "Link" of 1890 which has added very materially to the value of the book, and that was the publication of the biographies, together with a full-page photographic reproduction, of the members of the Faculty, one of which appears in each volume. Down to the present time the following Professors have received such kindly consideration, in the order given:

1890	Prof. Coleman Sellers, E.D.	1896	Prof. De Volson Wood, A.M., C.E.
1891	" Albert R. Leeds, Ph.D.	1897	" Edward Wall, A.M.
1892	" Alfred M. Mayer, Ph.D.	1898	" James E. Denton, M.E.
1893	" J. Burkitt Webb, C.E.	1899	" Wm. E. Geyer, Ph.D.
1894	" Charles William MacCord, A.M., Sc.D.	1900	" Thomas B. Stillman, Ph.D.
		1901	" David S. Jacobus, M.E.
1895	" Charles F. Kroeh, A.M.	1902	" Adam Riesenberger, M.E.

1903 President Alexander C. Humphreys, M.E., Sc.D., LL.D.

The "Stevens Life."—In the spring of 1890 the "Stevens Life" was established by several members of the Classes of 1892 and 1893 and was published every two weeks. It was devoted entirely to news concerning the students. It prospered for several years and continued until 1898, when its publication was entirely suspended.

MUSICAL CLUBS

Glee Club.—Among the first Associations at Stevens was the Institute Glee Club, organized prior to 1873 with seven members. Its career covered a period of only two years. For a number of years thereafter there were various class and society glee clubs, but no regular Institute club. In 1881 an Institute Glee Club was organized, principally through the efforts of members of the Class of 1884. The first public appearance of the Institute Glee Club occurred in March, 1885, when it gave a successful concert in Odd Fellows Hall, Hoboken. The following year four concerts were given in various near-by places; but the club had reached its zenith, for it soon began to decline, and finally dissolved in 1886.

Two years later the Glee Club was reorganized. It adopted the Tonic Sol-Fa system on the recommendation of Prof. Kroeh, through whom the club was enabled to secure the services of Prof. Unseld, of New York, a gentleman of high standing in his profession. About sixty-five members were enrolled, and much interest was taken in the club, which has since given, conjointly with the other Institute musical clubs, many successful concerts in New York, Brooklyn, Jersey City, Orange, Hoboken, and other places.

Banjo Club.—The first regularly organized Stevens Banjo Club was established in 1888 with nine members, and assisted the Glee Club, during its first year, at a public concert. In 1889 it scored a decided success at a concert in Chickering Hall, New York, in competition with clubs from other colleges. Since its organization it has been an important factor in the success of the many entertainments that have been given by the Institute's musical clubs.

Mandolin Club.—The two musical clubs at Stevens received a very welcome addition in 1893 on the advent of the Mandolin Club, which was then organized through the efforts of Mr. R. W. Smith, '94, with 13 members. The Club has proved to be a most popular innovation and has been a very decided success. In 1895 it contained 20 members, including 11 mandolins, 5 guitars, and 4 violins.

Orchestra.—A College Orchestral Association was organized in 1875, with four flutes, three violins, one 'cello, two clarinets, and a cornet. It was successful for a few years. Small class and society orchestras were subsequently organized, but no other College orchestra existed until 1887, and then only for a short time. In the fall of 1903 a Stevens Orchestra was organized with eleven members. During its first season the Orchestra has done highly creditable work, in conjunction with the other musical clubs, at the regular concerts.

MISCELLANEOUS CLUBS AND COLLEGE CUSTOMS

In addition to the organizations and customs referred to already, and which have, in general, survived to the present day, may be briefly mentioned some of the more prominent of the many student enterprises that have contributed to the pleasures of college days. They are as follows:

Naval Reserve.—In the early part of 1896 an Engineer Division of the Naval Reserve of New Jersey was organized for the purpose of equipping the old warship "Portsmouth," which had been assigned to the above Reserves by the United States government, and which was stationed at Hoboken. This Engineer Division was effected chiefly through the efforts of B. F. Hart, Jr., '87, and E. W. Frazer, '90, and at one time more than 90 per cent of its membership consisted of Stevens undergraduates. Its purpose was to give the men practical instruction in the running of engines and general below-deck management of ferryboats, tugboats, and modern warships; practice in electrical wiring and construction; torpedo practice and the planting of mine-fields under the supervision of experts; the use of the Army and Navy code of signals, as well as of the Morse telegraph and the installation of field telegraph and telephone lines; and instruction in infantry and artillery tactics. During the war with Spain the members were called upon for active service, being detailed on the U. S. S. "Badger."

Telegraph Company.—In 1876 a local organization known as the Hoboken Domestic Telegraph Co. was established, and although not restricted to Stevens students they comprised a large proportion of the membership and of the engineering force. Members were taught telegraphy and otherwise versed in all matters pertaining to this subject. The line extended from Fourth to Eleventh streets, and from Hudson to Garden streets, and had eight offices.

Photographic Club.—The first photographic club at Stevens was started in 1882 and was known as Photocosmos. In 1888 the present Stevens Photographic Society was organized, and it is still a prosperous organization. An annual public lantern-slide exhibition of the work of this society has been given each year, with few exceptions, since its organization.

Chess Club.—A Stevens Chess Club was organized in 1889 with 16 members. It has held a number of tournaments, and considerable talent has been developed in this scientific game. The club grew from the above membership to a maximum of 46; it is still in a prosperous condition.

Southern Club.—Outside of the densely populated community in which Stevens is situated, no other section of the country furnishes so large a proportion of our student body as does the Southern section. This large representation brought about the organization of the Southern Club in 1889, with 20 members.

Sketch Club.—The many pen and pencil illustrations that had appeared in the Stevens annuals gave evidence of much artistic ability in the Institute, and to promote this talent a Sketch Club was organized in January, 1892, with 19 mem-

bers. Lecturers, among whom was the well-known artist, Mr. Beard, of New York, were secured. They gave much valuable information, which was evidently assimilated, and was reproduced in tangible form in the succeeding annuals, which acquired a reputation for their artistic merit.

Dramatic Association.—The Stevens Dramatic Association was one of the first enterprises at the Institute. Although it was not of long duration, lasting only for three or four years, it accomplished much in the way of dramatic production, performing, among other pieces, "A Travestie on Hamlet," " An Ugly Customer," and " Cool as a Cucumber," in the Lecture Hall, for the benefit of the College Rowing Club and for the Gymnasium. A minstrel troupe also performed, and at the various entertainments very satisfactory audiences were recorded.

A number of dramatic clubs have been formed since, but without result, the latest attempt being made in 1893, when a club was organized, and a play entitled " The Iron Mask " was written, but never performed.

Literary Society.—Three Literary Societies are on record at Stevens; the first was contemporaneous with the Dramatic organization, and the second and third were chiefly debating societies organized by the Classes of 1894 and 1896 respectively. An active and enthusiastic interest was developed, but unfortunately it passed away with the graduation of those classes.

College Senate.—A College Senate was organized at the Institute in 1892, and was composed of four members in each of the Classes of 1893 and 1894, two in each of the Classes of 1895 and 1896, and one from the Alumni, who presided at the meetings. It was formed for the purpose of calling mass meetings of the students, for representing them before the Faculty, and for taking the lead in dealing with disputed college affairs. Enthusiasm, however, died out with the graduation of the organizers.

Cremation of Calculus.—The custom of cremating that book of the college course for which the students have the greatest antipathy was inaugurated at Stevens in March, 1878, when " Guizot's History of Civilization," then a regular subject in the Department of Belles-Lettres, was incinerated.

In June, 1888, Calculus was cremated for the first time by the Class of 1890. It was and still is an elaborate affair, involving gorgeous costumes, brass bands, and much combustible material. The Cremation of Calculus is one of the notable events of Commencement week for the undergraduates. In 1894 President Morton, in view of certain reforms in the above exercises, generously provided refreshments in the Institute library. In 1895 the cremation exercises were dispensed with for that year only, and Calculus was doomed after a mock trial held at Quartette Club Hall. In 1896 the regular outdoor exercises, such as prevailed before 1894, were resumed, and have since been continued.

Class Rivalry.—Probably not a single year has passed that has not witnessed some new, original, and even startling manifestations of that pent-up emotion called class rivalry, between the lower classes. Undoubtedly the most

brilliant of these manifestations was the *coup-d'état* whereby the Freshman class of 1891 ate the dinner that the Sophomore class of 1890 had prepared for itself at Morello's, in New York, on the evening of February 29, 1888.

For many years it has been the custom for the Sophomores to engage with the Freshmen, during the first two or three weeks of the latter's existence, in a physical test of one kind or another, in order that the worth of the Freshmen in the eyes of the undergraduates might be measured. Until 1890 the cane-rush was in vogue; but since then the cane-spree has been in favor, although an informal and unofficial cane-rush usually immediately succeeds the latter event.

Theatre Parties.—The first theatre party mentioned at Stevens occurred at the Park Theatre in New York in 1878. It was entirely lacking in the class rivalry which was the distinguishing feature and real object of the Hoboken theatre parties which were indulged in in later years. The height of class rivalry in these parties was reached in the early 'nineties.

Eating-Clubs.—The number of eating and "hash" clubs, together with the various *soi-disant* "funny" clubs, which existed during the early days of the Institute, is legion. Prominent among these was the Burnett Club, which was organized in 1874 and continued for seven years.

II

THE STEVENS FAMILY

II

The Stevens Family

A FAMILY OF ENGINEERS[1]

THERE is a chapter in the history of this country during the century now closing which has never been presented to the general public, but which contains matter of the greatest interest both in relation to the development of our interior resources by means of steam transportation on land and water, and also as to the protection of our great commercial centre in and about New York from the possible attack of any foreign power. This chapter might well be entitled, "John Stevens and His Sons as Engineers and Naval Constructors."

On a recent public occasion Mr. Abram S. Hewitt, referring to one of these men, said: "That was the greatest mechanical engineer, the greatest naval engineer, and the greatest railroad engineer which the nineteenth century has produced." When to this testimony I add the statements that the Camden and Amboy railroad was built and operated by these men; that for twenty years or more they were substantially the only builders and operators of steamboats on the Hudson and Delaware rivers; and that from 1840 to 1860 the harbor of New York was potentially protected from any possible attack of a foreign navy by a shot-proof steam ram (far more powerful than the famous "Merrimac") which during all these years lay under construction in a dry dock belonging to the Stevens family at Hoboken, and which at any time could have been finished and could have destroyed an entire fleet of the vessels of that day,— then there is reason enough evident why the chapter mentioned should be written and presented to the public.

The facts to which I have referred above are so little known among the public at large that many, no doubt, will find themselves hardly able to accept them at first; but the evidence available is abundant, as I shall make clear presently. The main reason why the work of John Stevens and his sons has not been prominent in the public eye is that all these men were disposed rather to avoid than to seek notoriety, and were, moreover, possessed of such considerable wealth

[1] This article was written by T. C. Martin E.E., at the instance of President Morton, for use in connection with the exercises of the Twenty-fifth Anniversary. It was published in the "Cosmopolitan Magazine" for May, 1898. More detailed records on which the statements in this article rest may be found on pp. 106 *et seq.*



COLONEL JOHN STEVENS

From a Marble Bust at Castle Point

that they could carry out their projects with little or no outside financial assistance, and thus had no reason for bringing their plans before the public.

The close of February, 1897, beginning with the 18th of that month, witnessed the celebrations attendant upon the Twenty-fifth Anniversary of the Stevens Institute of Technology at Hoboken, N. J., created by the generosity of Mr. Edwin A. Stevens. The initial feature of this celebration was a banquet of three hundred covers at the Hotel Waldorf, at which the speakers and their topics brought out in sequence the history of the institution as well as the great work of the three engineers to whom for more than a century was due no small part of American advance in the arts of peace and war. That work it is the object of this paper to set forth.

Col. John Stevens was born in New York, in 1749, of English lineage. He was a graduate of King's College (now Columbia University) in 1768; a member of the New York bar in 1771; treasurer of New Jersey during the perilous days of the Revolution; and a pioneer citizen alike of New York city and Hoboken, where he located his family estate. He was not forty years of age when he saw John Fitch's steamboat making headway against the tide on the Delaware, off Burlington, N. J., and was at once seized with enthusiasm as to the new means of locomotion. He examined the boat and her mechanism, and in 1792, under the new patent system he had himself petitioned into existence, he took out patents for steam propulsion. Experiments were hotly pushed, and in 1798, nearly a decade before Fulton ran his "Clermont," Col. Stevens had a steamboat on the Hudson, as builder, owner, and captain. Six years later he equipped with double screws another predecessor of Fulton's craft. The short four-bladed screw which he designed has shown great vitality as against later comers; and Mr. Abram Hewitt's father, who remembered being a passenger on the first Stevens boat, built for her at the Soho Works at Belleville, N. J., the first condensing double-acting engine made on this continent. Col. John Stevens continued prolific in invention and enterprise. He patented the multitubular boiler in the United States in 1803, and in England in 1805; established in 1811, between Hoboken and New York, the first steam ferry in the world; in 1812, before work began on the Erie Canal, he urged on the State authorities of New York the superiority of a railroad; before 1812 he made steam navigation on the Delaware a commercial success, with his son Robert; in 1813 he designed an ironclad ship which fully embodied the "Monitor" type, and was the first ironclad ever worked out for construction; in 1813 also he put into operation the first of numerous double-hull ferryboats carrying a paddle-wheel driven by circling horses; in 1817 he obtained a charter, the first in America, for a railroad from the Delaware to the Raritan; in 1823 he secured acts of legislature for the incorporation of the Pennsylvania Railroad; and in 1826 he built a steam locomotive with multitubular boiler, which he operated on a circular track at twelve miles an hour, carrying passengers, at his own expense, on his own property in Hoboken. This was the

first engine and train that ever ran on a railroad in America — built by a man verging on his eightieth year!

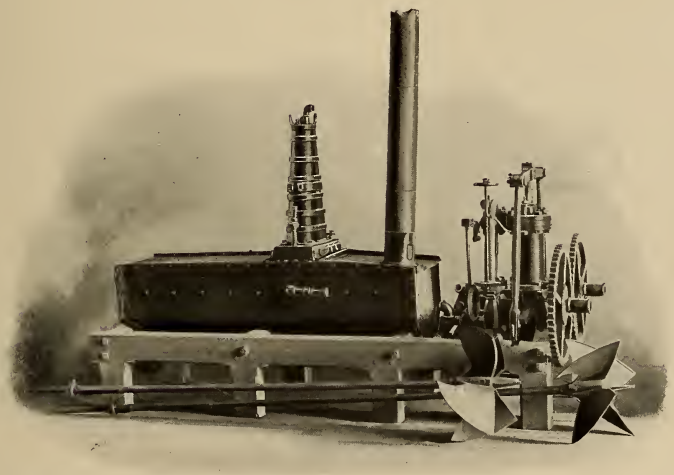
Such a record as this, very few men are permitted to make. The engineering events it includes are of wonderful magnitude; their effect on the development of the United States is still working itself out in widening rings. To have forewarned us of the collapse of the popular canal system, in which $214,000,000 of public money is now well-nigh hopelessly sunk, reveals prescience of exceptional character. To have set on foot vast transportation enterprises required quite different capacities, but here again, like Vanderbilt, he was successful; for, aside from his own work, other schemes, like that of the South Carolina Railroad in 1829, were based on his plans and recommendations. Then to have turned from all these victories of peaceful commerce and to have laid down the lines on which the naval warfare of the world was to be completely revolutionized, was to round out a figure of heroic proportions.

So fast is the pace of these later days, so crowded is their multiplication of discoveries, refinements, processes, that we are apt to belittle the beginnings and forget the beginners. This is a fitting place to raise one memorial at least. We are not pausing to speak of private qualities, or something might be said of Col. Stevens's studies in metaphysical philosophy, his experiments in botany, and his love of plants and flowers. These pursuits, enough to fill many cultivated and useful lives, were for him the recreations of none too ample leisure, the ornamental, softer side of a genius cast in a large mold.

Bred a lawyer and always a man of affairs, John Stevens had in him also the qualities that distinguish the great engineers. These were markedly perpetuated in his son. Robert Livingston Stevens; just as in the other son, Edwin A. Stevens, his financial acumen and business sagacity were so signally exemplified on the broader plan of larger times. Robert was born in the very year when his father saw that tiny, primitive paddle-wheeler of Fitch struggling up the Delaware, and as a lad of seventeen he assisted in 1804 in the construction of the first screw steamboat. Five years later, barely of age, he took the side-wheeler "Phœnix" from New York to Philadelphia by sea in June, in spite of a storm which rendered welcome the temporary shelter of Barnegat Inlet. This was the first sea trip of a steam-propelled craft. Col. Stevens and his son had been barred from navigation on the Hudson by the monopoly accorded to Fulton and their powerful relative Livingston. Many men would have accepted defeat, but they determined simply to take their boat around to the Delaware, and therefore pushed boldly out into the Atlantic; thus out of their deep discouragement snatching immortal honors. For the resolute there is ever the open sea.

It was now as a builder of steamships that Robert Stevens made himself famous, each successive boat being faster until in 1832, with the handsome "North America," using forced draft, he attained a speed of fifteen miles an hour. For a quarter of a century, and while he gave his chief attention to that line of work,

he stood at the head of the naval engineering profession in this country; and his inventions and improvements up to 1840 were so valuable and numerous that a bare catalogue would fill pages. We may specify, for example, the invention, as early as 1818, of the cam-board cut-off, being the first use of steam expansively for navigation purposes; the universally prevalent forms of ferry-boat and ferry-slip, the overhanging guards, the fenders, the spring piling; the adoption of the walking-beam in 1821; the invention of the split water-wheel in 1826; the invention of the balance valve for beam engines in 1831; the location of the steamboat



The Original John Stevens Boat Engine of 1804
Now in the National Museum, Washington, D. C.

boilers on the wheel-guards; the increase of strength in the boilers until they could stand fifty pounds to the square inch, although English naval engineers had got no further than five pounds as late as 1848.

Nothing could be sharper than the ordinary contrast between the lines of a steamboat and those of a fine clipper, yet it was Robert L. Stevens who designed and built in 1844 the "Maria," a yacht literally as fast as his steamers. She was the conqueror of the "America" just before the latter went across the Atlantic to capture, in the Solent, the famous cup which now gleams on Uncle Sam's sideboard, for the British an object of, apparently, as hopeless a quest as that for the

Holy Grail. In 1860 Commodore Stevens, on the "Maria," overhauled and sailed around the fast revenue-cutter "Harriet Lane," carrying the Prince of Wales; and she remained the fleetest of her school on the Atlantic coast until 1869, when she made a poetically mysterious disappearance off the face of the waters, no one knowing to this hour whither she went or what became of her.

Before dealing with another and even more exciting chapter of naval history in the life of the younger Stevenses, we must go back a few years to pick up the thread of their pioneer work in railroad construction and operation. As a result of its steamboat enterprises the family had become deeply interested in the travelling facilities between New York and Philadelphia, their three-linked water and land route between the two cities covering 101 miles. Col. John Stevens, convinced by his own success with steam in boats, was early satisfied that he could



The Locomotive "John Bull"

From a Bronze Tablet on the Pennsylvania Railroad Monument at Bordentown, N. J.

do even better with it on tracks. He had applied for charters, had operated experimentally his own locomotive, and had done all that was possible to educate public opinion on the subject. And now in 1830 came the incorporation of the famous Camden and Amboy Railroad, with Robert L. Stevens as its president and chief engineer, and Edwin A. Stevens as its treasurer. Its object was in reality to take over the enormous stage-coach traffic already built up by the celebrated Union Line, with its steamboats on the Raritan and Delaware, and its scores of four-horse lightning coaches that shuttled to and fro on the Trenton and New Brunswick turnpike. But while the business was ready, all the crude problems of steam railway locomotion had to be squarely met, and the first step was taken by Robert Stevens in his trip to England the same year, which had seen also the opening of the Liverpool and Manchester railway as a great national event. Before leaving he had obtained permission from his directors to buy an all-iron rail in preference to wooden rail or the stone stringer thinly plated with strap iron.

In those days there were no rolling-mills in America to make T-rails, and as labor and metal in this country were scarce and dear, he wished to get a rail that would dispense with the chair to hold it in place. During the long voyage to Liverpool, in good Yankee fashion he whittled bits of wood into various shapes, and finally selected the form in which a suitable base was added to the T-rail, making a continuous foot or flange and dispensing with the chair. The moment he landed on the Mersey shore he asked for bids on five hundred tons of this form, since known universally as the Stevens or American rail, and now the general form used by every road in the United States. Concurrently Mr. Stevens designed the hook-headed spike, which is the ordinary railroad spike of the present day, the "iron



The "Phœnix," the First Sea-Going Steamship, Making Barnegat Inlet, N. J., in a Storm, 1809.

tongue" or tie-piece which has grown into the fish-plate, and the bolts and nuts required to give integrity to the track construction.

Shortly after his arrival in England Mr. Stevens saw the "Planet" of the Stephensons at work on the Liverpool line, and at once ordered a locomotive of the same character for his own road. This purchase, the "John Bull," was landed in August, 1831, and was put together immediately. She weighed ten tons, with a boiler thirteen feet long by three and a half feet in diameter; cylinders, nine inches by twenty; a fire-box surface of thirty-six feet; four driving-wheels; and a rail gauge of five feet between centres. There was no tender. The fuel and water were carried on a rough four-wheeled flat car; the tank consisted of a whiskey-barrel from a Bordentown storekeeper; and the hose leading to the boiler was made of leather by a local shoemaker. When fired up with pine wood, and with

steam reading on a scale at thirty pounds pressure, this august combination moved off, to the relief and intense delight of those who were staking their fortunes heavily on her success. Just as nowadays we see fixtures to give either gas or electric light, so two coaches were built to be hauled either by the locomotive or by horses; and thus the road settled down to business, not, however, without appropriate ceremonies, a vast amount of newspaper talk, and the beginning of a series of improvements which have done much to give us the distinctive American railroad of to-day with all its remarkable differentiations and adjustments to the needs and conditions of this country. The record of the road reveals the trial or adoption of many things now familiar to every schoolboy — the first pilot, planned in 1832 by Robert L. Stevens; spiking the rail directly to the cross-tie; the bogie truck and forms of the vestibuled car; methods of wood-preservation; and a host of other features whose permanence depended largely on approval by this foremost among the pioneer railroads of America.

Among illustrations of the primitive apprehension of such subjects as railway management at the outset, it may be mentioned that during the early days of the running with steam on the Camden and Amboy railroad a man on a fast racehorse was sent ahead of the train by Mr. Stevens to clear the road and warn away possible intruders from the line. This was the more easy of accomplishment as one of the Stevens brothers, who had previously superintended the supply of horses for the stage route, possessed a fine stud.

It is also recorded that on one of the earliest trial trips the locomotive, coming upon a curve in the track at considerable speed, as the necessity of raising the grade of the outer rail had not been realized, left the track and took its way down an embankment into a neighboring field, where some men were employed cradling wheat. These men, in not unnatural alarm, fled with prompt alacrity; and did not come to a pause until they had placed two fields between themselves and the seemingly pursuing monster.

Complex and difficult beyond most institutions to manage, the railroad may be said to have called into existence a new type of "captains of industry." In the earlier days, functions in railroad management now discharged by several responsible heads at large salaries were faintly distinguished, and were all left to the care of some one man whose success became an immediate test of his wide ability. The world was born anew when steam was hitched to its wheels; and with new powers of locomotion the human race began its career all over again at a faster gait than of old. The railroad managers who first grappled with the conditions of the work, while without our experience of fifty years in its novel developments and relationships, had also but poor adumbrations and sketchy outlines of the actual gigantic problems confronting them in politics, in financial affairs, in the changes of life and custom due to travel, in the jealousies of great commonwealths and cities, in the passion against monopoly, in the needs of a growing population, in the handling of multitudinous armies of employees, in

meeting competition wisely, and in maintaining the health of the intangible but very real corporation which is itself the great underlying power and cause. When Mr. Edwin Augustus Stevens became the active business manager of the Camden and Amboy railroad, all the intricate fundamental principles and methods just hinted at had to be discovered or worked out; but his genius and training were all in the line of harmonious predisposition for the great task. A seventh son, he was born at Castle Point, Hoboken, in 1795. At the age of twenty-five, by family agreement, he became trustee of the bulk of the paternal estate. At the age



The Yacht "Maria," Rigged as a Sloop, off Castle Point, Hoboken, N. J.

of thirty he took charge of the huge transportation system known as the Union Line. At thirty-five he became the treasurer and manager of its offspring, this pioneer steam railroad; and at once there sprang into light and full vigor his splendid qualities of initiative, executive, and diplomacy. Merely to state that during the thirty-five years of his management of the Camden and Amboy road its stock appreciated steadily in value and never passed a dividend, would be sufficient indication of masterly skill; but it tells a very significant part of the story. Not only had the "property" to be created, but it had to be conserved amid all the storms of political intrigue and commercial rivalry; through all the stress of finan-

cial disaster and national trouble; despite all the vicissitudes due to the redistribution of population and the shifting of industries. Mr. Stevens was a keen discerner of ability in other men. He allied with himself the best engineers of the time. He enlisted in the company's service the best legal talent of the State. He combated political onslaught and conciliated public sentiment; he saw the first compacts made between the conflicting railroad and canal interests, assisted in successive extensions or consolidations, and was quick to begin again new railroad work in New Jersey when released from earlier responsibilities.



Edwin A. Stevens

The magnificent bequest of Mr. Edwin A. Stevens, endowing the Stevens Institute, will be referred to later, and in succeeding paragraphs reference will be made to the other great national work in which he was associated with his brother. But this epitome of a noble life would not be complete without mention of his engineering talent, which apparently takes place below that of his brother chiefly because he gave his energies to business. While still a young man he invented the Stevens plough, which was long made and sold in large quantities under his patent, and which brought him into very close touch with the agricultural interests of the country. But even more noteworthy was his invention, patented in April, 1842, of the airtight fire-room, one of the important features to be found in the warships of every modern navy for their forced draft. He may, in fact, be

said to have taken up steamship improvement at the point where his elder brother Robert left it as age came on.

While assiduously devoted to the arts of peace, none of the three Stevenses could altogether forget the scriptural fact that spears were a prerequisite to pruning-hooks. In 1812 Col. John Stevens had projected his interesting circular fort, rotated by steam, for the defense of New York harbor; and before the year of Waterloo, young Edwin, under guidance of his father, was hard at work experimenting with a six-pounder bronze cannon against some iron plating, and anticipating the prolonged savage contest between projectile and armor whose end is not yet. Later again, in 1841, Mr. Edwin A. Stevens, at an anxious period when hostilities with England threatened, took up the subject, with laminated plates, just as during the previous troubles with the same country Robert had experimented with bombs to be fired from cannon and had sold to the government the secret for a percussion shell. From tests made at Bordentown, N. J., in 1841, Mr. Edwin A. Stevens reached the conclusion that four and a half inches of iron sheathing would withstand sixty-four-pound shot at thirty yards from the marine guns of the day; and eighteen years later the first English ironclad, as well as a French frigate, donned an armor of exactly that thickness. The brothers Edwin A. and John C. submitted to a board appointed by President Tyler their views and data on the subject, in a document full of accurate forecasts on the coming principles in naval warfare; and after the armor tests had been repeated at Sandy Hook before the official authorities, Congress, in 1842, voted $250,000 to Robert L. Stevens for the construction of a war steamer, shot and shell proof. Robert and Edwin dug a dry dock at Hoboken immediately and began work on the steamer. A little later, however, the terms of the contract were changed, to make the armor superior to newer penetrating powers; and this process of interruption and delay was kept up until 1856, when Robert died, leaving the Stevens Battery in the basin at Hoboken, partially finished, with twin-screw engines and boiler in position. She was then four hundred and ten feet long; forty-five feet inside the armor shelf, with two feet of freeboard, and with a square immovable turret enclosing depressible guns. She was similar to the boats of the "Monitor" class built six years after by Ericsson, except that the latter had circular turrets embodying the idea of revolution, as suggested for the whole ship by Col. John Stevens at the beginning of the century, and for the individual guns by Robert L. Stevens about 1840. That the Stevens Battery would have been irresistible as a ram and invulnerable as a fort is easy to be seen; but the Stevenses were condemned in this case, by official obstruction, to undeserved failure; while Ericsson, with happier conditions, was able to seize the supreme moment, and by a conclusive demonstration do much to determine the fortunes of our country. It is among the memorable links between events that one of the present faculty of the Stevens Institute was able, as the draughtsman and representative of Ericsson, by his energetic and intelligent action, to send the rather erratic "Monitor" off upon her

memorable trip to Hampton Roads in time to render never-to-be-forgotten service on the 7th of March, 1862.

Robert L. Stevens left to Edwin A., somewhat in the nature of a sacred trust, the floating battery which his fancy had depicted doing such valiant service for his country. Preceding in conception and construction by more than ten years the little French ironclads seen at Kinburn in 1854, she was still a highly available vessel, and in 1861 Edwin A. and John C. offered to complete her at their own expense if the government would simply reimburse them after her utility had been proved. But the fates were against her, and she lay undisturbed until after the death of Mr. Edwin A. Stevens, who bequeathed her, with a million of dollars for completion, to the State of New Jersey. This sum was expended in 1869 and 1870, but the vessel was not launched, and in 1881 she was torn to pieces and her materials were disposed of. The family had not, however, wanted in courage — or in patriotism either, for that matter — while the war was raging, but at their own expense built and fitted out the "Naugatuck." This craft, accepted by the government, was one of the fleet that attacked the "Merrimac." She was propelled by twin screws; carried a single gun of heavy calibre; could turn from end to end in seventy-five seconds; could be immersed three feet below her load-line, and could come again to full visibility in eight minutes by pumping. And so, having, against much injustice, prejudice, and discrimination, done their part when national perils were greatest, the Stevens family closed with credit and honor this chapter of their history. Might it not be suggested that here were noble deeds and a lofty intent still awaiting proper recognition?

It is worthy of note, moreover, that although the Stevens Battery was never launched, and of course, therefore, was never in actual conflict, yet for the twenty years which intervened between 1840 and 1860 she was potentially effective for the protection of New York and its harbor from any attack which might have been made by a foreign fleet.

During these years, though constantly undergoing alteration and reconstruction, she was at all times in a condition which would have admitted of her rapid completion, had an emergency arisen, on the plans which were for the moment being carried out, and these plans were always so far in advance of general naval construction that if so finished she would have been a match for a fleet of the best vessels of the world at the same date. Thus, while the naval armament of the world was light, her original armor of four and a half inches would have rendered her invulnerable to the shot of an enemy, while her shell-guns would have meant certain destruction to any vessel not provided, like herself, with an armor capable of keeping out all such shells. As the size and penetrating power of cannon-shot were increased, so was the provision for heavier armor made in the Stevens Battery, and her own guns were at the same time enlarged in the successive designs.

It is interesting to know that the utility of a marine ram in naval warfare

was brought home to the mind of Mr. Stevens by an accident which occurred on the Hudson River at an early period. One of the swift wooden steamboats, by reason of some derangement of her steering-gear, ran into a "crib" dock, cutting through the massive timbers of the crib and penetrating the body of stone with which the crib was filled for a distance of twenty feet. After this performance she backed out and went on her way, having suffered no material injury. If, argued Mr. Stevens, a frail wooden hull could accomplish this, how irresistible must be the blow delivered by an iron steamer specially constructed with a view to such work, and armed with an immense steel prow shaped like the blade of an axe and solidly attached to and supported by the entire framework of the vessel.



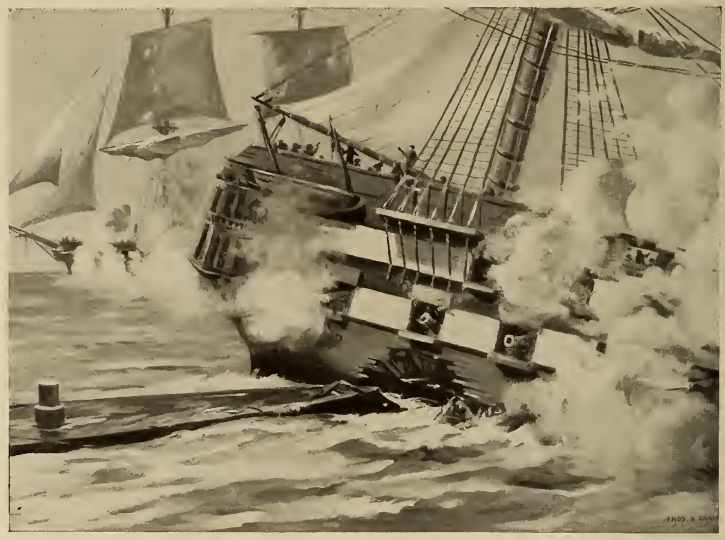
The Stevens Battery Shelling an Enemy's Fleet in the Bay of New York[1]

Turning now to those paths of peace fuller of pleasantness than the grim arena of war, we may tell briefly how the Stevens Institute of Technology took root and grew as a seat of scientific and technical culture. Here we have the best, the most lasting monument of the Stevens family; for, while steamboats and railroads and warships may disappear from the earth, the intellectual and spiritual work of such a place can never fade away. Mr. Edwin A. Stevens, dying in 1868, left by will land in Hoboken, a building fund, and an endowment fund, so that his executors might create the Institute. This was done, and, the nature of the college having been left for their decision, they wisely resolved to make it a centre for

[1] From a painting made at the suggestion of the late President Morton, to illustrate Mr. Stevens's conception of the Battery in action.

hitherto neglected mechanical engineering study, so that the wealth which had been derived largely from steam and transportation might return to fructify its origin. Thus the work began which up to 1895 had sent out from the Institute no fewer than five hundred and fifty-one graduates, of whom nearly five hundred to-day are occupying positions of honor and responsibility in the fields of work for which it was the special aim to educate them.[1]

In no respect has failed the ambition to establish firmly one more place for the preservation of ancient knowledge, one more fountain for the refreshment



The Stevens Battery Drawing Back After Ramming a Frigate[2]

and stimulus of studious youth, one more quiet asylum for the patient, devoted investigator. Nor has the growth of the foundation ceased. With the celebration of February, 1897, came the announcement that Mrs. E. A. Stevens, widow of the founder and a trustee under his will, had added to its resources real estate valued at $30,000; with the further news that Dr. Morton had added to his previous donations, aggregating $50,000, railroad securities worth $10,000, and that other members of the Faculty and friends were contributing toward the proposed new building and the equipment of various departments of instruction.

[1] The total number of graduates up to and including the Class of 1904 is 1,088.

[2] See footnote on p. 93.

The exhibit made at the celebration by the graduates constituted in itself an ample justification for the existence of the Institute. Twenty-five years ago the mechanical engineering professions had barely suggested their present prominence, and many of the mechanical inventions that have rendered the age memorable had not been born. This display, comprehensive and compact, could not then have been made, but it now signalized the readiness with which young men well trained had gone out into the world and had adapted themselves to the later conditions or had shaped the newer environment of the race. Plant for power generation, transmission, or conversion; electricity in its varied work; apparatus to gratify the civilized passion for utmost accuracy in measurements; invention in its latest reaches; journalism in its most authoritative technical organs; literature in its standard technical books,— these, in suggestive contrast to the Stevens relics with their records of pioneer triumph, formed an exhibition that summed up felicitously the glory of a great benefaction and all the marvellous progress of the century.

PERSONAL REMINISCENCES OF THE STEVENS FAMILY

At the Banquet held at the Waldorf-Astoria Hotel, New York, on the occasion of the Twenty-fifth Anniversary of the founding of the Stevens Institute of Technology, February 18, 1897,[1] in response to the toast, "Our Founders," Mr. Abram S. Hewitt said in part:

"I suppose I am the only person in this room, and one of the very few persons alive, who can say that he has seen and known the entire family from its founder, John Stevens, who was born in 1749, before the Revolution, as well as his children, grand-children, and great-grandchildren, who have gathered around the old ancestral home on the other side of the Hudson River. It may seem strange that any one should be here who knew the elder John Stevens, but it so happened that when I was a boy of about six years of age I was taken by my father to Hoboken for the purpose of being introduced to John Stevens, because at that early age I had witnessed from the wharf at the foot of Jay Street a magnificent steamer, with four ponderous smoke-stacks, passing rapidly up the Hudson River, and had asked whose steamer it was and where it was going. My father told me that there were two of these boats, the finest in the world, and that they had been built by the Stevens family of Hoboken. I said, 'Do you know the Stevens family?' to which he replied, 'Yes. I will take you to Hoboken and let you see the greatest engineer of his time.'

"And so before 1830, somewhere between 1828 and 1830, I was taken to Hoboken and introduced to John Stevens, who was then a man of eighty-three years of age, but in possession of all his faculties, and manifesting the greatest possible interest in this visit from an old friend and a young boy. Familiarly he called my father 'John,' for both bore the same name, and my father said, 'This is my son. I want him to see you and know you,' and then they began to talk of old times and particularly of this remarkable story, which was often repeated to me by my father, or else possibly I should not remember it so well.

"My father was the draughtsman and pattern-maker who had come out from

[1] A full account of the addresses at this banquet may be found in the "Stevens Indicator" for April, 1897.

England, with a party of machinists, to erect the first stationary double-acting condensing-engine which was put at work upon the American continent. It was built by Boulton & Watt at the Soho Works, near Birmingham, England, and was brought out and erected at Centre Square in Philadelphia for the purpose of supplying that city with water, before the Fairmount Works on the Schuylkill River were erected. In a monograph which I have seen it is stated that John Stevens saw the first engine that was 'built' in America: but he did more than this; he not only saw the first condensing-engine that was erected in America, but he had built for himself the first Watt engine which was constructed in America; for that party of men, at the head of whom was an engineer of the name of Smallman—whose name possibly none of you have ever heard — and whose ironfounder was a man named Rhode, the predecessor and instructor of James P. Allaire, who founded the Allaire Works in this city, where many of the engines which were subsequently designed by the Stevens family were built,— these men, with my father as draughtsman and pattern-maker, erected a new Soho Works at Belleville, N. J., near the old copper mines known usually as the Schuyler mines. There John Stevens came, and there he had built the first low-pressure engine that was constructed upon the American continent. He therefore not only saw the first one erected, but he himself ordered and paid for the first condensing double-acting engine that was built upon the American continent.

"Of course this interview with John Stevens made a profound impression upon my mind, and on my way home my father said: 'Yes, that engine was put in a boat in which I traversed the route from Belleville to New York and back again, John Stevens being the owner, the builder, and the captain of the boat, and Mr. Smallman, Mr. Rhode, and myself being the passengers; and we came to New York in that boat nine years before Fulton put the "Clermont" on the Hudson.'

"Portions of the engine thus constructed were for a time preserved in the Stevens Institute, and must be there still unless they have been placed in the National Museum at Washington; but the boat in which the engine was placed must not be confounded with the one, whose model I see here upon the table, built later, in 1804, with a double screw, and which preceded Fulton's boat by four or five years. I only remember that the Belleville boat had a stern wheel, and my father said that Mr. Stevens, during the trip, remarked that wheels should have been placed upon the side and not at the stern. But upon this ground I shall not further trespass, as I understand the subject has been assigned for a more competent authority to deal with in the course of the evening. . . .

"Personally I saw no more of the Stevens family until the year 1846, more than fifty years ago, when Mr. Edwin Stevens sent for me one day and said that the Camden & Amboy Railroad Co. wanted to get two thousand tons of rails, and that it was impossible, owing to the great scarcity of the article, to procure them in time to be laid in that year. He said, however, that he was prepared to pay the cost of importation if my firm would undertake to make the rails at a price which will make the mouth of my friend Carnegie water, or to use the more orthodox Scotch phraseology —'will make him lick his chops with envy'— when I tell him that the price offered was ninety dollars per ton. We had just built a little rolling-mill at Trenton for the manufacture of wire. Now wire is very much the reverse of a railroad bar. Mr. Stevens said, 'I want you to make two thousand tons of rails, weighing sixty-five pounds to the yard,' which was the heaviest rail at that time ever made in the world. I afterward discovered that the pattern, like all the inventions of the Stevens family, was peculiar, and somewhat difficult to roll. Nevertheless, I finally agreed to make the attempt, and as a matter of fact we succeeded in delivering two thousand tons of rails, for which we received the sum of one hundred and eighty thousand dollars in hard cash, an amount sufficient at this time to pay for ten thousand tons of rails according to the latest quotations which Mr. Carnegie has just whispered in my ear.

"Robert L. Stevens, as you all know, was the designer of what is known as the flange rail. He had it made in Wales at the works of Sir John Guest, and with such expedition that within two years from the time of undertaking the practical scheme of building the Camden and Amboy railroad, that road was constructed, running, and carrying passengers and freight with entire success between the cities of New York and Philadelphia. Robert L. Stevens and his brother Edwin, who was the business manager of the enterprise, thus performed in two years a feat which at that time, if you will consider the development of the mechanical arts, the state of the financial transactions of the world, and the unknown elements which entered into the problem, was a greater performance than if any man were now to undertake to build a road from New York to San Francisco in two years. The world never saw a greater triumph than the construction of that road. . . .

"John C., Robert, and Edwin Stevens had subordinates, they had trusted men, they had tried assistants, but the superintendence of the work to the minutest part was done by themselves personally. Together they built railroads, and ferries, and steamboats, and yachts, and ironclad batteries; and this suggests the first lesson which I would draw from this necessarily sketchy statement for the benefit of the young men who are here assembled. It is this, that these three brothers worked as though they were one man. No one ever heard of any quarrel or dissension in the Stevens family. They were workmen themselves, and they were superior to their subordinates only because they were better engineers and better men of business than any people who up to that time had undertaken the business of transportation within the limits of the United States. More than any other men whom I have ever known, they demonstrated the truth of the saying, 'Behold, how pleasant a thing it is for brethren to dwell together in unity.'

"But I am asked to speak especially of the Founder. I have been speaking of the founders, John Stevens the elder, John C. Stevens, Robert L. Stevens, and Edwin A. Stevens, who were the founders and pioneers who have made this country what it is,— the miracle of the ages, the admiration of the world. No one who cannot go back as I can to the time when there were no railways, to the time when there were no ocean steamers, when there were no telegraphs, no telephones, no armored navies, no access to any point beyond the Mohawk Valley, when the great West was yet unsettled, when this great empire was a wilderness,— no one who cannot recall this primitive condition of things and did not see it can realize what the Stevens family has done for America.

"I have said enough of the achievements of this remarkable family, but I have not said enough of the other side of their personality — the lovely, gentle, sweet, and human character which belonged to the father and to the three brothers of whom I have spoken. I told you that I was a poor and diffident boy, yet when I was brought into contact with them I never was made to feel that there was any difference in social standing, in wealth, in years, or even in ability. I was welcomed to Castle Point in my early youth just as I would be to-day by the honored mistress of that noble mansion. They did not believe that the acquisition of wealth was sufficient for the development of human nature. They knew that the emotional side of man's nature controls in the long run, and that the reason is always the servant of the imagination. Hence, when they ran stage coaches, they had fine horses; when they ran boats for profit to Albany, they adorned them with pictures and beautiful objects. The sense of beauty was ever present in everything they did. Their leisure hours were regaled by the charms of art and music. I suppose no connoisseur who ever lived in New York was superior to Robert Stevens in his knowledge of music, and no man ever lived who enjoyed it more. I heard him once tell how, when for the first time he heard the angelic notes of Malibran, the golden gates of Paradise seemed to open, and the heavenly hosts to be lost in adoration. . . .

"The Stevens Institute was created by Mr. Stevens's will, which was signed on the 15th of April, 1867, on the night before Mrs. Stevens and her children sailed on the 'Great Eastern' with Mr. Stevens for that trip from which he was never to return. It was my good fortune — in fact, it was my understanding with him — that I should accompany him. He was very anxious to understand the 'Great Eastern,' and so was everybody that ever had anything to do with that ship,— and I doubt if anybody succeeded. I only refer to it on this occasion because from the time we left New York until we arrived at Brest she was subjected to a chapter of accidents of a very amusing character. Mrs. Stevens will remember that it was a matter of wonderment every day what was going to happen next, for everything did happen that nobody wanted to happen during that eventful voyage. I refer to it now because I had many conversations with Mr. Stevens on the subject of the Stevens Institute. Mr. Peter Cooper, my father-in-law, had founded the Cooper Institute, and it had been in operation for eight years at that time. Mr. Stevens was very anxious to know exactly the methods upon which it was conducted, and how far it had fulfilled the expectations of the founder. Of course I explained to him that Mr. Cooper was a mechanic, and that he had founded his institution for mechanics; that as the Stevens family were engineers it was natural and fitting in every way that the institution which he proposed to found should be devoted to the education of engineers. I explained to him that all the resources of the Cooper Union were used in giving the education which the mechanic needed, and that what was wanted in this country was a higher institution which could start where the mechanic ended, and produce the engineers who were to become the leaders of modern enterprise and the captains of industry.

"Mr. Stevens entered heartily into this view of the subject, so that I have reason to know that while the language of the will provides for 'an institution of learning,' President Morton, with the approval of Mrs. Stevens, Mr. Dod, and Mr. Shippen, as trustees, merely carried into effect the views which Mr. Stevens entertained as to the objects of the institution and the position which it should occupy in the domain of education.

"But I referred to the voyage which we took together for the purpose mainly of showing some of the traits in the character of Mr. Stevens which made him so interesting and so lovable to all his friends. The 'Great Eastern' for want of funds had but a scanty supply of bituminous coal which was supplemented by a stock of anthracite which not a stoker on board had ever used or even seen. The captain, Sir James Anderson, came to us and asked what he should do. So Mr. Stevens and I, old as he was, and younger as I was then, crawled down through many devious passages until we reached the boiler-room, and there found a very discouraged lot of people who were trying to burn anthracite coal in the same manner as they would burn bituminous coal. Of course the fire went out, and you will be surprised to learn that he and I, and mostly he, spent nearly two days in the boiler-room, teaching the stokers how to burn anthracite coal, which we succeeded in doing and were finally landed at Brest. This is a simple illustration of the character of this remarkable man.

"The Stevens family of the last generation were creators as well as founders. You gentlemen who have profited by the beneficence and foresight of Edwin A. Stevens are reaping the fruits of the seed which they in their day and generation sowed so abundantly. They were men of not only great sagacity and untiring energy, but of a high order of courage and fortitude. When Robert L. Stevens found that Fulton had preceded him by a few weeks in placing the 'Clermont' on the Hudson, and thus securing the monopoly of the navigation of that river, he boldly took the 'Phœnix' by sea from New York to Philadelphia, thus gaining the imperishable glory of having been the first man to traverse the ocean with a boat propelled by steam. The honor is increased by the fact that while

Fulton had imported his engine from England, Stevens used one which he had constructed in America, and which I believe in part to have been the identical one which I have referred to as used in the boat propelled from Belleville to New York in 1799. . . .

"When, at the beginning of the late Civil War, the necessities of the country seemed to demand the legislation by which paper money was made a legal tender, Mr. Edwin A. Stevens, who was then the sole survivor of the family, insisted that the Camden & Amboy Railroad Co., which he controlled, should continue to pay the obligations which it had contracted before the war, principal and interest, in gold, when he might have availed himself, as many others did, of the privilege of paying in depreciated paper money. But it never formed any part of the code of morals or of honor of the Stevens family of that day to take advantage either of accident or of technicalities in the discharge of their obligations. Rough experiences they often encountered, but the star of personal honor was never dimmed."

RECOGNITION OF THE ENGINEERING ACHIEVEMENTS OF JOHN, ROBERT L., AND EDWIN A. STEVENS

On the same occasion[1] Commodore George W. Melville, E.D., U.S.N., in responding to the toast, "Our Ironclad Navy," said in part:

"The story of the life of three generations of the Stevens family is not only the story of the development of railway construction and of steam navigation in this country, but it is the history of the early days of naval engineering, and of the first practical design of applying armor to the hulls of war vessels. It is also the story of the recognition of the importance of the mechanical and naval engineering professions. With the name of this family also will be associated the progressive advancement of the study of the mechanic arts and sciences.

"Closely associated with early railway operations, as well as with the beginning of steam navigation in this country, was John Stevens, the first of a family which has been prominent in engineering circles for a century. A man in advance of his time, he had the comprehensive intelligence to grasp the future possibilities of the steam motor. As one studies his character and life he is impressed with the fact that John Stevens had a clearer knowledge than any of his contemporaries of the future revolution that would be effected in commercial, maritime, and naval affairs by the progressive development of the steam-engine.

"It has been a crime of the engineering profession that it has been too indifferent in securing due credit and honor for its professional achievements. The technical expert and scientist has been too backward in claiming the substantial rewards of his labor, and this lack of business efficiency has always stood in the way of his official, financial, and social advancement.

"The legal and medical fraternities have each established a code of ethics which secures to its members and to the profession the reward of individual labor. But the engineer has too long been content to build the foundation and even the structure of great inventions, and then permit others to claim the rewards which should accompany his work.

"John Stevens was one of those engineers whose labor has never received due official recognition, and a duty devolves upon some one connected with this institution or State

L. of C.

[1] The Twenty-fifth Anniversary Banquet.

to show forth the value of Stevens's services to the development of railway, marine, and naval engineering. He did possess business efficiency, however, and the competence which he secured was a tribute to his success in commercial matters.

"In the quiet of his home and the quiet of his sleep John Stevens passed away, and then Robert L. Stevens undertook the work of developing his father's idea of constructing an armored steam battery. The contest between armor and the projectile waged fiercely in 1842, when the Congress passed an act authorizing the Secretary of the Navy to enter into a contract with Mr. Robert L. Stevens, 'for the construction of a war steamer to be built principally of iron upon the plan of the said Stevens.' About this time also appeared upon the scene the great Swedish engineer John Ericsson, who, failing to gain recognition from the British Admiralty, left that country in disgust and came to the United States. Ericsson undoubtedly crossed the Atlantic at the instance of Capt. Richard S. Stockton, U.S.N., and he had, for some years at least, the moral if not the official support of men high in favor at the Department.

"The wrought-iron gun of English manufacture which Ericsson brought over was undoubtedly able to pierce the plates of the projected Stevens Battery; but Robert L. Stevens was not ignorant of the possibility of hardening iron and steel surfaces, and if the officials of the Navy Department had not become dismayed at the improved ballistic qualities of the gun, Stevens would have shown that a corresponding advance was also possible in the means of defence, by making improvements in the arrangement and character of the armor plates. Officials too hurriedly decided then, as have experts several times since, that the projectile would always be in advance of the armor. As a result of this belief, official interference with the plans of Stevens became so persistent that his work was interrupted to such an extent that the project languished until 1854, when work upon a modified battery was begun in earnest.

"In 1856 Robert L. Stevens rested from his labors. Like his gifted father he was in advance of his age. Before the arrival of Ericsson he had shown that armor was in advance of the gun. As he recognized the fact that there had been a development of the weapon in England, he surely would have met this advance by designing an improved quality of armor if conservative officials would have given him the opportunity.

"The bright fancies which Stevens pictured were far different from his experiences in the attempt to do a great work for his country. While semi-official encouragement was given to Ericsson, distrust and opposition were encountered by the various members of the Stevens family in their effort to induce the Navy Department to deal justly with them in the construction of their armored vessel. In 1861 Edwin A. and John C. Stevens offered to complete the projected battery at their own expense if the government would reimburse them for the ship after its usefulness and efficiency had been successfully shown. The country at that time was sorely in need of armored vessels, and the officials of the Navy Department were giving patient hearing to designers who came along with any new type of armored ships. It mattered not that the Stevens family had been successful in various railway and shipping enterprises, and that they had been identified closely with every success pertaining to the introduction of steam for navigation purposes. The naval vessel proposed by them contained too many machines, and it bore too many evidences of the forge and the foundry, rather than of the sail-loft, to suit the traditions of the sea.

"In a marked degree the whole Stevens family possessed grit, for at their own expense they fitted out the steamer 'Naugatuck' with their arrangement of protective armor and lent it to the government. By reason of the bursting of her Parrott gun the armor of the 'Naugatuck' was not subjected to a desired test, and the value of the design of Robert L. Stevens could not be impressed upon the navy officials of that period.

"The experience of all countries during the past century conclusively shows that there are people who will condemn systems of naval construction because auxiliaries are defective which have no relation to the general plans. In this generation we have become wise enough not to reject the system because mishaps have occurred to some details during the course of construction. It would have been fortunate for the country if the invention of Stevens had been judged upon its merits, and not from the standpoint of tradition and prejudice. The engines and boilers of the Stevens Battery were the equal in design of anything then afloat, and it is fair to presume that an engineer of the varied experience of Robert L. Stevens had provided for armor the superior of which had not been manufactured. The vessel came too near being an engineer's ship to suit the sailors of that period, and therefore reasons were looked for why such an armored vessel should be condemned, rather than why she should be taken into the navy.

"From 1854, when work on the armored vessel of Stevens was begun in earnest, the designers had a constant battle with the officials of the Navy Department. If it be true that the blood of the martyrs is the seed of the church, then the injustice heaped upon the Stevens family eventually resulted to the benefit of the naval service, and possibly to the safety of the nation.

"Without detracting in any manner from the genius or glory of Ericsson, one cannot but believe that had the government completed the ship designed by Stevens, the fate of the 'Merrimac' would have been sealed before she sank the 'Cumberland' and set on fire the 'Congress.' It must not be forgotten that the contract for the 'Monitor' was not signed until September, 1861, while work on the Stevens Battery had commenced seven years earlier. That Ericsson worked independently of Stevens cannot be controverted, neither can it be doubted that the energy and persistency of Stevens so educated the minds of the officials to the value of armor that they were thus able to comprehend some of the advantages of the 'Monitor' and other types of protected vessels.

"The conversion of the 'Merrimac' into an ironclad battery was undoubtedly an outcome of Robert L. Stevens's suggestion. It is peculiarly significant that the term 'battery' was used by the Confederates in connection with the changes that were made in this first-class frigate. In the specifications submitted by Ericsson for the construction of an ironclad steamship, he speaks of a 'floating battery.' The Naval Board appointed to examine carefully all plans submitted to them in 1861 for the best type of iron- or steel-clad war vessel also uses the term 'steam battery.' In his controversy with the government officials Stevens undoubtedly hammered the word 'battery' into the vocabulary of these men in describing an armor-clad floating fortress.

"The Navy owes much to the Stevens family, and as an officer of that service I am pleased to pay an humble tribute to the importance of the work accomplished by its members.

"That a memorial should be erected to the work of John, Robert L., and Edwin A. Stevens is more than fitting. The day will yet come when the Congress of the United States will give some official recognition of the work rendered by these men. The engineering profession should also give expression to the value of their services, for the successes of this family are closely identified with the progressive advancement and development of mechanical engineering along its lines.

"In founding and sustaining a school for the development of the mechanic arts and sciences, the various members of the Stevens family have honored their ancestors and established the best memorial that could have been devised. It was appropriate also that the institution should be established at that place where the work of the Stevens family had been carried on."

Mr. J. Elfreth Watkins, E.D., Curator of the Department of Transportation of the National Museum at Washington, D. C., in responding to the toast, "The Railroads and Steamboats of the United States," said in part:

"In measuring the progress of the human race we are accustomed to associate the name of some one person with each of the great epoch-making inventions. Although this is neither the time nor the place to consider the claims of rival inventors to distinction, I cannot even briefly discuss the theme upon which I have been invited to speak without calling to your attention some facts which have come to my notice in the course of the efforts made to preserve the history of the steamboat and railway in the Smithsonian Institution at Washington.

"Over a century ago, in 1792, John Stevens, of New Jersey, took out a patent in the United States to propel boats by steam. He experimented continuously until 1804, when he invented and constructed the first steamboat, to navigate the waters of any country, driven by a screw. A model of this twin-propeller boat, belonging to the United States National Museum, is before us. The original machinery is also at Washington.

"This boat was successfully operated three years before Fulton obtained fame and fortune by putting his English engine, built by Watt, in an American hull afterward called the 'Clermont.' . . .

"But the Stevenses did not confine themselves to the problems of steam navigation. The late John C. Stevens once told me that he heard his grandfather say that he firmly believed in the success of the locomotive as early as 1795, when he worked upon a plan of a steam locomotive which he hoped to patent during Washington's administration. His great difficulty was in designing a track strong enough to support the heavy low-pressure steam machine which he then had in mind.

"During the early years of the century John Stevens was indefatigable in his exertions in behalf of the railway, as shown by private letters, signed articles in the newspapers, and several printed pamphlets published at his own expense. In the early chapters of the history of the Pennsylvania Railroad Co. I have fully recorded his efforts which resulted in obtaining the first railroad charter granted in America. I refer to the road from New Brunswick to Trenton, which he desired to lay upon almost the exact line between those two cities now occupied by the New Jersey Division of the Pennsylvania Railroad Co.

"In 1823, with Stephen Girard and Horace Binney as his associates, John Stevens organized the movement for constructing a railroad from Philadelphia to Harrisburg and Pittsburg, which resulted in the incorporation of the first Pennsylvania Railroad Co., twenty-three years before the present corporation was chartered. Two years later he completed at his own expense the first steam locomotive that ran upon a track on the Western continent. This locomotive, which had a multitubular boiler, still in existence, was designed and constructed by John Stevens upon his estate at Hoboken, where it afterward ran upon a track laid within a few hundred yards of the present Stevens Institute building. This was four years before Horatio Allen ran the 'Stourbridge Lion' at Honesdale, nearly five years before Stephenson achieved his success in England with the 'Rocket.'

"The Camden & Amboy Railroad Co., the greatest railway of its time, was a monument to the skill and energy of John Stevens and his sons. The rails for this great iron highway, over which all of the traffic between New York and Philadelphia was conducted for many years, were designed by and rolled under the direction of Robert L. Stevens, and the American rail with a base — the type now in universal service on this side of the water — was solely his invention. After a controversy of many years this fact has lately been proved by documentary evidence."

BRIEF BIOGRAPHICAL RECORD OF THE STEVENS FAMILY

Colonel John Stevens, to whom Mr. Hewitt referred in the address at the Twenty-fifth Anniversary banquet as the founder of the Stevens family, was of the second generation born in this country, and of the first to achieve distinction for scientific invention and mechanical development. His grandfather, who was an officer in the Queen's Court (or Court of Chancery) came to America early in the eighteenth century.

His father was the Hon. John Stevens, who became prominent in affairs of state and nation. He was Vice-President of the Council of the first legislature of



Castle Point Homestead in 1802

New Jersey in 1776, and also in 1781; President of the Council of East Jersey Properties in 1783; President of the New Jersey State Convention which met Dec. 11, 1787, to consider the adoption of the Constitution of the United States, which was ratified on the 18th of the same month, New Jersey being the third State to adopt the Constitution; Delegate to present New Jersey's ratification to Congress; Commissioner to mark northern boundary between New York and New Jersey; Commissioner to treat with Indians, etc. He married Miss Elizabeth Alexander, a daughter of Hon. James Alexander, Surveyor-General of New Jersey, and a sister of William Alexander, the American general of the Revolutionary War who was known as "Lord Sterling."

Col. John Stevens was born in New York city in 1749. His education was obtained at Mr. Kenersley's College at Perth Amboy, and at King's College

(now Columbia University), from which he was graduated in 1768 with a class which was later distinguished for its eminent men, including Gouverneur Morris, Julian Verplanck, Rev. Benjamin Moore, and others of note. He studied law, and in 1772 received an attorney's license, under the royal government, for both New York and New Jersey. In 1776 he was captain in Col. Beaver's battalion. During the active period of the Revolutionary War, from 1777 to 1783, he held the office of Treasurer of New Jersey. In 1782 he married Miss Rachel Cox, daughter of John Cox, of Bloomsbury, a village near Trenton, N. J. John Cox was As-



Col. John Stevens

sistant Quartermaster-General of the American army under Gen. Greene. Early in 1783 Col. John Stevens and his bride moved to New York city, where they occupied the old home of John Stevens, which was located at 7 Broadway, opposite Bowling Green, and continued to reside there until the year 1814. The following description appears in the old records of the property:

"The lot extended in front, on Broadway, about 49 feet; in the rear, at high-water mark, the breadth was 55 feet, and the length of the north line was 180 feet, and the south line, 187 feet. Adjoining was a lot 66 feet 8 inches broad, and extending 200 feet into Hudson's River."

During the month of March, 1784, Col. John Stevens purchased the confiscated lands of the Tory, William Bayard, comprising the island of Hoboken, and

he also purchased an adjoining tract in Weehawken. (It is a singular coincidence that William Bayard was in the ancestral line — not direct but related — of Martha Bayard Stevens, the wife of Commodore Edwin A. Stevens, the Founder of Stevens Institute of Technology.) Immediately after the purchase of the Hoboken property Col. Stevens began the construction of a homestead on the site of the present Castle, and continued to reside in it during the summer seasons from 1786 until 1814, when he moved from 7 Broadway, New York, and resided at Hoboken continuously. The succeeding generations of the Stevens family have occupied the premises ever since.

The children born to John and Rachel Stevens were:

John Cox Stevens . . . . . Sept. 24, 1785
Robert Livingston Stevens . Oct. 18, 1787
James Alexander Stevens . . Jan. 29, 1790
Richard Stevens . . . . . Feb. 16, 1792
Francis Bowes Stevens . . . June 5, 1793
Edwin Augustus Stevens . . July 28, 1795
Elizabeth Juliana Stevens . April 18, 1797
Mary Stevens . . . . . Aug. 7, 1799
Harriet Stevens . . . . . Dec. 29, 1801
Esther Cox Stevens . . . . Aug. 6, 1804
Catharine Sophia Van Cortlandt Stevens . . . . . May 27, 1806

It was after purchasing the Hoboken property that Col. John Stevens, then thirty-seven years of age, began to develop his remarkable ability as an inventor and engineer. And in the work which he carried on during the remaining fifty-two years which were granted him he was most ably assisted by his sons Robert L. and Edwin A. Stevens.



Castle Point Homestead in 1904

CLASSIFIED RECORD OF THE ENGINEERING WORK OF JOHN, ROBERT L., AND EDWIN A. STEVENS [1]

INTRODUCTION AND DEVELOPMENT OF THE STEAM-ENGINE FOR BOAT-PROPULSION

THE following extracts are from a lecture on "The Progress of the City of New York During the Last Fifty Years," delivered by President Charles King, of Columbia College, before the Mechanics' Society, at Mechanics' Hall, Broadway, New York, December 29, 1851: [2]

"For at that time (1807) steam-engines, as applied to the various processes of manufacturing or other industry on land, were little known generally, and the whole United States furnished, it is believed, but one machine-shop or foundry where a steam-engine could be made, and that was opposite to this city, at Hoboken, in the works of Col. Stevens, of whom more anon. . . .

"The palm thus gained by Fulton was closely contested by John Stevens, of Hoboken, who, long in concert with R. R. Livingston,[3] had made experiments in steam as a means of propulsion, but now, aided by the genius and practical mechanical skill of his son, R. L. Stevens, was operating separately. Almost simultaneously, but yet behind by that fatal quarter of an hour which determines the fate of so many enterprises and of so many human beings, both men and women, Mr. Stevens produced, independently of Mr. Fulton's plans and experiments, his steamboat 'Phœnix;' but, precluded by the monopoly which Fulton's success had obtained for him of the waters of New York, Mr. Stevens first employed her as a passage boat between this city and New Brunswick, and finally conceived the bold purpose of sending her round to Philadelphia by sea; and he executed it successfully. His son, Robert L. Stevens, went around with the boat in the month of June, 1808.[4] A fierce storm overtook them. A schooner in company was driven out to sea and was absent many days, but the 'Phœnix' made a safe harbor at Barnegat, whence, when the storm abated, she proceeded safely to Philadelphia, and plied many years between that city and Trenton.

"Mr. Stevens thus earned indisputably the honor of first venturing — and succeeding — to encounter the might of the ocean with a steam-propelled vessel. When the 'Phœnix' went to Philadelphia, the Atlantic, and no other sea, had ever known the domination of victorious steam. Even now, when our magnificent steamers, exceeding in dimensions

---

[1] The records here given consist largely of extracts from original documents. They have been compiled and arranged in a certain order of grouping, the first referring particularly to the marine-engineering work of the Stevenses, the second to railroad engineering, the third and fourth to important details in marine and railroad engineering, the fifth to naval engineering, and the sixth to miscellaneous inventions.

[2] This lecture was printed in 1852 by D. Appleton & Co., in a pamphlet of 80 pages octavo.

[3] "It was stated in the address, when delivered, that the experiments were made in concert with R. Fulton, as well as with Chancellor Livingston; but I have since ascertained that Col. Stevens's acquaintance with Mr. Fulton began only after that gentleman's return from Europe in 1803 or 1804." The foregoing is from a statement of Eugene B. Cook, whose father, Gen. William Cook, was long associated with Messrs. Stevens as engineer-in-chief of the Camden and Amboy Railroad.

[4] The statement, in the pamphlet recording Mr. King's lecture, that the "Phœnix" went from New York to Philadelphia in 1808, is evidently a misprint and in error by just one year. This correction is made by the Editor on the statement made to him by Mr. Francis B. Stevens, E.D., a grandson of Col. John Stevens, who is now living at Castle Point, Hoboken, N. J. Whether the "Phœnix" sailed for Philadelphia in 1808 or 1809 makes little or no difference, for the claim that Mr. Stevens was the first to take a steam-propelled vessel on the high seas has never been disputed.

line-of-battle ships, go and come with the regularity of mail-coaches on a beaten turnpike road, this first daring conception of trusting to the ocean a frail craft, with nothing but steam for her means of safety and progress, may recall the lines of the Roman lyrist:

> "'Illi robur et æs triplex
> Circa pectus erat, qui fragilem truci
> Commisit pelago ratem,
> Primus.'
>
> "'Cased was his breast in triple brass and oak,
> Who first old Ocean's storm-tossed surface broke
> With his frail bark.'

"The limit, the utmost limit of speed, which Fulton hoped or thought it possible to attain, was seven miles an hour,[1] and that he in later boats accomplished; but it was again reserved for the name of Stevens, in the person of Robert L. Stevens, after long and numerous experiments cautiously conducted and tested, as to the form of vessel best calculated to overcome the resistance of the dense medium through which it was to make its way, to send forth on the Hudson — the monopoly law of the State of New York having meanwhile been overruled by the Constitution of the United States — a boat as superior in size and equipments, as in speed, to all before it, and to travel at the rate of 13½ miles per hour. . . . But when the 'New Philadelphia,' R. L. Stevens's boat, in 1814, started forth at the rate of 13½ miles per hour, even the senses were distrusted; philosophy, which had calculated only the resistance of the medium to the forms then usual, was at fault, and what had actually been done was pronounced impossible. But the steady, far-reaching mind of the younger Stevens knew the secret of his success,— that it was due to the form he had given to his vessel. He saw, too, after some trips, that even that form was far from the perfection he had designed, and accordingly he went to Brown & Bell, then — and even yet I believe — eminent ship-builders, and begged them to put on the 'New Philadelphia' a long, sharp, false bow, of which he gave them the drawings. After considering the proposition they declined, declaring themselves unwilling to encounter the ridicule of what struck them as so unseemly a work, and Mr. Bell added that it would be called 'Bell's nose' and would be the general laughing-stock. Repulsed, but not disconcerted, young Stevens, sure of his own conclusions, built a bow at his own shop, put it on, and obtained in consequence an additional speed of several miles an hour.

"With the 'New Philadelphia' commenced the first day line to Albany. This was the commencement of the new models, which, alike in clipper steamers and in clipper ships, have given to both classes of our build and navigation — for there is a great deal, too, in the latter — our superiority over the world.

"And here let me expatiate a little upon the service to the mechanic arts, and consequently to the welfare of humanity, of the family of Stevens, resident during the half-century among us. We have seen that by the lucky quarter of an hour Fulton carried away from Stevens the prize of the first successful steamboat. But years before, namely, 1804, Col. Stevens, whose fertile and ingenious mind was specially turned to mechanical inventions, had constructed and put into operation a steamboat of which the motive power was a propeller which at this day, I believe, is admitted, in form and proportion, to be the best. This boat was a small one. In it Col. Stevens put an engine with tubular boilers, the first ever made, now universal in locomotives. The machinery, made under his own direction and in his own shop at Hoboken, set in motion two propellers of five feet diameter each, and each furnished with four blades having the proper twist — to obtain which

[1] In his patent Fulton named six miles an hour as the limit he expected to attain, but in letters and conversation he spoke of nine as possible.

he had the greatest difficulty with his workmen — and set at an angle of about thirty-five degrees. This vessel — used only for testing the possibility of steam navigation — so completely demonstrated the fact, that Col. Stevens applied it on a larger scale in 1806 to a pirogue 50 feet long, 12 feet wide, and 7 feet deep — which attained very considerable speed. Encouraged thereby, he commenced the 'Phœnix' with side-wheels, to whose success allusion has already been made. It is proof of the remarkable accuracy and mechanical skill of the Hoboken workshop that the engine of the first small propeller, carefully preserved, was set up again, not more than seven or eight years ago, in a new vessel, and, without altering a screw, worked most successfully. The old hull and the blades of the propeller are yet in existence in Hoboken.

"Not the least useful purpose to which steam was applied about these times was to the ferry-boats which dart at all hours across the rivers separating us at once from, and binding us to, the shores opposite our island. . . . I address many, doubtless, who remember the comfortless row-boats, or the more comfortless pirogues, which alone, until after the year 1810, afforded the means of transporting man or beast to Long Island or to Jersey City. The first step in advance was the introduction of horse-boats — twin-boats with the wheel in the center — set in motion by a sort of horizontal treadmill wheel on which horses were made to step. For horses, steam was substituted; first by Fulton at the Fulton Ferry. Then came the single boats with side-wheels, and propelled by steam, of which the first was the 'Hoboken,' by R. L. Stevens, in 1822.[1] She is still at work, much enlarged and sound as ever, and much faster than at first. . . . The spring piles now used to deaden the force of the blow as the boat approaches the ferry, and to direct her course aright, are due to Robert L. Stevens, who introduced them in 1822."

The following extract from a letter written by Col. John Stevens, April 10, 1811, shows that he had a steam ferry-boat in operation on the Hudson River at an earlier date:

"In the boiler put last season on board the 'Juliana' ferry-boat I have improved upon the one in the 'Phœnix'."

The following footnote occurs in the article on "Railroads and Canals," including the correspondence of John Stevens during 1811–1812, which was presented in the "Stevens Indicator," for July, 1895:

"The steam ferry-boat 'Juliana' here referred to was built by Col. Stevens in 1811. She was an undecked open boat, 62 feet in length and only 12 feet in breadth, drawing from 2½ to 3 feet of water. The engine in her was of the model patented by Col. Stevens, having a cylinder of 14 inches diameter and 2½ feet stroke; with copper boilers, cylindrical, with flues. The steam was used expansively, cut off in the main valves, as is now done in the most approved engines. The 'Juliana' attained a speed of seven miles an hour. Mr. Fulton, having an interest in the Jersey City ferry, objected to the right of Col. Stevens to run the 'Juliana' as a ferry-boat between Hoboken and New York city, as infringing his monopoly from the State of New York, and the 'Juliana' was driven off.

"She afterward plied on the Connecticut River between Middletown and Hartford, being the first boat to navigate the Sound, although undecked, as Col. Stevens's boat 'Phœnix' was the first, in 1808, to navigate the ocean between Sandy Hook and the Delaware."

[1] This statement is evidently an error, as is indicated by several extracts from other sources given on this and the following pages, in which it is shown that the year should read 1811, and the boat the "Juliana."—Editor.

As a further evidence of the very narrow margin by which Fulton secured the popular credit and honor of having operated the first commercial steamboat, the following reference to Col. John Stevens is quoted from "Appleton's Encyclopedia of American Biography," V. 673, 674:

"He began experiments in the application of steam in 1788, and now continued them, having as his associates Nicholas I. Roosevelt and the elder Brunel, who afterward built the Thames tunnel. During the close of the century he was engaged with his brother-in-law, Robert R. Livingston, and Roosevelt, in building a steamboat to navigate the Hudson River, the legislature of the State of New York having previously offered a monopoly of exclusive privilege to the owners of a boat that, complying with given conditions, should attain a speed of three miles an hour; but their boat failed to achieve the required speed, and their joint proceedings were interrupted by the appointment of Livingston as Minister to France in 1801. In Paris, Livingston met Robert Fulton, and afterward was associated with him in establishing steam navigation. Stevens persevered, and in 1804 built a vessel, propelled by screws, that navigated the Hudson. The boiler was tubular, and the screw was identically the short four-threaded screw that is now used. . . . This was the first application of steam to the screw propeller. The engine and boiler of this steamboat are preserved in the Stevens Institute at Hoboken, N. J.[1] Mr. Stevens always upheld the efficiency of the screw and its great advantages for ocean navigation. Shortly after his death his sons placed the engine and boiler referred to in a boat which was tried before a committee of the American Institute of New York and attained a speed of about nine miles an hour.

"It is remarkable that after 1804 no serious attempt was made for the practical introduction of the screw until 1837, when it was brought into use simultaneously in England and the United States. Still more remarkable is the fact that its introduction into use in England was by the Archimedian screw of a single thread, and in America by a multi-threaded screw on the outer surface of a cylinder; that the first was completely modified in the course of five or six years into the short four-threaded screw that was used by Stevens in 1804. In 1807, assisted by his son Robert, he built the paddle-wheel steamboat 'Phœnix' that plied for six years on the Delaware. Professor James Renwick,[2] who from his own observation has left the best description extant of Fulton's boat, the 'Clermont,' as she ran in the autumn of 1807, says that 'the Stevenses were but a few days later in moving a boat with the required velocity' and that, 'being shut out of the waters of New York by the monopoly of Livingston and Fulton, Stevens conceived the bold design of conveying his boat to the Delaware by sea, and this boat, which was so near reaping the honor of first success, was the first to navigate the ocean by the power of steam.' Fulton had the advantage of a steam engine that was made by James Watt, while his predecessors were provided only with inferior apparatus, the work of common blacksmiths and millwrights."

The following is an extract from an article on "The First Steam Screw-Propeller Boats to Navigate the Waters of Any Country," by Dr. Francis B. Stevens, in the "Stevens Indicator" for April, 1893. Dr. Stevens is a grandson of Col. John Stevens, and is still living at Castle Point, Hoboken, N. J.:

---

[1] They were removed to the National Museum at Washington, D. C., in 1893.—EDITOR.

[2] Professor of Natural and Experimental Philosophy in Columbia College, New York; author of several treatises on the Steam Engine, including an article "On the Steamboats of the United States of America."—EDITOR.

"At the date of the introduction into use of the screw propeller, the pressure of steam carried on the boilers of condensing engines of the vessels that now navigate the bays and rivers of the Atlantic seaboard averaged about 30 pounds per square inch; while on the innumerable steamboats on the Mississippi and its tributaries the steam averaged 140 pounds per square inch. At the same date the pressure on English vessels was the same that Watt had established — namely, 2½ to 3 pounds. The 'Great Western,' in 1838, carried that pressure, and the iron screw propeller 'Great Britain,' in 1846, carried only 5 pounds per square inch.

"Col. Stevens attempted to introduce steam navigation by the screw propeller; laboring at the project for six years, and relinquishing it only one year before the successful application of the paddle wheel by Fulton. The five distinct means he proposed were:

"1. The short four-bladed screw propeller.

"2. The use of steam of high pressure.

"3. The multitubular boiler.

"4. The quick-moving engine connected directly to the propeller shaft.

"5. Twin screws.

"None of these means were applied to steamships for forty years thereafter, and yet all are elements in the success of ocean navigation at the present day.

"Steam-engine building, as a trade, did not exist in the United States until the year 1797, although it had long been established in England. Farey, in his 'Treatise on the Steam-Engine' (London, 1827), states that in the sixty-two years intervening between Newcomen's first engine in 1712, and Watt's first engine in 1774, the steam-engine had been extensively introduced throughout England, in the form of pumping-engines for draining mines, and for raising water to turn overshot wheels, by which cotton mills and a great variety of machinery were driven; and that as early as 1750 steam-engine building had become a recognized trade in England.

"The exportation from England, of all machinery, was prohibited by law, except upon an order from the King in Council, until 1820, when the law was repealed. Three known instances when this order was obtained were, for the pumping-engine at Chantilly, for supplying the city of Paris with water; for the pumping-engine of the Manhattan Company, for supplying the city of New York in 1799; and for Fulton's rotative engine in 1806. All three engines were made by Watt.

"Toward the close of the last century, Hornblower, a distinguished English engineer, came to this country and erected a pumping-engine at the mouth of the shaft of a copper mine near Belleville, on the left side of the Passaic River, N. J., about 8 miles from New York; and established a small machine-shop near by. This was then the only machine-shop in the country. The second was erected in 1801, by McQueen, in Duane Street, New York, near the Manhattan pumping-engine.

"The efficiency of the tools for engine-building in this country in the year 1800 can be judged by the following extracts from a letter written by P. T. Cope to the city authorities at Philadelphia in relation to the boring of a cylinder 38½ inches diameter by 6 feet stroke, for the pumping-engine that was erected in the square at Broad and Market streets, now the site of the Municipal Building. This letter, dated July 3, 1800, from Belleville, was published in the 'Scientific American Supplement' No. 45, November, 1876, p. 706. He says that the boring of the cylinder was commenced on the 9th of the previous April; that the boring had been in progress from that date to the date of the letter, July 3, two men working day and night, relieving each other, 'one almost living in the cylinder'; and that he expected 'that about six weeks would be required to finish it.'

"An inspection of the rude workmanship of the twin-screw engine, as well as that

of the boiler, will explain the reason for the abandonment, by Col. Stevens, of his plan of screw propulsion. There were no tools or competent workmen in America at that date to properly construct the steam-engines and the boilers that he planned between 1800 and 1806. Success was impossible.

"When he finally realized this, unwearied by his attempts to introduce steam navigation, dating from the year 1791, he reverted to the paddle wheel, with its slow-moving engine, and with the boilers then in use, carrying steam at the pressure of two or three pounds above the atmosphere. He was engaged in building the 'Phœnix' when Fulton arrived from Europe with the engine made for him by Watt in 1806, which, complete in all its details, and in these respects far in advance of any engine that could then have been built in this country, achieved success.

"Fulton's engine was the first rotative steam-engine that was allowed to be exported from England.

"The paddle steamboat 'Phœnix' was completed a few weeks after Fulton's vessel; and, as she was debarred from navigating the waters of the Hudson by the monopoly given to Fulton by the legislature of the State of New York, she was sent by sea to Philadelphia. The 'Phœnix' was the first steamboat that navigated the ocean.

"Col. Stevens always maintained that with proper machinery the screw would be found superior to the paddle for sea-going vessels. In 1816 he presented a plan to our government for a man-of-war propelled by a screw. This may still remain in the archives of the government at Washington."

EARLY DAYS OF THE LOCOMOTIVE AND THE STEAM RAILROAD

The following extracts are taken from a lecture on "The Progress of the City of New York During the Last Fifty Years," delivered by President Charles King, of Columbia College, December 29, 1851:[1]

"Next in succession among the operative causes of our growth, as connected with steam, was its application to land carriage, and soon the railroad and the locomotive were constructed to soothe and to satisfy, as far as that *can* be done, our national go-ahead spirit. And here again New York was the point whence proceeded the first railroad enterprise, which was to connect this city with Philadelphia, by the Camden and Amboy Railroad in 1831; and here again Col. John Stevens claims our admiration and gratitude. He had clearly worked out in his own mind, long before any locomotive was constructed in Europe, the theory of such an application of steam, and the actual form in which it could be advantageously made, as well as the cost of constructing and working a railway for the use of locomotives. Long before any experience existed to justify his anticipation, he said and published that there was no limit to the speed of a locomotive on a rail but the strength of the materials; that it might easily be made to run as fast as a pigeon could fly; and it is one of the striking incidents connected with the opening or the early use of the Camden and Amboy Railroad, that a flock of pigeons which had settled on the track, being disturbed in its approach by the rapid engine, took wing in the direction of the track; and that one of them, attempting to cross in front of the car, was struck down by it; thus most literally verifying the prediction that the locomotive would equal in velocity the pigeon's flight.

[1] This lecture was printed in 1852 by D. Appleton & Co. in a pamphlet of 80 pages, octavo.

"Since this address was delivered, I have succeeded in finding among the bound pamphlets of the Society Library a copy of the very remarkable pamphlet upon 'Railroads and Steam Carriages'[1] published by Col. John Stevens in May, 1812, and I cannot refuse myself the pleasure of briefly stating its purport here,— briefly, I say, as I am gratified in being able to add that the sons of that great benefactor of his country (themselves not without large claims to its gratitude and remembrance) are about to reprint that pamphlet, with additions and notes, which will make it a very curious as well as a very instructive publication.

"Colonel Stevens, who, as has already been seen, was the inventor of the tubular boiler as far back as 1804, and who had been an experimenter in steam as a motive power, both on the water and on the land, as far back as 1790, became so thoroughly convinced of the superiority of railways to canals for internal communication and the transportation of passengers and produce, that when, in 1810, the project of connecting Lake Erie with the Hudson was so seriously discussed as to lead to the appointment, by the legislature, of commissioners to examine the routes and report on the feasibility of the work, Col. Stevens, after seeing their report, which contemplated a continuous inclined plane from the lake to the river, to be fed in its whole length by the waters of the lake, earnestly pressed upon the commissioners, as preferable alike in economy, speed, and rapidity of construction, a system of railways adapted to steam carriages. This was the origin of the pamphlet to which we are referring, which is in fact little else than a copy of his memorial to the canal commissioners, with their objections and his rejoinders, preceded by a preface in which Col. Stevens sets forth his motives for the publication, and the grounds and extent of his faith in these then untried ways and carriages. Having failed to convince the New York commissioners, he enforces the national advantages of his project thus:

"'So many and so important are the advantages which these States would derive from the general adoption of the proposed railways, that they ought, in my humble opinion, to become an object of primary attention to the national government. The insignificant sum of $2,000 or $3,000 would be adequate to give the project a fair trial. On the success of this experiment a plan should be digested, a general system of internal communication and conveyance be adopted, and the necessary surveys be made for the extension of these ways in all directions, so as to embrace and unite every section of this extensive empire. It might then, indeed, be truly said that these States would constitute one family, intimately connected and held together in bonds of indissoluble union.'"

"This remarkable paper then proceeds to estimate the great fiscal advantages to the federal government from the estimated tolls to be derived from these roads, which, while so light, in comparison with the actual cost of transportation of merchandise and passengers, as to secure a preference, would in the aggregate constitute a large revenue.

"The practicability of commencing the work, and carrying it on upon many distant points at once, with a view to their ultimate connection, is also clearly pointed out; and then comes this distinct — and when it is considered that there existed not in the world, at that time, railways and steam carriages such as had been shadowed forth — and truly wonderful prophecy of the speed which could be attained by locomotives on railways:

"'But there remains another important point of view in which this improvement demands the attention of the general government; the celerity of communication it would afford with the distant sections of our wide extended empire is a consideration of the utmost moment.

[1] This pamphlet, which was originally printed by T. & J. Swords, New York, in 1812, was reprinted in 1852, and, having since become very rare, was again reprinted in full in "Stevens Indicator" in 1895 (XII, Nos. 3 and 4).—Editor.

To the rapidity of the motion of a steam carriage on these railways, no definite limit can be set. The flying proas, as they are called by voyagers, belonging to the natives of the islands in the Pacific Ocean, are said at times to sail more than twenty miles an hour; but as the resistance of the water to the progress of the vessel increases as the squares of her velocity, it is obvious that the power required to propel her must also be increased in the same ratio. Not so with a steam carriage; as it moves in a fluid eight hundred times more rare than water, the resistance will be proportionally diminished. Indeed the principal resistance arises from friction, which does not even increase in a direct ratio with the velocity of the carriage. If, then, a proa can be driven by the wind (the propulsive power of which is constantly diminishing as the velocity of the proa increases), through so dense a fluid as water, at the rate of twenty miles an hour, I can see nothing to hinder a steam carriage from moving on these ways with a velocity of one hundred miles an hour.'

"To this bold conjecture Mr. Stevens adds this note, more sagacious, even, than the conjecture:

"'The astonishing velocity is considered here as merely possible. It is probable that it may not, in practice, be convenient to exceed twenty or thirty miles an hour. Actual experience, however, can alone determine this matter; and I should not be surprised at seeing steam carriages propelled at the rate of forty or fifty miles an hour.'"



First Train on the Camden and Amboy Railroad

"Should it not seem that, to the teeming and enthusiastic mind of this most ingenious engineer, the actualities of railways and locomotives, which we witness now at a distance of forty years from this prophecy, had been, as it were, revealed? Every capability, indeed, and recommendation of railways seem to have been present to Col. Stevens's mind,—as, for instance, their military importance:

"'In a military point of view the advantages resulting from the establishment of these railways and steam carriages would be incalculable. It would at once render our frontiers on every side invulnerable. Armies could be conveyed in twenty-four hours a greater distance than it would now take them weeks or even months to march.

" 'Thus, then, this improvement would afford us prompt and effectual means, not only of guarding against the attack of foreign enemies, but of expeditiously quelling internal commotions, and thus securing and preserving for ever our internal tranquillity.'

" In the memorial to the New York commissioners, precise calculations were made of the cost of fuel for locomotives; of constructing the railways (which were at first to be of wood, raised on posts some three feet from the ground, so as to be clear of snow, and afterward, when proved to be successful, to be plated with iron); and of working the whole road. These calculations are marvellously verified by the experience of this day."

In connection with the above remarks by President King, the following extract from an address delivered by Mr. J. Elfreth Watkins before the Philosophical Society of Washington, May 7, 1892, on "John Stevens and His Sons, Early American Engineers,"[1] is of interest:

" The South Carolina Railroad (commenced in 1829), which, when completed in 1832, was the longest railway in the world, was constructed upon his plans as laid down twenty years before."[2]

The following extracts are taken from an address delivered by Mr. J. Elfreth Watkins, C.E., E.D. (Curator of the Section of Transportation and Engineering of the United States National Museum), at Bordentown, N. J., November 12, 1891,[3] upon the completion of the monument erected by the Pennsylvania Railroad to mark the first piece of track laid between New York and Philadelphia; and to commemorate the Sixtieth Anniversary of the first movement by steam upon a railway in the State of New Jersey, November 12, 1831:[4]

" The Union Line

" At that time (1812), in connection with his son Robert, he (John Stevens) had made steamboat navigation on the Delaware a commercial success. Shortly afterward he became connected with the firm that was soon merged into the famous Union Line, which controlled the transportation of merchandise and passengers between Philadelphia and New York for many years. During that time the through route, 101 miles long, between Philadelphia and New York, was divided into three links:

(1) The steamboat route from Philadelphia to Trenton	36 miles
(2) Overland stage and wagon route, Trenton to New Brunswick, over the turnpike . .	25 "
(3) Steamboat route, New Brunswick to New York	40 "
	101 miles

" The Trenton and New Brunswick Turnpike Company (chartered in 1804) had made a marked improvement in their road, but these twenty-five miles were a tedious journey to passengers, and expensive to the company in hauling freight by wagon.

[1] This address was printed in pamphlet form by W. F. Roberts, Washington, D. C.
[2] See also " Appleton's Encyclopedia of American Biography," V. 673.—Editor.
[3] The address was published in pamphlet form by Gedney & Roberts, Washington, D. C.
[4] See the illustration, on p. 86, of the bronze tablet erected at Bordentown on this occasion.

"The First Railroad Charter

"Colonel Stevens was anxious to put his recommendations of 1812 into practice. In 1817 he obtained a charter from the State of New Jersey 'to build a railroad from the river Delaware, near Trenton, to the river Raritan, near New Brunswick.' This was undoubtedly the earliest railroad charter granted in America; but no tangible result followed, because the scheme was regarded as wild and visionary. The introduction of the steamboat, coupled with the success of the Duke of Bridgewater in the introduction of canals abroad, had made them more popular with capitalists than the untried railroad, and no money could be raised for that undertaking. Col. Stevens regretted that his financial condition was not such as to warrant him in building the road at his own expense.

"First Charter of the Pennsylvania Railroad

"His interest in the subject of internal communication did not flag on account of this failure, for in 1823, through the exertion of Mr. Stevens, acts were passed by the legis-



PRIVATE TRACK IN HOBOKEN, NEAR THE PRESENT LACKAWANNA TERMINUS

lature of Pennsylvania[1] for the incorporation of a company to construct a railway from Harrisburg to Pittsburg, and another company to construct a railway from Philadelphia to Columbia, in Lancaster County, among the incorporators being John Stevens, Stephen Girard, and Horace Binney.

"John Stevens's Experimental Locomotive

"Three years later (1826), Col. Stevens, then seventy-six years old, constructed at his own expense a locomotive[2] with a multitubular boiler which he operated for several years on a circular track on his estate at Hoboken. A model of this locomotive, together

[1] Laws 1823, sec. 6, p. 252.

[2] "This was the first locomotive in America, driven by steam upon a track, of which there is reliable record."—Mr. J. Elfreth Watkins, in an address before the Philosophical Society of Washington, May 7, 1892.

with the original multitubular boiler which formed a part of it, is also preserved in our National Museum.

"Camden and Amboy Railroad Organization; First Officers, etc.

"The meeting of the stockholders at which the first organization of the Camden and Amboy Railroad was effected was held . . . at Camden, N. J., April 12, 1830.[1] The following persons were chosen the sole officers and directors of the company: Robert L. Stevens, of Hoboken, President; Edwin A. Stevens, of Hoboken, Treasurer; Jeremiah H. Sloan, of Camden, Secretary. . . . Robert L. Stevens was also appointed Chief Engineer. . . .

"The Stevens brothers, Robert L. and Edwin A. (with their father John Stevens) became the active managers of the road. The former took charge of laying the track and procuring equipment, while the other looked after the political, financial, and practical management of affairs. Considerable judgment had to be used in both of these branches. No laws had been established in regard to the steps to be taken in the purchase of right of way, and many of the New Jersey legislators were very chary when they were asked to grant franchises and rights. In Mr. Robert L. Stevens's department the field was indeed wide. The few short railways built at that time were isolated and separated by considerable distance, which in those days was a difficulty not easily surmounted. When we think of the fact that Robert L. Stevens was compelled to begin to lay track and provide engines and cars for a railroad, with no experience to guide him, and with no experienced railroad men to consult, we can form some idea of the responsibility which rested upon his shoulders and the perplexing problems he was called upon to solve. But the son of the great inventor 'knew no such word as fail,' and he bent himself to the task with a success that was remarkable."

---

[1] The circumstances leading up to this meeting were as follows:

The Union Line, mentioned above, had been uniformly successful over competing lines for the passenger and freight business between New York and Philadelphia. Passengers leaving New York at noon one day arrived in Philadelphia early the next morning. Freight charges were from 75 cents to $1.25 per 100 pounds. This was the condition of affairs in 1827, when the need for better transportation facilities between the Raritan and the Delaware rivers became apparent. Numerous petitions were presented to the New Jersey legislature in 1828–29 and 1829–30, praying for the incorporation of a railroad company. Opposed to these petitions were the advocates for a canal across the State of New Jersey, and with these were associated the unsuccessful and unfriendly competitors of the old Union Line.

Early in 1829 the "Stourbridge Lion," the first locomotive that ever turned a driving-wheel on a railroad built for traffic on the western continent, was ordered from England by the Delaware & Hudson Canal Co., arriving here in August, when it made its first trip under Horatio Allen. Later in that year great impetus was given to the construction of railways by Stephenson's success in England with the "Rocket" on the Manchester and Liverpool road.

Railroad construction was at that time (1828–29) under way in several sections of the country. In spite of this there were many who thought that a steam railroad in New Jersey could not be made to pay. In the New Jersey legislature the deadlock which had resulted between the friends of the railroad and canal was compromised in January, 1830, when Robert L. and John C. Stevens, representing the railroad interests, met by chance Commodore Robert F. Stockton, representing the canal interests, in the lobby of the Park Theatre, New York. As a result of this meeting one charter was granted to the Camden & Amboy Railroad & Transportation Co., and another charter to the Delaware & Raritan Canal Co. on the same day, the 4th of February, 1830.

Robert L. Stevens was elected President and Engineer of the new railroad company on the 28th of April following, and sailed for Europe in October. After attending to the work of obtaining the T-rail which he had designed, and which will be described later, he went to the works of George and Robert Stephenson at Newcastle-on-Tyne, where the famous locomotive "Rocket" had been built. At that time Mr. Stevens contracted for the locomotive afterward known as the "John Bull." He then returned home and built a railway track 1,067½ feet long, with his rails laid on stone blocks, near Bordentown, where on the 12th of November he exhibited to the legislature of New Jersey the capabilities of the railway and the locomotive. A letter dated October 15, 1901, from Mr. Francis B. Stevens, nephew of Robert L. Stevens, and to whom we are indebted for much information in this connection, states that he was present October 9, 1831, at the opening of the road, when it was completed and formally opened for traffic from Bordentown to Hightstown. In the latter part of December the road was completed to Amboy, but locomotives were not used until August, 1833, when a sufficient number had been made.

INVENTION OF THE T-RAIL AND SPIKE BY ROBERT L. STEVENS

THE following extracts are taken from an address, delivered by Mr. J. Elfreth Watkins, C.E.:

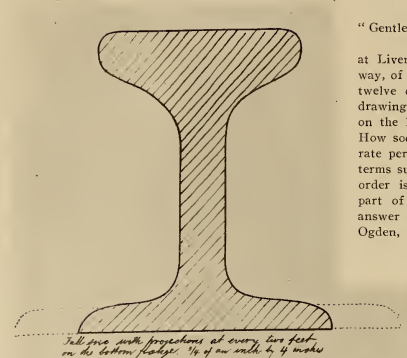
"Early in October, 1830, and shortly after the surveys of the Camden and Amboy Railroad were completed, Robert L. Stevens sailed for England with instructions to order a locomotive and rails for that road. At that time no rolling-mill in America was able to take a contract for rolling T-rails.



ROBERT L. STEVENS

"Robert Stevens advocated the use of an all-iron rail in preference to the wooden rail or stone rigger plated with strap iron, then in use on one or two short American railroads. At his suggestion, at the last meeting held before he sailed, after due discussion, the board of directors of the Camden and Amboy Railroad passed a special resolution authorizing him to obtain the rails he advocated.

"During the voyage to Liverpool he whiled away the hours on shipboard by whittling thin wood into shapes of imaginary cross-sections until he finally decided which one was best suited to the needs of the new road. He was familiar with the Berkenshaw rail with which the best English roads were then being laid, but he saw that, as it required an expensive chair to hold it in place, it was not adapted to our country where metal-workers were scarce and iron was dear. He added the base to the T-rail, dis-



TRANSCRIPTION OF LETTER SHOWN IN MANUSCRIPT BELOW.

"LIVERPOOL, November 26, 1830.

"Gentlemen,—

"At what rate will you contract to deliver at Liverpool, say from five to six hundred tons of railway, of the best quality iron rolled to the above pattern in twelve or sixteen feet lengths, to lap as shown in the drawing, with one hole at each end, and the projections on the lower flange at every two feet. Cash on delivery? How soon could you make the first delivery, and at what rate per month until the whole is complete? Should the terms suit and the work give satisfaction a more extended order is likely to follow, as this is but about one-sixth part of the quantity required. Please to address your answer (as soon as convenient) to the care of Francis B. Ogden, Consul of the United States at Liverpool.

"I am,

Your Obedient Servant,

ROBERT L. STEVENS,

President and Engineer of the Camden and South Amboy Railroad and Transportation Company.

FACSIMILE OF SKETCH OF CROSS-SECTION, SIDE-ELEVATION, AND GROUND-PLAN OF THE FIRST T-RAIL

(Also of Letter Addressed by Robert L. Stevens to English Ironmasters, Asking for Bids.—Preserved in the United States Notional Museum, Washington, D. C.)

pensing with the chair. He also designed the 'hook-headed' spike (which is substantially the railroad spike of to-day) and the 'iron tongue' (which has developed into the fish-bar), and the rivets (which have been replaced by the bolt and nut) to complete the joint.

"The base of the rail which he first proposed was to be wider where it was to be attached to the supports than in its intervening spaces. This was afterward modified, so that the base was made the same width (three inches) throughout.

"Mr. Stevens received no favorable answer to his proposals, but, being acquainted with Mr. Guest (afterwards Sir John Guest), a member of Parliament, proprietor of large ironworks in Dowlais, Wales, he prevailed upon him to have rails rolled at his works. Mr. Guest became interested in the matter and accompanied Mr. Stevens to Wales, where the latter gave his personal supervision to the construction of the rolls. After the rolls were completed the Messrs. Guest hesitated to have them used, through fear of damage to the mill machinery, upon hearing of which Mr. Stevens deposited a handsome sum guaranteeing the expense of repairing the mill in case it was damaged. The receipt of this deposit was preserved for many years among the archives of the Camden and Amboy Company. As a matter of fact the rolling-apparatus did break down several times. A facsimile of a bill for altering the rolls for the Stevens rail is shown on the following page. At first, as Mr. Stevens, in a letter to his father, which I have seen, described it, 'the rails came from the rolls twisted and as crooked as snakes,' and he was greatly discouraged. At last, however, the mill-men acquired the art of straightening the rail while it cooled.

"The first shipment,[1] consisting of 550 bars 18 feet long, 36 pounds to the yard, arrived in Philadelphia on the ship 'Charlemagne,' May 16, 1831. . . .

"The rail was first designed to weigh 36 pounds per yard, but it was almost immediately increased in weight to between 40 and 42 pounds, and rolled in lengths of 16 feet. It was then 3½ inches high, 2⅜ inches wide on the head, and 3½ inches wide at the base, the price paid in England being £8 per ton. The import duty was $1.85 per ton.

"This iron proved to be of such a superior quality that after it was worn out in the track the company's mechanics preferred it to new iron in making repairs. Some of this rail is still in use in side tracks. It is pronounced equal in durability to much of the steel rail of to-day.

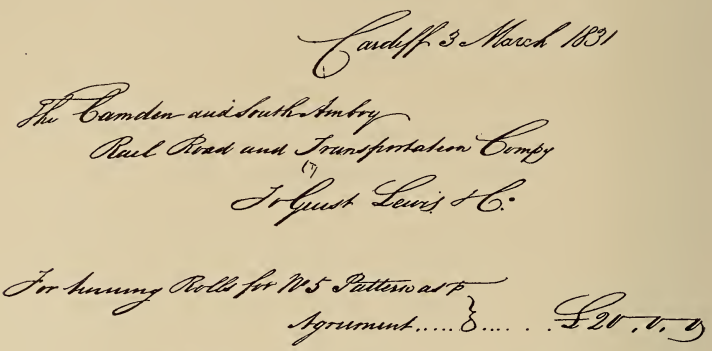
[1] A list of the vessels chartered to transport the rails, with dates, tonnage, etc., is given below:

Date	Ship	No. of Bars	Tonnage			Rate of Duty
			Tons	Cwt.	Lbs.	
May 16, 1831	"Charlemagne"	550	504	0	14	$1.85
May 19, 1831	"Salem"	963	774	2	14	1.85
April 7, 1832	"Caledonia"	38	73	3	07	1.85
April 23, 1832	"Armidilla"	525	1,000	3	21	1.85
May 4, 1832	"George Clinton"	624	986	2	14	1.85
June 2–18, 1832	"Henry Kneeland"	204	377	3	21	1.85
May 8, 1832	"Cumberland"	1,464	2,790	1	00	1.85
June 2, 1832	"Gardiner"	601	1,136	0	00	1.85
June 5, 1832	"Globe"	499	943	1	14	1.85
June 6, 1832	"Jubilee"	70	130	0	21	1.85
June 18, 1832	"Hellen"	1,080	2,004	3	21	1.85
July 19, 1832	"Nimrod"	937	1,745	3	00	1.85
August 2, 1832	"Emery"	240	454	2	00	1.85
August 6, 1832	"Ajax"	364	700	0	21	1.85
August 13, 1832	"Concordia"	622	1,174	3	14	1.85
August 14, 1832	"William Byrne"	1,120	2,138	1	07	1.85
August 20, 1832	"Mary Howland"	932	1,755	3	07	1.85
August 23, 1832	"Pulaski"	488	924	1	00	1.85
August 24, 1832	"Robert Morris"	1,985	3,732	0	14	1.85
August 27, 1832	"Ann"	506	961	2	07	1.85
September 3, 1832	"Montgomery"	1,369	2,959	0	14	1.85
September 4, 1832	"Marengo"	534	1,004	2	07	1.85
October 12, 1832	"Vestal"	237	460	2	07	1.85

"Mr. Stevens ordered the first joint fixtures, also from an English mill, at the same time. . . .

"The first 'spikes six inches long, with hooked heads' were also ordered at the same time. These were undoubtedly the first 'railroad spikes' (as they are known to the trade) ever manufactured.

"Mr. Stevens neglected to obtain a patent for these inventions, although urged to



Cardiff 3 March 1831

The Camden and South Amboy
Rail Road and Transportation Comp.y
To Guest Lewis & C.°

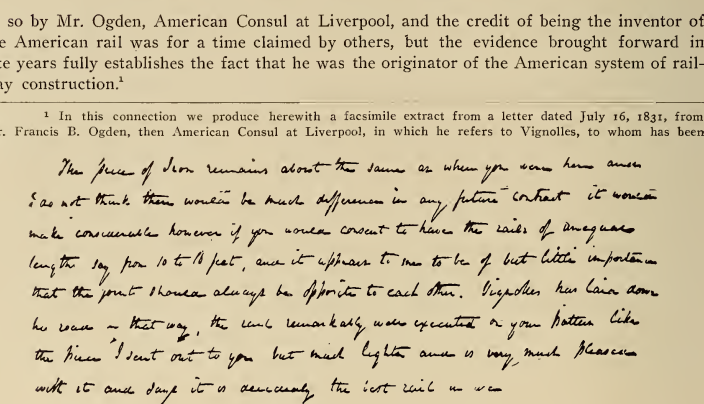
For turning Rolls for W.m Patterson as p
Agreement..... £ 20, 0, 0

FACSIMILE OF BILL FOR ALTERING ROLLS FOR THE FIRST T-RAIL

do so by Mr. Ogden, American Consul at Liverpool, and the credit of being the inventor of the American rail was for a time claimed by others, but the evidence brought forward in late years fully establishes the fact that he was the originator of the American system of railway construction.[1]

---

[1] In this connection we produce herewith a facsimile extract from a letter dated July 16, 1831, from Mr. Francis B. Ogden, then American Consul at Liverpool, in which he refers to Vignolles, to whom has been



The price of Iron remains about the same as when you were here and I do not think there would be much difference in any future contract it would make considerable however if you would consent to have the rails of unequal length say from 10 to 16 feet, and it appears to me to be of but little importance that the joints should always be opposite to each other. Vignolles has been down here a few days, the rails remarkably well executed & your pattern like the piece I sent out to you but much lighter and is very much pleased with it and says it is decidedly the best rail he has

given the credit for the invention of the T-rail. That it belongs to Robert L. Stevens is now firmly established by this document and by other evidence. The extract reads as follows:

"The price of iron remains about the same as when you were here, and I do not think there would be much difference in any future contract. It would make considerable, however, if you would consent to have the rails of unequal length, say from 10 to 16 feet, and it appears to me to be of but little importance that the

"Sixty years have elapsed since this rail was adopted by the Camden and Amboy Company, and with the exception of slight alterations in the proportions incident to increased weight, no radical change has been made in the 'Stevens rail,' which is now in use on every railroad in America. Many improvements have been made in the joint fixture, but the 'tongue' or fish-plate, improved into the angle slice-bar, is in general use, and nothing has yet been found to take the place of the 'hook-headed' railroad spike which Robert Stevens then designed.

"The track upon which we stand was the first in the world that was laid with the rail and spike now in general use.

"Mr. Robert L. Stevens was present in England, December 4, 1830, when the locomotive 'Planet,' built by Stephenson & Co., was given its first public trial. He at once ordered a locomotive of similar construction from the same builders. This locomotive was completed and shipped to America, where it became known as the 'John Bull.' The parts were assembled by Isaac Dripps, the first master-mechanic of the Camden and Amboy Railroad, and the first public trial was given November 12, 1831, at Bordentown, N. J., before the State legislature and other high officials. This had the effect of quieting the opposition to the steam locomotive, which had been developed by the farmers and other horse owners and dealers, who wished to have the cars on the railroad drawn by horse power. This question had already become a political issue in the State."[1]

INVENTION OF THE ELONGATED SHELL FOR CANNON

The following extracts are taken from a lecture on "The Progress of the City of New York During the Last Fifty Years," delivered by President Charles King, of Columbia College, December 29, 1851:

"1813–1814.—The war with England being then in progress, he [Robert L. Stevens] invented, after numerous and most hazardous experiments, the elongated shell, to be fired from ordinary cannon. Having perfected this invention, he sold the secret to the United States after making experiments, to prove their destructiveness, so decisive as to leave no doubt of the efficacy of such projectiles. One of these experiments was made at Governor's Island in the presence of officers of the army, when a target of white oak, four feet thick and bolted through and through with numerous iron fastenings, was completely destroyed by a shell weighing 200 pounds, and containing 13 pounds of best Battle powder. This solid mass of wood and iron was torn asunder; the opening made being large enough, as the certificate of the officer commanding, Col. House, stated, for a man and horse to enter.

"These shells are free from the danger accompanying ordinary shells, for they are hermetically sealed and suffer no deterioration from time. Some of these, after being kept twenty-five years, by way of proving their safety till needed and as needed, were tested by exploding gunpowder under them, and then they were taken to high places and let fall on rocks below, and all without causing them to explode. After this they were plunged into water, and then, being put into the cannon, were fired, and, upon striking the object, exploded with devastating effect."

joints should always be opposite to each other. Vignolles has laid down his road in that way, the rails remarkably well executed on your pattern, like the piece I sent out to you, but much lighter, and is very much pleased with it, and says it is decidedly the best rail in use."—Editor.

[1] Further particulars in reference to this subject may be found in the Report of the United States National Museum, 1888–89, pp. 651–708, in the article on "The Development of the American Rail and Track," as illustrated by the collection in the National Museum, by Mr. J. Elfreth Watkins, Curator of the Section of Transportation and Engineering.—Editor.

THE STEVENS BATTERY, THE FIRST IRONCLAD VESSEL TO BE ACTUALLY PLACED UNDER CONSTRUCTION

THE following extracts are taken from an address entitled "John Stevens and His Sons, Early American Engineers," by Mr. J. Elfreth Watkins, delivered before the Philosophical Society of Washington, May 7, 1892:[1]

"In the year 1814, and toward the close of our last war with Great Britain, Col. Stevens had projected the circular iron fort moved by steam, . . . for the harbor of New York, and by his direction his son Edwin, then nineteen years of age, experimented with a six-pounder bronze cannon fired against iron plating. This cannon is still retained at Castle Point. Iron armor for the protection of the person has been in use from prehistoric ages, but the demonstration that it could be applied to ships of war was made for the first time by Edwin A. Stevens in 1841, twenty-seven years after he had made the experiment for his father, and at the time when we were on the brink of war with Great Britain on account of the aggressions on our Canadian frontier. As thick armor plate could not be made at that date, he devised the method of armor plating in *laminæ*, or plates laid over each other and riveted. He then made a series of experiments to determine the thickness of plating required to resist the different sizes of balls then in use. From these experiments, which were made at Bordentown, N. J., in the summer of 1841, he made the deduction that a target of iron 4½ inches thick would resist a 64-pound shot, at that time the heaviest ball used in our navy. With the assistance of his brother John C. (his brother Robert being then in Europe) he laid the results of his experiments before President Tyler. As the whole country was then aroused, the President immediately appointed a joint board composed of the ablest ordnance officers of the army, and of the leading officers of the navy, to superintend the experiments of the Messrs. Stevens on iron as a protection for war vessels; and in accordance with the request of this joint board John C. and Edwin A. Stevens wrote them a letter giving their views upon the subject of steamers for coast and harbor defence, stating that their ideas were principally derived from their brother Robert L. Stevens, then abroad. This letter,[2] written August 13, 1841 and before the application of the screw to vessels of war, can be said to embody the leading principles of naval warfare that have since been reduced to practice.

"The army officers were Colonels Totten, Thayer, and Talcott, and the naval ones, Commodores Stewart, Perry, and Smith. The targets, 4½ inches thick, made by Edwin A. Stevens, were tested at Sandy Hook by the joint board of officers in the months of September, October, and November, 1841. They made an elaborate report, unanimously agreeing that the targets fully withstood the numerous shots from the heaviest guns then in service. It was upon the presentation of this report by the Naval Committees of the Senate and the House of Representatives that the act of Congress was passed authorizing the Secretary of the Navy to contract with Robert L. Stevens, who had then just returned from Europe, for an ironclad steamer to be 'shot and shell proof.' That act is as follows:

"'Chapter XII (Statutes of the United States at Large) April 14, 1842, An Act Authorizing the Construction of a Steamer for Harbor-Defence.

"'Be it enacted by the Senate and House of Representatives of the United States of America, that the Secretary of the Navy is hereby authorized to enter into contract with Robert L. Stevens for the construction of a war steamer, shot and shell proof, to be built principally of

[1] This address was printed in pamphlet form by W. F. Roberts, Washington, D. C.

[2] See *post*, p. 124.

iron, upon the plans of said Stevens, provided the whole cost, including hull, armament, engines, boilers, and equipment, in all respects complete for service, shall not exceed the average cost of the steamers "Missouri" and "Mississippi," and be it further enacted that two hundred and fifty thousand dollars ($250,000) be and the same is hereby appropriated, out of any money in the Treasury not otherwise appropriated, toward carrying this law into effect.

"'(Approved by the President of the United States)

"'JOHN TYLER.'

"It may be mentioned that this bill was reported from the Committee of the Whole of the House of Representatives, April 7, 1842, at the suggestion of Ex-President John



THE STEVENS BATTERY IN HER DRY DOCK

Quincy Adams, then a member of the House, who characterized it as 'one of pressing emergency.' It passed the Senate unanimously, and in the House there were but thirteen dissenting votes.

"Upon the passage of the act, Robert, with the assistance of his brother Edwin, commenced immediately to plan and construct the vessel. He built a dry dock for it at Hoboken and proceeded rapidly with the work.

"At the date of the passage of this Act of Congress there had been but little change in the power of guns from those used by Nelson at the battle of Trafalgar in 1805, or on our frigates in the War of 1812. But when Commodore R. F. Stockton, after the failure of his first gun, February 28, 1844, succeeded in having constructed in England a wrought-

iron gun throwing a round shot that pierced a target 4½ inches thick, Robert Stevens altered his plans, increasing the thickness of the armor and the size of the vessel that he had contracted to build 'shot and shell proof,' and then began, in the great navies of the world, the long-drawn-out battle between gun and armor,— a contest that by the intervention of other methods may never be decided. When more powerful guns were introduced, either at home or abroad, other alterations were made, thus causing interminable interruptions of the work, many long delays, and an increase of expenditures far beyond that provided by the Act of Congress. Dying in 1856, five years before our Civil War, he left the vessel unfinished in the basin at Hoboken, but with all the plating on, and with the twin-screw engines and the boilers, having 876 square feet of grate surface, in their positions.

"This vessel was 410 feet long, 45 feet beam inside the armor-shelf, with the deck two feet above the water, and was similar in these respects to the 'Monitor' class of vessels built six years afterward by Ericsson, but differing in having a square and immovable turret, instead of a circular and movable one.

"During the Crimean War, in 1855, the French government built three small vessels protected by thin armor, this being the first use of ironclads in naval warfare.

"It is significant that on the 'Warrior,' the first English ironclad, and on the French frigate 'La Gloire,' both built in 1860, eighteen years after the demonstration of Edwin A. Stevens at Sandy Hook, and on the 'Monitor,' built in 1862, the thickness of the armor adopted was that of his targets; namely, 4½ inches.

"At the commencement of our Civil War, and twenty years after his demonstration at Sandy Hook that a vessel could be protected by iron armor, Edwin Stevens presented to the government a plan for completing the 'Stevens Battery' (which had been bequeathed to him by his brother Robert), together with a small vessel called the 'Naugatuck,' to demonstrate the practicability of his plans. This small vessel was accepted by the government and was one of the fleet that attacked the 'Merrimac.' She was a twin-screw vessel, capable of being immersed three feet below her load-line, so as to be nearly invisible, and of being raised again in eight minutes by pumping out the immersing weight of the water, and of turning end for end on her centre in one minute and a quarter.[1] As the plans for the modification of the 'Stevens Battery' embodied ideas then novel, but which have since been found practicable and necessary, his offer was rejected by the government. The 'Stevens Battery' remained in the same state in which it was left at the death of Robert L., in 1856, until after the death of Edwin in 1868. The latter bequeathed it to the State of New Jersey, together with $1,000,000 for its completion. This money was spent in 1869 and 1870. The vessel was never launched, and in 1881 was taken to pieces and sold for old material."[2]

Subjoined are reprints of some of the original documents which passed between Robert L. and Edwin A. Stevens and the United States government in reference to the building of the "Stevens Battery."

The following brief extract is from the letter addressed to the United States government, August 13, 1841, by John and Edwin A. Stevens, in response to the request of the joint board of commissioners mentioned above.[3]

"It appears to us that steam vessels of war should possess the following qualifications: That the motive power (so far as steam is concerned) should be out of reach of an enemy's shot. That the vessel herself should be proof against damage from either shot

[1] See *post*, p. 127. [2] See "Engineering," London, March 26, 1897, p. 417. [3] See *ante*, p. 122.

or shells; that she should have the capability, when required, of great speed, combined with the power of choosing, under all circumstances, her position with certainty and facility.

"These qualities we believe may be combined in one vessel:

"*First,* by having the engine and boiler placed below the water-line, and by using as a propeller the Stevens Circular Scull, whose action is entirely below the surface of the water.

"*Secondly,* by constructing the vessel, above the water-line, of such material as should be proof against shot or shell, and placed at such angle as should best resist or turn the one or the other.

"*Thirdly,* by working the engines expansively at ordinary times, with boilers capable of resisting a high pressure, and generating, by the use of a more concentrated and inflammable fuel, a very large quantity of steam, giving greater power and speed when required.

"In the construction of the vessel, we propose to substitute iron for wood; iron, for ship-building, being of less weight than wood of equal strength, and capable of opposing an equal resistance.

"The thickness necessary to resist balls of the largest size would require to be determined by experiment. . . . If so, it would require only 4½ to 6 inches to resist a 9-inch shot. . . .

"We would arm her with a few guns of the largest calibre. . . . We would load them at the breech."

"That no two steam vessels of war, at the present day, could come together at a speed of say six or seven miles an hour, without sinking one or both, is, in our opinion, certain. What, then, must be the effect of coming in contact with a vessel (save from the shock herself) at double that speed? Instant and immediate destruction."

"The only question seems to be, could a vessel be constructed with the requisite strength and speed? If this can be done, and we are sanguine that it can, armed with shells, and completely proof against shot of any size, one would protect a harbor and be more than a match for a fleet of steamers, or ships of war of the usual construction."

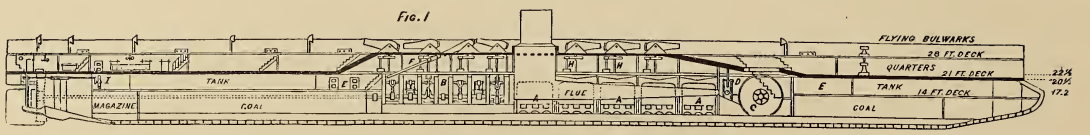
The following comments on the foregoing letter were published in an article by President Morton in "Engineering," London, March 26, 1897:

"It will be noticed that the use of this vessel as a ram is manifestly present in the mind of the writer of the above letter even at this early period, but an accident which occurred subsequently strongly confirmed this view.

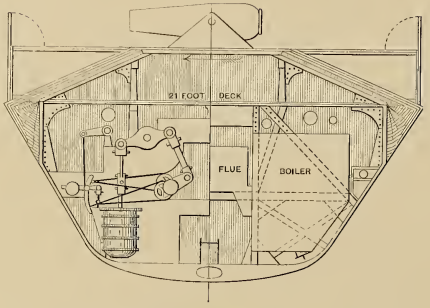
"By some derangement of her steering-apparatus the 'Thomas Powell,' one of the fast North River steamboats, ran into a 'crib' dock built of 12-inch timbers and filled with stone. The bow of the boat penetrated the dock for some 15 feet, shearing through the timbers and displacing the stone, and the steamboat then backed out, entirely uninjured. 'If (Mr. Stevens argued), a lightly built river steamer, with wooden hull, could so cut into and damage a solid crib dock, what would an equally rapid steamer with iron hull and prow made like the blade of an immense axe, thoroughly backed up and supported by the entire structure behind it, accomplish, if hurled against the side of any ordinary wooden or iron vessel?'

"With this in view, the steamer, whose keel was laid in 1843, in consequence of a contract made by Robert L. Stevens with the Secretary of the Navy in April, 1842, was provided with an immense axe-like solid iron prow, so braced and supported from the rest of the iron hull as to constitute an inseparable portion of the same. Again, to secure adequate protection combined with a minimum weight, Mr. Stevens proposed to provide each of the

Fig. 1



ELEVATION



CROSS-SECTION

Fig. 2



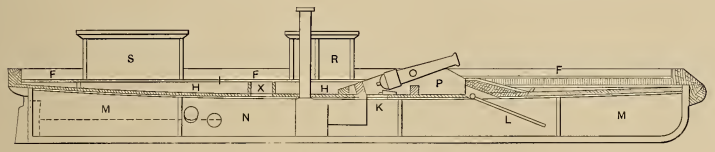
PLAN

large guns located above the armored deck or horizontal shield of the craft, with an individual housing or 'bomb-proof.' These guns were mounted on revolving carriages, their recoil being taken up by rubber disk-springs in the manner since practised, and were to be loaded, directed, and fired from below the deck; the loading being accomplished by bringing their depressed muzzles opposite holes in the deck, provided for the purpose.

"This method of loading, directing, and firing was put into successful practice, in 1863, in the 'Naugatuck,' a small boat which Mr. E. A. Stevens fitted out himself with a single gun of large calibre, and placed at the service of the United States government in the time of anxiety immediately succeeding the combat of the 'Monitor' and 'Merrimac' in Hampton Roads on March 7, 1862. This steamer, with the location of her gun, is shown in the accompanying cut.

"The 'Naugatuck' was in commission for several months, and did good service in combats with batteries on the James River until the bursting of her 100-pound Parrott gun (without injury to her crew, who were below the armored deck) caused her retirement, and her place was soon supplied by the 'monitors' built in great numbers at that time.

"Experiments made on January 11, 1862, showed that a 10-inch gun could be



THE "NAUGATUCK"

loaded with charges of 11 pounds of powder and a ball of 124 pounds, and discharged four times in 139 consecutive seconds, the quickest time for a loading and discharge being 25 seconds."

The following letters are self-explanatory:

"HOBOKEN, N. J., *December 22*, 1856.

"HON. J. C. DOBBIN,

"*Secretary of the Navy:*

"SIR,—

"As one of the executors of my brother, Mr. Robert L. Stevens, of Hoboken, N. J., it becomes my duty formally to announce his decease to the government of the United States, with whom he was a contractor. My own indisposition, and that of members of my family, must be my excuse for the delay which has occurred in transmitting to you this communication. Entertaining, as I do, no doubt of the success of the work on which he was employed, and having participated in some of the experiments which led to his contract, I feel the greatest anxiety that it should be diligently prosecuted; to that end I am ready, cheerfully, to give my services, believing that from my intimate knowledge of the origin and progress of the vessel, and of the views of the contractor, I can, better than any other person, consummate that work in which he ever felt the greatest pride and the most entire confidence.

"It may not be improper that I should at this time, and with a view to a full and

proper understanding of the relative position of my brother's estate and the government, briefly recapitulate the origin, progress, and present position of the vessel.

"Satisfied, by experiments conducted upon a large scale at great expense and with entire success, that he had discovered a means by which he could construct a vessel proof against all warlike weapons then in use, and specially adapted to the harbors of the United States Mr. Robert L. Stevens, in 1842, proposed to the government that he would build such a vessel for that purpose and for the defence of the harbor of New York.

"A contract in pursuance of an act of Congress, and with which you are familiar. was duly executed.

"Finding it impossible to launch a vessel of the size and description contracted for, he was compelled to excavate upon his own property at Hoboken, and to erect at his own and at a very great expense, a dry dock of sufficient capacity to contain the vessel and to float her into the harbor when completed.

"While constructing the dry dock, materials were procured and patterns made for the ship itself; but in December, 1843, Mr. Henshaw, then Secretary of the Navy, declined to make payments for the materials as purchased; and accordingly, in November and December, 1844, a second, full, minute, and supplemental contract was entered into with the Department.

"To these papers, on file in your office, I beg leave most respectfully to refer you.

"In pursuance of these provisions the work was commenced and prosecuted for some time, when, in 1845, Mr. Secretary Bancroft directed all further proceedings on the contract to be discontinued until a plan of the vessel should be furnished, though the plan in detail was contained in the special contract of 1844. By this order the whole work was stopped. The health of the contractor, who had devoted himself to the fulfilment of his contract with the indefatigable energy which was ever one of the leading traits of his character, was broken down, and he was ordered abroad by his physician for the preservation of his life. While so abroad, in 1847, he learned that the Hon. J. Y. Mason, with whom this special contract, already referred to, had been made, and who was familiar with its details, had been appointed Secretary of the Navy. He immediately returned to this country, communicated to him the embarrassments to which he had been subjected, and the causes of the delay, and applied to him for an extension of the time to complete the contract, which in 1848 was granted.

"The rates and mode of payment for the materials as received were provided for in the special contract, and also in a letter of February —, 1849, as will appear by the papers on file in your department.

"In August, 1849, Mr. Preston, then Secretary of the Navy, again declined to make further payments on the contract. Mr. Stevens was then in Europe, having gone there for the purpose of procuring, under his own immediate personal supervision, materials for some portion of the steamer which could not be so well obtained in this country, and had himself made contracts to secure this supply. Upon his return in November, 1849, he both personally and by letter applied to Mr. Secretary Preston, who still refused to make any further payment on account of the work or material, and expressed his determination to refer the matter to Congress, which he did in his communication to the session of 1849.

"It was not acted upon by that body; and the attention of his successor, Mr. Graham, being called to the subject, he, in September, 1850, declined to interfere, upon the ground that the whole matter had been referred to Congress.

"In January, 1851, Commodore Skinner advised the contractor by letter that the Department regarded the contract void, and intended to sell the materials that had been collected.

"To protect himself against the ruinous consequences thus threatened, Mr. Stevens applied by petition to Congress. It will be perceived that at this time an act of Congress had directed a Secretary of the Navy to make the contract, and it was made; that the contractor, in good faith and by large expenditures of his own funds, proceeded to execute it; that the contract was afterward made more specific by another Secretary. Ample mortgage security for its execution was required and given. Officers of the government were appointed to superintend the receipt of materials and payments made on their certificates. A third Secretary suspended the execution of the contract, leaving the contractor liable to pay about $40,000, mostly for materials, and all of which was paid from his own funds. His successor in office restored the contract, extended the time for its execution; the contractor was again actively and earnestly engaged in the prosecution of the work, when the succeeding Secretary suspended all payments and referred the subject to Congress, and, regarding the whole contract at an end, was about to sell under the power of sale contained in the mortgage executed by the contractor to secure the faithful completion of his work.

"The facts to which I have thus taken the liberty to call your attention will sufficiently explain the delay that has ensued. The different views taken from time to time by the officers of the government upon the subject, and the directions given for the suspension of the work, of necessity prevented its execution with that regularity and system that might otherwise have been secured.

"This may not, however, prove ultimately disadvantageous to the United States, for the reasons which I am about to state, and in stating which I shall in a great degree explain the unanticipated increase of cost.

"Vast changes have taken place, both in the size of vessels of war and the weight of their armament, since the year 1842. Paixhan guns of 64 pounds were the heaviest metal then used in the navy. Now, solid shot of 172 pounds are not unfrequent. The sizes of the vessels themselves have correspondingly increased.

"While, therefore, the size and strength of the battery were amply sufficient to resist the character of the vessels and arms then in use, they might prove an insufficient defence against the larger vessels and heavier guns which were rapidly being introduced into the navies of all the great Powers. These changes manifestly rendered necessary corresponding alterations in the size and strength of the battery, without, however, in any respect changing the principles of construction (were by letter communicated to the Department by Mr. Stevens), and to this cause is to be referred the increased cost of the battery. It could have been completed for the price named in the contract, and delivered to the government, but under the changed condition of the navies of maritime powers it would have been comparatively useless, and it would have been unworthy the well-earned character of the contractor (who never sought profit from his country's government) to have done so.

"The battery required to be correspondingly enlarged and strengthened; it would protect against steam vessels of great size and speed, and the power of her engines required to be correspondingly increased. She must carry a heavier armament to meet upon a footing of something like equality those of other nations, and must therefore be larger to carry it. She must resist effectually the vastly increased weight and power of the guns newly introduced, and must therefore be strengthened accordingly.

"The changes made were fully stated in a letter by the contractor to your Department, dated January 28, 1856, and in a communication made by him to Capt. L. Hudson and Wm. Kemble, Esq., appointed by the Secretary of the Navy in February, 1856, to visit and examine the then condition of the battery.

"From the letter of Mr. Stevens, I beg leave to make the following extract, as

expressing in the clearest manner the nature and character of the changes made in the battery and the reasons which led to their adoption:

"'My reasons why the cost of the present steam battery so far exceeds the sum mentioned in the contract are as follows: The contract specifies that the steamer to be constructed by me should not be less than 250 feet in length, 40 feet beam, 28 feet in depth amidships; shot and shell proof against the artillery then in use on board vessels of war, namely, from 18 to 64 pounders; the protection to be 4½ inches thick. She was to have four iron boilers with 50 per cent more exposed fire surface than either the "Mississippi" or "Missouri," and four or more condensing engines whose combined effect exceed by 50 per cent those of either the above-named vessels when worked at their usual pressure of steam, namely, 12 inches.

"'The battery I am now constructing is 415 feet long at her water line, 48 feet beam, and 32 feet 4 inches deep amidships; has 10 large boilers, and 8 driving-engines, whose combined meditated power, when required, will be 8,624 horses (33,000 pounds per horse-power raised 1 foot per minute), with nine other engines of various powers for other purposes, and a proposed thickness of 6¾ inches of iron protection over every part of the vessel exposed to shot.

"'The above increase of dimensions were necessary for an increase of speed to keep up with the present improvements in vessels of war now afloat, so as to enable her to overtake quickly any vessel she may be in pursuit of. In addition to which the government required an increase of strength in the protection to resist a shot of 125 pounds, instead of 64 pounds, as the contract called for when made in 1843. Consequently, the weight of the hull and protection are necessarily increased to carry the same. The present hull is nearly four times, and the protection nearly three times the weight of the battery contracted for. The propelling power is 98½ times greater than that required in the contract; and the horse-power of the present battery is 8,624, while the contract called for but 900. The cost is also much increased in consequence of having two propellers and two lines of shafting worked independent of one another, with the necessary fixtures to enable the battery to turn quickly on the center, making her in effect, when required, a revolving battery, instead of one propeller and line of shafting, as called for in the contract.

"'Recapitulation of Dimensions and Power

Contract of 1843	*Battery of 1856*
Length, not less than 250 feet	415 feet length
Beam, not less than 40 feet	48 feet beam
Depth amidships, 28 feet	32 feet 4 inches depth
Protection against shot, 4½ inches	6¾ inches protection
4 iron boilers	10 iron boilers
4 or more condensing engines	8 condensing engines
900 horse-power	8,624 horse-power
Propeller and 1 line of shafting	2 propellers and 2 lines of shafting
2 accessory engines	9 accessory engines

"'I take this occasion to state that after having made my original contract with Mr. Secretary Upshur in 1843 I prepared the necessary buildings, machinery, and tools, and excavated the dock in which the steamer is being built at my own expense, for the cost of which, up to the present time, I have received no compensation from government. I have been busily engaged in collecting materials for the construction of the battery at my establishment at Hoboken, but in consequence of the refusal of subsequent Secretaries of the Navy, at different times, to go on with the work, the first floor-timbers of the battery were not laid until July, 1854. The work from that time until September, 1855, was pressed on vigorously; and during the period of fifteen months nearly $387,000 of the appropriation of $500,000 was expended on the battery, engines, etc., and I have expended since that time, from my own private resources, as shown by the bills exhibited to you for engines, materials, and labor, the amount of $113,579$\frac{11}{100}$ up to the 23d of February.

"'You will perceive from the above statement that the battery has been in process of building, up to the present time, but a little over eighteen months; and I feel assured that I can complete her for service in twelve months from this time, provided the necessary funds are supplied to carry on the work.'

"The Report of the gentlemen to whom this letter was addressed, dated March 7, 1856, is on file in your department, and to it I respectfully call your attention. By it you will observe the contractor had, at that time, expended $113,579.11 more than he had received.

"As his executor, and to prosecute the work since his death, and to fulfil, perhaps beyond his obligation, his duty to the government, I have further paid toward the work the sum of $62,000 and upward, and for which I hold the vouchers, to be presented as you may desire.

"It may be proper to add that these sums include no charge whatever for the rent, taxes, or expenses of the real estate of the contractor, which has for some thirteen years been thus used by the government.

"The question now presented for your consideration is, what shall be done with the vessel?

"Unfinished, and comparatively valueless as she now is, I cannot for a moment suppose that the government can mean to abandon the great work.

"My confidence in its success, and my deep regard for my brother's fame, make me most anxious that it should be completed.

"I have abundant means, and do not desire, either for myself or my brother's estate, the slightest profit from the work; indeed, if my means were immediately available to the extent required, I might not hesitate to use them.

"Believing the invention which gives value to the vessel to have been exclusively my brother's and American; finding that in the recent conflicts in Europe the officers of those governments have not hesitated to adopt, from this very vessel and the experiments which led to her construction, the same principle as the only sure and best method of resisting the heavy batteries of the present day (although not there put into such form as to test its greatest powers); satisfied that by this means the harbors of our country can be securely protected against all assault, that one vessel thus constructed, combining size, speed, strength, and resistless armament (ball and shell proof), can successfully combat a fleet of our enemies,—I earnestly hope it will not be abandoned.

"I am ready to give freely, in any manner you may see fit to call upon me, my aid, time, experience, and skill, to the work; and I sincerely, sir, trust that you will exercise your power and well-earned influence to secure the completion of a work which will go far to preserve to our country the blessings of peace, by protecting her commercial ports from successful assaults in war.

"E. A. Stevens,
"Act. Exr."

"Washington, *July* 10, 1862.

"Hon. John P. Hale, *Chairman of Senate Committee on Naval Affairs,*
and
"Hon. Charles B. Sedgwick, *Chairman of House Committee on Naval Affairs:*

"Gentlemen,—

"With a view to make my propositions more clear and definite, and to prevent any misunderstanding, I now present them to the Committees, and will carry into effect, on my part, any one of them that may be adopted by Congress during its present session.

"*First,* that the Government pay me the money advanced by my brother and myself[1] for the Stevens Battery, and finish the vessel on such plans as they may think best, relieving me of all responsibility.

"*Second,* I am willing to modify the first proposition as follows, namely, to commence auditing the accounts *de novo,* charging everything that properly belongs to the battery, and crediting all received on account of the same, without reference to the contract.

"*Third,* that the government release to me their claim to the vessel, and I will finish it at my own risk and expense, as a war vessel, within eighteen months, with the right in that event of the government, after it is finished — if, in their opinion, it is a success — to take the vessel at the amount estimated for its completion, namely, $783,294, or I will forfeit $100,000 as liquidated damages.

"*Fourth,* that the vessel be sold for the benefit of the parties concerned, and the proceeds of the sale paid according to the decision of any federal court having jurisdiction, with the right of either party to appeal to the Supreme Court of the United States.

"Yours respectfully,

"E. A. Stevens."

Hoboken, *February* 24, 1863.

"Hon. Gideon Welles, *Secretary of the Navy:*

"Sir,—

"I see by the public press that the government is about to construct several large sea-going ironclad ships of war. These vesels are intended, as I understand, to be about the same length and size as the Stevens Battery; and one of them now under contract with Mr. Webb, of New York, it is said, will cost $4,000,000.

"I propose to relieve the government of all risk as to the success of at least one of these vessels by obligating myself to complete the Stevens Battery and deliver her ready for service on the following terms, viz.:

"1. That she shall be impenetrable to the most destructive missile fired from the most powerful gun (with its ordinary service charge) now used in our own or in any European naval service, to be tried upon her at short range,— say 220 yards.

"2. That she shall have greater speed than any other ironclad war steamer in the world.

"3. That she shall be more manageable and more quickly turned and manœuvred than any other large armed sea-going steamer.

"4. That she shall have an armament capable of throwing a broadside at least equal to that of any ship now afloat.

"5. That she shall be delivered to the government complete and ready for service within nine months from the time the order is given, for the sum of $1,500,000, but no payments will be required until she shall be ready for delivery; provided, however, that the performance by me of these conditions is not to rest upon theoretical opinions, but (if desired) shall be brought to practical tests,—the test of her sea-going qualities to be a voyage to Charleston Bay and back to New York harbor.

"The conditions attached to this offer, if fulfilled, would make the ship the most powerful and efficient war steamer in the world, at a cost to the government far less than that of the 'Warrior' or 'La Gloire,' or than that of any other ship of the same size and quality. She could also be completed in less than half the time it would require to build

[1] "Fearing that the expression in the above proposition, 'the money advanced by my brother and myself,' may be misunderstood, I will state that it was intended to apply only to the accounts not yet audited by the Department, and not to those already audited, settled, and paid by the Department, amounting to $500,000."

a new ship. If she should prove a failure, the whole loss falls upon me, and not upon the government.

"Or I will transfer the vessel to the government as she now stands — having her hull, boilers, engines, and machinery nearly all complete — for her cost to me (say $250,000); provided she is then finished by them on my general plan, I estimate she would cost the government in all $1,000,000.

"This arrangement would give the government the benefit of the $500,000 heretofore expended by them on the ship, and which was relinquished by the action of the last Congress. As will be seen from the last offer, I do not propose to make any profit out of the government, but desire the completion of the vessel for the national good. And, to protect the reputation of my brother and myself from the discredit of any failure, that she may be completed on our plans, that we may not be held responsible for the success of the plans of others.

"E. A. Stevens.

"P. S.—If time is of great importance to the government, the vessel could be completed in much less time, but of course at an increased cost."

The following account of the Stevens Ironclad Steam Battery is taken from the Report of the Commission appointed in 1874 to effect a sale of the vessel after the death of Mr. E. A. Stevens. The Commission consisted of His Excellency Joel Parker, Governor of New Jersey; Hon. Amzi Dodd, Vice-Chancellor of New Jersey; and Mr. W. W. Shippen and the Rev. S. B. Dod, executors of the estate of Mr. Edwin A. Stevens. Prof. R. H. Thurston, A.M., C.E., was engaged as Consulting Engineer to the Commission.

"By a provision in the will of the late Edwin A. Stevens, of Hoboken, N. J., his executors were directed to complete an iron steam-vessel, then lying unfinished in dry-dock in the city of Hoboken, making of said vessel an effective ironclad, and, when completed to present the ship to the State of New Jersey.

"It was further directed that the machinery and tools used in construction, and not exceeding $1,000,000 in money, should be appropriated for the purpose of carrying out this provision of the will.

"It was still further provided that, should the State of New Jersey not receive the said vessel, the executors were to sell the ship and to retain the proceeds of such sale as a part of the estate of the testator.

"A special act of Congress having been obtained, authorizing the State to accept the gift under the provisions of the will, the legislature, by an act approved April 1, 1869, accepted the vessel on the terms above stated, and a Commission consisting of Messrs. Fitz John Porter, Benjamin G. Clark, and William W. Shippen, was appointed to advise with the executors, and to represent the State during the completion of the vessel.

"Under authority conferred as above, and in accordance with the previously expressed desire of the testator, Gen. George B. McClellan, U.S.A., was appointed as Engineer to assist in determining upon the proper method of completing the vessel, and to take charge of the work. On the recommendation of Gen. McClellan, Mr. Isaac Newton was engaged as Assistant Engineer.

"By the advice of the Engineers it was determined to make important modifications with the object of complying with the directions of the testator,— to make the vessel 'an effective ironclad for purposes of war.'

"It was concluded to introduce an inner skin, transverse water-tight bulkheads,

water-tight coal-bunkers, to build new engines, and to prepare the ship for transformation either into an ironclad of the 'Monitor' type, having very high speed, carrying a powerful armament within a turret of extraordinary thickness, and capable of acting efficiently as a 'steam ram,' or into a broadside ironclad.

"The bow of the vessel was modified accordingly, and was considerably strengthened by means of water-tight transverse and longitudinal bulkheads and breasthooks.

"A very strong inner hull, with seven transverse bulkheads placed at intervals of from thirty to eighty feet, was built, and a heavy wale-strake was carried above the original upper line of the gunwale, making the vessel two feet deeper than before.

"This was done by workmen employed by the Engineer in Charge, none of this work being done by contract. All of the iron was of the best quality, furnished by the Abbott Iron Co., of Baltimore, Md. The workmanship, as well as all material, was of the best possible description.

"The new engines and machinery were built by the Delamater Iron Works, of New York, from drawings furnished by the Engineer in Charge, and were subject to rigid inspection as delivered.

"Material was charged by the pound, and labor was paid for by the day.

"The reputation of the Delamater Iron Works is a sufficient guarantee of the excellence of this portion of the work.

"The decks of the vessel were constructed of carefully selected well-seasoned Georgia pine, well laid down, and so completely free from sapwood and from shakes that no change of form or texture is perceivable.

"It was the intention of the executors and of their engineers to put afloat a vessel that should be the most formidable ironclad on the ocean.

"The amount of money appropriated proved insufficient to complete the vessel, and, after the hull and the machinery had been nearly finished, the work was necessarily stopped, leaving the ship in the condition hereafter described.

"A question having been raised as to the real ownership of the vessel, suits in chancery were commenced, and, pending these suits, the State legislature, by an act to which reference has already been made, directed a positive sale and the payment of the proceeds into court.

"The vessel is therefore offered for sale as she now lies, with hull and machinery nearly completed as exhibited in the following detailed description furnished by the Consulting Engineer to the Commission.

"If finished on the plan indicated by the Consulting Engineer, and already so far carried out, it is believed that the purchaser will acquire the fastest ironclad in the world, and the most formidable steam ram afloat. The armament may be made to consist of the most powerful guns yet successfully constructed and worked, and the battery protected by armor of a thickness which has been attained with no vessel yet built.

"The speed shown to be attainable is greater than that of any armored vessel known to have been tried, and is higher than even unarmored ships, such as the British 'Magicienne,' the 'Rover,' or the 'Bacchante,' which represent the fastest foreign men-of-war yet designed.

"Completed as a torpedo-ship, the vessel would carry armor of sufficient thickness to secure safety against the projectiles of an enemy, while the speed attainable would ensure, in a stern chase even, the capture or destruction of any vessel attacked.

"Dispensing, in this case, with a turret, a larger quantity of coal could be carried and the ship would be capable of keeping the sea for a long time, and of making long voyages.

"Should it be determined to complete the vessel as a merchant steamer, the twin screw, with the two pairs of independent engines, the double bottom, and the almost indestructible bow, would afford an immunity from danger by breakage of machinery, by collision, or by running on shore, which would make the steamer a favorite one with prudent travellers.

"The security against complete disability by injury of machinery which is given by the two screws and their duplicated machinery would justify the total abandonment of all top-hamper; and the vessel, built up two decks, would afford pleasanter and more comfortable quarters than are to be found on any steamer crossing the Atlantic. If considered advisable to introduce masts and sails, the great stability of the vessel would enable her to carry all the sail that can be put upon her.

"The exceptionally high speed of the ship would be an important advantage, and all the above detailed advantages conspire to make the steamer available as an excellent fast passenger or mail steamer for any Transatlantic line, and to make her particularly suitable for any line on which ships are at all exposed to danger of injury by ice, or of being cast away upon rocky coasts."

The above constitutes the introduction of the report, which is followed by a technical description of the condition of the vessel at that time, and also by a number of classified lists showing an inventory of materials and supplies. In concluding his report as Engineer to the Commission, Prof. Thurston stated:

"The unfinished work, as detailed in the inventory herewith submitted, may be done readily in three months, and the vessel will then be in condition to steam across the Atlantic if necessary.

"Should it happen that the ship should be purchased with the intention of taking it to Europe, it might be found advisable to leave a portion of the work of completion to be done there. The difference between the cost of work of equal quality in the United States and abroad is not, however, sufficient to justify the acceptance of either inconvenience or danger to secure the benefit of it, and the difference now existing is gradually disappearing.

"The cost of the work required, as stated, to complete hull and machinery, but not of armor or armament, will vary greatly with the character of material and workmanship, and with the nature of the plans adopted, where not already determined, by work already done. An approximate estimate may be taken as $100,000. To this is to be added the expense of removing the vessel from the dock.

"The expense of completing as an ironclad, fully armored and armed, has been estimated at about $450,000."

At the sale mentioned above the vessel was purchased by a dealer in second-hand materials.

This was the undeserved fate of a great and worthy project. The Stevens Battery was the production of two generations of experimenters and inventors who had successfully planned and established railroads and steamship lines, and numerous engineering devices for operating them. It was based on the plans of tried and experienced men of acknowledged standing, men who never doubted its success; it was their last work, and who can say but that it was the harbinger of the armored navies of the present day?

MISCELLANEOUS INVENTIONS BY JOHN, ROBERT L., AND EDWIN A. STEVENS

The following extract is taken from the inscription beneath the medallion portrait of John Stevens which hangs in the Section of Transportation and Engineering in the United States National Museum at Washington, D. C.:

"It was on his [John Stevens's] petition that the patent law of April 10, 1790,—the foundation of the American patent law,—was framed. [See 'Journal of House of Representatives,' p. 30.]

"In 1792 he took out patents for propelling vessels by steam pumps, modified from the original steam pumps of Savary. He made many experiments on different modes of propulsion by steam, having as his associates the elder Brunel, constructor of the Thames Tunnel, Chancellor Robert L. Livingston, his brother-in-law, and Nicholas I. Roosevelt. In 1798 he constructed a steamboat that navigated the Hudson.

"He made the first practical application of steam to the screw-propeller in 1804; and although the screw-propeller did not come into use until thirty-five years afterwards, his engine and screw, which are still preserved, show the correctness of his ideas, as well as the imperfection of the workmanship of that period that prevented commercial success. His short four-bladed screw has survived many forms afterwards tried.

"He patented the multitubular boiler in the United States, 1803; in England, 1805; established the first steam ferry in the world, between New York and Hoboken, October 11, 1811, with the 'Juliana'." [See also Valentine's Annals of the City of New York.]

The following extracts are taken from a lecture on "The Progress of the City of New York During the Last Fifty Years," delivered by President Charles King, of Columbia College, December 29, 1851:

"The extent, variety, and value of Mr. R. L. Stevens's labors and inventions in mechanics should have more fitting commemoration than can be given in any passing notice by one unskilled, as is the writer of this, in the mechanic arts. Yet he cannot suffer this allusion to Mr. Stevens to go forth without attempting, at least, to enumerate some of the many services and ingenious inventions and appliances of that gentleman, in steam, in gunnery, and in mechanics. From the time when, a mere boy, in 1804–5, he was zealously working in the machine-shop at Hoboken, up to the passing hour, he has given his time, his faculties, and his money to what may be justly described as experimental philosophy, and the results have been of great public benefit. Of some of them the following chronological record may bear witness:

"1809. Suspended the projecting guard-beam by iron rods from above,—now universal in river steamers.

"1813. First to fasten planks and braces of steamboats (in the 'Philadelphia') with screw bolts, and to place diagonal knees of wood and iron inside of them.

"1815. First to use steam expansively in steamboat 'Philadelphia.'

"1818. First to burn anthracite coal in a cupola furnace, and subsequently to introduce this fuel in fast steamers — the 'Passaic' being the earliest to use it.

"1822. To substitute for the heavy, solid, cast-iron walking-beam of steamboats the skeleton wrought-iron walking-beam (in the 'Hoboken') now in universal use.

"1824. First to place the boilers on the guards, and to divide, in steamboat 'Trenton,' the buckets on the water-wheels.

"1827. First, on steamboat 'North America,' to apply successfully artificial blast to the boiler furnace by means of blowers, and in the same boat to apply what is technically known as the hog-frame, now general in fast boats, consisting of the large timbers on the sides to prevent the boat from bending in the centre, or, as it is called, being hogged. This boat attained a speed of 15 miles per hour.

"1828. First applied steel spring bearings, under centre of the wheel-shaft of the steamer 'New Philadelphia.'

"1832. First to introduce, in the 'New Philadelphia,' perfect balance valves, now in general use in steamboats, which enables one man to work the largest engine with ease. In the same year he used braces to the connecting-rod, thus strengthening it and preventing its tremulous motion.

"1832–3. Constructed a boat (betweeen Camden and Philadelphia) capable of navigating through solid heavy ice. In the same year he constructed and introduced tubular boilers, having the fire under the bottom and returning through the tubes.

"1840. Improved the packing of pistons for steam-engines by using the pressure of steam instead of hemp, steel springs, india-rubber, etc., to retain the metallic packing-ring against the surface of the cylinder. One of these rings, which has been in use on board steamer 'Trenton' since 1840, is at this day in good order.

"1841. The Stevens cut-off by means of main valves worked by two eccentrics, invented by R. L. Stevens and his nephew (for mechanical ingenuity and skill runs in the blood), F. B. Stevens; these are generally used now in the river boats and in the ocean steamers built in New York. In the same year he invented and applied on the Camden and Amboy railroad the double-slide cut-off for locomotives and large engines; and improved locomotives for transporting goods, etc., by using eight wheels, and with increased adhesion was enabled to turn short curves with little friction on the flanges; also used anthracite as a fuel to great advantage on the heavy engines, weighing 24 tons, with wheels of 42 inches diameter, cylinders of 18 inches, and 34-inch stroke.

"1842. Having contracted to build for the United States government a large steamer, shot and shell proof, R. L. Stevens built a steamboat at Bordentown for the sole purpose of experimenting on the forms and curves of propeller blades as compared with side wheels, and continued his experiments for many months, the result of which we may yet hope to see in an iron war steamer that will be *invincible*, and should be so named. While occupied with this design he invented about 1844, and took a patent for, a mode of turning a steamship on a pivot, as it were, by means of a cross-propeller near the stern, so that if one battery were disabled she might in an instant, almost, present the other.

"1848. This year succeeded in advantageously using anthracite in fast passenger locomotives.

"1849 witnessed the successful application of air under the bottom of steamer 'John Neilson,' whereby friction is diminished, and she has actually gone at the rate of 20 miles an hour; this was the invention of R. L. Stevens and F. B. Stevens. The 'John Neilson' also has another ingenious and effectual contrivance of R. L. Stevens, first used in 1849, for preventing ill consequences from the foaming of the boiler.

"In conclusion of this dry and imperfect chronological recital of some of R. L. Stevens's contributions to the mechanic arts, to public convenience and national power as well as renown, it must be added that Mr. Stevens is himself the modeller of all the vessels built by or for him, and many of our fastest yachts are of his molding; and especially the 'Maria,' which beat without difficulty the victorious 'America,' which in her turn carried the broom at her mast-head through the British Channel, distancing all competitors, as she continues to do, I believe, under her new owner, in the Mediterranean.

"Of such a man, not the mechanics only of our city, among whom he has worked and is well known, but the nation may well be proud.

"The locomotives first used on the Camden and Amboy railroad were made or constructed by Robert L. Stevens at his works, or upon his models in England, differing in details from those in use in England. At the outset he applied a spark-catcher, though patents for like contrivances have since been taken out; and he invented and applied then, and has continued ever since, and other railways have adopted, the contrivance of the guide, or cowcatcher,[1] as it is commonly called from an incidental function it discharges, of which the wheels, easily following the curves, give a direction to the forward wheels of the locomotive, fixed on an axle slightly movable, as with the forward pair of carriage wheels, and thus enable it, without danger of flying off at a tangent, to diverge from its straight, onward, rapid course."

Following is an excerpt from an address by Mr. Charles H. Haswell before the Institution of Naval Architects, delivered March 23, 1899:

"John Stevens, of Hoboken, N. J., applied the parallel motion, invented in 1784, by James Watt, of England, to guide the piston-rod of an overhead or beam engine in the steamboat 'Phœnix'; in 1809 he patented slides and a crosshead to guide the piston-rod; and in 1817 his son, Robert L. Stevens, applied a cut-off to an engine by a camboard, and in 1852 he applied slides and a crosshead to the engine of the steamboat 'Trenton,' connecting the crosshead to the beam by a rod with bifurcated ends; which design, in a few years after, was improved by the use of two right-line rods, as now practised. . . .

"In 1822 Robert L. Stevens largely increased the steam valves by assigning to the single one-third the diameter of the cylinder, and to the double beat a combined equivalent area. These latter were first introduced by him, in 1830, in the engine of the steamboat 'New Philadelphia'. . . .

"In 1839 Francis B. Stevens (nephew of Robert L. Stevens), of Hoboken, N. J., designed the cutting-off of steam by the addition of a second eccentric and rock-shaft, and in 1840 successfully applied it to the steamboat 'Albany.'

"In 1842 Edwin A. Stevens, of Hoboken, N. J., designed, patented, and operated a closed fire-room in the steamboat 'Rainbow,' supplied with air by a fan blower located externally; and in 1845 the system was introduced in the U. S. S. 'Mississippi.' This patent is a U. S. Patent No. 2524, dated April 1, 1842."

Mr. J. Elfreth Watkins, C.E., in an address[2] entitled "John Stevens and His Sons, Early American Engineers," delivered before the Philosophical Society of Washington, May 7, 1892, uttered the following appreciation of the work of this gifted family:

"In 1813 John Stevens designed an ironclad vessel with a 'saucer-shaped' hull which was to be plated with iron and to carry a heavy battery. This vessel was designed to be secured to a swivel which was to be held in position by an anchor in the channel of the stream to be defended. Screw propellers driven by steam engines were to be placed

[1] "The reader should notice that the rigid iron cowcatcher now affixed to the front of a locomotive is not the ingenious contrivance here described, with its 'pilot-wheels' for guiding and steadying the engine in its progress."—Eugene B. Cook.

[2] This address was printed in pamphlet form by W. F. Roberts, Washington, D. C.

beneath the vessel (in order that they would be safe from injury by shot), and connected with the machinery, which was arranged to cause the vessel to be rapidly revolved about the swivel in its centre. Each gun was to be fired as it was brought into line, and was to be reloaded before it came around again. This was an early embodiment of the 'Monitor' principle. It was the first ironclad ever designed. . . .

"In 1821 he [Robert L. Stevens] originated the form of ferry-boats and ferry-slips now in general use, constructing the ferry-slips with spring piling and fenders. In 1818 he invented the camboard cut-off, and applied it to the steamboat 'Philadelphia' on the Delaware; this being the first application of the expansive action of steam to navigation. In 1818 he adopted the working (or walking) beam and improved it by making it of wrought-iron strap with a cast-iron centre; in 1829 he adopted the shape now universally used in



THE YACHT "MARIA" RIGGED AS A SCHOONER. THE "GREAT EASTERN" IN BACKGROUND TO THE LEFT

this country. He invented the split water-wheel in 1826, and in 1831 the balance-valve which is now always used on the beam engine. . . . Beginning with a pressure of two pounds to the square inch he increased the strength of his boilers until fifty pounds could be safely carried. He made his first marine tubular boiler in 1831. He reduced the vibration of the hull and added greatly to the strength by the overhead truss frame of masts and rods now used. . . .

"Toward the close of the War of 1812 Robert L. Stevens was engaged in making a bomb that could be fired from a cannon instead of from a mortar, in order that it might be applied to naval warfare. He succeeded in producing a successful percussion shell, which was adopted by the United States government, who purchased a large quantity together with the secret of its construction.[1] . . .

[1] See *ante*, p. 121.

"In 1844 he designed and built the 'Maria,' the fastest sailing-vessel of her day. This was the yacht that defeated the 'America' in New York harbor a month before the latter won the memorable race on the Solent. It was in this race[1] that her Majesty, Queen Victoria, when she asked her favorite skipper who was first and second in the race, received for a reply 'The "America" leads, there is no second.'

"Robert L. Stevens will be remembered as the greatest American mechanical engineer — a most intelligent naval architect — to whom the world is indebted for the commencement of the mightiest revolution in the methods of modern naval warfare. . . .

"The laborious and useful life of Edwin A. Stevens was occupied in the lifelong management of his father's estate, on which the city of Hoboken now stands; in the organization, construction, and operation of the Camden and Amboy Railroad, of which he was the active business manager; in making improvements in steam navigation; in the great



Race Between Yachts "America" and "Maria," the Latter, Rigged as a Sloop, in the Foreground

part taken by him in the introduction of iron armor on ships of war; and in devising methods of attack and defence for ironclads. . . . During that period (1820–25) he invented and patented the Stevens plough, which was much liked and extensively used for years. . . . In 1825, at the age of 30, he took charge of the Union Line, which then car-

[1] The "America Cup," which has been so well defended by successive American yachts, and which is still held in this country, was won in this race.

The "Maria" was modified from time to time in her hull and spars by Edwin A. Stevens, but remained to the last the fastest sailing-vessel of her time. She disappeared mysteriously in 1869, being, it is supposed, run away with and lost at sea.

Another evidence of the remarkable speed of the "Maria" was furnished during the visit of the Prince of Wales to America in 1860. Mr. E. A. Stevens, then Commodore of the New York Yacht Club, sailed down the bay in the "Maria" to meet the Prince, who was coming from Elizabethport to New York on his way from Philadelphia on the fast revenue-cutter steamboat "Harriet Lane." Commodore Stevens sailed past the approaching steamboat, saluting, and, rounding to in her wake, proceeded to follow her up toward New York; but it was soon noticed that the "Maria" was fast overhauling the steamer, and in fact soon passed her. to the profound surprise of all present.—Editor.

ried nearly all the passengers and freight between New York and Philadelphia. The Union Line was organized in 1820, and it consisted of steamboats on the Raritan and Delaware, and of coaches on the turnpike between Trenton and New Brunswick, and after the year 1827 it was chiefly owned by Robert L., Edwin A., and John C. Stevens, Edwin remaining its business manager until it was merged into the Camden and Amboy Railroad in 1832. . . . He remained business manager of the Camden and Amboy Railroad for upward of thirty-five years, during which time the stock constantly appreciated in value and no dividend was passed."



THE "PHILADELPHIA," OR "OLD SAL"
Built in 1813

"Appleton's Encyclopedia of American Biography" (V. 673) contains the following in regard to the improvements made by John and Robert L. Stevens in the construction of ferry-boats and steamships:

"On October 11, 1811, he [John Stevens] established the first steam ferry in the world, with the 'Juliana,' which plied between New York and Hoboken. In 1813 he invented and built a ferry-boat made of two separate boats, with a paddle-wheel between them, which was turned by six horses. On account of the simplicity of its construction and its economy, this description of horse-boat continued long in use on the East River and on the Hudson." . . .

"At the death of Fulton the speed of steamboats on the Hudson was under seven miles an hour, and at about that date Robert L. Stevens built the 'Philadelphia,' which had a speed of eight miles. He built many steamboats, increasing the speed of each successive one up to 1832, when the 'North America' attained fifteen miles. From 1815 until 1840 he stood at the head of his profession in the United States as a constructor of steam

vessels and their machinery, making innumerable improvements, which were generally adopted."

In a paper[1] on "Forced Combustion in Steam-Boilers," read before the International Engineering Congress, Division of Marine and Naval Engineering and Naval Architecture, held in connection with the World's Columbian Exposition at Chicago, July 31–August 5, 1893, Mr. James Howden, M.I.C.E., M.I.N.A., etc., said:

"So far as the writer has yet learned from published statements, the honor of first using a blowing fan to accelerate combustion in a steamboat belongs to Mr. Edwin A. Stevens, of Bordentown, in the State of New Jersey, who in 1827, in the steamer 'North America,' fitted the boilers with closed ash-pits, into which the air of combustion was forced by a fan. In 1828 it is also stated that in England the famous pioneer in many engineering novelties, Ericsson, fitted in a similar manner the steamer 'Victory,' commanded by Sir John Ross. No details, however, of these applications are given or probably exist. As regards that of Ericsson, the writer has been unable to learn anything further than that some use of a fan was made in this steamer; but whether it was continued for any period, or what was the character of the results, no record appears to exist. It is probable that in the discussion of this paper some further information, regarding at least the case of the 'North America,' may be forthcoming. It appears that Mr. E. A. Stevens, in conjunction with his brother Mr. R. L. Stevens, continued the use of forced draught for a considerable period, during which, it is recorded, they tried three different modes of using the fan for promoting combustion. The first, as mentioned, was blowing direct into a closed ash-pit; the second, exhausting the base of the funnel by the suction of the fan; the third, forcing air into an air-tight boiler-room or stokehold.

"The two latter modes of accelerating combustion by means of a fan in furnaces of steam-boilers are the natural sequence of what would occur to an inventive mind after experiencing the difficulties arising from the first mode. In an article in the 'Engineer' of February 6, 1891, there are particulars given of these trials, taken from a letter of Mr. Francis B. Stevens, which appeared in the 'Engineering News' of June 7, 1890. In an extract from this letter it is stated that in the use of the closed ash-pit, 'the blast-pressure would frequently force the gases of combustion, in the shape of a serrated flame, from the joint around the furnaces' doors in so great a quantity as to affect both the efficiency and health of the firemen.' It is therefore not surprising to find it recorded that Mr. R. L. Stevens tried, in 1836, a horizontal screw ventilator on a vertical spindle at the root of the chimney of the 'Passaic' in New York harbor, and that in 1837–38 the brothers Stevens tried an exhaust-fan on a horizontal spindle in the chimney of a shop engine, and that in 1838 they fitted a similar fan to the steamboat 'Philadelphia' on the Delaware River.

"The last design of Mr. E. A. Stevens was that of the air-tight fire-room charged with air above atmospheric pressure, more generally known, since its resuscitation and its extensive use in warships in recent years, as the 'closed stokehold' system."

In the discussion which followed Mr. Howden stated further:

"As mentioned in my paper, the first to try, so far as I can ascertain, ash-pit, suction, and closed fire-room draughts by means of air supplied by a fan, was Mr. Edwin A. Stevens. It is only very lately that I came upon the facts in relation to those early investi-

[1] Printed in Proceedings of the International Congress, published by John Wiley & Sons.

gations and operations in forced draught, but they leave no doubt whatever on my mind that to the late Mr. Edwin A. Stevens belongs the honor of being the originator of these three different systems in steamships; and I have peculiar pleasure indeed in finding that he is represented here to-day so ably by his son, Col. E. A. Stevens, who has materially contributed to the success of this Congress by the effective manner in which he has taken part in the discussions of various papers."

Mr. C. S. Watkins, a resident of Denver, Colo., but formerly of Hoboken, N. J., gives to the Stevens brothers the credit of two useful inventions that have never before been recorded. From a letter written by him May 9, 1898, we quote the following:

"My father once accompanied Robert on a business trip to Amboy by steamboat. On the return trip, at night, the weather being severe, Robert expressed much sympathy for the steersman, who, as was then the practice, stood at the wheel — unsheltered — on the upper deck. At last Robert — in his usual emphatic manner — said the pilot should have a shelter. Before that boat again left the city, he had caused a pilot-house to be erected around and over the wheel, and, immediately following, all the Stevens's boats were similarly provided. This was the first pilot-house.

"The second invention was devised by Edwin. The great fire in New York city in 1842 caused such an immense amount of debris that the city took charge of its removal and advertised for proposals. Edwin made a bid and got the contract. Previous to that time all soil removals were made by the 'one-horse dumping-cart.' But Edwin then devised the 'two-horse dirt-wagon' with loose sides and bottoms of narrow planks, now in universal use.

"Pilot-houses and dumping-wagons are now as common as pegged boots, but although Leonardo da Vinci is known to fame as the inventor of the wheelbarrow no one seems to have preserved the name of the inventor of the dumping-wagon."

For further reference to the achievements of John, Robert L., and Edwin A. Stevens, see Appleton's Encyclopedia of American Biography, Vol. V, pp. 673–675.

A SUMMARY OF THE ENGINEERING WORK OF THE STEVENS FAMILY

President Charles King, of Columbia College, writing of John Stevens in 1852, said: "Born to affluence, his whole life was devoted to experiments, at his own cost, for the common good"; and the same may be said in substance as to his sons, Robert L. and Edwin A. Stevens.

III

THE TRUSTEES, FACULTY, AND ALUMNI



M. B. STEVENS

W. W. SHIPPEN

S. B. DOD

III

THE TRUSTEES, FACULTY, AND ALUMNI

THE biographies given in the first section of this book are limited to those who have not been, or are not now, connected with the Institute in any other capacity than that of Trustee. For example, that of President Morton, who was a Trustee for sixteen years, is placed at the head of the biographies of the Faculty. In accordance with this plan those of President Humphreys and Mr. Wolff, both Permanent Trustees, are placed, one with the Faculty and the other with the Alumni; and the biographies of the Alumni Trustees who have served or are now serving limited terms of office are also given with those of the Alumni. The names and portraits of all are, however, given here in the order of their appointment, first the Permanent Trustees and then the Alumni Trustees.

THE PERMANENT TRUSTEES

MARTHA BAYARD STEVENS

Trustee, 1868–1899

Mrs. Martha B. Stevens was the daughter of Professor Albert Baldwin Dod, of the College of New Jersey (now Princeton University), born in Princeton in 1831. Her mother was Caroline Bayard, a branch of the family of William Bayard, a Tory, who owned the island of Hoboken before the War of Independence. As he remained loyal to the Crown, the land was declared forfeited, and was bought from the government by Colonel John Stevens.

It thus came about that the Castle Point property, forfeited during the War of Independence, as above related, came back in the course of time to a member of the family originally owning it, and to her descendants.

After the decease of her husband in 1868, Mrs. Stevens, with her family of young children, spent many years in Europe, but after her return to this country she took great interest in the Institute, especially from the social side. On all occasions when opportunity offered, she was quick to extend hospitality to distinguished visitors, as well as to those connected with the Institute; and such men as Professor Tyndall, Lord Kelvin, Major Herschell, and countless other men of science, who were attracted by the reputation of the Institute, have enjoyed entertainments of the most delightful character at her beautiful mansion on Castle Point, overlooking the bay and city of New York. She was always ready, also, to contribute to the pleasure of the Undergraduates and Alumni by many delightful receptions at her house. Finally, in connection with the Twenty-fifth Anniversary Celebration in 1897, she presented to the Trustees of the Institute the two lots and houses which for many years, and up to the time of his death, were occupied by President Morton as a residence.

Mrs. Stevens was largely interested in works of humanity and charity. She built and endowed the Church of the Holy Innocents in Hoboken, presented the land on which were built the Free Public Library and Manual Training School, and gave largely to many other objects, both in New Jersey and elsewhere. She represented New Jersey on the Board of Managers of the Columbian Exhibition at Chicago.

Mrs. Stevens died April 1, 1899.

SAMUEL BAYARD DOD

Trustee, 1868–

Samuel Bayard Dod, who is a brother of Mrs. Stevens, and son of Albert B. and Caroline Bayard Dod, was born December 3, 1837, in Princeton, N. J., where his father held the position of Professor of Mathematics in the College of New Jersey from 1830 until the time of his death in 1845.

Mr. Samuel B. Dod graduated at Princeton in 1857, and after a year's study in Germany entered the Princeton Theological Seminary and graduated therefrom in 1861, receiving his A.M. degree from the College of New Jersey (now Princeton University). He then served for seven years in the Presbyterian ministry at Monticello, N. Y., and at Wilkes-Barre, Pa.

In 1868, having been named as one of the executors of the estate of Edwin A. Stevens, he came to Hoboken and entered on the management of the estate in association with Mr. William W. Shippen. The executors were charged by the will of Mr. Stevens with the duty of establishing on the block of ground bordered by River and Hudson streets, between Fifth and Sixth streets, "an institution of learning for the benefit of the youth residing from time to time in the State of New Jersey." In the discharge of this trust Mr. Dod found a congenial task which enlisted his hearty interest from the first.

After obtaining as accurate information as could be had of the technical schools at Berlin, Zurich, and Mannheim, and visiting the mining and engineering schools of this country, it seemed that a school of mechanical engineering would fill a gap in the educational facilities of the United States and be a fitting memorial to a family whose talents for two generations had made such valuable contributions to the progress of that science.

As a preliminary to the opening of the Stevens Institute of Technology, a school for the fitting preparation of students to enter the same was opened, as the course of study in the public schools at that time was not sufficiently advanced.

When Dr. Morton was selected as President of the new institution, Mr. Dod coöperated with him in the selection of the Faculty of instructors, in planning the course of instruction, in the location of the buildings, and in the purchase of apparatus. He was also a frequent visitor at the Physical Laboratory when interesting experiments with the new apparatus were being made.

In the growth of the Institute, the high reputation which its Professors have established at home and abroad, the splendid record of its graduates who have gone forth to fill places of honor and trust in their profession, he has an abiding source of pleasure and pride.

WILLIAM W. SHIPPEN

Trustee, 1868–1885

William W. Shippen, the second son of Richard and Anna Elizabeth Shippen, was born October 9, 1827. He was educated at Bordentown and at Bolmar's well-known school at West Chester, Pa. In 1843 he received an appointment as acting-midshipman in the United States Navy, and was serving on the man-of-war "Princeton," on her trial trip down the Potomac River, with President Tyler, members of his Cabinet, and a distinguished company on board, when Commodore Stockton's 100-pound gun exploded, killing A. P. Upshur, Secretary of State, Thomas W. Gilman, the Secretary of the Navy, the father of President Tyler's second wife, and several others. Late in 1844 he entered the employment of Mr. Edwin A. Stevens, when he settled in Hoboken, where he passed the rest of his life. In September, 1853, he married Georgina Morton, daughter of George W. Morton, of Hoboken and New York.

During the Civil War, in 1862, he had command of the "Naugatuck," a vessel fitted out by Mr. E. A. Stevens to assist in opposing the rebel ram "Merrimac," and remained with her until the bursting of her 100-pound Parrott gun put her out of commission,— a singular coincidence when noted in connection with the disaster on the "Princeton," mentioned above.

In 1868 he was appointed one of the executors of Mr. E. A. Stevens's will, and was chiefly occupied with the management of that estate, which included three ferries between New York and Hoboken and large amounts of real estate. As a Trustee of the Institute he confined his attention chiefly to the management of its financial affairs. He died September 2, 1885, at his seaside residence at Seabright, N. J.



Henry Morton

HENRY MORTON, Ph.D., Sc.D., LL.D.

Trustee, 1885–1902

(For biography of President Morton see page 165.)

ANDREW CARNEGIE

Trustee, 1891–

Andrew Carnegie was born in Dunfermline, Fifeshire, Scotland, November 25, 1837. He came with his family to the United States in 1848 and settled in Pittsburg. His first employment was in a cotton factory at Allegheny, Pa., where he was engaged as a bobbin-boy. In his next position he attended a small stationary engine, after which he became a telegraph messenger-boy in the Pittsburg office of the Ohio Telegraph Co. in 1851. About this time he began to study telegraphy, and later secured a position as telegraph operator with the Pennsylvania Railroad Co., in whose service he was quickly advanced, through successive positions, to the office of superintendent of the Pittsburg Division of the Pennsylvania System.



Andrew Carnegie

While in the employ of the Pennsylvania Co. he joined with Mr. Woodruff, inventor of the sleeping-car, in the organization of the Woodruff Sleeping Car Co., and it was in this company that Mr. Carnegie gained the nucleus of the great fortune which he acquired in later years. With profits secured in the sleeping-car business he entered a syndicate formed to purchase the Storey farm on Oil Creek for $40,000, which, within a year, yielded over $1,000,000 in cash dividends.

During the Civil War he served as superintendent of military railways and government telegraph lines. After the war he developed iron works of various kinds, and established at Pittsburg the Keystone Bridge Works and the Union Ironworks. He adopted the Bessemer process of making steel in 1868. Later he became the principal owner of the Homestead and Edgar Thomson Steel Works and other large plants, and also head of the firms of Carnegie, Phipps, & Co., and Carnegie Bros. & Co. The organizations in which he held a controlling interest were consolidated in 1899 in the Carnegie Steel Co., and this in turn was merged in the United States Steel Corporation in 1901, when Mr. Carnegie retired from active participation in the iron and steel business which under his masterful direction had become the foremost American industry.

Mr. Carnegie has given generously of his immense fortune for educational purposes, establishing libraries or institutions of learning in more than a thousand cities and towns in the United States, Great Britain, Canada, and other British colonies. Some of his largest gifts include $10,000,000 to the Carnegie Institute at Pittsburg; $5,200,000 for a system of branch libraries in New York; $10,000,000

for the Carnegie Institution at Washington; $10,000,000 to Scotch universities; $5,000,000 to the fund for the benefit of the employees of the Carnegie Steel Co.; $1,500,000 for a Peace Temple at The Hague, etc.

The Stevens Institute of Technology shares with other beneficiaries of Mr. Carnegie's generosity, and it is a rare privilege to record here our hearty appreciation of the endowed Laboratory of Engineering which bears his name.

Mr. Carnegie has contributed many articles to periodicals on social and economic questions, and is author of "An American Four-in-Hand in Britain," 1883; "Round the World," 1884; "Triumphant Democracy," 1886; "The Gospel of Wealth," 1900; "Empire of Business," 1902, and other essays. In 1903 he became Lord Rector of the University of St. Andrew at Edinburgh, also President of the Iron and Steel Institute. He is a member of the Engineers', Authors', Aldine, Lotus, Union League, South Side Sportsmen's, and Nineteenth Century clubs; the American Fine Arts, Musical Art, and Pennsylvania societies; the Metropolitan Museum of Art; the American Institute of Mining Engineers; and the American Institute of Mechanical Engineers.

Mr. Carnegie married Miss Louise Whitfield in 1887. They have one daughter.



A. C. Humphreys

ALEXANDER CROMBIE HUMPHREYS, M.E., Sc.D., LL.D.

Trustee, 1891–

(For biography of President Humphreys, see page 195.)

CHARLES MACDONALD, C.E., LL.D.

Trustee, 1891–1903

Charles Macdonald was born in Gananoque, Canada, of Scotch ancestry, January 26, 1837. His father was a prominent merchant and a member of the famous family of Macdonald of Athol, Perthshire, Scotland. On the maternal side Mr. Macdonald's ancestry in America dates back to 1639, when William

Stone emigrated from England and located in the old town of Guilford, Connecticut. Joel Stone, son of William, was prominent in the Revolutionary War, and barely escaped hanging as a Tory, he making his escape by a daring and judicious flank movement on Long Island, where the British troops were then stationed. Joel Stone was a great-grandfather of the subject of this sketch.

Charles Macdonald received his academic education at the Queen's University, Kingston, Ontario, Canada, subsequently attending and graduating from the Rensselaer Polytechnic Institute, of Troy, N. Y. After finishing his course of studies at the latter place of learning as a civil engineer, he became an assistant on construction of the Grand Trunk railway in Michigan; thence on the Philadelphia and Reading railroad, in charge of survey and construction, until the year 1868, when he came to New York and engaged in the business of bridge construction, making it a specialty. How he has succeeded in his profession all the world knows. He has been directly connected with bridge building since 1868, with headquarters at New York, and has assisted in the construction of the Hawksburg Bridge in Australia, the Leavenworth Bridge, the Poughkeepsie Bridge, and the Merchants' Bridge at St. Louis. In 1884 Mr. Macdonald associated himself with the Union Bridge Co. as a member of that concern, and was senior member at the time of its absorption by the American Bridge Co. in May, 1900.



CHARLES MACDONALD

He is a member of the American Society of Civil Engineers; of the American Institute of Mining Engineers of Canada; the Society of Civil Engineers of England; and of the Century, Union, and Engineers' clubs, of New York. He is an ex-Trustee of the East River Bridge and a Trustee of the Rensselaer Polytechnic Institute at Troy. His degree of Civil Engineer was conferred by the former Institute, and the degree of Doctor of Laws by Queen's University, of Kingston, Ontario. He resigned the office of Trustee of Stevens Institute of Technology in 1903.

Mr. Macdonald was married to Sarah L. Willard, a daughter of the late Col. William T. Willard, of Troy, N. Y., August 5, 1861, and five children have blessed their union, two of whom have passed away. Those living are William Stone, Mary Louisa, and Lillie Paine Macdonald.

ALEXANDER T. McGILL, LL.D.

Trustee, 1891–1900

Alexander Taggart McGill was born in Allegheny City, Pa., October 20, 1843. His father, the Rev. Alexander T. McGill, D.D., LL.D., was then Professor of Church History in the Western Theological Seminary in that city; in 1854 he accepted the Chair of Ecclesiastical, Homiletic, and Pastoral Theology in the Theological Seminary of the College of New Jersey.



A. T. McGill

The subject of this sketch graduated in 1864 from the latter institution, which later conferred upon him the degree of Doctor of Laws. In 1866 he graduated from Columbia Law School, New York, with the degree of Bachelor of Laws. He continued his study of law in the office of the late Supreme Court Justice, Edward W. Scudder, at Trenton, N. J., and in 1867 was admitted to the bar as an attorney, and three years later as a counsellor.

He was counsel for the city of Bayonne, N. J., during 1874–75. At the same time he represented the then First District of Hudson County in the House of Assembly, serving on leading committees and taking a very active part in legislation. He also became a law partner of the late ex-Attorney-General Gilchrist. He served one term as Prosecutor of the Pleas of Hudson County, succeeding the Hon. A. Q. Garretson, who was appointed Law Judge, and when the latter resigned that office Mr. McGill again succeeded him as Judge, an office he held when he was appointed Chancellor by Governor Green, March 29, 1887. He was unanimously confirmed by the Senate two days later. At the expiration of his term of office in 1894 he was reappointed by Governor Werts and again unanimously confirmed by the Senate. He was the Democratic candidate for Governor of New Jersey in 1895, but, with his party, was defeated.

His untiring devotion to the duties of the office of Chancellor during the thirteen years of his incumbency was a severe strain, and after a year of failing health he passed away, April 21, 1900.

EDWIN A. STEVENS

Trustee, 1891–

Edwin A. Stevens, second son of Edwin A. Stevens, Founder of the Stevens Institute, was born in Philadelphia March 14, 1858. He was educated at St. Paul's School, Concord, N. H., from which he entered Princeton, graduating in 1879. He has since then been employed in the management of the Hoboken Land and Improvement Company in various capacities.



E. A. Stevens

In spite of a lack of technical education he has been busy mainly with engineering matters. His best-known work has been the designing of screw ferry-boats, a type which he originated and is now much used in this country. He has also worked on the designs of high-speed steam-engines and machine tools. At present he is engaged as consulting engineer for the City of New York in the matter of the construction of ferry-boats for the Staten Island Ferry, and he is also in charge of the design of ferry-boats for the Lackawanna Railroad Co. to ply in New York harbor. He is vice-president of the Society of Naval Architects and Marine Engineers. He was connected with the National Guard of the State of New Jersey for twelve years, being a portion of that time in command of the Second Regiment. He resigned in 1892.

He has been a Democrat in politics, and was Presidential Elector in 1888 and 1892. His residence is Castle Point, Hoboken.

Mr. Stevens has contributed the following papers to engineering literature:

"Performances of the 'Bergen' and 'Orange' Steam Ferry-Boats," written, in conjunction with Prof. J. E. Denton, for the American Society of Mechanical Engineers, and published in the *Transactions* of that Society.

"Screw Ferry-Boats," for the Society of Naval Architects and Marine Engineers.

"Ferry-Boat Performances," for *Stevens Institute Indicator*, 1900.

"Tidal Corrections," written in conjunction with Mr. C. P. Paulding, M.E., for the Society of Naval Architects and Marine Engineers.

"Application of Taylor's Analysis to the Performance of the Ferry-Boat 'Cincinnati'" (in conjunction with Mr. C. P. Paulding, M. E.), *Stevens Institute Indicator*, 1901.

"Progressive Trial of the Ferry-Boat 'Edgewater,'" in conjunction with Mr. C. P. Paulding, M. E., for the Society of Naval Architects and Marine Engineers.

"Progressive Trial of the Ferry-Boat 'Bremen,'" for the Society of Naval Architects and Marine Engineers.

"Screw Ferry-Boats," for *Cassier's Magazine*.

"American Competition," for *Engineering* (London), 1899.

RICHARD STEVENS

Trustee, 1896–

Richard Stevens, son of Edwin A. Stevens (Founder of Stevens Institute) and Martha B. Stevens, was born in Paris, France, May 23, 1868. He attended the Stevens High School during the scholastic year 1880–81, and then entered St. Paul's School at Concord, N. H., from which he was graduated in June, 1886. He entered the Columbia College School of Arts in the fall of the same year, and graduated with the degree of Bachelor of Arts in 1890. After a two years' course in the Columbia Law School he entered the New York Law School, from which he was graduated in the spring of 1893, receiving the diploma of the school.



Richard Stevens

He was admitted to the bar of the State of New Jersey in November, 1893, as attorney-at-law. In 1896 he was elected second vice-president of the Hoboken Land and Improvement Company. In conjunction with Mr. Edwin A. Lewis and Mr. J. W. Rufus Besson he formed the law firm of Lewis, Besson, & Stevens, with offices at 1 Newark Street, Hoboken, in 1898, and is still engaged in the practice of law.

He was married, November 11, 1893, to Miss Elizabeth C. Stevens, daughter of Mr. and Mrs. Francis B. Stevens, of Hoboken. Their home is situated on the old family estate at Castle Point, Hoboken, N. J.

HENRY R. TOWNE, C.E.

Trustee, 1900–

Henry R. Towne was born in Philadelphia, Pa., in 1848. His father was John Henry Towne, a partner in the firm of I. P. Morris, Towne & Co., owning and operating the Port Richmond Iron Works.

After completing an academic course of study, Henry R. Towne entered the University of Pennsylvania and remained there during the college years of 1861–62, but the outbreak of the War of Secession led him to interrupt his studies and enter the draughting-room of the Port Richmond Iron Works, where he remained for nearly two years. In 1863 he was placed in charge of the government work in the shops connected with repairs on the gunboat "Massachusetts."

The Port Richmond Iron Works had meanwhile taken a contract to fur-

nish the engines for the monitor "Monadnock," and in 1864 Henry R. Towne, then about twenty years old, was sent to assemble and erect them in the shops at the Charlestown, Mass., Navy Yard. He was subsequently sent to the Portsmouth, N. H., Navy Yard, in sole charge of erecting and testing the machinery of the monitor "Agamenticus" (now the "Terror"), and later of the cruiser "Pushmataha" at the Philadelphia Navy Yard. At the age of twenty-one he was placed in general charge of the shops of the Port Richmond Iron Works as acting superintendent. Boys developed rapidly during the great national upheaval which followed the attempted secession, and those equal to great responsibilities found the opportunity to show what was in them.



H. R. Towne

When the strain was relieved by the restoration of peace, Mr. Towne realized the need of exact knowledge in many lines of study which the war had interrupted. He became a close and industrious student under the guidance and instruction of the late Robert Briggs, and accompanied him on an engineering tour through Great Britain, Belgium, and France. Before returning he took a special course in physics at the Sorbonne, Paris. During this time his father had disposed of his manufacturing interests and retired from business. After returning to the United States the young man spent a year in further study and experimental work with Robert Briggs. During this association he carried on numerous experiments with leather belting, the results of which were accepted as standard for twenty years. For further education in the designing and use of special machinery Mr. Towne entered the shop of William Sellers & Co., devoted to the production of Giffard injectors.

In the summer of 1868 a mutual friend introduced Mr. Towne to Linus Yale, Jr., a talented and ingenious inventor of locks, whose business, chiefly in bank locks, then employed about thirty-five men. Foreseeing great possibilities in the then recent invention by Mr. Yale of the lock with a small flat key now universally known as the "Yale lock," Mr. Towne proposed a partnership in which he should undertake the manufacturing management, and which resulted in October, 1868, in the organization at Stamford, Conn., of what is now the Yale & Towne Manufacturing Co. The association thus formed lasted but three months, being terminated by the premature death of Mr. Yale in December, 1868. Since then Mr. Towne, as President, has controlled and directed the enterprise thus begun.

Mr. Yale's legacy to the new concern was one of brilliant ideas, which have since revolutionized American practice in lock-designing, but which could be



A. P. Trautwein



William Kent



William Hewitt



E. B. Wall



Durand Woodman

Alumni Trustees

made commercially valuable only if reduced to practice by just such work as Mr. Towne had undertaken to perform. This work occupied the succeeding ten years and forms the basis on which has been reared a great industry which is still in process of vigorous development. Starting with Mr. Yale's radical departure from previous types of lock-construction, Mr. Towne's work has greatly amplified these original features, and has embodied with them equally radical departures in design and workmanship, especially in methods of production, which have become the accepted standards of the trade.

In the brief space at the writer's command it would be impossible to give even an idea of the variety and perfection of the special machinery employed at Stamford in the production of locks, or of the steps of growth from small beginnings in 1869, when Mr. Towne became President, to the present daily output of 25,000 locks and an organization under normal conditions employing 1,500 men. During these thirty years almost every improvement in locks and lockmaking machinery has come from the Stamford works. What Mr. Towne has accomplished in useful results is shown in the thirteen volumes of the Yale & Towne Manufacturing Co.'s catalogue, in which more than ten thousand separate articles of manufacture are illustrated and described.

Mr. Towne has been prominently identified with several engineering societies, and has filled with dignity many positions of honor and responsibility. One of the early members of the American Society of Mechanical Engineers, he became its president in 1888 and was made chairman of the large party of American engineers, representing the three great American engineering societies, which visited Europe in 1889. His contributions to technical literature, standard and current, though mainly relating to his own work, have shown a scholarly mind, a rare breadth of culture, and a clear appreciation of the relation of theory to practice in useful undertakings.



A. R. WOLFF

ALFRED R. WOLFF, M.E.

Trustee, 1900–

(For biography of Mr. Wolff see section devo ted to the Alumni.)



F. E. Idell



G. M. Bond



H. de B. Parsons



L. H. Nash



J. W. Lieb, Jr.

Alumni Trustees

GEORGE B. M. HARVEY

Trustee, 1902–

George B. M. Harvey was born of Scottish ancestry at Peacham, Vt., February 16, 1864. He was educated at the Caledonia Grammar School in that town, and at the age of eighteen became a reporter on the staff of the Springfield "Republican," one of the foremost papers in New England, and remained there two years.



G. B. M. Harvey

When twenty-one years old he went to New York and became a reporter for the "World." For nearly seven years he served that paper, rising from place to place on its staff until he became managing editor. In 1893 his health became impaired and he was compelled to resign.

Mr. Harvey soon after turned his attention to business affairs. For two years he was associated with William C. Whitney. Then he undertook the development of electric railroad and lighting concerns on his own account. He built the electric roads on Staten Island, and at Long Branch, Asbury Park, and elsewhere on the New Jersey coast. In 1898 he formed what was known as the Harvey Syndicate, and purchased the street railroads of Havana and other properties in Cuba.

Mr. Harvey, at the age of twenty-one, was appointed aide-de-camp, with the rank of colonel, on the staff of Governor Green of New Jersey. He was reappointed and made chief of staff by Governor Abbett, and declined another appointment at the hands of Governor Werts. He was also appointed Commissioner of Banking and Insurance by Governor Abbett, but resigned the place after a few months, in order to give his full time to newspaper work. He also declined the place of Consul-General at Berlin, which was offered to him by President Cleveland.

Early in 1899 Col. Harvey purchased and became editor of the "North American Review," perhaps the most noted of literary and critical periodicals in the United States. In November, 1899, financial distress overtook the famous publishing-house of Harper & Brothers, and Col. Harvey, at the solicitation of all parties in interest, undertook the task of reorganization. Within two years he succeeded beyond the expectations of himself or anybody else, and the house is now more prosperous than ever before in its long history. Besides being president and chief owner of the publishing concern, he is the editor of "Harper's Weekly." He is also a director of several financial institutions, and a member of the principal clubs in New York and London.



G. J. Roberts



A. S. Miller



W. L. Lyall



C. H. Page, Jr.



E. A. Uehling

Alumni Trustees

THE ALUMNI TRUSTEES

The graduates who have served, or who are serving, as Alumni Trustees, and whose portraits are given in this section, are as follows. Their biographies may be found in alphabetical order with those of the Alumni toward the end of this volume. The years during which they held office are subjoined:

1887–1890	Alfred Philip Trautwein, M.E., '76
1890–1893	William Kent, M.E., '76
1892–1895	William Hewitt, M.E., '74
1892–1895	Alfred R. Wolff, M.E., '76
1893–1894	Edward Barry Wall,[1] M.E., '76
1894–1896	Durand Woodman, Ph.D., '80
1894–1897	Frank E. Idell, M.E., '77
1895–1898	George Meade Bond, M.E., '80
1896–1897	Harry de Berkeley Parsons, M.E., '84
1897–1900	Lewis Hallock Nash, M.E., '77
1898–1901	John William Lieb, Jr., M.E., '80
1899–1902	George J. Roberts, M.E., '84
1900–1903	Alten S. Miller, M.E., '88
1901–1904	William Lord Lyall, M.E., '84
1902–1905	Carter H. Page, Jr., M.E., '87
1903–1906	Edward A. Uehling, M.E., '77

[1] Deceased, 1894.



HENRY MORTON
From His Favorite Photograph

THE FACULTY

HENRY MORTON, Ph.D., Sc.D., LL.D.

President of the Stevens Institute of Technology from its beginning until the day of his death, May 9, 1902.[1]

ANY one attempting to write of the life of Henry Morton must at once be impressed with the difficulty presented by reason of his many-sided life; but the very nature of the difficulty suggests a way to meet it,—to let those who have worked with him in the various fields join in the telling of his life.

Prof. R. H. Thurston, in a recent issue of "Science," in the present connection, said:

"Nor can his work be fully appreciated by any one man or by any one class of men, so varied has it been in character, in its fields of action, and in its specialization.

"Physicist and engineer; chemist and educator; investigator and legal expert; linguist, editor, and writer; man of business and philanthropist; pioneer in the reduction of the art of the mechanic and inventor to a professional and scientific form; mechanic, inventor, and organizer, and administrator,— his many-sidedness necessarily precludes alike appreciation, correct judgment, and exact quantitative measurement of his life's work. Whoever studies the life of the man and endeavors to weigh his work and its productive value to the world will at least conclude the investigation impressed with the conviction that this was the rarest of rare cases, that of the man of genius, at once brilliant and versatile, and fruitful of good works in many departments ordinarily supposed to be far separated, as vocations, by the constitution of the human mind. But heredity, environment, and an irrepressible ambition conspired with extraordinary powers to make this life fruitful in both opportunity and accomplishment."

This from a man well qualified to judge, who was closely associated with President Morton in the first years at Stevens Institute, when the experiment in education was in course of development into the acknowledged success.

The dry record of the work he accomplished would be sufficient to show how much the world has gained through this man's life; from the more intimate record of his daily life we should again find inspiration.

In 1892, in connection with the presentation by the Alumni to Stevens Institute of a portrait of President Morton, a biographical sketch of him was published under the direction of Prof. Coleman Sellers, E.D., and Prof. Albert R. Leeds, Ph.D.

Shortly before his death there was prepared a much briefer sketch of his life, to be included in a volume[2] which was originally intended to have been pub-

[1] This account of President Morton's life was written and arranged by his close friend and successor, President Alexander C. Humphreys, M.E., Sc.D., LL.D., for the "Stevens Institute Indicator," in which it appeared, July, 1902.

[2] The volume here referred to is the present book. At the time of President Humphreys' writing it was the intention to issue the book under the title of the "25th Anniversary Volume," but later the entire arrangement of the book was recast and finally issued as a "Morton Memorial Volume."—EDITOR.

lished shortly after, and in commemoration of, the Institute's Twenty-fifth Anniversary. This volume, now most appropriately, will be completed in such a manner as to serve as a memorial to Dr. Morton, for in addition to this sketch of his life it will contain the complete history of the Institute during his leadership and the records of the work accomplished by the Alumni. In these last will be again fittingly found the reflected record of his work, for they are not the Alumni records of a college long established of which he was simply one of a series of heads, but they are the records of the Alumni of a college established and developed along lines yet untried. Even if these records stood alone they would be his sufficient monument. I shall draw upon these two sketches for the main facts in President Morton's life.

Henry Morton was born in New York city on the 11th of December, 1836. His great-grandfather was John Morton, who came to New York in the commissary department of the British Army, from which he resigned to engage in business some years before the Revolution, at which time he took sides actively with the Colonies. John Morton's eldest son was Gen. Jacob Morton, whose youngest son, President Morton's father, was the Rev. Henry J. Morton, D.D., for fifty-six years rector of St. James's Episcopal Church, Philadelphia.

Henry Morton entered the University of Pennsylvania at the age of seventeen, and graduated therefrom in the class of 1857.

Toward the close of his college life he suggested to some of his associates the taking up of a piece of work far beyond the ordinary range of student effort. He was a member of a college philosophical society called the Philomathean, to which was presented in 1856 a plaster cast of an engraved stone tablet, discovered in Egypt during the occupation under Napoleon, and named the Rosetta Stone, from the name of the town near which it was found. It contained inscriptions in three texts: Greek, demotic, and hieroglyphic, and was valued as a probable key to the interpretation of the last-named characters, with which the monuments of Egypt are covered.

While this stone had been studied by others, no complete translation of all its texts had been made. Morton, rather in a spirit of fun, proposed in a meeting of the society that a committee be appointed to translate these inscriptions. This was agreed to, and the committee was constituted by the appointment of Morton, with Charles R. Hale and S. H. Jones as his associates. About this time Morton's attention was directly turned to the study of the hieroglyphic language by reading a lecture on that subject by Cardinal Wiseman, and this led him to take up seriously the Rosetta Stone work, and he devoted almost all his spare time to the hieroglyphic inscription during his Junior and Senior years. Hale, of the committee, at the same time worked out translations of the Greek and demotic texts.

But Morton went still further and illuminated each page of the report with an appropriate design in color. This remarkable manuscript attracted so much

attention that it was decided that it should be properly reproduced, and to do this it was found necessary to lithograph the entire work; and to keep the cost within limits it was necessary that Morton should himself draw all the designs on stone.



Reduced Copy of Page 66 of "The Rosetta Stone Report"

Without previous experience he undertook this work, and it was carried through successfully in about six months. Within two weeks the edition was exhausted, and it is now a "rare" book. Among others, Alexander von Humboldt wrote to the committee to express his appreciation of the importance of this work.

This early effort indicated what was to be expected from Henry Morton in the way of daring, versatility, and perseverance.

In 1859 he took up the study of law, but this was not for long. By accident he was now turned definitely in the direction of science. His father was a trustee of the Episcopal Academy of Philadelphia, from which Henry Morton had graduated into the University of Pennsylvania. The trustees of the Academy were desirous of getting in line with the movement favoring the claims of natural science to a place in the school and college curriculum. The Academy was not financially able to bear the expense of a new department, and so Henry Morton, hearing of the need through his father, volunteered to give lectures on chemistry and physics. This was the commencement, and a notable commencement, of President Morton's career as a scientist. His lectures were so novel, lucid, brilliant, entertaining, and instructive that the small lecture-room was soon found to be inadequate, and the trustees found it necessary to add to the school building a larger lecture-room for the proper accommodation of the boys and the public. The fame of these lectures spread, and President Morton was offered other engagements as a lecturer and as a professor.

In 1863 he accepted the professorship of chemistry in the newly organized Philadelphia Dental College; the next year he was appointed resident secretary of the Franklin Institute of Pennsylvania. This last had lapsed into a decrepit state, but the able men in its board recognized in Morton the very qualities needed to reinvigorate this formerly strong society. It was to augment the usefulness and pecuniary resources of the Franklin Institute that President Morton undertook the first of a series of public lectures on light, sound, and cognate topics.

"The prime object of these lectures was to attract and interest the general public in scientific subjects, and with this object in view Prof. Morton made it his aim to develop experimental illustrations of the most striking and scenic character, utilizing for this purpose all the appliances of the scenery and stage mechanism which were at his command in such a place as the Academy or Opera House, and adding many devices of his own, especially constructed for the object in view."

On the occasion of the presentation of President Morton's portrait to Stevens Institute, his old friend and associate, Dr. Coleman Sellers, made the address in reply to the presentation address of Edward B. Wall, then President of the Alumni Association.

Dr. Sellers told the history of these lectures so well that I shall quote him at length:

"At one of the first meetings of the managers of the Franklin Institute after Mr. Morton's appointment, it was suggested that an excellent means of interesting the public at large in the objects of the Institute would be a course of scientific lectures, delivered in some large hall.

"One of the managers was even so bold as to suggest the Opera House or Academy of Music, one of the largest auditoriums in the country, seating more than 3,500 persons.

Others considered this too venturesome, but it was finally decided to leave this to Mr. Morton's decision.

"Deputed to communicate with Mr. Morton on this subject, I well remember the characteristic courage and enthusiasm with which he at once seized on the idea of making



Lecture by Henry Morton at the Academy of Music, Philadelphia, 1869

the so-far unparalleled experiment of devising and executing illustrations on such a scale as should render them impressive on so large a stage and to so vast an audience.

"All who came in contact with him were inspired with his confidence and enthusiasm (myself among the number), and the preparations were commenced at once.

"Some notices of these got abroad, and long before the date assigned for the lec-

ture every seat in the house was sold; and so pressing was the demand that the Academy was engaged for another evening, a few days later, and, before the night of the first delivery arrived, every seat had been again sold for the repetition.

"There are occasions, even in the life of a scientific professor, which call for no small stock of moral courage, and the evening in which Mr. Morton for the first time walked forward upon a public stage in the face of an audience which crowded every seat and every inch of standing-room, with the consciousness that he was committed to the absolute necessity of a success by the arrangements for the repetition, was one of them.

"I was with him at the time, having undertaken the office of manager, to direct and superintend the work of his assistants behind the screen; and I have not forgotten what were my own feelings.

"But when the curtain rose, he stepped forward with easy grace, amid the enthusiastic applause which greeted his appearance, and began his lecture as calmly and collectedly as if he had done the same thing fifty times before.

"He told me afterward that he was so anxious about the success of his experiments that he had no room in his mind for personal embarrassment, or the nervous agitation often caused by facing a great audience.

"I need hardly say that the lecture throughout was a success. The clearness of the explanations and the novelty and beauty of the experiments held the audience in close attention for nearly two hours, and when Mr. Morton made his exit from the stage, amid applause even heartier than that which welcomed him, he carried with him a reputation as a scientific lecturer which I believe has never been equalled.

"During the following years similar lectures on related subjects were given by Mr. Morton in the same place. Some of their titles were the following: 'Reflection,' 'Refraction,' 'Sunlight,' 'Moonlight,' 'Eclipses,' 'Fluorescence,' and so on.

"In these lectures Mr. Morton used not only numberless new devices for the production of striking illustrations of scientific phenomena, but also brought into play appliances of the stage, such as shifting scenery to aid in color effects, stage traps to bring apparatus into position when wanted, and endless other applications.

"In looking over some old papers a few days since, I came across some interesting relics pertaining to these lectures in the shape of notes in Mr. Morton's writing, which were for my use as 'stage directions' in the management of his assistants and in securing the prompt and orderly succession of the experiments.

"They form curious reading and well illustrate how complex were the combinations and how necessary were complete organization and co-ordinate action to the successful presentation of these experiments. One of these memoranda reads as follows:

"'Then, when through, McIntyre will show diagram 6, Mr. Brown, Mr. Higby, etc., will then remove truck and lantern, while Mr. Sellers removes electric lamp to table and makes connections ready. Then Mr. Higby will RUN IN THE ANGEL, Mr. Sellers will light up electric lamp, Mr. Brown will light a red fire, and Mr. Stewart a piece of magnesium, as also Klapp, Phillips, etc.

"'Then Mr. Higby will RUN OUT THE ANGEL, and McIntyre will show diagrams 7 and 8, while Mr. Sellers removes the electric lamp and gets ready red and green fires.

"'Show shadow of veil and needle. Send out lantern by Klapp and Phillips.

"'Higby will then RUN IN EARTH, AND WORK MOON, then run off these and bring in movable flat.

"'Mr. Higby will then RUN IN MOUNTAINS on background and bank in front while Mr. S. SETS THE SUN ON FLOOR IN POSITION FOR RISING. Show spectre of Brocken. During this time Mr. S. will arrange the other electric lamp BEHIND THE MOUNTAINS for next experiment.

"'Mr. Outerbridge will tell Mr. Higby to lower white curtain, raise horizon drop, and RUN OUT MOUNTAINS, and McIntyre to show diagrams 3 and 4.

"'Experiments with electric light in the sun. Mr. S., on signal from Outerbridge, will



BURNING A SWORD DURING THE COURSE OF A LECTURE DELIVERED BY HENRY MORTON AT THE ACADEMY OF MUSIC, PHILADELPHIA, MAY, 1868.

light up and have combat of giant and dwarf. Klapp and Outerbridge. Rabbit on chair. CARRY OFF MEN IN HAND, run about and STEP INTO CEILING,' etc., etc., etc.

"I also find among my notes the perorations or concluding paragraphs of two of Mr. Morton's lectures, which are interesting as illustrating the poetical forms of expression which, judiciously introduced, added not a little to the charm of these discourses. The first was the conclusion to the lecture on 'Light,' in which the analogies, or, rather, close

relations, between sound and light, had been dwelt upon and fully developed. It reads as follows:

"'From what has been seen this evening I hope that you will be able to attach a more definite meaning to that frequently used, though vague expression, "Music of the Spheres."

"'There is such music. All day long, from the glowing sun, pours down an harmonious flood of commingled "light" notes, which are echoed, reflected, and reverberated in a thousand accordant tones from various natural objects. Then, when night comes upon the earth, the stars and planets from their far-off seats above the clouds send down songs, fainter but not less sweet, like the voices of birds, singing as they float and circle amid the sky. And always and in all places amid the nearer planets, and amid the more distant stars, and throughout the vast abyss of the universe, floats everywhere, floats eternally, that commingled symphony of luminous vibration which constitute the grand visible anthem of nature, the true "Music of the Spheres."'

"The other passage was the conclusion of a lecture on 'Color,' in which the composition of sunlight and the characteristics of light from colored stars had been, among other things, fully explained. It runs as follows:

"'As a merely poetical and not a very strict analogy, we may regard this experiment as a spinning of colored light threads into a single white cord. From the lantern to the screen run at first the seven colored threads, distinct and distinguishable at every point—then we give motion to the painted glass, and twist these seven bands into a single compound fillet of white light. Carrying out this idea into our contemplation of the astronomical universe it naturally develops itself into a very beautiful thought.

"'We seem to see the countless stars, each throwing out a web of light rays; some, like our sun, of woven white, others of every rainbow dye. Through this vast variegated web flash constantly the golden shuttles of the comets, weaving together, into compact perfection, the great and glorious universe, the "Garment of God."'"

These lectures were unique, and, I believe, so remain. In some of their details they were like an exhibition of legerdemain, except that here the lecturer explained, so that all could understand, how his marvellous effects were obtained. The biographical sketch by Professors Sellers and Leeds gives many reports of these lectures as extracted from the daily press, and they preserve in considerable detail the record of these novel, beautiful, and elaborate experiments so successfully performed, and in this record we find the anticipation of Dr. Morton's later more important successes. We find in this man of less than thirty years of age an unusual display of daring, originality, ability to impart knowledge, artistic temperament, thoroughness, and comprehensive grasp of details, resulting in a series of lectures at once accurate and popular.

Most of these lectures were delivered during the period of 1867 to 1870, and they served to make Professor Morton's name well known at home and abroad.

At a recent joint meeting of the Society of Chemical Industry, the American Chemical Society, the Chemists' Club and the Verein Deutscher Chemiker, Prof. C. F. Chandler gave an extemporaneous tribute to the memory of President Morton. After claiming him as his dearest and most intimate scientific friend for the past thirty years, and saying that he was amiable, generous, gentle, the soul of honor, and a most devoted husband and the best of friends, he enlarged par-

ticularly on his ability as a public lecturer, on account of the clear, simple, and incisive way he had of bringing the most intricate subjects within the reach of every intelligent listener, and claimed that he compared most favorably with our distinguished scientific lecturers, notably Prof. Tyndall.

In 1867 Prof. Morton was made editor of the "Journal of the Franklin Institute," a publication dating back to 1826, which had enjoyed in the past a wide and favorable reputation for the character of its original papers on engineering and scientific subjects; but it had at this time almost lost its reputation for originality.

Under Prof. Morton's editorial guidance and through his own contributions this journal quickly regained the ground which had been lost.

In 1868 Prof. Morton occupied the Chair of Chemistry and Physics at the University of Pennsylvania during the year's leave-of-absence granted to Prof. John F. Fraser; and after the return of Prof. Fraser, in 1869, the work of this department was divided,— a new Chair of Chemistry was created, and this was offered to and accepted by Prof. Morton.



Solar Eclipse, August 7, 1869

In 1869 Prof. Morton organized and conducted an expedition under the auspices of the United States Nautical Almanac office, to make photographs of the total eclipse of the sun, as observed on the 7th of August in the State of Iowa. The late Prof. A. M. Mayer, of Stevens Institute, was of this party.

In connection with these eclipse observations Prof. Morton was the first to prove the true nature of the bright line on the sun's disk adjacent to the edge of the moon, seen in partial-phase eclipse photographs.

Many of the most eminent men of the time had here fallen into error. Prof. Morton showed by experiments, absolutely conclusive, that this line was simply the result of a local redevelopment, and was therefore a photographic phenomenon, and not an optical one, as had been declared.

In this connection Prof. C. A. Young, of Princeton University, writes:

"Every one interested in astronomy remembers his most successful organization of the Philadelphia photographic parties which obtained such valuable results in their work on the eclipse of 1869, especially in the photography of the solar prominences."

During this period Prof. Morton wrote many papers on optics and mechanics. One on the Giffard injector was written at the request of the firm then controlling the manufacture in this country; for the invention was considered by many a mechanical paradox.

"A Scotch mechanic of considerable practical skill, who was sent to Paris by his English employers to report on this instrument, brought home a clear account of its form and operation; but, when asked to explain the philosophy of the propulsion of water by a steam jet into a boiler of greater pressure than the one that furnished the steam, answered the question as to what makes it work by the positive assertion, 'The Will o' God, mon, the Will o' God.'

"Now, the 'Will o' God,' as manifested in this and in many other remarkable discoveries, found in Prof. Morton an exponent who could make clear to the most ignorant the laws that not only govern the universe, but also govern such minor applications of these laws as constitute the remarkable inventions that from time to time, in rapid succession, are brought to public notice.

"Before we become accustomed to the discoveries that we cannot understand, and cease to wonder at them on account of our familiarity with them, there is needed somebody who is capable of making clear to the unscientific the principles that govern them: *and in this regard few have equalled Prof. Morton in his method and in his diction.*"

In this quotation the italics are mine, for I was continually struck by his remarkable capacity in this direction, and I have many times profited by it. Finally, this so impressed me that in the case of any question which seemed to contain some element of mystery, I came to feel that could the question be placed before President Morton the mystery would be quickly eliminated and all fallacies exposed.

Prof. Morton received the degree of Doctor of Philosophy from Dickerson College in 1869. The following year Princeton University conferred upon him the same degree. In 1870 Dr. Morton was tendered the presidency of the Stevens Institute of Technology.

But before passing from Dr. Morton's life in Philadelphia to his life in Hoboken, let me quote the words of some of his friends, more particularly of the former period. Dr. J. Foster Flagg writes:

"It was in the exciting days of 1861 when we first met, and I was at once impressed with the abundance of desirable attributes with which he was endowed. Our ac-

quaintance ripened promptly into friendship, and it was this which urged me in 1863 to favor most earnestly the tendering to him the Chair of Chemistry in the newly organized Philadelphia Dental College. This enterprise was a matter of the utmost importance to us who were engaged in it, and Mr. Morton's extreme youth — he being not quite twenty-seven years old — was urged as an objection to the experiment of placing him in the position, but as the result of a trial lecture he was most cordially invited to become one of the Faculty.

"For six years the service he rendered became increasingly acceptable, and the bonds of professional association a closer and stronger tie, until at last he one day came to my office with the call to the Stevens Institute — and with the friendly inquiry as to what he should do about it.

"I well remember, as though it were but yesterday, how my heart sank at the thought of the loss of him, but I also as well remember how my heart rejoiced in what seemed to me to be a heaven-sent opening for a glorious life-work; and so it was that strength was given me to urge an immediate visit to Hoboken and a prompt 'spying out of the land.'

"And all the years since then have been but added ones of continued affection between us, and of united gratitude for the blessings which have been poured out upon his lovely work of the 'ever since.'"



HENRY MORTON

From a Photograph Taken about 1863

In a subsequent letter Dr. Flagg writes of President Morton's interest and work in the art of dentistry as follows:

"It was in 1875, at the American Dental Association, that Dr. Palmer, of Syracuse, N. Y., continued his enunciation of his theory that 'failure in filling teeth was due to incompatibility of filling-material with tooth-bone' and that he was joined in this by Prof. Flagg, of Philadelphia, and soon after by Prof. Chase, of St. Louis.

"With the view to thorough discussion and experimental research in this regard it was suggested that a 'Corps' should be formed consisting of three Sections, viz.: Scientific, Metallurgic, and Dental.

"In furtherance of this organization President Morton and Prof. M. B. Snyder, of Philadelphia, were induced to form the Scientific Section; Messrs. Jacob B. Eckfeldt and Patterson Du Bois, Assayers of the Philadelphia Mint, to form the Metallurgic Section; while Dr. S. B. Palmer, Prof. J. Foster Flagg, and Prof. Henry S. Chase formed the Dental Section.

"Into this work President Morton entered with his usual interest, enthusiasm, and energy; and it was from this that great comfort and support were derived by all his associates, for it was recognized that upon the Scientific Section rested largely the status of the investigation.

"After two years of most interesting experimental and practical work, much of which was done, with President Morton's help, in the laboratory of Stevens Institute, a

'creed' was evolved which was so decidedly different from what was regarded as 'accepted' views that the technical term of 'New Departure' was applied to it, and as such it has become truly historic.

"It was from this 'Corps' that knowledge of plastic materials for filling teeth was given to dentistry from a scientific standpoint, and it was the broad range of relief to suffering humanity which this promised that so interested President Morton."

Mr. Theodore D. Rand writes:

"My acquaintance with Dr. Morton began in boyhood, while we were schoolmates at the Episcopal Academy together with Bishop Potter, Bishop Coleman, Dr. J. Andrews Harris, Dr. Potter, Dr. Conrad, and others who later in life were distinguished.

"At school and at home Morton was an unusually good boy, and was universally loved and respected, while his standing in his classes was excellent.

"Very early in his life he showed great mechanical talent. In the house of his father, Rev. Henry J. Morton, D.D., he had quite a workshop from which he turned out many creditable things, among others an accurate and sensitive chemical balance. Boy-like, he wanted a cannon, and Morton, Hartley Merrick, a son of Samuel Vaughan Merrick, and myself undertook to make one; but Morton did most of the work, making the pattern, a fan blower, flasks for the mold, and finally the carriage. The day of the casting was an eventful one with us. In the back yard of 140 South Ninth St., Philadelphia, where I was living, a furnace was contrived, and, urged by a blast from the fan, several pounds of copper and tin were melted and successfully poured. Merrick, whose father had a large machine-works, finished and bored the cannon, which was fired off with great appreciation.

"Early in his life Dr. Morton taught chemistry in the Episcopal Academy, and I well remember the great skill and care he exercised in designing a new chemical laboratory for the Academy.

"After his removal to Hoboken I saw little of him, though corresponding with him and visiting him occasionally.

"For many years I presume I was his most intimate friend. He was always the same, amiable and wise. I cannot recall that I ever knew him to lose his temper or to speak harshly or unkindly."

The cannon referred to by Mr. Rand is still in his possession. He has offered it to Stevens Institute, and this offer has been accepted.

Prof. Elihu Thomson, the eminent scientist, inventor, and electrical engineer, writes:

"A little less than forty years ago I listened with rapt attention, as a boy of eleven, to a scientific lecture, the first in my experience. It was given by a young lecturer, Mr. Henry Morton, to an audience of apprentices in Philadelphia, and was copiously illustrated by instructive experiments well calculated to appeal to the youthful mind. Years after that I became acquainted with Dr. Morton when he was secretary of the Franklin Institute, where he was held in the highest esteem. He was a frequent lecturer on scientific subjects to delighted audiences. His manner was uniformly courteous and kindly. His imagination and poetic sense, his enthusiasm, his skill in illustration, together with his easy command of language, filled his audience-rooms.

"On his leaving Philadelphia to take the presidency of the Stevens Institute, I

saw him infrequently, but remember reading his contributions to the early literature of dynamo-electric machinery and electric lighting, a remarkably clear and comprehensive set of articles. As the head of Stevens Institute he found his life-work. Of this period others are better qualified than I to speak. Only occasionally have we met in the later years, and letters to and fro at intervals, touching upon subjects of mutual interest, have in a sense supplemented these occasional meetings. I can say that my regard and esteem for Dr. Morton increased and deepened as the years went by. When we last met, early this year, there was no intimation of suffering or of the approach of a crisis in his life.

"As a man he was broad in his views and sympathies, versatile in talents, tolerant in his attitude, a true gentleman of high ideals.

"In answer to a solicitous communication on the subject of his health, he wrote me on April 12. The letter is in an autograph which discloses no dread or painful apprehensions."

To form the link between the two distinct periods in Prof. Morton's career, a few words written by Dr. Coleman Sellers may well be given, for Dr. Sellers's intimacy with Prof. Morton was never interrupted, and some years after the Institute was opened he took up the professorship of engineering practice and so again came closely in contact with Prof. Morton's work. Dr. Sellers writes:

"My long intimacy with President Morton, extending over more than forty years, has been more than that of friendship; his death is to me and to mine the loss of a beloved son, and the shock is as great. I have watched his mental growth from youth to ripe maturity, and our lives have been closely linked one to the other with no break in continuity during the whole time.

"As a sincere friend of the great school over which he so long presided, I recognize fully all he has done for its betterment and for the cause of engineering in the broadest sense of the term."

Dr. Morton accepted the presidency of the Stevens Institute, and then began a new and important step in his career and a distinct departure in technical education, for he and the Trustees decided to confine the Institute work exclusively to the teaching of mechanical engineering, and in doing so to make the effort efficiently to combine theory and practice.

When President Morton took up his new duties he recognized that his first working plan must be elastic; only to be put into more permanent form as the result of experience. From first to last he was ready to listen to suggestions from those who by experience were capable of giving intelligent advice.

As the Institute increased in years, he always had an open ear for suggestions from the Alumni, and especially those who had proved in their own careers the value of the training they had received. As might be expected from a man of President Morton's practical ability, the effort was always made to maintain and strengthen in the course the harmony between theory and practice. It may be fairly claimed that in the records so far made by the Alumni the value of this feature of the course has been well demonstrated. President Morton believed that the students should be able to perform the mechanical and practical work of the

course, and also thoroughly to understand the scientific reasons for this performance. In teaching scientific truths he was also careful to see that the practical application of these truths should be fully kept in mind. Although pre-eminent in the laboratory and on the platform, he was not a schoolman, but a practical man of affairs.

Almost at once upon taking up his work at Hoboken he was called in by prominent lawyers in New York to assist them in patent litigation. And here his practical and far-reaching grasp of scientific truths enabled him immediately to take a prominent position. Not only was he able to arrive at the truth by reason of his capacity in research and his powers for logical deductions therefrom, which amounted to genius, but he was able to place convincingly before the courts the results of his investigations. He never had to hesitate if there was a fallacy to be exposed.

But I can here best quote the words of some of those who in this line placed their dependence upon him. Mr. Frederic H. Betts says:

"I had the pleasure of becoming acquainted with him as an expert in patent cases at a very early stage of the practice of my profession, and he testified a few days prior to his death in a case in which I was counsel, and which, I believe, was the last case in which he appeared. It is difficult to say too much in praise of Dr. Morton's resourcefulness and efficiency as an expert in patent cases. The range and variety of his knowledge was great. He had it in complete command. His readiness in meeting unexpected contingencies and his forcibleness in stating his position in a patent contest were remarkable. I knew of no one who was his superior in those regards.

"I feel a sense of personal loss in the death of Dr. Morton; he was not only my coadjutor in many difficult legal contests, but I entertained for him a warm feeling of regard for his engaging personal qualities."

In this same connection Mr. William A. Jenner writes:

"My intimate acquaintance with Dr. Morton began in 1884 and arose from our taking long walks over the Berkshire Hills in the summer of that year. Since then we were quite frequently associated on the same side in patent cases, he as expert and I as counsel, and I also met him quite often on social occasions. One could not be very long in his company without being impressed by the variety and accuracy of his knowledge and his power of lucid explanation of intricate problems. This faculty of his was, of course, more specially manifest on social occasions which did not place any limit upon either the topics of discussion or the mode of treatment. In his handling, as expert, of questions arising under patents for inventions, those qualities of mind and his varied knowledge, and his power of lucid explanation to which I have above alluded, were also displayed, and they were supplemented by extraordinary acuteness in making accurate distinctions. The province of an expert in patent cases may be briefly described as comprising the functions of advising counsel in respect to the relations of the inventions under examination to the state of the art in the particular field of litigation, and, by answering questions propounded to him, to expound for the instruction of the court those relations. The latter especially make it necessary to express opinion, and to fortify these opinions by intelligent and valid reasons. In this work he was particularly happy. He was accus-

tomed to fortify his reasons by illustrations often taken from familiar subjects as well as by laws, phenomena, and happenings in the world of science which were often curious and of refreshing novelty, but which seemed to be always apposite, and one often wondered where he got them and how he could remember them. These qualities of his mind always made his depositions as interesting as such things can be. He never, at least in my experience, took a position which he did not conscientiously believe in. He was not, of course, always right, but he intended to be always right, and he frankly admitted the difficulties which confronted the positions taken by him and left the matter where it belonged, to the judgment of the court.

"In litigations over patents there is generally much to be said on both sides, and arguments often nearly balance. Under such circumstances he deemed it to be the duty of an expert, as indeed it is, to explain the matter, to suggest the considerations which weigh on either side of the question, and to afford a clue for either reconciling or deciding between conflicting arguments.

"I should say that the qualities mentioned above characterized Dr. Morton's labors as an expert.

"I might also mention his enthusiastic disposition. That disposition made him a most welcome coadjutor to counsel in a difficult case, his buoyancy of spirit was contagious; counsel felt refreshed by talking with him and hearing him talk, and a conversation or session with him increased one's confidence or hopefulness."

Mr. Livingston Gifford, writing on the same feature of President Morton's work, says:

"President Morton's familiarity with both the theoretical and the practical side of the arts, combined with his facility of clear and concise expression, and his perception of the decisive points of a controversy, made him easily the foremost expert witness of his time. It is safe to say that a greater number of decisions have been based on his testimony than on that of any other expert. For more than a score of years past he was retained in nearly all of the great litigations involving intricate questions for the physicist, the chemist, or the electrician.

"Whether the tribunal were the Federal or State courts of this country, the Canadian courts, or the Patent Office, his deposition was received with universal welcome by the judges, who knew that they would find in it a presentation of the salient facts in a manner most helpful to them in reaching a decision.

"But counsel who were associated with President Morton will always remember him as at his best in the consultation-room. There his conservatism and common sense were invaluable in determining upon the policy to govern litigations, and his genial disposition afforded so much pleasure to his associates that we look backward at the times spent in consultation with him as among the most enjoyable hours of our professional careers."

President Adolf Kuttroff, of the firm of Kuttroff, Pickhardt, & Co. (Dyestuffs), says:

"More than twenty-five years ago President Morton was chosen as the leading American expert in the chemistry of coal-tar coloring matters by the Badische Anilin & Soda Fabrik, which is the world's largest manufacturer in that branch of the science. From that time to the present we have had constant need of his aid in this most difficult art. Observation of his work from the standpoint of a client during all of these years resulted

in ever-increasing admiration for the brilliancy of a mind which qualified him to cope successfully, not merely with the best experts of this country, but with the best that could be brought against him from the very home of the art itself, Germany.

"If the countless chemical individuals of this art were better known to the general public, the position which President Morton filled in it would rank among the highest of the many honors with which his life has been crowned."

In the biographical sketch by Professors Sellers and Leeds, the record of President Morton's work as a patent expert concludes as follows:

"His printed testimony in these cases, if collected in a separate form, would equal in volume a set of Scott's novels, and much of it is very interesting reading to any one conversant with the subjects involved, and occasionally, as a specimen of witty dialogue, has proved entertaining to a general reader. It is often like a Socratic dialogue, only that the answerer, rather than the questioner, generally proves his point. It is full of passages which are models of clear, concise, and expressive diction."

President Morton was for many years the scientific adviser of the New York Board of Fire Underwriters. This board recently took action in reference to the loss it had sustained "by the death of our dearly beloved scientific adviser, Dr. Henry Morton." After the record at length of Dr. Morton's services, the following appears on the minutes of the meeting:

"That in the death of Dr. Henry Morton this board sustains an irreparable loss. He was a man of profound knowledge and withal of great modesty; a generous, unselfish citizen, contributing liberally of his time and means to the advancement of education, and by his example and precept, his intelligent researches, and practical application of his discoveries, has left as his best monument his beneficial influence upon the young men of his day and generation, and his contributions to the sciences in which he instructed others and of which he was himself a master."

Although President Morton prepared thoroughly for his work he was, by reason of his systematic methods and his unusual powers of absorption, able to do much of this expert work in addition to his work at Stevens Institute; and it was through the income derived from his expert work that he was always able to supply at the critical moment the financial needs of "Stevens." The Institute had been liberally endowed for what its founder had in mind; but the wise direction and management of President Morton increased its classes and widened its scope so that the endowment was found to be insufficient to meet the constantly increasing demands.

In 1881 President Morton presented to the Institute a new workshop, fitted up at an expense of $10,500.

In 1883 he equipped with apparatus the new Department of Applied Electricity at a cost of $2,500, and for several years thereafter he supplied the funds for the maintenance of this department.

In 1888 he made the first instalment of $10,000 toward the endowment of the Chair of Engineering Practice.

In 1892 he added $20,000 to this endowment.

In 1897, in connection with the Institute's Twenty-Fifth Anniversary Celebration, he placed in the hands of the Trustees, to be applied to the so-called Alumni Building Fund, stocks which shortly thereafter sold for $24,000.

In 1900 and 1901, in connection with the building of the Carnegie Laboratory, he erected at a cost of $15,000 a new boiler-house to supply the entire group of Institute buildings.

In the spring of 1901 he placed in the hands of the Trustees $50,000 in bonds, as a special endowment fund.

From his letter to the Trustees placing this last gift in their hands, it is evident that he fully realized how insecure was his hold on life.

In connection with their acceptance the Trustees passed the following resolution:

"WHEREAS, President Henry Morton has donated to the Stevens Institute of Technology $50,000 in bonds to be united with his previous donation of $30,000 for the Chair of Engineering Practice now superseded, in order to create an endowment fund for the maintenance of the chemical building soon to be erected from funds subscribed by himself and the Alumni; or, in case of other provision being made for the maintenance of this building, the income of the fund to be applied as need may arise for pensioning such retiring members of the Faculty of Stevens Institute as may, by reason of age or sickness, become incapacitated while in the employment of said Institute:

"*Resolved,* That the Trustees accept this additional donation in accordance with the terms set out in President Morton's letter of June 6, 1901, which is made part of the record of this meeting;

"*Resolved,* That the combined fund be known as the Henry Morton Endowment Fund;

"*Resolved,* That the Trustees hereby express to President Morton their keen appreciation of his continued generosity to the Institute, the repeated expressions of which aggregate a sum of no less than $145,000, whereby the Institute has been enabled to opportunely broaden its field of usefulness and meet developed requirements for which its original endowment proved inadequate; and further

"*Resolved,* That the Trustees avail themselves of this opportunity to record their recognition of the foresight and wise initiative exercised by President Morton in shaping the original character of the Institute, and their grateful sense of his able and devoted administration of its affairs to which, more than to any other source, the Trustees attribute its success."

With this, his last gift, President Morton had given back to the Institute, out of his earnings as an expert, an amount about equal to the total salary received by him as President.

With the work thus far referred to, his time was almost entirely employed, and therefore he found opportunity for only occasional contributions to the current technical journals, but what he wrote was opportune and of distinct value.

From 1873 to 1876 he wrote a series of notable papers on the phenomena

of fluorescence, which appeared in the *London Chemical News,* the *Moniteur Scientifique,* and the *American Chemist.*

Later he wrote a series of papers on the "Fluorescent and Absorption Spectra of the Uranium Salts" for the same journals.

He wrote the articles on "Fluorescence" for *Johnson's American Encyclopedia,* editions of 1878 and 1896, and the article on "Electricity" in the edition of 1878.

Articles on "The Maximum Efficiency of Galvanic Batteries," "The Pneumatic Pyrometer," "Conservation of Energy," "Gaseous Compounds of Iron and Metal with Carbonic Oxide," "Roentgen Rays," and "Photometry" were published in *Cassier's Magazine,* the *Stevens Institute Indicator, Engineering* (London) and elsewhere.

In 1899, when discussions on liquid air came before the public, he published several articles exposing the fallacies in connection therewith in the *Scientific American,* the *Stevens Institute Indicator, Cassier's Magazine,* and elsewhere.

The following may also be mentioned:

"Some Recent Developments in Artificial Illumination," *American Journal of Gas Lighting,* L, 139.

"Storage of Electricity," *Harper's Monthly Magazine,* 1882, LXIX, 84.

"Electricity in Lighting," *Scribner's Monthly Magazine,* 1889, VI, 176. Also included in "Electricity in Daily Life."

"Engineering Fallacies," *Cassier's Magazine,* VII, 200, 487, VIII, 428. Also *Stevens Institute Indicator,* XI, 273, XII, 125.

"Elimination of Antimony from the Human System," *American Journal of Medical Science,* 1879, p. 89; *Moniteur Scientifique,* XXI, 112.

"Notes on the Recent Progress of Applied Science," *North American Review,* 1879, p. 526.

"Measurements of an Edison Horseshoe Lamp," *Chemical News,* XLI, 109; *Scientific American,* XLII, 241; *Van Nostrand's Magazine,* XXIII, 1–16; *The Philosophical Magazine* (London), X. 21.

"Dynamo-Electric Machines," *Van Nostrand's Magazine,* XXII, 397, 441; *Report of the United States Light House Board,* 1879.

"The Gary Motor," *Journal of the Franklin Institute,* 1879, LXXII, 337.

"The True Relations of the Substances which Have Been Named Anthrapurpurine and Flavopurpurine," *Chemical News,* XXXIX, 225; *Moniteur Scientifique,* XXI, 872; *Journal of the American Chemical Society,* I, 186.

"Water Gas from Coal; Its Calorific Energy," *American Journal of Gas Lighting,* XXXII, 99.

"American Competition," *Engineering* (London), LXIX, 12. Written at request of editor.

President Morton found time for some study in quite a different direction, — Biblical criticism. This was one of the subjects to which he turned for change and rest. His studies and investigations were here again applied to the benefit of others in clearing away the mists of prejudice and bigotry; his occasional writ-

ings here serving to strengthen the faith of those who were not able to believe in the verbal inspiration of the Bible, but were not, on the other hand, willing to reject its message. With his scientific attainments, his logical mind, and his genius for analysis he was peculiarly fitted to meet the shallow criticisms of those who held that the advance in scientific knowledge had removed all basis for faith in Bible truths; while on the other hand his uncompromising honesty made him unsparing of those who by their bigotry had done so much to make the acceptance of these truths difficult if not impossible.

Like Huxley, he followed without hesitation or regret wherever truth led; but unlike Huxley, with the heart and mind of a poet, he felt the truths which cannot be mathematically demonstrated. Huxley's investigations, while teaching him to feel more and more the incompleteness and unsatisfactoriness of this life, also led him to assert the impossibility of setting up any definite theories as to a future life. Morton's investigations served to clear away the doubts which had been suggested to his mind by ignorant and narrow interpretations of the Bible.

While a student at the Institute, and since I have been practising my profession, I was privileged to go to President Morton for help when groping for the truth. I never applied to him in vain. When some practical matter was involved with which he was not familiar, his cross-examination soon gave him the necessary insight into the problem and enabled him to clear away my difficulty or to put me into a position to clear it away for myself. So in discussing with him questions of the Higher Criticism my reason was satisfied when I was led to appreciate more and more fully that there is something to be finally reckoned with far above and beyond the human reason.

In spite of his modesty he asserted his beliefs when circumstances seemed to demand. The following words from Bishop Henry C. Potter show how these declarations for the truth had their effect. President Morton and the Bishop had known each other since the school days in Philadelphia, but of late years there had been no opportunity for intimacy.

"I shall never think of him without recalling the occasions, which occurred more than once in my history, when in some critical moment he wrote to me expressing his appreciation of some utterance of mine; or some position which I had taken which involved a departure from old conventions and the recognition of new truths, or a new vision of the truth, in the realm both of morals and of theology. Such a man was a benediction to his time; and his loss is not alone a loss to the Stevens Institute, but to all that is best in our modern life."

As an example of his writings on the Higher Criticism it may be recorded that in 1897, at the request of the editor of the "Bibliotheca Sacra," he wrote an article entitled "The Cosmogony of Genesis and its Reconcilers," which appeared in the April and July numbers of that quarterly magazine for 1897. Writing in

the "Expositor," June, 1898, the Rev. Professor S. R. Driver, D.D., of Oxford, refers to this article of President Morton's as follows:

"But since 1888 times have changed. In the 'Bibliotheca Sacra' for April and July, 1897, there appeared two articles by President Henry Morton, of the Stevens Institute of Technology, Hoboken, N. J., in which the whole subject was reopened, and the arguments of the 'Reconcilers' were subjected to a searching examination, with the result that, in substance, precisely the same conclusions are arrived at which were reached by me twelve years ago in the 'Expositor.' To this indorsement of my conclusions by a professed man of science, who is plainly also well able to appreciate the theological aspects of the question, I naturally attach no small weight. President Morton examines in detail, first the reconciliation of Prof. Guyot (pp. 11–39 of the reprint), then more briefly — for this theory is in many respects the same as that of Prof. Guyot, so that there is no necessity for repeating the same criticisms — that of Prof. Dana (pp. 39–43), then (pp. 43–50) that of Sir J. W. Dawson, and lastly that of Mr. Gladstone (pp. 50–57); his own view, in stating which he refers with warm approval to Prof. Henry Drummond's paper in the 'Nineteenth Century' for February, 1886, follows, pp. 57–62. I cannot well abridge the trenchant and detailed criticisms by which President Morton exposes, one after another, the unreality of all these schemes of reconciliation; but, speaking generally, the rock upon which each in turn is wrecked is the extreme and incredible violence done to the text of Genesis for the purpose of forcing its statements into harmony with what is taught by science.

"Prof. Guyot, for instance, finds in the division of the waters below the 'expanse' from those above it (v. 7), the separation of the 'visible lower starry world' from the primitive luminous nebula; and in the appearance of the dry land above the water (v. 9) the whole history of the earth according to the nebular hypothesis, including a stage in which it was a self-luminous sun! How Prof. Dana understands the apparently simple terms 'earth' and 'water' has been stated already. Sir J. W. Dawson, if he treats the text of Genesis with less violence than this, nevertheless makes many other wholly unauthorized assumptions: he harmonizes the work of the Third Day, for instance, not with the history of the earth as attested actually by geology, but with an *assumed* history, which assigns to plants and trees a place in better conformity with the narrative of Genesis (p. 47 *f.*). President Morton expresses frequently his astonishment at these and the other extraordinary suppositions, by means of which the cosmogony of Genesis is 'reconciled' with the cosmogony of science; and at the singular paradoxes to which even able men will commit themselves when a given opinion has at all hazards to be maintained. His general conclusion is stated in these words:

"'In reading the works of all these writers, the impression is the same. The more we admire their ability, learning, and pious enthusiasm, the more clearly do we see that they have undertaken an impossible task, and that their failures are in no way due to any deficiencies on their part, but only to the insoluble character of the problem they have set themselves to elucidate.'

"And he considers (pp. 57–62) the true solution of the problems presented by the cosmogony of Genesis to have been found by those scholars who read it in the light of the age in which it was written, and who, while not forgetful of the spiritual teachings of which it is made the vehicle, interpret it, on its material side, in accordance with the place which it holds in the history of Semitic cosmological speculation."

President Morton's studies in Biblical science naturally led him to take a

deep interest in archæological investigations in the East. His record in this connection can be best told by some of those who were associated with him in this work. Dr. Willis Hatfield Hazard writes:

"The most significant aspect of President Morton's intellectual power was its versatility. The capacity to devote himself to wholly dissimilar subjects with equal perception and equal sympathy secured for him that poise, many-sidedness, breadth, and inherent dignity of mind that marked him as one of the very rarest of men. This genius for appreciating diverse intellectual interests not only contributed an irresistible charm to his personality in every social relationship, but was of supreme use in enabling him to perform that remarkable measure of good works which has been universally lauded by all who knew him.

"The most striking illustration of this quality was President Morton's interest in archæology and theology. These lines of work early drew his attention. While still an undergraduate at the University of Pennsylvania he made the famous translation of the Rosetta Stone which has since been rated as among the rarest books published during the century. The illustrations that enliven the text were wholly young Morton's work, and proved a strong artistic inheritance from his father, who had an uncommon talent for spirited and graceful drawing. This volume was in large part an original contribution to the infant science of Egyptology, being the first complete English translation of the Greek, demotic, and hieratic scripts. It was the interest thus early aroused that paved the way in later years for a delight in archæology most unusual on the part of a physicist.

"The practical turn came through the allied science of Biblical Criticism. President Morton was one of the first laymen to appreciate the significance of the new learning. Ten or twelve years ago the scientific difficulties with current interpretations of the Bible and Christianity received their first satisfactory solution to his mind through the explanations afforded by the Higher Criticism. With the singular mental alertness and sympathy that marked his nature he grasped at once the value of these researches. His scientific mind was charmed with the clear reasoning and the splendid conquests of the secrets of the past that were being made by the new literary and critical studies. For him they brushed away hitherto insoluble problems as mist before the sun.

"This sense of obligation to the higher critics led to his becoming their frequent and valiant champion in the public press. The extraordinary spectacle was presented of a physical scientist writing articles for journals, reviews, magazines, and newspapers on theological and archæological questions as a protagonist for the highest technical scholarship in opposition to the almost universal disdain, not to say contempt, in which the religious world held these new theories.

"A great change has taken place in educated thought in the decade during which President Morton wrote for the New York 'Tribune,' 'The Churchman,' 'The Outlook,' 'Bibliotheca Sacra,' 'The Church Eclectic,' and a host of similar publications. There can be no doubt that this change of public opinion, which is still in progress, has been materially aided by President Morton's keen logic, sound scientific learning, and philosophical acumen.

"One result of these studies in Biblical science, during the course of which a theological library of large proportions was collected and read, was an appreciation of the importance of archæological work in the East. When the present American expedition for excavating Ur of the Chaldees and other Babylonian sites was organized some eighteen months ago, it found a ready friend in President Morton. His interest in the work was deep and vigorous as soon as he was acquainted with its purpose. After the expedition was fully organized, the money yet unsubscribed to the sum which the committee thought requi-

site to carry on the work for one year was guaranteed by Dr. Morton personally. This generous act not only completed the official equipment of the expedition, and enabled its director to start for Constantinople, but it put Dr. Morton virtually at the head of the organization, and identified his name permanently with Oriental archæology as among its most enlightened supporters. His sagaciousness and practical advice in the conduct of the expedition's affairs was of the highest value — indeed, under the circumstances, his fathering care to the day of his death was an indispensable element in its ultimate success. As with many other public interests, the loss to archæology of this man, who was one of its most intelligent patrons, will be irreparable.

"To illustrate the nature of Dr. Morton's interest in the Ur expedition, it is only necessary to refer to the now famous archæological dinner that he gave last December at the Waldorf-Astoria, New York. Although far from well, Dr. Morton devoted himself for several days to the designing and constructing of a number of table ornaments. These exhibited the brilliancy and ingenuity of his mind in precisely the same way that the lectures in the Philadelphia Academy of Music had done years before. They embodied that sense of congruousness and proportion and fitness in detail that seemed part of the man's mental feeling, and that had been vital in his lifelong success as a popularizer of science. The ornaments were miniature reproductions of objects of interest to Orientalists and archæologists, and were prepared with consummate taste and arranged with exceeding cleverness. The obvious meaning of the whole scheme was the surprise and delight of the distinguished guests. Thanks largely to these admirable efforts, the dinner proved the most original and characteristic social gathering of the year.

"The labors of such a man in the varied fields of thought that interested him could not help being of notable value. As a matter of fact, few of his peers have exercised a deeper influence on those with whom they came in contact, whether personally or otherwise. His monument is far larger than even the institution whose fortunes he guided with such signal ability. It is built into the lives of hundreds of men who had the great privilege of profiting by his companionship and example."

Dr. James B. Wasson writes thus of President Morton's interest in archæological subjects:

"From his earliest manhood Dr. Morton was not merely an enthusiastic student of Oriental languages and of archæology, but an original investigator in these great departments of history. I say history advisedly, because they were so regarded by him. He held that the language and the buried remains of an ancient race furnished the only trustworthy data for understanding it. Yet he realized how easy it was to misinterpret and misunderstand these records of the buried past. His enthusiasm as a student and investigator was always held in restraint by his cautious scientific spirit.

"In spite of his brilliant achievements in so many lines of original investigation, Dr. Morton had no pride of opinion. With him truth was supreme, and the words of St. Paul, 'Prove all things; hold fast that which is good,' inspired and guided him in every act of his life.

"Another marked characteristic that distinguished him was his painstaking thoroughness. I recall an incident of the archæological dinner which he gave last winter at the Waldorf-Astoria, that illustrated this trait in his character. He had written the names of the guests on the dinner cards in illuminated hieroglyphics, which to some of us — myself included — was an unknown tongue. I would therefore have taken my name on the card for what it purported to be in complete good faith. But so great was his passion for accu-

racy that he called my attention to one or two very slight imperfections in the transcription, due to hurry. He could not endure the thought of even seeming to take advantage of my ignorance in a trivial matter like this. It was in such a spirit of absolute and loyal devotion to truth that he did all his work. 'Ye shall know the truth, and the truth shall make you free' always seemed to him the noblest and most inspiring utterance of the Master whom he served with such unostentatious devotion through all the years of his life."

Dr. Cyrus Adler, Librarian of the Smithsonian Institution, writes:

"In the midst of a busy life, devoted to the things of to-day, Dr. Morton found time to remember the days of old, the peoples of Egypt and Babylon. As a young man, a



The Living Hand on the Screen, Shown during the Course of a Lecture Delivered by Henry Morton at the Academy of Music, New York, February 3, 1871

student at the University of Pennsylvania, and a member of a committee of three of its famous literary society, the Philomathean, he assisted in the preparation of a translation of the Rosetta Stone, doing much of it himself, and the hieroglyphic part altogether. He had immediate charge of its publication by a lithographic process. The volume had two editions, and is one of the most noteworthy publications ever issued by students in the United States.

"More than forty years after this first show of interest in Egypt, Dr. Morton came forward as an earnest advocate and ready helper of the proposed expedition to Ur of the Chaldees in Babylonia. He was one of the executive committee, and up to the present the

most generous contributor to its funds. I met him a number of times on the committee in connection with this work and was impressed with his enthusiasm for its objects, his knowledge of the details required in their execution, and his willingness to sacrifice his time and his means so that another buried city of ancient Babylon might be made known to men."

President Morton had been desirous for a year or two of submitting himself to an operation in the hope of obtaining relief from constant pain and weariness. But as long as Mrs. Morton was alive, and, as an invalid, demanded his care, and while matters in connection with the building and endowment of the Carnegie Laboratory required his personal attention, he refused to risk his life in the attempt to secure this relief. After Mrs. Morton's death and the completion of the Carnegie Laboratory, he then felt warranted in taking this risk. But he was concerned about the inability of the director of the Ur expedition to obtain a firman from the Porte authorizing the work of excavation. This had been deferred month after month. It was therefore a great comfort to him when in the hospital, a few days before his death, he received a cable message announcing the fact that the firman had been granted. For fear that the work might still further be delayed by lack of means, he sat up in bed, weak as he was, and drew his check for an amount to cover immediate necessities.

As President Morton felt his physical infirmity gaining on him, he became more and more anxious that the Carnegie Laboratory of Engineering should be fittingly dedicated, and that Mr. Carnegie himself should be present at the exercises. This matter was constantly on his mind for many months.

In anticipation of the event he designed a number of novel features for the banquet table,[1] including a perfect facsimile of a modern blast furnace which, when "tapped," yielded punch; a Bessemer converter which during the "blow" gave out flames, but when reversed produced cakes; an open-hearth furnace which yielded fried oysters. Items of the menu were contained in ingot-molds, ladles, etc.

The bread was molded in the form of railroad spikes, as a reminder that this was one of the inventions of Robert L. Stevens. President Morton also conceived the idea of finding and verifying a piece of the first T-rail ever laid, another of Robert L. Stevens's inventions. This he succeeded in doing, and under his careful supervision a silver box was prepared to receive this T-rail sample for presentation to Mr. Carnegie.[2]

After a number of disappointments President Morton succeeded in making all the arrangements for the dedication, including the attendance of Mr. Carnegie. On the evening of February 6, 1902, Mr. Carnegie presented to the Trustees the building bearing his name, and President Morton, on behalf of the Alumni Association, presented to Mr. Carnegie the T-rail in its beautiful casket.

The result of the evening's exercises was to demonstrate anew President Morton's versatility; while the successful issue of the novel features was neces-

[1] See *ante*, p. 60.

[2] For description of this box see *ante*, p. 57

sarily the outcome of careful and artistic supervision, the address by President Morton was graceful, witty, and delightful, and served to draw from Mr. Carnegie a spontaneous response of the happiest character.

The record of the exercises and the events leading up thereto were reprinted from the "Indicator," enriched with appropriate illustrations, and the final directions for the binding of a special copy for presentation to Mr. Carnegie were given by President Morton in the hospital, a few days before his death.

So on his death-bed he provided for the work still remaining to be done.

Unfortunately the sense of relief so obtained served to confirm him in the belief that his work was done, and that he was free to go to join those who had gone before. This led him to look bravely forward to the beyond rather than to struggle to remain. In answer to our remonstrances he would smile and say he was prepared to go or stay. But this very readiness to go made it hard to detain him.

But there was a less serious side to Dr. Morton's life. For recreation he wrote verses, and sometimes applied his ability with the pencil and brush in the illustration and illumination of these productions.

Of one phase of this lighter side of his life, his friend, Thos. B. Craig, the artist, has this to say:

"Dr. Morton had that in his nature which, if he had devoted his life to the pursuit of art, would have placed him in the foremost rank of the profession.

"His eye for form and color, his keen enjoyment from an artist's standpoint, united with a true understanding of composition, were gifts such as few enjoy.

"His work on the illustrations in connection with the text of the Rosetta Stone volume, and in various other things which I have had the pleasure of seeing and discussing with him, often caused me to think that the world of art had lost a bright star.

"His judgment of pictures on exhibition was that of one who looked into both subject and composition from an artist's point of view, and that of no narrow kind.

"Together we have visited most of the important exhibitions held during the past dozen years, and his remarks on the drawing, qualities of color, and execution of the pictures of various schools of art, were as instructive as they were interesting. There was always that quiet vein of humor, well known to his intimate friends, which made him a delightful companion in such jaunts. In a life so full of many interests his love of art never flagged.

"The last evening I spent at his home, his water-colors and brushes were before him on his table. He had been working on some designs. We find him thus to the very last doing something to gratify his love of art."

In the same connection Mr. George H. McCord, the artist, writes:

"I cannot speak with too great warmth of Dr. Morton's appreciation and love of art; his knowledge in this direction was almost unlimited, and was based upon an intelligent discrimination. He found time, in the midst of arduous study and research in matters pertaining to electrical and mechanical engineering and archæology, to keep in touch with artists of reputation and their work.

"All 'brethren of the brush' were welcome visitors in his beautiful home, and participated frequently in the delightful hospitality extended by himself and Mrs. Morton."

It yet remains to speak of President Morton as a man of letters, and here his friend, Mr. Thomas A. Janvier, the writer, may be quoted:

"In my twenty years' friendship with Dr. Morton I saw many of his many sides, and in all of them there were both edification and charm. But oftenest — because of his keenly sympathetic intuitions which made him adapt himself to the mental capacities, and even to the mental incapacities, of his friends — our talks were of literary matters, and of his own lighter activities (as they were by contrast with the varied very serious activities of his highly useful life) in literary ways.

"His habit, in common with many hard thinkers, was to seek mental relaxation in story-reading: a little laughing at his own liking for vivid fiction; but rarely failing to make his excursions into romance of value to others by a running fire of commentary in which his wit and his critical acuteness had full play. As a critic he was admirable: precisely because he had high literary standards, and because he lived up to those standards in his own literary work. In literature, as in science, he got his results by direct experiment; and the soundness of his knowledge and his ability to apply it were shown in the strength and clearness of his prose, and still more markedly in his polished, smoothly-flowing verse. With him poetry was a natural form of expression. As was to be expected from one of his kindly temperament and lively humor, he was peculiarly happy in his verses of occasion. But he sounded also a deeper note. In such poems as 'The Discontented Island'—a most delicate fantasy, treated with serious purpose and a great tenderness — he dealt with the deep principles of human nature; and his work of this order, it is interesting to observe, was informed by an imaginative quality that, in a way, was a by-product of the powerful imagination which was a necessary part of his equipment as a creative scientist.

"It is to be regretted that so few of his poems have been published. For himself, he was content with the agreeable recreation that he found in writing them; and with the further pleasure that he found — and gave — by printing one now and then in a dainty pamphlet, illustrated in accordance with his own suggestions, for circulation among his immediate friends. Sometimes, and that was the best of all, he would read one to a few of us gathered of an evening in his library — a room so filled with characteristic belongings that it absolutely was a part of himself. The reading rarely was of set purpose. Something in our casual talk would suggest it; or there would be on an easel a fresh lot of illustrations for one of his booklets, and we would ask for the poem to which they belonged. And then we would have our reading — the charm of the poem increased by the charm of his voice — in quite an accidental way.

"Indeed, it was because everything went easily and a little by chance in those evenings, that they were so delightful. Their only constant and certain quantities were a great friendliness and a flow of brilliant talk, that sometimes held seriously to a single topic the whole evening through, and that sometimes played with a dozen topics in an hour. In those givings and takings of thought he was equally good as a leader or as a listener, and I cannot remember an occasion on which any subject was broached about which he was not deeply and accurately informed. At the end of our talks he left us always the better for his wisdom or his wit: and yet his method was such that, for the moment, we would have the feeling that he was merely refreshing knowledge that we possessed and had suffered to grow rusty, or that his keen comments and lively sallies of fancy were what we were about to say ourselves.



ILLUSTRATION FOR A HUMOROUS POEM ENTITLED "THE DAMSON TART; OR, TRUE LOVE"
From a Color Design Painted by Professor Morton in 1866

"The charm of those evenings — and it was the same charm that made all who came in touch with him better and happier — was his strong, warm sympathy in the doings and in the hopes of his fellow men. His manifestation of that sympathy was not careless or fitful.

"The considerate purpose of his life was to add to the happiness of other lives. He believed, and he realized his belief, that only on the lines of reciprocal helpful kindness can the approach to universal happiness be made. Here, in his own words, is the statement of his creed:

"'None are alone,
Each hand in hand with each
Is travelling toward the fair sublime unknown.
Forget thy little self. One moment turn
Thine eyes upon the universe and learn
That thou, and with thee all created things
Are fellow architects
Each one of whom erects
In part, from out this present heaven and earth,
New earths, new heavens of surpassing worth
Lovely beyond thy best imaginings.

"'Oh, weary, weeping heart, then turn
From vain repinings at thy state!
With thy vast brotherhood of nature learn
Ever to work and wait.
And rest assured of this, oh, soul of mine,
Thy essence is eternal and divine,
And shall not share its mortal garment's fate.'"

Mr. Richard Watson Gilder, the well-known poet and editor, writes:

"How well I remember the late Henry Morton, who used to come into the office in Philadelphia, where I was employed, in the days when he was astonishing the city by his ingenious and popular lectures on science, and winning laurels also by his share in the enterprise of translating and representing the Rosetta Stone with its inscriptions. His was a singularly handsome and genial presence, and it seemed to me that he never lost his charm and look of youth. The making of verses was only one evidence of his many-sided talent. His poems seemed to me interesting experiments in verbal form and inventive fancy, and were entered upon largely in a spirit of recreation. I thank you for letting me record my admiration for this interesting man whose career was so consistent, so honorable, and so widely useful."

Thus reaching out into some of the many fields of his activities, the attempt has been made to bring together the testimony of some of those who were his co-workers. No matter how roughly this testimony has been woven together, the facts stand out that Henry Morton was a great scientist, a brilliant demonstrator of natural phenomena, an able administrator, a practical man of affairs, an advanced educator, and a gentle, God-fearing man.

I have made no special reference to his unostentatious charities. Let the following words which he wrote some years ago on the death of a dear friend be applied to him as he applied them to his friend:

"In the vast caravan which o'er the sand
Of time creeps onward toward the promised land

Of human hope and happiness for each,
Which yet how few of all that host may reach,
Out-worn, exhausted by the toilsome way,
Our brother fell, as 't were but yesterday:
He fell, to rise no more beneath the sky,
But passed into the perfect life on high.
Ah, gentle soul, so loving, kind, and true,
What blessedness was there in store for you.
Hath He not said, who His own life hath given
And died in agony to win us Heaven,
'Blessed and welcome to eternal rest
Are those through whom their fellow-men are blessed;
Who 've soothed with kindly hand another's grief
And found delight in ministering relief,'
That 'Even a cup of water given in love
Might win perennial streams 'mid meadows fair above.'
What hand so prompt as his for other's aid?
What heart so kind has ready hand obeyed?
No thought of self found harbor in that breast
Always unbarred to welcome the distressed.
The kindliest soul that e'er to man was given,
With him departing, sought its native heaven.
The blessings that commingled with our tears
Amid Heaven's harmonies he surely hears;
And the fond love his goodness won him here
Will find its way to him even in that highest sphere,
For hath it not been said by Him we trust
Supremely: of the good, the true, the just,
That: 'From their labors when at last they rest,
Their works do follow them, and they are blessed.'
We mourn with bitter tears and heartfelt woe
The loss we suffer missing him below.
But for our grief is surely balm in this,
He enters earlier into endless bliss;
There by the shining river's shade-cool shore
He waits to welcome, having gone before."



President Alexander C. Humphreys

ALEXANDER CROMBIE HUMPHREYS, M.E., Sc.D., LL.D.

President of Stevens Institute of Technology

So CLOSELY were President Morton and Mr. Humphreys linked by friendship, and by unity of hope, purpose, and endeavor in the interests of Stevens, that praise of the elder naturally implies indorsement of the younger as his successor.

Likewise the remarkable call of Mr. Humphreys to the vacant presidency, by the unanimous vote of Trustees, Faculty, Alumni, and Undergraduates of Stevens Institute, is additional tribute to the master-mind which conceived this system of education, and which hitherto has governed the destinies of Stevens.

For Mr. Humphreys was not only the choice of Dr. Morton's mind and heart, but one of his own graduates whom he had especially helped to perfect. Mr. Humphreys was the one man whom he desired as his successor, although Dr. Morton's characteristic modesty scarcely entertained that hope. Could he have known of Mr. Humphreys' coming succession, it would have cheered his last hours. Therefore to understand and appreciate Mr. Humphreys' peculiar fitness for the Presidency of the Stevens Institute of Technology is a special tribute to the memory and influence of Henry Morton.

In my deliberate opinion [1] Mr. Humphreys' greatest, probably far greatest, work is still before him. The loss of his beloved sons, on the Nile, February 12, 1901, while it laid bare the folly of human vanities, has but increased his human interests and sympathies. His one residual ambition is to extend his usefulness, to the limit of his energies, in the most practical fields for good works.

His personality must lend new life to a field unploughed by such forces, for not before has technical education been directed by so unique a blend of broad technical attainment, rare executive ability and experience, and that comprehensive grasp of practical affairs which alone unites cause and effect with a true sense of proportion, and conserves to maximum usefulness the energies within its sphere of influence.

In addition, Mr. Humphreys is a Stevens graduate, and the first father of a Stevens graduate—who closed his young life with an act glorifying to his Alma Mater. Before Mr. Humphreys became President of Stevens, he was a Permanent Trustee of the Institute, and was a Past-President of the Alumni Association. He had founded a scholarship, had initiated the course in Business Methods and Bookkeeping, and had lectured to the undergraduates and addressed the graduating class. As President, therefore, he is an old friend in a new and more potent guise, and his heart is in the work.

[1] These words, and also a large portion of this biography, are taken from the sketch of Mr. Humphreys' life, written for the "Stevens Institute Indicator" of October, 1902, by his business partner and personal friend, Mr. Arthur Graham Glasgow, M.E., '85.

Alexander Crombie Humphreys was born in Edinburgh, Scotland, March 30, 1851. His father, E. R. Humphreys, M.A., M.D., LL.D., was an English classical scholar of profound erudition; a well-known educator. The immediate antecedents of his mother, Margaret MacNutt, were from Nova Scotia and Prince Edward Island. Dr. Humphreys, with his family, moved from England to the United States in 1859, and was domiciled in Boston, where he later took out letters of naturalization. His children, being minors, *ipso facto* became American citizens.

Mr. Humphreys' early aspirations were maritime. At the age of fourteen he received an appointment to the United States Naval Academy and successfully passed a special test for entrance. He was, however, much under the regulation age, and was consequently debarred by the authorities. He then began work in a Boston insurance office, pending the period when he might legally enter the Naval Academy. But in 1866 he joined the staff of the Guaranty & Indemnity Co., of New York, and, his interest being thus diverted, he remained with that company until 1872, rising from junior office-boy to a post of high responsibility. On the 30th of April in the latter year he married Eva, daughter of the late Dr. Émile Guillaudeu, of Bergen Point, N. J. The directors of the gas company of that district, having noted his characteristics, induced him to become secretary, and shortly afterward also superintendent, of the Bayonne & Greenville Gas Light Co.

Mr. Humphreys' unparalleled success as a gas engineer and manager has led many of his acquaintances to consider that work especially adapted to his talents, and to regard his accidental failure to enter the navy as a happy contributory cause to his success. To attribute any measure of his success to gas engineering is to ascribe to that somewhat restricted industry opportunities greater than those enjoyed in other fields of endeavor. On the contrary, it is due to Mr. Humphreys himself that he and many who have followed him have found satisfying scope in gas-manufacture, for he has given an impetus to the American gas industry which is little short of revolutionary. Its stagnant technical condition when he entered Stevens Institute is in happy contrast to the occupation it now affords to seventy Stevens graduates.

Nor was Mr. Humphreys especially fitted for this line of work. On the contrary, after toiling for five years at the underlying drudgery of the business, he perceived that he was not justifying the hope of notable success in his work. He then evidenced, for the first time unmistakably, the fundamental qualities to which his success is due. Having convinced himself of what may be fairly called his unfitness for his occupation, he did not cast about for more congenial and promising employment, but straightway grappled with himself. It was not his work, but himself, that aroused his dissatisfaction. He felt the will to wring success out of existing circumstances, and looked to increase his forces rather than to smooth his path. His deliberate conclusion was that he needed special technical education and training in order to raise his work to a satisfying plane.

Having reached his conclusion, as an accountant arrives at his balance, he was not long in making new and radical dispositions. He first sought the President of Stevens Institute, who ultimately agreed to accept him as a special student on the understanding that he would attend Institute classes two mornings each week. In this way Dr. Morton thought he might, in six years, complete the regular four years' course of the Institute, provided his strength and determination lasted,—small wonder if Dr. Morton doubted the latter!

Mr. Humphreys had left school at the age of fourteen, twelve years previously. He was without the habit of study, and utterly unqualified to pass the entrance examinations of the Institute. He had been a bread-winner during that period of irresponsible youth when most of us have stored our potential energy. He had assumed responsibilities in his community which he could not relinquish; for during his Stevens course he was vestryman and treasurer of Trinity Church and superintendent of its Sunday School, member of the Bayonne Board of Education, and foreman of the Volunteer Fire Brigade. To crown all, his wife, two young children, and himself were wholly dependent upon the modest salary derived from his responsible and exacting employment.

But out of his gravest responsibilities he drew his greatest strength. He had found the woman whose price is above rubies, and through her self-sacrificing devotion the deficient scholar overtook and mastered one of the most difficult of collegiate courses.

Three children in all were born to Mr. and Mrs. Humphreys, two of whom were drowned.[1] The remaining one, Eva Margaret, was married to Mr. H. S. Loud, M.E., (Stevens, '90), August 3, 1898.

Mr. Humphreys entered Stevens in 1877, and graduated with his Class in 1881. He thus compressed into his few "spare moments" the work which normal students, fresh from advanced schooling, accomplished only by four years of unremitting application. So remarkable an achievement was formally recognized by resolutions of commendation and congratulation addressed to Mr. Humphreys, adopted by the Faculty of the Institute June 11, 1881.

Shortly after his graduation Mr. Humphreys became chief engineer of the Pintsch Lighting Co., of New York. In this position, which he held for over three years, he built many oil-gas works, acquired great experience in the manufacture and utilization of gases of high illuminating power, and ascertained the gas-making values of all kinds of oil, especially with reference to the compression and storage of gas for the lighting of railway trains, ferryboats, light-buoys, etc. To this end he conducted much experimental and demonstrative work, and greatly broadened his previous knowledge of the gas industry.

In 1885 Mr. Humphreys was appointed superintendent of construction for the United Gas Improvement Co., and shortly afterward its general superintendent, with headquarters in Philadelphia.

[1] See *ante*, pp. 17, 195.

During Mr. Humphreys' decade with the United Gas Improvement Co., the increase in his responsibilities more than kept pace with the marvellous growth of the company. He was first constructing engineer, next general superintendent, then he annexed the contracting department, then the purchasing agent's department, and finally the commercial management of all of the company's works. In addition he was acting general manager of the Welsbach Incandescent Gas Co. (controlled by the United Gas Improvement Co.) while its independent organization was being effected. During this time the gas works comprised in the company's system increased from ten to nearly fifty.

In May, 1892, the firm of Humphreys & Glasgow, of London, was established; and in August, 1894, Mr. Humphreys retired from his official connection with the United Gas Improvement Co. in order to establish the firm of Humphreys & Glasgow, of New York.

When Mr. Humphreys announced his resignation at the sixth annual meeting of the engineers and superintendents of the United Gas Improvement Co., held in Philadelphia, April 21, 1894, the subjoined resolutions were unanimously adopted:

"Whereas, Alexander C. Humphreys, General Superintendent of the United Gas Improvement Co., has, at this meeting of superintendents, engineers, and other employees assembled, announced his resignation and withdrawal from the services of the company, and—

"Whereas, this announcement is received by us with profound and heartfelt regret, it is herewith—

"Resolved, that this occasion be taken to express to Mr. Humphreys our deep regret at the severance of the present relations; that we herewith convey to him the expression of our admiration, esteem, and affection for him as a man; and that we extend to him our heartfelt wishes for his success in whatever lines of work he may hereafter engage.

"To the building up of a business to be carried out on lines that were a departure from existing precedents, there was required a man of unusual foresight, ability, and clearness of purpose. In the development of the United Gas Improvement Co., under Mr. Humphreys, we recognize the logical outcome of such ability, and the work of a natural leader and of a manager foremost in his profession, and we believe that the working organization that he has perfected stands to-day the best and most enduring monument to his labors.

"A conscientious worker, rarely skilled in his profession, indefatigable and earnest in purpose—he, more largely than any other one person, has been the factor that has brought the United Gas Improvement Co. to its present enviable position in the gas world; to a point where its integrity, rank, and purpose are recognized, and where connection with it is an honor to every man of us here assembled.

"But while we recognize, as above, the business ability of Mr. Humphreys, there is a deeper and a sweeter attraction that draws us all to him, and that makes the pain of losing him the greater,—and that is, his integrity, his individuality, his personality, and his magnetism as a man. Rarely, indeed, is seen a man so conscientious in his effort to meet his responsibility to his employers; so keenly appreciative of earnest work; so impartial in his judgment; so constant and so successful in the effort to act with fairness to all. Of no man can it be more truly said, he is a man of honor, integrity, and justice.

"To the younger men of us his example is one for admiration and inspiration, showing the possibilities of a man. To the older men here assembled, who have known him during years of association and of ever-increasing respect, there is but admiration for his unswerving adherence to his principles and belief, for his constant kindliness, his daily living of the Golden Rule. In his new fields of labor the united good wishes of this assembly go out to him for his success, joined with the earnest hope for continuance to him of good health.

"Again, in losing him, we express the unanimous, profound, and heartfelt regret of every man among us; for in working with him we have learned to love him."

To this may be added the following extract from one of the gas journals:

"Mr. Humphreys has built up the present system of management of controlled companies which is the admiration of gas men throughout the world, and which enables the company's small army of employees to be worked as a unit. In 1885 the company had practically no well-defined system of managing its various properties, which at that time numbered less than ten. During the next few years, while the new system was being developed, more than twenty works were added to the number. The development of the Humphreys system, which is the chief distinguishing work of the author, had to be undertaken without any guide in the way of previous experience.

"An impartial history of the progress of water gas during the past twenty years must place in the foremost rank three names: These are Lowe, Granger, and Humphreys. To the first belongs the palm of mechanical success; to the second, that of commercial success; to the third, that of the perfect development of both of these. If such a history were to be confined to a single chapter, the caption of that chapter might well be written: Water Gas, Before and After Humphreys."

Mr. Humphreys was especially responsible for the development of the "Lowe" water-gas apparatus into its present form, known as the "double-superheater," and the London firm of Humphreys & Glasgow, of which Mr. Glasgow is the active partner, was the first to introduce this type of water-gas apparatus into foreign countries. The New York firm confines its business to the management of lighting properties and to consulting, Mr. Humphreys' professional advice being of special value to bankers in connection with schemes of reorganization and consolidation.

On June 5, 1902, Mr. Humphreys was elected President of Stevens Institute of Technology by a unanimous vote of the Board of Trustees, who adopted the following resolution:

"Resolved, that the Trustees of Stevens Institute, feeling assured of the eminent fitness of Mr. Humphreys to carry on the work so well established by Dr. Henry Morton, and rejoicing in the cordial unanimity with which the faculty, students, and alumni indorse his nomination, do appoint Mr. Alexander C. Humphreys President of the Stevens Institute of Technology."

In 1903 the degree of Doctor of Science was conferred upon President Humphreys by the University of Pennsylvania, and the degree of Doctor of Laws by Columbia University.

Mr. Humphreys has been the chief executive officer of more than fifty-five gas and electric-light companies, and was for a time President of the Syracuse Gas Co., of Syracuse, N. Y.; Vice-President of the United Coke & Gas Co., of Philadelphia, Pittsburg, and New York; and President of the City Gas Co., of Norfolk, Va. At present Mr. Humphreys is President of the Stevens Institute of Technology; senior member of the firm of Humphreys & Glasgow, gas engineers, New York and London; President of the Buffalo Gas Co.; and President of the Manganese Steel Safe Co., of New York; a director of the Taylor Iron & Steel Co.; and a director of the Consolidated Gas Co., of Baltimore, Md.

He is a member of the following technical societies: American Society for the Promotion of Engineering Education; New York Section of Society of Chemical Industry; Institution of Civil Engineers, Great Britain; American Society of Civil Engineers; American Society of Mechanical Engineers; American Institute of Mining Engineers; American Gas Light Association; Western Gas Association; New England Association of Gas Engineers; Society of Gas Lighting, New York; Ohio Gas Light Association; Pacific Coast Gas Association; The Franklin Institute; American Association for the Advancement of Science; British Association for the Advancement of Science; American Chemical Society; and the American Academy of Political and Social Science; also of the following societies: Chamber of Commerce, New York; American Geographical Society; New York Botanical Garden; Metropolitan Museum of Art; Civic Federation, New York; School of Applied Design for Women (Director); Society of Art Collectors (Director); Municipal Art Society; Wild Flower Preservation Society of America; Civil Service Reform Association, Philadelphia, and the Delta Tau Delta fraternity; and an honorary member of the Tau Beta Pi fraternity; and in addition he is a member of the Century Association, the University Club, Philadelphia, and the Lotos, City, Church, Lawyers', Chemists', Buffalo, Parmachinee, St. Maurice Fish and Game, Philadelphia Cricket, and Somerset Hills Country clubs; and the Morris County, Nassau Country, Manchester (England), West Lancashire (England), and Turnberry (Scotland), golf clubs. He is also connected with about thirty societies engaged in philanthrophic work, is Junior Warden of St. Paul's Church, Glen Cove, N. Y., and treasurer and member of the Vestry of All Angels' Church, New York.

Mr. Humphreys was President of the American Gas Light Association for the year 1898–1899. It was through the agency of this Association that Mr. Humphreys and Mr. Walton Clark—his successor in the United Gas Improvement Co.—were instrumental in establishing the Correspondence Class in Gas Engineering. This class has been a marked success.

Mr. Humphreys has contributed a number of valuable papers to technical literature. The more important of his writings are included in the following list:

"Water Gas; Its Efficiency as Compared with Coal Gas." Prepared as a Graduating Thesis, 1881.

"Illumination *versus* Candle Power." Read before the American Gas Light Association, October, 1887.

"Water Gas in the United States." Read before the British Association for the Advancement of Science, August, 1899.

"The Stevens Course in Engineering." Address to the Alumni Association of Stevens Institute, January, 1891.

"Theory *versus* Practice." Read before the American Gas Light Association, October, 1892.

"Address to the Graduating Class of Stevens Institute," 1893.

"Enrichment of Coal Gas." *Progressive Age,* August 1, 1894.

"The Question of Economical Gas Enrichment," by A. C. Humphreys and A. G. Glasgow. *Journal of Gas Lighting* (English), November 6, 1894.

"The Commercial Value of Photometry." Read before the American Gas Light Association, October 16, 1895.

"The Alleged Law of Inverse Squares." Written discussion of paper by B. E. Chollar under above title, read before the Western Gas Association, May 20, 1896.

"Self-Education in Gas-Engineering." Read before the Western Gas Association, May 20, 1896.

"Some Experiments in Interior Illumination." Written discussion of paper by C. H. Page, Jr., read before the American Gas Light Association, October, 1896.

"Inclined Retorts up to Date." Written discussion of Fred. Egner's paper on above subject, read before the American Gas Light Association, October 28, 1896.

"Cheap Gas." Consideration of the questions involved in a fair analysis of the question of cheap gas at any one locality. Read before the Society of Gas Lighting, New York, January, 1897.

"Is a Knowledge of Business Methods of Importance to the Engineer?" Read before the Senior Class of Stevens Institute, March 23, 1897.

"Correspondence Schools." Read before the New England Association of Gas Engineers, February, 1899.

"President's Annual Address," delivered before the American Gas Light Association, October, 1899.

"Recent History of the Hall (Chisholm) Gas Process." Read at the March, 1900, meeting of the Society of Gas Lighting, New York.

"Talk on Business Methods." Read before the students of Stevens Institute, March 30, 1900.

"Should the Stevens Curriculum Include Instruction in Bookkeeping and Accounting?" *Stevens Institute Indicator,* July, 1900.

"Investigation of Gas Processes." Read before the Pacific Coast Gas Association, July, 1900.

"Obituary, Henry Morton, Ph.D., Sc.D., LL.D." *Stevens Institute Indicator,* July 1902.

"President's Opening Address to the Faculty and Students of Stevens Institute," September 24, 1902.

"Technical Education; Its Bearing on the Question of Commercial Supremacy." Delivered October 15, 1902, before the Newark Wednesday Club.

"Technical Education." Address to the Alumni of the Massachusetts Institute of Technology, Boston, December 26, 1902.

"Instruction in Business Methods for the Engineer-Student." *Cassier's Magazine,* March, 1903.

Inaugural Address, delivered February 5, 1903, upon the occasion of his taking oath as President of Stevens Institute of Technology. *Stevens Institute Indicator,* April, 1903.

Address to the Alumni of Stevens Institute and their guests at the Inaugural Banquet, February 5, 1903. *Stevens Institute Indicator,* April, 1903.

"The Commercial Value of a College Training." Address before the Alumni of Columbia University, June 10, 1903.

"The College Graduate as an Engineer." Address at the College of the City of New York, December 15, 1903. Published in the *Stevens Institute Indicator,* January, 1904.

"Our Correspondence School." Read at the October, 1903, meeting of the American Gas Light Association, at Detroit, Mich.

"The Claims of Business upon the Engineer." Address to the students of Armour Institute, March 23, 1904.

"The Engineer as a Business Man." Address to the students of the University of Wisconsin, March 25, 1904. Published in the *Stevens Institute Indicator,* July, 1904.

"The Engineer, to be Practical, Must be Trained in Business Methods." Address to the students of Sibley College, Cornell University, April 22, 1904.

"The Crowding of the Curriculum." Paper presented at the September, 1904, meeting of the Society for the Promotion of Engineering Education.

"The School." Address before the American Society of Civil Engineers and visiting members of the Institution of Civil Engineers, September 16, 1904. Published in the *Stevens Institute Indicator,* October, 1904.

"Notes on Some of the Business Features of Engineering Practice." Used as a text book in the Department of Business Engineering of Stevens Institute, 1904.

ALFRED MARSHALL MAYER, Ph.D.

Professor of Physics, 1871–1897

Alfred M. Mayer was born in Baltimore, Md., November 13, 1836. He was the son of Charles F. Mayer, a distinguished jurist of the Baltimore bar, and nephew of Col. Brantz Mayer, U.S.A., the historian, and founder of the Maryland Historical Society. His grandfather, Christian Mayer, a native of the old free imperial city of Ulm, on the Danube, came to this country in 1784 and resided during the remainder of his life in Baltimore, where he formed the firm of Mayer & Brantz, and engaged in commercial transactions with, and in voyages to, Holland, Italy, Denmark, Isle of France, Calcutta, and Madras. Christian Mayer was also consul-general to the kingdom of Wurtemberg.

Alfred M. Mayer was educated at St. Mary's College, Baltimore, which institution he left in 1852 to enter the workshop and draughting-room of a mechanical engineer, where he acquired a knowledge of mechanical processes and the use of tools, for which he had a natural aptitude. He remained in this place for two years and then took up a course of laboratory practice in physics and chemistry for two years more, during which period his first contribution to science, entitled "A New Apparatus for the Determination of Carbonic Acid," was published both in this country and in Europe. It was at this time that he attracted

the attention of Joseph Henry, who was then Secretary of the Smithsonian Institution, and who had been for thirty years identified with the advancement of pure science. The encouragement which young Alfred Mayer received from this distinguished scientist did much to influence him to a life devoted to scientific research. At the remarkably early age of twenty years he was made Professor of Physics and Chemistry in the University of Maryland, and three years later accepted a similar position in Westminster College, Missouri. He went abroad in 1863 and entered the University of Paris, where he pursued his studies in physics, mathematics and physiology. While in Paris he was a pupil of the distinguished physicist Regnault. On his return to this country in 1865 he became Professor of Physics in Pennsylvania College, Gettysburg, where he remained until 1867, when he was called to the Chair of Physics and Astronomy in Lehigh University, where he designed and equipped an astronomical observatory, erected the delicate instruments and finished the tedious work of adjusting them, without assistance. A series of systematic observations on Jupiter were made, the results of which were published on two continents.



Prof. A. M. Mayer

During the summer of 1869 the United States Almanac Office selected Prof. Mayer to take charge of one of several parties of astronomers sent out to make observations of the total solar eclipse of August 7. At Burlington, Iowa, forty-two perfect photographs were taken with exposures of 0.002 seconds each. This was in the early days of photography and was accounted an unusual feat; five of these photographs being taken during the eighty-three seconds of totality. The results given by these Burlington photographs were published in an elaborate paper in the "Journal of the Franklin Institute," and in the publication of the Almanac Office. While at Lehigh University he published, also, a number of articles on physical and astrophysical subjects, and in 1869 read a paper at the Salem meeting of the Scientific Association on "The Thermodynamics of Waterfalls" based on observations made at Trenton Falls and Niagara Falls.

In 1871 Professor Mayer was called to Stevens Institute of Technology to organize and take charge of the Department of Physics. Of his connection with Stevens, "Science" of August 20, 1897, says:

"It is with this institution, therefore, that his name will be chiefly identified, though his researches were for the most part in channels somewhat removed from those that are

usually characteristic of an engineering school. Its instrumental equipment was unusually good, and proximity to a great metropolis afforded the intellectual stimulus and the prompt recognition of merit which are wanting in isolated institutions of learning."

The same journal also says that—

—" soon after entering upon his duties at Hoboken, Professor Mayer began the series of investigations in acoustics for which he is perhaps best known, and which made him decidedly the leading authority on this subject in America."

One of the strong points of Dr. Mayer's character was his great industry in his profession, and he has been alluded to as the " prince of experimenters." His labors since 1855 resulted in about one hundred publications, of which six are standard books. All of his writings are characterized by a clear and graceful style, and embody that personal charm of originality which he alone possessed. Acoustics was his favorite field of research, although electricity, electro-magnetic phenomena, and optics, especially photometry and color-contrasts, received much of his attention.

The degree of Doctor of Philosophy was conferred upon Prof. Mayer in 1864 by the Pennsylvania College. In 1872 he was elected a member of the National Academy of Sciences, and was connected with many other scientific societies, among which may be mentioned the American Philosophical Society, the American Academy of Arts and Sciences, the New York Academy of Sciences, and the American Meteorological Society. He was a corresponding member of the British Association for the Advancement of Science, and a Fellow of the American Association of the same name; he was also a member of the Century Club.

With all the scientific work which Prof. Mayer accomplished in his three-score years, he found much time to devote to outdoor recreation. While in youth he became an accomplished marksman, and during his entire life was an exceptionally successful sportsman. In 1884 he won the national championship in minnow-casting with a rod of his own invention. The columns of the " Century Magazine " frequently received articles from him on sporting subjects, and in 1883 he edited and was author of a number of chapters of a superbly illustrated book entitled " Sport with Gun and Rod in American Woods and Waters." This book is spoken of by the " Scientific American " as " one of the finest books on sports that has ever been produced." He also took particular pleasure in the study of archæology, in which subject he showed an unusual acumen. While in France some years ago he secured some remarkable finds of prehistoric handiwork, almost in the identical places where Boucher de Perthes carried on his earliest researches more than sixty years ago.

Prof. Mayer married Catherine Duckett Goldsborough in 1865, and they had one son, Alfred G. Mayer. He lost his first wife, and in 1869 married Maria

Louisa Snowden. By this marriage there were two sons, Brantz and Joseph Henry Mayer.

The following is a list of papers and publications embodying results of original researches of Prof. Alfred M. Mayer from 1871 to 1897:

"Acoustical Experiments, Showing that the Translation of a Vibrating Body Causes It to Give a Wave-Length Differing from that Produced by the Same Vibrating Body when Stationary." *Am. Jour. Sci.*[1], April, 1872; *Phil. Mag.*[2], XLIII, 278; *Pogg. Ann.*[3] CXLVI; *Comptes Rendus*, March, 1872; *Nature*, May 9, 1872; *Karl Rep.*[4], VIII, 128.

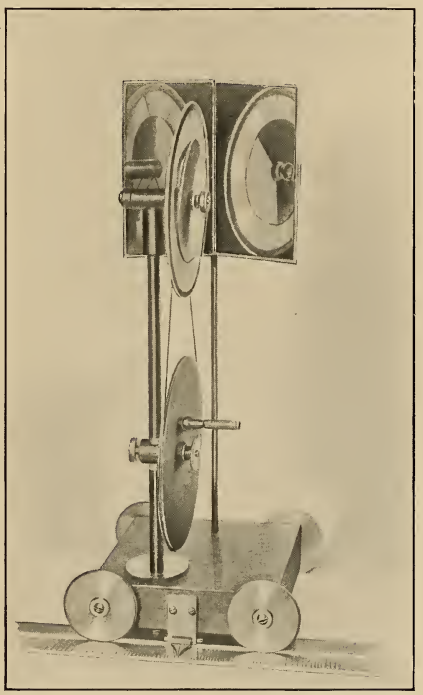
"On a New Form of Lantern Galvanometer." *Am. Jour. Sci.*, June, 1872; *Phil. Mag.*, XLIV, 25; *Karl Rep.*, VIII, 133; *Jour. Frank. Inst.*[5], 1872.

"On a Precise Method of Tracing the Progress and of Determining the Boundary of a Wave of Conducted Heat." *Am. Jour. Sci.*, July, 1872; *Phil. Mag.*, XLIV, 257; Abstract of the above in the *Journal de Physique*, 1872.

"Remarks on Dr. R. Radau's Paper in Dr. Karl's *Repertorium*, Entitled, 'Remarks on the Influence of a Motion of Translation of a Sounding Body on the Pitch of the Sound'." *Am. Jour. Sci.*, September, 1872; *Karl Rep.*, 1872.

"Erratum of the Errata; or, A Few Millions." *Nature*, September 5, 1872; *Am. Jour. Sci.*, October, 1872.

"On a Method of Detecting the Phases of Vibration in the Air Surrounding a Sounding Body; and thereby Measuring Directly in the Vibrating Air the Length of Its Waves and Exploring the Form of Its Wave Surface." *Am. Jour. Sci.*, November, 1872; *Phil. Mag.*, XLIV, 321; *Pogg. Ann.*, CXLVIII, 278.



CHROMATIC PHOTOMETER
Prof. A. M. Mayer

"The Manometric Flames of Dr. R. König." *Amer. Jour. Sci.*, December, 1872.

[1] "American Journal of Science." [2] "Philosophical Magazine." [3] "Poggendorf's Annalen." [4] "Karl's Repertorium." [5] "Journal of the Franklin Institute."

"On a Simple and Precise Method of Measuring the Wave-Lengths and Velocities of Sound in Gases; and on an Application of the Method in the Invention of an Acoustic Pyrometer." *Ibid.*, December, 1872; *Phil. Mag.*, XLV, 18; *Pogg. Ann.*, CXLVIII, 287.

"On the Experimental Determination of the Relative Intensities of Sound; and on the Measurement of the Powers of Various Substances to Reflect and to Transmit Sonorous Vibrations." *Am. Jour. Sci.*, February, 1873; *Phil. Mag.*, XLV, 90; *Journal de Physique*, 1873.

"On the Effects of Magnetization in Changing the Dimensions of Iron, Steel, and Bismuth Bars, and in Increasing the Interior Capacity of Hollow Iron Cylinders." Part I. *Am. Jour. Sci.*, March, 1873; *Phil. Mag.* XLV, 350.

"On a Simple Device for Projecting on a Screen the Deflections of the Needles of a Galvanometer, and thus Obtaining an Instrument Convenient in Research and Suitable for Lecture Experiments." *Am. Jour. Sci.*, April, 1873; *Phil. Mag.*, XLV, 260; *Karl Rep.*, IX, 65.

"On the Effects of Magnetization in Changing the Dimensions of Iron, Steel, and Bismuth Bars, and in Increasing the Interior Capacity of Hollow Iron Cylinders." Part II. *Am. Jour. Sci.*, August, 1873; *Phil. Mag.*, XLVI, 177.

"Researches in Acoustics, Paper No. 5, containing: 1. Experimental Confirmation of Fourier's Theorem as Applied to the Decomposition of the Vibrations of a Composite Sonorous Wave into Its Elementary Pendulum-Vibrations. 2. An Experimental Illustration of Helmholtz's Hypothesis of Audition. 3. Experiments on the Supposed Auditory Apparatus of the Culex Mosquito. 4. Suggestions as to the Function of the Spiral Scalæ of the Cochlea, Leading to an Hypothesis of the Mechanism of Audition. 5. Seven Experimental Methods of Sonorous Analysis Described and Discussed. 6. The Curve of a Musical Note, Formed by Combining the Sinusoids of Its First Six Harmonics; and the Curves Formed by Combining the Curves Corresponding to Various Consonant Intervals. 7. Experiments in Which Are Produced from the Above (sec. 6) Curves the Motions of a Molecule of Air when It Is Animated with the Resultant Action of the Six Elementary Vibrations Forming a Musical Note; or Is Set in Motion by the Combined Action of Sonorous Vibrations Forming Various Consonant Intervals." *Am. Jour. Sci.*, August, 1874; *Phil. Mag.*, XLVIII, 445.

"Researches in Acoustics, Paper No. 6, containing: 1. The Determination of the Law Connecting the Pitch of a Sound with the Duration of Its Residual Sensation. 2. The Determination of the Numbers of Beats, throughout the Musical Scale, Which Produce the Greatest Dissonances. 3. Application of These Laws (1) and (2) in a New Method of Sonorous Analysis, by Means of a Perforated Rotating Disk. 4. Deductions from These Laws Leading to New Facts in the Physiology of Audition. 5. Quantitative Applications of These Laws to the Fundamental Facts of Musical Harmony." *Am. Jour. Sci.*, October, 1874; *Phil. Mag.*, XLIX, 352.

"Researches in Acoustics, Paper No. 7, containing: Experiments on the Reflection of Sound from Flames and Heated Gases." *Am. Jour. Sci.*, November, 1874; *Phil. Mag.* XLIX, 428.

"On a New Method of Investigating the Composite Nature of the Electric Discharge." *Am. Jour. Sci.*, December, 1874; *Phil. Mag.*, XLIX, 47; *Journal de Physique*, 1875.

"A Redetermination of the Constants of the Law Connecting the Pitch of a Sound with the Duration of Its Residual Sensation." *Am. Jour. Sci.*, April, 1875.

"The History of Young's Discovery of His Theory of Colors." *Ibid.*, April, 1875; *Phil. Mag.*, February, 1876.

"On Proposed Researches in Acoustics." *Am. Jour. Sci.*, April, 1876.

"The Discovery of a Method for Obtaining Thermographs of the Isothermal Lines of the Solar Disk." *Ibid.*, July, 1875; *Nature*, August, 1875.

"Mayer's Method of Obtaining the Isothermals of the Solar Disk." *Nature*, October, 1875.

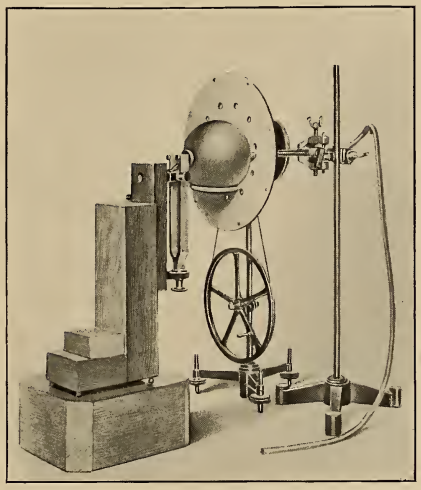
"Researches in Acoustics, Paper No. 8, containing: 1. On the Obliteration of the Sensation of One Sound by the Simultaneous Action on the Ear of Another More Intense and Lower Sound. 2. On the Discovery of the Fact that a Sound, even when Intense, Cannot Obliterate the Sensation of Another Sound Lower than It in Pitch. 3. On a Proposed Change in the Usual Method of Conducting Orchestral Music, Indicated by the Above Discoveries. 4. Applications of the Interferences of Sonorous Sensations to Determinations of the Relative Intensities of Sounds." *Am. Jour. Sci.*, 1876; *Phil. Mag.*, 1876; *Nature*, August 10, 1876.

"Experiments with Floating Magnets; Showing the Motions and Arrangements in a Plane of Freely Moving Bodies, Acted on by Forces of Attraction and Repulsion; and Serving in the Study of the Directions and Motions of the Lines of Magnetic Force." *Am. Jour. Sci.*, 1878; *Nature*, XVIII, 1878.

"On the Morphological Laws of the Configurations Formed by Magnets Floating Vertically and Subjected to the Attraction of a Supposed Magnet; with Notes on Some of the Phenomena in Molecular Structure which these Experiments May Serve to Explain and Illustrate." *Am. Jour. Sci.*, October, 1878.

"Observations on the Transit of Mercury of May 6, 1878." *Sci. Am. Supp.*[1], May, 1878.

"Translation, with Additions, of Prof. Dvorak's 'Acoustic Repulsion'." *Am. Jour. Sci.*, July, 1878; *Phil. Mag.*, 1878.



ACOUSTIC EXPERIMENT
Prof. A. M. Mayer

"Experimental Researches in the Determination of the Forms of Acoustic Wave-Surfaces, Leading to the Invention of the Topophone, an Instrument to Determine the Direction of a Source of Sound." *Am. Jour. Otology*, October, 1879.

"The Velocity of Shot." *A. A. A. S.*[2], 1880.

"A New Method of Obtaining a Permanent Trace of the Plane of Oscillation of a Foucault Pendulum." *Ibid.*, 1880.

"On a Simple Means of Measuring the Angle of Inclination of the Mirrors Used in Fresnel's Experiment on the Interference of Light." *Ibid.*, 1880.

---

[1] "Scientific American Supplement." [2] American Association for the Advancement of Science.

"Henry as a Discoverer." A Memorial Address, Delivered August 26, 1880, in Sanders Theatre, Harvard University, before the American Association for the Advancement of Science.

"On a New Heliostat." *Nat. Acad. Sci.*[1], April, 1882.

"On a Method of Precisely Measuring the Vibratory Periods of Tuning-Forks, and the Determination of the Laws of the Vibrations of Forks; with Special Reference of the Facts and Laws to the Action of a Simple Chronoscope." *Memoirs, Nat. Acad. Sci.*, III, pt. I, 1884.

"On the Well-Spherometer; an Instrument that Measures the Radius of Curvature of a Lens of any Linear Aperture." *Am. Jour. Sci.*, July, 1886.

"Experiments with a Pendulum-Electrometer, Illustrating Measurements of Static Electricity in Absolute Units." *Ibid.*, May, 1890.

"On Electric Potential as Measured by Work." *Ibid.*, May, 1890.

"On a Large Spring-Balance Electrometer for Measuring (Before an Audience) Specific Inductive Capacities and Potentials." *Ibid.*, June, 1890.

"An Experimental Proof of Ohm's Law: Preceded by a Short Account of the Discovery and Subsequent Verification of the Law." *Ibid.*, July, 1890.

"On the Determination of the Coefficient of Cubical Expansion of a Solid from the Observation of the Temperature at which Water, in a Vessel Made of This Solid, Has the Same Apparent Volume as It Has at 0° C.; and on the Coefficient of Cubical Expansion of a Substance Determined by Means of a Hydrometer Made of This Substance." *Ibid.*, October, 1890.

"On the Illuminating Power of Flat Petroleum Flames in Various Azimuths." *Ibid.*, January, 1891.

"On the Physical Properties of Hard Rubber, or Vulcanite." *Ibid.*, January, 1891.

"On a Method of Transferring Chladno's Acoustic Figures to Paper without Distortion." *Nat. Acad. Sci.*, April, 1892.

"Studies of the Phenomena of Simultaneous Contrast-Color; and on a Photometer for Measuring the Intensities of Lights of Different Colors." *Am. Jour. Sci.*, July, 1893; *Stev. Ind.*[2], X, 326.

"Researches in Acoustics; Paper No. 9, containing: 1. The Law Connecting the Pitch of a Sound with the Duration of Its Residual Sensation. 2. The Smallest Consonant Interval Among Simple Tones. 3. The Durations of the Residual Sonorous Sensations as Deduced from the Smallest Consonant Intervals Among Simple Tones." *Am. Jour. Sci.*, January, 1894.

"An Apparatus to Show Simultaneously to Several Hearers the Blending of the Sensations of Interrupted Tones." *Ibid.*, April, 1894.

"On the Production of Beats and Beat-Tones by the Co-Vibration of Two Sounds so High in Pitch that when Separately Sounded They Are Inaudible." *Nat. Acad. Sci.*, April, 1894.

"On the Production of Beat-Tones from Two Vibrating Bodies Whose Frequencies Are so High as To Be Separately Inaudible." Oxford Meeting of the British Association for the Advancement of Science, August 13, 1894.

"On the Berthellot-Mahler Calorimeter for the Determination of the Calorific Power of Fuels." *Stev. Ind.*, April, 1895, p. 133.

---

[1] National Academy of Sciences. [2] "Stevens Indicator."

"A Simple Linkage Showing the Laws of the Refraction of Light." *Nat. Acad. Sci.*, April, 1895.

"Note on the Analysis of Contrast-Colors by Viewing through a Reflecting Tube a Graded Series of Gray Disks, or Rings, on Colored Surfaces." *Am. Jour. Sci.*, January, 1896.

"Researches in Acoustics. Paper No. 10, containing the Variation of the Modulus of Elasticity with Change of Temperature as Determined by the Transverse Vibration of Bars at Various Temperatures." Read before the British Association for the Advancement of Science at Oxford, August, 1894. *Ibid.*, February, 1896; *Stev. Ind.*, XIII, 107. (The results contained in these various researches in Acoustics, extending over twenty-four years, have been embodied by Lord Rayleigh in his "Theory of Sound," 2 vols., London, 1894–96.)

"Researches on the Roentgen Rays, containing: 1. The Roentgen Rays Cannot Be Polarized by Passing through Herapathite. 2. The Density of Herapathite. 3. The Formulæ of Transmission of the Roentgen Rays through Crown Glass, Aluminum, Platinum, Green Tourmaline, and Herapathite. 4. The Actinic Action of the Roentgen Rays Varies Inversely as the Square of the Distance of the Sensitive Plate from the Source of the Rays." *Am. Jour. Sci.*, June, 1896.

"Malus' Residence in Paris, where He Discovered the Polarization of Light, Located by Means of the Angle of Polarization of Light Reflected from the Windows of the Luxemburg Palace." *Nat. Acad. Sci.*, April, 1896.

"On the Floating of Metals and Glass on Water and Other Liquids." *Science*, September 4, 1896; *Stev. Ind.*, October, 1896, p. 400.

"An Experimental Investigation of the Equilibrium of the Forces Acting in the Flotation of Disks and Rings of Metal; Leading to Measures of Surface-Tension." *Nat. Acad. Sci.*, October, 1896.

The following books have been written by Prof. Mayer:

"The Earth a Great Magnet." A lecture delivered before the Yale Scientific Club, February 14, 1872. D. Van Nostrand, New York.

"Lecture Notes on Physics." *Jour. Frank. Inst.*, 1869; "Light." D. Appleton & Co., New York, 1877.

"Sound." D. Appleton & Co., New York, 1878.

"Sport with Gun and Rod in American Woods and Waters." Illustrated. 1 vol. roy. 8vo. The Century Co., New York, 1888.

Prof. Mayer has also written articles for cyclopædias and technical journals as follows:

"Harmony," "Microscope," "Music," "Pyrometer," "Sound," "Spectrum," and "Stereoscope," in Appleton's "American Cyclopædia," 1874–75.

"Diamagnetism," in "Johnson's Cyclopædia," 1876 and 1893.

"Magnetism" and "Radiometer," *Ibid.*, 1877.

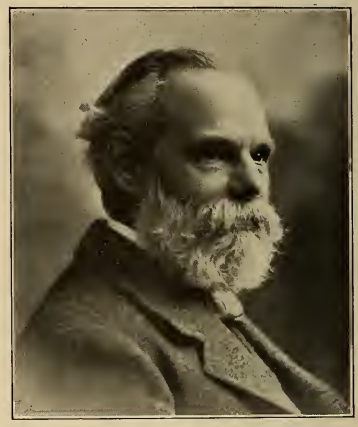
"Edison's Talking-Machine," "Flying-Machines and Penaud's Artificial Birds" (translated from the *Journal de Physique*), and "Marcy's New Results in Animal Movements," in the *Popular Science Monthly*.

"Minute Measurements of Science," a series of nineteen articles in the *Scientific American Supplement*, 1876–78.

ROBERT HENRY THURSTON, Ph.B., C.E., LL.D.

Professor of Mechanical Engineering 1871–1885

Robert Henry Thurston, son of Robert Lawton Thurston, a veteran mechanic and pioneer steam-engine manufacturer of Providence, R. I., was born October 25, 1839. He was trained in the workshops of his father, and graduated at Brown University in 1859 with the degrees of Bachelor of Philosophy and Civil Engineer, to which were added Master of Arts in 1869, and Doctor of Laws in 1889. For two years following he was engaged with the firm of which his father was senior partner.



Prof. R. H. Thurston

In 1861 he entered the navy as officer of engineers and served during the Civil War on various vessels, being present at the battle of Port Royal and at the siege of Charleston. He was attached to the North and South Atlantic squadrons until the close of 1865, when he was detailed to do duty in the Department of Natural and Experimental Philosophy at the United States Naval Academy at Annapolis. Upon the death of the Professor of the Department he was placed in charge, *ad interim,* under Adm. David D. Porter, Superintendent of the Academy. The late Admiral, then Lieutenant-Commander, Sampson relieved him in 1870, when he was invited by President Morton to take part in the organization of the Stevens Institute of Technology and to occupy the Chair of Mechanical Engineering.

From the start Prof. Thurston was actively engaged in supplying the technical and other journals with such matter as was appropriate to each, and did much in that way to secure a constituency and friends for the new institution. He secured from the United States Patent Office and from private sources the nucleus of a technical collection and some useful tools and machinery. At the time of the opening of the Institute in the fall of 1871, Prof. Thurston, who had assisted President Morton in the arrangement of the engineering curriculum, organized a mechanical laboratory on a small scale. This was the first instance, so far as known, in which it had been proposed to combine research, instruction, and commercial work as an adjunct to a school of engineering or other institution of learning.

The Mechanical Laboratory promptly took up important tasks and extensive investigations, many of them incomplete and sometimes crude; for the task was that of a pioneer, and the means were not yet obtainable with which to perform ideal work. But the way was broken and the path well cleared for more modern methods and apparatus and for better-trained observers, and these trained observers often became successful investigators in all branches of engineering and applied science. It may be safely asserted that this output of skilled scientific investigators is a most important product of the Institute, and perhaps its most valuable contribution to the advancement of the profession of the old empiricism into the modern systematic and scientific methods and practice.

The work performed during that embryonic period included an extensive investigation of the effects of time and loading upon the materials of construction, and resulted in the discovery, with iron and steel, of "the exaltation of the normal series of elastic limits by strain;" in the distinction of the two classes of metals called the "iron class" and the "tin class;" and their characteristic differences as to the behavior and safety under overstrain; in the discovery and the exhibition of the fact that a piece of structural iron always carries in its elastic limit a measure of the greatest load which has come upon it in its history from the rolling-mill, and of a method of application of this fact to the detection, in some cases, of the causes of accidents. It was discovered that it is practically possible to test a bar to its elastic limit, and thus to obtain a knowledge, substantially accurate, the class of metal being known, of its value under load, and then to place the piece in its position in the structure with confidence that it has the required strength and resilience; or, rejecting it, and testing it to rupture, to prove its unfitness. It was shown that steel was subject to the same effects of time and strain as was iron, and the value of cold-rolled steel was revealed and proved.

The relations were traced between the tensional and the torsional resistances of materials of various classes, and an exact relation was determined for steel as a basis for employment of the "Autographic Recording Testing Machine," the invention of which, as well as of other apparatus, was compelled by the necessities of researches planned at the time.

In the field of metals of the "tin class," and especially of the alloys of the familiar metals, copper, tin, and zinc, extensive researches were conducted, in 1875 and later, resulting in the exploration of the whole field by a pioneer investigation, and the revelation of the composition as well as of the existence of the "maximum alloys," the complete exploration of the binary and ternary compositions, and the publication of results by the United States government as a portion of the work of the United States board appointed to test iron, steel, and other metals, of which Prof. Thurston was secretary. He was also chairman of a number of committees and in direct charge of this class of researches, the greater part of which were conducted at the Stevens Institute as the only avail-

able place at the time for that work. The research was left incomplete by the government through refusal of Congress to make appropriations for another year, the Ordnance Bureau of the War Department pressing for control, and it was finished by the Laboratory. In subsequent years, with larger facilities and a more perfect plan, investigation for the "maximum alloy" was repeated, more refined work brought still more accurate results, and the composition was very accurately determined.

The invention of the method of investigation reduced the extent and cost of the research enormously, and it was described in various Journals and Transactions of societies, including the American Association for the Advancement of Science from 1877. The later work appeared in the "Transactions of the American Society of Civil Engineers" and the "Journal of the Franklin Institute."

Still another field of research entered upon very extensively was that of the friction of lubricated surfaces. For this work it also became necessary to invent a testing-machine, and this has been in constant use on both sides of the Atlantic since, and has performed a great amount of both commercial and research work.

In the testing of steam engines and boilers, modern methods were brought into use, and their standardization and systematic and general employment were greatly promoted. The character and method of variation of engine-friction became generally known through the initiative of the Mechanical Laboratory. The first attempt to ascertain with accuracy the precise "quality" of the steam from the boiler was made, under its supervision, for a committee of the American Institute, in 1871, condensing all of the steam supplied from each of several typeforms of boiler,— shell and water-tube,— and measuring the total content of either moisture or superheat, thus securing a satisfactory check upon the later system of testing by sample. The work of the mechanical engineer was in fact systematized and perfected in many ways by that *bureau veritas,* and its influence has been continually greater and greater up to the present time, under the direction and by force of the example of the talented men who have had direction of its work.

Prof. Thurston represented the United States — and the Institute — at the International Exposition at Vienna in 1873; was member both of the United States Scientific Commission at that Exhibition and of the International Jury; and he was fortunate enough to secure for the American exhibitors of machinery a very liberal proportion of the awards, including an *ehren diplom* for George H. Corliss, the famous inventor, although that builder exhibited no engines of his own make. The argument that he was represented by almost every builder in Europe and in every section of the Exposition prevailed, and such distinguished authorities as M. Tresca, Professors Reuleaux, Hirsch, Dwelshauvers-Dery, and M. Schneider, the great French manufacturer, of Creusot, indorsed the claim. He was later made editor of the Reports to the U. S. Government on that Exhibition, and passed four large volumes through the press in ten months, two years hav-

ing been the common estimate of the time to be required. He also edited the reports of the United States board appointed to test iron, steel, and other metals, writing a considerable portion of the two large volumes, and describing the extensive work of the Mechanical Laboratory in connection therewith. His three-volume work on the "Materials of Engineering" also consisted largely of matter obtained through researches conducted at the Institute, the detailed work being performed mainly by its students and alumni. His "History of the Growth of the Steam-Engine" was still another product of his labor during the earlier years of the Institute. It was based primarily upon lectures delivered in the courses inaugurated by President Morton for a general audience, and which in those days were attended by interested auditors from New York and other neighboring places. His treatises on the "Stationary Engine for Electric Lighting" and "Friction and Lost Work" appeared while he was still a member of the Faculty of the Stevens Institute of Technology. His richest working years were those of his connection with the Institute, and their fruits continued to appear even after his removal to another field, and his absorption into the later work of organization and administration of an offshoot of this pioneer institution compelled his attention more and more to an entirely different sort of enterprise.

His service as a member of the United States commission to determine the causes of steam-boiler explosions occupied his time during the summer of 1875, and the only published accounts of that work in any detail were from his pen.

Of some three hundred published papers on scientific and technical subjects, a large proportion of the most important and influential were issued in the course of the fourteen years of his connection with the Stevens Institute.

In 1885 Prof. Thurston accepted a call from the Trustees of Cornell University to organize a course in Mechanical Engineering for the Sibley College of Engineering and Mechanic Arts, then established.

In 1865 he married Miss Susan T. Gladding, of Providence, R. I. She died in 1878, and two years later he married Miss Leonora Boughton, of New York. Prof. Thurston died suddenly at his home at Ithaca, N. Y., on his birthday, October 25, 1903.

He was a member and secretary of the New Jersey State commision to report a plan for encouragement of manufacturers of ornamental and textile fabrics; a member of the United States commission on safe and vault construction for the United States Treasury; of the New York State commission to report on a modern rifle for the National Guard, and to examine and authorize voting-machines.

He was made Vice-President of the American Institute of Mining Engineers in 1878; Vice-President of the American Association for the Advancement of Science, at Nashville, in 1877, in the absence of Prof. Pickering, elected at the preceding meeting; was regularly elected to serve in 1878, at the St. Louis meeting of the Association, and in 1884 at Philadelphia, in which year he was

also Honorary Vice-President of the British Association for the Advancement of Science. He was the first President of the American Society of Mechanical Engineers, 1880. He was a member of International Juries at Vienna, 1873, Paris, 1889, and Chicago, 1893. He was Officier de l'Instruction Publique de France, etc.; an editor (for engineering) of "Science," of "Johnson's Cyclopedia," and of the "Century Dictionary." He was also connected with the following and other societies: The Franklin Institute, of Pennsylvania; American Institute, of New York; American Society of Civil Engineers; Institution of Engineers and Shipbuilders of Scotland; British Institution of Naval Architects; Royal Institution of Great Britain; Société des Ingénieurs Civils de France; Verein Deutscher Ingenieure; Oesterreichische Ingenieur-und-Architekten Verein; United States Naval Institute; Order of the Loyal Legion of the United States; Naval Order of the United States; Kongl. Svenska Vetenskap-Academien; Société Industrielle de Mulhouse; Société d'Encouragement, etc., de France; American Metrological Society; American Historical Society; National Geographical Society; Washington Academy of Sciences; International Association for the Advancement of Science, Art, and Education; and of the International Association for Testing Materials of Engineering, etc.

Among his inventions are: the magnesium-ribbon lamp, a magnesium-burning naval and army signal apparatus, an autographic recording testing-machine, a form of steam-engine governor, an apparatus for determining the value of lubricants, etc.

He edited the following government volumes:

"Reports of the United States Commissioners to the International Exhibition, Vienna, 1873," and the "Reports of the United States Board Appointed to Test Iron and Steel, etc.," 1878–81.

He was the author of:

"Report on Manufactures and Machinery at the International Exhibition, Vienna, 1873."

"Introduction to the Reports of the United States Commissioners to the Vienna International Exhibition, Vienna, 1873."

"Report to the United States Board on Investigation of the Properties of the Copper-Tin Alloys," 1879.

"Treatise on Friction and Lubrication," 1879.

"Manual of the Steam-Engine," also translated and published in French.

"Materials of Engineering," comprising: "Part I. The Non-Metallic Materials of Engineering and Metallurgy," 1882–99; "Part II. Iron and Steel," 1883–98; "Part III. The Alloys and their Constituents," 1884–1900.

"Materials of Construction," 1884–1900.

"Stationary Steam-Engines," 1885–89.

"Treatise on Friction and Lost Work in Machinery and Mill-Work," 1885–98.

"A Manual of the Steam Boiler: Design, Construction, and Operation," 1888–1901.

"A Hand-Book of Engine and Boiler Trials, and the Use of the Indicator and Prony Brake," also translated (by Roussel) and published in French.

"Reflections on the Motive Power of Heat, and on Machines Fitted to Develope That Power." From the original French of N. L. S. Carnot, to which is appended Lord Kelvin's "Account of Carnot's Theory," 1890.

"Heat as a Form of Energy," 1890.

"Life of Robert Fulton," 1891.

"History of the Steam Engine," 1878–1901, also translated by Hirsch and by Uhland and published in French and German respectively.

The following is a list of some of his papers:

"A New Marine Signal Light." *Jour. Frank. Inst.*[1], 1866.

"Losses of Propelling Power in the Paddle-Wheel." *Ibid.*, 1870.

"H. B. M. Ironclad 'Monarch'." *Ibid.*, 1870.

"British Iron Manufacturers." *Ibid.*, 1870.

"Experimental Steam Boiler Explosions." *Ibid.*, 1872.

"Trial of Steam Traction Engines by the Author." *Ibid.*, 1873.

"Temperatures, Pressures, and Volumes of Compressed Air." *Ibid.*, 1874.

"Consulting Engineer's Report on the Design, Construction, and Anticipated Performance of the Stevens Ironclad." Pamphlet, 8vo. D. Van Nostrand, New York, 1874.

"On the Torsional Resistance of Materials, as Determined Experimentally by the Autographic Recording Testing Machine." *Jour. Frank. Inst.*, 1873.

"On a New Apparatus for Testing Lubricants." *Railroad Gazette*, 1873.

"On the Effect of a Change of Temperature on the Resistance of Materials." *Jour. Frank. Inst.*, 1873.

"On the Increase of the Resisting Power of Metals under Stress." *Ibid.*, 1873–74.

"On the Accuracy of Rumford's Determination of the Mechanical Equivalent of Heat Energy." *Trans. Am. Soc. Civ. Eng.*[2], 1874; *Jour. Frank. Inst.*, 1874.

"On the Mechanical Properties of the Materials of Construction, and on Various Previously Unobserved Phenomena Noticed During Experimental Researches with a New Testing Machine Having Automatic Registry." *Trans. Am. Soc. Civ. Eng.*, 1874.

"Note on the Resistance of Materials" (Announcement of Discovery of Abnormal Elevation of Elastic Limit by Intermitted Strain). *Ibid.*, 1875.

"Note on the Resistance of Materials as Affected by Flow and by Rapidity of Distortion." *Ibid.*, 1876.

"On the Rate of Set of Metals Subjected to Strain for Considerable Periods of Time." *Ibid.*, 1876.

"On the Mechanical Treatment of Metals and Methods of Exalting the Elastic Limit." *Metallurgical Review*, 1877.

"A New Method of Planning and of Representing the Results of Researches Involving Three or More Elements." *Trans. Am. Assoc. Adv. Sci.*[3], 1877; Pamphlet, 8vo, 1877.

"Strength, Elasticity, Ductility, and Resilience of Cold-Rolled Iron and Steel." Pamphlet, 8vo, 1878.

"On a New Method of Detecting Overstrain in Iron and Other Metals, and on Its

[1] "Journal of the Franklin Institute." [2] "Transactions of the American Society of Civil Engineers."
[3] "Transactions of the American Association for the Advancement of Science."

Application in the Investigation of Causes of Accidents to Bridges and Other Structures." *Trans. Am. Soc. Civ. Eng.*, 1878.

"On a Newly Discovered Relation Between the Tenacity of Metals and Their Resistance to Torsion." *Ibid.*, 1878.

"Ueber die Natur der Elasticitätsgrenze und die Art Ihrer Veränderungen." *Dingler's Polytechnisches Journal,* 1877.

"Plan for the Encouragement of Manufacturers of Ornamental and Textile Fabrics." (Appendix to Report of New Jersey State Commission.) Pamphlet, 8vo, 1878.

"New Determination of the Coefficients of Friction of Lubricated Surfaces, and on the Laws Governing such Friction." *Transactions of the American Institute of Mining Engineers,* 1878.

"On the Character of Physical Science, and on the Philosophic Method of Advancement of Science." (Vice-President's Address before the American Association for the Advancement of Science, 1878.) *Trans. Am. Assoc. Adv. Sci.*, 1878.

"President's Inaugural Address Before the American Society of Mechanical Engineers, 1880." *Trans. Am. Soc. Mech. Eng.*[1], 1880–81.

"The Strongest of the Bronzes." *Trans. Am. Soc. Civ. Eng.*, 1881.

"The Several Steam-Engine Efficiencies." *Trans. Am. Soc. Mech. Eng.*, 1882.

"Development of Theory of Steam-Engine." *Jour. Frank. Inst.*, 1884.

"Forms of Ship and Fish." *Transactions, British Institution of Naval Architects,* 1887.

"Friction Waste of Steam-Engines." *Trans. Am. Soc. Mech. Eng.*, 1888.

"Notes on Technical Education." *Academy,* 1888–89.

"Address to British Institution of Civil Engineers in Behalf of Visiting Representatives of American Societies of Engineers." *Trans. Brit. Inst. Civ. Eng.*[2], 1889–90.

"Effects of Strain in Metals and Their Self-Registration." *Trans. Am. Soc. Civ. Eng.*, 1890–91.

"Problem of Air Navigation." *Forum,* 1890.

"Builders of the Steam-Engine, etc." Patent Centennial Address, Washington, 1891.

"Scientific Basis of Belief." *N. Am. Rev.*[3], 1891.

"Final Improvement of the Steam-Engine." *Proceedings of the Naval Institute,* 1891.

"Réduction des Pertes de Chaleur dans les Machines à Vapeur." *Rev. Gen. des Sci.*[4], 1891.

"L'Éducation Technique aux États Unis." *Ibid.*, 1891.

"Economics of Automatic Engines." *Jour. Frank. Inst.*, 1892.

"Thermal Analysis of Tandem Compound Engine." *Ibid.*, 1893.

"Technical Education in United States, Chicago Congress, 1893." *Trans. Am. Soc. Mech. Eng.*, 1893, etc.

"Trend of Modern Progress." *N. Am. Rev.*, 1895. (Also: "La Marche du Progrès aux États Unis." *L'Industrie,* 1896.)

"Superheating Steam." *Trans. Am. Soc. Mech. Eng.*, 1896. (Also: "Avantage de la Surchauffe." *Bulletin de la Société d'Encouragement,* 1896.

"Promise and Potency of High-Pressure Steam." *Trans. Am. Soc. Mech. Eng.*, 1896.

---

[1] "Transactions of the American Society of Mechanical Engineers."
[2] "Transactions of the British Institute of Civil Engineers."
[3] "North American Review." [4] "Revue Général des Sciences."

"Standards of Efficiency of Steam-Engines." *Jour. Frank. Inst.*, 1896.

"The Engineer and His War Engine." *N. Am. Rev.*, 1897.

"Quadruple Expansion Engine at 500 Pounds Pressure." *Marine Engineering*, 1897–8.

"The Animal as a Prime Motor." *Smithsonian Report*, 1896.

"The Steam Engine at the End of the Nineteenth Century." *Trans. Am. Soc. Mech. Eng.*, 1899. (Also: "La Machine à Vapeur à la Fin du XIXème Siècle." *Revue de Mechanique*, 1900.)

"A Century's Progress of the Steam Engine." *Smithsonian Report*, 1899.

"The Steam Turbine." *Trans. Am. Soc. Mech. Eng.*, 1900.

"Recherches sur la Résistance des Matériaux, etc." Congrès International des Méthodes d'Essai, etc., Paris, 1900.

"La Laboratoire Moderne et Son Évolution en Amérique." Congrès International de Mechanique Appliquée, 1900.

"Progress and Tendency of Mechanical Engineering in the United States in the Nineteenth Century." (Address before the Washington Academy of Science.) *Science*, 1901.

"Trend of Professional Education." *Bulletin, Board of Regents, New York State University*, 1901.

"Voting-Machines." *Trans. Am. Soc. Mech. Eng.*, 1901.

"The Manufacturing Industries." *Transactions, New England Cotton Manufacturers' Association*, 1901.

And many other papers and addresses.

EDWARD WALL, A.M.

Professor of English and Logic

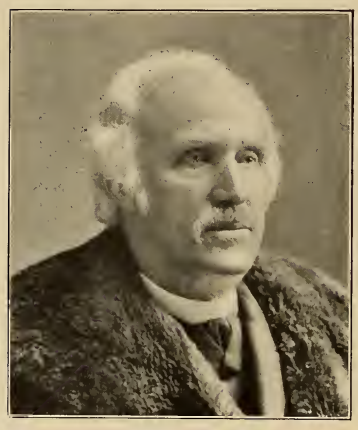
Edward Wall was born in Pictou, N. S., November 4, 1825. His parents, Peter and Margaret Barry Wall, were of English and Scotch-Irish lineage. His early education was obtained in New York. He was prepared for college by Prof. John J. Owen, the editor of school editions of the Greek Classics. In 1845 he was admitted to the Sophomore class of Princeton College, was graduated in 1848, and was the valedictorian of his class. He studied theology at the Seminary in Princeton, and was graduated in 1851, in the latter part of which year he entered the ministry of the Presbyterian Church.

In 1852 he became pastor of a church in the northern part of the State of New York. After nearly ten years' service, the severity of the winter climate, and exposure incident to his work, caused an affection of the throat which led him to resign his charge.

He was married to Miss Sara Berry, October 21, 1852. They have had four children, Eleanor Berry, Edward Barry, Albert Chandler, and George Lloyd Wall. Edward Barry died in 1894.

During the Civil War he served as chaplain of the 3d New York Cavalry, and for three years he was pastor of a church in New Jersey.

In the beginning of 1870 he was appointed Professor of Belles Lettres in the Stevens Institute of Technology. It was a part of the plan of the Trustees of Stevens Institute to establish an Academy of a high grade, where pupils might obtain the requisite preparation for the Institute. Accordingly, after an experiment in developing a local school which had shared the benevolence of the founder of the Institute, the east wing of the Institute was built, and the Stevens School was organized in September, 1872.



Prof. Edward Wall

Prof. Wall, in addition to his professorship in the Institute, became the Principal of the School; and with the increase in the number of students in both the Institute and the School he has found abundant employment for his time and strength.

From its foundation, the School, although it does not share in the endowment of the Institute, has been successful. The east wing became inadequate for its accommodation, and in 1887–88 the present commodious building on River Street was erected.

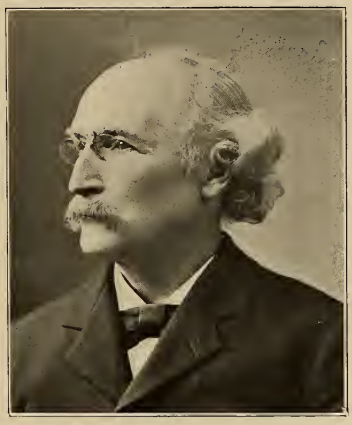
The course of instruction in Stevens School from the beginning embraced improvements in methods which are now generally recognized, one being the introduction of some branch of natural science in every class of the school; the choice in each case, and the method of instruction, being governed by the grade of the pupils. Another feature is the teaching of two mathematical subjects at the same time. Thus, before arithmetic is finished, algebra is begun. In like manner geometry overlaps algebra, and trigonometry overlaps geometry. It is believed that in this way progress is more rapid, and comprehension of the subject more complete; that a student's mastery, for instance, of arithmetic is helped by his study of algebra. For some time Stevens School, according to the Report of the Bureau of Education of the United States, was the only secondary school in the country in which instruction in two branches of mathematics at the same time was practised. And even now it is sometimes difficult conveniently to grade students coming to Stevens from other schools, because this improvement has been introduced. The good results which have followed the methods used in Stevens School, except in the residuum of the incorrigibly lazy and idle, who will not work, prove their value.

CHARLES WILLIAM MacCORD, A.M., Sc.D.

Professor of Mechanical Drawing and Designing

Charles William MacCord is of Scottish origin, being a lineal descendant of Hamish MacCord (called Sir James by the English), a Highland chieftain who fell at the Pass of Killiecrankie in 1689.

His father, the Rev. W. J. MacCord, was stationed in the township of Northeast, Dutchess County, N. Y., where Charles William was born March 18, 1836. The lad taught himself to read while very young, without the knowledge of his parents, who thereafter guided his early training until he became a student in the Amenia Seminary in 1847, where he prepared for college.



Prof. C. W. MacCord

Entering Princeton in 1852 as a "Sophomore half advanced," he was graduated as Bachelor of Arts in 1854, receiving in 1857 the degree of Master of Arts in course; and in 1881 his Alma Mater conferred upon him the degree of Doctor of Science. After leaving Princeton Mr. MacCord engaged in teaching, at first in one of the large educational institutions near Schenectady, N. Y., and afterward in a private family. Having through his own exertions acquired the art of mechanical drawing, he obtained in 1858 a position as assistant draughtsman at the De Lamater Iron Works, New York, and while there his work attracted the attention of Capt. John Ericsson, who subsequently engaged him as his chief draughtsman.

Mr. MacCord remained with Capt. Ericsson for nine years, from 1859 to 1868; during which time he assisted that famous engineer in the construction of the Ericsson hot-air engine, of marine steam-engines, of implements of war and of apparatus for Ericsson's well-known researches in physics: but above all, Mr. MacCord achieved distinction for his work on the plans of the famous turreted ironclad "Monitor," the details of which were made in Capt. Ericsson's office. It was due, in a large measure, to Mr. MacCord's rapid and accurate execution of the working drawings of this vessel, that she was able to appear in Hampton Roads on the 9th of March, 1862, and check the victorious and seemingly invincible career of the "Merrimac," which had almost destroyed the Union fleet and was preparing to make a final move on New York.

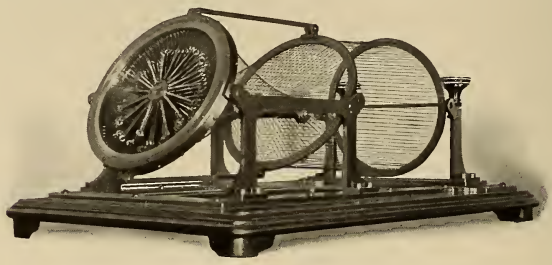
In 1868 Mr. MacCord was selected as chief draughtsman in the construction of the "Stevens Battery," then building at Hoboken, N. J., under the supervision of Gen. George B. McClellan. In 1870 he became chief draughtsman for the Department of Docks, New York, of which Gen. McClellan was the chief engineer.

In 1871 Mr. MacCord was called to organize and take charge of the Department of Mechanical Drawing in the Stevens Institute of Technology.

During the time that he was with Capt. Ericsson, his life was for the most part uneventful: but the monotony was sometimes broken by incidents of stirring interest. Many of these, naturally, occurred during the construction of the famous "Monitor"; and the most exciting episode of all was that in which he was despatched, on a blustering winter morning, to superintend a change in her steering-gear. This, under the circumstances, was neither easy nor free from danger; but his successful accomplishment of it was what enabled the "Monitor" to seize the golden moment of opportunity, to change the defeat of yesterday into the victory of to-day, and to revolutionize the naval warfare of the world.

Once installed in his chair at the Stevens Institute, his long experience as a practical draughtsman amply qualified him for the routine work of giving instruction in mechanical drawing; and he soon began to devote his leisure to the advancement of the literature not only of that subject, but of descriptive geometry and kinematics, which also were included in his Department.

A native inventive faculty, combined with a sense of mechanical proportion and of mechanical beauty which can be described only as intuitive, led him to design many models illustrating different parts of his work. Those shown in



Adjustable Model Showing Six Geometrical Surfaces
Prof. C. W. MacCord

the accompanying illustrations were originally "Olivier" models from Paris, in which the rectilinear elements of ruled surfaces were represented by silk cords kept taut by means of weights. The workmanship was excellent, but the proportions were very bad; and, as they one by one became unserviceable, Prof. MacCord,

with rare skill and patience, replaced them by others in which springs took the place of weights; thus placing the Stevens Institute in possession of a set of models, few in number, but absolutely unique in construction and design.

Prof. MacCord was married, June 23, 1863, to Evelyn Holden. Three



THE BATTLE BETWEEN THE "MONITOR" AND THE "MERRIMAC"[1]
The Working Drawings for the "Monitor" were made by Mr. MacCord

children were born to them, Katherine Stanley, Harry Holden, and Charles William MacCord, Jr. The latter son died in 1898.

Prof. MacCord is a member of the American Society of Mechanical Engineers. He is the author of the following books:

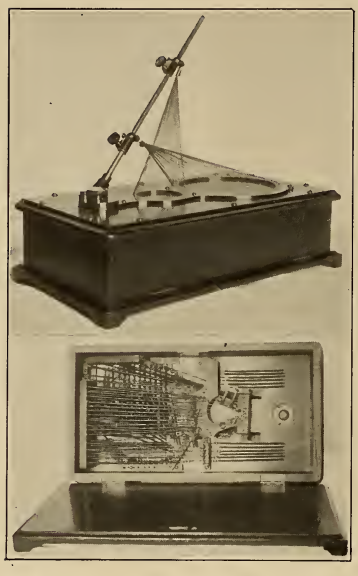
"Lessons in Mechanical Drawing," 1876–77; "Kinematics, or Practical Mechanism"; "Practical Hints for Draughtsmen"; "Progressive Exercises in Mechanical Drawing"; "Elements of Descriptive Geometry"; "Velocity Diagrams, Their Construction and Their Uses."

His contributions to the *Scientific American Supplement* include the following:

A series of five articles on "Teeth of Skew Bevel Wheels," Nos. 174–178; five articles on "Planetary Wheel Trains," Nos. 437, 441, 451, 470, 482; "Instruments for Drawing Curves,"— Hyperbola, No. 530; Parabola, No. 535; Lemniscate, No. 574; Sinusoid, No. 703; Roulette Spirals, No. 743; Cycloids and Trochoids, No. 706; Witch of Agnesi, No. 730; Cissoid and Associated Curves, No. 758; Quadratrix and Subquadratrix, No. 768; Polar Harmonic, No. 796; Ellipse, No. 854. Also papers on "Rolling Cams," Nos. 509, 510; "Simultaneous Dead Points," Nos. 614, 617; a series of articles on "Radii of Curvature Geometrically Determined,"—General Principles, Nos. 537, 538; Archimedean Spiral,

[1] Of course numerous so-called representations of this famous conflict were published at the time; but that given in the illustration, copied from one in Prof. MacCord's possession, is the only one which bears the true stamp of authority, the approval of Capt. Ericsson himself.

No. 557; Cycloid, No. 558; Epicycloid and Epitrochoids, No. 563; Ellipse, 567; Path of Point on Connecting-Rod, No. 595; Path of Point on Piston-Rod of Oscillator, No. 678; Parabola, No. 680; Lemniscate, No. 681; Hyperbola, No. 709; Helix No. 732; Sinusoid No. 772; Conchoid No. 884. Also articles on "Point of Contrary Flexure." Conchoid, No. 900; "Elliptical Gearing," No. 2; "Shaping-Machines—the Slow Advance and Quick Return Motion," No. 16; "A Mechanical Curiosity—New Form of Differential Wheels," No. 134; "Annular Wheels," No. 291; "Equidistant Gear Cutters," No. 333; "A Novel Propeller Engine," No. 415; "Parallel Curves," No. 420; "A New Drawing Instrument—Villa's Pantagraph," No. 424; "A New Lunarian," No. 447; "Graphic Processes Relating to the Logarithmic Spiral," No. 554; "Composite Gearing," No. 695; "Spacing the Frets on a Banjo Neck," No. 794; "The Conic Sections," No. 803; "Mechanical Equivalents," No. 938; "A New Elliptical Lathe;" "A New Machine for Cutting out Elliptical Mats."



Model Showing Intersecting Cones, and Arrangement of Springs for Keeping Cords in Tension
Prof. C. W. MacCord

The following papers were published by him in the *American Artisan:*

"A New Drawing Instrument. The Protracting Centrolinead," XVIII, No. 6; "Spiral Gearing," XVIII, Nos. 7, 8; "The Rolling Hyperboloids," XIX, No. 5; "Imagination in Mechanism," XIX, No. 5; "A New System of Lobed Wheels," XIX, Nos. 11, 12.

Prof. MacCord is the author of the following papers published in the *Stevens Institute Indicator:*

"Biographical Sketch of Capt. John Ericsson," VII, 2; "A Transparent Device Illustrating Oldham Coupling and Elliptic Chuck," X, 269; "A Curious Mechanical Movement," XIII, 15; "The Helical Convolute," XIII, 245; "Olivier Models Remodelled," XIV, 1; series of articles on "Velocity Diagrams, Their Construction and Uses," XV–XVIII, subsequently published in book form; "Slow Advance and Quick Return Produced by Elliptical Wheels," XIX, 361.

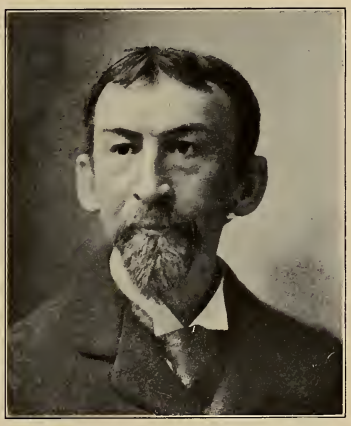
The following articles relating to Capt. John Ericsson are also from the pen of Prof. MacCord:

"Ericsson's Home," *Scientific American,* LII, No. 5; "Ericsson and his Monitor," *North American Review,* October, 1889; "Ericsson's Methods of Work," *American Machinist,* XIII, No. 13.

ALBERT RIPLEY LEEDS, Ph.D.

Professor of Chemistry, 1871–1902

Albert Ripley Leeds was born in Philadelphia June 27, 1843. He came of a line of Americans, many of whom were active in engineering and scientific pursuits The colonist of his name was the Surveyor-General of New Jersey in 1680.



Prof. A. R. Leeds

After graduating from the Central High School of his native city in 1860, he passed through the Sophomore year at Haverford College and then entered Harvard in 1861, taking the usual academic degree four years later. In February, 1865, previous to his graduation, he was one of three candidates who creditably passed an examination ordered by the Board of Education for the Professorship of Physics and Chemistry in the Central High School, which was made vacant by the resignation of Prof. B. Howard Rand. He now became the Lecturer on Chemistry in the Franklin Institute of Pennsylvania, and Professor of Chemistry in the Philadelphia Dental College. To these labors were added similar duties at Haverford College during the college year of 1868–69, his connection with the latter institution being marked by the raising of the funds necessary for the organization and equipment of a laboratory for chemical analysis and research.

Not realizing until too late how great a strain upon health and strength the work and study incident to three such laborious positions would be, he was compelled to take rest in the autumn of 1869. He spent that year and the one following in European travel, and in study at the School of Mines and the University of Berlin.

In 1871, when the Stevens Institute was to be opened, he was called to the Chair of Chemistry, a position he was destined to occupy for the remainder of his life, contributing actively to the success of the graduates by his instruction, and inspiring them with his own zeal for original investigation. The same year he had married Miss Margaret West, the great-granddaughter of Gen. Reed, first President of the State of Pennsylvania. Their home in Hoboken was always

a charming resort for his colleagues as well as for the students, who will ever cherish the memory of their genial hospitality.

Prof. Leeds at once took charge of the installation and equipment of the chemical laboratory, and laid out the course of instruction on broad and practical lines which have stood the test of time, many of the students having met with distinguished success in positions demanding both engineering and chemical knowledge.

During the earlier years of his connection with the Institute Prof. Leeds devoted himself to investigations in mineralogy and analytical chemistry. A number of his papers on lithology were published in the "American Journal of Science," and about thirty papers on analytical subjects appeared in Fresenius's "Zeitschrift," the "Chemical News," and elsewhere. Subsequently he turned his attention to general and organic chemistry and investigated more particularly the properties of ozone and peroxide of hydrogen, and the action of these bodies, as well as of chlorine, and the oxides of nitrogen upon the members of the benzene and naphthalene groups. Many papers were likewise published upon the action of light upon the various haloid compounds of the metals. These led to the publication of a method for the measurement of the varying actinism of sunlight and other sources of illumination when passing through absorbent media like the earth's atmosphere. This method was republished in the English "Philosophical Magazine."

In this connection Prof. Leeds made a number of careful analyses of the atmosphere, and was thus led into investigations connected with sanitary chemistry. In 1881 he was made a member of the newly created State Board of Health of New Jersey, in which capacity he continued to the last to investigate the adulteration of foods, the purity of waters, the hygienic condition of the schools. the disinfection of steamships and railroad cars, etc. He also served continuously as chairman of the Board's committee of analysts, and as one of the four public analysts of the State.

In 1873 Prof. Leeds was requested by the authorities of Jersey City to report upon its water supply, and somewhat later he was asked by the water departments of that city and of Newark to act as their chemist. This led to an examination of the water supplies, not only of these two cities, but eventually of most of those in the State of New Jersey.

In the winter of 1881 the water supply of the city of Philadelphia became unusually foul and offensive. The inquiry into the causes of this condition, which was referred to Prof. Leeds for investigation, showed that it was due to the presence of volatile products of putrefaction, the oxygen normally present in water having largely disappeared and gaseous products of decay having taken its place. This inquiry and his subsequent connection with the work during the survey for a new water supply (see "Philadelphia Water Reports" 1881–85) led, among other things, to his introducing an artificial mechanical aëration of water

supplies as a means of aiding or effecting their purification. This method was introduced into the water-supply systems of Hoboken and surrounding towns in 1884, since which time there has been no recurrence of the former foul tastes and odors due to the excessive multiplication of certain algæ. The same system was introduced by its author at Brockton, Mass., Norfolk, Va., and many other localities, and has become the settled practice in water-supply engineering.

Prof. Leeds was thus led into connection with public work in many cities such as Albany, N. Y., Wilmington, Del., Reading, Pa., New London, Conn., Minneapolis, Minn., and into engaging in the incorporation of systems of filtration as part of effective water-works management. The last considerable inquiry of this character was into the offensive condition of the water supply of Brooklyn. It extended through several years and included hundreds of microscopical and bacteriological as well as chemical analyses. The trouble was found to be due to the enormous multiplication of one species of diatomaceous algæ.

The degree of Doctor of Philosophy, *honoris causa,* was conferred upon Prof. Leeds by the University of New Jersey in 1884. For several years he acted as presiding officer of the American Chemical Society, and in 1886 he was made a corresponding member of the British Association for the Advancement of Science. He was also a member or fellow of the German Chemical Society, the Academy of Sciences of Philadelphia, the American Association for the Advancement of Science, and of other scientific bodies.

The loss of his first wife in 1887 was a great blow to Professor Leeds, and a great misfortune came upon him in his later years in the form of a growing deafness which gradually led to his abandonment of class-room recitations; but he continued to deliver his valuable lectures until a few weeks before his death, which occurred at his home March 13, 1902.

In 1891 he married Miss Anne Webb, daughter of William H. Webb, secretary of the Reading Railroad, who, with two daughters, survives him.

The following is a complete list of his scientific memoirs:

"Spectroscopic Examination of Silicates." *Am. Chem.*[1], III, 446.

"The Volumetric Determination of Chlorine with Standard Silver Solution and Potassic Chromate." *Ibid.,* III, 290.

"The Alteration of Albite and Genesis of Deweylite." *Ibid.,* IV, 164.

"Contributions to Mineralogy, with Analyses of: 1. A Hydrous Unisilicate Approaching Pyrosclerite. 2. Talc Pseudomorphous after Pectolite. 3. Leucaugite from Amity, N. Y. 4. Mineral Associated with Corundum and Approaching Ripidolite. 5. Moonstone from Media, Delaware County, Pa. 6. Antholite from the Star Rock, Concord, Delaware County, Pa. 7. Wernerite from Van Arsdale's Quarry, Bucks County, Pa." *Am. Jour. Sci.*[2], 1873.

"Aventurine Orthoclase." *Ibid.,* 1872.

"The Dissociation of Certain Compounds at Very Low Temperatures." *Ibid.,* 1874.

"Magnesia-Iron Tremolite." *Ibid.,* 1875.

[1] "American Chemist." [2] "American Journal of Science."

"Mittheilungen aus dem Chem. Laboratorium des Stevens Institute of Technology. Notiz über Zinkwasserstoff, Reducirende Wirkungen des Wasserstoffs, speciell auf Silbernitratlösung." *Berichte der Deutsch. Chem. Gesell., 9te Jahrgang, No. 16; Jour. Chem. Soc.*[1], 1876.

"Enlarged and Reduced Photographs of Two Hundred Fractures of Alloys of Copper and Tin, Broken by Transverse, Longitudinal, and Torsional Strains; with Lecture Illustrations of the Same Accompanied by Catalogue and Physical Description." For publication by the United States Board Appointed to Test Iron, Steel, etc.

"Contributions to the Chemistry of Hydrogen." *Am. Chem.*, 1876.

"Upon the Reduction of Silver at Ordinary Temperatures in the Presence of Free Nitric Acid." *Ibid.*, 1876.

"Recent Progress in Sanitary Science." *Ibid.*, 1877.

"A New Test Reaction for Zinc, and Other Laboratory Notes." *Ibid.*, 1877.

"Neue Methode der Eisenoxydulbestimmung in Silicaten, Welche in den Gewöhnlichen Mineralsäuren Unlöslich Sind." *Zeitschrift für Anal. Chemie*, 1877.

"Notes upon the Lithology of the Adirondacks." Read December 11, 1876, before the New York Academy of Sciences. *Am. Chem.*, 1877; *Report of the Regents of the University of the State of New York*, 1877.

"Determination of Ferrous Oxides in Silicates." Read January 8, 1877, before the New York Academy of Sciences. *Am. Chem.*, 1877.

"Analytische Beiträge." *Zeitschrift für Anal. Chemie*, 1878.

"New Method for the Estimation of Combined Carbon in Iron and Steel." *Proc. Am. Chem. Soc.*[2], 1878.

"Constitution of the Atmosphere. Atmospheric Ozone. Collection and Preservation of Ozone. Critical Examination of Methods at Present in Use in Ozonometry. New Method for the Generation of Ozone. Action of Ozone upon the Coloring Matters of Flowers." *Ann. N. Y. Acad. Sci.*[3], 1878.

"Discovery of Nitric Acid in Normal Urine, and Upon the Results of Aëration and Ozonation." *Proc. Am. Chem. Soc.*, 1878.

"The Spectra of Certain Metallic Compounds." *Jour. Frank. Inst.*[4], LX.

"Contributions from the Laboratory of the Stevens Institute of Technology. 1. The Alteration of Standard Ammonium Chloride Solution when Kept in the Dark. 2. The Titration of Hydrochloric Acid for Chlorine, and of Sulphuric and Nitric Acid for Hyponitric Acid. 3. The Determination of Nitrates. 4. Action of Potassium Permanganate upon Oxalic Acid." *Proc. Am. Chem. Soc.*, 1878.

"Contributions from the Laboratory of the Stevens Institute of Technology. 1. Solubility of Ozone in Water. 2. Action of Ozone upon the Coloring Matter of Plants. 3. Bleaching of Sugar Syrups by Ozone. 4. Reduction of Carbonic Acid by Phosphorus at Ordinary Temperatures. 5. Oxidation of Carbonic Oxide by Air over Phosphorus at Ordinary Temperature." *Jour. Am. Chem. Soc.*, 1879.

"Ozone and the Atmosphere." Read before the American Lyceum of Natural History, April 9, 1878.

"Ammonium Nitrite, and the By-Products Obtained in the Ozonation of Air by Moist Phosphorus." *Ibid.*, 1879.

"Some Additional Notes on Ozone. 1. Comparative Results Obtained with Previous Electrical Ozonisers, with Description of a Modified and Powerful Form. 2. Preparation of Ozone by Chemical Methods. 3. Hydrogen Peroxide and Sulphuric Acid.

[1] "Journal of the Chemical Society."
[2] "Proceedings of the American Chemical Society."
[3] "Annals of the New York Academy of Science."
[4] "Journal of the Franklin Institute."

4. Non-Production of Ozone in the Crystallization of Iodic Acid. 5. Action of Ozone upon Organic Substances. 6. On the Action of Ozone on Carbonic Acid. 7. Reduction of Carbonic Acid by Phosphorus at Ordinary Temperatures—Correction of an Erratum." *Ibid.*, 1879.

"Ueber den Einfluss von Volum und Temperatur bei der Darstellung des Ozons mit der Beschreibung Eines Neuen Ozonators." *Annalen der Chemie,* Band. 198, 26ten Maerz, 1879.

"Influence of Light upon the Decomposition of Iodides." *Jour. Am. Chem. Soc.*, 1879.

"Ueber die Entdeckung und Bestimmung der Salpetrigen Säure im Trinkwasser, in Säuren, etc." 1. Mit Metadiamidobenzol. 2. Mit Jodkalium." *Zeitschr. für Anal. Chemie,* XVIII.

"The Production of Peroxide of Hydrogen, as Well as Ozone, by the Action of Moist Phosphorus upon the Air." *Ann. N. Y. Acad. Sci.,* II, No. 1.

"Peroxide of Hydrogen and Ozone." *Jour. Am. Chem. Soc.,* 1880. Two papers.

"The Production of Ozone by Heating Substances Containing Oxygen." *Ibid.,* 1880.

"Action of Hyponitric Anhydride on Organic Bodies. 1. Action upon Benzene. 2. Action upon Naphthalene. 3. Action upon Cymene."

"Laws Governing the Decomposition of Equivalent Solutions of Iodides under the Influence of Actinism." *Jour. Am. Chem. Soc.,* 1880.

"Action of Light on the Soluble Iodides, with the Outlines of a New Method in Actinometry." *Ibid.,* 1880.

"The Compounds of the Aromatic Bases with Metallic Salts, with a Note upon Thiocarbanilide. Compounds with Aniline. Compound with Paratoluidine." *Jour. Am. Chem. Soc.,* 1881.

"The Invariable Production, Not Only of Ozone and Hydrogen Peroxide, but also of Ammonium Nitrate, in the Ozonation of Purified Air by Moist Phosphorus." *Ibid.,* 1881.

"The Action of Oxygen, Ozone, and Nascent Oxygen upon Benzene." *Ibid.,* 1882.

"The Direct Conversion of the Aromatic Amides into Their Corresponding Azo-Compounds." *Ibid.,* 1881.

"The Adulteration of Food, Drink, and Drugs, from the Chemist's Standpoint; and the Attitude of Chemists in the Matter of Appointment of Government Analysts." *Ibid.,* 1881.

"A Method for the Analysis of Mustard." *Ibid.,* 1881.

"Oenantholanilin, Oenantholxylidin, und Oenantholnaphtylamin. Cryptidin. Den bei der Distillation von Ricinusöl im Vacuum Erhaltenen Unlöslichen Rückstand. Acroleinureid mit Bemerkungen zu Hugo Schiff's Mittheilungen über Condensirte Ureide." *Berichte der Deutsch. Chem. Gesell.,* 1882.

"The Conversion of Carbon Monoxide to Carbon Dioxide by Active (Nascent) Oxygen." *Jour. Am. Chem. Soc.,* 1883.

"Benzureide." *Ibid.,* 1884.

"Atomation (2d paper). Atomation of Oxygen at Elevated Temperatures, and the Production of Hydrogen Peroxide and Ammonium Nitrite, and the Non-Isolation of Ozone, in the Burning of Purified Hydrogen and Hydro-Carbons in Purified Air." *Ibid.,* 1884.

"The Chemistry and Clinical Value of Sterilized Milk." *Am. Jour. Med. Sci.*[1], June, 1891.

[1] "American Journal of Medical Sciences."

"Liquid Peptonoids." *Medical News,* May 30, 1896.

"Acetic Acid in Vinegar." *Jour. Am. Chem. Soc.,* 1895.

"Bacteria in Milk Sugar." *Ibid.,* 1896.

"Standard Prisms in Water Analysis, and the Valuation of Color in Potable Waters." *Ibid.,* 1896.

"Quantitative Estimation of Micro-Organisms." *Stevens Indicator,* 1897.

The following is a complete list of his technical papers and reports:

"Water-Supply of Jersey City." Board of Public Works, 1873.

"Spang Collection of Minerals." *Science Monthly,* 1874.

"Water-Supply of Hudson County." New York State Sanitary Association, 1878.

"Water-Supply of State of New Jersey." *Jour. Frank. Inst.,* 1878.

"Relative Purity of the City Waters in the United States." *Jour. Am. Chem. Soc.,* 1879.

"Adulteration of Food." New York State Board of Health, 1881.

"Papers upon Industrial Chemistry. Analysis of Soaps." *Chemical News,* XLVIII, 67.

"Reports on Pollution of Passaic River." Newark Aqueduct Board, 1881, 1882, 1883.

"Report on Water-Supply of City of Wilmington, Del." 1882.

"Scientific Examination of Foods." 1882.

"Investigation of the Schuylkill Water-Supply." Report to Philadelphia City Councils, 1883.

"Physical and Chemical Analysis of Flour." *Jour. Am. Chem. Soc.,* 1883.

"Infant Foods." *Transactions of the College of Physicians of Philadelphia,* 1883; *Med. News,* 1883.

"Chemical Investigation of Water-Supply of Philadelphia." Reports to Water Department, 1883, 1884, 1885.

"Chemical, Biological, and Experimental Inquiry into the Water-Supply of the City of Albany." *Jour. Am. Chem. Soc.,* 1885.

"Aëration of Water." *Transactions of the American Society of Civil Engineers.* 1885.

"Purification of Water-Supply of Cities." *Jour. Frank. Inst.,* 1886.

"Origin and History of the Epidemic of Typhoid Fever at Mount Holly, New Jersey." *Medical News,* 1887.

"Hardness of Waters." American Water Works Association, 1887.

"Mechanical Aëration of Water." *Stevens Indicator,* 1892.

"Water Bacteria." *Am. Jour. Med. Sci.,* 1893.

"Official Dairy Inspection and Sanitary Milk Control." *Annals of Hygiene,* 1893.

"Report to New Jersey Dairy Commission on Milk," 1894.

"Modified Milk and Sterile Milk." *Am. Jour. Med. Sci.,* 1895.

"Dangerous Condensed Milk." *Ibid.,* 1895.

CHARLES FREDERICK KROEH, A.M.

Professor of Modern Languages

Charles Frederick Kroeh, the only child of his parents, Karl August and Sophie Katharine (Ossmann) Kroeh, was born in Darmstadt, Germany, March 28, 1846. During the revolutionary times of 1848 his parents left Germany for the United States, settling in Baltimore and afterward in Philadelphia, where he received his early education, first in German private schools and then in the public schools.



Prof. C. F. Kroeh

While a student in the Philadelphia Central High School (forty-fourth class) his fondness for physics and chemistry brought him to the notice of Prof. B. Howard Rand, who encouraged his scientific studies by making him his assistant in the High School laboratory and also in preparing his lecture experiments in the Franklin Institute and Jefferson Medical College. During his last year at the High School he employed his evenings and vacations in completing a course in business at Bryant & Stratton's Business College. In 1864 he was graduated, standing second in his class, and delivered the salutatory address in French at the Commencement. Shortly afterward he lectured on electricity in Bryant & Stratton's College and on chemistry in the Friends' School, Salem, N. J.

In the fall after his graduation he was appointed assistant to the Professor of German at his alma mater, a post which he resigned after one year, in order to engage in the manufacture of inks. In September, 1866, he left this business to fill the position of assistant editor of the "Philadelphia Demokrat," his chief duties being the selection and translation of news from English into German. The training in accuracy and rapidity acquired in translating and condensing long Congressional reports and Presidential messages proved invaluable afterward.

In March, 1868, he accepted the instructorship of French and German in Lehigh University, South Bethlehem, Pa. His services were also required in Bishopthorpe Seminary. At the same time he gained a command of Spanish, Portuguese, and Italian, besides continuing his Latin studies and working in the chemical laboratory.

In July, 1871, shortly before the opening of the Stevens Institute of Technology, he was appointed Professor of Languages. The departments of Belles Lettres and Languages had been included in the course of the new institution by President Henry Morton at the suggestion of Mr. S. Bayard Dod. In the first announcement (1871) of the Institute he found the following wise words which have since been reprinted without material change in each succeeding catalogue:

"The French and German languages will be an essential part of the course of instruction, since they are of incalculable value to the engineer and man of science as the vehicles of a vast amount of new information in his special subjects, and also afford that kind of mental culture which mathematical and physical science, if followed exclusively, would fail to supply. . . . This (the Department of Languages) will include a thorough course of instruction in the French and German languages, by which the student will be enabled to read, write, and speak in both of these, so that every means of acquiring information which they can afford will be thrown open to him."

Prof. Kroeh felt bound to work out a course that would fulfil the requirements of the preceding paragraph, which he regarded as the terms of his commission. Encouraged by the atmosphere of original research which pervaded the new Faculty, and dissatisfied with the text-books (Fasquelle, Otto, Peissner, Chapsal, etc.) of those days, he at once set to work to discover better means of presenting the various subjects connected with the acquisition of languages, such as pronunciation, declensions, verbs, sentence-building, and derivations; to prepare lectures on language and literature; and to collect material for scientific and technological reading for the higher classes.

In 1876 he began to manifold his exercises for the different classes, and in this way gradually developed methods of instruction and freely tested them by experiment in the class-room. In 1882 Prof. Kroeh's treatises on the pronunciation of French, the Pronunciation of German, and the French Verb, had assumed a permanent form and were then printed for the first time.

Prof. Kroeh's activities as a teacher may be roughly divided into three periods. During the first he was engaged in improving existing methods of teaching grammatical subjects, with the view of quickly acquiring a reading knowledge. The books already mentioned, as well as his "First German Reader" and "Die Anna-Lise," belong to this period. He realized the desirability of teaching students to speak, but did not believe it could be done in class.

During the second period he proceeded upon the theory that the organs of speech should be trained to fluency. He held that students should be enabled to understand French and German when they are read aloud to them, and also to read these languages with correctness and fluency. To accomplish these results in the limited time provided, grammatical study had to be reduced to its lowest terms. This method of procedure is fully described in the catalogue of 1876.

The third period began in 1885, when Prof. Kroeh made the acquaintance

of the "Leitfaden," by Prof. Gottlieb Heness, which convinced him that speaking can be taught in the class-room. He immediately began to master the method and to construct a course suitable for the Institute. It took about three years of steady work to study his languages over again from their simplest beginnings, in order to make them self-explanatory to his classes. A full description of this so-called "natural method" is found in a paper read by Prof. Kroeh before the Modern Language Association in 1886, which Prof. Heness called the best he had ever seen. With a view to further study, he visited the Sauveur Summer School of Languages in Oswego in 1887, and the Amherst School in 1888, and taught in the Burlington School in the summer of 1889.

His experience in these schools and in the Institute was that the pupils learned better by this than by any other method to understand spoken French, German, etc., and to frame answers to some extent; but they did not seem to acquire in any sense a command of these languages. Now it happened that while he was describing the working of this "natural method" to the Modern Language Association, Prof. Kroeh made a very simple but important discovery as applied to the "natural method" of teaching. By this method the teacher handles certain objects and performs certain actions, which he describes, say in French. The pupils passively associate word and thing, word and action, etc. They learn in this way to understand the foreign words without the medium of English, but not to use them. The discovery was that the pupils themselves ought to perform these actions while speaking the sentences which describe them. They should convert their passive, listening attitude into an active, speaking one. From the time they rise until they retire, they should say the French for all their actions. They should live in French. Thus was born the "Living Method for Learning How to Think in French," etc.

Soon after coming to the Institute Prof. Kroeh reached the conclusion that it was better to know a few languages thoroughly than many in a superficial way. Hence he acquired only one more besides those already mentioned. In 1877, while engaged in a controversy with his friend J. Mason Child on the authenticity of the Fourth Gospel, he revived the study of Greek, which he had begun in his boyhood.

He never abandoned his interest in his scientific studies. During the early years of the Stevens Preparatory School (1876–1892) he not only taught French and German there, but frequently supplied the places of instructors in astronomy, physical geography, etc.

In 1880 he read an essay on the Structure of Matter before the New York Academy of Sciences. In 1881, when he moved to Orange, N. J., he took up the subject of mathematics and spent some time in the solution of problems in that science. In 1893 his knowledge of chemical manipulations came into play through a translation he had made three years before and which was produced in a case of patent litigation. His experimental work won the case for his clients.

From 1872 to 1881 he spent his summers on a farm near Pocomoke City, Md., where he had abundant opportunity to apply his chemical knowledge to practical agriculture. Here he also became interested in scientific bee-keeping which he afterward pursued as a recreation from teaching and writing. Beginning with a few colonies of bees on his place in Orange in 1882, he had increased them to over ninety by 1887, when he was obliged to abandon this fascinating avocation owing to the pressure of other work. From 1882 to 1884 he held the office of Treasurer of the New Jersey and Eastern Bee Keepers' Association.

He is a thorough believer in out-door exercise and attributes his ability to do a vast amount of literary work to the restorative effects of bicycling. He has been a wheelman since 1883.

Having become interested in the Tonic-Sol-Fa method of teaching the art of singing by note when he read Helmholtz's great work on Sound, Prof. Kroeh, together with Mr. J. O. Ward, of Orange, succeeded in 1885 in organizing a large popular singing class under the leadership of Prof. Theodore F. Seward, for the purpose of fostering and improving congregational singing in the churches of all denominations.

During his residence in Hoboken, Prof. Kroeh was a vestryman of Trinity Church, and he has held the same office in Grace Church, Orange, since 1886, serving for many years as Chairman of the Music Committee. During some of his vacations he acted as lay reader in Pocomoke City, Md., and he conducted Bible classes for many years in Grace Church Sunday School, Orange, and during the summers of 1894 to 1897 at Point o' Woods, Long Island, where he established a summer school for the purpose of bringing his methods of language-teaching to the knowledge of teachers.

Although taking no active part in politics, Prof. Kroeh has always recognized the claims of civic duty, and has resisted by speech and pen the influence of political intrigue in educational matters and the encroachments of trolley and other monopolies on the rights of the people.

He has been corresponding secretary of the Orange branch of the Indian Rights Association, and treasurer of the Educational Union. He is a member of the Modern Language Association, of the Nationaler Deutsch-Amerikanischer Lehrerbund, and of the New England Society of Orange, N. J. He has been the secretary of the Stevens Faculty from its first meeting.

In 1872 Prof. Kroeh married Miss Julia Phillips, of La Porte, Ind., and their union has been blessed with one daughter, Jenny Rose, and one son, Karl F. Kroeh.

Prof. Kroeh's writings consist of text-books, memoirs, reports, and literary, scientific, and technological translations. The titles of his books follow:

"The First German Reader." 1875. D. Appleton & Co., New York.

"Die Anna-Lise German Reader, with Notes." 1882. D. Appleton & Co., New York.

"The Pronunciation of French." 1884. Published by the Author.
"The Pronunciation of German." 1884. Published by the Author.
"The French Verb." 1885. Published by the Author.
"The Pronunciation of Spanish." 1888. Published by the author.
"The Living Method for Learning How to Think in French." 1892. Published by the Author.
"The Living Method for Learning How to Think in German." 1893. Published by the Author.
"The Living Method for Learning How to Think in Spanish." 1894. Published by the Author.
"Descripciones Científicas." 1893. Published by the Author.
"Three-Year Preparatory Course in French." 1897–99. Macmillan Co., New York.
"Syllabi for Courses in French and Spanish." 1902. Home Correspondence School, Springfield, Mass.

Prof. Kroeh is also the author of the following original articles:

"Lightning Rods." *Sci. Am.*,[1] August 16, 1873.
"Recent Developments in Quantitative Spectrum Analysis." *Ibid.*, November 22, 1873.
"Recent Progress in Electromagnetism. The Gramme Machine." *Ibid.*, December, 6, 1873.
"Methods of Measuring High Temperatures." *American Artisan*, January 11, 18, 25, 1875.
"A New and Important Mineral (Utah Mineral Wax)." *Sci. Am.*, February 22, 1879.
"New Minerals (Huntilite, Animikite)." *Sci. Am. Supp.*,[2] March 1, 1879.
"The Dzierzon Theory." *Beekeepers' Magazine*, New York, April, 1882.
"Parthenogenesis in Bees." *American Bee Journal*, Chicago, April 12, 1882.
"What It Is to Read Music." *Sci. Am. Supp.*, June 7, 1884.
"Methods of Teaching Modern Languages." Read before the Modern Language Association. *Ibid.*, March 31, 1888.
"A Spanish Poet (Trueba)." *Christian Union*, May, 1890.
"Memorial of Marshall Shepard." New England Society of Orange, N. J., 1896.
"Memorial of James S. Cox." *Ibid.*, 1901.
"Obituary of Albert R. Leeds." *Stevens Institute Indicator*, 1902.

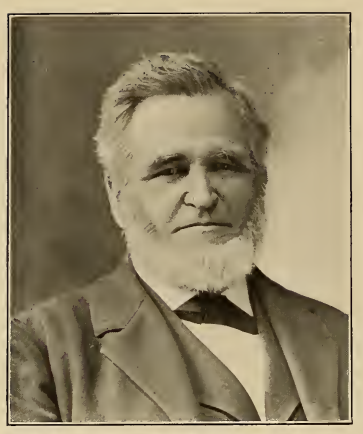
Prof. Kroeh's reports and translations of literary, scientific, and technical subjects are so numerous that their titles alone would occupy several pages of this book. They are published in the "Reports of the Smithsonian Institution," Washington; "Poggendorff's Annalen der Physik und Chemie," Berlin; "Comptes Rendus de l'Académie des Sciences," Paris; Liebig's "Annalen der Chemie"; "Moniteur Scientifique"; "Report of the United States Iron and Steel Board"; "Scientific American"; "American Artisan"; "North American Review"; and the literature of patent litigation.

[1] "Scientific American." [2] "Scientific American Supplement."

De VOLSON WOOD, C.E.

Professor of Mechanical Engineering, 1885–1897

De Volson Wood, son of Julius and Amanda (Billings) Wood, was born near Smyrna, N. Y., in 1832. His early education was that of the public school, with an additional six weeks in a private academy and two terms in Cazenovia Seminary. In 1849 he began teaching, with which he was occupied until his death, his subsequent education being received while he was himself instructing.



Prof. De Volson Wood

Mr. Wood's first charge was at Smyrna, his native town, where he taught for three terms. Desiring to continue his education, he then went to the Albany State Normal School, continuing, however, his work as instructor, and graduated thence in 1853. He then obtained his first position as principal, in the Napanoch School, Ulster County, N. Y., and there commenced teaching one week after his graduation. Returning to the closing exercises of the Albany Normal School during a week of vacation, the first he had had since beginning to teach in 1849, Mr. Wood was greeted by the principal with the offer of an assistant professorship in mathematics. This offer he accepted, and at the beginning of the next scholastic year Prof. Wood (as he now became) was a member of the Faculty of the school from which he had graduated one year before.

Still being desirous of extending his studies, after a year at the Albany Normal School he went to the Rensselaer Polytechnic Institute, Troy, in 1855, entering the Junior class, but still did not give up teaching, as the Preparatory Department of the Institute was being organized at that time, and he was asked to take charge of the mathematical studies of the Preparatory students. He was thus enabled to pay for his entire education by the proceeds of his teaching. On graduating at Troy with the degree of Civil Engineer, Prof. Wood went West, although in rather troublous times, with introductions from the principals of the Albany and Troy schools, hoping to obtain a position in Chicago. Advised by a friend to go by way of the Lakes instead of by rail, he stopped for a few days at Detroit, and went to see the University of Michigan buildings at Ann Arbor. After hearing President Tappan, of that University, lecture, Prof. Wood intro-

duced himself, and was told of the nonappearance of a recently appointed Professor of Civil Engineering. He consented to take the Professor's place for a few days and remained there fifteen years, receiving during that time the honorary degrees of A.M. and M.Sc. from Hamilton College and the University of Michigan respectively. During this time he organized the Department of Civil Engineering at Ann Arbor, which is still a noted one and retains evidences of his work, and among the since prominent men then under him were Brush of electric fame and Prof. Webb of the Stevens Institute. A record of Prof. Wood's journey westward, the queer chance which led to the obtaining of his University of Michigan professorship, and his trials, financial and otherwise, in his early work there before he attained his status as a professor, would form an interesting history.

At about the time when the original building of this Institute was completed, Prof. Wood, by invitation of President Morton, came down to look over the prospects of the new venture. Shortly after his return to Ann Arbor he received an offer of a professorship of Mathematics and Mechanics, and a desire to return East made him at once accept. The Faculty of the University of Michigan, however, on hearing of his acceptance, at once increased his salary by $500 and personally escorted him to a telegraph office that he might telegraph a recall of his acceptance. Events in the ensuing year, however, caused Prof. Wood to resolve that a repetition of such an offer should not be passed over so lightly, so a second offer from the Stevens' Trustees one year later caused his advent in 1872 to this Institute, where he faithfully labored until his death, June 27, 1897.

Possibly the greatest satisfaction to Prof. Wood was the success he had in the class-room. Many of his pupils returned, years after graduation, to compliment him on his success. Mr. Brush, the electrician, has said: "Prof. De Volson Wood got more genuine study out of me than any other teacher I ever was under." The "American Mathematical Monthly" said:

> "The civil, mechanical, and electrical engineers, architects, railroad managers and presidents, college professors and presidents, etc., who formerly were Prof. Wood's students, and who now are scattered over the whole world, would, if simultaneously rounded up, form the most intelligent army that ever moved on the face of this mundane sphere."

Some years ago Prof. Wood went on a trip through New Mexico and Colorado, and in the whole course of his journey he found that he only stopped at one place where he could not have been immediately identified at a bank by one of his former pupils.

Prof. Wood was married in September, 1859, to Cordera E. Crane, who died in June, 1866. One child was born to them. In August, 1868, he married Fannie M. Hartson, by whom he had six children.

Prof. Wood was a member of the American Society of Civil Engineers from 1871 to 1885, and a member of the American Association for the Advance-

ment of Science from 1879 to his death. He was the vice-president of this latter Association in 1885. He was a member of the American Mathematical Society, and an honorary member of the American Society of Architects. He was also a member of the American Society of Mechanical Engineers; the first president of the Society for the Promotion of Engineering Education; and was the engineer of the Ore-Dock, Marquette, Michigan, in 1864. He was the inventor of "Wood's Steam Rock-Drill," 1866 and later; and he was also the inventor of other machinery. Comparatively late in life, he took up the subject of thermodynamics, upon which he wrote a standard book.

The following text-books and articles in encyclopædias were written by Prof. Wood:

"Trussed Bridges and Roofs." 250 pp. New York, 1872.

Revision[1] of "Mahan's Civil Engineering." 589 pp. New York, 1873.

American edition[1] of "Magnus's Lessons on Elementary Mechanics." 312 pp. London and New York, 1876.

"A Treatise on the Resistance of Materials." 314 pp. New York and London. 3d edition, 1877.

"Elements of Analytical Mechanics." New York, 1876. Revised edition, New York, 1877.

"Elements of Co-ordinate Geometry, Including Quaternions." 329 pp. New York, 1879.

"Foundations." *Johnson's Encyclopaedia.* New York, 1875.

"Dynamics." *Appleton's Cyclopaedia of Applied Mechanics.* New York, 1879.

"Key and Supplement to Elements of Mechanics," and "Key and Supplement to the Mechanics of Fluids," 1884; "Trigonometry," 1885; "Thermodynamics," 1887, enlarged. 1889; "Turbines," 1895.

"Technical Education in America." *American Supplement to Encyclopaedia Britannica,* 1897.

The many papers and articles written by Prof. Wood are listed as follows:

"New Method of Alligation Alternate." *New York Teacher,* 1855.

"The Coursing Joint Curve of an Oblique Arch in the French System." *Mathematical Monthly,* I, 208, 279. February, 1859.

"Triangular Beams." *Jour. Frank. Inst.,*[2] XLI, 198. 1861.

"Momentum and Vis Viva." *Ibid.,* XLIV, 351. 1862.

"Problems of Open-Built Beams." *Ibid.,* XLIV, 385. 1862.

"Problems of Beams." *Ibid.,* XLV, 256. 1863.

"Beams of Uniform Strength." *Ibid.,* XLVII, 28. 1864.

"Work, Vis Viva, and Momentum." *Ibid.,* XLVII, 84. 1864.

"Resistance of Solid Bodies." *Ibid.,* XLVII, 100. 1864.

"Omissions in a Closed Survey." *Ibid.,* XLVII, 159. 1864.

"Trussed Arch." *Ibid.,* XLVII, 223. 1864.

"Hydrostatic Trough." *Ibid.,* XLVII, 289. 1864.

[1] Edited by Prof. Wood.

[2] "Journal of the Franklin Institute," 3d Series.

"General Problem of Trussed Girders." *Ibid.,* XLVIII, 1864. XLIX, 97, 308. 1865. L., 3. 1865.

"Work and Vis Viva." *Ibid.,* XLIX, 27, 385. 1865. L, 177. 1865.

"Moment of Inertia of Surfaces." *Ibid.,* LI, 91. 1866.

"Cambered Bridge versus the Arch." *Ibid.,* LII, 15. 1866.

"Drilling-Machines at the Hoosac Tunnel." *Ibid.,* LIV, 83. 1867.

"Friction Grip." *Ibid.,* LIV, 101. 1867.

"Strains on Trussed Bridges." *Railway Times,* XXI, 1–4, April 17, 1869.

"Problem of the Rafters." *Jour. Frank. Inst.,* LXIII, 100. 1872. *Van N. Ec. Eng. Mag.*[1], VI, 223. 1872.

"Neutral Axis in Deflected Beams." *Ibid.* 1873.

"Backwater Caused by Dams in Streams." *Trans. A. S. C. E.*[2], July, 1873.

"Bridge Pins." *Van N. Ec. Eng. Mag.,* IX, 504. 1873.

"On Courses of Instruction in Civil Engineering." *Ibid.* 1874.

"On the Position of the Neutral Axis in Deflected Beams." *Ibid.,* XII, 365. 1875.

"Force." *Ibid.,* XVI, 28, 420. 1877.

"Beams of Uniform Strength." *Ibid.,* XVI, 564. 1877.

"Solutions to Problems." *Mathematical Visitor,* 1877–1881. Nos. 14, 15, 59, 60, 62, 75, 78, 84, 87, 111, 113, 116, 117, 120, 131, 133, 136, 139, 145, 147, 175, 176, 183, 184, 188, 192.

"Momentum and Vis Viva." *Van N. Ec. Eng. Mag.,* XVIII, 33, 241. 1878.

"Stresses in Eye Bars." *Trans. A. S. C. E.,* pp. 189–192. 1878.

"Flow of Water in Rivers—The Tortuous Path of a Particle." *Ibid.,* July, 1879.

"Theory of Transverse Strength of Beams." *Ibid.* 1879.

"Absolute Zero of Temperature." *Van N. Ec. Eng. Mag.,* XXII, 168. 1880.

"Second Law of Thermodynamics." *Jour. Frank. Inst.,* LXXXV, 347. 1883. LXXXVII, 228. 1884. *American Engineer,* April 6, 1883.

"Cheapest Point of Cut-Off." *Jour. Frank. Inst.,* LXXXVII, 5, 321. 1884.

"Turbines." *Ibid.,* LXXXVII, 412. 1884.

"Luminiferous Æther." *Ibid.,* XCII. 1886.

"A Deduction from the Principle, 'The Moment of the Momentum,' in the Case of Turbines." *Ibid.,* XCIII, 21, 128, 196. 1887.

"Thermodynamics." *Ibid.,* XCIX, 128, 196, 298. 1887.

"An Authority." *Stev. Ind.*[3], IV, 21. 1887.

"The Strength of Iron as Affected by Tensile Stress while Hot." (Abstract of Paper read before the American Association for the Advancement of Science, August, 1887.) *Ibid.,* IV, 207. 1887.

"The Mechanical Equivalent of Heat." (Reprinted from the *Railroad and Engineering Journal,* February, 1888.) *Ibid.,* V. 1888.

"Efficiency." *Ibid.,* VI, 272. 1889.

"Expansion of Timber Due to the Absorption of Water." *Trans. A. S. M. E.,* X, 539. 1888–89.

"Some Properties of Ammonia." *Ibid.,* X, 627. 1888–89.

"Some Properties of Vapor and Vapor Engines." *Ibid.,* X, 648. 1888–89.

"Formulas for Saturated and Superheated Vapors." *Ibid.,* 670. 1888–89.

"Test of a Refrigerating Plant." *Ibid.,* XI, 830. 1889–90.

"The Graphic Representation of Thermal Quantities." *Ibid.,* XI, 997. 1889–90.

---

[1] "Van Nostrand's Eclectic Engineering Magazine."
[2] "Transactions of the American Society of Civil Engineers."
[3] "Stevens Indicator."

"Chimney Draught." *Ibid.*, XI, 974. 1899–90.

"Some Properties of Ammonia" (Second Paper). *Ibid.*, XII, 133. 1890–91.

"Mechanical and Physical Properties of Sulphur Dioxide (SO_2)." *Ibid.*, XII, 137. 1890–91.

"Theoretical Investigation of the Efficiency of Vapor Engines." *Ibid.*, XII, 155. 1890–91.

"The Flexure of Thin Elastic Rings." *Ibid.*, XII, 911. 1890–91. *Stev. Ind.*, VIII, 13. 1891.

"Effect of Machinery upon Labor." *Mech. N.*[1], March 15, 1891.

"Rotation of the Earth on Its Axis." *Ibid.*, 285, September 1, 1891.

"A Pine Stick and the Sun's Density." *Ibid.*, XXII, 387, November 1, 1892.

"Test of a Pulsometer." *Trans. A. S. M. E., XIII*, 211. 1891–92.

"Properties of the Saturated Vapor of Ammonia." *Stev. Ind.*, IX, 140. 1892.

"Examinations." *Ibid.*, IX, 150. 1892.

"Negative Specific Heat." *Trans. A. S. M. E.*, XIV, 75. 1892–93.

"Hydraulic Reaction Motors." *Ibid.*, XIV, 266. 1892–93.

"Engineering Education." *Railroad Gazette*, XXVI, 577, August 24, 1894.

"Flotation versus Aviation." *Aeronautics*, I, 161, September, 1894.

"Analysis of the Tremont Turbine." *Trans. A. S. M. E.*, XVI, 707. 1894–95.

"The Strength of Iron as Affected by Tensile Stress while Hot." *Ibid.*, XVI, 739. 1894–95.

"Universities." *Stev. Ind.*, XII, 51. 1895.

"The Turbine of the Niagara Power Company." *Ibid.*, XIII, 1. 1896.

"Address to the Senior Class at the Opening of the Term, September 23." *Ibid.*, XIII, 405. 1896.

WILLIAM ERNEST GEYER

Professor of Physics

William E. Geyer was born in 1848 at Naumberg, in the northern part of New York State. In 1858 the family removed to New Brunswick, N. J., where young Geyer had the advantage of excellent schooling. In the higher classes he was impressed by a course in elementary physics and chemistry. His spare time and money, which before had been largely devoted to water-wheels, windmills, and the like, were now given to making simple philosophical apparatus. From 1864 to 1869 he attended the College of the City of New York. Although giving most attention to his favorite studies, other subjects were not neglected, so that he graduated with the highest honors and was at once offered a position as assistant in chemistry at Bellevue Hospital Medical College.

The surroundings and atmosphere of a medical college were, however, not to his liking. In 1870, when the Stevens School was established, he applied for and obtained the position of Instructor in Mathematics and Natural Science. President Morton, perceiving Prof. Geyer's devotion to science, at once invited

[1] "Mechanical News."

him to spend his spare time at the Institute building, which was at that time nearly completed. As the apparatus for the new Institute gradually arrived, and as new forms of it were developed, there began for him a great era of experimentation and investigation, which has been continued with but slight interruptions to the present day. Very little of this work has been published, however, for, unfortunately, perhaps, as far as popular reputation is concerned, the results of these numerous and various investigations were embodied in reports to corporations and courts in patent litigations. Many original observations and discoveries could not be made public until the cases were decided, and on account of the slow course of the law this was generally too late for publication.



Prof. W. E. Geyer

In connection with another class of patent litigation Dr. Geyer was called upon to follow up the subject of chemical synthesis as involved in the manufacture of artificial dye-stuffs. In a few years he made himself conversant with the theory and practice of this difficult subject, so that he ranks to-day among the best-informed color chemists of this country. A few years ago one of his clients, the representative in this country of the largest aniline color works in the world, arranged to have Dr. Geyer spend some time in the "research laboratories" of their factory on the Rhine. On his return a letter was received from the Director of this laboratory, one of the first chemists of the time, saying that he had found Dr. Geyer already so proficient in the general subject that there had been little or nothing for them to teach him.

Largely as a recognition of his necessarily unpublished investigations, the Institute in 1880 conferred upon him the degree of Doctor of Philosophy.

When, in the early 'eighties, electricity suddenly sprang into prominence, the Stevens Institute became a Mecca for inventors who had ideas to develop, and for capitalists who wanted inventions tested. In all these tests Dr. Geyer took a prominent part, so that in 1884, when it was considered desirable to establish a separate Chair of Applied Electricity, he was deemed the fitting occupant.

When the Department of Applied Electricity was first established, the time allotted to it was very moderate. But Prof. Geyer, creating more work for himself year by year, and surrounding himself with assistants equally enthusiastic and industrious, gradually pushed the Department to a point of prominence and to a degree of efficiency second to none in the Institute course.

Shortly after the death of Prof. Mayer in 1897, Dr. Geyer was asked to take charge of the Department of General Physics, his work in the Department of Applied Electricity being somewhat moderated by his assistants, so that his title became Professor of General Physics and Applied Electricity.

On the death of President Morton in 1902, the lectures which he had delivered naturally fell to Dr. Geyer, as did also a physical laboratory course which it was considered desirable to give our students earlier than it had been done heretofore.. The burden thus becoming too great, Dr. Geyer, at his request, was relieved from work in the Department of Applied Electricity, so that now his title is Professor of Physics.

Dr. Geyer married Miss Emilia K. Sauer, June 7, 1901.

JAMES EDGAR DENTON

Professor of Engineering Practice

James Edgar Denton was born of New England parents, in 1855, at Piermont, New York, which was then the eastern terminus of the Erie Railroad, his father being employed as master blacksmith by the above-named company.

In 1858 the family moved to New England, to enable the father to enter the millwrighting business in Cambridgeport, Mass. At the opening of the Civil War the father joined the Blacksmith Corps at the Watertown Arsenal, and was soon appointed to the charge of the large smithshops built there for the manufacture of gun-carriages. The family therefore settled in Brighton, Mass., in whose public schools the son received his education up to about twelve years of age. He was then withdrawn from school for a time, and worked for a year in a sewing-machine repair-shop in Boston until the family removed to Jersey City to enable the father to return to the service of the Erie Railroad Company, to take charge of one of their shops.

After a couple of years spent in a Jersey City public school, young Denton attended the Bryant & Stratton Business College in New York, as a preparation for some college course of study. His parents had always desired him to follow the engineering profession, and about this time the prospectus of the Stevens Institute attracted their attention. Accordingly the son was entered there as a member of its first regular class in 1871. He passed through the regular four-year course, graduating in 1875.

During his college career he was always an ambitious and fairly successful student, but found time to take a prominent part in all the kinds of athletics then in vogue, serving as captain of the football and baseball teams, and as a member of the college crew in its six-oar shell races.

After graduation he entered the personal service of Prof. Thurston, then occupying the Chair of Mechanical Engineering at the Institute, to take charge

of the testing work carried on by Prof. Thurston as a separate department known as the Mechanical Laboratory. To this work he added, in 1878, the instruction in mathematics at the High School.

In 1879, during about a year's illness of Prof. Thurston, he took temporary charge of the Engineering Department, and organized a systematic course of shop practice, which developed the insufficiency of the Institute's shop facilities and induced Dr. Morton to donate to the Institute the means for equipping the workshops with most of their present appliances, and to provide a regular corps of shop instructors.



Prof. J. E. Denton

In 1880 Mr. Denton laid before Dr. Morton a plan for supplementing the theoretical instruction in engineering by a series of experimental exercises designed to give the student an opportunity of testing for himself the truth of the principles and formulæ which the textbooks represent as governing the design and operation of practical machinery. This led to the organization of the course of experimental exercises given to the Senior students in the Summer, or Preliminary Term of the Institute, which was commenced with the Class of 1881 in the summer of 1880, and was the first systematic effort to provide a course of instruction of this kind, aiming to cover examples of all the principal applications of the theoretical matter covered in mechanical engineering courses.

Between 1882 and 1886 Mr. Denton became engaged in the manufacture of rock-drilling machinery, and was finally thereby led to engage in the construction of the new Croton Aqueduct tunnel, about three miles of which were constructed under his direction and with drills of his own construction, which secured a record for the most rapid rate of excavation[1] reached during the construction of the new Aqueduct. During this period he divided his time between his engineering business and the supervision of the workshop and experimental instruction of the Institute.

In 1886, having acquired a considerable experience in practical engineering, Mr. Denton commenced a series of lectures to the Senior classes, designed to illustrate the value of the theoretical laws of mechanics in engineering practice by means of actual instances where theory had been importantly applied;

[1] Wegmann on "The Water Supply of the City of New York," pp. 151–218.

and this work, together with the direction of the workshop and experimental instruction, was made to constitute the Department of Experimental Mechanics, the professorship of which was at this time awarded to him.

In the management of this Department Prof. D. S. Jacobus became associated with him, and they developed its resources together until 1898, when Prof. Denton succeeded Prof. Wood in the Chair of Mechanical Engineering.

As the occupant of these chairs of the Faculty, Prof. Denton made many experimental investigations, which have furnished new data regarding the physics of engineering, and at the same time have contributed important facts to engineering practice.

He has also carried on a large amount of technical work for the general public who apply to the Institute, as a seat of authority, for expert service and information, which has enhanced its reputation and enabled his instruction to keep in touch with practice.

Professor Denton is a member of the American Society of Mechanical Engineers; American Society of Civil Engineers; American Institute of Mining Engineers; American Institute of Electrical Engineers; American Association for the Advancement of Science; Society for the Promotion of Engineering Education; Society of Naval Architects and Marine Engineers; New England Water Works Association; Engineers' Club of New York; Delta Tau Delta fraternity; Baltusrol, Morris County, and Madison golf clubs. He was also a member of the World's Fair Commission on the Jury of Awards in Engineering at Chicago in 1893, and at St. Louis in 1904.

Important examples of his public work are as follows:

A complete test of the performance of absorption refrigerating machines, which, until his investigation was published, were not considered capable of competing with the more modern type of compression refrigerating machines.

A complete test of the economy of the famous Pawtucket pumping-engine, whose performance marked an era in the use of compound steam-engines for mill purposes in this country.

An extensive set of experiments[1] on the effect of speed upon the economy of steam-engines of moderate speed; which furnishes important data regarding the laws of cylinder condensation.

A series of tests of the economy and capacity of an ammonia refrigerating machine of the compression type, in which the amount of anhydrous ammonia circulated was measured, thereby exposing for the first time the important effect of the use of the ammonia cylinder in reducing the amount of fluid circulated below that due to the theoretical displacement of the piston.

Experiments with an ammonia absorption machine to verify the conclusions of theory regarding the superior economy of this type of machine for producing very low temperatures.

Investigation to determine the possibilities of the Patten sulphuric-acid absorption-system for making ice in a vacuum.

[1] In conjunction with Prof. D. S. Jacobus.

Test of the Holden system for making ice by freezing it in thin films, and compressing the latter into cakes.

Lecture on refrigeration before the Massachusetts Society of Arts.

A series of investigations of the mechanical properties of lubricants by laboratory tests with special apparatus, supplemented by the observance of the behavior of lubricants in practice on many kinds of machinery, leading to the determination of the limit of pressure to which oil can be subjected, and the discovery of an important principle regarding the cause of the relative value of pure mineral oil, and mixtures of mineral and animal oils, in practice, and to the establishment of the practical value of the element of viscosity in lubricants.

Measurement of the friction of pistons of steam-engines as a means of testing cylinder lubricants.

Principle of action of cooling compounds, sulphur, or emery, when applied to cure the overheating of journals.

Vice-President's address to the American Association for the Advancement of Science, on the "History of Attempts to Determine the Relative Value of Lubricants by Mechanical Tests."

Photographic study of jets of steam as a means of judging the amount of moisture by their appearance to the eye.

Determination of the primary cause of the erratic behavior of throttling calorimeters.

Test of the Laketon pumping-engine with and without jackets, resulting in a method of analyzing the various elements of loss in multiple-expansion steam-engines.

Analysis of the performance of four leading types of pumping-engines.

A series of experiments with ferryboats propelled by double screws, leading to a method of calculating the loss of efficiency due to the use of a bow screw.

Investigation to determine the cause of an abnormal amount of condensation in one cylinder of a quadruple-expansion marine engine.

Tests of two Staten Island ferryboats with radial and feathering paddles, to compare their performance with that of double-screw ferryboats.

Progressive trials of the yacht "Sovereign."

Complete test of the performance of the twin-screw steamer "City of Lowell."

Investigation to determine the cause of the wreckage of the low cylinder of a compound engine, resulting in the exposure of a peculiar action of water lodged in an unjacketed receiver.

Tests to determine the cause of increase of economy of boiler furnaces by admitting heated air above the fire.

Tests to determine the liability of gasoline vapor to ignite at considerable distances from an open fire.

Verification of the German experiments on the economy of the Diesel motor.

Investigation of the relative value of Texas oil and various coals as fuel, and of the danger attending the use of the oil in power plants.

Specifications for the direct-current versus alternating systems of electric lighting for the New York City Insane Asylum at Central Islip, N. Y.

Specifications for rewiring the New York City Insane Asylum at Ward's Island.

Investigation of the cause of the explosion of the receiver of an air-compressor.

Report[1] on the strength and merits of the Brown wire-wound five-inch gun.

Theory of the liquefaction of air.

[1] In conjunction with Professor Webb.

Tests of the Curtis steam turbine to determine its economy at various stages of its development by a new principle for absorbing-dynamometers invented by Prof. Webb.

Test of the performance of the steam-turbine yacht "Revolution," by a new principle of transmitting dynamometry invented by Prof. Webb.

Tests of steam turbines to obtain data for determining their applicability to ocean liners.

Lecture on the construction of the New York Aqueduct before the New England Water Works Association at Providence, Altoona Lyceum, and the Franklin Institute.

Lecture on the improvement of the economy of steam-engines between 1840 and 1895, before the New England Water Works Association at Fall River and the Brooklyn Lyceum. (Published in the "Engineering News.")

Report to Providence Electric Power Co. on the profit available by abandoning the use of the condensers of their multiple-expansion engines, in order to devote the exhaust steam to the heating of the business buildings of Providence. ("Engineering Record.")

Comparative tests of the efficiency of chain *versus* chainless bicycles.

Tests of strength of frozen silt, and estimate of cost of freezing a section of the bed of the Hudson River for the purpose of tunnelling it.

JOHN BURKITT WEBB, C.E.

Professor of Mathematics and Mechanics

J. Burkitt Webb, son of Charles Roe and Eliza Ann (Greaves) Webb, was born in Philadelphia, November 22, 1841, of English parents, who settled in America about 1820. He entered the Philadelphia high school at the age of thirteen, and developed a talent for mathematics, penmanship, and drawing, and a strong taste for the study of natural philosophy.

His father was an amateur machinist and inventor, working among steam-engines, pumps, windmills, etc., and young Webb, although kept at work in a store for some years after leaving school, was always in pursuit of mechanical and physical problems. He fixed up a small workshop in the loft of the store, and spent his spare daytime in it, and his evenings with a melodeon, which he taught himself to operate with some skill. Various constructions were undertaken with fair success in his amateur shop, such as a steam-engine, a machine for winding copper wire with silk, an air-pump, windmill, etc.

His father having patented a windmill, he set himself at the problem of determining the speed and angle of sails giving the maximum efficiency, and thereby was led to study Hutton's Mathematics, Loomis's Calculus, and other works on higher mathematics.

Finally he left the store and went to Bridgeton, N. J., where, with Mr. Oberlin Smith, now President of the Ferracute Machine Co., he formed a small company to make an electro-magnetic apparatus for playing organs automatically. The enterprise proved too great, however, for the means at hand, notwithstanding the apparent success of the mechanical devices, and was therefore abandoned.

Mr. Webb then went to work in a pipe-mill, and built a trip-hammer which ran many years and greatly expedited a part of the manufacture. The war then broke out, and business at Bridgeton became so dull that he sought employment for a year and a half with a medical journal in Philadelphia, meanwhile studying in the evening at the Franklin Institute Drawing School.



Prof. J. B. Webb

In the summer of 1863 Mr. Webb again started in business at Bridgeton in partnership with Mr. Smith, building special machine tools. He also taught music and drawing at the Church School, and acted as organist in churches at Bridgeton and Vineland.

The tool business at Bridgeton continued to grow, and has since been absorbed by the Ferracute Machine Co.; but about 1869, being in ill health from the climate, Mr. Webb felt the need of a change and decided to attempt a good scientific education. He accordingly entered the University of Michigan in February, made up entrance conditions in a few months, and became so strong a student of mathematics as to be credited with assistance by Prof. Olney in the preface to the latter's work on the Calculus. He skipped a class by extra work, and after graduation was engaged as assistant in the civil engineering department, then under charge of Prof. De Volson Wood.

In 1871, at the solicitation of the former Assistant Professor, S. W. Robinson, who then occupied the Chair of Mechanical Engineering at the Illinois State University, Prof. Webb accepted the charge of the Civil Engineering School, newly established in that institution, which school soon became one of the most prosperous and best-attended departments of the university. He held this position eight years, during which time he made a trip to Europe for the inspection of scientific schools and for the purchase of apparatus, started a small astronomical and meteorological observatory for the school, delivered several courses of original lectures, partially developed his method of treating bridge stresses, and constructed various pieces of apparatus.

On April 19, 1876, he married Mary Emeline Gregory, eldest daughter of Hon. John M. Gregory, the president of the university, a lady of high scholarly attainments and literary tastes. Six children, all now living, were born to them; their names are, Margaret, Gregory Burkitt, Dudley Lankester, Hubert Greaves, Harold Worthington, and Carolus Roe Webb.

In 1879, after spending a year in Europe with his family on leave of absence, he resigned his professorship to pursue a course of advanced scientific study abroad, and spent over two years longer attending lectures on pure mathematics, mathematical physics, logic, etc., and in experimental work in physical laboratories at Heidelberg, Göttingen, Berlin, and Paris, making the acquaintance of Professors Quincke, Schering, Schwarz, Listing, Riecke, Lötze, Clausius, Kirchhoff, Helmholtz, Tresca, Jamin, and others. A year was spent in Helmholtz's laboratory constructing apparatus for, and working at, the then undeveloped action of an oscillating current through coils of wire and electrolytic solutions, with which considerable progress was made. His skill with tools secured him the privilege of using the apparatus in the instrument-maker's shop of the University, and before leaving Berlin he was made a member of its Mathematical Society. Nearly a year was spent in Paris attending lectures at the Sorbonne and Collége de France, and in examining technical schools, collections and methods there and in other parts of France, preparatory to assuming the duties of a new professorship.

Hon. Andrew D. White was then United States Minister to Germany, and president of Cornell University, and Prof. Webb was through him appointed in 1880 to a new Chair of Applied Mathematics at Cornell University, the active duties of which he assumed in the fall of 1881. During his occupancy of this Chair Prof. Webb delivered original courses of lectures on thermodynamics, mechanism, drawing, and drawing instruments; acted as judge at the International Electrical Exhibition of 1884; invented a draught gauge which was officially used at this exhibition, and an inertialess steam-engine indicator which excited much attention at the American Association meeting at Montreal, and published an exhaustive article on "Belting to Connect Shafts Which Are Not Parallel and Do Not Intersect." This paper attracted the favorable notice of Prof. Reuleaux, of Berlin, the leading modern authority on pure mechanism, who caused it to be translated and published in Germany.

Prof. Webb was called to his present position in 1886, to succeed Prof. Wood, who then assumed the Chair of Engineering vacated by Prof. Thurston. He is a member of the American Association for the Advancement of Science, American Society of Mechanical Engineers, American Mathematical Society, Congregational Club of New York, University of Michigan Round Table, and Point o' Woods Yacht Club.

In 1888 Prof. Webb originated his "Floating Dynamometer" (patented), which is a most convenient and perfect device for measuring the power given out or absorbed by motors, dynamos, and other machines. In 1892 he invented the "Viscous Dynamometer" (patented), which is an absorption dynamometer depending on fluid friction, or viscosity, between rapidly moving surfaces. It is especially adapted for use with high speeds and is remarkably simple, convenient, and compact. In 1900 he invented the "Dynamophone" (to be patented),

which is a transmission dynamometer measuring the twist of a shaft carrying power, by a simple telephonic method of great accuracy and reliability.

Prof. Webb has written numerous technical papers, many of them at the request of advanced students of mechanics, who have felt that his rare powers of analysis were needed to clear up or advance the subjects treated. The principle of determining bridge stresses and strains, originating with Prof. Webb, and given in a course of lectures to each Senior class, is a very general method of truss analysis. The paper on "'Overhauling' of a Mechanical Power" exposed the fallacy of an important practical law regarding hoisting-tackle which had been announced by one of the best British authorities on mechanics. The lectures on mechanical paradoxes involved the use of much new and ingenious apparatus, designed (and in some cases made) by Prof. Webb for the purpose, including a large-sized self-acting gyroscope.

A complete record of the subjects of papers and lectures by Prof. Webb is given in the subjoined list:

"Belting to Connect Shafts Which Are Not Parallel and Do Not Intersect." *Trans. A. S. M. E.*[1], III, 22; IV, 165; *American Machinist,* August 12, 1882.

"Method of Eliminating the Personal Equation in Transit Observations." *Proc. A. A. A. S.*[2], XXXI, 118.

"Method of Cutting Screws of Increasing Pitch." *Ibid.,* XXXI, 314.

"Indicator Attachment for High Speeds." *Ibid.,* XXXI, 316.

"Ueber Riemenleitung auf geschränkten Achsen." *Verhandlungen des Vereins zur Beförderung des Gewerbfleisses,* Mai, 1885.

"Descriptive Geometrical Treatment of Surfaces of the Second Degree." *Proc. A. A. A. S.,* XXXII, 93.

"Conic Sections in Descriptive Geometry." *Ibid.,* XXXII, 93.

"Regularity of Flow in Double-Cylinder Rotary Pumps." *Ibid.,* XXXII, 173.

"Improvements in Shaping-Machines." *Ibid.,* XXXII, 173.

"New Form of Steam-Engine Indicator." *Trans. A. S. M. E.,* IV, 182.

"Reuleaux's Kinematic Models." *Ibid.,* IV, 367.

"Rules for Conducting Boiler Tests" (Discussion). *Ibid.,* V, 277.

"Second Law of Thermodynamics." Vice-Presidential Address before Section D of the American Association for the Advancement of Science. *Proc. A. A. A. S.,* XXXIV, 143.

"Proceedings of the Section of Mechanical Science." Section D of the American Association for the Advancement of Science, Philadelphia Meeting. *Science,* September, 26, 1884.

"Economy of Accurate Standards." *Proc. A. A. A. S.,* XXXIV, 158.

"Entropy." *Ibid.,* XXXIV, 86.

"The Lathe as an Instrument of Precision." *Ibid.,* XXXIV, 156.

"The Life of the Universe." *Ibid.,* XXXIV, 86.

"Polar versus Other Co-ordinates." *Ibid.,* XXXIV, 51.

---

[1] "Transactions of the American Society of Mechanical Engineers."

[2] "Proceedings of the American Association for the Advancement of Science."

"Report on Steam Boiler Trials" (Discussion). *Trans. A. S. M. E.*, VI, 322.

"Technical Training" (Discussion). *Ibid.*, VI, 525.

"A Simple Form of Draught Gauge." Officially adopted at the International Electrical Exhibition at Philadelphia, Pa., 1884, and published in its Report and in the *Franklin Institute Journal*, June, 1885.

"Entropy as a Physical Quantity." *Proc. A. A. A. S.*, XXXV, 105.

"Maximum Stresses on Bridge Inclines." *Ibid.*, XXXV, 183.

"Rankine's Thermodynamic Function Φ." *Ibid.*, XXXV, 107.

"Second Differentials and Equicrescent Variables." *Ibid.*, XXXV, 69.

"A New Dynamometer, with Working Model." *Ibid.*, XXXVI, 90.

"A New High-Speed Steam Engine Indicator." *Ibid.*, XXXVI, 163.

"Moment of Inertia." *Ibid.*, XXXVI, 65.

"Experimental Determination of the Reaction of a Liquid Jet." *Ibid.*, XXXVI, 100.

"A New Viscosimeter." *Ibid.*, XXXVI, 100.

"Piston Packing Rings" (Discussion). *Trans. A. S. M. E.*, VIII, 452.

"Economical Electrical Distribution." *Electrical World*, June 18, 1887.

"The Spool Paradox." Letter to the Editor of the *Manufacturer and Builder*, November, 1887.

"The Reaction of a Liquid Jet." *Journal of the Franklin Institute*, August, 1887.

"A New Dynamometer." *Electrical World*, September 10, 17, 1887.

"Floating Dynamometer." *Proc. A. A. A. S.*, XXXVII, 87.

"Impact in the Injector." *Ibid.*, XXXVII, 88.

"'Overhauling' of a Mechanical Power." *Ibid.*, XXXVII, 88.

"A Persistent Form of Gear Tooth." *Trans. A. S. M. E.*, IX, 398.

"Friction in Toothed Gearing" (Discussion). *Ibid.*, IX, 206.

"Effect of Friction at Connecting-Rod Bearings on the Forces Transmitted" (in conjunction with Prof. D. S. Jacobus). *Annals of Mathematics*, December, 1888.

"The Centrifugal Catenary." *Proc. A. A. A. S.*, XXXVIII, 76.

"The Polar Tractrix." *Ibid.*, XXXVIII, 74.

"A Precession Model." *Ibid.*, XXXVIII, 75.

"Determination of the Pulsation Period in a Jena Glass Thermometer" (in conjunction with Prof. Wm. A. Rodgers). *Ibid.*, XXXVIII, 140.

"Error in the 'Encyclopædia Britannica.'" *Trans. A. S. M. E.*, X, 778.

"'Overhauling' of a Mechanical Power." *Ibid.*, X, 402; *Stev. Ind.*[1], VI, 131.

"Note on the Steam Turbine." *Ibid.*, X, 680; *Stev. Ind.*, VI, 288.

"The Mechanics of the Injector." *Trans. A. S. M. E.*, X, 339; *Stev. Ind.*, VI, 192; *American Journal of Railway Appliances*, December, 1888.

"Standards" (Discussion). *Trans. A. S. M. E.*, X, 572.

"Effect of Friction at Connecting-Rod Bearings on the Force Transmitted." *Ibid.*, XI, 1134.

"Length of an Indicator Card." *Ibid.*, XI, 941.

"Péclet's Treatment of Chimney Draught." *Ibid.*, XI, 762.

"The Comparison of Indicators." *Ibid.*, XI, 311; *Power*, January and February, 1890.

"The Mechanical Theory of Chimney Draught." *Trans. A. S. M. E.*, XI, 772.

"Steam Jackets on the Pawtucket Pumping Engine" (Discussion). *Ibid.*, XI, 363.

"Performance of a Double-Screw Ferryboat" (Discussion). *Ibid.*, XI, 446.

---

[1] "Stevens Indicator."

"Theory and Design of Chimneys" (Discussion). *Trans. A. S. M. E.*, XI, 477.
"The Determination of Stresses in a Truss." *Engineering News*, April 12, 1890.
"Note on Rankine's Treatment of Chimney Draught." *Stev. Ind.*, VII, 50.
"Jet Propulsion." *Trans. A. S. M. E.*, XII, 904.
"Performance of a Steam Reaction Wheel." *Ibid.*, XII, 888; *Stev. Ind.*, VIII, 287.
"Chimney Draught: Facts and Theories" (Discussion). *Trans. A. S. M. E.*, XII, 119.
"Bending Tests of Timber." *Proc. A. A. A. S.*, XLI, 139; *Stev. Ind.*, IX, 365.
"Economical Steam Compression." *Proc. A. A. A. S.*, XLII, 119.
"Theory of Shaft Governors" (Discussion). *Trans. A. S. M. E.*, XV, 956.
"Maxwell's Demons" (Letter to President Morton—see his letter on "Conservation of Energy"). *Engineering* (London), May 17, 1895, 648.
"Mechanical Integrators." *Stev. Ind.*, January and April, 1895; April and July, 1896.
"Polar Tractrix." *Stev. Ind.*, April, 1895; April and July, 1896.
"Note on Strength of Wheel Rims" (Discussion). *Trans. A. S. M. E.*, XX, 134.
"Possible New Law in the Theory of Elasticity." *Proc. A. A. A. S.*, LI, 328.
"Displacement Polygons." *Ibid.*, LI, 329.
"On the Accuracy of the Zero in the Dynamophone." *Ibid.*, LI, 358.
"The Dynamophone, a New Dynamometer." *Ibid.*, LI, 394.
"The Deflection of a Complete Quadrilateral." *Ibid.*, LI, 394.
"Second Law of Thermodynamics," "The Metrical System," and "Stress" (Papers read before the American Association for the Advancement of Science, at the Washington meeting, 1903).

COLEMAN SELLERS, E.D., Sc.D.

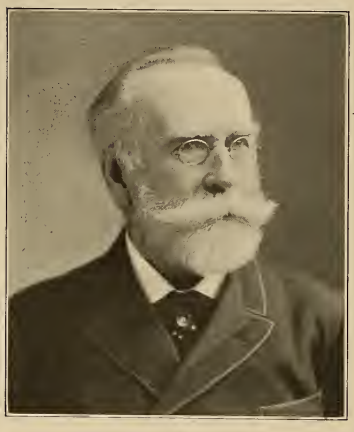
Professor of Engineering Practice 1887–1894

Coleman Sellers was born in Philadelphia January 28, 1827. His father's family were among the earliest Quaker settlers of Pennsylvania, and his immediate ancestors were men of mechanical pursuits and respected and influential citizens. His mother was a daughter of Charles Willson Peale, best known for his portraits of Washington and other officers of the Revolution, but also remarkable for the versatility of his talents, his mechanical skill, and his ingenuity.

Dr. Sellers began his education in private schools in Philadelphia, and in 1838 entered the academy of Anthony Bolmar at West Chester, Pa., where he remained until his seventeenth year, distinguishing himself for his scholarship, especially in mathematics and the natural sciences, which had for him a marked attraction.

It was his mother's wish that he should follow agriculture, and upon leaving school he spent two years as a farmer's apprentice. In his nineteenth year an opportunity was offered him in the Globe Rolling Mill in Cincinnati, then

operated by his elder brothers, Charles and Escol. It was arranged that he should be the draughtsman for the rolling-mill, and his first work was in that line. He found his new business congenial, and he applied himself with ardor to mastering its details and with such success that we find him, before his twenty-first birthday, acting as superintendent of the plant, with entire control of its operation. The mills made wire rods, merchant bar, and flat rails such as were then in use, and also drew iron telegraph wire.



Prof. Coleman Sellers

His brothers sold out their interests in the business, and in 1850 he was persuaded to join his brother Escol in building his patent hill-climbing locomotives and his "orograph," a mechanical surveying-machine for plotting contours; it was also a part of the scheme that they should instruct young men in the mechanic arts. Three locomotives were built for the Panama Railroad and did good service there, although the third-rail grip — the hill-climbing feature — was not used. A few other locomotives were constructed, but the enterprise failed, and Coleman Sellers accepted a position in the Niles Locomotive Works in Cincinnati and soon became foreman. He reorganized the shop, subdivided the work, introduced an effective piece-work system, and radically changed the methods of manufacture, purchased and installed new machinery, and recorded in his diary that he was prepared to complete two engines a week.

These strenuous years of his young manhood were formative in a great degree in determining the bent of his mind and in giving him a fund of experience and a diversified practice which has been of great value to him in his subsequent career. They were years of hard mental and manual work, often with primitive and inefficient appliances; but they developed his ingenuity and resourcefulness.

He read with interest the published accounts of electrical discoveries as they were from time to time announced by Faraday and others, and made for his own use the apparatus necessary to repeat many of the experiments for the benefit of his friends. Much of this apparatus is still in existence, and its marked excellence speaks well for his neatness and skill. He botanized, collected fossils and fresh-water shells, and in the latter pursuit his zeal and success were recognized by the distinguished conchologist, Mr. Isaac Lea, who named a new species from his cabinet *Melania Sellersiana* in his honor.

In 1850 he married the daughter of Horace Wells, of Cincinnati, a man of

advanced mechanical ideas, who was first attracted to his future son-in-law by a lecture he delivered on "Scientific Fallacies," in which he demonstrated the conservation of energy and assailed, among others, a perpetual-motion scheme then very alluring to many otherwise sane persons.

In 1856 he removed to Philadelphia and entered the establishment of William Sellers & Co. as chief draughtsman and engineer. He applied himself with zeal to the duties of his new position, which afforded him ample scope for his marked inventive ability. His thoroughness, his originality, and sound mechanical ideas, as illustrated in the productions of his firm and demonstrated in his published writings and his lectures, soon earned for him a distinguished position in the engineering world. As in Cincinnati he had identified himself with the Ohio Mechanics' Institute, so in Philadelphia he soon applied himself to the work of the Franklin Institute, and in a great measure helped, by his papers, lectures, and committee work, to instil a new measure of vitality into that venerable society.

Dr. Sellers early took up photography, first as an adjunct to his business, then as a pastime, and found in it a new outlet for his vigorous mental activity. He attained considerable proficiency and contributed many useful papers to the photographic press. He was for several years the American correspondent of the "British Journal of Photography," then the leading exponent of the art.

Dr. Sellers was admitted to partnership in the firm of Wm. Sellers & Co. about 1870, and upon its incorporation in 1885 was elected to the office of engineer. He remained with the house for over 30 years, retiring in 1887 to take up an independent practice as a consulting engineer. He has been granted more than thirty patents of utility and value, and the science of engineering is largely indebted to him for the great progress it has made during the last half-century in the direction of increase of efficiency of machinery and mechanical appliances.

The versatility of Dr. Sellers has already been referred to. As additional evidence of this, and also of the practicality which marked his original work in whatever line, may be mentioned the use of absorbent cotton for surgical operations, which was first thought of and recommended by him in his contributions to scientific journals as early as 1861. He also proposed the employment of glycerine for the purpose of keeping photographic plates moist; and it is interesting to note, in connection with his experiments in the early days of photography, that in the year 1861 Dr. Sellers invented and patented an apparatus in which figures in stereoscopic photographs could be seen as if in motion. Dr. Sellers's uncle, the late Franklin Peale, suggested the name "kinomatoscope" for this apparatus, which therefore, both in name and purpose, may be truly accepted as the parent of the "kinetoscope" of to-day, that has since been made possible by instantaneous photography and subsequent improvements in electrical appliances.

When Dr. Sellers retired from his position as chief engineer with William Sellers & Co. in 1887, President Morton secured his services as a non-resident member of the Faculty of the Stevens Institute as Professor of Engineering Prac-

tice, with the intent of his giving such time as he could spare from his practice as consulting engineer to deliver lectures on the actual practice of engineering: first, as an encouragement to students, in illustrating the needs of precise methods; second, to point out the utility of the course pursued in imparting instruction to engineers; and mainly to bring the students into close relationship with a wide range of engineering practice.

Dr. Coleman Sellers, in a letter to President Morton, said:

"In 1887, when you solicited my aid as a lecturer in Engineering Practice, I was deeply interested in your good work and felt that through you, first, and later through the members of the Faculty of the Stevens Institute, I was indebted for much of the scientific knowledge I have gained during that time, and which I have been able to use to advantage in engineering work quite out of the line of my earlier experience.

"I beg leave to call attention to one important fact bearing upon the utility of technical instruction in harmony with practice. When students from technical schools began to seek employment in workshops, it was found that with the exception of those educated at the Stevens Institute those admitted to drawing-room practice lost much valuable time in acquiring the methods of presenting the several views of machinery according to the mode in universal shop practice and in getting their minds rid of what they had been taught at school. This suggested an address in favor of the common-sense system of mechanical drawing practised in the shops and as taught in the Franklin Institute and in the Drawing School of the Stevens Institute.

"In arranging the course of studies in the first college devoted to teaching mechanical engineering, I am aware that your intercourse with practical engineers while in Philadelphia fitted you to present a plan of instruction in harmony with the confirmed practice of the engineering profession. The methods pursued from the start in your school in so important a branch as mechanical drawing shows your full knowledge of the wants of engineers when you were entrusted with the organization of the Institution."

Following his appointment as a non-resident member of the Faculty of Stevens Institute, Professor Sellers continued his work in this capacity, giving a valuable series of practical lectures each year for a number of years. Some of the subjects covered by Dr. Sellers in these lectures included "Drawing-Room Practice"; "The Machine-Shop"; "Notes on Steam Hammer and Hydraulic Forging and Riveting"; "Transmission of Motion"; "Water-Wheels"; "Transmission of Power"; "Mechanical Integrator"; and "Rules, Tables, and Notes on Engineering Practice," which included a wide range of topics. These lectures, based on the wide and successful experience of Dr. Sellers, are a valuable contribution to the work of the Institute, recorded as they are, for reference and utility in the work of instruction for the present and future time, in the pages of the college publication, the "Stevens Institute Indicator." It is to be regretted that the students could not continue indefinitely to have the benefit of listening to Dr. Sellers personally in the delivery of these lectures. Since 1894 he has been unable to give his time to this work. In 1887 he received from the Stevens Institute the honorary degree of Doctor of Engineering.

The value and importance of the unrivalled work accomplished by Dr. Sellers in advancing the cause of engineering through the contribution of his numerous useful mechanical devices, as mentioned in this sketch, is paralleled by his own achievements in later years in connection with his work on the development of the mechanical features of the great power plant at Niagara Falls. Numerous letters written by him in response to the solicitations of President Morton indicate conclusively the vast amount of engineering detail for which there was no precedent or guide, and which he was called upon to devise. A brief outline of Dr. Sellers's work is given by Mr. Frederick A. Riehle in the "Digest of Physical Tests" for October, 1897. From this we quote:

"In 1889 Dr. Sellers was called upon by capitalists to consider the practicability of the development and utilization of the hydraulic power of Niagara Falls. He was subsequently appointed to represent America in the International Niagara Commission of five members, with Lord Kelvin as chairman, which in 1890 was established in London to consider various methods of utilizing the power of the Falls, and since that time he has been the active engineering head of the work, both as consulting engineer of the Cataract Construction Company, and president and chief engineer of the Niagara Falls Power Company. The important mechanical design of the large dynamos for the plant was the invention of Dr. Sellers, and was built under his patents by the Westinghouse Electric & Manufacturing Company. Under his advice and directions important improvements have been made in the hydraulic machinery, and to his mechanical ability, sound judgment, and experience is largely due the success of the entire equipment and its freedom from costly methods so often met with in undertakings of this magnitude.

"Besides directing this important work at Niagara Falls, Dr. Sellers is actively engaged in his private practice of consulting engineer. In 1881 he was appointed to the honorary Chair of Professor of Mechanics in the Franklin Institute of the State of Pennsylvania.

"He is a member of the American Society of Naval Architects and Marine Engineers; member and past president of the Franklin Institute of the State of Pennsylvania; member and past president of the American Society of Mechanical Engineers; member of the American Society of Civil Engineers and of the American Philosophical Society; also of the Institution of Civil Engineers and the Institution of Mechanical Engineers, both of Great Britain; and corresponding member of the Society of Arts of Geneva, Switzerland.

"In 1887 the Royal Norwegian Order of St. Olaf was conferred upon him by the king of Sweden in recognition of his valued services in his profession. He was one of the founders and for a time president of the Photographic Society of Philadelphia, and also of the Pennsylvania Museum and School of Industrial Art of Philadelphia. He was a member of the Seybert Commission of the University of Pennsylvania for the investigation of the claims of Spiritualism, being chosen in consequence of his active and clear perception of the laws governing cause and effect, and his knowledge of sleight-of-hand, in which art, as a pastime, he has been an expert since boyhood."

In 1899 the University of Pennsylvania conferred upon him the honorary degree of Doctor of Science, and his diploma makes special and just reference to his interest in education and his readiness at all times to impart to others the results of his studies and experience.

THOMAS B. STILLMAN, M.Sc., Ph.D.

Professor of Engineering Chemistry

Thomas B. Stillman, son of Charles H. and Mary E. (Starr) Stillman, was born at Plainfield, N. J., May 24, 1852. His early education was received in Dr. Bigelow's school, and in the schools of Plainfield; afterward he became a student at the grammar school of Madison University, Hamilton, N. Y., and Alfred University, Alfred, N. Y., and in 1870 entered Rutgers College, New Brunswick, N. J., graduating in June, 1873, receiving the degree of Bachelor of Science, and membership in Phi Beta Kappa. His graduating thesis on "The Composition of the Ashes of Plants" was awarded the second thesis prize. He also received the mineralogical prize.



Prof. T. B. Stillman

While pursuing a postgraduate course in chemistry at the New Jersey State Scientific School, he was also connected with the New Jersey State Geologic Survey, with practical surveying work at the zinc mines of Sussex County. In 1874 he received his appointment as private assistant to Prof. Albert R. Leeds, of Stevens Institute, which he retained until October, 1876. In the latter year he received the degree of Master in Science from Rutgers College and in November entered the chemical laboratory of Dr. R. Fresenius, of Wiesbaden, Germany, as a student of chemical research. For some investigations upon salts of uranium in this laboratory Dr. Stillman was elected a foreign corresponding member of the Edinburgh Society of Arts and Sciences.

In 1879 he opened an office in New York city for the practice of analytical chemistry. In connection with his professional work he was chemist to the Sawyer-Mann Electric Light Co.; associate editor in the science department of the "Scientific American"; and manager of the assay department of the "Mining Record." This gave him a practical acquaintance with the chemical industries of the time, and his services have often been required since as an expert in his specialties. In 1881 Dr. Stillman again became connected with the Institute in the Department of Chemistry; in 1886 was elected to the Chair of Analytical Chemistry; and in 1902, upon the death of Prof. Leeds, took charge of the en-

tire chemical work in the Institute course under the title of Professor of Engineering Chemistry. In 1883 the Stevens Institute conferred upon him the degree of Doctor of Philosophy.

Dr. Stillman's membership in scientific societies includes the Chemical Society of London, Eng.; the Society of Chemical Industry, London, Eng.; the American Institute of Mining Engineers; the American Chemical Society; the American Section of the International Association for Testing Materials of Construction; the American Electro-Chemical Society; the Deutsche Chemische Gesellschaft, Berlin, Germany; the Societè Chimique de Paris; and the Edinburgh Society of Arts and Sciences.

He married Emma L. Pomplitz, of Baltimore, Md. They have three children, Albert Leeds, Anita May, and Thomas B., Jr., Stillman. Mrs. Stillman, since her residence in Hoboken, has taken much interest in the social affairs of the Institute, endeavoring to relieve the monotony of college life by entertaining the students at receptions and participating in their various social functions.

Dr. Stillman is an enthusiastic student of genealogical matters, and has devoted much attention to genealogical research. In 1889 he became a member of the Sons of the Revolution; he is also a member of the Mayflower Society as a direct descendant of Elder William Brewster, of the "Mayflower." He is entitled to membership in the Society of Colonial Wars, as a descendant of Governor Arnold, the first governor of Rhode Island in 1665.

Dr. Stillman has been granted seven patents,—two on the manufacture of nitrogen gas, and the others as follows: Apparatus for charging electric lamps with nitrogen gas; Treatment of phosphates of iron and alumina; Treating insoluble phosphates for fertilizer; Apparatus for manufacturing illuminating gas; and Process for the manufacture of water gas.

Some attention has also been given to the publication of his investigations in chemical work, as the following list of subjects will indicate:

"Composition of the Ashes of Plants." *Report of the State Geologist of New Jersey*, 1873.

"A New Salt of Uranium." *Trans. Edin. Soc. Arts and Sci.*[1], Edinburgh, 1877.

"Bismuth, A Comparison of the Methods of the Quantitative Determination of Bismuth." *Sci. Am. Supp.*[2], May 18, 1878.

"The Adulteration of Olive Oil." *Jour. An. Chem.*[3], III, 365; *Stev. Ind.*[4], VI, 202.

"The Composition of Boiler Scale." *Jour. An. Chem.*, IV., 24; *Chem. News*,[5] LXI, 258; *Chem. Cent. Bl.*[6], LXI, 174; *Jahresb. Wag.*[7], XXXVI, 578; *Journal London Chemical Society*, LVIII, 944; *Ding. Poly. Jour.*[8], CCLXXXI, 24; *Sci. Am. Supp.*, XXX, 12,181; *Repertorium der Technischen Journal—Literature*, 1891, p. 243.

[1] "Transactions of the Edinburgh Society of Arts and Sciences."
[2] "Scientific American Supplement."
[3] "Journal of Analytical Chemistry."
[4] "Stevens Institute Indicator."
[5] "Chemical News.'
[6] "Chemisches Central Blatt."
[7] "Wagner's Jahresbericht der Chemischen Technologie."
[8] "Dingler's Polytechnisches Journal."

"The Examination of Lubricating Oils." *Stev. Ind.*, VII, 211; *Chem. Tr. Jour.*[1], (London), July, 1890.

"The Analysis of Water for Boiler Use." *Jour. An. Chem.*, IV, 446, 450; *Chem. News*, LXII, 299, 311; *Stev. Ind.*, VII, 317; *Ding. Poly. Jour.*, CCLXXX, 297; *Zeitschr. Ang. Ch.*[2], 1891, 251; *Chem. Cent. Bl.*, LX, 292; *Phillips's Engineering Chemistry*, London, 1893.

"Animal, Marine, and Vegetable Oils; Their Chemical Reactions, and Methods of Detection in Mixtures." *Jour. An. and Ap. Ch.*[3], V, 206, 314, 695; *Zeitschr. Ang. Ch.*, 1892, p. 286; *Stev. Ind.*, VIII, 99, 202, 318; *Chem. Tr. Jour.* (London), 1892; *Jahresb. Wag.* XXXVIII, 1,038; *Chemische Technische Repertorium*, XCIII, 343.

"Water Analysis": Table for Converting Milligrams per Litre to Grams per Gallon." *Jour. An. and Ap. Ch.*, VI, 372; *Stev. Ind.*, IX, 149.

"The Chemical and Physical Examination of Portland Cement." *Jour. Am. Chem. Soc.*[4], XV, 182, XVI, 160, 283, 323, 374; *Chem. Cent. Bl.*, LXV, 847, 1,067; *Jour. Soc. Ch. Ind.*[5], XIII, 278, 637; *Ding. Poly. Jour.*, CCLX, 90, 94; *Bull. Soc. Chim. Paris*[6] (3), XII, 1,069, 1,156; *Jahresb. Wag.*, XXXIX, 740; *Stev. Ind.*, X, 137, 287; *Chemische Technische Repertorium*, XCIV, 3.

"The Determination of Carbon in Iron and Steel." *Stev. Ind.*, XI, 306.

"The Analysis of Cylinder Deposits." *Jour. Am. Chem. Soc.*, VI, 321; *Stev. Ind.*, IX, 360; *Chem. Cent. Bl.*, LXIII, 639; *Cassier's Magazine*, VI.

"Sodium Cyanide as an Adulterant of Potassium Cyanide." *Jour. An. and Ap. Ch.*, VI, 467; *Jour. Soc. Ch. Ind.*, XII, 41; *Zeitschr. Ang. Ch.*, XXXIII, 594; *Chem. Cent. Bl.*, LX, 822.

"The Analysis of Lubricating Oils Containing Blown Rapeseed Oils and Blown Cottonseed Oils." *Jour. Soc. Ch. Ind.*, XV, 265; XLII, 286; *Transactions of the American Association for the Advancement of Science*, XLII, 206; *Bull. Soc. Chim. Paris* (3), XII, 112.

"The Chemical and Physical Examination of Paper." *Stev. Ind.*, XII, 169, 282, 389.

"Scheme for the Analysis of White Paint Ground in Oil." *Quart. Dig. Phys. Tests*,[7] I, 263.

"References to the Literature of Portland Cement." 1892–1896. *Stev. Ind.*, XIII, 433.

"Note on the Solubility of Bismuth Sulphide in Alkaline Sulphides, with Special Reference to the Determination of Bismuth in Metal-Bearing Alloys." *Jour. Am. Chem. Soc.*, XVIII, 683; *Chem. News*, LXXIV, 196; *Chem. Cent. Bl.*, LXVII, 687.

"Paint Analysis." *Quart. Dig. Phys. Tests*, II; *Stev. Ind.*, XIV; *Drugs, Oils, and Paints*, XIII, 320.

"The Action of Nitric Acid upon Aluminum, and the Formation of Aluminum Nitrate." *Jour. Am. Chem. Soc.*, XIX, 712–717; *Chem. Cent. Bl.*, LXVIII, 888; *Stev. Ind.*, XIV; *Rev. Am. Chem. Res.*[8], XIX, 4; *Jahrbuch der Chemie* (R. Meyer), 1897, 82.

"Engineering Chemistry, A Manual of Quantitative Chemical Analysis for Students, Chemists, and Engineers." Pp. 523, 820. Chemical Pub. Co., Easton, Pa., 1897. (3d ed.)

"The Adulteration of Paris Green, with a Scheme for Analysis." *Stev. Ind.*, July, 1898; *Paints, Oils, and Drugs*, 1898, 172.

"A Scheme for the Rapid Analysis of Boiler Water." *Stev. Ind.*, October, 1898.

"The Determination of Alkalies in Portland and Natural Cements." *Stev. Ind.*, October, 1901.

---

[1] "Chemical Trade Journal."
[2] "Zeitschrift für Angewandte Chemie."
[3] "Journal of Analytical and Applied Chemistry."
[4] "Journal of American Chemical Society."
[5] "Journal of Society of Chemical Industry."
[6] 'Bulletin de la Société Chimique de Paris."
[7] "Quarterly Digest of Physical Tests."
[8] "Review of American Chemical Research."

DAVID SCHENCK JACOBUS, M.E.

Professor of Experimental Engineering

David S. Jacobus was born in Ridgefield, Bergen County, N. J., January 20, 1862. His father, Nicholas Jacobus, for forty years a resident of Ridgefield, was the junior member of the firm of D. Jacobus & Son, manufacturers of sashes, doors, and blinds, Wooster Street, New York.



Prof. D. S. Jacobus

Young Jacobus received his early education at a private school conducted by the Rev. A. B. Taylor, a venerable country pastor who for many years presided over the old Dutch Reformed Church at Ridgefield,—a man whose precept in all things was, "Be sure of your foundation," and whose painstaking and kindly instruction was ever given with this in mind. He afterward entered the Junior class of the Stevens High School at Hoboken, N. J., and won, by competitive examination, a free scholarship in the Institute. He graduated with the degree of Mechanical Engineer in the Class of 1884, and was appointed Instructor in the Department of Experimental Mechanics. He served as such and as Assistant Professor for thirteen years until 1897, when he was advanced to a full professorship and placed in charge of the Department of Experimental Mechanics and Engineering Physics. On April 5, 1899, he married Laura Dinkel, of Jersey City, N. J. They have two children, David Dinkel and Laura Jacobus.

Prof. Jacobus acted as an assistant to Prof. Denton in the Department of Experimental Mechanics and Shop Work for fifteen years, starting this work even before the time of his graduation. Believing that members of the Faculty should keep in close touch with the engineering world, President Morton arranged matters so that much time could be spent by Professors Denton and Jacobus in the practical field and on original experiments, and by his kindly advice and encouragement aided them greatly in their researches. His youthful ambition changed night into day, and he then obtained a broad experience in practical experimental engineering work, in which field he is now an acknowledged authority. The work of Prof. Jacobus has been so closely associated with that of Prof. Denton that to speak of one is to speak of the other; and Prof. Jacobus attributes his success to the inspiration and assistance received from him.

In connection with his work in experimental engineering he has developed original apparatus for the illustration of physical laws and for testing various mechanical devices. These investigations have formed the basis of a large number of papers presented before engineering and scientific societies.

He is a member of the following associations: the American Society of Mechanical Engineers; the Society of Naval Architects and Marine Engineers; the American Institute of Mining Engineers; the American Society of Refrigerating Engineers; the American Mathematical Society; the Society for the Promotion of Engineering Education; the American Association for the Advancement of Science; the Franklin Institute of Philadelphia; and an associate member of the American Institute of Electrical Engineers. He is also a member of the Engineers' Club; the Holland Society of New York; and the New York Railroad Club.

In 1898 he was recommended by the Council of the American Society of Mechanical Engineers and appointed by their President on a committee of five to report upon the subject of "Codifying and Standardizing the Methods of Making Engine Tests." As secretary of this committee he expended much time preparing the report, which was accepted by the Society. He was elected a manager of the American Society of Mechanical Engineers in December, 1900, and also served for some time as a member of the Publication Committee and the Committee on Admissions. In December, 1903, he was elected a vice-president of this society.

Professors Denton and Jacobus worked together in developing the course of Experimental Mechanics, a line of work which had been inaugurated by Prof. Denton, in order that the work of the class-room might be supplemented with practical experiments made by the students. For many years they hoped that it might be possible to secure a building in which the machines and apparatus used in their department could be so placed as to form an attractive laboratory, and which should give facilities for the further development of the educational features which they had made a part of the course. Their desire was gratified when Mr. Andrew Carnegie donated the funds required to build the Carnegie Laboratory of Engineering, and the building was planned and constructed to embody their joint ideas. Later, Mr. Carnegie gave a generous endowment fund for the maintenance of the building.

The following is a list of the scientific papers of which Prof. Jacobus is the author:

"Error of Approximate Calculations of the Effect of the Inertia of the Moving Parts of a Steam-Engine." *Proc. A.A.A.S.*[1], XXXVI, 166, 1887; *Stev. Ind.*[2], V, 198, 1888.

"Special Lectures in Applied Mechanics." *Stev. Ind.*, V, 21.

"Comparative Efficiency of the Injector and Steam Pump." *Ibid.*, V, 112, 1888.

[1] "Proceedings of the American Association for the Advancement of Science."
[2] "Stevens Institute Indicator."

"Effect of Friction at the Connecting-Rod Bearings on the Forces Transmitted" (with Prof. J. B. Webb). *Proc. A. A. A. S.*, XXXVII, 153, 1888; *Ann. Math.*[1], IV, 169; *Trans A. S. M. E.*[2], XI, 1134.

"Efficiency of Vapor-Engines." *Stev. Ind.*, V, 249, 1888.

"Efficiency of a Steam Boiler Using the Waste Gas of a Blast Furnace as Fuel." *Trans. A. I. M. E.*[3], XVII, 50, 1888; *Stev. Ind.*, V, 238, 1888.

"Water Gas as a Steam-Boiler Fuel." *Trans. A. I. M. E.*, XVII, 300, 1889.

"Friction of a Small Vertical Engine." *Stev. Ind.*, VI, 102, 1889.

"Steam Consumption of Engines at Various Speeds" (with Prof. J. E. Denton). *Trans. A. S. M. E.*, X, 722, 1889.

"Experimental Mechanics as Developed in Foreign Technical Schools." *Stev. Ind.*, VI, 257, 1889.

"An Interesting Exercise in Applied Mechanics." *Stev. Ind.*, VI, 275, 1889.

"General Solution of Transmission of Force in a Steam Engine, as Influenced by the Action of Friction, Acceleration and Gravity." *Trans. A. S. M. E.*, XI, 492, 1890; *Ann. Math.*, February, 1890.

"An Improved Form of Closed Circuit Burglar Alarm." *Stev. Ind.*, VII, 39, 1890.

"Two Instruments for Illustrating the Action of the Polar Planimeter." *Ibid.*, VII, 130, 1890.

"Appendix to General Solution of the Transmission of Force in a Steam-Engine." *Trans. A. S. M. E.*, XI, 1,116, 1890.

"The Effective Area of Screws." *Ibid.*, XI, 1,028, 1890; *Proc. Inst. Civ. Eng. Gt. Brit.*[4], CIV, 391.

"Influence of Steam-Jackets of the Pawtucket Pumping Engine." *Trans. A. S. M. E.*, XI, 1,038, 1890.

"Determination of the Sensitiveness of Automatic Sprinklers" (Discussion). *Ibid.*, XI, 709, 1890.

"An Open Mercury Column for High Pressures" (Discussion). *Ibid.*, XI, 893, 1890.

"Latest Developments in Compressed-Air Motors for Tramways." *Trans. A. I. M. E.*, XIX, 553, 1890; *Stev. Ind.*, VIII, 17, 1891.

"Ledoux's Equations for the Latent Heat of Ammonia and Sulphur Dioxide" (with Prof. A. Riesenberger). *Stev. Ind.*, VII, 334, 1890.

"Experimental Determination of the Latent Heat of Ammonia and Sulphur Dioxide." *Trans. A. S. M. E.*, XII, 307, 1890.

"Influence of Receiver Jacket on Indicator Cards of a Compound Engine." *Stev. Ind.*, VIII, 131, 1891.

"Report on Duty Trials of Pumping-Engines; Comparison of Various Steam Tables" (Discussion). *Trans. A. S. M. E.*, XII, 590, 1891.

"Comparison of the Economy of Compound and Single-Cylinder Corliss Condensing Engines, Each Expanding about Sixteen Times." *Ibid.*, XII, 943, 1891.

"Relative Value of Carbonic Acid as the Working Fluid in Refrigerating Machines." *Proc. A. A. A. S.*, XL, 214, 1891; *Am. Mach.*[5], December 10, 1891.

"Maximum Error Due to Neglecting the Radiation Correction of a Barrus Universal Calorimeter." *Proc. A. A. A. S.*, XL, 214; *Am. Mach.*, December 17, 1891.

---

[1] "Annals of Mathematics." [2] "Transactions of the American Society of Mechanical Engineers."
[3] "Transactions of the American Institute of Mining Engineers."
[4] "Proceedings of the institute of Civil Engineers of Great Britain." [5] "American Machinist."

"Relative Merits of Various Steam Tables." *Stev. Ind.*, VIII, 314, 1891.

"Influence of the Steam Jackets of the Pawtucket Pumping-Engine" (Discussion). *Trans. A. S. M. E.*, XIII, 190, 1892.

"Economy of the Pawtucket Pumping-Engine With and Without Superheating." *Stev. Ind.*, IX, 40, 1892.

"On the Heat of Dissociation of Ammonia in Refrigerating Machines of the Absorption Type" (with Prof. J. E. Denton). *Stev. Ind.*, IX, 23, 129, 1892.

"Summary of Results of Principal Experimental Measurements of Performance of Refrigerating Machines" (with Prof. J. E. Denton). *Trans. A. S. M. E.*, XIII, 507, 1892.

"Two-Cylinder versus Multi-Cylinder Engines" (Discussion). *Ibid.*, XIII, 660, 1892.

"Steam Economy of the Engines of the Screw Ferryboat 'Bremen'" (with Prof. J. E. Denton). *Proc. A. A. A. S.*, XLI, 135, 1892.

"Use of Anemometers for Measuring the Velocity of Air in Flumes." *Ibid.*, XLI, 137, 1892.

"Measurements of the Total Heats of Combustion." *Ibid.*, XLI, 136, 1892.

"Calculation of the Heat of Combustion of an Illuminating Oil Gas, and Comparison With the Heat Determined by Experiment." *Stev. Ind.*, IX, 351, 1892.

"Experimental Determination of the Heat Generated per Candle-Power by Oil and Gas Lamps." *Trans. A. S. M. E.*, XIV, 331.

"Ice-Making Machines," by M. Ledoux. Revision and Transformation into English Units (with Prof. J. E. Denton and Prof. A. Riesenberger). Van Nostrand's "Science Series," No. 46, 1893.

"Comparison of the Power Obtainable from Liquefied Carbonic Acid Gas and Compressed Air." *Stev. Ind.*, X, 130, 1893.

"Tests of Automatic Fire Sprinklers." *Proc. A. A. A. S.*, XLII, 123, 1893; *Am. Mach.*, January, 1894.

"An Accurate Method of Measuring Heavy Liquid Pressures." *Proc. A. A. A. S.*, XLII, 123, 1893.

"Experimental Determination of the Quickness of Action of a Shaft Governor." *Ibid.*, XLII, 124, 1893.

"A Comparison of the Mean Effective Pressure of Simultaneous Cards Taken with Different Indicators." *Trans. A. S. M. E.*, XV, 277, 1894.

"Ice-Making." *Johnson's Universal Cyclopedia*, IV, 478.

"Errors of Measurements of Power by the Steam-Engine Indicator." *Stev. Ind.*, XI, 65, 1894.

"An Improvement in the Planimeter." *Trans. A. S. M. E.*, XV, 635, 1894.

"Results of Measurements of the Water Consumption of an Unjacketed 1,600 Horse-Power Compound Harris-Corliss Engine" (with Prof. J. E. Denton and R. H. Rice). *Ibid.*, XV, 882, 1894.

"Results of Experiments with a 50 Horse-Power Single, Non-Condensing Ball & Wood Engine, to Determine the Influence of Compression on the Water Consumption." *Ibid.*, XV, 915, 1894.

"Notes on the Theory of Shaft Governors" (Discussion). *Ibid.*, XV, 950, 1894.

"On the Precautions Necessary in the Use of Mercurial Thermometers in Determining the Amount of Superheat in Steam." *Proc. A. A. A. S.*, XLIII, 191, 1894. Included in the general article on "Measurements of Temperature of Steam." *Stev. Ind.*, XIII, 43, 1896.

"Improvements in Method of Testing Automatic Fire Sprinkler Heads." *Proc. A. A. A. S.*, XLIII, 193; *Stev. Ind.*, XI, 159, 1894.

"Preliminary Experiments on a New Air Pyrometer for Measuring Temperatures as High as the Melting-Point of Steel." *Proc. A. A. A. S.*, XLIII, 192, 1894.

"A Dynamic Steam-Engine Indicator Tester" (Discussion). *Transactions of the Society of Naval Architects and Marine Engineers*, II, 156, 1894.

"Experimental Determination of the Quickness of Action of a Shaft Governor, and Theoretical Consideration of the Influence of an Inertia Weight." *Stev. Ind.*, XI, 323, 1894.

"Results of Measurements to Test the Accuracy of Small Throttling Calorimeters." *Trans. A. S. M. E.*, XVI, 448, 1894; *Stev. Ind.*, XII, 177.

"Refrigerating Processes." *Johnson's Universal Cyclopedia*, VII, 39.

"Tests of Automatic Fire Sprinkler Heads." *Stev. Ind.*, XI, 159, 1894; XII, 45, 1895.

"New Forms of Friction Brakes" (Discussion). *Trans. A. S. M. E.*, XVI, 819, 1895.

"Tests to Show the Distribution of Moisture in Steam when Flowing through a Horizontal Pipe." *Ibid.*, XVI, 1,017, 1895.

"Some Experiments with Throttling Calorimeters" (Discussion). *Ibid.*, XVII, 162, 1895.

"Experimental Methods of Determining the Effective Centre of the Light Emitted from a Standard Photometric Burner." *Ibid.*, XVII, 212, 1895.

"Correspondence on Thermal Efficiency of Steam Engine: Uses of the Diagram. Necessity of a Standard, Taking into Account the Conditions under which an Engine Works. Measurements of the Efficiency of the Distributions of Steam in Compound Engines." *Proc. Inst. Civ. Eng. Gt. Brit.*, CXXV, 226.

"Measurement of Temperature of Steam." *Stev. Ind.*, XIII, 43, 1896.

"An Apparatus for Exhibiting the Distribution of Moisture in a Steam Main." *Proc. A. A. A. S.*, XLV, 97, 1896.

"An Apparatus for Accurately Measuring Pressures of Two Thousand Pounds per Square Inch and Over." *Ibid.*, XLV, 97, 1896.

"An Apparatus for Tracing a Curve Representing the Force Required to Overcome the Inertia of the Reciprocating Parts of a Steam Engine." *Ibid.*, XLV, 97, 1896.

"Values of Heat of Combustion of Various Gases per Cubic Foot for Use in Calculating the Heating Power from the Analysis of a Gas. *Ibid.*, XLV, 97, 1896.

"Artificial Lighting; Modern Methods Compared,—Electric-Incandescent, Welsbach, Acetylene." *Jour. Frank. Inst.*, CXLIII, 364, 1897.

"Tests to Show the Influence of Moisture in Steam on the Economy of a Steam Turbine." *Trans. A. S. M. E.*, XVIII, 699, 1897.

"An Apparatus for Accurately Measuring Pressures of Ten Thousand Pounds per Square Inch and Over." *Ibid.*, XVIII, 1,041, 1897.

"Flue Gas Analysis in Boiler Tests." *Trans. A. A. A. S.*, XLVI, 180, 1897.

"On Determining the Moisture in Steam." *Stev. Ind.*, XIV, 395, 1897.

"Correspondence on Condensation of Steam; Determination of the Factor of Condensation." *Proc. Inst. Civ. Eng. Gt. Brit.*, CXXXI, 245, 1897–98.

"Experimental Mechanics; Methods of Calculating and Recording the Results of Experiments Made at the Stevens Institute During the Supplementary Term." *Stev. Ind.*, XV, 175, 255, 388, 1898.

"Methods of Testing Indicators." *Trans. A. S. M. E.*, XX, 404, 1898.

"Correspondence on High-Speed Engines; Employment of a Vibratory Tachometer to Determine Instantaneous Variations of Speed of the Governor." *Proc. Inst. Civ. Eng. Gt. Brit.*, CXXXVI, 130, 1898–99.

"Determination of the Moisture in Steam Flowing Through a Horizontal Pipe." (contributed to "Code for Conducting Steam Boiler Trials"). *Trans. A. S. M. E.,* XXI, 106, 1899.

"Test of Pumping Engines" (Matter in regard to the calibration of indicators) (Discussion). *Ibid.,* XXI, 345, 1899.

"Testing Indicator Springs." *Stev. Ind.,* XVI, 397, 1899.

"New Form of Pressure Gauge" (Discussion). *Trans. A. S. M. E.,* XXI, 447, 1899.

"A Le Chatelier Pyrometer in Which any Error Due to Variations in the Resistance of the Platinum and Platinum-Rhodium Elements is Eliminated." *Trans. A. A. A. S.,* XLIX, 151, 1900.

"Education of Machinists and Mechanical Engineers" (Discussion). *Trans. A. S. M. E.,* XXI, 739, 1900.

"Testing Steam-Engine Indicators" (Discussion). *Ibid.,* XXII, 121, 1901.

"Tests of Non-Conductive Coverings for Steam Pipes." *Stev. Ind.,* XVIII, 240, 1901.

"A Comparison of Pipe-Covering Tests." *Ibid.,* XIX, 12, 1902.

"Tests of Steam-Pipe Coverings" (Discussion). *Trans. A. S. M. E.,* XXIII, 838, 1902.

"Water and Heat Consumption of a Compound Engine at Various Powers." *Ibid.,* XXIV, 1,274, 1903.

"Tests of a Compound Engine Using Superheated Steam." *Ibid.,* XXV, 1904.

ADAM RIESENBERGER, M.E.

Professor of Mechanical Drawing; Registrar and Assistant Treasurer

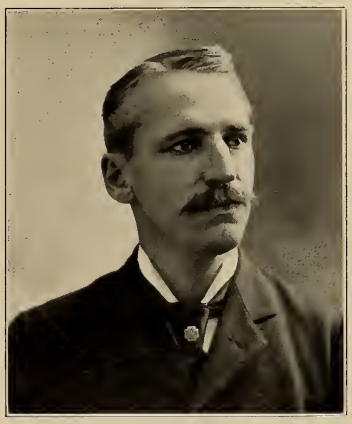
Adam Riesenberger was born in Whiteport, Ulster County, N. Y., February 9, 1857, and when he was three years old the family moved to Hudson County, N. J. His parents, Nicholas and Catherine Riesenberger, were natives of Bavaria, Germany, and came to this country about 1847. At the age of eight years he entered the Hoboken Academy, and attended this school until 1872, completing the course in his sixteenth year. He was admitted as a student of the Stevens Institute in the same year, and was graduated with the degree of Mechanical Engineer in 1876.

During his college course he took an active part in athletics and played upon the regular 'Varsity baseball and football teams. After graduation from the Institute he served a short apprenticeship in a general machine-shop, and was then appointed an assistant in the Mechanical Laboratory of the Stevens Institute, which was at that time under the directorship of Prof. R. H. Thurston. His duties included the testing of materials of construction and the computation of the results of tests. In conjunction with his work he also had charge, for one year, of a class in the Stevens High School.

In 1881 he was appointed Instructor in the Department of Mechanical Drawing, was advanced to Assistant Professor in 1887, and to Professor in 1899. Until 1892 he assisted Prof. MacCord in the four classes. Then, owing to the

large number of students in attendance, Prof. MacCord confined his instruction to the Senior and Junior classes, and to Prof. Riesenberger was given the full charge of the Sophomore and Freshman classes.

In 1884 he succeeded Mr. William A. Macy as Treasurer of the Institute. The accounts, which previous to that time had been kept at the office of the Hoboken Land & Improvement Company in Newark Street, Hoboken, were then transferred to the Institute Building. He was treasurer to the Board of Trustees until 1892; since the latter year Col. E. A. Stevens has been the Treasurer, and Prof. Riesenberger Assistant Treasurer. During the years 1881 to 1892 he acted as Librarian. For a number of years he has also performed duties usually devolving upon the registrar of a college, and in 1902, when the office of Registrar was formally established, he was appointed to fill it.



Prof. A. Riesenberger

With the many routine office duties devolving upon him he has still found time for some literary work, and accepted the editorship of the "Stevens Indicator" in 1890, three years after it had been changed to a quarterly magazine; continued in charge of the editorial management until 1893; and in 1896 resumed the editorship, jointly with Dr. Thos. B. Stillman, for a year and a half. As a member of the Publication Committee of the Twenty-fifth Anniversary of the Stevens Institute (to which was originally assigned the publication of a volume commemorating the occasion), he compiled, in 1897 and 1898, a record of the work done and positions held by the Alumni of Stevens from the time of graduation to and including the year 1896. In 1889 Professors Denton, Jacobus, and Riesenberger made a revision and transformed the units of Ledoux's treatise on Ice-Making Machines.

He has been an active member of the Stevens Institute Alumni Association since its organization, was its Treasurer from 1879 to 1889, a Director for several terms, and Vice-President in 1894. In 1892, when the Alumni Association decided to raise a fund for the erection of an Alumni Building, Prof. Riesenberger was made custodian, and later, with President Morton, a trustee of the fund. He served in this capacity until 1900, when the securities comprising the fund were transferred to the Trustees of the Institute.

He has been a member of the American Society of Mechanical Engineers since 1890. He is a member of the Beta Theta Pi and Tau Beta Pi fraternities.

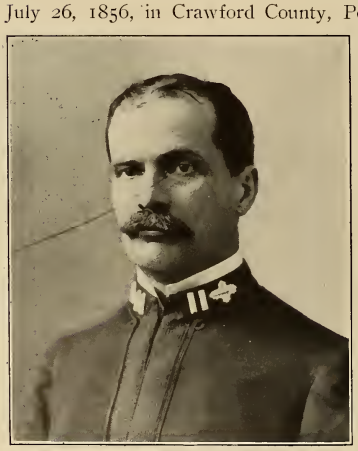
When his present term as member of the Board of Education of the Town of Union, N. J., expires, he will have served twelve years in that office. He was one of the incorporators, and a director for ten years, of the Hudson Trust & Savings Institution (now the Hudson Trust Co.) of Hudson County; is vice-president of the Hoboken Trust Company; has been a director of the Hoboken Building & Loan Association for fourteen years; and was for several years vice-president of the Town of Union Building & Loan Association. He is also a trustee of the Old People's Home Benevolent Association of North Hudson County. When the Library Association of the Town of Union was organized, he was elected a trustee and was its first secretary. The Free Library then established was supported with funds raised by private subscriptions until, by a legislative enactment, it could be supported by the taxpayers of the town.

In 1878 Professor Riesenberger married Antoinette Schlemm, who died June 27, 1880. This union was blessed with one daughter, Antoinette. On December 18, 1881, he married Sophie Werner, and to them have been born six children, Kate, Florence, Edwin Adam, Otto John, Elsie, and Frank Riesenberger.

LT.-COM. CLARENCE ALFRED CARR, U.S.N.

Professor of Marine Engineering, 1883–1886

Clarence A. Carr, Lieutenant-Commander, United States Navy, was born July 26, 1856, in Crawford County, Pennsylvania. He was educated at a public school in the country until, after a competitive examination, he entered the United States Naval Academy as a cadet engineer in September, 1875. After graduating at the Academy in June, 1879, he served in the junior grades of the engineer corps of the navy, doing duty at sea on the "Kearsarge," "Omaha," "Monocacy," "Marion," and "Marblehead." In the intervals between cruises he did duty on shore as Professor of Marine Engineering and Instructor in Mathematics at the Stevens Institute of Technology (1883–1886), at the Bureau of Steam Engineering, at the New York Navy Yard, and as inspector of machinery building for the navy in New York city, South Boston, Mass., and Newport News, Va.



Prof. C. A. Carr

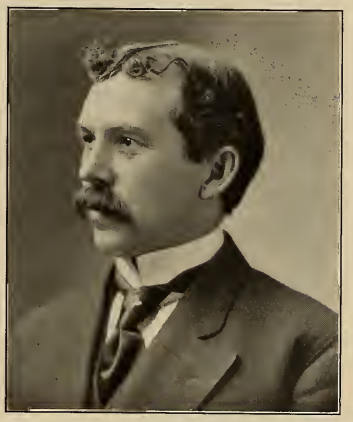
At the beginning of the Spanish-American war he had charge of the work on machinery necessary to fit for service the auxiliary cruisers "Panther," "Badger," "Resolute," and "Gloucester," and later served as chief engineer of the ammunition and ordnance transport "Armeria."

The Personnel Bill, which united the line and the engineer corps of the navy, gave him the rank of lieutenant (for engineering duty) from March 3, 1899. Since that time he has served at sea, in China and the Philippines, on the "Monadnock," the "Bennington," and the "Solace," and ashore at the Cavité naval station and as inspector of repairs and supplies for the navy at Hongkong. He was commissioned lieutenant-commander September 28, 1901.

WILLIAM HENRY BRISTOL, M.E.

Professor of Mathematics

William H. Bristol, son of Benjamin H. and Pauline (Phelps) Bristol, both of English descent, was born in Waterbury, Conn., July 5, 1859. He studied at the public schools at Naugatuck, Conn., until 1876, when he became clerk in a general store at that place, in which position he remained until 1880. In the fall of that year he entered the Stevens Institute with the Class of 1884. During his Junior year he organized the manual-instruction department in the Workingman's School, New York, and began teaching there, at the same time continuing his course of study at the Institute, from which he was graduated in 1884 with the degree of Mechanical Engineer. He continued to teach at the Workingman's School until 1886, when he resigned this position to accept that of Instructor in Mathematics at the Stevens Institute of Technology, and two years later he became Assistant Professor in that department. He was appointed Professor of Mathematics in 1899.



Prof. W. H. Bristol

In 1885 Professor Bristol married J. Louise Wright, who died three years later. On June 28, 1899, he married Elise H. Myers.

He is a member of the American Society of Mechanical Engineers and a Fellow of the American Association for the Advancement of Science.

In addition to carrying on his instruction in the Department of Mathe-

matics at the Institute he has, during the past fourteen years, devoted considerable attention to inventing, experimentally perfecting, and manufacturing a series of recording instruments adapted to make continuous records of pressure, temperature, and electricity. As indicating the character of Prof. Bristol's work in this direction we give a brief illustrated description of several of the more important instruments.



FIG. 1.—RECORDING PRESSURE GAUGE

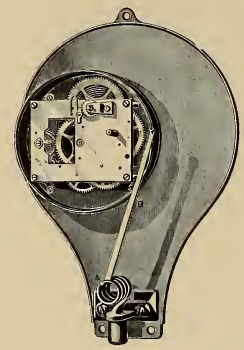


FIG. 2.—INTERIOR OF RECORDING PRESSURE GAUGE

The recording pressure gauge, as shown in the accompanying illustration, Fig. 1, is complete and ready for use. In the second illustration, the front of the case has been removed to show the operative portions of the instrument. It will be seen that the design is such that no multiplying devices are necessary to secure sufficient movement of the pen for making the record. The pressure to be recorded acts directly upon a helical tube of flattened cross-section. The pen-arm is fastened to the free end of this tube, and is turned with it through angles corresponding to the changes of pressure. The pen makes a record with ink upon a circular chart which is revolved by a clock movement. The charts are graduated by concentric circles representing various ranges of pressure, and by radial arcs corresponding to the time of day. This type of gauge is regularly manufactured for all ranges of pressure between 12 pounds and 10,000 pounds per square inch. For extremely low ranges of pressure, where the total scales are between one ounce and ten pounds per square inch, the helical tube is replaced by a system of corrugated diaphragms which offer a greater area for the low pressure to act upon. Gauges of this class are employed for recording the distributing pressures of illuminating gas.

Prof. Bristol's recording thermometers involve an application of the working principle described in the above-mentioned pressure gauges. Three types of recording thermometers are made, as follows:

I. Those for atmospheric ranges of temperature in which the helical tube of the pressure gauge is completely filled with a liquid such as alcohol, and the operation depends upon the direct expansion of the liquid enclosed to produce a pressure which is recorded upon a chart having graduations representing degrees of temperature. This type of thermometer is made in two forms,—one in which

the helical tube is enclosed within the case of the recorder, and the other where the sensitive bulb portion is connected by a capillary tube so that the recorder may be located within doors for recording outside temperature, as illustrated in Fig. 3.

II. Those for ranges of temperature between 150° and 500° Fahrenheit, in which the bulb is connected with the recorder by a capillary tube of the desired length, and in which the operation depends upon the pressure of the vapor of a liquid enclosed within the bulb, which is exposed to the temperature to be recorded. This type is illustrated in Fig. 4, from which it will be seen that the bulb may readily be caused to record temperatures of liquids flowing in pipes, or of gases in closed spaces. The records made by this type of thermometer are absolutely independent of changes of temperature at the recorder, or at points between the recorder and the bulb, since the pressure communicated to the recorder depends entirely upon the pressure of the vapor within the heated bulb.

III. Recording thermometers adapted for ranges from 0° to 800° Fahrenheit, which are an application of the working principle of the recording pressure gauge, where the operative force is the expansion of an inert gas which is enclosed within a bulb and connected to the recorder by a capillary tube of convenient length.

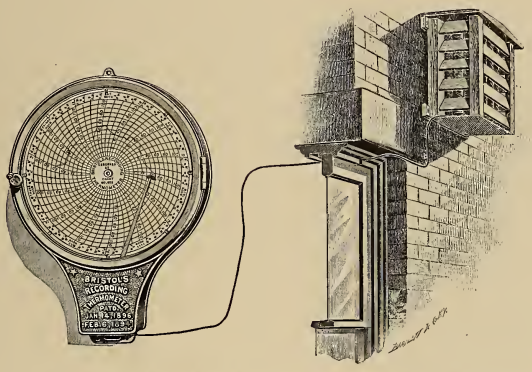


Fig. 3.—Recording Thermometer for Atmospheric Ranges of Temperature

The electrical recorders include volt, ampere, and watt meters for both alternating and direct currents. Fig. 6 represents the recording voltmeter complete, with the case removed in order to show the principle of its operation. A solenoid is supported by knife-edge springs, and is free to move toward a stationary solenoid when they are mutually attracted to each other by a current of electricity of which the voltage is to be measured. The recording pen is secured directly to the end of one of the supporting knife-edge springs, and partakes of its angular

motion, carrying the pen over the entire scale of the chart without other multiplying devices. The recording ampere meters are made with a stationary solenoid

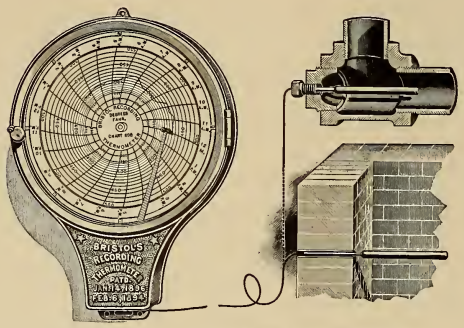


FIG. 4.—RECORDING THERMOMETER FOR CLOSED SPACES

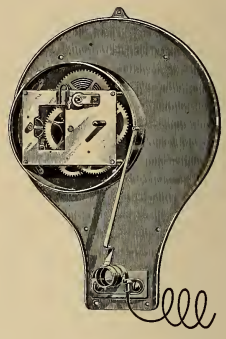


FIG. 5.—INTERIOR OF RECORDING THERMOMETER

as in the voltmeter, but a very light iron armature is substituted for the movable solenoid. The movable armature is of special design to produce a scale which is nearly uniformly divided. The pen is carried by one of the supporting knife-edge springs, such as are used in the recording voltmeters. Recording wattmeters are made by replacing the stationary solenoid of the recording voltmeter with one having the proper winding to carry the entire current to be measured. The mutual attraction of the volt and ampere coils gives a deflection of the pen-arm proportional to the watts of the circuit.

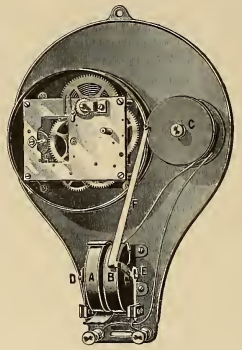


FIG. 6.—INTERIOR OF RECORDING VOLTMETER

Up to the present time Prof. Bristol has developed over four hundred different varieties of the above-mentioned instruments, to meet almost every industrial requirement, and additions are continually being made. Thousands of the instruments have been sold and are in daily use.

Illustrated descriptions of the above and other inventions of Prof. Bristol may be found in the following publications:

A New Recording Pressure Gauge. *Trans. A. S. M. E.*[1], XI, 225, 1890.

A New Recording Pressure Gauge for Extremely Low Ranges of Temperature. *Ibid.*, XIV, 325, 1893.

A New Recording Pressure Gauge for Extremely High Ranges of Temperature. *Ibid.*, XV, 1,119, 1894.

A Recording Voltmeter. *El. Eng.*[2], Oct. 11, 1893.

A Recording Wattmeter. *Ibid.*, June 6, 1894.

A Recording Ampere Meter. *Ibid.*, March 20, 1895.

A Recording Thermometer for Closed Spaces. *Sci. Am.*[3], September 1, 1894.

A Recording Thermometer for Atmospheric Ranges of Temperature. *Ibid.*, March 7, 1896.

New Atmospheric Range Recording Thermometer for Closed Spaces. *El. Eng.*, July 29, 1897.

A New Recording Air Pyrometer. *Trans. A. S. M. E.*, XXIII, 143, 1902.

Bristol's Patent Belt-Lacing (illustrated descriptions). *Sci. Am.*, August 24, 1889; April 14, 1894.

In the year 1889 he organized The Bristol Company for the purpose of manufacturing his inventions. At the World's Columbian Exposition in Chicago in 1893 his company was awarded a medal and diploma for the recording instruments and steel belt-lacing exhibited.

On March 5, 1890, the Committee on Sciences and Arts of the Franklin Institute, of Philadelphia, awarded him the John Scott Legacy medal and premium for his sinuous-tube recording pressure gauge, and on January 3, 1894, the Franklin Institute also awarded him the Edward Longstreth medal of merit for his diaphragm gauge for extremely low ranges of pressure. Prof. Bristol's instruments were exhibited by the Bristol Company at the Paris Exposition in 1900, and were awarded a silver medal.

The following United States patents have been granted to Prof. Bristol:

Expansion Device for Galvanometers, 1888
Pressure Indicator and Recorder, 1888
Belt-Fastener, 1889
Pressure Indicator and Recorder, 1890
Photographic Camera, 1890
Electric Meter, 1890
Pen, 1891
Photographic Camera, 1892
Camera Shutter (two patents), 1892
Recording Voltmeter, 1893
Pressure Gauge, 1894
Pressure Gauge, 1894
Recording Pressure Gauge (with E. H. Bristol), 1894
Temperature Compensating Device, 1894
Recording Ampere Meter, 1895
Electrical Measuring Instrument, 1895
Recording Thermometer, 1896
Steel Belt-Lacing, 1898
Multiplying Device for Recording Instruments, 1899
Method of Manufacturing Steel Belt-Lacing, 1899
Design for Recording-Instrument Case, 1899
Damping Device for Electrical Recorders, 1900
Recording Air Pyrometer (with E. H. Bristol), 1900
Thermometer-Thermostat (with E. H. Bristol), 1903
Record Sheet for Recording Instruments, 1904

[1] "Transactions of the American Society of Mechanical Engineers."
[2] "Electrical Engineer."
[3] "Scientific American."

ALBERT FREDERICK GANZ, M.E.

Professor of Electrical Engineering

Albert F. Ganz, son of Albert and Helen T. Ganz, was born in Elberfeld, Germany, April 25, 1872, and came to this country with his parents in 1881, settling in New York city. After attending private and public schools he entered the College of the City of New York in 1886, and completed the first year's work in the mechanical course. He then determined to become an electrical engineer, and, in order to learn the practical side, entered the electrical works of Bergmann & Co., New York, as an apprentice. After three years in the shops he was made assistant electrician, working in the testing and designing departments. He remained with the firm in this capacity until its absorption by the Edison General Electric Co., of Schenectady, and held the same position with that company until 1892. While with Bergmann & Co. he attended the Cooper Union Night School for four years, taking courses in mechanical drawing, mathematics, and physics.



Prof. A. F. Ganz

Feeling the need of a thorough technical training he left the Edison General Electric Co. in the summer of 1892 to prepare for the course of study at Stevens Institute; in the fall of that year he entered the Sophomore class and graduated in 1895 with the degree of Mechanical Engineer. During the summer of the latter year he taught mathematics in the Long Island Chautauqua Summer School at Point o' Woods, under Professor Webb, whom he also assisted in resurveying the grounds.

In the fall of 1895 he was appointed Instructor in Applied Electricity in Stevens Institute, and immediately began to work with Dr. Geyer in developing the electrical course so as to keep it abreast with the rapid progress in this science. After the death of Prof. Mayer in 1897 President Morton and Dr. Geyer took up the class-room work in physics, and Prof. Ganz was called upon to assist in this work in addition to his duties in the Electrical Department. His title was at this time changed to Assistant Professor of General Physics and Applied Electricity. He continued his work in the two departments until December, 1902, when Applied Electricity was separated from Physics and he was promoted to Professor of Applied Electricity and placed in charge of the Department,

the name of which was changed to the Department of Electrical Engineering in 1903. Being relieved of the work of Physics, he devoted himself entirely to Electrical Engineering and began a systematic revision of the Laboratory equipment, installing two new slate switchboards, completely rewiring the laboratories, and installing a large amount of new apparatus to supplement and partly take the place of some of the older types. He was greatly assisted in this work by the generous donations made to the Department by a number of graduating classes, and also by some of the leading electrical manufacturers. He also developed a series of lecture and laboratory notes which are used by the Junior and Senior classes.

In addition to his work of instruction and of developing the electrical course, he has been frequently engaged by both private parties and public bodies to make commercial and scientific tests, to examine and report on new electrical devices, and to give expert testimony in lawsuits involving electrical problems. He has also given a number of popular lectures on "Wireless Telegraphy," "The Nernst Lamp," "History and Development of Electric Lighting," "Color," etc. He has made trips to Europe on several occasions, visiting the leading electrical works and technical schools, and has made a detailed study of their equipments and methods. He has also contributed several articles to the "Stevens Institute Indicator."

Prof. Ganz is a member of the American Institute of Electrical Engineers; the American association for the Advancement of Science; the Society for the Promotion of Engineering Education; the New York Electrical Society; and the Tau Beta Pi fraternity. From 1899 to 1902 he was Treasurer of the Stevens Alumni Association.

He married Antonia Christina Stursberg, June 21, 1902. They have one son, Albert Gustav Ganz.

FRANKLIN DeRONDE FURMAN, M.E.

Professor of Mechanical Drawing and Designing

Franklin DeR. Furman, son of John Lewis and Adelia Catherine (De Ronde) Furman, was born in Ridgely, Caroline County, Md., August 30, 1870. His parents were respectively of Holland and of French descent, and on both sides the families were among the early settlers in the southeast section of New York State. After a short residence in Maryland the family removed to Monsey, Rockland County, N. Y., and later, in 1881, settled in Jersey City, N. J. Franklin, the eldest son, received his early schooling at Monsey, and in the public grammar schools of Jersey City. He then attended Hasbrouck Institute, Jersey City, for three years, and upon graduation, in 1888, entered business in New York, where he secured a year's experience in office and factory work.

In the fall of 1889 he entered Stevens Institute, and was graduated with his Class in 1893, receiving the degree of Mechanical Engineer. He was one of the organizers of the "Stevens Life" in his Freshman year, and continued as its business manager for three years, during which time he was actively engaged on the "Link" and in various college enterprises. He was president of his Class during the Junior year, and at the graduating exercises he delivered the valedictory address. Previous to his graduation he accepted a temporary position in the Department of Drawing in the Stevens Institute, and later, during the summer, was asked to return as an assistant in the same department, instructing in the Freshman and Sophomore classes. In addition to his duties in the Drawing Department he assisted in the surveying work of the Department of Mathematics for two years, and had charge of the Department of Mechanical Drawing in the Stevens School from 1894 to 1900. During the year 1894–95 he organized and established the elementary course in mechanical drawing which has since been pursued in the School, and has been adopted in other preparatory institutions. During the above period he also arranged an advanced course in draughting for a number of special students who subsequently obtained responsible positions.



Prof. F. DeR. Furman

In May, 1897, he accepted the position of managing editor of the "Stevens Institute Indicator," a quarterly magazine, and the official organ of the Stevens Institute. He held this office, in addition to his Institute work, for five years, during which time the "Indicator" continued its prestige as a high-class technical college journal, each one of the twenty issues appearing regularly with original technical articles which were largely reprinted in prominent engineering papers at home and abroad. During this period the "Indicator" also prospered financially, earning sufficient to pay off an old indebtedness amounting to over $1,000, and accumulating, in addition, a cash surplus of over $1,500.

Prof. Furman was appointed, in the fall of 1899, to assist Prof. MacCord in the work of the Junior and Senior classes in addition to his other duties. The following year he was relieved of the work of the lower classes and of the preparatory school, and his entire time was given to the development of the Junior and Senior work in drawing, and to his editorial duties.

He was assigned the work of instruction in Valves, Valve Diagrams, and

Valve Gears in 1901. Since then he has prepared and issued a complete set of notes for this course in the class-room work, including governors for steam-engines; and has also made an extensive revision of the notes for the designing work in this subject in the draughting-room.

In the spring of 1902 Prof. Furman's position was advanced from Assistant Professor of Mechanical Drawing to Associate Professor of Mechanical Drawing and Designing, and again in 1904 to the full professorship in these subjects.

He resigned the editorship of the "Indicator" in the summer of 1902 to devote more time to the development of the Department of Mechanical Drawing and Designing, the scope of which had just previously been largely increased. During the collegiate year 1902–03 he prepared and issued a set of notes for a complete engine design. Several new exercises were also introduced, including the study of actual working blue-prints until a proficiency in reading them is demonstrated by the ability of the student to make free-hand isometric working drawings or pictures from the views given in the blue-print. During 1903–04 he issued a set of notes for the Senior Class, giving the elementary principles involved in the calculations for columns, girders, beams, etc., and general directions with practical data for laying out foundations, and superstructures for buildings, towers, bridges, etc.

For a number of years Prof. Furman has given much time to visiting, and studying the methods pursued and the practices followed in, the draughting-rooms and shops of the most prominent manufacturers in the East. During the summer of 1902 he visited several of the European countries. One of the concrete results of his observations is a tabulated review of standard draughting-room methods for reference in the Institute work.

During the winter of 1900–01 President Morton called upon Prof. Furman to assist in the work of issuing the "Twenty-fifth Anniversary Volume," which had been in preparation for several years. He began by compiling the data for, and editing a chapter on the engineering work of the Stevens Family. He then devoted much time to the history of the Institute which was largely condensed from a very complete work that was done by him at the time of the Twenty-fifth Anniversary in 1897. Finally he completed the technical records of the alumni. Upon the death of President Morton in the spring of 1902, the responsible work of completing many unfinished items, the editing and the raising of funds for publishing the book, fell entirely to him. Early in 1903 Prof. Furman proposed that the book be changed from a "Twenty-fifth Anniversary Volume" to the "Morton Memorial Volume" although such proposed departure from the original plan involved a radical change in the arrangement and size of the book, and in the character of the subject-matter. This proposed change of plan was favored by all who were closely interested in the book. The revision of the text was begun in the spring of 1903, and in the fall of the same year the contract for printing was placed.

Prof. Furman gave his entire spare time to this work from 1900 to the day of the issue of the book.

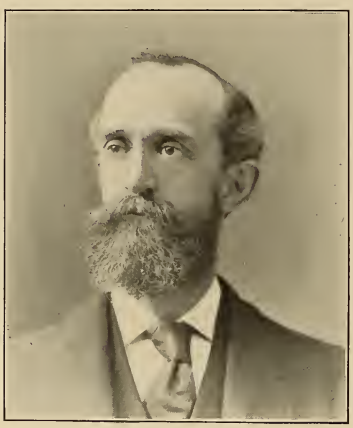
Prof. Furman is a member of the American Society of Mechanical Engineers, the Tau Beta Pi fraternity, and the Roseville Golf Club. From 1895 to 1898 he was Corresponding Secretary of the Alumni Association of Stevens Institute of Technology, and then Director of the same for two years.

On November 3, 1894, he married Minnie Adelaide Thompson, daughter of the late Col. William H. Thompson, of Brooklyn, N. Y.

SAMUEL DAYTON GRAYDON, M.E.

Assistant Professor of Mechanical Drawing

Samuel D. Graydon, son of Samuel and Ida (Dayton) Graydon, was born in New York city August 13, 1852. His paternal grandfather, John Graydon, was born in the north of Ireland, whither his ancestors had gone from the north of England at the time of Cromwell's invasion. John Graydon married Mary Whitley, and to them were born five sons and four daughters, all of whom came with their father to New York about 1826. The sons established themselves in the dry-goods importing and jobbing trade, Samuel, John W., and Joseph in the firm of Graydon, Swanwick, & Co., and William and James in the firm of Graydon, McCreery, & Co. .



Asst.-Prof. S. D. Graydon

Prof. Graydon's preparatory education was completed in 1868 at the Collegiate Institute, New York. The following year he went to Colorado with a view to prepare for the study of mining engineering; but the death of his father in September, 1869, necessitated his return home to care for the family.

Entering Stevens Institute in January, 1872, he took the full course of study with the Class of 1875. Before graduating he was compelled to go west on business relating to his father's estate. In 1878 he entered the employ of Charles Vogt, in New York, with whom he remained till 1882, when he joined in organizing the Graydon & Denton Manufacturing Co., for the manufacture and sale of rock-drills and other machinery. From 1886 he was for several years connected

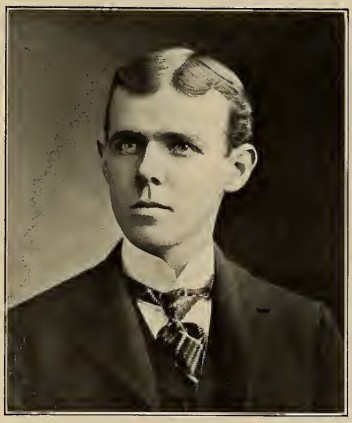
with the Harrison Safety Boiler Works, and in September, 1892, he received the appointment of Assistant Professor of Mechanical Drawing at Stevens Institute.

In 1878 he married May Field, who died in 1886, leaving one son, Samuel, and three daughters, Winifred, Linda, and Edith. In 1890 he married Mary A. MacDonald, and five children have been born to them, Whitley, Mary Constance, MacDonald, Kenneth, and Margaret Graydon.

FREDERICK LINCOLN PRYOR, M.E.

Assistant Professor of Experimental Engineering

Frederick L. Pryor, son of Robert W. and Rachel A. (Walsh) Pryor, was born in Newark, N. J., April 6, 1875. He attended successively the primary, grammar, and high schools of that city. Before graduating from the high school he decided to enter the Stevens Institute in the approaching fall. In order to prepare himself more fully for the task of passing the entrance examinations, he left the public school and enrolled at the Stevens School for five months. With this preparatory education he entered the Institute with the Class of 1897.



Asst.-Prof. F. L. Pryor

After completing the college course he was engaged as an Instructor in the Department of Mathematics, and a year later was transferred to the Department of Experimental Mechanics and Engineering Physics. Besides being an Instructor in this Department he became an Assistant in the Department of Tests. He was prominently identified in the supervision of the construction of the Carnegie Laboratory of Engineering, and also had charge of the work of equipping the mechanical department of the Laboratory. In the spring of 1901 he was appointed Assistant Professor of Experimental Mechanics and Engineering Physics, and when the Department of Buildings and Grounds, in conjunction with a Purchasing Department, was inaugurated at the Institute, he was appointed Assistant Superintendent. At the beginning of the year 1903 he assumed charge of the course in Shop Work, and during the college year 1903–04 he carried on the work of the Department of Engineering Practice in the absence of Prof. Denton.

For six months of the year 1902 he was at Buffalo, organizing an experimental department for the American Radiator Co., returning to reassume his duties at the Institute at the beginning of the college year 1902–03.

He is a member of the American Society of Mechanical Engineers, and was for two years Recording Secretary of the Alumni Association of the Stevens Institute. He is also a member of the Tau Beta Pi fraternity.

FRANK LOUIS SEVENOAK, A.M., M.D.

Assistant Professor of English and Logic

Frank L. Sevenoak, son of Francis Giles and Evelina Bloodgood (De Witt) Sevenoak, was born in Sterling, N. Y., October 8, 1858. He was graduated from Princeton University in 1879, and from the College of Physicians and Surgeons, New York, in May, 1883, taking one of the Harsen prizes for proficiency. He came to the Stevens School as Instructor in 1883, and in 1887 was made Assistant Principal, which office he still holds. In 1902 the position of Assistant Professor of English and Logic was created in the Institute course, and he was selected to take up this work.



Asst.-Prof. F. L. Sevenoak

Dr. Sevenoak has prepared, for use in American colleges and schools, editions of the Hall and Knight "Algebras," and the Schultze and Sevenoak "Geometry." He also prepared the Sevenoak "Logarithmic Tables." All of these works are published by the Macmillan Company of New York.

He married Emily Van Zandt in December, 1886. He is a member of the Princeton Club, and of the Psi Upsilon fraternity.

EDWIN ROE KNAPP, M.E.

Assistant Professor of Mechanical Drawing

Edwin R. Knapp, son of William H. and Mary I. (Hammond) Knapp, was born in Jersey City, N. J., March 21, 1871. He is descended from Anglo-Saxon ancestors who settled in New England in 1630. His early education was

received in the public schools of Newark and Red Bank, N. J., and he was graduated from the high school at Red Bank in 1887.

With the intention of entering college the following year, he took a position as grocery clerk with his father; but a serious injury to his knee, received while at work six months later, prevented the carrying out of his plan. The next five years were chiefly occupied with efforts toward recovery. In January, 1890, however, he became the representative of the American Biscuit & Manufacturing Co., to their New Jersey seashore trade, and later took charge of the dry-goods branch of his father's business.



Asst.-Prof. E. R. Knapp

In 1892 he decided to carry out his original plan, and entered Stevens School to prepare for Stevens Institute. In 1893 he entered the Institute, and was graduated with his Class in 1897. During his college course he was president of the Engineering Society for one year, and, upon election to the Tau Beta Pi honorary fraternity, was made the second president of the chapter. At the close of his Junior year he was offered and accepted a position, for the summer vacation, with the Shore Electric Co., at Red Bank, N. J., as operating engineer in charge of plant. The station was equipped with direct and alternating current dynamos and supplied current for trolley purposes and for commercial and municipal lighting.

In June, 1897, following his graduation, he secured an engagement at the then new 2,500-horse-power electric light and power plant at Orange, N. J., where he had been making a test for thesis purposes. His duties included the supervision of alterations in the electrical equipment, and the installation of new machines, in addition to the testing and repairing of several hundred meters and arc lamps. This plant, in conjunction with those in Newark and Jersey City, was owned and operated by the People's Light & Power Co., and about March 1, 1898, he was transferred to the position of second assistant to the general superintendent in the main offices of the company at Newark, N. J.

In December, 1898, he became superintendent of construction to the Lawrence Gas Co., at Lawrence, Mass., which owned and operated both the gas and electric-light plants of the city. While with this company he designed a new power house equipped with four water turbines aggregating 1,700-horse-power capacity, with a reserve of 750 steam horse-power to be used in the emergency of low water-supply.

In June, 1900, he was appointed Instructor in the Department of Mechanical Drawing at Stevens Institute. This appointment included also that of Instructor in Mechanical Drawing at the Stevens School. In September, 1902, he resigned the latter position in the School to accept that of Instructor in Calculations of Tests in the Department of Experimental Engineering in the Institute. In December, 1902, he was advanced to the rank of Assistant Professor of Mechanical Drawing, retaining also the post of Instructor in Calculations of Tests in Experimental Engineering. At the close of the college year 1902–03 he resigned from the Department of Experimental Engineering to devote his entire time to the Freshman-Sophomore work in the Department of Mechanical Drawing and Designing, added responsibilities and duties having devolved upon him through the appointment of Prof. Riesenberger to the additional office of Registrar of the Institute.

Professor Knapp is Treasurer of the Alumni Association of the Stevens Institute of Technology, to which office he was elected in June, 1902. He is also a member of the Roseville Golf Club.

Upon his appointment to the Institute in 1900 he took up his residence in Hoboken, N. J., and became a member, by letter, of the First Methodist Episcopal Church. He was made a member of its official board in January, 1902, and was elected a steward in January, 1904, at the close of his second term of office as president of Chapter 18 of the Epworth League, the local chapter of the young people's organization of the Methodist Episcopal Church. He is also a teacher in the home and mission Sunday Schools of the church, and a member of the executive committee on deaconess work in Hoboken, Jersey City, and the surrounding district.

WILLIAM J. MOORE, M.E.

Assistant Professor of Electrical Engineering

William J. Moore, son of Francis A. and Mary P. Moore, was born in Metuchen, N. J., September 19, 1878. On his mother's side he is a descendant, in the eighth generation, of Roger Williams, founder of Rhode Island. His grandfather was an English clergyman. He attended the public schools at Metuchen until his twelfth year, when he entered the Rutgers College Preparatory School at New Brunswick. After two years' study at this place his parents moved to Brooklyn, N. Y., where he continued his preparatory education. In the fall of 1896 he entered Stevens Institute.

Upon receiving the degree of Mechanical Engineer in 1900 he took a position in the Belleville Copper Rolling Mills at Soho, N. J., where he was engaged as assistant to the superintendent of machinery, being employed upon the designs for the plate-rolling mill and for general construction work; he also assisted in the installation of a boiler and engine plant at the company's works. He had been



Asst.-Prof. W. J. Moore

in this position a short time when called to become an Instructor during the Supplementary Term work at the Stevens Institute. At the end of the term he was offered the position of Instructor in the Department of General Physics and Applied Electricity. He has been engaged in electrical testing work and has assisted in conducting investigations of an original character. In December, 1902, he was advanced to his present position as Assistant Professor of Electrical Engineering. He is a member of the New York Electrical Society, and of the Tau Beta Pi fraternity.

He married Marie Fay Bateman, November 28, 1900. They have one child, William Francis Moore.

CHARLES OTTO GUNTHER, M.E.

Assistant Professor of Mathematics

Charles O. Gunther was born in New York city May 21, 1879, his parents being Otto and Anna (Eybel) Gunther. He studied in the public schools in New York and Brooklyn, and in the Stevens School, from which he entered Stevens Institute in 1896.



Asst.-Prof. C. O. Gunther

After graduation he was engaged first as Instructor during the Supplementary Term and then as Instructor in Mathematics. In December, 1902, he was given the title of Assistant Professor of Mathematics. The following year he was transferred to the Department of Mechanical Drawing with the same title.

His work at the Institute required only part of his time at first, and he took up the study of patent work in the office of J. M. Hicks, a patent expert in New York. In April, 1902, he established his

own office in New York as mechanical engineer and patent attorney. During the summer of 1902 he accepted the position of managing editor of the "Stevens Institute Indicator," but on account of ill health he was obliged to resign this office early in 1904.

He is a junior member of the American Society of Mechanical Engineers, a member of the New York Electrical Society, and of the Tau Beta Pi fraternity.

He married Beatrice Disbrow, February 19, 1901.

FRANCIS J. POND, M.A., Ph.D.

Assistant Professor of Engineering Chemistry

Francis J. Pond, son of Abel and Lucy A. Pond, was born in Holliston, Mass., which place was his home for seventeen years. His early education was received in the public schools of Holliston.

In the fall of 1888 he entered The Pennsylvania State College, and was graduated in the chemical course with the Class of 1892, receiving the degree of Bachelor of Science. During the college year 1892–93, he pursued post-graduate work in chemistry at the State College, and in the following year he was appointed Assistant in Chemistry at the same institution. In October, 1894, he entered the University of Göttingen, Germany, to continue the study of chemistry, as well as of mineralogy and physics. In February, 1896, upon the completion of an original investigation and after an oral examination, he received the degrees of Master of Arts and Doctor of Philosophy (*magna cum laude*). In April, 1896, he entered the Royal Mining Academy in Freiberg, Germany, where he studied especially the subjects of metallurgy and metallurgical chemistry.



Asst.-Prof. Francis J. Pond

In the fall of 1896 he returned to The Pennsylvania State College as Instructor of Chemistry and Assaying, and was subsequently advanced by being made Assistant Professor of the same branches. In August, 1903, he resigned his position at the State College to accept the Assistant Professorship of Engineering Chemistry at Stevens Institute.

He is the author of "Notes on Assaying," and of the English edition of Dr. Heusler's monograph, "Die Terpene"; the latter work is published by P.

Blakiston's Son & Co., Philadelphia, under the title "The Chemistry of the Terpenes," and is the recognized standard work on this line of chemistry. He has also contributed a number of articles to the "Journal of the American Chemical Society," these contributions embracing the results of original research conducted by himself and students. During his college course he was a member of the Sigma Chi fraternity, and was later elected to membership in the honorary society Phi Kappa Phi. He is also a member of the American Chemical Society.

He was married, June 10, 1902, to Nellie, daughter of Charles and Emma Olds, Circleville, Ohio.

CLIFFORD BLONDEL LE PAGE, M.E.

Instructor in Physics

Clifford B. Le Page, son of Nicholas and Rachel E. (Le Brocq) Le Page, was born in New York city March 28, 1879. Both of his parents are natives of the Channel Islands, having come to this country in the early 'seventies.

Mr. Le Page received his early education in the public schools of Brooklyn and Mount Vernon, and was prepared for Stevens Institute at the Mount Vernon high school and at the Stevens School. He was graduated from Stevens Institute with the degree of Mechanical Engineer in 1902. While preparing for college, and during the first two years at the Institute, he filled in succession the various positions in a surveying party, such as rod-man, chain-man, leveller, and transit-man. During the college year of 1899–1900 he was in charge of a surveying party of five employed by Mr. G. W. Drumheller, C.E., of Mount Vernon, N. Y., who did all kinds of municipal surveying and railroad work.



C. B. Le Page

For six months after graduation he was employed in the Metropolitan sales office of the United Telpherage Co., when he was transferred to the company's designing department at their factory in Westfield, N. J. This latter position he resigned in March, 1902, to accept his present one as Instructor in the Department of Physics at Stevens Institute.

He is a member of the Sigma Nu fraternity.

WILLIAM ALLEN SHOUDY, M.E.

Instructor in Experimental Engineering



W. A. Shoudy

William A. Shoudy, son of Joseph Allen and Caroline (Travis) Shoudy, was born in Brooklyn, N. Y., April 5, 1878. He entered Stevens Institute in the fall of 1895, and was graduated with the degree of Mechanical Engineer in 1899. He entered the employ of the Fuller Cotton Machine Co., of New York city, where he remained until the fall of 1899, when he accepted an engagement with the Oxnard Construction Co.

During the year 1900 he was employed for a few weeks on work for the Tripler Liquid Air Co., and then accepted a position in the New York office of the Harrison Safety Boiler Works Co., of Philadelphia, where he remained for two years. Resigning then, he entered the employ of the American Linseed Co., and later of the D'Olier Engineering Co., of Philadelphia. He remained with the latter company until September, 1903, when he accepted his present position as Instructor in Experimental Engineering at Stevens Institute. Since January, 1904, Mr. Shoudy has also been Managing Editor of the "Stevens Institute Indicator." He is a junior member of the American Society of Mechanical Engineers.

LOUIS ADOLPHE MARTIN, JR., M.E., A.M.

Instructor in Mathematics and Mechanics

Louis A. Martin, Jr., the son of Louis Adolphe and Pauline Justine Martin, both Swiss, of Huguenot origin, from Geneva, was born in Hoboken, N. J., November 5, 1880. On completing the course at Hoboken Academy, young Martin was awarded the Stevens Scholarship. He was Instructor in Mathematics, Physics, and Chemistry at Hoboken Academy, and Instructor in Applied Electricity (evening classes) at Cooper Union, New York, during the academic year of 1900–01. During the following year he retained his position at the Hoboken Academy, and was a Lecturer in Physics at the Mechanics' Institute (evening classes) New York. In addition to these regular positions, he has been busily engaged in private tutoring and coaching. He was also engaged as Instructor in Experimental Mechanics during the Supplementary Terms of 1900 and 1902



L. A. Martin, Jr.

at Stevens Institute. In 1902 he resigned the above positions and matriculated in the School of Pure Science, Columbia University, choosing as his subjects, mechanics, mathematics, and physics. The degree of Master of Arts was conferred upon him in the summer of 1903. He is still engaged in tutoring and coaching at Hoboken and at Columbia University. During the summer of 1903 he was appointed Instructor in Mathematics and Mechanics at the Stevens Institute. He is a member of the American Association for the Advancement of Science, the American Mathematical Society, and the Tau Beta Pi fraternity.

He was married, June 30, 1904, to Alwynne Elaine Buttlar.

HARRY WEEKS JOHNSON, M.E.

Instructor in Mechanical Drawing and Designing

Harry W. Johnson, son of James Henry and Annie Ross (Weeks) Johnson, was born in Orange, N. J., July 14, 1881. His ancestors on his father's side were of English, and on his mother's side of Puritan descent. Seven years of his early life were spent in Michigan, in the cities of Jackson and Muskegon, in which places he received all but a few months of his primary and grammar school education.

In the spring of 1895 he went to Newark, N. J., and was graduated from the grammar school in June of that year, and from the high school in 1899. He entered Stevens Institute in the fall of the same year and was graduated in June, 1903, delivering the valedictory address at the Commencement exercises. While at Stevens he was elected to member-



H. W. Johnson

ship in the honorary society, Tau Beta Pi, for high scholarship, and was active in student enterprises. He was twice elected president of his class, serving during his junior and senior years, and was president of the Athletic Association for one year.

Mr. Johnson accepted a position with the Rockwell Engineering Co., and commenced his duties with them, some two weeks before graduation. In September, 1903, he was appointed Instructor in Mathematics at the Newark Evening Technical School. In October following he resigned his position with the Rockwell Engineering Co. to accept his present one of Instructor in Mechanical Drawing and Designing at the Stevens Institute of Technology.

SAMUEL HOFMANN LOTT, M.E.

Instructor in Mechanical Drawing

Samuel H. Lott, son of Isaac W. and Annie (Hofmann) Lott was born in Jersey City, N. J., July 7, 1881. Four years later his family moved to Union Hill, N. J., where he attended the public schools, graduating in 1897. He then spent two years in the Stevens Preparatory School before entering the Stevens Institute from which he received the degree of Mechanical Engineer in 1903.



S. H. Lott

During his junior and senior years he had charge of the courses in machine shop practice and wood turning in the department of Manual Training at the Montclair High School at Montclair, N. J.; and since December, 1904, he has been in charge of the department of Mechanical and Architectural Drawing at Drake's Business College, Jersey City, N. J.

After graduation from Stevens Institute and up to the time of his appointment to his present position he was employed in the draughting-room of the Rockwell Engineering Co., New York; as inspecting engineer by the Buffalo Forge Co., at their works in Buffalo, N. Y.; and as assistant engineer in the engineering department of the New York Telephone Co., New York.

He is a member of the Gamma chapter of the Sigma Nu fraternity.

THE ALUMNI

THE ALUMNI.

The following pages are devoted to brief biographical sketches of the graduates of the Stevens Institute of Technology, so far as it has been possible to obtain data. From the graduation of the first student in 1873, and ending with the graduating class of 1904, 1,088 men have received degrees from Stevens Institute, and every name is here recorded. All are in alphabetical order except the members of the classes of 1903 and 1904, who are grouped as explained on page 635.

The aim in producing these sketches of Stevens graduates has been primarily to show the kind and quality of engineering work accomplished by technical graduates, and also to show the high character and standing of the men who have contributed so largely to founding the engineering profession and maintaining it as one of the learned vocations which in recent years has accomplished much in developing and perfecting mechanical appliances, and processes for the economical use of nature's resources.

An endeavor has been made to present a complete biography of each alumnus along the lines set down in some detail in the preface. Uniform blanks were sent to every graduate, or, in the case of those deceased, to their relatives, where their names could be learned. About twenty-five per cent of the total number, including those whose locations were unknown, failed to reply; and in such instances the name is merely mentioned in alphabetical order with whatever information could be obtained from a search of the Institute Catalogues, the yearly numbers of which contain a list of the names of graduates, with their positions at the time. A number who replied with data regarding their engineering work refrained from making any statements regarding other features which go to make up a complete biography.

Notwithstanding these deficiencies and the manifest incompleteness of the sketches, an examination of the records will show that the broad plan upon which the Institute's course of instruction was founded, and afterward developed, has borne, and is bearing natural fruit in fitting young men to occupy positions of responsibility in many fields of engineering work.

THE ALUMNI

Abbey, Henry (M.E., '85), has been professionally engaged, since graduation, as superintendent of the Cowles Electric Smelting Co., Lockport, N. Y.; works manager of the Cowles Electric Syndicate, Ltd., Milton-Stoke-on-Trent, England, 1887–95; consulting engineer, London, England, 1895–97; electrician with the American Biograph Co., New York, 1897–98, and the American Biograph Syndicate, Ltd., London; and as mechanical engineer with the Mutoscope and Biograph Syndicate, London.

Abé, Keüchi (M.E., '99), has been engaged, since graduation, in professional work with the Baldwin Locomotive Works, Philadelphia, Pa.; with W. D. Forbes & Co., Hoboken, N. J., 1899–1901; as draughtsman with the General Electric Co., Schenectady, N. Y., 1901–02; and with the Bucyrus Co., South Milwaukee, Wis., 1902–03. He is now at the Mitsu-Bishi Dockyard & Engineering Works, Nagasaki, Japan.

Ackerman, William Sickles (M.E., '91), son of Simeon and Catherine Ann (Berdan) Ackerman, was born in Paterson, N. J., November 2, 1868. He was manager of the drill and air-compressor department of the Stearns-Roger Manufacturing Co., Colorado agents of the Ingersoll-Sergeant Drill Co., 1891–92, and with Mr. James Breen, Butte, Montana, 1892–93. While with Mr. Breen, who had been engaged by Eastern capitalists to erect a copper-smelter at Durango, Colo., Mr. Ackerman was entrusted with the preparation of the plans and the superintendence of the construction of the plant. He also designed power-plants, office-buildings for mining companies, etc., and was engaged in examining mining properties and superintending their operation. From 1893 to 1896 he was consulting engineer with the National Lead Co., for whom in 1895–96 he remodelled the Philadelphia plant. A sectional view of the factory, in water-colors, was shown at the 25th Anniversary Exhibition of the work of the Alumni of the Institute in 1897. From 1897 to 1902 he was a member of the firm of Ackerman & Ross, engineers and architects, New York. Their work includes the Carnegie libraries at Washington, D. C.; Atlanta, Ga.; San Diego, Cal.; Port Jervis, N. Y.; and the Carnegie Laboratory of Engineering at Hoboken. In 1902 Mr. Ross resigned from the firm, and since then Mr. Ackerman has formed a partnership with Mr. W. T. Partridge, under the firm



Carnegie Library, Washington, D.C.
Ackerman & Ross, Architects

name of Ackerman & Partridge. The Morton Laboratory of Chemistry, illustrated on page 17 of the present volume, is the work



W. S. Ackerman

of this latter firm. Mr. Partridge, before associating with Mr. Ackerman, was instructor in architecture in Columbia College. Mr. Ackerman is a member of the American Society of Mechanical Engineers, the American Institute of Mining Engineers, the Engineers' and Lotos clubs of New York; of the Hamilton Club, and North Jersey Country Club of Paterson, N. J.; and a non-resident member of the Franklin Institute. He was president of the Alumni Association of Stevens Institute, 1902–03.

Adams, Harry Harris (M.E., '93), was born in Jersey City, N. J., January 7, 1871. After graduating he entered the service of the Consolidated Traction Co., of Jersey City, N. J., with whom he remained from 1893 to 1902, holding successively the positions of foreman of motor repair-shops, assistant electrical engineer of the company, and master mechanic of the North Jersey Street Railway Co., which absorbed the Consolidated Traction Co. From 1902 to date he has been superintendent of shops for the United Railways and Electric Co., Baltimore, Md. In 1900 he took out a patent on a sectional rotary sweeper, an improvement on brooms or sweepers as applied to snow sweepers in particular. The invention facilitates the refilling, handling, and repairs of the rotary broom, at the same time giving strength, lightness, and durability. He is a member of the New York Railroad Club and an associate member of the American Railway Mechanical and Electrical Association.

Mr. Adams is the son of Charles S. and Mary Caldwell Adams. He married Agnes Collard, May 18, 1898, and they have one child, Harry Harris Adams, Jr.

Adger, John Bailey (M.E., '83), was born in Charleston, S. C., April 19, 1858. His early education was obtained in Virginia, and he took the degree of M.A. from the University of Virginia in 1880. The following year he taught in the Preparatory Department of the University of Louisiana (now Tulane University), New Orleans. He entered Stevens Institute in 1881, and graduated two years later, becoming treasurer and assistant manager of the Charleston Iron Works, 1883–84; member of the firm of James Adger & Co., steamship agents, from 1885 to date; secretary and treasurer of the Coosaw Co., 1886–98; and president and treasurer from 1898 to date. He was president and treasurer of the Charleston Basket & Veneer Manufacturing Co., 1896–1902.

Mr. Adger, who is the son of J. Ellison and Susan C. Adger, married Miss Warren, August 3, 1887.



W. A. Adriance

Adriance, William Allen (M.E., '85), was born in Poughkeepsie, N. Y., February 6, 1864. On graduation he became associated with the firm of Adriance, Platt, & Co., manufacturers of agricultural machinery, Poughkeepsie, N. Y. He is now in charge of the purchasing and stock departments, and has general supervision of the company's plant, the erection of additions, etc. He is a member of the University, St. Nicholas, and Theta Xi Graduate clubs, the Holland Society, and the Theta Xi fraternity.

Mr. Adriance is the son of John Peter and Mary Jane Ruthven (Platt) Adriance. He married Minnie B. Horton, May 20, 1888, and they have two children, Dorothy Allen, and William Allen Adriance, Jr.

Aguilera, Antonio, Jr. (M.E., '86), was a sugar-refiner at Senado-Munos, Nuevitas, Cuba, up to the time of his death, August 23, 1903.

Ahrnke, Hans Paul (M.E., '99), son of August and Catherine Ahrnke, was born in Hoboken, N. J., October 28, 1878. He received most of his early schooling at the Hoboken Academy, where he gained the scholarship for Stevens Institute in 1895. He was Assistant Instructor at the Institute during the Supplementary Term, 1899, and the same year became draughtsman for the Fuller Cotton Machine Co., New York, designing cotton machinery. From 1899 to 1902 he was draughtsman with Westinghouse, Church, Kerr, & Co., New York, and in the latter year was employed in designing and constructing electric railway power plants in the engineering department of the same firm. Thence to date he has been engaged in similar work with the British Westinghouse Electric & Manufacturing Co., Ltd., London, England. He is a member of the Tau Beta Pi fraternity, and a junior member of the American Society of Mechanical Engineers.

Alden, James Strong (M.E., '84), was born in Aldenville, Wayne County, Pa., February 1, 1863; the son of Levi H. and Lois M. Alden, the seventh generation from John Alden and Priscilla Mullens, who came to America with the Pilgrims in 1620. He assisted his father for several years in the manufacture of brick at Passaic, N. J., and has spent nearly all of his time since then in private study and investigation. In 1896 he published a pamphlet on "A Theory of the



J. S. Alden

Structure of Matter," which is based upon the assumption that an atom of matter consists of a vortex ring of luminiferous ether. After publishing the above he turned his attention to the problem of finding a cheaper and more efficient means of obtaining power from fuel, etc. From 1891 to 1900 he was an associate member of the American Institute of Electrical Engineers.

Aldrich, Roger Cyrenus (M.E., '99), was born in Boston, Mass., February 13, 1879. He received his early education in the public schools of Boston and of Passaic, N. J., and took the full course at Stevens Preparatory School, winning a scholarship to the Institute. On graduation he took up a course of work in each of the departments of the Anatron Chemical Co., Elizabethport, N. J., with a view to familiarizing himself with the various details of chemical manufacturing, later (1900) becoming draughtsman and works chemist at the Erie Chemical Works, Erie, Pa. He was superintendent of erections and additions to the Waterbury (Conn.) plant of the Franklin H. Kalbfleisch Co., manufacturing chemists, of New York, 1900–01, and superintendent of the Brooklyn

(N. Y.) works of the same company, 1901 to date. He is a member of the Tau Beta Pi fraternity; of the Society of Chemical Industry; of Kane Lodge No. 454, Free and Accepted Masons; of Jerusalem Chapter No. 8, Royal Arch Masons; and of Cœur de Lion Commandery No. 23, Knights Templar.

Mr. Aldrich is the son of Frank E. and Louise M. (Love) Aldrich. He married May A. Locke, October 16, 1901, and they have one child, Roger Williams Aldrich.

Aldrich, William Sleeper (M.E., '84), was born in Philadelphia, Pa., March 3, 1863. He was graduated from the grammar school at Burlington, N. J., in 1878, and entered the United States Naval Academy by competitive examination in 1879 as cadet engineer; graduated as naval cadet in 1883, and resigned from the naval service to enter Stevens Institute. He was employed in the shops and draughting-room of the Ball Engine Co., Erie, Pa., 1884–85; was instructor in mathematics, mechanical drawing, and surveying in the Boys' High School, Reading, Pa., 1885–87; instructor in drawing and building construction at the Central Manual Training School, Philadelphia, Pa., 1887–89, and instructor in drawing, 1889–91; Associate in the Mechanical Engineering Department of Electrical Engineering at Johns Hopkins University, Baltimore, Md., 1891–92, meanwhile pursuing advanced studies and work in mathematics, physics, and electricity. He held the position of Professor of Mechanical Engineering, and Director of Mechanic Arts, at West Virginia University, Morgantown, W. Va., 1893–99, and was Dean of the College of Engineering and the Mechanic Arts at the same institution, 1896–98. He volunteered for service in the Spanish-American War, and on May 12, 1898, was appointed passed assistant engineer in the United States Navy, with the relative rank of lieutenant, attached to the naval repair ship "Vulcan," with Admiral Sampson's fleet in Cuban waters, being honorably discharged, October 18, 1898. He was Professor of Electrical Engineering at the University of Illinois, Champaign, Ill., 1899–1901; and since then he has been Director of the Thomas S. Clarkson Memorial School of Technology, Potsdam, N. Y.

During vacations and between intervals of teaching he was engaged in professional work as follows: in the draughting-room of the Baldwin Locomotive Works, Philadelphia, Pa., 1886; visiting technical schools and manufacturing establishments in England and on the Continent, 1888; electrical testing work for the Cobb Vulcanite Co., Wilmington, Del., and in the subways of New York city, 1889; designing special wood-working machinery, under patents of Mr. Greenleaf Johnson, Jr., Baltimore, and designing special hydraulic and electric machinery under patents of Dr. Louis Duncan,



W. S. Aldrich

Baltimore, 1890–91; making joint tests, with Mr. Herman S. Hering, of the Neversink Mountain Electric Road, Reading, Pa., 1891, and of the Druid Hill Avenue cable plant, Baltimore, Md., 1892 (see *Transactions* of the American Society of Mechanical Engineers, 1894, .XV, 705); in the shops and draughting-room of the William A. Harris Steam-Engine Co., Providence, R. I., 1892; and in the draughting-room of the I. P. Morris Co., Philadelphia, Pa., 1892–93; designing new additions to the Mechanical Building of the West Virginia University, 1893, and superintending the erection and equipment of the same, 1894; engaged in professional work with Mr. Cecil B. Smith, under the firm name of Smith & Aldrich, Toronto, Canada, 1901.

In 1889 Prof. Aldrich published a book of

"Notes on Building Construction and Architecture," and has since published, jointly with Prof. William H. Brown, Jr., of the University of Illinois, a "Manual of Instructions, Forms, and Schedules for the Electrical Engineering Laboratory," and a "Junior Manual for the Electrical Engineering Laboratory." He has contributed many papers and discussions to various societies and journals as follows:

"Spirally Welded Tubes." *Am. Soc. N. E.*[1], I, 207, 1889.

"Piston Valve." *Trans. A. S. M. E.*[2], XIII, 325, 1892.

"Notes on Electro-Magnetic Machinery" (2 papers). *Jour. Frank. Inst.*[3], 1892.

"On the Variable Action of Two-Coil Solenoids." *Ibid.*, 1892.

"Designing Mechanical Movements." *Am. Mach.*[4], *XV*, 1892.

"Notes on Electro-Magnetic Transmission of Energy." *Stevens Ind.*[5], IX, 1892.

"The Speed Regulation of Central-Station Engines." *Cassier's Magazine*, II, 1892.

"Epicyclic Gearing for Electric Cars and Elevators." *Electrical Engineering*, XIII, 1892.

"Test of the Neversink Mountain Electric Road." *Electrical World*, XIX and XX, 1892.

"Power Losses in the Transmission Machinery of Central Stations." *Trans. A. S. M. E.*, XV, 705, 1894.

"Use of the Indicator for Continuous Records in Dynamometric Testing." *Ibid.*, XV, 112, 1894.

"Engineering Education and the State University." *Soc. Pro. Eng. Ed.*[6], II, 268, 1894.

"Some Observations on Shop Training." *Stevens Ind.*, XI, 1894.

"Engineering Research in the Navy." *Trans. Soc. N. A. M. E.*[7], III, 185, 1895.

"The Work of the United States Naval Repair Ship 'Vulcan,'" (jointly with Gardiner C. Sims). *Eng. Mag.*[8], XVII, 359, 569, 1895.

"The Hale Engineering Experiment Station Bill" (abstract). *Soc. Pro. Eng. Ed.*, IV, 187, 1896.

"Engineering Experiment Stations." *Assoc. Am. Agr. Coll. and Exp. Sta. Sect. Mech. Arts*[1], Washington, D. C., 1896.

"Speed in Modern Warships." *N. Am. Rev.*[2], CLXII, 48, 1896.

"The Engineer in Naval Warfare." *Ibid.*, CLXII, 520, 1896.

"Compressed Air in Railway Work." *Am. Elec.*[3], VIII, 1896.

"On Rating Electric Power Plants Upon the Heat Unit Standard." *Trans. A. S. M. E.*, XVIII, 721, 1897.

"Development of Engineering Industries by Scientific Research." *Am. Assoc. Adv. Sci.*[4], 1897.

"The Engineering Value of Magnetic Surveys," read before the Association of Engineers of Virginia. *Jour. Assoc. Eng. Soc.*[5], XVIII, May, 1897.

"Notes on Rating Electric Power Plants Upon the Heat Unit Standard." *Trans. A. S. M. E.*, XIX, 93, 1898.

"Central Power Plants on Board Ship *versus* Distribution of Power." *Am. Soc. N. E.*, X, 95, 1898.

"Economic Manner of Working Steam in Electric Power Plants." *Am. Elec.*, X, 262, 1898.

"The Variation of Belt Tensions with Power Transmitted." *Trans. A. S. M. E.*, XX, 136, 1899.

"Engineering Education and Expansion." *Soc. Pro. Eng. Ed.*, VII, 71, 1899.

"Some Engineering Experiences with Spanish Wrecks." *Am. Assoc. Adv. Sci.*, 1899.

"Electric Mining of Bituminous Coal." *Ibid.*, 1899.

"Economy of Multiple-Expansion Engines." *Am. Elec.*, XI, 210, 259, 1899.

"The Mechanical and Electrical Features of the Pan-American Exposition." *Eng. Mag.*, XXI, 839, 1899.

"Systems and Efficiency of Electric Transmission in Factories and Mills." *Trans. A. S. M. E.*, XXI, 912, 1900.

"Operating Work as a Feature of Electrical Laboratory Training." *Soc. Pro. Eng. Ed.*, VIII, 359, 1900.

"Requirements of Electricity in Manufacturing Work." *Trans. A. S. M. E.*, XXII, 1003, 1901.

"Performance of an Artificial Forty-Mile

---

[1] "Journal of the American Society of Naval Engineers."
[2] "Transactions of the American Society of Mechanical Engineers."
[3] "Journal of the Franklin Institute."
[4] "American Machinist."
[5] "Stevens Indicator."
[6] "Society for the Promotion of Engineering Education."
[7] "Transactions of the Society of Naval Architects and Marine Engineers."
[8] "Engineering Magazine."

[1] "Association of American Agricultural Colleges and Experiment Stations, Section of Mechanic Arts."
[2] "North American Review."
[3] "American Electrician."
[4] "American Association for the Advancement of Science."
[5] "Journal of the Association of Engineering Societies."

Transmission Line" (with Mr. George W. Redfield). *Trans. A. I. E. E.*[1], XVIII, 1901.

"Research and Publication Among Engineering Teachers." *Soc. Pro. Eng. Ed.*, IX., 249, 1901.

"Electrical Progress in the United States During the Year 1901." *Western Electrician*, Jan. 4, 1902.

"Electric Transmission of Power for Navy Yards." *Am. Soc. N. E.*, XIV, 448, 814, 1109, 1902.

In addition to the above, Prof. Aldrich has contributed a number of "discussions" to the several technical associations of which he has been a member, including the following: The American Society of Mechanical Engineers; American Society of Naval Engineers; Society of Naval Architects and Marine Engineers; American Institute of Electrical Engineers; Society for the Promotion of Engineering Education; Franklin Institute of the State of Pennsylvania (Electrical Section); American Association for Advancement of Science (Fellow); National Geographic Society (Corresponding Member); Canadian Electrical Association; "Old Northwest" Genealogical Society. He is also an honorary member of the Alpha of Illinois Chapter of the Tau Beta Pi fraternity.

Prof. Aldrich is the son of George Wells and Sarah Edith (Sleeper) Aldrich. His great-grandfather was Noah Aldrich, the fifth lineal descendant from George Aldrich who came to America in 1631. He married Mary Lavinia Purdy, daughter of Robert and Ellen (Compton) Purdy, of Philadelphia, Pa., July 1, 1886. They have five daughters, Alice Kennard, Ellen Purdy, Elizabeth Herrick, Rachel, and Mary Aldrich.

Allaire, Alexander (M.E., '01), son of Francis and Ida May Allaire, was born in Brooklyn, N. Y., August 6, 1877, and graduated at the Stevens Preparatory School. He was employed in the draughting department of the American Engine Co., Bound Brook, N. J., 1901–02; in the estimating and order department of the Best Manufacturing Co., Pittsburg, Pa., 1902–03; and in the master-mechanic's department of the blast furnaces at the Edgar Thomson Steel Works, Wilkinsburg, Pa., since June 23, 1903. He is a member of the Beta Theta Pi fraternity.

[1] "Transactions of the American Institute of Electrical Engineers."

Allan, Percy (M.E., '95), was born in New York, December 5, 1873; the son of George



PERCY ALLAN

S. and Eunice R. Allan, his grandfather on his mother's side being Prof. Charles Davies, author of Legendre's "Geometry." He served the Safety Car Heating & Lighting Co. as draughtsman and inspector, 1895–96, and in the latter year became assistant superintendent of E. Schroeder's Lamp Works, Jersey City, N. J., for six months, then superintendent, 1896–1903. He has recently become secretary of the Jenkins Manufacturing Co., of Bloomfield, N. J. He is the joint author, with G. Everett Bruen and Frederick K. Vreeland, of a thesis entitled "Experimental Determination of the Influence of Back Pressure on the Economy of a Surface Condensing Engine with Independent Vacuum Pump," published in the *Stevens Indicator*, XIII, 136. He is a member of the American Society of Mechanical Engineers and of the Franklin Institute.

Allen, Albert Mark (M.E., '01), was born in Akron, O., August 26, 1877. He was engaged as mechanical engineer with the General Building & Construction Co., New York, until 1904 when he opened an office as consulting engineer at Cleveland, O. He is

a member of the American Society of Mechanical Engineers and of the Phi Sigma Kappa fraternity.

Mr. Allen, who is the son of Miner J. and Frances D. Allen, married Christina Pellinger, April 6, 1900, and they have one child, Margaret Cynthia Allen.

Allison, Philip (M.E., '98), was night engineer at the hat factory of E. A. Mallory & Sons, Danbury, Conn., having charge of a steam and electric plant consisting of a boiler plant of 300 horse-power, a 200 horse-power Corliss engine, a generator for lighting, and pumps, etc., 1898; draughtsman with the Wellman-Seaver Engineering Co., Cleveland, O., 1898–1900; with the General Electric Co., Lynn, Mass., 1900–02; and electrical engineer for the De Laval Steam Turbine Co., Trenton, N. J., 1902 to date.

Ames, Joseph Bushnell (M.E., '01), was born in Titusville, Pa., August 9, 1878; the son of Elias H. and Eleanor G. (Bushnell) Ames; and grandson of Hon. Frederick W. Ames, member of the House of Representatives. He has been with the Lidgerwood Manufacturing Co., New York, with E. P. Dutton & Co., New York, and is now in the



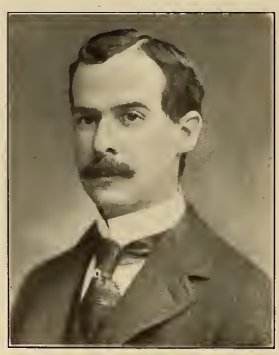
J. B. Ames

gas department of the Public Service Corporation at Jersey City, N. J. He is a member of the Beta Theta Pi and Tau Beta Pi fraternities, the Strollers Club of New York, and of the Washington Association of New Jersey.

Anderson, Harold W. (M.E., '97), was with the General Incandescent Arc Light Co., of New York, as an inspector and outside man for the lamps, motors, etc., installed by the company, in 1897. Later (1897–98) he became draughtsman and assistant shop superintendent for Henry W. Bulkley, manufacturer of injector-condensers and pumps, Orange, N. J., where he was engaged in both designing and outside construction. While thus occupied, having been one of the original members of the 3d Division, Battalion of East, Naval Reserves of New Jersey, he was sent to the League Island Navy Yard at Philadelphia with a detachment largely composed of Stevens men. There he superintended the finishing repairs to the machinery of the monitor "Montauk," being appointed her chief engineer, to go to the Maine coast. Later on, the monitor was assigned to the Western Battalion, and, passing the required examination, he was given a commission as assistant engineer in the United States Navy. Resigning his position with Mr. Bulkley in May, 1898, he spent the following four and a half months in the government service, being assigned to the U.S.S. "Badger," which vessel, with the exception of three officers, was completely manned and officered by the New Jersey Naval Reserves. This ship, an auxiliary cruiser, was, during the Spanish war, in northern waters for a short period and then off Havana, Nuevitas, and other Cuban ports, having some minor engagements and making several captures. Being honorably discharged in October, 1898, he became a draughtsman for the Electric Vehicle Co., of New York, being occupied in designing automobiles and charging-stations, 1898–99. He then joined the San Carlos Copper Co., San José, Mexico, as their erecting engineer, 1899–1900, and installed a complete equipment at their largest mine, consisting of boilers, hoisting and pumping engines, air-compressors, etc., and also had charge of various engineering operations at the other mines and the furnaces. He was designing and erecting engineer to the Reno Inclined Elevator Co., New York, having charge of the fulfilment of several contracts in New

York, Philadelphia, and Coney Island, 1900–01; and in the latter year became draughtsman, looking after repair work, testing, etc., at the Hoboken, and Jersey City shops of the Pennsylvania Railroad Co. As mechanical engineer to the Lanyon Zinc Co., Iola, Kan., manufacturers of spelter, 1901–02, he had charge of everything in the engineering line at the company's three works,—the machinery, all construction and repair, the furnaces, roasting-kilns, buildings, etc., improvements and mechanical devices, the refining-furnace, labor-saving schemes, etc. These works, situated in the centre of the natural-gas belt, and reputed to be the largest in the United States, have a combined output of 100 tons and more of spelter per day, and employ upward of 900 men. A rolling-mill recently completed has a capacity of 40 tons of sheet zinc per day, and employs about 40 men, with arrangements for enlarging. He is now mechanical engineer to the San Carlos Copper Co., Linares, N. L., Mexico.

Anderson, Larz Worthington (M.E., '88), was born in Cincinnati, O., December 3, 1866. He was employed by the Addyston Pipe & Steel Co., Addyston, O., 1888–93; was treasurer of the J. A. Fay & Eagan



L. W. Anderson

Co., Cincinnati, O., 1893–98; member of the firm of Silk, Anderson, & Co., makers of machine tools, at Cincinnati, 1898–1901; and has been secretary and treasurer of the Cincinnati Shaper Co. from 1901 to date. He is a member of the Queen City Club, Country Club, The Pillars, and the Delta Tau Delta fraternity.

Mr. Anderson is the son of William Pope and Julia (Worthington) Anderson, is American on both sides for six generations, and great-grandson of Richard Clough Anderson, who served as aide-de-camp on Lafayette's staff. He was married, February 12, 1895, to Grace Ferguson, and they have two boys, Larz Ferguson and Alexander Anderson.

Anderson, Richard T. (M.E., '02), is with the George A. Fuller Construction Co., New York.

Anderson, Robert Marshall (M.E., '87), was born in Pickaway County, O., February



R. M. Anderson

13, 1862. He is the son of William Marshall and Ellen C. Anderson, and a member of a Virginia family dating back to 1650, his ancestors having come from border counties of England and Scotland. His grandfather, Col. Richard Clough Anderson, of Revolutionary services, moved to Kentucky as surveyor-general of Virginia military lands in 1795. His grandmother was a cousin of Chief Justice John Marshall and of General George Rogers Clark. He received his early education in the public schools of Circleville,

O., and took the degree of Bachelor of Science at the University of Notre Dame, South Bend, Ind., in 1883. He was with the Springer Torsion Balance Co., Jersey City, N. J., 1887–89; held positions at the Stevens Institute, in the Department of Tests, 1889–91; as Instructor in the Department of Experimental Mechanics, 1891–93; and as Assistant Professor of Applied Mathematics, 1893–99; was in the firm of Anderson & Murphy, consulting and contracting engineers, 1899–1900; was treasurer of the Anderson-Murphy Co., general contractors, 1900–01; was vice-president and secretary of the Bacon Air Lift Co., hydraulic engineers and contractors, New York, 1901–04; and at the present time is secretary and treasurer of the Hudson Engineering & Contracting Co., general contractors and engineers, making a specialty of hydraulic work. He published an article on "A Simple Geometrical Proof for the Zeuner Valve Diagram" in the *Stevens Indicator,* X. He is a member of the American Society of Mechanical Engineers, of the Delta Tau Delta fraternity, and of the Catholic Club.

Anderson, St. George M. (M.E., '94), was assistant chemist in the State Agricultural Department of Virginia, 1894–95; assistant superintendent of the horseshoe factory at the Tredegar Iron Works, Richmond, Va., 1895–1901; and has been superintendent of the rolling-mills with the same company from 1901 to date. His graduating thesis, prepared jointly with E. J. Burke, on a "Test of a 240-horse-power Babcock & Wilcox Boiler with Three Different Coals, for the Determination of Economy," was published in the *Stevens Indicator,* XII.

Angell, Frederic Jackson (M.E., '94), was born in Brooklyn, N. Y., September 9, 1870; the son of Frederic Allan and Abby Wheaton (Jackson) Angell, and is descended from old Rhode Island families on both father's and mother's sides. Thomas Angell came to the United States from England in 1630 with Roger Williams, and, with him, was one of the original founders of Providence, R. I. F. J. Angell prepared for college at the high school, Montclair, N. J. Three years' business experience (office work) in New York intervened between leaving school and entering Stevens Institute. He was a special apprentice in the locomotive shops of the Pennsylvania Railroad, Altoona, Pa., 1894–96; draughtsman with the Solvay Process Co., Syracuse, N. Y., 1896–97; and then entered the London office of Humphreys & Glasgow, gas engineers, New York and London, where he has remained to date. In this latter position he has been engaged in the construction and operation of carburetted water-gas plants, among which might be mentioned those at Bournemouth, England, capacity of 1,000,000 cubic feet per day; Tunbridge Wells, 1,000,000 cubic feet; Fulham, London, 1,750,000 cubic feet; and Copenhagen, Denmark, 2,500,000 cubic feet. His work, which at first was purely constructional and operative, developed largely into expert work in connection with problems of manufacture and distribution arising in gas-works where the Humphreys & Glasgow plants are installed. For the past two years most of his time has been devoted to negotiations leading to new business.

Annett, Edward Burdett (M.E., '02), son of Charles E. and Mary E. (Overbagh) Annett, was born in Bayonne, N. J., September 28, 1881. He was draughtsman and assistant to the engineer in charge of erection of a new plant for the Rock Plaster Co., of New York and New Jersey, 1902–03; draughtsman for the New York Mutual Gas Light Co., 1903–04; and since January of the latter year has been with the Consolidated Gas Co., of New York.

Antz, Oscar (M.E., '78), was born in Newark, N. J., September 16, 1859. After leaving the Institute, he entered the service of the Pennsylvania Railroad as machinist apprentice at the Meadows shops. He was advanced, through successive stages of draughtsman and general foreman at other shops of the division, to the position of assistant master mechanic of the Meadows shops, during twelve years of service. In 1890 he accepted the position of master mechanic of the Central of Georgia Railway at Savannah, Ga., where he remained for a year and a half, and then took a position, in 1893, with the Lake Shore & Michigan Southern Railway Co., as chief draughtsman of the car department. He was subsequently advanced

to general foreman of car shops at two different points, and is now general foreman of



Oscar Antz

the locomotive shops at Elkhart, Ind. While engaged in railroad work at some of the above places he gave instruction in mechanical drawing.

He contributed a series of articles on the "Construction and Maintenance of Railway Car Equipment" to the *American Engineer, Car Builder, and Railroad Journal,* which were published during 1896 and 1897, and has also contributed other articles to this and other technical journals. *The American Engineer and Railroad Journal,* in its issue of January, 1899, speaks of him as an authority on car subjects. He is a member of the American Railway Master Mechanics' Association.

Mr. Antz is the son of Theobald and Emma Antz. He married Jennie Lavinia Menagh, December 26, 1900, and they have one child, Joseph Lyndon Antz.

Appleton, Henry William (M.E., '00), was born in Brooklyn, N. Y., March 18, 1877; the son of Henry W. and Anna Elizabeth (Black) Appleton. His father was born in London, England, of English parentage, and his mother was born in New York of Scotch and Irish ancestry. He was draughtsman and assistant to the master mechanic of the Passaic Print Works, Passaic, N. J., 1900; in charge of the designing and construction for W. Noble Dickerson, Jr., & Co., manufacturers of electric power machinery, New York, 1900–01; assistant master mechanic at the Passaic Print Works, 1901–02, during which period he designed and drew plans for a one-story bleach-house 295 × 70 feet, a two-story "white room" 175 × 50 feet, and a six-story storehouse 250 × 120 feet. He also assisted in installing a gravity water-filter plant of 4,000,000 gallons daily capacity, and the engines, generators, and motors for a 750-kilowatt three-phase electric plant. In July, 1902, he was advanced to the position of master mechanic, having charge of general maintenance and repair of machinery and buildings of a plant having 3,000 boiler horse-power and three and a half acres of floor space devoted to the manufacture of printed cotton goods. He is now engaged in the installation of an electric plant which



H. W. Appleton

will eventually entirely displace the steam-engines formerly used.

Armitage, Frederick William (M.E., '01), was born in East Orange, N. J., July 10, 1877. He is employed in the manufacturing department in charge of the factory of Hitchings & Co., New York. He is a member of the Theta Xi fraternity, the Montclair, the Montclair Golf, and the Montclair Camera clubs.

Mr. Armitage is the son of Charles and

Harriet Armitage. He married Grace Johnson, March 10, 1903.

Armour, George (M.E., '89), is the Spokane (Wash.) district manager of the Houser & Haines Manufacturing Co., of Walla Walla, Wash.

Arrison, Pearson (M.E., '95), has been with the Thompson Meter Co., Brooklyn, N. Y., from 1895 to date.

Arroyo, Agustin Cayetano (M.E., '81), was born at Molino de Hercules, Queretaro, Mexico, May 4, 1851. On his graduation



A. C. Arroyo

he became connected with the La Reforma Cotton Mill, Salvatierra; the Molino de Soria Cotton and Woolen Mill, Soria; the Molino del Carmen Bleaching Mill, Celaya, all owned by Señor Don Eusebio Gonzalez, and held his positions until his death.

Mr. Arroyo was the son of Juana D. and Cayetano Arroyo. He married Mary Gillespie, December 19, 1881, at Paterson, N. J., and two children, Agustin Fernando and Felipe Fernando Arroyo, were born to them. Mr. Arroyo died October 29, 1892.

Aspinwall, John (M.E., '81), was born in Paris, France, October 15, 1858. He left the Stevens Institute during his senior year. In 1901 the degree of Mechanical Engineer was conferred upon him by the Institute in consideration of his record as student and of his professional work. He was Lecturer in Chemistry at St. Stephen's College, Annandale, N. Y., from 1882 to 1894, and received from that institution the degree of Master of Arts, *honoris causa*, in 1889. In March, 1900, he became general manager of the New York Leather & Paint Co., which was succeeded in 1902 by the Fabrikoid Co., of which, in 1903, he became president. While in Florida in 1890 he took up the culture of various delicate plants, which up to that time had been unsuccessful. One of these plants was the cucumber, and finding that failure to raise it was due to shock caused by the rapid cooling of the surface of the ground through radiation, he found, after various methods had been tried, that a layer of cheese-cloth above the plant would afford the necessary protection. A large house 100 feet square was built with walls 8 feet high, and the whole structure covered with cheese-cloth. Irrigation was obtained through artesian wells supplying water at a pressure of some 15 pounds to the square inch. The plants were raised upon upright trellises, and fertilization was had through the use of a camel's-hair pencil. The cucumber plants were raised in benches about two and a half feet above the ground, and earth placed in these benches to a depth of about four inches. The aphides (green plant-lice) were kept under control by means of damp tobacco stems which were laid above the ground on the benches. The result of this method of culture was the raising of an enormous quantity of magnificent cucumbers of the white spine variety, varying in length from six to nine inches, and hundreds of boxes of this fruit were shipped to the Northern markets.

The above data is of general interest chiefly on account of the fact that it was the first instance of the use of a thin material like cheese-cloth over an extended area at a height sufficient to walk under; and, also, that this experiment has revolutionized the raising of leaf tobacco for wrappers in the State of Connecticut and the New England States, where now hundreds of acres are covered with cheese-cloth nine feet above the ground, resulting in the raising of a leaf which is considered to be equal to the Sumatra wrapper, and vastly increasing the

productiveness of the tobacco plant and the money obtained for the crop.

During the winter of 1898, Mr. Aspinwall had occasion to make some photomicrographs of cross sections of a flexible backing coated with a flexible layer of pyroxylin, and in his attempts to demonstrate the penetration of the pyroxylin into the backing, he discovered the curious fact that when a layer of flexible pyroxylin is placed under pressure with heat, a resist is obtained, which, with a proper condition of dye bath, makes possible the dyeing of the raised portion of an embossed pyroxylin surface only. After a winter's work he discovered the law which governs the action of the dye upon pyroxylin compounds under these conditions. He also discovered a method by which the opposite result could be obtained with the same pyroxylin compound embossed in the same manner, by which the depressed portion becomes dyed, while the upper portion remains undyed; and also discovered a method by which a double dyeing is obtained; that is, by the immersion of an embossed pyroxylin compound in a single bath, the raised portion will be dyed one color, while the depressed portion will be dyed another. It was unfortunate that the fugitive character of the dyes which will produce this result made this process of little value from a commercial point of view.



John Aspinwall

As a boy of sixteen (1874) he designed and built the first really practical small steam launch in America, which he named the "Skedaddle." She was 17 feet long, had a single high-pressure cylinder, and was propelled by a screw which worked entirely below the keel, so as to obtain solid water,—a method now quite general. She was used on the Hudson River for two years.

Mr. Aspinwall is a member of the New York Yacht Club; the Calumet Club, of New York; the Camera Club, of which he was president in 1901; the New York Microscopical Society, of which he was president in 1899–1900, and of the "Journal" of which he is now editor; the American Microscopical Society, of which he was vice-president in 1901; the Arkwright Club, of New York, and of the Theta Xi fraternity.

Mr. Aspinwall is the son of John Lloyd and Jane Moore (Breck) Aspinwall. His father was a member of the old commission house of Howland & Aspinwall, New York.

He was married, September 9, 1885, to Juliet Wilson, and they have one child, Bessie Reed Aspinwall.

Atkins, Harold Bedford (M.E., '92), was born in Brooklyn, N. Y., February 24, 1872; the son of Thomas Bedford and Elizabeth J. (Dunham) Atkins, is of English descent on the paternal, and of Knickerbocker and Plymouth Colonial on the maternal side. He was assistant electrician in the experimental department of the American Telephone & Telegraph Co., 1892–93, being engaged chiefly in an effort to improve the operation of extreme long-distance apparatus. He then became connected with the Pintsch Compressing Co., 1893–95, the first six months as a draughtsman; from September, 1893, to the end of the year, engaged in building gas-works in Jacksonville, Fla.; and during 1894 and until October, 1895, as superintendent of gas-works and resident engineer in Boston, Mass. As a "student" with the General Electric Co., at Schenectady, N. Y., 1895–96, he engaged in personal experimental work, and in the latter year he also served as an instructor in Experimental Mechanics during the Supplementary Term at Stevens Institute. He was in the electrical repair shops of the firm of A. K. Warren & Co., 1896–98, during which time

he was engaged in inspecting, testing, and estimating repairs, and was also superintendent of shops and engineer in charge of designing-work. In 1898 he was engaged in designing details connected with the 96th Street Power station of the Metropolitan Street Railway Co., and in 1898–99 designed automobiles for the Electrical Vehicle Co. He obtained a patent for a flexible running-gear frame for vehicles, which frame is now being used on some of the Columbia automobiles. With the United States Motor Vehicle Co., 1899–1900, he also engaged in designing automobiles. Draughtsman with H. de B. Parsons (Stevens, '84), 1900 to date; he is now associated with Mr. Parsons, who is practising as consulting engineer, handling physical valuations of industrial properties, making investigations and reports for investors and manufacturers; also reporting on steam economy and preparing plans and specifications for steam and water power developments, and heating and ventilating.

He is a member of the American Society of Civil Engineers and of the American Institute of Electrical Engineers. He was at one time a member of the Calumet Club, New York.

Atristain, Alberto (M.E., '90), has been engaged with the Mexican Central Railroad at Mexico City, Mex., 1893 to date.

Atwater, Christopher Greene (M.E., '91), was born in Millville, N. J., December 23, 1869. He received his early education under German tutors and at Friends' School at Providence, R. I., and prepared for Stevens Institute at Stevens High School. He was a student in the design and construction of glass-melting furnaces in the technical bureau of Robert Dralle, Berlin, Germany, 1891–92; and was constructing engineer for R. M. Atwater & Sons, glass engineers, Alton, Ill., and Pittsburg, Pa., 1892–93. He then engaged with the Semet-Solvay Co., Syracuse, N. Y., American agents for the Semet-Solvay by-product coke-oven, 1893–99. He was constructing engineer for this firm on plants of 50 ovens at Dunbar, Pa., 25 ovens at Sharon, Pa., and 10 ovens at Halifax, N. S. He was also engaged in experimental work for the company at the Syracuse plant, and took charge of a garbage-reduction plant at Dorchester, Mass. As engineer for the National Coal Tar Co., 1900–01, he designed and erected tar distillation and storage plants at Everett, Mass., and also took charge of improvements at the company's Brooklyn plant. He was a member of the editorial staff of the *Engineering Record*, New York, in 1901; in the draughting-room, and assistant to Dr. F. Schniewind, consulting chemist, with the United Coke & Gas Co., New York, 1901–03; superintendent of the coke-oven department of the Dominion Iron & Steel Co., Sydney, C. B., 1903–04, when he resigned to take a similar position with the Maryland Steel Co. at Sparrows Point, Md. He is now mechanical engineer for the United Coke & Gas Co., New York city.

He took out a patent in 1900 on an improvement in horizontal-flue coke-ovens, the walls being inclined slightly from the perpendicular to increase the area of the lower flues and decrease the width of the coking-



C. G. Atwater

chamber at bottom. He presented papers on by-product coke-ovens before the American Association for the Advancement of Science, the American Chemical Society, and the American Institute of Mining Engineers, and is the author of technical descriptions of steam-power plants, cement-mills, garbage-reduction plants, and similar papers in the *Engineering Record* for 1902. He also assisted Dr. F. Schniewind in the prepara-

tion of an article on by-product coke-ovens in *Mineral Industry*, X. His thesis, "Test of a Pulsometer," formed part of a paper presented to the American Society of Mechanical Engineers by the late Prof. De Volson Wood, and was published in its *Transactions*, XIII, and in *Kent's Pocket-Book*, p. 612.

He was a junior member, 1892–1901, and member since 1901, of the American Society of Mechanical Engineers; associate member of the American Gas Light Association since 1899; and member of the American Institute of Mining Engineers since 1903.

Mr. Atwater is the son of Richard Meade and Abby Sophia (Greene) Atwater. His maternal grandfather was a graduate of the United States Military Academy; his paternal grandfather was a civil engineer; and his father was a chemist and commercial engineer. He married Jane Power Dunnell, May 5, 1903.

Axford, William Baldwin (M.E., '93), was born in Jersey City, N. J., December 28, 1871; son of William H. and Margaret A. Axford, is a direct descendant of John Hart, a signer of the Declaration of Independence; also of Major John Polhemus and Capt. John Axford, of the Revolutionary Army; also of John Axford, one of the first three settlers of northern New Jersey, at Oxford Furnace, N. J. He was a member of the firm of W. H. Axford & Son, contractors, 1893–94, but on the retirement of W. H. Axford in the latter year became engineer with the Cockburn-Barrow Co., Jersey City. A student of law, 1895–97, he received the degree of Bachelor of Laws from New York University in the latter year, and practised law in Jersey City, 1897–99. He was also a member of the firm of Seguine & Axford, speculators in real estate, bonds, mining properties, patents, etc., in Jersey City, 1895–99, and in the latter year he organized the Seguine-Axford Veneer Co., manufacturers of railroad and depot seatings and settees, and also of ceiling and panel work, with factory and cutting-mills at Jersey City. He reorganized this company in 1900 as the American Veneer Co., for the manufacture of veneer and cabinet work, automobile bodies and mudguards, car-ceilings and built-up work of all kinds, Mr. Seguine having retired, and Mr. Axford taking entire control as president and general manager, 1900–02. In 1902 he became associated with Senator V. W. Macfarlane, of Greenville, Me., as secretary and general manager of the Moosehead Case & Power Co., and secretary of the Greenville Manufacturing & Veneer Co., both of Greenville, Me.

He is a member of the Phi Gamma Delta and Phi Delta Phi fraternities of the New York University; of the Jersey City and Palma clubs, Jersey City; and of the Theta Nu Epsilon fraternity of Stevens Institute.

Ayres, Brown (B.S., '78, Ph.D., '88), was born in Memphis, Tenn., May 25, 1856. He attended the Washington and Lee Univer-



Brown Ayres

sity, Virginia, 1871–74, and entered Stevens in 1874, where he took the regular course in Mechanical Engineering until the Senior year, when he specialized somewhat in physics and chemistry, and graduated in the Class of '78 with the degree of Bachelor of Science. He entered Johns Hopkins University, at Baltimore, in 1878, taking the postgraduate courses in physics and mathematics, and in 1879 was appointed Fellow in Physics in that University. While holding this fellowship he was elected to the professorship of Physics in the University of Louisiana (now Tulane University of Louisiana), at New Orleans. He received the de-

gree of Doctor of Philosophy from Stevens in 1888. In 1894 he was appointed Dean of the newly created College of Technology of Tulane University of Louisiana, to the development of which as a thoroughly modern engineering school he gave most of his time for six years. In 1900 he was appointed Vice-Chairman of the Faculty of Tulane University, and in 1901 Dean of the Academic Colleges (Colleges of Arts and Sciences, and of Technology). He was Professor of Physics and Electrical Engineering from 1886 to 1900. Since the latter date he has been Professor of Physics and Astronomy.

He has published a number of papers on scientific and educational subjects, and served as a member of the Electrical Jury at the World's Columbian Exposition, Chicago, 1893; of the Electrical Jury at the Atlanta Exposition, 1895, and of the Electrical and Mechanical Jury at the Nashville Exposition, 1897. He organized the educational exhibit of Louisiana at the Louisiana Purchase Exposition at St. Louis. He is a Fellow of the American Association for the Advancement of Science; member of the American Institute of Electrical Engineers; the American Physical Society; the Association for the Promotion of Engineering Education; the New Orleans Academy of Science; the New Orleans Electrical Society, etc.; of the Delta Psi fraternity; and of the Louisiana Naturalists' Society. Especially fond of music, which he cultivates somewhat more than is usual with American men who lead busy lives, he is president of the New Orleans Choral Symphony Society, the philharmonic organization of New Orleans.

The son of Samuel Warren and Elizabeth (Cook) Ayres, he is of Scotch-Irish stock on his father's side and of Scotch and French-Huguenot on his mother's side, his American ancestry being traceable for 250 years. He married Katie Allen Anderson of Lexington, Va., July 5, 1881, and they have eight children, Mattie Garland, Samuel Warren, John Anderson, Elizabeth Cook, Mary Douglas, Katherine Stuart, Ruth, and Morgan Brown Ayres.

Azevedo, Luiz Marinho de (M.E., '99), was born in Casa-Branca, São Paulo, Brazil, November 10, 1876. He has been mechanical and electrical engineer at São Paulo, Brazil, 1899 to date. He was assistant superintendent, during construction, of the 24,000-volt, 20-mile transmission line of the



L. M. de Azevedo

São Paulo Tramway Light & Power Co., Ltd., and assistant electrical engineer for the same company during two years. Leaving this position, he acquired a concession for an electric light and power plant for the city of Itu, province of São Paulo. This electric company is now organized under the name of Companhia Ituana Força e Luz, and all the plans for the hydraulic development of 1,500 horse-power and the present utilization of 250 kilowatts were drawn by Mr. Azevedo, who is chief constructing, hydraulic, and electrical engineer for the company. He has also a contract with the municipal council of Itu for the construction of sewerage works for the city, the plans and specifications having been furnished by him after a competition. He is a member of the Theta Xi fraternity.

Mr. Azevedo is the son of Dr. Fernando Marinho and Anna Luiza Sampaio (Marinho) de Azevedo. His paternal grandfather was a physician who had three sons, all physicians, one of whom was an attendant of Dom Pedro II, of Brazil. His maternal great-grandfather was one of the most notable lawyers of his time, and his mater-

nal grandfather was an artist. Mr. Azevedo married Sylvia de Almeida Sampaio, September 4, 1902. They have one child, Maria Clarice de Azevedo.

Bachmann, Valentine (M.E., '75), was born in Germany, June 5, 1848. Up to 1883 he was engaged in mill-construction, and in the latter year established the "Avenue Mills," at Indianapolis, Ind., for the manufacture of high grades of flour, which he has since conducted. He has taken out a patent on a mechanical stoker.



VALENTINE BACHMANN

Mr. Bachmann married Lina von Königslow, and they have four children.

Badenhausen, John Phillips (M.E., '96), was machinist apprentice at the Consolidated Iron Works, Hoboken, N. J., 1896; in the repair department of the shops of P. Sanford Ross, contractor for docks, bridges, dredging, harbor improvements, etc., Clifton, Staten Island, 1898; assistant engineer on the American Line steamship "St. Louis," 1898–99; student in a postgraduate course in marine engineering and ship-building, Cornell University, receiving the degree of Master Mechanical Engineer, 1900; draughtsman with the New York Shipbuilding Co., Camden, N. J., 1900; assistant superintending engineer in the Atlas Line, of New York, and superintendent of shops of the Tietjen & Lange Dry Dock Co., Hoboken, N. J., 1902–03. He has been a contracting and



J. P. BADENHAUSEN

constructing engineer from 1903 to date. Mr. Badenhausen is the author of an article on "Tail Shafting for Marine Engines," which appeared in *Marine Engineering* for July, 1902; one on "A Patent Stern Tube," *Ibid.*, October, 1902; and of another on "Replacing a Slide Valve with a Piston Valve," *Ibid.*, July, 1903.

Baird, William Raimond (M.E., '78), was born in Philadelphia, Pa., April 24, 1858. After graduation from the Institute he decided to follow the legal profession, and with this end in view attended Columbia College Law School, graduating with the degree of Bachelor of Laws, *cum laude*, in 1882. He has been a counsellor-at-law for many years, with an office in New York, and has made a specialty of patent and corporation law, acting as expert in patent cases, and as counsel for many corporations. He was president of the New York Correspondence School of Law from 1892 to 1897. He is the author of:

"American College Fraternities," Philadelphia, 1879, 1880; New York, 1886, 1890, 1898.

"A Guide to the Principles of the Law," (with F. S. Babcock). New York, 1883, 1885, 1886, 1889.

"The Principles of American Law." Two volumes. New York, 1892, 1895, 1898, 1901.

"The Study of Languages." New York, 1893.

"Fraternity Studies." 1894.

He was general secretary of the legal fraternity, Phi Delta Phi, 1882–93; has been editor of the *Beta Theta Pi* since 1893; and is a member of La Société Minéralogique de France; the American Chemical Society; and of the Society of Chemical Industry.

The son of William J. and Mary Emma (Cornish) Baird, he is of Scotch and Franco-German descent on his father's side and Welsh and English Quaker on his mother's.



W. R. Baird

He married Jennie G. Mansfield, September 29, 1886. They have one child, Raimond Duy Baird.

Baker, E. S. (M.E., '00), has been with the West Virginia Paper Co., of Piedmont, W. Va., from 1900 to date.

Baker, I. Fraley (M.E., '98), has been with the Sprague Electric Co., Watsessing, N. J., from 1898 to date. With Harvey Brett, M.E., he prepared a thesis on "Experimental Investigation of the Reliability of Pitot Tubes for Determining the Velocity of Flow of Water in Pipes," which was published in full in the *Stevens Institute Indicator*, October, 1898. He is a member of the Tau Beta Pi fraternity.

Baldasano, Arthur, Jr. (M.E., '97), was in the engineering department of the Trenton Iron Works, Trenton, N. J., 1897–98; in the works of Vickers Sons & Maxims, London, England, 1898–1903; and from 1903 to date has been manager of the Rio Negro Mines, Ltd., Riello, Province of Leon, Spain.

Baldwin, Oscar H. (M.E., '85), was employed in the maintenance of way and motive power departments of the Pennsylvania Railroad Co., 1885–86; in the Westinghouse Electric & Manufacturing Co., 1886–89, on general construction work and operation of electric lighting and power plants; as engineer with the Westinghouse Electric Co., Ltd., and as superintendent of the Sardinia Street station of the Metropolitan Electric Supply Co., 1889–92, serving in this capacity in drawing up the plans, etc., for the boilers, engines, and piping work for the extension of the station, superintending its erection, and operating the entire plant for one year; and as chief engineer with the Westinghouse Electric Co., Ltd., London, 1892–94. He was managing director of the same company, 1894–1900, and on the formation of the British Westinghouse Electric & Manufacturing Co., Ltd., he was given the additional appointment of assistant manager of that company, and, no manager having been officially appointed, was acting manager. From 1890 to 1900 he had general charge of all the engineering work of both the Westinghouse Electric Co., Ltd., and the British Westinghouse Electric & Manufacturing Co., Ltd. He was managing director of J. G. White & Co., Ltd., engineers and contractors, London, England, 1900–02; and from 1903 to date has been with the British Westinghouse Electric & Manufacturing Co., Ltd., London.

Ball, Frederick Ossian (M.E., '97), was born at Grand Island, Erie County, N. Y., February 10, 1872. He has been assistant to the general manager of the American Engine Co., Bound Brook, N. J., from 1897 to date. Has taken out three patents on a duplex compound engine, and several patents on minor parts of steam-engines. He is a junior member of the American Society of Mechanical Engineers, before whom, in

May, 1901, he read a paper on "Draughting Room and Shop Systems." He is also a member of the Park Club, of Plainfield, N. J., and of the Beta Theta Pi fraternity. With his brother, B. C. Ball, '95, he sailed in the "Ethelwynne" when she defeated the English yacht "Spruce IV" in the international races for the Seawanhaka Corinthian Challenge Cup for small yachts.

The son of Franklin Harvey and Kate (Bedell) Ball, he is a direct descendant of Jonathan Ball, a Revolutionary soldier. He married Cornelia Mueller, September 16, 1897. They have three children, Thomas Franklin, Robert Cornelius, and Jonathan Mueller Ball.

Bandaret, Leon (M.E., '87), has not been heard from since graduation.

Bang, Arthur Charles (M.E., '98), was born in New York city, January 13, 1877. He has been employed as draughtsman on special work with G. W. Pond, New York; in the same capacity with the American Air Power Co., New York, and at the Bethune Street works of the Western Electric Co., New York. He was manager of the Sturtevant House, New York, 1899–1903; and from 1903 to date has been superintendent

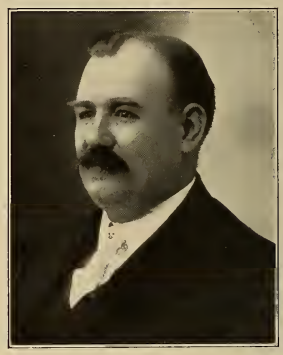


A. C. Bang

of the Hotel Collingwood, New York. He is a member of the Tau Beta Pi fraternity.

Mr. Bang is the son of Henry J. and Augusta F. (Bergstein) Bang. His ancestors originally came from the Rhine country, Germany. He married Eleanor L. Gilles, February 26, 1902.

Bang, Henry August (M.E., '88), was born in New York city, February 5, 1867.



H. A. Bang

His employments have been with the Korting Gas Engine Co., manufacturing gas engines; the National Water Purifying Co., for whom he designed and superintended the erection of plants for purifying water, in various parts of the country, 1889–91; the Haskin Wood Vulcanizing Co., New York, 1891; the John A. Roebling's Sons Co.'s works, Trenton, N. J., 1892, designing machines for covering wire with cotton insulation; and as consulting engineer, jointly with Mr. E. B. Benham, for the Brott Electric Rapid Transit Bicycle Railway Co., 1893. He has been a mechanical engineer and contractor for power plants, steam and hot water heating, etc., from 1894 to date, and is also the owner and manager of the Kensington Hotel, Saratoga Springs, N. Y. He is a member of the American Society of Mechanical Engineers, and of the New York State Hotel Association. Until January, 1903, he was a member of the American Institute of Mining Engineers.

Mr. Bang, who is the son of Henry J.

and Augusta F. (Bergstein) Bang, married Laura Belle Pullen, June 5, 1895. They have one child living, Frank Lester Bang. Another child, William Henry Bang, died August 16, 1896.

Barnes, William O. (M.E., '84), was born in Newburgh, N. Y., in 1864. He engaged in silk-manufacture at Paterson, N. J., under the firm name of Barnes & Reel, until 1889; then at Barmen, Germany, 1889–91, and again at Paterson, 1891–93, as superintendent of the Barnes Manufacturing Co. He was engaged in the same line of work as superintendent with the Gregory Silk Manufacturing Co., Scranton, Pa., 1893–94; and later with the Blickensderfer Manufacturing Co., manufacturers of typewriting machines, Stamford, Conn., 1895–1900; the American Bicycle Co., Toledo, O., 1901–02; the Mergenthaler Linotype Co., Brooklyn, N. Y., 1902; and with the Ross Rifle Company of Canada, at Hartford, Conn., from 1902 to date.

Mr. Barnes, who is the son of David A. and Elsie E. (Ackerman) Barnes, married Grace D. Herdman, May 8, 1889. They have two children, William Oliver and Herdman Barnes.

Barnum, Dana Dwight (M.E., '95), was born at Bethel, Conn., August 15, 1872. His employments since graduation have been as draughtsman with E. W. Bliss & Co., Brooklyn, N. Y., 1895; as chemist with the Worcester Gas Light Co., Worcester, Mass., 1895–96; as superintendent of distribution for the same company, 1896–1902; and as its superintendent from 1902 to date. He is a member of the American Society of Mechanical Engineers; the New England Association of Gas Engineers; the Worcester Club; and the Beta Theta Pi and Theta Nu Epsilon fraternities.

Mr. Barnum is the son of W. H. and Lydia Alvord Barnum. He married Mary Caroline Munroe, October 16, 1900.

Bates, George Harold (M.E., '98), was born in Hackensack, N. J., August 22, 1877. He became an instructor during the Supplementary Term at Stevens Institute in 1898; and later served as engine draughtsman with the Burlee Dry Dock Co., Port Richmond, Staten Island, 1898–99. As draughtsman he assisted in designing the machinery of four sea-going and four harbor tugs. From 1899 to date he has been chief engineer of the above company, and during that period he has designed and supervised the construction of the machinery in the following boats: New York Central Railroad Co.'s lighters Nos. 4 and 6, having single engines, and flue and return tubular boilers of 400 indicated horse-power; the Pennsylvania Railroad ferry-boat "Chicago," with a compound engine and Thornycroft water-tube boilers of about 1,200 indicated horse-power; the piping arrange-



G. H. Bates

ments of four Standard Oil Co.'s barges of about 150 feet in length, and the piping, boilers, etc., of a 300-foot barge for the same company; the twin-screw lighthouse tender "Larkspur," with compound engines and gunboat boilers of 750 indicated horse-power; the twin-screw lighthouse tender "Sumac," with compound engines and Scotch boilers of 700 indicated horse-power; the twin-screw yacht "Rheclair," with triple-expansion engines of 2,500 indicated horse-power and four Almy water-tube boilers, and an actual speed of 17 knots; the twin-screw yacht, "Noma," with four-cylinder triple-expansion engines of 5,000 indicated horse-power and six Almy boilers, and an actual speed of 19½ knots; the harbor tug

"Independent," with a compound engine and fantail boiler of 850 indicated horse-power; the Erie Railroad ferry-boat "Arlington," with two compound engines and two Scotch boilers of about 1,400 indicated horse-power; a compound engine 20 and 42 × 28 for tug "Coastwise;" a triple-expansion engine 17, 25, and 43 × 30, to run a centrifugal pump, of 950 indicated horse-power; and the engines and pumping machinery of a 4,000-ton dry dock belonging to the Burlee Dry Dock Co. Mr. Bates has also designed numerous tool attachments and a fifty-ton derrick with a wooden mast and steel boom. He is a member of the Cranford Country Club, and an associate member of the Society of Naval Architects and Marine Engineers.

Mr. Bates is the son of George Greer and Fannie Elizabeth (Robjohn) Bates. His father's ancestors, originally from England, settled in Massachusetts during the 17th century. His mother's ancestors came from Cornwall, England. He married Elizabeth M. Miller, November 7, 1901.

Bates, James Hervey (M.E., '87), was born in Woodburn (now part of Cincinnati),



J. H. Bates

O., August 28, 1863. He is of New England Colonial stock and of purely English descent for centuries; the son of Joshua H. and Elizabeth (Hoadly) Bates, and grandson of Dr. George Bates, U.S.N. He has studied natural science since he was ten years of age, has travelled much in North America and Europe, and has undertaken much experiment and research work relating to insect life. He engaged in a brief dynamo test under the direction of Professors Geyer and Jacobus, 1887; and was employed in the development of the trolley system, with F. J. Sprague, 1887–88. He was one of the construction corps of the first trolley line in Richmond, Va., and was also employed upon the construction of the earlier electric lines in other cities. In 1888 he was employed on the Bentley-Knight conduit system, preparing designs and working and other drawings for extensions of conduit roads then in operation, thus assisting in the development of many of the inventions of Messrs. Bentley, Knight, and Blackwell. In the same year he calculated the equalizers for the local Edison Co., of Philadelphia, of which plant Prof. William D. Marks was at the time supervisor. He was engaged upon work in connection with the first trolley line in Boston, Mass. He was employed in construction work in connection with the Manhattan Electric Light Co., and the West Side Electric Light Co., in New York, in 1889; and as constructing engineer and draughtsman, for central stations of what is now the Fort Wayne Electric Corporation, 1889–91; and with the Moore Electrical Manufacturing Co., 1891–93. He associated with his brother, Mr. C. J. Bates, of New York, as consulting engineer, 1893–98, and the brothers did much consulting work for various parties, including Mr. J. Munsie, who supervised the building of a large part of the earlier telegraph mileage of the United States and Canada, and also the wire lines of the Canadian Pacific Railroad from Montreal to British Columbia. Jointly with Mr. J. A. Guest he designed a system for applying the electric light to marine life-saving apparatus, life-buoys, life-boats, and life-rafts, which has been covered by broad patents. He was engaged with F. L. Smidth & Co., of New York, engineers for cement plants, mills and machinery, 1899–1901; was then in the engineering department of the New York Edison Co., and of the Interurban Street Railway Co., and is now with F. S. Pearson, consulting engineer, New York. Mr. Bates and Mr. Guest have taken out two United States

patents, 512,957 and 551,081, and two British patents, Nos. 980, of 1894, and 23,674, of 1895. For the problem of the "dynamite rocket" for coast-defence Mr. Bates has a solution in the application of the enlarged simple sky-rocket, which is covered by a patent. Besides the patents already mentioned he has taken out one for traction improvements, one for an annunciator, and another for an incandescent lamp. He has contributed a number of articles to the *Electrical Engineer*, 1895 and 1896, and to the *Street Railway Journal*, 1896 and 1897. He is a member of the American Institute of Electrical Engineers; also of the Technology Club of New York.

Bayless, Charles Thomas (M.E., '93), was born in Louisville, Ky., September 2, 1871. He was an instructor during the Supplementary Term at Stevens Institute, 1893; and was engaged with Mr. David L. Barnes, consulting engineer, of Chicago, 1893–96. On account of ill health he was compelled to go to New Mexico in 1896, where he became chemist in a small smelter at Chloride, N. M., during the spring of 1897. After the closing down of the smelter he went to Mexico City and entered the employ of the Mexican Central Railway, 1897, as draughtsman in the motive power department. In 1899 he was made chief draughtsman, and on September 1, 1901, was appointed mechanical engineer of the same road, with headquarters in Mexico City. He is a member of the Railway Club of Mexico, and a junior member of the American Society of Mechanical Engineers; member of Beta Theta Pi and Theta Nu Epsilon fraternities; Past Master of the Toltec Lodge No. 214, Free and Accepted Masons, Mexico City; and a member of Mexico City Chapter of Royal Arch Masons.

Mr. Bayless, who is the son of Benjamin and Wilhelmine C. Bayless, married Clara E. Lindamood, April 4, 1899. They have one child, Wilhelmine Crawford Bayless.

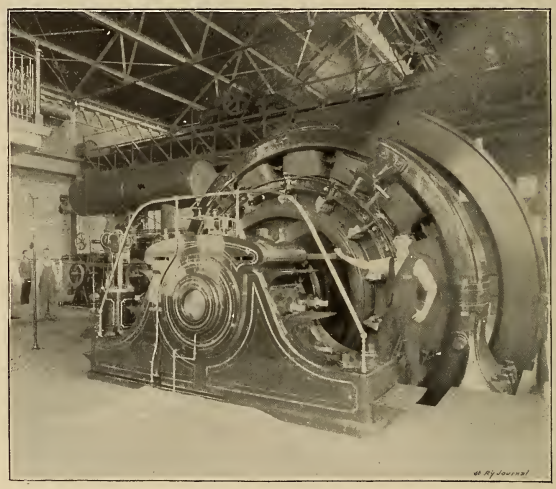
Baylis, Robert Nelson (M.E., '87), was born in Englewood, N. J., March 16, 1867; the son of Robert and Martha N. (Smith) Baylis. He was an apprentice in the shops of the Southwark Foundry & Machine Co., Philadelphia, Pa., 1887–89; draughtsman, and then successively head draughtsman, purchasing agent, electrician, and chief engineer of the C & C Electric Co., New York, 1889–93. In the latter capacity he had entire charge of the works of the company, including the manufacturing as well



R. N. Baylis

as the designing of a variety of electrical machinery. He designed and constructed a full line of motors from one to one hundred horse-power during this engagement. It was at this time also that he devised the ingenious "reaction" brush-holder, which was such a radical departure from all previous devices of the kind that when it was first introduced it aroused endless arguments as to whether the carbon could possibly remain in the holder when the machine was in motion. Mr. Baylis introduced numerous improvements into the factory methods and management of his company. In 1893 he resigned from the C & C Electric Co., and visited the Columbian Exposition at Chicago, and among other engagements was employed by the Committee of Awards in testing some of the large direct connected railway and power generators that were in service at the intramural power station during the season of the Exposition. After returning to New York he was engaged for a time upon engineering work in connection with isolated electric light and power plants, giving particular attention to the subject of

electric-power transmission for factories, and in the summer of 1894 entered the employ of the Walker Co., Cleveland, O., in its street railway department. He was eventually put in charge of all the technical work of the Walker Co., and gave his attention particularly to the designing of railway generators. The cut shown herewith of a 1,500 K. W. generator is an example of his work in this line, which comprised machines of all sizes, and for lighting as well as for railway and power purposes. He also had charge of the outside construction and erection work. In 1896 he was appointed chief electrical engineer of the Walker Co.; but in February, 1897, he resigned this position and entered into partnership with his brother, under the name of "The Baylis Company," mechanical and electrical engineers and contractors. Finding that there was a large demand from dynamo and motor builders and users for the Baylis reaction brush-holder, the Baylis Company began the manufacture of these holders, and since then have branched out into the manufacture of various other mechanical devices and specialties. Mr. Baylis has been retained as expert in numerous patent causes before the United States circuit courts, which involved technical points in the manufacture of electrical apparatus of various kinds. United States patents have been issued to Mr. Baylis in connection with the commutator brush-holder, 1893; a brush-holder support, 1899; a fluid pressure-regulator, 1900; and an anti-fluctuating device for gas service-pipes, 1902, and other applications for patents are pending. He is a member of the American Institute of Electrical Engineers, and served as a member of its board of examiners; also a member of the American Society of Mechanical Engineers; the Delta Tau Delta fraternity; the Engineers' Club; the New York Athletic Club, and the Brooklyn Institute of Arts and Sciences.



1,500 Kilowatt Generator
R. N. Baylis

Beach, Willard J. (M.E., '97), was, after his graduation, employed in the Meadows shops, and in the office of the superintendent of motive power, of the Pennsylvania Rail-

road, Jersey City, N. J.; and from 1900 to date he has been draughtsman with Heyl & Patterson, contracting engineers, of Pittsburg, Pa. He is a member of the Tau Beta Pi fraternity.

Beale, Frederick Wight (M.E., '99), was born in Omaha, Neb., March 3, 1875. Since graduation he has been draughtsman with the Oxnard Construction Co., New York, 1899; engaged in remodelling the plant of the Peninsular Beet Sugar Refining Co., for



F. W. Beale

the same concern, at Caro, Mich., 1900; draughtsman with the Carbondale Machine Co., Carbondale, Pa., 1900; business manager and in charge of the installation of refrigerating plants at the New York office during the absence of the regular manager, and later chief draughtsman at the Carbondale works, 1901–02; assistant superintendent of construction during the enlargement of the Peninsular Beet Sugar Refining Co., for the Oxnard Construction Co., at Caro, Mich., 1902; assistant engineer and manager of draughting department with the Continental Construction Co., Denver, Colo., and has been engaged in the complete designing and construction of beet sugar refineries, 1903 to date. He is a member of the Chi Phi fraternity.

Mr. Beale is the son of Francis A. and Anna Belknap Beale, and is descended from John Beale, who came from Old Hingham, England, to New Hingham, Mass., in 1636; and on his mother's side from the Fiske, Wight, and Belknap families who came to Massachusetts early in the 17th century. He married Jeannette Lane, January 20, 1900, and they have one child, Edward Belknap Beale.

Beard, Maximillian Cornelius (M.E., '87), was born in Biloxi, Miss., November 27, 1865. Before entering Stevens Institute he spent three years at the Tulane University, New Orleans, La., in the general academic course. He was assistant engineer with the Welsbach Gas Light Co., New York and Philadelphia, 1888–89; half-owner of the Ontario Iron Works, Canandaigua, N. Y., 1889–96, manufacturing light gray-iron castings and building light machinery; superintendent of works with the Herendeen Manufacturing Co., Geneva, N. Y., manufacturing cast-iron steam and hot-water heating-boilers, 1897–98; in the sales department of the Hohman & Maurer Manufacturing Co., New York, 1898–1900; assistant manager of sales department with the Elliott & Hatch Book Typewriter Co., New York, and also purchasing agent with the same company, 1900 to date. He is a member of the Red Jacket Club, Canandaigua, N. Y., and a charter member of Mu chapter of Chi Phi at Stevens Institute.

Mr. Beard is the son of Cornelius and Philadelphia I. Beard. His father was born in England, and his mother at Canandaigua, N. Y., of Scotch parents. He married Gertrude Field Finley, September 22, 1888. Three children were born to them, of whom Stuart-Menteth and Philadelphia Isabella Beard, are living.

Beatty, James, Jr. (M.E., '84), was born in Baltimore, Md., May 12, 1861. He was educated in the public schools of Baltimore, and at Bethel Military Academy, Va., after which he entered Stevens Institute in 1880. He was an ardent seeker after knowledge, especially that derived from personal experiment. He was professor of engineering branches at Haverford College, Pa., 1884–86; superintendent of James Beatty & Co.'s works, Baltimore, Md., 1886–90; and with Wieting & Richter, Georgetown, Demerara,

until his death, August 24, 1893. He was a member of the American Society for the Advancement of Science, and of the Beta Theta Pi fraternity; also one of the founders of the Engineers' Club, of Philadelphia.

The son of James and Mary Louisa Goodwin Beatty, James Beatty, Jr., was sixth in descent from John Beatty, who was born in Scotland in 1660, left that country on account of religious persecution, and after remaining some time in Ireland, and in England, where he married Susanna Affordby, and also in Holland, came to America about 1700 and settled at Esopus, N. Y. After his death his widow and children removed to Maryland about 1728. On his mother's side James Beatty, Jr., was of English descent, tracing his ancestry back through the Goodwins, Howards, Ridgeleys, and Dorseys. He married Margaret Isabel Williams, July 15,



James Beatty, Jr.

1886. One son, James Castleman Beatty, was born to them.

Beck, George Henry (M.E., '99), was born in New York city, December 30, 1875. He has been second assistant superintendent of the tire department of the Midvale Steel Co., Nicetown, Philadelphia, Pa., from 1899 to date. In the spring of 1902 the Midvale Steel Co. sent Mr. Beck on a three-months tour of inspection of European steel plants. He is a member of the Theta Xi fraternity.

Mr. Beck, who is the son of Jacob and Karolina (Maurer) Beck, married Hortense



G. H. Beck

Burnham Thompson, November 22, 1899. They have two children, Rodney Maurer and Newton Thompson Beck.

Beers, William J. (M.E., '89), was a graduate assistant in the Drawing Department of Stevens Institute, 1889–92, and has been head draughtsman for W. D. Forbes & Co., engineers, Hoboken, from 1892 to date. His work has consisted largely in designing high speed engines of from 300 to 800 revolutions per minute, for various conditions of government, marine, and electric-light service.

Benavides, Rafael Augusto (M.E., '00), the son of Ramon and Serafina Benavides, was born in Guatemala, Central America, October 12, 1877. He received the degree of Bachelor of Arts at Puerto Principe, Cuba, June 15, 1893. He has been employed in the testing department of the Western Electric Co., New York, 1900; in the meter department of the Edison Electric Illuminating Co., New York, 1900–01; in the superintendent's office of the C. W. Hunt Co., West New Brighton, Staten Island, 1901–02; as electrical engineer for the Chaparra Sugar Co., Chaparra, Cuba, 1902–04; and is now assistant engineer of the Public Works of

Camagney, Cuba. He is a member of the Theta Xi fraternity.

Benedict, Harding (M.E., '96), has, since graduation, served with the E. W. Bliss Co., Brooklyn, N. Y., 1896–98; as engineer with the New York Steam Co., New York, 1898–1901; and with Robert A. Keasbey, New York, handling heat-insulating materials, pipe and boiler coverings, etc., from 1901 to date.

Benjamins, Israel (M.E., '01), son of Benjamin and Rebecca Benjamins, was born in the village of Eftodia, near the city of Balta, Russia, December 2, 1871. His Hebrew ancestors have been domiciled in southwestern Russia from times immemorial. He grew up in Odessa, coming to the United States in 1894, and being naturalized in 1900. He was in the employ of the Burlee Dry Dock Co., Port Richmond, Staten Island, 1901–02; with the Oakes Manufacturing Co., Steinway, Long Island, 1902–03; in the draughting department of the General Electric Co., Schenectady, N. Y., 1903; with the Brooklyn Water Supply Department, New York, 1903–04; and is now in the department



Israel Benjamins

of Public Works, Borough of Richmond, New Brighton, Staten Island, N. Y. He has a patent on an improvement in windmills, issued in 1902; one on a car-fender and stop, issued in 1897; and a caveat, filed in 1901, on an improved steam turbine, for which patent application is now pending.

Bennett, Frank (M.E., '01), son of Mary and John Bennett, was born in London,



Frank Bennett

England, January 18, 1874. He has been employed by the Edward Ogden Co., New York, 1901; the United Gas Improvement Co., Philadelphia, Pa., 1901–02; and has been with the Worcester Gas Light Co., since 1902, being now engaged as superintendent of works. He is a member of the Free and Accepted Masons, and of the Phi Sigma Kappa fraternity.

Benns, Charles P. (M.E., '89), has been draughtsman with the Garvin Machine Co., New York, 1889–90; assistant foreman in the machine shop of the Builders' Iron Foundry, Providence, R. I., 1890–91; machinist, foreman, and draughtsman with the Brown & Sharpe Manufacturing Co., Providence, 1891–93; teacher of applied mechanics and shopwork, at Providence Manual-Training High School, 1893–97; and instructor in metal work and mechanical and electrical engineering courses at the Teachers' College, New York, from 1897 to date. He is a joint patentee of an instrument for platting stadia notes, 1896; an occasional contributor to the *American Machinist*; and a member of the American Society of Mechanical Engineers.

Bensel, John A. (M.E., '84), was born in New York city in 1863. He served as rodman at the New York Aqueduct, 1884; in the same capacity with the Pennsylvania Railroad Co., 1884–87; as assistant engineer and assistant supervisor with the last-named company, 1887–89, during which period, except while acting as assistant supervisor, his work was principally in charge of the improvement of the dock and freight terminals of the road; assistant engineer in the New York Dock Department, 1889–95, having entire charge of all construction work on the North River water-front; engineer for water-front improvements, 1895–98, acting as consulting engineer for the New Jersey Central Railroad, for the Girard Estate of Philadelphia, and for the municipality of Philadelphia in the improvement of a mile of the water-front on the Delaware River; and has been engineer-in-chief of the Department of Docks, New York, from 1898 to date.

His reports on "An Improved Balance Transfer Bridge," and on "The Removal of Rock in Thirty-five Feet of Water in New York City," have been published in the *Transactions* of the American Society of Civil Engineers. He presented a paper on "Wharves and Piers" at the International



J. A. Bensel

Engineering Congress, held under the auspices of the American Society of Civil Engineers in St. Louis, October 3–8, 1904, during the Louisiana Purchase Exposition. He is a member of the American Society of Civil Engineers; of the Engineers', University, Union, and City Mid-Day clubs, of New York; and of the Delta Tau Delta fraternity.

Mr. Bensel is the son of Brownlee and Mary Maclay Bensel, American on both sides for two generations, and tracing back to Scotch and Dutch ancestry. He married Ella Louise Day in 1896. Two children have been born to them, Louise Day and John A. (Jr.) Bensel.

Berg, Howard Morrell (M.E., '99), son of Maurice Michael and Nellie (Morrell) Berg,



H. M. Berg

was born in Elizabeth, N. J., January 31, 1877. He has been employed in the ordnance department of the Midvale Steel Co., Philadelphia, Pa., from 1899 to date. He is a member of the Theta Nu Epsilon fraternity.

Berg, Louis de Lissa (M.E., '99), the son of Hart E. and Rega (de Lissa) Berg, was born in Philadelphia, Pa., February 11, 1878. He was in the motor carriage department of the Pope Manufacturing Co., Hartford, Conn., 1899–1901; with the Manhattan Brass Co., New York, 1901–02; manager of the Wanamaker Automobile Station, New York,

1902; and has been a member of the firm of Kennedy & Berg, automobile engineers and



L. DE L. BERG

agents, New York, from 1902 to date. He is a member of the Tau Beta Pi fraternity.

Bernhard, Harry T. (M.E., '96), has not been heard from since graduation.

Betts, Harold Scofield (M.E., '00), the son of John MacEwen and Ellen (Scofield) Betts, was born in New York city, July 27, 1876. He has been employed in the engineering department of the New Amsterdam Gas Co., New York; and in the United States Department of Agriculture, Bureau of Forestry, Washington, D. C. He is a member of the Beta Theta Pi and Tau Beta Pi fraternities.

Beutler, Albert, Jr. (M.E., '97), was born in Jersey City, N. J., April 1, 1876. He was employed at the Eagle Oil Works, Communipaw, N. J., 1897–98; with Mr. A. R. Shattuck, New York, designer and builder of gasoline motor carriages, and chief draughtsman for the Automobile Company of America, 1898–99; assistant superintendent of the same company, 1899–1902; and has been manager of the automobile body department of the firm of Frederick R. Wood & Son, New York, from 1902 to date. A thesis on "Efficiency Test under High Driving Heads and the Determination of the Lowest Ratio between the Driving and Pumping Heads," written by Mr. Beutler in connection with Messrs. P. J. Brune and T. J. Main, was published in the issue of the *Stevens Institute Indicator* for April, 1898. He is a



ALBERT BEUTLER, JR.

member of the University Club of Hudson County, N. J.

Beyer, Richard (M.E., '88), was born in Jersey City, N. J., April 8, 1868. He was general assistant with Beyer & Tivy, civil engineers, Hoboken, 1888; draughtsman for the United Gas Improvement Co., Philadelphia, 1888–89, first in the Philadelphia office, then assistant engineer in extension of a gas plant at Marshall, Mich.; then employed in making maps of gas mains at Sioux City, Iowa, and at Omaha, Neb.; and still later in making plans of a gas plant at Sioux Falls, Dak.; next chief assistant in the office of Beyer & McCann (later Thomas H. McCann, member of the American Society of Civil Engineers), Hoboken, 1889–1903; now associated with Mr. McCann as partner, under the firm name of T. H. McCann & R. Beyer. The work in which Mr. Beyer has been engaged includes a long list of important surveys, constructions, maps, etc. The surveying work in constructing the Carnegie Laboratory of Engineering was done by him. He is a member of the German Club of Hoboken.

Mr. Beyer is the son of Albert and Ida Beyer. His father is a civil engineer, and architect of many prominent buildings, such as the Hoboken Library, School No. 6, the Hoboken Theatre, etc., and many private buildings, factories, etc. His grandfather was an officer in the customs department, Germany. Mr. Beyer married Caroline A. Rabe, March 30, 1893. One girl, Hilda Lusbie Beyer, has blessed their union.

Bingham, Carl G. (M.E., '02), is with the Samuel Bingham's Son Manufacturing Co., Chicago, Ill. Mr. Bingham married Mary Norris Simon, daughter of Dr. C. Irving Simon of Hoboken, N. J., January 20, 1904.

Birchard, Pliny T. (M.E., '78), has, since graduation, been engaged in the motive power department of the Lake Shore & Michigan Southern Railway at Elkhart, Ind., 1878–79, then at Marshalltown, Iowa, 1879–81; as civil engineer with the Wisconsin, Iowa, & Nebraska Railway (now the Chicago Great Western) at Des Moines, Iowa, 1883–84; in the same capacity with the Kansas City & Southern Railway at Kansas City, Mo., 1884–86; as railroad contractor, doing work on various railroads in Missouri, Nebraska, and South Dakota, 1886–90; member of the firm of Birchard, Bridge, & Co., Norfolk, Neb., 1890–97; and as general foreman of bridges and buildings on the Eastern division of the Fremont, Elkhorn, & Missouri Valley Railway at Norfolk, Neb., since 1897.

Birdsall, Edward Tracy (M.E., '86), was born in Cumberland, Md., April 14, 1863. He has been draughtsman in the motive power department of the Manhattan Elevated Railroad, New York, 1886–87; with the United States Electric Lighting Co., 1887–88; the Edison Electric Light Co., 1888; the C & C Motor Co., 1889; the Daft Electric Co., 1889; and the Edison United Manufacturing Co., 1889–92. From 1892 to date he has been a consulting electrical engineer, in New York, and is now engaged in the manufacture of automobiles. He has about 16 patents on electric and automobile devices. Mr. Birdsall contributed an article to the *Electrical World and Engineer*, July 22, 1899, on an "Electric Contact Device for a Drawbridge," designed by him, and now in successful operation over the Harlem River at Third Avenue, New York. He is a member



E. T. Birdsall

of the American Institute of Electrical Engineers; the Delta Kappa Epsilon fraternity; the Automobile Club of America; and the New York Athletic and Camera clubs.

Mr. Birdsall is the son of George W. and Jane E. Birdsall, of English and Dutch descent, and a member of a family that for five generations have been engineers. He married Louise Banker Goetchius in 1892. Two children, Beatrice and Mildred Birdsall, have been born of this union.

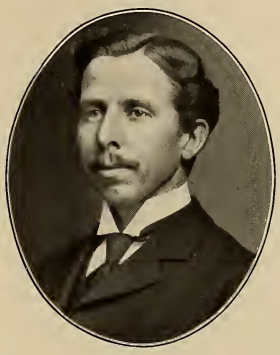
Blankenship, Robert Millington (M.E., '88), was born in Richmond, Va., May 5, 1866. He was successively draughtsman, chemist, assistant to superintendent, and superintendent of the nail department, and from 1894 to the time of his death was general superintendent of the Old Dominion Iron & Nail Works Co., engaged in the manufacture of bar-iron, nails, horse-shoes, bolts and nuts, and high-grade refined iron. The plant is operated by steam, water, and electric power. He was also the superintendent of the granite quarry and stone-crushing plant. He was a member of the American Society of Mechanical Engineers; of the Commonwealth Club, of Richmond, Va.; and of the Alpha Xi Chapter of the Chi Psi fraternity.

Mr. Blankenship was the son of Robert Emmett and Kate (Millington) Blankenship, and the grandson of John Millington, M.D., C.E., and F.R.S., of Great Britain, who was, successively, professor of mechanics in the Royal Institution of Great Britain; of civil engineering and applications of science in the London University; and of chemistry, natural philosophy and civil engineering in William and Mary College, Va. He married Virginia Sinclair Cadot, December 6, 1893. He was drowned in the forebay of the Horse-Shoe mill of the Old Dominion Iron & Nail Works Co. at Richmond, Va., January 22, 1904. He left a widow and two children, Robert Moore and John Millington Blankenship.



R. M. Blankenship

Blauvelt, Cornelius D. (M.E., '86), was born in Oradell, N. J., August 23, 1864; the son of James C. and Eliza A. (Zabriskie) Blauvelt. His paternal ancestors were early Dutch settlers of Manhattan and vicinity. His maternal ancestors came from Poland a century or more ago. He completed two years of the classical course at Marietta College, Ohio, before entering the Stevens Institute. He was assistant superintendent of the United Gas Improvement Co., Paterson, N. J., 1887–89, and superintendent and secretary for the same company at St. Augustine, Fla., 1889–92; but resigned the latter position in 1892 and came north again, and has since been giving most of his attention to private business which has not been of a professional character.



C. D. Blauvelt

Blumgardt, Isaac (M.E., '98), son of Jacob and Sophia Blumgardt, was born in New York city, April 29, 1877, and prepared for Stevens Institute at the College of the City of New York. He was engaged in the De-



Isaac Blumgardt

partment of Tests at Stevens Institute, 1898; with the Edison Electric Illuminating Co., New York, 1899; as draughtsman in the engineering department of the Metropolitan Street Railway Co., New York, 1900–01; in charge of the inspecting, testing, etc., in the department of construction and repair at the Brooklyn Navy Yard, New York, 1901–03; and is now in the engineering department of the New York Central & Hudson River Railroad, New York.

Mr. Blumgardt is a member of the Tau Beta Pi fraternity.

Boettger, Robert (M.E., '98), was born in Union Hill, N. J., May 24, 1874; attended public school at West Hoboken; and graduated from the Hoboken Academy. He prepared for the Institute at Stevens School. He was vice-president and chief engineer of the Boettger Piece Dye Works, at Lodi, N. J., 1898–1903; and thence to date has been secretary of the United Piece Dye Works at Lodi, and chief engineer of Mill B of that corporation. He is a member of



Robert Boettger

the Waverley Boat Club, and of the Acquackanouk Club, of Passaic.

Mr. Boettger is the son of Henry W. and Pauline Boettger, being of German descent on his father's side and American on his mother's. He married Paula G. Shimonek, January 20, 1902.

Boller, A. P., Jr. (M.E., '91), was born in East Orange, N. J., April 7, 1869. He received his preparatory education at the Dearborn-Morgan School, Orange, N. J., graduating in 1886. After receiving his degree from Stevens in 1891 he entered the shop and draughting room of the H. R. Worthington Hydraulic Works, Brooklyn, N. Y., and for two years was assistant on construction, operating and testing pumping engines.

During 1893 he was with the International Contracting Co., New York, in charge of dyke-building and dredging on government contract on the upper Hudson River, and also for a time with the Snow Steam Pump Works, in their New York office. In 1894 he returned to the H. R. Worthington Co. and remained in their employ until 1902, during which time he was in charge of construction work and engaged in the testing of pumping plants, and as assistant on tests. For one year he was manager of the Water Meter department. His most important work was on engines at the St. Louis Water Works, at Haverhill, Mass., and on three gas-compressor plants in Indiana (3,000 H.P.).

In 1898 he went to the Hawaiian Islands, headquarters at Honolulu, as engineer for the Worthington Co., and remained there for two years and a half, being in charge of the installation, construction, and testing of a complete irrigation plant, including some twelve high-duty triple-expansion engines with boilers, piping, and equipment, ranging in heads from 100 to 600 feet, and capacity for 5 to 10 million gallons per 24 hours. Returning to New York, he was in charge on outside construction and testing of pumping engines, including six high-duty engines for the city of Philadelphia. Since 1903 he has been in the employ, as engineer, of Westinghouse, Church, Kerr, & Co., New York, representing, in New York, the Westinghouse Machine Co.; also in charge of the erection and operation of large Corliss engines and steam turbines in New York and New England, units ranging from 300 kilowatts to 5,000 kilowatts.

Mr. Boller is a member of the American Society of Mechanical Engineers and an associate member of the American Society of Civil Engineers.

Bolton, Harold Lovering (M.E., '02), the son of Edward D. and Dora M. (Lovering) Bolton, was born in Somerville, Mass., April 2, 1879. Since graduation he has been employed in the engineering department of the American Sheet Steel Co., 1902–04; and as assistant superintendent of the Waterbury works of the Franklin H. Kalbfleisch Co., manufacturing chemists, 1904 to date. He is a member of the Engineers' Society of Western Pennsylvania, and of the Delta Tau Delta fraternity.

Bond, George Meade (M.E., '80), was born in Newburyport, Mass., July 17, 1852. The son of Daniel George and Wilhelmina Bond, he came of a long line of New England ancestry, his father's forebears having landed at Newbury, Mass., from England, about 1638. His work in connection with standards commenced in 1879, while in his senior year, through the foresight of Prof. James E. Denton, who, appreciating the importance of establishing a standard system of measurement, brought about relations between Mr. Bond and Prof. William A. Rogers, at that time Professor of Astronomy at Harvard College Observatory, Cambridge. As assistant to the Professor, Mr. Bond designed a comparator, carrying out the astronomer's ideas to enable him to conduct his investigations more efficiently in standards of length. Drawings were completed at the Institute in 1880, and on July 1 of that year Mr. Bond entered the service of the Pratt & Whitney Co., of Hartford, Conn., to carry out the work of establishing standards for the company, under the general direction of Prof. Rogers, whose scientific work forms the basis for the system of measurement now generally recognized as the practical solution of accurate interchangeability in machine-construction in this country. The comparator built by the Pratt & Whitney Co. in 1880–81, and since used for this work, was entered for record by a patent issued in 1885, now expired, the invention being jointly that of Prof. Rogers and Mr. Bond.

The need of uniformity in the sizes and threads of bolts and nuts for railroad service was the incentive for much of the preliminary work above referred to, and its successful adoption and the many other applications of standard interchangeability, not only in railroad service, but in manufactures as well, has amply repaid the time and investigation required for it.

Mr. Bond was manager of the standards and gauge department of the Pratt & Whitney Co., Hartford, Conn., from 1880 to Oct. 25, 1902. He is a Fellow of the American

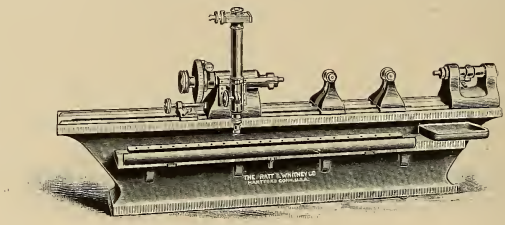


G. M. Bond

Association for the Advancement of Science; a member of the American Society of Mechanical Engineers, the American Society of Civil Engineers, the Hartford Scientific Society, Hartford, Conn., and of the Engineers' and Transportation clubs, New York. He was president of the Alumni Association of Stevens Institute, 1886–87, and Alumni Trustee of the same, 1895–98. He has been active on various committees of the American Society of Mechanical Engineers, and was chairman of the Committee on Units of Measurements, of the American Society of Civil Engineers; was secretary of Section D of the New York meeting, held in 1887, of the American Association for the Advancement of Science.

The following papers have been presented by Mr. Bond at meetings of the American Society of Mechanical Engineers: "Standard Measurements," *Transactions,* II; "A Standard Gauge System," *Ibid.,* III; "Standard Pipe and Pipe Threads," *Ibid.,* VI. He also took part in various discussions.

In 1884 he delivered two lectures before the Franklin Institute, Philadelphia,—one upon "Standards of Length and their Subdivision," and the other upon "Standards of Length as Applied to Gauge Dimensions." He also lectured in 1888 before the Society of Arts, Massachusetts Institute of Technology, Boston, upon "Standards of Length and Their Practical Application." At the meeting of Section D of the American Association for the Advancement of Science, held in Indianapolis in 1890, he presented a paper on "Internal Strains in Hardened Steel." Two articles by Mr. Bond, "An Instance of Standards of Length Practically Applied," and "An Interesting Experiment with a Hot-Air Engine," appeared in the *Stevens Indicator,* V. and VIII, respectively.



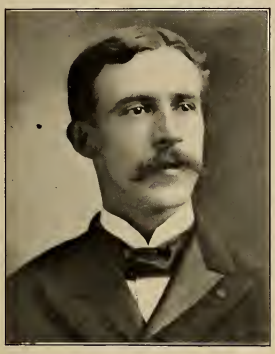
Bond Standard Measuring-Machine
G. M. Bond

On February 15, 1902, Mr. Bond attended, by invitation, a hearing before the Congressional Committee on Coinage, Weights, and Measures, held in Washington in reference to the proposed compulsory adoption of the metric system, opposing such legislation, the metric system being already, by act of Congress in 1866, a legal standard. On the 19th of February he spoke before the Franklin Institute in Philadelphia on the same subject, also opposing the above-mentioned compulsory measure. On the same day a committee of the American Society of Mechanical Engineers, of which Dr. Coleman Sellers, and Messrs. Coleman Sellers, Jr., J. E. Sweet, and Charles T. Porter, and Mr. Bond were the members, signed a report opposing the proposed legislation. He was also a member of the committee appointed by the American Society of Mechanical Engineers, on standard unions for pipe, in 1901, and in 1902–03 a member of a committee to report upon the metric system, and also a member of a committee on standard proportions for machine screws.

Bonn, Hillric J. (M.E., '78), has been, since graduation, with the Dickson Locomotive Works, Scranton, Pa., 1878–80, and the Delamater Iron Works, New York, 1880–81; a member of the firm of Endress & Bonn, engineers, with offices at Pittsburg, Pa., and Hoboken, N. J., 1881–86; resident engineer of the North Hudson County Railway Co., Hoboken, N. J., 1886–93, and its vice-president, 1893–94. Upon the reorganization of the company in 1894 he retired, and has since resided at Wechawken, N. J.

Bonnett, Louis Blake (M.E., '89), was born in New York city, June 8, 1867. He is the son of Daniel Blake and Margaret Augusta Bonnett, and of Huguenot French and English descent, a direct ancestor being Daniel Bonnett, who left France at the time of the revocation of the Edict of Nantes in 1676, and came to America from England in 1700, settling near New York. Mr. Bonnett was educated in private schools, and prepared for college at Pingry School, Elizabeth, N. J. He was assistant engineer of the Davids Machine Works, New York, 1889–90, being employed in designing machinery and on patent research; draughtsman and designer on switchback-railroad construction for the Dunderberg Construction Co., New York, 1890; assistant to the secretary of the American Society of Civil Engineers (his duties in this position con-

sisting of editorial work on the Society's *Transactions,* etc.), 1890–92; special correspondent and writer for the *Railroad Gazette,* 1892; assistant editor of the *Street*



L. B. Bonnett

Railway Journal, 1892–94; with the New York *Tribune,* 1895–96; employed on editorial work on *America's Successful Men,* and managing editor for the Bellman Publishing Co., Elizabeth, N. J., 1896; engaged upon literary work and expert and general engineering at Elizabeth, N. J., 1896 to 1902; and from 1902 to date has been mechanical engineering examiner of the Municipal Civil Commission of the City of New York, preparing and rating examinations on all subjects covered by the general scope of mechanical engineering. He is the author of a paper on "The Test of Power Required to Drive Electric Street Cars and Total Efficiency of Motor," published with a discussion in the *Transactions,* XXVII, of the American Society of Civil Engineers, of which body he was a junior member, 1892–97. He is also a member of the Elizabeth Town and Country, Elizabeth, and Bay Head Yacht clubs.

Boody, Alvin (M.E., '93), has been engaged, since graduation, with the Jenney Electric Motor Co., Indianapolis, Ind., 1893; with the Elmira Gas & Illuminating Co., Elmira, N. Y., 1893–95; and since then as general manager of the Winrow Gold Mining & Milling Co., Alma, Colo., and as deputy commissioner of parks for the boroughs of Brooklyn and Queens, New York. He is a life member of the Brooklyn Institute of Arts and Sciences.

Borland, L. J. (M.E., '96), was from the time of his graduation, until recently, inspector for the Middle States Inspection Bureau, New York. He is at present with the German American Insurance Co., New York.

Botchford, Henry Jay (M.E., '01), was born in Port Leyden, N. Y., March 8, 1877. He is the son of Henry Jay and Clementine Garrison (Woodworth) Botchford. His father enlisted in the 44th New York State Volunteers in 1861, and rose to the rank of captain. Mr. Botchford has been with the Carbondale Machine Co., Carbondale, Pa., from 1901 to date. During the fall of 1901 he was placed in charge of the erection of a 20-ton ice-making and refrigerating-plant in the Yale Memorial dining hall, New Haven, Conn. In February, 1902, he took charge of the company's Pittsburg office for several



H. J. Botchford

months during the illness of the Pittsburg manager, there being then under construction seven refrigerating-plants in Pittsburg and its vicinity. From August, 1902, until

recently, he was located at the company's main office at Carbondale, Pa., and he is now in charge of the Boston office. He is a member of the Delta Tau Delta fraternity.

A thesis, written in conjunction with Messrs. Chatard and Holcombe, on the "Comparison of Cost of Operating an Iron-Smelting Plant by Gas-Engines Using Waste Blast-Furnace Gas, and by Gas-Fired Boilers and Steam-Engines," was published in the *Stevens Institute Indicator* for January, 1902.

Boucher, William J. A. (M.E., '96), was born in Jersey City, N. J., January 19, 1875. He is of German-French and English descent, the son of John and Lydia (Anderson) Boucher, and his parents resided in the Hudson River valley near Albany, where their antecedents had been settled for the past two centuries. Mr. Boucher has, since graduation, filled engagements as follows: draughtsman in the shops of the American Motor Co. (now the Automobile Company of America), builders of gasoline and kerosene motors, 1897; in the testing department of the Sprague Electric Elevator Co., Watsessing, N. J., 1897–98; draughtsman, and on outside work installing heaters, blowers, and mechanical draught apparatus, for the New York office of the B. F. Sturtevant Co., 1898–99; in the mechanical engineer's office of the Delaware & Hudson Railroad Co., at Albany, N. Y., 1899–1900; and in the chief engineer's office of the Rapid Transit Subway Construction Co., New York, from 1900 to date. In 1902 he was appointed assistant engineer, in charge of the draughting office. He is a member of the New York Railroad Club.

Boyer, Shirk (M.E., '90), was born in Lebanon, Pa., October 19, 1869. He was assistant engineer with the Sloss Iron & Steel Co., Birmingham, Ala., 1890–94; in the employment of Humphreys & Glasgow, gas engineers, New York and London, 1894–99; engineer in the water-gas department of the Julius Pintsch Co., Berlin, 1899 to date; and is now located at the Berlin office.

Mr. Boyer is the son of Bassler and Ellen B. Boyer. He married Anna A. Gosau in 1900, and two children, Henry Frederic and Helen Florence Boyer, have blessed their union.



Shirk Boyer

Brackett, Charles K. (M.E., '00), has been employed at the works of the American Sugar Refining Co., Jersey City, N. J., from 1900 to date. A thesis on "The Rites Shaft Governor," written by Mr. Brackett and Mr. Buerger, was published in the issue of the *Stevens Institute Indicator* for January, 1901.

Bradley, Edgar L., Jr. (M.E., '01), has been with the American Beet Sugar Co., Chino, Cal., from 1901 to date. In 1904 he was transferred to the Rocky Ford factory of the same company at Rocky Ford, Colo.

Brainard, Allen Wing (M.E., '84), was born in Brooklyn, N. Y., September 24, 1862. He was the son of John Allen and Evelene A. Brainard. His employments were in the testing and erecting departments of the Worthington Hydraulic Works, Brooklyn, N. Y., where he spent the six years from 1884 to 1890; as manufacturers' agent in the city of New York, 1891–93; as representative in charge of the exhibit of the Bristol Co., manufacturers of self-recording instruments for pressure, temperature, and electricity, at the World's Fair, Chicago, 1893; as representative of the same company in New York, 1893–95; and again as manufacturers' agent, 1895–98. After a

lingering illness, Mr. Brainard died in Monticello, N. Y., June 18, 1901.



A. W. Brainard

Braine, Bancroft Gherardi (M.E., '93), was born at the Navy Yard, New York, March 19, 1871. He is the son of the late Rear-Admiral Daniel L. Braine, U. S. Navy, who served in the Mexican and Civil wars, and Mary Elizabeth (Fulton) Braine. The



B. G. Braine

name is originally Norman French; his father's ancestry was English, and his mother's Scotch; but both parents and grandparents were American born. Mr. Braine's engineering and other experiences have included those of draughtsman with Thomas E. Brown, M.A.S.C.E., chief engineer for the Otis Elevator Co., New York, working on elevator designs, etc., and especially on the design of the "Glasgow Harbor Tunnel Elevator," Glasgow, Scotland, 1893–94;



Lake George Incline
B. G. Braine

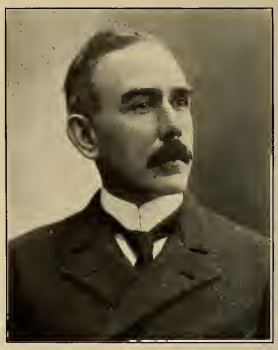
transit-man and time-keeper for C. F. Parker, M.E., on construction of a trolley road at Point Pleasant, N. J., 1894; assistant engineer with the Otis Engineering & Construction Co., on the survey, location, and construction of an incline railway up Prospect Mountain, Lake George, N. Y., and the installation of an electric-light plant in con-

junction with the same, 1894–95; assistant engineer on a survey for a trolley road from Catskill Mountain Station to Tannersville, N. Y., and also on a survey for a proposed incline road up Mount Tom, Holyoke, Mass., 1895; assistant engineer with Thomas E. Brown, engaged upon designs of the elevators for the St. Paul Building, New York; also on a design for the proposed bascule bridge over Newtown Creek, N. Y., and on various other work, 1896–97; and from 1897 to date engineer for the Continuous Rail-Joint Company of America, Newark, N. J. He has also been secretary and treasurer of the Essex Co., Newark, N. J., from 1902 to date. An abstract of his thesis, "Test of Otto Gas-Engines Operating an Electric-Light Plant at Danbury, Conn.," was published in the *Stevens Indicator*, July, 1894, and in *Power*, August, 1894. Mr. Braine is a member of the American Society of Mechanical Engineers, and a member of the Brooklyn Engineers' Club, and of the Essex Club, Newark, N. J.

Brett, Harvey (M.E., '98), has been engaged, since graduation, as draughtsman with the Dutchess Tool Co., Matteawan, N. Y.; with the Green Fuel Economizer Co., working at first in its machine shop and afterward on the road, erecting machines, etc.; with the Sprague Electric Co., Bloomfield, N. J., being first in the testing department, afterward in the construction department, and then employed as assistant electrical engineer; with the Eastman Kodak Co., Rochester, N. Y., as superintendent of metal work, 1901–03; and with the Pneumatic Signal Co., Rochester, N. Y., 1903 to date, first having charge of the construction of its new plant, installing machinery and getting the work in operation, and now holding the position of assistant superintendent. Together with Mr. I. Fraley Baker he wrote a thesis, "Experimental Investigation of the Reliability of Pitot Tubes for Determining the Velocity of Flow of Water in Pipes," published in the *Stevens Indicator* for October, 1898.

Brewer, Samuel Brainerd (M.E., '76), was born in Brooklyn, N. Y., January 27, 1850. He is the son of Joseph I. and Harriet Brewer, and his ancestors came to this country from Somersetshire, England, in 1632, and located in Roxbury, Mass. The family moved to New York in the early part of the 19th century. He was engaged in various capacities, 1876–79; in the Mechanical Laboratory of Stevens Institute, 1879–80; as draughtsman with Wilson Bros., architects and civil engineers, Philadelphia, Pa., 1880–81, and in a similar capacity with A. H. Emery, C.E., New York, 1882. In the fall of the latter year he began to devote most of his time to patent work, but owing to its confining nature he abandoned it in 1895 for outdoor labor, and has again for several years been engaged as draughtsman at Elizabeth, N. J.

Brinckerhoff, Alexander Gordon (M.E., '77), was born in Portsmouth, N. H., August



A. G. Brinckerhoff

23, 1856. In 1877 he was employed in the draughting-room of the Sixth Avenue Elevated Railroad, New York, at that time in process of construction. He then served with Wyllys H. Warner (the firm now being Johnson & Morris) contractor for steam-heating and ventilating apparatus, New York, with which house he has remained to the present date. Since December, 1880, he has been superintendent of the works, and has had charge of the designing and superintendence of erection of steam and water heating and ventilating plants for buildings of all kinds and sizes, located in various

parts of the country. Since 1886 he has been a member of the American Society of Civil Engineers, and is a member, also, of the Holland Society of New York and of the Delta Tau Delta fraternity.

His father was Isaac Brinckerhoff, a descendant of Joris Dericksen Brinckerhoff, who came to this country from Holland in 1638. On the side of his mother, Mary Gordon Brinckerhoff, he is third in descent from Gen. James Gordon, an officer in the American Revolutionary army. He married Minerva Ella Archer, September 27, 1882.

Brinckerhoff, Henry Morton (M.E., '90), was born at Fishkill-on-Hudson, N. Y., April 20, 1868. Being employed by the Thomson-Houston Electric Co., of Boston, he was put on construction work on the West End Street Railway of that city, serving in various capacities, commencing as lineman's helper, and occupying nearly every position in line-work, car-equipment, and power-house operation, 1890–91. He then became assistant engineer at the power house of the Utica Belt Line Street Railway Co., 1891–92; foreman in charge of car equipment for the General Electric Co., in Boston and on the Coney Island and Brooklyn Railway, 1892; and assistant electrical engineer of the Intramural Railway at the World's Columbian Exposition, Chicago, 1892–94. In this position he assisted in designing and in-

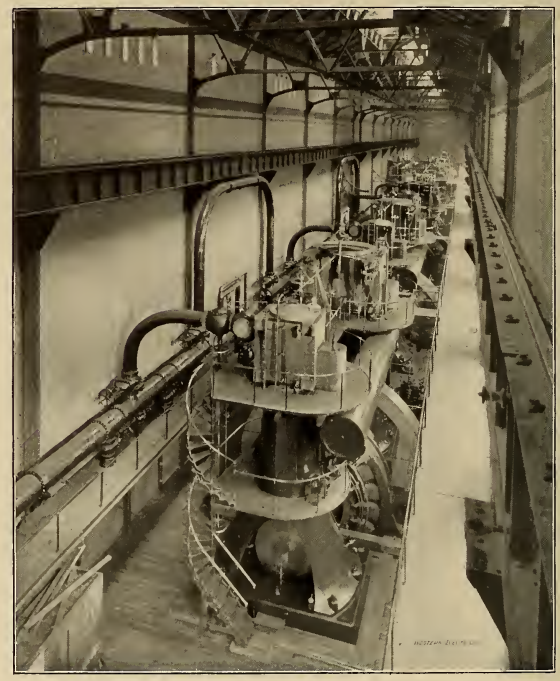


H. M. Brinckerhoff



Roll-Lift Bridge
Metropolitan West Side Elevated Railroad, Chicago
H. M. Brinckerhoff

stalling the electrical equipment on this, the first third-rail elevated road of the country, and was joint patentee with the electrical engineer, Mr. C. H. Macloskie, of special apparatus designed for this system. During the operation of the road in the summer of 1893, Mr. Brinckerhoff had charge of the car equipment, power house, and other electrical apparatus. He then (1894) took the position of electrical engineer on the Metropolitan West Side Elevated Railroad of Chicago, assuming charge of the designing and installation of the electrical equipment for that road. He is patentee of various devices and machines in use on this railroad, and is still connected with the company, having successively filled the positions of superintendent of motive power and way, assistant general manager, and general manager, which post he now holds. He is a member of the American Institute of Electrical Engineers, the Western Society of Engineers, Illinois Club, of Chicago, and of the Technical and Chicago Automobile clubs.



Interior of 16,000 H.P. Power House, Metropolitan West Side Elevated Railroad Co., Chicago
H. M. Brinckerhoff

Mr. Brinckerhoff is the son of Peter Rem-

sen and Helen (Morton) Brinckerhoff. He married Florence Louise Fay, January 20, 1903.



Four-Track Combination Crossing, Metropolitan West Side Elevated Railroad, Chicago
H. M. Brinckerhoff

Brisley, Edward Betts (M.E., '02), was born in New York city, July 23, 1880; the



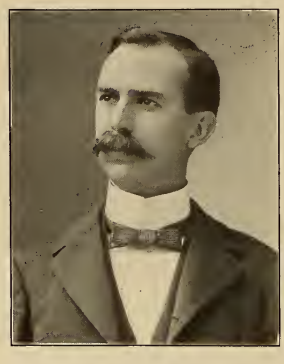
E. B. Brisley

son of William Henry and Louise (Post) Brisley. He was with the Manhattan Railway Co., New York city, 1902–03; employed at the power house of the Interborough Rapid Transit Co., 1903; with the Rapid Transit Subway Construction Co., 1903–04; and is now at the Pittsburg office of the Crocker-Wheeler Co. He is a junior member of the American Society of Mechanical Engineers, and of the American Society of Civil Engineers; associate member of the American Institute of Electrical Engineers; and member of the New York Electrical Society, New York Athletic Club, and the Chi Psi fraternity.

Bristol, Bennet B. (M.E., '93), was born in Naugatuck, Conn., May 3, 1868. He was employed at office work in Waterbury, 1884–88; became assistant to the Treasurer at the Stevens Institute, 1889–90; and in 1890 entered the Sophomore class with the class of 1893. He has been secretary and general superintendent of factory of the Bristol Co., Waterbury, Conn., assisting in the improvement and development of recording-instruments for pressure, temperature, and electricity, since 1894. In 1904 he became vice-president of the Bristol Co.

Mr. Bristol is the son of Benjamin H.

and Pauline (Phelps) Bristol. He married Gertrude A. Rexford, June 28, 1898. They



B. B. Bristol

have three children, Mary Louise, Helen, and Rexford Allyn Bristol.

Bristol, William H. (M.E., '84), Professor of Mathematics at Stevens Institute of Technology. For biography see page 265.

Broadhurst, William G. (M.E., '02), has been engaged with the Green Engineering Co., Chicago, Ill.; has studied hydraulics at Cornell University; and is now assistant manager of the Atlantic Roofing Co., having charge of the company's factory at Perth Amboy, N. J.

Broadmeadow, Walter J. (M.E., '85), was born in Hoboken, N. J., May 7, 1863. He was with J. Broadmeadow & Son, Red Bank, N. J., 1885–88; superintendent of the Seashore Electric Railway Co., Asbury Park, N. J., 1888–91; with Mr. W. P. Stevenson, New York, 1891–94; manager of the Sanitary Plumbing Co., Red Bank, N. J., 1894–97; with the Brooklyn Rapid Transit Co., 1897–99; and has been assistant superintendent of the Canoe Ridge mines of the Clearfield Bituminous Coal Corporation, Rossiter, Indiana County, Pa., from 1899 to date.

Mr. Broadmeadow is the son of James and Lavinia (Anderson) Broadmeadow, and is of English descent. Mr. Broadmeadow married Ella T. Smock, June 17, 1894. They have one child, Helen Broadmeadow.

Brookfield, Augustus Baker (M.E., '93), was born in Newark, N. J., August 11, 1872. He was with Baker & Co., gold and platinum refiners, assayers and smelters, Newark, N. J., 1893–1902, successively as salesman, in charge of the ordering, shipping, inspecting, weighing, and manufacturing departments, and as factory manager. While with this company he devised a scheme for shop costs, and succeeded in producing machine-made platinum ware of a high grade. He resigned, on account of ill-health, in January, 1902. He is at present engaged in the Angora goat-raising industry at Frerro, N. M.

Mr. Brookfield is the son of J. V. and Elizabeth J. Brookfield, and a descendant of Capt. John Brookfield, of the Morris Rangers, and Barbara Heck, who founded the first Methodist Church in the United States. He married Caroline A. Schulz, June 11, 1903.

Brooks, Morgan (M.E., '83), was born in Boston, Mass., March 12, 1861. He was educated at Roxbury Latin School, Boston, entering Brown University in 1877, with first (Hartshorn) prize for preparation in mathematics. He graduated in 1881 with the degree of Bachelor of Philosophy, and entered Stevens Institute in the fall of 1881. He spent 100 days in Europe with a college friend in 1886, and went abroad again in 1889 with a party of American engineers visiting the Paris Exposition. He engaged with Hill, Clarke, & Co., Boston, selling and installing engines, especially gas-engines, in 1883; was laboratory assistant with the American Bell Telephone Co., Boston, inspecting and testing all the hard-drawn copper wire made by three factories for the earliest long-distance lines; also preparing reports on the practical utility of inventions offered to the company, 1884–86; and became engineer for the Boston office of the Electrical Accumulator Co., soliciting and installing plants in Boston and vicinity, 1886–87. In the spring of 1887 he equipped a car experimentally with electric lighting,

for the Old Colony Railroad, one of the earliest examples of electric train-lighting in the United States. The car was run in connection with the Fall River steamers. From 1887 to 1890 he was secretary-treasurer of the St. Paul (Minn.) Gas Light Co. On his way to St. Paul he stopped at Pittsburg to inspect the new system of alternating current lighting of the Westinghouse Co., and recommended and superintended the installation of the same system in the Gas Light Company's station in St. Paul, the work being completed in 1888.

In October, 1890, he organized the Electrical Engineering Co. at St. Paul, installing many isolated and central-station lighting-plants throughout the Northwest. After the expiration of the telephone patents he also built many independent telephone exchanges. He is still president of this company, now actively engaged in the electrical supply business in Minneapolis. In 1898 he resigned the management of the above company to accept the position of Professor of Electrical Engineering at the University of Nebraska at Lincoln, and in 1901 resigned from Nebraska to fill a similar position with the University of Illinois at Urbana, his present occupation.

Prof. Brooks has taken out patents for a telephone exchange (1895) and an automatic telephone system (1896). His graduating thesis, written in conjunction with his classmate J. E. Steward, was published in abridged form in Van Nostrand's *Engineering Magazine,* February, 1884, under the title "Some Experiments upon the Otto Gas Engine." This was noticed by several foreign periodicals, and was translated by M. Gustave Richard, and included in his treatise, "Les Moteurs à Gaz" (Paris, 1885), pp. 143–156. He contributed "The Telephone and Its Operation" to *Cassier's Magazine,* May, 1895. From 1895 to 1898 he delivered occasional lectures to the engineering students at the University of Minnesota, at Minneapolis, upon "Telephones," "The Electrical Distribution of Standard Time," and "Finance and Engineering,"—the last-named being published in the *Engineer's Year Book* (Minneapolis), 1899. A talk upon "The Economic Limitations of Isolated Electric Plants" was given to the Northwestern Association of Architects. His inaugural address at the University of Nebraska was entitled "Electricity and Enlightenment," and was delivered October 28, 1898. "Interior Lighting" appeared in the *Blue Print* (the Nebraska University annual) in 1902; "Operating Conditions Governing Direct-Current Machinery," in the *Technograph* (Illinois engineering annual) in 1902; and "Electrical Progress in the United States in 1902," in the New Year's number (January, 1903) of the *Western Electrician,* Chicago.

He is a life member of the American Society of Mechanical Engineers; and a member of the American Institute of Electrical



Morgan Brooks

Engineers; the American Electrochemical Society; the Western Society of Engineers; the Society for the Promotion of Engineering Education; the American Association for the Advancement of Science; the Franklin Institute; the Delta Kappa Epsilon fraternity of Brown University; the Sigma Xi and Tau Beta Pi honorary scientific college societies.

Prof. Brooks is the son of Francis A. and Frances (Butler) Brooks. His father, grandfather, and great-grandfather on the paternal side were all lawyers. His grandfather on the maternal side was preceptor of Lawrence Academy, Groton, Mass., for many years. Prof. Brooks married Frona Marie Brooks, daughter of B. F. Brooks,

a lawyer of Boston, April 24, 1888. They have seven children, Henry Morgan, Charles Franklin, Francis, Frederick Augustus, Roger, Edith, and Frona Marguerite Brooks.

Brooks, Royal Deane (M.E., '00), was born in Brooklyn, N. Y., August, 1878. He was assistant steam expert at the Minnequa Works of the Colorado Fuel & Iron Co., Pueblo, Colo., 1900–01; engineer in erecting department of the American Stoker Co., New York, 1901–03; and has been engaged in the sales department of the International Steam Pump Co., New York, from 1903 to date. He is a member of the Beta Theta Pi and Theta Nu Epsilon fraternities, of the Crescent and University Clubs, of Brooklyn, and of the Minnequa Club, of Pueblo, Colo.

Brown, Wilbur Vincent (B.S., 1880; Ph.D., 1888), was born in Warren County,



W. V. Brown

N. J., in 1860. He received his early education at home, under his parents, and had but two years of grammar-school work and one year of high school before entering Stevens Institute. He was assistant in the Harvard College Astronomical Observatory, being assigned to work with Prof. William A. Rogers on the meridian circle, 1880–83; Instructor in Mathematics at the Indianapolis High School, 1883–85; was elected Assistant Professor of Mathematics and Assistant Director of the Observatory at De Pauw University, 1885–87; in 1887 was appointed Director of the Observatory and Associate Professor of Mathematics; in 1894 Professor of Astronomy, and in 1897 Professor of Mathematics and Astronomy at the latter University, at the same time retaining his position as Director of the Observatory. Stevens Institute conferred the degree of Doctor of Philosophy upon Mr. Brown in 1888.

He is the author of the following articles: "The Cartesian Ovals and Related Curves as Sections of the Anchor Ring," published in the *Annals of Mathematics,* 1892; "The Collimation of a Reversible Transit," *Observatory,* 1900; "Effect of Single and Double Lines upon Personal Error in Transit Observations," *Astronomical Journal,* 1901; and "A Proposed Classification of Weather Maps as an Aid in Weather Forecasting," *Monthly Weather Review,* 1901. He is a member of the Phi Beta Kappa fraternity.

Prof. Brown is the son of Rev. Albert H. and Julia A. Brown. He married Addie Edson Fish in 1883, and they have one child, Irving Frederick Brown.

Brown, Willard Y. (M.E., '95), was born in Newark, N. J., June 6, 1873, and received his early education in the Newark public schools. He was assistant to the master mechanic of the Pencoyd Iron Works, Philadelphia, 1895–96, engaged in the erection and repair department of the rolling mill and steel mill; assistant to the mechanical engineer of the King Bridge Co., Cleveland, O., 1896–98, being occupied in the construction of hoisting-machinery for coal and ore, cranes, etc.; with the Lorain Steel Co., Lorain, O., 1898–99; in charge of the Pittsburg office of the Dominion Iron & Steel Co., Ltd., 1899–1900; engaged at the main office of the same company at Sydney, C. B., 1900–01, as first assistant engineer; construction engineer for the Colorado Fuel & Iron Co., Pueblo, Colo., having charge of building a new Bessemer department and rail-mill, 1901–02; and superintendent of construction for the Garrett-Cromwell Engineering Co., from 1902 to date, in charge

of the erection of a plant for the Colorado Fuel & Iron Co., consisting of open-hearth



W. Y. Brown

furnaces, blooming-mill, rod-mill, merchant-mill, and cotton-tie mill.

Mr. Brown is the son of George and Margaret A. (Giffins) Brown, his ancestors being Quakers and early New England settlers. He married Grace V. Hessler, February 24, 1900, and they have one child, Doris Giffins Brown.

Bruck, Henry Theobald (M.E., '78), was born in Hoboken, N. J., May 29, 1858. His early education was received at Martha Institute, Hoboken. He passed the entrance examination for the Class of 1876 of the Stevens Institute of Technology, but on account of youth delayed entering for two years, which were passed as a special student at the University of the City of New York.

He was draughtsman in the shops of the Delaware, Lackawanna, & Western Railroad at Kingsland, N. J., 1878–83; in the same capacity with W. H. Bowers, New York, 1883–84, and with W. A. Lorenz, manufacturer of paper-bag machinery, Hartford, Conn., 1884–87; assistant to the general manager of the United States Torsion Balance & Scale Co., New York, 1887–90; master of machinery of the Cumberland & Pennsylvania Railroad, Mount Savage, Md., 1890–98, and superintendent of motive power of the same road from 1898 to date. He is a member of the American Society of Mechanical Engineers; of the American Railway Master Mechanics' Association; the Master Car Builders' Association; and of the Delta Tau Delta fraternity.

Mr. Bruck is the son of Charles Louis and Laure Elizabeth (de Grand Val) Bruck, of mixed German and French ancestry. On his mother's side he is descended from one of the families driven from San Domingo by the revolution of Toussaint l'Ouverture.



H. T. Bruck

He married Minnie Orme Kenah, April 28, 1896, and they have one child, Laure Elizabeth Bruck.

Bruckner, Rudolph Eglin (M.E., '96), was born in Hoboken, N. J., January 13, 1875, the son of Charles H. and Josephine (Munson) Bruckner. His father was born in Basel, Switzerland, and came to America in 1866. The family of Bruckner-Eglin are related to Euler the mathematician. On his mother's side he is descended, through the Munson and Carhart families, from Thomas Carhart, who came to this country in 1683, from Cornwall, England, and, through the Munsons, from the Pell family who founded Pelham, Westchester County, N. Y., and from the Hunt family who settled Hunt's Point in 1667. Thomas Carhart was private

secretary to the English Governor, Thomas Dongan. The Munsons founded Wallingford, Conn., and owned much of the land which at present is New Haven, Conn. The family has left many bequests to Yale College, one of $20,000 left by Israel Munson in 1844 being recorded as the largest received by the College up to that time. Members of the family have served in the American army in the Indian, Revolutionary, and later wars.



R. E. Bruckner

Upon graduating in 1896 Mr. Bruckner entered the employ of the Safety Car Heating & Lighting Co., New York, as inspector of material, and in 1897 he became one of its assistant engineers. With this company he remained until June, 1898, when he passed the examination for assistant engineer with the relative rank of ensign in the United States Navy, and received a commission as such, serving until October of the same year, when he was honorably discharged and became one of the engineers of the Prindle Pump Co., New York. In 1899 he was engaged in the designing and erection of furnaces and dryers for the treatment of waste products from canneries, etc. In 1901 he entered the service of the Curtis Steam Turbine Co., New York, and remains in that employment at the present time.

His graduating thesis, which was prepared jointly with Messrs. Martin Shepard and John Schimmel, Jr., was published in the *Stevens Indicator* and in *The Progressive Age*. The subject of the thesis is "Calorific Power of Gases by the Junker Calorimeter." He is a member of Lafayette Lodge 64, Free and Accepted Masons, Order of the Founders and Patriots of America, and of the Theta Nu Epsilon fraternity.

Bruen, Albert Electus (M.E., '93), was born in Brooklyn, N. Y., May 13, 1871, and was educated in private schools in that city. He was second rodman on the engineer corps at the Twenty-fifth Street Power House of the Lexington Ave. Cable Road, Metropolitan Traction Co., 1895; and has been inspector with the Underwriters' Bureau of the Middle and Southern States, New York, since 1895. He was a member of the New York Railroad Club down to 1898, and is a member of the National Fire Protection Association, and of the Insurance Society of Philadelphia.

Mr. Bruen is the son of Albert and Electa Bruen. He married Emma L. Wint, April 10, 1901.



A. E. Bruen

Bruen, George Everett (M.E., '95), was born in Brooklyn, N. Y., August 11, 1873; the son of Albert and Electa Bruen. He was an instructor at the Stevens Institute during the Supplementary Term, 1895; rod-

man with the Metropolitan Traction Co., New York, 1895; chemist in the department of tests of the Baldwin Locomotive Works, Philadelphia, 1895–96; superintendent of the Raritan Electric Light & Power Co., Perth Amboy, N. J., 1896–99; in the engineering department of the Western Electric Co., New York, 1899; and electrical inspector for the National Board of Fire Underwriters, New York, 1899 to date. His graduating thesis, prepared jointly with Messrs. Percy Allan and Frederick K. Vreeland, on "Experimental Determination of the Influence of Back Pressure on the Economy of a Surface-Condensing Engine with Independent

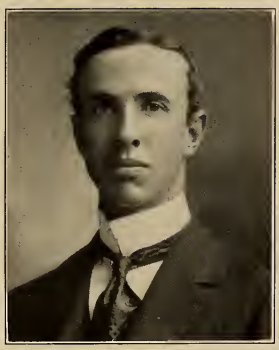


G. E. Bruen

Vacuum Pump," was published in the *Stevens Indicator*, XIII, 136.

Brune, Percy J. (M.E., '97), was engaged by the Nicaragua Canal Commission (one of 65 successful candidates out of an application list of nearly 500) in work at Nicaragua, and in 1899 became engineer on a sugar plantation at Central Occitania, Cuba. He is now with the United Railways of Havana, Cuba.

Buckley, Thomas John (M.E., '98), was born in Tenafly, N. J., November 30, 1873. He was engaged in surveying work, 1898; with the Edison Electric Co., New York, 1898–99; and from 1899 to date has been in the service of the Midvale Steel Works, Philadelphia, Pa. He was Instructor of the



T. J. Buckley

night class in Applied Electricity at Drexel Institute, 1899–1900, and is a member of the Engineers' Club of Philadelphia, of the Englewood Field, Tenafly Field, and Tulpohocken Tennis clubs, and of the Theta Xi fraternity. From 1898 to 1900 he was a member of the New York Electrical Society.

Mr. Buckley is the son of Charles P. and Ellen A. Buckley. He married Cornelia Lewis, January 30, 1901, and they have one child, Elizabeth Buckley.

Buerck, J. O. (M.E., '76), was employed in lighthouse work at New London, Conn., 1876; and with the Scientific Publishing Co., New York, 1878–79. From the latter year up to the date of his death, which occurred in 1895, there is no record of his occupations.

Buerger, Charles (M.E., '00), received the degree of Bachelor of Science from the College of the City of New York in 1898 and has been engaged with the Atlantic Refining Co., Philadelphia, Pa., 1900 to date. His graduating thesis, written in conjunction with Mr. C. K. Brackett, on the "Rites Shaft Governor," was published in the *Stevens Institute Indicator*, January, 1901. He is a member of the Phi Beta Kappa fraternity.

Buffet, E. P., Jr. (M.E., '94), was connected with the *American Manufacturer and Iron World,* Pittsburg, Pa., during part of the year 1895, and afterward became financial editor of the *Pittsburg Commercial Gazette.* During the latter part of 1895 he became associated with the *American Machinist,* and ever since that time he has maintained a connection with that paper in various capacities. He graduated in June, 1897, from the New York Law School, with the degree of Bachelor of Laws, *cum laude.*

Contemporaneously with his connection with the *American Machinist,* he was engaged in other work. Besides studying law he was for a while an editorial writer for *Current Literature,* and was also associated with *Heating and Ventilation.* In his writings he has made a specialty of the commercial side of engineering. An editorial on German-American machinery trade relations, written during the latter part of 1900, was used as the basis of argument for a lengthy controversial circular drawn up by a committee of the Association of German Machine Tool Manufacturers, and syndicated among the leading engineering papers of Germany, and it was also translated and answered in the daily press. He has given particular attention to export trade, and has translated matter from French and German periodicals.

He has published in book form a "Digest of Elementary Law" for the use of students, also a slight work of fiction. In 1901 and 1902 he published in the columns of the *American Machinist* a series of articles on the "Mechanical Antiquities of America," and in 1903–04 he was engaged in bringing out another series on the early manufacture of iron. He is a regular contributor, to the last-named paper, of notes on legal topics. His graduating thesis, "On the Magnetic Properties of Nickel Steel," was published in the *American Manufacturer* and in the *Stevens Indicator,* XIII, 27. Within two years past, articles from his pen have appeared in the *New England Magazine, Education,* and the *Journal of Geography.* Of late he has given much time to independent historical research and has recently been called upon to prepare a law book of considerable magnitude.

Bumsted, E. Bradford (M.E., '96), was employed in the repair shops of the North Jersey Street Railway Co., Newark, N. J., 1896; in the testing laboratory of the Printing Telegraph News Co., New York, which operates the general news tickers in New York and elsewhere, 1896–97; with Isaac A. Hopper, general contractor, New York, as assistant engineer, and later as contrac-



Tipple Inclined Conveyor—Moves with Steam Shovel on Track Parallel to Canal
E. B. Bumsted

tor's engineer in charge of the construction of the Third Avenue bridge across the Harlem River, 1897–98, during which period he made up contractor's estimates and progress drawings of the work, and gave lines and levels, etc. The cost of this structure was about $2,000,000. It included a 300-foot swing span, having a roadway 81 feet in width; three river masonry pieces on pneumatic caissons, steel and masonry approaches aggregating 2,500 feet in length, general street improvement of adjoining neighbor-



Power House of St. Lawrence Power Co. Concrete Monolith. Steel Truss Roof. Cement Beton Exterior Finish
E. B. Bumsted

hood, overhead-trolley track construction, etc. In 1898–99 he was with G. H. Selleck & Co., electrical contractors, New York, estimating on the electrical equipment of buildings, etc.; and with the T. A. Gillespie Co.,

general contractors, 1899–1902. Mr. Bumsted was temporarily located at Massena, St. Lawrence County, N. Y., on the construction of the electrical power plant for the St. Lawrence Power Company, costing about $4,500,000, and comprising a canal 3 miles long,



Power House in Course of Construction, Showing Concrete Partly in Place. Concrete Forms. Three Sets of Draught Tubes in Place
E. B. Bumsted

200 feet wide, and 18 feet deep, necessitating the excavation of some 8,000,000 cubic yards of material; also of a power house for the development of 35,000 horse-power. He was first employed in the capacity of engineer in charge of the power-house construction, later having personal charge as engineer and superintendent of some 600 men. As such he designed and erected the rock-crushing and concrete-mixing plant, which mixed in the course of erection some 60,000 cubic yards of concrete; designed and erected three tipple inclined conveyors for taking the earth away from the steam shovels on the canal; erected a pontoon bridge 500 feet in length to carry ten-ton wagon loads and for five years' service; also changed an orange-peel dipper, vacuum suction type of dredge, to a centrifugal pump dredge of 2,500 cubic yards capacity. During this last period of employment he also designed and erected the rock-crushing and concrete-mixing plant used in the construction of the filter plant for the East Jersey Water Co. at Little Falls, N. J. He was resident manager of the St. Lawrence River Power Co. at Massena, N. Y., 1902–04; and is now general manager of the same company in New York city. He has also been manager of the St. Lawrence Water Co., the St. Lawrence Telephone Co., and the Massena Electric Light & Power Co. since January, 1903. He was recently elected secretary and treasurer of the above companies. He is a member of the New York Electrical Society, and a junior member of the American Society of Civil Engineers.

Mr. Bumsted married Clara Louise Warren, April 27, 1904.

Burchard, Anson Wood (M.E., '85), was born in Hoosick Falls, Mass., April 21, 1865; the son of Walter Howard and Julia (Cooley) Burchard. He was mechanical engineer with the J. M. Ives Co., Danbury, Conn., 1885–92, being engaged in designing and erecting motive-power plants, electric stations, fire-protection of mill properties, and heating and ventilating apparatus; manager and engineer of the T. & B. Tool Co., Danbury, Conn., 1892–98, in which capacity he designed and constructed original and improved machinery for manufacture of twist drills and machinists' tools. He was also engaged in general engineering work to some extent, having been employed by various corporations and municipalities,



A. W. Burchard

including an appointment as consulting engineer to special counsel in charge of the proceedings connected with the extension of

the water supply for the city of New York in the Croton watershed. During 1901–03 he was vice-president of the Greene Consolidated Copper Co., New York. He is now comptroller of the General Electric Co., Schenectady, N. Y. He is a member of the American Society of Mechanical Engineers; of the Engineers' Club, New York; the Franklin Institute of Philadelphia; and the University Club, New York. He is also an associate member of the American Society of Civil Engineers. An article by Mr. Burchard on "A Design for a Hot-Air Heating-Apparatus" appeared in the *Stevens Indicator*, VII, 54.

Burhorn, Edwin (M.E., '85), was born in New York, June 21, 1866; the son of August and Henrietta W. Bickel Burhorn. Both parents were born in Germany and came to the United States about 1849, their parents being revolutionary exiles. He was educated in the public schools of Hoboken, N. J., graduating from Hoboken High School, and receiving the Stevens scholarship. He served as draughtsman with Henry Warden, Germantown Junction, Philadelphia, Pa., manufacturer of boilers and special wrought-iron work, etc., 1885; and as assistant to the general manager of the Franklin Sugar Refinery, Philadelphia, 1885. While in the latter position he took entire charge of testing boilers, engines, evaporating apparatus, etc., designed and installed a special system



Cooling-Tower, Baltimore Abattoir Co., Baltimore, Md.
Edwin Burhorn



Edwin Burhorn

of draining bag filters by vacuum process, filling char filters by automatic spreading-machines, etc. He became interested with Mr. B. H. Coffey, '85, in the Cycle Water Filter, having obtained a patent on a special controlling valve mechanism, and joined with Mr. Coffey at the shops of Henry Warden, improving the filter and placing it successfully on the market. He was with the Link-Belt Engineering Co., of Philadelphia and New York, 1890–93, planning many systems of handling material by machinery of special design, and afterward took entire charge of the designing department of the New York office of the same company.

In 1893 he started in business as an engineer and contractor under the firm name of Warren & Burhorn, changed the following year to Burhorn & Granger, of New York, the firm acting as manufacturers' agents in addition to professional work. This partner-

ship lasted for eight years, during which time it installed many complete plants for power, heat, and electric light; made several improvements in the Woodbury high-speed automatic engine, built by the Stearns Manufacturing Co., and placed the engine in successful operation in many places, notably in the "World" Building, New York. In 1901 the firm of Burhorn & Granger was dissolved, Mr. Burhorn opening an office for himself in New York, as engineer and contractor, which business he is now carrying on. Some of the installations made under Mr. Burhorn's supervision are as follows: Boiler plant at the rope-walks of the Boston Navy Yard (750 horse-power); electrical transmission plant for the factory of John Mehl & Co., Jersey City Heights; a motor-driven swing-bridge over the Passaic River, at Fourth Avenue, Newark, N. J.; char-drying equipment and incinerator for sugar-baskets at the Arbuckle sugar-refinery, Brooklyn, N. Y., and an Acme water-cooling tower at Baltimore, Md. (depicted in the accompanying illustration, and showing a class of work of which Mr. Burhorn is making a specialty,—namely, recooling water from condensers in steam plants, or, in ice plants, for recooling water from ammonia condensers). He is a member of the Franklin Institute of Philadelphia.

Burke, E. J. (M.E., '94), was assistant superintendent of the motor department, of the Brooklyn Heights Railroad Co., Brooklyn, N. Y., until 1901; and then with the United Gas Improvement Co., Philadelphia, 1901 to date. His thesis, prepared jointly with St. George M. Anderson, on a "Test of a 240-horse-power Babcock & Wilcox Boiler with Three Different Coals, for the Determination of Economy," was published in the October, 1895, issue of the *Stevens Indicator*.

Burke, George Herman Babcock (M.E., '99), born in Flatbush, L. I., August 18, 1878; son of William L. and Harriet Eugenia (Babcock) Burke, is a descendant of the Norman family De Burg. His mother is from a New England line of the English family of Babcock. He has been engaged in engineering work in the shops and draughting room of the Rand Drill Co., manufacturers of rock drills, pneumatic tools, and air and gas compressors, at the works of the company at North Tarrytown, N. Y., from 1899 to date.



G. H. B. Burke

Burnet, Edgar Emmell (M.E., '96), was born in Madison, N. J., July 14, 1874; the son of Benjamin Warren and Caroline Geddis (Emmell) Burnet. He is descended from Thomas, brother of Bishop Burnet, of England, whose son landed at Lynn, Mass., and afterward moved to Southampton, N. Y., in 1734. Eight generations of the family have lived at Madison, N. J. Mr. Burnet was employed in the repair shops of the Consolidated Traction Co., New Jersey, 1896–97; with E. K. Brown, civil engineer and surveyor, Madison, N. J., 1897; with the Pennsylvania Iron Works Co., Philadelphia, being for a time engaged in the erection of several 1,500 horse-power engines of the Corliss type for the Metropolitan Street Railway Co., at the 146th Street and the 25th Street power stations, New York, 1897–98. On May 17, 1898, he enlisted with the New Jersey Naval Reserve, and served through the war with Spain on board the auxiliary cruiser "Badger," with the rating of watertender. He was discharged from the service October 8, 1898, and a few days later received the position of draughtsman with the American Brass Works, Newburgh, N. Y. The following March he started work as draughtsman with the Davis Calyx Drill

Co., and was located at the shops of that company, at Tarrytown, in the capacity of superintendent, until 1902; when he entered



E. E. Burnet

the service of Ford, Bacon, & Davis, engineers, New York, as draughtsman. He now holds a similar position with J. G. White & Co., Inc., engineers and contractors, New York. He is a member of the order of Free and Accepted Masons.

Bush, Samuel Prescott (M.E., '84), was born in Orange, N. J., October 4, 1863. After graduation he entered the employment of the Pennsylvania Lines West of Pittsburg, South-West System, starting in the capacity of special apprentice at the Logansport shop, where he served two years, doing a general line of work in the locomotive department. For two months of each of the years 1885 and 1886 he was engaged, in conjunction with a member of the Class of '83, in making a series of coal tests for determining the relative values of coals for locomotive purposes that were within practical reach of the railroad company. The result of this work was exceedingly satisfactory and valuable to the company, enabling it to determine what were the most desirable and economical coals for use at various points. In the early part of 1887 he was detailed to some work of a special nature, and shortly afterward went into the iron foundry of the company at Columbus, Ohio, where he worked until the end of the year. In 1888 he was transferred to the motive-power draughting-room, and was from time to time detailed on special work to aid the assistant to the superintendent of motive power. During the year 1889 his work in the draughting-room ceased, and he was engaged in special work until in the latter part of the year, when he was made assistant engineer, or assistant to the superintendent of motive power, which position he occupied until the latter part of 1890, at which time, on account of the death of the master-mechanic of the Dennison, O., shops, he was temporarily detailed to perform the duties of that position; remaining at Dennison as acting master-mechanic of the Pittsburg Division until January 1, 1891, at which time he was appointed master-mechanic of the company's general shops at Columbus, O. He remained in this position until March, 1893, when he was made acting superintendent of motive power, as well as retaining the position of master-mechanic of the Columbus shops, the superintendent of motive power having been detailed to special work in connection with the World's Fair at Chicago. In January, 1894, he was appointed superintend-



S. P. Bush

ent of motive power, which position he held up to January 1, 1900. His duties herein comprised the maintenance of the locomo-

tive and car equipment, and the supervision of the operation of the four shops, which employed in the aggregate 3,100 men. The work was largely and necessarily executive, its principal feature being that of economical maintenance and operation, and involving a careful study of locomotive and car construction as well as the care of the equipment after being put into service, and much was done toward improving construction. While the work involved continuous invention, its character was not such as to be specially significant individually, but, taken collectively, accomplished improvement of performance and reduction of cost of maintenance.

On January 1, 1900, Mr. Bush accepted the position of superintendent of motive power of the Chicago, Milwaukee, & St. Paul Railroad, which position he resigned June 1, 1901, to become second vice-president and general manager of the Buckeye Malleable Iron & Coupler Co., manufacturers of malleable iron castings and the "Little Giant" buckeye coupler, at Columbus, O., where he is now situated. Mr. Bush was active in his railroad work, and contributed largely to the advancement of railroad engineering through his numerous writings and addresses before the meetings of the several societies to which he belonged, and, through his service on many committees detailed by these organizations, to the development and perfection of special lines of work, and mechanism. His most prominent labor in this line was his service as chairman of the Committee on Laboratory Tests of Brake Shoes, appointed by the Master Car Builders' Association. This committee carried on its work for five years, conducting a long series of tests, obtaining some very valuable information, and designing and building an apparatus for determining the coefficient of friction of brake shoes for railway service. Mr. Bush also served as a member of the Arbitration Committee of the Master Car Builders' Association, and as a member of its Executive Committee from 1898 to 1901. He is a member of the Delta Tau Delta fraternity.

Mr. Bush is the son of James Smith and Harriet Eleanor Bush, his ancestors being of Puritan and Huguenot stock. He married Flora Sheldon, June 27, 1894. Five children, Prescott Sheldon, Robert Sheldon, Mary Eleanor, Margaret Livingston, and James Smith Bush, are the fruit of their union.

Bushnell, Douglas Stewart (M.E., '96), was born in New York city, October 12, 1873. He was assistant manager at the Snow Steam Pump Works, New York, 1896–99, and spent part of 1899–1900 travelling in Europe for the benefit of his health, after undergoing a severe operation which compelled him to give up business. He became assistant engineer in the engineering department of the Standard Oil Co., serving from 1900 to 1903. From the latter year to date he has been assistant general superintendent of the National Transit Co., Trunk Lines Division, New York. He is a member



D. S. Bushnell

of the Washington Association of New Jersey, the Calumet, Morristown, and Morris County Golf clubs, and of the Tau Beta Pi fraternity.

Mr. Bushnell is the son of Robert Gray and Ella J. (Stewart) Bushnell. His English ancestors, landing in Connecticut in 1629, moved to Pittsburg, Pa., in the early part of the nineteenth century, and his parents lived in that city until a few years before his birth, when they moved to New York. He married Helen Maude Applegate, daughter of Rev. Octavius Applegate, D.D.,

October 5, 1901, at Newburgh-on-Hudson. They have one daughter, Eleanor Ray Bushnell.

Butler, Pierce (M.E., '82), was born in Franklin County, Ky., September 6, 1858.



PIERCE BUTLER

He was draughtsman with the Delaware, Lackawanna, & Western Railroad, 1883; with the Brooks Locomotive Works, Dunkirk, N. Y., 1884; in the employ of the Pullman Car Co., Pullman, Ill., 1885; in the mechanical department of the Union Pacific R. R. Co., 1886; chief designer of the Ohio Falls Car Co., Jeffersonville, Ind., 1887–90; chief draughtsman in the mechanical department of the Louisville & Nashville Railroad Co., Louisville, Ky., 1890–95; and has been a consulting mechanical engineer at Louisville from 1895 to date. In 1894 he visited Europe for the purpose of inspecting foreign shops. He presented a paper on "Standardizing American Railway Cars" to the Engineers' and Architects' Club, of Louisville, Ky., of which club he is a member and was secretary for 1897. He is a member of the Engineering Association of the South, and of the Beta Theta Pi fraternity.

Mr. Butler is the son of John Russell and Jane Short Butler. He is descended from Thomas Butler, who had five sons, all commissioned officers in the Revolutionary Army and all members of the Society of the Cincinnati. His great-grandfather was first adjutant-general of Kentucky, and his grandfather was, for several terms, a member of the Kentucky legislature. His father was a physician and was on the staff of his uncle, General William O. Butler, in the Mexican War, and also a colonel in the Confederate Army. Mr. Butler married Roberta Boyle, March 22, 1888.

Butterfield, Thomas (M.E., '95), entered the Rensselaer Polytechnic Institute in 1895, and graduated from that institution as Civil Engineer in 1897. He was in the service of the Spartan Plaster & Cement Co., Perth Amboy, N. J., 1897; with the New Jersey Portland Cement Co., 1897–98; draughtsman in the Otto Gas-Engine Works, Philadelphia, 1898–1900; with the Gasmotoren Fabrik Deutz, Köln-Deutz, Germany, 1900; and in the engineering department of the Otto Gas-Engine Works, Philadelphia, to date.

Butterworth, Samuel Fowler (M.E., '96), was born in Morristown, N. J., July 8, 1874; the son of Theron H. and Selina S. Butterworth. He was employed in the meter department of the Edison Electric Illuminating Co., Duane Street Station, New York, 1898–1899; with the Gas & Electric Co., of Ber-



S. F. BUTTERWORTH

gen County, N. J., as assistant chief engineer of the gas department, 1899–1900; in

the office of Public Buildings and Grounds, War Department, Washington, D. C., 1900–01; with the Post & McCord branch of the American Bridge Co., Brooklyn, N. Y., 1901; in the mechanical department of the Waldorf-Astoria Hotel, New York, 1901–02; and with the Traction Elevator Co., New York, from 1902 to date.

Buvinger, William Sherman (M.E., '91), was born in Pittsburg, Pa., July 22, 1866; the son of Charles W. and Emma P. Buvinger. His family is of German origin, and its members have had a tendency toward professional callings. He served in the engineering department of the Pittsburg Iron & Steel Engineering Co., 1891–92, being at first engaged in preparing plans and estimates for the construction of iron- and steel-working machinery, and later placed in charge as supervising engineer of erection of the new steel-plate mill for the Carbon Steel Co., at Pittsburg, Pa., the most important of several contracts then held by the Iron & Steel Engineering Co. He then became chief draughtsman with Thomas Carlin's Sons, engine-builders, Allegheny, Pa., 1893–95, but during the latter year failing health necessitated a change of climate for recuperation. On resuming work he entered the engineering department of the Carnegie Steel Co., at their works at Bessemer, Pa., as mechanical engineer. Here he was closely identified with the work of providing the blast furnaces of the Edgar Thomson Steel Works with automatic charging-machinery, which later has proved so economical in use and has permitted exceptional records in tonnage output. Evidence of impaired health induced Mr. Buvinger to give up this work for an extended season of travel in Europe, from which he returned in the fall of 1899 greatly benefited by his tour of France, Switzerland, Germany, and England. At the present time he is employed as mechanical engineer in a corps engaged in the construction of new blast furnaces and equipment at the Eliza furnaces, of the Jones & Laughlin Steel Co., Pittsburg, Pa. He is a member of the Delta Tau Delta fraternity.

Calisch, Julius C. (M.E., '87), was born in New York city, October 18, 1867; the son of Charles H. and Servillia Calisch, both born in Denmark. After a very short experience in the draughting-room of the Edison Central Station, construction department,



J. C. Calisch

New York, he entered the service of the Electrical Accumulator Co., New York, whose laboratory and works were located in Newark, N. J. He began in the laboratory, and later went out on installation and general construction work; finally locating in Detroit as superintendent of one of the first central-station storage-battery systems. This plant was somewhat unique in that it consisted of a central power plant for charging a number of storage-battery sub-stations, which were connected up in series on the charging side, discharging in multiple; furnishing current for lighting, etc., to subscribers in the neighborhood. After two years' service with the Electrical Accumulator Co., he entered the employ of the Edison United Manufacturing Co. in the capacity of foreman of construction, being placed in charge of various lighting installations,—isolated, central station, and marine plants. After serving in this capacity for about three years, he was detailed on general commercial and engineering work. During this period the Edison United Manufacturing Co. changed names several times, until in the spring of 1892 the General Electric Co. was organized. In August of that year he was detailed to

the Pittsburg office, where his duties comprised both engineering and commercial work; and eventually in 1895 he was placed in charge of the Pittsburg office, where he remained until 1898, being then transferred and placed in charge of the Buffalo office, where he is at present located. Mr. Calisch's thesis, written in conjunction with Mr. B. F. Hart, Jr., on "Chrome-Steel History and Chemical Analysis," was printed in the *Stevens Indicator*, IX, 49, and quoted in *Iron Age* and several other journals. He is an associate member of the American Society of Electrical Engineers; a member of the Buffalo, Ellicott, University, Park, and Niagara clubs, and of the Buffalo Chamber of Commerce; and is a thirty-second degree Mason.

Cameron, Barton H. (M.E., '94), was an apprentice with the Norfolk & Western Railroad, Radford, Va., 1895–98; draughtsman with the Richmond Locomotive Works, Richmond, Va., 1898–99; and has been general manager and treasurer of the Cameron-Tennant Machine Co., Richmond, Va., from 1899 to date. He is a member of the American Society of Mechanical Engineers.

Campbell, Donald (M.E., '97), was born in Newport, R. I.; the son of Col. John



Donald Campbell

Campbell, U.S.A., and Mary (Price) Campbell. After graduation, and a season with the firm of W. D. Forbes & Co., Hoboken, N. J., he took the course at the New York Law School, graduating with the degree of Bachelor of Laws in 1899. In 1898 he entered the offices of Dickerson, Brown, Raegener, & Binney, New York, and practised there as patent attorney and counsellor-at-law until 1904, when he established an office of his own at Boston, Mass. He is a member of the Delta Tau Delta fraternity and of the New York Athletic Club.

Campbell, Edward (M.E., '96), was born in Liverpool, England, September 15, 1874; the son of George and Rosalie H. Campbell. He served in the shops of the Southern Railway Co., Alexandria, Va., 1896–98; in the same company's draughting-room, Washington, D. C., 1898–1900; and with the Germania Electric Lamp Co., Harrison, N. J., 1901–03; since which period to date he has been its secretary and treasurer. He is an associate member of the American Institute of Electrical Engineers, and a member of the Alpha Xi chapter of the Chi Psi fraternity.

Campbell, Gordon (M.E., '88), acted as Assistant Instructor in Experimental Mechanics at Stevens Institute during the Supplementary Term, 1888; was draughtsman in the master-mechanic's office, Colorado Division of the Union Pacific Railroad, and later in charge of the draughting of that office, 1888–91; superintendent of the Colfax Avenue Electric Railway, Denver, Colo., 1891–93; assistant to the general Western sales agent of the Illinois Steel Co., at their office in Denver, Colo., 1893; purchasing agent of the Consolidated Traction Co., of New Jersey, 1893–97; mechanical engineer in charge of maintenance of rolling-stock, and also purchasing agent of the same company, 1897–1900; and has since been general superintendent of the Union Railroad Co., Providence, R. I., and master-mechanic of lines controlled by the Washington Traction & Electric Co., Washington, D. C. He is a junior member of the American Society of Mechanical Engineers.

Campbell, Grant (M.E. '99), was born in Newport, Ky., February 19, 1879; son of Col. John Campbell, U.S.A., and Mary

(Price) Campbell. He was Assistant Instructor at Stevens Institute during the



GRANT CAMPBELL

Supplementary Term of 1899; was next employed in the draughting-room of the firm of Westinghouse, Church, Kerr, & Co., New York, and in a few months on installation of work for the company, in Covington, Va., for the West Virginia Pulp and Paper Co. From August, 1900, his work was entirely in the stoker department, with headquarters at New York, until April, 1902, when he was transferred to the new Manchester (England) works of the British Westinghouse Electric & Manufacturing Co., Ltd., where he continued in the same line of work. From this he was transferred by the company to Birkenhead (England), where, from August, 1902, until April, 1903, he was in charge of stoker and general power-house work in connection with the electrification of the Mersey Tunnel. On April 15 of the latter year he was again transferred to Bath (England), being placed in charge of the construction of a power station and car barns for the Bath Electric Tramways Co., Ltd. He is now located in the New York offices of Westinghouse, Church, Kerr, & Co. He is a member of the Delta Tau Delta fraternity.

Campbell, N. St. G. (M.E., '88), on graduation, entered the works of the Welsbach Incandescent Light Co., Gloucester, N. J., and was assistant engineer at the company's Philadelphia office in 1888. Later he was engaged in several departments of the Baldwin Locomotive Works, during which period he designed new oil furnaces and burners which reduced the oil bill about one half, and increased the life of the furnace from about three days to a month. He also constructed a two-foot sheet-steel pipe-line, 250 feet long, across the yards at a height of 45 feet. As scaffolding could not be used, an original plan of stringing a cable and drawing the pipe across, length by length, proved successful. After this he was placed in charge of the spring contract; but after five months his health began to show the effect of the heat, so he was put in charge of one of the shops as night foreman. Since then he has filled an engagement with the firm of W. D. Forbes & Co., representing interests of Col. E. A. Stevens; has conducted a business as consulting engineer and manufacturers' agent, together with some personal interests; and has been associated with the Lightning Wage-Calculator Co., the American Impulse-Wheel Co., and with the firm of Halsey & Hudnut, all of New York.

Carey, Paul C. (M.E., '01), was born in Newark, N. J., January 17, 1879. Since



P. C. CAREY

graduation he has been employed in the department of tests of the General Electric Co.,

Schenectady, N. Y., 1901–02; and with the United Electric Co. of New Jersey, Newark, N. J., from 1902 to 1904, in charge of the consumers' end of their power business throughout the Newark division. In the latter year he became a member of the firm of Runyon & Carey, mechanical and electrical engineers, Newark, N. J. He is a member of the Tau Beta Pi fraternity.

Carll, Benjamin Wainbirg (M.E., '91), was born in Northport, L. I., November 28, 1868. He was the New York representative of the Buffalo Steam Pump Co., 1891–92; inspector for the Lancashire Insurance Co., 1892–94; and held a like position in the tannery department of the German American Insurance Co., 1894–95. He then served with the Chrome Steel Works Co., of Brooklyn, N. Y., introducing their mining-steel into Mexico, South America, South Africa, Australia, New Zealand, etc., 1896–99; and from 1899 to date has been engineer and assistant manager of the General Power Co., of Brooklyn, manufacturers of kerosene engines.

Mr. Carll is the son of Jesse and Ann Eliza Carll. His father's family settled at Northport, Long Island, N. Y., in 1670. Several of the family held commissions during the Revolutionary War, and one member sat in the first Continental Congress. Mr. Carll was in Johannesburg, South Africa, during the Jameson Raid, and was in the second party that crossed the desert of West Australia on camels. He has been around the world twice, and travelled all over the American continent from Alaska and Greenland to Patagonia. He married Henrietta V. Schlim, November 22, 1900.



B. W. Carll

Carlton, Newcomb (M.E., '90), was born in Elizabeth, N. J., February 19, 1869; the son of William James and Helen (Newcomb) Carlton. He was engaged in the practice of mechanical and electrical engineering at Buffalo, N. Y., 1892–1900, from 1895 with Mr. H. G. Meadows. He was Director of Works for the Pan-American Exposition held in Buffalo in 1901; then vice-president and executive officer of the Bell Telephone Company in that city; and in 1904 was appointed to his present position as fourth vice-president of the Westinghouse Electric & Manufacturing Co., with offices in New York city. He is an associate member of the American Society of Mechanical Engineers, and a member of the Engineers' Society of Western New York.



Newcomb Carlton

Carroll, Lafayette D. (M.E., '84,, has filled positions, since graduation, as follows: In the department of installation, and afterward as assistant superintendent of machin-

ery at the World's Industrial and Cotton Centennial Exposition, New Orleans, La., 1884–85; manager of the Jefferson Pressed Brick Works, Birmingham, Ala., 1886; assistant engineer of the Coalburg Coal & Coke Co., Coalburg, Ala., 1887; assistant engineer with the Sloss Iron & Steel Co., Birmingham, Ala., 1888; engineer and inspector for the latter company in charge of the construction of their blast furnaces at North Birmingham, 1889; engineer with J. W. Worthington & Co., Birmingham, Ala., 1890; assistant engineer engaged in field-work location of a line for the Ferro Carril Nacional de Tehuantepec in the State of Oaxaca, Mex., 1890–91; mechanical and electrical engineer at New Orleans, 1892–95; general manager for the Automatic Machine Co., 1892–94; manager of the Louisiana Machine Co., Ltd., 1895; engineer on construction and operation of carburetted water-gas works in England and on the Continent for Messrs. Humphreys & Glasgow, London, 1896–98; and as engineer and manufacturing expert for the latter named firm, 1898 to date. He is a member of the American Society of Mechanical Engineers, and of the American Institute of Mining Engineers. He was a member of the International Congress for Mines and Metallurgy held at Paris in 1900.

Carroll, Walter (M.E., '84), held the position of superintendent of the department of machinery at the International Southern Exhibition, New Orleans, La., which was in progress at the time of his graduation. When the Exhibition closed he became associated with the Hardy Machine Co., Birmingham, Ala. While located at Birmingham he was taken with rheumatism of the heart, which caused his death February 15, 1887.

Carter, Lattimore Douglass (M.E., '95), was born in Jefferson County, Ky., November 16, 1872. He was in the department of tests of the Southern Railway Co., 1895–96; and engineer and contractor for steam and electric plants and dealer in electrical supplies at Louisville, Ky., in 1897. But he was compelled to abandon this work on account of ill health, and since 1900 he has been secretary and treasurer of the Cave Hill Cemetery Co., Louisville, Ky. He is a member of the Engineers' and Architects' Club, Louisville, Ky.; of the Benevolent Protective Order of Elks, and also of the Fall City Lodge No. 376, Free and Accepted Masons.

Mr. Carter is the son of Kearsley and Sally R. Carter. He married Ellen Douglass Moore, August 13, 1896, and they have two children, Eleanor Rutherford and Cleon Moore Carter.

Carter, R. S. (M.E., '00), during the summers of 1898–1900, and until December of the latter year, worked at the bench in the shops of the Ingersoll-Sergeant Drill Co., of New York. In December, 1900, he was transferred to the New York office, and a few months later was given a position as assistant manager and engineer of the New England branch at Boston, where he remained until December, 1902, when he took a similar position in the English house, with headquarters in London.

Cartwright, James A. (M.E., '99), has held positions with the McAdams & Cartwright Elevator Co., at New York and at Philadelphia, Pa.

Cartwright, Wilmer Griffith (M.E., '82), was born in Philadelphia, Pa., April 18, 1856. Immediately after graduation he was appointed principal assistant to Prof. R. H. Thurston, who was then at the head of the Engineering Department of the Stevens Institute of Technology, and held this position until his death. He was especially interested in chemistry, taking the Priestley Prize in 1881. During his work in the Mechanical Laboratory he made some peculiarly interesting investigations, including a study of the distribution of heat, in useful work, and wastes in gas-engines of several sizes and different makes; also in regard to the efficiency of worm and spur gearing. He was a member of the American Society of Mechanical Engineers and of the American Gas Light Association. In the *Stevens Indicator* for March, 1884, will be found an account of Mr. Cartwright written by Prof. Thurston.

Mr. Cartwright, who was the son of William and Elvira (Levering) Cartwright, died in Jersey City, N. J., February 23, 1884.

Chadwell, William Hall (M.E., '00), was born in Catskill, N. Y., June 20, 1878. He has been employed in the works of the Pittsburg Plate Glass Co., Ford City, Pa., 1900; in the meter-testing department of the Edison Electric Illuminating Co., 1900; as works clerk for the Essex & Hudson Gas Co., Newark, N. J., 1901; and as superintendent of the Front Street works of the Public Service Corporation of New Jersey, 1902 to date. He is a member of the Theta Xi fraternity.

Mr. Chadwell is the son of George H. and Emma C. (Willard) Chadwell. He married Rosetta T. McNaughton, October 1, 1903.

Chandler, Richard Edward (M.E., '93), was born in Goderich, Ont., November 17, 1866. Previous to entering the Institute in 1889, he served an apprenticeship in the



R. F. Chandler

shops of the Roanoke Machine Works, Roanoke, Va., and was draughtsman for two years with the same company. After graduation he engaged with the Snow Steam Pump Co., Buffalo, N. Y., but in the same year became Professor of Mechanical Engineering at the Montana Agricultural College, a position he held until 1896, during which time he organized the mechanical course there and built and equipped the college workshops. Taking a postgraduate course at Cornell University, 1896–97, he received from that institution the degree of Master of Mechanical Engineering. He then became Adjunct Professor of Mechanical Drawing and Machine Design at the University of Nebraska, 1897–98; and from the latter year to date has been in charge of the Department of Mechanical Engineering at the Oklahoma Agricultural and Mechanical College, Stillwater, Okla. In conjunction with F. Bedell and R. H. Sherwood he wrote a paper on "The Predetermination of the Regulation of Transformers with Non-Inductive Loads," which was presented at the Detroit meeting of the American Association for the Advancement of Science, and which also appeared in the *Electrical World*, August 4, 1897. Mr. Chandler is a member of the Montana Society of Civil Engineers, of the American Association for the Advancement of Science, and of the Sigma Xi society.

Mr. Chandler is the son of Libert and Marion Chandler, and great-grandson of Dr. Richard Chandler, of Oxford, England. He married Lena A. Luce, August, 24, 1897.

Chapin, Warren Winthrop (M.E., '97), was born in New York city, May 25, 1875; the son of Henry Judson and Elizabeth Christy Chapin. After graduation he was engaged for some time as a draughtsman in New York city. He then took an interest in, and became an active member of the firm of the Interstate Vending Co., and was engaged in the business of this company for several years when he took the position which he now holds in the engineering department of the American Bridge Co. He is a member of the American Society of Mechanical Engineers and of the Chi Phi fraternity.

Chapman, Alexander (M.E., '02), was born in Jersey City, N. J., July 30, 1880; son of Samuel C. and Emma J. Chapman, and of Scotch descent. He prepared for Stevens Institute in the Stevens School, and after graduation was for a short time in the department of tests of the General Electric Co., at Schenectady, N. Y., and then with the Bristol Co., manufacturers of self-recording instruments for pressures, temperatures, and electricity, at Waterbury, Conn. Since 1903 he has been with the Continuous

Rail Joint Co. of America, whose general offices are in Newark, N. J.



Alexander Chapman

Chasteney, Charles Dunton (M.E., '01), was born in Passaic, N. J., March 29, 1877; son of Edward A. and Rebecca S. (Westervelt) Chasteney. He was Assistant Instructor at Stevens Institute during the Supplementary Term, 1901, and has been with the



C. D. Chasteney

De Laval Steam Turbine Co., Trenton, N. J., from 1901 to date. His graduating thesis, prepared in conjunction with Mr. Howard Watkins, was published in the *Stevens Institute Indicator,* October 1901. He is a junior member of the American Society of Mechanical Engineers, a member of the American Electrochemical Society, and of the Beta Theta Pi and Theta Nu Epsilon fraternities.

Chatard, William Miles (M.E., '01), was born in Baltimore, Md., June 26, 1875; son of Dr. Ferdinand E. and Josephine M. (Miles) Chatard. Upon graduation he entered the employment of the Carbondale Machine Co., at Carbondale, Pa., and after a short time was placed in charge of the Bos-



W. M. Chatard

ton office of the company, becoming later its New England manager, and being subsequently placed in charge of the Chicago office of the same company. Recently he opened a temporary office for the Carbondale Machine Company at Baltimore, Md. He is a junior member of the American Society of Mechanical Engineers and a member of the Delta Tau Delta fraternity. His graduating thesis, written in conjunction with his classmates, Messrs. Botchford and Holcombe, on "Comparison of Cost of Operating an Iron-Smelting Plant by Gas-Engines Using Waste Blast-Furnace Gas, and by Gas-Fired Boilers and Steam-Engines," was published in the *Stevens Institute Indicator,* January, 1902.

Chester, William Sidell (M.E., '86), was born in Englewood, N. J., December 7, 1865. In January, 1887, he entered the employ of the C & C Electric Co., with which he was connected up to the time of his death in 1900. His work with this company suggested to him the idea of blowing church organs by means of electric motors, and he was the originator of this most successful system. After the first installation he practically devoted all his time to putting in, and caring for, motors for operating organs. Mr. Chester was a musical genius, there being no instrument on which he could not per-



W. S. Chester

form, and he showed wonderful musical ability at a very early age. He was particularly fond of the organ. He was appointed organist and choir-master at St. George's Church, New York, in 1888, and left many compositions for voice and organ. He was a member of the following societies: The Players', Clef, Marine and Field, and St. George's Men's clubs, and of the American Guild of Organists, and the Brotherhood of St. Andrew.

The son of Charles T. and Lucretia L. (Roberts) Chester, he was a descendant of Baron Leonard Chester, who died in Wethersfield, Conn., in 1648. He married Jeanne F. Constentin, November 29, 1897.

Chew, Roger (M.E., '97), has been engaged in the chemical department of the Standard Oil Co.'s works at Bayonne, N. J., from 1897 to date.

Christy, Charles Roland, Jr., (M.E., '97), was born in Morristown, N. J., August 14, 1873; son of Charles Roland and Jennie Pierson Christy. He was engaged with the Blickensderfer Manufacturing Co., Stamford, Conn., from 1898 to 1900, the first year on experimental work and draughting, the second year as assistant superintendent. From 1901 to date he has been a member of the firm of C. R. Christy & Son, Sabattis, N. Y., manufacturers of soft-wood lumber.

Christy, John Lundy (M.E., '96), was born in Stamford, Conn., August 11, 1874; son of Charles R. and Jennie P. (Lundy) Christy. He is a descendant of the Pierson and Lundy families of Revolutionary fame. He was draughtsman with the Newell Universal Mill Co., New York, 1896–99; secretary to the same company 1899–1900; and its treasurer from 1901 to date. His graduating thesis, prepared jointly with Mr. S. A. Hasbrouck, on "The Determination of the Cost of Electric Lighting by Gas-Engine," was published in the *Stevens Indicator*, XIV, 12. He is a member of the Seventh Regiment N. G. S. N. Y.

Church, Austin (M.E., '95), was chemical engineer for the firm of Church & Co., at their ammonia soda plant, Trenton, Wayne County, Mich., 1895–96; and has been secretary of the Sibley Quarry Co., Sibley, Mich., since 1896. He is a junior member of the American Society of Mechanical Engineers.

Church, Charles Thomas (M.E., '95), was born in Brooklyn, N. Y., February 17, 1873. He was mechanical engineer at Church & Co.'s ammonia soda plant, Trenton, Mich., 1895–96; his work being principally in the line of chemical engineering, such as the manipulation of machinery for handling large quantities of chemicals; and in charge of the Brooklyn plant of the Church & Dwight Co., manufacturers of bicarbonate of soda and sal-soda from 1896 to date. He has been director and assistant treasurer of that company since 1903. He is a junior member of the American Society of Me[illegible]l Engi-

neers and a member of the Franklin Institute, the Mayflower Society, and the Theta Xi fraternity.



C. T. Church

Mr. Church is the son of Elihu Dwight and Helen Victoria (Cooke) Church. He married Charlotte S. Nichols, of Detroit, Mich., June 3, 1903.

Church, Warren Demarest (M.E., '99), was born in Brooklyn, N. Y., April 5, 1877;



W. D. Church

son of Frank Alden and Alice (Demarest) Church. [illegible]s draughtsman with the Isbell-Porter Co., 1899–1900; and has since been with Kellogg & Alexander and M. W. Kellogg & Co., first as inspector on construction work in connection with fertilizer plants, and now engaged in estimating and superintending contract work. He is a member of the Crescent Athletic Club, Brooklyn, and of the Chi Psi fraternity.

Clark, Baylies C. (M.E., '96), was located in New York city, 1897–98; and has been a member of the Thurston-Clark Hosiery Co., Allendale, N. J.; and of the Dolores Mining Co., Minaca, Chihuahua, Mex., from 1898 to date. He is a member of the Delta Kappa Epsilon and Tau Beta Pi fraternities.

Clark, Francis Morton (M.E., '02), was born in New York, February 22, 1880; son of Francis Baylies and Mary Catherine (Hill) Clark. He took the postgraduate course at the Columbia School of Mines, and is now at the Amador Reduction Works, Sutter Creek, Cal. He is a member of the Delta Kappa Epsilon Club and of the Delta Kappa Epsilon and Theta Nu Epsilon fraternities.

Clerk, William Thompson (M.E., '85), was born in Jersey City, N. J., June 13, 1864. He was draughtsman with Post & McCord, engineers, 1885–86, and from May to December in the latter year he served in the same capacity for Mr. Henry J. Hardenberg, architect. While thus engaged his health became so impaired that he was compelled to give up his position. After travelling for nearly two years he entered Columbia College to take the postgraduate course in architecture, which he completed in June, 1890. He again entered the employ of Mr. Hardenberg, and was engaged upon calculations for the ironwork of the Waldorf-Astoria Hotel, 1890–91.

At this time, his health not having been satisfactorily restored, he decided to establish himself as an architect in Santa Barbara, Cal., where he remained until April, 1895, and then spent several years travelling for both study and pleasure. In 1898 he removed to Washington, D. C., and resumed his practice as an architect. In 1893 he invented and designed a hoist for lifting and transporting large live trees, and in the same year erected the then largest lemon-

curing warehouse in America. In 1894 he designed and built a modern genuine adobe *hacienda* on the lines of the Mexican struc-



W. T. Clerk

tures of a century ago, having an enclosed *patio*; an almost unique specimen of architecture in which tiles made in the old Mexican days of California were used. He was formerly a member of the University Club of New York, the New York Athletic Club, Palma Club of Jersey City, and the Santa Barbara and Santa Barbara Country clubs. He is a member of the University and Dumbarton clubs, of Washington, D. C.

Mr. Clerk is the son of Andrew and Louise Clerk. He married Eleanor Doubleday, February 4, 1897.

Coffey, Barton Haxall (M.E., '85), was born in London, England, January 31, 1865; son of Edward Lees and Lucy E. (Haxall) Coffey. His father, who is of Irish descent, was an officer of the East India Company and afterward of the British army, a veteran of the Crimean war and of the Indian mutiny. His mother is a member of the Haxall family, of Richmond, Va. He was draughtsman for Otto C. Wolff, mill engineer, Philadelphia, 1887; with the Hyatt Filter Co., Newark, N. J., 1887; Henry Warden, Philadelphia, 1887–90; the Pennsylvania Ironworks Co., Philadelphia, 1890; Joseph Edwards & Co., New York, 1891; mechanical engineer for the International Contracting Co., New York, 1892–1900; and has been president of the Submarine Contracting Co., from 1901 to date. He has also been associated with Mr. Edwin Burhorn, M.E., as engineer and contractor, New York, from 1900 to date. Mr. Coffey has taken out patents for a gas-engine and gas-engine valve-gear, 1894, and for a subaqueous rock-breaker, 1900. He is a member of the Engineers' and University clubs, of Philadelphia, the National Arts and Fencers' clubs, of New York, and of the Chi Psi fraternity.

Cohen, Frederick William (M.E., '92), was born in Orange, N. J., November 3, 1870; son of Herman Cohen, of Germany, and Helene A. (Harrison) Cohen, of Philadelphia. He has been engaged with the Pennsylvania Steel Co., since his graduation: as draughtsman in the bridge and construction department, 1892–94; in the designing room of the same department, 1894–96; resident engineer in the erection of the Niagara Arch between Suspension Bridge, N. Y., and Clifton, Canada, 1896–97; in the designing-room at Steelton, Pa., 1897–98; engineer of erection in the bridge and construction department, having charge of all the erection, 1898 to date, including



F. W. Cohen

the Gokteik Viaduct, Burma, and the approaches and suspended span of the New

East River Bridge, New York, and many others. He is a member of the American Society of Civil Engineers; the Reform Club, of New York; the Harrisburg and Country clubs, of Harrisburg, Pa.; the Pennsylvania Forestry Association; and the Harrisburg Municipal League.

Coker, J. L., Jr. (M.E., '88), is treasurer of the Carolina Fibre Co., manufacturers of manila paper, Hartsville, S. C. He has taken out two patents relating to the production of sulphite pulp, which are in successful operation.

Coleman, Hubert Dudley, Jr. (M.E., '94), was born in New Orleans, La., October 2, 1871. He worked during one grinding season as assistant engineer and oiler in a Louisiana sugar-house, and then became draughtsman, inspector, and estimator with the H. Dudley Coleman Machinery Co., Ltd., of New Orleans, of which company he was a stockholder and director, his father being president. The company made sugar-, rice-, cotton-, and corn-mill machinery, and did repair work of all varieties, besides doing a large manufacturers' agent's business, and carrying a large stock of their own and consigned machinery. While with this company he was for two years local inspector for the United States Casualty Co. He was employed as weight-clerk in the melting and refining department of the United States Mint, New Orleans, La., from 1900 to January 1905, when he was advanced to the position of melter and refiner by direct appointment from President Roosevelt. He is a member of the Delta Tau Delta fraternity.



H. D. Coleman, Jr.

Mr. Coleman is the son of Hamilton Dudley and Jessie (Prague) Coleman. He married Isabelle Baquié, April 16, 1902.

Coley, Clarence Tallman (M.E., '01), was born in Jamesburg, N. J., December 1, 1877:



C. T. Coley

son of Frank W. and Minnie H. Coley. His early education was received at a New Jersey country district school. At the age of 13 he spent one year at the Columbia Institute Military School, New York; then, after four years, graduated with gold medal from Grammar School 69, New York; entered Stevens Preparatory School in 1895, and the Institute in 1897. He was employed in the department of tests of the General Electric Co.'s works, Schenectady, N. Y., 1901–02; foreman of a section of the testing department, 1902–03; and has been Instructor in Mechanical and Electrical Engineering in Union University, Schenectady, N. Y., 1903 to date. He is taking postgraduate work under Prof. C. P. Steinmetz in the modern theory of electrical engineering, and the

phenomena of alternating currents. Mr. Coley is an associate member of the American Institute of Electrical Engineers, and a member of the Mohawk Lacrosse Club, of Schenectady, N. Y. He is also a member of the Theta Xi fraternity and an honorary member of the society of Sigma Xi of Union University.

Colles, George Wetmore (M.E., '94), was born in New York city February 16, 1871; son of George Wetmore and Julia Keese Colles. Before entering Stevens Institute he received the degree of Bachelor of Arts at Yale University in 1892, and in 1900 he took the degree of Master of Science at Columbian University, Washington. His occupations since graduation have been: machinist in the Hoboken shops of the Pennsyl-



G. W. Colles

vania Railroad Co., subsequently becoming draughtsman and designer, 1894–95; in the shops of the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., 1895–96; engaged in developing a new process for electrolysis of salt, Boston, Mass., 1896; draughtsman and designer with Stone & Webster, Massachusetts Electrical Engineering Co., 1896–97; engineer in the isolated lighting department of the Edison Electric Illuminating Co., Boston, 1897–99; assistant examiner of patents, 1899–1901; engineer for the Crabtree Creek Mica Co., of North Carolina, with offices at Washington, D.C., 1900–01; mechanical engineer and chief of the technical force of the firm of Marion & Marion, Montreal, Canada, 1902 until recently; and he has now an office as consulting engineer in Milwaukee, Wis. For about two years, 1897–99, he was correspondent of the *Railroad Gazette*.

Mr. Colles was granted a patent in 1895 for an electric regulator,—a governor for prime movers driving dynamos and for some other purposes. He has other patents pending. An article on "The Distance of the Stars by Doppler's Principle," by Mr. Colles, appeared in the *American Journal of Science*, April, 1893. It consisted of a new method of calculating stellar distances and involved higher mathematics, the theory of mean values and of probability; by its application the mean distance of 95 stars is given as from 80 to 150 light-years. He published "Opportunities for Improvement in Mica-Mining" in the *Engineering Magazine*, February, 1902. His graduation thesis at Stevens Institute was "Report of a Test on a New Design of Electric Railway Power Station," prepared jointly with Mr. E. B. Gallaher. This thesis was awarded first prize in the *Engineering News* thesis competition of 1894, and was published in that journal March 7, 1895. He presented a paper, December, 1896, entitled "The Metric Versus the Duodecimal System," to the meeting of the American Society of Mechanical Engineers; this paper was favorably noticed by the engineering journals of this country, and by *Engineering* of London. His thesis for the Master of Science degree was "Rotary Transformers,"—the first complete treatment of the subject,—published by the *Journal of the Franklin Institute*, March, July, 1901. Mr. Colles is a member of the American Society of Mechanical Engineers, and of the Phi Beta Kappa fraternity, of Yale. He was formerly an associate member of the American Institute of Electrical Engineers.

Collins, C. R. (M.E., '86), after graduating, entered the service of the United Gas Improvement Co., Philadelphia, as draughtsman. During the first year he was detailed to carry on the first tests of the original investigation of the Welsbach incandescent lamp, which later in the year was brought

to this country and the rights for the United States offered to the United Gas Improvement Co. During his service for the Welsbach interests he held the position of engineer of the first company organized, and was later made acting superintendent of the factory at Gloucester, N. J., and finally placed in charge of the work of making the first practical installation for the sub-company organized in Philadelphia, Pa. In 1888 he resigned from the Welsbach Co. and re-entered the service of the United Gas Improvement Co. From 1888 to 1895 he served on the staff of the constructing force, finally taking a position on the home office staff as one of the company's inspectors, his special detail being the supervision of manufacturing results.

In 1895 Mr. Collins accepted the position of general manager of the Manhattan Incandescent Light Co., organized to take the agency for New York city for the sale of Welsbach lamps, being also vice-president. This company was finally absorbed by the Welsbach Commercial Co. Mr. Collins resigned in 1896 and opened an office as consulting engineer in New York. In the same year he became general manager of the Seattle Gas & Electric Light Co., Seattle, Wash., and in 1900 opened offices in Seattle as consulting and constructing engineer, having severed his official connection with the Seattle Gas & Electric Light Co. His chief work outside of the consulting business was the construction of the works and distribution system for the city of Everett, Wash. From 1900 Mr. Collins also occupied the position of general manager and chief engineer of the Citizens' Light & Power Co., of Seattle, the works and street mains being laid out and constructed under his direction. In 1904 the gas companies of Seattle were consolidated, and Mr. Collins assumed the position of manager and engineer, at the same time continuing his consulting business.

Mr. Collins has taken out patents for oil spray for water-gas apparatus, process and apparatus for the continuous generation of carburetted water-gas, and a carburetter for vaporizing oil in the manufacture of water-gas, and has contributed several papers to the American Gas Light Association, of which, as also of the Pacific Gas Association, he is a member.

Collyer, Charles F. (M.E., '96), has since graduation been employed in designing hydraulic and pneumatic machinery for operating balanced canal locks for the Dutton Pneumatic Lock & Engineering Co., New York; as computer and draughtsman with John J. McLaughlin, county engineer of Queens County, N. Y.; as assistant mechanical superintendent of the Clark Thread Co., of Newark, N. J.; and with the Watts Campbell Co., Newark, N. J. He is a member of the Tau Beta Pi fraternity.

Condit, Edward Ager, Jr. (M.E., '02), was born in Hoboken, N. J., September 17, 1880; son of Edward Ager and Addie M. (De Ronde) Condit. His ancestors are first recorded as purchasers of land in Newark, N. J., in 1678. His great grandfather was Col. David Condit, of the Revolutionary army, who died in 1777. Since graduation he has been engaged in draughting and designing with the Continuous Rail Joint Co. of America, at Newark; later being given charge of the inspection of a certain line of work. He is at present resident inspector of the Albany Iron and Steel Works department of this company at Troy, N. Y.



E. A. Condit, Jr.

Connet, Frederick N. (M.E., '89), in the fall of 1889 became chief draughtsman with the Builders' Iron Foundry, Providence, R. I.,

and in connection with Mr. A. A. Fuller (M.E., '88) designed special metal-working machinery, part of which was used in the construction of 12-inch mortars and their carriages for the United States Government. In connection with Mr. Fuller and Mr. Walter W. Jackson (M.E., '89) he designed, and patented in the United States, an integrating and registering instrument forming part of the well-known Venturi water-meter for large water-mains. Patents have also been issued on this invention in England and France. He also designed, and patented in the United States, a three-motor electric travelling crane, two of which, each of 25 tons capacity, were built; and he designed, and patented in the United States, France, and England the "Pull to Start and Pull to Stop" belt-shifter for use in connection with countershafts, being attached thereto directly or to the ceiling. Mr. Connet represented the Builders' Iron Foundry on the Committee on Standardization of Extra Heavy Flanges, whose report, as published in the *Stevens Indicator* for January, 1902, has been widely adopted. Mr. Connet now holds the position of engineer at the Builders, Iron Foundry, Providence, R. I. In connection with Mr. Fuller he wrote for the *Indicator* of July and October, 1890, two articles relating to the manufacture of 12-inch mortars; and a number of articles by Mr. Connet also appeared in that publication, as follows: "Amateur Photography," VI, 41; "Design for Locomotive Combustion Chamber," VI, 190; and "Notes on Book-Making," VI, 209. The *Journal of the Franklin Institute*, CXLVII, No. 2, said of the Venturi water-meter:

"Its invention, design, and perfection are the fruit of great ingenuity and of much knowledge and painstaking labor, and they [the inventors] have been of vast benefit to the community by making the Venturi meter a practical working tool. Its inventors, Messrs. Frederick N. Connet and Walter W. Jackson of Providence, are therefore entitled to distinguished honor at the hands of the Franklin Institute, and we take pleasure in recommending the award to them of the John Scott Legacy Premium Medal for their registering apparatus."

This meter was also described in *Cassier's Magazine* for March, 1899, by Mr. Clemens Herschel, who gives Messrs. Connet and Jackson high praise for their invention. Mr. Connet's thesis subjects were, "Design for a Locomotive Valve Gear" and "A New System for Compounding Locomotives." The first consisted of a valve gear that requires no eccentrics, overhung cranks, or cams, neither is the movement derived from a point on the connecting-rod. The second design, relating to compounding, involved the use of three cylinders of about equal bore, but requires no cranked axle.

Cook, Edward Jerome (M.E., '86), was born in Springfield, O., January 4, 1865. He



E. J. Cook

was employed in the shops and draughting-room of the Engine & Thresher Co., and the Whiteley Reaper Works, 1886–88; and became successively assistant engineer, superintendent of steam plant, and superintendent of the Edison Electric & Illuminating Co., Brooklyn, N. Y., 1888–91; and constructing engineer and vice-president of the Field Engineering Co., New York, 1891–94. He was engaged in designing the plants of the Cleveland Electric Illuminating Co., Cleveland, O., and of the Detroit Citizens' Street Railway Co., Detroit, Mich., 1894–96; as electrical engineer with the Cleveland Electric Railway Co., 1896–1900; in the same capacity with the Cleveland City Railway Co., 1900–03; and has been chief engineer of the consolidated companies since

1903. He is a member of the American Society of Mechanical Engineers, an associate member of the American Institute of Electrical Engineers, and a member of the Sigma Chi fraternity.

Mr. Cook is the son of Jerome W. and Hettie A. Cook. He married Mary Hertzler Rubsam, October 14, 1894, and they have one child, Mary Katharine Cook.

Cook, Herbert Bloomer (M.E., '93), was born in Middletown, Conn., November 5, 1870; son of George Harvey and Addie M. (Silliman) Cook. After graduation he entered the machine-shops of the Pencoyd Iron Works and then became assistant engineer with C. H. Gifford & Co., agents for the B. F. Sturtevant Co., in Philadelphia. After the death of Mr. Andrew Shiebler (M.E., '92), who had been his superior, he was promoted, in August, 1895, to the position of chief engineer, in which capacity he was engaged until the time of his death, August 23, 1896. The graduating thesis of Messrs. Cook and A. B. Lord on the "Determination of the Water-Consumption of a



H. B. Cook

Ball & Wood Engine when Running Under Light Loads," was published in the *Stevens Indicator*, X, 278.

Cooke, Frederick W. (M.E., '82), was vice-president of the Cooke Locomotive & Machine Co., of Paterson, N. J., 1886–1902; and has been vice-president of the American Locomotive & Machine Co., Paterson, N. J., from 1903 to date.

Cooke, John S. (M.E., '79), was with the Danforth Locomotive & Machine Co., Paterson, N. J., 1879–82; vice-president and general manager, 1882–86, and president, 1886–1902, of the Cooke Locomotive & Machine Co., Paterson; and has been president and general manager of the American Locomotive & Machine Co., Paterson, from 1903 to date.

Cooper, Stuart (M.E., '95), was born in Nice, France, April 17, 1873. He was with



Stuart Cooper

the Dean Linseed Oil Co., Port Richmond, Staten Island, N. Y., for one year, as assistant to the superintendent. Next he took charge of the refinery of the Northfield Oil-Refining Co., as superintendent for producing a special varnish oil, 1896–1900; was with the Pennsylvania & Delaware Oil Co., of New York, 1900–01; master at St. Paul's School, Concord, N. H., 1901–02. He was next located in Annapolis, Md., as half-owner and manager of the Annapolis Storage Co., during the erection of a ferro-concrete-construction warehouse for that company and getting the business under way. In addition to this duty he became, on May

7, 1903, treasurer, secretary, and manager (being also the largest stockholder) in the Bernhard Dietz Co., of Baltimore, manufacturers of printers' rollers and roller-composition. He is a member of the Delta Tau Delta fraternity.

Mr. Cooper is the son of Rear-Adm. Philip H. Cooper, U.S.N., and Sarah Stuart Cooper. He married Elizabeth McDougal, September 1, 1898.

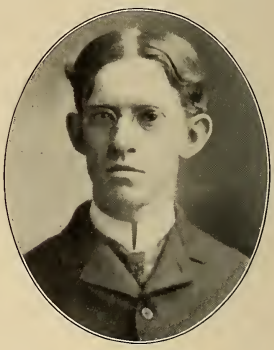
Corbett, L. B. (M.E., '92), is engaged in the manufacture of chemicals at Brookdale, Pa., under the name of the Susquehanna Manufacturing Co.

Corbett, William H. (M.E., '95), became, soon after graduation, assistant superintendent of the Garvin Machine Co., New York, and later successively superintendent of the bicycle department of the F. F. Chase Machine Works Co., Plainfield, N. J.; chief draughtsman for the Ball & Wood Co., Elizabeth, N. J.; chief engineer at the Bayonne (N. J.) works of the Martin Kalbfleisch Chemical Co.; superintendent of the New Era Metal Co., Garwood, N. J.; and from 1898 to 1900 consulting and contracting engineer, in connection with B. C. Ball, New York. During the latter period he assisted in the organization and became president of the Whitman Manufacturing Co., incorporated for the manufacture of tools and special machinery, with the Ball & Corbett friction clutch for gas and gasoline engines, a new wrench for iron pipe, and one for polished or nickeled brass pipe, as specialties. Associated with Mr. Corbett in this enterprise were his college mates, Messrs. B. C. Ball and Allen E. Whitman. In 1900 he went to Portland, Ore., to take the office of vice-president and general manager of the Willamette Iron & Steel Works in that city, and later the office of vice-president of the Willamette Boiler Works, also of Portland. Recently Mr. Corbett has become president of each of these companies.

Corbin, David (M.E., '94), was born in Brooklyn, N. Y., April 24, 1869; son of Job and Maria H. (Weaver) Corbin. His ancestors were natives of New England. On graduation he entered the employment of the East River Gas Co., Long Island City, N. Y.; was then engaged in the students' course at the works of the General Electric Co., Schenectady, N. Y., 1895–97; draughting for the Western Electric Co., New York, on telephone and power switchboard work and shop machine design, 1897–98; in the shop of W. D. Forbes & Co., Hoboken, N. J., 1899; with the Fayne Engine Co., Elmira, N. Y., 1899–1900; in the engineering corps of the Diesel Motor Co., New York, 1900–01; with the De Dion Bouton Motor Co., Brooklyn, N. Y., 1901; and has been engaged in professional engineering work from 1901 to date.

Corwin, William S. (M.E., '85), has since graduation had the following experience: as electrical and mechanical engineer, at Newark, N. J., 1885–88; with John F. Bahr & Co., manufacturers of electrical and telegraph instruments, New York, 1888–89; with the Daft Electric Railway Co., Marion, N. J., 1890–92; in the railway department of the General Electric Co., New York, 1893–94; and in the firm of Tucker & Corwin, consulting and supervising engineers, Newark, N. J., from 1896 to date.

Cosgrove, James Edward (M.E., '00), was born in Brooklyn, N. Y., July 20, 1879. His



J. E. Cosgrove

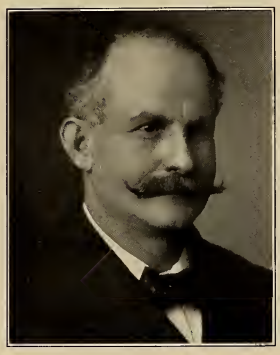
preparatory education was received at the Brooklyn grammar and high schools. He was assistant superintendent of the Morris

& Cumings Dredging Co., 1900; superintendent of the New York shops of the American Electrical & Maintenance Co., 1900–01; superintendent of the Columbian Foundry & Machine Works, Brooklyn, N. Y., 1901–02, and its secretary and treasurer, 1902–03. He was superintendent of the Morris & Cumings Dredging Co. at the time of his death, which resulted from an operation for appendicitis, April 11, 1904.

Mr. Cosgrove was the son of John Nicholas and Catherine E. Cosgrove, both of whom were born, in New York State, of Irish parents who had settled in Canada in the early part of last century. He married Helen Wallace McCoy, January 7, 1903.

Coster, Maurice (M.E., '77), was born in Paramaribo, Surinam (Dutch Guiana), August 4, 1856. He went to Boston, Mass., in June, 1873, and shortly afterward became night clerk in the Congress Hall hotel, Albany, N. Y., during the day attending the Albany high school. He entered the Sophomore class of Stevens Institute in 1874. He was naturalized in 1880.

He became an apprentice in the shops of the Central Railway of Iowa, Marshalltown, Iowa, in 1877; was instructor of mechanical drawing to the apprentices of the Lake Shore & Michigan Southern Railway, at Cleveland, O., 1878–80; manager of a sugar refinery at Anna Regina, and consulting engineer for sugar estates in British Guiana, 1881–87; engineer with the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., 1888–91; manager of the Pittsburg agency of the same company 1892–95; and manager of its Chicago agency 1895–99; *sous-directeur* of the Société Industrielle d'Electricité, Procédés Westinghouse, Paris, France, 1899–1901; and *directeur* of the Société Anonyme Westinghouse, Paris, from 1901 to date. The Société Anonyme Westinghouse, with a capital of 20,000,000 francs, took over the business of the Société Industrielle d'Electricité, Procédés Westinghouse, and is the sole manufacturer of Westinghouse Electric and Westinghouse Air Brake Apparatus for the countries of France, Spain, Portugal, Italy, Switzerland, Belgium, and Holland, their colonies and dependencies. Mr. Coster has taken out several patents relating to the construction of furnaces for the burning of green bagasse. He has written several papers treating of the manufacture of sugar, which were read before the Royal Agricultural Society, Georgetown, British Guiana, and published in the journal of that society. He was honorary consulting engineer to the Commissioner-General of the United States to the Universal International Exposition at Paris in 1900; and is a member of the American Institute of Electrical Engineers and of the Automobile Club de France.



MAURICE COSTER

Mr. Coster is the son of A. M. and P. Coster. He married Edith Beckett (deceased in 1895) in 1886. Three children were born of this marriage, Norman Beckett, Helen Beckett, and Kenneth Beckett Coster. He married Augusta Blanche Bennett in 1902.

Cotiart, Emil Maurice (M.E., '86), was born in Havana, Cuba, September 22, 1864; son of Jean Pierre and Adelaide (del Campo) Cotiart. He studied in France for a time and is now a consulting engineer in Paris. He is a member of Theta Xi fraternity.

Cottier, Joseph Germain Charles (M.E., '94), was born in Jersey City, N. J., May 29, 1874; son of Jean Germain Charles and Amanda Malcom (Luxton) Cottier. On his father's side he was descended from an old Huguenot family, and on his mother's side

of American extraction. He showed remarkable ability in early life, being gifted as a musician, a writer, and a photographer.



J. G. C. Cottier

At the age of eleven he entered a school in France and remained there two years. He graduated from Grammar School No. 7 Jersey City, at the age of fourteen. He was then a student at Stevens Preparatory School. He won the scholarship and entered Stevens Institute, graduating in 1894. He edited the journal of a literary society in Jersey City, and wrote for various periodicals, such as Anthony's "Photographic Bulletin," etc. After graduation he secured several positions in mercantile establishments, none of which, however, offered opportunities for him to pursue the studies for which he still entertained a fond desire. Accordingly in the autumn of 1895 he made application for and secured an appointment as University Scholar in Mechanics in the School of Pure Science at Columbia University. The following account and estimate of Mr. Cottier's ability is taken from a letter received from Prof. R. S. Woodward, of Columbia University:

"He pursued mechanics as his major subject, and chose mathematics and education as minor subjects. At the end of the academic year 1895–96 he took the degree of Master of Arts. At the same time he was appointed to a University Fellowship, one of the highest honors conferred upon graduate students by Columbia. Continuing his studies during the year 1896–97, he completed nearly all the lecture work essential for the degree of Doctor of Philosophy. By reason of his exceptional merits as a student he was reappointed Fellow in Mechanics for the year 1897–98. It was his expectation and our desire that he would have this entire year to devote to the completion of his doctorate dissertation on fluid motion and pressure."

This career, so full of promise, was suddenly terminated by the death of Mr. Cottier, which occurred in Paris, August 18, 1897, while he was on a bicycle tour through France.

He left two important papers in Prof. Woodward's hands for publication. One of these, "On the Application of the Equations of Hydromechanics to the Terrestrial Atmosphere," appeared in the *Monthly Weather Review* for July, 1897, published by the United States Weather Bureau. The other, "On the Applications of Curvilinear Coordinates to the Equations of Hydromechanics," appeared subsequently in the *Mathematical Review*, published at Clark University.

Cox, Frederic William (M.E., '00), was born in Bridgeton, N. J., September 20, 1877;



F. W. Cox

son of Stephen Cox, Jr., and Laura C. Cox. He was assistant foreman in the shops of the Cox & Sons Co., founders and manu-

facturers, at Bridgeton, N. J., 1900–01; draughtsman with the same company, 1901–02; and has been assistant superintendent of the factory and secretary of the corporation from 1902 to date. He is a member of the Theta Xi and Tau Beta Pi fraternities.

Cox, James McCullough (M.E., '94), was born in New York city January 19, 1873. He has been assistant superintendent of the Philadelphia & Reading Railroad Terminal at Philadelphia, from 1894 to date, and has charge of the machinery connected with the terminal station, including arc and incandescent electric lighting, cold-storage and ice plant, air-compressors, elevator machinery, storage battery, boilers, etc. Since 1899 he has been electrical engineer in charge of all electric lighting and power for the above-mentioned road. He is a member of the Engineers' Club, Philadelphia, and of the Delta Tau Delta fraternity.

Mr. Cox is a son of Edwin Marion and Alida (McCullough) Cox. He married Nellie Glover, July 14, 1894, and they have one child, Harold Marion Cox.

Cox, John Lyman (M.E., '87), was born in Philadelphia, Pa., in 1866; son of James S. and Mary F. (Hazard) Cox. He was



J. L. Cox

educated in private schools, finishing his preparation for the Institute by a special course in the Stevens High School. Early in the year 1888 he entered the employ of the Midvale Steel Co., of Philadelphia, and shortly thereafter was made assistant foreman of the forge. Since 1896 he has been in charge of this department, which includes the hammer, tilting, and hydraulic press shops, as well as the blacksmith shop, rolling-mill and shipping-department. He has taken an active part in many of the improvements and extensions which have marked the phenomenal growth of these works in recent years.

Mr. Cox is a member of the University Club of Philadelphia, of the Society of Colonial Wars, the Geographical Society of Philadelphia, the American Geographical Society, and of the Pennsylvania Academy of Fine Arts.

Coyne, Frank Henderson (M.E., '94), was born in East Orange, N. J., June 25,



F. H. Coyne

1873. He attended Stevens Preparatory School, 1888–90. He was superintendent of the sulphite mills of the Remington Paper Co., Watertown, N. Y., 1894–95; manager of the Carson Creek Gold-Mining Co., Angels' Camp, Cal., 1895–97; took a special mining engineering course at Massachusetts Institute of Technology, 1897–98; was engineer with Fraser & Chalmers, Chicago, 1898; superintendent of Pecos Sulphur Co., Pecos,

Tex., 1899; president and general manager of the New Jersey & Missouri Zinc Mining Co., and of the Standard Zinc Co., Webb City, Mo., 1900–01; general manager of the Waverly Gold Mines Co., Waverly, N. S., and the Rose Blanche Gold Mines Co., Newfoundland, 1901–02. From 1903 to date he has been conducting a general mechanical and mining engineering business at Chicago, Ill. He is a member of the American Institute of Mining Engineers, of the University Club of San Francisco, of the New York Athletic, Orange Athletic, Chicago Athletic, Halifax, Union, and Orange clubs, and of the Theta Xi and Theta Nu Epsilon fraternities.

Mr. Coyne is the son of John and Mary Sears (Kendall) Coyne. His father was born in Ireland of Irish-French Huguenot ancestry, and came to this country and settled in East Orange in 1840. His mother was born in Concord, Mass., of Scotch-English Puritan stock whose ancestors came to America in the seventeenth century. He married Frances Smith Moffett, April 22, 1900.

Craft, Morgan E. (M.E., '95), was born in New York city May 15, 1869; son of



M. E. Craft

Elijah R. and Julia M. Craft. He was of old Revolutionary stock, and his father served in the Union army from 1861 to 1865.

While a student at the Institute he was engaged as instructor in manual training and mechanical engineering at the high school at Montclair. After graduation he was appointed assistant to Prof. Leeds, in the Department of Chemistry at Stevens Institute. Owing to ill health he was compelled to relinquish his duties in 1897, and was unable thereafter to resume his work. He died at Phœnix, Arizona, November 18, 1899. He was a member of the New Jersey Athletic Club and of the Chi Phi fraternity.

Cremer, James M. (M.E., '76), was employed for nearly a year at the Midvale Steel Works, Philadelphia, Pa., as assistant to the chief engineer and under the direction of the superintendent and assistant superintendent. His duties included general work in draughting, testing of steel for tensile strength and other properties, and other special work. After leaving the Midvale Steel Works he was for a time draughtsman for Messrs. Taws & Hartman, Philadelphia, Pa., on blast-furnace work and on the Siemens-Cowper-Cochrane hot-blast stoves. He then took a position with Wm. B. Bement & Son, Philadelphia, where he remained about three years, being engaged upon heavy work which included a great variety of machine-tools, also upon steam and hydraulic work. In 1882 Mr. Cremer became assistant to Wm. M. Barr, then superintendent of the Cummer Engine Co., Cleveland, O. He was employed upon special work in connection with the design of a complete line of steam-engines and of special tools and jigs for their manufacture. When Mr. Barr resigned his position, Mr. Cremer assumed part of the duties of superintendent at the Cummer Co. Early in 1886 he received an offer from Mr. Barr (then superintendent of the works of H. R. Worthington) of a position similar to the one he originally held with the Cummer Co., which he accepted. He then began designing special tools, etc., making drawings for two large machines, from one of which designs a number of engines were built. He was afterward put in charge of the purchasing department of H. R. Worthington. He also had charge of the making of contracts for new buildings and alterations and extensions of the works. Owing to changes in the organization of the Worthington Co. in 1893, Mr. Cremer's connection with it ended, and

he accepted, for a short time, a similar position with the firm of J. B. & J. M. Cornell, New York. Since April, 1896, he has been engaged in the sale and installation of the Nash gas engine for electric lighting and power, for the National Meter Co., New York.

He has written a number of articles relating to the Nash gas and gasoline engines for various technical journals, besides attending to the gas-engine catalogue work for the National Meter Co.

Crisfield, James Alfred Pearce (M.E., '87), was born in Chestertown, Md., in November,



J. A. P. Crisfield

1864. He was with the Welsbach Incandescent Gas Light Co., New York, 1887–89; assistant superintendent and secretary of the Mutual Gas Light Co., Savannah, Ga., 1889–94; superintendent, for the United Gas Improvement Co., of the Mutual Gas Light Co., at Savannah, 1894–99; designing engineer for the United Gas Improvement Co., Philadelphia, 1899–1904; and is now engineer of construction for the same company. He is a member of the American Gas Light Association and of the Theta Xi fraternity.

Mr. Crisfield is the son of Arthur and Charlotte A. L. Crisfield. His ancestors were lawyers and physicians as far back as anything is known of them. He married Josephine Noble Jones in December, 1894, and they have three children, Lillie Habersham, Arthur Woodland, and Josephine Neyle Crisfield.

Cromwell, Jacob Ellsworth (M.E., '97), was born in Piedmont, W. Va., February 8, 1870; son of Andrew Jackson and Margaret Ann Cromwell. His paternal ancestors were residents of Maryland, and those on the maternal side, of Virginia. Maternally he is a branch of the same family tree as George Washington. He received his early education in the public schools of Baltimore. After leaving the high school he served as an apprentice in the Baltimore & Ohio railroad shops, during which time he attended and graduated from the Maryland Institute of Art and Design. Since graduating from Stevens he has been handling general engineering work in the Baltimore & Ohio draughting-room, and is now special inspector in the motive power department of the Mt. Clare shops of the company.

Cronise, Ernest S. (M.E., '81), was born in New York, October 16, 1861. He was an apprentice in the Fort Wayne shops of the Pennsylvania Railroad in the spring of 1882; engaged on expert work for the motive-power department of the New York,



E. S. Cronise

West Shore, & Buffalo Railroad, and also held the position of superintendent of car-

construction of this road, at the Pullman shops. In 1885 he entered the shops of Henry R. Worthington, Brooklyn, N. Y., and at the end of a year was engaged in superintending the erection of various Worthington pumping-engines for waterworks. Among these may be mentioned two vertical engines for the Cincinnati Waterworks, of 25,000,000 gallons capacity, which was the first vertical direct-acting pumping-engine of any size ever constructed. Later he was confidential secretary in New York, and superintendent of branch offices and agencies of Henry R. Worthington. In September, 1894, he established himself in New York as a consulting engineer and railway expert. His contributions to the "Bond Record" received favorable comment from leading American and English financial papers, and his reports on the Baltimore & Ohio Railroad, and on the Erie Railway, which also appeared in the "Bond Record," were esteemed by prominent financiers as remarkable for their scope and clearness. He was engaged upon reports of other railway systems when an attack of malarial fever caused his death, September 14, 1896.

Crowell, Henry Walcott (M.E., '99), was born in Newark, N. J., September 6, 1877.



H. W. Crowell

He was assistant foreman and draughtsman with the Lambert Hoisting-Engine Co., Newark, N. J., 1899–1901. Through competitive examination, in which he took first rank, he secured a position in the equipment department of the electrical branch of the New York Navy Yard, which he has held from November, 1901, to date. He was associated with Mr. W. B. Rainsford in the preparation of a graduating thesis on "Experimental Determination of the Steam Consumption of an Automatic Engine at Exceptionally High Speeds," published in the *Stevens Institute Indicator*, January, 1900.

Mr. Crowell is the son of Joseph Grover and Laura F. Crowell. He married Blodwen Sauvage, December 10, 1902.

Cuming, Thomas B. (M.E., '95), has been connected, since graduation, with the Worthington Pump Co., and the Meyer-Sniffen Co., Ltd., both of New York. During the war with Spain Mr. Cuming served on board the U. S. S. "Yankee."

Cuntz, Hermann Francis (M.E., '93), was born in Hoboken, N. J., July 21, 1872. Immediately after graduation he spent a few months as assistant engineer of tests in the Department of Awards of the World's Columbian Exposition. For ten months thereafter he was assistant engineer in the testing department of the Pope Manufacturing Co., Hartford, Conn., in which he had entire charge of all steel analyses for a manufacturing establishment which bought strictly on specification, and also had charge of physical tests and investigations into bearings, friction, strength, and all parts under peculiar stress in special articles of manufacture, and particularly work on very elaborate tests in the matter of chemical and physical qualities of cold-drawn seamless steel tubing. For eleven months he was in the bridge and construction department of the Pennsylvania Steel Co., engaged in draughting, bridge and structural work, estimate and cost, and erection work. He then spent four months in New York, first in a private undertaking, and then examining data concerning copper, gold and platinum mines, and similar subjects; also assisting on erection work for a steel buildings contractor in New York. In December, 1895, he entered the employ of the Pope Manufacturing Co. as engineering and general assist-

ant to the vice-president. Since that date his work has gradually concentrated on the patent work of the company, specializing in the general subject of road propulsion, and he had the oversight of all the automobile patent matters in connection with his other duties. Early in 1896 his attention was particularly attracted to the now famous Selden gasmobile patent, and he immediately started careful search, and historical, technical study, drawing his company's attention to the matter. This resulted ultimately in their acquiring the control of these basic automobile patent rights, through the considerate and broad-minded and able handling of which by the companies with which he was successively associated it formed a basis for broad patent protection for this new industry. This wholesome patent protection promises well for the rapid and healthy development of an industry, enjoyed by all the able manufacturers interested, as compared with the prevalent single-head monopolies which have become so numerous in our manufacturing enterprises in the last fifteen years. The Selden patent is now looked upon as marking the third great epoch in mechanical land propulsion.

He is now devoting half his time to the Electric Vehicle Co., of Hartford, and the other half to the Association of Licensed Automobile Manufacturers, and has his office in New York. He is making a specialty of what he terms "manufacturing patents managing," and is rendering services as an expert in this special branch of a combination of engineering and patent work.

On December 14, 1899, he was duly registered in the United States Patent Office as attorney, and entitled to practise before that office.

At the outbreak of the Spanish-American War, as an officer in the Second Division of the Connecticut Naval Battalion, he volunteered for service, and after examination at Niantic was commissioned in June, 1898. He served as ensign, including, besides watch duty, engineering and paymaster's work on the U. S. S. "Sylvia." The "Sylvia" went south in July, and was stationed at Key West and on the Havana blockade. His service concluded in three months with an honorable discharge at the close of the war. Thereafter he was appointed navigator on the staff of the Connecticut Naval Battalion. He resigned in October, 1899, after four years' service in the State Naval Militia. He has patents taken out for the following: Design of crank-shaft bracket, 1897; velocipede, 1898; gear-cutting machine, 1899; device for indicating condition of storage batteries, 1900; a gear-cutting machine, 1901, and automobile-controlling mechanism, 1903. He has applications pending for patents for other inventions. He is a member of the Engineers', Transportation, Automobile Trade, Hartford, and Hartford Canoe clubs, of the Automobile Club of America, and of the Hartford Scientific Society. He was formerly a member of the New York Athletic Club.

Mr. Cuntz is the son of Emil A. H. and Frances (Cooper) Cuntz. His father's family were all German, and were prominent in commercial, legal, educational, and also, to some extent, in engineering affairs. His mother's family were scientists and merchants. His grandfather Cooper was an eminent naturalist, and his great-granduncle, Samuel Wilson, of Troy, N. Y., was probably the original "Uncle Sam." Mr. Cuntz married Frieda Jenny Sophie Moldenhauer (now deceased), March 14, 1900. One child, Frieda Frances Cuntz, was born to them.

Cuntz, John Henry (M.E., '87), was born in Hoboken, N. J., August 9, 1866; brother of the preceding. He graduated from the Hoboken Academy in 1881. Previous to entering the Institute in 1886, he was graduated from the Rensselaer Polytechnic Institute, Troy, N. Y., in 1886, with the degree of Civil Engineer. He was employed for a time at Edison's Laboratory at Orange, N. J., and then as graduate assistant at the Stevens Institute. Later he entered Yale University as a graduate student. During the war with Spain he served as ensign in the United States Navy. He is now with *The Engineering Magazine* of New York. He is a member of the American Association for the Advancement of Science, an associate member of the American Institute of Electrical Engineers, and a fellow of the American Geographical Society.

Cuntz, William Cooper (M.E., '92), was born in Hoboken, N. J., January 21, 1871;

brother of Hermann Francis and John Henry Cuntz. He was with the Pennsylvania Steel Co., at Steelton, Pa., as draughtsman in the bridge and construction department, 1892–93; in charge of outside construction, 1893–96 (train-shed of the Boston & Maine Railroad station at Boston, Mass., the Boston Subway, and other work in New England); attached to the Boston office as engineer for New England for the bridge and construction department during this period and until 1897; assistant to sales agent in the Boston office, 1897–1900; attached to the London office, 1900–01; and assistant to the general manager of sales, with the same company, at Philadelphia, 1902–03. Since January 1, 1904, he has been sales agent in the office at Steelton, Pa. He is a member of the Boston Society of Civil Engineers.

Dale, Orton Goodwin (M.E., '93), was born at Helensburgh, Scotland, November 8, 1870. He was draughtsman for the National Sugar Refinery, Yonkers, N. Y., 1893–95; in the New York office of the B. F. Sturtevant Co., 1895; inspector for the Mutual Fire Insurance Co., New York, 1895–96, until the dissolution of their inspection department; draughtsman with the C. W. Hunt Co., 1896; salesman for J. W. Hoffman & Co., New York and Philadelphia, 1896–97; and has been engineer with the John A. Mead Manufacturing Co., manufacturers of coal-handling machinery, from 1897 to date. A number of prominent coaling-stations have been designed and installed under Mr. Dale's directions, the principal one of which is at Frenchman's Bay, Me. (A view of this is shown herewith.) This plant has a storage capacity of 10,000 tons, and a handling capacity from colliers to storage of 160 tons



O. G. Dale

per hour for each tower, and a handling capacity from storage to war-vessels of 250 tons per hour. Another prominent coal-storage plant installed by Mr. Dale for the Mead Company is that at the Navy Yard, Washington, D. C. Mr. Dale is a member of the American Society of Mechanical Engineers, and of the Engineers' Club, of New York.



Naval Coaling-Station at Frenchman's Bay, Me.
O. G. Dale

The subject of this sketch is the son of James Jeffrey and Mary H. (Goodwin) Dale,

of Scotch and English descent. He married Amy Slade, February 12, 1896, and they have three children, Orton Goodwin, Amy Lane, and Frederick Slade Dale.

Dalrymple, Francis Clewell (M.E., '02), was born in Hoboken, N. J., February 11,



F. C. Dalrymple

1878; son of James M. and Kate R. Dalrymple.

Danziger, Jacob C. (M.E., '89), was draughtsman with the Atlantic Refining Co., Point Breeze, Philadelphia, 1889–90; was employed in the physical laboratory, and later as night superintendent, of the blast-furnaces of the Bethlehem Iron Co., Bethlehem, Pa., 1890–95; a consulting engineer in Detroit, 1895–97; consulting engineer and contractor 1897–1900; and from 1900 to date has been a member of the firm of Cowles & Danziger, manufacturers of steel barrels under United States patents granted to them.

Darbee, William (M.E., '97), was assistant engineer with the Kings County Electric Light & Power Co., Brooklyn, N. Y., 1897–98; local manager of the Connecticut Lighting & Power Co., South Norwalk, Conn., 1898–1901; and has been connected with the Connecticut Railway & Lighting Co., Bridgeport, Conn., from 1901 to date. He is a member of the Tau Beta Pi fraternity.

Darby, John (M.E., '91), was draughtsman in the ordnance department at the Washington Navy Yard, 1891–92; held a similar position with the Link-Belt Engineering Co., New York, 1892; and later became a member of the firm of Wolcott & Darby, mechanical engineers, Hartford, Conn. Some of the firm work carried on under Mr. Darby's personal supervision was the making of extensive topographical surveys for the Hartford Park Commission, and making plans and estimates and drawing up specifications for work in the park system, also the designing of special automatic machinery and the development of inventions. In September, 1899, Mr. Darby went to Harrisburg, Pa., where he took the position of chief draughtsman for the Harrisburg Foundry & Machine Works in that city. He held this post until December, 1901, when he was transferred to New York, with the title of chief engineer, attached to the New York office.

Dashiell, Wm. W. (M.E., '79), was employed in the engineering department of the American Steamship and International Navigation companies at Philadelphia and Jersey City, 1879–85; was secretary and superintendent of the Bayonne & Greenville Gas Light Co., Bergen Point, N. J., 1885–88; mechanical expert with the firm of Swan & Finch, New York, 1888–90; consulting engineer and mechanical expert in New York, 1890–91; and consulting engineer and expert in lubrication, New York, 1892–93. He became a member of the firm of W. W. Dashiell & Co., New York, dealing in motive power and machinery supplies in 1893, and is still engaged in this business. He has been vice-president and general manager of the New York Lubricating Oil Co. since 1893, and vice-president of the Bayway Refining Co. since 1900. He is a member of the American Society of Mechanical Engineers and of the Engineers' Club, of New York.

Dates, F. D. (M.E., '97), was employed in the consolidated works of the Gas Engine & Power Co. and Charles L. Seabury & Co., yacht builders, at Morris Heights, N. Y., 1897–1900; and has been with the Robins Conveying Belt Co., New York, from 1900 to date.

Davey, Warren (M.E., '97), was born in Jersey City, N. J., March 17, 1876. He was draughtsman for Colgate & Co., Jersey City, 1897–98; foreman with William E. Uptegrove & Bro., New York, 1898–99; assistant engineer with the Findlay, Fort Wayne, & Western Railroad, Findlay, O., 1899; superintendent of the Findlay Crushed Stone Co., 1899–1900; and has been superintendent for Carl H. Schultz, Inc., manufacturer of artificial mineral waters, New York, from 1900 to date. He is a junior member of the American Society of Mechanical Engineers and a member of the Hudson County University and New York Railroad clubs.

Mr. Davey is the son of Edmund H. and Emma (Stiles) Davey. He married Celeste A. Abrams, February 7, 1903.

Davis, H. R. (M.E., '98), was an instructor in boiler-testing during the Supplementary Term at Stevens Institute, 1898; was in the employment of W. S. Rockwell & Co., New York, designers and builders of metallurgical furnaces, 1898–1900; vice-president of the Rockwell Engineering Co. 1900–04; and is now with the Gorham Manufacturing Co., Providence, R. I. He is a member of the Tau Beta Pi fraternity.

Davis, Jesse Andrew (M.E., '91), was born in South Amboy, N. J., December 6, 1870; son of Andrew J. and Amanda Woodhull (Houston) Davis. He served with the Baltimore & Ohio Railroad under the general superintendent of motive power, Baltimore, Md., 1891–97; was engaged for two years in the draughting-room, reporting to the mechanical engineer of the road; two years on inspection duty, reporting to the engineer of tests, and the rest of the time on experimental work and inspection of cars building by the Michigan Peninsula Car Co., and of locomotives building at the Baldwin Locomotive Works. He was engaged on steel inspection duty for the United States Navy Department, 1897–1900, during which time he was detailed to the Midvale Steel Co. while manufacturing the machinery forgings for the battleships "Kearsarge," "Kentucky," and "Alabama;" to the Shelby Tube Co. on seamless steel tubes for torpedo-boats and torpedo-boat destroyers; and the Pennsylvania Steel Co., and Central Iron & Steel Co., on material for a floating steel drydock for Algiers, La. From 1900 to date



J. A. Davis

he has been in the sales department of the Pennsylvania Steel, Maryland Steel, and Central Iron & Steel companies, with headquarters at Baltimore, Md., under the management of R. C. Hoffman & Co., sales agents for the Southern States. He is a member of the Franklin Institute, the American Society of Mechanical Engineers, the Harrisburg Club, Harrisburg, Pa., and the Baltimore Country Club, Baltimore, Md.

Daw, William Lawrence (M.E., '01), was born in New York in 1878; son of William E. and Emily (Parker) Daw. He was an electrician with the General Electric Co., Lynn, Mass., in 1901; electrician with the New York & New Jersey Telephone Co., Brooklyn, N. Y., 1901; draughtsman for the W. & A. Fletcher Co., Hoboken, N. J., 1901–03; and is at present inspector for the Middle States Inspection Bureau, New York. He is a member of the Phi Sigma Kappa fraternity.

Dawes, H. F. (M.E., '79), was employed in the Mason Machine Shops, Taunton, Mass., 1879–80; with the Fairmount Shafter Mining Co., Idaho Springs, Colo., 1880–82; as superintendent of mine at Riley, Inyo County, Cal., 1882–83; (no record from

1883–85); located at Englewood, N. J., 1885–86; was chemist with the Port Henry Steel & Iron Co., 1886–87; and later chemist at Englewood, N. J. He is not now engaged in any active business.

Dawes, Lewis C. (M.E., '83), was from 1891 to 1901 editor of the "Metal Worker," New York, having been engaged in an editorial capacity from the time of his graduation until his retirement in the last-named year. He is not engaged in business at the present time.

Dawson, Edgar R. (M.E., '88), is not engaged in active business. His home is in Baltimore, Md.

Dear, William Yerrington (M.E., '93), was born in Jersey City, N. J., December 10, 1872. For a short time after graduation he served an apprenticeship in a printing-shop as feeder and pressman, and then went out to solicit business. He has been salesman for the Jersey City Printing Co., since 1893 and has been secretary from 1901 to date. For the past three years he has given special attention to the manufacturing of memorandum calendar pads, for which he has designed, constructed, and patented a machine for collecting the leaves into a pad. This machine was built in the company's own machine-shop under Mr. Dear's personal supervision. He has since been engaged in the construction of another machine for feeding paper to a punch and delivering the same. He is a member of the University Club, of Jersey City.

Mr. Dear is the son of Joseph A. and Kate Barber Dear. He married May B. Burgett, November 29, 1899.

De Bonneville, Arthur A. (M.E., '78), was born in New York city February 15, 1858. His early education was received in Hoboken Academy, Martha Institute, and Stevens High School. His first professional work was in the motive-power department of the Erie Railroad Co., at Buffalo, N. Y., and Susquehanna, Pa., 1878–83; with the De Lamater Iron Works, New York; designing steam pumps, hot-air engines, gas-engines, and a general line of machinery, 1883–88; and in charge of the gas-engine department of the De Lamater Iron Works, 1888; and with the George F. Blake Manufacturing Co., as engineer and salesman, 1888–90. He then studied law and was admitted as an attorney-at-law in New Jersey in 1896. Since that time he has taken out many United States and foreign patents and has been engaged in expert mechanical work. He now practises as attorney-at-law and solicitor of patents in New York. He is the designer of special transfer cranes in successful operation for foundry work. He contributed an article on "Artesian Wells" to the *Stevens Indicator*, XIII, 298. His thesis on "The Theory and Manufacture of Springs" was published in *Van Nostrand's Engineering Magazine*, May and June, 1878.



A. A. De Bonneville

He is a member of Zeredatha Lodge 131, Free and Accepted Masons, Jersey City, N. J.

Mr. De Bonneville is the son of Arthur A. and Laura (Decking) De Bonneville. He married Wilhelmina E. Hubbe, August 9, 1888. One child, Wilhelmina Hubbe De Bonneville, has blessed this union.

De Camp, Lyon (M.E., '00), spent several months abroad after graduation, and upon his return engaged in his present occupation in the lumber business at Fulton Chain, Herkimer County, N. Y.

He married Beatrice Sprague, March 1, 1905.

Decker, Edwin Lanson (M.E., '96), was born in Newark, N. J., November 14, 1873. He served with Frederick N. Taff (M.E., '95) as road contractor, 1896; was employed at the Lucy Furnaces of the Carnegie Steel Co., 1896–97; and is now secretary, treasurer, and general manager of the Uehling-Decker Co., and of the Friction Door Check Manufacturing Co., both of which have factories located at Passaic, N. J. In June, 1898, he read a paper before the Franklin Institute, Philadelphia, on "The Flow of Air Through



E. L. Decker

Small Apertures as Applied to the Measurement of High Temperatures and Analysis of Gas."

Mr. Decker is the son of Edwin B. and Mary Phillips Decker. He married Bertha Chedister Thompson, February 16, 1898, and they have two children, Lewis Thompson and Mary Phillips Decker.

Decker, Rudolph J. (M.E., '99), was employed in the Philadelphia works of the Midvale Steel Co., in 1899; with the Buffalo Forge Co., Buffalo, N. Y., in charge of the engine department, 1899–1900; at the Holley Pump Works, Lockport, N. Y., 1900; as mechanical engineer for the mines and smelter of the Montana Ore-Purchasing Co., Butte, Mont, 1900; and in the construction department of the new smelter of the Anaconda Copper Mining Co., Anaconda, Mont., 1900–01. He has been a consulting and contracting engineer at Salt Lake City, Utah, from 1901 to date. In 1899 he was granted a patent for the drying of pulp, incident to the manufacture of beet sugar. He is a member of the Montana Society of Engineers.

De Gress, Francis Barrett (M.E., '91), was born in Hoboken, N. J., June 22, 1869. He lived in Mexico from 1875 to 1881, and went to Bonn, Germany, in 1882, remaining there at school for three years. He entered the employ of the Crocker-Wheeler Co. in 1891. The following year he was placed in charge of the testing and inspecting department, and continued this work for four years, when he was transferred to the sales department as office engineer, and shortly after was attached to the New York office of the company. He remained in New York for three years, when in 1899 he was placed in charge of the Pittsburg, Pa., branch office. On October 1, 1901, he was again transferred to the New York office, this time as manager. While acting as office engineer and manager he had charge of the electrical equipment of several plants where Crocker-Wheeler apparatus was used, among them the New Jersey Zinc Co., Hazard, Pa.; Post & McCord, Greenpoint, N. Y.; the National Tube Co., McKeesport, Pa.; and the Colliery Engineer Co., Scranton, Pa. He has translated, from the German, Dr. Arnold's "Armature Windings;" the translation being published by the Van Nostrand Co. He is a member of the Chi Psi fraternity.

Mr. De Gress is the son of Francis and Isabella Stafford (Greene) De Gress. His family name was originally Gress. His great-grandfather was chief justice of the Supreme Court in Wetzlar, and was created Baron of the Holy Roman Empire, with the prefix "von," in 1774. Members of his mother's family were among the first settlers in New England and Georgia. Mr. De Gress married Edith Cornwell Stodart, April 12, 1894, and they have one child, Francis Barrett De Gress, Jr.

De Hart, John S., Jr. (M.E., '90), was born in Jersey City, N. J., February 14, 1869. He prepared his graduation thesis on the results of tests made on coal-handling machin-

ery as built by the Link-Belt Engineering Co., and after graduation engaged with this company at Nicetown, Pa., as draughtsman. His time there was devoted exclusively to



J. S. De Hart, Jr.

coal-handling machinery as applied to equipments for railroads. Later he spent three months with the Henry Warden Co., of Germantown, Pa., in the estimating and testing department. Their work consisted in the manufacture of boilers and wrought-iron tanks. In the spring of 1891 he took a position with the Isbell-Porter Co. as draughtsman. Later he was detailed to construction work in various parts of the country, and now holds the position of president. He is a member of the Chi Psi fraternity.

Mr. De Hart is the son of J. S. and M. F. De Hart. He married Katharine Seward, April 16, 1900, and they have one child, John Seward De Hart.

Delamater, Oakley R. (M.E., '98), has been engaged in experimental work in New York since graduation.

Da la Rosa, Francisco U. (M.E., '91), was topographical engineer for the State of Oaxaca, Mex., 1891–93; superintendent of an electric-light plant in the city of Oaxaca, 1893–94; engaged at the Washington Hotel, city of Mexico, 1894–95; and engineer for the "India Rubber Co., Limited, Mexico" 1895–1900. He engaged in engineering work, 1900–01, and from the latter date to the present time has been employed in mining work and as consulting engineer for the Mexican Southern Mining Co.

Demarest, Thomas W. (M.E., '88), was employed in the Department of Tests of the Stevens Institute with Prof. Denton, 1888, and with the Standard Oil Co., 1888–89. In August of the latter year he engaged in the service of the Pennsylvania Lines West of Pittsburg, serving two years as special apprentice in the Columbus, O., shops; three months as shop and motive-power office draughtsman; about six years in special work under the direction of the superintendent of motive power; one year as assistant to the master mechanic and one and a half years as general foreman of the locomotive department at the Indianapolis shops of this company; five months as master mechanic of the shops at Logansport, Ind.; from January, 1900, to August, 1903, as superintendent of motive power of the South-West System, and since the latter date he has held the same office on the North-West System. Mr. Demarest has been actively engaged for several years in special and permanent committee work for the Master Car-Builders' Association and also for the Master Mechanics' Association.

Dent, Edward Linthicum (M.E., '84), was born in the old family residence, Georgetown Heights, D. C., July 5, 1861. His early education was received at Georgetown College and at Columbian University, where he was a student in both the preparatory and collegiate courses, receiving from the latter the degree of Bachelor of Science. He was an engineer and contractor for steam and power plants, 1885–90; manager and superintendent of the E. L. Dent Iron Works, Washington, D. C., 1887–95; consulting engineer on structural and architectural iron work, 1895–96; estimator and designer for the Berlin Iron Bridge Co., 1896–97; mechanical engineer and draughtsman with Morris, Tasker, & Co., New Castle, Del., 1897–98; with the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., 1898–99. Jointly with H. F. Hayden, superintendent of the Water Department of the Dis-

trict of Columbia, he took out a patent for a fire hydrant in 1889. This hydrant is now exclusively used in the District. While engaged as consulting engineer, as mentioned above, he did much for the government, including work on the United States Observatory at Washington, D. C. He was a member of the American Society of Mechanical Engineers, of the Metropolitan Club, of Washington, and of the Chi Phi fraternity. He died of typhoid fever at Wilkinsburg, Pa., October 19, 1899. His remains were brought home to Washington and buried in the family vault in Oak Hill Cemetery, Georgetown.

Mr. Dent was the son of Josiah and Mary Katherine Dent. His ancestors, English on both sides, settled in lower Maryland. His grandfather, Edward Magruder Linthicum, endowed the Linthicum Institute of Georgetown, a night school for poor boys, in which the subject of this sketch founded a class in mechanical and architectural drawing, and taught it himself for a year, giving prizes for proficiency. He married Mary Gantt Taylor, April 23, 1889, and they had



E. L. Dent

three children, Edward Linthicum, Jr., Mary Katherine, and James Armistead Dent.

Denton, James E. (M.E., '75), Professor of Engineering Practice at the Stevens Institute of Technology. For biography, see page 240.

Denton, Waldo Emerson (M.E., '96), was born in Roslyn, L. I., September 4, 1875;

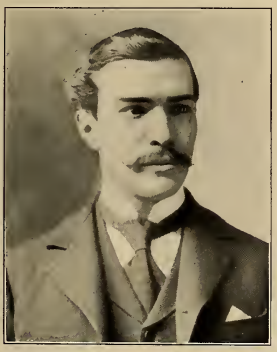


W. E. Denton

son of George W. and Emma P. (Haskins) Denton. He is descended from Robert Haskins, the first of the name to settle in the Colonies. John Haskins's daughter Ruth was the mother of Ralph Waldo Emerson. Mr. Denton in 1896 held a position under the city government of New York, and was employed in surveying streets in the upper part of the city. He then became a draughtsman in the machinery department of the Central Railroad of New Jersey, Jersey City, N. J., being advanced in 1900 to the position of chief draughtsman, having charge of the designing of new rolling-stock, shops, etc. He became representative of the Midvale Steel Co., with headquarters at its New York office, 1902; and in 1904 resigned to take a similar position with the American Blower Co. He is a member of the New York Railroad Club, and of the Tau Beta Pi fraternity.

Dickerson, Walter Howell (M.E., '96), was born in Newark, N. J., December 8, 1874; son of Lemuel F. and Sarah Jane Dickerson. He is of English descent, one branch of the family being among the earliest English settlers in America, and the other branch coming over considerably later, but previous to the Revolution. Both branches ultimately settled in New Jersey.

Young Dickerson received his early education in the public schools of Newark, N. J., leaving the high school there to enter Stevens Preparatory School. After graduation he became mechanical engineer with the Atlas Manufacturing Co., Newark, N. J., 1896–97; was associated with Mr. Charles E. Tripler, of New York, in the investigation of compressed and liquefied air, 1897–98; with the Canadian Rand Drill Co., Sherbrooke, Que., as draughtsman and engineer, 1898–99; assistant forge-master at the Midvale Steel Co.'s works, Philadelphia, 1899; was employed in the laboratory of Thomas A. Edison, Orange, N. J., 1899–1900; engineer for the Tripler Liquid Air Co. at the Paris Exposition, 1900; and was engaged in special engineering work in England, 1900–01. He was next engaged with the American Can Co. at their machine-shop in Brooklyn, N. Y., 1901–02; as salesman with the International Steam Pump Co., 1902; as engineer for the Consolidated Liquid Air Co., New York, in the same year; and during 1903



W. H. Dickerson

was engineer for the Tripler Liquid Air Co., of New York.

During the period 1896–98 he also did considerable investigation in the subject of high-pressure compressed air; among other work making a complete test of a three-stage high-pressure air-compressor, compressing air to 2,500 pounds to the square inch, and including indications of all the stages. This test was the first one of its kind made. At various times he also delivered several lectures upon the subject of liquid air. He wrote an article on "Liquid Air," which was published in the *Stevens Institute Indicator,* April, 1898. During the following year he experimented in the physical laboratory of Stevens Institute and determined the latent heat of liquid air. Shortly after, he prepared an article on "Latent Heat of Evaporation of Liquid Air," which was published in the *Stevens Institute Indicator,* October, 1899. Mr. Dickerson is a member of the Franklin Institute, and of the New York Railroad Club.

Dietz, Carl Frederick (M.E., '01), was born in New York February 12, 1880; son of Frederick Adolph and Caroline Dietz, both sides being originally German. He was employed in the engineering department of the Hamburg-American Steamship Line, Hamburg, Germany. From this department he was transferred to the S. S. "Pennsylvania" to do some practical work, and shipped as assistant for a voyage from Hamburg to New York and return. He then resigned his position and went to Berlin, where he enrolled in the Royal Technical High School, taking a course in land and marine engine and boiler designing. Having taken a year of postgraduate work, he returned to America, and for three months was with the United Telpherage Co., at their factory in Westfield, N. J. In January, 1903, he took a position with Mr. E. A. Uehling, M. E., (Stevens, '77) consulting engineer, New York, which position, as assistant to Mr. Uehling, he holds at the present time, being engaged principally in metallurgical engineering work. An article by him on "The Technical Schools of Germany" appeared in the *Stevens Institute Indicator,* October, 1902, and was reprinted in *Electricity,* November, 1902. Mr. Dietz is a member of the "Verein Deutscher Ingenieure," a junior member of the American Society of Mechanical Engineers, and a member of the Phi Sigma Kappa and Theta Nu Epsilon fraternities.

Dilworth, Walter G. (M.E., '79), was with Mr. G. S. Morrison, chief engineer of the Chicago, Burlington, & Quincy Railroad,

1879–80, acting as assistant engineer in charge of the construction of the bridge of this railroad over the Missouri River at Plattsmouth, Neb. He then became assistant engineer (1880–81) on the Yellowstone division of the Northern Pacific Railroad, in charge of the construction of the section of the road running from Miles City to Bozeman. In the latter year he established a real estate and surveying business, under the firm name of Dilworth-Yerkes, at Bozeman, Mont., and was elected county surveyor for Gallatin County, Mont., and laid out the streets in the town of Bozeman. While engaged in this work, an accident, due to a runaway horse, caused injuries which resulted in his death in October, 1882.

He was the eldest son of William H. and Mary D. (Skinner) Dilworth, and was born in Hoboken, N. J., October 24, 1858.

Dilworth, William S. (M.E., '85), was born in Hoboken, N. J., March 9, 1864. He has been connected with the firm of Gordon & Dilworth, manufacturers of table delicacies, New York, since 1885. He is a member of the Roseville Athletic Club, Newark, N. J.; past-regent of the Roseville Council, Royal Arcanum; a vestryman of St. Thomas's Episcopal Church, Newark, N. J., and a member of the Sigma chapter of the Beta Theta Pi fraternity.

The son of William H. and Mary D. (Skinner) Dilworth, he is a direct descendant of Capt. John Dilworth, R. N., who piloted the British fleet through the Delaware River to Philadelphia when that city was captured by the British, and soon after married Miss Aldrich, daughter of the Dutch governor of Delaware. Mr. Dilworth's mother is the daughter of Dr. Joshua Skinner, of North Carolina, and a descendant of William Bradford, printer, and contemporary of Benjamin Franklin. Mr. Dilworth married Ida J. Crevier, December 15, 1886, at Mount Holly, N. J., and they have one boy, William Lee Dilworth.

Dinkel, George (M.E., '88), was born in Boston, Mass., November 29, 1866. He was educated in the public schools of Jersey City, N. J., and after attending Stevens High School entered Stevens Institute. He entered the service of F. & O. Matthiessen & Wiechers in 1889, and has advanced to his present position as chief engineer with the American Sugar Refining Co., New York. He has taken out several important patents on sugar machinery, and is a member of the American Society of Mechanical Engineers.

Mr. Dinkel is the son of George and Barbara Dinkel. He married Bertha Bauman



George Dinkel

(since deceased), February 19, 1899. One child, Helen Dinkel (deceased), was the fruit of the union.

Dix, Walter S. (M.E., '87), was born in Forestville, Chautauqua County, N. Y., June 15, 1866; son of James Morse and Ophelia (King) Dix. He was employed in the shops and draughting-room of the E. W. Bliss Co., Brooklyn, N. Y., 1887–89; as chief draughtsman for the C & C Electric Co., New York, 1889–93; in miscellaneous engineering work, 1893–94; as head-draughtsman with the Stanley Electric & Manufacturing Co., Pittsfield, Mass., 1894–95; assistant to the works engineer of the Royal Electric Co., Montreal, Que., manufacturers of Stanley apparatus under royalty for the Dominion, 1895–99; with Westinghouse, Church, Kerr, & Co., New York, 1899–1901; and from 1901 to date on the engineering staff of Sanderson & Porter, engineers and contractors, New York. He has developed many patentable ideas in connection with his work, but has

taken out no patents. Several articles on mechanical and electrical subjects have been



W. S. Dix

contributed by him to technical journals. He is an associate member of the American Institute of Electrical Engineers.

Dixon, J. Alfred (M.E., '91), was born in East Orange, N. J. In July, immediately



J. A. Dixon

after graduation, he entered the employ of the Pintsch Compressing Co., New York, as assistant engineer, and for several months was engaged in the construction of special oil-gas plants. Early in 1892 he was made superintendent of the company's plant at Boston, where he remained for a year, and in 1893 succeeded to the position of engineer. In this capacity his duties included the designing and supervision of new plants, with their apparatus and machinery, and the operation of those already built. In 1902 he was appointed general superintendent. He is a member of the American Gas Light, and Western Gas Light associations.

Mr. Dixon married in the year 1898.

Dixon, Robert M. (M.E., '81), was born in East Orange, N. J., Sept. 19, 1860. He



R. M. Dixon

was draughtsman for the Delaware Bridge Co. until 1883, when he entered the employ of the Pintsch Lighting Co. In 1888 he became engineer of the Safety Car Heating & Lighting Co., and manager of the Pintsch Compressing Co., and in 1902 vice-president of both companies.

He has taken out about 50 patents for inventions. His lecture on "Railroad Car Lighting" before the Stevens Engineering Society, June 3, 1898, was published in the *Stevens Indicator,* October, 1890. He contributed an article on "The Combined Gaslight and Bell Buoy" to the *Stevens Indicator,* January, 1900. He is a member of

the American Society of Mechanical Engineers and of the American Gas Light Association.

Dodge, Robert M. (M.E., '99), was with the Brooklyn Rapid Transit Co., Brooklyn, N. Y., 1899–1902; and from thence to date has been in the draughting department of the General Electric Co., Schenectady, N. Y.

Doty, Paul (M.E., '88), was born in Hoboken, N. J., May 30, 1867. He entered the service of the United Gas Improvement Co., Philadelphia, in July, 1888, as cadet engineer, and was assigned to the Paterson (N. J.) Gas Works in January, 1889, as assistant engineer, being also, during the same year, assistant engineer at the Jersey City Gas Works on special work in distribution and construction. He returned to the Paterson Gas Works, and was appointed assistant superintendent, in January, 1890, continuing at Paterson until December, 1895. While with the United Gas Improvement Co., he prepared reports and discussions on the following subjects for the annual meetings of the superintendents of the company: "The Governor Burner;" "Services and Their Appurtenances;" "Steam in a Lowe Set;" "Care of Boilers and Machinery;" "Handling a Distribution Force;" "Locating and Repairing Street Main Leaks;" "Notes on the Manufacture of Oxide of Iron,"—and other special tests and reports.



Paul Doty

In December, 1895, he was appointed general manager of the newly organized Consolidated Gas Co. of New Jersey, a corporation controlling the gas and electric interests in Long Branch and vicinity, including Red Bank and Asbury Park. The plan of consolidation required the erection of a complete gas-manufacturing plant, also a novel distribution system. This work was accomplished and put in successful operation under Mr. Doty's direction in ninety days from the beginning of the work, and included many important contracts. He continued as general manager of the Consolidated Gas Co. about two years, when he was called in December, 1897, to represent Mr. Emerson McMillin, of the Consolidated Gas Co., in the organization of the gas companies at Buffalo, N. Y. His work having been satisfactorily accomplished in the latter city, he went to Grand Rapids, Mich., March 1, 1898, as general manager of the Gas Light Co. there, and in April, 1901, he accepted the position of general manager of the Detroit City Gas Co., Detroit, Mich., and the following month he was elected to the offices of secretary and director of the company.

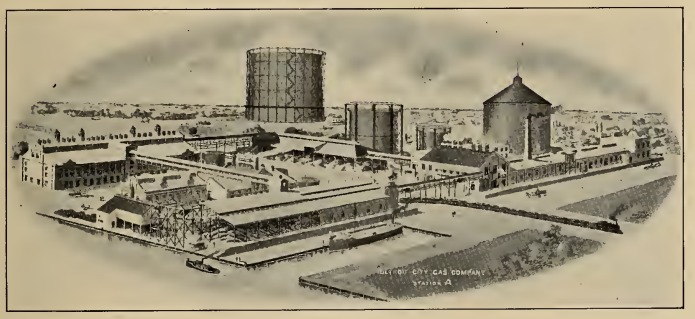
While at Detroit Mr. Doty planned and directed the building of a new works having a daily capacity of 2,500,000 cubic feet of carburetted water-gas at Station B; a new works at Station A, with an ultimate daily capacity of 4,000,000 cubic feet of coal-gas; and a purifying and pumping plant at Delray, with a daily capacity of 6,000,000 cubic feet of coke-oven coal-gas. The completion of these works, together with the task of laying street mains incident to the development of the property of the Detroit City Gas Co., required the disbursement of upward of $2,000,000. Since September 1, 1903, Mr. Doty has been vice-president and general manager (as well as manager for the receiver) of the Denver Gas & Electric Co., Denver, Colo.

The subject of Mr. Doty's thesis, "Report of Test of Naphtha Engine," was published in abstract in the *Iron Age*, July, 1888, and was also included in Prof. Wood's *Thermodynamics*, pp. 246–254 (second ed., 1888). The *Progressive Age* for December, 1895,

contains a comment by Mr. Doty on "The Commercial Value of Photometry," a paper presented by Mr. Alexander C. Humphreys, '81, to the American Gas Light Association. In 1897 Mr. Doty read a paper on "Burner Stoppages" before the American Gas Light Association; in 1899, a paper on "The Causes Underlying the Formation of Naphthalene, and Their Prevention," before the Western Gas Association; in 1900, a paper on "Meter Testing," before the Michigan Gas Association; and in 1901, a paper on the "Analysis of Gas Accounts," for the American Gas Light Association.

He is a member of the American Gas Light Association (member of the Council 1900–01); director of the Western Gas Association during the years 1902 and 1903, and second vice-president 1903–04; associate member of the American Institute of Electrical Engineers; member of the American Association for the Advancement of Science and of the American Academy of Political and Social Science; ex-president of the Michigan Gas Association, 1902; member of the American Society of Mechanical Engineers, and of the St. John's Protestant Episcopal Church, Detroit; ex-trustee of the Union Benevolent Hospital, Grand Rapids, Mich.; ex-director of the National City Bank, Grand Rapids, Mich.; president of the McMillin Gas Companies' Association, 1902 (re-elected 1903); member of the Detroit Club, of the Municipal League, and Chamber of Commerce; deputy governor of the Society of Mayflower Descendants in Michigan, of the Society of Colonial Wars, and of the Caledon Mountain Trout Club. He is permanent secretary of the Class of '88, Stevens Institute.

Mr. Doty is the son of W. H. H. and Anna (Langevin) Doty, and is seventh in descent from Edward Doty, Pilgrim passenger in the "Mayflower" in 1620, who took part in the "First Encounter" in 1620, and was a member of Capt. Miles Standish's first military company, at Plymouth, Mass., in 1621. The subject of this sketch married Theodosia Stiles, only daughter of Gen. I. N. Stiles, U. S. V. (1861–65), February 10, 1892, at Chicago, Ill.



DETROIT CITY GAS CO.—STATION A.
Paul Doty

Dougherty, Wm. M. (B.S., '78), has been engaged in the profession of law since graduation, in Jersey City and Hoboken, N. J.

Doughty, William F. (M.E., '97), was draughtsman with the New York Sugar Refining Co., Long Island City, N. Y., 1897–99; with the International Paper Co., New York, 1899–1900; and has been with the New York & Boston Dyewood Co., Brooklyn, N. Y., 1900 to date. He received the degree of LL.B. from New York University in 1902.

Douglas, Edwin Rust (M.E., '93), was born in Brandon, Vt., September 26, 1872. He attended school in New York city, at White Plains, N. Y., and at Alfred University, Alfred, N. Y., before entering Stevens School in 1888. Immediately on completion of his thesis in 1893, and before graduation, he began work for the Howe Scale Co., Rutland, Vt., as blue-print boy and helper in the draughting-room, and in a short time became draughtsman, a position he retained for two years. In the winter of 1894–95 eyesight troubles forced him to give up draughting, and he undertook a postgraduate course in physics and mathematics at Harvard, entering the Graduate School in the following fall. During the summer of 1897 he obtained a position with the Crocker-Wheeler Co., manufacturers and electrical engineers, Ampere, N. J., which led to a later permanent alliance. During his last year at Harvard he gave instruction, as an assistant, in the Jefferson Physical Laboratory. In the spring of 1898 Mr. Douglas decided on a line of special study to be made the subject of a thesis for the degree of Doctor of Science, and devised a method for determining the specific heats of gases at high,



E. R. Douglas

though constant, pressure, and at temperatures approaching the point of dissociation. Owing to the expense of necessary apparatus, the danger involved in the experiments, which would have occupied a period of two years, and also to the fact that he was offered a desirable permanent position with the Crocker-Wheeler Co., and that he desired ultimately to enter the field of engineering rather than that of pure physics, he relinquished his hopes of the doctorate, but presented more than the full requirements for, and obtained the degree of, Master of Science, given for the first time that year.

During the summer of 1898 he was engaged in draughting and similar work for the Crocker-Wheeler Co., and in the fall he commenced in its laboratory a series of experiments on the properties of armatures and on commutation, on which he was engaged for about two years with occasional interrupting periods given to other matters, such as the design of motors and generators, a detailed investigation into the cost of manufacture of the company's product, helping to devise and put in operation a new stock-accounting and cost-keeping system, etc. Since the beginning of 1901 his attention has been increasingly given to shop installations and electric power for factories. He has been closely identified with mechanical and electrical equipment, from the power side, of the shops of the American Locomotive Co., Richmond Works; the William R. Trigg Shipbuilding Co.; the Lake Shore & Michigan Southern Railway, at Collingwood; the Pittsburg & Lake Erie Railroad, at Pittsburg; the American Bridge Co., at Pencoyd; the Jeanesville Iron Works at Jeanesville, Pa.; the Ingersoll-Sergeant Drill Co., at Easton, Pa.; the Ansonia Brass & Copper Co., at Ansonia, Conn.; the Allis-Chalmers Co., at Chicago; and others. In these the Crocker-Wheeler system of factory driving, with the development of which Mr. Douglas has been closely connected, has been employed.

Of the articles contributed by Mr. Douglas to the technical journals, the following are the most important:

"A Historical and Descriptive Review of Acetylene," *Stevens Institute Indicator*, July, 1897.

"The Design of Oil Slings," *American Machinist*, June 21, 1900.

"Some Thermodynamic Formulæ, Considering the Specific Heat a Function of the Temperature," *Stevens Institute Indicator*, October, 1900.

"The Heating of Electrical Machinery Under Two or More Regularly Alternating Conditions of Load," *Electrical World and Engineer*, May 11, 1901.

"Theory and Design of Mechanical Brakes," *American Machinist*, December 19–26, 1901.

Mr. Douglas is a member of the Harvard Graduates' and M. P. clubs, of Boston.

The son of Orlando Benajah and Mary Ann (Rust) Douglas, on his father's side, he is ninth in descent from William Douglas, English, of Scotch descent, who landed at Boston in 1640. On his mother's side he is ninth descendant from Henry Rust, English, of Norse descent, who landed at Hingham, Mass., in 1633. Mr. Douglas married Caroline Estelle Sleeper, July 12, 1899, and they have one child, Dorothy Douglas.

Dow, Alexander (M.E., '91), has been connected with the Dow Type Composing Co., New York, and practises as a mechanical engineer in that city.

Dow, B. P. (M.E., '76), died in 1878, and no record of his career from the time of his graduation has been obtainable.

Dreyfus, Theodore Frank (M.E., '98), was born in Brookhaven, Miss., March 22, 1878; son of Maurice and Pauline Dreyfus. His parents and ancestry are German. At the outbreak of the war with Spain he enlisted as a first-class fireman (May 17, 1898) in the New Jersey Naval Reserves, and soon afterward received a warrant as first-class water-tender. He served during the entire war, seeing considerable service in Cuba, and was mustered out October 7, 1898. In the following December, he entered the employ of the Illinois Central Railroad Co. at Chicago, Ill., as draughtsman in the office of the superintendent of motive power. The following year he was transferred to the Burnside shops of the same company where he began a special apprenticeship of two years. During the year 1901 he was employed as a machinist in the backshop and roundhouse of the Illinois Central Railroad Co., at Burnside. From September 1, 1901, to July 14, 1902, he was motive-power inspector with the Pittsburg, Cincinnati, Chicago, & St. Louis Railroad, Columbus, O. From July 14, 1902, to February 16, 1903, he was general foreman in the Lancaster shops of the Cincinnati & Muskingum Valley Railroad, Lancaster, O., and later general foreman in the loco-



T. F. Dreyfus

motive and car department of the Pendleton shops of the Pittsburg, Cincinnati, Chicago, & St. Louis Railroad, Cincinnati, O. Since August 1, 1903, he has been general foreman of the Erie and Ashtabula Division of the Northwest System of the Pennsylvania Lines West of Pittsburg. He is a member of the Western Railway Club, the Railway Club of Pittsburg, of the Tau Beta Pi fraternity, and a junior member of the American Society of Mechanical Engineers.

Dreyspring, Ernest (M.E., '85), was with the New York Plough Co., Yonkers, N. Y., 1885–86, and from the latter year to date has been connected with the Williamson Iron Co., Birmingham, Ala.

Drummond, Edwin May (M.E., '88), was born at Louisville, Ky., May 1, 1867. Since his graduation he has had charge of the mechanical department of the Drummond Manufacturing Co., Louisville, Ky., whose product consists of high-grade wagon and buggy axles. Under his management quality has been developed and improved, and cost of production materially reduced, and

a steadily increasing demand has grown for the company's product from local to national proportions. While in college Mr. Drummond displayed an active interest in practical engineering subjects and was one of the five founders of the Stevens Engineering Society. He is also one of the original members of the American Foundrymen's Association, organized in Philadelphia, Pa., in May, 1896; a charter member of the Engineers' and Architects' Club of Louisville, Ky.; a life member of the Polytechnic Society of Kentucky; and a member of the Beta Theta Pi fraternity.

Mr. Drummond is the son of William Whyte and Alice Thompson Drummond. His father was born in Paisley, Scotland, of Scotch parents; his mother, of English parentage, was born in Louisville, Ky. He married Carrie Dent Moon, May 2, 1889,



E. M. Drummond

and they have four children, William Russell, James Ainslie, Robert Pearce, and Alice May Drummond.

Ducommun, Edward (M.E., '88), was born in Hoboken, N. J., May 8, 1868. He was engaged upon lubrication tests for the Canadian Pacific Railroad, in the interest of the Standard Oil Co., 1888-89; as draughtsman with the firm of Watson & Stillman, New York, 1889; with the Riker Pump Co., 1890; as draughtsman with Mr. E. D. Leavitt, Jr., Cambridgeport, Mass., 1890–91; in the machine-shop and erecting department of the



Edward Ducommun

Henry R. Worthington Hydraulic Works, Brooklyn, N. Y., 1891–93; and has been assistant engineer for the American Sugar Refining Co., Jersey City, N. J., 1893 to date. He is a member of the American Society of Mechanical Engineers.

Mr. Ducommun is the son of Jules and Henriette (Atrel) Ducommun (French on both sides). He married Amelia E. Montague, April 26, 1893, and they have one child, Marguerite Ducommun.

Durrie, Clarence Nicoll (M.E., '00), was born in Jersey City, N. J., October 30, 1879; son of William Augustus and Stella Elizabeth (Nicoll) Durrie. On his father's side he is a direct descendant of William Bradford, first governor of Plymouth Colony. On his mother's side he is a direct descendant of Col. Richard Nicoll, first English governor of New York. He was assistant to Mr. Walter K. Freeman, consulting engineer on motive power, 1900, and upon the organization of the Hercules Motor Co. by Mr. Freeman, Mr. Durrie entered the shops and was soon made foreman in charge of the automobile work in all its branches, 1900–01. He was head draughtsman with the Model Machine Co., New York, 1901–02; and has held a similar position with the

Pierson-Sefton Co., Jersey City, N. J., designers, manufacturers and builders of horticultural structures, from 1902 to date. He is a member of the University Club of Hudson County, N. J., of the Signal & Telegraph Corps, N. G. N. J., the Jersey City



C. N. Durrie

Golf Club, the Jersey City Tennis Club, and of the Chi Phi fraternity.

Eastwood, James (M.E., '89), was born in Paterson, N. J., December 11, 1867. His early education was received in the public schools of Paterson. He prepared for college at Stevens High School and secured one of two scholarships which were conferred in 1885. He has been with the B. Eastwood Foundry & Machine Works, Paterson, N. J., from 1889 to date, being superintendent from 1891 to 1899. In June of the latter year he organized the Benjamin Eastwood Co., and was elected its president and treasurer, positions which he still holds. His whole time since graduation has been taken up in organization and improvements at the above works, including the design for a large modern foundry building and its equipment, which was built in 1899. He is a director of the Citizens Trust Co., Paterson, N. J., and a member of the Hamilton Club, of Paterson, and of the Chi Psi fraternity.

Mr. Eastwood is the son of native-born English parents, Benjamin and Sarah (Baxter) Eastwood. He married Louise Neer Woodward, September 14, 1898, and they



James Eastwood

have two children, Marion and Florence Eastwood.

Ebsen, Henry L. (M.E., '89), was engaged in the superintending engineer's department of the International Navigation Co., New York, 1889–98; with the W. & A. Fletcher Co., Hoboken, N. J., 1898–1900; and has been consulting engineer in New York city from 1900 to date. He has contributed the following articles to technical journals: "The Indicator as Applied to Marine Engines," *Marine Engineering*, April, May, and June, 1897; "Auxiliary Machinery of an Ocean Greyhound," *Cassier's Magazine*, VI, 369; "High-Pressure Indicator Diagrams," *Marine Engineering*, June, 1898. He is a member of the Society of Naval Architects and Marine Engineers.

Ebsen, Wm. A. (M.E., '90), was associated with Col. E. A. Stevens, president of the Hoboken Ferry Co., on the design of the double-screw ferryboats "Bremen" and "Hamburg," 1890–91. In this connection he made experiments on ferryboats in commission, in order to determine whether they possessed sufficient stability for double-decking. He was next in the employ of the W. & A. Fletcher Co., Hoboken, mak-

ing drawings of engines and boilers of the new ferryboats mentioned above, and was engaged upon other work of the same character 1891–94; was with the Geo. F. Blake Manufacturing Co., New York, as consulting and corresponding engineer, 1894–1902; and has been manager of sales for that company and for the Knowles Steam Pump Works from 1902 to date.

Echeverria, Ricardo Jose (M.E., '89), was born in San José de Costa Rica, February



R. J. Echeverria

14, 1866. He has been a director of the American Bank at Guatemala, is now engaged in coffee and sugar planting, and is president and general manager of the Street Railway Co., of Guatemala, of which he is principal owner. He is a junior member of the American Society of Mechanical Engineers; and a member of the International Club, Costa Rica; of the American and Guatemala clubs in Guatemala, and of the Theta Delta Chi fraternity.

Mr. Echeverria is the son of Francisco and Juana Aguilar de Echeverria. Both his father and his grandfather were respectively Secretary of War and Secretary of the Treasury in Costa Rica. He married Isabel Herrera, April 2, 1894, and five children, Maria Isabel, Ricardo Meguil, Margarita, Marta, and Eduardo Alberto Echeverria, have been born to them.

Edmunds, James Fornance (M.E., '99), was born in Norristown, Pa., December 1, 1874; son of Frank H. and Kate (Fornance) Edmunds. He was with Burhorn & Granger, engineers, New York and Philadelphia, 1899–1901, and has been employed in the testing department of the General Electric Co., Schenectady, N. Y., from 1901 to date.

Eicks, Carl Fanning (M.E., '02), was born in New York city, March 23, 1880; son of Casper H. and Joanna Fanning Eicks. He was employed for a short time with the Underfeed Stoker Co. at New York and Montreal, and then with the C. W. Hunt Co., West New Brighton, N. Y., until the time of his death, September 25, 1904. He was a junior member of the American Society of Mechanical Engineers, an associate of the Canadian Society of Civil Engineers, and a member of the Tau Beta Pi fraternity.

Elleau, Louis Antoine (M.E., '97), was born in Hoboken, N. J., May 25, 1876; son of Louis H. and Helena Elleau. He studied in the Columbia School of Mines, 1897–98; was with the Safety Car Heating & Lighting Co., New York, 1898–99; and with the Essex & Hudson Gas Co., Newark, 1899–

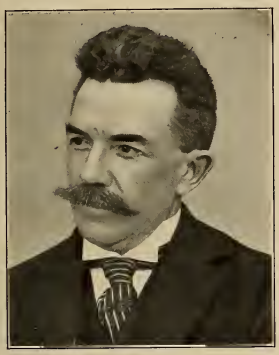


L. A. Elleau

1902. He died at Newark, N. J., October 9, in the latter year. He was a member of the Tau Beta Pi fraternity.

Ellinger, Edgar (M.E., '01), was employed in the works of the General Electric Co., Schenectady, N. Y., 1901; with the Geo. A. Fuller Co., New York, 1901–04; and is now a member of the firm of L. K. Comstock & Co., New York. He is a member of the Tau Beta Pi fraternity.

Elliott, Theodore Arthur (M.E., '80), was born in Orange, N. J., March 3, 1858; son



T. A. Elliott

of Theodore C. and Martha Elliott. His grandparents were both of New England birth and of English descent. In early life he was greatly interested in the construction of mechanical devices and utilized all spare time from school and other duties for such purposes. He was draughtsman with the John T. Noye Manufacturing Co., Buffalo, N. Y., builders of flour-mills and flour-mill machinery, 1880–85, being employed in making plans of the largest flour-mills and designing most of the special devices used on the machinery made by the company. He engaged in professional work at Buffalo, selecting as his particular line the designing of special machinery and appliances, 1885–91; and was with Plumb, Burdict, & Barnard, Buffalo, manufacturers of bolts and nuts and of bolt and nut machinery, 1891–97. While with this firm he had charge of matters pertaining to the construction of the machinery used in its works, and also of the machinery sent to different parts of the world, including some of the most efficient machines for bolt-making known to the trade, and ranging in size from small automatic to heavy heading-machines. From 1897 to date he has been with the Buffalo Bolt Co. as mechanical engineer in charge of construction and operation of machinery and plants. He wrote an article on "Flour Mill Machinery" for *Appleton's Cyclopedia of Applied Mechanics*. He is a member of the Delta Tau Delta fraternity.

Ellsworth, Oliver (M.E., '94), was in the employment of the East River Gas Co., New York, 1894–95; with the Ingersoll-Sergeant Drill Co., New York, 1895–97; with the Deane Steam Pump Co., Holyoke, Mass., 1898; with the Knowles Steam Pump Works and the Geo. F. Blake Manufacturing Co., East Cambridge, Mass., 1899–1900; and in New York from 1900 to date.

Elson, Louis Edward (M.E., '91), was born in Red Wing, Minn., March 28, 1868; son of Julius and Lottie Elson. He was superintendent in the shops of W. D. Forbes & Co., Hoboken, N. J., 1891–92; with the Beckwith Foundry & Machine Co., Arlington, N. J., 1892–93; with the Elson & Brewster Engineering Co., New York, 1893–96; and has been superintendent of the Ignaz Strauss Fan Co., East Braintree, Boston, Mass., from 1896 to date. In 1901 he became a member of the firm, still retaining his position as superintendent of the works, which were then removed to New York. The product of this company is chiefly ladies' fans, an industry newly developed by the firm in this country. Mr. Elson has patents pending on a machine for folding fan-tops, and another on a machine for pasting fan-tops to fan-sticks. He is a member of the American Society of Mechanical Engineers, and of the Freundschaft Club, of New York. Mr. Elson married Jennie Scharpes, January 2, 1905.

Emmet, C. Temple (M.E., '91), was in the employ of the Edison General Electric Co., and later of the General Electric Co., until February, 1893, when he commenced the study of law in the office of Martin J. Keogh, New Rochelle, N. Y. He was graduated from the Yale Forest School in 1902.

Ennis, William Duane (M.E., '97), was born in Bergen County, N. J. He served a machinist apprenticeship with the Rogers Locomotive Co., and spent a year in the engineering department of the Passaic Rolling Mill Co.; and from 1897 to 1898 was employed in the works of the Consolidated Gas Co. of New Jersey, at Long Branch, N. J. He was mechanical engineer with the Walworth Construction & Supply Co., Boston, Mass., 1898–1900, during which time he designed and installed steam and electric power plants and several representative steam-pipe equipments throughout New England. He was next in charge of the mechanical department in the office of Tower & Wallace, mill architects, New York, for whom he located, designed, and installed an 8,000 horse-power plant for the Oxford Paper Co., Rumford Falls, Me., together with water-piping, fire-protection system, and piping for handling pulp, aggregating $250,000. He also designed brick chimneys for the Champion Coated Paper Co., Hamilton, O. (10 × 225 feet) and the Toronto Paper Manufacturing Co., Cornwall, Ont. In February, 1901, he was sent to the State of Washington by New York capitalists to revamp the power and mechanical equipment of five associated industries, including a railroad, lead-smelter, street railway, concentrator, and paper-mill. He was recalled in August to undertake for the same parties the mechanical supervision of the 60-odd mills of the American Linseed Co. In June, 1902, he was advanced to the management of that company's manufacturing interests east of Chicago, now having entire charge of the production of linseed oil in the largest mills in the country.

Mr. Ennis is a member of the American Society of Mechanical Engineers. He has written many articles for the technical press, some of the more important of which are the following:

"Central Station Economics," *Railroad Gazette*, September 2 and 16, 1898.
"Variation in Boiler Efficiency," *Power*, August, 1898.
"The Selection of a Steam-Engine," *American Electrician*, XIII, No. 7.
"The Future of Power Development," *Engineering Magazine*, 1900, p. 278.
"Steam Engineering in Paper and Pulp Mills," *Engineering Magazine*, 1901, p. 518.
"Engineering Management of Industrial Works," *Engineering Magazine*, 1901.
"Specific Heat of Anhydrous Liquid Ammonia" in collaboration with Mr. L. A. Elleau), *Journal Franklin Institute*, March and April, 1898.
"Calibration of Water Meters," *Stevens Indicator*, July, 1898.
"The Central Station Boiler Room," *American Electrician*, XIII, No. 7.
"Intensified Production and Industrial Investment," *Engineering Magazine*, 1902.
"Steam Piping for Central Stations," *Street Railway Review*.
"Central Station Piping," *American Electrician*, XII, Nos. 6 and 7.
"Open and Closed Feed-Water Heaters," *Power*.
"Isolated Lighting Plants," *Electrical World and Engineer*.
"Central Station Meter Tests," *The Electrical Engineer*.
"Relative Steam Producing Value of Three Qualities of Coal," *Street Railway Journal*, April, 1898.
"Electricity in Mining" (serial), *Journal of Electricity*, V, No. 9.
"Flange Joints for Steam Pipes," *Steam Engineering*, August and September, 1900.
"Brick Chimneys for Power Stations," *American Electrician*.

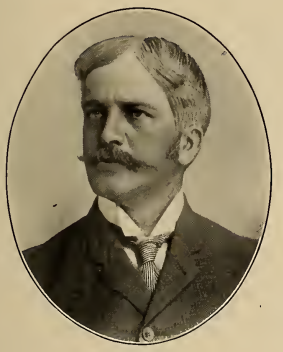
Mr. Ennis, who is the son of William C. and Katherine (Burroughs) Ennis, married Margaret B. Schuyler, December 28, 1898.

Erben, Hermann F. T. (M.E., '87), has been with the Edison Machine Works, Schenectady, N. Y., now the General Electric Co., from 1887 to date.

Erdman, Albert Wm. (M.E., '91), was assistant electrician with the American Telephone & Telegraph Co., New York, 1891–98; superintendent of the Driggs-Seabury Gun & Ammunition Co., Derby, Conn., 1898–1901; and has been superintendent of the Randolph-Clower Co., Waterbury, Conn., from 1901 to date.

Estrada, Esteban Duque (M.E., '83), was born at Puerto Principe, Cuba, November 22, 1859. He was a member of the engineer corps of the Juragua Iron Co., Santiago, Cuba, 1883–85; was employed in the division of steam supply of the New York Steam Co., 1886; was assistant inspector of bridges for the Southwest System of the Pennsyl-

vania Co., 1886–90; a member of the firm of Estrada, Kenyon, & Gray, inspecting engineers, Pittsburg, Pa., 1890–93; consulting and contracting engineer, Pittsburg, 1893–1900; and has been chief engineer of public works, Province of Pinar del Rio, Cuba,



E. D. Estrada

from 1900 to date. He has been granted a patent for an impact-testing machine. He has presented two papers to the Engineers' Society of Western Pennsylvania; the first on "The Effect of Impact Upon the Strength and Other Properties of Iron and Steel," read June, 1892; and the second on "The Expansion of Cast Iron at the Moment of Solidification," read at the meeting of 1894. He is a member of the American Society of Mechanical Engineers; of the Engineers' Society of Western Pennsylvania; the International Association for Testing Materials; the University Club of Pittsburg, Pa., and of the Delta Tau Delta fraternity.

Mr. Estrada is the son of Esteban Duque and Loreto Castillo Estrada. He married Isabel Arnold Reynolds in 1892, and they have two children, Sarah Isabel and Esteban Estrada.

Everett, Charles J., Jr. (M.E., '90), was born in Tenafly, N. J., March 21, 1868; son of Charles J. and Constance F. Everett. He was in the employ of Henry R. Worthington, manufacturer of steam pumping machinery, first in the shops, and later as supervising engineer for installing pumping and condensing machinery, including a 5,000-horse-power condensing-apparatus for one of the Buffalo street railroads, and others of less power on some of the large Lake steamships, 1891–93; and from the latter year to 1899 was consulting engineer in New York city, doing general designing and construction work; designing special machinery; testing work; investigating inventions for prospective investors; and acting as expert in patent and appraisement suits. He was engineer of water works for the town of Toms River, N. J., the plant consisting of wells, mains, tank, and gasoline pumping-station. He also engaged in fireproof building engineering for the Pittsburg Terra Cotta Lumber Co., and prepared an elaborate catalogue for that company. He was with the De La Vergne Refrigerating Machine Co., of New York, redesigning and reducing cost of production of the Hornsby-Akroyd oil engine, 1899–1901; with Stephen T. Williams, business economist, New York, 1901–03, being also engaged in work for the New York Life Insurance Co. and the Greenwich Fire Insurance Co., of New York, effecting savings in the clerical work of their respective offices. For the former company, in connection with Mr. Henry W. Herrman, he developed and patented special methods and apparatus for producing, by electric light, blue-print copies of card records with such rapidity that this method has entirely superseded the old method of hand-written transcripts in that office. In 1903 he opened an office in New York as a specialist in factory cost-reducing methods and general engineering work.

Everhart, Henry B. (M.E., '86), was with the Louisville & Nashville Railroad, Louisville, Ky., 1887–89; with the United States Rolling Mills Co., Anniston, Ala., 1889–91; with the United Gas Improvement Co., Philadelphia, Pa., 1891–92; with the Hardie Tyne Machine Co., Birmingham, Ala., 1899–1904; and with the F. H. Lummus Sons Co., manufacturers of ginning machinery, Columbus, Ga.

Everitt, Frank Conger (M.E., '99), was born in Hackettstown, N. J., February 19,

1876. He attended the public school at Hackettstown, N. J., graduating in 1893. He entered the Stevens Preparatory School the same year, and graduated from the college course in 1899. From 1899 to date he has been assistant to the superintendent of the Jordan L. Mott Iron Works, New York. He joined the "Associated Foundry Foremen" in February, 1904, at which time he was elected secretary and treasurer of the New York branch, then organized. He is a member of the Theta Xi fraternity.

Mr. Everitt is the son of George T. and Anna K. Everitt. He married Carrie E. MacLean, October 10, 1900, and they have one child, Marion Everitt.



F. C. Everitt

Evertsz, John Frederick (M.E., '96), was born in Curaçao, D. W. I., March 31, 1875; son of J. P. and J. C. Evertsz. He was assistant electrician with the Maracaibo Electric Light Co., Maracaibo, Venezuela, 1896–97, and superintendent of the installation of the Cucuta Electric Light Plant, Cucuta, Colombia, 1897–98. The latter work included the construction of a flume 6,000 feet long; the erection of a Leffel turbine and a General Electric single-phase generator; the construction of a high-voltage transmission line six miles long; and the transformation and distribution of the current in the city of Cucuta. From 1898 to date he has been a partner in, and engineer of, the Hygeia Ice Co., at Curaçao, operating one 4-ton Pontifex & Wood absorption ice-machine making ice on the plate system, and from 1901 to date he has been superintendent of the "Curaçaosche Inrichting voor Elektriciteit." This plant consists of two 100-horse-power tubular boilers, one 200-horse-power Galloway boiler, one 125-horse-power Ball duplex compound engine, one 100-horse-power McIntosh & Seymour engine, two Wheeler Admiralty surface condensers, two Worthington duplex boiler-feed pumps, one 90-kilowatt and two 37½-kilowatt Fort Wayne single-phase alternators. He is a member of the Theta Nu Epsilon fraternity.



Curaçaosche Inrichting voor Elektriciteit and Hygeia Ice Co.
J. F. Evertsz

Faber du Faur, A., Jr. (M.E., '84), was employed by Van Santvoord & Hauff, patent lawyers, 1884–88; and practised as consulting engineer and patent attorney, New York, from 1888 until the time of his death, July 12, 1904. He handled many patent cases for Charles Cooper & Co.; the Chemical Works of Newark, N. J.; the Diesel Motor Co., of New York; Fried. Krupp, of Essen, Germany; Prof. Bristol, of Stevens Institute; and many others of equal prominence. From 1898 until his death he was a member of the firm of Faber du Faur & Donnely, New York, consulting and constructing engineers, which prepared plans for the 10,000-ton floating dry-dock for the Tietjen & Lang Dry Dock Co., Hoboken, N. J., in 1899, the dock having since been in successful operation. The firm also com-

pleted a plant necessary for the repair of vessels at the same place; perfected the Westlake Powdered Fuel Burner; was also engaged on down-draught furnaces for the Smokeless Combustion Co., Walbridge, Berwind, and others; erected a glass-sand plant for the Valley Hill Sand Co., and was connected with the development of the Jaeger rotary engine. He acted as purchasing agent for large amounts of machinery, and also designed and equipped large plants for hoisting and conveying material.

Falk, Myron S. (M.E., '00), entered Stevens in the Senior year, having previously received the degree of Civil Engineer from Columbia University in 1899. He was an assistant in the summer school of geodesy, Columbia University, at Osterville, Mass., 1899; assistant in the department of civil engineering, Columbia University, 1900–01; tutor in same department, 1901–03; and instructor, 1903 to date. He is assistant to William H. Burr, consulting engineer. He is a member of the commission of five appointed by Governor Odell, of New York, to investigate the threatened pollution of New York Bay by the trunk sewer planned to drain a large portion of northern New Jersey, and emptying into the upper bay. He is a junior member of the American Society of Civil Engineers, and a member of the Sigma Xi fraternity.

Fanning, Winthrop Saltonstall (M.E., '93), was born in Brooklyn, N. Y., November 26, 1870. He was in the employ of Norton Bros., Chicago, Ill., makers of sheet-metal goods, 1893–95; assistant superintendent of one of the factories of this firm, the Norton Can Co., at Whitestone, L. I., 1895–98; and has been with Mr. Francis H. Richards, New York, in the capacity of mechanical engineer, from 1898 to date. Mr. Richards is a solicitor of patents, mechanical engineer, and expert in patent causes, and has had issued to him the second largest number of patents in the United States. Mr. Fanning was instructor in advanced mechanical drawing in the Mechanics and Tradesmen's School, of New York, during the school year 1891–92. He wrote an article on "Graphic Methods of Figuring" for the *American Machinist* in 1902.

The son of David Green and Elizabeth (Buckingham) Fanning, he is of Irish descent on his father's side and English on his mother's. He married Marie Talbot Metcalfe, February 2, 1897, and they have two children, Marion Talbot and Stanton Metcalfe Fanning.

Farrar, William Matthew (M.E., '90), was born in Milton, Florida, August 11, 1867. He was educated in the public schools of Lynchburg, Va., and Nashville, Tenn. He was draughtsman with the Link-Belt Engineering Co., New York, 1890; assistant to the furnace manager of the Sloss Iron & Steel Co., Birmingham, Ala., 1890–91, in



W. M. Farrar

this connection making designs for rebuilding and equipping two blast furnaces and designing a coal-handling plant and machinery; with the Union Iron Co., Brooklyn, and the Wallis Iron Co., Jersey City, in designing and detailing ironwork for buildings, 1891; instructor in mathematics and drawing, in the College of the City of New York, 1892; and with John J. Radley & Co., Inc., New York, from 1892 to date, now holding the position of secretary and chief engineer. He is engaged in designing, detailing, and superintending the manufacture of ironwork for buildings, and has had charge of a number of important buildings in New York city. He has also designed and

superintended the erection and equipment of a new plant for this purpose, and has installed a compressed-air system with numerous special machines. An illustrated account of this system appeared in *Compressed Air,* December, 1898. He was granted a patent in 1898 for a method of supplying compressed air to moving motors, and in August, 1904, he made application for a patent on a special form of I-beam column. He is a past-regent of the Royal Arcanum.

Mr. Farrar is the son of Matthew S. and Martha A. Farrar. He is descended from William Farrar who came to Virginia from Yorkshire in 1618 and was treasurer of the London Company and afterward of the Colony. Members of his family took part in the War of American Independence, War of 1812, and Civil War. He married Elizabeth L. Watson, November 23, 1892, and they have four children, William Matthew, Jr., Anna Virginia, Catherine Elizabeth, and Benjamin Randolph Farrar.

Faulks, James Buckley, Jr. (M.E., '96), was born in East Orange, N. J., December 13, 1873. He received a common-school education supplemented by four years at the Bordentown Military Institute, N. J., and one year at Stevens School, before entering Stevens Institute. He has held many positions since graduation with a view to obtaining a broad practical experience. To that end he has secured employment in various works, shops, factories, draughting-rooms, etc., in Pennsylvania, New Jersey, New York, New England, and the Northwest, and has studied gas-engines, steam-engines, electrical machinery, compressed-air machines, etc. He taught mechanical drawing and geometry for one term at an evening trade-school in Newark, N. J., and was also instructor in mechanical drawing at Cooper Union, New York. From 1902 to 1904 he was employed in the engineering department of the New York Safety Steam Power Co., New York. He is now an instructor in the College of Applied Science at Syracuse University, Syracuse, N. Y. He is a junior member of the American Society of Mechanical Engineers, and a member of the body of Free and Accepted Masons.

Mr. Faulks is the son of James B. and Jennie E. (Eveland) Faulks. He married M. Emma Smack, March 20, 1902, and they have one child, Russell Reid Faulks.

Fearn, Richard Lee (M.E., '84), was born in Mobile, Ala., August 31, 1862. He attended the University of the South, Sewanee, Tenn., 1874–79, and the University of Alabama, 1879–80. He is established at Washington, D. C., as an authoritative specialist in news and comment on army and navy and international affairs. He has had a complete training in diplomatic and newspaper correspondence, treating specially of technical matter in popular form. He was on



R. L. Fearn

the staff of the "Brooklyn Eagle," 1886–91; Secretary of Foreign Affairs at the World's Columbian Exposition, Chicago, Ill., 1891–93; Washington correspondent of the United Press, 1893–97, and in 1896 its London correspondent. Since 1896 he has been on the Washington staff of the New York "Tribune," and since 1902 has been chief of the Washington bureau of that paper. He was a war correspondent in 1898. He is a member of the Beta Theta Pi fraternity.

Mr. Fearn is the son of Richard Lee Fearn and Elizabeth (Spear) Fearn. He married Eleanora Egerton at Baltimore, Md., April 21, 1887, and they have two children, Richard Lee and Mildred Fearn.

Fechheimer, Solomon (M.E., '90), was born in New York city July 19, 1868; son of Sigmund and Henrietta Fechheimer. He was assistant manager of the Columbia Typewriter Manufacturing Co., New York, 1891–92; was located in New York, 1892–94, was engaged with the Columbia Typewriter Manufacturing Co., New York, 1894–95; and was located in New York, 1895–97. In May, 1897, he received the degrees of Bachelor of Science and Mining Engineer at the Michigan College of Mines, Houghton, Mich., and practised as mining engineer at Eureka, Utah, from 1897 to 1898. He was located in New York, 1899–1902; was employed in the construction department of the Schwarzschild & Sulzberger Co., Chicago, Ill., 1902–03; was again located in New York city for a short time, and is now insurance engineer with the Louisiana Fire Protection Bureau, New Orleans, La.

Fellheimer, W. J. (M.E., '89), is a member of the firm of Fellheimer & Lindauer, manufacturers and importers, New York.

Ferguson, John (M.E., '00), was special agent at Jacksonville, Fla., for the Peninsula & Occidental Steamship Co., operating a line of steamers between Havana, Nassau, Port Tampa, and Key West in 1901; and from that time to date has been employed in the Fox Hill Foundry, conducted by F. Ferguson & Son at Hoboken, N. J. He is a member of the Tau Beta Pi fraternity.

Fernandez, Lucas (M.E., '92), went to Costa Rica after graduation and was appointed Secretary and Professor of Mathematics at the Institute of Cartago. He next received an appointment as fourth assistant engineer in the office of Public Works, a government position, which he held for two years. He was also general manager, at Esparta, of the Pacific Railroad. In 1895 the office of Public Works was reorganized, and Mr. Fernandez returned to it as assistant engineer of the Technical Section, which position he now holds. For six months, during a leave of absence from the government of Costa Rica, he was general manager for the Costa Rican Telephone Co. and the Alapula & Heredia Electric Light Co. He is located at San José, Costa Rica.

Ferris, Henry Carr (M.E., '88), was born in Sandusky, O., March 1, 1865. He was draughtsman with the Massillon Bridge Co., 1888–89; instrument-man and division engineer on construction with the Toledo, Col-



H. C. Ferris

umbus, and Cincinnati Railway Co.; engineer of maintenance of way, 1890, and superintendent and engineer of maintenance of way of the same line, 1891–92. November 1, 1892, when the above railway was absorbed by the Toledo & Ohio Central Railway Co., he retained the same positions with this company and was placed in charge of the Western Division. In December, 1893, he was relieved of the duties of engineer of maintenance of way and made superintendent of the Western Division of the Toledo & Ohio Co., which position he held until 1901, when he was made assistant chief engineer of this company and of the Kanawha & Michigan Railway. He resigned in the year 1902, and accepted the position of assistant superintendent of the Union Pacific Railroad, being located at Omaha, Neb. He was appointed superintendent of the Colorado Division with headquarters at Denver, Colo., in 1903, also president of the Union Depot & Railway Co. of Denver. He is a member of the American Railway, Engineering, and Maintenance of Way Association, and of the Beta Theta Pi and Theta Nu Epsilon fraternities.

Mr. Ferris is the son of James M. and Mary Ellen (Dickinson) Ferris. He married Clara E. Shingle, March 18, 1893.

Fezandié, Joseph Hector (M.E., '75), was born in Paris, France, August 22, 1856. He



J. H. Fezandié

came to this country with his parents in 1861, and attended a public school in New York city for a couple of years, then studied in a private school founded by his father until 1872, when he entered Stevens in the Sophomore year. He engaged in teaching mathematics at the Fezandié Institute, New York, 1875–77; attended the Paris Exposition in 1878 as representative of "The Iron Age," and was a regular member of its editorial staff until 1880. Although afterward engaged in other occupations, he maintained his connection with that journal until 1903, being employed upon its French Supplement. From 1881 to 1891 he was in the employ of the firm of John Matthews, manufacturers of soda-water machinery and apparatus, and when this firm sold out its business he returned to teaching, and has since then been instructor of mathematics and physics at the Cutler School, New York. He is the patentee (1887 and 1891) of two improvements in card lists, or catalogues, and has contributed to technical journals articles (published under various *noms de plume*) relating chiefly to the construction of soda-water machinery and kindred topics. His more recent writings have been in quite another field, entirely unconnected with science or technology. He is a member of the Schoolmasters' Association of New York, and of the Physics Club of New York.

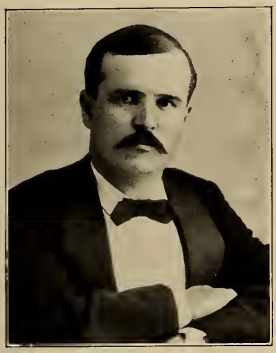
Mr. Fezandié is the son of Eugene F. G. and Marie (Bardin) Fezandié. His father was a Professor in the College of Bordeaux, and came to the United States because of political persecution during the reign of Napoleon III., being an ardent Republican. His grandfather was an officer under Napoleon I. in the Spanish and German campaigns. His paternal ancestry was Huguenot. He married Margaret Ann Phillips, July 15, 1886, and they have three children, Dorette, Eugene Hector, and Margaret Fezandié.

Field, Cornelius James (M.E., '86), was born in Chicago, Ill., January 4, 1862. At the age of thirteen his parents moved from Chicago to Montreal, Canada, where young Field was engaged in business, all the while devoting his spare time to study. When nineteen years old he moved to New York, where after one year's study, he entered Stevens Institute. He paid his own college and living expenses through the Institute.

He was employed in the engineering department of the Edison Electric Light Co., New York, 1886–87; was chief engineer for the Edison United Manufacturing Co., New York, in charge of all construction work for isolated electric light and central station work throughout the United States, 1887–89; and general manager and chief engineer of the Edison Electric Light Co., Brooklyn, having charge of the designing and building of the plant and system of this company and organizing its business, 1889–90. This plant, which included a 4,000-horse-power steam electric plant and a 100,000-light underground system, marked a radical departure from former practice and developed the highest economy. He was president and chief engineer of the Field Engineering Co., New York, engineers and contractors, in the designing and construction of electric railways, 1890–95. In this connection he designed and built over 500 miles of electric railways and over 50,000 horse-power of steam and electric central power stations, at Buffalo,

Philadelphia, Newark, Paterson, Trenton, Worcester, Bridgeport, Boston, Elmira, Detroit, Towanda, Lancaster, Rutherford, etc.

He practised as consulting engineer and contractor, 1895–98; was general manager and chief engineer with the American Vitrified Conduit Co., New York, 1898–99, contracting for over 7,000,000 duct feet of subway systems in New York, Brooklyn, Providence, Philadelphia, New Orleans, Boston, and other cities, in one year. He was vice-president and general manager of the United States Motor Vehicle Co., New York, 1899–1900, and vice-president and general manager of the De Dion-Bouton Motorette Co., Brooklyn, N. Y., 1900–02. From the



C. J. Field

latter date to the present time he has been engineer for and manufacturer of vitrified glazed clay conduits, and owner and patentee of conduit and subway systems. He is president and chief engineer of the Field-Foulks Co., engineers and contractors in the above-mentioned lines of business. In 1904 he took up, in addition, consulting engineering work.

He has delivered several talks before the undergraduates of the Electrical Department, Stevens Institute, on central-station practice and electric railways; and before the undergraduates of Sibley College, Cornell University, on the same subject. He has presented papers before the American Society of Mechanical Engineers, the Street Railway Association, the Edison Electric Illuminating Association, the National Electric Light Association, and to the following technical publications: "The Street Railway Journal," "Cassier's Magazine," "Stevens Indicator," "Electrical Engineer," "Electrical World," "Sibley College Journal," "Power," "Western Electrician," etc.

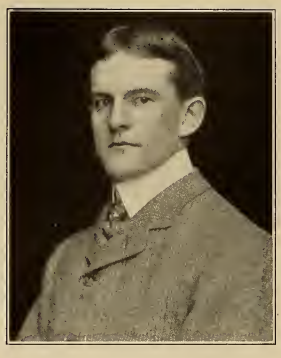
He is a member of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Society of Naval Engineers, the Society of Naval Engineers and Marine Architects, and of the Beta Theta Pi fraternity.

Mr. Field, who is the son of Cornelius R. and Sarah E. (Henry) Field, is connected with the Field family who came to this country in the seventeenth century. He married Agnes M. Craven, of Montreal, Canada, June 7, 1888, and they have four daughters, Gertrude Craven, Edith May, Lucia Ethelwynne, and Agnes Olive Field.

Field, William Alexander (M.E., '91), was born in Dixon Springs, Tenn., September 27, 1869. During the Freshman year in college Mr. Field's father met with business reverses. Instead of giving up the course, young Field set about resolutely to raise sufficient funds to complete the three years' study. In this he succeeded, and in due time after graduation repaid the entire sum. While in college he was a member of the football, baseball, and lacrosse teams, and of the glee and banjo clubs.

On graduation he entered the employment of the Illinois Steel Co., South Chicago. Starting in at the bottom, he served in various capacities until the latter part of 1896, at which time he held the position of night general superintendent. Between October, 1896, and March, 1897, he was superintendent in charge of the rod-mills at the company's Joliet plant. In March, 1897, he severed his connection with the Illinois Steel Co., taking the position of mechanical engineer for an electric welding company in Detroit. After several months as designing and constructing engineer for this company, he joined the Michigan Peninsular Car Co., of Detroit, as assistant superintendent of their rolling-mill, which position he held until September, 1898. He then became general superintendent of the Sim-

mons Manufacturing Co., Kenosha, Wis., with which company he remained until July, 1901, immediately thereafter assuming the duties of assistant general superintendent of



W. A. Field

the South Works of the Illinois Steel Co.; in July, 1903, he was appointed general superintendent.

While occupying these positions he has given his spare time to the development and institution of new methods of conducting business, including shop organization, piece-work and premium systems, labor-saving devices, condensed and quickly available records of cost of manufacture, etc., in which lines he has had a large measure of success. In 1902 he took out a United States patent for an improved tuyere, for use in the Bessemer process of making steel. The design differs from the ordinary tuyere in that the air-passages, instead of having a uniform cross-section throughout the length of the tuyere, conform approximately to the path theoretically assumed by a fluid under pressure escaping through an orifice. The theory is not new, but its adaptation to a converter tuyere is. By actual test this tuyere has shown an increased efficiency of from 15 to 25 per cent over the old design, all other conditions being equal. He has now on file an application for letters patent on a machine to manufacture the above tuyeres.

An abstract of Mr. Field's thesis, prepared jointly with Mr. James T. Wallis, was published in the *Stevens Indicator*, IX, 318. Mr. Field is a member of the Beta Theta Pi fraternity.

The son of Henry Philip and Mary Alexander Field, he is a descendant of Zachariah Field, one of the first immigrants to this country. On his mother's side he is descended from the Alexander family (Scotch), several members of which were signers of the Mecklenburg Declaration of Independence. He married Bertha Phillips, April 25, 1900, and they have two children, William Alexander, Jr., and Harriet Phillips Field.

Field, William Bradhurst Osgood (M.E., '94), was born in Geneva, Switzerland, September 16, 1871. He was assistant engineer in the chief engineer's office of the New York Central & Hudson River Railroad Co., New York. In December, 1898, he went on a hunting-trip to India. Upon his return a year later he organized the Holophane Glass Co., becoming its president. He retired from this position in 1901, and has since been a member of the firm of M. W. Kellogg & Co., New York. He is a member of the Automo-



W. B. O. Field

bile Club of France, the Automobile Club of America, the University, Union, Players', and Lawyers' clubs, and of the Chi Psi fraternity.

Mr. Field is the son of William Hazard and Augusta (Bradhurst) Field. He married Lila Vanderbilt Sloane, July 8, 1902.

Fielder, George B., Jr. (M.E., '94), was born in Rocky Hill, N. J., April 27, 1870; son of George B., and Eleanor A. Fielder. He was draughtsman with the Sprague Electrical Elevator Co., 1895; chief clerk of the Ordnance Department, New York Navy Yard, 1895–96; foreman for the P. Lorillard Co., Jersey City, 1896–99; and has been paying and receiving teller with the Trust Company of New Jersey, Hoboken, from 1899 to



G. B. Fielder, Jr.

date. He is a member of the University Club of Hudson County, N. J., and of the Chi Psi fraternity.

Firestone, Joseph Frederick (M.E., '87), was born in Middle Branch, Stark County, O., May 30, 1862. He attended the country schools and was for two winters at Worley's private school in Canton; then took two years preparatory course in the Ohio State University, and, after completing the Freshman and Sophomore years at the University, entered the Stevens Institute in the fall of 1885 and graduated with the Class of 1887. He has been connected with the Columbus Buggy Co., Columbus, O., since graduation, first as foreman of the shops, then as assistant to the superintendent, and next as superintendent. At present he holds the positions of vice-president and general superintendent.



J. F. Firestone

He has read papers before the Engineers' Club of Columbus on the "Horseless Carriage," and the "Purification of Boiler Feed Water." He is a member of the American Society of Mechanical Engineers, the Columbus Club, the Engineers' Club of Columbus (of which he was president in 1897), and of the Independent Order of Odd Fellows.

Mr. Firestone is the son of Henry and Barbara (Rowland) Firestone. He married Josephine Leas, November 14, 1888, and they have one child, Anita Firestone.

Fischer, Frederick K. (M.E., '85), has been with the Birmingham Foundry & Machine Shop Co., of Pittsburg, Pa., since graduation. For a number of years he has held the position of contracting agent.

Fitch, Mallory K. (M.E., '00), was engaged for a time on experimental work on a refrigerating-machine; with Mr. E. F. Ferguson, New York, 1901–02; and with the Ives Process Co., New York, from 1902 until his death, September 25, 1904.

Flack, Jacob Day (M.E., '87), was born in Baltimore, Md., July 26, 1864. His early education was received in the public schools

and in the Friends elementary and high school, Baltimore, Md., up to 1881. He was a machinist apprentice in the Pennsylvania Railroad shops at Baltimore, Md., in 1883, and in May of that year he won the mile handicap and mile scratch races at the meet of the Capital Bicycle Club, Washington, D. C. In the following July he also won the ten-mile Maryland State Bicycle championship.

He was with the Edison Lamp Co., East Newark, N. J., 1887–88; with the Weston Electrical Instrument Co., Newark, N. J., 1888–89; assistant electrician for the Edison Lamp Co., 1889–91; superintendent of motive power and construction of the same com-



J. D. Flack

pany, 1891–95; consulting and constructing electrical and mechanical engineer, New York, 1895–97; superintendent and mechanical director of the Home Ice Machine Co., Baltimore, Md., 1897–98; with Burhorn & Granger, engineers, New York, 1899; engineer and salesman with Steele & Condict, manufacturers of refrigerating and ice-making machinery, Jersey City, N. J., 1899–1900; and in a similar capacity with the Isbell-Porter Co., Newark, N. J., 1900–01. As superintending engineer of the International Smokeless Powder & Dynamite Co., 1901–03, he reconstructed the entire plant and put it in successful operation for the manufacturing of smokeless powder for the United States Government. He conducted experimental work for the International Lithoid Co., Philadelphia, in 1903; and has been superintendent and engineer with the A. D. Granger Co., New York, from 1903 to date.

He is a member of the American Institute of Electrical Engineers; of the Orange, Essex County Toboggan, and Maryland Bicycle clubs; and of the Sigma Chi and Theta Nu Epsilon fraternities; and director and treasurer of the Orange Athletic Club.

Mr. Flack is the son of John Sims Oliver and Martha Ann Flack. He married Helen Finney, April 19, 1892, and they have two children, Jacob Day, Jr., and Walter Gillette Flack.

Flannery, William (M.E., '02), has, since graduation, been a special apprentice in the shops of the New York Central Railroad at West Albany, N. Y.

Foppes, Alfred M. C. H. (M.E., '01), was born in Hamburg, Germany, April 22, 1879; son of Gustav and Emilie Foppes. His parents left Germany to engage in business in the United States when he was four years of age. Since then he has spent most of his time, with the exception of frequent visits to Europe, in New York and New Jersey. The greater part of his school education was received in the grammar and high schools of Montclair, N. J., where he was graduated and honored with the gold medal for scholarship in 1897. He spent several months on a vacation trip in the Black Forest of Germany, and through Switzerland, after which he entered the machine-shops at Harburg-on-the-Elbe. He was employed as engineer in the Hamburg house of the Rudolph Otto Meyer firm (a large heating and ventilating concern having branches in Berlin, München, Bremen, Kiel, and a separate manufacturing branch in Mannheim) in 1901. He is at present with White, Child, & Beney, Ltd., London, England, agents for Great Britain of the Strebel hot-water and low-pressure steam boilers manufactured by the house of Rudolph Otto Meyer, at Mannheim. Mr. Foppes is a member of the Tau Beta Pi fraternity.

Foster, Ernest Howard (M.E., '84), was born in Springfield, Mass., May 5, 1865. His

first summer vacation in college he spent as fifth engineer on the S.S. "Grecian Monarch," between New York and London. He



E. H. Foster

was employed at the Worthington hydraulic works, 1884–1900, serving in the machine-shops, draughting-room, outside erecting, designing, engineering, and contracting departments of the firm of Henry R. Worthington and the Worthington Pumping-Engine Co. In the interest of Henry R. Worthington he constructed the pumping-plants for the water supply of the Expositions at Paris in 1889 and 1900, and was also in charge of the machinery on the Trans-Caucasian pipe line for transporting refined petroleum from the refineries at Baku to the seaport at Batoum in southern Russia. Since 1900 he has been vice-president of the Power Specialty Co., a New York corporation engaged in manufacturing steam superheaters and hydraulic apparatus, and contractors for the general improvement of power plants. He has contributed papers to scientific bodies as follows: On "The Water-Supply of Memphis, Tenn.," to the Brooklyn Engineers' Club, 1897; on "A Pumping-Engine Test with Superheated Steam," to the American Society of Mechanical Engineers, at the Cincinnati meeting, 1900; and on "Superheated Steam," at the Milwaukee meeting of the same society in 1901. He is a member of the American Society of Mechanical Engineers, of the American Society of Civil Engineers, the British Institution of Mechanical Engineers, the American Water Works Association, the Engineers' Club, the New England Water Works Association, and of the Delta Tau Delta fraternity.

Mr. Foster is the son of Edwin Dexter and Mary A. (Phipps) Foster, and grandson of Dexter Foster, engineer of construction for the Boston and Albany Railroad, and the first man to run a tunnel on a curve. He married Margaret Willard Martin, May 28, 1902, and they have one child, Margaret Foster.

Foster, Frank W. (M.E., '84), was born in New York city; son of Alonzo A. and Helen M. Foster. He spent some time in the shops of the Chicago, Burlington & Quincy Railroad at Aurora, Ill., but found the manual labor too much for his strength and returned to his home in Brooklyn, where he assisted his father in light office work. Having a fondness for music, he practised much, and upon the death of his father gave his entire time to settling up the estate and



F. W. Foster

giving lessons in music. Encouraged with his success in this line, he made it his profession, and is still following it.

Fox, William (M.E., '86), was born in Bohemia, September 18, 1864. His early

education was received in Prague, Bohemia, but he graduated from a public school in New York city, and also from the College of the City of New York, at which institution he



William Fox

was Assistant Professor of Physics and with which he has been connected since 1889. Previous to that year he had been instructor in mechanics and drawing at the Workingman's Institute, New York. In 1898 he contributed an article on the "Graphics of Water Wheels" to the October issue of the *Stevens Indicator,* and in the January, 1899, issue of the same journal he presented an article on "The Application of the Graphics of Water Wheels to the Faesch & Picard Turbines at Niagara Falls." He also contributed an article on "The Fallacy of Liquid Air" to the May, 1899, issue of *Machinery,* and one on "The Solignac Boiler" to *Power,* April, 1898. Besides, he contributed articles on "The Graphics of Thermodynamics" and "The Zeuner Diagram" to the *Journal of the Franklin Institute,* 1898. Together with C. W. Thomas, '84, he wrote "Elements of Mechanical Drawing," published by the Van Nostrand Co., New York. He is a member of the American Society of Mechanical Engineers, the American Physical Society, the American Association for the Advancement of Science, the Electrical Society, and of the Phi Beta Kappa and Chi Psi fraternities.

Mr. Fox is the son of Joseph K. and Barbara Fox. He married Madeleine Arnaud, February 18, 1889, deceased March 11, 1899. He has two children, William Arnaud and Madeleine Arnaud Fox.

Fraentzel, Frederick C. (M.E., '83), was born in Newark, N. J., June 4, 1862. He was assistant in the department of maintenance of ways of the Pennsylvania Railroad, Jersey City, 1883; in the shops of the Pittsburg, Chicago, & St. Louis Railroad, Logansport, Ind., 1883–84; and first assistant engineer with the Celluloid Manufacturing Co., Newark, N. J., 1884–85. He has been a member of the firm of Campbell & Co., Newark, N. J., mechanical engineers, solicitors of patents, and experts in patent causes, from 1885 to date. Since the death of Mr. Campbell in 1887 Mr. Fraentzel has continued the business alone at the same place. He has a large number of prominent clients, and he has acted as patent agent for James E. Sague, A. H. Hickok, and E. D. Estrada, all of the Class of '83, in securing United States and foreign patents for them. He is also secretary and treasurer of the Electra Manufacturing Co., Newark, and a member of the



F. C. Fraentzel

Board of Trade, the Newark Club, the Republican Club of Newark, N. J., and of the Freylinghuysen Lancers.

Mr. Fraentzel is the son of H. Hugo R.

and Regina Fraentzel. He married Lillie Blewett (deceased), February 5, 1885; and Willmia Blewett, September 30, 1890. He has one child, Frederick H. W. Fraentzel.

Frank, Emil H., Jr. (M.E., '98), was with the Edison Electric Illuminating Co., New York, 1898–99; and with the American Paper Goods Co., Kensington, Conn., 1899–1900. He has been constructing engineer and draughtsman for the Electric Launch Co., Bayonne City, N. J., from 1900 to date.

Frazar, Everett Welles (M.E., '90), was born in Shanghai, China, August 17, 1867. He was laboratory assistant with Thomas Shaw, Philadelphia, 1890–91; engaged in experimental work in the laboratory of Thomas A. Edison, Orange, N. J., 1891; and was assistant manager of the Sims-Edison Electrical Torpedo Co., 1891–93.

In March, 1892, he went to France, where he constructed and tested a complete torpedo plant at Toulon for the French government. Returning to New York in September, 1893, he installed a torpedo on the Brazilian warship "America." In February of the following year he went to England, France, and Turkey, on torpedo survey work. Upon the completion of these surveys he returned to New York to organize the Sims-Dudley Defense Co., and commenced the development of the Dudley pneumatic dynamite gun.

In November, 1896, he resigned this position and went to Yokohama, Japan, to enter the employ of Messrs. Frazar & Co. as mechanical engineer. In this capacity he superintended, among other plants, the erection of the Yasuda Wire Nail Factory at Tokyo, the first nail plant in Japan. In October, 1897, he was made manager of the Yokohama branch of Messrs. Frazar & Co. In May, 1898, he became chief engineer of the Moyoro Sulphur Mine on the island of Etorufu, northern Japan, designing, installing, and putting into operation an extensive plant for sulphur-mining, including an aërial wire-rope tramway three miles in length, a description of which will be found in the February, 1901, number of *Cassier's Magazine*.

In 1900 he resigned and again entered the offices of Frazar & Co. On January 1, 1902, he acquired the firm name and business by purchase, and inheritance from his father, who died January 3, 1901. The firm is at present actively engaged in general import and export business, but more especially in engineering work, such as electric street-car installation, locomotives, and general machinery, a recent contract secured being the equipment of 100 cars for the Tokyo street railways. He is also interested in various industrial enterprises, being managing director of the Tokyo Sawmills and the Yokohama Dyeing & Finishing Works, Ltd.

An abstract of his graduating thesis, prepared jointly with Mr. William A. Ebsen, on "The Measurement of High Temperatures by the Electrical Resistance of Platinum, Including a Design of an Electrical Pyrometer," was published in the *Stevens Indicator*, VIII, 1. He contributed an article on "The New Hoboken Ferryboat 'Bergen'" to the same magazine, VI, 129. He is a member of the Delta Tau Delta fraternity.



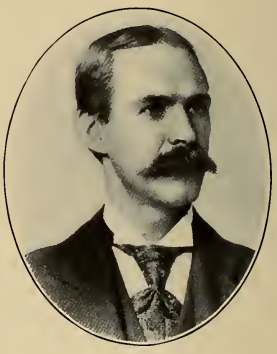
E. W. Frazar

Mr. Frazar, who is the son of Everett and Annie Lindsley Frazar, is a descendant of the Clan Fraser of Inverness, Scotland, the name being changed to Frazar at the time of an ancestor's coming to America. He married Maude Wolcott, October 7, 1896, and they have one child, Anna Halstead Frazar.

Freygang, Henry (M.E., '80), was born in New York city May 17, 1861. He became draughtsman for J. G. Clarke & Co., bridge contractors, Baltimore, Md., later reorganized into the Clarke Bridge Co., with whom he remained until 1883, mostly doing construction work upon Howe truss bridges and trestle work in Virginia. He was with the Missouri Valley Bridge & Iron Works, Leavenworth, Kan., 1883–84; engineer with the California Bridge Co., 1885; went abroad on account of ill health, 1886; and joined the Missouri Valley Bridge & Iron Works Co., at Leavenworth, again, 1887–89. He was assistant engineer at the Texas agency of the same company, 1889–91, and took full charge of the agency, 1891–95, obtaining many large contracts, among which may be mentioned the Galveston Bay Bridge, two miles long, connecting Galveston Island with the mainland. He also obtained a contract from the Texas & Pacific R. R. Co. for some difficult foundation work on the Atchafalaya River in Louisiana. He was in the main office of the Missouri Valley Bridge & Iron Works Co., Leavenworth, 1895–96, and assistant engineer with the Schultz Bridge & Iron Co., McKee's Rocks, Allegheny County, Pa., 1896–99. In 1899 Mr. Freygang, together with Mr. A. A. Trocon, established the Midland Bridge Co., Kansas City, Mo. This firm is still doing an active business as bridge contractors, and as designers of bridges, viaducts, foundations, steel structures, etc.

Fridenberg, Henry L. (M.E., '94), was a student in the School of Mines, Columbia University, 1894–95; with the Stanley Electric Manufacturing Co., Pittsfield, Mass., 1895–97, and became superintendent of construction in the New England office of the Manhattan Concrete Co. in 1897. In the latter part of that year he was transferred to the main office in New York, and in 1899, jointly with Mr. J. E. Sparrow, he purchased the business and continued it, under the name of Sparrow, Fridenberg, & Co., until 1901, when Mr. Fridenberg engaged in professional work as consulting electrical engineer, and is now secretary and manager of the Electric Utilities Co., New York. He is an associate member of the American Institute of Electrical Engineers.

Fuller, Arthur Ames (M.E., '88), was born in Providence, R. I., October 19, 1862. He was Assistant Professor of Engineering and Physics at the Missouri State University, for the collegiate year 1888–89, but resigned at the beginning of his second year to take charge of the machine-shops of the Builders' Iron Foundry at Providence, R. I., which had then been awarded its first contract from the United States government for the fabrication of 12-inch breech-loading rifled mortars. Under his direction the shops were fitted for this work, and special tools were designed and built. The latter included a rifling-machine, a combined threading- and slotting-machine, a breech-milling machine, and an adjustable furnace to heat steel hoops of various sizes by the impingement of gas flames against the hoops. The registering



A. A. Fuller

instrument for the Venturi water-meter was designed and developed under his direction. This instrument has made practical the utilization of the principles of Torricelli's theorem and the Venturi tube for the commercial purpose of measuring the quantity of liquids flowing through pipes. In all of this work he desires to acknowledge the able assistance of Mr. F. N. Connet and Mr. W. W. Jackson, both Stevens graduates. He has had charge of some large machine-shop construction, including steam-engines, mortar-carriages, printing-presses, etc., as well

as the manufacture of smaller products, such as hot-air engines, wood-trimmers, grinding and polishing machinery, etc. In 1899 he resigned his position at the Builders' Iron Foundry to accept the superintendence of the Providence Engineering Works, where he is now engaged.

Mr. Fuller was president of the Providence Association of Mechanical Engineers for the first two years of its existence, and is the author of the following papers:

"Fabrication of 12-inch Mortars," *Stevens Indicator*, July and October, 1890.

"American Coast-Defense Mortars," *Cassier's Magazine*, May, 1895.

"Specification of Error Limits for Machine-Tool Construction," *American Machinist*, September 16, 1897.

"Standard Fits in the Machine Shop," *Machinery*, November, 1897.

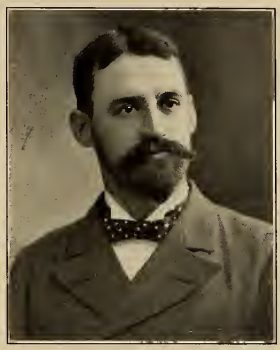
"Wages and Production," *Machinery*, March, 1899.

He is a member of the Providence Association of Mechanical Engineers, the Providence Public Education Association, and of the Religious Education Association (National).

Mr. Fuller is the son of Leonard F. and Mary (Hunt) Fuller. He married Annie L. Ide, September 26, 1889.

Furman, Franklin DeR. (M.E., '93), Professor of Mechanical Drawing and Designing at Stevens Institute of Technology. For biography, see page 271.

Furman, Job R. (M.E., '85), was with Otis Bros. & Co., manufacturers of elevators and hoisting-machinery, New York, until 1896, during the last two years of which engagement he held the position of acting chief engineer. He then resigned to become secretary and treasurer for Charles F. Parker & Co., engineers and contractors, New York, until the fall of 1898, when he went to London, where he conducted professional engineering work as consulting and contracting engineer. He was one of the sub-contractors on the $15,000,000 Central London Railway, installing the "lifts," or elevators, in connection therewith, being also consulting engineer to the Sprague Electric Elevator Co. of America. He returned to New York in 1901, and is now assistant chief engineer of the Otis Elevator Co. He is a member of the American Society of Civil Engineers, and of the Engineers' Club of New York.



J. R. Furman

Gallaher, E. B. (M.E., '94), engaged in professional engineering work on his own account, in 1894; was employed in the gas-engine department of Patterson, Gottfried, & Hunter, New York, 1896–97; and was general superintendent of the New York Air Compressor Co., 1897–98, designing air-compressors. He organized and became president and general manager of the Keystone Motor Co., Philadelphia, Pa., in 1898, and organized the Searchmont Motor Co., which absorbed the Keystone Co., and became its vice-president and general manager, 1899–1900. This company was reorganized with double capital under the name of the Fournier-Searchmont Automobile Co., Mr. Gallaher being its first vice-president and general manager, 1900–02. In December, 1902, he became general manager of the Mobile Company of America, with offices in New York. From 1898 to 1903 he designed the entire product of the Keystone Motor Co., the Searchmont Motor Co., and the Fournier-Searchmont Automobile Co., eleven types of automobiles being constructed by him during this period, and he took full charge of the companies' affairs, laying out and operating their extensive shops. The output reached a production of one complete automobile per

day. Mr. Gallaher is at present general sales agent for the United States for the Georges Richard-Brasier automobiles.

Gantt, Henry Lawrence (M.E., '84), was born in Calvert County, Md., May 20, 1861.



H. L. Gantt

His early education was received at McDonough School, near Baltimore, and he graduated from Johns Hopkins University in 1880. He was draughtsman for Poole & Hunt, Baltimore, Md., 1884–86; in charge of the manual-training department of a technical school, 1886–87; with the Midvale Steel Co., first as assistant in the engineering department, and then as superintendent of the steel-casting department, 1887–93; and with the American Steel Car Wheel Co., 1893. He practised as a consulting engineer in Philadelphia, Pa., 1894–95, building during that time a number of glass furnaces; was superintendent of the American Steel Casting Co., 1895–96; superintendent of the Simonds Rolling Machine Co., Fitchburg, Mass., 1897–98; and with the Bethlehem Steel Co., as engineer, 1899–1901. From 1902 to date he has been consulting engineer to the American Locomotive Co., Schenectady, N. Y.

Mr. Gantt has taken out a patent for heating and melting iron, etc., also for a high-temperature furnace, and in conjunction with Mr. G. H. Chase has patented a process of casting armor. He has presented several papers at the meetings of the American Society of Mechanical Engineers, on "Steel Castings," "Recent Improvements in the Manufacture of Steel Castings," "A Bonus System of Rewarding Labor," and "A Graphical Daily Balance in Manufacture." A paper entitled "A New High-Temperature Furnace" was read by him before the Franklin Institute, Philadelphia, Nov. 17, 1896. Mr. Gantt is an associate member of the Society of Naval Architects and Marine Engineers, and a member of the American Society of Mechanical Engineers, and of the Beta Theta Pi fraternity.

Mr. Gantt is the son of Virgil and Mary Jane (Stuart) Gantt. His ancestors on both sides came to this country about 1650 and settled in southern Maryland, and members of both families have figured in Maryland history for over 200 years. He married Mary Eliza Snow, November 29, 1899, and they have one child, Margaret Heighe Gantt.

Ganz, Albert F. (M.E., '95), Professor of Electrical Engineering at Stevens Institute of Technology. For biography, see page 270.

Garcia, Celestino (M.E., '96), has been draughtsman with the De La Vergne Refrigerating Machine Co., New York, 1896–98; an instructor in mechanical drawing at Cooper Institute; and with the firm of Garcia, Pando, & Co., New York. He is a member of the Tau Beta Pi fraternity.

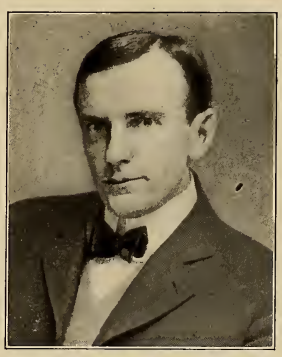
Gardiner, F. W. (M.E., '92), entered the locomotive shops of the New York Central & Hudson River Railroad, West Albany, N. Y., as draughtsman, and after a short time was transferred to the erection shop as helper to a machinist, and later, from the shop, to be assistant to P. H. Dudley, engineer of tests for the road. The work under Mr. Dudley consisted in making an exhaustive examination of the merits of the Westinghouse and New York air brakes. About the time these tests were finished the road began to introduce the block-signal system, and Mr. Gardiner was transferred to the office of superintendent of signals on the Mohawk Division, extending from Albany to Syracuse. His work here consisted in laying an eight-wire cable from Albany to Syracuse and in inspecting the electrical and mechanical work of the interlocking and

block signals as it was installed by the contractor. When this work was finished he went with Mr. Dudley to Scranton, Pa., to inspect rails. He spent about seven months at the mill, and during that time inspected about 80,000 tons of rails of various weights. From Scranton he went to New York to enter the steel building business, and has been connected with the Atlas Iron Co., Lewinson & Just, and the Jackson Architectural Iron Works. In 1898 he became associated with M. L. Vanderkloot in consulting and contracting engineering work, continuing in this line about a year, when he became assistant engineer for the Manhattan Railway Co., of New York, with which lines he is still connected. In 1903 he was made principal assistant engineer for the Manhattan Railway Division of the Interborough Rapid Transit Co. He was elected a member of the American Society of Civil Engineers in 1899.

Gately, Charles L. (M.E., '84), was with the Cane Umbrella Co., 1884–88; with the Lombard Investment Co., 1888–89; superintendent of the heating department of the Safety Car Heating & Lighting Co., 1889–93; with the United Wood Gas Co., 1896–98; manager of the railroad department of the New York Belting & Packing Co., Ltd., 1898–1900; with the Rubber Manufacturing Co., of New York, 1900–02; and has been with the Gold Car Heating & Lighting Co., New York, from 1902 to date.

Gause, Frederick Taylor (M.E., '91), was born in Kennett Square, Chester County, Pa., March 16, 1866. Between the ages of 16 and 21 he took a regular course in marine engine building in the shipyard of the Harlan & Hollingsworth Co., Wilmington, Delaware, of which his uncle was president. Upon graduation he was immediately engaged by the Department of Tests of the Institute, and under Prof. Denton's direction made a series of tests for the Thompson & Bedford Department of the Standard Oil Co., of New York, to determine the practicability of lubricating the main engines of the large Atlantic steamers with pure mineral oil. This work was done in the engine-rooms of a large number of steamers, and in all comprised about forty trips across the Atlantic. After about one year he was transferred from the Department of Tests to the Thompson & Bedford Department, continuing the experiments on marine engine oil, and acting in an advisory capacity to the Standard Oil Company's agents in European countries until the end of 1894. He then made a special trip around the world, visiting especially India, Burma, Java, China, and Japan. The reports prepared by him on this trip resulted in his appointment as business manager in the Far East, with headquarters at Yokohama, Japan, where he is at present located.

An abstract of Mr. Gause's thesis on "Compressed Air" was published in the *Transactions* of the American Society of Mechanical Engineers and reprinted in the *American Machinist*. An abstract of his report from Paris on the "Popp System of Compressed Air" forms part of the *Transactions* of the American Association for the Advancement of Science. Mr. Gause is a member of the American Society of Mechanical Engineers; the American Association for the Advancement of Science; the Engineers' Club of New York; the American Asiatic Association; the Yokohama United Club; and of the Sigma Chi fraternity.

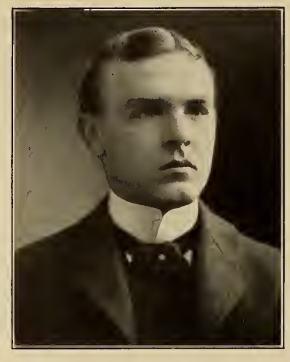


F. T. Gause

Mr. Gause is the son of S. Irwin and Edith M. Gause. His ancestors were of English and German extraction, resident in Pennsylvania for several generations, and generally

members of the Society of Friends. He married Gertrude Grier, June 26, 1900, and they have one child, Sarah Boileau Gause.

Gerdes, Henry Theodore (M.E., '02), was born in New York city August 17, 1877;



H. T. Gerdes

son of John Henry and Catherine Tienken Gerdes. He was with M. H. Treadwell & Co., New York, 1902–04; and is now inspector in the mechanical engineer's office, New York Central Railroad Co., New York city.

Gerdes, Theodore Richard Nicholas (M.E., '02), was born in New York city December 12, 1879; son of John Henry and Catherine Tienken Gerdes, and of German descent. He is inspector of electric subways for the Interborough Rapid Transit Co., New York. He is an associate member of the American Institute of Electrical Engineers.

Gerner, Richard (M.E., '78), was associated with his father, under the firm name of Henry Gerner & Co., in the business of patent solicitors in New York from 1878 to 1880. During that time the firm issued a periodical called the *Patent Right Gazette*, the matter for which was principally written by Mr. Richard Gerner, who at the same time contributed to *Oliver Optic's Magazine, The Youths' Companion, Scientific Amateur, New York Herald, Commercial Advertiser, Telegram, Harpers' Weekly*, and *New York Mirror*. He wrote several poems and serial stories; including among the latter "The Death of Haroun al Raschid," published in the *Herald* of Halifax, N. S., and "Sweet Marjory, a Story of the Revolutionary War." He was in the employ of the United States Heveenoid Co., New York, for about a year. About this time his health began to fail, and he went to Mexico, and thence to London, England, where he accepted a position as draughtsman and general foreign correspondent for the firm of Herbert & Co., patent agents. He continued in this position until compelled to leave it owing to his weak physical condition. He returned to the United States, and died in 1885.

Geyer, William E. (Ph.D., '77), Professor of Physics at Stevens Institute of Technology. For biography, see page 238.



T. R. N. Gerdes

Gibbs, Alfred Wolcott (M.E., '78), was born in Fort Filmore, N. M., October 27, 1856. He was an apprentice in the shops of the Pennsylvania Railroad Co., at Altoona, Pa., 1879–81; was employed as draughtsman by the Richmond & Allegheny Railroad, at Richmond, Va., 1881; as draughtsman by the Richmond & Danville Railroad, at Richmond, Va., 1881–86; as master mechanic of the Atlanta & Charlotte Division of the same company, at Atlanta, Ga., 1886–88; and in

the same capacity on the Virginia Midland Division of that road, at Alexandria, Va., 1888–90. He was in the employ of the Central Railroad of Georgia as assistant superintendent and superintendent of motive power, at Savannah, Ga., 1890–92, when he re-entered the service of the Richmond & Danville Railroad as master mechanic of the Atlanta & Charlotte Division, at Atlanta, Ga., and remained until July 1, 1893. He then became assistant mechanical engineer with the Pennsylvania Railroad Co., at Altoona, Pa., which position he held until September 1, 1902, when he was appointed superintendent of motive power of the Philadelphia, Baltimore, & Washington Railroad, at Philadelphia, Pa. On January 1, 1903, he was appointed to his present position of general superintendent of motive power of the Pennsylvania Lines East of Pittsburg and Erie. He was a member of the Committee on Locomotive Front Ends, which made its report at the recent meeting of the Master Mechanics' Association. In 1900 he presented a written discussion on the subject of "Ton-Mile Statistics" before the Western Railway Club. He is a member of the American Railway Master Mechanics' Association, the Master Car Builders' Association, the Engineers' Club, New York, and of the Rittenhouse Club, Philadelphia.

Mr. Gibbs is the son of Alfred and P. F. (Blair) Gibbs. He married Marianne Skelton, March 12, 1890, and they have one child, Marianne Skelton Gibbs.

Gibbs, George (M.E., '82), was born in Chicago, Ill., April 19, 1861; son of F. S. and Eliza H. Gibbs. The Gibbs family have lived in Newport, R. I., for many generations. His paternal grandmother was a daughter of Oliver Wolcott, Secretary of the Treasury under Washington, and granddaughter of Oliver Wolcott, Sr., signer of the Declaration of Independence.

Mr. Gibbs was assistant to Thomas A. Edison, in his private laboratory in New York, 1882; in charge of the meter department of the Edison Electric Illuminating Co., New York, 1882–83; chemist to the Oxford Copper & Sulphur Co., Bergen Point, N. J., 1883–85; engineer of tests of the Chicago, Milwaukee, & St. Paul Railway Co., 1885–87; mechanical engineer of the same company, 1887–97, having charge of the testing and experimental work for the road, as well as of car, locomotive, and machinery design, and being also head of the signal department; consulting engineer to the Illinois Steel Co., 1894–97; and president of the Gibbs Electric Co., Milwaukee, Wis., 1897. In 1898 this latter company was sold to the Westinghouse Electric & Manufacturing Co., and Mr. Gibbs removed to Philadelphia, becoming connected jointly, as consulting engineer, with the Baldwin Locomotive Works, Philadelphia, and the Westinghouse Electric & Manufacturing Co., Pittsburg, his special work in both companies being in the field of heavy electric traction engines and locomotives.



GEORGE GIBBS

While engaged in the above capacity Mr. Gibbs visited Europe a number of times; acted as chief engineer of the British Westinghouse Electric & Manufacturing Co., Ltd., London; the Westinghouse Electric Company, Ltd., London; the Société Industrielle d'Electricité Procédés Westinghouse, Paris; the Westinghouse Electricitäts-Actiengesellschaft, Berlin; and the Société Anonyme Westinghouse, St. Petersburg; and made plans for the electrification of the Metropolitan and the Metropolitan & District railways in London, and of the Mersey Railway, Liverpool.

In 1902 he severed his connections with

the above companies and became consulting engineer to the Rapid Transit Subway Construction Co. (afterward the Interborough Rapid Transit Co.), New York; member of the Board of Engineers of the Pennsylvania Railroad, New York tunnel lines and terminals; electrical engineer to the Long Island R. R. Co.; member of the Electric Traction Commission of the New York Central & Hudson River Railroad Co.; first vice-president of Westinghouse, Church, Kerr, & Co.; and adviser in engineering to the Carnegie Institution, Washington, D. C., all of which positions are still held by him.

The following is a partial list of patents taken out by Mr. Gibbs for devices used in railway service: Steam-heat coupling, 1887; a fire-extinguisher for railway cars, and an interlocking switch and signal stand, 1888; an electric berth-lamp for sleeping-cars, and an electric car-lighting system, 1889; a dumping-car for ore traffic, and a car-lighting system, 1891; a car-spring, and an electric connection for car-lighting, 1892; an interlocking switch and signal apparatus for railway crossings, an electric locking for interlocked crossings, and a derailing device for railway tracks, 1896; a motor suspension, 1898; a car vestibule, a system of train control, and a signaling system, 1903. He is also the designer and patentee of the first all-steel incombustible passenger cars ever built, of which 200 are now in use by the Interborough Rapid Transit Co., of New York.

Mr. Gibbs is a past president of the Western Railway Club, a member of the American Society of Mechanical Engineers; the American Society of Civil Engineers; the Institution of Civil Engineers of England; the Lake Superior Mining Institute; the Master Car Builders' Association; and of the Railway Master Mechanics' Association. He has been on a number of committees of the two last-named societies; was chairman of the Master Mechanics' Association committee to determine the economy, etc., of compound locomotives, which carried on extensive road tests of locomotives; and was a member of the Master Car Builders' Association committee in 1896 to design a standard axle for forty-ton freight cars. He was also a member of the Transportation Department Jury of Awards at the World's Fair, 1893.

To the Western Railway Club proceedings for the past eight years he has contributed a number of papers, including: "Steam Heating for Railway Cars;" "Testing Laboratories for Railways;" "Purification of Water for Locomotive Boilers;" "Railway Signaling;" "Locomotive Tests;" "Car-Lighting Systems;" and "Equipment at the World's Fair, 1893." He presented a paper to the New York Railroad Club in March, 1898, on "Electric Distribution of Power," which attracted wide attention. It treated of the description of electric transmission systems, direct and alternating current apparatus, suggestions on the manner of laying out the system, and electric distribution at the Baldwin Locomotive Works. He is also the author of an article on "Locomotives" in the 10th edition of the "Encyclopædia Britannica."

Mr. Gibbs is a member of the University, Century, and Down-Town clubs, New York; of the Rittenhouse Club, Philadelphia; and of the Theta Xi fraternity of Stevens Institute.

Gibbs, W. E. (M.E., '82), was located in New York city, 1883–89; in Elizabeth, N. J., 1889–94; in New York, 1894–98; and has been with Knight Bros., New York, from 1898 to date.

Giberga, Ovidio (M.E., '86), after graduation, took charge of work as sub-chief of section at Emperador, on the Panama Canal, and in the diversion of the several affluents of the Chagres River. Besides filling engagements in several civil engineering works, he assisted in substituting modern improved American locomotives and drills for the low efficiency Belgian locomotives and steam drills in use, introducing American ideas and methods wherever possible. From 1888 to 1894 he was in Cuba, installing sugar and electrical machinery on plantations, and designing electric lighting and tramway plants for several cities. In 1895 he took charge of the gas works and electric-light plant of the Spanish American Light & Power Co., of Havana, Cuba, increasing their capacity and economy of running by the introduction of modern machinery. He was engaged in this work for a period of five years, when he took charge of the water and sewer branch

of the Engineering Department of the city of Havana and of its electrozone plant. In 1900 he was elected a director of the Albear Canal. At the same time, through competitive examination, he obtained the Chair of Electricity at the School of Engineers and Architects of Havana, and was appointed director of that School, which position he holds at the present time.

Gibson, Frederick Montague (M.E., '01), was born in Dover, N. J., November 16, 1877; son of John Simpson and Ella Mary (Gordon) Gibson. He has been with the



F. M. Gibson

Cambria Steel Co., Johnstown, Pa., as assistant to steam engineer, from 1901 to date. He is a member of the Theta Xi fraternity.

Gibson, William Loan (M.E., '94), was born in Brooklyn, N. Y., April 22, 1873. He was foreman in the erecting-shops and draughtsman for the Snow Steam Pump Works, Buffalo, N. Y., 1894–96; with the Mexican National Railroad, at Mexico City, Mex., as foreman on grading, draughtsman in construction department, and instrumentman in engineers' camp, 1896–99; division engineer with S. Pearson & Son, on the reconstruction of the National Railway of the Isthmus of Tehuantepec (Ferro Carril Nacional del Istmo de Tehuantepec), 1899–1902; and has been resident engineer in charge of erection of the Henry R. Worthington new pumping-engine plant at Harrison, N. J., from 1902 to date.

Mr. Gibson is the son of George R., and Mary (Loan) Gibson, of New England ancestry. He married Socorro Farias, December 13, 1899, and they have three children, Mary, William, and Robert Gibson.

Gildersleeve, David H. (M.E., '89), was with the United Gas Improvement Co. of Philadelphia, 1889–90; with the Archer Gas Fuel Co., Newark, N. J., 1891–94; mechanical engineer with the Yaryan Co., New York, 1894–97; Eastern representative of the Snow Steam Pump Works, New York, 1897–98; and with the Blake-Knowles Pump Co., New York, 1898. He also acted as consulting engineer for several firms and companies. He was appointed first lieutenant in the 2d Regiment, U. S. Volunteer Engineers, in the war with Spain. After the war he remained in Cuba and took charge of the installation of the electrozone plant in Havana for the purpose of disinfecting the streets and sewage system of the city, and the harbor. Upon the completion of this work Mr. Gildersleeve returned to the United States and became manager of the New York office of the Cleveland Pneumatic Tool Co., and he has since practised as consulting and contracting engineer in New York.

Gilmore, J. W. (M.E., '94), was assistant engineer with the Hall Signal Co., 1894–95; assistant engineer with the Mining & Dredging Power Co., New York, 1895; secretary of the C. J. Field Co., consulting electrical engineers, New York, 1895–96; engineer in charge of the construction of track, linework, power-house, etc., of the Union Traction Co. of New Jersey, 1896–97; and chief engineer and superintendent of this company, 1897–98. In May, 1898, he enlisted for the Spanish war and served in the United States Navy in the capacity of assistant engineer. In April, 1899, he again entered the service of the Hall Signal Co. as engineer at their works at Garwood, N. J., and in the spring of 1901 was transferred to the office of the company at Chicago, Ill. From 1903 to date he has been with the Crouch & Fitzgerald Co., New York.

Glasgow, Arthur Graham (M.E., '85), was born in Buchanan, Va., May 30, 1865. He was in the service of the United Gas Improvement Co. from 1885 to 1891; as draughtsman and constructor, 1885–86; as



A. G. Glasgow

secretary and manager (in the Improvement Company's interests) of the Lewiston (Me.) Gas Light Co., 1886–87; as personal assistant to the Improvement Company's general superintendent, 1887–88; as superintendent (in the Improvement Company's interests) of the Kansas City Gas Light & Coke Co., 1888–90; and as general inspector of the Improvement Co., 1890–91. In December, 1891, Mr. Glasgow became engineer and general manager of the Standard Gas Light Co. of the City of New York, and from May, 1892, to date, he has been managing partner in Europe of the firm of Humphreys & Glasgow, contracting and constructing gas engineers. Under his direction, this firm has designed, constructed, and brought into successful operation carburetted water-gas works throughout the United Kingdom and the continent of Europe, as well as in Australia, New Zealand, China, etc., aggregating a total productive capacity of over 130,000,000 cubic feet daily. Mr. Glasgow gave extensive evidence before the Water Gas Committee of the British Home Office in 1898, and was president of the official delegation representing the United States Government at the World's Gas Congress at Paris in 1900.

Mr. Glasgow is the author of numerous essays, among which are the following: "Practical Efficiency of a Carburetted Water-Gas Setting," presented to the American Gas Light Association, 1890; "Carburetted Water Gas," and "Carburetted Water-Gas Apparatus," presented to the Incorporated Institution of Gas Engineers, London, 1891 and 1893; "Notes on Carburetted Water Gas," presented to the Cleveland Institution of Engineers, Middlesboro', England, 1897; "Carburetted Water Gas and the Home Office Inquiry," a lecture before the Incorporated Gas Institute, London, 1899; "Carburetted Water Gas as a Coal-Gas Auxiliary," presented to the American Gas Light Association, October, 1899, for which Mr. Glasgow received the Beal medal, which is awarded for "the best paper" presented to the Association during the year. The committee of award said:

"Mr. Glasgow treated his subject in a masterly manner. The paper is broad in its scope and of great and general usefulness to the gas engineer. The deductions are reached by the author after a thorough analytical examination of all the underlying bases of gas-manufacture. The paper exhibits, in a marked degree, the results of the large and varied experience of a gas engineer."

In 1903 he presented to the American Gas Light Association of Detroit a paper entitled "The Policy of Gas Enrichment; Illustrated by London Practice." He delivered the address to the Stevens Graduating Class of 1901.

Mr. Glasgow is a member of the Institution of Civil Engineers of Great Britain; of the Institution of Mechanical Engineers of Great Britain; the American Society of Mechanical Engineers; the American Society of Civil Engineers; the American Gas Light Association; and of the Western Gas Association. He is also a member of the Westmoreland and Commonwealth clubs, of Richmond, Va.; the Lotos Club, of New York; the Wellington, Whitehall, and Pilgrims' clubs of London; and of the Delta Tau Delta fraternity.

Mr. Glasgow is the son of Francis Thomas and Anne Jane (Gholson) Glasgow, and is of Scotch-Irish, English, and Swiss descent.

He married Margaret Elisabeth Branch, October 1, 1901, and they have one daughter, Margaret Gholson Glasgow.

Gnade, Edward Richard (M.E., '94), was born in Rutherford, N. J., August 23, 1874; son of Richard E., and Sarah Frances Butler Gnade. After a few months' shop-work in the Cooke Locomotive Works he was employed as draughtsman, with the National Meter Co., Brooklyn, N. Y., for about 18 months, and then took a position with the International Correspondence Schools of Scranton, Pa., taking charge of the instruction in mechanical drawing. In July, 1897, he entered the service of the Dickson Manufacturing Co., Scranton, Pa., as draughtsman, and a year later took his present position as mechanical engineer for the Oil Well Supply Co., Oil City, Pa., manufacturing gas and steam engines and all apparatus and appliances for the production of petroleum. He is a junior member of the American Society of Mechanical Engineers.

Goldsmith, James Alfred (M.E., '93), was born in New York city January 29, 1873. He has been connected with the firm of Hess, Goldsmith & Co., silk manufacturers, Wilkesbarre, Pa., from 1893 to date; as general



J. A. Goldsmith

manager 1897, and as member of the firm 1903. He is a member of the Hamilton Club, Paterson, N. J., and of the Reform Club, New York.

Mr. Goldsmith is the son of Louis and Hannah Fuller Goldsmith. He married Kate Morse Price, September 13, 1898, and they have two children, Katherine Price and Margaret Fuller Goldsmith.

Goode, Curtis Bates (M.E., '01), was born in Des Moines, Iowa, May 13, 1880; son of L. W. and H. S. (Newton) Goode. He was a special apprentice in the mechanical department of the Atchison, Topeka, & Santa Fé Railway Co., San Bernardino, Cal., specializing in oil-burning work for locomotive and stationary practice. He is a member of the Western Railway Club.

Grady, Charles Benedict (M.E., '97), was born in West Orange, N. J., August 29.



C. B. Grady

1876; son of Joseph B. F. and Frances A. (Benedict) Grady. He was draughtsman with Milliken Bros., engineers and contractors, New York, 1897–99; with the Oxnard Construction Co., New York, engaged in erecting and equipping beet-sugar plants in various parts of the country, 1899–1901; and has been in the engineering department of the New York Edison Co., New York, designing steam power plants for electric lighting and trolley service, from 1901 to date. He is now resident engineer of the

company's Waterside Power Station in New York city. He is a member of Alpha Tau Omega fraternity.

Graf, Carl H. (M.E., '90), was born in Newark, N. J., January 23, 1869. He was with the Atlantic Refining Co., Philadelphia, 1890; assistant to the manager of the Lawrence Gas Co., Lawrence, Mass., 1890–98, and in 1892 was made superintendent of its gas department, his work consisting of a general supervision of the process of gas manufacture and distribution as well as of work of construction and erection. He was in charge of the gas department of the Hackensack Gas & Electric Co., Hackensack, N. J., 1898–99; engineer of the gas department of the Gas & Electric Co., of Bergen County, N. J., a consolidation of five lighting companies, 1899–1903. In 1903 he became general superintendent of the Tilford-Lynn Syndicate, which controls some fifteen gas and electric companies in various States and has its office in New York. He is now located at Detroit with the J. T. Lynn Co. He is a member of the American Gas Light Association, the New England Association of Gas Engineers, and of the Delta Tau Delta fraternity.

Mr. Graf is the son of Herman and Adol-



C. H. Graf

phine Graf. He married Corinne Battell, November 18, 1896, and they have two children, Madeline and Eleanor Graf.

Graham, F. D. (M.E., '02), is with the Graham Transportation Lines, Seabright, N. J.

Graupner, Paul Charles Augustus (M.E., '89), was born in Jersey City, N. J., March



P. C. A. Graupner

24, 1867; son of C. A. and Emma Graupner. He is a graduate of the Hoboken Academy, 1879, and of the Stevens School, 1885. He was one of the engineering corps of the Union Iron Works, 1889–91; assistant engineer to Alfred R. Wolff, heating and ventilating expert, 1891–94; with Macy & Mixer, as engineer and designer of their refrigerating-machines of the absorption type, and subsequently preparing plans of various classes of desulphurization plants of the Macy system, 1894–96; consulting engineer to Josiah H. Macy; the Agatine Shoe Hook & Eyelet Co., and other clients; and supervising municipal work, 1896 to date.

Gray, Charles B. (M.E., '99), has been with the Pennsylvania Railroad in the shops at Altoona, Pa.; and at Buffalo, N. Y.

Graydon, Samuel D. (M.E., '75), Assistant Professor of Mechanical Drawing at Stevens Institute of Technology. For biography, see page 274.

Greenebaum, Leon (M.E., '85), was in the shipbuilding department of the Union Iron

Works, San Francisco, Cal., 1885–88; at the Atlas Iron Works, San Francisco, 1888–89; associated with Mr. Paul G. Hussey (M.E., Stevens, '85), 1889–92; then in the employ of the Western Meat Co., in the erection and equipment of their packing-houses and refrigerating-plant, ultimately taking charge of their engineering and purchasing departments, 1892–97; and has been located at San Francisco, Cal., 1897 to date, giving attention to mining properties in which he is interested. Since 1903 he has been president of the Bryan Elevator Co., San Francisco.

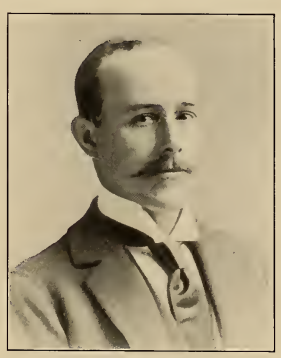
Greenidge, C. Austin (M.E., '95), was mechanical and electrical engineer with the Mount Morris Electric Light Co. of New York city, 1896–98, and superintendent 1898–99; assistant superintendent with the New York Edison Co., 1899–1902; superintendent of the electrical department of the Utica Gas & Electric Co., Utica., N. Y., from 1902 to date. He is an associate member of the American Institute of Electrical Engineers, and a member of the Syracuse Technology Club.

Gregory, Donald McG. (M.E., '00), was born in Oakland, Cal., May 10, 1877; only son of Silas Wright and Grace V. Gregory. His early education was obtained in Germany, the Drisler School in New York city, and the Stevens Preparatory School. Upon graduating he entered the employ of the Pintsch Compressing Co., of New York, erecting gas-plants in various parts of the country, among which may be mentioned those at Los Angeles, Cal., and Shreveport, La. He was just completing a plant for the company at El Paso, Tex., and was about to engage in similar work in Mexico, when his death occurred, March 11, 1902.

Grelle, C. Edward (M.E., '98), was with the New Amsterdam Gas Co., New York, 1898–99; draughtsman with the American Engine Co., Bound Brook, N. J., 1899; with Markt & Co., Ltd., Paris, France, 1900. In 1900 he became secretary of the Willamette Boiler Works, Portland, Ore., and he now holds the offices of vice-president and manager.

Griswold, Harold Ely (M.E., '93), was born in New York city October 16, 1870; son of William N. and Harriett L. (Ely) Griswold. He was with the Middle States Inspection Bureau, as inspector of special risks for thirty-eight companies comprising the Bureau, 1893–1900; special agent for New Jersey for the Phœnix Assurance Co., of London, 1900; and special agent for New Jersey and part of New York for the Phœnix Insurance Co., of Hartford, Conn., with headquarters in New York, from 1901 to date. He is a member of Squadron A., N. G. S. N. Y., and of the Chi Psi fraternity. He married Elsie M. Whitney in June, 1904.

Griswold, Howard Clifton (M.E., '88), was born in Louisville, Ky., February 28, 1866. His early education was received in the public graded schools of Louisville, Ky. With the exception of eighteen months, during which time he was with the Louisville



H. C. Griswold

& Nashville Terminal Co., in charge of terminal improvements at Nashville, Tenn., made jointly by the Louisville & Nashville Railroad Co. and the Nashville, Chattanooga, & St. Louis Railroad Co., he has been in the employ of the Louisville & Nashville Railroad Co., having held during the past 15 years the positions of draughtsman in chief engineer's office, 1888; rodman and assistant engineer in connection with terminal improvements, Cincinnati, O., 1888–89; assistant engineer in charge of masonry con-

struction at various places on the Louisville & Nashville system, 1889–90; division engineer on the Louisville, Cincinnati, & Lexington division, 1890–98; engineer in charge of terminal improvements, Nashville, Tenn., made by the Louisville & Nashville Terminal Co., 1898–1900; roadmaster of the Knoxville division of the Louisville & Nashville Railroad Co., 1900 to 1903; and roadmaster of the Louisville, Cincinnati, & Lexington division from 1903 to date.

Mr. Griswold is the son of Howard M. and Anna Grant Griswold. He married Mec M. Young, November 16, 1898.

Gsantner, Otto C. (M.E., '78), was in the Engineer Corps of the United States Navy, 1878–86, and since the latter year has been in the Examining Corps of the United States Patent Office.

Gubelman, Frederick P. J. (M.E., '89), was born in Hoboken, N. J., January 7, 1869; son of Theodore Franz and Julia Susanna Gubelman. Shortly after graduating he entered the employ of the Phœnix Iron Works Co., of Meadville, Pa., and had charge of the outside erection of steam-boiler and engine plants, electric-light stations, etc., besides doing more or less designing of compound engines.

In May, 1890, he engaged with McKee & Milson, Paterson, N. J. This firm had the contract for building a steel rivetted pipe line for the city of Newark, N. J. Mr. Gubelman had entire charge, as engineer, of both shop and field work; and retained this position until March, 1893. Messrs. McKee & Milson also built half of a pipe system at Rochester, N. Y. Up to this time these pipe lines were the largest and longest undertaken; and the system of conveying water by continuous steel rivetted conduits was practically new. The Newark line consisted of 22 miles of 48-inch pipe and 5 miles of 36-inch pipe, all rivetted together in a continuous shell without expansion joints. This portion of the work cost $1,750,000, the whole costing about $6,000,000. The Rochester line consisted of 28 miles of 38-inch pipe of a similar construction, and cost about $1,250,000.

In March, 1893, Mr. Gubelman left this position to go into contracting on his own account. This, however, proved unsuccessful, and he did some special work in the Department of Tests of Stevens Institute until September, 1894, when he became principal assistant to Mr. Robert Swan, supervising engineer for the new waterworks of Allegheny City, Pa. In this position, which he retained until July 1, 1896, he had entire charge of the designing and construction of the waterworks. During this last period he was also employed at different times by the East Jersey Water Co., to look after the designing of some of its extensions and improvements, including the 42-inch steel pipe line connecting its system with the Jersey City waterworks. He also practised to some extent as consulting engineer in various legal controversies, etc.

On July 1, 1896, he engaged as chief engineer with the firm of T. A. & R. G. Gillespie, engineers and contractors, of Pittsburg and New York, which was engaged in building a storage reservoir at Canistear, N. J., with a capacity of 2,500,000,000 gallons, a water surface of about 440 acres, and four separate dams at a cost of about $350,000. This firm was reorganized, January 1, 1897, into the T. A. Gillespie Co., a corporation, in which Mr. Gubelman was elected a director and also appointed as chief engineer and manager of the New York office. In February, 1890, he was elected vice-president of the Company, a position which, together with those of chief engineer and director, he held until February, 1903. During that time the firm constructed, among other engineering works, the following:

Portions of the Pittsburg, Bessemer, & Erie Railroad.

About eight miles of 50-inch steel rivetted pipe for the city of Minneapolis, including a double line under the Mississippi River.

New lines for the Passaic Water Co., including a crossing under the Passaic River by one 42-inch and two 48-inch pipes.

A large pumping-station and power plant at Little Falls, N. J.; the new 51-inch rivetted steel conduit running from Little Falls to Newark, a distance of about 9 miles; and a large reservoir on Garrett Mountain, near Paterson, which is connected with this pipe line. These three pieces of work were done for the East Jersey Water Co. and cost about $2,000,000. They were completed in 1899.

About $600,000 worth of 36-inch and 48-inch water-mains for the New York Water Department, 1898.

A large power-development plant at Massena, N. Y., designed ultimately to develop 100,000 horse-power; commenced in 1898 and completed in 1902.

A large filtration plant at Little Falls, N. J., for the East Jersey Water Co., costing about $300,000, constructed in 1901.

Large mains for the Pittsburg water system, at a cost of about $600,000, 1901.

On February 1, 1903, Mr. Gubelman severed his connection with the Gillespie corporation and formed the Eastern Construction Company of New Jersey, general contractors, of which he is president. Among its contracts is one for the construction of part of the new waterworks for Jersey City, amounting to about $400,000.

Mr. Gubelman has taken out a patent for an automatic air-valve which permits air to escape from the high points in a pipe line, but allows no water to escape, and, *vice versa,* prevents the formation of a vacuum when water is drawn off. His graduating thesis, "The Performance of the Steamer 'Homer Ramsdell,'" was published in the *Stevens Indicator,* VI, 296.

Mr. Gubelman is a member of the New England Water Works Association; of the American Water Works Association; the American Society of Mechanical Engineers; the American Society of Civil Engineers; the Franklin Institute, of Philadelphia; the University Club of Hudson County, N. J.; the Hamilton Club of Paterson, N. J.; the Jersey City Club; the Deal Golf Club, of Deal Beach, N. J.; and of the Tau Beta Pi fraternity.

Guenther, Frederic A. (M.E., '99), has been in the electro-chemical department of the United Electric Light Co., Springfield, Mass., 1899; in the Carnegie Steel Works, Duquesne, Pa., 1899–1900; and draughtsman with the United Engineering & Contracting Co., New York, from 1900 to date. He is a member of the Tau Beta Pi fraternity.

Gunagan, Richard Henry (M.E., '95), was born in Chicago, Ill., December 2, 1872. He was graduated from the Rutherford, N. J., public school, and entered the Stevens Institute from the Stevens School in 1891. He worked with his father, who was a carpenter and builder; was draughtsman for the Cooke Locomotive & Machine Co., Paterson, N. J., 1895–96; in the same capacity for the Garvin Machine Co., New York, 1896, and in the Equipment Department at the United States Navy Yard, Brooklyn, N. Y., 1896–1902, where also he has been master electrical machinist from 1902 to date.

Mr. Gunagan is the son of Thomas C. and



R. H. Gunagan

Mary J. (Horne) Gunagan. He married Florence C. Shugg, January 14, 1898.

Gunnison, Albert Waldron (M.E., '96), was born in St. Louis, Mo., August 12, 1873. At an early age he was left an orphan and spent most of his life in Brooklyn. He received his education at the Polytechnic Institute and Stevens Institute. He entered the employ of the Pneumatic Tube Co. of Philadelphia in January, 1897, and was actively engaged upon work connected with the installation of the pneumatic tube mail system in Greater New York when he was stricken with typhoid fever from which he died, December 1, 1897. The meritorious work performed by him upon this contract was rewarded by promotion, but the information came too late to be imparted to him. He was a member of Theta Xi fraternity.

Mr. Gunnison was the son of George

Stuart and Mary Frances (Waldron) Gunnison. He married Frances Gratia Olena,



A. W. Gunnison

December 16, 1896, and they had one child. Waldron Olena Gunnison.

Gunther, Charles O. (M.E., '00), Assistant Professor of Mechanical Drawing at Stevens Institute of Technology. For biography, see page 279.

Gurney, Howard F. (M.E., '92), was born in Jersey City, N. J., September 29, 1870. He is a graduate of the public grammar and high schools of Jersey City, and of Stevens School. He was draughtsman with the Central Railroad of New Jersey, Elizabethport, N. J., 1892–93; draughtsman, shop foreman, and superintendent of construction with the Sprague Electric Elevator Co., 1893–96; at Lockport, N. Y., with the Charles F. Parker Co., engineers and contractors, as superintendent in charge of canal improvement contract No. 3, Western Division of the Erie Canal, involving the deepening of the canal for six miles of its length, 1896–97; general superintendent of the Metropolitan Electric Construction Co., New York, 1897–98; general superintendent of the Sprague Elevator Co., 1898–99; and general superintendent of construction for the Otis Elevator Co. 1899–1904. He then purchased control of the National Elevator & Machine Co., and became president and general manager. He is now manufacturing electric elevators, and is located at the New York branch which is conducted under the firm name of the National Elevator & Construction Co. He is



H. F. Gurney

an associate member of the American Institute of Electrical Engineers, and a member of the Engineers' Club of New York.

Mr. Gurney is the son of William H. and Annie Gurney. He married Clara L. Dear, April 16, 1895, and they have one child, Howard F. Gurney, Jr.

Gutierrez, Jose Rafael (M.E., '00), was born in Sancti Spiritus, Cuba, June 14, 1878; son of Teresa and Manuel Gutierrez. For a short time during 1900 he was draughtsman in the Rogers Locomotive Works, Paterson, N. J., and then until December, was in the City Engineering Department at Havana, Cuba. He next became Engineer of Public Works, and was engaged in the construction of a highway between Sancti Spiritus and Placitos, a distance of 42 miles. In June, 1901, he engaged in professional work for himself as a contracting engineer, his first work being on the above-mentioned highway, where he completed four bridges, one being the largest highway bridge in Cuba. It is a Pratt steel bridge with spans of 20, 27, and 50 meters, making a total length of 97 meters between abutments. In addition

to this work he has been connected with several copper, iron, asbestos, and graphite mines; designer of the Sancti Spiritus electric light plant; and contractor for the Department of Public Works. He is a member of Amor y Verdad, Sancti Spiritus.

Guttin, Henry (M.E., '96), has been engaged in other than engineering work since graduation. During the war with Spain he was commissioned assistant engineer with the relative rank of acting ensign, U. S. N. His home is in New York city.

Hackstaff, John D. (M.E., '98), was with Evans, Almirall, & Co., heating and ventilating engineers, Boston, Mass., 1898–99; since which time he has been with W. S. Rockwell & Co., New York, later becoming a member of the reorganized firm, the Rockwell Engineering Co. Mr. Hackstaff's graduating thesis, written jointly with Messrs. Miller & Lunger, on "The Efficiency of the Twin-Screw Steam-Yacht 'Sovereign,'" was published in the *Stevens Institute Indicator*, April, 1899. He is a junior member of the American Society of Mechanical Engineers.



J. R. Gutierrez

Hagar, Arthur Percy (M.E., '02), was born in Newark, N. J., August 7, 1880; son of George J. and Emma L. (Hubbard) Hagar. His paternal ancestry is Scotch and Dutch; his mother's French and German. On his father's side he is a direct descendant of George Ross, a signer of the Declaration of Independence. While a student at Stevens he was engaged in the compilation and revision of cyclopædias. He was an Instructor at Stevens Institute during the Supplementary Term, 1902; with the Illinois Steel Co., South Chicago, Ill., in the same year; and since then he has been with the Continuous



A. P. Hagar

Rail Joint Co. of America, Newark, N. J. He is a member of the Tau Beta Pi fraternity.

Hagstoz, Arthur Thomas (M.E., '99), was born in Camden, N. J., October 29, 1876; son of Thomas Barwiss and Emma Reed Hagstoz. On his father's side he is descended from a family which came to Philadelphia, Pa., from England, in 1733. His maternal ancestors came to Philadelphia from Heidenheim, Germany, in 1802. He was in the meter department of the Edison Electric Illuminating Co., New York, 1899; and has been with the T. B. Hagstoz Co., Ltd., Philadelphia, Pa., smelters and refiners of gold, silver, and lead, from that period to date. While in this employ he was sent to the smelting department of the Courvoisier-Wilcox Manufacturing Co., Newark, N. J., and worked on their furnaces for about six months. He then returned to Philadelphia and superintended the erection and starting

of the new furnaces of the T. B. Hagstoz Co., Ltd., at the nearby town of Riverside, Burlington Co., N. J. In August, 1901, his work was transferred to the Philadelphia office, where he held the positions of secretary and treasurer for over a year. On October 1, 1902, he located at Riverside, where he has



A. T. Hagstoz

since been engaged in general charge of the works. He is a member of the Jewellers' Club of Philadelphia, Pa., and of the Chi Phi and Masonic fraternities, and is president of the Delanco Athletic Association. He is also an honorary member of the Veteran Corps, 1st Regiment, N. G. P.

Haight, Robert Stanley (M.E., '99), was born in Westchester, N. Y. He was draughtsman in the engine draughting-room of the Newport News Shipbuilding & Dry Dock Co., 1899–1900; with the New York Shipbuilding Co., Camden, N. J., 1900–01; and has been assistant to the superintending engineer of the Old Dominion Steamship Co., New York, from 1901 to date. His graduating thesis, on "Analysis of the Speed Trial of the Twin-Screw Steam-Yacht 'Sovereign,' by D. W. Taylor's Method of Trial Analysis," was published in the *Stevens Institute Indicator*, April, 1900. He is a member of the Society of Naval Architects and Marine Engineers, and of the Delta Tau Delta and Tau Beta Pi fraternities.

Hake, August R. (M.E., '92), was born in Hoboken, N. J., March 17, 1872. He graduated from the Hoboken Academy in 1888. He was a member of the engineering corps on the Park Avenue Improvement, New York Central Railroad, New York, in laying out the preliminary survey for overhead plate girders, 1892; in the steel-rail rolling-mill of the Pennsylvania Steel Co., Harrisburg, Pa., 1892–93; and has been with the Ph. Hake Manufacturing Co., New York, from 1893 to date. He is a member of the Deutscher Club of Hoboken.

Hall, Arthur H. (M.E., '90), was in the shops of the Spiral-Weld Tube Co., Bloomfield, N. J., 1890–91; assisted in redesigning and superintending the construction of spiral-weld tube machines in Germany, 1891–92; with Spaulding, Jennings, & Co., in charge of their cold-roll-steel and wire-drawing department, 1893–94; with the Central Gas Light Co., New York, as superintendent of street mains, 1894–97; and has been with the Central Union Gas Co. and the Northern Union Gas Co., as superintendent of distribution, from 1897 to date. He is a member of the American Gas Light Association.

Hall, Burton Pettinger (M.E., '88), was born in New York city, April 19, 1867. He has been engaged in steam construction work since graduation; as superintendent of the New York Steam Fitting Co., has had charge of the designing and construction of heating, ventilating, and power plants which have been installed in some of the largest hotels, apartment houses, and factories in New York city and vicinity. He has also done considerable consulting work in the line of power transmission and consumption, and at present is the treasurer of the New York Steam Fitting Co. He is a member of the Theta Xi and Tau Beta Pi fraternities.

Mr. Hall is the son of George F. and Mary M. Hall. He married Bertha L. Packard, April 19, 1893, and they have one child, Clifford Alden Hall.

Hall, Charles A. (M.E., '87), was with Price & Hall, dealers in hardware, etc., Mobile, Ala., 1887–90; and then became general manager of the Mobile Phosphate & Chemi-

cal Manufacturing Co., Mobile. In 1899 he was elected president of the company, retaining his position as manager, in which capacity he had under his direct charge the management of the technical department of the company, which was engaged in the manufacture of sulphuric acid, acid phosphates, guanos, etc. He also planned and executed many improvements in the plant. In 1901 Mr. Hall sold out his interest in this business to devote his time to professional work as consulting and contracting engineer, giving special attention to examinations and reports of industrial properties, crushing and pulverizing plants, fertilizer works, sulphuric-acid plants, etc., at Mobile.

Hall, Robert Everett (M.E., '95), was born in Brooklyn, N. Y., March 15, 1871; son of George F. and Mary M. (Powers) Hall. He was in the department of tests as inspector of materials used in the motive-power department of the Baltimore & Ohio Railroad, Baltimore, Md., 1895–97; with the Hall Steam Power Co., New York, holding successively the positions of inspector and superintendent, 1897–98; and has been secretary of the New York Steam Fitting Co. from 1898 to date. He is also a director of the G. F. Hall Co., New York. During the



R. E. Hall

war with Spain Mr. Hall entered the navy as passed assistant engineer (with rank of lieutenant) and served as chief engineer of the monitor "Jason" until she was put out of commission at the conclusion of the war. He is a junior member of the American Society of Mechanical Engineers; a member of the Society of Naval Architects and Marine Engineers; engineer lieutenant in the 2d Naval Battalion, N. M., N. Y., and a member of the Delta Tau Delta fraternity.

Halliday, William Reeder (M.E., '02), was born in South Orange, N. J., November



W. R. Halliday

27, 1879; son of W. S. and M. L. (Pierson) Halliday. He was an Instructor in Supplementary Term work at Stevens Institute, 1902; labor foreman at the rail mill of the Illinois Steel Co., 1902–03; and has been in the general offices of the Continuous Rail Joint Co., Newark, N. J., from 1903 to date.

Hamilton, Alexander King (M.E., '95), was born in Johnstown, Pa., September 10, 1873. He was in the mechanical department of the Cambria Steel Co., Johnstown, 1895–1900, doing general experimental work; was draughtsman in charge of a squad, 1900–01; assistant to chief draughtsman, 1901–02; and division engineer with the Lackawanna Steel Co., Buffalo, N. Y., in charge of the designing and construction of new mills, 1902–03. In June of the latter year he was appointed assistant engineer

to the same company, in charge of all engineering work, and he now holds the position of chief engineer. He is a junior member of the American Society of Mechanical Engineers and a member of the Beta Theta Pi fraternity.

Mr. Hamilton married, September 15, 1897.

Hamilton, James Brown (M.E., '95), was born in North Carolina December 25, 1873.



J. B. Hamilton

He prepared for Stevens Institute at the University School, Petersburg, Va. He was draughtsman with the Baldwin Locomotive Works, Philadelphia, Pa., 1895–97; with the Western Electric Co., New York, 1897–98; with A. Faber du Faur, consulting engineer, New York, 1898–99; and has since been with the Mutual Life Insurance Co., of New York. He is a member of the Royal Arcanum, of Euclid Lodge No. 136, Free and Accepted Masons, and of the Theta Xi fraternity.

Mr. Hamilton is the son of Robert A. and Martha E. V. Hamilton. He married Helen C. Knapp, July 24, 1899, and they have two sons, James, Jr., and Alston Hamilton.

Hamilton, Robert P. (M.E., '94), immediately upon graduating became a partner in the firm of Bland Bros. & Wright, tobacco manufacturers. The business was incorporated in 1897 under the name of the Bland Tobacco Co., and since that time he has held the position of secretary and treasurer of the company.

Hamilton, William Juél (M.E., '89), was born in Albany, N. Y., December 17, 1867; son of William A. and Amanda J. (Juél) Hamilton. His father's ancestors were of New England birth, and their forebears came from England, Ireland, and Scotland. The first Hamilton in this country settled in Massachusetts about the middle of the 17th century. His mother's ancestors were French Huguenot and English. Mr. Hamilton received his early education in the Albany Academy. He has been in the employ of the Hendrick Manufacturing Co., Ltd., Carbondale, Pa., from 1889 to date, holding the position of mechanical engineer until 1896, purchasing agent, 1896–1902; and mechanical engineer, 1902–03, in which latter year he was appointed assistant secretary. He is a member of the Scranton, and Scranton Engineers' clubs, of the New England Society of Northeastern Pennsylvania, and of the Delta Tau Delta fraternity.

Hammond, George Overton (M.E., '98), was born in New York city April 20, 1874.



G. O. Hammond

Upon graduation he entered the shops of the Erie Railroad at Susquehanna, Pa., as

special apprentice, and since then has been connected with the engineering work of the road successively as draughtsman, engineer of tests, general foreman of Meadville shops, assistant inspector of machinery, general inspector of machinery, and chief draughtsman. He is a member of the New England Railroad Club and of the Theta Nu Epsilon fraternity.

Mr. Hammond is the son of Charles Edward and Caroline Augusta Hammond. He married Agnes Dunphy, April 10, 1901, and they have one child, Dorothy Dunphy Hammond.

Handforth, Walter S. (M.E., '97), was engaged with Burhorn & Granger, consulting and contracting engineers, until 1901. He is at present a teacher of manual training in the public schools of New York city.

Handloser, Robert Carl (M.E., '98), was born in Trenton, N. J., October 26, 1875;



R. C. Handloser

son of Thomas V. and Louisa Handloser. He is of German descent. He was draughtsman with the Western Electric Co., New York, 1898; engineer with the Garvin Machine Co., New York, 1898–99; and in the same capacity in the factory of the Keuffel & Esser Co., manufacturers of drawing and surveying instruments, etc., Hoboken, N. J., 1899; engineering salesman and then manager of the Vienna house of Gustav Diechmann & Sohn, Berlin and Vienna, a firm holding the European agency for a great variety of American machinery and tools, representing some of the largest American manufacturers, including the Brown & Sharpe Manufacturing Co., Providence, R. I., and the Niles Tool Works Co., Hamilton, O. This position he held until 1902. He is at present in charge of the eastern office in New York of the Dilworth, Porter, & Co., Ltd., rolling-mills, Pittsburg, Pa. He is a member of the Theta Nu Epsilon fraternity.

Hann, Robert A. (M.E., '91), was in the railway department of the Westinghouse Electric & Manufacturing Co., Newark, N. J., 1891–94; and has been assistant mathematician for the Equitable Life Assurance Society, New York, from 1894 to date.

Hansen, Johann M. (M.E., '91), devoted himself to the study of water-gas production, and was employed by the United Gas Improvement Co., Philadelphia, superintending the construction of gas plants in various parts of the country. He had supervised the erection of eight of these plants at the time of his death, which was caused by consumption, July 23, 1895. He was a mathematical genius and showed exceptional proficiency in chemistry. He won the Priestley Prize while a student at the Institute. While a student Mr. Hansen contributed a paper on "Marine Governors and the Causes of Their Failure," to the Stevens Engineering Society; this paper was published in the *Stevens Indicator*, VIII, 47.

Hardie, Henry M. (M.E., '96), has been with the John T. Hardie & Sons Co., New Orleans, La., from 1896 to date.

Hardie, Lewis H. (M.E., '96), has been with the New York Metallic Bedstead Co., Jersey City, N. J., from 1896 to date.

Haring, Max (M.E., '83), died in 1887. There is no record of his work.

Harrington, Harry Garfield (M.E., '00), was born in Newark, N. J., October 27, 1877; son of Joseph and Anna Kathryn Harrington. On his father's side he is descended

from an old English family; on his mother's side, from Revolutionary stock, his great-grandfather serving in the War of Independence, and his grandfather in the War of 1812. He has been an assistant in the engineering department of the New Jersey Zinc Co., New York, from 1900 to date. He is a member of the American Institute of Mining Engineers; a junior member of the American Society of Mechanical Engineers



H. G. Harrington

and of the American Society of Civil Engineers; and a member of the Tau Beta Pi fraternity.

Harris, Frederic R. (M.E., '96), was associated with Henry D. Steers, contracting engineer on harbor improvements, etc., New York, being engaged in designing, preparing estimates, and supervising work, until 1901, when he became superintendent for the Degnon-McLean Contracting Co., New York. In 1903 he was commissioned a civil engineer in the U. S. Navy, and is now stationed at the Navy Yard, Charleston, S. C.

Harrison, E. Mortimer (M.E., '95), upon graduation went into the manufacture of paper at Bozrahville, Conn., and has continued in that business ever since. His graduation thesis, prepared jointly with Messrs. Schmidt and Slipper, on "Experiments with a Boiler Arranged to Serve as a Calorimeter for Determining the Heating Value of Fuel," was published in the *Stevens Institute Indicator* for July, 1900.

Harrison, Harold (M.E., '92), has since graduation been with McArthur Bros., Chicago, Ill., railroad contractors, and in the engineering department of the American Telephone & Telegraph Co. He was treasurer of the Carter Package Co., manufacturers of woodenware, 1894–99, and since the latter date has been principally concerned with private interests.

Hart, Benjamin Franklin, Jr. (M.E., '87), was born in Hoboken, N. J., July 14, 1865. He received the scholarship to Stevens from the Hoboken public schools. He served five years in the Ninth Regiment of the National Guard of New Jersey, and having been chief engineer of the Battalion of the East, Naval Reserve of New Jersey, for several years previous to the breaking out of the war with Spain, he entered the United States Navy as a passed assistant engineer with rank of lieutenant. He served successfully as first assistant engineer of the U. S. S. "Badger," chief engineer of the U. S. S. "Saturn," and assistant to the chief engineer at the Norfolk (Va.) Navy Yard. After eight months' service in the navy, the war emergency having passed, he was honorably discharged, and secured a position with the Wheeler Condenser & Engineering Co., becoming the superintendent of the works at Carteret, N. J. After about two years at Carteret he became the company's engineer and was located at the New York office. While in the employ of this company he supervised the erection of several large installations, including a cooling-tower plant, complete with fan and pumping-engines, at Central Soledad, near Cienfuegos, Cuba, and one of the largest cooling-tower outfits ever constructed, complete with surface condensers and pumps, at St. Louis, Mo. He has contributed papers to the engineering journals on the subject of cooling-towers, and has been employed as an expert witness in litigation. He left the employ of the Wheeler company in the latter part of 1901, and associated himself with Edwin Burhorn, M.E., engineer and contractor, with whom he remained until 1904, when he established the

firm of B. Franklin Hart, Jr., & Co., contracting engineers and manufacturers of all manner of plate-steel construction. He is a member of the Chi Psi and Sigma Xi fraternities, and of the Benevolent and Protec-



B. F. Hart, Jr.

tive Order of Elks; lieutenant in the Naval Reserve of New Jersey, and a vestryman of St. John's Church, Sewaren, N. J.

Mr. Hart is the son of Benjamin Franklin and Emeline Amelia (McDowell) Hart. His paternal ancestors were English, having come to America from England in 1832, and his father (Col. B. F. Hart) was an officer in the Union Army during the Rebellion. Mr. Hart married Florence Virginia Perry, April 5, 1899, and they have one child, Benjamin Franklin Hart, 3d.

Hartpence, Charles Clifford (M.E., '94), was born in Trenton, N. J., October 8, 1871. Immediately after graduation he entered the service of the East River Gas Co., now the New Amsterdam Gas Co., at Long Island City, where he remained until 1901, serving during the last three years as superintendent of the Ravenswood works. In 1901 he opened an office in New York and commenced practice as consulting gas engineer, a business he still follows. He is a member of the American Gas Light Association, and of the Beta Theta Pi fraternity.

Mr. Hartpence is the son of John and Keziah Hartpence. He married Cora Lummus, February 8, 1899.

Harvey, D. Carroll (M.E., '90), was draughtsman with the General Electric Co., Schenectady, N. Y., 1890–91, and was engaged in the same capacity with the Third Avenue Cable Road, New York, 1891–94. From the latter year to date he has been with the Fidelity & Casualty Insurance Co., New York.

Hasbrouck, Stephen Augustus (M.E., '96), was born in New York city, August 9, 1874. He was with R. H. Wolff & Co., Ltd., manufacturers of the Wolff-American High Art cycles and also wire manufacturers, New York, 1896–97, being employed in testing, laying out repairs in the factory, designing "jigs" and several new machines. In 1898 he was engaged in developing a gasoline motor of his own design, and he later organized the Hasbrouck Motor Co., with factory at Piermont, N. Y., where he was engaged in manufacturing the motor for yachts, boats, trucks, and carriages. He was president of this company, 1899–1901. In the latter year the company was re-organized as the Hasbrouck Motor Works, and in 1902 the factory was removed to Yonkers, N. Y., and the firm confined its operations to marine work. In August, 1902, it turned out the 35-foot launch "Cricket," equipped with one four-cylinder 16-horse-power gasoline motor, which averaged 16 miles per hour in trials on the Hudson River, its complete machinery weighing about 800 pounds. The firm has recently established its factory at West Mystic, Conn.

In 1899 Mr. Hasbrouck took out a patent on a convertable compound explosive engine intended for use in automobiles where great power was required at times. For ordinary use the motor runs compound and uses but little fuel. When extra power is required, the low-pressure cylinder is turned into a high-pressure cylinder by simply pulling a lever, thus doubling the power. The pushing back of the lever changes the motor back into a compound. In 1900 a patent was granted him on a "Regulator for Gasoline or Other Like Engines." This is intended to control the speed of the engine by a throttle as in a steam-engine and makes the motor

very flexible. He has other patent applications filed.

Mr. Hasbrouck is a member of the Theta Nu Epsilon fraternity, of the Stevens, Passaic River, and Yonkers yacht clubs, of the League of American Wheelmen, and of the American Motor League.

The subject of this biography is the son of Stephen Hasbrouck, M.D., and Anna M. (Stilville) Hasbrouck. The family is French Huguenot, descended from Abraham Hasbroucq, a native of Calais, France, who came to America in 1675 and settled in New Paltz, N. Y. Mr. Hasbrouck married Edith Auryansen, June 26, 1902.

Haussling, Joseph H. (M.E., '02), was born in Newark, N. J., March 6, 1877; son of Andrew and Emma (Schaefer) Haussling. He received his early education in the public schools of Newark. He has been em-



J. H. Haussling

ployed in the testing department of the General Electric Co. from 1902 to date.

Hawkins, William Clark (M.E., '89), was born in Orange, N. J., September 5, 1866. He was assistant engineer on the Third Avenue Cable Road, New York, 1890–91; engaged in independent engineering work in Central America, 1892; manager of the Plymouth, Mass., Electric Light Co., 1893–96; superintendent and receiver of the Concord Land & Water Co., Concord, N. H., 1896–98; managing engineer of the Columbia



W. C. Hawkins

Water Power Co., Columbia, S. C., 1898; engineer in charge of installations, etc., for the General Electric Co., until July 1, 1901; general manager and secretary of the Hamilton Electric Light & Cataract Power Co., Hamilton, Canada, 1901–03; and has been general manager and secretary of the Hamilton Cataract Power, Light, & Traction Co., the successor to the above company, from 1903 to date. He is a junior member of the American Society of Mechanical Engineers.

Mr. Hawkins is the son of John Thomas and Mary O. Hawkins. He married Mary Elizabeth Chambers, December 29, 1898, and they have two children, Francis Chambers and Elizabeth Chambers Hawkins.

Haworth, J. Frederick (M.E., '90), was with the Pittsburg & Birmingham Traction Co., Pittsburg, Pa., 1890–92, and has been a member of the firm of Haworth & Dewhurst, Pittsburg, from 1892 to date.

Haynes, William Leseur (M.E., '86), was born in Weston, N. J., August 30, 1863. He was draughtsman in the Department of Public Works, New York city, 1887–88; draughtsman with Henry Warden, Philadelphia, Pa., 1888–90; superintendent of the Ti-

conderoga Machine Co., Ticonderoga, N. Y., 1890–92; in the Crane department of William Sellers & Co., Inc., Philadelphia, 1892–1901; and has been chief draughtsman in the mechanical engineering department of the American Bridge Co., Pencoyd, Pa., from 1901 to date. He is a member of the University Club of Philadelphia, of the Franklin Institute, and of the Chi Psi fraternity.

Mr. Haynes is the son of John S. and Sarah (Smith) Haynes. He married Augusta R. Wicker, October 24, 1895, and they have one child, John Shields Haynes.

Hays, David (M.E., '02), was born in New York city March 3, 1881; son of Benjamin F. and Anna H. Hays. He was draughtsman, 1902–03, and assistant to the superintendent, 1903–04, in the superintending engineer's office of the Old Dominion Steamship Co., New York, and is now assistant superintendent of the United States Gauge Co. He is a member of the Society of Naval Architects and Marine Engineers, and of the Tau Beta Pi fraternity.

Hayward, Henry Selby, Jr. (M.E., '00), was born in Elizabeth, N. J., December 25,



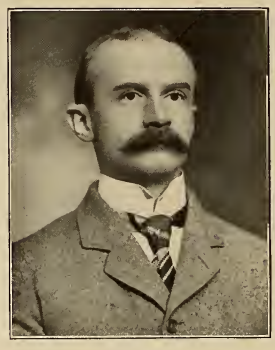
H. S. Hayward, Jr.

1876; son of Henry S. and Emma Purviance (Hastings) Hayward. He was Instructor at the Stevens Institute during the Supplementary Term, 1900, and then became mechanical engineer with the Franklin Air Compressor Co., Franklin, Pa., which was then building its plant. He was placed in charge of designing and equipping the power plant and power transmission, and on completion of this work he took charge of the tests and repairing of the machinery. In 1902 he spent two months in travelling, returning to Franklin to superintend the installation of some new machinery at the Franklin Steel Casting Co.'s plant; after the completion of which he commenced practice in October, 1902, as mechanical engineer, making power plants a specialty and acting as representative of several machinery firms. In January, 1903, he added to his other work the duties of special representative or travelling engineer for the Franklin Manufacturing Co., and the Franklin Railway Supply Co., to look after their goods and interests on the Pennsylvania, Baltimore & Ohio, Long Island, Central of New Jersey, and the New York, Philadelphia, & Norfolk railroads. Mr. Hayward is a junior member of the American Society of Mechanical Engineers, of the New York Railroad Club, and of the Chi Phi fraternity.

Hazard, Harry Williams (M.E., '78), was born near Newcastle, Del., December 12, 1856. He was appointed chemist at the works of the Dunbar Furnace Co., Dunbar, Pa., in August, 1878, and about six months later became assistant superintendent. Shortly afterward he went to the Oliphant Furnace as superintendent, returning to Dunbar in 1881, where he successively filled the positions of superintendent, vice-president, and president of the Dunbar Furnace Co., which latter position he held until 1895. In 1890 he was elected president of the Crane Iron Co., Catasauqua, Pa., serving in this capacity until 1893. During the construction of the works of the Radford-Crane Iron Co., Radford, Va., in 1890 and 1891, he was president of the company and superintended the work. His duties consisted of looking after all the details of engineering and management of these various plants, including the purchasing of ores and other supplies, and, at Dunbar, the mining and coking of coal in addition to the regular furnace work. Mr. Hazard has not been

in business since 1895. He is a member of the Westmoreland, Art, and Hermitage clubs, Richmond, Va., the Bay Head Yacht Club, and of the Theta Xi fraternity.

Mr. Hazard is the son of Albert Barnes and Mary A. Hazard, and a descendant of Thomas Hazard who settled in Rhode Island in 1639. He married Catharine Dawson



H. W. Hazard

Willson, April 19, 1882, and they have had six children, Jessie Evans, Alpheus Evans Willson, Erskine, Harry Williams, Rowland, and Norman (deceased) Hazard.

Healy, Raymond (M.E., '02), was born in Brooklyn, N. Y., April 7, 1880; son of Frank and Mabel C. (Raymond) Healy, and nephew of R. W. Raymond, secretary of the American Institute of Mining Engineers, and of Col. Charles Raymond, president of the Board of Engineers, of the Pennsylvania Railroad tunnel, etc., and of A. A. Healy, president of the Brooklyn Institute of Arts and Sciences. He is in the employ of J. M. Delaney & Co., New York, and is a member of the New York Electrical Society.

Heger, William S. (M.E., '79), was employed in the Edgemoor Iron Works, Wilmington, Del., 1879–87; was agent for the Edison Electric Light Co. at Wilmington, and is district office manager of the Westinghouse Electric & Manufacturing Co., San Francisco, Cal.



Raymond Healy

Heiskell, John McKinney (M.E., '86), was born in Rogersville, Tenn., September 3, 1853; son of J. B. and Sarah A. (McKinney) Heiskell. He was a rodman on preliminary surveys for the Memphis bridge, 1886–87; draughtsman, with S. Whinery, C.E., Chattanooga, Tenn., where he plotted the line of railway up Lookout Mountain and designed new safety devices for the incline previously built, 1887; in the office of the Illinois Central Railroad bridge, Cairo, Ill., 1888; assistant engineer with George S. Morison, chief engineer, and A. Noble, resident engineer, of the Kansas City & Memphis Railway & Bridge Co., who had charge of the construction of the Memphis bridge, 1888–92, resigning this position in 1892, when the bridge was about completed.

He has been associated at different times with J. H. Weatherford, mechanical engineer and patent solicitor at Memphis, from 1896 to date; was assistant engineer on concrete work for bridges and buildings of the Illinois Central Railroad, 1898–1900; assistant engineer on two bridges at the Kansas City stock yards, 1900–01; assistant engineer on a wharf at Tampico, Mex., 1901–02; and assistant engineer on concrete work for the Nashville, Chattanooga, & St. Louis Railroad, at Memphis, 1902–03. Mr. Heis-

kell has taken a special interest in good road construction, and read a paper on the subject before the Road Congress at Chicago in 1892. He has also written several articles on the subject. He is a member of the Memphis Engineering Society, before which he has read a paper on "Wide Wheels, Economic Traffic, and Best Pavements."

Hemminger, George Reverdy (M.E., '98), was born in Newville, Pa., April 25, 1872; son of George and Annie E. (Powell) Hemminger. He was engineer with the Atlanta Gas Co., Atlanta, Ga., 1898–99; with the Hudson & Essex Gas Co., Newark, N. J., 1899–1901; and from the latter year until recently was assistant superintendent of the People's Gas Light Co., Manchester, N. H. He is at present with the United Gas Improvement Co., Philadelphia, Pa. He is a member of the Delta Tau Delta fraternity, and of the Derryfield Club, Manchester, N. H.

Henderson, Arthur P. (M.E., '83), obtained a large experience through employment with different firms, including the Delamater Iron Works Co., New York; the Worthington Hydraulic Works Co., Brooklyn, N. Y.; the Collender Waterproofing Co., East Newark, N. J.; the Passaic Rolling-Mill, Paterson, N. J.; the Newport News Shipbuilding & Dry Dock Co., Newport News, Va.; the Norfolk Navy Yard; the marine department of the Babcock & Wilcox Co., New York; and the Baltimore Electric Refining Works, Baltimore, Md. After his retirement from the Babcock & Wilcox Co. Mr. Henderson was compelled to take a year's rest, owing to failing health. During the period of his occupation in Baltimore he was seized with appendicitis which resulted in his death on February 19, 1900.

Henderson, John Augustus (M.E., '73), was born in Philadelphia December 31, 1853; son of Andrew Augustus and Mary Virginia (Peaco) Henderson. His father and maternal grandfather, John Peaco, were both surgeons in the United States Navy. His father, in addition to his professional duties, including service in several wars, contributed substantial work to the earlier geological survey of Pennsylvania, and to other natural sciences. He was also an inventor, taking out several patents, including one on a hot-air engine, one on a marine-engine governor, and another on an automatic rake for reapers. The last named was sold to the Walter A. Wood Co.

Mr. Henderson was the first graduate of Stevens Institute, and in point of high character and attainments as a student, as well as of evidences of the best mental capacity, well merited the pre-eminent position in which he was in this way placed.

On his graduation in 1873 he entered the employ of the Delaware River Iron Shipbuilding & Engine Works, Chester, Pa., and in 1874 took a position with the Baltic Iron



J. A. Henderson

Shipbuilding Works at St. Petersburg, Russia. The prospects of advancement in the employment of this company not proving encouraging, he returned to America and entered the Engineer Corps of the United States Navy in 1876, in which he continued until 1884, when serious impairment of health necessitated his being placed on the retired list, and compelled him to lead a life of actual, rather than merely nominal, retirement. He has remained in touch with engineering progress, but with an inclination toward general scientific and philosophical studies. He has always been especially interested in evolutionary philosophy, not only in its biological aspects, but as extended into social, historical, ethical, and other fields.

All who have known Mr. Henderson agree that under ordinary conditons he would have accomplished work in his profession which would have constituted a worthy monument to his capacity and character.

Henning, Gustavus Charles (M.E., '76), was born in Brooklyn, N. Y., January 1, 1855. His primary education was received at the Hoboken Academy, 1861–69, and his collegiate education at the Brooklyn Polytechnic Institute, from which he was graduated in 1875.

He was in the employ of the New York Elevated Railroad, on the construction of foundations, shops, and track, 1876–77;



G. C. Henning

draughtsman, calculator, and inspector on the Brooklyn Bridge, 1877–82; superintendent of the East Baltimore Machine & Boiler Works, 1882–83; constructing engineer for the Beaver Wire Mills, Beaver Falls, Pa., 1883; and has been inspector of materials and bridges, and consulting engineer, New York, from 1883 to date.

Mr. Henning was the representative of the Yale & Towne Manufacturing Co., for Emery's testing-machines, in London and Paris, from 1887–89, and special expert engineer for the Department of Buildings, New York, 1896.

He represented the American Society of Mechanical Engineers at International Conferences on Testing Materials held at Vienna in 1893, at Zurich in 1895, and at Stockholm in 1897, at the latter of which he was chosen honorary president during the Conference, and appointed chairman of the Section on Metals, and at Dresden, in 1898, was elected Member of Council until 1900. He was one of the most prominent workers in the International Association for Testing Materials, which originated in Europe, and he organized its American Section at a meeting of American scientists at Philadelphia, June 16, 1898. In 1900 the membership in the International Association included 2,000 names, and that of the American Association 135 names. He was awarded the Edward Longstreth Medal of Merit by the Franklin Institute, for his "Pocket Recorder for the Tests of Materials," in 1900.

Mr. Henning has taken out patents on an apparatus for making a grit-covered roofing ("Granite Roofing") successfully, 1896; a swivelled adjustable rope coupling which permits adjusting driving-ropes to uniform tension and length after stretching during service, 1898; an indicating recording apparatus used in tension and crushing, as well as alternating or repetitive tests of materials, 1899; an apparatus for reversing propellers of steamships, with the engine always running in one direction, 1901; a steam reversing-turbine which permits driving boats in either direction by a single turbine, instead of using several turbines designed to run in opposite directions, 1902.

His principal writings include the following:

"Notes on Steel," *Transactions of the American Society of Mechanical Engineers*, IV, 410.

"Apparatus Used in Testing Materials," *Ibid.*, VI, 479.

"Notes on Working Stress in Iron and Steel," *Ibid.*, VIII, 174.

"Reports of Committee on Standard Tests and Methods of Testing Materials," *Ibid.*, XI, 527, 587, 604.

"On Elastic Curve and Treatment of Steel," *Ibid.*, XIII, 571.

"Autographic Recording Apparatus," *Ibid.*, XIII, 640.

"Pocket Recorder for Tests of Materials," *Ibid.*, XVIII, 823.

"Mirror Apparatus," *Ibid.*, XVIII, 849.

"Investigations of Boiler Explosions," *Ibid.*, XX, 649.

"Report of Committee on Methods of Testing Materials," *Ibid.*, XX, 15.

"How Materials Are Tested," *Cassier's Magazine*, October, 1894.

"From an Inspector's Note-book," *Ibid.*, May, 1895.

"Testing Machines," *Stevens Indicator*, VI, 264.

"The Pike's Peak Rack Railroad," *Ibid.*, VIII, 112.

"Review of the Present Status of Iron Analyses," *Ibid.*, XIII, 191.

Translation and condensation of article on "Explosions of Air-Compressors," from Glückauf, *American Machinist*, January 27, 1898.

"Ten Different Methods of Distinguishing Sheet Iron from Sheet Steel," *Ibid.*, 1898.

"The International Association for Testing Materials," *Engineering Magazine*, April, 1899.

"Improvement on Pocket Recorders," *American Machinist*, March 14, 1901.

He also translated and added to the contents of "Handbook of Testing Materials for the Constructor," by authority of the author, Prof. Adolf Martens, Director of the Royal Testing Laboratories at Berlin and Charlottenburg, in 1900.

Mr. Henning is a life member of the American Society of Mechanical Engineers, of which also he was a member of Council and one of the managers, 1896–99. He is a member of the American Institute of Mining Engineers; the American Society of Naval Engineers; the International Association for Testing Materials; the Institution of Mechanical Engineers of Great Britain; and of the Iron and Steel Institute of Great Britain.

Mr. Henning is the son of Henry William and Louise (Thomass) Henning. The Thomass family, which is traced back to 1600, came from Saxony; the Henning family, from Billings in the Duchy of Hessia. Both parents migrated to the United States before reaching their majority in 1848 and 1849. Mr. Henning married Fanny Funk, September 1, 1892.

Henry, Jacob Schermerhorn (M.E., '99), was born in South Orange, N. J., July 31, 1876; son of Lewis B. and Catherine E. (Schermerhorn) Henry. He prepared at the Dearborn–Morgan School, Orange, N. J., and later entered Stevens School. He was a special apprentice with the Pittsburg, Cincinnati, Chicago, & St. Louis Railroad, Logansport, Ind., 1899; was with the Automobile Company of America, Marion, N. J., 1899–1901; and has been assistant engineer at the Jersey City works of the Safety Car Heating & Lighting Co. from 1901 to date. He is a member of the Baltusrol Golf, the East Orange Golf, and the New York Rail-

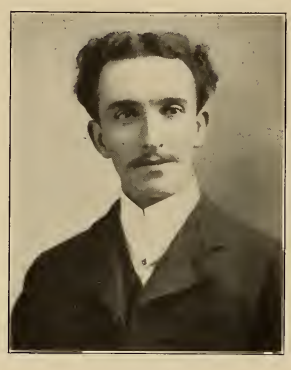


J. S. Henry

road clubs, of Hope Lodge No. 124, Free and Accepted Masons, of East Orange, and of the Theta Xi fraternity.

Hewitt, George (M.E., '96), was born in Paterson, N. J., January 30, 1876. He has divided his time between technical work and music. At present he holds a position as organist in a Paterson church. He was draughtsman with the Passaic Rolling Mill Co., Paterson, N. J., 1896–97; with the firm of Post & McCord, 1897; with the Passaic Rolling-Mill Co., 1897–98; with Benjamin Eastwood, machinist and founder, Paterson, N. J., 1898; with the Passaic Rolling Mill Co., 1898–1903; and has been assistant to chief draughtsman with the Passaic Steel Co., Paterson, N. J., from 1903 to date. His graduating thesis on "Experiments to Determine the Economy of Operating a Non-Condensing Steam Engine Using a Mixture of Steam and Compressed Air," prepared jointly with Messrs. Harding Benedict and Robert Leber, was published in the *Stevens Indicator*, XIII, 411.

Mr. Hewitt is the son of William and Mary (Rainey) Hewitt, his parents being



George Hewitt

respectively of English and Irish descent. He married Ellen Latham, April 14, 1903.

Hewitt, William (M.E., '74), was born in Trenton, N. J., October 26, 1853. He has been with the Trenton Iron Co., Trenton, N. J., from 1874 to date: first as paymaster; later as assistant to the president and general manager, employed in remodelling and installing new machinery at the works, and in 1879 was elected vice-president, which position he held for 24 years, being employed since then in an engineering capacity. When the company engaged in the manufacture of wire rope in 1885, he devised, patented, and installed machinery for the purpose, whereby the wires are laid into strands and the strands into rope simultaneously, performing in one operation what by the common method required two. These machines have been in continuous and successful operation ever since. He has patented numerous other inventions.

In 1890–91 he planned and installed a wire-rope tramway for the East Shore Terminal Co., Charleston, S. C., for conveying cotton. Since then he has been concerned in the laying out of many other wire-rope tramways, haulage plants, and power transmissions, and is the author of various publications issued by the Trenton Iron Co. on wire-rope tramways, cable-hoist conveyors, wire rope and its application to the transmission of power, and the application of wire rope to surface and underground haulage, etc.

Mr. Hewitt has contributed numerous papers to various technical journals, among which are the following:

"Construction and Management of Roll Trains for the Manufacture of Heavy Bars, Rails and Girders." *Iron Age*, XVI: October 21, 1875, p. 1; October 28, p. 7; November 4, p. 3; November 11, p. 1; November 25, p. 11; December 2, p. 1.

"Efficiency of Roll Trains." *Journal of Franklin Institute*, CI, 302.

"Construction of Passes in Rolls for Reducing Metal." *Engineering and Mining Journal*, August, 1888.

"Transportation by Wire Rope Tramways." *Engineering Magazine*, VII, 18.

"Cableways for Unloading Vessels." *Cassier's Magazine*, VIII, 448.

"Cableways for Handling Heavy Loads." *Stone*, IX, 473.

"Transmission of Power by Wire Rope." *Engineering News*, XXXV, 300.

"Across the Chilkoot Pass by Wire Cable." *Cassier's Magazine*, April, 1898, p. 529.

"Progress in Aërial Transportation." *Ibid.*, April, 1900, p. 502.

"Operation of a Wire Rope in Multiple Laps." *Stevens Institute Indicator*, October, 1901, p. 356.

"Aërial Cable Transportation" (read before the Engineers' Club of Philadelphia, May 3, 1902). *Transactions* of that Society, October, 1902.

"The Continuous Rod Mill of the Trenton Iron Co." *Transactions of the American Society of Mechanical Engineers*, II, 70.

"Novel Hammer-Head and Die." *Ibid.*, VI, 77.

"Wire-Rope Fastenings." *Ibid.*, IX, 671.

"A Method of Making Tubes from Solid Bars," by Geo. H. Babcock. (Discussion.) *Ibid.*, VIII, 564.

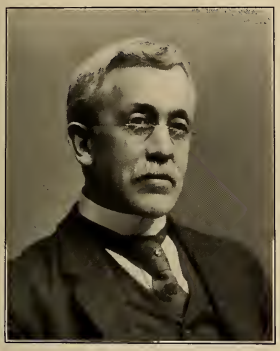
"Notes on Results Obtained from Steel Tested Shortly After Rolling," by Edgar C. Felton. (Discussion.) *Ibid.*, IX, 38.

"Steel Car Axles," by John Coffin. (Discussion.) *Ibid.*, IX, 135.

Paper on the "Effect of Bending on Wire Rope." Read before the Engineering Association of the South.

Mr. Hewitt was the first president of the Alumni Association of Stevens Institute and

was again elected in 1894. He was Alumni Trustee of the Institute in 1893 and 1894. He has been a member of the American Society of Mechanical Engineers since its formation in 1880, and is a member of the Engineering Association of the South and of the Theta Xi and Tau Beta Pi fraternities.



William Hewitt

Mr. Hewitt is the son of Charles and Anna (Conrad) Hewitt. His grandfather was John Hewitt, an English yeoman of Cannock, Staffordshire, who settled in New York city in 1796 as the representative of the firm of Boulton & Watt, and who was instrumental in the construction of the first steam-engine built entirely in this country. His paternal grandmother was Ann Gurnee, a descendant of Isaac Garnier, a Huguenot refugee, who settled first on Long Island and moved in 1729 to Haverstraw, Rockland County, N. Y. His maternal grandfather was Solomon White Conrad, of German extraction, a descendant of Thones Kunders, who came to America in 1683 with a party of Mennonites under the direction of Francis Daniel Pastorius (six years after William Penn), an expedition that inspired Whittier to write "The Pennsylvania Pilgrim," and who was one of the founders of Germantown, Pennsylvania. His maternal grandmother was Elizabeth Abbott, a descendant of John Abbott, gentleman, of Nottinghamshire, England, and Anne Mauleverer, who emigrated to America in 1684 and settled in Nottingham (now Hamilton) Township, Burlington (now Mercer) County, near Trenton, N. J. The Mauleverers are of royal lineage, their pedigree having been traced to William the Conqueror. For many generations they were the owners of the manor of Ingleby Arncliffe in the North Riding of Yorkshire, England, and of Arncliffe Hall, the present residence of Sir J. Lowthian Bell. The Conrads and Abbotts were Quakers.

Mr. Hewitt married Josephine Helen Walker (a descendant of the Rev. George Walker, the defender of Londonderry, known as "The Fighting Parson"), December 11, 1878. They have three children living, Charles Conrad (graduate of Princeton University and winner of the Baird prize of $100 for the best oration, 1903), Waldburg, and Helen Bradley Hewitt.

Hickok, Henry Addison (M.E., '83), was born in Sandy Hill, Washington County, N. Y., November 1, 1860. He was draughtsman at the Wallis Iron Works, Jersey City, N. J., 1883–86; draughtsman at the Morse Bridge Works, Youngstown, O., 1886–87; assistant engineer at the Riverside Bridge Works, Paterson, N. J., 1887–88; and has been an engineer and contractor at Newark, N. J., from 1888 to date. Among the buildings which he has designed, and for which he has furnished the steel structural work, are the following: The Peddie Memorial Church, Newark, N. J., a building 100 feet square, with a domed roof and groined ceiling; the St. John's School and Theatre, Orange, N. J., in which the balcony in the auditorium is suspended from the roof trusses, thus leaving the main floor entirely free from columns; the Empire Theatre, Newark, N. J.; St. Patrick's Lyceum, Jersey City; and the new $1,000,000 Cathedral of the Sacred Heart in Newark, N. J. He was also consulting engineer in charge of the steel structural work of the new City Hall at Newark, costing $1,250,000. He has patented an adjustable centro-lineal, a useful instrument for making perspective drawings. He is a member of the American Society of Civil Engineers, of Hope Lodge, Free and Accepted Masons, East Orange, and of the New England Society, Orange, N. J.

Mr. Hickok is the son of Henry Franklin

and Elizabeth Tefft (Cleaver) Hickok. He married Mary Sybelle Ward, August 5, 1885,



H. A. Hickok

and they have three children, Helen Ward, Mary Hilda, and Henry Addison, Jr., Hickok.

Hidden, Charles P. (M.E., '97), has been employed in the testing department of the Sprague Electric Elevator Co., Watsessing, N. J., and is at present located in New York. His graduating thesis, written in conjunction with Mr. Olaf M. Kelly, was published in the *Stevens Indicator*, January, 1898.

Hill, Nicholas S., Jr. (M.E., '92), was, after graduation, in the employ of the Southside Elevated Railway Co., of Chicago, and of the Sewerage Commission of the city of Baltimore, Md.; was engineer to the Electrical Subway Commission, Baltimore, 1894–95, having under his supervision the construction and equipment of a system of subways for the police and fire-alarm telegraph; engineer of an Electrical Commission appointed to prepare and report plans and estimates of cost for a general subway system to accommodate all the overhead wires in Baltimore. This Commission submitted the plans and estimates prepared by Mr. Hill to the City Council, 1895–97. He was chief engineer to the Water Board of Baltimore, 1897–98, in which position he was engaged upon the extension of the water supply into a newly annexed district and in reinforcing the system in other parts of the city. This system of extensions also included additional pumping-engines, erection of standpipes, etc., and entailed an expenditure of $2,000,000. He also reorganized the Water Department and put it on a satisfactory basis.

Mr. Hill engaged in a general consulting engineering business with Mr. B. C. Howard, under the firm name of Hill & Howard, in Baltimore, 1898–99. In 1899 Mr. Alfred M. Quick succeeded Mr. Howard in this firm, which continued its professional work at Baltimore as before, 1899–1900. Mr. Hill was also chief engineer and general manager of the Charleston, S. C., Consolidated Gas & Electric Co., 1899–1900; a member of the firm of Hill, Quick & Allen, consulting engineers, New York, 1900–02; and has been practising as consulting engineer in New York down to date. He was chief engineer in the Department of Water Supply, Gas, and Electricity of the City of New York, 1903–04. Mr. Hill has contributed to technical journals articles relating to the work with which he has been from time to time connected, and is an associate member of the American Institute of Electrical Engineers.

Hill, Wallace M. (M.E., '89), was born in Elizabeth, N. J., June 28, 1868; son of Walter B. and Ellen Cardwell (Stock) Hill. He is of New England Puritan stock, the first of the name being John Hill, a member of the Ancient and Honorable Artillery Company of Massachusetts Bay Colony in 1630. He is also a direct descendant of Edward Rawsen, who was first Secretary of the Massachusetts Bay Colony.

He was draughtsman with the Allentown Rolling-Mills, Allentown, Pa., 1889; assistant of Mr. Edward Weston toward the end of the case of Brush *vs.* Percival, concerning the storage-battery patent; and was engaged in laboratory work and general testing for the Weston Electrical Instrument Co., Newark, N. J., 1890–93. For about one year of this period he conducted some mechanical and electrical tests for himself. At the time of his resignation from the Weston Co. he had charge of the ammeters, voltmeters, and millivoltmeters in the laboratory. He next engaged with the General Electric Co., at

Lynn, for a few months, and then returned to New York, where he is now practising as expert on electrical instruments.

He is the author of three books, with their question-papers and keys, which were written for the Scranton Correspondence School of Science; one on "Telegraphing and the Telephone," and two on "Electrical Power Transmission." He has also contributed articles to technical journals as follows: "The Standardizing of Electrical Instruments," and "Temperature Errors in Electrical Instruments," to the *Electrical World;* "Tests of the Hyatt Roller Bearing," to the *Railroad Gazette;* and "Otto Wolf's Standard Resistances in Electrical Measurement," to the *Stevens Institute Indicator,* October, 1900.

Hiller, Nicolai Henry (M.E., '89), was born in Nikolaievsk, Amur River, Siberia,



N. H. Hiller

July 15, 1868. He was with the Hendrick Manufacturing Co., Carbondale, Pa., 1889–92; manager of the Ice & Cold Storage Co., of Los Angeles, Cal., 1892–93; mechanical engineer with the Hendrick Manufacturing Co., Ltd., Carbondale, 1894–96; assistant superintendent of the same company, 1896–98; and has been vice-president and treasurer of the Carbondale Machine Co., from 1899 to date. He has taken out patents on a liquid level gauge, 1898; an absorption refrigerating apparatus (with H. Torrance, Jr., '90), 1900; and on a distilling apparatus, 1901. He is a member of the American Society of Mechanical Engineers; of the Engineers' Club, New York city; of the Scranton Engineers' Club, and of the Delta Tau Delta fraternity.

Mr. Hiller married Olivia Howes, November 21, 1893; they have two children, Paul Winans and Nicolai Henry, Jr., Hiller.

Hinkle, Eugene E. (M.E., '90), was draughtsman, assistant engineer, and then chief engineer of construction of the Union Iron Works, New York, contractors and engineers for structural iron work, 1890–93. He engaged in steam engineering in the South, contracting for cotton-gin plants, including cotton-gins, presses, feeders, condensers, boilers and engines, etc., 1893–95; was engineer for the Empire Iron Works, New York, 1895; and in the latter year he organized, with his brother, the Hinkle Iron Co., manufacturers of ornamental and structural ironwork, New York, of which he has been the engineer and senior member from 1895 to date.

Hodges, C. B. (M.E., '91), was in the employ of the Rapid Transit Commission of the city of Boston, surveying and draughting work, 1891; draughtsman with E. D. Leavitt, Jr., E.D., Cambridgeport, Mass., 1891–92; with the Cleveland, Cincinnati, Chicago & St. Louis Railroad, as assistant engineer in the chief engineer's department, in the motive power department, and as special apprentice in the shops, 1892–95; machinist in the Chicago shops of the New York, Chicago, & St. Louis Railroad, 1895; and has since been with the H. K. Porter Co., builders of light locomotives, Pittsburg, Pa., at first as engineer of tests and now as assistant superintendent. He is a junior member of the American Society of Mechanical Engineers.

Hodgman, George Perry (M.E., '95), was born in Wilmington, Del., April 8, 1868; son of Stilman Augustus and Helen Eliza Hodgman. His paternal ancestors were among the early settlers of New England, and have been distinguished in public affairs and in the learned professions. His great-grandfather was an officer in the War of 1812. On the maternal side his ancestors were among the

first Dutch settlers of New York and served in the War of 1812. After graduating from the public school system of Wilmington with honors, he entered the shops of the Philadelphia, Wilmington, & Baltimore Railroad to learn the trade of machinist. Deciding upon a technical education, he entered Lehigh University in 1889, and Stevens Institute one year later. He was president of the Junior class in 1892–93, also of the Glee Club of the same year. Upon graduation he entered the employ of the Baldwin Locomotive Works Co., where he soon worked his way up to the position of track foreman. During the fall of 1898 he was sent to the United States of Colombia, for the purpose of erecting several engines on the Ferro-Carril del Cauca, with headquarters at Buenaventura. Stopping at Panama, he contracted the fatal fever of



G. P. Hodgman

that country, from which he died at Venticas, Colombia, November 28, 1898. He was a member of the Theta Nu Epsilon fraternity.

Hoffman, Charles Swan (M.E., '99), was born in Brooklyn, N. Y., November 9, 1875. He has been with Baker, Smith, & Co., heating and ventilating engineers and contractors, New York, from 1899 to date. He is a member of the University Club of Brooklyn and of the Chi Phi fraternity.

Mr. Hoffman is the son of Luther and Margie (McRobbie) Hoffman. He married Julia Francese Fox, June 24, 1903.



C. S. Hoffman

Hoffman, Howard (M.E., '02), was born in Brooklyn, N. Y., September 5, 1880; son of Luther and Margie (McRobbie) Hoffman. He is a cadet engineer with the Essex & Hudson Gas Co., Newark, N. J., and is a



Howard Hoffman

member of the Chi Phi, and Gamma Delta Psi fraternities, and of the Gamma Delta Psi Club.

Hoffman, Samuel Verplanck (M.E., '88), was born in Brooklyn, N. Y., May 12, 1866. He was a special student in the College of Physicians and Surgeons, New York, and a graduate student at Johns Hopkins University, where he remained until 1895. While at Baltimore he was "Student Assistant" in Astronomy for one year, "Fellow" in Astronomy for one year, and "Fellow by Courtesy" for three years in the same subject. His home is in Morristown, N. J.

Mr. Hoffman is a Fellow of the Royal Astronomical Society; president of the New York Historical Society; trustee of the General Theological Seminary, New York; secretary-general of the Society of Colonial Wars; and a member of the Astronomical Society of the Pacific; of the Astronomische Gesellschaft; and of the Grolier, Century, University, Seventh (New York) Regiment, and Morristown (N. J.) clubs; and of the Delta Phi fraternity. He was formerly also a member of the Metropolitan Club, of Washington, D. C.

Mr. Hoffman is the son of Eugene Augustus Hoffman, D.D., LL.D., D.C.L., and Mary Crooke (Elmendorf) Hoffman. He is descended from Martinus Hoffman, who came to America from Holland in 1640. He married Louisa N. Smith, April 17, 1895, and they have three children, Louisa Verplanck, Margaret Elmendorf, and Eugene Augustus, Jr., Hoffman.

Holberton, George C. (M.E., '91), was with the Edison Machine Works, Schenectady, N. Y., 1891–95; engineer with the Oakland Gas, Light, & Heat Co., Oakland, Cal., 1895–97; chief engineer and electrician to the Bangkok Electric Light Co. and the Siam Electricity Co., Ltd., Bangkok, Siam, 1897–1901; general superintendent of the electrical department of the Oakland Gas, Light, & Heat Co., Oakland, Cal., 1901 to date. Mr.



LINE OF THE SIAM ELECTRICITY CO., LTD., AT BANGKOK, SIAM
G. C. Holberton

Holberton read a paper on "Distribution of Alternating Currents" before the Pacific Coast Gas Association in June, 1901. He is an associate member of the American Institute of Electrical Engineers.

Holcombe, Emley Mentz (M.E., '01), was born in Lambertville, N. J., May 29, 1879.



E. M. Holcombe

He was assistant engineer, for the erection of a modern blast-furnace, with the Warwick Iron & Steel Co., Pottstown, Pa., 1901; assistant bridge engineer and draughtsman for the Cuba Company, in their New York office, 1901–02; and has been draughtsman for the Carbondale Machine Co., Carbondale, Pa., in connection with which work he was also engineer for the construction of a reservoir dam for the Belmont Water Co., from 1902 to date.

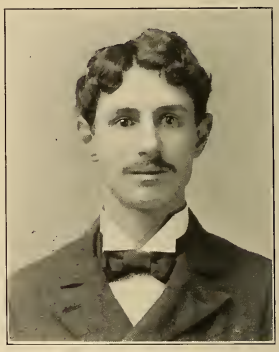
His graduating thesis, prepared jointly with his classmates, Messrs. W. M. Chatard and H. J. Botchford, on "Comparison of Cost of Operating an Iron Smelting-Plant by Engines Using Waste Blast Furnace Gas, and by Gas-Fired Boilers and Steam-Engines," was published in the *Stevens Indicator* for January, 1902. He is a member of the Delta Tau Delta fraternity.

Mr. Holcombe is the son of Alexander H. and Malvina Kay (Mentz) Holcombe. His first American ancestor, John Holcombe, came from England to Philadelphia, Pa., soon after the arrival of William Penn. Mr. Holcombe's father was commissioned to raise a company of volunteers during the Civil War, and in 1876 he was appointed aide-de-camp (with the rank of colonel) to Governor Bedle, of New Jersey. He married Ruth Newman Coals, November 23, 1904.

Hollingsworth, Samuel (M.E., '96), was draughtsman with the Campbell Printing Press & Manufacturing Co., Plainfield, N. J., and draughtsman with the Potter Printing Press Co., Plainfield. He has lately opened an engineering office at Plainfield, making a specialty of printing-machine design and construction. He is a member of the Tau Beta Pi and Theta Nu Epsilon fraternities.

Hopkins, Guy (M.E., '95), was born in New Orleans, La., January 15, 1874. He has been with the Southern Pacific Railroad, New Orleans, from 1895 to date, first as draughtsman, then as chief draughtsman. In 1902 he was promoted to the position of assistant master mechanic, and in 1904 was again advanced to operating engineer. He is also president of the Biloxi Supply Co., and a member of the New Orleans Chess, Checkers, and Whist Club.

Mr. Hopkins is the son of Aristide and

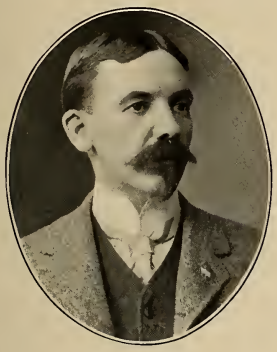


Guy Hopkins

Mamie (McNeil) Hopkins. His ancestors on both sides were natives of Louisiana for

four generations. He married Marietta Wiltz, January 30, 1902, and they have one child, Corinne M. Hopkins.

Hotopp, Carl H. (M.E., '92), was born at "Pen Park," Albemarle County, Va., August



C. H. Hotopp

28, 1869. He was employed by the Illinois Steel Co., South Chicago, for two years, after which he became manager for the Tanite Co., Stroudsburg, Pa., where he remained for four years, during which time he designed and remodelled all their machinery for crushing and grading emery. He then took the positions of manager and treasurer of the Hotopp Emery Co., Peekskill, N. Y. For several years previous to his accidental death, May 25, 1901, Mr. Hotopp had been compelled to give up active engineering work to act as executor of his father's estate. He found time, however, to develop his interest in "Coronet" steel which had proved itself to be exceptionally hard and free from blowholes. He had made numerous tests, along with the inventor of the process, at various steel mills, and was convinced of its superiority. He was a member of the American Chemical Society.

Mr. Hotopp was the son of William H. and Emma (Von Kamlah) Hotopp. He married Marie Frincke, September 19, 1894, and they had two children, Adalbert Frincke and Emmanuel Reginald Hotopp.

Howell, John White, '81 (E.E., 1900), was born in New Brunswick, N. J., December 22, 1857. He joined the Class of 1881 in its Sophomore year and continued with it until graduation, pursuing a partial course including mathematics, physics, mechanical drawing, engineering, and shop-work.

He was placed in charge of the photometer room, and of experimental lamp-testing, by the Edison Lamp Co., Menlo Park, N. J. After obtaining in this manner a good knowledge of the performance of incandescent lamps, he worked to improve the practical conditions under which they were operated. While thus engaged he took out twelve patents on systems of electrical distribution and electrical-pressure indicators, which have been very extensively used. He gave testimony, as lamp expert of the Edison General Electric Co., in all their suits involving the Edison incandescent lamp patents, and in this connection made very successful lamps following exactly the specifications of the Edison filament patent, after other experts in this country and in England had failed in their attempts, and the experts for the defence had claimed that such lamps could not possibly be made.

In 1892 the "Novak" lamp was placed upon the market, which contained in the bulb a very small amount of bromine vapor. In the litigation over this lamp it became necessary to know the exact amount of bromine vapor which the lamp contained, a very difficult problem, but one which Mr. Howell solved by observing the change in efficiency caused by taking out the bromine vapor and making a good vacuum in the lamp. He also observed in other lamps the change produced by letting definite amounts of bromine vapor into well-exhausted lamps. From these results he plotted a curve showing the effect of the bromine vapor in changing the efficiency of the lamp, and from this curve found the amount of bromine in the Novak lamps by noting the above change in their efficiency on re-exhaustion. The figure given in his testimony based on these experiments was exactly the same as that given by the defendants as the amount of vapor which they put into the lamps.

In 1894 Mr. Howell was appointed engineer of the lamp works of the General Electric Co. after the consolidation of the Thomson-

Houston and the Edison General Electric companies' lamp factories. While thus engaged he made several important improvements in methods of lamp manufacture and developed the present type of the General Electric Company's lamp, which is very successful. He went abroad in 1895 to investi-



J. W. Howell

gate lamp-manufacture in Europe, and made a report on a new Italian method of lamp-exhaustion which has since been adopted with great success by the General Electric Co. Under his management improvements have been made in lamp-manufacture which in the last year have improved the quality of the General Electric Company's incandescent lamp over 50 per cent.

Between 1886 and 1901 he took out 18 patents in the electrical field. In the latter year 12 others were either pending or in process of preparation, some of which have since been issued, and several more applications are now on file or are being prepared.

Mr. Howell is author of the following papers:

"Function of the Neutral Wire in the Edison Three-Wire System," written for the Association of the Edison Illuminating Companies, 1887.

"Development of the Incandescent Electric Lamp," *Engineering Magazine*, April, 1894.

"Radiating Power of Incandescent-Lamp Filaments," *Electrical Engineer*, January 6, 1897.

"Conductivity of Lamp Filaments and of the Space Surrounding Them," written for the meeting of the American Institute of Electrical Engineers, February 17, 1897.

He has also presented several additional papers to the last-named society, and to the Association of the Edison Illuminating Companies. He is a member of the American Institute of Electrical Engineers; the American Association for the Advancement of Science; the Essex and Essex County Country clubs; and of the Theta Xi fraternity.

Mr. Howell is the son of Martin A. and Abby Stout Howell. He married Frederica Burckle Gilchrist, April 23, 1895, and they have four children, Frederica Burckle, John White, Augusta Appleton, and Cornelia Margaret Howell.

Hoxie, William Dixie (M.E., '89), was born in New York city July 1, 1866. He is vice-president of the Babcock & Wilcox Co., New York, and the patentee of several designs of marine water-tube boilers, some of which are used to the extent of over 405,000 horse-power in the American navy and 225,000 horse-power in the American merchant marine. He has contributed several articles on marine boilers to technical journals. He is a member of the Society of Naval Architects and Marine Engineers; the American Society of Naval Engineers; the American Society of Mechanical Engineers; the Engineers' and Lawyers' clubs; the Kitchi Gammi, Atlantic, and New York yacht clubs; and of the Delta Tau Delta fraternity.

Mr. Hoxie is the son of John and Isabelle Hoxie. The first Hoxie came to America in 1640 and settled in Sandwich, Mass. Mr. Hoxie married Vinnie Louise Brown, October 19, 1892, and they have one child, Isabelle Hoxie.

Hughes, Robert S. G. (M.E., '98), was in the testing department of the Rogers Locomotive Works, Paterson, N. J., 1898–1900; with Samuel Smith & Son, boiler manufacturers, Paterson, 1900–01; with John W. Ferguson, builder and general contractor, New York and Paterson, 1901–02; and has been located at Paterson, N. J., from 1902 to date.

Hulse, George Egbert (M.E., '02), was born in Bellport, L. I., January 21, 1877; son



G. E. Hulse

of Egbert Hampton and Mary Roe (Homan) Hulse. He is a graduate of the Pratt Institute High School, Brooklyn. He has been assistant engineer in the engineering department of the Safety Car Heating & Lighting Co., New York, since April 17, 1902. He is a member of the Tau Beta Pi fraternity.

Humphreys, Alexander C. (M.E., '81), President of Stevens Institute of Technology. For biography, see page 195.

Humphreys, Harold (M.E., '99), was born at Bergen Point, N. J., November 30, 1877; the son of Alexander C. Humphreys, of the Class of 1881, and the first son of an alumnus of Stevens to graduate from the Institute. He entered his father's office upon graduation, and took up a course of work to fit him to become his father's personal assistant in carrying on the business of the well-known firm of Humphreys & Glasgow, consulting engineers, of New York and London. He was an associate member of the American Gas Light Association and a member of the Nassau Country Club.

He married Lydia B. Bell, daughter of Mr. J. Lowrie Bell, general traffic manager of the New Jersey Central Railroad, December 15, 1900, and, very shortly after, the young couple, accompanied by Mr. Humphreys' father, mother, and younger brother, left on an extensive pleasure tour. While ascending the Nile to Assouan, Egypt, February 12, 1901, young Crombie Humphreys, who was seven years of age, fell overboard, and Harold, in endeavoring to save the life of his little brother, lost his own. Both were drowned. The bodies were recovered and brought to New York, where funeral services were held March 23, 1901.

At the annual meeting of the American Gas Light Association in October, 1901, Mr. Edward C. Pratt, the retiring president, in



Harold Humphreys

his valedictory address, paid the following tribute to the memory of Harold Humphreys:

"In this list of the dead of the year, members of the Association will observe the names of many veterans in the great enterprise which our Association represents. They have gone to their reward full of years, full of honors, leaving untarnished names behind. However, there is one name, that of Humphreys, whose mere mention will bring tears to the eyes of those present who will recall his tragic death in the Nile while struggling to save his younger brother. He died in an attempt to save a life. He paid his last full measure of devotion; he laid down his life for his brother. A mere youth, athletic and strong, educated and brilliant, on his bridal tour, his death could not have been more tragic. The world was all before him. I have deemed

it proper to make special mention of this brilliant youth taken from us in the morning of life. While we mourn all our dead of the year, we especially mourn Humphreys, the promising son of our respected and valued member."

Hunt, Charles Haviland (M.E., '96), was born in Brooklyn, N. Y., August 13, 1872.



C. H. Hunt

He was draughtsman with the Rand Drill Co., North Tarrytown, N. Y., 1896; then located in business in New York; and has been a member of the firm of David Hunt & Co., New York, from 1900 to date, operating canning factories at Oswego and at Cherry Creek, N. Y., called respectively the Oswego Preserving Co. and the Cherry Creek Canning Co. He is a member of the Alpha Tau Omega and Theta Nu Epsilon fraternities.

Mr. Hunt is the son of David and Anna Pauline Hunt. He married Katharyne Barlow Stevens, April 18, 1900.

Hunter, James Francis (M.E., '97), was born in Baltimore, Md., October 10, 1876; son of James W. and Mary (Devereux) Hunter. He has been engaged at the works of the Maryland Steel Co., Sparrow Point, Md., from 1897 to date, being apprentice for two years and master mechanic for four. He now holds the position of assistant superintendent of coke ovens. He is a junior member of the American Society of Mechanical Engineers, and a member of the Delta Tau Delta fraternity.

Hunter, Wilfred Kenneth (M.E., '93), was born in Newark, N. J., May 13, 1870. His early education was received in the grammar school of East Orange, N. J. He was obliged to leave the high school, before finishing his course, on account of illness, and was with the city engineer of East Orange for about a year and a half before entering Stevens Preparatory School in 1888. He was employed in the draughting-room of the Crocker-Wheeler Co., Ampere, N. J., and also in that of the Westinghouse Co., Newark, N. J. He has been connected with the Stanley Electric Manufacturing Co., Pittsfield, Mass., as assistant superintendent of the motor department, 1895–1901; assistant to general superintendent, 1901–02; and superintendent of production department, 1902; in which year he organized and took charge of the estimating department. He has helped to start a social and educational club for the employees of the Stanley Electric Manufacturing Co.

He is a member of Mystic Lodge of Masons, Pittsfield, Mass.; of the New York



W. K. Hunter

Electrical Society; and of the East Orange Republican Club, East Orange, N. J.

Mr. Hunter is the son of Robert and Mary

(Kean) Hunter, both of Scotch descent. He married Rose Mary Harding, October 25, 1898.

Hupfel, Adolph G. (M.E., '93), was born in New York city December 14, 1870. He has been with the J. Chr. G. Hupfel Brewing Co. from 1893 to date, being now its secretary. He patented the Trim sail-fastener, 1899. He is a member of the New York Athletic Club and of the Chi Psi fraternity.

Mr. Hupfel is the son of John Chr. G. and Anna Hupfel. He married Matilde Doelger,



A. G. Hupfel

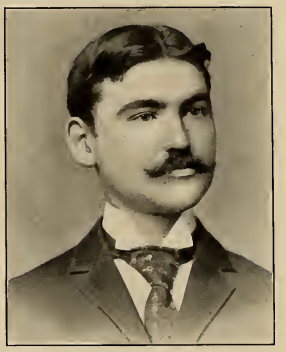
May 3, 1898, and they have two children, Adolph P. G. and John G. Hupfel.

Huppertz, Edward Alfred Vail (M.E., '93), was born in Frankfort, Germany. He was in the general offices of the American Telephone & Telegraph Co., New York, and Chicago, Ill., from 1893 until 1902, and is now in the general office of the New England Telephone & Telegraph Co., Boston, Mass. He is a member of the Theta Xi fraternity.

Mr. Huppertz is the son of William and Mary Louise (Vail) Huppertz. He married Mary Stuart Kroehl, April 4, 1899, and they have one child, Louise Vail Huppertz.

Hussa, Theodore F. (M.E., '96), has been with the T. A. Gillespie Co., engineers and contractors, Little Falls, N. J., 1896–1900; and consulting and contracting engineer, New York city, from 1900 to date.

Hussey, Paul Gordon (M.E., '85), was born in Boston, Mass., May 19, 1864; son of



P. G. Hussey

John W. and Clara A. Hussey. He was with the Midland Electric Co., Omaha, Neb., until 1887, and during the five years preceding his death, which occurred in 1892, he was connected with the Remington Standard Typewriter Co., New York.

Hussey, William Edgerly (M.E., '98), was born in New York city October 15, 1873. Before graduation he served as engineer in the United States Navy during the Spanish-American War. He has since been draughtsman with the Metropolitan Electric Construction Co., New York; chief draughtsman with the Clonbrock Steam Boiler Co., Brooklyn, N. Y.; in the laboratory and erection department of the firm of Uehling, Steinbart, & Co.; engineer in charge of construction and operation for the Phœnix Dredging Co., Toledo, O., 1899–1900; assistant to the manager of the New York office of McIntosh, Seymour, & Co., engine-builders, Auburn, N. Y., 1900–04; and is at present manager of the New York office of the Providence Engineering Works. He is a member of the Tau Beta Pi fraternity.

Mr. Hussey is the son of Levi and Mary A. Hussey. He married Florence A. Becker, November 14, 1901.

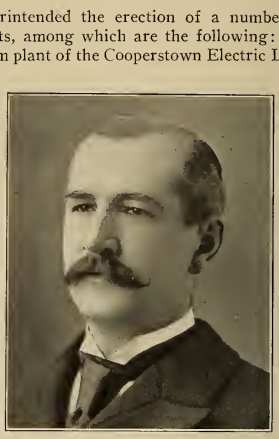
Hutchings, Clifford F. (M.E., '02), has been with the New York & New Jersey Telephone Co., Brooklyn, N. Y., and is now with the General Electric Co., Lynn, Mass.

Hutchins, Gordon Lines (M.E., '97), was born in Brooklyn, N. Y., July 7, 1875; son of Alexander and Mary Frances Hutchins. He took a post-graduate course in the Columbia School of Mines, graduating in 1898 with the degree of Mining Engineer. He was foreman of the cyanide mill of the De Lamar Nevada Gold Manufacturing Co., 1898–99; manager of the Bingham Electric Co., Bingham Canyon, Utah, 1899–1901; superintendent of the Blackbird Copper & Gold Mining Co., Ltd., Frisco, Beaver County, and of the Bluebird Copper Mining Co., Milford, Beaver County, Utah, 1901–03; superintendent of the Southwestern Electric Power Co., Salt Lake City, 1903–04; and is now Western engineer for the American Stoker Co., at Salt Lake City. He is a member of the University Club of Salt Lake City; the Independent Order of Foresters; the Knights of Pythias; the Knights of the Maccabees; the Benevolent Protective Order of Elks; and of the Beta Theta Pi fraternity.

Hutchinson, Edwin (M.E., '95), was first employed with the Western Union Telegraph Co., and then in the Townsend Furnace and Machine Shops at Albany, N. Y. After an illness of ten months he died at his home in Brooklyn, N. Y., July 7, 1897. When in the employ of the Western Union Telegraph Co. he drew a creditable set of plans for a dredging-machine for one of the stockholders of that company.

Hyatt, Henry R. (M.E., '00), was with the Oxnard Construction Co., New York, 1900; with the firm of Adam Weber's Sons, New York, from 1900 until 1903; and is now employed with the Alphons Custodis Chimney Construction Co., New York.

Idell, Frank E. (M.E., '77), began his professional career as consulting engineer soon after graduation, and, as such, planned and superintended the erection of a number of plants, among which are the following: The steam plant of the Cooperstown Electric Light



F. E. Idell

& Power Co., Cooperstown, N. Y.; the Seashore Electric Railway Co., Asbury Park, N. J. (including tests); a refrigerating plant for F. A. Ferris & Co., New York; and factory, building, and power equipment for William Campbell & Co., Hackensack, N. J. He also tested the steam plants of the electric light companies at Union Hill, N. J., and at Jamestown, N. Y., to determine if engines came up to guarantee, and made an examination of, and a report on, the condition of the electric railway at Richmond, Va., for the city council. He has been engaged in a professional capacity by the Heyden Chemical Works, Garfield, N. J.; the Terminal Warehouse Co., the Durant Land Improvement Co., the Market & Fulton Bank (in connection with R. N. Baylis, Stevens, '87), the Phœnix Iron Works Co., A. L. Marvin, Esq., and the New York Herald, of New York; and for the San Francisco Examiner, San Francisco, Cal. General work on refrigerating plants has taken him to Montreal, Canada, and to Cuba. He is consulting engineer for Charles C. Moore & Co., San Francisco, Cal., and for the Guaranty Development Co., New York; and is the New York representative of the Harrison Safety Boiler Works, Philadelphia, Pa.

Mr. Idell has rendered expert services in the cases of Stevens *vs.* United States Desiccated Cocoanut Co.; Durant Land Improvement Co. *vs.* East River Electric Light Co.; and Durant Land Improvement Co. *vs.* T. & H. Electric Co.

He has edited the following books for the Van Nostrand Science Series: "Chimneys for Furnaces and Steam Boilers"; "Boiler Incrustation and Corrosion"; "Theory of the Gas Engine"; "Compressed Air"; "Triple-Expansion Engines and Engine-Trials."

Mr. Idell is a member of the American Society of Mechanical Engineers; an associate member of the American Institute of Electrical Engineers; and a member of the Tau Beta Pi fraternity. In 1894 he was elected to represent the Alumni Association on the Board of Trustees of the Institute, and served until 1897.

Idell, Percy Child (M.E., '99), was born in Hoboken, N. J., December 30, 1878; son of David Beatty and Emma Bertha Idell. He is American on both sides of the family since the early part of the eighteenth century. He was educated in the public schools



P. C. Idell

of Hoboken, and entered the Institute on a scholarship of the Hudson County schools. He was draughtsman in the engineering department of the Babcock & Wilcox Co., New York, manufacturers of forged steel water-tube marine boilers, 1899–1900, since which time he has been assistant engineer in the department of tests. He is a junior member of the American Society of Mechanical Engineers, and a member of the Delta Tau Delta and Tau Beta Pi fraternities.

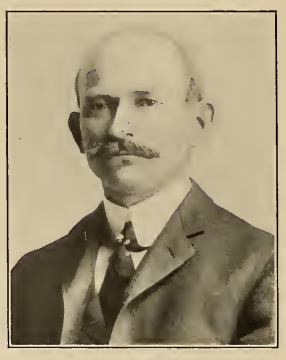
Mr. Idell married Alice E. Ketcham, of Hoboken, October 25, 1904.

Inglis, Beattie Andrew (M.E., '93), was born in Madison, Fla., April 20, 1871. He attended public schools in Madison until 15 years old, and in 1886 entered the South Carolina Military Academy at Charleston, finishing his preparatory education at the Stevens School and entering Stevens Institute in 1889.

Since graduation he has been in the employ of the Florida Manufacturing Co., Madison, Fla., and at times with the Dunnellen Phosphate Co., Dunnellen, Fla., which was under practically the same management for some years. His work with the latter company consisted principally in designing and constructing phosphate plants. During his Junior vacation he designed a storage warehouse for phosphate, 400 feet long by 40 feet wide, built on columns to allow cars to be loaded from chutes. After thoroughly learning the details of the plant of the Florida Manufacturing Co., and its operation, he was gradually promoted, and in 1898 was made superintendent, a position he still holds, as well as being on the board of directors. He has complete charge of the plant and its repairs, operation, changes, and additions; has designed several storage warehouses and superintended their construction; also a system of water-works for fire protection, electric-light plant, battery of 72 in. × 20 ft. return tubular boilers with self-supported steel stack, and other work.

The Florida Manufacturing Co. buys Sea Island cotton for its thread-mills, and a large portion of this cotton is bought in the seed and has to be ginned. The ginnery is the largest in this country—probably the largest in existence—using roller gins, of which the company operates 40. On cold dry days a peculiar problem presented itself; the rollers, which are covered with rubber and canvas piston-packing, would become

electrically charged by rubbing against the lint, which would thus stick to the rollers and break the gins. After some experiments,



B. A. Inglis

remembering that on warm damp days the late Prof. Mayer could do nothing toward his experiments in frictional electricity, he arranged perforated pipes under the rollers, and, by means of a centrifugal blower and a steam heater with a jet of steam in the air pipe, forced warm, moist air on the rollers, which not only solved the difficulty of the cotton's sticking, but blew it into a lint basket and warmed the building at the same time. The cotton seeds are carried to the oil mill as they drop from the gins, and are then crushed, making crude cotton-seed oil and cotton-seed cake and meal.

Mr. Inglis is a member of the Kappa Alpha (Southern) fraternity, and of Madison Lodge of the Knights of Pythias.

Mr. Inglis is the son of John Livingston and Louise Olive (Thomas) Inglis. His grandfather, Andrew Inglis, a Scotchman, came to America about 1850, and became interested in the People's Iron Works of Philadelphia. He was among the first to advocate the placing of tubes in boilers. Beattie Andrew Inglis married Katharine Eugenia Livingston, January 25, 1899, and they have three children, John Livingston, 2d; Beattie Andrew, Jr., and Clifford Thomas Inglis.

Inglis, Robert Napier (M.E., '02), was born in Jersey City, N. J., August 10, 1880, son of William and Mary Allan (Macaulay) Inglis. He is a graduate of the public schools of Jersey City and of the Stevens Preparatory School. He is engaged in general engineering construction work with M. W. Kellogg & Co., engineers and contractors, New York. He is a member of the Tau Beta Pi fraternity.

Irwin, Franklin Kilshaw (M.E., '83), was born in Mobile, Ala., December 4, 1859. He prepared for college in Towle's Collegiate Institute at Mobile, and was a student at Georgetown College, D. C., in the Class of 1882 for the freshman year only. He was draughtsman with the American Shipbuilding Co., Philadelphia, Pa., 1883–84; chief draughtsman and mechanical engineer in the motive-power department of the Wisconsin Central Railroad, Waukesha, Wis., 1884–1900; superintendent of car construction for the International Correspondence Schools of Scranton, Pa., for whom he planned and built three air-brake instruction cars, 1900; assistant engineer in charge of the designing and construction of repair shops and equip-



F. K. Irwin

ment with the Union Pacific Railroad Co., Omaha, Neb., 1900–04; and is now mechanical engineer with the Galena Signal Oil Co., Franklin, Pa. He is a member of Waukesha

Lodge 37, Free and Accepted Masons; Waukesha Chapter 37, Royal Arch Masons, and of the Beta Theta Pi fraternity.

Mr. Irwin is the son of Thomas Kilshaw and Mary (Ketchum) Irwin. His father, an American born of Scotch-English parentage, traces his descent (on his mother's side) from Generals Howe and Greene of Revolutionary fame, and was an officer in Gen. J. E. Johnston's Confederate army. Mr. Irwin married Mary A. McHenry, September 11, 1890, and they have one child, Kilshaw McHenry Irwin.

Jackson, Bethel Howard (M.E., '95), was born in East Orange, N. J., August 30, 1874;



B. H. Jackson

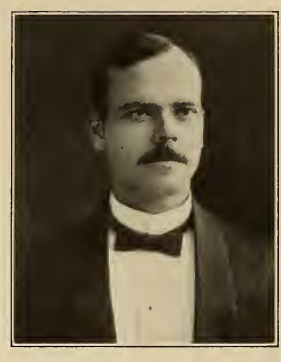
son of Francis W. and Adeline (Egbert) Jackson. He was an Instructor during the Supplementary Term at Stevens Institute, 1895; was employed in the Mount Clare shops and as inspector in the department of tests of the Baltimore & Ohio Railroad, Baltimore, Md., 1895–96; and was general assistant to F. J. Falding, consulting chemical engineer, New York, for whom he was engaged in designing and constructing, in various parts of the United States, chemical plants and apparatus chiefly for the manufacture of sulphuric acid, 1896–98. Owing to failing health he left for Europe in July, 1898, intending to study technical chemistry; but after some months of work with Prof. Lunge at the Federal Polytechnic School, Zurich, Switzerland, he was compelled to seek further change, and spent about four years in Germany, Switzerland, Italy, and France. Mr. Jackson returned to America in October, 1902, and is at present in the West.

Jackson, Francis Egbert (M.E., '86), was born in Brooklyn, N. Y., June 27, 1865; son of Francis Whiting and Adeline (Egbert) Jackson. He was with the Edison Lamp Co., Harrison, N. J., 1886–94; at first in the testing and standardizing department, and afterward as inspector of electric lighting plants. He then became a member of the firm of F. E. Jackson & Co., which later was changed to the Essex Lamp Co., manufacturers of incandescent lamps. Upon resigning his active interest in that company he formed a partnership with Mr. J. W. Aylsworth, under the firm name of Aylsworth & Jackson, and became the managing partner of the firm, 1894–98. The chief business of this firm was the manufacture of incandescent-lamp filaments. Through its experimental department the firm became interested in the X-ray after Prof. Roentgen's discovery, and took up the manufacture of fluorescent screens. Since May 1, 1898, Mr. Jackson has been sole proprietor of the business, which he conducts under his own name. His graduating thesis, on "Crank Pin Stresses," was published in the *Franklin Institute Journal*, 1886. He has also written several articles of a commercial nature for technical journals. He is a member of the American Institute of Electrical Engineers.

Jackson, Henry Whiting (M.E., '92), was born in East Orange, N. J., July 8, 1872. He held several positions in different companies from 1892 to 1894, and then started business in the manufacture and sale of incandescent lamps. He was connected with the Essex Lamp Co., of Newark, N. J., from 1894 to 1900; and in the latter year became connected with the Sawyer-Man Electric Co., New York, being made assistant superintendent in 1901, and acting superintendent in 1902.

Mr. Jackson is the son of Francis W. and Adeline (Egbert) Jackson. He married Har-

riet M. Egbert, October 23, 1901, and they have one child, Elisabeth Egbert Jackson.



H. W. Jackson

Jackson, Walter Weldon (M.E., '89), was born in East Orange, N. J., January 4, 1870. He was in the employ of the Safety Car Heating & Lighting Co., New York, 1889; and with the Builders' Iron Foundry, Providence, R. I., 1889–99, first as draughtsman, next as machinist, and later in charge of the Venturi meter department, and conducting tests. In May, 1899, he joined the Providence Engineering Works as assistant superintendent, and in March of the following year resigned to accept the position of superintendent of the Wheeler Condenser & Engineering Co., Carteret, N. J. This position he held until February, 1904, when he resigned, and has since been engaged in consulting and expert engineering work.

Jointly with Mr. F. N. Connet (M.E., '89) he took out a patent for an integrating-machine for the Venturi meter. Of this invention the *Journal of the Franklin Institute* states:

"Its invention, design, and perfection are the fruit of great ingenuity and of much knowledge and painstaking labor, and they have been of vast benefit to the community by making the Venturi meter a working tool. Its inventors, Messrs. Frederick N. Connet and Walter W. Jackson, of Providence, R. I., are therefore entitled to distinguished honor at the hands of Franklin Institute, and we take pleasure in recommending the award to them of the John Scott Legacy Premium Medal for their registering apparatus."

In 1899 Mr. Jackson patented a controller for filters, which is designed to maintain an absolutely uniform rate of discharge from a filter unit under varying conditions of the bed. He is a member of the American Society of Mechanical Engineers; of the American Foundrymen's Association; and of the Chi Psi fraternity.

Mr. Jackson is the son of Francis W. and Adeline (Egbert) Jackson. He married



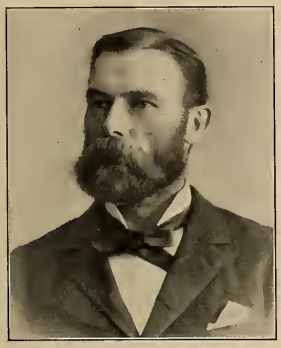
W. W. Jackson

Ellen W. Halton, October 31, 1894, and they have one child, Frances Halton Jackson.

Jacobs, William Egbert (M.E., '79), was born in Brooklyn, N. Y., February 18, 1855. For the last fifteen years he has been in the business of selling mining-machinery and contracting for the erection of mining and milling plants. He is a member of the firm of Jones & Jacobs, engineers and contractors, Salt Lake City, Utah, whose plans for the construction of mills and hoisting works are largely his personal work. He is also in general practice as a civil engineer. He was at one time engineer of the Diamond Coal & Coke Co., the erection of whose works he planned and superintended.

Mr. Jacobs is the son of Egbert Cumstom

and Caroline Elliot Jacobs. He married Ida May Frye, June 1, 1903.



W. E. Jacobs

Jacobus, David S. (M.E., '84), Professor of Experimental Engineering at the Stevens Institute of Technology. For biography, see page 257.

Jenkins, Matthew C. (M.E., '87), was in the steel mill of the Lackawanna Iron & Steel Co., 1887–88; was draughtsman on bridge and structural ironwork with Post & McCord, New York, 1888–93; general agent and mechanical engineer with the Coxe Iron Manufacturing Co., New York, being employed at the same time upon engineering work for Coxe Bros. & Co., Inc., and for the Cross Creek Coal Co., 1893–97; Eastern sales agent for the Abendroth & Root Manufacturing Co., for several years; and is now general manager of the Spiral Riveted Tube Co., New York. He read a paper on "Smoke Prevention" before the Franklin Institute of Philadelphia in 1897, and is a member of the American Society of Mechanical Engineers and of the Franklin Institute.

Jennings, Randolph Parmly (M.E., '99), was born in Jersey City, N. J., May 12, 1877; son of Ernest F. and Alice Clough Jennings. His father (born in New York city) is of old Connecticut stock, tracing back to "Mayflower" days. His mother's parentage is of old Hudson River Dutch ancestry, from Athens and Hudson, N. Y. He is also a descendant of Gen. Nathaniel Greene, of Revolutionary fame.

Mr. Jennings was a cadet engineer with the United Gas Improvement Co., Philadelphia, 1899–1901, first in the Jersey City plant; next in charge of the Bayonne works of the Hudson County Gas Co., and of the distribution work of the company, during which time several miles of 16 in. and 24 in. trunk mains were laid; in charge of the Consumers' works of the Hudson County Gas Co., and of experimental work, improvements, etc. Owing to ill health he resigned his position with the gas company in the fall of 1901, and formed a partnership with A. E. Banks under the name of Jennings & Banks, and went to Mexico, where he represented "The Locomobile Company of America," with offices in Monterey. He is now also engaged in general engineering and mining in Mexico.

He read a paper at the annual meeting of the superintendents of the United Gas



R. P. Jennings

Improvement Co., February, 1901, on "Some Experiments in Water-Gas Manufacture at Jersey City, N. J." He is a member of the Theta Xi and Tau Beta Pi fraternities; of the Theta Xi Graduate Club of New York; the Palma Club of Jersey City; the University Club of Hudson County, N. J.: the

Yountakah Country Club of Nutley, N. J.; and of the Casino of Monterey, Mex.

Jennings, William H., Jr. (M.E., '96), was born in South Orange, N. J., July 15, 1874; son of William H. and Marion A. Jennings. He was in the employ of the Standard Oil Co., New York, 1896–98; with Robert F. Wentz, Nazareth, Pa., 1898–1901; was located at Bay City, Mich., 1901–02; and from the latter year to date has been erecting engineer for the Allis-Chalmers Co., at Barcelona, Spain.

Jennings, William James (M.E., '00), was born in Redruth, Cornwall, England, January



W. J. Jennings

6, 1874, where he lived until he was seven years old, then coming to New York State, where he remained for three years, next going to Mexico, where he lived until he was twenty-one. He attended a private school at San Antonio, Tex., and served as machinist and draughtsman in the shops of the Mexican International Railway. He obtained a scholarship from the Master Mechanics' Association, and entered Stevens Institute with the Class of 1900. He was with the Standard Pneumatic Tool Co., of Chicago, as manager of its Pittsburg office, 1900; was then made foreign manager, with office in Paris, a position he resigned in June, 1902. He is now inspecting and testing engineer with R. W. Hunt & Co., Chicago. He is a member of the Theta Xi fraternity, and of its graduate club.

Mr. Jennings is the son of William and Martha Jennings. His father was for 18 years superintendent of motive power of the Mexican International Railroad; he is now general superintendent of the Pacific Electric Traction Co., Los Angeles, Cal. W. J. Jennings married Edith Allison, March 27, 1901, and they have one child, William Allison Jennings.

Jewell, Theodore E. (M.E., '95), has been with the Hecker-Jones-Jewell Milling Co., Brooklyn, N. Y., from 1895 to date.

Jobbins, William E. (M.E., '82), was located at Aurora, Ill., 1883–85, and at Chicago, Ill., 1885–87, in which latter year he died.

Johnson, Luther Halsey (M.E., '98), was born in Newark, N. J., October 12, 1877; son of J. William and Josephine P. Johnson. His father's family was one of the settlers of Newark, N. J., in 1660. His early education was received in the public schools of Newark and Summit, N. J. He was in the Stevens Preparatory School one year before entering the Institute. He was in the em-



L. H. Johnson

ploy of the Derby Gas Co., Derby, Conn., 1898–99; and has been with the United Gas

Improvement Co. from the latter year to date, as follows: At their works in Omaha, Neb., 1899, where he was the clerk of works, 1899–1900; with the Sioux City (Iowa) Gas Light Co., 1900; foreman of works of the Sioux City Gas & Electric Co., 1900–03; and superintendent of the Consumers' works of the Hudson County Gas Co., Jersey City, N. J., from 1903 to date. He is a member of the Chi Psi fraternity.

Johnson, Theodore Woolsey (M.E., '96), was born in Owego, N. Y., June 4, 1872. He graduated as Bachelor of Arts in classical subjects at Johns Hopkins University in 1892, and was for three years a graduate student in science at the same institution under Prof. Henry Rowland. He was in the locomotive erecting shop of the Baltimore & Ohio Locomotive Works, Mount Clare, Baltimore, for three months, as an apprenticed mechanic, and in January, 1897, he was appointed, after civil-service examination, assistant inspector of steel for the United States Navy. This position he held until June, 1898, being stationed at the Bethlehem Iron Co., South Bethlehem, Pa., at the Midvale Steel Co., Philadelphia, Pa.; and at the American Steel Casting Co., Thurlow, Pa. In 1898 he entered into partnership with Mr. Jay M. Whitman and conducted professional engineering work at Philadelphia. In January, 1900, in a competitive examination, he won the Professorship of Drawing at the Naval Academy, Annapolis, a position which he now holds.

Mr. Johnson's graduating thesis, written jointly with Mr. A. J. Wood, on "Efficiency and Capacity Test and Comparison of the Effect of 'Statical' and 'Sliding' Head in Driving the Hydraulic Ram," was published in the *Stevens Institute Indicator*, April, 1898. He is also the author of chapters "On the Theory of the Connecting-Rod," and "On Designing Connecting-Rods" (38 pages), in the "Notes on the Design of Propelling Machinery for Naval Vessels" published by the U. S. Naval Institute, Annapolis, Md., 1902. He is a member of the Engineers' Club of Philadelphia; an associate member of the American Society of Mechanical Engineers; and of the Alpha Delta Phi and Phi Beta Kappa fraternities (Johns Hopkins Chapters).

Mr. Johnson is the son of W. Woolsey and Susannah Leverett (Batcheller) Johnson. His father is descended from the Strat-



T. W. Johnson

ford (Conn.) Johnson, and the Woolsey, Livingston, and Bayard families of New York. His mother is descended from the Batchellers of New Hampshire and the Leveretts (Colonial Governor Sir John Leverett) of Massachusetts. He married Mary Carter Craven, April 19, 1902.

Jones, Edward Lathrop (M.E., '92), was born in Franklin, Conn., June 12, 1868. He was draughtsman with the Link-Belt Engineering Co., New York, 1892; held the same position with the Crowell Clutch & Pulley Co., Westfield, N. Y., 1892–1902; and with the Lackawanna Steel Co., Buffalo, N. Y., from 1902 to date. He was granted a patent for an improvement on a friction clutch in 1894. He is a member of the Royal Arcanum.

Mr. Jones is the son of Franklin Chappell and Harriet L. Wurts Jones. He married Lizzie J. Thompson, August 9, 1894.

Jones, Frank Cazenove (M.E., '78), was engineer and draughtsman with the Baldwin Locomotive Works, Philadelphia, Pa., 1878–79; assistant engineer with the Delaware Bridge Co., in the field, erecting bridges, and later on in charge of inspection of work and the draughting-room at Trenton, N. J., 1879–

80; mechanical engineer and factory manager in the works of the New York Belting & Packing Co., in Connecticut and New Jersey, 1881–93, during part of this time being also general manager of the factory of the Okonite Co. and of the International Okonite Co., Passaic, N. J., and building and equipping two rubber factories and one insulating factory. He has been president and general manager of the Manhattan Rubber Manufacturing Co., from 1893 to date. This company built and equipped its own works at Passaic, N. J. Mr. Jones is a member of the American Society of Mechanical Engineers, and of the Engineers' Club.

Jones, Henry Parsons (M.E., '90), was born in Hoosick Falls, N. Y., April 27, 1868. He received his primary education in the grammar and high schools at Hoosick Falls. He was employed in draughting work on automatic screw machinery for Russel & Erwin, New Britain, Conn., 1888; in the civil engineer's office at the United States Navy Yard, Portsmouth, N. H., engaged



H. P. Jones

upon construction of buildings, Navy Hospital, reservoir and waterworks system, etc., 1890–91; with the Berlin Iron Bridge Co., 1891–92; was associated with H. K. Jones, of Hartford and New Britain, Conn., in the development of an annealing process, also with the Russel & Erwin Manufacturing Co., New Britain, 1892; with the Pennsylvania Steel Co., Steelton, Pa., engaged in plant-construction, 1892–93; in business in New York, 1893–94; with the Pennsylvania Steel Co., 1894–97, as engineer of surveys, street railway department; was engaged on engineering work, principally in New York city, 1897–98; associated with G. A. Wright, C.E., designing waterworks at Lindsay, Pa., 1898–99; with the Planters' Compress Co., Boston, engaged in developing and placing in the field a round-bale system for pressing cotton, 1899–1901; with the Fore River Ship & Engine Co., Quincy, Mass., 1901–03; associated with the building committee of the United Shoe Machinery Co., 1903; and is now with the industrial and power department of the Westinghouse Electric & Manufacturing Co. in New York.

Mr. Jones has written the following articles for technical journals:

"Comparison of Ball Automatic Cut-Off Gear and Stephenson Link Motion." *Transactions of the American Association for the Advancement of Science*, 1890; *Stevens Indicator*, October, 1890.

"A Non-Oxidizing Process of Annealing." *Engineering News*, 1892, I, 5; *Engineering and Mining Journal*, 1892; *Kent's Mechanical Engineer's Pocket-Book*, p. 387.

"Girder Rails in Building Construction." *Engineering Record*, August 4, 1894.

"A Protractor for Compound Curves." *Engineering News*, 1895, II, 246.

"Present Status of the Centrifugal Pump." *Ibid.*, 1899, I, 155.

"Importance of Economizing Tonnage Facilities by Compact Stowage of Cargoes." *Ibid.*, 1901, I, 150.

"The Development of Shipyard Crane Service." *Ibid.*, 1901, II, 402.

"The Seven-Masted Schooner—In General and in Detail." *Ibid.*, November 26, 1902.

He has also compiled "Cost Tables for Seed Cotton and Lint," copyrighted in 1901. He is a junior member of the American Society of Mechanical Engineers and a member of the Delta Tau Delta fraternity.

Mr. Jones is the son of Edward M. and Blandina (Burtis) Jones. He married Caroline Seymour Hull, June 20, 1899, and they have one son, Edward Milton Jones.

Jones, Robert R. (M.E., '01), was employed for some time in the Riverside department

of the National Tube Co., Wheeling, Va., and is now located at Chicago, Ill., with the Illinois Steel Co. He is a member of the Tau Beta Pi fraternity.

Jones, William Anthony (M.E., '94), was born in Nanuet, Rockland County, N. Y.,



W. A. Jones

September 21, 1872. He attended the Adelphi Academy, Brooklyn, for seven years previous to entering Stevens Institute. He was Instructor during the Supplementary Term at Stevens, 1894; draughtsman with Bement, Miles, & Co., Philadelphia, machine-tool builders, 1894–95; Instructor at Drexel Institute, Philadelphia, teaching mechanical drawing, descriptive geometry, and applied and experimental mechanics, 1895–98; designer with the Betts Machine Co., Wilmington, Del., in the summer of 1896, during which time a 15-inch slotting-machine, designed by him for this company, was described and illustrated in the *American Machinist;* designer for the C. W. Hunt Co., West New Brighton, N. Y., builders of coal-handling and conveying machinery, 1898–1900; and in the engineering department of the Babcock & Wilcox Co., employed in building its new plant at Bayonne, N. J., and since in designing special machinery, from 1900 to date. During the year 1903, he spent two months at the Renfrew (Scotland) works of the Babcock & Wilcox Co.

Mr. Jones is the son of Anthony and Emily Johnson (Tremaine) Jones. His father, Anthony Jones, a civil engineer, was born in London, and on his mother's side he comes from Revolutionary and French and Indian War stock. He married Sallie Pringle Fisler, December 24, 1896.

Joubert, Frederick L. (M.E., '91), was engaged in the ironworks of John H. Murphy, New Orleans, La., as draughtsman and chief draughtsman, 1891–95; and has been a member of the firm of Payne & Joubert, New Orleans, La., from 1895 to date. This firm makes a specialty of sugar machinery, contracts for the complete erection and furnishing of refineries and sugar-houses, and has a patent on improved hollow-blast bagasse-burners, which they build.

Keepers, Edgar S. (M.E., '02), is with the Middle States Inspection Bureau, New York.

Kellogg, Ernest D. (M.E., '98), has been employed in the laboratory of Thomas A. Edison, Orange, N. J.; and is at present engineer at the Post & McCord branch of the American Bridge Co., Brooklyn, N. Y.

Kellogg, Morris Woodruff (M.E., '94), was born in Elizabeth, N. J., January 16, 1873; son of James Crane and Elizabeth L. (Woodruff) Kellogg. He is a direct descendant of John Rogers, the Martyr. He assisted Mr. Charles Emery, the well-known engineer, upon some scientific tests on the efficiencies, economies, etc., of a fuel-pulverizer in connection with boiler-practice; and was later with Mr. W. T. Hiscox (Cornell, Hiscox, & Underhill, and W. T. Hiscox & Co.), New York, whose firms made a specialty of all kinds of power-house and factory construction work. In this connection Mr. Kellogg had complete charge of the Middlesex Water Co.'s plant, running from South Plainfield through Metuchen and Woodbridge to Carteret, N. J., and also of the erection of the power-house, containing 1,250 horse-power of boilers, for the Atlantic branch of the National Lead Co. Brooklyn.

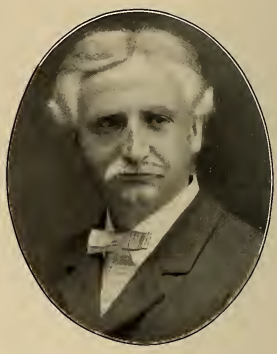
In 1899, in conjunction with Mr. James L. Alexander, he established the firm of

Kellogg & Alexander, New York, as engineers and contractors for factory and mill construction, making a specialty of the construction of high-pressure steam-piping, and of conveying-lines for coal, ores, phosphates, etc. In 1902 this firm was succeeded by that of M. W. Kellogg & Co., consisting of the subject of this sketch and Mr. William B. Osgood Field. Among other work the firm has installed a plant for handling fertilizer material for the largest fertilizer works in the United States, handling 125,000 tons. The firm's business also includes the improved perforated radial brick chimneys built by them. Mr. Kellogg is a member of the University Club of New York; the Suburban Riding and Driving Club; the Engineers' Club of New York; the Elizabeth Town and Country Club; Squadron A of New York; and of the Chi Psi fraternity.

Kelly, James Forrest (M.E., '79), was born in Ireland, October 16, 1860. He was with the Gold & Stock Telegraph Co., New York, 1879–80; in charge of the testing-room of the Western Electric Co., New York, 1881–82; electrician with the Electrical Supply Co., New York, 1883–87; manager of the wire department of the Edison Machine Works and its successors, the Edison General Electric Co., the General Electric Co., and the United States Wire & Cable Co., 1887–94; and has been with the New York Insulated Wire Co., New York, from 1895 to date.

Mr. Kelly is the son of Jeremiah and Kate (Forrest) Kelly. He married Julia Kennedy, October 27, 1885, and they have two children, Forrest and Gerald Kelly.

Kelly, John Forrest (Ph.D., '78), was born in Carrick-on-Suir, Ireland, March 28, 1859. He was a chemist in the laboratory of Thomas A. Edison, 1879; electrician with the Western Electric Co., New York, 1879–82; assistant to Mr. Edward Weston, then chief electrician of the United States Electric Lighting Co., 1882; with the Parker Electric Lighting Co., afterward known as the Remington Co., 1882–84; and with the United States Electric Lighting Co., 1884–86. During this period he was closely identified with the now historical work of the old United States Co., covering not only the field of electrical-machine design, but also those of the incandescent and arc lamps. He was chief electrician, remaining in charge of all the electrical work of that company, until



John F. Kelly

its absorption by the Westinghouse Electric Co., with which latter company his position remained substantially similar, except in title (as he was the electrician of the Newark shops of the Westinghouse Co.) until his resignation, in January, 1892, to join the Stanley Laboratory Co., which had just been organized in Pittsfield, Mass., and with which he was actively connected until January, 1895. During this period he and his associates designed the now well-known "S.K.C." alternating current inductor generator, and arranged with the Stanley Electric Manufacturing Co. to place on the market a complete system for the transmission and distribution of power by alternating currents. In 1895 he resigned from the Stanley Laboratory Co. and took a position as consulting electrical engineer to the Stanley Electric Manufacturing Co., Pittsfield, and the Royal Electric Co. of Montreal, Canada, which companies were at this time actively entering the field of alternating-current work. Mr. Kelly still holds this relation to the Stanley Electric Manufacturing Co. For about ten years he had entire charge of the patent affairs of the Stanley Laboratory Co. and the Stanley Electric Manufacturing Co., and in all the

important litigation between these companies on the one hand, and the Westinghouse and General Electric companies on the other, he was uniformly successful. He is also consulting engineer and director of the Stanley Instrument Co., of Great Barrington, Mass., and consulting engineer and president of the John F. Kelly Engineering Co., consulting and contracting engineers, New York.

As an inventor Mr. Kelly's career has been active and brilliant. Early in 1891 he showed the prejudicial effects of lagging currents on alternating-current power and lighting circuits, and, in conjunction with his associates, at that time patented and developed an alternating-current induction motor having a condenser in parallel with the main motor circuit for furnishing the lagging component of the motor current. In 1892 he pointed out the value of synchronous motors on alternating-current circuits, and showed that, by a proper adjustment of the field, the armature current of a synchronous motor can be made to lag or lead the *e. m. f.* of the line as desired, and in consequence can be made to correct, not only the lagging or leading currents of the circuit, but used as a voltage regulator for an entire transmission system. A patent for a synchronous motor used as a condenser was issued to him in 1893.

During the same year he pointed out that in the operation of alternating-current motors and also of transformers, and in the general transmission of power by alternating currents, it is of considerable importance that the currents and magnetic fluxes should vary sinusoidally, for experience had shown even at that time that the more nearly such a condition is approached the less are the losses and idle currents. A first step toward obtaining these conditions is the making of the impressed *e. m. f.* of the generator sinusoidal. To accomplish this it is necessary and sufficient that the magnetic flux through the armature coils should vary sinusoidally. In order to accomplish this latter result and obtain a sinusoidal *e. m. f.*, Mr. Kelly, in 1893, designed alternating-current generators in which the poles were shaped so that the clearance or air-gap varied in an inverse sinusoidal manner, and consequently the flux and generator *e. m. f.* varied sinusoidally. This was probably the first attempt to shape scientifically the poles of alternators to obtain a predetermined *e. m. f.* wave, and was the basis of a United States patent issued to him in 1894.

Among his later inventions may be mentioned the "non-hysteresis growth" transformer iron, the static ground-detector, and various measuring-instruments. It is pertinent here to remark that he has always been an advocate of extreme voltages in transmission work, and is recognized as the original "60,000-volt man."

He has devoted much attention to the protection of electric plants from lightning, and has introduced two novel and effective types of arrester. One of these is similar in principle to the coherer of the wireless telegraph. The other is a sort of electric sieve, shutting out waves of the normal frequency while allowing the high frequency electric waves due to lightning to pass with the utmost freedom.

In co-operation with Mr. Stanley, Mr. Kelly has recently introduced a new form of alternator in which the principle of the transformer is combined with the ordinary dynamic action. The exciting current in this machine varies spontaneously whenever the load is altered either in amount or character, so as to maintain the induced electromotive force constant.

One of the most recent and at the same time largest of installations designed by Mr. Kelly is the Bay Counties power plant at Colgate, Cal., where was placed in operation in 1902 three dynamos of 3,000 horse-power each. These dynamos are connected to Risdon water-wheels driven by a column of water with a 700-foot fall. Current is transmitted to San Francisco, 142 miles away, at a pressure of 40,000 and 60,000 volts, or twice and three times the transmission pressure used at Niagara. This plant was described and illustrated in "Harper's Weekly," and in the "New York Herald," December 1, 1901.

He is widely known as one of the foremost of the world's electrical engineers, being quoted largely in Thompson's "Polyphase Alternating Currents" and in Niethammer's "Ein-und-Mehrphasen Wechselstrom-Erzeuger." At a recent hearing of the case of Westinghouse Electric Co. *vs.* Stanley Instrument Co., the complainant's counsel spoke of Mr. Kelly as "an electrician of

high scientific attainments," and as "probably the best-informed person on the subject-matter of the suit;" while the defendant's counsel characterized him as having "a practical experience in regard to alternating-current apparatus that is perhaps unequalled by anybody in the country."

He has been instrumental in taking out a large number of patents in his line of work. Of these 26 have been issued in his own name, 32 in conjunction with Mr. William Stanley, 7 in conjunction with Mr. C. C. Chesney, and 2 others in which he was associated with Messrs. Stanley and Chesney, and one with Messrs. Chesney and R. W. Power. Of these patents 39 have been issued by the United States, and the remainder by foreign countries, including England, France, Belgium, Germany, Austria-Hungary, Italy, and Canada.

Mr. Kelly is a member of the American Institute of Electrical Engineers; the Engineers' Club; the American Association for the Advancement of Science; the Société Internationale des Électriciens; the Institution of Electrical Engineers (England); the American Economic Association; the American Electrochemical Society; the American Academy of Political Science; and of the American Statistical Association.

Mr. Kelly is the son of Jeremiah and Kate (Forrest) Kelly. He married Helen Tischer in 1892, and they have two children, Eoghan and Domnall Kelly.

Kelly, Moore (M.E., '99), was born in New York city September 6, 1877; son of Thomas P. and Mary J. Kelly. He was engaged as chain-level-man, transit-man, and head of party, in the field engineering corps of Naughton & Co., contractors (who were at that time changing the motive power from horse to underground electric on the Third Avenue lines in New York), in 1899–1900. Later he was employed in the testing department of the Bristol Co., Waterbury, Conn., and as draughtsman and assistant to mechanical engineer with Colgate & Co., soap-manufacturers, Jersey City, N. J., in 1900; in which year he, together with a classmate, Charles W. Owston, Jr., established and conducted a sales agency as Eastern representatives for the C. H. Shaw Pneumatic Tool Co., Denver, Col. The Eclipse Co., of New York, was then organized to do a general sales agency business, making a specialty of pneumatic appliances; Mr. Owston being made president, and Mr. Kelly one of the board



Moore Kelly

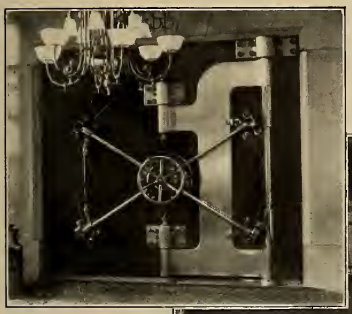
of directors, 1900–02. The company subsequently established branch offices in Pittsburg, Chicago, and Boston, Mr. Kelly first opening up the Boston office and territory, later assuming the management of the Pittsburg office. He was also associated with Messrs. Edwin S. Gleason and J. J. McQuade, of New York, who in 1901 were granted a franchise for an electric street railway in the city of Albuquerque, N. M., an enterprise which, however, was not carried out by them, although a company was organized and incorporated. In the fall of 1902, associated with Mr. C. H. Shaw, Jr., he organized the Shaw-Eclipse Co., taking over the Eclipse Co.'s business, Mr. Kelly being elected secretary and treasurer. Mr. Kelly has since become the Central States representative of the Ajax Metal Co. He is a member of the Pittsburg Railway Club and of the Knights of Columbus.

Kelly, Olaf M. (M.E., '97), was on the engineer's staff of the Williamsburg Bridge, New York, 1897–1904; and is now in the Department of Bridges of the City of New York. Mr. Kelly's graduating thesis, written with Mr. C. P. Hidden, on "Experiments

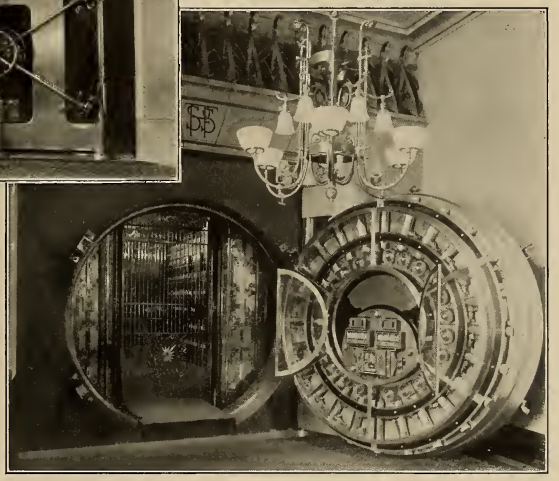
on the Disruptive Strength of Insulating Materials," was published in the *Stevens Institute Indicator* for April, 1898.

Kemble, Edmund (M.E., '95), was with the Western Electric Co., New York, 1895–1900; assistant superintendent and, later, superintendent of the Electric Fireproofing Co., New York, 1900–02; and has since been with Mr. Charles J. Tagliabue, New York.

Kennedy, Anthony (M.E., '91), was born in Wye Hall, Queen Anne's County, Md., September 12, 1870. He was engaged in the motive-power department at the Mount Clare shops of the Baltimore & Ohio Railroad, testing materials at the various steel mills, superintending the construction of locomotives and cars, locomotive testing, experimental work, etc., 1891–93; and was chief engineer with the Hollar Lock Inspection & Guaranty Co., engineers of bank-vault construction, 1893–1900. He patented numerous inventions relating to this work, among them, two electric re-winding time-locks and an electrically actuated combination lock, besides several patents on the construction of vaults of armor plate, and a number of patents on improvements in locks and locking apparatus. In 1898 he made a series of experiments for the Carnegie Steel Co. to determine the value of armor plate for vault-construction. He designed and patented the first round-door burglar-proof vault ever built. (An illustration of one of Mr. Kennedy's bank vaults is here shown. Its weight is 222.8 tons; that of the door 16 tons.) He was employed in the hull department of the New York Shipbuilding Co., in charge of standardization of small tools and pneumatic apparatus, 1900–01; and was the general manager of the L. H. Miller Safe & Iron Works, Baltimore, manufacturers of fire- and burglar-proof safes, bank vaults, etc., from 1901 to 1904. In January, 1903, he was elected first vice-president and general manager of the above company, and had entire control of its business and operation up to the time of his entering business on his own account as consulting engineer, in Camden, N. J., in the summer of 1904. He



(Door Locked)



Burglar and Mob Proof Vault (Door Open)
Anthony Kennedy

has made several addresses on "Vault-Construction" before bankers' conventions.



Anthony Kennedy

He is a member of the Franklin Institute; the American Society of Mechanical Engineers; the Merchants' Club of Baltimore; and of the Beta Theta Pi fraternity.

Mr. Kennedy is the son of Edmund Pendleton and Julia Chew (Paca) Kennedy. His father's family is of Scotch origin, being descended from Gilbert Kennedy, third Earl of Cassilis. His mother is of English and Italian descent. Both families have been in America since about 1600, and have taken prominent parts in the early history of the country, as signers of the Declaration, Colonial Cabinet officers, etc. He married Katharine von Landerothe Conrad, June 18, 1901, and they have two sons, Anthony and Joseph Conrad Kennedy.

Kennedy, F. D. (M.E., '98), was in the meter department of the Edison Electric Illuminating Co., New York, 1898; later engaged in experimental work and assisted Prof. Jacobus in the Department of Tests, Stevens Institute; and is at present located in New York.

Kennedy, John Pendleton (M.E., '96), was born in Wye Hall, Queen Anne's County, Md., March 21, 1873; son of Edmund Pendleton and Julia Chew (Paca) Kennedy. He was with the Illinois Steel Co., Chicago, Ill., 1896–97; and has been engaged on construction work with Humphreys & Glasgow, gas engineers, London, England, from 1897 to date. He is a member of the Tau Beta Pi fraternity.

Kent, Robert Thurston (M.E., '02), was born in Jersey City, N. J., July 17, 1880; son of William and Marion (Smith) Kent. He was educated in the public schools of Passaic, N. J.; apprentice in the Cooke Locomotive Works, Paterson, N. J., 1896–97; and attended Stevens School one year (1897–98), before entering the Institute. He spent his college vacations in the draughting-room of the Robins Conveying Belt Co., New York, with whom also he was engaged in erection work, draughting, and testing, 1902–03; was draughtsman with the Link-Belt Engineering Co., Philadelphia, 1903–04; and is now associate editor on the "Electrical Review," New York city. He is a junior member of the American Society of Mechanical Engineers, and a member of the Delta Tau Delta fraternity.



R. T. Kent

Kent, William (M.E., '76), was born in Philadelphia, Pa., March 5, 1851. He was educated in the public schools of Philadelphia, and graduated from the Central High School in 1868 with the degree of Bachelor of Arts (receiving Master of Arts in 1883).

He was clerk and bookkeeper in a coal-shipping house in Philadelphia, 1868–69, and in December of the latter year moved to Jersey City to become bookkeeper in the office of the Jersey City Gas Light Co. In 1870 to 1872 he took the two higher classes in mathematics, engineering, etc., at the night school in Cooper Union, New York, graduating with the Class of 1872. He was bookkeeper (and for a few months storekeeper, and assistant on land and canal surveys) with Cooper, Hewitt, & Co., Ringwood Iron Works, N. J., 1872–75. In 1873–74 he took a special course in chemistry, under Dr. Albert Gallatin, at Cooper Union, New York, and at the same time was private tutor to Mr. A. S. Hewitt's eldest son, Peter Cooper Hewitt. He entered Stevens Institute in January, 1875, as special student in iron chemistry, and also took the work of the Junior class in engineering, mechanics, and French. He became a regular member of the Senior class in September, 1875, and graduated with the Class of 1876.

In June, 1875, Mr. Kent was made assistant to Prof. R. H. Thurston on the United States Board appointed to test iron and steel and other metals, and was put in charge of the research on metallic alloys. He continued on this work, as far as time permitted, while he was a student, and afterward remained in charge of it until April, 1877, completing the work on copper and tin, and copper and zinc alloys, and writing the report on it.

He has had an extended experience in practical work in various branches of engineering, as will be indicated by the following condensed statement of his professional record: Draughtsman at the Pittsburg Car Wheel Works, and for Witherow, Shepard, & Lamond, blast-furnace engineers, Pittsburg, Pa., 1877; editor of the "American Manufacturer and Iron World," Pittsburg, and correspondent of other engineering papers, 1877–79; with Shoenberger & Co., iron and steel manufacturers, Pittsburg, 1879–82, being superintendent of the open-hearth steel department, 1881–82. He resigned on account of ill health, and during May, June, and July, 1882, visited iron and steel works in England, Scotland, and Belgium. Returning, he entered the employ of the Babcock & Wilcox Co., water-tube steam boiler manufacturers, being manager of the Pittsburg office, 1882–83, and superintendent of the sales department and engineer of tests, with office in New York, 1883–85. In 1882 he founded, with William F. Zimmermann (M.E., '76), the Pittsburg Testing Laboratory, his interest in which he sold to Messrs. Hunt & Clapp in 1886. He was secretary and general manager of the Springer Torsion Balance Co., Jersey City, N. J., 1885–90, developing the invention of the torsion balance



William Kent

and building and equipping a factory for its manufacture. He practised as a consulting engineer in New York city 1890–1903; was general manager of the Passaic Art Casting Co., Passaic, N. J., 1893–94; and was associate editor of "Engineering News," New York, from 1895 to 1903. In May, 1903, he was appointed Professor of Mechanical Engineering and Dean of the Lyman Cornelius Smith College of Applied Science in Syracuse University, and entered upon his duties there in September of the same year.

In connection with his office practice as consulting engineer he has designed and installed power plants, heating and ventilating apparatus, and other machinery; designed an ironworks erected in Brazil in 1892; made tests of fuels, boilers, engines, materials, and machines; given advice and made reports on mechanical and metallurgical processes, inventions, and projects; and investigated

causes of accidents for lawyers in connection with damage suits. He has also been employed as expert in a number of law cases, among which are the following:

Page, Newell, & Co., *vs.* Collector of Port of Boston (United States Court), government expert in tariff case, involving question, "What Is Steel?" 1881.

Babcock & Wilcox Co. *vs.* Kidd (Superior Court of New York), steam boiler case, 1882.

Hewitt *vs.* Pennsylvania Steel Co. (United States Court), patent infringement case involving validity of the Martin patents on open-hearth steel process, metallurgical expert for defendants, 1883–84.

Babcock & Wilcox Co. *vs.* Dushane (Court of Common Pleas of Baltimore), steam boiler case, 1884.

Kent *vs.* Pratt (in Patent Office), patent interference case, 1886.

Dubois *vs.* Commissioner of Patents, lead trap case against the City of Worcester, 1889.

Factory Owners on Blackstone River (Mass.) *vs.* City of Worcester, expert for owners in water-diversion case, 1898.

Town of Blackstone *vs.* Blackstone Manufacturing Co., expert for town in water-diversion case, 1900.

Schlicht *vs.* Æolipyle Co., expert for defendants in infringement case, 1902.

Several suits brought by Long Island farmers against the City of New York for alleged damages done by Brooklyn pumping-stations in lowering the underground water on their farms, expert for the city, 1901.

In 1892 he spent over two months in Birmingham, Ala., auditing the books of the Sloss Iron & Steel Co. In 1896 he made 75 complete boiler tests at Aurora, Ill., for the Babcock & Wilcox Co., to determine the relative value of several furnaces for burning different varieties of bituminous coal. He was for one year a member of the New Jersey State Commission on Pollution of Streams.

In 1890 Mr. Kent was elected to represent the Alumni Association on the Board of Trustees of the Stevens Institute of Technology, and served until 1893. From 1888 to 1895 he was lecturer on steam engineering at the Newark Technical School, delivering a course of ten lectures in each year. In 1902 he delivered a course of six lectures on engineering subjects at Purdue University. He has also lectured at Brooklyn Institute; Franklin Institute, Philadelphia; Worcester Polytechnic Institute; Clarkson School of Technology, Potsdam, N. Y.; University of West Virginia; University of Illinois; Cornell University; and at Stevens Institute.

Following is a list of Mr. Kent's contributions to the societies of which he is a member, and to the technical journals:

"The Rapid Corrosion of Iron in Railway Bridges." *Iron Age*, May 27, 1875; *Jour. Frank. Inst.*[1], June, 1875.

"Project for the Erection of a Blast Furnace in Northern New Jersey" (graduating thesis, Stevens Institute, 1876). *Eng. and Min. Jour.*[2], 1876.

"The Use of Red Charcoal in the Blast Furnace." *Trans. Am. Inst. Min. Eng.*[3], VI, 207, 1877.

"Graphic Method of Keeping the Record of Working of a Blast Furnace." *Ibid.*, VI, 551, 1877.

"An Apparatus for Testing the Resistance of Metals to Repeated Shocks." *Ibid.*, VIII, 76, 1879.

"Some Curious Phenomena Observed in Making a Test of a Piece of Bessemer Steel." *Ibid.*, VIII, 81, 1879.

"An Autographic Transmission Dynamometer." *Ibid.*, VIII, 177, 1879.

"The Wearing Power of Steel Rails." *Ibid.*, IX, 554, 1880.

"The Metric System." *Trans. Eng. Soc. West. Pa.*[4], I, 1880.

"Manganese Determinations in Steel." *Trans. Am. Inst. Min. Eng.*, X, 101, 1881.

"Evaporative Tests of Steam Boilers." *Trans. Eng. Soc. West. Pa.*, 1883.

"Evaporative Power of Bituminous Coals." *Trans. A. S. M. E.*[5], IV, 249, 1883.

"Evaporative Power of Anthracite Coal." *Van Nostrand's Eng. Mag.*[6], 1884.

"Rules for Conducting Boiler Tests." *Trans. A. S. M. E.*, V, 260, 1884.

"Water-Tube Boilers at the Lucy Furnace." *Trans. Am. Inst. Min. Eng.*, XIII, 45, 1884.

"Proposed Apparatus for Determining the Heating Power of Different Fuels." *Ibid.*, XIV, 727, 1885.

"Recent Failures of Steel Boiler Plates," *Ibid.*, XIV, 812, 1885.

"Specific Gravity of Open-Hearth Steel" (prepared discussion of paper by another author). *Ibid.*, XIV, 585, 1885.

---

[1] "Journal of the Franklin Institute."
[2] "Engineering and Mining Journal."
[3] "Transactions of the American Institute of Mining Engineers."
[4] "Transactions of the Engineers' Society of Western Pennsylvania."
[5] "Transactions of the American Society of Mechanical Engineers."
[6] "Van Nostrand's Engineering Magazine."

"Table of Sizes of Chimneys." *Trans. A. S. M. E.*, VI, 81, 1885.

"Tables for Facilitating Calculation of Boiler Tests." *Ibid.*, VI, 84, 1885.

"Report of Committee on Standard Method of Steam Boiler Trials."[1] *Ibid.*, VI, 256, 1885.

"The Torsion Balance." *Ibid.*, VI, 636, 1885.

"Engineering as a Profession" (Presidential Address to the Alumni Association of the Stevens Institute of Technology). *Van Nostrand's Eng. Mag.*, August, 1885.

"Proposal for an American Academy of Engineering." *Ibid.*, October, 1886.

"Classification of Iron and Steel." *Railroad and Engineering Journal*, April, 1887.

"Is Water-Gas an Economical Fuel?" *Trans. A. S. M. E.*, VIII, 225, 1887.

"A Problem in Profit-Sharing." *Ibid.*, VIII, 630, 1887.

"The Future Water-Supply of Northern New Jersey" (read before the Citizens' Association of Passaic, N. J., January 12, 1888). *Passaic Daily News*, January, 1888.

"Weighing-Machines." *Jour. Frank. Inst.*, September, 1888.

"The Iron Industry of the United States." *Stevens Indicator*, October, 1888.

"The Heating Value of Coal." *Mineral Industry*, I, 97, 1890.

"Tests of Recent Formulæ for Chimney-Draught." *Trans. A. S. M. E.*, XI, 984, 1890.

"American Blast Furnaces" (prepared discussion of paper by another author). *Trans. Am. Inst. Min. Eng.*, XIX, 981, 1890.

"Designing a Toggle-Joint Press." *American Machinist*, March 27, 1890.

"Testing the Relative Value of Different Fuels." *Eng. and Min. Jour.*, July 19, 1890.

"A Thirty Years' Retrospect of the Iron Trade." *Ibid.*, September 27, October 4, 1890.

"Gold and Silver Statistics." *Mineral Resources of the United States*, 1889–90.

"Critical Review of Efficiency Tests of Coals." *Eng. and Min. Jour.*, October 10, 17, 24, 31, 1891.

"Limits of the Battle Ship." *Cassier's Mag.*, November, 1891.

"Tests of Structural Wrought Iron and Steel" (prepared discussion of paper by another author). *Trans. Am. Inst. Min. Eng.*, XX, 700, 1891.

"Influence of the Steam-Jackets of the Pawtucket Pumping-Engine." *Trans. A. S. M. E.*, XIII, 176, 1892.

"The Efficiency of a Steam Boiler. What Is It?" *Ibid.*, XIII, 645, 1892.

[1] The committee consisted of William Kent, Chairman, John C. Hoadley, R. H. Thurston, Charles E. Emery, and Charles T. Porter. Each of the members participated in the writing of the report.

"Ropes Pass, Texas." *Engineering Magazine*, June, 1892.

"The Ideal Preparatory School for Engineering Students." *Cassier's Mag.*, August, 1894.

"The Relation of Engineering to Economics" (Vice-Presidential Address before Section D of the American Association for the Advancement of Science). *Proc. Am. Assoc. Adv. Sci.*, XLIV, 1895.

"Some Preventable Wastes of Heat in the Generation and Use of Steam." *Jour. Frank. Inst.*, December, 1895.

"Coal Dust in Mine Explosions" (prepared discussion of paper by another author). *Trans. Am. Inst. Min. Eng.*, XXIV, 913, 1895.

"Industrial Education the Need of the Commonwealth" (address at the 39th Annual Commencement of the Michigan Agricultural College, August 14, 1896). *Mich. Agric. Coll. Record*, August 18, 1896.

"Notes on the Proposed Removal of Sewage from the Passaic River" (presented to the New Jersey State Commission on the Pollution of Streams). *Passaic Daily News*, 1899.

"Fuel and Its Economical Utilization." *Mineral Industry*, VIII, 1899.

"The Manufacture of Iron and Steel" (a lecture delivered at Sibley College, Cornell University). *Sib. Jour. Eng.*[1], February, 1900.

"Heat Resistance, the Reciprocal of Heat Conductivity." *Trans. A. S. M. E.*, XXIV, 1903.

"University Education of Engineers." *Sib. Jour. Eng.*, December, 1903.

Mr. Kent also prepared a large number of discussions on papers by other authors in the societies of which he is a member. In 1890 he was special agent of the U. S. Census as assistant to R. P. Rothwell, and had charge of the collection and compilation of the statistics of Gold and Silver for the Census Report. In 1891 he contributed 300 pages to Appleton's "Cyclopedia of Mechanics." He is the author of "The Mechanical Engineer's Pocket-Book" (John Wiley & Sons, 1895). The compilation of this work occupied a large part of his time from 1891 to 1895. The book has been revised each year, and is now in its sixth edition, over 30,000 copies having been sold. He is also the author of "Steam Boiler Economy" (John Wiley & Sons, 1901).

Mr. Kent has taken out over twenty patents for his inventions, including several

[1] "Sibley Journal of Engineering."

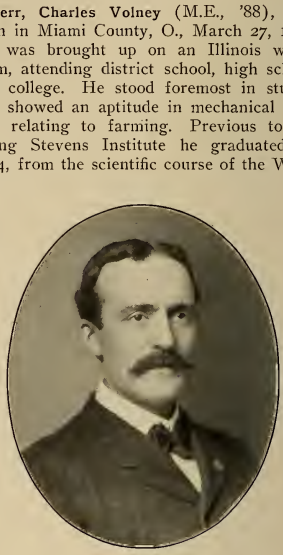
from 1885 to 1887 for water-tube boilers and for machinery for forming their special parts, which were purchased by the Babcock & Wilcox Co. In 1887 and 1888 he patented improvements in torsion balance scales and automatic weighing-machinery, the rights in which were assigned to the Springer Torsion Balance Co. He has also taken out two patents for smokeless furnaces for steam boilers, one in 1898 and another in 1901. The later furnace was tested in St. Louis, in January, 1902, by Mr. William H. Bryan, and according to the smoke scale used in St. Louis the smoke was reduced to 0.6 per cent, a practically perfect result.

Mr. Kent is or has been a member of the following engineering societies, in which he has been very active upon committees, and a frequent contributor of papers on a variety of subjects, as shown above: The American Institute of Mining Engineers, 1876 to date (member of the board of managers, 1901–03); American Association for the Advancement of Science, 1877 to date (vice-president and chairman of Section D, 1895); Engineers' Society of Western Pennsylvania, 1880–84 (treasurer, 1880–82); American Society of Mechanical Engineers, 1880 to date (manager, 1885–88; vice-president 1889–90; chairman of committee on steam boiler trials, 1884–85; member of executive committee of European trip of joint societies, 1889; of new committee on boiler trials, 1896–99; and of committee to report on the metric system, 1903); American Society of Heating and Ventilating Engineers, 1898 to date (member of board of governors, 1901; vice-president, 1903); Society for Promotion of Engineering Education, 1894 to date; and of the Engineers' Club, 1889 to date. He is also a member of the Delta Tau Delta and Tau Beta Pi fraternities.

Mr. Kent is the son of James and Janet (Scott) Kent. His father was a native of Bothwell, Scotland, where his ancestors had lived for many generations. He was a florist and landscape gardener, as were his fathers before him. His mother was the daughter of a schoolmaster in Annan, Scotland, who was an intimate friend of Thomas Carlyle. Mr. Kent married Marion Weild Smith, February 25, 1879, and they have three children, Robert Thurston, Agnes Scott, and Edward Raylor Kent.

Kenyon, Charles C. (M.E., '94), has been a member of the firm of R. D. Kenyon & Son, manufacturers of woolen machinery, Raritan, N. J., from 1894 to date.

Kerr, Charles Volney (M.E., '88), was born in Miami County, O., March 27, 1861. He was brought up on an Illinois wheat farm, attending district school, high school, and college. He stood foremost in studies and showed an aptitude in mechanical matters relating to farming. Previous to entering Stevens Institute he graduated, in 1884, from the scientific course of the West-



C. V. Kerr

ern University of Pennsylvania with the degree of Bachelor of Philosophy.

He was Teacher of Mathematics and Science at Pratt Institute, Brooklyn, 1888–89; Assistant Professor of Mechanical Engineering at Western University of Pennsylvania, 1890; Professor of Mechanical Engineering, and Superintendent of Mechanic Arts, at Arkansas Industrial University, Fayetteville, Ark., 1891–96; and Director of the Department of Mechanical Engineering at Armour Institute of Technology, Chicago, Ill., 1896–1902.

In the course of these changes he helped to plan the course of instruction for Pratt Institute; planned the course in mechanical engineering and equipped the shops for the Western University of Pennsylvania; or-

ganized the department of electrical engineering at Fayetteville, and rebuilt the shops and equipped the mechanical laboratory there; and built and equipped the shops of the mechanical department of the Branch Normal College, Pine Bluff, Ark., and organized the instruction. While at Armour Institute he developed the course in mechanical engineering, improved the equipment of the laboratories, and planned the arrangement and equipment of the new shop building. He also did some work as consulting engineer, especially making a series of tests to determine the relative merits of brass and roller bearings at various loads and speeds, and equipping a deep-well pumping-station for the village of Riverside, Ill. He has also engaged in special investigations such as displacement curves for piston engines, parallel operation of alternators, theory and practice of superheated steam, development of Holly gravity return system, etc. He is now with the firm of Westinghouse, Church, Kerr, & Co.

Among the articles contributed by Prof. Kerr to technical papers perhaps the most important are those on "The Arkansas Industrial University," *Cassier's Magazine*, V, 405; and "Fly-Wheel Arms," *American Machinist*, August 8, 1895. He has presented the following papers at meetings of the American Society of Mechanical Engineers:



Shops of Armour Institute, Chicago, Ill.
C. V. Kerr

"Theory of the Moment of Inertia," 1894; "Moment of Resistance," 1896; "Theory of the Moment of Inertia," 1899; "The Berthier Method of Coal Calorimetry," 1900; "Efficiency of a Gas Engine as Modified by Point of Ignition," 1901.



Deep-Well Pumping-Plant for Village of Riverside, Ill.
C. V. Kerr

Prof. Kerr lectured before the annual meeting of the Association of Gas and Gasoline Engine Manufacturers in Chicago, February 15, 1890, on the subject, "The Development of the Gas-Engine." This lecture was widely published in the technical press. He also delivered a lecture in one of the regular courses at the Field Columbian Museum, on "Steam-Engine Development." He presented before the Western Railway Club, in 1900, a paper on "Bending Test of

an M. C. B. Arch Bar Truck," which was published in the *Railway Master Mechanic;* and in 1902 he read a paper before the same association on "The Education of Railway Mechanical Engineers." He contributed an article on "Successful Compounding of Gas-Engines Improbable" to *Modern Machinery* in 1900. In 1894 he took out a patent on a boiler-setting. He is a member of the American Society of Mechanical Engineers; the New York Railroad Club; the Western Society of Engineers; and of the Society for the Promotion of Engineering Education.

Prof. Kerr is the son of George W. and Nancy Kerr. He married Libbie Applebee, December 25, 1888, and they have four children, Vida A., Delia A., Volney A., and Marion A. Kerr.

Ketchum, Samuel (M.E., '02), was born in Montclair, N. J., November 14, 1879. He was engaged in the engineering and construction department of the Chase Rolling Mill Co., Waterbury, Conn., in 1902, mainly on work in connection with the brass furnace and concrete work of a new casting-shop. Since 1903 he has been employed in

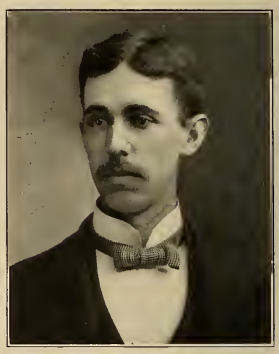


Samuel Ketchum

the machine shop of the W. D. Forbes Co., Hoboken, N. J. He is a member of the Sigma Nu fraternity and of the Tau Beta Pi association.

Mr. Ketchum is the son of William H. and Ella (Gowan) Ketchum. He married Cornelia C. Stevens, of Montclair, N. J., January 7, 1904.

Kidd, George F. (M.E., '98), was born in Boston, Mass., in 1874; son of James B.



G. F. Kidd

and Annie (Bramble) Kidd, and of Scotch and English descent. By reason of exceptionally high standing throughout the course, he was honorably graduated without examination from the Newark, N. J., public high school. He undertook to pay his own way through the Institute, but suffered financial reverses when half way through, and became a beneficiary of the Vreeland Fund, in order to finish the course. He was engaged as electrician in the incandescent department of the Mount Morris Electric Light Co., New York, at intervals between 1892 and 1898; was electrician in the equipment department of the Brooklyn Navy Yard, 1898–99; in the testing-department of the General Electric Co., Schenectady, N. Y., 1899–1902; in the electrical department of the Bristol Co., Waterbury, Conn., 1902–03; and has been mechanical engineer with the Western Engineering & Construction Co., San Francisco, from 1903 to date.

Kidde, Walter (M.E., '97), was born in Hoboken, N. J., March 7, 1877. He was

constructor with Burhorn & Granger, contracting engineers, New York, 1897–1900, making a study of electricity and power-transmission as applied to factories; and has practised as engineer and contractor, New



Walter Kidde

York, from 1900 to date. His first independent work was the erection of a factory for the manufacture of a special roofing paper, the design of the machinery and system of operation being original. This factory plant is the first of its kind in which the paper is so treated as to get the desired result in one continuous operation; whereby both output and efficiency have been greatly increased over old methods, marking a distinct advance in this line of manufacture. Alternating current transmission of power is used throughout the works, and the control of the motor speeds has contributed to the successful operation of the plant. Since the completion of this work Mr. Kidde has had charge of change-over to electric transmission and motor system of several mills in and about New York and in New Jersey.

Mr. Kidde is the son of F. E. and Mary (Oberdoerfer) Kidde. His father came to this country from Dresden, Saxony, in the early 'sixties. His mother was a resident of West Virginia. He received his early training in German-American private schools. He married Louise Carter, daughter of Rev. F. B. Carter, Montclair, N. J., October 22, 1902, and they have one son, Walter Lawrence Kidde.

Kiernan, Eugene H. (M.E., '87), was with Waterbury & Co., Brooklyn, N. Y., 1887–90; vice-principal of the high school at Hoboken, N. J., 1891–93; and principal of a public school at Hoboken, 1893–1902, since which time he has been located in Hoboken.

King, Harry De Golier (M.E., '92), was born in Joliet, Ill., July 26, 1870. He was with the King Engineering Co., New York, 1892–94; mechanical engineer and draughtsman with Bromell, Schmidt, & Co., York, Pa., 1894–95; supervisor of the North Jersey Street Railway Co., 1895–96; general manager and superintendent of the Middletown Light & Power Co., Middletown, N. Y., 1897; with the People's Light & Power Co., Newark, N. J., 1897–1900; and has been superintendent of the Hoboken Division of the United Electric Company of New Jersey, Hoboken, N. J., from 1900 to date. With reference to this latter position the "Street Railway Journal" of March 23, 1901, states:

"This station has been recently overhauled, and practically re-equipped with both railway and lighting apparatus. The change from a belted plant containing engines and generators of various types and capacities to modern direct-connected units, embodying the latest improvements in engineering practice, was accomplished without shutting down on any circuit. All the work was done under the direction of H. D. King, Superintendent of the Hoboken Division."

The United Electric Company was absorbed by the Public Service Corporation of New Jersey in 1903, since which time Mr. King has been superintendent of the electrical department of the Hoboken division of that corporation, including all power houses and sub-stations of the old Jersey City, Hoboken, & Paterson Street Railway Co., in addition to the Hoboken station.

Mr. King is the son of Edwin C. and Ella T. (De Golier) King. He married Beth Lothrop Tower, October 7, 1896, and they have one child, Dorothy De Golier King.

King, William Roberts (M.E., '86), was born in New York city in 1864. He held a clerical position in, and later became assist-

ant superintendent of, the works of R. Hoe & Co., manufacturers of printing-machinery, New York, 1886–90; and in the latter year he took charge of the mines of the Florida Rock Phosphate Co., Florida, in the capacity of engineer, later becoming general manager



W. R. King

and engineer. When the company was subsequently merged in the Empire State Phosphate Co., a New York corporation which did business in Marion and Citrus counties, Fla., Mr. King continued in the same position with the new company and successfully carried on the exploitation and development of its extensive mining properties and the designing and establishment of the mining plant. He next became chief engineer with the Illinois Phosphate Co., Marion, Hernando, Citrus, and Levy counties, Fla., where he remained from 1894 to 1895, completely reorganizing the mining plant, as well as developing and establishing new and improved methods of handling and treating the ores. As a consulting and contracting mechanical engineer, New York, 1895–98, he made and developed several improvements in the brewing industry; made extensive investigations of artificial processes for the manufacture of malto-dextrin, etc., and entered the field of research surrounding the then new illuminating agent, calcium carbide and acetylene gas. After an exhaustive series of experiments he succeeded in devising an entirely new system of electric furnaces for the manufacture of calcium carbide and the reduction of highly refractory compounds. A number of patents, in this and foreign countries, were granted him on his inventions, which are now the property of, and form the basis of, the Calcium Carbide Co., of New York. At the beginning of 1898 he gave up his professional practice to become superintendent of construction and engineer of the Oxnard Construction Co., New York, constructors and builders of beet-sugar houses and refineries; and while in their employ he erected for the American Beet Sugar Co., Ventura County, Cal., a beet-sugar plant of 2,000 tons daily capacity, and at Rocky Ford, Colo., a 1,200-ton plant. He also erected a 1,000-ton plant for the Standard Beet Sugar Co., at Ames, Neb. In the spring of 1901 he again resumed his private practice and is now located in New York.

Besides the patents for the manufacture of calcium carbide, etc., mentioned above, he took out one for an acetylene-gas generator, also the property of the above company, and one for an improved triple valve for automatic air brakes. He is a member of the American Society of Mechanical Engineers, and of the Society of Chemical Industry.

Mr. King is the son of John W. and Anna M. (Clark) King, descended from New England stock tracing back to 1646. He married Linzee D. Watson in 1889, and they have one child.

Kingsford, Russell Thomas (M.E., '96), was born in Jersey City, N. J., February 12, 1875, son of Albert H. and Clara A. (Aldridge) Kingsford, both of English parentage. He was draughtsman in the Rushmore Dynamo Works, Jersey City, 1896–97. While there he designed a complete line of multipolar dynamos and motors of both belted and direct-connected types, and made many improvements in the search-lights and mirror-lens projectors made at the works. In April, 1897, he entered the employ of the American Impulse Wheel Co., New York, as assistant to the consulting engineer, at the same time acting as consulting engineer for the Rushmore Dynamo Works. In September, 1897, he became chief engineer of the latter works, and with Mr. S. W. Rushmore brought out

the new "multi-voltage" dynamos. The arc dynamo supplies any number of separate and parallel circuits of arc lamps, being the only one of the so-called multi-circuit arc machines in which the circuits are not really in series. The multi-voltage dynamo does away with the troublesome and expensive "booster," as feeder-circuits can be taken at higher potential from the same dynamo. In 1898 he again entered the engineering department of the American Impulse Wheel Co., and during the Spanish-American War he had charge of the draughting-room of the Rushmore Dynamo Works, which were so crowded with government work that his health was considerably impaired. In 1899 he designed for these works the largest dynamo for D. C. arc lighting that had ever



R. T. Kingsford

been built, carrying two parallel and independently regulated series circuits of 150 lights each. In 1900 his health was so poor that he was compelled to give up work and spend a year in the Adirondacks. In April, 1901, he went with the New York Safety Steam Power Co., New York, as chief engineer and engine-designer, but after a few months he returned to the Adirondacks.

For technical journals Mr. Kingsford, in conjunction with Mr. W. H. MacGregor (M.E., '96), has written the following articles: "Test of an Otis Electric Elevator with Leonard Motor Control System," *Electrical Engineer,* 1896; "Method of Determining the Indicated Horse-Power of an Engine under Varying Load," *Power,* 1896,— both extracts from the graduating thesis of Messrs. Kingsford and MacGregor. Mr. Kingsford has also written "A Complete Theory of Impulse Water Wheels and Its Application to Their Design," *Engineering News,* July, 1898.

Kingsland, Charles S. (M.E., '79), was employed at the Kingsland Paper Mills, Franklin, N. J., for several years, and was then obliged to abandon his work owing to ill health. He is now located at Nutley, N. J.

Kingsland, Joseph (M.E., '76), has, since graduation, been in the employ of the Yantacaw Ice Co. and the Kingsland Paper Mills; was mining engineer for a company at Batapolis, Mex., 1880–83; and was with the Kingsland Paper Co., 1885–93, becoming engineer in 1890, and president in 1893. For a number of years Mr. Kingsland was in poor health, which he overcame by avoiding active business duties and spending several years in California. He is now located at Nutley, N. J.

Kirby, Chapman M. (M.E., '99), was born in Jamaica, Long Island, N. Y., July 1, 1877. He was draughtsman with Post & McCord, engineers in structural iron work, Brooklyn, N. Y., 1899–1900; with the Locomobile Co., Newton, Mass., 1900; the Stanley Manufacturing Co., Lawrence, Mass., 1901; at the works of the Kansas City (Mo.) Gas Co., 1901–03; and has been at the Northern Liberties Gas Works, Philadelphia, Pa., from 1903 to date. He is a member of the Chi Phi fraternity.

Kirkland, William A. (M.E., '97), has been employed since graduation in the United States Navy Yard, Mare Island, Cal., as ship draughtsman in the Construction and Repair Department, until 1899, when he was appointed chief draughtsman in the Department of Ordnance, a position he still holds.

Kirsten, George Emil Adolph (M.E., '00), was born in Hoboken, N. J., September 29, 1879; son of Emil and Gesine (Heinz) Kirsten. After four months' experience as

draughtsman in the Newburgh steel works department of the American Steel & Wire Co., Cleveland, O., in 1900, he was transferred to the master mechanic's staff, in which



G. E. A. Kirsten

he rose to the position of assistant master mechanic of the Newburgh wire mill of the same company, a branch employing 1,000 men. In June, 1902, he became inspector in the Middle States Inspection Bureau, New York city. He is a member of the German Club, Hoboken, N. J., and of the Sigma Nu fraternity.

Kissam, W. W. (M.E., '90), was employed in the South Chicago Iron Works, South Chicago, Ill., 1890–94, and with the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., 1894–95. His present location is unknown.

Kletzsch, Alvin Paul (M.E., '84), was born in Newburg, Wis., August 21, 1861; son of Charles F. and Ernestine M. Kletzsch, who were both born near Dresden, Saxony, and emigrated to this country in 1853. After graduating from the Milwaukee high school in 1877, Alvin took a course of drawing with a leading architect of Milwaukee for the purpose of studying architecture, but, being fond of mathematics, was induced to take the engineering course at Stevens and matriculated at that Institution in 1880. He was in charge of the Mechanical Laboratory at Stevens Institute, under the directorship of Prof. Thurston, until July, 1885. He resigned in order to give assistance to his father in the management of the "Republican House" at Milwaukee, Wis. In 1889 he formed the Charles F. Kletzsch Co., and has managed the hotel for the corporation since that time. In 1897 he was elected to the presidency of the Wisconsin State Semi-Centennial Celebration, and in 1898 and 1899 was president of the Milwaukee Carnival Association, an outgrowth of the Celebration society, which had for its object the advancement of the interests of the city of Milwaukee. He has also, since 1898, been secretary of the Badger Oil Co., operating in Hancock County, O., for oil and gas, and since 1902 has been secretary of the Septicide Co., of Chicago, Ill., a concern organized for the purpose of treating tuberculous patients by means of ozone passed through essential oils. He has been president of the Citizens' Business League of Milwaukee since 1902. He is a member of the University, Deutscher, Calumet, and Milwaukee Country clubs; Lafayette Lodge of Free and



A. P. Kletzsch

Accepted Masons; Ivanhoe Commandery No. 24, of which he was eminent commander in 1900; of the Wisconsin Consistory; and of the Benevolent and Protective Order of Elks.

Klumpp, John Bartleman (M.E., '94), was born in Jersey City, N. J., June 2, 1871. He has been with the United Gas Improvement Co., Philadelphia, from 1894 to date. Until 1899 he was assistant engineer in the general superintendent's department. He was then advanced to the position of executive clerk to the company, and in 1901 was appointed superintendent of the Omaha Gas Co., Omaha, Neb. In 1902 he was made assistant inspecting engineer, and in 1904 inspecting engineer, of the United Gas Improvement Co. at Philadelphia, where he is now located. He is a member of the American Gas Light Association; the American Institute of Electrical Engineers; the National Electric Light Association; the University Club of Philadelphia; the Germantown Cricket Club; the Jersey City Club; and of the Beta Theta Pi fraternity.

Mr. Klumpp is the son of John Frederick and Ellen (Bartleman) Klumpp. His father's parents came from Stuttgart, Germany, in 1831; his mother's were of English descent and lived in Augusta, Ga. He married Theodora E. Meyer, May 12, 1896.

Knapp, Edwin R. (M.E., '97), Assistant Professor of Mechanical Drawing at Stevens Institute of Technology. For biography, see page 276.

Knapp, Isaac Newton, '75 (M.E., '01), was born in Greenwich, Conn., June 6, 1851. At the age of 13 he went as cabin-boy on a voyage to Santiago, Cuba. At the ages of 17 and 18 he went to England and the West Indies as ordinary seaman. He learned the machinist's trade, and entered Cornell University with the Class of 1875; then entered Stevens Institute in January, 1873, with the Class of 1875, but left college at the end of the Junior year to install an outfit of Wood's rock-drills and an air-compressor in Plumas County, Cal., where he ran a small tunnel. He remained on the Pacific Slope until 1883, working at tunnelling, shaft-work, hydraulic mining, and general mining work in various capacities, from British Columbia to Mexico.

In 1885 he became a member of the firm of Denton, Breuchaud, & Co., contractors on the new Croton Aqueduct, New York, 1885–86; next was constructing engineer with the United Gas Improvement Co. and other gas companies, also acting as expert on gas-holder-tank masonry, 1887–92; assistant superintendent of the Omaha Gas Manufacturing Co., 1892–97; and superintendent of



I. N. Knapp

the Omaha Gas Co., 1897–1901. Since 1899 he has spent part of his time prospecting for and developing a production of petroleum in southeastern Kansas, where he became a successful oil-producer 1899–1902. He was assigned to the task of making a valuation of the gas plant of the Peoria Gas & Electric Co., Peoria, in their suit in the United States District Court against the city of Peoria, 1901. In 1902 he was appointed engineer for special work in the general superintendent's department of the United Gas Improvement Co., Philadelphia, Pa.

In December, 1901, the Stevens Institute conferred upon Mr. Knapp the full degree of Mechanical Engineer. He read a paper on "Notes on Cement Masonry" before the 30th Annual Meeting of the American Gas Light Association in October, 1902, in New York. This paper was printed in the *Stevens Indicator* for January, 1903. He is a member of the American Gas Light Association, the Western Gas Association, and the American Institute of Mining Engineers.

Mr. Knapp is the son of Isaac and Theodosia (Mead) Knapp. He is descended from Nicholas Knap, who came from Sussex, England, and settled in Watertown, Mass.,

in 1630. His third son, Joshua, settled in Stamford, Conn., and afterward moved to Greenwich. John Mead 2d settled in Greenwich, Conn., in 1660. The Mead and Knap families, (afterward Knapp) were among the pioneers of the town of Greenwich and acquired title to lands direct from the Indians. The mother of the subject of this sketch was of English origin. Mr. Knapp married S. Anna Dickinson, December 5, 1883, and they have five children, Arthur, Bessie, Walter, Ralph, and Paul Knapp.

Knox, Samuel Lippincott Griswold (M.E., '91), was born in New York city in 1870. He was employed at the Camden Iron Works, Camden, N. J., 1891–94; successively as draughtsman; engineer in charge of the erection of a large gas-holder, Cleveland, O.; and in charge of the designing of hydraulic travelling cranes at the works in Camden. One of the cranes designed by him was exhibited in practical operation at the World's Fair, Chicago. While on this work he designed a three-cylinder hydraulic motor working under 1,500 pounds pressure per square inch. Several years later he designed another motor to work under 3,000 pounds pressure, which also gave entire satisfaction in practice. He was Senior Instructor in Mechanical Engineering at Lehigh University, 1894–96; with the Crocker-Wheeler Electric Co., 1896–98, first as chief draughtsman, and later as first assistant engineer and in charge of starting a cost system and other work of an executive nature; engaged in reorganization of shops of the Bethlehem Steel Co., 1898; mechanical engineer with the Stilwell-Bierce and Smith-Vail Co., having charge of the design of turbines, air-compressors, and general engineering work, 1899–1900; engineer in charge of the draughting department, and chairman of the committee on mechanical design, of the General Electric Co., at the Schenectady works, 1900–1902. At these works he had charge of the largest draughting department in the world, employing 250 draughtsmen. In 1902 he became manager and chief engineer of the Bucyrus Co., South Milwaukee, Wis., builders of dredges, steam shovels, wrecking-cranes, etc. He is a member of the American Society of Mechanical Engineers; the University, Country, and Town clubs, of Milwaukee; and of the Kappa Alpha fraternity; also an associate member of the American Institute of Electrical Engineers.

Mr. Knox is the son of Andrew and Annabella Grace (Douglas) Knox, both of Scotch descent. He married Edith Somerville Rulison, September 16, 1897, and they have two children, Nelson Rulison and Alexander Douglas Knox.

Koch, Frank Alexander (M.E., '97), was born in New York city September 7, 1874; son of Frank and Isabella Koch. He graduated from the New York public schools, took a course in bookkeeping and banking in Packard's Business College, and was an apprentice for two years in a machine-shop and electrical manufacturing business. He attended the Stevens Preparatory School two years before entering the Institute. He has been mechanical engineer for the Department of Parks, New York, from 1898 to date, his duties consisting in testing all cements, iron, and other material used in park work; inspection of sewer work and the laying of water-pipe for irrigation purposes; inspection and repairing of walks and roadway pavements under Park jurisdiction in the boroughs of Manhattan and Richmond; and field-survey work. He was employed for two seasons by the City of New York to organize life-saving stations in and around New York. He is commodore of the New York Volunteer Life-Saving Corps, and a member of the Waverley Boat Club and of the Municipal Engineers of the City of New York.

Koezly, Theodore F. (M.E., '75), was employed by Prof. R. H. Thurston to keep the record-books and accounts of the Mechanical Laboratory, Stevens Institute, 1875–78; and was with the steam-heating firm of Gillis & Geoghegan, New York, 1878–85. Under his superintendence the heating and ventilating plants of some of the largest buildings in New York at that time were erected. In 1885 he became seriously ill and was incapacitated for work. When his health was partly restored he entered upon a short engagement on the new Croton Aqueduct, New York, and then went abroad. Upon his return he was employed in the Department of Tests of the Stevens Institute,

until November, 1889, when he took a position in the steam-heating department of the Supervising Architect's Bureau, Washington, D. C. While thus engaged he contracted pneumonia, from which he died May 20, 1890.

Kollstede, A. G. (M.E., '94), has been manager of the Champion Extractor Co., New York; general manager, secretary, and treasurer of the Long Island Agricultural Chemical Co., Long Island City, N. Y.; and has lately been located in New York.

Kollstede, George (M.E., '96), entered the employ of the Long Island Agricultural Chemical Co., Long Island City, N. Y., as chemist. During the war with Spain Mr. Kollstede was a gunner's mate on the U.S.S. "Yankee" and was engaged in the bombardment of Santiago. In 1898 he returned to the Institute for a special course in chemistry under Dr. Stillman, and then resumed his professional duties with the Long Island Agricultural Chemical Co. In 1900 he was advanced to the position of superintendent of the company, which position he held until 1903. He then located at Providence, R. I.

Kopp, Henry (M.E., '93), has been employed by the American Sugar Refining Co., Brooklyn, N. Y., since graduation.

Kornemann, Henry A., Jr. (M.E., '99), was in the employ of the American Motor Co., New York, 1899; with the New York Air Compressor Co., Arlington, N. J., 1899–1900, and the Franklin Air Compressor Co., Franklin, Pa., 1900–01; and has been in the patent department of the Singer Manufacturing Co., Elizabeth, N. J., from 1901 to date.

Kreischer, John B. (M.E., '96), was connected with B. Kreischer & Sons, manufacturers of fire-brick, front-brick, and terra-cotta, Kreischerville, Staten Island, N. Y., 1896–1901. He then studied law at the New York Law School and was graduated in 1903, since which time he has practised law in New York.

Kuper, George H. (M.E., '00), was inspector with the National Conduit & Cable Co., New York, 1901. During the months of November and December, 1901, he filled the temporary vacancy caused by the illness of Mr. C. O. Gunther, Instructor in Mathematics at Stevens Institute. He has been draughtsman with the Geo. A. Fuller Co., New York, from 1902 to date. He is a member of the Tau Beta Pi fraternity.

Kursheedt, Roland Simeon (M.E., '80), was born in New York city February 24, 1860; son of Asher and Abigail (Judah) Kursheedt. He was employed in the Morgan Iron Works, New York, 1880–81; and has been connected with the Kursheedt Manufacturing Co., New York, in managerial positions, from 1881 to date.

Ladd, James Beach (M.E., '81), was born in Throgg's Neck, N. Y., June 27, 1860. He



J. B. Ladd

was in the employ of the Southwark Foundry & Machine Co., Philadelphia, 1881–86; for five years as draughtsman and designer, and one year as assistant engineer in charge of draughting-room and all engineering work. During this time he designed Porter-Allen engines, blowing-engines, heavy rolling-mill reversing-engines, pumps, etc., all of which were built at the company's shops, and also a great variety of rolling-mill, furnace, and steel works. He also attended to a considerable portion of the outside engineer-

ing, estimating, etc. From 1887 to 1891 he was with the Pennsylvania Steel Co., being chief engineer of the Maryland extension of their works, which are now owned by the Maryland Steel Co. Two years and a half of this period was spent in designing at Steelton, Pa., and the remainder at Sparrow's Point, Md., in charge of construction. During this time he designed and erected four complete blast-furnaces, of 300 tons daily capacity each, together with blowing-engines, buildings, and all accessories. He also designed and erected a machine shop, foundry, etc., and erected a Bessemer-steel plant and rail-mill. From 1891 to 1898 he was engaged with the Robert Poole & Son Co., Baltimore, as chief engineer, designing special machinery, developing shop methods, etc., but in the latter year he was forced by ill health to take a much-needed rest. In 1900 he again entered the field of engineering in his present capacity as consulting engineer at Philadelphia, Pa. He is a member of the American Society of Mechanical Engineers, and of the Delta Tau Delta fraternity.

Mr. Ladd is the son of William W. and Sarah H. Ladd. He married Rebecca Serrill, October 29, 1889, and they have one child, Frances Serrill Ladd.

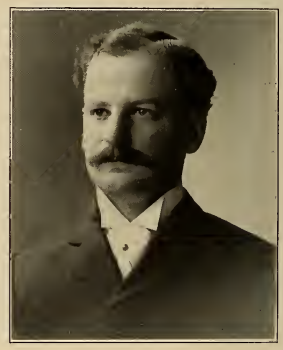


F. A. La Pointe

La Pointe, Frank Augustine (M.E., '86), was born in Oswego, N. Y., April 9, 1864. He received the free scholarship from Hoboken (N. J.) high school, of which later he was vice-principal. He was superintendent of the trades school at Elmira, N. Y.; machinist at the Delaware, Lackawanna, & Western Railroad shops, Kingsland, N. J.; assistant postmaster at Hoboken, N. J.; storekeeper and assistant superintendent at the Hudson County Electric Light Plant at Snake Hill, N. J. Until recently he was a member of a firm of electrical engineering contractors, Hoboken, N. J., but is now doing business under his own name. He is a member of the National Association of Stationary Engineers.

Mr. La Pointe is the son of Charles and Mary (McCarthy) La Pointe. He married Sarah E. Bélanger, September 10, 1890, and they have two children, Justine Bélanger and Frank Bélanger La Pointe.

Law, Frank Everard (M.E., '92), was born in Brooklyn, N. Y., October 25, 1869; son



F. E. Law

of J. Adams and Mary J. (Burroughs) Law. He attended the public schools in Brooklyn, N. Y., and East Orange, N. J., and Stevens Preparatory School, Hoboken, N. J. He was in the machine-shops of W. D. Forbes & Co., Hoboken, N. J., 1892; and has been with the Fidelity & Casualty Co., New York, from 1893 to date, occupying successively the following positions: assist-

ant superintendent of inspection department; assistant in liability and steam-boiler department; acting superintendent of liability department; assistant superintendent of steam-boiler and elevator department; actuary of liability lines, and second assistant secretary of the company, which latter position he now holds. During his connection with this company he has contributed largely to the development of the actuarial side of liability insurance, thus putting it on a scientific basis, and has originated fly-wheel insurance.

Lawrence, Frank Vinton (M.E., '95), was born in London, England, in 1874. He



F. V. Lawrence

was in the employ of the Pope Manufacturing Co., makers of Columbia bicycles, Hartford, Conn., 1895–98, as designer of special machinery, rising to next in rank to the chief draughtsman; designer and draughtsman at the Henry R. Worthington Hydraulic Works, Brooklyn, N. Y., 1898–99; and chief draughtsman and assistant engineer with the Ransome Concrete Co., New York, 1899–1901, during which time the Mineola (L. I.) court house was designed and built under the Ransome system of reinforced concrete construction, in which all the foundations, walls, floors, roof, and dome are a combination of concrete and square steel bars twisted, the steel bars being introduced wherever the concrete is subjected to tensional stresses. He was engineer with the Ransome Construction Co., Philadelphia, 1901–02; and is now engineer with the Ransome Companies, New York, designing and supervising the construction of reinforced concrete structures, a specialty being made of factory buildings. Notable among these is that for the United Shoe Machinery Co. at Beverly, Mass. He is a member of the Chi Psi fraternity.

Mr. Lawrence is the son of R. B. and Susan (Freeman) Lawrence, and his ancestry dates back to the early English settlement of this country. He married Margaret Ransome, October 25, 1902.

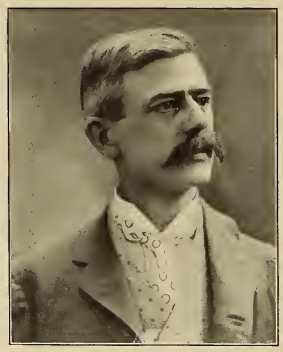
Lawrence, Wilder F. (M.E., '90), was with the Natural Gas Fuel Co., Philadelphia, Pa., 1890–91; engineer with the Derby Gas Co., Derby, Conn., 1891–98; superintendent of the Trenton Gas Co., Trenton, N. J., 1898–99, during which period he entirely remodelled the works; engineer with the New York & Queens Gas & Electric Co., Flushing, N. Y., 1899–1901; and has been superintendent of the Ravenswood works of the New Amsterdam Gas Co., Ravenswood, Long Island, N. Y., from 1902 to date. He is a member of the American Gas Light Association, and of the New England Association of Gas Engineers.

Lawton, Henry Douglas (M.E., '94), was born in Havana, Cuba, August 17, 1872; son of Benjamin Evans and Sarah Douglas (Green) Lawton (both Americans). He was in the employ of Uehling, Steinbart, & Co., manufacturers of pyrometers, 1894–95, and with Ludlow & Valentine, architects, New York, 1895–99. He became a student in architecture under Mr. John G. Howard, preparatory to a trial for entrance to the "École des Beaux Arts" in Paris 1899. He went to Paris with the intention of remaining for three years, but was obliged to give up his plans. Returning to New York, he was in the employ of Lawton, Flint, & Co., stock-brokers, New York, in 1900; and has been with F. S. Mosely & Co., note-brokers, New York, Boston, and Chicago, from 1901 to date. He is now engaged with the New York house. He is a member of the City Club, of Squadron A

of the National Guard of the State of New York, and of the Delta Tau Delta fraternity.

Layat, Felix (M.E., '01), was Instructor during the Supplementary Term at Stevens Institute, 1901; engaged at the Deane Linseed Oil Works, Port Richmond, N. Y., 1901; with the American Sugar Refining Co., Jersey City, 1901–04; and since November, 1904, has been in the draughting room of the Campbell Printing Press Manufacturing Co., Taunton, Mass. He is a member of the Beta Theta Pi and Tau Beta Pi fraternities.

Leavitt, Frank McDowell (M.E., '75), was born in Athens, O., March 3, 1856. He was



F. M. Leavitt

engaged in designing steam steering-gear with Mr. F. E. Sickles, 1876; as head draughtsman with Bliss & Williams, 1877–81; master mechanic for the Texas Mexican Railroad, 1881–82, and as manager of the Graydon & Denton Manufacturing Co., 1882–84. In the latter year he became assistant superintendent with the E. W. Bliss Co., Brooklyn, N. Y., taking the management of the works as chief engineer about 1888, and holding that office until 1901. In 1890, on behalf of the E. W. Bliss Co., he undertook the introduction of the Whitehead torpedo into the United States navy, and also installed the plant of the United States Projectile Co. for the manufacture of forged-steel shell and shrapnel. In 1900 he perfected an improvement in the Whitehead torpedo, in which, by means of a superheater, the air is heated before passing to the engine, increasing the efficiency about 40 per cent, and adding to the speed of the torpedo about five knots per hour.

In 1901 he opened an office in New York for general engineering practice. He has taken out many patents for sheet-metal working and other machinery, and received the honorary degree of Mechanical Engineer from Stevens Institute in 1899. He presented a paper on "Tests Made to Determine the Power Consumed in Propelling a Whitehead Torpedo at Various Speeds," before the Society of Naval Architects and Marine Engineers, November 14, 1901. He is a member of the American Society of Mechanical Engineers; the American Society of Civil Engineers; the Society of Naval Architects and Marine Engineers; the American Association for the Advancement of Science; and of the Engineers' Club. He was formerly a member of the Crescent Athletic Club of Brooklyn, N. Y.

Mr. Leavitt is the son of Rev. John McDowell Leavitt, D.D., LL.D., and Bithia Brooks Leavitt. His first American ancestor, John Leavitt, born in England in 1608, came to America in 1628, was a member of the Colonial Legislature, and died at Hingham, Mass., in 1691. His grandfather, H. H. Leavitt, LL.D., sixth in descent from John Leavitt, was for nearly forty years judge of the United States district court in Ohio. The subject of this sketch married Gertrude Mitchell Goodsell, November 8, 1893.

Leber, Robert (M.E., '96), is with Leber & Meyer, New York.

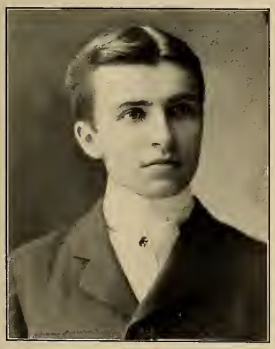
Lederle, Frank (M.E., '81), was located in Atlanta, Ga., in 1882, as consulting engineer, making a specialty of steam and electric plants; was resident engineer for the Southern department of the General Electric Co., 1889–93; and has been practising as consulting engineer at Atlanta, Ga., from 1893 to date.

Lembeck, Otto A. (M.E., '02), was born in Jersey City, N. J., and is connected with

the Lembeck & Betz Eagle Brewing Co., Jersey City, N. J.

Lenone, Jose M. (M.E., '02), is with the firm of M. W. Kellogg & Co., New York.

Lenssen, Gustave Arthur, Jr. (M.E., '95), was born in Elizabeth, N. J., December 23, 1874; son of Gustave Arthur and Emily Bulow (Wilson) Lenssen. On his mother's side he comes from an old New York family, being a descendant of the original Peter Goelet. His father, a silk-importer, came to the United States from Rheydt, Rhenish Prussia, in 1870. Young Lenssen's early education was received at home, at Wilson & Kellogg's School, New York, and at the Stevens High School. He was mechanical engineer with the Ansonia Brass & Copper Co., Ansonia, Conn., 1895–98; being employed upon designs and the construction of wire-drawing machines. He introduced an improved system for automatically oiling the bearings of the machines in the cable-screw-wire department. The company patented a wire disk of his invention, which is specially adapted for continuous wire-drawing machines. He was in the inspection department of the Edison Electric Illuminating Co., 1898–1901; and is now of the firm of Lenssen & Thompson,



G. A. Lenssen, Jr.

insurance brokers, New York. He is a junior member of the American Society of Mechanical Engineers; a member of the Buffalo Club, Buffalo, N. Y., and of Company K of the Seventh Regiment, National Guard of the State of New York.

Lent, Leon Brewster (M.E., '97), was born in Brewster, N. Y., July 22, 1876; son



L. B. Lent

of Leander B. and Rosetta (Brewster) Lent. He was with the Coulter & McKenzie Machine Co., Bridgeport, Conn., 1897–98; with the Deane Steam Pump Co., Holyoke, Mass., 1898; spent most of 1899 (on account of ill health) in the woods; was in the Middle States Inspection Bureau, New York, 1900; engaged in mine-surveying and construction work, 1901; and has been associate editor of *Power* from 1902 to date. He has written several articles for *Power*, among them being: "Producer Gas and Gas Producers"; "The Use of Blast Furnace Gas and Coke Oven Gas in Gas Engines"; "A Method of Calculating Crank Effort Curves"; and "The Diesel Engine," reprinted in *Engineering* (London), *The Mechanical World* (London), and other papers.

Leonhard, Theodore S. (M.E., '93), was draughtsman at the Raub Locomotive Works, Mayville, N. Y., 1893–94; with Mitchell & Co., New York, candle manufacturers, 1894; the W. & A. Fletcher Co., Hoboken, N. J., 1894–95; the National Sugar Refining Co.,

Yonkers, N. Y., 1895–1900; the Hohmann & Maurer Co., manufacturers of high-grade thermometers for engineering purposes, 1900–01; the W. & A. Fletcher Co., Hoboken, N. J., 1901–02; and with the Munoz Boiler Co., New York, from 1902 to date. He is a junior member of the American Society of mechanical engineers.

Le Page, Clifford B. (M.E., '02), Instructor in Physics at Stevens Institute of Technology. For biography, see page 281.

Leverich, Jerome W. (M.E., '02), is with the Scranton Bolt & Nut Co., Scranton, Pa. He is a member of the Tau Beta Pi fraternity.

Levie, George Henry (M.E., '02), was born in Paterson, N. J., June 3, 1880; son of



G. H. Levie

James and Kittie E. Levie. He entered the employ of the Providence Engineering Works in April, 1902, and served for a short time in the draughting-room and then in the sales department. In July he was taken ill, and he died August 14, 1902. He was a member of the Sigma Nu and Tau Beta Pi fraternities.

Lewis, Arthur Schultz (M.E., '01), was born in Brooklyn, N. Y., December 27, 1880; son of Osborn H. and Emma (Schultz) Lewis. He entered Sibley College, Cornell University, in the fall of 1901, as a candidate for the degree of Master Mechanical Engineer in the post-graduate course in Marine Engineering and Naval Architecture, but, being stricken with typhoid fever, withdrew from the University. He is at present employed in the Department of Construction & Repair of the Brooklyn Navy Yard, Brooklyn, N. Y. He is a member of Phi Sigma Kappa and Theta Nu Epsilon fraternities.

Lewis, Edward Dayton (M.E., '93), was born in Brooklyn, N. Y., September 6, 1871; son of Theodore Frelinghuysen and Elizabeth Clement Lewis. His ancestors, from both sides, came to America from England and Wales about 1672. He was draughtsman and computer in the Department of Tests at the Stevens Institute, 1893–95; draughtsman with the American Reduction Co., Brooklyn, N. Y., 1895; was again employed in the Department of Tests, Stevens Institute, 1895–96; was associated with Mr. Charles J. Everett, M.E., New York, as computer on structural steel work, 1896; draughtsman with the Dutton Pneumatic Lock & Engineering Co., New York, 1896–97; in the Department of Tests, Stevens Institute, 1897–98; and from 1898 to date has



E. D. Lewis

been employed with the Continuous Rail Joint Company of America, Newark, N. J.,

draughtsman, 1898–99, and assistant engineer, in charge of the order department and the draughting room, ever since.

Lewis, Nathan E. (M.E., '01), has been with the Babcock & Wilcox Co., Bayonne, N. J., from 1901 to date.

Lidgerwood, James Graeme Onslow (M.E., '01), was born in Morristown, N. J., January, 1877; son of John Hedges and Harriet Bethia Vail (Cutler) Lidgerwood. He has been at the shops of the Lidgerwood Manufacturing Co., Brooklyn, N. Y., from 1901 to date. He is a member of the Beta Theta Pi and Tau Beta Pi fraternities.

Lidgerwood, John Hedges, Jr. (M.E., '99), was born in Morristown, N. J., September 6, 1875; son of John H. and Harriet B. Vail (Cutler) Lidgerwood. He took the post-graduate course at the School of Mines, Columbia University, 1899–1901, receiving the degree of Engineer of Mines. He has been in the shops of the Lidgerwood Manufacturing Co., manufacturers of hoisting-engines, etc., Brooklyn, N. Y., from 1901 to date. He is a member of the American Institute of Mining Engineers, of the Beta Theta Pi and Tau Beta Pi fraternities, and of the Alumni Association of the Stevens Institute of Technology, and of the School of Science of Columbia University.

Lieb, John William, Jr. (M.E., '80), was born in Newark, N. J., February 12, 1860. He was draughtsman with the Brush Electric Co., Cleveland, O., 1880–81; in the engineering department of the Edison Electric Light Co., New York, 1881–82; and was subsequently transferred to the testing department of the Edison Machine Works and engaged on experimental work for Mr. Thomas A. Edison. He was next placed in charge of the electrical installation of the historic Edison Pearl Street station, the pioneer central station for the general distribution of electric light and power through an underground system, and on the inauguration of regular service became the first electrician of the Edison Electric Illuminating Company of New York.

In 1883 Mr. Lieb was sent to Milan, Italy, by Mr. Edison, to represent his interests in the construction and operation of the Edison station in that city. On the organization of the Italian Edison Co. he became chief electrician, then chief engineer and manager of stations, in charge of the construction and operation of the central stations and isolated plants erected throughout Italy by that company. The accompanying illustration shows a part of the *façade* of the cathedral and the Galleria Vittorio Emanuele, in Milan. The view was taken at the time of the inauguration of the electric trolley line equipped under Mr. Lieb's direction in 1893, for the purpose of exhibiting to the Milan public a model trolley equipment, on the successful performance of which the Milan Edison Co. was awarded the franchise for the transformation to the trolley system of the entire horse car system of the city, with an equipment of 300 cars.



J. W. Lieb, Jr.

Mr. Lieb returned to the United States in 1893 to become assistant to the first vice-president of the Edison Electric Illuminating Company of New York, and was subsequently appointed assistant general manager and later general manager. On the consolidation of the various electric lighting and power interests in New York city under the auspices of the New York Edison Co., Mr. Lieb was appointed third vice-president and associate general manager. He is also president of the Electrical Testing Laboratories,

and a director in a number of electrical corporations. He was appointed by President Elihu Thomson (President of the Committee of Organization of the St. Louis International Electrical Congress), chairman of Section E., Electric Light and Distribution.



Electric Street Railway at Milan, Italy
J. W. Lieb, Jr.

His writings comprise the following:

"Underground Electric Light Wires," *Industries*, (London), March 30, 1888.

"The De Laval Steam Turbine" (discussion), presented at meeting of the American Society of Mechanical Engineers, December, 1895.

"An Historic Electric Central Station." Presidential address before the New York Electrical Society; abstract published in *Cassier's Magazine*, May, 1896.

"Methods of Charging for Electric Current," paper read before the Association of Edison Illuminating Companies at the Niagara Falls Convention, September, 1897.

Also discussions on various subjects, published in the *Transactions* of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the Association of Edison Illuminating Companies.

He is president of the American Institute of Electrical Engineers; a member of the American Society of Civil Engineers; the American Society of Mechanical Engineers; the Association of Edison Illuminating Companies (ex-president and member of executive committee); the Associazione Elettrotecnica Italiana; the Franklin Institute; the New York Electrical Society (ex-president); the Engineers' Club; and of the Delta Tau Delta fraternity. He was president of the Stevens Institute Alumni Association, 1897–98, and Alumni trustee of Stevens Institute of Technology, 1898–1901. In 1904 Mr. Lieb was honored by H. M. the King of Italy, with the decoration of Knight Commander of the Order of the Crown of Italy.

Mr. Lieb is the son of John William and Christina Lieb. He married Minnie F. Engler, July 29, 1886, and they have three children, Julia C., Minnie E., and Adolph W. Lieb.

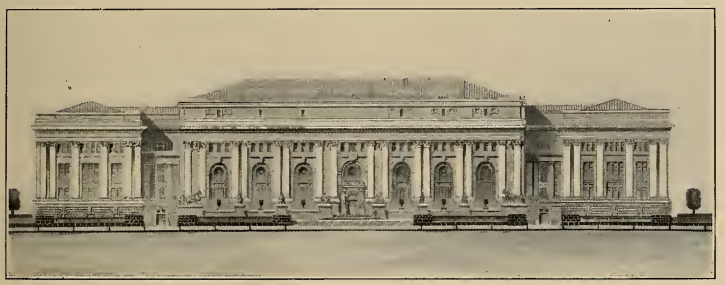
Lienau, J. Henry (M.E., '91), was with the Robert Deely & Co. Ironworks, 1891; draughtsman at the Greenpoint Refinery of the American Sugar-Refining Co., 1891–93; in the superintendent's department of the same company's Jersey City Refinery, 1893–1900; and from 1900 to date has been superintendent of the New York Refinery of the National Sugar-Refining Co. of New Jersey, Long Island City.

Lilly, Martin G. (M.E., '86), was draughtsman at the Pennsylvania Steel Works, Steelton, Pa., 1886–92; and assistant engineer in the construction of the great Belt Line Bridge across the Mississippi at Alton, Ill., in which capacity he was engaged until its completion in 1894. Beginning with the fall of 1894 and until the time of his death, which occurred March 2, 1895, he was a member of the W. H. von Mengemighausen Co., mechanical and constructing engineers, York, Pa.

Litchfield, Electus Darwin (M.E., '92), was born in New York city April 25, 1872; son of William Backus and Emily (Pope) Litchfield, both of whom are descendants of early American colonists who were nearly all English in origin and settlers in this country before 1650. His great-grandfather (Elisha Litchfield) was a member of Congress, 1813–15, and Speaker of the legislature of New York, 1844. His father and his grandfather (Electus B. Litchfield) were prominent railway builders, having built the Lake Shore & Michigan Southern, the first division of the St. Paul & Pacific (now the Great Northern) Railway, and several other railroads. His father founded and was the first president of the National City Bank of St. Paul, Minn., and at the time of his death was manager of the Brooklyn Improvement Co.

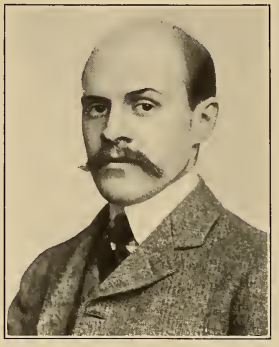
Electus D. attended the public schools at Staten Island and at Hartford, Conn., and was graduated in the scientific course from the Brooklyn Polytechnic Institute in 1889.

Immediately upon graduation from Stevens Institute he accepted an offer of a position as draughtsman and inspector with the Gould Coupler Co., Buffalo, N. Y., where he drew plans for steel and malleable-iron furnaces for the largest coupler-works in America. After leaving this position in 1893 he was superintendent in charge of the office and works of the Philadelphia Car-Wheel Works, Philadelphia, 1893; assistant superintendent of the paraffine department of the Atlantic Refining Co. (Standard Oil Co.), Philadelphia, 1894–97; in the employ of the well-known structural constructors, Post & McCord, Lewinson & Just, Marinus Vanderkloot, studying the steel construction of buildings, 1897–98; assistant to engineer and manager of the architectural firm of Carrère & Hastings, 1898–1900, having for some six months, owing to illness of the chief engineer, full charge of the engineering work; and associate engineer with Lord & Hewlett, 1900, and member of the firm, 1904. This firm came prominently before the public as winners of the architectural competition for the new building for the Department of Agriculture, Washington, and also as one of the Board of Architects of the Carnegie libraries in the boroughs of Brooklyn and Queens, New York. Among other works of this firm, complete, in process of construction, or about to be erected, are a number of buildings for the William Astor Estate; the Stillman Memorial Wing for the Brooklyn Home for Aged Men; private residences, and store, loft, and factory buildings; armory for the Second Battalion of Naval Militia, New York city; a Soldiers and Sailors' monument at Philadelphia; monument to President McKinley, etc. In 1901 Mr. Litchfield was employed by the Brooklyn Improvement Co. to report as to the best type of bridge to replace the antiquated structures spanning Gowanus Canal, Brooklyn. His findings were practically adopted by the Department of Bridges, of Brooklyn.



United States Department of Agriculture, Washington, D. C.
E. D. Litchfield

Mr. Litchfield is a member of the New York chapter of the American Institute of Architects; the architectural department of the Brooklyn Institute of Arts and Sciences;



E. D. Litchfield

City Club of New York; the Badminton Club; the Society of Colonial Wars; the Brooklyn League; the Church Club; and of the Improvement League of the Thirtieth Ward, Brooklyn.

Litchfield, Norman (M.E., '01), was born in Hartford, Conn., September 23, 1880; son of William Backus and Emily (Pope) Litchfield. (For note of ancestry see the biography of his brother, E. D. Litchfield.) Norman graduated with the Class of 1895 from the Preparatory School of the Polytechnic Institute of Brooklyn, where he spent two years in the civil engineering course. He was employed in the car-repair shops of the Brooklyn Rapid Transit Co. (repairing electrical apparatus on surface cars, and installing and repairing the Westinghouse and General Electric multiple unit train control system on elevated cars), 1901–02; in the electrical director's department of the Interborough Rapid Transit Co., operators of the New York Subway (engaged on the installation of the General Electric and Westinghouse train control on sample cars used for the exhibition of equipment in competition for the subway equipment contract, and on tests of General Electric No. 69 and Westinghouse No. 86 ring motors and train control, etc.), 1902–03; and assistant engineer of car equipment, 1904 to date. He is a member of the Tau Beta Pi fraternity.

Litchfield, Percy (M.E., '97), was born in New York city March 25, 1877; son of William Backus and Emily (Pope) Litchfield. (For note of ancestry see the biography of his brother, E. D. Litchfield.) He was draughtsman with Charles Henry Davis, consulting engineer, New York, 1897; assistant to engineer in charge of the construction of a new plant for the John Stephenson Co., Ltd., car-builders, Elizabeth, N. J., 1897–98 (the work consisting of grading the site, erecting eight factory buildings, a steel tank and clock tower, lumber-sheds, etc.; constructing about two miles of railroad spurs and sidings, two distinct water systems, and a sewer system over a mile in length; and installing heating and electric-power plants), and later superintendent in charge of the above work under the direction of the superintendent of construction of Mr. C. H. Davis's office; employed by Thompson & Adam, builders, as a superintendent of construction having charge of



Percy Litchfield

the foundations of a large residence at Princeton, N. J., 1899; in the experimental department of the Planters' Compress Co. of

Boston, 1899; with the Rapid Transit Subway Construction Co., New York, as first assistant to the resident engineer of the first division (having in charge the different subcontracts between the City Hall and Thirty-fourth Street, and the erection of two electrical sub-stations) 1900–03; and later as resident engineer (in charge of Section 3 of the Brooklyn extension), 1903 to date. He is a vestryman of St. Jude's Church, Blythebourne.

Littlejohn, Kenneth S. (M.E., '98), was in the engineering department of the Brooklyn Elevated Railroad, Brooklyn, N. Y., 1898–1902, and has been assistant to the civil engineer on "Lampasos" work of the Mexican Central Railroad, from 1902 to date.

Lockwood, Rutherford T. (M.E., '99), was with the Edison Electric Illuminating Co., of New York, 1899; has since been assistant to the superintendent of the electrical department of the Carnegie Steel Co., Ltd., Duquesne Steel Works and Blast Furnaces, Duquesne, Pa.; draughtsman at the Crescent Shipyard, Elizabeth, N. J., and is now engineer at the Bayonne Refinery of the Standard Oil Co., Bayonne, N. J.

Loewenherz, Herman (M.E., '92), was born in Hoboken, N. J., August 3, 1871; son of Joseph and Sophia Loewenherz. He received his early education at the Hoboken Academy. He was employed by the Missouri Electric Light & Power Co., and the Wagner Electric & Manufacturing Co., on designing and testing work, 1892, for the former company, redesigning all the old-style Westinghouse alternators of 250 horsepower; took an expert course in shop-work with the Westinghouse Electric & Manufacturing Co., Newark, N. J., 1893; was assistant engineer with the New York Telephone Co., 1893–96, during which time he was engaged upon designs for the Harlem, and Broad, Eighteenth, and Cortlandt streets telephone exchanges. The designs for the Harlem exchange called for the use of the so-called "common battery system" and included many new features.

He also designed a submarine cable crossing at 85th St. and East River, New York. He was engaged on the subway work of the Newark Telephone Co., Newark, N. J., in charge of workmen and of manhole construction, 1896; with Mr. Vanderkloot, New York, for whom he detailed the steel girders in a public-school building, and was also engaged upon the Taylor Building, East Nineteenth St., 1897; was detailer and designer with Lewinson & Just, civil engineers and contractors, New York, 1897–98; and from spring of the latter year to 1903 he was employed in the draughting departments of the following New York firms: Milliken Bros.; Jackson Architectural Iron Works; Cooper & Wigand; S. C. Weiskopf (in charge of shop details for steel work on the Simpson-Crawford Co. building, New York); Thompson-Starrett Construction Co.; Empire Bridge Co.; Tidewater Building Co.; and then in the engineering department of the J. B. & J. M. Cornell Iron Works, New York city.

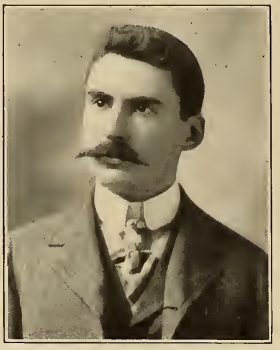


Herman Loewenherz

While in the employ of the New York Telephone Co. in 1895 Mr. Loewenherz contributed two articles to the *Electrical Engineer:* on "Inspection of Steel Rails for Electric Railways," and on "A Handy Cable-Testing Arrangement." He is an associate member of the American Institute of Electrical Engineers.

Loewy, George Julius (M.E., '97), was born in New York city February 19, 1874; son of Sigmund and Minna Loewy, both of

German parentage. He received his early instruction in the public schools of New York city, and in Canada, and at the College of the City of New York. He worked his way through the latter and the Stevens Institute, earning the necessary funds as a musician. He was employed in the Department of Tests at the Stevens Institute, 1897–98; was with the Uehling & Steinbart Co., Newark, N. J., 1898; draughtsman with R. Hoe & Co., printing-press manufacturers, New York, 1898–99; instructor in shop work for the Public School System, New York, 1899–1901. During the years 1901–03 he served as instructor in chemistry in the East Side Evening High School for Men, New York, and at the same time pursued a post-



G. J. Loewy

graduate course of study in chemistry at Columbia University.

Loizeaux, Alfred Samuel (M.E., '99), was born in Vinton, Iowa, February 12, 1877. He was Instructor during the supplementary Term at Stevens Institute, 1899; with Strong & Totten, electrical contractors, New York, 1899; draughtsman with the Compressed Gas Capsule Co., Bridgeport, Conn., 1899–1900; switchboard draughtsman with the General Electric Co., Schenectady, N. Y., 1900–01; and has been foreman of the switchboard draughting department of the same company (with a force of 75 men) from 1901 to date. The largest individual job that he has had to do in his latter posi-



A. S. Loizeaux

tion was in connection with the great power house and sub-station equipment recently installed by the Manhattan Elevated Railway Co., New York, in changing its power from steam to electricity. He has been a member of the General Electric Engineering Society since 1900, and secretary of the Society since 1903. He is also a member of the Tau Beta Pi fraternity.

Mr. Loizeaux is the son of T. O. and Anna M. (Roberts) Loizeaux. He married Edith May MacMurchy, May 3, 1903.

Longstreet, J. Holmes (M.E. '79), was born in Bordentown, N. J., March 19, 1856; son of Henry H. and Hannah Ann Longstreet, and of Dutch descent. Since graduation he has been president of the Waterworks and of the Gasworks at Bordentown, N. J.; proprietor of the Riverview Ironworks; and director of the Bordentown Banking Co. He has taken out several patents for printing telegraph instruments. He is a member of the Beta Theta Pi fraternity, and of the Benevolent and Protective Order of Elks. He was formerly a member of the Holland Society of New York.

Lopez, David H. (M.E., '88), was superintendent of the Little Belle Iron Co.,

Bessemer, Ala., erecting blast furnaces, coal-bins, coke-ovens, etc., 1888–90; and assistant superintendent of the Coosaw Mining Co., engaged in mining phosphate rock, from 1890 to date. He has been assistant superintendent of the Sea Island Chemical Co., and Oak Point Mines Co., Beaufort, S. C., for the last few years, and is a member of the American Society of Mechanical Engineers.



J. H. Longstreet

Lord, Alfred Bowen (M.E., '93), was born in New Jersey, September 24, 1871; son of William A. and Alice (Bowen) Lord. He was chemist and manager in the solder and Babbitt metal department of the Atlantic White Lead Works, Brooklyn, N. Y., from 1894 until his death, which occurred February 17, 1897. He was a member of the Lincoln Club, Brooklyn, and of the Alpha Tau Omega fraternity.

Lord, Edmund P. (M.E., '82), has been assistant superintendent of motive power of the Pennsylvania Co. (Northwest System); superintendent of motive power of the Cleveland, Cincinnati, Chicago, & St. Louis Railroad; and is now general manager for the H. K. Porter Co., Pittsburg, Pa. He is the author of a paper on "Mechanical Haulage by Compressed Air," read before the Ohio Institute of Mining Engineers, and also of a paper presented to the Anthracite Coal Operators' Association in New York.

Lorsch, Edwin S. (M.E., '91), was born in New York city November 19, 1869; son of Sigmund and Jenny (Schimmel) Lorsch, both born in Germany. He was employed by the George F. Blake Manufacturing Co., Cambridgeport, Mass., manufacturers of pumping-machinery, 1891–93, his work being that of testing and inspecting machinery before shipment, and also "efficiency tests" of several waterworks; in the engineering and erection department of the Electrical & Mechanical Engineering Co., New York, 1894–95; and with Sussfeld, Lorsch, & Co., commission merchants, New York, 1895–1901. From the latter year to date he has been a member of the last-mentioned firm, in charge of the export department, making a specialty of introducing American machinery into European countries. He is a member of the Harmonie Club, and of the American Society of Mechanical Engineers.



A. B. Lord

Loud, Henry Sherman (M.E., '90), was born in Brooklyn, N. Y., August 31, 1868. He was president of the Class of 1887, captain of the football team, and editor-in-chief of the "Polywog," while at the Brooklyn Polytechnic Institute; and while at Stevens he was active in college affairs, being "neutral" editor of the "Eccentric," guard on the 'Varsity football team, and manager of the 'Varsity baseball team.

He was with the Illinois Steel Co., South

Chicago, Ill., 1890–96, being successively night superintendent of the rail-mill, night superintendent of the South Works, and superintendent of the open-hearth and plate department. In 1896 he went to Russia to build and manage the works of the Nicopol-Mariopol Mining & Metallurgical Co., plans for which were prepared by Julian Kennedy. During the four years he spent in Russia, he built and put in successful operation a plant employing 4,000 men and consisting of two blast-furnaces, 100 Coppée coke-ovens, five 30-ton O. H. furnaces, two plate-mills (one 132-inch and one 72-inch), a lap-weld pipe-mill, machine-shop, foundry, electric and pumping stations, etc. The works were



H. S. Loud

built on the steppe, and a village for 15,000 people was put up by the company. In 1900 he became manager of the Trafford Park works of the British Westinghouse Electric & Manufacturing Co., Ltd., Manchester, England, which employ nearly 5,000 men in the manufacture of all classes of electrical apparatus, steam and gas engines and steam turbines.

He is a member of the American Society of Mechanical Engineers, the Institution of Mechanical Engineers, the Institution of Electrical Engineers, the Chicago Club, the University Club of New York, the Conservative Club of Manchester, and the Beta Theta Pi fraternity.

Mr. Loud is the son of Henry W. and Louisa Sherman Loud. His paternal ancestors were Maine people. On his mother's side he is descended from Roger Sherman one of the signers of the Declaration of Independence. He married Eva Margaret Humphreys, August 3, 1898, and they have three children, Henry Sherman, Jr., Marguerite Erskine Westinghouse, and Alexander Crombie Humphreys Loud.

Lozano, Carlos Augusto (M.E., '87), was born in Lisbon, Portugal, April 7, 1851; son of Manuel José and Carlotta Luisello Lozano. He received a business education in Lisbon, and prior to entering Stevens Institute in 1883 he had commercial and consular experience in Portugal, Brazil, and New York. He was engaged in various capacities (as draughtsman, machinist, foreman erector, refrigerating expert, and engineering salesman) with the following firms: the Welsbach Incandescent Gas Light Co., New York, 1887–88; Bergman & Co., New York, 1888; the De La Vergne Refrigerating Machine Co., New York, 1888–94; the Fulton Engineering & Shipbuilding Works, San Francisco, Cal., 1895–96; the Fred. W. Wolf Co., Chicago, Ill., 1896–97; and was a consulting engineer in New York from 1897 to 1898. He was with the Babcock & Wilcox companies of New York and London, 1899–1900. He has not been engaged in engineering since 1900.

Lozier, Arthur de la Montagnie (M.E., '94), was born in Orange, N. J., August 2, 1874; son of Abraham W. and Jennie de la M. Lozier, and grandson of Clemence Sophia Lozier, M.D. His mother's ancestry is French Huguenot. Shortly after graduation he entered the employ of Warren & Lozier, and later that of Church, Kerr, & Co. He next became assistant manager of the Bullock Electric Co., which position he occupied at the time of his death, August 26, 1897.

Mr. Lozier took out a patent in 1896 for an automatic electrical deep-sea sounding-machine for ascertaining the depth of water without measuring the length of the sounding-line or hauling up the lead, the depth being indicated on a dial placed on the bridge. He contributed to *Power* a series of

articles headed "Dynamos and Motors: First Aid to the Injured,"—which appeared



A. de la M. Lozier

for six consecutive months commencing August, 1895. Mr. Lozier was an active member of the Naval Militia of the State of New York and a petty officer of the Signal Corps of that body.

Ludlow, William Orr (M.E., '92), was born in New York city May 24, 1870. He was draughtsman, and, later, superintendent of construction with Carrère & Hastings, architects, New York, 1892–95, in the latter capacity having charge of the erection of a number of buildings, among which was the City Hall of Paterson, N. J. At the termination of the last named work he was appointed, by the city, architect in charge of the furnishing and equipment of the building. He has been associated with Charles A. Valentine, under the firm name of Ludlow & Valentine, architects, New York, from 1895 to date. The work of this firm has been the designing and superintending of the erection of many important buildings, including a 12-story, skeleton construction, $500,000 apartment-hotel building on 44th and 45th streets, sales stables for the Standard Coach Horse Co., and business buildings on Clinton Place and 9th St., and an operating pavilion in connection with Bellevue Hospital, New York; a bank building for the East Orange National Bank, East Orange, N. J.; a mill for the Sterling-Worth Railway Supply Co., Easton, Pa.; mills for the American Pegamoid Co., at Undercliff, N. J.; a pumping-station at Santiago, Cuba, for the United States government; church buildings at Paterson, N. J., New York city, and in the State of Washington; the erection of a large number of suburban residences; and the extending and alteration of many other buildings.

He was a junior member of the American Society of Mechanical Engineers from 1892 to 1898. He is an associate member of the American Institute of Architects; and a member of the Architectural League of New York; of Hope Lodge, Free and Accepted Masons; the Republican Club, of East Orange, N. J.; and of the Delta Tau Delta fraternity.

Mr. Ludlow is the son of James M. and Emma (Orr) Ludlow. On his mother's side he is a descendant of the brother of Abram Pierson, first president of Yale College, and on his father's side is a direct descendant from Edward Doty, one of the Pilgrim



W. O. Ludlow

Fathers who came over in the "Mayflower." He married Abbie G. Hartwell, June 10, 1902.

Lukens, Lewis N. (M.E., '85), was born in McKeesport, Pa., July 11, 1864. He was assistant superintendent for the Alan Wood

Co., Conshohocken, Pa., manufacturers of sheet iron, 1885–88; a dealer in wrought-iron pipe, New York, and agent for the Conshohocken Tube Co., 1888–97; and has been vice-president of the Longmead Iron Co., manufacturers of wrought-iron pipe and skelp iron, Conshohocken, Pa., with offices in Philadelphia, from 1897 to date. He is a member of the University and Art clubs, Philadelphia.

Mr. Lukens is the son of Alan Wood and Elizabeth (Nevius) Lukens, and of Dutch descent, ancestors of both families coming to America in the 17th century. He married Edith Clark, December 3, 1890, and they have four children, Alan Wood, Edward Clark, Lewis Nelson, and Elizabeth Nelson Lukens.



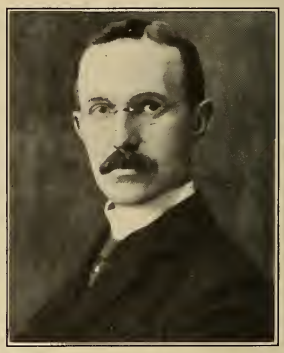
R. O. Luqueer

Lunger, Waldo G. (M.E., '98), before graduation, volunteered in the war with Spain and was detailed on the U. S. S. "Badger." At the close of the war he entered the repair shops of the North Jersey Street Railway Co., Jersey City, N. J.; and has since been with the Rockwell Engineering Co., New York. His thesis, written jointly with Messrs. J. D. Hackstaff and Warren H. Miller, on "Efficiency of the Twin-Screw Steam-Yacht 'Sovereign,'" was published in the *Stevens Institute Indicator* April, 1899. He is a junior member of the American Society of Mechanical Engineers.

Luqueer, Robert Orr (M.E., '99), was born in New York city December 5, 1878. He has been with Humphreys & Glasgow, since graduation, in the capacity of assistant engineer, having spent about one year in England working on the erection and operation of carburetted water-gas plants, and since that time has been engaged in the regular examination work of the New York firm. He is a member of the American Gas Light Association, and the Delta Tau Delta and Tau Beta Pi fraternities.

Mr. Luqueer is the son of Robert S. and Mary Orr Luqueer. He married Florence Dudley Guillaudeu, October 22, 1903.

Lyall, William Lord (M.E., '84), was born in New York city June 24, 1863. After graduation he became connected with the firm of J. & W. Lyall, loom and machine works, New York. In 1890 he was made superintendent, also acting as mechanical engineer for the Brighton Mills owned by



W. L. Lyall

the above firm. In 1900 he was placed in general charge of the design and erection of the new plant of the Brighton Mills at Passaic, N. J., and in 1901 was made treasurer, assuming the general management of the company. He is a member of the American Society of Mechanical Engineers; the New England Cotton Manufacturers' Association; the Engineers' and Yountakah Country

clubs; the St. Andrew's Society; and of the Delta Tau Delta fraternity.

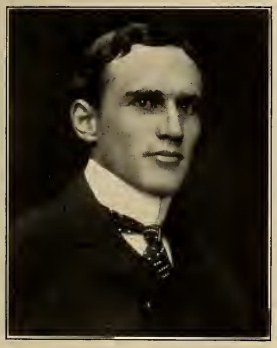
Mr. Lyall is the son of William and Kitty



BRIGHTON MILLS
W. L. Lyall

(Earl) Lyall. He married Cecelia C. Lambert, December 3, 1902.

Lydecker, Leigh K. (M.E., '02), after graduation, studied law at New York University, from which he received the degree of Bachelor of Laws in 1904. He is now practising law in New York city.



A. B. MACBETH

Macbeth, Alexander Barksdale (M.E., '97), was born in Batesville, S. C., September 5, 1873; son of Alexander and Eliza T. Macbeth, and grandson of George A. Trenholm, Secretary of the Treasury of the Confederate States of America. He was with the B. F. Sturtevant Co., New York, 1897–98; and has been in the employ of the United Gas Improvement Co., Philadelphia, from 1898 to date; being detailed to the Philadelphia Gas Works, 1898–99; to Atlanta, Ga., with the Atlanta Gas Light Co., 1899–1900; assistant superintendent of the Kansas City (Mo.) Gas Co., 1900–03, and engineer of the same company from 1904 to date. He is a member of the Western Gas Association, and of the Beta Theta Pi fraternity.

McBurney, E. L. (M.E., '89), is associated with his brother in the practice of law, with special reference to patent and insurance work, under the firm name of McBurney & McBurney, New York. He has taken out a number of patents concerning the hardware and boot-and-shoe trades.

MacCord, Charles William, Jr. (M.E., '94), was born in Hoboken, N. J., May 14, 1873; son of Charles William and Evelyn Holden MacCord. He was draughtsman at the Schenectady Locomotive Works, 1894, his work including the determination, by computation from drawings, of the location of the centres of gravity of locomotives. His computed weights were checked by actual weighing, and found to be practically correct. He was associate editor of *Power*, 1895–97. In this capacity he wrote numerous leading articles, as follows:

"Riveted Joints" (reprinted by the *Mechanical World*, England).

"Valve Gears" (serial), 1896. This series of papers, revised and with new drawings, and with the addition of an analysis of shaft governors, was subsequently published in book form with the title of "Slide Valves," by John Wiley & Sons, New York.

"Flow of Steam in Pipes."

"Heating Surfaces of Boilers."

"Power Dictionary" (serial).

"Electrical Catechism" (serial).

"Valve-Setting on Steam Pumps" (serial).

He was with McIntosh, Seymour, & Co., engine builders, Auburn, N. Y., from 1897



C. W. MacCord, Jr.

until his death, which followed an operation for appendicitis, June 5, 1898. He was a member of the Alpha Tau Omega fraternity.

McCoy, Joseph S. (M.E., '85), was with the Baltimore & Ohio Railroad, Baltimore, Md., 1885–86; at the Riverside Iron Works, Wheeling, W. Va., 1886–87; and has been government actuary under control of the Treasury Department, from 1887 to date. In 1893 the Georgetown University conferred upon him the degree of Bachelor of Laws, and in 1894 that of Master of Laws. In 1895 he was admitted to the bar of the District of Columbia. In 1898 he was made statistical expert and disbursing officer to the High Joint Commission appointed by President McKinley to adjust all grievances between Canada and the United States. This Commission met in Quebec in 1898 and in Washington in 1899. In 1898 he was also detailed as aid to the special commissioner plenipotentiary under the tariff law of 1897. In this capacity he assisted in the negotiation of a series of reciprocity treaties with a number of foreign governments, including Great Britain, Germany, France, Italy, Portugal, Denmark, Brazil, etc., and in advancing the interests of American exporters in all parts of the world. In 1902 he appeared a number of times before the Foreign Relations Committee of the United States Senate as a tariff expert, and in 1903 was sent by the Department of State to China on matters of business relating to the Chinese indemnity, returning in 1904.

McCulloch, John A. (M.E., '86), was placed in charge of the mechanical interests of the Pittston Engine & Machine Co., Pittston, Pa., at a time when the president of the company had resigned, the general manager was unable to attend to his duties, and the superintendent and foreman had left their posts. Mr. McCulloch secured enough work to keep the business going and placed it upon a better basis, enabling the directors to arrange more favorable terms when the company was merged into the Vulcan Iron Works of Wilkesbarre, Pa., 1886–87. He was test expert with the Welsbach Incandescent Gas Light Co., 1887–88, and was engaged on special test and research work for the company at Gloucester, N. J., 1888–89, and he took charge of the shop for lamp repair work and for constructing models of new devices, 1889–90. He was in the estimating-office of the Midvale Steel Co., Philadelphia, 1890–92; with Henry Aiken, M.E., Pittsburg, Pa., 1892–93; with Julian Kennedy, M.E., Pittsburg, 1893; draughtsman in the United States Engineer Office, Pittsburg, under Major R. L. Hoxie, U.S.A., 1894–95; in charge of the Hydraulic Machine Co., Pittsburg, 1895–96; chief draughtsman and, later, assistant engineer in the United States Engineer Office, engaged in designing machinery and masonry, and construction for river improvements on the Allegheny and Monongahela rivers, first under Major Hoxie and subsequently under Major Charles F. Powell, U.S.A., 1896–1900; and has been in the jobbing-shop of the national depart-

ment of the National Tube Co.'s works, McKeesport, Pa., from 1900 to date.

McCullough, Charles Herbert, Jr. (M.E., '91), was born in Philadelphia, Pa., Decem-



C. H. McCullough, Jr.

ber 25, 1868. He occupied various positions with the Illinois Steel Co., Chicago, becoming 2d vice-president, 1891–1904. He is now assistant to the president of the Lackawanna Steel Co., New York. He is a member of the Chicago Club, and of the Chi Phi fraternity.

Mr. McCullough is the son of Charles H. and Elizabeth G. (Platt) McCullough. He married Jessie Martin, November 3, 1897, and they have two children, Eleanor Elizabeth and Jessica McCullough.

Macdonald, James V. (M.E., '93), was assistant engineer with the Safety Car Heating & Lighting Co., of New York; has spent some time in foreign travel; and is now engaged in contract work in New York. He is a junior member of the American Society of Mechanical Engineers.

McElroy, Joseph Aloysius (M.E., '87), was born in Bridgeport, Conn., March 20, 1859. He left school when twelve years old, and worked in a factory for four years. Then, after ten months more of school, he served a three-years apprenticeship as a machinist. He next worked as journeyman for Brown & Sharpe Manufacturing Co., the Boston Machine Co., the Waltham Watch Co., and the Ashcroft Steam Gauge Co., all the time preparing to enter Stevens Institute.

He was assistant superintendent of work at Omaha, Neb., for the United Gas Improvement Co., of Philadelphia, 1887–88; and was employed on the Central Tressa Sugar Estate, Cuba, 1888–89; and by the Field Engineering Co., 1889–96. As one of the engineers of this company, he prepared many of the plans, etc., of the Buffalo, Worcester, and other railway systems built by that concern. In 1894 he designed and built the power station for the Bridgeport Traction Co., Bridgeport, Conn., and was the company's engineer during the equipment of the system. In 1895 he designed and built the power station for the Brunswick Traction Co., New Brunswick, N. J., and was engineer of construction until January, 1896, at which time he became associated with Mr. J. F. Macartney, E.E., under the firm name of Macartney, McElroy, & Co., for the construction of electric roads. This firm was successful in securing a number of contracts in this country and in Canada, chief among which were those for roads at New Brunswick and Bound Brook, N. J., Highlands and Syracuse, N. Y., Hamilton, O., Hamil-



J. A. McElroy

ton, Ont., and Sherbrooke, Que. They also designed the (water) power station, together

with the dam, canal, etc., for the Syracuse & Suburban Railway, Syracuse, N. Y.

In 1898 Messrs. Macartney and McElroy organized the firm of Macartney, McElroy, & Co., Ltd., under British laws, and with the registered office of the company in London. During its second year the firm increased its capital from £12,000 to £60,000; and since its organization it has executed contracts at Glasgow and Aberdeen, Scotland; at Manchester, Brighton, Southampton, Halifax, Southport, Hartlepool, Stockport, etc., in England; at Lisbon, Portugal; at Durban and Delagoa Bay, South Africa; and at Wellington, N. Z. Its work comprises the complete equipment of electric roads, including the overhead work, track, paving, feeders, power houses, cars, etc.

Mr. McElroy has taken out a patent for rollers for heavy doors used in car-houses, freight-sheds, etc., and, in association with others, owns patents for a third-rail system of electric traction. He is a member of the American Society of Mechanical Engineers; of the Tramway and Light Railway Association of Great Britain; the Catholic Club of New York; and of the Chi Psi fraternity.

Mr. McElroy is the son of Charles and Margaret McElroy, both Irish. His father served in the 17th Connecticut Volunteers during the Civil War, and died in 1869 from the effects of a wound received at Gettysburg. Joseph Aloysius married Caroline A. Crotty, in June, 1889 (deceased, 1891), and Alice Elizabeth Mary Dial, October 23, 1902.

McGahie, Fred. H. (M.E., '92), was in the shops of H. R. Worthington, 1892–93; assistant with the Pneumatic Torpedo & Construction Co. in experiments on military explosives and the projection of torpedoes from guns with smokeless powder, 1893–94; and superintendent of the Maxim Powder & Torpedo Co., Lower Squankum, N. J., 1894–97. He took an active share in the development of the multi-perforated smokeless powder used by the United States army and navy, and took out a patent for an improved form of multi-perforated powder. He has been in the draughting department of the E. W. Bliss Co., Brooklyn, N. Y., since 1899.

McGowan, Henry Eddy (M.E., '94), was born in Brooklyn, N. Y., October 3, 1872; son of Henry D. and Sophia C. (Pitts) McGowan. He was process chemist at the factory of Church & Co., Trenton, Wayne County, Mich., manufacturers of bicarbonate of soda by the ammonia process, 1894–98. In 1898 he was engaged by the Brooklyn Union Gas Co. to assist in investigating the electrolytic destruction of their piping by stray trolley-currents, and at the termination of this survey, etc., an electrical department being formed by the company, Mr. McGowan was placed at its head, with the title of electrical engineer. This position he still holds, having charge of the question of electrolysis and of the gas-engine business. In 1903 he was appointed general manager of the Flatbush Gas Co., still retaining his position with the Brooklyn Union Gas Co. He is the author of the following articles: "Electrolysis, The Effect of Stray Trolley-Currents," *Stevens Institute Indicator*, XVIII, No. 2; "Remedy for Electrolytic Damage to Mains," *Progressive Age*, XX, No. 24.

In 1900 Mr. McGowan was instrumental with two or three others, in forming a University Glee Club in Brooklyn to be a nucleus for a University Club similar to that in Manhattan. The University Club of Brooklyn, of which he is a member, was incorporated July 18, 1901. He is also a member of the Crescent Athletic Club and of the Beta Theta Pi fraternity.



H. E. McGowan

MacGregor, Willard Holmes (M.E., '96), was born in New York city May 3, 1865. Previous to 1896 he studied at the College of



W. H. MacGregor

the City of New York and was a teacher in the New York schools. He was designer and draughtsman with Cary T. Hutchinson, Ph.D., consulting engineer, his work consisting of designs for aërial and underground lines for the transmission of power from Lachine Rapids to Montreal (a three-phase alternating current being used), 1896–97; assistant superintendent with the Ward & Leonard Electric Co., 1897–99; designing and superintending the construction of rheostats, preparing estimates, and attending to correspondence and to the illustration and publication of the catalogues of this company. He also made working drawings for the Ward & Leonard Electric Co.'s new double-pole circuit-breaker. In 1898 he was appointed New York agent for the company. He was general Eastern agent, with headquarters in New York, for the Cutler Hammer Co., Chicago, manufacturers of rheostats, 1899–1901, and has been assistant manager in the New York sales office of the Westinghouse Electric & Manufacturing Co. from 1901 to date; from June, 1902, being in charge of detail department sales. He contributed an article on "Test of an Otis Electric Elevator with Leonard Motor-Control System" to the *Electrical Engineer*, July 29, 1896, and an article on "A Method of Determining the Indicated Horse-Power of an Engine Under Varying Load," to *Power*, October, 1896. He is a member of the American Institute of Electrical Engineers; the New York Electrical Society; the Mendelssohn Glee Club; the Musical Art Society; the New Rochelle Yacht Club; and of the Tau Beta Pi fraternity.

Mr. MacGregor is the son of Henry and Mary (Holmes) MacGregor. His father is of Scotch descent, and his mother is of early New England ancestry. He married B. Helen MacDonald, September 18, 1901.

Machold, Charles Emmet (M.E., '85), was born in Hoboken, N. J., December 28, 1864. He was educated at Hoboken Academy and at Stevens High School; was in the draughting-room and shops of the Delaware, Lackawanna, & Western Railroad, East Buffalo, N. Y., 1885–87; and was with Stokes & Parrish, Philadelphia, 1887–88. During the four years succeeding 1889 he was draughtsman and chief draughtsman with the Link-Belt Engineering Co., Nicetown, Philadelphia, Pa., and at New York. He was associated with the firm of Burhorn & Granger, as constructing engineer, and



C. E. Machold

then as general manager of its Philadelphia office, until 1901. He designed and installed for them complete steam and electric-light-

ing plants, including boilers, stacks, engines, steam heating, dynamos, etc. In 1901 he retired from the firm, which then became known as the A. D. Granger Co., Mr. Machold retaining charge of the Philadelphia office as before. On July 1, 1903, he severed this connection to enter into partnership with Mr. A. H. Riddell, under the firm name of Machold & Riddell, contracting engineers, of Philadelphia, Pa. Mr. Machold is a member of the American Society of Mechanical Engineers; of the Engineers' Club of Philadelphia; the Mount Airy, Belfield, and Torresdale country clubs, and of the Delta Tau Delta fraternity.

Mr. Machold is the son of Charlotte and William Machold. He married Martha Deas Mecke, April 29, 1903.

Mackenzie, William Percival (M.E., '93), was born in New York city April 12, 1871. He was assistant engineer with the New York Steam Co., 1893–96; chief engineer at the Bayonne (N. J.) Refinery, Standard Oil Co., 1896, where, besides having charge of the entire 12,000 horse-power steam plant, he was also engineer of construction and had charge of the erection of a new refinery of the same capacity as the old one, upon the completion of which he went as salesman with the Harrisburg Foundry & Machine Co., Harrisburg, Pa., from which position he rose to that of assistant manager of the company at Harrisburg, and later was made manager of the New York office. In 1902 he formed a partnership with A. B. Quarrier which in 1903 was incorporated as Mackenzie, Quarrier, & Ferguson with offices in New York, acting as representatives of the Harrisburg Foundry & Machine Co., and other manufacturers, as well as doing a general engineering business. His graduating thesis, prepared in conjunction with Messrs. H. E. Griswold and Adolph G. Hupfel, on a "Test of the New York Hygeia Ice-Making Plant," was published in the *Stevens Indicator,* XI, 1. He is a member of the Engineers' Club and of the Chi Psi fraternity.

Mr. Mackenzie is the son of Mortimer and Harriette Price Williams Mackenzie. He married Clementina Rittenhouse Cissel, May 23, 1899, and they have one child, Sidney Thompson Mackenzie.

Mackiewicz, Victor (M.E., '84), was employed in the workshops, erecting-floor and draughting-room of Henry R. Worthington, pump and pumping-engine builder, New York, 1884–90. He was also engaged upon the introduction of the jig and template system for duplicating pump parts in conjunction with the development of the piece-work system throughout the works. As erecting engineer he designed and erected large waterworks installations, one of the largest being the 30,000,000-gallon plant, complete with boiler installation, at Minneapolis, Minn. He was with the Gauley Coke & Coal Land Association of West Virginia, in charge of geological and topographical surveys of Greenbrier County, W. Va., locating bituminous coal beds and establishing properties as a preliminary to opening mines and planning railroad communication, 1890–92; and with the Atlantic Refining Co., Point Breeze, Philadelphia, Pa., manufacturers of petroleum products, 1892–1902, at first taking charge of the investigation and designing of pumping machinery to handle petroleum products, and then in charge of the steam boiler department and the distribution of steam throughout the company's yards. He was next installed as mechanical engineer to the company, designing and erecting manufacturing plants to handle the products made from crude oil, and was also placed in charge of the draughting-room and of the general testing work involving engineering problems. In addition he made tests to determine the coal products to be purchased by the company for the steam department. In 1902 he resigned on account of ill health, and devoted himself to further study in mechanical and electrical engineering until his death, which occurred in 1903. He was a member of the American Society of Mechanical Engineers.

McLean, Embury (M.E., '88), was proprietor of a power station, and consulting engineer in New York city, 1889–91; a member of the McLean Engineering Co., consulting and contracting engineers, New York, 1891–97; and is now general manager of the Engineering Co., New York, consulting and contracting engineers, and making a specialty of the McLean system of automatic fuel and pressure control, patented, for steam

boiler plants, of which system Mr. Embury McLean is the inventor.

McLean, North (M.E., '85), has been with Kessler & Co., New York, since 1886.

McNaughton, Malcolm (M.E., '83), was born in Mumford, N. Y., August 12, 1860. He was with the Pintsch Lighting Co., New York, 1883–84; with the United States Torsion Balance & Scale Co., New York, 1885–87; and has been with the Joseph Dixon Crucible Co., Jersey City, N. J., from 1887 to date, being now its department superintendent. He contributed a very complete article on "Graphite" to the *Stevens Institute Indicator*, January, 1901. He is a member of the American Society for Testing Materials and of the Jersey City Club.

Mr. McNaughton is the son of Daniel C. and Margaret (Blue) McNaughton. He married Catherine McVean in 1890, and they



MALCOLM MCNAUGHTON

have two children, Cameron Malcolm, and George Douglas McNaughton.

MacVeety, F. N. (M.E., '95), was with A. R. Wolff, consulting mechanical engineer, New York, 1895–97; chief engineer with the F. N. Pierce Engineering Co., New York, 1897–98; employed on "Power," 1899; with the Baldwin Engineering Co., New York, 1900; and was engaged with the Board of Education, 1901–02. In the latter year he resigned to seek health in Arizona; his death occurred at Suffern, N. Y., October 12, 1904.

Magee, Frank Allen (M.E., '83), was born in New York city August 8, 1862. He was



F. A. MAGEE

employed in the engineering departments of the New York Steam Heating Co., and the Edison Electric Light Co., and with Buck & McNulty, engineers. He has also been connected with different companies in the capacity of sales agent: for several years with E. S. Greeley & Co., New York; then with the Engineering & Equipment Co., New York and Boston; and is at present with the Revere Rubber Co., New York. He is a member of the Beta Theta Pi fraternity.

Mr. Magee is the son of Frank Allen and Jennie Magee. He married Clara Nairne Burt, February 22, 1892, and two children were born to them, Frances Adelaide (deceased 1897), and Burt Allen Magee.

Magee, William Adam (M.E., '88), was born in San Francisco, Cal., June 21, 1865. He entered the real-estate business in 1888, and has been a member of the firm of Thomas Magee & Sons, San Francisco, Cal., since 1894. Since the death of his father in 1902 he and his two brothers have conducted the business, which was established in 1866.

The firm owns and edits the "San Francisco Real Estate Circular," which has been published continuously since 1866. He is a



W. A. Magee

member of the Pacific Union Club, the University Club, and of the Beta Theta Pi fraternity; and is a director of the San Francisco Savings Union and of other local corporations.

Mr. Magee is the son of Thomas and Elizabeth English Magee. He married Harriet L. Hush in 1892, and they have three children, William A., Jr., Harry H., and Elizabeth English Magee.

Magie, W. E. (M.E., '00), was with the Hasbrouck Motor Co., Piermont, N. Y., 1900; draughtsman for the New York Telephone Co., 1900–02; and is now with the Bucyrus Co., South Milwaukee, Wis.

Magovern, Edward Everett (M.E., '81), was born in Hoboken, N. J., March 16, 1861. He was assistant in the Mechanical Laboratory of Stevens Institute, 1881–82; with the New York Steam Co., first as assistant engineer, and then as assistant manager, being engaged upon the development of the meter system and the underground distribution of steam through New York city, 1882–87; was consulting engineer, New York, 1887–90; superintendent and manager of the Edison Phonograph Toy Manufacturing Co., 1890–92; and manager of the Branford works and manager of product for the Stamford and Branford works of the Yale & Towne Manufacturing Co., 1892. He was general sales manager for the Yale & Towne company, 1900–03; and has been commissioner of the Contract Association from 1903 to date. Jointly with T. Scanlan, he took out a patent for a wrought face lock in 1894. He contributed a paper to the American Society of Civil Engineers on "The Theory and Practice of Aqua Ammonia Engines," and an article on "The Most Economical Elevator" to the *Stevens Indicator*, IV, 47.

Mr. Magovern is the son of John and Elizabeth A. Magovern. He married Hortense Zacharie, June 20, 1891, and they have three children, Everett Z., Beatrice M., and John E. Magovern.

Magruder, William Thomas (M.E., '81), was born in Baltimore, Md., April 22, 1861. He was with the Campbell Printing Press & Manufacturing Co., Taunton, Mass., 1881–86; at Johns Hopkins University, Baltimore, 1886–87; chief chemist with the Baltimore & Ohio Railroad Co., Mount Clare, Baltimore, 1887; Instructor in, and Adjunct Professor of, Mechanical Engineering, Vanderbilt Uni-



W. T. Magruder

versity, Nashville, Tenn., 1887–96; chief of machinery at the Tennessee Centennial Exposition, 1896; and has been Professor of

Mechanical Engineering at the Ohio State University, Columbus, O., from 1896 to date.

Prof. Magruder has published occasional articles in the engineering press; a paper on "Gas-Engine Hot-Tube Ignition" in the



W. E. Mallalieu

Transactions of the American Society of Mechanical Engineers, Vol. XXI, and has contributed papers to the American Association for the Advancement of Science, the Society for the Promotion of Engineering Education, and the Engineers' Club of Columbus. He is a Fellow of the American Association for the Advancement of Science and secretary of the Engineering Section; a member of the American Society of Mechanical Engineers; the American Institute of Mining Engineers; the Society for the Promotion of Engineering Education; the Columbus (O.) Engineers' Club (president, 1904); the Engineers' Association of the South; and of the Beta Theta Pi fraternity.

Professor Magruder is the son of William Thomas and Mary (Hamilton) Magruder. His father belonged to the Maryland and Virginia branch of the Magruder family, was an alumnus of West Point, and was killed in action at Gettysburg. His mother is a daughter of William Hamilton of Baltimore, Md., a noted educator in his day. The subject of this sketch married Ellen Fall Malone, daughter of T. H. Malone, Nashville, Tenn., June 18, 1891, and they have two children, William Thomas, Jr., and Thomas Malone Magruder.

Main, Thomas J. (M.E., '97), has been draughtsman with the Kinetic Manufacturing Co.; in the employ of the Clonbrock Steam Boiler Co., Brooklyn, N. Y.; in the engineering department of the A. A. Griffing Iron Co., Jersey City, N. J.; assistant to the consulting engineer of the same company, New York; and is now with the Baldwin Engineering Co., New York.

Mallalieu, Wilbur Emerson (M.E., '97), was born in Jersey City, N. J., February 16, 1874; son of Frank A. and Sarah Frances (Wickham) Mallalieu. He was in the shops, draughting-room, and erecting department of the Henry R. Worthington Steam Pump Co., Brooklyn, N. Y., 1897–99; in the engineering department of the Western Electric Co., New York, 1899–1900; and has been assistant electrical inspector with the National Board of Fire Underwriters, New York, since 1900. He is an associate member of the American Institute of Electrical Engineers, and a member of Theta Xi fraternity.

Manley, Robert Early (M.E., '00), was born in Washington, D. C., April 19, 1875.



R. E. Manley

He graduated from Swarthmore College with the degree of Bachelor of Science in

1897. He was with the Seaboard Steel Casting Co., Chester, Pa., 1900; draughtsman with the York Manufacturing Co., York, Pa., 1900–01; manager of the Pullman Automatic Ventilator Co., 1901, in which capacity he equipped and started the factory and developed every branch of the business; erecting engineer for the United Gas Improvement Co., Philadelphia, Pa., 1902; and is now general manager of the Hanover Light, Heat & Power Co., Hanover, Pa. He is a member of the Phi Kappa Psi fraternity.

Mr. Manley is the son of H. De Haven, U.S.N., and Hallie J. (Early) Manley. He married Anna K. Himes, June 6, 1902.

Manning, George Lincoln (M.E., '91), was born in Fitchburg, Mass, April 13, 1865. He was Instructor in Mathematics and Drawing at the Adelphi Academy, Brooklyn, N. Y., 1891–92; and Assistant Professor in Physics and Chemistry at Stevens Institute, 1892–95. In 1895 he went to the University of Berlin to study for the degree of Doctor of Philosophy, which he received in 1900. Upon his return he was appointed Assistant in the Department of Physics at Cornell University, Ithaca, N. Y. In September, 1902, he went to Robert College, Constantinople, to fill the Chair of Physics, a position which he now holds.

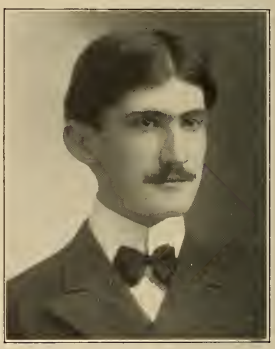
Professor Manning is the son of Joseph E. and Hannah A. (Estabrook) Manning. The Mannings are descended from an ancient and noble family which took the name from Manning, Saxony, whence they went to England before the Conquest. They were early settlers in this country (Roxbury, 1634) and were prominent in the colonial and later wars. The subject of this sketch married Alice Washburn Heald, June 19, 1893.

Martin, George W. (M.E., '99), was with the Edison Electric Illuminating Co., New York, 1899; assistant engineer with the Baldwin Engineering Co., heating and ventilating engineers and contractors, 1899–1901; with Evans, Almirall & Co., New York, 1901–02; with the W. D. Forbes Co., Hoboken, N. J., 1902–03; with the C. W. Hunt Co., West New Brighton, Staten Island, N. Y., 1903–04; and has been associate editor on "The Electrical Age" since April, 1904.

Martin, Kingsley Leverich (M.E., '92), was transit-man with the East River Bridge Co., Brooklyn, N. Y., 1892; assistant engineer on the New York and Brooklyn Bridge, in charge of the erection of the Brooklyn terminal, 1892–96; assistant engineer on the East River Bridge, 1896–1901, resident engineer, 1901–04, and is now engineer-in-charge. He is a member of the American Society of Civil Engineers, and a member of the Brooklyn Engineers' Club.

Martin, Louis A., Jr. (M.E., '00), Instructor in Mathematics at Stevens Institute of Technology. For biography, see page 282.

Martin, Paul Justin (M.E., '02), was born in Hoboken, N. J., July 10, 1882; son of



P. J. Martin

Louis Adolphe and Pauline Justine Martin. His ancestors were of Huguenot origin, and his father was a native of Switzerland. He took the complete course at the Hoboken Academy, winning the Stevens Scholarship. Since graduation he has been employed at the Quintard Iron Works, New York.

Martinez, Simeon (M.E., '85), was employed as interpreter for Mr. Geo. H. Sisson, general manager of the International Company of Mexico, 1885–86; salesman in the New York office of Fraser & Chalmers, Chicago, manufacturers of mining-machinery,

1887; buyer of machinery in the exporting department of M. Echeverria & Co., 1888; engineer in charge of the machinery of F. Munguia & Sons, Industrial House, Mexico City, 1889–90; engineer with the Mexico City Gas & Electric Light Co., in charge of the manufacture of illuminating gas, 1890–92; consulting and erecting engineer for the Noria Alta Silver Mills, the Peregrain & El Tajo Mining Co., and J. B. Rocha's gold mine "El Monte," having charge of the erection of silver-mills, Cornish pumping-machinery, hoisting-engines, etc., and the general care and superintendence of machinery, 1893–95; in partnership with F. Munguia in the manufacture of chocolates and candies, Mexico City, 1896; and has been consulting engineer at Guanajuato, Mex., and proprietor of "La Cruz Blanca" starch factory, from 1897 to date.

Mathey, Edward D. (M.E., '94), was in the testing department of the General Electric Co., Lynn, Mass., 1894–95; in the repair shops of the North Hudson County Railway Co., West Hoboken, N. J., 1895–96; with the electrical engineer of the Metropolitan Street Railway Co., New York, 1896–1902; and has been assistant engineer with Westinghouse, Church, Kerr, & Co., New York, from 1902 to date.

Mathey, Henry Clarence (M.E., '97), was born in Hoboken, N. J., in 1875. He was with the Western Electric Co., New York, 1897–99; in the electrical department of the Metropolitan Street Railway Co., New York, 1899–1900; with the Chicago Motor Vehicle Co. and the Deering Harvester Co., Chicago, 1900–02; and has been with the National Board of Fire Underwriters, New York, from 1902 to date.

Maul, William Christian (M.E., '96), was born in New York city, March 18, 1874. His early education was received at a German school in New York, the Eastern public school and high school, East Orange, N. J., and at Stevens Preparatory School, Hoboken, N. J. He was engaged with the H. W. Johns Manufacturing Co., Brooklyn, N. Y., surveying and erecting their new dock, 1896; draughtsman and assistant to the superintending engineer of the Foster Engineering Co., Newark, N. J., 1896–99; and has been with the Isbell-Porter Co., Newark, N. J., from 1899 to date, being now first assistant



W. C. Maul

to the chief draughtsman. He is a member of the Tau Beta Pi fraternity.

Mr. Maul is the son of William and Louisa Maul, both born in Germany. He married Florence Maude Mason, June 8, 1898, and they have one child, Gilbert Emerson Maul.

Maury, Dabney Herndon (M.E., '84), was born in Vicksburg, Miss., March 9, 1863. He entered the Junior class of Stevens Institute in 1882 after graduating from the Virginia Military Institute; served as rodman on surveys for a railroad bridge across the Ohio River at Point Pleasant, W. Va., during the summer vacation of 1881; was chief of party on preliminary surveys for the Brighthope Railway, near Richmond, Va., in the summer vacation of 1882; draughtsman with the Richmond Locomotive & Machine Co., Richmond, Va., during the summer vacation of 1883; assistant to Prof. R. H. Thurston, in the Mechanical Laboratory of the Stevens Institute, 1884; engineer, located in Texas, for the Grand Belt Copper Co., of New York, 1884–85; principal assistant engineer of the Fort Worth & New Orleans Railway, Texas, 1885–86; superintendent of El Paso County surveys for the Southern Pacific Railway Co., 1886; engineer for James G.

Green, general manager of the Tolima, North Tolima, Organos, Socorro, and other gold and silver mines in the Republic of Colom-



D. H. Maury

bia, 1886–90; also local manager of the Organos and Socorro mines, erecting the machinery and building dams and ditches for the Silencio, Tetuan, and Colon mines. During this period he also made examinations, plans, surveys, and estimates for a number of other mines, and did other engineering work. He was general manager for the Saldana Syndicate, Ltd., of Liverpool, in Tolima, Colombia, in charge of all its interests there, designing and constructing its dams, ditches, and entire plant, and operating its mines, 1890–93; engineer and superintendent of the Peoria Water Co., Peoria, Ill., 1893–94, and later engineer and superintendent for the receiver of that company, 1894–98. Since 1893 he has designed and constructed for the water company, two new pumping-plants on a system for which United States patents have been granted to him, and has been in charge of all the engineering work for the company and its receiver, and for the Peoria Waterworks Co., reorganized after the receivership. In addition to this connection with the Peoria Waterworks Co., which he still retains, he has a large professional practice, more especially in the line of waterworks, hydraulic and steam power plants, and in electrolytic investigations, having established himself as a consulting engineer in 1900.

His patents include one on a fluid-distribution system 1897; one on pumping-machinery, 1900; and one on well inlets, 1902.

He has presented papers to the American Waterworks Association and to the Illinois Society of Engineers and Surveyors, and has contributed articles to *Engineering News*, *Municipal Engineering*, and other journals. He is a member of the American Society of Mechanical Engineers; the American Society of Civil Engineers; the Western Society of Engineers; the American Waterworks Association; the Illinois Society of Engineers and Surveyors; the Central States Waterworks Association, and of the Kappa Alpha fraternity (Southern).

Mr. Maury is the son of Dabney Herndon and Nannie Rose (Mason) Maury. His father's ancestors were of Huguenot and English descent; those on his mother's side, principally Scotch-Irish. All were Virginians for many generations. Nearly all of his father's people have been in the army or navy since Colonial times. Mr. Maury married Mary McCaw, April 26, 1893. They have one child living, Dabney Herndon Maury. Two are dead.

Maxfield, Howard H. (M.E., '95), was born in Bloomfield, N. J., October 27, 1873. He received his early education principally in private schools. He was a student at the Pingry School, Elizabeth, N. J., for four years, and at Stevens School one year. He was special apprentice at the Meadows shops, of the Pennsylvania Railroad, near Jersey City, 1895–98; in the Altoona (Pa.) shops of the same company, 1898–1900; inspector in the office of the superintendent of motive power of the United Railroads of New Jersey Division of the Pennsylvania Railroad, Jersey City, N. J., 1900–01; assistant road foreman of engines on the New York Division of the above part of the Pennsylvania Railroad system, 1901–02; assistant master mechanic at the same company's Camden shops, 1902–03; and has been assistant engineer of motive power in the United Railroads of New Jersey Division, with office in Jersey City, N. J., from 1903 to date. He is author of the article, "A Scheme for Testing Locomotive Boilers Over Com-

paratively Short Distances in Fast Express Service," *Stevens Indicator,* October, 1898. He is a member of the American Society of



H. H. Maxfield

Mechanical Engineers, the New York Railroad Club, and the Theta Nu Epsilon fraternity.

Mr. Maxfield is the son of Charles W. and Ellen S. Maxfield. He married Mary E. Bailey, April 25, 1901.

Mayer, Alfred Goldsborough (M.E., '89), was born in Frederick, Md., April 16, 1868 He was Assistant in Physics at Clark University, Worcester, Mass., 1889–90; held the same position at the University of Kansas, 1890–92; and was assistant to Prof. Alexander Agassiz, and in charge of Radiates at the Museum of Comparative Zoology, Harvard University, 1893–1900. In 1897 he received the degree of Doctor of Science from Harvard University, and three years later became curator of Natural Science, and afterwards curator in chief, at the museum of the Brooklyn Institute of Arts and Sciences. In 1904 he became director of the Marine Biological Laboratory at Tortugas, Fla., established by the Carnegie Institution. He accompanied Prof. Agassiz as assistant upon scientific expeditions to the Bahamas in 1892, the barrier reef of Australia, 1895; the Fiji Islands, 1897–98; and on the cruise of the "Albatross" through the tropical Pacific Ocean, 1899–1900; and has travelled 90,000 miles on scientific expeditions within the tropics.

He has published the following scientific researches:

"Radiation and Absorption of Heat by Leaves," *American Journal of Science*, 1893.

"Account of Some Medusæ Obtained in the Bahamas," *Bull. Mus. Comp. Zool.*[1], 1894.

"Development of the Wing Scales and Their Pigment in Butterflies and Moths," *Ibid.*, 1896.

"On the Color and Color-Patterns of Moths and Butterflies," *Ibid.*, 1897.

"Development of Color in Moths and Butterflies," *Woods Holl Lectures*, 1899.

"On the Mating Instinct in Moths," *Annals and Magazine of Natural History*, London, 1900; "*Psyche*," February, 1900.

"Descriptions of New and Little-Known Medusæ from the Western Atlantic," *Bull. Mus. Comp. Zool.*, 1900.

"Some Medusæ from the Tortugas, Florida," *Ibid.*, 1900.

"An Atlantic 'Palolo,'" *Ibid.*, 1900.

"The Variations of a Newly Arisen Species of Medusa." Brooklyn Institute Museum, *Sci. Bull.*[2], 1901.

"Variations of Genus Partula of Tahiti," *Mem. Mus. Comp. Zool.*[3], 1902.

"Effects of Natural Selection and Race Tendency upon the Coloration of Lepidoptera," Brooklyn Institute Museum, *Sci. Bull.*, 1902.

"The Atlantic 'Palolo,'" Brooklyn Institute Museum, *Ibid.*, 1902.

In connection with Prof. Alexander Agassiz he has written:

"On Dactylometra," *Bull. Mus. Comp. Zool.*, 1898.

"On Some Medusæ from Australia," *Ibid.*, 1898.

"Acalephs from the Fiji Islands," *Ibid.*, XXXII, No. 9.

"Medusæ from the Tropical Pacific," *Mem. Mus. Comp. Zool.*, 1902.

"Medusæ of the Atlantic Coast of North America," *Ibid.*

He is a member of the American Association for the Advancement of Science; the American Society of Zoologists; the Boston Society of Natural History; the New York Zoological Society; the New York Academy

[1] "Bulletin of the Museum of Comparative Zoology," Harvard College.
[2] "Science Bulletin."
[3] "Memoirs of the Museum of Comparative Zoology," Harvard College.

of Sciences; the Cambridge Entomological Society; and the American Society of Naturalists.

Mr. Mayer is the son of Alfred Marshall



A. G. Mayer

and Catherine D. (Goldsborough) Mayer. His family is of German origin. Its first member resident in America was Christian Mayer, who came here in 1784, and was consul-general of Würtemburg. Alfred Marshall Mayer was Professor of Physics in Stevens Institute from 1873 to 1897. Alfred G. Mayer married Harriet Randolph Hyatt, August 27, 1900, and they have one child, Alpheus Hyatt Mayer.

Meding, Ernest (M.E., '00), born in Paterson, N. J., January 16, 1879; son of Charles E. and K. L. (Aplin) Meding. He was Instructor during the Supplementary Term at Stevens Institute, 1900; and has been with the Meding Manufacturing Co., Paterson, N. J., 1900 to date. He is a member of the Sigma Nu fraternity.

Meeks, Howard Victor (M.E., '01), was born in Union Hill, N. J., April 11, 1878; son of Hamilton V. and Euretta E. (Gardner) Meeks. On his father's side his ancestry can be traced back to John Meeks, captain of a Revolutionary militia company called "Hearts of Oak," whose wife, Hélène Molineaux, acted as interpreter between Washington and Lafayette at Morristown, N. J. On his mother's side he is descended from Thomas Gardner, one of three brothers who came to this country from England in 1600. He was Instructor during the Supplementary Term at Stevens Institute, 1901; assistant draughtsman with W. D. Forbes & Co., Hoboken, N. J., 1901–04; and since June of the latter year has been associated with Mr. Frank Hermance under the firm name of Meeks-Hermance Co., electrical and mechanical engineers, Union Hill, N. J. Since 1902 he has been a director in the Gardner & Meeks Co., Union Hill, N. J. He is a member of the Sigma Nu and Tau Beta Pi fraternities.



H. V. Meeks

He married Ethel Colon, of New York city, November 4, 1903.

Meister, Conrad Ludwig (M.E., '97), was born in Brooklyn, N. Y., June 22, 1876. He was rodman with the Metropolitan Traction Co., 1897; and was engaged with the Erie Railroad from 1897 to 1901, as follows: special apprentice in the shops at Susquehanna, Pa., 1897–99; in charge of the dynamometer car, and for a time on the road, making engine tests of various kinds, and also as draughtsman in the mechanical engineer's office, 1899–1901. He then became assistant chief draughtsman with the Union Pacific Railroad, Omaha, Neb., 1901; draughtsman

at the Grand Central office of the New York Central Railroad, New York, 1902; and chief draughtsman with the Atlantic Coast



C. L. Meister

Line Railroad, Wilmington, N. C., which position he has held from 1902 to date. He is the designer of Beck & Meister's japanning ovens, a number of which are now being built in Germany. He is a member of the New York Railroad Club.

Mr. Meister is the son of Conrad and Elizabeth Meister. He married Esther Fredriksson, December 29, 1902.

Mendoza, Luis (M.E., '90), was with R. D. Wood & Co., Camden Iron Works, Camden, N. J., 1891–93; and has been general manager of the Oaxaca Electric Light Co., Oaxaca, Mexico, from 1893 to date.

Merkel, Arthur Ernest (M.E., '93), was born in Cleveland, O., July 21, 1872; son of Louis J. and Augusta Merkel. He served in Troop A, 1st Ohio Volunteer Cavalry, as a private, during the Spanish-American War. He was assistant superintendent of the White Cloud Copper Mining Co., Lovelocks, Nevada, 1893; with the Chicago, Milwaukee, & St. Paul Railroad, Milwaukee, Wis., 1893–94; assistant superintendent of the Fairfield Copper Co., of Connecticut, 1894–95; and has been a patent solicitor and expert from 1895 to date. In 1904 he took out a patent on a log-loading machine. He is a member of the University Club of Cleveland; of Troop A, Ohio National Guard; of the Beta Theta Pi and Theta Nu Epsilon fraternities; and a member and former adjutant of the R. E. Burdick Command No. 114, Spanish War Veterans.

Merriam, Lyman Lyon (M.E., '00), was born in Lyons Falls, N. Y., November 4, 1877. He attended Dr. Holbrook's Military School, Ossining-on-Hudson, from which he entered Stevens. He was engaged in the lumber business and railroad location work at Lyons Falls, N. Y., 1900–01; with Chambers & Hone, consulting engineers, New York, as transit-man on a double-track electric line from Johnstown to Schenectady, and in charge of construction of the extension of the Amsterdam street railroad from Rockton to Hagaman, N. Y., 1901–03; mechanical engineer for the John J. Crooke Co., tin-foil manufacturers, New York, 1903; in charge of construction of the Lyons Falls & Port Leyden Electric Light Co.'s plant at Lyonsdale, N. Y., 1903–04; and is now engineer for the O'Rourke Engineering Construction Co., New York. He is a member of the Delta Tau Delta fraternity.

Mr. Merriam is the son of Charles Collins



L. L. Merriam

and Florence I. (Lyon) Merriam. He married Delia Brandreth, September 30, 1903.

Merrick, Herbert Lansing (M.E., '92), was born in Brooklyn, N. Y., April 16, 1873. He was mechanical engineer with the New York, Ontario & Western Railway, Middletown, N. Y., 1892–96; assistant engineer and chief draughtsman with the Sprague Electric Elevator Co., New York, 1896–1900; construction engineer with the Marine Engine & Machine Co., New York, 1900–01;



H. L. Merrick

and has been with the Robins Conveying Belt Co., New York, since 1901, now holding the position of shop superintendent.

Mr. Merrick is the son of Charles and Anna Merrick. He married Katherine A. Selleck, July 20, 1898.

Merritt, Charles Fowler (M.E., '01), was born in New York city August 14, 1877; son of Mortimer C. and Carrie E. (Quimby) Merritt. He has been mechanical engineer with Hurd & Co., engineers and manufacturers, New York, from 1901 to date. He is a member of the New York Railroad Club, and of the Alpha Delta Phi and Tau Beta Pi fraternities.

Merritt, C. H., Jr. (M.E., '93), has been with Charles H. Merritt & Son, hat-manufacturers, Danbury, Conn., from 1893 to date.

Merritt, George W. (M.E., '90), son of Charles H. and Luana K. Merritt, has been with Charles H. Merritt & Son, hat-manufacturers, Danbury, Conn., from 1890 to date, and is now a member of the firm.

Merritt, James Smith (M.E., '86), was born in Philadelphia, February 7, 1864. After graduating from the William Penn Charter School, Philadelphia, he spent a year in travel and study in Europe before entering Stevens Institute. He was employed in the United States Geological Survey, engaged upon triangulation work in Wyoming and Montana, 1886; in the shops of Bement, Miles & Co., Philadelphia, 1886–87; assistant engineer with the Welsbach Incandescent Light Co., engaged upon the development of the Welsbach light at Gloucester, N. J., 1887–88; secretary and treasurer of the Rutter & Merritt, Ltd., Architectural Ironworks, Philadelphia, engaged in the design and manufacture of structural and ornamental ironwork and "expanded metal" fireproofing of buildings, 1888–93, subsequently (1893–1900) holding the same position with its successors, Merritt & Co., Inc. Since 1900 he has been president and general manager of that company.

Mr. Merritt has taken out United States patents on a steel post, 1890; an automatic weighing-machine, 1891; a corner plaster strip, 1897; ceiling or wall constructions, 1898, and a slide scale, 1902. He is a member of the Franklin Institute, Philadelphia; the Engineers' Club of Philadelphia; the Rittenhouse and Huntington Valley Country clubs, at Philadelphia; and of the Theta Xi fraternity.

Mr. Merritt is the son of Daniel S. and Emma A. Merritt. He is descended from Thomas Merritt, who settled at Rye, Westchester Co., N. Y., in 1684. He married Gertrude R. Morris, January 28, 1891, and they have two children, Morris H., and James S. Merritt, Jr.

Messimer, Hillary C. (M.E., '96), was a student in the New York Law School, 1896–98, receiving the degree of Bachelor of Laws *cum laude* in 1898. He was admitted to the Bar of the State of New York in July, 1898; engaged in the practice of law with Kerr, Page, & Cooper, making a specialty of patent law, 1898–1900; and has been associated with John R. Bennett, New York, in the practice of patent law, from 1900 to date.

Messimer, Robert L. (M.E., '97), was mechanical engineer in the motive-power department of the Calumet & Hecla Mining Co., Calumet, Mich., 1897–99; and has since been engaged in experimental engineering work in New York.

Metcalfe, George Richmond (M.E., '86), was born in Brooklyn, N. Y., in 1865. He attended the Brooklyn Polytechnic Institute before entering Stevens. He was with the Daft Electric Railway Co., 1888–90; the Edison General Electric Co., 1890–92; consulting electrical engineer, 1892–93; editor of "Electricity," New York, 1893–97; member of the firm of Metcalfe & Moeller, engaged in electrical machinery and incandescent lamp repairing, New York, 1897–99; electrical editor of the "Street Railway Review," Chicago, 1899–1904; and editor of the "Technical World," Chicago, 1904 to date.

Mr. Metcalfe is the son of George and Elizabeth T. (Root) Metcalfe, and of English descent. He married Grace D. Brown, November 8, 1899, and they have two children, Richmond and Winthrop Metcalfe.

Meyer, Ernest Henry (M.E., '97), was born in Jersey City, N. J., November 4, 1875; son of R. M. and E. C. H. Meyer. He has been assistant inspector in the electric department of the National Board of Fire Underwriters; accountant for Zimmermann & Meyer; draughtsman with the Allentown Rolling-Mills and the New York, Susquehanna & Western Railroad; machinist, tester, and draughtsman with the Central Railroad of New Jersey; and inspector and draughtsman for the Automobile Co.

Meyer, Henry Coddington, Jr. (M.E., '92), was born in Orange, N. J., November 28, 1870. He visited places of engineering interest in Europe during the summer of 1892; was with George H. Barrus, M.E., of Boston, Mass., as assistant in designing and testing engine and boiler plants for textile mills, street railway and lighting stations, manufacturing establishments, etc., 1892–93; represented the "Engineering Record" in an editorial capacity at the World's Columbian Exposition, Chicago, and assisted Mr. Barrus, who was one of the board of judges in Machinery Hall, in testing engines and boilers, 1893; was on the editorial staff of the steam engineering, heating, and ventilation department of the "Engineering Record" 1893–1902, and is now practising as



H. C. Meyer, Jr.

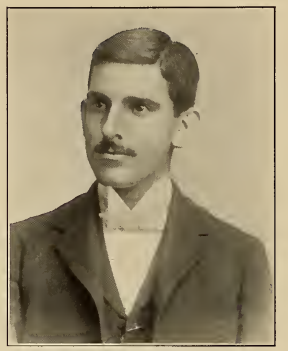
consulting engineer in New York. He has been retained by the War Department to design and superintend the construction of a heating and lighting station to be erected at West Point, N. Y., as part of the extensive improvements to be made at the United States Military Academy.

He read a paper on "The Ventilation and Heating of Tall Buildings" before the American Society of Heating and Ventilating Engineers, 1899. In addition to his editorial work on the "Engineering Record," Mr. Meyer is the author of a book on "Steam Power Plants, Their Design and Construction." He is a member of the American Society of Mechanical Engineers; an associate of the American Society of Civil Engineers; a member of the American Society of Heating and Ventilating Engineers; the Engineers' Club of New York; and of the Military Order of the Loyal Legion.

Mr. Meyer is the son of Henry C. and Charlotte (Seaman) Meyer. He married Louise Griffen Underhill, November 18, 1896, and they have one child, Henry C. Meyer, 3d.

Meystre, Frederic Julien (M.E., '93), was born in Hoboken, N. J., November 7, 1872.

He was with the United Gas Improvement Co., at the Paterson Works, 1893–94; and



F. J. Meystre

has been member of the firm of Louis Meystre & Son, architects, at Hoboken, N. J. from 1894 to date. He is a member of the Board of Managers of the Hoboken Bank for Savings.

Mr. Meystre is the son of Francis Louis and Marie Louise (Charles) Meystre. He married Bertha Whilldin, October 22, 1902.

Miller, Alten S. (M.E., '88), was born in Richmond, Va., October 6, 1868. He was in the offices of the United Gas Improvement Co., Philadelphia, Pa., 1888; assistant superintendent of the Omaha Gas Manufacturing Co., Omaha, Neb., 1888–92; Western sales agent for the United Gas Improvement Co., with headquarters in Chicago, 1892–94; engineer of works, and, later, chief engineer, of the East River Gas Co., Long Island City, N. Y., 1894–98. Part of the gas made at these works is sold in New York city, being conveyed through a tunnel 110 feet below mean low water of the East River, and is 2,516 feet long between centres of shafts. About one third of its length is lined with cast-iron rings, the rest being driven through solid rock. The unlined portion is 10 feet wide and 8½ feet high, and is designed to give sufficient room for four 36-inch pipes and to still allow access to the pipes for inspection and repairs. At present it contains two 36-inch pipes as shown in the illustration. In May, 1898, he was appointed chief engineer of the New Amsterdam Gas Co., which was formed by the combination of the East River Gas Co. and the Equitable Gas Co., a position he held until 1902. He was consulting engineer for the Brooklyn Union Gas Co., 1900–01, and assistant engineer of the Consolidated Gas Co., 1901–02. During his connection with the above-mentioned New York gas companies he quadrupled the capacity of the New Amsterdam Gas Co.'s plant at Ravenswood (the East River Gas Co.), giving it a capacity of 25,000,000 cubic feet daily, making it the largest gas plant in the country. Mr. Miller also built for the company several holders having a capacity of about 14,000,000 cubic feet, and put in coal-handling machinery with a capacity of 1,100 tons a day, all of which, with lesser work, has contributed to the development of plans which have given the New Amsterdam Gas Co. the largest and best equipped water-gas plant in the world. He has been manager of the Consolidated Gas Co. of Baltimore City, Baltimore, Md., since November 1, 1902,



A. S. Miller

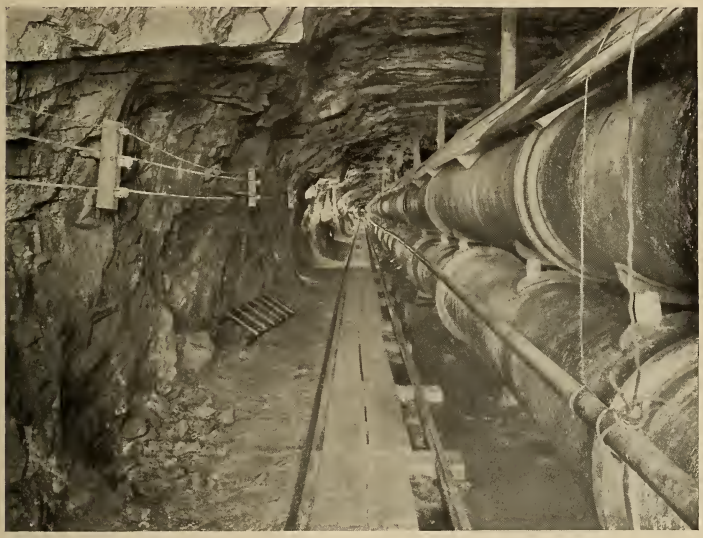
at which time he severed his connections with New York companies. In his present capacity he has designed a gas plant to make all the gas for the city, and take the place of the old plants.

He is the author of papers on "Oils for Gas-Enriching," read before the Ohio Gas Association, 1893; "Metal Gasholder Tanks," read before the Western Gas Association, 1895; and of the following papers, read before the American Gas Light Association: "The Separation of Water-Gas Tar," and "Report of Experiments on Interior Illumination," 1897; "Steam Consumption in a Water-Gas Plant," 1899; and "Report of Tests of the Edgerton Standard Burner," 1900. He also wrote an article on "Practical Photometry," published in the *Stevens Indicator*, XIII, 205.

He is a member of the American Gas Light Association, of which he was president in 1903; of the Western, Ohio, and Michigan Gas associations; the Engineers' Club of New York; the Society of Gas Lighting of New York; the Baltimore Country Club; and of the Chi Phi fraternity. He has served as Alumni Trustee of Stevens Institute.

Mr. Miller is the son of William G. and Emma H. Miller. He married Virginia Bennett, January 14, 1902.

Miller, Arthur Barrett (M.E., '97), was born in Winchester, Va., August 11, 1874. He was teacher of manual training and mechanical drawing in the Ethical Culture Schools, New York, 1897–99; was engaged in erecting cotton-carding engines in the shops of the Saco & Pettee Machine Co., Newton Upper Falls, Mass., 1899; consulting engineer, engaged in surveying and engineering connected with the electrical development of water power, 1900; electrician in the testing department of the General Electric Co., Schenectady, 1901; engineer in charge of construction work for the United Engineering & Contracting Co., New York, 1901–02, designing and erecting the motor-driven centrifugal pumping-plant for Dry Docks 2 and 3, at the New York Navy Yard;



Tunnel of the East River Gas Company, New York
A. S. Miller

architect and engineer of the machine-shop of the Warren Steam Pump Co., Warren, Mass., 1902–03; and has been assistant to the master mechanic of the Draper Co., Hopedale, Mass., from 1903 to date.

Mr. Miller is the son of William and Adelaide Gerish (Barrett) Miller. His father's ancestors were early settlers in Virginia; the name being originally Millern; the "n" was dropped about 1790. His mother's ancestors, named Eddy on the distaff side,



A. B. Miller

settled near Plymouth in 1630. He married Edith A. Canning, October 7, 1902.

Miller, Carroll (M.E., '96), was born in Richmond, Va., March 18, 1875. He was with the Illinois Steel Co., Chicago, 1896–97; the New Amsterdam Gas Co., Long Island City, N. Y., 1897; in the London office of Humphreys & Glasgow, 1897–98; with the United Gas Improvement Co., Philadelphia, first as superintendent of the gasworks at Fall River, Mass., 1898–99, and next as superintendent of the Market St. works, Newark, N. J., 1899–1901. He has been a consulting-engineer in Chicago, Ill., from 1901 to date. During 1901–02 he made two trips to Japan to investigate the advisability of and make arrangements for installing gas in one of the large cities. He is the author of a paper on "The Proportion of Sulphur Removed in Each Purifying-Box," read before the New England Association of Gas Engineers, February 19, 1901. He is a member of the



Carroll Miller

American Gas Light Association; the New England Association of Gas Engineers; the Western Gas Association; and of the Beta Theta Pi and Theta Nu Epsilon fraternities.

Mr. Miller is the son of William G. and Emma H. Miller, both Virginians. He married Mary Emma Guffey, October 28, 1902.

Miller, George Hope (M.E., '92), was born in Orange, N. J., July 29, 1869; son of Thomas and Marion Downey Miller. He travelled in Europe for two years and a half, 1883–85, making Stuttgart his headquarters, and studying in the Polytechnic of that city. After graduation he was connected with a drop-forging concern in Brooklyn, N. Y., 1892; inspector of manufacturing concerns for fire-insurance purposes, with the Middle States Inspection Bureau, 1893–98; special agent of the Netherlands Fire Insurance Co., 1898–1900; and has been a special agent of the Agricultural Insurance Co., for the States of Pennsylvania, New Jersey, Delaware, Maryland, and the District of Columbia, with headquarters at Philadelphia, Pa., from 1900 to date. He is a Master Mason and a member of the Delta Tau Delta fraternity.

Miller, Henry J. (M.E., '84), was a member of the firm of Crane & Miller, patent

solicitors, Newark, N. J., 1884–93. In 1893 Mr. Crane withdrew, Mr. Miller continuing the business until 1896. He then assumed charge of the patent department of the Singer Manufacturing Co., Elizabeth, N. J., which position he holds at present.



G. H. Miller

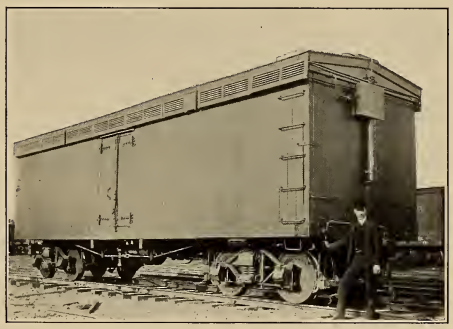
Miller, S. W. (M.E., '87), has been in the employ of the Pittsburg, Columbus, Cincinnati, & St. Louis Railway, since 1887, in the capacities of: apprentice in shops, 1887–89; fireman, 1889–90; draughtsman, 1890; assigned to special work under direction of (1890–96), and assistant to (1896–1900), superintendent of motive power; assistant master mechanic (1900–01) and master mechanic (1901 to date) on the Pennsylvania Lines West of Pittsburg. He is a member of the Western Railway Club; the Master Mechanics' Association; and the Master Car-Builders' Association.

Miller, Warren Hastings (M.E., '98), was born in Honesdale, Pa., August 21, 1876. He prepared for a technical course of study at Mr. Hallam's school, Dresden, Germany.

Before graduation he was commissioned assistant engineer in the United States Navy with the rank of ensign, and was attached to the New York Navy Yard until July 5, when he was assigned to the U.S.S. "Glacier" as senior assistant engineer. On November 9, he was appointed chief engineer of the same ship at Santiago de Cuba, and on March 17, 1899, was detached from the "Glacier" and honorably discharged after putting the vessel out of commission and refitting her for the Philippines.

He then became superintendent of construction with the Compressed Gas Capsule Co., 1899–1900, during which time he was engaged upon work for the company in Europe, and at Bridgeport, Conn., where a factory, 200 × 60 feet, with a capacity of 300,000 "Sparklets" per diem, was constructed by him. As refrigeration expert with Ladenburg, Thalman, & Co., New York, in 1900, he assisted in the erection of the 360-ton ice-plant of the Standard Ice Manufacturing Co., in Philadelphia.

He took out patents in August, 1900, for a mechanical system of freight-car refrigeration on the carbonic-acid system, and, interesting capitalists in the project, he resigned his former position, July 10, 1901, and began to develop the mechanical refrigeration-car business, and also became manager of the



Mechanical Refrigerator Car
W. H. Miller

Erie Exploration Co. The United States Refrigerator Car Co. was organized in Philadelphia, June 28, 1902, with Mr. Miller as

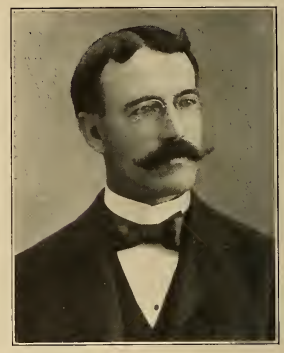
president. During the fall and winter of 1902 Mr. Miller took out five additional patents for mechanical car-refrigeration. He also finished a series of experiments with electric condensers used with his own simplified types of "rheocrats," and took out patents on which the Erie Exploration Co. was reorganized. In December, 1902, he was commissioned by Charles E. Levy, of New York, to conduct investigations with static electrical machinery for producing light, and by F. Schoff, of Philadelphia, to develop a line of electrical rivetting and portable tools. In February, 1903, the United States Refrigerator Line was organized, with Mr. Miller as its first president, to operate between North Carolina, Delaware, and New York in the transportation of fruits over the Seaboard Air Line and Pennsylvania railroads. The illustration herewith shows one of the refrigerating cars and its inventor.

He is a member of the Theta Xi fraternity. He was a member of the Engineers' Club of New York until 1902. He was a member of the Shipping Information Commission during the Spanish War.

Mr. Miller is the son of Everard P. and Sophie Hastings Miller. He married Susan Barse, November 15, 1899.

Mitchell, Harvey F. (M.E., '84), was born at Machiasport, Me., January 9, 1859. He followed the sea ("before the mast") for several years; and before entering Stevens Institute was a bookkeeper for three years. He was with the Brooks Locomotive Works, Dunkirk, N. Y., as assistant in the draughting-room, and principal of the night school for apprentices, 1884; and was tutor in the College of the City of New York, 1884–93. In 1885 he organized and arranged a course for a manual-training department in the Institution for the Improved Instruction of Deaf-Mutes, New York, of which institution he was assistant principal and superintendent from 1896 to 1900. In the latter year he became instructor in the Department of Physics of the College of the City of New York. Before accepting the latter position he was secretary and treasurer of the Everett Transportation & Commercial Co., Inc., Everett, Wash. Mr. Mitchell was one of the lecturers for the Board of Education of New York city, and also Eastern agent for the Lost Creek and Sunset mining companies of Washington. From 1884–87 he was a member of the American Association for the Advancement of Science, and he is a member of the Beta Theta Pi fraternity.

Mr. Mitchell is the son of Forrest and Miranda Mitchell. He married Marcie Forsyth, June 19, 1890 (deceased), and Marie Theresa Eustis, April 14, 1900. He has one child, Gladys Virginia Mitchell.



H. F. Mitchell

Moeller, Franklin (M.E., '87), was draughtsman with Johnson & Morris, steam-heating engineers, New York; assistant engineer with the Welsbach Incandescent Gas Light Co., New York; draughtsman with the Ingersoll-Sergeant Rock Drill Co.; draughtsman, chief draughtsman, and assistant to general manager of the Webster, Camp, & Lane Machine Co., Akron, O.; mechanical engineer with the William A. Harris Steam Engine Co., Providence, R. I.; designer with the Guild & Garrison Steam Pump Works, Brooklyn, N. Y.; and has been with the Webster, Camp, & Lane Machine Co., Akron, O., from 1901 to date. He is a junior member of the American Society of Mechanical Engineers.

Moffit, Robert (M.E., '00), is with the Burlee Dry Dock Co., Port Richmond, N. Y.

Moore, Albert Bridges (M.E., '90), was born in Elizabeth, N. J., April 4, 1868. He



A. B. Moore

was hull draughtsman with the Samuel L. Moore & Sons Co., Elizabeth, N. J., 1890–92, having entire charge of the ship building ironwork; and became foreman ironworker in the same company in 1892, and eighteen months later vice-president and assistant superintendent. He was superintendent of the Marine Engine & Machine Co., Harrison, N. J., builders of Alco-Vapor launches and New Standard electric elevators, 1899–1902. This company has erected an entirely new plant since 1899, the original building, 200 × 100 feet having been extended to 332 feet in length and of modern steel construction. A foundry was erected and equipped with all modern appliances, with an initial cupola capacity of 15 tons per hour, and so planned as promptly to meet further requirements. A 600-horse-power electric-power plant was erected, and equipped with direct-connected compound condensing generator sets; and a 75-horse-power compound condensing air-compressor for operating pneumatic hoists, drills, shippers, etc., was installed. This work was under the supervision of Mr. Moore, who in addition entirely redesigned the launch motors turned out by the company. He has recently been engaged upon special work with the Tirrill Gas Machine Lighting Co., of Newark, N. J., and in April, 1904, took charge, as shop superintendent, of a new plant at Bridgeport, Conn., belonging to the Eaton, Cole, & Burnham Co., manufacturers of valves, fittings, etc. In 1903 a United States patent was issued to him for an improvement in feed pumps. He is a member of the American Society of Mechanical Engineers, the Essex Club of Newark, N. J., and of the Chi Psi fraternity.

Mr. Moore is the son of Miller F. and Helen S. (Brown) Moore. He married Ethel G. Field, June 10, 1896, and they have one child, Margaret Moore.

Moore, MacMartin Niven (M.E., '98), was born in Elizabeth, N. J., July 4, 1877; son of Thomas and Constance Rosalie (Tait) Moore. He is descended from Nathaniel Bacon on one side of the family, and from Robert Fulton on the other. He was engaged as Assistant Instructor at Stevens Institute during the Supplementary Term following his graduation, and upon the completion of this work he took a position in the engineering department of the New York



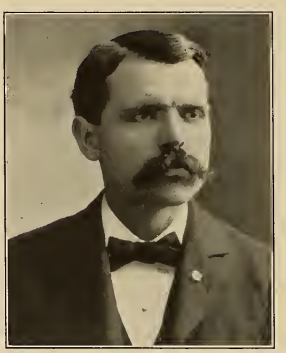
M. N. Moore

Air Brake Co., at Watertown, N. Y. He remained with this company until his death, which occurred, from consumption, May 20, 1901.

Moore, William J. (M.E., '00), Assistant Professor of Electrical Engineering at Ste-

vens Institute of Technology, Hoboken, N. J. For biography, see page 278.

Morley, Charles Norman (M.E., '99), was born in Ashland, O., July 28, 1875; son of Charles and Normanda Harriet (Smith) Morley. He attended public schools in Akron, O.; then studied with a private teacher and entered Stevens Preparatory School in 1894 and Stevens Institute in 1895. He was located at the Spalding & Jennings Steel Works, Jersey City, N. J., from 1899 to 1904, his work consisting almost entirely in the development of an accurate and systematic cost system for the works. He left the Spalding & Jennings Works, now controlled by the Crucible Steel Company of America,



C. N. Morley

to enter the Engineering Department of the New York & New Jersey Telephone Co., Brooklyn, N. Y.

Morris, Anthony Saunders (M.E., '84), was born in Philadelphia, Pa., April 13, 1862. He was with Henry G. Morris, Philadelphia, 1885–86; superintendent with the Julien Electric Co., Camden, N. J., 1886–87; employed in the shop course, as draughtsman, operating and erecting engineer, and as assistant to electrician, etc., with the Westinghouse Electric Co., Pittsburg, Pa., 1887–90; detailed to the Brush Electric Co., Cleveland, O., in charge of alternating apparatus, as electrician, for the Thomson-Houston Electric Co., Boston, Mass., 1890–91; correspondent and afterward in charge of the polyphase depart-



A. S. Morris

ment for the Westinghouse Electric Manufacturing Co., 1891–98; and was transferred to Philadelphia in 1898, with headquarters at that point, where he is still engaged in a general engineering and selling work in all parts of the United States. He is a member of the American Institute of Electrical Engineers; the Merion Cricket Club, of Philadelphia; and of the Theta Xi fraternity.

Mr. Morris is the son of Henry G. and Sally Marshall Morris. The family is of Welsh origin and settled in Philadelphia about 1680. He married Elisabeth Hicks Wood, October 15, 1890, and they have two children, Anthony Saunders and Wistar Morris.

Morris, William Cullen (M.E., '96), was born in Jersey City, N. J., February 3, 1874. He was a mechanic in the Newark shops of the Consolidated Traction Company of New Jersey, 1896; engineers' assistant at the Ravenswood works of the New Amsterdam Gas Co., Long Island City, N. Y., 1896–1900; superintendent of those works, 1900–03; and has been engineer to the same company, New York, from 1903 to date. He is a member of the American Gas Light Association, to which he has presented the following papers: "Separation of Tar from Water-

Gas," 1900; "Test of a High-Power Incandescent Gas Lamp," 1902; and "Notes on Operation of Large Carburetted Water-Gas Sets," 1903, which were read before the Association and published in its *Proceedings*. He is also a member of the Chi Phi fraternity.

Mr. Morris is the son of Theodore Frelinghuysen and Gertrude Vreeland (Johnson) Morris. He is descended from the Major Joseph Morris branch of the Morris family and the Peter Stryker family on his father's side, and from the Vreeland family of New Jersey on his mother's. He married Edna Frances Bennett, September 29, 1897.

Morrison, Henry Kent (M.E., '86), was born in Gambia, O., November 12, 1864. He was with the Pennsylvania Railroad, 1886–87; with the Welsbach Incandescent Gas Light Co., 1887–89; assistant superintendent, for the United Gas Improvement Co., of the gasworks at Jersey City, N. J., 1889–93; and has been superintendent of the Concord Light & Power Co., Concord, N. H., from 1893 to date. He has taken out patents on a coal-handling device, and on a fire-condition indicator, and is the author of papers (read before the New England Association of Gas



H. K. Morrison

Engineers) on "Advertising" and "Gas Appliances" in 1899 and 1903 respectively. He is a member of the New England Association of Gas Engineers; the American Gas Light Association; and of the University Club.

Mr. Morrison is the son of Archibald M. and Margaret C. Morrison. He married Emma Marshall Howard-Smith, December 6, 1888, and they have four children, Howard Archibald, Archibald Stone, Alexander, and Theodore Morrison.

Morton, Frederick Nash (M.E., '86), was born in Hoboken, N. J., September 16, 1864.



F. N. Morton

He was with the United Gas Improvement Co., Philadelphia, engaged in the draughting-room and in making trips to the various gas-works operated by the company, 1886–88; was superintendent of the St. Albans Gas Light Co., St. Albans, Vt., 1888–94; superintendent and manager of the Lockport Gas & Electric Light Co., Lockport, N. Y., 1894–95; with Humphreys & Glasgow, New York, 1895–97; superintendent of the Hudson County Gas Light Co., Hoboken, N. J., 1897–1903; and has been assistant engineer with the United Gas Improvement Co. from 1903 to date. He contributed various short articles to the "American Gas Light Journal" and to "Progressive Age." On October 19, 1899, he read a paper on "Another View of Interior Illumination" before the American Gas Light Association, of which he is a member.

Mr. Morton is the son of Edmund L. and Josephine (Holdich) Morton. He is descended from John Morton, an officer who came to New York with the British army before the Revolution. When the war broke out he contributed such sums to the cause of the patriots that he was known as the "Rebel Banker." Frederick Nash Morton married Ellen Harwood Rich, June 22, 1892, and they have two children, Edmund Rich and Dorothy Ludlow Morton.

Morton, Henry Samuel (M.E., '97), was born in Hoboken, N. J., May 24, 1874. He



H. S. Morton

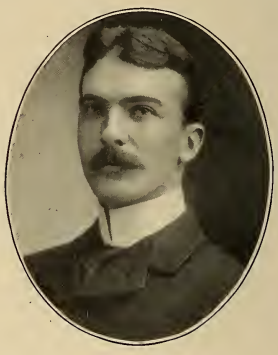
attended the New York Law School, 1897–99; was admitted to the Bar of New York State and of the United States Circuit Court, 1900; and has since practised law in New York city, making a specialty of patent litigation and applications. For a period of two years, from 1900 to 1902, he was associated with Mr. Harold Binney, but since the latter year he has been in business for himself. He is also secretary and treasurer of the Nash Engineering Co., New York.

He is a member of the St. Nicholas and Baltusrol Golf clubs, the New York Yacht Club, and of the Delta Tau Delta and Phi Delta Phi fraternities.

Mr. Morton is the elder son of Henry and Clara Whiting (Dodge) Morton. His father was the first president of Stevens Institute of Technology. He married Sarah Chapman Bronson, April 23, 1902.

Morton, Quincy L. (M.E., '02), is the second son of Henry and Clara Whiting (Dodge) Morton. His father was the first president of Stevens Institute. He superintended the construction of the Morton Memorial Library at Pine Hill, N. Y.

Mott, Charles Stewart (M.E., '97), was born in Newark, N. J., June 2, 1875. He served five years in the naval militia of the State of New York. In April, 1898, he enlisted in the United States Navy and served during the Spanish-American War as gunner's mate on the U.S.S. "Yankee." At the conclusion of his sophomore year he went abroad and took up a six-months' course of zymotechnology, studying yeast culture, after Hansen's method, under Prof. Jorgensen, of Copenhagen, after which he spent another six months studying the chemistry of fermentation, under Dr. Lintner, at Munich. He then returned and completed his junior and senior years, and upon graduation became actively engaged with C. S. Mott &



C. S. Mott

Co., New York, manufacturers of carbonating apparatus, of which firm he had become a member during his senior year. In 1900 the business was absorbed by the Weston-Mott Co., of Utica, Mr. Mott taking the office of vice-president and charge of all

manufacturing, etc. He is a member of the American Society of Mechanical Engineers; the Utica Chamber of Commerce; the Yahnundasis Golf Club; and the Automobile Club of Utica.

Mr. Mott is the son of John C. and Isabella T. (Stewart) Mott. He is a descendant from the French Huguenot family De La Motte. He married Ethel Culbert Harding, June 14, 1900, and they have one child, Aimée Mott.

Mount, Albert R. (M.E., '91), was born in Jersey City, N. J., May 1, 1870; son of Samuel C. and Martha Rynders Mount. One of his ancestors was George Mount, who came from England and settled at Middletown, N. J., in the seventeenth century, being one of the original purchasers from the Indians and a grantee of Governor Nichols. His mother's ancestors settled in Dutchess County, N. Y., about the year 1700. Immediately after graduating he was employed as draughtsman at the Wallis Iron Works, Jersey City, N. J. In the spring of 1893 he went to Philadelphia and was engaged as draughtsman upon a new electric power house. He was taken ill with typhoid fever in July, and died at Sea Girt, N. J., August 13, 1893. He draughted the bridges



A. R. Mount

which now span the Pennsylvania and the Central of New Jersey railroads at the crossing of the Hudson County Boulevard, Jersey City, N. J.

Mowton, Edward Pearsall (M.E., '86), was born in New York city November 15, 1863. He graduated from the public schools,



E. P. Mowton

worked as an apprentice in the pattern-shop of the Continental Iron Works, Greenpoint, L. I., remaining for three years, and then entered Stevens Institute. Shortly after graduation he went to Germany and took a course in electricity, under Dr. Kohlraush, at the Polytechnicum, Hanover. Upon his return in 1887 he went to work with the Edison Electric Illuminating Co., New York, assisting in the installation of the company's underground system for the distribution of electricity from the 26th and 53d streets stations, 1887–88; was assistant to the president and engineer of the Newark Gas Light Co., Newark, N. J., 1888–91; and attended the New York Law School, and at the same time studied law in the office of Booraem, Hamilton, Beckett, & Ransom, New York, 1891–93. He received the degree of Bachelor of Laws and was admitted to the bar in May, 1893, and has since been actively engaged in the practice of law in New York. He is a member of the General Society of Mechanics and Tradesmen, and of the Association of the Bar of the City of New York.

Mr. Mowton is the son of Charles Carroll

and Adèle E. Mowton. His paternal ancestors came from England and settled in Maryland in 1752. John Mowton was the first engineer in charge of the New York Gas Light Co., which position he retained until his death, when he was succeeded by his son, Charles C. Mowton, who remained with the company until the formation of the Consolidated Gas Co., after which he was retained until his death in 1889. E. P. Mowton's maternal ancestors came from Philadelphia and were early settlers from Holland. He married Mabel W. Mason, September 30, 1896, and they have three children, Edward M., Adèle, and Eleanor Mowton.

Moynan, Frank (M.E., '90), was in the engineering department of the Third Avenue Cable Road, New York, 1890–91; and since then has been with the Illinois Steel Co., South Chicago, Ill., and in the real-estate business, South Chicago, Ill., under the firm name of Edwards & Moynan.

Muldaur, George Barton (M.E., '89), was born in Dover, Del., August 1, 1866. He was in the office of Edward P. Thompson (M.E., '78), patent expert, 1889; with the Edison Electrical Illuminating Co., New York, 1889–90; on the editorial staff and, later, "World's Fair" editor and associate editor of the "Electrical Engineer," 1890–95; was on the staff of the "Evening Sun," New York, 1893; in the New York office of the Fidelity & Casualty Co., as investigator of accidents relating to machinery, etc., 1895–96; examiner of claims for the same company, for Western and Central New York, 1896–98; in the insurance business in New York, 1898–1901; and is now sales and manufacturer's agent in that city. He is a member of the Mattano Club, Elizabeth, N. J.; the Military Order of the Loyal Legion; and of the Theta Xi fraternity.

Mr. Muldaur is the son of Alonzo W. and Elizabeth H. (Sayre) Muldaur. His father (of Russian family) was a lieutenant-commander in the United States navy when he was lost on board the U.S.S. "Oneida" at Yokohama in 1870. The subject of this sketch married Caroline Southmayd, June 14, 1894, and they have two children, George Barton and Theodora Muldaur. Another child, Dayton S. Muldaur, is deceased.

Munby, Ernest John (M.E., '97), was born in Turvey, Bedfordshire, England, May 19, 1875; son of the Very Rev. George Frederick Woodhouse and Harriet Louisa (Linton) Munby. His father has been rector of Turvey from 1870 to date, and his grandfather



E. J. Munby

was Joseph Munby, J. P. of York and the wapentake of Bulmer, Yorkshire, in which county the family has been for some sixteen generations, giving its name (corrupted) to the village of Mumby. He was educated at Bedford Grammar School and at Rugby, being the Royal Humane Society's medallist at the latter in 1891. He was engaged in gold-mining in the West, 1897–98; engineer on the first gold-dredgers in the United States, at Breckenridge, Colo., 1898; acting superintendent of gold-dredging operations on rivers in Borneo, for the Chartered Company of British North Borneo, 1899, and chief engineer of the same work, 1899–1900. In May, 1900, he was compelled to resign his position on account of incessant fever. He then went to the Philippine Islands, where he was engaged as chief assistant engineer on the United States government $1,500,000 refrigeration plant then under construction. Continued ill health compelled another change, and after six months he left for China and Japan, spending two months in the latter country, recuperating, and then returned to the United States, settling at

Denver, Colo., in the employ of the Gardner Electric Drill & Hammer Co. He has been chief engineer of the European branch of this company in London, from 1901 to date, and has put in rock drills and electric plants at mines in Lancashire, Staffordshire, Carnarvonshire, Denbighshire, Norway, Portugal, Australia, South Africa, and Egypt. He is the author of the following papers: "Electric Rock-Drilling," read before the Royal Institution, February, 1902; "Electric Drills in Collieries," read before the South Staffordshire and East Worcestershire Society of Mining Engineers, Birmingham, April, 1902; and "Electric Drills," published in the *Stevens Institute Indicator,* July, 1903; and is an occasional contributor to the European edition of *Power.* He is a member of the Beta Theta Pi fraternity.

Munkwitz, Edward H. (M.E., '85), is located at Milwaukee, Wis.

Munkwitz, William H. (M.E., '85), is located at Milwaukee, Wis.

Murphy, Edward J., Jr. (M.E., '98), was born in New York city August 5, 1876; son of Edward J. and Margaret A. Murphy. He attended the New York public schools, and prepared for entrance to Stevens Institute at the De La Salle Institute, New York city, and at the Stevens School, Hoboken, N. J. He entered the draughting department of the Metropolitan Street Railway in 1898, and was engaged on work for the track and structural divisions of the road. In 1899 he became a member of the Kruse & Murphy Manufacturing Co., New York., makers of a special line of textile machinery, and has continued in the firm to date. His graduating thesis, written with Mr. P. E. Van Saun, on "Test of a Multi-Circuit Direct-Current Dynamo," was printed in the *American Electrician,* November, 1898.

Murray, John Heber (M.E., '92), was born in Milton, Pa., June 24, 1868; son of S. Wilson and Sarah Matilda (Meckly) Murray. He is descended from John Murray, who came from Scotland in 1732 and settled in Pennsylvania. Members of his family served as officers in the Revolutionary War, and as members of the Pennsylvania Assembly, the State Senate, and the 17th Congress. The subject of this sketch graduated from Dickinson College, Carlisle, Pa., in 1889. He entered the engineer's office of the New York, New Haven, & Hartford Railroad in the fall of 1892, but an affection of the eyes compelled him to resign in the following spring. During the summer of 1894 he was employed by his father, at Milton, Pa., but in September of that year was taken ill with tubercular consumption, and despite a southern trip his health gradually failed, and he died at Carlisle, Pa., June 18, 1895.



J. H. Murray

He married Margarett Bosler, December 23, 1890, and one child, Samuel Wilson Murray, Jr., was born to them.

Muschenheim, F. A. (M.E., '91), was with the Haskin Wood Vulcanizing Co., New York, 1891–93; and the Western Electric Co., at their works in Chicago, and in New York city, 1893–1904. He is now engaged with his brother in the management of the Hotel Astor, New York city. He is an associate member of the American Institute of Electrical Engineers.

Myers, Allan Chalmers (M.E., '98), was born in Tyrone, Pa., February 19, 1873; son of Henry and Nancy Myers. He was with the Cambria Steel Co., Johnstown, Pa., 1898–1900; and has been first assistant special

mechanical engineer for the Carnegie Steel Co., at the Edgar Thomson Steel Works and



A. C. Myers

Furnaces, Braddock, Pa., from 1900 to date. He is a member of the Tau Beta Pi fraternity.

Myers, Charles H. (M.E., '99), was draughtsman with Post & McCord, Brooklyn, N. Y., 1899; in the shops of the Missouri, Kansas, & Texas Railroad, Smithville, Tex., 1899–1900; later assistant inspecting engineer with the Panama Railroad Co., New York; and has been erecting engineer with Westinghouse, Church, Kerr, & Co., New York, from 1903 to date.

Myers, Cornelius Tiers (M.E., '00), was born in Elizabeth, N. J., March 23, 1879; son of James Lawrence and Amelia Ogden (Allen) Myers. He graduated in 1896 from the Pingry School, Elizabeth, N. J.; was with the American Engine Co., Bound Brook, N. J., 1900–01; with the John A. Mead Manufacturing Co., engineers and manufacturers of coal-handling machinery, 1901–02; engineering draughtsman at the Tarrytown (N. Y.) shops of the Rand Drill Co., manufacturers of air compressors, tools, etc., 1902–03; and has been air-compressor representative at Pittsburg, Pa., of the International Steam Pump Co., of New York, from 1903 to date. He is a member of the Beta Theta Pi fraternity.

Myers, Edwin L. (M.E., '78), was born in Plattsburg, N. Y., January 18, 1858; son of John Henry and Julia R. Myers. He was with the Sawyer-Man Electric Light Co., New York, until his death, which occurred February 26, 1881.

Nash, Lewis Hallock (M.E., '77), was born in South Norwalk, Conn., April 16, 1852. He served his time as apprentice in the Norwalk Iron Works from 1869 to 1873. He has been with the National Meter Co., New York, since 1877, when he began designing improvements in water-meters, and after a few months produced the "Crown" meter, the first of a large class which may be described as single-piston rotary meters, and which, though it has now been in the market for more than twenty-five years, still holds place as the best of its kind. Later he invented several other forms of water-meter, such as the "Empire," "Nash," and "Improved Gem," which the same company, now grown to large proportions, and employing many hundreds of men, are at present manufacturing by the thousand. The single-piston rotary meter has practically superseded all other forms of dis-



L. H. Nash

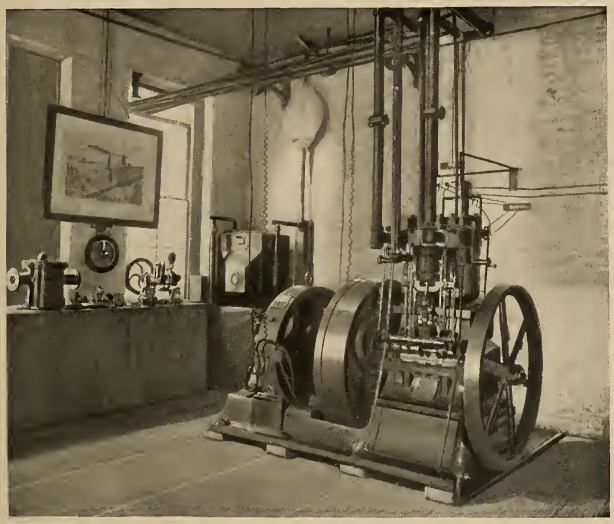
placement water-meter. Mr. Nash has taken out and assigned to his company about sixty United States patents on water-meters.

In 1884 Mr. Nash began the study of the

gas engine and since that time he has taken out over sixty patents, all of which have been assigned to the National Meter Co. Many of these patents are extensively used by engine manufacturers, one being for the two-cycle engine with piston-controlled valves, which is said to be manufactured at the present time by more than two thousand firms. Another one of his patents covers the starting of gas engines by the use of compressed air; this feature has been adopted by all makers of large gas engines. The National Meter Co. is now manufacturing engines up to 150 horse-power. The company has never prosecuted infringers of their gas-engine patents.

Mr. Nash was elected Alumni Trustee of the Stevens Institute of Technology in 1897. He contributed an article on the "Testing of Large Water-Meters" to the *Stevens Institute Indicator*, January, 1901. He is a member of the American Society of Mechanical Engineers, and of the New York Electrical Society.

Mr. Nash is the son of Francis H. and Sarah M. (Hallock) Nash. He is descended from the early settlers of the old town of South Norwalk. He married Anna M. Archer July 2, 1883, and they have four children, Marion Hallock, Douglas Elliott, Mildred Archer, and Harold Lewis Nash.



20-Horse-Power Nash Gas-Engine in the Electrical Laboratory
Lewis H. Nash

Nathan, Alfred (M.E., '90), was born in New York city, November 21, 1866. He is now vice-president of the Nathan Manufacturing Co., New York; secretary and director of the International Steam Pump Co., New York; director of the Ludlow Valve Manufacturing Co., Troy, N. Y.; and secretary of the Lakewood Hotel Co. He is a member of the Beta Theta Pi fraternity, and a junior member of the American Society of Mechanical Engineers.

Mr. Nathan is the son of Max and Rosalie Nathan. He married Mabel Lauer, Oc-

tober 26, 1902, and they have two children, Madge Lauer and Alfred Max Nathan.

Nettleton, Lloyd Henry (M.E., '91), was born in Washington, Conn., October 25, 1868. He has been with Gillis & Geoghegan, New York, engineers and contractors for power, steam and hot water heating, and ventilating plants, from 1891 to date. The work of this firm is mostly confined to large office, hotel, and hospital buildings, and includes boiler, pump, and tank installations, and the connections of engines in addition to the heating and ventilating plant. Mr. Nettleton was assigned to the engineering department, and has been engaged during the past thirteen years in estimating, preparing plans and specifications, and superintending the erection and construction of heating and ventilating plants, etc., and has had charge of some of the largest work of the firm. He is a member of the Royal Arcanum and is now secretary of Hoboken Council No. 99 of that order. He is a trustee of the Free Public Library of Hoboken, N. J., for the term 1898–1905.

Mr. Nettleton is the son of Henry S. and Martha (Bronson) Nettleton. His father's ancestors were among the first settlers in



L. H. Nettleton

Connecticut, record being found of them in old Milford in 1636. On his mother's side he is descended from the well-known Mosley family of Revolutionary times. He married Reba Hedges, February 1, 1894, and they have one child, May Edna Nettleton.

Newell, Charles Zenas (M.E., '98), was born in Whitestone, Long Island, N. Y., No-

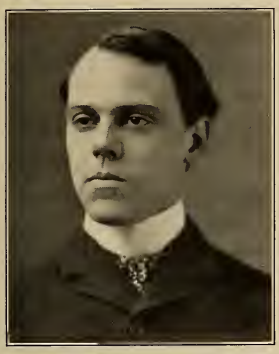


C. Z. Newell

vember 3, 1874; son of Zenas Edgar and Anna Cornelia (Sneden) Newell. He was in the motor wagon department of James Orin Noakes & Co., coach-makers, New York, 1898–1902; and has been with the Federal Leather Co., New York, having charge of the office and of the production of new and special work, from 1902 to date. In 1904 he drew plans for a frame dwelling which has been completed and is now occupied by one of the members of the firm. He has also designed and recently completed the plans for a new brick factory building for the Federal Leather Co.

Newell, Harvey Edgar (M.E., '98), was born in Whitestone, Long Island, N. Y., September 29, 1876; son of Zenas Edgar and Anna Cornelia (Sneden) Newell. He was with the Western Electric Co., New York, 1898; electrician with the India Rubber & Gutta Percha Insulating Co., Yonkers, N. Y., 1898–1900; and is now employed by this company as mechanical and electrical engineer. He is a junior member of the American Society of Mechanical Engineers,

and an associate member of the American Institute of Electrical Engineers.



H. E. Newell

Newman, Leslie Herbert (M.E., '00), was born in Flatbush, Long Island, N. Y., April



L. H. Newman

23, 1872; son of William B. and Elizabeth G. (Bogardus) Newman. His father is commander, and his grandfather captain, in the United States navy. He was with the Moose River Power Co., Lyons Falls, N. Y., 1900–01; in the testing department of the General Electric Co., Lynn, Mass., 1901; with Chambers & Hone, consulting engineers, New York, in charge of the construction of the new power house for the Fonda, Johnstown, & Gloversville Railroad, Akin, N. Y., 1902–03; superintendent with the St. Lawrence County Electric & Water Co., Massena, N. Y., 1903–04; and has been superintendent of the Laurentide Paper Co.'s steam plant at Grand Mire, P. Q., Canada, from March, 1904, to date. He is a member of the Delta Tau Delta fraternity.

Nichols, Frank B. (M. E., '78), attended a medical college in New York after graduation, but discontinued his studies when he found the profession uncongenial. He then entered the employ of the Standard Oil Co., being connected with the Weehawken (N. J.) docks, where he remained four or five years. In 1883 he became associated with Mr. William H. Sheldon (M.E., '78) in the Keystone Rubber Co., acting as its treasurer for several years, and was also interested as vice-president in the Sonneborn Comb & Novelty Co. His death, which was due to consumption, occurred July 10, 1886.

Nichols, Frederick William (M.E., '02), was born in New Haven, Conn., August 1,



F. W. Nichols

1879; son of Augustus Charles and Mary Lundy Nichols, of English and Scotch de-

scent respectively. He was electrician in the engineering department of the New York & New Jersey Telephone Co., later with Hurd & Co., New York, and is now with the New York Safety Steam Power Co.

Norcross, Joseph Arnold (M.E., '91), was born in Derby, Conn., December 27, 1869.



J. A. Norcross

He was with the Consolidated Gas Co., New York, 1891–92, serving in the street department, and then at the 99th Street and 111th Street works, where his duties were principally those of chemist. He superintended, for the United States government, the rebuilding of the gasworks at West Point, N. Y., 1893; and from 1894 to 1903 was with Messrs. Humphreys & Glasgow, of London and New York, at first as engineer in charge of construction and initial operation of carburetted water-gas works at Brussels, Tottenham, Swansea, and Shanghai. After having sole charge of starting and operating additional works in numerous European towns (Liverpool, London, Brussels, etc.) he became chief expert in gas-manufacture in the London office, in which capacity he had immediate personal charge of the initial operation of thirty additional gasworks and general supervision of about thirty more, aggregating altogether a capacity of 100,000,000 cubic feet per day. He held the position of principal assistant to the managing partner from 1900 to 1903. In 1896 he was appointed consulting engineer to the Derby Gas Co., Derby, Conn. He has been engineer to the New Haven (Conn.) Gas Light Co. from 1903 to date.

In conjunction with A. G. Glasgow (M.E., '85), he took out a patent on improvements in the operation of carburetted water-gas plants. He is a member of the American Gas Light Association; the American Society of Mechanical Engineers; the Society of Gas Lighting; the New England Association of Gas Engineers; the University Club, of New York; the Whitehall Club, of London; The Graduates', Quinnipiack, and Country clubs of New Haven; and of the Delta Tau Delta fraternity.

Mr. Norcross is the son of Henry Fanning and Susan Brainard (Arnold) Norcross, of English ancestry on both sides, mostly settled in New England since the seventeenth century. He married Cellissa Brown, May 27, 1902.

Norris, Henry Lee (M.E., '02), was born in Edinburgh, Scotland, May 13, 1879; son of Henry Lee Norris, M.D., and Charlotte Mary (Urquhart) Norris. He made two voyages as cadet engineer on the American Line steamship "St. Paul," while a student at Stevens Institute. He was draughtsman with the Robins Conveying Belt Co. during the summer of 1900, while a student at Stevens. During the summer of 1901, while engaged with the superintendent of buildings and grounds at Columbia University, he designed and constructed a tunnel for the accommodation of steam lines and electric conduits between the Engineering Building and Earl Hall. At the completion of his college course in 1902, he resumed relations with the superintendent at Columbia University.

Norris, Rollin (M.E., '85), was engaged in draughting for Bartlett, Hayward, & Co., Baltimore, Md., 1885–87; and now holds the position of superintendent of works in the engineering department of the United Gas Improvement Co. of Philadelphia. He is a member of the American Gas Light Association (of which he was second vice-president in 1902, and was elected president in October, 1903); and of the Western Gas

Light Association. He has taken out several patents. He read the following papers before the American Gas Light Association: "The Theoretical Effect of Pre-Heating Blast Steam and Oil in Water-Gas Manufacture," 1891; "Some Experiments with the Edgerton Standard," 1899; and "The Harcourt Ten-Candle-Power Pentane Lamp," 1900.

Ode, Randolph Theodore (M.E., '98), was born in New York city August 10, 1878; son of Adolph and Annie Ode. He studied at the College of the City of New York for two years. He was assistant engineer with the Merchants' Refrigerating Co., New York, 1898–1900; and has been with the Providence Engineering Works from 1900 to date, having had charge of the sales department at Providence for some time. He is now secretary of the company. He is a junior member of the American Society of Mechanical Engineers; a member of the



R. T. Ode

University Club, of Providence, R. I.; and of Kane Lodge of the Order of Free Masons.

Oelbermann, Julius (M.E., '91), was born in Philadelphia, Pa., December 24, 1868. He was draughtsman with Bement, Miles, & Co., machine-tool builders, Philadelphia, 1891–92; draughtsman with William Wharton, Jr., & Co., Inc., street-railway contractors, and afterward supervising engineer of construc-



Julius Oelbermann

tion for this firm during the building of two roads in Philadelphia, 1892–94; salesman with the Link-Belt Engineering Co., Philadelphia, 1895–96; and with Brenniser, Stillwagen, & Co., Philadelphia, 1897–99; and has been a member of the firm of William D. Oelbermann & Co., importers of wool, hair, and noils, Philadelphia, from 1900 to date. He is a member of the Chi Psi fraternity.

Ogden, Frederic D. (M.E., '95), has been employed as chemist with the Equitable Gas Light Co., New York, and as assistant superintendent with the New Amsterdam Gas Light Co., New York, and as assistant superintendent of the Northern Gas Light & Coke Co., New York, 1899; and has been treasurer and director of the J. Edward Ogden Co., dealers in heavy hardware, New York, from 1900 to date.

Oliphant, Robert C. (M.E., '89), has been employed in the works of the Atlantic Refining Co., Philadelphia, Pa.; as draughtsman with the Link-Belt Engineering Co., Nicetown, Pa.; with the Harvey Steel Co., Newark, N. J., 1894–96; as manager in the New York office of the Snow Steam Pump Works; and is now located at Oakland, Cal.

Onderdonk, John Remsen (M.E., '89), was born in Jersey City, N. J., October 15, 1868; son of John Remsen and Rosina Onderdonk.



J. R. Onderdonk

He is descended from Adrian Onderdonk, who settled on Long Island in 1672. Henry Ustic Onderdonk, Bishop of Pennsylvania, and Benjamin Tredwell Onderdonk, Bishop of New York, were his great-uncles. Before entering Stevens he spent considerable time on the construction work of the Sea Wall, California; the Canadian Pacific Railway, British Columbia; and on the waterworks tunnel under Lake Michigan for the Chicago water supply, contracts for the above work being held by his uncle and father. He was with the Streeter-Amet Weighing & Recording Co., Chicago, having charge of the application of their track weighing and recording instruments on railroads in the East, 1889–90; with the Baltimore & Ohio Railroad as inspector of materials, spending considerable time in the draughting department, 1890–92; assistant engineer of tests of the same company, 1892–95 and engineer of tests, both physical and chemical, with offices and laboratories, at Mount Clare, Baltimore, Md., from 1895 to date.

Mr. Onderdonk has copyrighted several diagrams for use in calculating helical and elliptical springs, which were used in designing the latest springs in use on the Baltimore & Ohio Railroad equipment, also diagram showing draw-bar pull of all locomotives on all grades at all speeds, and the tonnage they are able to haul under those conditions. As engineer of tests he has charge of the testing of all new designs submitted, of tests of locomotives and all road and service tests, the inspection and testing of all material purchased for the motive-power department, also all material for locomotives and cars built by outside contractors, as well as the inspection of the erection of all new locomotives and cars. He is at present assisting in collecting data and writing a report on "Locomotives of Great Power," to be read at the meeting of the International Railway Congress to be held at Washington, D. C., in May, 1905. He is a member of the American Society for Testing Materials.

O'Neil, Rowland Jesse (M.E., '01), was born in Claremont, N. H., September 30, 1878; son of David Webster and Jane A. (Gray) O'Neil, both of Scotch lineage. After graduation he entered the employ of the Parkersburg Iron & Steel Co., of Parkersburg, W. Va., as mechanical engineer, a position he held until the completion of



R. J. O'Neil

the plant, then becoming assistant manager, and holding that post until his death from typhoid fever at Parkersburg, January 1, 1903.

Ophüls, Frederick (M.E., '97), was born in Crefeld, Germany, August 18, 1876; son of Charles and Clara (Wilhelms) Ophüls. He was draughtsman and salesman with the De La Vergne Refrigerating Machine Co., New York, 1897–99; draughtsman with the Baldwin Locomotive Works, Philadelphia, 1900–01; with the Frick Co., Waynesboro, Pa., 1901; and has been mechanical engineer and estimator with the Vulcan Iron Works, San Francisco, Cal., from 1901 to date. His graduating thesis, prepared jointly with Messrs. Thomson and Tiemann of his class, on "Test of Nash Gas-Engine with Direct-Connected Dynamo," was published in the *Stevens Institute Indicator*, October, 1898, and reprinted in full in the *Water and Gas Review* for October of the same year. He is a member of the Olympic Club of San Francisco, and of the Tau Beta Pi fraternity.



Frederick Ophüls

Oppermann, Fred M. (M.E., '94), was born in Roux, Belgium, June 13, 1873. His father took out a number of patents for glass-furnaces, machinery, ovens, etc., and



Motor Car
F. M. Oppermann

designed the first tank for glass. The subject of this sketch was assistant superintendent at the Charleroi Plate Glass Works, Roux, Belgium, where he devised a plant for making wire-glass on the American system, 1894–95; superintendent of Works No. 3 of the Pittsburg Plate Glass Co., Ford City, Pa., 1895–96; secretary to M. Bailly, M.I.C.E., general agent in Europe for the Westinghouse Air Brake Co., located in Belgium, 1896–99; and has been with Malevez Frères, engineers, St. Servais, Belgium, designing and constructing steam motor-cars for heavy traffic, from 1899 to date. He has taken out several patents pertaining to steam-engines for this special work. He is a member of the Chambre Syndicate in Brussels (legal expert); of the Automobile Club of Belgium; and secretary of the Automobile Club in Namur.

Mr. Oppermann married Eugénie Petit, January 6, 1896, and they have two children. Lucy and Madeleine Oppermann.

Orr, Alexander Macklin, Jr. (M.E., '97), was born in New York city, October 10, 1875; son of Alexander M. and Margaret Young (Knox) Orr. His ancestors on the paternal side were Scotch and Irish, and on

the maternal side English and Scotch, among the latter being John Knox, the Reformer. Among the former who came to this country were founders of Southampton, L. I., Branford, Conn., and Newark, N. J.; and Abraham Pierson, whose father settled in Massachusetts in 1639 and was the first president of Yale University, founded in 1701. Before entering college young Orr attended Lyon's Collegiate Institute, New York, and the Stevens School. During the latter part of 1900 he travelled extensively in Great Britain and on the continent of Europe.

He was with R. W. Hildreth & Co., New York, inspecting and civil engineers, being



A. M. Orr, Jr.

located as inspector of shop-work at the Union Bridge Co.'s shops at Athens, Pa., and at those of the Elmira Bridge Co.; and as field inspector of erection, with headquarters at the above places, 1897–98; assistant superintendent at Orrs & Co.'s Troy and Mount Vernon Paper Mills, manufacturing news, hanging, and high-grade tissue papers, having immediate charge of the design and construction of new work, alterations, and repairs. He also carried on various tests and investigations resulting in a more economical and efficient operation of the plants, 1898–1901. For some time he was assigned to special work at the company's pulp mill, the Treadwell Mills, Pulp & Paper Co., on the Saranac River, near Plattsburg, N. Y., and, in the Adirondacks, as inspector and measurer of the spruce and other timber manufactured by the mill into wood pulp. Early in 1901 he went to New York as assistant sales manager of the firm, since incorporated as the Orr Paper Co. He remained with the company until December, 1902, when he resigned to become a special partner of Sadler, Perkins, & Field, naval architects and engineers, New York. He withdrew from this firm in September, 1903, and associated himself with Mr. Henry J. Gielow, engineer and naval architect, New York. Besides designing and superintending the construction, alteration, and repair of yachts and merchant vessels, this latter firm conducts a yacht and ship brokerage and marine-insurance business.

Mr. Orr is a member of the New York Yacht Club and the Strollers Club, New York; the Troy Club, and the Laureate Boat Club, Troy, N. Y.; the Albany Country Club, Albany, N. Y.; and the Delta Tau Delta and Tau Beta Pi fraternities. He was president of the Stevens Engineering Society.

Osborn, W. B. (M.E., '96), spent his spare time during the first three years of the course at the Institute in the office of the city engineer of Yonkers, N. Y., mainly on construction work in connection with the Fort Field distributing reservoir. During his senior year he was employed in the department of mains of the East River Gas Co., Long Island City, N. Y. He was assistant superintendent of the Lockport Gas & Electric Light Co., Lockport, N. Y., 1896–98, and has been constructing engineer of the Riter-Conley Co. from 1898 to date. After a few months with this company he was placed in charge, for them, of the erection of a gas plant for the People's Gas Light & Coke Co., Buffalo, N. Y.

Overton, Franklin F. (M.E., '96), was in the employ of the W. & A. Fletcher Co., marine-engine and boiler builders, Hoboken, N. J., 1896–97. During the latter part of 1898 he enlisted in the United States army as an electrician, and the following year went to Manila, P. I. He was later located at Peconic, Long Island, N. Y.

Mr. Overton married Susan Marie Sweet, September 13, 1904.

Owston, Charles William, Jr. (M.E., '99), was born in Franklin, Pa., February 8, 1878. He was assistant steam expert with the Illinois Steel Co., 1899; salesman with Marshall & Huschart Machine Co., 1899–1900; salesman with the Chicago Pneumatic Tool Co., 1900; president and general manager of the Eclipse Co., Inc., 1900–02; superintendent of the Railway Spring & Manufacturing Co., 1902; manager of the Washington plant of the Railway Steel Spring Co., 1902–03; and has been manager of the St. Louis plant of the same concern from 1903 to date. He is a member of the American Society of Mechanical Engineers; the Railroad clubs of New York and Pittsburg; and of the West Side Republican Club of New York.

Mr. Owston is the son of Charles W. and Emma L. Owston. He married Helen B. Strickland, December 1, 1902.

Page, Carter H., Jr. (M.E., '87), was born in Cobham, Va., September 4, 1864. He was in the employ of the Welsbach Incandescent



C. H. Page, Jr.

Gas Light Co., 1887; with the Welsbach Incandescent Gas Light Co., of the South, at New Orleans, 1887–88; with the Welsbach Incandescent Gas Light Co. of the Northwest, at Chicago, 1888; assistant engineer of the United Gas Improvement Co., 1888–89; superintendent of the Gate City Gas Co., Atlanta, Ga., 1889–92; inspector of appliances with the United Gas Improvement Co., 1892–97; assistant to the comptroller at the Philadelphia Gas Works, 1897–1900; and has been commercial agent of the United Gas Improvement Co. from 1900 to date. He is a member of the American and Western Gas Light associations; the City Club of New York city; the Masonic Order; and of the Chi Phi fraternity. He is an alumni Trustee of Stevens Institute.

Mr. Page is the son of Carter H. and Leila (Graham) Page, and of Virginia Colonial descent. He married Elizabeth H. Roberts, April 30, 1891, and they have three children, Richard Channing Moore, Edward Roberts, and Katherine Carlisle Page.

Paine, Leonard Gregory (M.E., '86), was born in Farmington, Conn., April 3, 1863. He has been secretary and treasurer of the Monson-Burmah State Co., Portland, Me.; connected with the Brown & Sharpe Manufacturing Co., Providence, R. I.; with the Pratt & Whitney Co., Hartford, Conn., and the International Paper Co., New York; and Philadelphia manager of the Standard Plunger Elevator Co., Worcester, Mass.

Mr. Paine is the son of Levi L. and Janette Holmes Paine. He married Elizabeth Carver Lane, October 14, 1891, and they have one child, Elizabeth Paine.

Palen, William De Witt (M.E., '89), was born in Canadensis, Monroe County, Pa., February 7, 1867. He was draughtsman, and later in the marine department under the superintendent, with the United Edison Manufacturing Co., New York, 1889–90; in charge of the testing department of the Crocker-Wheeler Motor Co., New York, 1890–91; with the Link-Belt Engineering Co., Nicetown, Philadelphia, 1891–95, at first as draughtsman, then upon outside work in charge of the installation of plants, and later as salesman, acting as agent at the Pittsburg office of the company; salesman for the New England States, for the Philadelphia Textile Machinery Co., Philadelphia, 1895–96, and chief engineer for the same company from 1896 to date. He has published "Palen's Pulley Chart," copyrighted in 1900. In 1902 he made a special series of tests on steel-disk ventilator-fans, with regard to volume, power, and pressure at different speeds and

under various restrictions to flow of air, in sizes from four to ten feet in diameter, and designed an extremely low pressure gauge for the purpose of the tests. He is a member of the Sigma Chi fraternity.

Mr. Palen is the son of Edward F. and Elizabeth (Northrop) Palen. He married Miss Van Horn, February 8, 1898.

Parish, William Henry (M.E., '02), was born in Newark, N. J., October 21, 1879; son of Mr. and Mrs. Thomas Parish. After attending Stevens Preparatory School, he worked one year before entering college, and after graduation was employed in the estimating and draughting department of the Herring-Hall-Marvin Safe Co., Hamilton, O., 1902; and is now inspector for the job-work department of the National Tube



W. H. Parish

Works, McKeesport, Pa. He is a member of the Phi Sigma Kappa and Theta Nu Epsilon fraternities.

Parker, Charles Francis (M.E., '84), was born in New York city November 17, 1862. He was assistant engineer with the Suburban Rapid Transit Co., New York, then engaged in building the Suburban Elevated Railroad above the Harlem River, 1884–90; member of the firm of Filley, Parker, & Filley, the Eastern representative of the Harvey Filley Aluminum Plating Co., of Brooklyn, N. Y., 1890–91; and was engaged as assistant engineer from 1891 to 1894 in designing and construction, first on the Otis Elevating Railway Co., Catskill, N. Y., then on the steel construction and general engineering work on several of the large office buildings in New York city, and finally in the engineering work in connection with the installation of elevators in the Glasgow Harbor Tunnel, Scotland. In 1894 Mr. Parker became associated with Mr. Charles W. Clinton, during which time he designed the steel construction in the Wilkes building and was general engineering superintendent for the construction of the Sheldon and Continental Insurance Co. buildings. He became connected with the Otis Engineering Co. in 1895, and was resident engineer during the construction of the Prospect Mountain Incline at Lake George, N. Y. In 1896 he became president of the firm of Charles F. Parker & Co., doing a general engineering business, among its prominent contracts being the design and construction of the Mount Tom Electric Incline Railway at Holyoke, Mass., in connection with which he patented a "turn-out"; and the deepening of the Erie Canal at Lockport, N. Y. Upon the dissolution of this firm in 1898 he established an office for general consulting and engineering work, and was consulting engineer to the Sprague Electric Co., but became ill after a few months, and died October 10, 1898. He was a junior member of the American Society of Civil Engineers and a member of the Engineers' Club of New York.

Mr. Parker was the son of Andrew J. and Helen Darlington Parker. He married Amy V. Sackett, November 20, 1895, and one child, Charles A. Parker, was born to them.

Parker, Franke Leclercq (M.E., '93), was born in Shanghai, China, February 28, 1871: son of Franke Henry and Marie (Leclercq) Parker. He worked his way through college; was employed on the *News and Courier,* Charleston, S. C., 1893–94; was inspector for the Sanitary Security Co., New York, 1894; engaged in electrical work for E. N. Bottsford in the Central Park apartments, 1894–95; with the Sprague Electric Elevator Co., New York, 1895; employed in editorial work on the *Engineering Record,* New York, 1896; engaged with Albert L. Webster, New

York, on inspection, draughting, and drainage work, 1896; in rapid transit survey work for H. de B. Parsons, New York, 1896–97; draughtsman with the Metropolitan Street Railway Co., New York, during the period



F. L. Parker

of conversion from horse to underground trolley power; draughtsman with the Electrical Vehicle Co., and with Albert L. Webster, 1898; member of the Consolidated Stock and Petroleum Exchange, New York, 1899–1900; and has been engaged in professional engineering work in Seattle, Wash., and at Nome, Alaska (two summers), from 1900 to date. Since 1902 he has been president and general manager of the North Star Railway Co., organized under the laws of the State of Washington for the purpose of building a mining railroad from Nome, Alaska, to the interior. He is a member of the Delta Tau Delta fraternity, and a charter member of the Pacific Northwest Society of Engineers, Seattle, Wash.

Parker, Thomas R. (M.E., '01), was with the Lehigh Valley Railroad Co., Easton, Pa., 1901–02; and has been with the Coal Saving & Heating Co., New York, from 1902 to date.

Parsons, Harry de Berkeley (M.E., '84), was born in New York city January 6, 1862. He was graduated from Columbia College, New York, in 1882, with the degree of Bachelor of Science, and two years later received the degree of Mechanical Engineer from the Stevens Institute of Technology. Since graduating from the Institute he has practised as consulting engineer in New York.

In 1886 he prepared plans for a tunnel under the Northumberland Straits from the mainland to Prince Edward's Island; and during the winter of 1886–87 was assistant engineer on the construction of the Fort Worth & Rio Grande Railway from Fort Worth to Granbury, sinking the coffer-dams and erecting the piers for the Brazos River bridge. He acted as one of the consulting engineers for the Nicaragua Canal Construction Co., and designed its machine-shops at San Juan del Norte, as well as boilers for some of the steamers owned by the Nicaragua Mail, Steam Navigation, & Trading Co.

Among the many industrial enterprises reported on or appraised by him, can be mentioned the Washington, D. C., street railways; the New Hampshire Traction Co.; the Southern Car & Foundry Co.; the St. Regis Paper Co.; the Rogers Locomotive Works; the Pressed Steel Car Co.; the William Cramp Ship & Engine Building Co.; the Seaboard Air Line Railway; the Crocker-Wheeler Co.; the Bass Foundry & Machine Co. including its iron ore lands; the Driggs-Seabury Gun & Ammunition Co.; the H. W. Johns Manufacturing Co.; and the Watertown & Carthage Traction Co. He designed the electric transmission plant for the Schaghticoke Powder Co.; and, associated with his brother, a 24,000-horse-power electric power plant and the masonry dam, 156 feet high by 1,400 feet long, for the Hudson River Water Power Co. He made plans for the dome of St. Matthew's Church, Washington, D. C.; heating plans for St. Paul's Church, Rochester, N. Y., and for Grace Church Settlement, New York; and was consulted in regard to the foundations of the John C. Calhoun Monument, Charleston, S. C., and the large stone columns of the Cathedral of St. John the Divine. He has done considerable work for the State of New York, especially in connection with the mechanical arrangements of the large State institutions. He has designed two fire-boats and an incinerating

plant for burning rubbish, for the City of New York.

Mr. Parsons has been Professor of Steam Engineering at the Rensselaer Polytechnic Institute, Troy, N. Y., since 1891; is consulting engineer for the Audit Company of



H. de B. Parsons

New York, for the New York Zoological Society, and also for many banking-houses in making examinations as to the value of industrial investments and combinations.

A partial list of his writings is as follows:

"The Influence of Sugar upon Cement," paper read before the American Society of Mechanical Engineers. *Transactions*, IX, 286.

"The Displacement and the Area-Curves of Fish," paper read before the American Society of Mechanical Engineers. *Ibid.*, IX, 679.

"An Improvised Ice-House." *Railroad and Engineering Journal*, April, 1890.

"Was It Iron or Steel?" *Ibid.*, January, 1892.

"Mechanical Aëration of Water." *Stevens Indicator*, January, 1893.

"Riveted Joints." *American Engineer*, February, 1893.

"Great Ships for the Great Lakes." *Harper's Weekly*, May 5, 1894.

"New York's Police Boat 'Patrol.'" *Ibid.*, June 23, 1894.

"New Police Boat for New York City," paper read before the American Society of Naval Engineers. *Journal*, VI, 345.

"An Interesting Well Experience." *Stevens Indicator*, October, 1895.

"Controversy about Boiler Efficiency." *Engineering Record*, February 22, 1896.

"The Expert Engineer." *Cassier's Magazine*, April, 1896.

"Fire Boats." *Ibid.*, May, 1896.

"American Fire Boats," paper read before the Society of Naval Architects and Marine Engineers. *Transactions*, IV, 49.

"The Law of the Conservation of Energy, as Related to Perpetual Motion and Similar Fallacies." *The Polytechnic*, May 22, 1897.

"Sewage Disposal." *Stevens Indicator*, January, 1899.

"The Tall Building under Test of Fire." *Engineering Magazine*, February, 1899.

"Sewage Precipitation Works of New Rochelle, N. Y." *Stevens Indicator*, April, 1899.

"Steam Pipes." *Ibid.*, April, 1900.

"Fire Hazards," paper read before Franklin Institute. *Journal of Franklin Institute*, September, 1900.

"Heating and Ventilating." *The Polytechnic*, December 20, 1900.

"Comparison of Rules for Calculating the Strength of Steam Boilers," paper read before the American Society of Mechanical Engineers. *Transactions*, XXII, 127.

"Grates for Steam Boilers." *The Polytechnic*, February 9, 1901.

"Smoke Prevention." *Ibid.*, June 3, 1902.

"A Small Rock-Fill Dam," paper read before the American Society of Civil Engineers. *Proceedings*, L, 351.

"Steam Boilers—Their Theory and Design," published by Longmans, Green, & Co., New York, 1903.

Mr. Parsons is an associate member of the American Society of Naval Engineers; and a member of the American Society of Civil Engineers; the American Society of Mechanical Engineers; the Society of Naval Architects and Marine Engineers; the New York State Commission to Examine Voting-Machines; the Chamber of Commerce of the State of New York; the Engineers', Union, American Yacht, and Country clubs, and of the Delta Psi fraternity. He has been vice-president and president of the Stevens Institute Alumni Association, and was Alumni Trustee of the Stevens Institute of Technology, 1896–99.

Mr. Parsons is the son of William Barclay and Eliza (Livingston) Parsons. He married Frances D. Walker, December 16, 1890, and they have two children, F. Livingston, and Katharine de B. Parsons.

Parsons, Washington Everett (M.E., '87), was born in Salisbury, Maryland, March 4, 1860. Although his youth was spent on a farm he learned while there, to run a sawmill, to erect machinery, and to survey land. He was at one time deputy county surveyor and for a while was assistant to one of the government engineers on rivers and harbors. He was draughtsman for E. J. Codd & Co., machinists at Baltimore, Md., and later entered Stevens Institute.

He was Instructor during the Supplementary Term at the Stevens Institute, 1887; was engaged in the engineering department of the United Gas Improvement Co., being employed in its draughting department in Philadelphia, Pa., and at Jersey City, N. J., 1887–88; superintendent of the Hungerford Co., New York, manufacturers of coffee-, rice-, and macaroni-machinery, 1888–90, during part of which time he conducted some special experimental work on treating binder twine, for the Chelsea Jute Mills; mechanical engineer with the De La Vergne Refrigerating Machine Co., having charge of planning and installing a large number of refrigerating and ice-making plants, besides furnishing designs for different kinds of apparatus, etc., 1890–96; also conducting a



W. E. Parsons

number of tests, notably a series of tests of a Yaryan triple-effect evaporator working under vacuum, and a Quiggan triple-effect evaporator working above atmospheric pressure, both evaporating water from the East River, New York; also a test of an ammonia car-motor. He represented the De La Vergne Co., for a short while, at the World's Fair in 1893.

During a part of 1895 and 1836 he had charge of the designing, construction, etc., of a mammoth cotton compress, of the steam lever type. On May 1, 1896, he became general manager of the Newark Hygeia Ice Co., and succeeded, in little over a year, in putting a formerly most unprofitable business on a solid paying basis. Since the year 1903 he has devoted himself entirely to his professional engineering work, as consulting engineer and expert, with refrigerating and ice-making machines and plants a specialty. During the latter part of 1901 he was appointed chairman of a board of experts to investigate and suggest improvements at a large ice-factory.

Mr. Parsons contributed an article on "Tests of Quiggan Evaporators in Single, Double, and Triple Effect," to the *Stevens Institute Indicator*, 1901, and in the following year several articles on ice-making, etc., to *Cold Storage*. He is a member of the American Society of Mechanical Engineers; the American Society of Refrigerating Engineers; the Cold Storage and Ice Association of London, Eng. (the first American to be elected a member); and of the Chi Psi fraternity.

Mr. Parsons is the son of Milton Alfred and Caroline Travers (Williams) Parsons. He married Estelle Virginia Barnett, November 7, 1889, and they have one child living, Helen Barnett Parsons; a son, Milton Alfred, and a daughter, Estelle Virginia Parsons, are deceased.

Parsons, W. P. (M.E., '80), was with the W. A. Wood Mowing & Reaping Co., Hoosic Falls, N. Y., 1884–92; chief draughtsman with the Trenton Iron Co., Trenton, N. J., 1892–93; assistant superintendent with the Southern Cotton Harvester Co., Eastwood Mill, Paterson, 1893–95; located at Hoosic Falls, N. Y., 1895–96; with L. K. Davis, New York, 1896–97; with the General Electric Co., Schenectady, N. Y., 1897–98; superintendent with the Pittsburg Gas & Coke Co., Glassport, Pa., 1898–1900; consulting engi-

neer, with the Matteawan Manufacturing Co., Matteawan, N. Y., 1900–02; with the Maryland Steel Co., Sparrow's Point, Md., 1902–04; and is now with the American Coke & Gas Construction Co., Buffalo, N. Y.

Patterson, Arthur Wellesley, Jr. (M.E., '92), was born in New York city, January 21, 1872; son of Arthur Wellesley and Mary Patterson. He has been in the employ of the Rand Drill Co., as chief draughtsman at Tarrytown, N. Y., 1897–1903; and mechanical engineer at the main office, New York, from 1903 to date. He is a member of the



A. W. Patterson, Jr.

American Society of Mechanical Engineers; and of the Beta Theta Pi fraternity.

Paulding, Charles P. (M.E., '95), was assistant in the office of the superintendent of motive power of the Calumet & Hecla Mining Co., Calumet, Mich., 1895–96; and later was draughtsman with the Detrick & Harvey Machine Co., Baltimore, with the W. D. Forbes Co., Hoboken, and with the American Impulse Wheel Co., New York; and again with the W. D. Forbes Co. as foreman. In 1897 he passed a civil-service examination for the position of junior engineer, inspector's grade, in the War Department, receiving the appointment of inspector on river and harbor work at Newport, but, being at the time in the employ of the W. D. Forbes Co., declined the appointment. He is now head office man with H. B. Roelker, New York. Mr. Paulding has contributed articles to the "American Machinist," the "Engineering News," and the "Stevens Institute Indicator," and, jointly with Col. E. A. Stevens, a paper to the Society of Naval Architects, of which he is a junior member.

Paulsen, John (M.E., '93), has been superintendent of the Beaufort Phosphate Co., Beaufort, S. C., from 1893 to date.

Peabody, Ernest Henry (M.E., '90), was born in Knoxville, Tenn., June 30, 1869; son of D. W. and Mary H. (Saltmarsh) Peabody. His father was a graduate of Dartmouth College and was a prominent lawyer of Nashville, holding successively important municipal and Federal offices until his death in 1879. His mother established one of the first manual-training schools in this country in 1878, at Cincinnati, O., and later became known as a lecturer and author on subjects pertaining to the kindergarten, history, art, and literature.

Mr. Peabody was rodman on construction work with the Norfolk & Western Railroad, spending the summer of 1890 in the West Virginia mountains; was draughtsman for a company designing and manufacturing electrical generators, 1890–91; and was employed in a similar capacity on special architectural work in the latter year.

He entered the employ of the Babcock & Wilcox Co. in 1891, and spent two years in the various departments of its draughting-room. Wishing to have some outside experience he then requested a transfer to the erecting department, and he was sent to the Homestead Steel Works about the end of the famous strike, to assist in the erection of new boilers. Later he had charge of such work, and spent six months as a mechanic on repair work, thus gaining a valuable experience with boilers in actual service.

From time to time during this period he had been employed as an assistant in making evaporative tests of boilers, and when the Babcock & Wilcox Co. began to develop its marine boiler, which has become such an important factor in modern marine engineering, he was selected to conduct a series of experimental tests, with the object of

making a thorough study of this generator, its performance with different fuels, methods of handling same, various styles of setting, etc.

Other experimental work, such as circulation of water in boiler-tubes, methods of



E. H. Peabody

sampling steam and testing its quality, strength of materials used in boiler-making, etc., was carried out under his direction, and later a department of tests was established and he became its head. In this capacity and as the expert representative of the Babcock & Wilcox Co., Mr. Peabody has had charge of a great variety of engineering work, including trial trips of steam vessels, guarantee boiler trials, engine tests, and considerable experimental work. He has visited Cuba and travelled extensively in all parts of the United States, studying the local methods of burning special fuels, such as coal, lignite, oil, sawdust, rice chaff, etc.

A liberal policy on the part of his employers has enabled him to make what is probably one of the most complete collections in existence of data covering the origin, heat value, chemical analysis, and evaporative results of many kinds of fuel, boiler trials of every description, and much miscellaneous information pertaining to the subject.

Mr. Peabody spent the winter of 1902–03 in California, conducting an exhaustive series of experiments in burning the heavy crude petroleum produced by that State. This work resulted in the invention by him of a furnace especially designed to meet the requirements of heavy oils.

Mr. Peabody is a member of the American Society of Mechanical Engineers, and an associate member of the American Society of Naval Engineers.

Pearce, Chouteau E. (M.E., '91), was with the J. M. Ives Co., Danbury, Conn., 1891–96; chief draughtsman with the John Stephenson Car Co., New York, and Elizabeth, N. J., 1897–1900; and has been with Mr. Charles H. Davis, who is engaged in professional engineering work in New York, from 1900 to date.

Peck, Charles Botsford (M.E., '96), was born in Brooklyn, N. Y., March 10, 1874. He has been in the New York office of the



C. B. Peck

B. F. Sturtevant Co., since graduation, and is now the New York manager. He is a member of the American Society of Mechanical Engineers, and of the Tau Beta Pi fraternity.

Mr. Peck is the son of Charles A. and Mary E. (Oliver) Peck. He married Helen Rice May, of Lee, Mass., June 19, 1900.

Peebles, Robert Payne (M.E., '99), entered the Homestead Steel Works of the

Carnegie Steel Co., at Munhall, Pa., shortly after graduation, and met his death by drowning, November 28, 1899.



J. C. Percy

Peirce, John Royden (M.E., '00), was born in Frankfort, Me., February 11, 1878; son of John and Mary Helen Peirce. He is descended from Capt. Michael Peirce, who came to America in 1660 and was killed while leading his company against the Indians in King Philip's War. He attended school for a year in Wiesbaden, Germany. Since graduation has been estimating clerk with the New York & Maine Paving Block Co., New York, 1900–04; and is now with the Empire City Marble Co., New York. He is a member of the Chi Phi fraternity.

Peirce, William H. (M.E., '84), was special apprentice in the Philadelphia, Wilmington, & Baltimore Division of the Pennsylvania Railroad, Wilmington, Del., 1884–87; draughtsman, assistant engineer of tests, and assistant master mechanic on the Chicago, Burlington, & Quincy Railroad, 1887–89; superintendent of marine installations for the Edison United Manufacturing Co., 1889–91; and has been with the Baltimore Copper Smelting & Rolling Co. (since 1894 as manager of works), from 1891 to date. He is a member of the American Institute of Mining Engineers, and of the American Society of Mechanical Engineers.

Percy, John Crocker (M.E., '00), was born in Chatham, N. Y., June 29, 1875. He entered the Riverside department of the National Tube Co., Wheeling, W. Va., where he became superintendent of blast-furnace, 1900–02; was in charge of estimating, ordering, and draughting departments of the Best Manufacturing Co., Pittsburg, Pa., 1902; general foreman of the blast-furnace department of the Colorado Fuel & Iron Co., at Pueblo, Colo., 1902–03; engaged in furnace construction at the Illinois Steel Co.'s works, Joliet, Ill., 1903; and since January, 1904, has been chief engineer in the purifying department of the Wm. B. Scaife & Sons Co., manufacturers of water softening and purifying systems and water-filters, at Pittsburg, Pa. He is a member of the American Institute of Mining Engineers and of the Theta Nu Epsilon fraternity.

Mr. Percy is the son of George R. and Abby C. Percy. He married Elizabeth Sutton, of New York, June 28, 1904.

Perkins, George S. (M.E., '91), was with the Dow Type-Composing Co., New York, 1892–95; the East Jersey Water Co., Montclair, N. J., 1895–1900; and has been assistant engineer with Robert F. Wentz, consulting engineer, Nazareth, Pa., from 1900 to date.



R. Petersen

Petersen, Reinhold (M.E., '98), was born in Albany, N. Y., October 24, 1875. He

has been in the telephone engineering and draughting department of the Western Electric Co., New York, since graduation.

Mr. Petersen is the son of Rev. J. C. J. and S. M. Petersen. He married Anna Auguste Henriette Denecke, June 18, 1902.

Pfordte, Otto F. (M.E., '86), studied for two semesters at the Royal Mining Academy in Freiberg, and visited the mining districts and metallurgical establishments in Saxony, and in the Hartz Mountains. Returning, he took charge of concentrating and assay work in Bisbee, Arizona, and Cusihuiriachic in Chihuahua, Mexico, and then spent two years in Peru as superintendent of the "Establecimiento Mineral de Casapalca" in the Andes, east of Lima, Peru. He travelled extensively in the interior, visiting a number of important mining regions, returned to New York, and accepted a position as assistant engineer of an exploration trip, for the Peruvian Exploration Syndicate, into the gold regions of Sandia, Peru; and to a number of famous silver and tin mines in Bolivia. He afterward returned to New York and then went to Germany and Austria to visit a number of mining districts there. On his return to the United States he did some private literary work, and then became superintendent of the Hector Concentrating Mill, Telluride, Colo.; and, later, superintendent of the Chispas mine in Arizpe, Sonora, Mexico. He has been to Chalchihuites, Zacatecas, Mexico, to inspect several mining properties, and has visited a number of interesting mines and metallurgical establishments in this country and Mexico.

His literary work includes among others, the following productions:

"Corrugated *vs.* Plain Belts." *Trans. Am. Inst. Min. Eng.*[1]

"The Cerro de Pasco Mining District." *Ibid.*; reprinted in *Cassier's Magazine.*

"Placer Mining in South America." *Cassier's Magazine*, X.

"The Oruro Mining District." *Engineering and Mining Journal.*

"The Ore-Dressing and Smelting Works at Casapalca, Peru." *Stevens Indicator*, IX.

"The Mining District of Oruro, Bolivia." *Engineering and Mining Journal.*

"Calculations of Concentrating Ores." *Trans. Am. Inst. Min. Eng.;* also translated into Spanish in *El Miñero Mejicano.*

He is a prominent contributor to the Spanish Mining Dictionary issued by the American Institute of Mining Engineers, and has contributed a number of interesting minerals to the United States National Museum in Washington, D. C., and the American Museum of Natural History in New York city.

Mr. Pfordte is a member of the American Institute of Mining Engineers, and of the New York Mineralogical Club.

Phelps, Walter F. (M.E., '90), was draughtsman and inspector with the Barney & Smith Car Co., Dayton, O., 1890–91; and has been superintendent, and, later, president of the Dayton Fan & Motor Co., from 1891 to date.

Phillips, Louis A. (M.E., '00), was born in Albany, N. Y., January 27, 1879. He was assistant electrical engineer with the Pullman Co., Jersey City, N. J., 1900–01; was employed jointly by the Niagara Falls Power Co., and the Cataract Power & Conduit Co., as assistant commercial engineer,



L. A. Phillips

1901–02; with the Pullman Co., Jersey City, N. J., 1902; in the mechanical department of the George A. Fuller Co., 1903; and has been with Edwin Burhorn, M.E., since 1903.

[1] "Transactions of the American Institute of Mining Engineers."

Mr. Phillips is the son of Edward and Agnes (Fisher) Phillips, and is of Colonial descent. He married Anna V. B. Kip in June, 1901.

Pierce, James Buchanan (M.E., '77), was born at Mount Hickory, Mercer County, Pa.,



J. B. Pierce

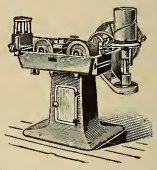
September 2, 1856. He was manager at the Mount Hickory Blast Furnaces, Sharpesville, Pa., 1878–84; and has been general manager of the Sharpesville Furnace Co., from 1885 to date. During the year 1901 he travelled in Great Britain and on the continent of Europe with his family. He is a member of the American Society of Mining Engineers, and was the founder of the Rho chapter of the Delta Tau Delta fraternity at Stevens Institute.

Mr. Pierce is the son of James and Chloe (Holbrook) Pierce, both of English descent. He married Albertina Pomplitz, June 17, 1880, and they have two children living, Pauline and James B., Jr., Pierce. (Louise Pierce deceased 1891.)

Pierson, John V. L. (M.E., '88), has been in the employ of the Edison Phonograph Co., Orange, N. J., and the De Loch Mill & Manufacturing Co., Atlanta, Ga.; was engaged in gold-mining near Los Angeles, Cal.; and employed as salesman for a steam-pipe covering house. He is located at Glen Ridge, N. J., but is not employed at present upon engineering work.

Pierson, William Dickson (M.E., '94), was born in Orange, N. J., September 24, 1872; son of Edward Dickson and Lelia P. (James) Pierson. On his father's side he is descended from Thomas Pierson who settled in Branford, Conn., before 1662. Thomas Pierson was a brother of Abraham Pierson, the first president of Yale College. He was employed in the machine-shop of the National Meter Co., South Brooklyn, N. Y., 1894; and was draughtsman with the Farrel Foundry & Machine Co., Waterbury, Conn., 1895. On January 1, 1896, he became draughtsman for the Waterbury Machine Co., Waterbury, and was engaged upon continuous wire-drawing machinery, presses for blanking and forming sheet-metal goods, machine tools, and automatic machinery for working metal and wire goods. He was placed in charge of the draughting-room early in 1900, and in July of the same year was elected secretary of the company. On December 1, 1898, he became one of the organizers, and secretary of the Waterbury Wire Die Co. manufacturers of diamond and other dies for drawing wire.

Two articles by Mr. Pierson, descriptive of continuous wire-drawing machines, appeared in the *Iron Age*. Other articles on



Wire-Drawing Machine
W. D. Pierson

the above subject and on diamond dies for wire-drawing, have been published in various papers. He also contributed an interesting article on "Dies for Drawing Wire—Their Manufacture and Use," to the *Stevens Institute Indicator*, 1901. He is a member of the Waterbury Club, and of the Graduates' Club of New Haven.

Plaisted, Harold M. (M.E., '83), was millwright with John Webster, mill-builder, Detroit, Mich., 1883–84; with the E. P. Allis &

Co., Milwaukee, Wis., 1884; draughtsman, foreman, and contract superintendent of the Chicago, Milwaukee, & St. Paul Railway Co., Milwaukee, 1884–88; designer and assistant foreman for the Barney & Smith Manufacturing Co., Dayton, O., 1889; mechanical engineer and patent solicitor at Springfield, O., 1889–93; and has been a member of the firm of Plaisted & Co., patent solicitors, St. Louis, Mo., and Washington, D. C., 1893 to date.

Mr. Plaisted has contributed several articles to *The Railway Age* on "Car-Building and Inspecting;" a paper on "Double-Deck Car," to *Whipple's Engineering Magazine;* and articles on friction, lubrication, shafting, gearing, etc., for farm machinery, to the *Age of Steel,* besides writing numerous articles on patents, patent law, etc.



G. G. Plyer

Plum, Frank H. (M.E., '96), was motive inspector and special apprentice with the Pittsburg, Columbus, Cincinnati, & St. Louis Railroad, and later a member of the firm of Dunlap & Plum, manufacturers of pneumatic tools and railway specialties, afterward incorporated as the Columbus Pneumatic Tool Co., of which Mr. Plum was elected vice-president, a position he held until 1902. He was assistant to the manager of the John R. Williams Co., Newark, N. J., 1902–04; with the corps of engineers of the Committee of Twenty, of the National Board of Fire Underwriters, 1904; and is now representing the C. W. Hunt Co., West New Brighton, N. Y.

Plyer, George Gregg (M.E., '89), was born in New York city June 8, 1867. He was special agent for the Lancashire Insurance Co., of Manchester, England, at Philadelphia, Pa., 1892–1901; and has been special agent and adjuster for the Continental Fire Insurance Co. of New York, at Philadelphia, Pa., from 1901 to date. He is a member of the Alpha Delta Phi fraternity.

Mr. Plyer married Clara M. Franklin, June 6, 1895.

Poinier, P. P. (M.E., '74), was a "Resident Graduate" at the time of his death in 1876. Of Mr. Poinier, Prof. Leeds spoke as follows in his farewell address to the students of Stevens Institute, February 20, 1902:

"Among these was one, a Mr. Poinier, who developed so marvelous a faculty in mathematics that he quickly outstripped all the teaching of the Institute, engaged in reading the most profound works on that subject, and completed a treatise on thermodynamics so remarkable that Prof. Henry Rowland, of Johns Hopkins University, undertook the editorship of it; and his death, which followed very shortly and unexpectedly after graduation, was so lamented that Lord Kelvin, in his address that year, as President of the British Association for the Advancement of Science, chronicled the death of this very young student of the Institute as one of the great losses to science."

Pope, Oliver Ashley Alexander (M.E., '96), was born in West Milton, O., February 16, 1874; son of W. G. E. and Georgiana Pope. He is a descendant of John Rogers, the Martyr, and William Greenleaf, who as sheriff of Boston first read the Declaration of Independence in Boston, from the State House balcony. The subject of this sketch was assistant engineer with the H. W. Johns-Manville Co., New York, 1896–98; in the inspection department of the Fidelity & Casualty Co., New York, 1899; engineer for the Willson Aluminum Co., New York, 1900. He went south during this year and assisted in the construction of an electric smelting plant at Kanawha Falls, W. Va.; with the H. W. Johns-Manville Co., New York, as superintendent of their paper-mill, 1901; with Arbuckle Bros., Brooklyn, N. Y., being at-

tached to the engineering staff of the sugar refinery, 1901–04; and is now associate engineer with Edwin Burhorn, New York city.

He addressed the Brooklyn Engineering Society in 1902 on "The Manufacture and Uses of Ferro-Chrome and Other Alloys." He is a member of the Brooklyn Engineers' Club, the University Club of Brooklyn, and the Alpha Tau Omega and Theta Nu Epsilon fraternities.

Post, Andrew Jackson (M.E., '92), was born in Jersey City, N. J., November 17,



A. J. Post

1871. He was draughtsman with Post & McCord, engineers and contractors, New York, 1892–1900; in 1900, when the Post & McCord business became a part of the American Bridge Co., he was appointed principal assistant engineer at the works in Brooklyn, N. Y., and on January 1, 1902 (upon the resignation of Mr. Henry W. Post), he was appointed chief engineer, which position he held until December, 1903, when he resigned to become secretary and chief engineer of a new company incorporated under the old name of Post & McCord. He is a member of the Blooming Grove Park Association and of the Chi Phi fraternity.

Mr. Post is the son of Andrew Jackson and Margaret (Combe) Post. His grandfather, Simeon S. Post, was at one time chief engineer of the Erie Railroad, consulting engineer of the Long Dock Co., inventor of the modern baggage check, and of the Post truss, which was used for a number of years in the days of cast-iron bridges; he was also one of the charter members of the American Society of Civil Engineers. His father, Andrew Jackson Post (deceased, 1896), who was of English descent, was senior member of Post & McCord, since absorbed by the American Bridge Co.. The subject of this sketch married Mary Briggs Abbett (daughter of ex-Governor Leon Abbett, of New Jersey), April 11, 1894, and they have two children, Andrew J., Jr., and Leon Abbett Post.

Post, Arden (M.E., '91), was inspector in the department of tests of the Baltimore & Ohio Railroad, Mount Clare, Baltimore, Md., 1891–93; draughtsman with the Peckham Motor, Truck, & Wheel Co., and later with the Metropolitan Street Railway Co., New York. In the latter position his duties consisted mainly in laying out railway curves and in designing track work and automatic devices for handling cable. He was also engaged upon designs for the underground electric road now in operation on that system. He was employed as inspector in the test department of the New York Gas & Electric Light, Heat, & Power Co. for two years, and later by the New York Edison Co. as agent and engineer in closing down isolated plants; and was engaged from July, 1902, to June, 1904, as consulting engineer for the University Power Co., designing and installing the heating and lighting plant at Princeton University.

Post, Henry Willis (M.E., '74), was born in Owego, Tioga County, N. Y., October 30, 1852. He spent a year and a half at Cornell University in the Class of 1873. He was draughtsman with the Watson Manufacturing Co., Paterson, N. J., 1874–76, and worked also in the pattern shop and foundry as apprentice. He was chief draughtsman and chief engineer with Post & McCord, Brooklyn, N. Y., 1876–1900; and engineer and later manager of the Brooklyn plant of the American Bridge Co., 1900–02, the nature of his work since 1876 being mainly the designing and construction of bridges, roofs, and structural iron and steel work of various kinds, principally that of large fireproof

buildings. In 1902 Mr. Post commenced practice as a consulting structural engineer. He is a member of the Theta Xi fraternity.

Mr. Post is the son of Simeon S. and



H. W. Post

Parthenia W. Post. He married Juliana MacBride, April 13, 1887, and they have two children, Ronald Willis and Henry Willis Post, Jr.

Post, Lionel (M.E., '99), was born in South Amboy, N. J., July 5, 1875; son of Richard Bayley and Eliza Deane Post. He was with the Edison Electric Illuminating Co., New York, 1899; superintendent of construction with the Ransome Concrete Co., New York, 1899–1901; superintendent of construction with the Cuba Supply Co., Havana, Cuba, 1901; in brokerage business, 1902; superintendent of the Natural Carbonic Gas Co., engaged in erecting plant at Saratoga Springs, N. Y., 1902; in the sales department of the Alphons Custodis Chimney Construction Co., 1903; and is now associated with Messrs. Bellman & Sanford, general constructors of power-plants, New York.

Post, Robert Cox (M.E., '98), was born in Jersey City, N. J., October 6, 1877. He was with the United Gas Improvement Co., Philadelphia, 1898–1900; assistant superintendent of that company's works at Atlanta, Ga., 1900; and was superintendent and agent of the company's business at Sag Harbor, N. Y., 1900–01. During the latter year he resigned to take a position as contracting agent in the Metropolitan district for the American Bridge Co., of New York. This position he held until December, 1903, when he resigned to go with a new company incorporated under the old name of Post & McCord, New York. He is a member of the University Club of Philadelphia; the University Club of Jersey City; the Blooming Grove Park Association; and of the Chi Phi fraternity.

Mr. Post is the son of Andrew Jackson and Margaret (Combe) Post. (For note of ancestry, see biography of his brother, Andrew Jackson Post.) He married Elizabeth Dixon (daughter of Supreme Court Justice Dixon of New Jersey), January 19, 1904.

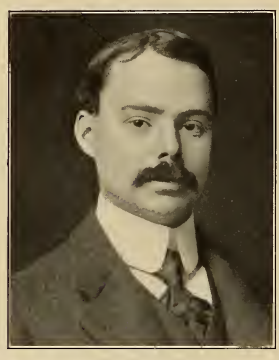


Lionel Post

Post, William Combe (M.E., '86), was born in Jersey City, N. J., January 1, 1867; son of Andrew J. and Margaret (Combe) Post. He was draughtsman for Post & McCord, 1886–96, and chief draughtsman 1896–1901. Upon the organization of the American Bridge Co. in the latter year he was appointed contracting engineer in the Metropolitan district. In 1902 he became contracting manager in charge of sales in the same district, with offices in New York. On January 1, 1904, he resigned his position with the American Bridge Co. to become

vice-president and treasurer of the new corporation of Post & McCord, organized to do a steel construction business for building work in New York and vicinity. He is a member of the Carteret, the Crescent Athletic, and the Chelsea Plantation clubs; the Jersey City and Baltusrol golf clubs; the Blooming Grove Park Association; and of the Beta Theta Pi fraternity. He was president of the Alumni Association of the Stevens Institute of Technology, 1903–04, and in June, 1904, was elected Alumni Trustee of the Institute.

Powell, William Betts (M.E., '92), was born in Brooklyn, N. Y., October 30, 1871. He was engaged in contracting work with



W. B. Powell

his classmate, Mr. H. D. King, under the firm name of the King Engineering Co., 1892–94. Mr. Powell gave up this work to enter the fight made against the consolidation of Brooklyn with New York by the League of Loyal Citizens of Brooklyn. He was engaged with the League for nearly two years (1894–96), having charge of all their organization work, canvassing, and publications. In the latter year he entered the employ of the Midford Salvage Co., engaged in raising wrecked vessels by pneumatic caissons. Starting as draughtsman with this company he obtained rapid promotion, and at the end of six months, when the company failed, he was first assistant superintendent. He then became boiler inspector for the Hartford Steam Boiler Inspection & Insurance Co., at Baltimore, for a few months in 1897, but resigned to take the position of teacher of mechanical drawing and mathematics in the Manual Training High School of Brooklyn, which he held from 1897 to 1902. In the latter year he became assistant superintendent, and in 1904 was advanced to superintendent, of the Worcester Salt Co., Silver Springs, N. Y. These works are the largest single salt-works in the country, and the first where evaporation by means of vacuum pans was successfully accomplished.

Mr. Powell is the son of Ardon K. and Mary B. Powell. He is descended from Thomas Powell, who came to Long Island about 1650; also from Joseph Betts, who settled in Delaware about the same time. He married Mabel Whiton, June 30, 1898, and they have one son.

Powers, Edgar Taylor (M.E., '97), was born in Richmond, Va., June 9, 1876; son of Robert W. and Juliet Colton Powers. He was employed with the East River Gas Co., Long Island City, N. Y. (which became merged with the New Amsterdam Gas Co. in 1898), and in 1900 was advanced to the position of superintendent of distribution. In May, 1901, he became general manager of the Lincoln Gas & Electric Co., Lincoln, Neb.; next (1902) practised as consulting engineer in Chicago, and went thence to Memphis, Tenn., as consulting engineer to the Equitable Gas Co. of that city. In February, 1903, he became secretary of the Consolidated Gas Co. of Baltimore, Md. He is a member of the Beta Theta Pi and Tau Beta Pi fraternities.

Pracy, Joseph (M.E., '81), had served an apprenticeship in the shops of Walkington & Kidd, San Francisco, Cal., and had advanced to the position of superintendent with this firm, when he decided to enter the Stevens School in 1876, preparatory to his admission to the Institute a year later. After graduating from the Institute he returned to San Francisco, where he successfully conducted a machine-shop for nearly ten years. An increasing business, requiring constant attention and application, aggravated a heart

trouble of long standing, from which he died July 22, 1891.

Pratt, Clayton A. (M.E., '85), was with the Pullman Palace Car Co., Pullman, Ill., 1886–87; member of the firm of C. A. Pratt & Co., engine-builders, Chicago, Ill., 1887–89; superintendent of a mining company at Austin, Nev., and is now with Armour & Co., South Omaha, Neb.

Prentiss, H. J. (M.E., '89), was with the Long Distance Telegraph & Telephone Co., New York, 1890–94; later became a student in the College of Physicians & Surgeons, New York, and is now Professor of Anatomy at Iowa State College, Iowa City, Ia.



H. S. Prentiss

Prentiss, Henry Smith (M.E., '84), was born in Switzerland July 6, 1859. He graduated at Princeton in 1882, from the full academic course and some specials in the scientific course. He was engaged on experimental work with the Ferracute Machine Co., Bridgeton, N. J., under the direction of Mr. Oberlin Smith, 1884–85; on experimental work with the Hammond Typewriter Co., New York, during which he produced one of the first "drop cabinets," manifolding improvements, etc., 1885–87; was superintendent, secretary, and treasurer of the Prentiss Calendar & Time Co., New York, 1887–90; lessee and manager of the same company, 1892–94; and has been president and manager of the Prentiss Clock Improvement Co., New York, from 1894 to date. The company makes a specialty of manufacturing sixty-day, calendar, electric, programme, electric tower, and self-winding clocks, synchronized and telemetric systems, time switches, etc.

He has taken out about twenty patents on improvements in clocks,—synchronizing devices, calendars, etc.,—and has also invented a complete automatic typewriter, not yet on the market. He is a member of Whig Hall, Princeton.

Mr. Prentiss is the son of George Lewis and Elizabeth Payson Prentiss. His father, Rev. George L. Prentiss, D.D., was Professor in Union Theological Seminary, New York, and his mother, a religious writer of considerable note, was the author of "Stepping Heavenward," and other works. He married Lila Roberts, June 25, 1889, and they have two children, Charlotte Roberts, and Elizabeth Payson Prentiss.

Prince, Duffield (M.E., '98), was born in Flatbush, L. I., April 7, 1876, son of Christopher and Sarah Barrea (Zabriskie) Prince. He was with the Edison Electric Illuminating Co. of Brooklyn, first as assistant superintendent of steam plant and then as assistant to chief engineer, 1898–1902; designing



Duffield Prince

and constructing engineer for W. S. Barstow, consulting engineer, New York, from 1902 to date. He is a member of the Knickerbocker Field Club of Brooklyn.

Prince, William B. (M.E., '00), has been with the Bishop & Babcock Co., Cleveland, manufacturers of air-compressors, water-lifts, carbonic-acid gas and carbonating machinery, from 1900 to date. Since January, 1902, he has acted as mechanical and electrical engineer and carbonator expert, being stationed at Cleveland, O., and engaged in testing and designing apparatus for the automatic and continuous carbonation of water by hand, hydraulic, electrical, steam, and belt power, and since July, 1903, he has, in addition, been assistant superintendent at the main factory of the company at Cleveland.

Pryor, Frederick L. (M.E., '97), Assistant Professor of Experimental Engineering at Stevens Institute of Technology. For biography, see page 275.

Pryor, Robert Westall, Jr. (M.E., '02), was born in Newark, N. J., July 31, 1881; son of Robert W. and Rachel A. Pryor. He has been in the sales department of the Buffalo Forge Co. since graduation. He is a



R. W. Pryor, Jr.

member of the Delta Tau Delta and Tau Beta Pi fraternities.

Pulsford, Ernest (M.E., '94), was born in South Orange, N. J., November 2, 1873; son of James E. and Josephine Allston Pulsford. He was employed in the machine-shop of the New York Central Railroad Co., Buffalo, 1894–95; was draughtsman with Messrs.



Ernest Pulsford

Wilhelm & Bonner, patent attorneys, Buffalo, N. Y., 1895–97, and with Charles H. Davis, consulting engineer, New York, 1897–98; and was in the employ of the Lidgerwood Manufacturing Co., New York, 1898–1900. During the latter year Mr. Pulsford decided to give up engineering, and he began a course of study for the ministry, at the General Theological Seminary of the Protestant Episcopal Church in New York. In June, 1902, he was offered a position in the Smithsonian Institution for three months, and while filling this he decided to return to engineering, remaining at the Smithsonian Institution till May 1, 1903, when he opened an office in Washington, D. C., as consulting engineer.

Quimby, William Everett (M.E., '87), was born in Orange, N. J., March 1, 1866. He was employed at the Minneapolis Harvester Works, Minneapolis, Minn., 1887–88; with the Weston Electrical Instrument Co., Newark, N. J., 1888–90; assistant superintendent with the John Patten Manufacturing Co., New York, experimenting with a vacuum ice machine, 1890–93.

In November, 1893, he patented a screw pump having peculiar features which makes it particularly well adapted for direct connection with electric motors, and also for the handling of thick liquids. In January,



W. E. Quimby

1894, he resigned his position with the John Patten Manufacturing Co., and since that date has devoted his time to the manufacture and sale of this pump, under the firm name of William E. Quimby, Inc. The pump has rapidly made a place for itself, and is used for hydro-electric elevator service, and has also found a considerable field in the automatic supplying of water for sanitary purposes in city buildings. In handling thick liquids it has been successfully applied to various sugar liquors, lard, tallow, and many other substances, as well as for pumping oil, especially where very large electric pumps are required. In 1903 Mr. Quimby was elected president of the Sundh Electric Co., a New York corporation organized to build pressure regulators, protective switches, and automatic motor controllers. He is a member of the American Society of Mechanical Engineers; the Engineers' Club of New York; the Essex County Country Club of Orange; and of the Sigma Chi fraternity.

Mr. Quimby is the son of Edward E. and Cynthia E. Quimby. He married Grace Tingue, September 1, 1900, and they have one child, William Tingue Quimby.

Rainsford, William Brent (M.E., '99), was born in Belpre, O., January 18, 1871; son of George E. and Miriam J. Rainsford, both born in England. He was a railroad and telegraph messenger, 1885–87; was in the employ of the Cumberland & Pennsylvania Railroad at Mount Savage, Md., as storeroom-keeper, 1887–89; as machinist apprentice, 1889–93; and as machinist during vacation periods; was Instructor during the Supplementary Term at the Stevens Institute, 1899; was employed in the shops of the Baltimore & Ohio Railroad, Newark, O., 1899–1900; was draughtsman with the Lackawanna Co., first at Scranton and then at Buffalo, working on the designs for the new Buffalo plant, 1900–03; and has been engaged as draughtsman at the United States naval



W. B. Rainsford

proving grounds at Indian Head, Md., since October, 1903.

Ramirez, Juan B. (M.E., '79), was engaged in introducing and shipping labor-saving machinery and American manufactures and promoting railroad-building and industrial improvements (waterworks, sugar-, paper-, brick-, and gas-making, distilleries, mining plants, sawmills, bridges, electric lighting, etc.) in Spanish countries, 1880–86; in the practical application in the United States of petroleum fuel and making researches in the production of fuel and illuminating gas from

petroleum by its own combustion; also in boring for oil in Venezuela, 1887–90; building roadways, dams, and drains, devising rolling sheds for cacao and coffee terraces, and conducting agricultural and other special engineering investigations in Venezuela, 1891–94; and from 1895 to date has been in the employ of the United States government as well as being engaged in private special investigations including the promotion of a new brewing system, the cultivation of single-cell microbes and their application to special fermentation; wine-making without fortification; bottling without admixture of air; sterilization of bottles, barrels, etc., with a gas; the preservation of grape juice and other fruit juices without heating, sweetening, or preservatives; and the burning of coal in ordinary practice by distilling it into gases.

Ramirez, Nestor (M.E., '95), was with the Westinghouse Electric & Manufacturing Co., 1895–96; and since then has been located at Caracas, Venezuela.

Randolph, Lingan Strother (M.E., '83), was born in Martinsburg, W. Va., May 13,



L. S. Randolph

1859. He served an apprenticeship of three years to the machinist trade in the shops of the Baltimore & Ohio Railroad before entering Stevens Institute; was engineer of tests in the motive-power department of the New York, Lake Erie, & Western Railroad, where he organized a laboratory and put in force a system of inspection and tests of oils and lubricants, besides doing much experimental work in other lines, 1883–85; was superintendent of motive power with the Florida Railway & Navigation Co., now the Florida Central & Peninsular Railroad, with headquarters at Fernandina, Fla., where he reorganized his department and changed the gauge of the engines and cars of the road from five feet to four feet nine inches (then adopted as the standard gauge of all southern railroads), 1885–87. He also designed a system of waterworks for the city of Fernandina.

He next entered the employ of the Cumberland & Pennsylvania Railroad, where he remained from 1887 to 1890, being engaged in designing a new type of heavy freight locomotive, ten of which were built from his plans, and three constructed under his supervision. He also designed a baggage car and a crane car, put in an electric-light plant, and devised a new time system for these shops, for a description of which see the *Transactions of the American Society of Mechanical Engineers,* Vol. IX.

Next becoming engineer of tests with the Baltimore & Ohio Railroad, he reorganized the department of tests and largely extended its scope of usefulness, 1890–92; and as electrical engineer with the Baltimore Electrical Refinery, Baltimore, Md., 1892–93, he invented a new form of tank for the electrolytic separation of metals.

He has been Professor of Mechanical Engineering at the Virginia Polytechnic Institute from 1893 to date, and has designed and erected for this institution a system of waterworks with a 4,000-foot compressed-air transmission of power, as well as designing and erecting a central heating and lighting plant at a cost of $25,000, and buildings to the value of $70,000.

He was consulting engineer for the Hollins Institute, Hollins, Va., in the erection of a central heating and lighting plant and waterworks; the Sweet Briar Institute, Amherst County, Va.; the Southwestern Virginia State Hospital, Marion, Va., in the reconstruction of its heating plant; the Western State Hospital; and for the Virginia School for Deaf and Dumb, at Staunton, Va.

He is president of the Brush Mountain Coal Co., Christiansburg, Va.; the Virginia Anthracite Coal & Railway Co., and vice-president of the Virginia Anthracite Coal Co. He is a member of the following technical societies: The American Society of Civil Engineers; the American Society of Mechanical Engineers; the American Railway Master Mechanics' Association; the American Association for the Advancement of Science; the International Association for Testing Materials; the Society for the Promotion of Engineering; the Society of Arts (England); and an associate member of the Institute of Electrical Engineers. He was formerly a member of the Baltimore and University clubs, Baltimore.

He has written various papers on technical subjects, particularly on technical education, and in addition the following papers and articles:

"Failure of Staybolts," paper read before the American Association for the Advancement of Science.

"Cost of Lubricating Car Journals." *Transactions of the American Society of Mechanical Engineers.*

"Strength of Staybolts." *Ibid.*

"Strains in Locomotive Boilers." *Ibid.*

"Strength of Freight Car Axles." *Ibid.*

"Economic Element in Technical Education." *Cassier's Magazine.*

"Engineering Education and Specialization." *Ibid.*

"Systematic Testing of Materials." *Digest of Physical Tests.*

Mr. Randolph is the son of James L. (chief engineer of the Baltimore & Ohio Railroad) and Emily Strother Randolph. He is descended from William Randolph who settled at Jamestown, Va., coming from Northumberland, England, and also from Powhatan and Pocahontas. On his mother's side he is descended from the Strothers who were of Scotch-Irish descent. He married Fannie Robbins, October 15, 1890, and they have four children, James Robbins, Orlando Robbins, Emily, and Strother Robbins Randolph.

Randolph, William W. (M.E., '86), was located at Englewood, Cooke County, Ill., 1886–90; with the Chicago, Rock Island, & Pacific Railroad, Chicago, 1890–91; in the engineer's department of the Kansas City Gas Light & Coke Co., Kansas City, Mo., 1891–92; with the City Gas Company of Des Moines, Iowa, 1892–94; the United Gas Improvement Co., Philadelphia, 1894–95; and has been with Humphreys & Glasgow, consulting gas engineers, New York, from 1895 to date.

Rapelje, John (M.E., '77), was born in East Fishkill, N. Y., September 18, 1856.



JOHN RAPELJE

He was engaged as assistant engineer on the construction of branch lines of the New York, Lake Erie, & Western Railroad Co., Pennsylvania, 1877–83; held a similar position with the Erie & Wyoming Valley Railroad Co., 1883–85; was general roadmaster on the Colorado Division of the Union Pacific Railway, 1885–86, and assistant superintendent of this road, 1886–88; superintendent of the Idaho Division of the same company's lines, 1888–89; division engineer on the Norfolk & Western Railway in West Virginia, 1889–92; and has been superintendent and chief engineer of the Gauley Coal Land Association, Alderson, W. Va., since 1892. This company owns about 200,000 acres of coal and timber land in West Virginia, and has its general office in Boston, Mass.

Mr. Rapelje is the son of Lawrence C. and Hannah M. Rapelje. He is descended from Joris Jansen de Rapelje, who came to this country from Holland in 1623. He mar-

ried Bessie J. Allen (deceased 1896), June 25, 1885, by whom he had one child, John Allen Rapelje. He married Emily Frances Baber, December 3, 1900.

Raphel, Henry Joseph (M.E., '00), was born in Havana, Cuba (of American birth),



H. J. Raphel

November 21, 1877; son of Joseph A. and Emma C. Raphel.

While of the Sophomore class he volunteered for service at the outbreak of the war with Spain, and was detailed to duty on the U. S. S. "Badger" as engineer's messenger. On account of his ability to converse fluently in Spanish he was placed as interpreter on board the captured Spanish ocean tug "Humberto Rodriguez." When the war ended he returned to the Institute to complete his technical education. Upon graduation he secured a position with the Oxnard Construction Co., but after three months entered the civil engineer's department of the New York Central & Hudson River Railroad, New York. In the following year he was transferred to the mechanical engineer's office, where he remained until October, 1903, when he resigned to take his present position with the New York Glucose Co. at their plant at Edgewater, N. J. He was a member of the New Jersey Naval Reserves and now belongs to the Badger Naval Veterans' Association.

Raqué, Philip E. (M.E., '76), was born in Brooklyn, N. Y., July 11, 1855. He has made a specialty of engineering as applied to architecture, and has secured and executed work involving the expenditure of many hundred thousands of dollars, requiring original designing and the solution of intricate and interesting engineering problems. He has had charge of the designing and building of the constructive work of some of the largest and tallest buildings in the country, and has worked under and in connection with some of the most prominent architects. He had personal charge of designing the details of the steel and iron construction of the Columbia, Morris, and Salvation Army buildings, Proctor's Twenty-third Street Theatre, the Academy of Medicine, Appraiser's Warehouse, Ninth Regiment Armory, and the House of Relief, New York, and the Kings County Hall of Records. He was consulting engineer for the Ansonia apartment hotel; also consulting engineer and contractor for the steel work of the Hotel Mount Washington, New Hampshire. He has filled the position of chief engineer for several construction companies, and as such has planned and equipped several manufacturing plants, including the installation of machinery. He is now engaged as a consulting and contracting engineer in New York, making a specialty of steel construction, architectural ironwork, etc. He is a member of the American Society of Mechanical Engineers; was corresponding secretary of the Stevens Institute Alumni Association for several years previous to 1896, and was a director of the Association for the two years following that date; also vice-president of the Association for one year.

Mr. Raqué is the son of Charles G. and Anna Raqué. He married Lizzie Ferrett, June 21, 1887, and they have three children, Arthur Edmund, Marjorie, and Carl Philip Raqué.

Rasmus, William T. (M.E., '96), was with the Elmira Municipal Improvement Co., Elmira, N. Y., 1896–1902; and has been a stock broker in New York from 1902 to date.

Rea, Henry R. (M.E., '84), was born in Pittsburg, Pa., May 29, 1863. He spent the

two years immediately following his graduation at Stevens at the University of Göttingen, Germany. In 1886 he became connected



H. R. Rea

with the Robinson-Rea Manufacturing Co., Pittsburg, Pa., being elected vice-president in 1891. In December, 1898, this firm united with one of its competitors to form the Mesta Machine Co., which then erected one of the largest machine plants in the country. Mr. Rea retained an interest in the new company, and remained a member of the board of directors after the consolidation, but transferred his active interest to the Steel Car Forge Co., Pittsburg, of which he was elected president and treasurer. This company was sold in 1902 to the Standard Steel Car Co., in which Mr. Rea is a member of the board of directors. He is also a director in the Safe Deposit & Trust Co. of Pittsburg, the Oliver Iron & Steel Co., the Oliver & Snyder Steel Co., the Union Bridge Co., the Shenango Furnace Co., the Blain Coal Co., and the People's Savings Bank of Pittsburg. He is a member of the Pittsburg and Duquesne clubs, of Pittsburg; the University, Racquet, and Tennis clubs, of New York, and of the Theta Xi fraternity.

Mr. Rea is the son of William and Matilda A. (Robinson) Rea. He married Edith Oliver, April 23, 1889, and they have two children, Edith Anne and Henry Oliver Rea.

Reed, Harry Douglas (M.E., '92), was born in Poughkeepsie, N. Y., February 11, 1869; son of Henry A. and Alice A. (Boardman) Reed. He is descended from John Reed, who distinguished himself in Cromwell's army in England, and at the restoration of the Stuarts came to America and settled at Providence, R. I. Another ancestor was John Crane, who settled in Massachusetts in 1635 and whose descendants were distinguished in the Revolution.

While in the Newark high school, Harry Douglas Reed won the Hammer prize for making the best set of apparatus for demonstrating the elementary principles of electricity and physics. He has won several prizes for bicycle-riding and tennis-playing.

Immediately after graduating he secured a position with the Bishop Gutta Percha Co., New York, manufacturers of submarine telegraph and telephone cables insulated with gutta percha or india-rubber, underground electric light and power cables, and special power-station cables. His first work was in estimating the cost of labor and material on cables. Then he was made assistant electrician, and in January, 1895, was promoted



H. D. Reed

to the position of electrician and engineer, his work having included the designing of new machinery and electrical test work embracing tests for insulation, capacity, and conductivity of cables before shipment, and

often after laying. In July, 1893, he had charge of the laying of two cables for the United States Life Saving Service in Lake Huron,—one from Middle Island, and the other from Thunder Island, to the mainland. In 1894 he laid a cable from Fort Wadsworth to Fort Hamilton, across the New York Narrows, for the United States Army Engineers. In December, 1899, the company's factory was badly damaged by fire, and he was given charge of rebuilding the factory, repairing the old machinery, and making new. On the completion of this work he was appointed superintendent of the factory, the position he now holds.

He is a member of the American Institute of Electrical Engineers; the New York Electrical Society; the Engineers' Club of New York; and of the Roseville Athletic Association, Newark, N. J.

Reese, Francis I. (M.E., '01), was with the McKiernan Drill Co., New York, 1901; engaged on temporary work for Prof. D. S. Jacobus at Stevens Institute 1901; draughtsman with the New York Central & Hudson River Railroad Co., New York, 1902–03; and has been in the engineering department of the Geo. A. Fuller Co., New York, from 1903 to date.

Reeve, H. E. (M.E., '88), has, with the exception of a few months draughting for E. D. Leavitt, Jr., E.D., been engaged in the manufacture of small articles (principally in the electrical line) which, necessitating manufacture at small cost and in large quantities, require the use of special tools, which are also designed by Mr. Reeve and built in his shop at Brooklyn, N. Y.

Reid, Thorburn (M.E., '88), was born in London, England, May 1, 1864. He received the degree of Bachelor of Arts from the Hampden-Sidney College, Virginia, in 1882, and that of Bachelor of Science from the University of Virginia in 1885.

He was Professor of Mechanical Engineering in the South Carolina State University, during the session of 1888–89; was in the employ of the United States Electrical Manufacturing Co., Newark, N. J., in charge of the testing department, and afterward assistant to Mr. William Stanley, Jr., in inventing work, until 1890. He then practised as a consulting engineer in New York until



Thorburn Reid

he undertook the designing of an alternating-current system for the Edison General Electric Co., in 1891. When this company entered the General Electric Co., he became engineer in the calculating department of the latter at Lynn, Mass., devoting his time at first very largely to designing alternating-current apparatus, and later superintending the work of the draughtsmen and engineers in that department. In 1893 he went to Schenectady, and took charge of the reports and technical data of all the dynamos, motors, and transformers manufactured by that company.

He next went to London, England, in 1896, in the employment of the British Thompson-Houston Co., as assistant to Mr. H. F. Parshall. After returning to the United States he opened an office in New York as consulting engineer, in which business he is at present engaged. For three years he was consulting engineer to the American Impulse Wheel Co., New York, designing their water-wheel and starting them in commercial operation. He had full charge of the company's engineering department for a time.

He has read papers before the American Institute of Electrical Engineers, on "Armature Re-actions of Alternators" (1896),

and on "Sparking—Its Causes and Effects" (1897), and among the articles he has contributed to technical journals are: "Magneto-Motive Force," published in the *Stevens Indicator,* VII, "Some Recent Developments in the Theory of Magnetism," *Ibid.,* VIII, and "Some Early Traction History," *Cassier's Magazine,* August, 1899.

He is a member of the American Institute of Electrical Engineers; the Engineers' Club and Southern Society of New York; the New York Electrical Society; and the Phi Gamma Delta fraternity.

Mr. Reid is the son of Charles Henry and Mary Helen (Cochran) Reid. He married Bertha Van Kleeck, January 9, 1900, and they have one child, Thorburn Reid, Jr.

Reitze, George, Jr. (M.E., '01), was born in Hoboken, N. J., February 28, 1878. He was Instructor during the Supplementary Term at Stevens Institute, 1901; and has been with the De La Vergne Refrigerating Machine Co., New York, from 1901 to date.

Mr. Reitze is the son of George and Josephine (Gerstner) Reitze, both of German birth. He married Mae L. Schutt, June 18, 1902, and they have one child, Dorothea L. Reitze.

Rendon, Jose C. (M.E., '85). His record and location are unknown.

Renwick, Edward Brevoort (M.E., '84), was born in New York city April 21, 1863. He was with the Brooks Locomotive Works, Dunkirk, N. Y., and the Worthington Pump Works, Brooklyn, N. Y., 1884–85; instructor in mechanics and drawing at the Workingmen's School, New York, 1885–86; with the Passaic Quarry Co., New York, 1887; and has been a member of the firm of Pirsson & Renwick, dealers in real estate and building-stone (principally granite), from 1888 to date. Since the death of Mr. Pirsson in 1895, Mr. Renwick has conducted the business alone under the firm name. He is a member of the Engineers' and Union clubs and of the Architectural League and St. Nicholas Society, of New York. He was a member of the First Naval Battalion of New York from 1891 to 1897.

Mr. Renwick is the son of Edward Sabin and Alice Renwick. He married Emily Dilworth Hicks, August 2, 1900.

Renwick, William W. (M.E., '85), was a member of the firm of Renwick, Aspinwall, & Russell, architects, New York city, 1885–90; and has practised as architect in New York down to date. He is a member of the Engineers' Club of New York.

Rice, Richard Henry (M.E., '85), was born in Rockland, Me., January 9, 1863. He was a special apprentice in the shops of the Pittsburg, Cincinnati, & St. Louis Railroad, Dennison, O., 1885–86; draughtsman with the New England Shipbuilding Co., Bath, Me., 1886–87; chief draughtsman with E. D. Leavitt, Jr., Cambridgeport, Mass., 1887–90; engineer and superintendent of the William A. Harris Engine Co., Providence, R. I., 1891–94; and in the latter year organized the Rice & Sargent Engine Co., Providence, which he conducted until its merger in 1898 into the Providence Engineering Works, of which he is treasurer. He presented before



R. H. Rice

the American Institute of Electrical Engineers, New York, October 25, 1901, a paper on "The Design of Engines for Operating Alternators in Parallel," which was published in the *Street Railway Journal,* November 2, 1901. He is a member of the American Society of Mechanical Engineers;

of the Association of Mechanical Engineers, and the Art and University clubs of Providence, and of the Delta Tau Delta fraternity.

Mr. Rice is the son of Albert Smith and Frances W. (Baker) Rice. His father was a representative in the Maine legislature, and his grandfather was president of the Portland & Kennebec (now the Maine Central) Railroad, and vice-president of the Northern Pacific Railroad. Henry K. Baker, his maternal grandfather, was a prominent author. The subject of this sketch married Mary Sue Durgin in 1887 (deceased 1895), and Alice Woodman Kimball in 1898. There are three children, Phyllis, Richard Drury, and Sue Durgin Rice.

Richardson, C. G. (M.E., '89), was assistant manager with the Jones & Lamson Machine Co., Springfield, Vt., 1889–92; salesman with the George F. Blake Manufacturing Co., at Boston and Chicago, 1892–94; assistant treasurer of the Parks & Woolson Machine Co., Springfield, Vt., 1894–98, and has been treasurer of the company from 1898 to date. He has been granted a patent on a turret lathe.

Richardson, George Partridge (M.E., '97), was born in Duxbury, Mass., September 5,



G. P. Richardson

1874. He has been with the Isbell-Porter Co., engineers and founders, Newark, N. J., from 1897 to date, and now holds the position of engineer of construction, being chiefly occupied in superintending erection work, estimating, designing, etc. The company, although engaged in general engineering and foundry work, makes a specialty of ice and refrigerating plants and gas-works apparatus, and the alteration of refrigerating and gas plants. He is a junior member of the American Society of Mechanical Engineers, and a member of the Chi Psi fraternity.

Mr. G. P. Richardson is the son of Parker C. and Harriette M. Richardson. He married Kathleen Gill Atkinson, January 19, 1903.

Richtberg, Hermann Andreas (M.E., '00), was born in New York, December 19, 1874.



H. A. Richtberg

He was Instructor during the Supplementary Term at Stevens Institute, 1900; in the testing department of the Westinghouse Electric & Manufacturing Co., Newark, N. J., 1900–02; and has been senior assistant in the electrical department and foreman of the watt-meter test department at the same works from 1902 to date. He is an associate member of the American Institute of Electrical Engineers.

Mr. Richtberg is the son of Hermann and Christine Richtberg, both of German birth. He married Lillian A. Thum.

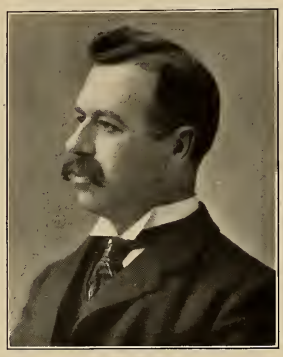
Riddle, Robert Moore (M.E., '81), was born in Pittsburg, Pa., November 10, 1856; son of Robert Moore and Mary Dickerson Riddle. He was an apprentice in the Pennsylvania Railroad shops, Altoona, Pa., 1881–86; and draughtsman with Cofrode & Saylor, bridge-builders, Philadelphia, 1886–87. Since 1887 he has not been actively engaged in engineering work, although during this time he designed and built a set of triple-expansion engines for a 62-foot launch, which stood the test of a voyage from Maine to Cuba and in the Bahamas and Florida waters. He is a member of the New York Yacht and Reform clubs, of New York, and of the Corinthian Yacht and Rittenhouse clubs of Philadelphia.

Riege, Rudolph (M.E., '93), was born in Penn Yan, N. Y., March 23, 1873; son of Emil August and Alice E. Riege. He was draughtsman with the Jackson & Woodin Manufacturing Co., Berwick, Pa. 1893–95; engaged in the construction and operation of gas works at the London Branch of Messrs. Humphreys & Glasgow, 1895–98; superintendent of the Front Street works of the Newark Consolidated Gas Co., Newark, N. J., 1898–1901; and superintendent of the Westchester Lighting Co., Yonkers, N. Y., in the latter year, but was shortly after compelled to resign his position on account of ill health. After a year's rest he took up patent law, and in January, 1903, joined the patent department force of the Electric Vehicle Co., Hartford, Conn., and is now engaged in the commercial handling of the patent interests of that company. His graduation thesis, on "Comparison of Insulating Materials for Cold Storage," prepared jointly with Mr. Franke L. Parker, was published in the *Stevens Indicator*. He is a member of the American Gas Light Association and of the Theta Xi fraternity.

Riesenberger, Adam (M.E., '76), Professor of Mechanical Drawing, and Registrar and Assistant Treasurer, at Stevens Institute of Technology. For biography, see page 262.

Righter, Addison Alexander (M.E., '82), was born in Newark, N. J., January 10, 1860; son of William A. and Emma L. (Shugard) Righter. He was educated at Willison Seminary, Easthampton, Mass., and graduated from the Sheffield Scientific School in 1881.

He was with the Rondout Iron Works, Rondout, N. Y., 1882–84, first as draughtsman and then as constructing engineer. These works built principally marine engines and boilers, dredges, river steamers, tugboats, stern-wheel vessels for shallow rivers in South America, and cement machinery. He was next mechanical engineer at the Yantic Woolen Co.'s works, Yantic, Conn., 1884–90, designing machinery and acting as mill architect in putting up new buildings and reorganizing the plant.



A. A. Righter

Early in 1890 he went to England to develop box-making machinery for the Corruganza Manufacturing Co., since which time he has been interested in this business. The Corruganza company was amalgamated with Hugh Stevenson & Sons, Ltd., Manchester, in 1900. He is now one of the directors of the latter firm, manager of the London works, and consulting engineer for the Conduit & Insulation Co., London, an electrical concern manufacturing steel conduits lined with paper, and general electric fittings.

Mr. Righter also conducts a general business as consulting engineer in London. He has taken out numerous patents which are registered under the names of the various companies with which he has been associated. He is a member of the University

Club, New York; the National Liberal Club, London; and of the Theta Xi fraternity.

Rittenhouse, Charles Tomlinson (M.E., '93), was born in New York city August 4,



C. T. Rittenhouse

1871; son of Moses and Rebecca L. Rittenhouse. After graduation from the Institute he entered the School of Mines at Columbia University, and at the end of a year graduated therefrom as an electrical engineer. In the spring of 1894 he was appointed University Fellow in Electricity in the Department of Pure Science, the highest honor conferred by this University. His post-graduate course comprised the study of the more advanced theories of electricity, electro-chemistry, and thermodynamics, and for minor subjects, mathematics, astronomy, political economy, etc. In the spring of 1895 he received the degree of Master of Arts, and was also reappointed University Fellow in Electricity for the succeeding year. The illness of the professor in charge of his major subject prevented Mr. Rittenhouse from presenting himself for the degree of Doctor of Philosophy.

During the period that he was at Columbia, the Roentgen or X-rays were being widely discussed and experimented with throughout the world. One of the first and foremost in this country to investigate this subject was Dr. Pupin, of Columbia, with whom Mr. Rittenhouse was associated. He conducted many experiments for Dr. Pupin, and succeeded in taking some of the first X-ray pictures on this side of the Atlantic. Mr. Rittenhouse wrote much on the subject, and also gave a number of lectures. In 1896 he was offered the position of editor-in-chief of the *Electrical World,* which duties he immediately assumed and continued to pursue until the latter part of 1897, when ill health, due to overwork, forced his resignation. He went west with the hope of recovery, but finally succumbed to an attack of pneumonia, at Denver, Colo., February 26, 1900.

He was the author of two articles which were published in *Electric Power:* one on "The Constancy of the Magnetic Field," March, 1895, and the other on "Progress in Electrical Development in Europe." He also wrote the article on "Wireless Telegraphy" in the "Century Dictionary," and that on the X-rays for the "Standard Dictionary."

He was a member of the American Institute of Electrical Engineers; the American Association for the Advancement of Science, and the British Association for the Advancement of Science.



L. H. Rittenhouse

Rittenhouse, Leon Hawley (M.E., '01), was born in Annapolis, Md., September 29, 1879. He was in the operating department of the Brooklyn Rapid Transit Co., Brook-

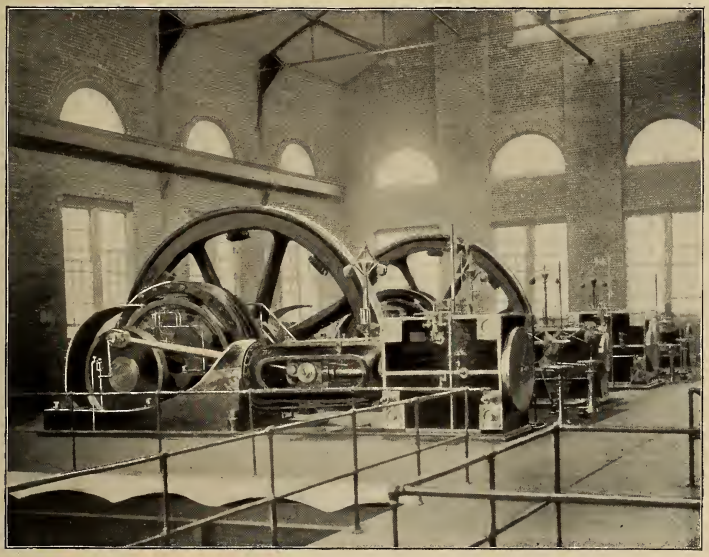
lyn, N. Y., 1901–02; sales engineer with the Goudey-McLean Co., 1902–03; and since the latter date has been in the mechanical engineering department of the American School of Correspondence, Chicago, Ill. He is a member of the Theta Nu Epsilon fraternity.

Mr. Rittenhouse is the son of Hawley O. and Leonora A. Rittenhouse. He married Eva Leah Ford, September 4, 1902.

Rittenhouse, Walter B. (M.E., '98), was assistant engineer with the International Paper Co., New York, 1899–1900; chief engineer with the Piercefield Paper Co., Piercefield, N. Y., 1900–01; and has been electrical engineer with the Highland Canal & Power Co., Duluth, Minn., from 1901 to date.

Robbins, Edward P. (M.E. '79), was with the Brown & Sharpe Manufacturing Co., Providence, R. I., 1879–80; and mechanical engineer and patent solicitor, Cincinnati, Ohio, 1880–84. Since 1884 no record of Mr. Robbins has been obtainable.

Roberts, Edward Parkinson (M.E., '77), was born in New York city in 1857. He was successively (between 1877 and 1883) lathe-hand in the tool-room of the Singer sewing-machine factory; draughtsman with Thomas Crane, patent attorney, Newark N. J.; draughtsman, and finally superintendent of George Yule's machine-shop, Newark; draughtsman, with Hewes & Philips, Newark; assistant to Hiram S. Maxim, electrical engineer to the United States Electric Co., New York; assistant to Edward Weston, electrical engineer for the above company; electrician and shop superintendent of the American Electric Co., New York; engineer in the West for a Boston electric light syndicate; electrician with the Swan Lamp Co., Boston; erecting engineer for the Brush-Swan Rocky Mountain Co.; then super-



Power Plant of Lorain & Cleveland (O.) Railway Co. (1896)
E. P. Roberts

intendent, and later general manager, of the Cheyenne (Wyo.) Electric Light Co., 1883–88; superintendent of the Cheyenne Gas Co., 1885–88; Associate Professor of Electrical Engineering at Cornell University, 1888–89; assistant engineer with the Brush Electric Co., and superintendent of the Swan Lamp Manufacturing Co., Cleveland, O. (at that time an allied interest), and later general manager of the latter company, 1889–93; and has been established at Cleveland as a consulting engineer under the firm



E. P. Roberts

names of E. P. Roberts & Co., and later the Roberts-Abbott Co., mechanical, electrical, and civil engineers, from 1893 to date. The recent work of the firm has been in nearly every State east of the Rocky Mountains (except those in the Southeast), and in Canada. It has been principally in connection with electrical railroads; but has also to a considerable degree included electric light and power plants, hot water and steam heating plants, waterworks, water-power development, gasworks, and manufacturing plants.

The illustration on page 541 is typical of the direct-current power-houses designed by the firm. The plant was fully described in the *Street Railway Journal* of April, 1897.

Among the articles written by Mr. Roberts are "A Storage Battery Station," *Transactions of the American Institute of Electrical Engineers,* 1882; "Considerations Governing the Choice of a Dynamo," read before the Civil Engineers' Club of Cleveland, and published in the *Journal of the Association of Engineering Societies,* 1891; a series on "The Most Economical Loss in Conductors," *Electrical World,* 1891; "The Power House in an Electric Railroad System," *Ibid.,* 1892; and "The Use of the Despatcher's Diagram in the Design of Interurban Railways," *Stevens Indicator,* 1901. Besides the above-mentioned technical journals the following have published papers by Mr. Roberts dealing with engineering problems: the *Street Railway Review,* the *Engineer,* and the *Journal of the Association of Engineering Societies.* He has also given several informal "talks" (mainly on electric railway design) before technical schools and the Electric Club of Cleveland.

He is a member of the American Society of Mechanical Engineers; the American Institute of Electrical Engineers; the Electric and Century clubs and the Chamber of Commerce of Cleveland; and of the Theta Xi fraternity; as well as being an honorary member of the Buffalo Electric Club. He was elected secretary of the Section of Practice at the International Congress of Electricians, Chicago, 1893; and was president of the Alumni Association for the year 1896–97.

Mr. Roberts is the son of John Parkinson and Anne Eliza Roberts. He married Jessie Boardman in 1883, and they have two children, Arthur Boardman and Eleanor Ruth Roberts.

Roberts, George J. (M.E., '84), was born in Charlotte County, Va., September 10, 1863. He was a special apprentice in the Topeka shops of the Atchison, Topeka, & Santa Fé Railroad, 1884–86; in the draughting-room of the Chicago, Burlington, & Quincy Railroad, Aurora, Ill., 1886–87; in the motive-power department of the Richmond & Danville Railway, Washington, D. C., 1887–89; and has been with the United Gas Improvement Co., from 1889 to date, in the following capacities: in charge of field work, 1889–91; in charge of draughting-room and assistant to inspector of construction, 1891–92; acting inspector of construction, 1892–93; inspector of construction, 1893–98; engineer of construction, 1898–1900; engi-

neer, 1900–04; and engineer in chief from March 1, 1904, to date. He has taken out a patent which permits of gas being made either up through the generator or down through the generator, a model of which was exhibited at the Stevens Institute at the time of its Twenty-fifth Anniversary exhibition.



G. J. Roberts

He contributed a paper on "The Pumping of Gas" to the American Gas Light Association in October, 1899. He is a member of the American Gas Light Association; the American Society of Mechanical Engineers; the Westmoreland Club, Richmond, Va.; the Philadelphia Country Club; the University Club; and the Merion Cricket Club.

Mr. G. J. Roberts was an Alumni Trustee of Stevens Institute of Technology for the term 1899–1902.

Roberts, William Henry Harrison, Jr. (M.E., '93), was born in Philadelphia, Pa., May 28, 1869; son of W. H. H. and Martha (Fife) Roberts. He is of the eighth generation from John and Sarah Roberts, who sailed from England on the "Kent" in 1677, and settled in Burlington County, N. J. He was with the Columbia Typewriter Manufacturing Co., New York, 1893–94; inspector with the Mergenthaler Linotype Co., Brooklyn, N. Y., 1895–96; with the Johnson Temperature Regulating Co., New York, 1896–1901; and has been with the Powers Regulator Co., New York, from 1901 to date. He is a Free Mason and a member of the Royal Arcanum.



W. H. H. Roberts, Jr.

Robinson, Edward William (M.E., '95), was born in Hamburg, Germany, May 13, 1874. He was employed by Colgate & Co., Jersey City, N. J., 1895; was draughtsman for the Elmira Bridge Co. on the North-



E. W. Robinson

western Elevated Railroad, Chicago, and inspector on the Park Avenue improvement,

New York, 1896; draughtsman with the C. W. Hunt Co., New York, engaged on coal-handling machinery, 1896–97; with R. P. and J. H. Staats, New York, engaged in designing and building sheds and plants for the White Star, Cunard, and Wilson steamship lines, New York, and similar work, 1897–1900; member of the firm of Ray & Robinson, contractors and builders, New York, 1900–03; and has been a member of the firm of Smith & Robinson, general contractors, from 1903 to date. He is a member of the Princess Anne Hunt Club, and of the Alandar Golf Club.

Mr. Robinson is the son of Edward and Emma (Weismann) Robinson. His first ancestor in America was William Robinson, of Dorchester, Mass., who settled there in 1635 in the company led by Richard Mather. The subject of this sketch married Georgiana B. Brock, October 26, 1896, and they have one child, Edward Herman Robinson.

Robinson, Herman (M.E., '98), has, so far as known, been located in New York city since graduation.

Rogers, Washington Hunt, Jr. (M.E., '02), was born in New York city July 23, 1881; son of Washington H. and Emma A. Rogers. He is descended from Lieut.-Col. Rogers who perished in the Black Hole of Calcutta. The direct line of the Rogers family have all engaged in active military service. The subject of this sketch was assistant in the testing department of the American Diamond Rock Drill Co. for one year, engaged in experimental work on steam turbines, condensers, compressors, and centrifugal pumping-machinery. He was inspector of construction with the New York Mutual Gas Light Co. until the latter part of 1903, when he was advanced to the position of assistant superintendent.

Rood, Vernon Harris (M.E., '82), was born in Elyria, O., November 10, 1856. He was assistant to the superintendent of the firm of J. C. Haydon & Co., builders of mining machinery, Jeanesville, Pa., 1882; draughtsman with Coxe Bros. & Co., Drifton, Pa., 1882–84; filled a like position with the Philadelphia & Reading Coal & Iron Co., Pottsville, Pa., 1884–87; was head draughtsman with the Barr Pumping-Engine Co., Philadelphia, Pa., 1887–90; and has been vice-president and manager of the Jeanesville Iron Works Co., Jeanesville, Pa., from 1890 to date. The product of the company is mine and special pumping machinery. He has taken out two patents, one for a coal jig, and the other for a cut-off for duplex pumps. He is a member of the American Society of Mechanical Engineers.

Mr. Rood is the son of Homer B. and Helen S. Rood. He married Alice A. Stone, December 21, 1882, and they have five children, Vernon S., Margaret S., Esther A., Carlos H., and Francis A. Rood.



V. H. Rood

Ropes, Albert Barrett (M.E., '83), was born in Orange, N. J., July 10, 1862; son of David Nichols and Lydia Laurelia Ropes. His father and his uncle, George Ropes, were the first manufacturers of table cutlery in this country, beginning about the year 1840. At the age of fifteen he made a complete working model in wood of a locomotive three feet long. He worked in the locomotive shops of the Northern Pacific Railroad at Brainerd, Minn.; then spent a short time in the service of the Philadelphia & Reading Railway at Reading, Pa., resigning to become engineer of tests for the Northern Pacific Railroad. At the time of his death, which occurred at Sacramento,

Cal., in October, 1889, he was engineer of tests for the Southern Pacific Railroad.



A. B. Ropes

Rose, Rudolf Viedt (M.E., '97), was born at Niagara Falls, N. Y., April 27, 1876; son of Adolf E. and Helene V. Rose, and of German descent. He has been with the Niagara Falls Power Co. and the Canadian Niagara Power Co. from 1897 to date. His work has been principally in connection with the installation of the 5,000-horse-power turbines in Power House No. 2 of the Niagara Falls Power Co. and the 10,000-horse-power turbines of the Canadian Niagara Power Co. He is now chief engineer of the Niagara Falls Power Co. During the period since graduation Mr. Rose spent nearly a year in the electrical instrument department of Die Allgemeine Elektricitäts-Gesellschaft of Berlin, Germany. He is a member of the Beta Theta Pi and Tau Beta Pi fraternities.

Rosenberg, Ernest M. (M.E., '89), was born in New York city September 4, 1868; son of Emil Rosenberg, M.D., and S. (Blumenthal) Rosenberg. He was electrician and superintendent of the Manhattan Electric Light Co., New York, 1889–91; draughtsman in the Crane department of the Yale & Towne Manufacturing Co., Stamford, Conn., 1892; draughtsman on track and power-house work for the Metropolitan Street Railway Co., New York, 1892–94; associated with Mr. J. A. Barrett, investigating electrolytic destruction of water-pipes by trolley currents, for the Brooklyn Subway Commission, Brooklyn, N. Y., 1894–95; draughtsman on structural ironwork with the Jackson Architectural Ironworks, New York, 1895–96; engaged on electrolytic investigation, again, for the Brooklyn Subway Commission (the work begun in 1894), 1896–97; consulting engineer to Gen. Collis, commissioner of public works, New York, in matters relating to conduit electric railroads, regarding electrolytic destruction of water-pipes, etc., and electrical engineer to the Department of Public Works, New York, on all work then being constructed by the Metropolitan Street Railway Co., 1897–98; and has been draughtsman on machine design and power plants and consulting engineer for mill transmission plants from 1898 to date. He is an associate member of the American Institute of Electrical Engineers.

Rosenbusch, Gilbert (M.E., '94), was born in New York city July 26, 1874; son of Joseph and Caroline Rosenbusch. He was with the Sprague Electric Co., New York, 1894–99, his work comprising draughting, designing, erecting, testing, and experimenting. As engineer in charge of the electric



Gilbert Rosenbusch

equipment of the forty-eight elevators installed on the Central London Underground

Railway, he was resident engineer for the Sprague Co., in London, 1899–1901. During the latter year he was employed on special work for Sir Douglas Fox, designing underground stations; and next became chief electrical engineer to the firm of Waygood & Otis, Ltd., London, consulting engineer for the Sprague Elevator Co., London, and patent expert for subsidiary companies. He is at present on the engineering staff of the Underground Electric Railways Co. of London. He has delivered several lectures before various societies on elevator practice.

He is an honorary member of the Engineering Society of the State University of Minnesota; a member of the Royal Societies Club, London; and an associate member of the American Institute of Electrical Engineers, and of the Institution of Civil Engineers, London.

Royle, Vernon Elmer (M.E., '02), was born in Paterson, N. J., July 10, 1877; son of Vernon and Jeannie (Malcolm) Royle. He worked in the machine-shop of John Royle & Sons, for two years, at vise work and all machines. At present he is in the draughting-room of this company. He has applied for a patent on textile machinery.



V. E. Royle

He is a member of the New York Electrical Society, and the North Jersey Automobile Club.

Ruprecht, Louis (M.E., '94), was born in Hoboken, N. J., November 22, 1873; son of Charles W. and Marianne Blume Ruprecht,



Louis Ruprecht

and of German descent. He was with the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., 1894–96, as apprentice in the shops, engaged in experimental laboratory work, and assistant in the engineering department on specification work and design; was in the employ of the National Lead Co., 1896–1901, as chemist and metallurgist of the smelting and refining department, engaged in manufacturing lead, tin, antimony, etc., alloys, and the reduction of oxides and drosses, etc. He designed and erected a smelting and refining plant at the Chicago branch, and was superintendent and buyer in this department. He was with the Russell & Erwin Manufacturing Co., New Britain, Conn., 1901–03, as chief engineer in charge of power and plant and of changes and additions in boiler, engine, electrical installations, etc.

During 1904 he became manager of the Washington Electric Vehicle Transportation Co., of the Electric Vehicle Co., Hartford, Conn., manufacturers of commercial and pleasure electric and gasoline vehicles. He designed and applied for a patent on a rapid casting mold. He contributed an article to the *Stevens Indicator* on "Graphic Method for the Determination of the Sum Value of

Two Components," designed for the National Lead Co. and used for determining conveniently the fluctuating value of an alloy for varying cost of the component metals. Mr. Ruprecht is a charter member of the University Club of Brooklyn.

Rusby, John Morrell (M.E., '85), was born in Franklin, N. J., March 5, 1861; son of John and Abigail E. (Holmes) Rusby. He has been with the United Gas Improvement Co., from 1885 to date, having occupied the following positions: in the engineering office at Philadelphia, 1885–86; superintendent of gasworks at Allentown, Pa., 1886–87; superintendent of the Jersey City gasworks, 1887–99; in charge of the Hudson County electric plant of Jersey City, 1891–96; engineer of the Hudson County Gas Co., 1899–1902; and inspecting engineer from 1902 to date. He is a member of the American Society of Mechanical Engineers; of the American Gas Light Association; the Engineers' Club of New York; and the Merion Cricket Club. He presented a paper to the American Gas Light Association, in October, 1898, on "The Effect of the Depth of Fire upon the Practical Efficiency of a Water-Gas Generator." An article by him on "An Outline



J. M. Rusby

Description of Carburetted Water-Gas Manufacture" appeared in the *Stevens Indicator*, October, 1899.

Rusling, William James, Jr. (M.E., '96), was born in Brooklyn, N. Y., August 10, 1874; son of William James and Emma R. (Smith) Rusling. He was in the motive-



W. J. Rusling, Jr.

power department of the Pennsylvania Railroad at Jersey City, N. J., 1896–99; at Altoona, Pa., 1899–1901; at Philadelphia, Pa., 1901–03; and at Pittsburg, from 1903 to date.

Sague, James Edward (M.E., '83), was born in Poughkeepsie, N. Y., July 2, 1862. He was assistant engineer of tests with the Chicago, Burlington, & Quincy Railroad, Aurora, Ill., 1883–85; engineer of tests, general foreman of machine-shops at Jersey City, and division master mechanic with the Erie Railroad, 1885-90; mechanical engineer with the West India Improvement Co., and superintendent of motive power for the Jamaica Railroad, Jamaica, W. I., 1890–92; mechanical engineer with the Schenectady Locomotive Works, Schenectady, N. Y., 1892–1901. In this latter year, at the time of the consolidation of most of the large locomotive manufacturing concerns into the American Locomotive Co., he was called to the main office in New York to take charge of the engineering business of the consolidated company. In March, 1904, he was made assistant vice-president, and in June vice-president of the American Locomotive Co.

While engineer of tests with the Erie Railroad, he designed and superintended the application of the system of steam car-heating in use on that road. He did considerable work in connection with the designing and fitting up of new shops of the Schenectady Locomotive Works, and later his work at Schenectady consisted principally of the designing and sale of locomotives. He contributed an article on the "Design of Locomotive and Car Springs" to the *Stevens Indicator,* VI. He has also been an active member in presenting papers, reports, discussions, etc., to the various associations to which he belongs, among which are the following: the American Society of Mechanical Engineers; the American Railway Master Mechanics' Association; and the New York, and the New England Railroad clubs. He was one of the three representatives of the American Society of Mechanical Engineers at the tests carried on at the locomotive testing plant which the Pennsylvania Railroad included in its exhibit at the St. Louis Exposition in 1904.

Mr. Sague is the son of Horace and Harriet Jane (Kelsey) Sague. He married Jeannette Kenyon, October 30, 1890, and they have one child, Isabel D. Sague.

Sanborn, Francis N. (M.E., '91), was with the Manhattan Electric Light Co., New York, 1891–93; mechanical engineer with the Susquehanna Coal Co., Wilkesbarre, Pa., 1894, and at Nanticoke, Pa., 1895; assistant master mechanic with the Coe Brass Manufacturing Co., Torrington, Conn., 1896–1900; and later has been with the Atlas Portland Cement Co., Hannibal, Mo. He is a junior member of the American Society of Mechanical Engineers; an associate member of the American Institute of Electrical Engineers; and a member of the American Institute of Mining Engineers.

Sander, George H. (M.E., '01), was born in Dresden, Germany, October 1, 1880; son of Hermann F. and Emma Sander. He entered school in Dresden, Germany, and came to America in 1888. He has been employed in the works of the General Electric Co., Schenectady, N. Y., from 1901 to date, at first in the department of tests, next as first assistant foreman of the transformer testing department, and then took the shop course and served for a short time in the draughting department. He is at present with H. G. Reist, chief engineer in the alternating-current engineering department of the same company, and taking a postgraduate course with Prof C. P. Steinmetz in the modern theory of electrical engineering and in alternating-current phenomena. He spent three months in 1904 inspecting electrical manufacturing establishments and lighting installations in Germany. He is an associate



G. H. Sander

member of the American Institute of Electrical Engineers, and a member of the Tau Beta Pi fraternity and the Mohawk Lacrosse Club.

Sander, Robert Hermann (M.E., '00), was born in Dresden, Germany, March 22, 1878; son of Hermann F. and Emma Sander. He was Instructor during the Supplementary Term at Stevens Institute, 1900, 1901, and 1902; was employed in the meter department of the Edison Electric Illuminating Co., New York, 1900–01; conducted, jointly with Mr. D. Corbin, M.E., a test of the plant of the Cross, Austin, & Ireland Lumber Co., Long Island City, N. Y., 1901; and has been Instructor in advanced mathematics, mechanical drawing, and manual training at the high school, North Plainfield, N. J., from 1901 to date. During the summer of

1904 he visited a number of engineering and industrial schools in Germany.

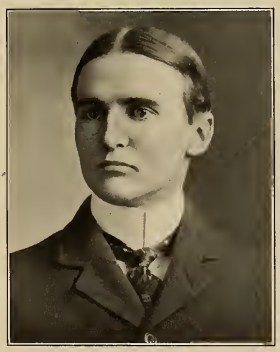


R. H. Sander

Sanders, Lewis (M.E., '98), was in the draughting-room of the Crocker-Wheeler Electric Co., Ampere, N. J., 1898; engaged in investigations at Stevens Institute (where he had assembled a gas-engine suitable for his purpose) concerning improvement of the economy of the gas-engine by means of an original method of exploding the gases, 1899; factory manager of the Holyoke Automobile Co., Holyoke, Mass., 1900–02. He has been president of the Suaqui Grande Ore Co., and chief engineer for the Mexican syndicate of the Placero del Rio Conchos (placer working), Chihuahua, Mexico; and is now in charge of the steam turbine tests for the General Electric Co. at West Lynn, Mass.

Sandt, George F. (M.E., '84), was with Linde, Smith, & Co., manufacturers of refrigerating machines, New York, 1884; the Edison Electric Light Co., New York, 1885–93; secretary and treasurer of the Electrical Engineering & Trading Co., New York, 1893–95; superintendent of the Georgia Electric Light Co., Atlanta, Ga., 1895–97; and for several years has been located at "The Home," Highlands Station, Denver, Colo.

Sanson, Frederick Bartholomew (M.E., '99), was born in East Orange, N. J., November 13, 1875; son of Thomas James and Frances Grace (McPherson) Sanson, and of Scotch descent. He was employed in the bridge and structural department of the Pennsylvania Steel Co., Steelton, Pa., 1899–1900; in the office of Percival R. Moses, consulting engineer, New York, 1900–01; and has been in the forge department of the Midvale Steel Co., Nicetown, Philadelphia, Pa., from



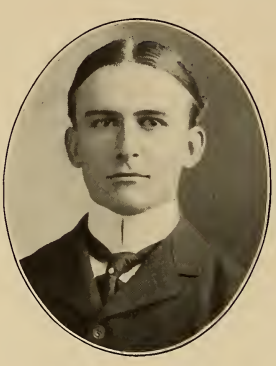
F. B. Sanson

1901 to date. He is a member of the Chi Psi fraternity.

Sanson, Harold R. (M.E., '99), was born in East Orange, N. J., November 30, 1876. He was employed in the forge department of the Midvale Steel Co., Philadelphia, Pa., 1899–1900; was assistant superintendent of the Northampton Portland Cement Co., Stockertown, Pa., 1900–01; was in the condenser department of the International Pump Co., New York, 1901–02; and has been secretary and general manager of the Southern Cement Co., Birmingham, Ala., from 1902 to date. He is also secretary and general manager of the Cahaba Southern Mining Co., Birmingham, miners and shippers of domestic and steam coal from the Cahaba-Underwood seam at Hargrove, Ala. He is a member of the Chi Psi fraternity, and of the Southern and Country clubs of Birmingham.

Mr. Sanson is the son of Thomas James and Frances Grace (McPherson) Sanson.

He married Florence Pierson, of East Orange, N. J., October 29, 1902.



H. R. Sanson

Sawyer, F. Hudson (M.E., '97), was in the employ of the Pintsch Compressing Co., New York, located first at Atlanta, Ga., and later at Memphis, Tenn., from 1898 until recently. He is now superintendent of the company and is located at Texarkana, Ark.

Scammell, Frederick A. (M.E., '99), was Instructor during the Supplementary Term at Stevens Institute, 1899; was employed in the Carnegie Steel Works, Homestead, Pa., 1899; engaged in the wood-pulp business in New Brunswick, 1899; and has been employed in the Carnegie Steel Works, Munhall, Pa., at first as assistant to the steam expert, 1901; and now as superintendent of the steam department.

Schaeffler, Joseph C. (M.E., '00), was born in New York city May 8, 1877. He was Instructor during the Supplementary Term at the Stevens Institute, 1900; was employed in the engineering department of the Patten Vacuum Ice Co., New York, 1900–01; was assistant to Mr. George H. Barrus, consulting engineer and steam expert, Boston, Mass., 1901–03; and has been engaged in consulting and contracting engineering work on his own account since 1903. He is a junior member of the American Society of Mechanical Engineers; and a member of the New York Athletic Club and of the Phi Sigma Kappa fraternity.

Mr. Schaeffler is the son of John and Anna



J. C. Schaeffler

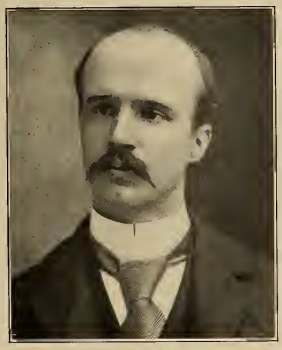
Schaeffler. He married Mildred A. Dolliver, March 19, 1903.

Schimmel, John, Jr. (M.E., '96), studied at Columbia University, 1896–97, receiving the degree of civil engineer in the latter year; and has since been employed in the general office of the Baltimore, Chesapeake, & Atlantic Railway Co., Baltimore, Md.; later, with the same company, at Salisbury, Md.; and at present as assistant supervisor No. 8 with the Pennsylvania Railroad, Tyrone, Pa. His graduating thesis, prepared jointly with Messrs. M. Shepard and Rudolph Bruckner, on "A Comparative Test of the Calorific Power of Wilkinson Carburetted Water-Gas and Lowe Carburetted Water-Gas, with the Junker Calorimeter," was published in the *Stevens Indicator*, XIII. He is a member of the Tau Beta Pi fraternity.

Schlesinger, Alfred Henry (M.E., '87), was born in College Point, N. Y., January 7, 1865. He was with the National Water Purifying Co., New York, first as assistant and then as engineer in charge, 1887–90. During this time he was in charge of the

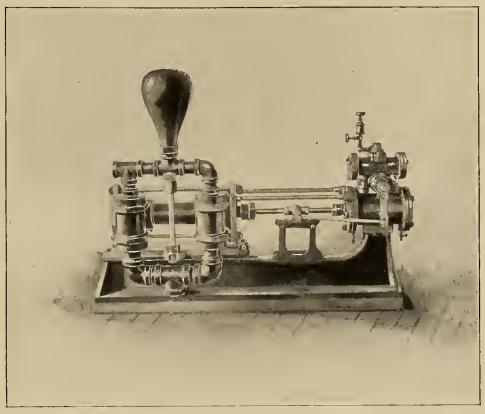
erection of water-purifying plants throughout the Eastern, Western, and Southern States, and designed several special devices in connection with the same. He was associated with C. W. Thomas (M.E., '84), mechanical and hydraulic engineers, New York, 1890–91; was mechanical engineer and assistant superintendent of the works of the India Rubber Comb, and the Goodyear Hard Rubber companies at College Point, N. Y., 1891–98, in which latter year the companies were merged into the American Hard Rubber Co., and Mr. Schlesinger was made superintendent of the College Point works, the position he now holds. He is also a stockholder in the company.

In 1892, under a contract for two power pumps and all the piping for the salt-water aquaria in the Fisheries Building at the World's Columbian Exposition, Mr. Schlesinger designed many of the fittings



A. H. Schlesinger

and superintended their erection. In 1893 he drew plans for and supervised the installation of the piping system in the New York Aquarium. During the time in which he has



Hard-Rubber Pump for Conveying Corrosive Liquids
A. H. Schlesinger

been associated with the rubber companies, he has designed and installed new tools for the manufacture of hard-rubber goods.

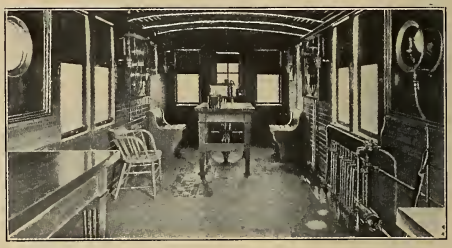
In 1894 he designed a double-acting hard-rubber pump to convey a solution of iron in nitric acid, which, prior to that time, was exceedingly difficult to handle. The pump is easily constructed and kept in order, and is applicable to any driving power. The pump end is complete in itself, and can be attached to a steam end for driving, or to a crank to be driven by belt power or electric motor. Several sizes of these pumps have been put on the market and installed, the largest being of six-inch diameter and ten-inch stroke. To meet a demand for a smaller pump, a single-acting plunger pump, to be worked by hand or by belt power, has been designed and manfuactured under Mr. Schlesinger's supervision. Over sixty of these machines are now in use in chemical plants together with complete systems of piping.

He contributed an article on the "Development of a Steam Plant of the Early 'Fifties" to the *Stevens Institute Indicator* for July, 1901.

He is a member of the board of control, and vice-president of the Poppenhusen Institute at College Point; director of the College Point Savings Bank; a member of the board of trustees of the Queensborough Library, New York city; a member of Consistory, and treasurer of the First Reformed Church of College Point; and a member of the Chi Psi fraternity.

Mr. Schlesinger is the son of Auguste D. and Jerusha C. (Pitkin) Schlesinger. His mother is a direct lineal descendant of William Pitkin, third Governor of Connecticut, 1766–69. The subject of this sketch married Mary Jones, September 25, 1895, and they have one child, Alfred Francis Schlesinger.

Schmidt, Edward C. (M.E., '95), was born in Jersey City, N. J., May 14, 1874; son of John Frederick and Catherine E. (Bisbord) Schmidt. He was employed in the engineering department of the Kalbfleisch Chemical Co., New York, 1895–96; in the like department of the C. W. Hunt Co., New York, 1896; in the steam department of the Edison Electric Illuminating Co., Brooklyn, 1896–97; in the construction department of the American Stoker Co., New York, 1897–98; and, connected with the University of Illinois, Urbana, Ill., 1898–1904, for the first three years as Instructor, and then as Assistant Professor of Railway Mechanical Engineering. He is now engineer of tests for the Kerr Turbine Co., Wellsville, N. Y.



Front End of Car—Interior
E. C. Schmidt

In 1899–1903 he conducted train-resistance experiments on the Illinois Central; Cleveland, Cincinnati, Chicago, & St. Louis; and the New Jersey Central railroads. He also designed Railway Test Car No. 17, owned by the University of Illinois and the Illinois Central Railway, of which illustrations are here shown.

In 1901 he conducted train-resistance experiments on the New York Central & Hudson River railroad to provide data necessary for the change in motive power in the Park Avenue tunnel, New York, from steam to electricity. In this connection he took part in competitive tests of steam locomotives and electric motor cars at the works of the General Electric Co., Schenectady, N. Y.



Railway Test Car No. 17
E. C. Schmidt

Mr. Schmidt is the author of the following papers: "Applications of Compressed Air in Railway Shop Practice," read before the St. Louis Railway Club, February, 1900; "The Dynamometer Car and its Uses," read before the Pacific Coast Railway Club, November, 1901; and "Education in Railway Engineering at the University of Illinois," read before the Illinois Society of Engineers and Surveyors, January, 1900.

He is a member of the Western and the St. Louis Railway clubs; of the Society for



E. C. Schmidt

the Promotion of Engineering Education; and of the Tau Beta Pi fraternity.

Schmitt, Joseph A., Jr. (M.E., '98), was born in Jersey City, N. J., December 26, 1874. He was designer with A. Schrader's Sons, manufacturers of bicycle-tire valves and United States diving-apparatus, 1898–99; in the engineering department of the Garvin Machine Co., New York, 1899–1900; with the C. W. Hunt Co., manufacturers of coal-handling machinery, etc., West New Brighton, Staten Island, N. Y., 1900–02, at first in the engineering department and later as chief draughtsman in the executive department; in the engineering department of the United Coke & Gas Co. (now at Camden, N. J.), 1902–03; and has been in the engineering department of the Federal Sugar Refining Co., of Yonkers, N. Y., as head draughtsman from 1903 to date.

Mr. Schmitt is the son of Joseph A. and Louisa (Morschhauser) Schmitt. He married Katheryne M. Reis, October 29, 1902.

Schoenborn, William Ernest (M.E., '87), was born in Washington, D. C. He has been an examiner in the United States Patent Office, 1887–1903, in the following departments: Division 25 (mills and threshing-machines) 1887–89; Division 3 (metallurgy, electro-chemistry, and gas manufacture), 1889–92; and Division 18 (steam engineering), 1892–1903. The work in the latter division involved the examination of applications concerning steam-boiler furnaces, steam boilers, feed-water heaters and purifiers, injectors, simple and multiple expansion steam-engines, steam pumping-engines, pulsometers, simple and compound locomotives, valve-gears, and shaft-governors. In 1903 he engaged in professional work as expert in patent causes and solicitor of patents in Washington, D. C.

In 1896 he investigated the patent systems and industrial arts of England, Germany, France, Switzerland, Austria and Italy. In 1902 he investigated the irrigation problem of Egypt and inspected the dams of Assouan and Assiut.

He received the degree of Bachelor of Laws from the National Law University, Washington, in June, 1889, and that of Master of Patent Law from the Columbian University of Jurisprudence and Diplomacy, Washington, June, 1895. He is a junior



W. E. Schoenborn

member of the American Society of Mechanical Engineers, and a member of the Chi Psi fraternity.

Schramme, John T. (M.E., '92), was born in New York city March 6, 1870. He was

a student in electricity at Columbia College, New York, 1892–93; with Schramme & Fuller, New York, 1893–95; and with Schramme Bros., stockbrokers, New York, 1895–98; since which time he has not engaged in business.

Mr. Schramme is the son of Christian F. and Marian Schramme. He married Frances I. Sage, June 29, 1892, and they have one child, Marian Irene Schramme.

Schumacher, H. J. (M.E., '91), was employed in the machine-shop, pattern-shop, foundry, and draughting-room of the Brown & Sharpe Manufacturing Co., Providence, R. I., 1891–92; superintendent of the Stamford Machine Works, Stamford, Conn., 1892–93; in the draughting-room of the Garvin Machine Co., New York, 1893; was located in Florida for a few years; and has since been with the American Surety Co., Brooklyn, N. Y. His graduating thesis, "Rolling Friction, Thames River Drawbridge," was read before the American Society of Civil Engineers. While in the employ of the Brown & Sharpe Manufacturing Co., he determined the cost of cast iron at spout of cupola and published the result of his investigation in the *Stevens Indicator*.

Scott, A. D. (M.E., '01), has been with the Varley Magnet Co., Providence, R. I., from 1901 to date.

Scott, Frederick Edwin (M.E., '97), was born in Jersey City, N. J., June 8, 1875; son of John Edwin and Hattie Augusta (McWilliams) Scott. Employed by the National Contracting Co., he was engaged in the construction of the underground trolley system for the Metropolitan Street Railway Co., New York, 1897–98; but upon the outbreak of the war with Spain he volunteered and was detailed to the U.S.S. "Badger," on which he served until honorably discharged in the fall of 1898, when he obtained the position of assistant purchasing-agent with the New Amsterdam Gas Co., New York. In 1899 he was advanced to the position of chief clerk in the auditor's office, and in 1901 he became superintendent's assistant in the works at Ravenswood, Long Island City, N. Y. He was then with the J. Edward Ogden Co., New York, as assistant purchasing-agent, 1902–03; in the employ of the Seacoast National Bank, Asbury Park, N. J., 1903–04; and since April of the latter year



F. E. Scott

has been inspector on construction with the Astoria Light, Heat, & Power Co., Astoria, Long Island, N. Y. He is a member of the Chi Psi fraternity.



J. H. Scott

Scott, James Hamilton (M.E., '89), was born in Petersburg, Va., July 18, 1867. He was analytical chemist in the laboratory of

the New York Cream of Tartar Works, Brooklyn, N. Y., 1889; engineer of tests with the Southern Pacific Railway, Sacramento, Cal., 1890–91, in which capacity he conducted a series of elaborate wheel tests to overcome the cracking of wheels from the braking heat, the results of which were published in the *Proceedings* of the Master Carbuilders' Association. He was a member of the Richmond Iron Works Co., Richmond, Va., builders of stationary engines and boilers, and contractors for iron lighthouses, 1891–95, and general manager of the works, 1895–1901.

Mr. Scott was the son of Major Frederic R. and Sarah Frances Scott. He married Mary Wingfield, daughter of Bishop Wingfield, of Northern California, October 11, 1893, and they had three children. He died in Richmond, August 24, 1901.

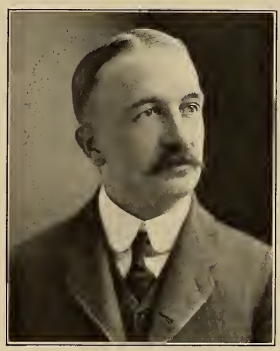
Scott, Rossiter S. (M.E., '98), at the time his graduating exercises were taking place, was serving as a volunteer in the war with Spain. He did service on the U.S.S. "Badger," and was honorably discharged at the conclusion of the war. He was with the Baltimore Traction Co., until 1900; he then spent one and a half years making a tour of the world. He was assistant engineer in the engineering department of the United Railways & Electric Co., Baltimore, Md., 1901–02; and has been with the Consolidated Gas Co., Baltimore, Md., from 1902 to date, first as engineer in charge of construction and now as engineer in charge of works.

Scribner, Charles Walter (M.E., '82), was born in Red Bank, N. J., September 7, 1857. He spent a year at Harvard, but, Princeton being his family college, he took the classical course there, and received the degree of Bachelor of Arts in 1880 with a $500 fellowship in mathematics. He was designer and draughtsman at the Wallis Iron Works, Jersey City, N. J., 1882–85; held the principalship of the Baltimore & Ohio Railroad Co.'s technological school, Baltimore, Md., 1885–87; was with the Daft Electric Co., Greenville, N. J., 1887–88; was Professor of Mechanical Engineering at Ames Agricultural College, Ames, Iowa, 1889–92; held the like chair at the University of Illinois, Champaign, Ill., 1892–93; Instructor in Mechanical Engineering at the University of Pennsylvania, Philadelphia, 1894–97; and Professor of Mechanical Engineering at the North Carolina College of Agriculture and Mechanic Arts, Raleigh, N. C., 1898–1901. In the latter year he gave up the profession of teaching and took a position with the Hibbard-Rodman-Ely Safe Co., Plainfield, N. J.; in 1903 associated himself with Mr. F. B. Rae, consulting engineer, New York; and is now in business for himself. He contributed an article on "Unfinished Inventions" to *Cassier's Magazine*, 1901. He is a member of the American Society of Mechanical Engineers.

Mr. Scribner is the son of Rev. William and Julia Scribner. He married Helen E. Vail (deceased 1899) June 30, 1891, and they had four children, Helen Katharine, Agnes Elizabeth, Charles Walter, and Julia Scribner.

Seaman, David S. (M.E., '02), is in the Boston office of the Green Fuel Economizer Co. He is a member of the Theta Xi and Tau Beta Pi fraternities.

Searing, Lewis (M.E., '88), was born in New York city July 21, 1866. After completing his school education he was employed in a factory, building small electrical apparatus; was afterwards employed in Edison's laboratory as assistant to Mr. Edison during



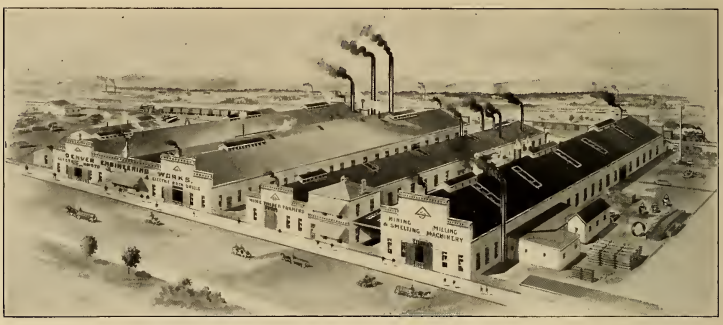
LEWIS SEARING

the winter of 1882–83. He then took a further school course to prepare for Stevens. He was first assistant to Dr. Geyer in the Electrical Department of Stevens Institute, and assistant in President Morton's private laboratory, 1888–89. He next went to Paris to enter the Geyer-Bristol recording ammeter for the prize competition and to exhibit the meter at the Exposition.

Since 1890 he has been established in Denver, Colo., as a consulting and constructing engineer in partnership with Mr. Frank E. Shepard, under the firm name of Shepard & Searing. In 1895 this firm acquired the plant of the Overland Machinery Co., and incorporated the Denver Engineering Works Co., building mining and smelting machinery which is shipped to all parts of the world. He held the office of secretary and treasurer, besides acting as constructing engineer, until 1898, when he was made vice-president and general manager, which position he now holds.

He has been employed as an expert witness in numerous legal cases, dealing principally with suits arising from steam-boiler explosions and in injunction suits between rival electric-lighting companies, and has conducted a large number of tests of prominent engineering plants and materials.

In 1893 he installed an electric-lighting plant at the Ruby Coal Mine, at an altitude of 10,000 feet and amid 10 feet of snow. In 1894 he designed and erected the Citizens' Electric Light Plant at Leadville, Colo., at an altitude of 10,000 feet,—the first in Colorado using direct connected units, vertical cross-compound engines, and supplying arc lights in any number from incandescent circuits. In 1895 he installed the electric power and lighting plant for the Omaha & Grant Smelter at Denver, and the lighting plant for the Antlers Hotel at Colorado Springs. In 1896 he installed one of the then largest electric pumping plants in the country, with pumps of an aggregate capacity of 2,000 gallons per minute, for pumping out the flooded coal-mine of the Colorado Fuel & Iron Co. at Rouse, Colo. This electric plant displaced a compressed-air system, did more work, and saved about 30 tons of coal per day, and, notwithstanding many predictions that 500-volt apparatus could not be operated in a flooded mine, was a success and is operating to-day.



Plant of the Denver Engineering Works Co., Denver, Colo.
Lewis Searing

In 1901 he was active in forming the Denver Machinery Manufacturers' Association, which for seven months successfully fought a machinists' strike. He is treasurer and member of the executive committee of this association. He also served two years as a member of the administrative council of the National Metal Trades Association, and was on the Fifteenth District Committee of the National Founders' Association.

He has contributed several articles to the technical journals, principally the *Electrical*

Engineer, and chiefly on the subject of electricity *versus* air for power in mining operations. These papers have called forth much discussion, especially on the part of the advocates of compressed air. His graduating thesis, on "Experimental Determination of the Variation of E. M. F. in the Armature of the Westinghouse Dynamo," was published in the *Journal of the Franklin Institute*, 1899.



Engine and Dynamo Room of the Citizens' Electric Light Plant at Leadvile, Colo.
Lewis Searing

His patent inventions include a vacuum tube lightning-arrester, an automatic coal-recording device for railways, an improved design of crushing-rolls, and an improved head motion for ore-concentrating tables.

He is a member of the American Society of Mechanical Engineers, and of the Denver Club, and an associate member of the American Institute of Electrical Engineers.

Mr. Searing is the son of Peter J. L. and Arabella (Lewis) Searing. He is a direct descendant of Francis Lewis, one of the New York signers of the Declaration of Independence. He married Jeanie P. Dana, June 29, 1892.

Seeligsberg, Leonard William (M.E., '96), was born in Hoboken, N. J., December 21, 1875. He was draughtsman at the Hecla Iron Works, Greenpoint, N. Y., 1896–97; was employed in the shops of the Brown & Sharpe Manufacturing Co., Providence, R. I., 1897–98; and has been Professor in Mechanical Engineering, vice-president, and secretary of the Consolidated Schools, New York, from 1898 to 1904. He has written textbooks on mathematics, mechanics, pneumatics, hydromechanics and mechanical drawing, and has also edited many other technical works published by the Consolidated Schools. He is now with the McGraw Publishing Co.

Mr. Seeligsberg is the son of William and Antonie (Kayser) Seeligsberg. He married Evelyn Young Gridley, January 15, 1902.

Seely, Frederick (M.E., '98), was born in New York city April 18, 1877; son of John F. and Margaret I. Seely, and of New England ancestry. He was assistant to the constructing engineer with Naughton & Co., general contractors, at the time of the installation of the underground trolley on Third and Eighth avenues, New York, 1898–99; took the course of postgraduate work leading to the degree of Civil Engineer at Purdue University, Lafayette, Ind., 1899–1900; was inspector in the Bureau of Yards and Docks at the New York Navy Yard, 1900–01, and in the latter year was structural steel draughtsman in the Bureau of Yards and Docks, Washington, D. C., and inspector of masonry for the Aqueduct Commission on the new Croton dam, New York; was an inspector in the Bureau of Yards and Docks at the New York Navy Yard, 1901–03; inspector on construction work at the Jerome Park Reservoir, New York, 1903–04;

and is now assistant engineer in the Topographical Department, Borough of Queens, New York city.



FREDERICK SEELY

Seeman, Edgar G. (M.E., '93), is with the S. Obermayer Co., Pittsburg, Pa.

Self, Edward D. (M.E., '86), was in the employ of the Electrical Accumulator Co., Newark, N. J., 1886; and later was engineer at Albany, N. Y., for the Edison Electric Light Co., and mechanical engineer with Coombs, Crosby, & Eddy, New York. He was engaged in engineering and construction work, designing and purchasing machinery for large mills in Australia and Mexico, making reports on a transmission of power project for a mining-plant in Mexico, and making examinations of mines in South America. He was superintendent of a mine in Guiana. In 1894 he received the degree of Engineer of Mines from Columbia University. He was assistant in mining at Lake Superior for the class in practical mining, of the Columbia School of Mines; and superintendent and manager of the Sonora Copper Co., Sonora, Mex. He received a patent for a system of ore-concentration.

He was consulting mining engineer (later consulting engineer) with the Transvaal Gold Fields Co., Johannesburg, South Africa, his general work consisting in mining engineering; the making of reports; construction of stamp mills, cyanide plants, coal-breakers, sorting-plants, railway construction, etc.; and making investigations of the economics of milling and gold recovery. He made a report, as consulting engineer, on the mineral land grant of 10,000,000 acres of the Cassiar Central Railway Co., British Columbia, and was general manager of the company's prospecting and business operations in the Cassiar district. He has been general manager of the San Carlos Copper Co., Linares, Nuevo Leon, Mex., from 1900 to date.

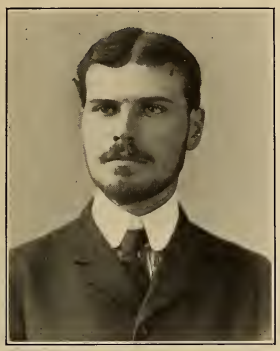
His thesis, "Aluminum and Its Alloys: Experimental Investigation of Strength Conductivity and Electrical Qualities," was published in the *Journal of the Franklin Institute*, 1887.

He is a member of the American Society of Mining Engineers, and of the London (England) Institute of Mining and Metallurgy.

Serrell, Lemuel William (M.E., '87), has been engaged as superintendent of the C & C Electric Motor Co., in which capacity he designed the machines manufactured by them, from ¼ horse-power upward; superintendent of the Daft Electric Co., Marion, N. J.; in the electric railroad business on his own account, having built many miles of electric railroad, including the designing and construction of car houses, power stations, etc., in Paterson, Passaic, and Plainfield, N. J., Baltimore, Md., Worcester, Mass., White Plains and Oswego, N. Y., and other places. He is now practising as a contracting engineer in New York. He has taken out several patents relating to the construction and regulation of electric motors. His contributions to technical journals include articles on generator and motor construction in the "Electrical World" and "Electrical Engineer;" articles on electric railway construction in the "Street Railway Journal" and "Cassier's Magazine;" and on electric railways as investments, in the "Engineering Magazine." He is a member of the American Institute of Electrical Engineers, and of the American Gas Light Association.

Shaw, John Cargill (M.E., '00), was born in Brooklyn, N. Y., May 11, 1879; son of

John Cargill and Kate (Vanderhoef) Shaw. His father was a prominent specialist in nervous disorders and insanity, and for seventeen years was clinical professor in his



J. C. Shaw

specialty at the Long Island College. The subject of this sketch was engaged in experimental automobile work covering various types, French and American, 1900–01; building, repairing and dealing in automobiles under the firm name of Patterson & Shaw, Brooklyn, N. Y., 1901–02; engaged as a constructing engineer in the department of engineering of the General Power Co., New York, manufacturing a new type of internal combustion engine, 1902–03; and is now in the construction department of the Consolidated Gas Co., New York. He is a member of Fulton Council 299, Royal Arcanum.

Sheldon, William H. (M.E., '78), was employed in the shops of the International & Great Northern Railroad, Palestine, Tex., 1878–82; was chief draughtsman for the Northern Pacific Railroad Co., Brainerd, Minn., 1882–83; president of the Keystone Rubber Co., Morrisville, Pa., 1883–87; manager of the Columbia Rubber Works Co., New York, 1887–1900; and of the firm of Wm. H. Sheldon & Co., manufacturers of rubber goods, New York, from 1900 to date. He is a member of the American Society of Mechanical Engineers.

Shepard, Horace L. (M.E., '92), was superintendent of the tanning department with George A. Shepard & Son, hat-leather manufacturers, Bethel, Conn., 1893–94; and has been a member of the firm, and manager of the same department, from 1894 to date. In 1897–98 he made extensive research, with Prof. J. J. Hummel, F.I.C., F.C.S., of Yorkshire College, Leeds, England, into modern methods of dyeing leather, and investigated many of the new coal-tar products for this use. Jointly with Prof. H. R. Proctor, F. I. C., of Yorkshire College, Leather Industries Department, England, he made further research into the chemistry of tanning during the year 1898.

Shepard, Martin (M.E., '96), was a student in architecture at Gallier Court, New Orleans, La., 1896–98; was architectural draughtsman in New York, 1898–1902, first for Mr. E. P. Casey, afterward for Carrère & Hastings, and finally draughtsman and assistant superintendent for Messrs. Stokes & Duboy on the Ansonia apartment hotel; and has been a member of the firm of Toledano & Wogan, architects, New Orleans, from 1902 to date.

Shiebler, Andrew (M.E., '92), was born in Brooklyn, N. Y., September 9, 1871; son



Andrew Shiebler

of Andrew K. and Mary E. (Shipley) Shiebler. He was draughtsman with the B. F.

Sturtevant Co., Boston, 1892–94; and in March of the latter year he was placed in charge of the draughting-room of the company's Philadelphia branch. Close application to work overtaxed his strength, and he died from typhoid fever August 11, 1895.

Shiebler, Marvin (M.E., '00), was born in Brooklyn, N. Y., January 27, 1879; son of Andrew K. and Mary E. (Shipley) Shiebler. He entered the Institute with the Stevens School scholarship. He was mechanical draughtsman with the Atlas Cement Co., Northampton, Pa., 1900; draughtsman, and,



Marvin Shiebler

later, salesman in the New York office of the B. F. Sturtevant Co., 1900–01; and was employed, successively as draughtsman, inspector, and engineer, in the department of construction at the Ravenswood works of the New Amsterdam Gas Co., Long Island City, N. Y., 1901–02; was constructing engineer with the New York Mutual Gas Light Co., 1902–04; and has been assistant engineer with the Consolidated Gas Co., of New York, from 1904 to date. He is a junior member of the American Society of Mechanical Engineers, and a member of the Crescent Athletic Club, and of the Chi Psi fraternity.

Shoemaker, William Erety (M.E., '94), was born in Bridgeton, N. J., July 8, 1871. He was employed in the open-hearth furnace plant of the Carnegie Steel Co., Ltd., Homestead, Pa., 1895–96; at the blast furnaces of



W. E. Shoemaker

the same company at Duquesne, Pa., and then in the draughting-room and with the civil engineering corps at its Duquesne steel works, 1896–98; was draughtsman with the Ohio Steel Co., Youngstown, O., 1898–99; assistant manager, Longdale Iron Co., Longdale, Va., 1899–1901; master mechanic at the Central blast furnaces and docks of the American Steel & Wire Co., Cleveland, O., 1901; represented F. C. Roberts & Co., of Philadelphia, Pa., as resident engineer in charge of constructing a blast furnace for the Nova Scotia Steel & Coal Co., Ltd., at



Blast Furnace at Sydney Mines, N. S.
W. E. Shoemaker

Sydney Mines, N. S., 1902. From July, 1903, to January, 1904, he was mechanical

superintendent for the Nova Scotia Steel & Coal Co., Ltd., and since the latter date has been superintendent of the blast furnace, retort coke ovens, and coal washing plant of the company at Sydney Mines, N. S., Canada.

Mr. Shoemaker is the son of Horace B. and Mary E. (Erety) Shoemaker. He married Jennie Howe, June 7, 1899, and they have one child, Jane Howe Shoemaker.

Shoudy, William Allen (M.E., '99), Instructor in Experimental Engineering at Stevens Institute of Technology. For biography, see page 282.

Shreve, Arthur L. (M.E., '88), was assistant engineer with the Arctic Ice Machine Co., 1888; was employed in the Mount Clare shops of the Baltimore & Ohio Railroad, Baltimore, Md., 1888–89; assistant engineer in charge of construction of intercepting sewers, Baltimore, 1889–92; assistant city commissioner, in charge of street improvements, Baltimore, 1892; general superintendent for Isaac S. Filbert, paving-contractor for sheet-asphalt pavement, Baltimore, 1892–95; and has been general manager for the Southern Asphalt Paving Co., of Baltimore, from 1895 to date; also its vice-president since 1900. As superintendent for Mr. Filbert and manager for the Southern Asphalt Paving Co., he has had entire charge of the construction of all of the asphalt pavements laid in Baltimore since July 1, 1892. From 1895 to date he has been a partner in the general contracting firm of Arthur L. Shreve & Co., Baltimore, Md.

Sidman, Alfred Gordon (M.E., '99), was employed in the draughting-room of Post & McCord, Greenpoint, Long Island, N. Y., 1899; and was assistant engineer and later chief draughtsman with the Barber Asphalt Paving Co., New York, 1899–1902. During this time he inspected, at Groton, N. Y., the structural steel work for a large building to be sent to Venezuela and used for a refining-plant; installed at the Jersey City plant a compressor, oil-storage system, boiler, and other improvements; rebuilt the asphalt plant at Fort Wayne, Ind., took charge of, and ran a three weeks' test of a smoke-consumer which had been installed at the company's Chicago plant; also inspected and rebuilt the plant at Decatur, Ill., and one at Marion, Iowa. As chief draughtsman at the New York office his work consisted in designing plants, one of which was erected at New Orleans, La. He is now with L. B. Stillwell, consulting electrical engineer, New York, who is also electrical director for the Interborough Rapid Transit Co., New York.

Siegele, August, Jr. (M.E., '01), was born in New York city January 24, 1878; son of August and Louise Siegele. He was Instructor during the Supplementary Term at Stevens Institute, 1901; assistant engineer in the gas generating department of the Liquid Carbonic Acid Manufacturing Co., New York, 1901; draughtsman, designing floating derricks, for the Merritt & Chapman Der-



August Siegele, Jr.

rick & Wrecking Co., New York, 1902; superintendent for Adam Weber Sons, New York, manufacturers of fire and chimney brick, enameled clay retorts, etc., at Weber, N. J., 1903; and is now in the construction department of the Consolidated Gas Co., New York. He was assistant secretary of the Clay Miners and Manufacturers' Association of the State of New Jersey, 1903. He is a member of the Theta Nu Epsilon fraternity.

Silber, Albert A. (M.E., '85), was born in Hoboken, N. J., September 14, 1865; son

of Andreas and Sophie L. H. (Sievers) Silber. He graduated at the Hoboken high



A. A. A. Silber

school, passing examinations for the Stevens scholarship. He was Professor of German and Instructor in Mathematics at the Florida State College, Lake City, Fla., 1895–97. From 1897 to date he has been engaged in journalism, and is now located at Jacksonville, Fla.

Sinclair, Arnold (M.E., '02), is superintendent of the Martins Creek Portland Cement Co., Easton, Pa.

Sinclair, Duncan G. (M.E., '02), is employed as superintendent of construction at the new blooming mills at the South Works of the Illinois Steel Co., Chicago, Ill.

Sinclair, George M. (M.E., '84), was employed in the Midvale Steel Works, Nicetown, Pa., 1884-89; with the Bethlehem Iron Co., Bethlehem, Pa., 1889–90; at the Midvale Steel Works, 1891–95; was secretary and treasurer of the Philadelphia Machine Tool Co., builders of standard machines for testing materials, etc., 1895–1902; and has been treasurer of the Falkenan-Sinclair Machine Co., Philadelphia, from 1902 to date. He is a member of the American Society of Mechanical Engineers and of the Franklin Institute.

Sinclair, John J. (M.E., '01), was born in Cranford, N. J., December 20, 1878; son of George W. and Mary A. Sinclair, of Scotch and English descent. After graduation he entered the shops of the Westinghouse Electric & Manufacturing Co. In October, 1901, he was placed in the railway division of the electrical engineering department of the same company, at East Pittsburg, Pa. He has been engaged in calculation of power requirements for operation of street railways; also in the testing of cars in operation on various roads throughout the country. He is an associate member of the American Institute of Electrical Engineers and a mem-



J. J. Sinclair

ber of the Electric Club of Pittsburg, and of the Theta Xi fraternity.

Sissons, W. J. (M.E., '00), was employed in the Providence Engineering Works, Providence, R. I., 1900–01; and in the Municipal Engineering Department, Havana, Cuba, 1901–03. He has been Provincial Supervisor at San Isidro, N. E., Philippine Islands, from 1903 to date.

Slack, John Ruggles (M.E., '86), was graduated from Columbia College before entering Stevens in 1884. He was an apprentice in the shops of the New York Central Railroad; draughtsman at the Frankfort (N. Y.) shops of the West Shore Railroad, 1886–90;

chief draughtsman, and later mechanical engineer, with the New York Central Railroad, 1890–98; mechanical engineer with the Central Railroad of New Jersey, 1898–99; assistant superintendent of motive power with the Delaware & Hudson Railroad, 1899–1901; and superintendent of the same department, at Albany, N. Y., from 1901 until his death in 1904. In 1896 Mr. Slack was sent abroad by the New York Central Railroad to make a study of Austrian, French, German, and English railroad methods, giving special attention to the Austrian roads. He was a member of the American Society of Mechanical Engineers, and of the Master Car Builders' Association. He was chairman of the committee on draft gear which reported to the latter association in June, 1900, and also reported to the International Railway Congress in 1901 the progress realized in the construction of locomotives for high-speed trains. Mr. Slack died of tubercular meningitis at the Presbyterian Hospital in New York city, August 1, 1904.

Slawson, Harry Harding (M.E., '98), was born in New York city July 17, 1875; son of David W. and Mary O. Slawson. He was with the Bristol Co., manufacturers of recording gauges, Waterbury, Conn., being employed principally in the electrical testing department, 1898–1903, and is now with the Brighton Mills, Passaic, N. J.

Slipper, Charles Jenkins (M.E., '95), was born in Brooklyn, N. Y., February 3, 1875; son of Joseph Augustus and Zillah Jenkins Slipper. He was with the Carter Package Co., and the Welsbach Gas Lamp Co., down to 1898; draughtsman for the John Stephenson Car Co., Ltd., New York, and Elizabeth, N. J., and with the Central Railroad of New Jersey, 1898; acting assistant engineer with the Manhattan Railway Co., New York, 1899–1902; assistant engineer with the Rapid Transit Subway Construction Co., 1902; erecting engineer with the Alphons Custodis Chimney Construction Co., New York; and since the latter year has been located in Boston, Mass. His graduating thesis, written in conjunction with Messrs. E. M. Harrison, Jr., and E. C. Schmidt, on "Experiments with a Boiler Arranged to Serve as a Calorimeter for Determining the Heating Value of Fuel," was published in the *Stevens Institute Indicator*, 1900. He is a member of the Engineers' and University clubs of Brooklyn.

Slocum, Mors Ostrander (M.E., '93), was born in Scottsville, N. Y., December 24, 1866. He graduated with the degree of



M. O. Slocum

Bachelor of Arts at the University of Rochester in 1889. He has been engaged in telephone engineering for the Western Electric Co. ever since graduation, and has served this company in various capacities. In 1893–94 he installed telephone exchanges in New York city, and had charge of the winding department. Transferred to the Chicago office of the company, he spent one year in the experimental department, and for two years was in charge of the commercial part of the business between Chicago and New York and foreign houses. From October, 1897, to October, 1899, he was assistant to the shop superintendent in the Chicago house, and had general charge of the manufactures. Since the latter date he has been connected with the telephone sales department at Chicago. He is a member of the Hamilton Club of Chicago; of the Garden City Council 202, Royal Arcanum; and of the Delta Kappa Epsilon fraternity.

Mr. Slocum is the son of George E. and Lydia Fort Slocum. He married Gertrude

G. Glass, December 27, 1894, and they have two children, Sanford Glass and Lester Mors Slocum.

Smart, F. R., Jr. (M.E., '95), was with the East River Gas Co., Long Island City, N. Y., 1895–1900, in 1897 being appointed superintendent in charge of the laying of mains, setting of meters, etc. From 1900 to date he has been with the York Gas Co., York, Pa., at first as superintendent and now as general manager..

Smith, Abel I., Jr. (M.E., '98), was born in Jersey City, N. J., September 23, 1877; son of Abel I. and Laura Howell Smith. He was employed in the meter department of the Edison Electric Illuminating Co., New York, 1898–99; a student at the New York Law School, 1899–1901; admitted to practice at the New York Bar in the latter year; with Murphy & Metcalf, patent attorneys, New York, 1901–02; then engaged in the practice of patent law with R. Forsyth Little, Jr., New York; and is now assistant attorney for the New York City Railway Co. He is a junior member of the American Society of Mechanical Engineers; a member of the Chi Phi fraternity; and a sergeant of Squadron A of the National Guard of the State of New York.

Smith, Annesley De Los (M.E., '97), was born in New York city March 20, 1874. He was draughtsman and inspector and designer of car bodies with the John Stephenson Car Co., 1897; with the Peckham Manufacturing Co., Kingston, N. Y., 1898–99, as draughtsman, superintendent of construction of Ruggles rotary snow plows, and assistant superintendent of works, while in this position installing the Peckham motor truck on the Third Avenue street railway system in New York; salesman with B. Nicoll & Co., New York, 1900; with the New York Belting & Packing Co., designing special rubber machinery for the manufacture of golf balls, 1901; works manager and designer of special railway machinery with the European McGuire Mfg. Co., London, England, 1901; and has been in charge of the car and truck department of W. E. Baker & Co., New York, from 1902 to date.

Mr. Smith is the son of Annesley Burdette and Prudence A. (La Mont) Smith. He married Harriet L. Germain, February 24, 1902.



A. De Los Smith

Smith, Arthur Daniel (M.E., '02), was born in Boonton, N. J., August 20, 1878. His engagements since graduation have been as erecting engineer in the sales department of the Buffalo Forge Co., builders of steam engines, mechanical draft fans, a fan system of heating, ventilating and drying, blowers and exhausters, drills, cutters, blacksmith tools, forges, etc.; as mechanical engineer in the Montour rolling-mills department of the Reading Iron Co., Danville, Pa.; and with the Scranton Railway Co., Scranton, Pa. He is a member of the Theta Nu Epsilon fraternity.

Mr. Smith is the son of Pierson W. and Lillia C. Smith. He married Susan Frances Smith, August 27, 1902.

Smith, Ellis Burton (M.E., '98), was born in Islip, N. Y., May 30, 1876. He was with the American Sugar Refining Co., Jersey City, 1898–1902; and has been superintending constructing engineer at the East St. Louis Works of the Pittsburg Reduction Co. from 1902 to date.

Mr. Smith is the son of Alonzo E. and Hannah L. (Muncey) Smith. His ancestors were early English settlers on Long Island, upon "King's Grant" of land. He married

Marion E. Hawkins, May 22, 1901, and they have one child, Helen Agnes Smith.



E. B. Smith

Smith, Howard Wells (M.E., '91), was born in Elizabeth, N. J., October 29, 1870. He was draughtsman in the marine engineering department of the Samuel L. Moore & Sons Co., Elizabeth, N. J., 1891–93, spending most of the time on work for the United States training-ship "Bancroft," supervising the erection of her machinery, etc.; draughtsman with the Third Avenue Railroad Co., New York, during the substitution of cable for horse power, 1893; mechanical engineer with the Kinsman Block System Co., New York, manufacturers of an appliance for automatically shutting the throttle-valve of a locomotive and applying the air brakes of a train, 1893–94; draughtsman with Colgate & Co., soap manufacturers, Jersey City, N. J., who were equipping their plant with modern machinery, 1894–95; engaged in professional work, principally designing special fittings for the Crystal Water Co., Stapleton, Staten Island, N. Y., 1895; was chief draughtsman for the Pope Tube Co., Hartford, Conn., 1895–99 (during which time the company built a complete mill for manufacturing seamless steel tubing, containing twenty hydraulic draw-benches supplied by a 1,500-horse-power hydraulic pumping plant), attending, in addition to the necessary designing, to the supervision of the erection of buildings, installation of machinery, etc.; assistant mechanical engineer with the Shelby Steel Tube Co., Cleveland, O., 1899–1902, at first at Cleveland, and later at the company's factory at Shelby, O., his work consisting in designing and installing special furnaces, piercing and rolling mills, draw-benches, etc.; mechanical engineer with the Macbeth Iron Co., Cleveland, O., building rolling-mill, tube-mill, and ore-handling machinery, and blowing-engines, 1902–03; and has been mechanical engineer with the Standard Engineering Co., Ellwood City, Pa., being principally engaged in building tube-mill machinery, from 1903 to date. He makes a specialty of pipe threading and cutting machines. He is a member of the



H. W. Smith

American Society of Mechanical Engineers, and of the Civil Engineers' Club, of Cleveland.

Mr. Smith is the son of Walter Ogden and Nettie Frances (Wells) Smith. He married Laura Brown Manning, June 17, 1896, and they have two children, Frederic Manning and Walter Kellogg Smith.

Smith, Humphrey Russell (M.E., '88), was born in Chicago, Ill., December 22, 1864. He was secretary for J. B. Smith & Co., paving contractors, Chicago, Ill., 1888–90; engineer with the Hale Elevator Co., Chicago, 1890–94; chief engineer with the Wins-

low Bros. Elevator Co., Chicago, 1894–97; associate engineer with Morse, Williams, & Co., elevator-builders, Philadelphia, Pa., 1897–98; engineer with the Otis Elevator Co., New York, 1899–1900, and at its Chicago office from 1900 to date.

His work since graduation has included the designing, building, and erecting of all classes of hydraulic, steam, and electric elevator machinery, and he has taken out patents for an elevator safety grip; electric elevator control devices; a hydraulic elevator automatic stop; an electro-magnetic elevator (solenoid); and an electro-magnetic door-operating device.

He contributed an article on "An Electro-Magnetic Elevator" to the *Western Electrician,* which was translated and reprinted, with comments, in *L'Electricien,* Paris, 1897.

He is a member of the Beta Theta Pi fraternity, and was formerly a member of the Loyal Legion of the United States (2d degree), the Union League Club of Chicago, and the Western Society of Engineers.

Mr. Smith is the son of James B. and Isabella Smith. He married Rossannah P. Gilman, June 30, 1892, and they have one child, Russell Gilman Smith.

Smith, Julian C. (M.E., '91), was born in Maryland March 1, 1869. His work has been largely construction connected with cable and electric street railways. As assistant superintendent and superintendent he has built roads in the cities of Baltimore, Washington, D. C., and Seattle, Wash. For several years he was engaged in the general contracting business under the firm name of Morton & Smith, Baltimore. In 1900 he became connected with the Hudson Contracting Co., New York, and is now president and manager of the firm, in addition to which connection he is engaged in general contracting under the firm name of Smith & Robinson, New York, whose work consists principally of dredging and dock-, jetty-, and breakwater-building. He is a member of the Baltimore Club of Baltimore, Md., and of the Delta Tau Delta fraternity.

Mr. Smith is the son of Robert H. and Mary Hall Smith. He married Mary Elizabeth Clarke in the year 1897, and they have two children, Julian Clarke and Robert Donnell Smith.

Smith, Merrill Van Giesen (M.E., '96), was born in Montclair, N. J., September 15, 1871; son of Frank A. and Adaline Van G. Smith. He was on the editorial staff of the "Railroad Gazette," New York, 1896–98; and Instructor in Mechanical Engineering at the University of Pennsylvania, 1898–99. For several years Mr. Smith had suffered from an injured knee, and in 1899 he received a second injury which compelled him to resign his position with the University of Pennsylvania, and for a time he was not engaged in any regular line of engineering work. In 1903 he was appointed Professor of Mechanical Engineering at the Clarkson Memorial School of Technology, Potsdam, N. Y., but resigned in the following year to take the Chair of Mechanical and Electrical Engineering at Delaware College, Newark, Del. While connected with the "Railroad Gazette" he contributed numerous articles to that journal. He is a member of the Tau Beta Pi fraternity.

Smith, P. H. F. (M.E., '98), is a dealer in investment securities at the office of Lathrop & Smith, New York.

Smith, Robert Keating (M.E., '89), after graduation, attended Worcester Academy, Worcester, Mass., for the study of Latin and Greek, and graduated thence in 1891. He then entered the Junior class at Harvard to study history, philosophy, and English, and received the degree of Bachelor of Arts in 1893. From 1893 to 1895 he attended the Episcopal Theological School, Cambridge, Mass., and received there the degree of Bachelor of Divinity. He was ordained deacon in the Protestant Episcopal Church in 1895, and priest in 1896. After holding the position of assistant minister of Trinity Church, Woburn, Mass., for a time, he went to Kansas City, Mo., to become rector of the parish of Westport (St. Paul's Church). In 1904 he returned East and is now assistant minister of Grace Church, Newton, Mass.

Mr. Smith is one of a number of graduates of the Institute who were to a great degree influenced to take up the particular line of work in which they are now engaged by inherited tendencies, or by a special aptitude for that work which manifested itself after

they graduated from the Institute. The preliminary training obtained at the Institute was, however, an effective aid in contributing to the success these graduates have achieved in their respective vocations, as they have themselves in numerous instances pointed out. Mr. Smith is interested in natural science, particularly in zoölogy, and has spent his vacations in collecting specimens of Batrachia, Colubridæ, and Mollusca for the Agassiz Museum, Harvard University, and for the Worcester Academy.

Smith, Robert W. (M.E., '94), was associated with Mr. Geo. P. Olcott, engineer and contractor, Orange, N. J., at first as a salaried engineer, and later with an interest in the business, from 1894 to 1902. They have built waterworks, sewerage systems, and sewage-disposal plants, etc., in several towns. Mr. Smith has also done much private landscape work, development of water supply, drainage, etc., and he has been associated with the Landscape, Drainage, & Water Supply, Newark, N. J., from 1901 to date. He is a member of the American Society of Mechanical Engineers.

Smith, Samuel F. (M.E., '90), was employed in machine-shop work, holding positions of mechanic and shop foreman, 1890–93; was assistant engineer on a sugar estate in San Domingo, being engaged in erecting and repairing sugar machinery, 1893–94; was engaged in draughting on structural iron work, 1894; with the Berlin Iron Bridge Co., East Berlin, Conn., employed in laying out roofs, buildings, and bridges, and detailing connections; also detailing and designing electrical and hand-power machinery and appliances for draw and lift bridges, 1894–1901; and has been designing engineer in the designing and estimating department of Milliken Bros., New York, from 1901 to date.

Smith, Thomas Gardner (M.E., '85), was born in Cincinnati, March 19, 1862. He was in the shops of the Indianapolis division of the Pennsylvania Railroad, 1885–86; with Henry Warden, Philadelphia, 1886–87; contracting engineer in Cincinnati, O., 1887–90; member of the firm of C. R. Vincent & Co., New York, 1890–91; member of the Ball & Wood Co., New York, 1891–92; and has been a consulting engineer at Cincinnati, O., from 1892 to date.

His practice is mainly in building equipments, covering steam heating, elevators, steam and power plants, and electric equipments. He has designed and built several constant potential, direct-current town-lighting plants, using enclosed arc lamps; and also compressed air-pumping plants for waterworks, in places having driven wells of considerable depth. He has contributed several articles to technical journals, one on "Direct Connected Engines and Dynamos" to *Cassier's Magazine*. He is a member of the American Society of Mechanical Engineers, the Business Men's Club, the Cincinnati Chamber of Commerce, and of the Beta Theta Pi fraternity.

Mr. Smith is the son of Thomas G. and Vanelia J. Smith. He married Blanche Stevens, June 11, 1890, and they have four children, Thomas G., Jr., Richard Nelson, Stilman Meservy, and Blanche Virginia Smith.

Smith, Wilfred C. (M.E., '79), was born in Peru, Indiana, October 3, 1857. He was in the employ of the Hocking Iron Co., Orbiston, O., 1879–80; with the Ohio Central Coal Co., Corning, O., 1880–81; the Newark Coal & Iron Co., Shawnee, O., 1881–87; and was vice-president and treasurer of the Union Iron Works Co., Newark, O., from the latter year until the date of his death, January 7, 1895. He was a member of the Order of Free and Accepted Masons; the Ancient Order of United Workmen; the Woodmen of the World; and of the Beta Theta Pi fraternity.

Mr. Smith was the son of James H. and Adelia D. Smith. He married Annie Ballou, October 3, 1883, and they had four children, Adelia D., Harriett B., Laura F., and James H. Smith.

Sofio, Edward C. (M.E., '98), was draughtsman with the Pintsch Compressing Co., New York, 1898–1901; was engaged with the International Gas Engine Co., New York, 1901–02; and at Mariner's Harbor, Staten Island, N. Y., from 1902 to date.

Sorenson, Laurids C. (M.E., '95), was recorded up to 1901 as being connected with

the firm of Edward Sorensen's Son, mason and builder, New York.

Sorge, Adolph, Jr. (M.E., '75), was born in Hoboken, N. J., September 28, 1857. He was employed at the West Point Iron Foundry, N. Y., 1876–77; with Bliss & Williams, manufacturers of presses and dies, Brooklyn, N. Y., 1877–80; machinery agent for Cayley & Cayley, London, England, 1881;



Adolph Sorge, Jr.

with the Norton Cement Works, Binnewater, N. Y., 1882; agent for the Campbell Press Co., Taunton, Mass., 1882–85; member of the firm of Randall & Sorge, A. Sorge, Jr., Successor, machinists, Rochester, N. Y., 1886–92; general manager of the Wood Mosaic Co., Rochester, N. Y., 1892–94; superintendent of the Twelfth Street works of Fraser & Chalmers, Chicago, Ill., 1895; and has been a consulting and contracting engineer at Chicago, Ill., from 1895 to date. He is a member of the American Society of Mechanical Engineers; the Engineers' Club of New York; the Western Foundrymen's Association; the Western Society of Engineers; and the Manufacturers' Club of Philadelphia, Pa. In 1901 he patented an apparatus for water-purification, being principally applied to the Cochrane feed-water heater.

Mr. Sorge is the son of F. A. and Katherine (Peters) Sorge. He married Hattie P. Orr, December 1, 1886.

Spencer, Paul (M.E., '91), was born in East Orange, March 19, 1866. He graduated at Yale in 1887 with the degree of Bachelor of Arts. He was engaged in electric railway construction with the Field Engineering Co., New York, 1891–94; was in the engineering department of the Stanley Electric & Manufacturing Co., Pittsfield, Mass., 1895–97; engineer at the New York office of the same company, 1897; general superintendent of the People's Light & Power Co., Newark, N. J., 1897–1900; and has been with the United Gas Improvement Co., Philadelphia, from 1900 to date. He is an associate member of the American Institute of Electrical Engineers, and a member of the University Club of New York; the Germantown Cricket Club, of Philadelphia; and of the Delta Kappa Epsilon fraternity.

Mr. Spencer is the son of George Gilman and Caroline Arnold Spencer. He married Frances Margaret Durbin, April 25, 1894, and three children have been born to them, Frederick Gilman, Frances Margaret, and Carol Spencer. The latter is deceased.

Spies, Albert (M.E., '81), became attached to the editorial staff of *The Iron Age,* of New York, in October, 1881, since which time his contributions to engineering literature have been many and varied. From 1883 to 1886, besides retaining his connection with *The Iron Age,* he was editor of *Mechanics,* a leading engineering weekly. In 1890 he became the managing editor of *The Engineering Record,* but late in 1891 exchanged editorial duties for active professional work as consulting mechanical engineer. In this capacity, besides executing miscellaneous expert steam work, he supervised the installation of the steam steering machinery on nearly all the Hudson River ferryboats of the Erie Railroad, and on some of those of the Central Railroad of New Jersey. Much of his time also was devoted to the designing of plants and machinery for prominent South American silver-mining companies. In June, 1893, Mr. Spies again entered the literary field as editor of *Cassier's Magazine,* a new publication of a novel kind, designed to present engineering subjects in a more picturesque and interesting manner than had ever before been attempted, and his work in this direction has been

signally successful, having raised the magazine to the front rank of engineering periodicals. Aside from editorial work Mr. Spies has written many articles, prominent among them a series in *Cassier's Magazine,* entitled "Modern Gas and Oil Engines," which at the time gave what was probably the first and most comprehensive account of the different kinds of such engines available. Among other articles written by him are the following:

"Heating Feed Water with Live Steam," *Cassier's Magazine,* III; "Oil Steam Engines," *Ibid.,* V; "Wasteful Use of Exhaust Steam," *Ibid.,* V; "Ascending Pike's Peak by Rail," *Ibid.,* VI; "The First Iron Casting in America," *Ibid.,* VII; "Some American Vertical Boilers," *Ibid.,* IX.

Beginning with 1904 he added to his work the editorial management of *The Electrical Age,* giving to this publication at once a new and much enlarged form. With the incorporation of the Cassier Magazine Co. as publishers of both *Cassier's Magazine* and *The Electrical Age,* in the early summer of 1904, he was elected vice-president and treasurer of the company and was made managing director.

Under Mr. Spies's editorial supervision also were published the interesting work on "The Life and Inventions of Thomas A. Edison," and the volume entitled "The Harnessing of Niagara." Mr. Spies's thesis, on "Gas Engines," was published in the *American Gas Light Journal,* 1881. He is a member of the American Society of Mechanical Engineers and of the American Institute of Mining Engineers.

Stahl, Albert William (M.E., '76), was born in New York city May 12, 1856. On graduation at Stevens he entered the United States Naval Academy as cadet engineer, and graduated in 1880 at the head of his class.

From 1880 to 1883 he served as engineer officer on the U.S.S. "Despatch," "Galena," "Quinnebaug," "Lancaster," and "Nipsic," principally on the European station. On his return to the United States in 1883 he was promoted to assistant engineer, and was on duty at the Bureau of Steam Engineering of the Navy Department for about six months.

He was then transferred to Purdue University, La Fayette, Ind., where he filled the Chair of Mechanical Engineering, 1883–87. In the latter year he resigned his commission as assistant engineer, and was at once



A. W. Stahl, U.S.N.

appointed assistant naval constructor, and assigned to special duty until 1889, during part of which time he instructed in naval architecture at the Naval Academy.

In 1889 he was transferred to the Union Iron Works, San Francisco, Cal., as assistant inspector of construction of the naval vessels building at those works. He was also appointed a member of the Naval Inspection Board for the Pacific Coast. In 1892 he was promoted to naval constructor with the rank of lieutenant. From 1892 to 1894 he superintended the construction of the U.S.S. "San Francisco," "Monterey," "Olympia" (later Admiral Dewey's flagship at Manila), and the famous "Oregon," all built at the Union Iron Works.

He was a member of the Advisory Council of the Engineering Congress of the World's Columbian Exposition at Chicago.

During 1894 and 1895 he was engaged as assistant to the Chief Constructor at the Navy Department, Washington, D. C., his special work being the designing of turrets for heavy guns. He introduced oval balanced turrets in the U. S. Navy, and designed such turrets for the U.S.S. "Iowa," "Kentucky," and "Kearsarge." He was president of the

Board on Method of Fitting Armor to Naval Vessels, whose recommendations have been adopted as the standard in the navy.

From 1895 to 1901 he was in charge of the Department of Construction and Repair at the Navy Yard, Norfolk, Va. While at that yard Mr. Stahl had a very active and important part in the preparation of the navy for the war with Spain. During the short period available the "Newark" was completely overhauled and modernized (among other items, eight electric ammunition-hoists were designed, constructed, and successfully installed); six revenue cutters ("Hamilton," "Manning," "Windom," "Woodbury," "Morrill," and "Hudson") and three light-house-tenders ("Armeria," "Maple," and "Mayflower") were transformed into auxiliary war vessels by installing batteries, fitting ammunition-rooms, protecting the more vulnerable parts with light armor, etc.; a number of colliers, including the famous "Merrimac," were provided with batteries and with means for handling large quantities of coal; the "Iris" was fitted out as a distilling-ship with tanks holding about 1,000 tons; the collier "Cassius" was transformed into the army transport "Sumner." In addition, much work was done that cannot be briefly classified,—as many as thirty vessels undergoing alterations at one time. Everything was designed and executed under Mr. Stahl's personal direction.

In 1899 he was promoted to naval constructor with the rank of commander. In May, 1901, he was transferred from the Norfolk Navy Yard to the works of the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., as superintending constructor of the naval vessels there building. In this position he superintended the completion of the "Illinois," the "Arkansas," and the "Missouri." At present (1904) he is, at the same works, superintending the construction of the following naval vessels: "West Virginia" and "Maryland," 14,000-ton armored cruisers; "Charleston," 10,000-ton protected cruiser; "Virginia," 15,000-ton battle-ship; "Louisiana," and "Minnesota," 16,000-ton battle-ships.

In 1903 he was promoted to naval constructor with the rank of captain.

In 1896 he patented, jointly with R. Gatewood, a novel form of wave motor, consisting of a vane so suspended as to follow the motions of the individual particles of water in each wave.

In 1884 he published, jointly with A. T. Woods, a text-book on "Elementary Mechanism," now in its tenth edition.

He is the author of papers on "The Utilization of the Power of Ocean Waves," presented to a meeting of the American Society of Mechanical Engineers; "Hydraulic Power for Warships" and "Experimental Test of Target Representing Armored Side of U.S.S. 'Iowa,'" presented to a meeting of the American Society of Naval Architects and Marine Engineers; "The Spanish War as Viewed from a Navy Yard," *Stevens Institute Indicator*, April, 1899. His graduating thesis, on "The Transmission of Power by Wire Ropes," was published by the D. Van Nostrand Co., 1876, and republished in 1887.

He is a member of the Institution of Naval Architects of England; the American Society of Naval Architects and Marine Engineers; the United States Naval Institute; the Army and Navy Club, Washington, D. C.; the Cosmos Club, San Francisco; and the Delta Tau Delta fraternity.

He is the son of Jacob and Henriette (Gerecke) Stahl. He married Blanche Vinton, December 18, 1884, and they have one child, David Vinton Stahl.

Stanford, George Chauncey (M.E., '00), was born in Elizabeth, N. J., October 13, 1878. He was employed at the Wright Steam Engine Works, Newburg, N. Y., 1900; with the J. E. Ogden Co., New York, 1901; rod-man in the Pennsylvania Railroad construction department, 1901; with the Newburg Ice Machine & Engine Co., Newburg, N. Y., 1901–02; transit-man in the construction department of the Lehigh Valley Railroad, Sayre, Pa., 1902–03; and has been with M. W. Kellogg & Co., New York, since 1903.

Mr. Stanford is the son of Theodore F. and Lizzie Stanford. He married May Faulks Wardell, June 26, 1902.

Stanley, Robert Crooks (M.E., '99), took a postgraduate course of study at the Columbia School of Mines, New York, and received the degree of Engineer of Mines in June, 1901. He was metallurgist with the S. S. White Mfg. Co., 1901–02, principally em-

ployed in experimental and research work on metals of the platinum group; assistant



R. C. Stanley

superintendent of the American Nickel Works, at the Camden plant of the International Nickel Co., 1902–03; did several months' field-work in mining engineering in the West; superintendent of the American Nickel Works, Camden, N. J., 1903–04; and is now assistant superintendent of the Oxford Copper Co., New Brighton, N. Y. He is a member of the American Institute of Mining Engineers, and of the Beta Theta Pi, Tau Beta Pi, and Theta Nu Epsilon fraternities.

Starr, Howard White (M.E., '00), was born in Brooklyn, N. Y., February 16, 1872. He lived in France and Germany for eight years, graduated at Yale in 1895, and travelled abroad, 1900–01. He was assistant to the vice-president and general manager of the Schenectady Railway Co., Schenectady, N. Y., 1901–02; assistant to the chief engineer of the same road 1902–03; and is now engineer of the Mohawk Gas Co., Schenectady, N. Y. He is a member of the Yale, Union League, and Atlantic Yacht clubs.

Mr. Starr is the son of Theodore B. and Caroline M. Starr, and is descended from Dr. Comfort Starr, who came from Kent, England, in 1632, and is said to have been the first doctor to arrive in New England. He married Henriette D. Danforth, April 18, 1900, and they have one child, Theodore Donald Starr.

Stearns, J. Herbert (M.E., '96), was with the United States Seamless Tube Works (department of National Tube Works Co.), McKeesport, Pa., 1896–1901. No record is available since the latter date.

Stehlin, Joseph (M.E., '98), was born in New York city August 2, 1876; son of Charles Vincent and Katherine Stehlin. He was with P. Pryibil, New York, 1898; with the Nestlé Food Co., Fulton, N. Y., 1899; assistant mechanical engineer in the engineering department of the New York Central & Hudson River Railroad Co., New York 1900–03; and has been mechanical engineer



Joseph Stehlin

in the same employ since 1903. He is an associate member of the American Society of Mechanical Engineers.

Steinbrügge, E., Jr. (M.E., '97), is the sole active partner of the firm of Lyon & Co., a foreign commission house, New York; also of the firm of Lyon, Dupuy, & Co., Boston.

Stephens, John R. (M.E., '78), was employed on the United States Coast Survey, at San Francisco, Cal., 1879; with the Ore-

gon Railway & Navigation Co., Portland, Ore., and The Dalles, 1880–89; with Loring & Brown, Wardner, Idaho, 1889–92; was assistant engineer with the Northern Pacific Railroad, Tacoma, Wash., 1892–93; with Barnato Bros., Johannesburg, South Africa, 1894–96; located at Spokane, Wash., and later at Victoria, B. C., 1898–1900; in the City of Mexico, Mex., 1900–02; and has been in the engineering department of the Grand Trunk Railway System, Montreal, Canada, from 1902 to date.

Stephens, Thomas Concklin (M.E., '00), was born in Pelham Manor, N. Y., January 29, 1878; son of Henry Clay and Anna Concklin Stephens. He was in the engineering department of the United Electric Co. of New Jersey, Newark, N. J., 1900–02; and was the assistant engineer with the Storey Motor & Electric Co., of Harrison, N. J., 1902–03. He is a member of the Tau Beta Pi and Phi Sigma Kappa fraternities.

Stern, Alfred (M.E., '82), was with Stern & Rose, New York, 1883–85; resident attorney and manager for Chas. Stern, Los Angeles, Cal., 1885–90, and then in New York, 1890–94; and is now president of the Charles Stern's Sons Co., Inc., Los Angeles, Cal.

Stevens, Francis Bowes, Jr. (M.E., '90), was born in Hoboken, N. J., July 1, 1868. He was in the testing laboratory of Clapp & Hunt, Pittsburg, Pa., 1890–91; at the H. R. Worthington Hydraulic Works, Brooklyn, N. Y., 1891–92; at the Passaic Rolling Mills, Paterson, N. J., 1892–95; with the Fidelity & Casualty Co., New York, 1895–1900; secretary of the Grafton Mica Co., New York, 1900–01; and has been a member of the firm of G. B. Salisbury & Co., bankers and brokers, New York, from 1901 to date.

Mr. Stevens is the son of Francis Bowes and Elizabeth C. (Harris) Stevens. He married Adèle Horwitz, December 6, 1898.

Stevens, Frederick R. (M.E., '00), was Instructor during the Supplementary Term at Stevens Institute, 1900; and has been in the erection-shop of the Brooks Locomotive Works, Dunkirk, N. Y., since 1900. He now occupies the position of supervisor.

Stevens, Ralph Herbert (M.E., '98), was born in New York city May 2, 1875; son of Plowdon and Laura (McEwen) Stevens. After graduation he was employed with the McKay Shoe Machinery Co., Winchester,



R. H. Stevens

Mass., 1898–99; with the Otis Elevator Co., Yonkers, N. Y., 1899–1901; and has been with the Ruggles-Coles Engineering Co., New York, from 1901 to date.

Stevens, William N. (M.E., '85), was employed at the H. R. Worthington Hydraulic Works, Brooklyn, N. Y., 1885–87; in the office of the engineer of bridges and buildings of the New York, Lake Erie, & Western Railroad, New York, 1887–91; with Algee, Stevens, & Co., manufacturers' agents for railway supplies, etc., Atlanta, Ga., 1891–94; general eastern agent of the Consolidated Car Heating Co., Boston, Mass., 1895–97; with the Edison Illuminating Co., New York, 1898–1900; assistant mechanical engineer on design of Manhattan Railway power house, 1900–02; assistant mechanical engineer of the Rapid Transit Subway Construction Co., New York, 1902–04; and is now with the J. G. White Co., New York.

He obtained a patent in 1889 for a device for compensating for the expansion and contraction of signal wires for railroad block signals. Patents were issued jointly to Mr. Stevens and Mr. John Van Vleck, March

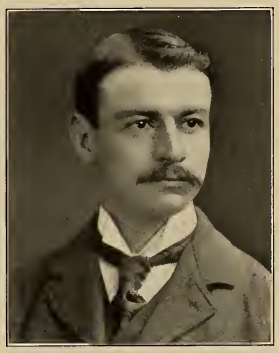
5, 1900, on apparatus for methods for establishing a flow of current through the refractory material of an electrolytic incandescent lamp, which material is a non-conductor at normal temperature, but upon being heated to a certain point becomes a conductor, and thus is rendered incandescent by the passage of the current.

Mr. Stevens is a junior member of the American Society of Mechanical Engineers.

Steward, Joseph E. (M.E., '83), was employed on the Chicago, St. Louis, & Pittsburg Division of the Pennsylvania Railroad, Logansport, Ind., 1883–86; was draughtsman with the Pittsburg, Columbus, & St. Louis Railroad, Dennison, O., 1887–88; assistant master mechanic with the Pittsburg, Fort Wayne, & Chicago Railroad, Fort Wayne, Ind., 1889–92; and has been assistant engineer of signals with the Pittsburg, Cincinnati, Chicago, & St. Louis Railroad, Pittsburg, Pa., 1893 to date.

Stillman, Thomas B. (Ph.D., '83), Professor of Engineering Chemistry at Stevens Institute of Technology. For biography, see page 254.

Strong, William Edward Schenck (M.E., '92), was born in Fishkill-on-Hudson, N. Y., July 25, 1869. He was Instructor during the Supplementary Term at Stevens Institute, 1892; with R. W. Hildreth & Co., as inspector of bridges at the Pencoyd Iron Works and the Edge Moor Bridge Works, and later on locomotive parts at the Baldwin Locomotive Works, 1892–93; shop superintendent with the American Paper Goods Co., Kensington, Conn., 1893–94, during which period he installed the rope transmission system, from the turbine furnishing the power, to the mill; and was assistant engineer with the Pneumatic Torpedo & Construction Co., New York, which was furnishing the United States government with a battery of dynamite guns, 1894–95. He had general supervision for the company at the West Point Foundry, Cold Spring, N. Y., and later had charge of the emplacement work at Sandy Hook. He was agent in New York State for the Columbian Regenerative Furnace Co., Philadelphia, 1895; with the Michigan-Peninsular Car Co., Detroit, Mich., 1895–99, first as draughtsman, and then as mechanical engineer of the company, and superintendent of the Michigan car department; was engaged upon special work in the shops of the Pratt & Whitney Co., Hartford, Conn., 1899–1900; and has been located with the American Radiator Co., Chicago, Ill., from 1901 to date, being vice-chairman of the operating board, having charge of the eight plants in the United States. He has recently been made manager of the engineering department, covering all engineering work and



W. E. S. Strong

improvements in methods and plant management for the eight American plants and two European plants. He is a member of the American Society of Civil Engineers; the University Club of Detroit, and of the Chi Phi fraternity.

Mr. Strong is the son of Benjamin and Adeline (Schenck) Strong. The Strong family are among the early Puritan settlers in New England. He married Lillian G. Bissell, April 17, 1900.

Stueck, George Herman (M.E., '88), was born in New York city February 24, 1867. He was with the Korting Gas Engine Co., 1888–90; was employed in testing underground circuits for the Brush Electric Light Co., New York, 1890; and has been engaged in commercial pursuits from 1890 to date.

Mr. Stueck is the son of Henry and Bar-

bara Stueck. He married Alicia Durell, April 9, 1891, and they have one child, David Durell Stueck.



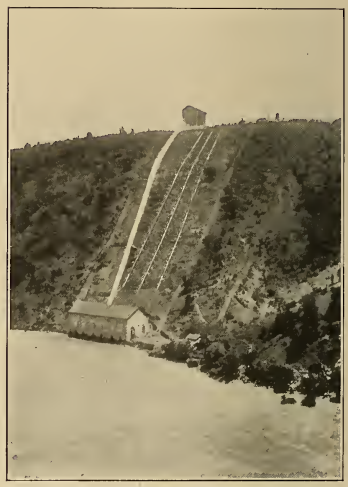
G. H. Stueck

Summerhayes, Henry Roswell (M.E., '96), was born at Fort Apache, Ariz., January 27, 1875. He took the student course with the General Electric Co., at Schenectady, N. Y., and at Lynn, Mass., 1896–97; was engaged in commercial work in the same company's foreign department 1897–98; and has been assistant engineer in its foreign engineering department, in charge of power, mining, and lighting work, from 1899 to date. The most important work he has handled has been the Cauvery power-transmission plant in the State Mysore, India,—a 93-mile, 6,000 horse-power, 30,000-volt transmission. He is a member of the Theta Xi fraternity.

Mr. Summerhayes is the son of Major J. W. Summerhayes, U. S. A., and Martha (Dunham) Summerhayes. He married Marion F. Stewart, June 5, 1900, and they have one child, Marion R. Summerhayes.

Summers, George Frederic (M.E., '91), was born in Philadelphia, Pa., March 6, 1870. He has been in the employ of the United Gas Improvement Co., Philadelphia, Pa.; the Hackensack Gas & Electric Co., Hackensack, N. J.; the Schenectady Locomotive Works, Schenectady, N. Y.; the Constancia Sugar Co., Cienfuegos, Cuba; the United States Arsenal, Rock Island, Ill.; and is now mechanical engineer at Davenport, Ia.

Suydam, Henry (M.E., '78), was employed at the Meadows shops, near Jersey City, and for a short time at the Altoona shops of the Pennsylvania Railroad Co.; was draughtsman with W. H. H. Bowers, contractor for the Moulton, Alice, and other mines; with the Denver & Rio Grande Railroad, in charge of construction work, buildings, etc., at the Salt Lake City terminus, 1882–84; and with P. Ballantine & Sons, brewers, Newark, N. J., 1884–90, engaged in superintending the construction of buildings, malt-houses, grain-elevators, etc., and in the erection of an ice-plant of which he had entire charge when it was put in operation. He died of typhoid fever, November 25, 1890.



Generating-Station of the Power Transmission Plant at Cauvery, India
H. R. Summerhayes

Taff, Frederick Nishwitz (M.E., '95), was born in Brooklyn, N. Y., November 20, 1873; son of Daniel W. and Wilhelmina N. Taff. He was engaged on stone road work as superintendent of the plant of the Morris

County Crushed Stone Co., Millington, N. J., then in general contracting work, 1895–98; served with the First United States Volunteer Engineers as a non-commissioned officer in Porto Rico, 1898; was superintendent of the agricultural implement works of F. Nishwitz at Millington, N. J., 1899–1900; and has been secretary and treasurer of the Nishwitz Manufacturing Co., Millington, N. J., and vice-president of the Morris County Crushed Stone Co., Morristown, N. J., from 1900 to date.

Takeo, Toshisuke (M.E., '98), was employed in the machine-shop and draughting-room of W. D. Forbes & Co., Hoboken, N. J., 1898–1900; in the Providence Engineering Works, Providence, R. I., 1900–02; and is now chief engineer of the Kobukuro Iron Works, Kobukuro, Japan.

Tatham, Edwin (M.E., '81), is one of the firm of Tatham & Brothers, New York and Philadelphia, manufacturers of shot, lead pipe, sheet lead, etc.

Taylor, Frederick W. (M.E., '83), was employed at the Midvale Steel Co., Nicetown, Philadelphia, Pa., in the capacities of laborer, machinist, gang boss, foreman of machine shop, master mechanic, and chief draughtsman, 1878–84, and as chief engineer of the company, 1884–90; general manager of the Manufacturing Investment Co., New York, 1890–93; and has been consulting engineer at Germantown, Pa., reorganizing manufacturing establishments in various parts of the country, from 1893 to date.

He has presented papers before the American Society of Mechanical Engineers on "Relative Values of Fuel Gases," "Notes on Belting," "A Piece-Rate System," and "Shop Management," and, in conjunction with Mr. Maunsel White, one on "Colors of Heated Steel Corresponding to Different Degrees of Temperature," in December, 1899. In the fall of 1904 a book on "Concrete, Plain and Reinforced," was issued jointly by Mr. Taylor and Mr. S. E. Thompson. He has taken out about fifty patents, the most notable being those for the "Taylor-White" process of treating tool steels, for which the Elliot Cresson medal was awarded by the Franklin Institute and a gold medal by the Universal Exposition in Paris, 1900. He is a member of the American So-



F. W. Taylor

ciety of Mechanical Engineers and of the American Institute of Mining Engineers.

Taylor, Horace Greeley (M.E., '99), was born in Trenton, N. J., February 23, 1876. He has been in the London office of Hum-



H. G. Taylor

phreys & Glasgow, gas engineers and contractors, from 1899 to date. In 1900 Mr.

Taylor had charge of the erection and operation of a water-gas plant at Dunedin, N. Z., and in 1901–02 he had charge of the erection and operation of a water-gas plant at Romford, Essex, England. He is an associate member of the American Gas Light Association.

Taylor, Russell Eugene (M.E., '94), was born in New York city July 7, 1869; son of Henry E. and Henrietta Walker Taylor. He assisted in tests of two locomotives belonging to the Jersey Central Railroad, which had been at the World's Fair as representing the modern simple and compound types of engines, 1894; was mechanical engineer in the Norwood (Mass.) shops of the New England Railroad, 1894–97; in the mechanical engineering department of the Erie Railroad, Susquehanna, Pa., engaged in designing and making tests, 1897–99, and engineer of tests for this road, 1899–1900. During the latter year he resigned to assist in his father's business in New York, where he has since been engaged, holding the position of vice-president.

He has taken out a patent for a "Self Retaining Air Hoist Valve" and has these valves installed in several railroad shops. His graduating thesis, prepared jointly with Messrs. E. D. Mathey and C. C. Kenyon, on "A Comparative Test of a Compound Locomotive and a Simple Locomotive, on the Central Railroad of New Jersey," was published in the *Stevens Indicator,* XII.

Taylor, Thomas, Jr. (M.E., '88), was born in Columbia, S. C., October 2, 1866. He was employed in a cotton-oil mill at Columbia, 1888; and was engaged in selling and erecting oil mills, 1888–90. Upon completing the Orangeburg Mill, Orangeburg, S. C., in 1890, he undertook its management until 1897. He then purchased an oil mill at Florence, S. C., and ran it for three years; and in 1901, with his brother, he purchased an oil mill at Gainesville, Ga., and another at Hogansville, Ga., and also erected one at Columbia, S. C., all of which they are operating still. He is a member of the Chi Phi fraternity.

Mr. Taylor is the son of Dr. B. W. and Anna Heyward Taylor. The Taylors went to South Carolina from Virginia in 1740, and the Heywards arrived from England in 1690. He married Susan Evelyn Ames, December 4, 1901, and they have one child, Thomas Taylor 3d.



T. Taylor, Jr.

Taylor, William Henry, Jr. (M.E., '02), was born in Ashley, Luzerne County, Pa., February 3, 1880; son of William Henry and Elizabeth Taylor. After graduation he was engaged for one year with the Link-Belt Engineering Co., Philadelphia, Pa., designing and erecting elevating and conveying machinery. He has since been employed by the United Gas Improvement Co., Philadelphia, and is now in the Construction Division. He is a member of the Engineers' Club of Philadelphia, and of the Chi Phi fraternity.

Terry, Thomas Lee (M.E., '97), was born in Englewood, N. J., January 31, 1876; son of William Owen, and Louise Van der Voort Terry. On his father's side he is descended from early English settlers of Long Island; on his mother's side from among the first Dutch settlers of New York. He took a special course in chemical work under the direction of Dr. Stillman in the private laboratory of the latter at the Institute, 1897, and was chemist with the Glens Falls Portland Cement Co., Glens Falls, N. Y., 1897–98. In this position he had sole charge of the chemical work of the company, which included calcimeter tests on the mixture of clay and limestone used, and complete analy-

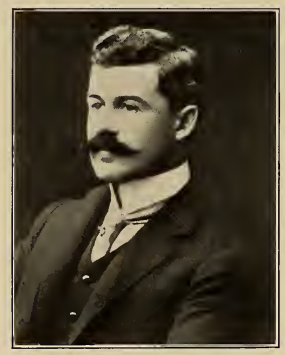
sis of the finished product twice a week, with occasional analysis of the raw material. He took a special course of study in Dr. Stillman's laboratory in 1898, and was Instructor during the Supplementary Term at Stevens Institute in the same year.



T. L. Terry

In 1899 he became chemist and assayer with the William F. Renziehausen Co., gold and silver refiners, Newark, N. J., and in December of that year took a financial interest in the company and was made its vice-president. The plant has since been enlarged and equipped to handle a growing volume of business, and a rolling-plant for sterling silver and other alloys added, rolling metals (principally sterling silver) up to 18 inches in width. The mechanical as well as the chemical work of the company has fallen largely upon Mr. Terry, who has also done considerable work of an original character on the chemical and physical properties of many alloys for special purposes. He is a member of the Englewood Club and of the New York Reform Club.

Théberath, Theodore Ernest (M.E., '88), was born in Newark, N. J., November 22, 1863. He was Assistant Instructor in Experimental Mechanics at Stevens Institute, 1888; draughtsman with the United States Electric Lighting Co., Newark, N. J., 1888–89, and on the absorption of the company by the Westinghouse Electric & Manufacturing Co., in the latter year, was placed in charge of the testing department of the Newark factory and of all special work of the outside construction department, a position he held until 1891. Some of this special work was the installation, in June, 1890, of the first two large generators for the Pittsburg Reduction Co., of Pittsburg, for the reduction of aluminum, the beginning of the great plant now operated at Niagara Falls by this company. In 1890 he was engaged in the installation of several Westinghouse plants to operate coal-cutting machinery in the soft-coal mines of West Virginia, and in 1891 he installed an electrical apparatus for the concentration of magnetic iron ore at the mill of the New Jersey Magnetic Concentrating Co., located in the Adirondack Mountains, in New York State. He was chief electrician at the Newark branch of the Westinghouse Co., 1891–92; special sales agent for Stanley transformers with the Ansonia Electric Co., of Chicago, 1892–93; in charge of the standardizing department of the Weston Electrical Instrument Co., 1893–94; engineer and salesman in the New York office of the Stanley Electric Manufacturing



T. E. Théberath

Co., 1894–96; and engineer in the Pacific Coast agency of the Stanley Co., at San Francisco, 1896–99.

Mr. Théberath came prominently before

the electric transmission interests of the Pacific Coast through his electrical engineering services in the construction of the transmission plant of the Blue Lakes Water Co., and as electrical engineer, later, for the Yuba Power Co.'s transmission to Marysville. The latter installation consisted of three 500-horse-power generators driven by impulse wheels under a 300-foot head. The transmission was 21 miles at 16,000 volts. In March, 1899, the Yuba Electric Power Co. was organized and absorbed the Yuba Power Co. In May of the same year actual work was commenced on the construction of a 60-mile line for 40,000 volts to Sacramento, and the construction of a large power house on the North Yuba River, now known as the Colgate Power House of the Bay Counties Power Co., the capacity of the plant being 15,000 horse-power furnished by seven generators driven by impulse wheels under 700 feet head. Mr. Théberath was chief engineer of the Bay Counties Co. from 1899 for several years. He was then with the California Gas & Electric Corporation, San Francisco, Cal., for whom he constructed several power houses, one of 10,000 and another of 20,000 horse-power capacity. Much of his time was spent in the mountains in connection with the development and construction of these plants. After a brief illness Mr. Théberath died at his home in San Francisco, March 29, 1904.



COLGATE POWER HOUSE, YUBA RIVER, CAL.
T. E. Théberath

Mr. Théberath read a paper on "Lightning on Transmission Lines" before the Sacramento convention of the Pacific Coast Electric Transmission Association, which was published in the *Journal of Electricity*, and was extracted by the *Electrical World* and the *London Engineer*, December 31, 1897, and also a paper on "Telephone Service on Power Transmission Lines" before the same Association. He was a member of the American Institute of Electrical Engineers; of the Pacific Coast Transmission Association; and of the Masonic Order.

Mr. Théberath was the son of Charles M. and Mary A. Théberath. He married, first, Erminie A. Pier, November 27, 1889, by whom he had one child, Erminie Theodora; and second, Annie M. Thompson, July 18 1901.

Thomas, Benjamin Franklin (Ph.D., '80), was born in Palmyra, Portage County, O., October 14, 1850. He was Professor of Physics at the Missouri State University, Columbia, Mo., 1880–85; and has filled a like position at the Ohio State University, Columbus, O., from 1885 to date. He is a Fellow of the American Association for the Advancement of Science; a member of the American Institute of Electrical Engineers; of the American Physical Society; and of the Sigma Xi fraternity. He served on the Jury of Awards at the Chicago Exposition of Railway Appliances; on the Board of Examiners of the Electrical Exposition, Philadelphia, 1884; and on the Jury of Awards in the Department of Electricity at the World's Fair, Chicago, 1893.

Mr. Thomas is the son of David D. and Eleanor Evans Thomas, both natives of Wales. He married Caroline C. Parsons, April 11, 1881, and they have had three children, Phillips, Laura Parsons, and Morton Thomas (the latter deceased).

Thomas, Charles Walter (M.E., '84), was born in New York city November 20, 1864. He was assistant superintendent with the Joseph Dixon Crucible Co., Jersey City,

N. J., 1884–86; assistant engineer with the Suburban Rapid Transit Co., New York, 1886–87; in the employ of the Hyatt Pure Water Co., Newark, N. J., 1887–88; was a member of the firm of C. W. Thomas & Co., mechanical engineers, New York, 1889; with the Rapid Transit Cable Co., New York, 1889–93; mechanical engineer, New York, 1893–96; Instructor in Drawing at the College of the City of New York, 1896–1901; Instructor in Chemistry at the New York Evening High School 1898–1901; has been secretary of the Rubel Paper Lithographing Co., Nutley, N. J., from 1901 to date, and is at present designing new automatic printing and paper-making machinery and sizing materials for paper-makers' use.

During the years 1894–96 he was also engaged evenings as Instructor in Mechanical Drawing at the Newark Technical School, Newark, N. J., and in Drake's College, Jersey City. During 1896–97 he was also Instructor in Carpentry and Wood-Turning at the Institution for the Improved Instruction of Deaf Mutes, New York, and the same year conducted tests of fireproof floors and materials for Constable Bros.

He has patented a noiseless sheave for cable roads, has taken out five patents for electric railways, and is part inventor of a universal mill. He has also done considerable work in designing presses for printing labels, newspapers, etc., and automatic hydraulic presses, and in the development of patents. He is the author, jointly with Prof. William Fox, of a series of books on mechanical drawing; has written an article for "Paper and Pulp" (London, Eng.) on technical education applied to paper-making, and is at present engaged on a work on paper-making. He is a member of the American Society of Mechanical Engineers; the Electro-Chemical Society; and of the Chi Psi fraternity.

Mr. Thomas is the son of John C. and Mary A. E. (Godfrey) Thomas, of English descent on his father's side. He married Juliette L. Conord in January, 1893.

Thomas, William W. (M.E., '86), was in the employ of Liddell & Co., manufacturers of machinery, Charlotte, N. C., 1886–91; with W. H. Gibbes, Jr., & Co., Columbus, S. C., 1891–94; and practised as a mechanical and hydraulic engineer at Chicago, Ill., 1894–95. For several years past Mr. Thomas has been located at Morristown, N. J.

Thompson, Edward Pruden (M.E., '78), was born in Elizabeth, N. J., August 25, 1856. He was engaged in teaching experimental chemistry and physics, algebra, geometry, trigonometry, and the English language at the Pingry School, Elizabeth, N. J., 1878–82. Jointly with Mr. William Stanley, now of the Stanley Electric Co., he made and developed (in a laboratory supported for two years by the Swan Electric Co., of Boston) certain electrical inventions which were sold to George Westinghouse, Jr., and upon which inventions the Westinghouse Electric Co. was incorporated 1882–83. Since then he has been a solicitor of patents and expert in New York.



E. P. Thompson

Mr. Thompson's earliest experience in patent matters began with the firm of Pope, Edgecomb, & Terry, with whom he was associated in completing thirty patents upon his own inventions. At the beginning of his career as a solicitor he was intrusted with all the business of the *Power* and *Electrical World* patent bureaus, for two years. He has made a specialty of patents which require for their proper understanding and handling a thorough knowledge of electricity, chemistry, and engineering. He has for a num-

ber of years enjoyed the services, as associate technical counsel, of Prof. William A. Anthony, formerly president of the American Institute of Electrical Engineers, and for fifteen years a Professor at Cornell University.

Mr. Thompson is the author of the following books: "Roentgen Rays and Phenomena of the Anode and Cathode," and "Invention as a Science and an Art." As associate editor for two years of the *Electrical World* he wrote numerous articles, especially a long series on "Analytical and Systematic Method of Inventing." He has also contributed the following papers to technical journals: "Expansion of Polynomials," *Mathematical Visitor,* 1880; "Chemistry of the Carbon Filament," *Transactions of the American Institute of Electrical Engineers,* I, 1884; articles relating to "Telephonic Action," *Electrical Engineer,* 1891 and 1892; "Micanite and its Application to Armature Insulation," *Transactions of the American Institute of Electrical Engineers,* IX, 1892; "How to Protect Inventions in Foreign Countries without Effect upon the Term of the United States Patent," *Science,* 1892; "Protection of Industrial Property," *Cassier's Magazine,* 1894; serial on "Principles of Invention," *Electric Power,* 1895; serial on "Automatic Telephone Exchange Systems," jointly with Mr. Ward Decker, *Ibid.,* 1896. Numerous other articles on patents, patent law, and related subjects have appeared in various journals.

Mr. Thompson is a member of the American Society of Mechanical Engineers, and of the American Institute of Electrical Engineers (a charter member), and has served the latter on the boards of Managers and Examiners.

Mr. Thompson is the son of William P. and the late Emily B. Thompson, and is a descendant of Capt. Lewis Thompson of the Revolutionary Army, and of the Butler family of Virginia, one member of which was the first wife of General George Washington's father. He married Edith Chetwood Coursen, February 10, 1886.

Thomson, William Inslee (M.E., '97), was born in Newark, N. J., June 26, 1876; son of James A. and Adaline W. Thomson. He was Instructor in Applied Electricity at Stevens Institute, 1897–1900; chief machinist of the U.S.S. "Badger" during the Spanish War; employed in the electric construction department of the Manhattan Railway Co., New York, 1900–02; and has been with the Safety Car Heating & Lighting Co., New



W. I. Thomson

York, from 1902 to date. He is an associate member of the American Institute of Electrical Engineers.

Thuman, Frederic (M.E., '90), was born near Evansville, Ind., February 7, 1867; son of John and Phillipine (Shickel) Thuman. Prior to entering the Institute he completed a four-years apprenticeship with a firm of engineers and millwrights, and acquired experience in the shops, at draughting, in the erection of machinery, and in surveying. He was employed in the Standard Oil Co.'s Atlantic Refinery, Philadelphia, 1890, and with the United Gas Improvement Co., Philadelphia, 1890–92, being engaged in draughting at Philadelphia, 1890; as assistant to the manager of the branch office in Chicago, 1891–92; and erecting apparatus and testing water-gas plants in various parts of the country, 1892. He has been identified with the work of Messrs. Humphreys & Glasgow, since their establishment in 1892. For the first two years he was engaged in designing and erecting water-gas plants, and in carrying out tests and experiments for the purpose of improving the economy of the Lowe proc-

ess under European conditions. In 1894 he was permanently installed in the London office as manager of the construction depart-



F. Thuman

ment and principal assistant to Mr. Glasgow. He now holds the position of chief engineer, and manager of the London office. He has developed several important patents in connection with the manufacture of carburetted water-gas; these have been assigned to Messrs. Humphreys & Glasgow. He is a life member of the American Society of Mechanical Engineers, and a member of the Stevens Alumni Association of America and Europe; the Rho chapter of the Delta Tau Delta fraternity; and of the Whitehall Club and the American Society of London.

Tiemann, Harry Donald (M.E., '97), was born in Brooklyn, N. Y., March 26, 1875; son of J. H. and M. A. Tiemann. His great-uncle, Daniel F. Tiemann, was mayor of New York. The subject of this sketch was Instructor in a correspondence school, 1897–98; Instructor in Physics and Chemistry at the Pratt Institute, Brooklyn, 1898–99; Instructor in Mechanical Engineering at the University of Pennsylvania, 1899–1900; was engaged in the Department of Forestry (now a Bureau) at Washington, doing both office and field work, 1900–01; and is now in the Bureau of Forestry in charge of the Yale timber-testing laboratory. He took the course at the Yale Forest School, and graduated with the degree of Master of Forestry, 1903. His thesis, on "Gas Engines," was published in the *Stevens Institute Indicator*, to which he also contributed an article on "The Mechanical Relation of Force and Mass," in 1901. In the same year he in-



H. D. Tiemann

vented a hypsometer for measuring the height of trees.

Tischner, Charles Frederick, Jr. (M.E., '02), was born in New York city October 10, 1879; son of Charles Frederick and Annie Jane Maddock Tischner. After graduation he entered the draughting-room of the General Building & Construction Co., and shortly afterward began patent law work, in which he is still engaged. He is an associate member of the American Institute of Electrical Engineers; a junior member of the American Society of Mechanical Engineers; and a member of the Phi Sigma Kappa and Theta Nu Epsilon fraternities.

Toby, Edward M. (M.E., '96), was engaged in the Department of Tests at Stevens Institute, 1896; in the General Electric Co.'s works, Schenectady, N. Y., 1896–97; and has been with the National Contracting Co., New York, from 1897 to date. He was sent to New Orleans, La., where the company had a contract with the city to construct

an electrical system of drainage, the general plan of which was a central power station supplying power to several pumping-stations located at various points around the city. In 1898 he became engineer in charge of the construction of the central generating station of 6,000 horse-power, and later had entire charge on the field of all construction of central and sub-stations. In 1900 he was promoted to the position of chief engineer of the company, and some months later, upon the death of the local manager at New Orleans, Mr. Toby assumed his duties, so that at the present time he is acting general manager and chief engineer. The total amount of the contracts already awarded to the National Contracting Co. by the city of New Orleans is about $2,500,000. He is a member of the Tau Beta Pi fraternity.

Tock, Clarence Robert (M.E., '98), was born April 13, 1874. He was with the Fos-



C. R. Tock

toria Incandescent Lamp Co., Fostoria, O., from 1898 to 1903, and is now superintendent of the Ravenna Lamp Factory, Ravenna, O.

Mr. Tock is the son of Orson W. and Ella M. Tock. He married Verna O. Parrish, November 2, 1898.

Todd, George Lawrence (M.E., '90), was born in New Rochelle, N. Y., February 13, 1868. He was in the employ of Hildreth Brothers, New York, 1890–91; in the department of tests of the Chicago, Burlington, & Quincy Railroad, Aurora, Ill., 1891–92; in the like department of the Great Northern Railroad, St. Paul, Minn, 1892–94; with the Paul Steam System Co., Boston, Mass., 1895–96; with the Newark Electric Light Co., Newark, N. J., 1897–98; and has been connected with the Nason Manufacturing Co., New York, from 1898 to date, being now vice-president of the company. He is a member of the Delta Tau Delta fraternity.

Mr. Todd is the son of James W. and Mary Platt Todd. He married Lucy Carpenter Bedell, June 24, 1896, and they have one child, Lynette Adèle Todd.

Topping, Howell (M.E., '02), was born in Brooklyn, N. Y., June 12, 1878; son of A. Howell and Cornelia Topping. His early education was received at the Adelphi Academy, Brooklyn. After graduation he was employed in the job-work department of the National Tube Co., McKeesport, Pa., until 1903, when he became erecting engineer for the William B. Scaife & Sons Co., of Pittsburg, Pa. He is a member of the Beta Theta Pi and of the Sigma Psi fraternities.

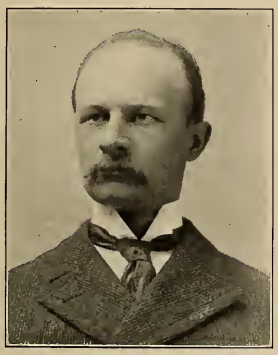


Henry Torrance, Jr.

Torrance, Henry, Jr. (M.E., '90), was born in Brooklyn, N. Y., March 7, 1870; son

of Henry and Sarah Creighton (Peet) Torrance. He was in the employ of the Hendrick Manufacturing Co., Ltd., Carbondale, Pa., for several years, and then became its agent in New York, 1896–99. In the latter year the Carbondale Machine Co., was organized, and he was appointed its engineer and director, managing the New York office of the company, where he is still located. He is a member of the American Society of Mechanical Engineers; the Engineers' Club of New York; the American Society of Refrigerating Engineers; and of the Delta Tau Delta fraternity.

Torrance, Kenneth (M.E., '84), was born in Brooklyn, N. Y., June 29, 1863. He was



KENNETH TORRANCE

employed in the shops of Henry R. Worthington, 1884–93, serving in various capacities, as vise hand in erecting pumps, assistant to foreman in machine-shop, engineer in the erecting department on waterworks engines, and as assistant manager and engineer of the Chicago office of the firm. He engaged in general engineering in Chicago, 1893–94, and has been chief engineer at the Ridgewood engine-house and line stations in the Department of City Works, Brooklyn, from 1894 to date. He is a member of the American Society of Mechanical Engineers; the American Waterworks Association; the Brooklyn Engineers' Club; the Municipal Engineers' Club; the National Association of Stationary Engineers; and of the Richmond Hill Golf Club.

Mr. Torrance is the son of Henry and Sarah Creighton (Peet) Torrance. He married Luise L. Meisel, April 15, 1895.

Towne, Joseph Minott (M.E., '97), was born in East Orange, N. J., July 7, 1875. After an extensive tour through the western and southwestern section of the United States he entered the office of Hill & Turner, architects and engineers, New York. He remained with this firm until 1900, when he obtained a position in the engineering department of the Jersey City works of the Safety Car Heating & Lighting Co., where he remained until January 1, 1903, when he was transferred as general agent to the company's offices in New York. He is a member of the American Society of Civil Engineers; the New York Railroad Club; and the Masonic Order.

Trautvetter, Carl (M.E., '90), was chemist and mechanical engineer with the Sharpsville Furnace Co., Sharpsville, Pa.; electrician with the Bristol Co., Waterbury, Conn.; and was last registered as manufacturing recording instruments at Paterson, N. J.

Trautwein, Alfred Philip (M.E., '76), was born in New York city October 10, 1857. He was in the employ of the Continental Iron Works, Brooklyn, N. Y., as mechanic, draughtsman, and mechanical engineer, engaged in the construction of coal and water gas works, fuel-gas plants, ice-making and refrigerating machinery, and marine construction, 1876–89; with the Hendrick Manufacturing Co., Ltd., Carbondale, Pa., as superintendent, engaged in the manufacture of ice-making and refrigerating plants, oil-works machinery, coal-breaker machinery, and perforated sheet metals, 1889–99; and since the latter year he has been president of the Carbondale Machine Co., building ice-making and refrigerating plants, oil-works machinery, hydraulic machinery, coal-breaker machinery, etc. He is also president of the Carbondale Chemical Co., the Carbondale Supply Co., the Fernbrook Water Co., and of the Belmont Water Co.; secretary of the Los Angeles Ice & Cold Storage Co.;

treasurer of the Sperl Heater Co., and director of the Pioneer Dime Bank, all of Carbondale, Pa.; also president of the American Acid & Alkali Co., of Bradford, Pa., and director of the Buffalo Cold Storage Co., of Buffalo, N. Y. He served the Institute in the capacity of Alumni Trustee from 1887 to 1890. His graduating thesis, on "The Manufacture of Coal Illuminating Gas," was published in the *American Gas Light Journal*, 1876–77. He is a member of the American Society of Mechanical Engineers; the Engineers' Club of New York; the Manufacturers' Club of Philadelphia; the Engineers' Club of Scranton, Pa.; the Drug Trade Club, New York; and of the Delta Tau Delta fraternity.

Mr. Trautwein is the son of John Philip and Emily Helwig Trautwein. He married Mary E. Hendrick, January 29, 1891, and they have four children, Caroline Hendrick, Emily Hendrick, Elizabeth, and Margaret Trautwein.

Trube, Gustave Adolph (M.E., '90), was born in Brooklyn, N. Y., July 25, 1869. He



G. A. Trube

graduated from Brooklyn Public School No. 15, in 1884, and from the Brooklyn Polytechnic Institute (scientific course) in 1887, in which year he entered the Sophomore class at Stevens. On graduation he joined the staff of the Illinois Steel Co., Chicago, holding different positions in the South Chicago, and Joliet works of this company. In 1893 he made a trip of inspection to all the principal steel and iron works in Great Britain and on the continent of Europe, and reported thereon to his company. In 1895 he was appointed assistant general superintendent of the Union Works of the company. In 1897 he joined the Ludlow Valve Manufacturing Co., Troy, N. Y., and in 1898 became connected with the Westinghouse interests: first, the Westinghouse Air Brake Co., Pittsburg; then the Westinghouse Brake Co., Ltd., of London, Paris, and Hanover (Germany), to introduce American methods of manufacture in the company's shops; and finally, in 1901, the British Westinghouse Electric & Manufacturing Co., Ltd., of London and Manchester, as manager of the brake department; and he is now located at Manchester, where he is manager of the tramway department, having charge of the street railway work. He has taken out patents on improvements in brakes for electric tram cars and other vehicles, and applications for other patents are pending. He is a member of the American Institute of Mining Engineers; the American Society of Mechanical Engineers; the New York Railroad Club; the Chicago Athletic Club; the Iron and Steel Institute; the American Society in London; and of the Conservative Club, Manchester, England.

Mr. Trube is the son of Carl and Ottonia (Fincke) Trube. He married Bertha Wunder, June 17, 1896, and they have two children, Robert Loud and Maud Ottonia Trube.

Tucker, Benjamin W. (M.E., '84), was in the employ of the Newark Filtering Co., Newark, N. J., 1884–88; and of the Hyatt Pure Water Co., Newark, 1888–90; with Henry Warden, Germantown Junction, Philadelphia, 1890–91; and was consulting engineer for special machinery at Newark, N. J., 1891–98. In 1898 he removed his office to New York city, where he is now located as consulting engineer in special and automatic machinery. From 1895 to 1899 he was associated with Mr. W. S. Corwin, M.E. (Stevens, '85), in electric work and coal-handling machinery.

Tuttle, Willard S. (M.E., '84), was born in Brooklyn, N. Y., June 22, 1863. He was

employed in the shops and draughting-office of the Ferracute Machine Co., Bridgeton, N. J., manufacturers of presses and dies for sheet metal, 1884-86; and has been with the Tuttle & Bailey Manufacturing Co., Brooklyn, N. Y., manufacturers of hot-air registers and ventilators (having served in the shop and office and being at present mechanical engineer and secretary) from 1886 to date. He has patented minor improvements in the construction of registers. He is a member of the American Society of Mechanical Engineers; the Brooklyn Engineers' Club; and the Dyker Meadow Golf Club. He is also a trustee of Adelphi College.

Mr. Tuttle is the son of Silas and Arabella Tuttle. He married Christine J. W. Loeser,



W. S. Tuttle

May 23, 1900, and they have one child, Dorothy Tuttle.

Twitchell, Richard S. (M.E., '90), was Instructor at the Hill School, Pottstown, Pa., 1890–97; Instructor in the department of science and technology of the Pratt Institute, Brooklyn, N. Y., 1897–99; and has been employed in the construction department of the Western Electric Co., New York, from 1899 to date.

Uehling, Edward A. (M.E., '77), was born in Richwood, Wis., June 3, 1849; the son of Frederick and Anna Margareth Uehling, who left their native village, Waldfish, Germany, in 1847, because of unsatisfactory political conditions, and went to Wisconsin.



E. A. Uehling

Frederick Uehling was one of the pioneers in the section in which he settled.

Edward A. was the sixth child and first American born in the family. The usual hardships and blessings of pioneer life fell to his lot. With the exception of about six months in the summer of 1870, during which time he endeavored to sell shop rights for a land-roller on which he had obtained a patent, he remained at home, going to school in winter, and working on the farm in summer, until he entered Stevens in 1873.

He was assistant to Dr. Thurston on experimental work in the Mechanical Laboratory of the Stevens Institute, testing cold rolled iron and steel, 1877–78; and was engaged on a preliminary survey of a line of railroad in western Pennsylvania and eastern Ohio, and then as draughtsman with the Douglas Furnace Co., Sharpsville, Pa., 1879–1880. He took a private course of study in metallurgy and chemistry with Dr. Stillman at Stevens Institute in 1880; conducted a commercial laboratory at Sharpsville, Pa., 1880–83; was in charge of the laboratory of the Bethlehem Iron Co., Bethlehem, Pa., 1883–85; of the blast furnace of the Sharpsville Furnace Co., Sharpsville, Pa., 1885–

87; of the blast furnaces of the Bethlehem Iron Co., 1887–90; and of the two furnace plants of the Sloss Iron & Steel Co., Birmingham, Ala., 1890–95. While there he had charge of the remodelling and reconstruction of the several furnaces. After these improvements had been completed he resigned his position.

While Mr. Uehling was with the Bethlehem Iron Co., in 1888, the idea of the pneumatic pyrometer was conceived in the course of his search for a pyrometer that would be reliable, durable, and accurate for temperatures usual in modern blast-furnace practice. The idea of the gas-composimeter from which the pyrometer was really evolved had occurred to him some time before. For lack of time nothing was done with these inventions until 1893, when Mr. A. Steinbart, a young German engineer, became sufficiently interested to devote his time to perfecting them. After Mr. Uehling's resignation from the Sloss Iron & Steel Co., he devoted most of his time to the further development of these instruments, which are now being manufactured by the Uehling-Decker Co., of which Mr. Uehling is president. The pneumatic pyrometer, a full description of which was published in the *Stevens Indicator*, April, 1894, records temperatures as high as 3,000° F. It has come to be the standard pyrometer for indicating and recording the blast and gas temperatures of the modern blast furnace, and is extensively used for annealing and tempering steel. A description of the composimeter was published in the *Stevens Indicator*, October, 1897.

Mr. Uehling is also the inventor of the pig-iron molding and conveying apparatus shown in the accompanying illustrations, which was first put in successful operation at the Lucy furnaces in 1896. The iron cast over this machine nowhere comes in contact with sand or other injurious substance. The molds, during their return, travel in an inverted position, and are sprayed with a refractory lining mixture, basic or carbonaceous, which, if anything, improves the quality of the iron. Hence the immense surface of sand-bed and a corresponding area of the cast-house, and the labor and other troubles connected therewith, are done away with. No labor is expended on the iron from the time it leaves the ladle until it is shipped



Fig. 1.—Uehling Pig-Iron Process

in the car. This means a saving of from 10 to 12 cents a ton.

The machine soon began to attract attention among the ironmasters of Europe. The Uehling Co., Ltd., was formed for its exploitation in Europe, and in the spring of 1899 Mr. Uehling crossed the Atlantic to assist in its introduction and development. He was located in Middlesborough, the centre of the celebrated Cleveland iron district, until August, 1901.



FIG. 2.—UEHLING PIG-IRON PROCESS

The machine has become a necessary adjunct to the modern American blast furnace, as without it the immense outputs, which in some instances have reached the almost incredible quantity of over 700 tons per furnace in 24 hours, could not be handled. There are few large furnace plants that are not equipped with it, and it is only a question of time when all will be obliged to have them. In Europe its general adoption will be much less rapid, principally due to the fact that the output per furnace is not much over 25 per cent of what it is here; it is therefore not so much of a necessity. Furthermore, labor being cheaper, the saving to be realized by its use is less marked than in the United States.

After his return from Europe Mr. Uehling devoted most of his time to the further development of the instruments, etc., manufactured by the Uehling-Decker Co., and in addition carried on a consulting and expert business, which he still conducts in New York city.

Mr. Uehling has taken out patents on a flexible land-roller (1869); gas seals for blast furnaces (1883 and 1884); furnace for burning gaseous fuel, water-circulation blast-furnace tuyers, etc. (1885); pneumatic pyrometer (1893); process of treating black band ores, gas composimeter, and Christmas-tree candle holder (1894); treatment of molten metal, and casting-machine (1895); multiple pressure-gauges (1896); calorimeter, or quantitative heat measuring and recording apparatus, recording traction dynamometer, and expansion pyrometer (1898); autographic grade-indicating or profiling apparatus, mixing and spraying apparatus for casting-machine and slag-machine (1899).

Mr. Uehling has written the following articles for publication:

"Harvesting Machinery." *Iron Age*, 1877.

"The Value of Gas Seals on the Blast Furnace." *Ibid.*, 1883.

"Process of Smelting in the Blast Furnace." *Stevens Indicator*, 1887.

"Improvements in Methods of Calculating Results in Chemical Laboratories." *Ibid.*, 1887.

"The Grading of Pig-Iron by Fracture Is Not Sufficient Guide as to Its Quality." *Iron Age*, 1888.

"The Modern Blast Furnace." *Stevens Indicator*, 1888.

"The Charging of the Blast Furnace." *Ibid.*, 1889.

"The Manufacture of Steel in the South." *Iron Age*, 1894.

"The Cost of Making Pig-Iron in the Birmingham District." *Ibid.*, 1894.

"The Pneumatic Pyrometer." *Stevens Indicator*. 1894.

"The Pneumatic Pyrometer." *American Manufacturer*, 1895.

"The Value of Measuring and Recording the Temperature of the Waste Gases of a Blast Furnace." *Ibid.*

"Blast Furnace Slag as a Reagent in the Process of Smelting." *Stevens Indicator*, 1896.

"The Blast Furnace as a Power Plant." *Ibid.*, 1903.

"Uehling's Method of Casting and Conveying Pig-Iron." *Cassier's Magazine*, June, 1903.

He has also read the following papers: "Dolomite as a Flux in the Blast Furnace," before the Alabama Industrial and Scientific Society, 1894; "Die Giessmachine," before the Verein Deutschen Eisenhuttenleute, 1900; "The Pneumatic Pyrometer," before the Cleveland Institution of Engineers, 1900. He is a member of the Tau Beta Pi fraternity.

Mr. Uehling married Jeannette Merz, December 25, 1880, and they have two children, Fritz Frederick and Edward Uehling.

Uhlenhaut, Fritz, Jr. (M.E., '88), was born in New York city July 7, 1867. He took the expert course with the Thomson-Houston Electric Co., 1888–89; was in the employ of the Edison Electric Illuminating Co., Brooklyn, N. Y., 1889–91; assistant engineer with the Field Engineering Co., New York, 1891–94; with the Philadelphia Traction Co., as assistant engineer, 1894–95, and as chief engineer, 1895–96; engineer with the Pennsylvania Heat, Light, & Power Co., Philadelphia, 1896–97; assistant engineer with the Metropolitan Traction Co., New York, 1897–99; consulting engineer to the Telephone, Telegraph, & Cable Co. of America, New York, 1899–1900; chief engineer of the Consolidated Traction Co., Pittsburg, Pa., 1900–01; and from January, 1902, to date has been chief engineer to the Pittsburg Railways Co. and the Allegheny County Light Co., Pittsburg. He is a member of the American Institute of Electrical Engineers; the Franklin Institute, and the Union League Club of Philadelphia; and an associate member of the American Society of Mechanical Engineers.



Fritz Uhlenhaut, Jr.

Mr. Uhlenhaut married Gertrude A. Goodhart, and they have one child, Fritz Uhlenhaut, 3d.

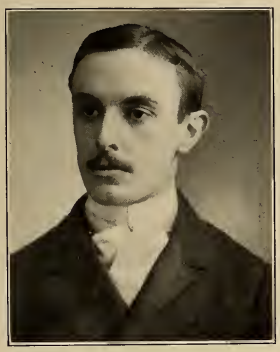
Underhill, Henry Lawrence (M.E., '00), was born at Croton Point, N. Y., October 11, 1875; son of Henry Haydock and Phœbe Wood Underhill. He is descended on both sides from Capt. John Underhill, who came to this country from England in the 17th century, and who obtained considerable prominence as an Indian fighter in the New England Colonies. He was in the employ of the New York Electric Vehicle Transportation Co., New York, 1900; inspector of factories for fire-insurance purposes, with the Middle States Inspection Bureau, New York, 1900–03; inspector of construction with the New York Mutual Gas Light Co., New York, during 1903; and is now one of the assistant engineers of the Consolidated

Gas Co. of New York. He is a member of the Chi Psi fraternity.



H. L. Underhill

Upjohn, Hobart B. (M.E., '99), was born in Brooklyn, N. Y., May 2, 1876. He won a scholarship to Webb's Academy of Shipbuilders in 1894, but chose to go to Stevens



H. B. Upjohn

School and Institute. He was in the employ of the Worthington Pump Co., Brooklyn, N. Y., 1899–1900; was third assistant engineer of the steamship "New York," of the American Line, 1900; in the draughting-room of the New York Shipbuilding Co., Camden, N. J., 1900–01; engineer with the Transit Contract Co., Scranton, Pa., 1901; junior assistant principal of the School of Architecture at the International Correspondence Schools, Scranton, 1901–04; and is now engineer for the firm of Eidlitz & McKenzie, architects, New York. He has written an article on the Steam Turbine, and text-books, for use in the above-mentioned school, on Masonry; Arches, Vaults, and Domes; and Columns and Struts. He is a member of the American Society of Naval Engineers and of the Scranton Engineers' Club.

Mr. Upjohn is the son of Richard M. and Emma Tyng Upjohn. His father and grandfather were both architects. The Hartford Capitol and Stevens Institute are works of his father, and Trinity Church, New York, was designed by his grandfather, Richard Upjohn. The subject of this sketch married Margaret Miller, April 8, 1902.

Vail, Eugene Lawrence (M.E., '76), was born in Saint Servan, France, September 29, 1856. After graduation he was employed with Major Wheeler as meteorologist, and after spending a year upon a geographical survey, during which time he had occasion to view some of the finest scenery in the world, he was encouraged to believe that success for him lay rather in the line of painting than of engineering. Accordingly he went to Paris to study with Cabanel at the Beaux Arts. After devoting three years there to drawing and painting from the nude, he was advised to take up the painting of scenes from every-day life.

Thrown upon his own resources, he went to the seaside village of Étaples, on the coast of Picardy, where for many years he painted pictures of the sea and of fishermen, and sent one painting annually to the Salon of the Champs Élysées. He was finally rewarded by receiving honorable mention, then a gold medal, and later, at the Universal Exposition, a first-class medal in the American Section, which placed him *hors concours*. He afterward obtained a gold medal at Munich, a first-class medal at Antwerp, and the diploma of honor at Berlin. In 1894 he received the decoration of the Legion of

Honor. He left the old Salon of the Champs Élysées in 1897 to become an Associate at the Nouveau Salon. He is a member of the Paris Society of American Artists and of the Theta Xi fraternity.

Mr. Vail is the son of L. E. and Clotilde (Le Gué) Vail, both Americans. He married Gertrude Mauran, January 14, 1890, and they have two children, Eugene Laurence and Mary Gertrude Clotilde Vail.

Van Atta, Harry (M.E., '81), was born in Hackettstown, N. J., November 2, 1860. He was superintendent of isolated plants for the United States Illuminating Co., New York, 1881–85; in charge of the manufacturing plant of Rathbone, Sard, & Co., Albany, N. Y., 1885–92; and has been general superintendent of the J. L. Mott Iron Works, New York, from 1892 to date. He is a member of the American Society of Mechanical Engineers; of the Board of Street Opening, Borough of the Bronx; of the Fordham and Jefferson clubs; and first vice-president of the Schnorer Club.

Mr. Van Atta is the son of Henry H. and Melinda T. Van Atta. His ancestors came from Etten, Holland, about 1650. He married Katharine McGovern, November, 1882, and they have three children, Blanche Adelaide, Kenneth Carlisle, and Willard Van Atta.

Van Brunt, John (M.E., '97), was born in Englewood, N. J., January 29, 1877; son of Stephen and Christiana (Orser) Van Brunt. After a short engagement with the American Luxfer Prism Co., New York, in 1897, he went with the American Stoker Co., by whom he is still employed. For several years he was located in various parts of the West in the interests of this company, but is now engaged at the home office, and works at Erie, Pa., as chief engineer.

Van der Willigen, Thomas Anthony (M.E., '88), was born in Twello, Holland, August 5, 1866. He received his early school education in Haarlem, Holland. He was in the employ of the United Gas Improvement Co., of Philadelphia, Pa., having charge of the erection of several water-gas plants, 1888–90. He was draughtsman and assistant engineer in the mechanical engineer's department of the Calumet & Hecla Mining Co., Calumet, Mich., 1890–93; assistant to the engineer of the Winslow Bros. Elevator Co., Chicago, being principally engaged upon designs of safety devices for passenger elevators, 1893–94; and chief draughtsman with the Buffalo Engineering Co., which at the time had the contract for making complete designs of a ship-lift to take the place of the locks at Lockport, N. Y., 1895–96.

Since the latter date Mr. Van der Willigen's time has been devoted exclusively to the gas business. Since his connection with Messrs. Humphreys & Glasgow in 1896, as constructing engineer at their London branch, he has erected numerous plants both in England and on the Continent. He is now Messrs. Humphreys & Glasgow's representative for Holland and Belgium, with headquarters at Brussels.

As a former member of the Engineers' Society of Western New York he read a paper giving the results of his investigation of the hydraulic ship-lifts at St. Omer, France, and at La Louvière, Belgium. He is a member of the Vereiniging van Gasfabrikanten in Nederland; of the American Society of Mechanical Engineers; and of the Theta Xi fraternity.

Mr. Van der Willigen is the son of V. S. M. and S. A. (Van der Hell) Van der Willigen. Prof. V. S. M. Van der Willigen was Director of the Physical Laboratory of Teyler's Museum, Haarlem, Holland, and devoted his entire life to researches bearing on natural philosophy. He married Helena Brown, September 8, 1898, and they have one daughter, Vera Helena Van der Willigen.

Van Saun, P. Edwin (M.E., '98), was born in Maywood, N. J., June 7, 1877. He was Instructor during the Supplementary Term at Stevens Institute, 1898; draughtsman at the Rogers Locomotive Works, Paterson, N. J., 1898; was employed in the meter department of the Edison Electric Illuminating Co., New York, 1898–99; in the engineering department of the Colorado Iron Works, Denver, Colo., manufacturers of mining and smelting machinery, 1899–1902; and has been chief engineer in the New York office of the latter company from 1902 to date.

Mr. Van Saun is the son of John C. and

Margaret A. Van Saun. He married Elizabeth G. Zabriskie, April 5, 1899.



P. E. Van Saun

Van Vleck, Frank (M.E., '84), was born in Napanoch, N. Y., January 7, 1863. He prepared for college at Holbrook Military Academy, Ossining, N. Y. After graduation at Stevens he pursued a postgraduate course in science and physics at Johns Hopkins University, Baltimore, Md., 1884–85; was Instructor in Mechanical Engineering at Sibley College, Cornell University, 1885–86; and Assistant Professor in Mechanical Engineering at that institution, 1886–88. From 1888 to 1889 he was mechanical engineer with the Los Angeles Cable Railway Co., Los Angeles, Cal., and consulting engineer for the power plant of the People's Railway, St. Louis, Mo., and from 1889 to 1890, chief engineer and constructor of the San Diego Cable Railway Co. During the next four years he was executive engineer of the Pacific Railway Co., Los Angeles, Cal., and, later, consulting engineer of the Los Angeles Railway Co., the Pasadena & Pacific Railway, the Los Angeles & Pasadena Railway, the Los Angeles Traction Co., and the Citizens' Traction Co., San Diego. He was for a time in the Department of Yards and Docks at the Mare Island Navy Yard, Vallejo, Cal., and from 1899 to 1902 was assistant superintendent engineer of the United States Army Transport Service, Pacific Fleet, San Francisco. From 1902 to 1903 he worked as naval architect at the Government Hull Department of the Newport News Ship Yard, Va. He is at present in the Bureau of Steam Engineering of the Navy Department, Washington, D. C., recently serving as technical secretary of the U. S. Naval Fuel Oil Board. He is a member of the California National Guard, being lieutenant commanding the engineer divisions of the State of California Naval Militia, and chief engineer of the U.S.S. "Marion" at San Francisco.

He developed the "Van Vleck System" of telephones for centralized battery service in use in large hotels. In cable-road work he made many inventions which were largely in use up to the time in which cable railways were superseded by electricity.



Frank Van Vleck

He is the author of the following (and other) papers:

"Standard Section Lining." *Transactions of the American Society of Mechanical Engineers*, IX, 107 (1887).

"Light Cable-Road Construction." *Ibid.*, 1890.

"A California Mountain Railway." *Cassier's Magazine*, 1893.

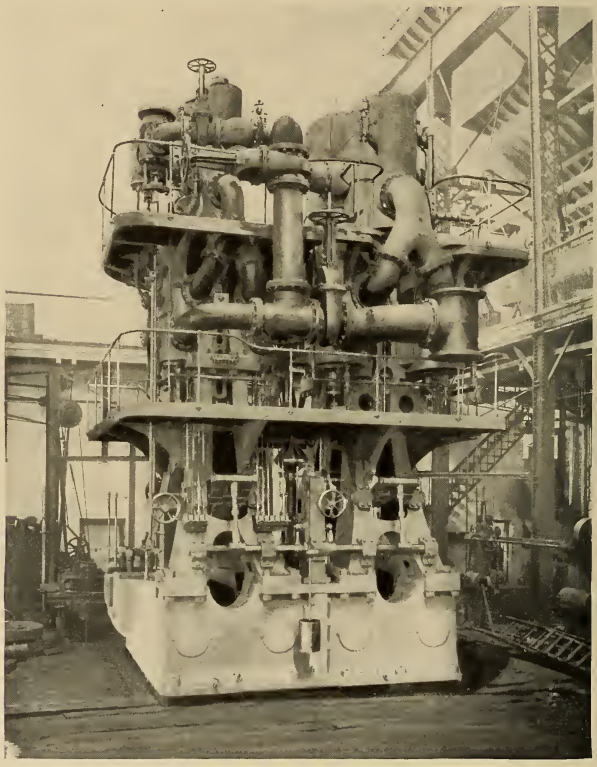
"Street Railway Track Brakes." *Street Railway Journal.*

"A Novel Cable Railroad." *Ibid.*

"The Longest Ocean Pier of the World." *Railroad Gazette*, 1893.

"The Army's Navy." *Harper's Weekly*, July, 1899.

He is a member (and at one time was secretary) of the Engineers and Architects' Association of Southern California; of the American Society of Naval Architects and Marine Engineers; and of the University Club of Los Angeles, Cal.; an associate member of the American Society of Naval Engineers; and founder and charter member of the Sigma Xi fraternity, the honorary scientific society corresponding to the classical Phi Beta Kappa. He received the degree of Doctor of Philosophy from Columbian University in 1904.



Van Vleck Quadruple Expansion Engine
John Van Vleck

Mr. Van Vleck is the son of Rev. John and Julia Falconer Van Vleck, descended from an old Dutch family which settled in New Amsterdam prior to 1675. He married Augusta S. Peirce, November 25, 1889, and

they have two children, Dorothy and Peirce Van Vleck.

Van Vleck, John (M.E., '84), was engaged by the Edison Co. for isolated lighting in the capacity of a blue-printer and assistant draughtsman; but shortly afterward his work consisted wholly in making plans of wiring and of isolated electric plants. This resulted, in 1895, in work on central stations, including the designing of electrical apparatus, and work in connection with the operation of electric meters. When this company was absorbed by the Edison Electric Light Co. in 1896, he was sent out on the road in the capacity of a central station inspector. In 1898 he became connected with the Edison Electric Illuminating Co. of New York, first as its chief electrician, and afterward as its constructing engineer, in which capacity he remained until April, 1901, when he became connected with the Rapid Transit Subway Construction Co. of New York, as its consulting mechanical engineer.

Van Winkle, Franklin (M.E., '77), was consulting engineer and solicitor of patents at Paterson, N. J., 1877–80; Professor of Mechanical Engineering at the State Mechanical Agricultural College of Texas, 1881–84; consulting engineer, New York, 1884–87; secretary and engineer with the Zell Engineering Co., New York, 1887–88; and has been consulting and mill architect, New York, from 1888 to date.

Vidal, Philip M. (M.E., '92), was draughtsman at the Camden Iron Works, Camden, N. J., 1892–96; was with the Sprague Electric Elevator Co., New York, 1897–1902; and has since been employed in the Government Printing Office, Washington, D. C.

Villa, Jose Maria (M.E., '78), has been Professor of Mathematics at the National University of the United States of Colombia, from 1878 to date.

Vogelius, C. F. (M.E., '92), was a student in electricity at Columbia College, New York, 1892–93; with the Sprague Electric Elevator Co., Watsessing, N. J., 1895–97; the New York Sugar Refining Co., Long Island City, N. Y., 1898; Johnson & Co., Lorain, O., 1898–99; the Bethlehem Steel Co., South Bethlehem, Pa., 1899–1901; and has been assistant mathematician with the Equitable Life Assurance Society, New York, from 1901 to date.

Voorhees, Edward C. (M.E., '99), has been employed in the ordnance department of the Midvale Steel Co., Nicetown, Philadelphia, Pa., from 1899 to date.

Vreeland, Frederick King (M.E., '95), was born in Jersey City, N. J., March 4, 1874; son of John Van Buskirk and Mary Amelia Vreeland, of Dutch and English descent respectively, their ancestors having settled in this country about the middle of the 17th century. At a very early age he showed a strong bent in the direction of science and mathematics. This was exercised in childhood by experimenting, mainly in the line of electricity and magnetism, building motors and other apparatus.



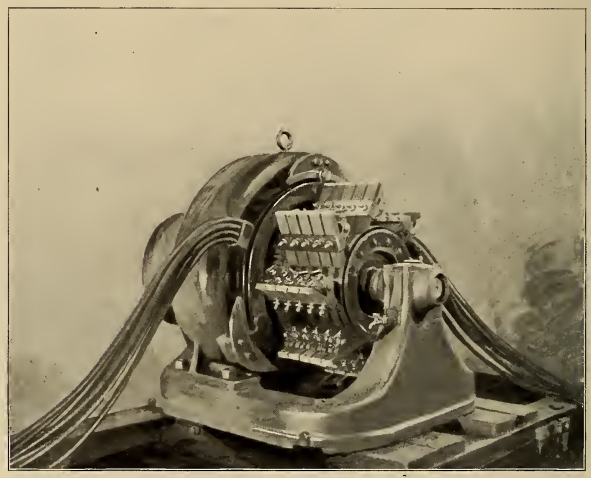
F. K. Vreeland

After graduation at Stevens he took a postgraduate course in electrical engineering at Columbia University, New York, 1895–96. He was with the Crocker-Wheeler Electric Co., Ampere, N. J., from 1896 to 1900, first as draughtsman, next in the engineering department, and subsequently in various capacities in the experimental laboratory and the testing and engineering departments until

1898, when he was made first assistant engineer. In this latter capacity he had active responsible charge of the engineering department, and general responsible oversight of the draughting and testing departments. His duties in the engineering department included the perfecting and standardizing of the stock forms of dynamos, motors, and other apparatus, and the designing of all odd machines for special purposes; also the preparation of bids, estimates, etc., on contracts and special work.

Mr. Vreeland held this position with the Crocker-Wheeler Co. until 1900, when he resigned to join an exploring expedition in the Rocky Mountains. While in the West he continued his earlier work in electrical theory, with especial reference to its application to wireless telegraphy. An article on "Maxwell's Theory and Wireless Telegraphy" was published in the *Electrical World and Engineer,* September 13, 1902, and he has since issued a book with the same title. Among the products of his work in this line is a new type of detector for electric waves, —a highly specialized form of electrolytic cell,—remarkable for its extreme sensitiveness, reliability, and ease of manipulation; permitting the transmission of messages at the highest speed attainable by a telegraph operator, with a very small expenditure of energy. Patents are pending on this and other wireless telegraph devices. Mr. Vreeland is now engaged in electrical engineering work, Montclair, N. J.

Mr. Vreeland's graduating thesis, prepared jointly with Messrs. Percy Allan and G. E. Bruen, on "Experimental Determination of the Influence of Back Pressure on the Economy of a Surface-Condensing Engine with Independent Vacuum Pump," was published in *Stevens Indicator,* XIII, 136. He is a member of the New York Electrical Society; of the American Association for the Advancement of Science; and of the Anthropological Society of Washington, D. C.; and an associate of the American Institute of Electrical Engineers.



ELECTROTYPING DYNAMO
F. K. Vreeland

Vuilleumier, Rudolph (M.E., '02), was born in Basel, Switzerland, April 19, 1869; son of Augustus V. and Marie B. (Schwei-

zer) Vuilleumier. He received his early education in Basel, and came to America in 1883. He spent a number of years in the jewelry trade. He is assistant engineer with the Pintsch Compressing Co., New York, engaged on experimental and construction work. He is a member of the Tau Beta Pi fraternity.

Wachter, Charles Lucas (M.E., '99), was born in Troy, N. Y., July 11, 1877. He was Instructor during the Supplementary Term at the Stevens Institute, 1899; with the Chicago Pneumatic Tool Co., New York, and later with the Standard Air Brake Co., 1899–1900; and has been with the Lidgerwood Manufacturing Co., New York, from 1900 to date. After about a year as draughtsman, he was advanced to the cableway engineering department of the company, in which he is assistant engineer of the cableway department. He is a member of the American Society of Civil Engineers; and of the Phi Sigma Kappa and Theta Nu Epsilon fraternities.

Mr. Wachter is the son of Louis F. and Ella J. Wachter. He married Minnie Louise Hartwig, April 8, 1902.

Wade, William Harvie (M.E., '85), was born in Henry County, Va., October 22, 1865; son of Rev. Anderson and Susan Colston (Harvie) Wade. He was a grandson of Gen. Jacquelin B. Harvie, U.S.N., Richmond, Va., and a great-grandson of Chief Justice Marshall. From earliest Colonial times his ancestors were men closely connected with the history of the country. Almost from infancy he developed a passion for the navy, but opposition on the part of his parents prevented his entering the Academy at Annapolis, and he turned to engineering as a profession, and graduated from the Virginia Military Institute, Lexington, Va., when only seventeen. He then went to the University of Virginia for the summer course, and thence to Stevens in the fall of 1883. He was employed in the shops of the Pittsburg, Cincinnati, & St. Louis Railroad, Dennison, O., 1885–86; in the erecting department of the Henry R. Worthington Hydraulic Works, Brooklyn, N. Y., 1886–89 (this term being broken by a long illness); consulting engineer in the shops and erecting department of the E. P. Allis Co., Milwaukee, Wis., 1889; draughtsman with E. D. Leavitt, 1890; draughtsman with the De La Vergne Refrigerating Machine Co., 1890–91; and with the Cambria Iron Co., 1891–92.

From July, 1892, to February, 1897, he was employed in the London office of Humphreys & Glasgow as engineer in charge of their construction work. In the winter of 1897 he returned to America and was employed by the Cambria Iron Co. This position he resigned to become designing and consulting engineer for the Frank M. Pierce Engineering Co. In the spring of 1899, with the assistance of some friends, he arranged to purchase the controlling interest in the Wilmington, N. C., Gas Light Co., and was about to take up the management of that company when his death occurred by drowning in the surf at Wrightsville Beach, near Wilmington, N. C., September 9, 1899.



W. H. Wade

Waefelaer, Louis, Jr. (M.E., '92), was born in Hoboken, N. J., in the year 1872; son of Louis and Mary (Storie) Waefelaer. He was an apprentice in a machine-shop, 1892–93; with Carl H. Schultz, manufacturer of mineral waters, as mechanical engineer and general superintendent, 1893–97; with the Consumers Co., Chicago, as mechanical engineer and superintendent, 1897–1901; mining

in the Klondike, 1901–02; and has been mechanical engineer to the Kennicott Water



Louis Waffelaer, Jr.

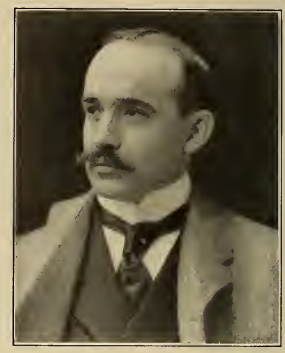
Softener Co., from 1903 to date, and is at present in London, England.

Wagner, Herbert Appleton (M.E., '87), was born in Philadelphia, Pa., February 24, 1867; son of William and Clara W. (Appleton) Wagner. He was a member of the engineering corps of the Westinghouse Electric Co., 1887–91; and general superintendent of the Missouri Electric Light & Power Co., and of the Missouri-Edison Electric Co., St. Louis, Mo., 1889–1900. In addition to this work he established in 1891 the Wagner Electric Manufacturing Co., St. Louis, and conducted this business until 1899. In connection therewith he took out patents on various devices referring to alternating-current transformers and motors. He was president of the Mississippi Valley Automobile Transportation Co., 1900–01, and has practised as a consulting engineer in St. Louis and New York from 1900 to date, being engaged chiefly in the electrical industry. For some time previous to opening these offices Mr. Wagner was frequently called upon for professional service in the East, particularly in Boston, where he was engaged by the Edison Electric Illuminating Co. and the Boston Electric Light Co.

Mr. Wagner has been retained as an expert witness in many important patent suits, notably in the extensive litigation between the Westinghouse Electric & Manufacturing Co. and the Stanley Electric Manufacturing Co., involving the Tesla polyphase patents, which led to the purchase of the latter company by the associates of the Westinghouse Company in the latter part of 1902 while the hearings and decisions were still pending. In these suits Mr. Wagner was the principal witness for the Stanley Company.

In connection with Mr. D. W. Roper he took out a patent in 1899 for an arc lamp controller for operating arc lamps on constant-potential circuits, whereby the efficiency of distribution is increased and the cost of production reduced.

Mr. Wagner is the author of several pa-



H. A. Wagner

pers contributed to technical journals or read before scientific societies. Among them are:

"The Missouri-Edison Electric Co. of St. Louis, and the Development of the Alternating Current System for Light and Power Distribution." *Electrical Engineer*, June, 1898.

"General Distribution from Central Stations by Alternating Currents." Read before the National Electric Light Association, 1898. *Cassier's Magazine*, 1898.

"A Method of Deriving Two or More Alternating Currents Differing from One Another in Phase from a Source of Electricity Supplying Alternating Current of a Single Phase." *Electrical Engineer*, 1899.

"Single-Phase Distribution." Read before the National Electric Light Association, 1899.

"The Use of Alternating Current for the Extension of Central-Station Supply and for General Distribution." Read before the Association of Edison Illuminating Companies, 1899.

He is a member of the American Institute of Electrical Engineers; of the Military Order of the Loyal Legion of the United States; and of the Engineers', University, Mercantile, and Country clubs of St. Louis.

Wagner, Julius Homer (M.E., '02), was born at Chatham, N. J., January 1, 1881; son of Julius T. and Carrie (Wurster) Wagner. He has been engaged as head draughtsman for the Buffalo Scale Co., Buffalo, N. Y.; with F. E. Jackson, M.E., Orange, N. J.; and is now with the Buffalo Forge Co., Buffalo, N. Y.



J. H. Wagner

Wagoner, Philip Dakin (M.E., '96), was born in Somerville, N. J., July 24, 1876. He was employed in the shops of the Brooklyn City Trolley Road, repairing and equipping cars, 1896; and has been with the General Electric Co. from 1896 to date. Starting with the student's course at Schenectady, N. Y., he has been employed in the testing department; the engineering department, where he was occupied with the design of direct-current motors; in the transformer engineering department at Lynn, Mass., 1897–99; and in the commercial engineering department at Schenectady, again being employed on transformers, both multiple and constant current, for series alternating arc lighting, from 1899 to 1901, when he was appointed manager of transformer sales, which position he now holds. His work includes the handling of the commercial questions involved in the sale of all transformers manufactured by the General Electric Co.



P. D. Wagoner

The graduating thesis of Messrs. Wagoner, E. L. Decker, and O. A. Pope, on "The Plant of the Cataract Construction Co., at Niagara Falls, N. Y.," was published in the *Stevens Indicator*, XIV, 20. Mr. Wagoner read a paper on "The Series Incandescent Lighting System of the Future" before the Northwestern Electric Light Association at its convention held in Milwaukee, Wis., January 15–17, 1901. The paper was reprinted or abstracted in many technical journals, and published in pamphlet form by the General Electric Co., the latter being now in its second edition. Mr. Wagoner is a member of the American Institute of Electrical Engineers; the Mohawk, Mohawk Golf, and Corlaer Rifle clubs; and of the Alpha Tau Omega and Theta Nu Epsilon fraternities.

Mr. Wagoner is the son of Henry G. and Rachel L. Wagoner. He married Effie Nichols, November 2, 1904.

Wainright, Arthur Vredenburgh (M.E., '98), was born in Farmingdale, N. J., August 8, 1875; son of Halsted H. and Belle V. Wainwright. He is of English descent, his ancestors settling at Shrewsbury, N. J., in 1670. He has been employed by the United Gas Improvement Co., Philadelphia, as assistant engineer at the works of the People's Gas Light Co., Manchester, N. H., 1898–1900; as superintendent of the South Side Gas Co., Pittsburg, Pa., 1900–01; and as district superintendent of the Connecticut Railway and Lighting Co., operating gas plant, electric lighting, and electric cars at South Norwalk, Conn., from 1901 to date. He is a member of the American Gas Light Association; the Western Gas Association; the York and Scottish Rite Masonry; and the Chi Phi fraternity. He is corresponding secretary of the Alumni Association of the Stevens Institute of Technology.

Walder, Jacob (M.E., '02), is employed at the Jacob Walder's Reed & Harness Mill, Paterson, N. J.

Walker, Frederick Wiley (M.E., '95), was born in New York city August 27, 1874; son of Robert Scott and Frances Helena Walker. He was employed by the Edison Electric Illuminating Co., of Brooklyn, successively as draughtsman, assistant superintendent of steam plant, superintendent of construction of union station, and superintendent of steam plant; with Westinghouse, Church, Kerr, & Co., New York, 1899–1902; and has since been vice-president and chief engineer of the Comstock-Haigh-Walker Co., engineer contractors, Detroit, Mich.; and chief engineer of the Rochester & Eastern Railway. He is a member of the Brooklyn Engineers' Club, and a junior member of the American Society of Mechanical Engineers.

Walker, Louis Bowman (M.E., '91), was born in New York city February 25, 1869. He was employed for two years with the Baltimore Electric Refining Co., Baltimore, Md., and was then made assistant superintendent of the Old Dominion Copper Co., Globe, Arizona, which position he held until the property was sold in 1895. He then came East to take a position with the Mountain Copper Co., Ltd., of England, by whom he was sent to their mines in Shasta County, Cal., on special work. Returning in the early part of 1896 to the company's smelting works at Elizabethport, N. J., he was made manager, and had the works put in readiness for handling the material sent there from the California mines, a task of considerable magnitude, which was carried out to the entire satisfaction of the owners. While holding the position as manager of these works, he became ill, and died of heart failure, May 11, 1897.

Mr. Walker was the son of Thomas George and Lucy Bowman (Holbrook) Walker. He married Elizabeth C. Wheeler, January



L. B. Walker

27, 1894, and one child, Margarette Louise Walker, blessed their union.

Walker, Millidge Penderell (M.E., '98), was born in Lime Rock, Conn., March 23, 1877; son of Millidge and Jessie Inches Walker. He is a direct descendant of the Penderell brothers who saved the life of Charles II of England after the battle of Worcester. His father's eldest brother still receives a grant given to the family after the Restoration. His family came to the United States before the Revolutionary war. He is a direct descendant of the pre-Revolutionary Governor Millidge, of Georgia. He attended the Military Academy at Cheshire, Conn. He was with the Sigourney Tool Co.,

Hartford, Conn., 1898–1901; draughtsman with the Columbia and Electric Vehicle Co.,



M. P. Walker

1902, in which year he was appointed Professor in St. John's College, Shanghai, China, and in 1903 was appointed Professor of Mathematics in the same college. He is an honorary member of the Alpha Chi Rho fraternity (Phi Psi Chapter, Trinity College, Hartford, Conn.).

Wall, Edward Barry (M.E., '76), was born in Kingsboro, N. Y., April 25, 1856. Immediately after graduation he entered the service of the Pennsylvania Railroad Co., in the car-shops at Altoona, and went through all the shops as an ordinary apprentice. The valuable experience and knowledge obtained in this way, of how work is to be done, and his determination to solve the problems that came before him, were matters of which his superior officers were aware, and gained for him promotion to responsible positions.

From Altoona he was called on June 1, 1883, when twenty-seven years old, to be superintendent of motive power of the Pittsburg, Cincinnati, Chicago, & St. Louis Railroad, an important part of the Pennsylvania System. In this position he spent ten years, and manifested such an ability to meet the problems of his profession, such singular power to deal with men, and such loyalty to his company, that he received the confidence not only of his superior officers, but also of the men who were under his control; and he was looked upon by railroad men everywhere as one of the brightest men in the profession.

In 1893 he was selected to represent the Pennsylvania Railroad's interest at the World's Fair, Chicago, and a large share of the success of that feature belongs to him. While in Chicago he was a member of the board of general managers of the railroads of the United States and Canada. He was chosen one of the Jury of Awards in the Transportation Department of the Fair, at the close of which he was promoted assistant to the general manager of the Pennsylvania Lines West of Pittsburg. The next step would have been to the position of one of the vice-presidents of the road, and there is no doubt but that he would shortly have occupied that place, but he was taken ill in the latter part of March, 1894, and died on April 1, of peritonitis succeeding an operation for appendicitis.

The following extract from the report of the President of the Pennsylvania Railroad will show the estimate put upon him by those associated with him in his work:

"While engaged in the preparation of this report, death has again deprived the company of the services of one of its most promising and valuable officers, Mr. Edward B. Wall, who, on March 1, 1893, was appointed assistant to the first vice-president, and transferred to Chicago, with the general supervision of traffic questions arising at that point, and particularly in connection with the Columbian Exposition. This office having been abolished in January, 1894, Mr. Wall was appointed assistant to the general manager, with special supervision of the operations of the purchasing department. His long connection with the motive power department and general knowledge of transportation had thoroughly fitted him for the discharge of responsible duties, and his sudden death on April 1 has entailed on our company a loss which cannot be too highly regretted."

By order of the Board,
"G. B. Roberts,
President."

He was a member of the Columbus Club, Columbus, O.; the Chicago Club, Chicago, Ill., and of the Duquesne Club, Pittsburg. He was also a trustee of Stevens Institute.

Mr. Wall was the son of Edward and Sara Berry Wall. He married Fanny Mitchell, June 24, 1891, and they had one child, Edward Barry Wall.

Wall, George B. (M.E., '75), studied and practised patent law in New York from 1879 until his death, which occurred in 1882.

Wall, George Lloyd (M.E., '93), was born in Hoboken, N. J., January 1, 1872. He was a special apprentice in the shops of the Southern Railroad, Knoxville, Tenn., 1894–95; resident inspector in the department of tests of the same company, Knoxville, 1895–96; mechanical engineer with the Hazleton Boiler Co., New York, 1896–98; inspector in the motive-power department of the Pennsylvania Lines West of Pittsburg, Northwest System, Fort Wayne, Ind., 1898–1902: general foreman of the Erie & Ashtabula division of the Pennsylvania Lines West of Pittsburg, 1902–03; assistant engineer of motive power of the same lines, 1903; director of the St. Louis Locomotive Tests of the Pennsylvania Railroad, 1904; and is now assistant engineer of motive power, Pennsylvania Co., Fort Wayne, Ind. He is a member of the American Society of Mechanical Engineers.

Mr. Wall is the son of Edward and Sara Berry Wall. He married Myra Kellog Crane, December 16, 1899.

Wallis, James T. (M.E., '91), was in the employ of the Pennsylvania Railroad shops at West Philadelphia, 1891–93; superintendent of the Altoona Manufacturing Co., 1893–94; and has been in the service of the Pennsylvania Railroad since the latter date in the following positions: at the West Philadelphia shops, 1894–96; assistant road foreman of engines of the Philadelphia, Wilmington, & Baltimore Railroad, 1896–99; assistant master mechanic at the Meadows shops, United Railroads of New Jersey, 1899–1900; assistant engineer of motive power in the office of the general superintendent of motive power, 1900–01, and in the same capacity in the Pennsylvania Railroad Division of the Pennsylvania Railroad, 1901–03; and is master mechanic in the Baltimore shop of the Northern Central Railway.

Wallis, John Mather (M.E., '76), has been employed in railway work almost from the time he completed his studies at the Institute. Beginning as apprentice in the Baltimore shops of the Northern Central Railway in 1877, he has been advanced to positions of increasing responsibility and is at present general superintendent of the Pennsylvania Railroad Division of the Pennsylvania Railroad, at Altoona, Pa. He has held the following positions: assistant road foreman of engines for the Northern Central Railway and the Baltimore & Potomac Railroad, 1879–81; assistant engineer of tests with the Pennsylvania Railroad, Altoona, Pa., 1881–82; superintendent of motive power of the Northern Central Railway, 1882–83; superintendent of motive power of the Philadelphia, Wilmington, & Baltimore Road, 1883–90; superintendent of motive power of the Pennsylvania Railroad Division of the Pennsylvania Railroad, 1890–96; general superintendent of the Philadelphia & Erie Railroad Division and Northern Central Railway, Williamsport, Pa.; and is now general superintendent of the Pennsylvania Railroad Division of the Pennsylvania Railroad, Altoona, Pa.

Wallis, Philip (M.E., '79), has been in the employ of the Chicago, Burlington, & Quincy Railroad, Aurora, Ill.; at one time as engineer of tests, and later as master mechanic, at Beardstown, Ill.; master mechanic with the Lehigh Valley Railroad, Hazleton, Pa.; and superintendent of motive power with the Long Island Railroad, Richmond Hill, Long Island, N. Y. He is a member of the American Society of Mechanical Engineers; the American Institute of Mining Engineers; and the Franklin Institute of Philadelphia.

Walton, Druid Alexander (M.E., '87), was born in Louisville, Ky., September 24, 1864. He has been connected with the Joseph Mitchell Boiler Yard Co., Louisville, Ky., since 1887, and at the present time holds the position of general manager and member of firm of C. J. Walton & Son, proprietors of the same shop.

Mr. Walton is the son of Charles James and Louise (Mitchell) Walton. He married Florence Knight Tapp, October 25, 1887, and they have one child, Louise Mitchell Walton.

Ward, William Wanklyn (M.E., '95), was born in Trenton, N. J., April 19, 1873. He was in the employ of the Mount Vernon Construction Co., Washington, D. C., 1895–96, engaged in the construction of a trolley road from Washington to Mount Vernon, Va. During this time he held various positions from time-keeper to superintendent of overhead work. He was next superintendent of a contract for the construction of a railroad in Brooklyn, N. Y., by R. W. Hildreth & Co., New York, 1896–1901. During his connection with this company he filled the positions of inspector of bridges and of lumber, superintendent of overhead construction during the extension of the Hartford, Manchester, & Rockville Railroad, and engineer in charge of the erection of the Grand Avenue drawbridge, New Haven, Conn. He was treasurer and general manager of the New York & Yucatan Construction Co., which was engaged in steel-work construction in the latter country, including the erection of buildings, conveyors, and piers, and the building of railroads 1901–04; and is now general manager of the Atlantic Pile Co., New York. He has constructed a pier, and warehouses at Key West for the Mallory Steamship Line, and has recently finished a pier and coal-conveyor for the Peninsular & Occidental Steamship Line. He is a member of the New York Society of Electrical Engineers, and of the Theta Xi fraternity.

Mr. Ward is the son of William Wanklyn and Frances Louise Ward. He married Susan J. Hopkins, October 28, 1896.

Warren, Edward Cyrus (M.E., '97), was born in New York city March 6, 1876; son of Dr. John S. and Sarah B. Warren. He is descended from James Warren, who settled in Kittery, Me., in 1656. Edward Cyrus has been employed as draughtsman with Struthers, Wells, & Co., Warren, Pa., founders, machinists, and boiler-makers; in the same capacity and as designer with the Electric Vehicle Co., Hartford, Conn., builders of electric and gasoline automobiles, his work being principally in connection with automatic battery charging and handling apparatus for the company's station at Boston, Mass., and later having charge of its installation; chief draughtsman and mechanical assistant to the manager of the American Radiator Co.'s Detroit plant, Detroit, Mich., having in charge the laying out and designing of improvements and alterations in special machinery and equipment of the plant;



E. C. Warren

and as salesman for the Standard Steam Specialty Co., New York.

He is a member of the University Club, of Detroit, Mich.; of the 7th Regiment, National Guard of the State of New York; and of the Chi Psi fraternity.

Warrington, James Nelson (M.E., '83), was born in Chicago, Ill., January 22, 1860; son of Henry and Isabella Warrington. He was draughtsman with the Vulcan Iron Works, Chicago, 1883–86; engineer and secretary of these works, 1886–91; consulting engineer, Chicago, 1891–97; and secretary of the Vulcan Iron Works, 1897–99. He then resigned on account of ill health, and since that time has resided at Los Angeles, Cal. He has taken out a patent for an automatic steam pile-hammer. A paper by him on "Propulsive Power of Ships" was published in the *Journal of the American Society of Naval Engineers*, VI. 259, and a second paper on the same subject was presented to the same society January 7, 1898. He is a member of the American Society of Mechanical Engineers; the American Association for the Advancement of Science; the Society of Naval Architects and Marine En-

gineers; the University Club of Chicago; and of the Sigma Chi fraternity. He is also an associate member of the American Society



J. N. Warrington

of Naval Engineers, and a non-resident member of the Franklin Institute.

Watkins, Howard (M.E., '01), has been with Baker, Smith, & Co., heating and ventilating engineers, New York, since 1901.

Watters, Edw. L. (M.E., '02), is located at Bayonne, N. J.

Webster, Hosea (M.E., '82), was graduated at Cornell University, with the degree of Bachelor of Science, in 1880, and received the degree of Master of Science at Cornell in 1881; entered Stevens Institute in 1881 as a senior; was in the employ of Henry R. Worthington, 1882–97, being engaged as a draughtsman, designing and erecting pumping and hydraulic machinery, at the Brooklyn, N. Y., works, 1882–84; as sales manager in the Chicago branch office, 1886–94; in the same capacity in the New York office, 1894–95; and in the condenser department and general sales department, New York, 1895–97. He has been manager of the sales department of the Babcock & Wilcox Co., New York, from 1897 to date. He is a member of the American Society of Mechanical Engineers; the American Institute of Mining Engineers; and of the Engineers' Club of New York.

Weeks, Frank J. (M.E., '93), was assistant engineer in the Park and Sewer Departments of New York city, 1893–1903; graduated from the New York Law School in 1901 with the degree of Bachelor of Laws; and is now practising Customs law in partnership with Edward E. Barret, Ex-United States Examiner of the Port of New York. He married Katherine B. Foley, June 7, 1902.

Weichert, Arnold Ernst (M.E., '97), was born in Stapleton, Staten Island, N. Y., December 24, 1875. He received his early education at private schools in Germany, and at the College of the City of New York. He engaged in a special course in chemistry at Stevens Institute, 1897; was Instructor with the Electrical Engineer Institute of Correspondence Instruction, New York, 1898–99; special apprentice with the William Cramp & Sons' Ship & Engine Building Co., Philadelphia, Pa., 1899–1900; draughtsman with the American Air Power Co., New York, 1900–01; and with the American Steel & Wire Co., Schoenberger Works, Pittsburg, Pa., the National Steel Co., New Castle, Pa., 1901; and the Marine Engine &



A. E. Weichert

Machine Co., Harrison, N. J., 1901–04. He is now with J. G. White & Co., New York.

Mr. Weichert is the son of Arnold Karl and Erna (Koepke) Weichert. He married Cora Kipp, April 23, 1902.

Weichert, Maximilian J. (M.E., '96), was born in New York city July 25, 1874. His early education was received in Germany, and at the College of the City of New York. He was employed in the shops of H. R. Worthington, Brooklyn, N. Y., 1896–97; by the A. A. Griffing Iron Co., Jersey City, N. J., 1897; the International Navigation Co., New York, 1897–1902; as draughtsman for the Tietjen & Lang Dry-Dock Co., Hoboken, N. J., 1902–03; for the Buffalo Refrigerating Machine Co., Harrison, N. J., 1903–04; and is now with W. D. Forbes & Co., Hoboken, N. J.

Mr. Weichert is the son of Arnold Karl



M. J. Weichert

and Erna (Koepke) Weichert. He married Ella Kipp, September 18, 1901, and they have one child, Charles Kipp Weichert.

Weissblatt, Murray Edward (M.E., '00), was born in New York city April 17, 1879; son of Siegmund and Bessie Weissblatt. He has been in the employ of the Crocker-Wheeler Co., manufacturers of electrical machinery, from 1900 to date; in the draughting department, 1900, and since that year in the manufacturing department, where at the present time he is assistant to the production manager. He was formerly a member of the Manhattan Athletic Club, New York.



M. E. Weissblatt

Welch, William McNair (M.E., '98), was born in Oil City, Pa., August 23, 1874. He was employed in the electrical construction department of the Metropolitan Street Railway Co., New York, 1898–99; by the Philadelphia Co., Pittsburg, Pa., being engaged in



W. M. Welch

the designing and construction of natural-gas compressing-plants, etc., 1899–1904; and

is now chief engineer of the Union Natural Gas Corporation, Columbus, O.

Mr. Welch is the son of John Collins and Eliza Jane (McNair) Welch. He married Nina Oliver Thompson, April 24, 1901, and they have two children, Marjorie Thompson and Elizabeth Welch.

Welles, Edward Richardson (M.E., '00), was born in Brooklyn, N. Y., November 21, 1878. He was in the employ of the New Amsterdam Gas Co., Long Island City, N. Y., 1900–01; and of the United Gas & Coke Co., New York, 1901; assistant superintendent of the boiler department of the Carnegie Steel Co., Homestead, Pa., 1901–02; in the ordering and estimating department of the Best Manufacturing Co., Pittsburg, Pa., 1902–03; in the sales department of the International Steam Pump Co., New York, 1903; and with M. W. Kellogg & Co., New York, from 1903 to date. He is a member of the Beta Theta Pi and Theta Nu Epsilon fraternities.

Welles, Frederick Alford (M.E., '98), was born in Perkinsville, Vt., January 31, 1877; son of Frederick R. and Mary E.



F. A. Welles

Welles. He was descended from Rev. Noah Welles, born at Stamford, Conn., in 1718. After graduation he was with the Cornell Iron Works, Garrisons, N. Y., for three months. He then engaged in electric work in Philadelphia, Pa., and in the fall of 1898 entered the employ of the United Gas Improvement Co., of Philadelphia, in which he remained until his death in 1902, at which time he was assistant engineer at Jersey City. While with this company he was located at the gasworks at Jersey City, Hoboken, Newark, and at the home office in Philadelphia. He was a member of the American Gas Light Association, and of the Beta Theta Pi and Tau Beta Pi fraternities.

Wells, Pierson L. (M.E., '92), was engaged as assistant engineer with the Scharff Manufacturing Co., New York; studied patent law at the New York Law School; and has practised as a patent attorney, New York, from 1898 to date.

Westcott, John Townsend (M.E., '90), was born in Granville, N. J., March 14, 1868. He entered the employ of the United Gas Improvement Co., Philadelphia, Pa., in 1890, being engaged in the draughting-room, designing carburetted water-gas works, later as assistant constructing engineer and then as constructing engineer in the erection of carburetted water-gas plants, including designing, construction, and experimental work, spending time at different gasworks at Chicago, Minneapolis, Allegheny, Hartford, etc.

He then associated himself with Mr. L. L. Merrifield, who was a colleague during his connection with the United Gas Improvement Co., and the Pearsons (father and son) of Toronto, to organize the Economical Gas Apparatus Construction Company, Ltd., of Toronto, and was made its manager and treasurer. The chief business of the company was to provide the carburetted water-gas apparatus known as the Merrifield-Westcott-Pearson setting. These settings were erected at Ottawa, Montreal, Toronto, and Belleville, in Canada, at Kingston, Pa., and other places in America.

At the same time Mr. Westcott had a private consulting practice for several companies in Canada, and was called upon to give expert testimony upon gas matters.

The Economical company had agents in London, but it soon became necessary to establish a London house, and in 1894 Mr.

Westcott was appointed to take charge of the European business. Soon after his arrival in England Mr. Westcott secured a contract with the Corporation of Blackburn for the



J. T. Westcott

supply and erection of two settings of the Improved Lowe carburetted water-gas plants of a combined capacity of 1,250,000 cubic feet per diem. This order was soon succeeded by others, and since 1894 more than thirty plants have been erected in England alone, besides others in Holland, Japan, and South America.

Mr. Westcott has taken out patents in England for improvements in apparatus for the manufacture of water-gas, 1894, and jointly with L. L. Mersifield and W. H. Pearson, Jr., for improvements in apparatus for the manufacture of carburetted water-gas, 1893. He has also taken out several United States patents.

He has written several articles for technical journals; one, on "The Evolution of Oil Heaters," appeared in *Light, Heat, and Power,* of Philadelphia, in 1894. "Observations on Carburetted Water-Gas" was the subject of a paper presented to the Civil and Mechanical Engineers' Society of London, and "Carburetted Water-Gas in Europe," and "Labor-Saving Machinery in Gas Works," were published in different Gas journals.

He is a member of the American Gas Light Association; the Western Gas Association, United States; the Institution of Civil Engineers of France; and of the National Liberal Club of London. He is also a director of the Nelson (B. C.) Gas Light & Coke Co., Ltd., and president of the Rimella Gold Mining Co., Ltd., and of the Frank Harden (Ltd.) Hat Manufacturers, Luton, England.

Mr. Westcott is the son of John Bunyan and Margaret (Townsend) Westcott. He married Grace Stevens Raphael in October, 1893, and they have one child, Margaret Townsend Westcott.

Westerfield, Jason R. (M.E., '99) was with the Diesel Motor Co., New York, 1899; the New York Dredging Co., New York, 1899–1900; in the electrical department of the New York Navy Yard, 1900–01; with the Holland Submarine Torpedo Boat Co., 1901–02; with Henderson, Lindley, & Co., 1902–04; and is now president of the American Oil Engine Co., New York.

Westervelt, Arthur Fountain (M.E., '98), was born in Hackensack, N. J., August 25, 1875; son of Erskine E. and Charlotte (Fountain) Westervelt. At the time of the outbreak of the war with Spain, and during his junior year, he volunteered his services and was detailed for duty on the U.S.S. "Badger." At the end of the war, he returned to the Institute and graduated with his class. He has since been engaged as president of the Union Electrical Supply Co., New York; and as a commission broker. He is a member of the Oritani Field Club of Hackensack, N. J., and of the Theta Nu Epsilon fraternity.

Wettlaufer, Louis F. (M.E., '92), entered the employ of Curtin & Co., engaged in the lubricating oil business, and was sent to Buenos Ayres, Argentine Republic, to assist in tests for the firing of locomotives on the Great Southern Railway with oil instead of coal. The tests were highly satisfactory, and oil would now be used but for a prohibitive duty which was laid on crude oil. At the conclusion of the tests he was appointed manager of the Rosario branch of the River Plate Petroleum Co., which position he held until 1899, when the company withdrew from the Argentine Republic. During his South

American engagement he travelled extensively through Brazil, Chile, Uruguay, and Paraguay, as well as in Argentina, and, noting the immense field for agricultural implements in those countries, he returned to New York and became associated with Mr. Philip Jones, with whom he engaged in the export of agricultural implements and machinery. He is now with A. B. Farquhar & Co., New York, manufacturers of agricultural implements and machinery.

Wetzler, Joseph (M.E., '82), was born in Hoboken, N. J., December 6, 1863. He was



Joseph Wetzler

in the employ of M. Hubbe, mechanical engineer, 1882; and at the Weston works of the United States Electric Lighting Co., Newark, N. J., 1883, where he went through all the departments and gained a working knowledge of the manufacture of dynamo-electric machinery. He was on the editorial staff of the "Scientific American," 1884; editor of the "Electrical World," 1885–90; and editor of the "Electrical Engineer," 1890–99. In the spring of 1898 he founded the Electrical Engineer Institute of Correspondence Instruction, which grew to such proportions that in 1899 he was obliged to relinquish the editorship of the "Electrical Engineer," and has since devoted his entire attention to the work of the Institute, of which he is president.

Mr. Wetzler has written a great many articles relating to electrical work. He is joint author with Mr. T. C. Martin of "The Electric Motor and Its Applications," which has run through numerous editions. He also edited, with Mr. Martin, the electrical section of the new edition of "Appleton's Cyclopædia of Applied Mechanics," and contributed to "Scribner's Magazine" the electric railway articles in the series since published in book form.

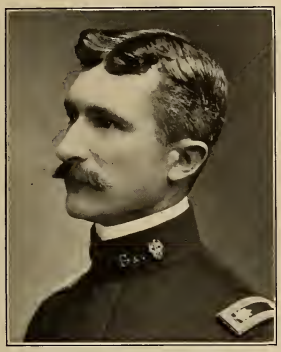
He is a member (and ex-vice-president) of the American Institute of Electrical Engineers, and represented it as delegate at the Paris Electrical Congress in 1889; member (and ex-president) of the New York Electrical Society; and member of the London Institution of Electrical Engineers; the Vienna Elektrotechnischer Verein; the American Association for the Advancement of Science; the American Electrochemical Society; and of the Masonic Order.

Mr. Wetzler is the son of Albert and Anna Wetzler, and is of Austro-German extraction. He married Pauline Gerson, October 30, 1895, and they have one child, Lucile Gerson Wetzler.

Wheatley, W. H. Crawford (M.E., '87), was born in Americus, Ga., December 6, 1866. He was engaged during part of 1887 upon the preliminary surveys, etc., for the location of the mains, standpipe, hydrants, etc., for the plant of the Americus Water Works, and in conjunction with this work prepared his graduating thesis on "The Manufacture of Cotton Seed Oil." He was superintendent of the Americus Oil Co., 1887–88, and while serving in this position built a large cotton-seed-oil mill at Americus. He was in partnership with his uncle under the firm name of C. M. Wheatley & Co., architects and contractors, at Americus, 1888–90, and in the latter year he organized the Americus Construction Co., of which he was vice-president and general manager, and the Americus Refrigerating Co., of which he was president, 1890–93. He practised as an engineer and contractor, and was also a member of the firm of T. A. Kluttz & Co., architects, 1893–96; was city engineer and superintendent of waterworks of Americus, 1896–97; engaged in a general engineering and contracting business in Americus, 1897–

1900; and has been secretary and treasurer of the Sheffield-Huntington Co., since 1900.

In addition to his professional work Mr. Wheatley has devoted considerable time to



W. H. C. Wheatley

raising cotton. He owns and operates two large plantations, and finds his technical training and knowledge of chemistry of vast importance in the successful planting and raising of this staple.

He is a member of the New York Athletic Club; a Royal Arch Mason, Knight Templar, and member of the Mystic Shrine; a member of the orders of Elks, Red Men, and Knights of Pythias; lieutenant-colonel of Georgia State troops, and aide-de-camp to Governor Joseph M. Terrell; and was recently elected to the State Senate from the Thirteenth Senatorial District.

Mr. Wheatley is the son of John W. and Mary E. (Dudley) Wheatley. He is the grandson of William H. Crawford, one of Georgia's most distinguished citizens, statesmen, and diplomats. He is great-grandson of Dorothea Dudley and John Cary of Virginia. He married Helen Huntington, October 12, 1897, and they have one child, Charles Huntington Wheatley.

Whigham, William (M.E., '88), has filled engagements with Thomas Carlin's Sons, engineers and general contractors; Julian Kennedy, mechanical engineer, Pittsburg, Pa.; and in the armor plate department of the Homestead Steel Works, Homestead, Pa. During the winter of 1895–96 he spent three months in St. Petersburg, Russia, in connection with the armor contract for the cruiser "Rossia." While connected with the armor-plate department he took out patents on a spraying device and methods of controlling the curvature of armor plate while hardening. He also patented a method of unloading ore cars, now owned by the McMyler Manufacturing Co., Cleveland, O. He was later detailed for special work in the development of certain grades of steel by the president of the Carnegie Steel Co.; was steam engineer at the Homestead works, 1900–01; and has been superintendent of the Howard Axle Works of the Carnegie Steel Co. from 1901 to date.

Whitcomb, Henry Donald, Jr. (M.E., '92), was born in Richmond, Va., September 26, 1869. He was draughtsman for the Edge Moor Bridge Co., Edge Moor, Del., 1892; inspecting engineer with the Wilkes-Barre & Eastern Railroad during the construction of 22 bridges, 1892–93; inspecting engineer of shop construction (the Boston train shed) with the Boston & Maine Railroad, 1893; engineer in charge of construction, at the Baldwin Locomotive Works, Philadelphia, Pa., for the Huanchaca Mining Co., Bolivia, of 16 locomotives, 1893–94.

From 1894 to 1901 he was connected in various capacities with the United Gas Improvement Co., of Philadelphia, during which term he erected the Standard Lowe water-gas apparatus and masonry tanks for gas-holders in numerous cities throughout the United States. Among his assignments to duty were the following positions: assistant to the superintendent of the Kansas City, Mo., Gas Co., 1897; engineer in charge of the erection of the Point Breeze Gas Works, Philadelphia, 1898; superintendent of the Mutual Gas Light Co., and of the Pintsch Gas Co., Savannah, Ga., 1899; superintendent of the Atlanta Gas Light Co., Atlanta, Ga., 1900; assistant to superintendent of works of the United Gas Improvement Co., Philadelphia, 1900–01, during which assignment he also erected two water-gas sets for the Municipal Gas Works, Richmond, Va.; assistant engineer of the Essex & Hudson

Gas Co., Newark, N. J., 1901. In 1903 he was appointed general manager of the gas department of the Public Service Corporation of New Jersey, at Newark, N. J.

He is a member of the American Gas Light Association; the Western Gas Association; the Masonic Order; and of the Chi Phi fraternity.

Mr. Whitcomb is the son of Henry Donald and Virginia K. Whitcomb. He married Daisy A. Cohen, September 27, 1899, and they have two children, Henry Donald and Helen Whitcomb.

White, Edward Francis (M.E., '86), was born at Constable Hook, N. J., April 6, 1862. He was superintendent of the Bergen Point Sulphur Works, 1886–89; vice-president and treasurer of the Field Engineering Co., 1889–93; consulting engineer, New York, 1893–97; in charge of the department of cooling-towers and condensing-equipments for M. T. Davidson, New York, 1897–98; passed assistant engineer in the U. S. Navy during the Spanish-American war, and has been president and manager of the S. C.



E. F. White

White's Sons' Co., brimstone smelters and refiners, Bayonne, N. J., and Conejos, Durango, Mexico, from 1898 to date.

Mr. White has taken out two United States patents, one for a continuous process apparatus for the manufacture and refining of brimstone, and the other for a combined evaporation cooler and surface condenser. He has also filed caveats for other apparatus. The brimstone apparatus was designed to employ, as a heat-conveying medium, either steam, hot water, or hot air. It differs from the old form of steam apparatus in that it operates by surface melting instead of by direct contact of steam and ore, and its most important feature is its continuous operation. The object of the combination water-cooler is to offer, in a single piece, a surface condenser for condensing the exhaust steam by the use of cooling water as in the usual way, and at the same time to recool the condensing water by a current of air drawn from the atmosphere, so that the cooling water can be used over and over again, reducing the quantity of cooling water to be continuously supplied to the amount that is evaporated by the absorptive action of the air.

Mr. White is the author of papers on the separation of native sulphur from its impurities, contributed to the "Engineering and Mining Journal"; on evaporation of water-coolers, to the "Electrical World"; and on self-cooling condensers, to the "Electrical Engineer."

He is a member of the American Society of Mechanical Engineers, and of the Beta Theta Pi fraternity.

Mr. White is the son of Samuel C. and Julia M. White. He married Lizzie M. Riegel, April 25, 1889, and they have four children, Helen Maria, Edward Russel, Samuel Charles, and Frances Elizabeth White.

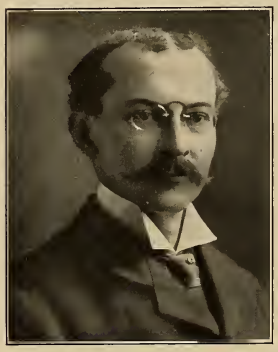
White, Henry C. (M.E., '81), was in the employ of the Hartford Engineering Co., 1881–82; manager of the Westinghouse Machine Co., Chicago, Ill., 1882–83; salesman for the same company, San Francisco, Cal., and Pittsburg, Pa., 1883–85; manager for B. W. Payne & Sons, New York, 1885–88; manager of the Phœnix Iron Works Co., New York, 1888–92; chief engineer of the Utah & Montana Machinery Co., Salt Lake City, Utah, 1892–93; manager of the Phœnix Iron Works Co., New York, 1894–96; engaged in general engineering work, 1897; engaged on the Uehling method of casting and conveying metals, 1897–98; and with the Pope Tube Co., Hartford, Conn., 1898–1900. In 1900 he went to Boston, where he has since been

connected with various companies. He did considerable engineering work for the Intercolonial Copper Co., of Dorchester, New Brunswick, and was engaged on some work for the Dominion Iron & Steel Co., at Sydney, Cape Breton. On his return from Sydney he went with the Planters' Compress Co., Boston, where he is at present. He is also engaged in the development of a pump on which one patent has been allowed and another is pending. He has taken out patents for steam separators and compound and triple-expansion engines.

White, Maunsel (M.E., '79), has been with the Bethlehem Iron Co., Bethlehem, Pa., from 1879 to date. In 1887 he was appointed to his present position as engineer of tests. In conjunction with F. W. Taylor, M.E., '83, he presented a paper on "Colors of Heated Steel Corresponding to Different Degrees of Temperature" to the December, 1899, meeting of the American Society of Mechanical Engineers, of which he is a life member. He is also a member of the American Institute of Mining Engineers.

White, William F. (M.E., '86), was with the Ames Iron Works, Oswego, N. Y., 1886–87; with John White, manufacturer and importer of machinery, Mexico, Mex., 1887–92; and engaged in the same business in the same city 1892–1902. He read a paper on "Alternating Current Tránsformers from the Station Manager's View-Point" before the American Institute of Electrical Engineers in 1898.

Whiting, Charles Willcox (M.E., '84), was born in Camden, N. J., April 8, 1863. He was draughtsman in the repair shops of the Philadelphia & Reading Coal & Iron Co., Pottsville, Pa., 1884–88, being engaged upon designs of engines and boilers and all kinds of mining machinery; with E. D. Leavitt, Jr., Cambridgeport, Mass., 1888–91: serving first as draughtsman; then as inspector of construction of five Belpaire boilers, locomotive type, 90 inches inside diameter and 34 feet long, and designed to carry a working pressure of 185 pounds of steam; next as engineer of tests; and later as mechanical engineer in connection with the installation of new machinery at the Calumet & Hecla mine, Calumet, Mich.; with the Calumet & Hecla Mining Co., 1891–94, superintending the installation of new machinery, conducting tests, etc.; superintendent of the shops of Van Bergen & Co., Carbondale, Pa., 1894–96; with Fraser & Chalmers, Chicago, Ill., 1896–97, for a time designing large hoisting-engines for the Anaconda Copper Mining Co., of Montana, and later as superintendent,



C. W. Whiting

having charge of a branch of work including the pattern-shop, foundry, and boiler-shop, employing about 500 men; with the E. P. Allis Co., Milwaukee, Wis., as engineer of the blowing-engine department, 1897–1900, during which period designs for several very large cross-compound vertical tandem blowing-engines, and numerous compressors of various types were prepared under his directions; was mechanical engineer with the Chicago, Milwaukee, & St. Paul Railroad, West Milwaukee, Wis., 1900; works manager of the Broad Oaks Iron Works, Chesterfield, England, 1900–02; and was assistant general manager of the works of the British Westinghouse Electric & Manufacturing Co., Trafford Park, Manchester, England, until recently.

Mr. Whiting is the author of an article on "The Gravity Railroad of the Delaware & Hudson Canal Co.," which was published in *Cassier's Magazine* in 1895; also of instruction papers on "Ventilating and Mining Ma-

chinery," and on "Hoisting and Hoisting Appliances," for the International Correspondence Schools of Scranton, Pa. He is a member of the American Society of Mechanical Engineers; and of the Delta Tau Delta fraternity.

Mr. Whiting is the son of Stephen Betts and Kate Burr (Draper) Whiting. He is a lineal descendant in the male line, of William Whiting, who was named among "some of the principal characters who undertook in the year 1636 the work of settling Connecticut, and were the civil and religious fathers of the Colony." His father, S. B. Whiting, was also an engineer, and during the Civil War he built the "Koka," one of the light-draught monitors designed by the Navy Department, and also the superstructure of the Chestnut Street Bridge, Philadelphia. He designed, built, and patented in 1866 the Whiting system of rope-driving, hauling, and hoisting machinery. The subject of this sketch married Mary Clinton, October 15, 1889, and they have four children, Dorothy Clinton, Harold Clinton, Gertrude, and Helen Whiting.

Whitlock, Elliott Howland (M.E., '90), was born in Brooklyn, N. Y., May 5, 1867. He



E. H. Whitlock

was employed in the shops of the Pittsburg, Cincinnati, & St. Louis Railroad, Columbus, O., 1890–91; was Professor of Mechanical Engineering in the South Dakota Agricultural College, Brookings, S. D., 1891–92; with the United Gas Improvement Co., Philadelphia, 1892–93; practised as consulting engineer at Cincinnati, O., 1893–95; was secretary and treasurer of the Miles Refrigerating & Ice Co., Cincinnati, 1895–97; expert mechanical engineer and assistant to superintendent of the National Carbon Co., Cleveland, O., 1897–1902; and has been first assistant superintendent of the same company from 1902 to date.

Jointly with Mr. Uriah M. White, he took out a patent for an improvement in an autographic register in 1896, and in 1897 secured a patent for an improvement on drop-hammers. In 1891 Mr. Whitlock read a paper on boiler tests before the College Scientific Club of Brookings, S. D. He is a member of the American Society of Mechanical Engineers; of the American Electrochemical Society; and of the Electric Club of Cleveland.

Mr. Whitlock is the son of Elisha S. and Sarah J. Whitlock. He married Lillian M. Drake (deceased 1899), in January, 1894, and Lily E. Jackson, in January, 1904.



R. H. Whitlock

Whitlock, Roger Haddock (M.E., '82), was born in Brooklyn, N. Y., July 15, 1860. He was in the employ of the Graydon & Denton Manufacturing Co., Jersey City, N. J., 1882; in charge of the night school for apprentices at the Brooks Locomotive Works,

Dunkirk, N. Y., 1882–83; and has been Professor of Mechanical Engineering at the State Agricultural and Mechanical College of Texas, College Station, Tex., since 1883.

He superintended the installation of the steam plant of the college, consisting of waterworks, laundry, ice-factory, and electric-lighting plant, and after putting these in operation continued to act as superintendent of the entire plant. On two occasions during his connection with this institution he has held the office of president *pro tem.* He is a member of the American Society of Mechanical Engineers.

Mr. Whitlock is the son of Elisha S. and Sarah J. Whitlock. He married Effie Cable, December 25, 1894, and they have two children, Marjorie and Roger Haddock, Jr., Whitlock.

Whitman, Allen Earle (M.E., '96), was born in Brooklyn, N. Y., March 28, 1872; son of I. A. and Cecilia A. (Robinson) Whitman. He prepared for college at the Brooklyn Polytechnic Institute and the Peekskill Military Academy. He was superintendent of construction for the Baldwin Engineering Co., New York, 1896–99. During the latter part of 1899 the Whitman Manufacturing Co. was incorporated, Mr. Whitman becoming vice-president and general manager, positions he still holds. The company started immediately to manufacture tools and special machinery, with the B. & C. friction clutch for gas and gasoline engines as a specialty, at their factory at Garwood, N. J. He is a member of the Beta Theta Pi fraternity, and of the Seawanhaka Corinthian Yacht Club. He was secretary of the latter, 1900–01, and secretary of its race committee in 1902.

Whitman, Paul S. (M.E., '97), was draughtsman in the gas-holder department of the Riter-Conley Co., Ingram, Pa., 1897–98; in the employ of the Keystone Bridge Works of the Carnegie Steel Co., Pittsburg, Pa., 1898–99; with the Brown Hoisting & Conveying Machine Co., Cleveland, O., 1899–1902; and has been with the Cambria Steel Co., Johnstown, Pa., from 1902 to date. He is a member of the Civil Engineers' Club of Cleveland, O.; and of the Tau Beta Pi fraternity.

Whitney, Alfred Rutgers, Jr. (M.E., '90), was born in New York city June 16, 1868. Prior to entering Stevens Institute of Technology he spent some time at the works of the Brooklyn Wire Nail Co. Upon graduation he entered the employ of the Portage Iron Co., Ltd., Duncansville, Pa., remaining with them for a little over a year, successively working as shop-boy, lathe-hand, machinist, puddler, time-keeper, shipping-clerk, and finally as assistant manager. During the ensuing year he constructed a seven-inch mill for the company. He had charge of all engineering work and organized a testing department.

In 1891 he became general manager of the newly incorporated Puget Sound Wire Nail & Steel Co., Everett, Wash., and superintended the designing and preparation of plans and specifications of the buildings and machinery, shipping the latter complete from New York, and, upon arrival at Everett, took charge of the work of construction and erection. Upon completion he was chosen vice-president and increased the plant one-third.

In 1892 he installed a temporary electric-light plant for the Everett Electric Light & Power Co., in connection with the plant of the Steel Co., and in 1893, upon the organization and construction of the new plant of the Everett Railway & Electric Co., became manager, treasurer, and electrician of the company, operating a railway, power, and arc and incandescent light plant.

During the Western engagements above mentioned he was also a director of the Everett Land Co., and the Everett Pulp & Paper Co., allied interests.

In 1896 he resigned his Western positions and returned to New York, where he became a partner in the firm of A. R. Whitney & Co., steel manufacturers, contractors and builders, and agents of the Carnegie Steel Co., Ltd., in which connection, among other pieces of work, he designed and constructed a rod, wire, and nail plant for the Portage Iron Co., Ltd., Duncansville, Pa. (described in "The Iron Age," December 15, 1896). In the fall of 1899 the firm disposed of its several manufacturing plants to the then forming steel combinations, and, the senior members retiring from business, the new firm of A. R. Whitney, Jr., & Co. continued the engineering, contracting, and building business.

In June, 1902, he incorporated the firm of A. R. Whitney, Jr., & Co., continuing the business of general contracting and building, and at the present time is engaged in building construction throughout the world. Among recent constructions are the following: Syrian College, Beirut, Syria; Gymnasium, St. Paul's School, Concord, N. H.; American Smelting & Refining Co., Perth Amboy, N. J.; the Consolidated Gas Co.'s building, the East Side Settlement Building, and the Twenty-third Street Young Men's Christian Association Building, New York, etc. He has recently received the general contract for the erection of the new Mutual Life Insurance Building, Mexico City, Mex.

Mr. Whitney is a member of the University, Union League, and New York Yacht clubs; of the Baltusrol Club; of Squadron A, National Guard of the State of New York, and of the Delta Tau Delta fraternity.

Whitney, Oscar Carpenter (M.E., '92), was born in Jersey City, N. J., April 20, 1867. He has been employed by the Pintsch Compressing Co., New York, from 1892 to date; at first as draughtsman, in which capacity he, among other things, prepared the drawings for a gas plant in Philadelphia and superintended its construction.

In December, 1892, he went to Boston as superintendent of operation of a plant in that city, where he remained until January, 1894. A plant was built in Cambridge for the Boston & Maine Railroad in the fall of 1893, of which he had the superintendence.

Returning to the New York office, he was engaged on both inside and outside work, among which was the construction of a plant at New Haven, Conn., and laying pipe lines in Cincinnati. In 1896 and 1897 plants were constructed under his superintendence at Washington, D. C., Baltimore, Md., Pittsburg, Pa., and Mobile, Ala.

In December, 1897, Mr. Whitney was given the superintendence of the Manhattan plant supplying gas to the Manhattan Elevated Railway, a position involving the manufacture and distribution of gas and the care of the car equipment. In May, 1900, he was sent to Jersey City to build the plant supplying the Pennsylvania Railroad, and since its completion in July of the following year has continued to operate it, although spending the greater part of his time at the New York office, and on the road inspecting the operation of the various plants manufacturing Pintsch gas as far west as Salt Lake City, Utah, and south to San Antonio, Texas.

Mr. Whitney is the son of Franklin and Caroline S. (Wheeler) Whitney; and a direct descendant in the eighth generation of John and Eleanor Whitney, Puritan settlers in Watertown, Mass., and, in the fourth generation, of Joshua Whitney, who settled near the junction of the Chenango and Susquehanna rivers in New York State, and afterward became agent to Mr. Bingham and was instrumental in founding the city of Binghamton, N. Y. The subject of this sketch married Jessica E. Clark, November 30, 1892, and they have two children, Homer Clark and Dorothy Whitney.

Wilbor, Anson Gifford (M.E., '93), was born in Albany, N. Y., May 26, 1869. He was engaged in professional work at Albany, 1893–94, making a specialty of heating, ventilating, and sewerage; was instructor in chemistry, physics, and mathematics in the Albany Academy, 1894–95; inspector with the Mutual Fire Insurance Co. of New York, 1895–96; and has been inspector with the Factory Insurance Association, Hartford, Conn., from 1896 to date. For a period of several years, ending in 1904, he had entire charge of the States of Georgia, Alabama, Mississippi, and Louisiana, with headquarters at Atlanta, Ga., his duties being to make regular inspections of all factories in his territory which were insured in the Association; to adjust losses; to make plans and specifications for fire protection of new factories, etc. He is still engaged as inspector but is located at Hartford, Conn.

Mr. Wilbor is the son of Samuel, Jr., and Ella (Gifford) Wilbor. He married Frances C. Gifford, June 29, 1898, and they have two children, Anson G., Jr., and Miriam Frances Wilbor.

Wildman, Leonard Delacour (M.E., '90), was born in Danbury, Conn., October 13, 1868; son of Alfred Nerum and Ella (Delacour) Wildman. His father's ancestors were English settlers in Connecticut about 1630; his mother's, French Huguenots who fled to Holland and arrived in America about 1618.

He was draughtsman and engineer with the Norwalk Iron Works Co., South Norwalk, Conn., 1890–97, during which time he was



L. D. Wildman

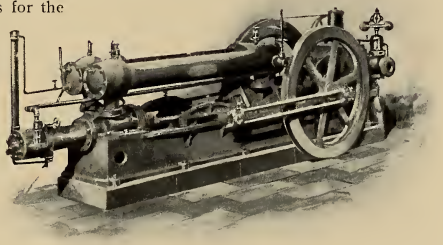
connected with the installation of the dynamite guns on board the U.S.S. "Vesuvius;" the installation of the pneumatic plant on the U.S. monitor "Terror;" the installation of gas-compressors for pumping natural gas through the States of Ohio and Indiana; and experimental work with compressors for the high pressures used with pneumatic locomotives, carbonic-acid-gas, and refrigerating machines.

In 1898, before war was declared with Spain, Mr. Wildman was selected by the chief signal officer of the United States Army, for the position of aeronautical engineer to the Signal Corps. On the breaking out of the war he was appointed first lieutenant in the Volunteer Signal Corps, and put in command of the second section of the Balloon Corps. He superintended the construction of the apparatus for the generation of hydrogen, and designed the plant for its compression and storage in Mannesman tubes at a pressure of 3,000 pounds per square inch. He was ordered to Tampa in May, 1898, to erect this plant and to prepare balloons.

After recovering from typhoid fever he was ordered to Havana, Cuba, before the formal occupation of that city by the Americans, and there superintended the erection of military telegraph lines in the Provinces of Havana and Pinar del Rio. This work included the establishment of the city systems of telephone and telegraph in the city of Havana and in Camp Columbia.

In May, 1899, he was appointed chief signal officer on the staff of Maj.-Gen. Lee, and was shortly afterward sent to Governor's Island on the staff of Maj.-Gen. Merritt, and put in charge of the purchase of electrical machinery, Signal Corps supplies, and the outfitting of a machine-shop for the repair of Signal Corps material in the Philippines. In September of the same year he was detailed to represent the Signal Corps in Mr. Marconi's wireless telegraph experiments during the international yacht races.

In October, 1899, Lieut. Wildman was ordered to the Philippine Islands and placed in command of Company H, of the Signal Corps, with orders to establish telegraphic communications in the Department of the Visayas. In June, 1900, he was appointed chief signal officer of the Department of the Visayas on the staff of Brig.-Gen. Hughes.



Air-Compressor, Norwalk Iron Works
L. D. Wildman

In August, 1901, he was detailed to the cable ship "Burnside," and with Capt. George O. Squier laid the Signal Corps cables connecting the southern islands. On the establishment of the Department of South Philippines he was appointed chief signal officer of

that Department on the staff of Brig.-Gen. Wade, in charge of the communications on all the islands of the archipelago south of the island of Luzon. On the passage of the Reorganization Bill of the Army, February 2, 1901, he was transferred from the rank of first lieutenant U. S. Volunteer Signal Corps, to that of captain in the Signal Corps, United States Army.

In March, 1901, he was put in command of the cable ship "Burnside," and afterward was made traffic manager for all the communications in the Philippine Islands. He was ordered to Washington in December, 1902, by way of the Suez Canal, and placed in charge of the Telegraph and Examining Divisions of the Signal Corps, at headquarters, and conducted the experiments in wireless telegraphy for the Army. He was subsequently ordered to New London, Conn., on business pertaining to the electric installations of the Signal Corps, and is now located at Nome, Alaska, as chief of the wireless telegraphy branch of the Signal Corps. Since August, 1904, he has been operating his system successfully between stations 110 miles apart.

Capt. Wildman is a member of the American Society of Electrical Engineers; of the Army and Navy Club, at Manila and Washington; the United Service Club, Cebu, P. I.; and of the Beta Theta Pi fraternity.

Wiles, Edwin L. (M.E., '76), was born in Grassy Point, N. Y., October 17, 1856; son of Alfred M. and Catherine Wiles. He was employed at the Brick Machinery Works, Stony Point, N. Y., 1876–78; was machinist, furnace helper, melter, and turn foreman with the Cambria Iron Co., Johnstown, Pa., 1878–81; superintendent of the steel works of the Union Iron & Steel Co., Chicago, Ill., 1881–82; superintendent of the Springfield Iron Co., Springfield, Ill., 1882–86; and thence to date has been connected with the Riverside Iron Works, Wheeling, W. Va., serving as superintendent, assistant manager, and manager. Mr. Wiles is a member of the Engineers' Club of New York, and of the Duquesne Club of Pittsburg.

Wilkes, James Renwick (M.E., '93), was born in Charlotte, N. C., July 10, 1871. He has been with the Mecklenburg Iron Works Co., Charlotte, N. C., from 1893 to date. He is a member of the Southern Manufacturers' and Elks clubs, of Charlotte, N. C., and of the Theta Xi fraternity.

Mr. Wilkes is the son of John and Jane Renwick Wilkes, and grandson of Rear-Adm.



J. R. Wilkes

Charles Wilkes, U.S.N. He married Caroline Settle, November 18, 1896, and they have one child, Charles Wilkes.



E. L. Wiles

Wilkes, John Francis (M.E., '85), was born in Charlotte, N. C., May 20, 1864. In

1883 he took the degree of Bachelor of Physics at the University of North Carolina. He has been superintendent of the Mecklenburg Iron Works at Charlotte from 1885 to date, his duties including the management of the business, travelling on special work, designing special machinery and buildings for machinery, etc. The works build principally gold-mining and milling machinery and engines. He was for several years a member of the American Institute of Mining Engineers; the American Society of Mechanical Engineers; and the Elisha Mitchell



J. F. Wilkes

Scientific Society. He is a member of the North State Club; the Independent Order of Foresters; the Vestry of the Episcopal Church; and of the Alpha Tau Omega and Theta Nu Epsilon fraternities; and is director of the Charlotte Public Library.

Mr. Wilkes is the son of John and Jane Renwick Wilkes. He has married twice: the first time, October 7, 1891, and the second time, July 12, 1898, to Frances McIver Lucas. They have two children, John, Jr., and Carrie McIver Wilkes.

Willett, Wallace (M.E., '96), was in the employ of the American Sugar Refining Co., Jersey City, N. J., 1896–99; engaged on the trade journal of the sugar industry, New York, 1899–1900; and has been in the brokerage business, New York, from 1900 to date.

Williams, Alonzo Rowland (M.E., '95), was born in Raleigh, N. C., February 11, 1869.



A. R. Williams

At the age of thirteen he began serving an apprenticeship as machinist in Raleigh, N. C., which was completed in the Wilmington & Weldon Railroad shops. He ran a locomotive on the Atlantic Coast Line for two years, resigning as locomotive engineer in 1889 to study at the Stevens Preparatory School. While a student he was regularly employed by the Department of Tests at the Institute. Since graduation he has been with the T. A. & R. G. Gillespie Co. as engineer on water supply for Newark, N. J., 1895–96; with the Underwriters at American Lloyds, New York, as chief inspector, 1897–99; and with Hall & Henshaw, United States managers of the Union Assurance Society and the Law, Union, & Crown Insurance Co., both of London, and of the State Insurance Co. of Liverpool, from 1899 to date, being special agent at Milwaukee, Wis. He is a member of the Brotherhood of Locomotive Engineers; the Knights of Pythias; the National Fire Protection Association; and has served on a number of important insurance committees. He is also a member of the Masonic Order, and of the Theta Nu Epsilon fraternity.

Mr. Williams is the son of John R. and Corina Morehead Williams, both families being among the first settlers in North Caro-

lina. He married Margarett Louise Taylor, November 7, 1900.

Williams, Frank H. (M.E., '81), is secretary and treasurer of the Dubuque Turbine & Roller Mill Co., Dubuque, Iowa.

Williams, Harold Edward (M.E., '00), was born in Newark, N. J., April 24, 1877; son of Charles E. and Margaret R. Williams. He was draughtsman for the Starr Engineering Co., New York, 1900–01; at the McKeesport mills of the National Tube Co., U. S.



H. E. Williams

Steel Corporation, 1901–04; and has since been in the sales department of the company at the Chicago office. He is a member of the Chi Psi fraternity.

Williams, Harvey D. (M.E., '85), was born in Shaftsbury, Vt., February 24, 1864; son of Lewis and Sarah Sleeper Williams. He was draughtsman with the Emery Scale & Testing Machine Co., Stamford, Conn., 1885–86; and designer for the Yale & Towne Manufacturing Co., in the same city, 1886–88. During the latter period he designed the portable self-sustaining hoist since known to the trade as the "Triplex Pulley Block," which has an efficiency of 79 per cent. Previous to that time the efficiencies of such hoists ranged from 20 to 50 per cent.

In 1888 he became connected with Sibley College, Cornell University, Ithaca, N. Y., as Instructor in Mechanical Drawing, from which he was advanced to the position of Assistant Professor of Machine Design. During the summers of 1891 and 1892 he visited various technical schools and universities in Great Britain, on the Continent, in the United States and Canada. He resigned his position at Cornell in 1898. At that time he was engaged in the design and construction of a complete line of machinery to produce a new article of manufacture.

He was next, for a short time, with Mr. A. H. Emery, of Stamford, Conn., assisting in the design of a coast-defence disappearing gun-carriage. In July, 1899, he was engaged in the Bureau of Steam Engineering of the Navy Department at Washington, D. C., and has recently received the appointment of Ordnance Engineer, U.S.N., a new post recently created by act of Congress.

He has been granted United States patents for a changeable color illusion device; a universal ratchet drill—an application of a new mechanical movement whereby a surface-contact mechanism is substituted for the usual bevel-gears; a new method of govern-



H. D. Williams

ing water wheels and motors, by which the energy usually wasted because of incorrect speed is utilized to open and close the gate (description published in the "Sibley Journal," March, 1896); a stamped sheet-metal

bucket for water wheels and motors and steam turbines of the free deviation type; and a double universal joint.

Following a natural inclination, Mr. Williams has been much occupied with theoretical and experimental investigations, some of which have yielded results of practical value, and these have been sold to interested parties. Among the subjects to which he has given attention are the following:

Experiments with kites, in which he developed the box form or cellular kite, independently of, but subsequent to, Mr. Hargreaves.

Investigation of the motion of thin revolving bodies in air, the results of which show that the ideal path of one form of boomerang in a frictionless medium is like a figure 8 drawn on the under surface of a sphere.

Determination of the theoretical relations that should exist between the diameter of wheel, diameter of jet, number of buckets, and position of jet in free deviation wheels of the Pelton type.

The effect of combined heat and pressure on amorphous carbon. These experiments, which were suggested by the peculiar geological formation of the South African diamond fields, were discontinued on the publication by Prof. Henri Moisson of results obtained along the same lines.

The hydroplane, a self-propelling model craft. (exhibited at Sheldrake-on-Cayuga in 1895) designed to skim along the surface of water in the manner of the skipping-stone, and of which a descriptive article was published in the "Sibley Journal," Vol. IX.

A novel form of steam-turbine (designed, built, and tested in 1894–95) having a capacity of 20 horse-power, a speed of 16,000 revolutions per minute, and an efficiency of 20 pounds of steam per brake horse-power; the brake used in testing the turbine being a smooth metal disk revolving in water.

In 1895 he constructed a lens to correct the optical defects of the human eye when immersed in water, and at the same time not to interfere with seeing in the air.

In 1893 he published for the use of his students "A Sixty-Hour Course in Kinematic Drawing."

He has made use of the strict mathematical conception of "Degrees of Freedom and Constraint" in the study of mechanical movements. He is of opinion that the subjects of mechanics and kinematics as applied to machinery need to be entirely rewritten from the point of view of the system of coordinates which is elaborated in Sir Robert Ball's great mathematical work "Theory of Screws."

His most recent published article, describing a rational method of comparing the relative magnitudes of line and point contacts, appeared in the "American Machinist" of February 10, 1903. Other articles, the outgrowth of his work in the Bureau of Steam Engineering, have appeared from time to time in the "Journal of the American Society of Naval Engineers."

Mr. Williams is a member of the Chi Psi and Sigma Psi fraternities.

Williamson, George Danforth (M.E., '97), was born in Jersey City, N. J., February 11,



G. D. Williamson

1876; son of J. Q. Aymar and Elizabeth (Henderson) Williamson. He was with the Consolidated Gas Co., New York, 1898–1900; was inspector for the Middle States Inspection Bureau, New York, 1900–02; and is now with Woodward & Williamson, insurance agents, Jersey City, N. J. His work includes the examination of boilers, engines, shafting, dynamos, motors, etc., testing of fire appliances and automatic sprinkler equipments, and inspection of special hazards. He is a member of the Chi Psi fraternity.

Williamson, James Abeel (M.E., '97), was born in Jersey City, N. J., May 13, 1875. He was in the employ of Colgate & Co., soap manufacturers, Jersey City, N. J., 1897; constructing engineer with Charles H. Davis, New York, 1898; and has been with the Isbell-Porter Co., manufacturers of refrigerating machinery and gas works apparatus, Newark, N. J., from 1898 to date. He is a charter member of the University Club of Hudson County, and a member of the Chi Psi fraternity.

Mr. Williamson is the son of James Rutsen and Nellie Alford Williamson. His ancestors came to New York about 1650 from Amsterdam, Holland, and have always lived on Long Island or in New Jersey. He married Helen Van Wyck, October 29, 1902.

Willis, C. Addison (M.E., '89), was with the Maryland Steel Co., 1889–91; at the Camden Iron Works, Camden, N. J., 1891–92; Instructor in Mechanical Engineering at the University of Pennsylvania, 1892–94; and has been Professor of Mathematics at Girard College, Philadelphia, from 1894 to date.

Willis, Edward J. (M.E., '88), was born in Savannah, Ga., April 1, 1866. He was assistant chemist in the State Agricultural Department, Richmond, Va., 1888–90; treasurer of the Richmond Mica Co., Richmond, 1893–95; general manager of the Talbot & Sons Co.'s Machine Works, Richmond, 1895–96; superintendent of the Richmond Traction Co., 1896–99, in which capacity he designed and superintended the erection of the power-house machinery and had charge of the operation of the road. In 1899 he became steam and electrical engineer for the Virginia Railway & Electric Co., Richmond, and had charge of the steam and electric designing of that company in its 8,000 horsepower plant and distributing system. In 1900 he became president of the Richmond Electric Co., manufacturers of electric machinery, Richmond, which position he holds at this date. He is also professionally employed on the Fredericksburg (Va.) municipal plant; for the Clifton Forge Light & Water Co., etc., making designs and having charge of installations.

He has received three United States patents upon an improved form of planimeter for determining areas, mean pressures, and horse-power, and also an English patent dated February 13, 1895. It was favorably commented upon at a meeting of the American Society of Mechanical Engineers. He has also patented an improved horse-power planimeter which was described and illustrated in the *American Machinist*, 1900.

He has contributed many articles to technical journals, among which are the following:

"Efficiencies of Mechanical and Electrical Machines," *Cassier's Magazine*, VII.

"Old and New Methods with the Indicator," *Machinery*, 1894.

"Energy Equivalents," *American Machinist*, 1895.

"A Horse-Power Planimeter," *Transactions of the American Society of Mechanical Engineers*, XVI.

"Practical Use of Water Rheostats," *American Electrician*, 1898.

"Test of a 300-Kilowatt Direct Connected Railway Unit at Different Loads," *Transactions of the American Institute of Electrical Engineers*, 1899.

"On the Natural Unit of the Planimeter," *Stevens Institute Indicator*, 1902.

He is a member of the American Society of Mechanical Engineers; the American Institute of Electrical Engineers; the Engineers' Club of New York; the Commonwealth Club of Richmond, Va.; and of the Chi Phi fraternity.

Mr. Willis is the son of John Pembroke and Mary (Willis) Jones. He changed his name from Jones to Willis, by order of court, in 1882. He married Bessie Fauntleroy, October 10, 1900, and they have one child, Francis T. Willis.

Willis, Paul (M.E., '85), was in the employ of the Wallace Iron Works, Jersey City, N. J., 1885–86; with Mr. Geo. S. Morrison, as inspector for his work in shops and mills, 1886–90; and later organized, in connection with Mr. F. W. Barker, the Kenwood Bridge Co., Chicago, Ill., of which he has been secretary and engineer from 1899 to date.

Wilson, Arthur (M.E., '99), was born in South Orange, N. J., August 21, 1876; son of Daniel and Julia A. Wilson. He was employed in the Department of Tests at the Stevens Institute, 1899; with Anderson &

Murphy, engineers, New York, 1899–1900; assistant to the manager of the Gas & Electric Co., Norristown, Pa., 1900–01; with the Waclark Wire Co., Elizabeth, N. J., 1901–03; and has been with the Federal Refining Co., New York, from 1903 to date.

Wilson, William Richardson (M.E., '96), was born in Norfolk, Va., in 1874; son of James R. and Angeline Perkins Wilson. He was inspector with the Edison Electric Illuminating Co., New York, 1896; draughtsman in the master mechanics' department of the Pencoyd Iron Works, Philadelphia, Pa., 1896; filled a similar position with the Watson-Stillman Co., New York, 1896–99; was in the sales department of the C. W. Hunt Co., New York, 1899–1900; with the Wheeler Condenser & Engineering Co., New York, 1900–04; and is now salesman for the Alberger Condenser Co., New York. He is a



W. R. Wilson

junior member of the American Society of Mechanical Engineers.

Wolcott, Henry Augustus (M.E., '91), was born in Lynn, Mass., August 6, 1866. He left school when fifteen years of age, worked about a year as office-boy, and then four years as assistant in a store. He prepared for Stevens Institute with a private tutor. He was in the employ of Frank McSwegan & Sons, New York, selling and erecting engines and boilers, 1891–92; draughtsman with the Link-Belt Engineering Co., New York, 1892; and was in partnership with Mr. John Darby (M.E., '91), at Hartford, Conn.,



H. A. Wolcott

1892–98. Their work embraced electrical, mechanical, and civil engineering. Since 1898, when Mr. Darby became connected with the Pope Manufacturing Co., Mr. Wolcott has conducted the business alone. The nature of his work has been of a varied character, embracing, besides the branches otherwise mentioned, sewer work, the preparation of large topographical maps, maps for court exhibits, division of land, and general surveying. In 1895 he acted as constructing engineer for the Pope Tube Co. during the erection of their new plant at Hartford. In 1897 he spent ten months in England introducing patented machinery. Since 1899 he has spent nearly all his time upon laboratory experiments on atmospheric resistance, high-speed bearings, and strengths of certain fastenings in frame structures; in the latter work designing and superintending the construction of the machines used in the experiments. In 1902 he designed and erected two large factory buildings for the Whittock Coil Pipe Co. at Elmwood, Conn., and subsequently entirely reorganized the cost-keeping system for a factory employing over 600 hands and having fourteen departments. He is now works-manager for the Whittock

company. He is a member of the American Society of Mechanical Engineers, and the Connecticut Society of Civil Engineers.

Mr. Wolcott is the son of Peter and Harriet B. Wolcott. He married Susan Lawrence, February 22, 1895, and they have three children, Ruth, Henry Freeman, and Lawrence Wolcott.

Wolff, A. F. T. (M.E., '01), was Instructor during the Supplementary Term at Stevens Institute, 1901; and has been Assistant in the Department of Tests at the Institute from 1901 to date.

Wolff, Alfred R. (M.E., '76), soon after graduation, became assistant to Charles E.



A. R. Wolff

Emery, C.E., and assistant engineer in the United States Revenue Marine. He was thus employed until 1880, when he established himself in New York as a practising consulting engineer. He has made a specialty of the design and installation of power, heating, and ventilating plants, among which may be mentioned: The Carnegie Building, Pittsburg, Pa.; the Chamber of Commerce Building, Rochester, N. Y.; the Brooklyn Institute of Arts and Sciences; the Princeton Library; the Bank of Montreal; and the following buildings in New York city: the Hanover National Bank of Commerce, Blair, and Speyer bank buildings; the New York Clearing House; the New York Life Insurance, Metropolitan Life Insurance, Chamber of Commerce, Empire, Johnston, Presbyterian, United Charities, American Lithographic Co., and New York Stock Exchange buildings; the Hall of Records; Columbia University, New York University, New York Herald, and Appellate Court buildings; Carnegie Music Hall, Teachers' College, Cornell Medical College, Mount Sinai Hospital, and the Lying-in Hospital; the Waldorf-Astoria, Sherry's, Delmonico's, and St. Regis hotels and restaurants; the Siegel-Cooper and Gimbel Bros.' department stores; the Metropolitan, Racquet, Century, Mendelssohn Glee, Freundschaft, Young Men's Christian Association, New York Athletic and Yale club buildings; the Cornelius Vanderbilt, John Jacob Astor, and Andrew Carnegie residences; and other large office and public buildings and residences.

Mr. Wolff is the author of "The Windmill as a Prime Mover," the "Ventilation of Buildings," "The Heating of Large Buildings," etc. He is a member of the American Society of Mechanical Engineers and of the Engineers' Club, New York. He was Alumni Trustee of the Stevens Institute of Technology from 1893 to 1896, and has been Permanent Trustee of the Institute since 1900.

Wolff, John (M.E., '88), was born in Brooklyn, N. Y., December 10, 1866; son of Frederick Nicholas and Margaret Wolff. He was in the employ of the Edison Electric Illuminating Co., Brooklyn, N. Y., 1888–98, being superintendent of their steam plants during two years of this period; his duties principally requiring surveillance of the operation and maintenance of the various steam plants. He also acted in the capacity of consulting and constructing engineer when additions were made to these plants. He was with the American Stoker Co., Brooklyn, N. Y., 1898–1902; when he became chief engineer and purchasing agent of the Pennsylvania & Mahoning Valley Railway Co., with headquarters at Youngstown, O., having supervision of the various plants, and charge of all construction work. He is now with the Cleveland Electric Illuminating Co., Cleveland, O.

Wood, Arthur Julius (M.E., '96), was born in Roseville, N. J., September 3, 1874; son of

De Volson and Frances Hartson Wood. He was on the editorial staff of the *Railroad Gazette*, 1896–1900, acting as associate editor for the last three years of this period. While connected with this paper he gave most of his attention to electric railroads and mechanical engineering subjects, the latter including principally compressed air, gas engines, and thermodynamics. He was Instructor in Mechanical Engineering at the Worcester Polytechnic Institute, Worcester, Mass., 1900–02; Professor of Mechanical and Electrical Engineering, Delaware College, Newark, Del., 1902–04; and is now Assistant Professor of Experimental Engineering at Pennsylvania State College, State College, Pa.

He has presented a number of printed discussions on "Studies in Acceleration of Trains," in the *Railroad Gazette*, 1897 and 1899, and in the *Stevens Institute Indicator*, 1899. He is the author of papers on "Compressed Air Motors," published in the *Railroad Gazette*, 1896, 1897, 1899, and the *Mechanical Engineer*, 1899; on "Electric Conduit Roads," *Railroad Gazette*, 1897; and on "Compound *vs.* Triple-Expansion Steam Engines," published in the *Railroad Gazette*, 1900. He made investigations in the subject



A. J. Wood

of hydraulic rams, and prepared articles thereon which appeared in the *Stevens Institute Indicator*, 1898 and 1902. In 1902 he re-edited (10th edition) "Elementary Mechanics," by De Volson Wood. He is a member of the Society for the Promotion of Engineering Education, serving as member of council of this Society, 1899–1902; a junior member of the American Society of Mechanical Engineers; and an associate member of the American Institute of Electrical Engineers.

Wood, Everett Norton (M.E., '97), was born in Kutstown, Pa., September 29, 1876;



E. N. Wood

son of Prof. H. A. Wood. He was with Riley Bros. (stereopticons), New York, 1897–99; and has been in the employ of the Merritt & Chapman Derrick & Wrecking Co., New York, from 1899 to date, now holding the position of chief constructing engineer and purchasing agent.

Wood, Frederick Harlow (M.E., '93), was born in Concord, Mass., October 2, 1871; son of David H. and Lydia H. Wood. His ancestors on both sides took part in the battle at Concord, April 19, 1775. He won the Stevens scholarship in a class of sixty members.

Owing to ill health at the close of his college course he was unable to take up the work for which he had so well fitted himself. He went to California, hoping to restore his strength which was being undermined by a lung trouble. The expected relief proving only temporary, he returned to his home at

Montclair, N. J., where he spent the last years of his life in study and in planning a house embodying new features in design. A photograph of this building was one of the



F. H. Wood

exhibits at the Institute's Twenty-fifth Anniversary Exhibition. Mr. Wood died September 2, 1897.

Woodbridge, J. Lester (M.E., '86), was employed in the Engineering Laboratory of Stevens Institute, 1886, and in the engineering department of the Edison Electric Light Co., New York, 1887–88. In the latter year he organized and became a partner in the firm of Woodbridge & Turner, established for carrying on electric railway construction and engineering, and in 1891 this partnership was merged into the Woodbridge & Turner Engineering Co., Mr. Woodbridge becoming secretary and treasurer. In 1898 this corporation was dissolved, and Mr. Woodbridge opened an office as consulting engineer in New York, and continued this until the spring of 1898, when he took a position as engineer of the Boston office of the Electric Storage Battery Co. In January, 1900, he was transferred to the principal office of the company at Philadelphia, as engineer of the sales department, in which capacity he has been employed up to the present time. He has taken out patents on improvements in the "booster" system for long-distance transmission; on electrical distribution; means for regulating double-current dynamo machines; and on a method of regulating double-current dynamo-electric machines, 1901. In 1897 he read a paper before the Electrical Section of the Brooklyn Institute on the subject "From Coal to the Trolley," and in the fall of 1897 a paper before the Electrical Section of the Franklin Institute, Philadelphia, on "The Booster System as Applied to Electric Railways;" and also contributed an article on "The Economy of the Booster" to the *Street Railway Journal*, 1898.

Woodman, Durand (B.S., '80; Ph.D., '87), was born in New York city September 16, 1859. He took a special two-year course in chemistry and physics after having completed the regular studies of the first two years of the Institute's course, at the end of which time he was awarded the Priestley prize in chemistry. In 1887 the Stevens Institute conferred upon him the degree of Doctor of Philosophy.

During the winter after graduation he



House Designed and Built by F. H. Wood

acted as volunteer assistant to Dr. A. R. Leeds with classes in the Analytical Laboratory. From 1881 to 1883 he was associated with Dr. Henry Wurtz in his second sanitary chemical investigation of the Passaic River water, made for the city of Paterson, N. J. A detailed summary of the work was published in the "Engineering and Mining Journal" of April 26, 1890.

From 1883 to 1884 he was connected with the office of William Farmer, gas engineer, New York, thus supplementing the chemistry of gas manufacture with an intimate knowledge of gas works construction and gas engineering practice.

From 1884 to 1886 he occupied the position of chemist in the experimental laboratory of the United States Electric Light Co., Newark, N. J., which was then under the direction of Mr. Edward Weston, and for whom he conducted investigations of the action of various gases on the filaments of the incandescent lamp; and of vapors of many of the rarer elements and compounds with regard to perfecting the vacuum. He also made an extended investigation of alloys in general, and the manganese-copper alloys in particular, which subsequently developed into the Weston constant resistance alloy, for which a patent was granted.

In October, 1886, he opened a laboratory for analytic and experimental chemical work in Newark, among the patrons of which were the Electrical Accumulator Co., the United States Electric Light Co., the Edison Lamp Works, the Weston Laboratory & Instrument Co., the United Gas Improvement Co., the Citizens' Gas Co., and others. For some time special attention was given to the chemistry and preparation of the Clark standard of electro-motive force, and a set of these standard cells, prepared for the Edison laboratory in January, 1888, agreed with each other six months later within 0.00012 volt, or about 0.009 per cent, at the same temperature. Two of these cells, set up under the care of Dr. Alexander Muirhead, of London, also agreed with each other within 0.00010 volt at one temperature. The difference between the electro-motive force of the London and Newark cells was within 0.00014 volt, or 0.028 per cent, all at the same temperature, and the mean difference was about 0.00025 volt excess on the side of the London cells. See the "Electrician" (London), June 29, 1888.

In September, 1889, Dr. Woodman went to Germany and took a course in organic chemistry at the University of Berlin, under Prof. A. W. von Hofmann, and also studied the methods of Fresenius at his laboratory in Wiesbaden. While at Berlin he visited many of the large chemical manufacturing establishments in the vicinity,—the Anilin Color, Bleaching, and Dye Works, Rubber Works, Kahlbaum's Chemical Manufacturing Industry, etc. He was invited by



Durand Woodman

Prof. Hofmann to represent the American Chemical Society by reading the congratulatory letter of its president at the Twenty-fifth Anniversary celebration of the Kekulé benzol ring theory, which occurred March 11, 1890, in the city hall at Berlin.

On his return from Germany he reopened his laboratory in New York, where he has continued in practice as analytic and consulting chemist, giving much attention to technical and industrial problems. In 1896 the oils used and the gases produced by the Pintsch process were investigated for the Pintsch Compressing Co. at their plants in and around New York.

In 1899 an investigation of the gases existing in the subways under the streets of New York was made for the Consolidated Telegraph & Electric Subway Co.; also of the

composition and character of insulated wire coverings, for the Edison Electric Illuminating Co. During 1900–01 complete analyses of feed water and boiler scale were made for the New York, Ontario, & Western Railway, for the Cheney Manufacturing Co., and others. Special varnishes and "metal coatings" were analysed and tested for the R. W. Hunt Co., and in a patent suit concerning the chemical treatment of cordage for waterproofing and weighting his services were retained through their attorneys by the Standard Rope & Twine Co. Since 1898 he has acted as chemical examiner of oils, paints, and other supplies for the United States Light-House Establishment, and has prepared special experimental fuses for ignition by percussion in the compressed-air chamber of high-speed torpedoes for the United States Naval Torpedo Station at Newport, R. I.

He was secretary of the American Chemical Society for two years, and, after the reorganization of the Society and establishment of local sections, was secretary and treasurer of the New York section, from 1895 to 1901.

His contributions to literature include a number of short articles which were published in scientific and other journals; among which are:

"Note on Lead Poisoning by Carbonated Beverages." *Journal of the American Chemical Society*, XI.

"Systematic Inspection of Wells in Cities and Towns." *Ibid.*, XIII.

"On Three Samples of Crude Petroleum." *Ibid.*, XIII.

"An Apparatus for Heating Sealed Tubes." *Ibid.*, XIII.

"Analysis of Glass Used in the Manufacture of Electric Lamps." *Ibid.*, XIV.

"Note on Denitration of Pyroxylin." *Ibid.*, XIV.

"Oil Gas Tar." *American Gas Light Journal*, January 8, 1894.

"Valuation of Purifier Oxide." *Ibid.*, January 29, 1894.

"Variations in the Composition of Red Lead." *Journal of the American Chemical Society*, XIX.

He served two years as Alumni Trustee of the Stevens Institute, and is a member of the American Chemical Society; the Society of Chemical Industry, London; the Deutsches Chemische Gesellschaft, Berlin; the Verein Deutscher Chemiker; and of the Chemists' Club, New York.

Dr. Woodman is the son of George and Lucy M. Durand Woodman. He married Katherine Lincoln Bowles, October 3, 1893.

Woodward, Arthur C. (M.E., '96), has been with A. & F. Brown, builders of power-transmission machinery, Elizabethport, N. J., from 1896 to date.

Woolsey, Arthur Eugene (M.E., '95), was born in Jersey City, N. J., August 31, 1874. He has been with the Illinois Steel Co., South Chicago, Ill., from 1895 to date, having held the following positions: clerk in the plate-mill, 1895–1900; night superintendent, 1900–01; and since then, superintendent of the plate-mill.

Mr. Woolsey is the son of Charles W. and Ella E. (Washburn) Woolsey. He married Emily A. Cox, December 26, 1895, and they have two children, Katherine and Louise Condict Woolsey.

Woolson, Clifford Griggs (M.E., '96), was born in Newark, N. J., July 9, 1874; son of Orosco C. and Edith H. Woolson. He is descended on his father's side through a



C. G. Woolson

continuous line of American mechanics or engineers since the latter part of the 17th century. He was under instructions on the

erecting floor of J. S. Mundy, builder of hoisting-engines, etc., Newark, N. J., 1896–97; draughtsman with the A. A. Griffing Co., Jersey City, N. J., engaged on heating and ventilating work, and draughtsman with H. de B. Parsons, consulting engineer and marine architect, New York, 1897–98. From the latter employment he resigned to enter the United States Navy, and during the war with Spain received a commission as assistant engineer with the relative rank as ensign, and was detailed at the Brooklyn Navy Yard in the Bureau of Steam Engineering, being engaged on construction work on the "Chicago," "Atlanta," "Texas," "Iowa," and "Topeka." He was a member of the board appointed to make tests and report on the evaporative performance of the distilling-ship "Rainbow." He was assistant engineer with the Union Bridge Co., engaged in the construction of two steel coal-sheds for the United States government at Key West, and two at Dry Tortugas, Fla., 1899–1900; draughtsman with the Patten Vacuum Ice Co., New York, 1900; assistant engineer with the Robins Conveying Belt Co., New York; with the E. F. Dupont Powder Co., of Wilmington, Del., and is now with the Baltimore Copper Smelting & Rolling Co., Baltimore, Md.



H. T. Woolson

Woolson, Harry Thurber (M.E., '97), was born in Wallington, N. J., September 20, 1876; son of George C. and Sarah M. Woolson. He was draughtsman with the National Meter Co., Brooklyn, N. Y., 1897–98, and when the Spanish war broke out he enlisted, being a member of the New Jersey Naval Reserve, and served for five months in the engineering corps aboard the United States auxiliary cruiser, "Badger." After the war was over he returned to the National Meter Co., where he remained a few months, and then went with the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y., where he has since been employed in designing and draughting on torpedo-boat and yacht engine work, also in boiler and engine testing. He is now chief draughtsman of the engineering department. He is an associate member of the American Society of Naval Engineers.

Wortendyke, Ira F. (M.E., '89), was born in Pascack, N. J., September 16, 1868. He



I. F. Wortendyke

has been in the employ of the United Gas Improvement Co., Philadelphia, from 1889 to date, representing its interests in the following capacities: assistant superintendent at the Jersey City Gas Works, 1893; and since 1894 superintendent of the New Gas Light Co., Janesville, Wis. He is a member of the American Gas Light Association.

Mr. Wortendyke is the son of Frederick F. and Effie (De Baun) Wortendyke. He married Parepa Rosa Neer, June 26, 1899,

and they have one child, Freda Louise Wortendyke.

Worth, Barzillai Gardner, Jr. (M.E., '01), was born in Cresskill, N. J., June 5, 1880. He constructed a small working model of a stationary slide-valve engine from original designs before leaving the public school. He was with the Schlicht Combustion Process Co., New York, 1901, in charge of the experiments with regenerative Welsbach gas burners. He secured an economy of 75 c.p. with a consumption of 2½ cubic feet of gas per hour. As chief draughtsman with the Union Subway Construction Co., New York, he designed the subway crossing of the Bronx River, 1901. He is now constructing engineer with Mr. Walter Kidde, engineer and contractor, New York, for whom he has had charge of the design and construction of a special electrical power and light equipment, and other steam and electrical work.

Mr. Worth is the son of Archibald C. and Elizabeth (Anderson) Worth. He married Mabel Demarest Palmer, December 20, 1899.

Wreaks, Charles F. (M.E., '89), was born in Jersey City, N. J., January 16, 1868. He was with the Edison Machine Works, Schenectady, 1889–91; and is now a member of the firm of Walker & Hughes, average-adjusters and insurance-brokers, New York.

He is a member of the Down Town Association and the Reform Club, New York; of the Maltano and Suburban clubs in Elizabeth; and of the Theta Xi fraternity.

Mr. Wreaks is the son of Charles F. and Mary K. Wreaks. He married Alice Gummey, June 6, 1893, and they have three children, Charles F. Jr., Dorothy, and Francis Wreaks.

Wreaks, Hugh T. (M.E., '90), was with the Westinghouse Electric & Manufacturing Co., New York, 1890–1902; and has been with the Exeter Machine Works, New York, from 1902 to date.

Wreaks, William B. (M.E., '89), was with the United States Electric Light Co., Newark, N. J., 1889–92, in the electrical laboratory, 1889–91, and assistant to the general superintendent, 1891–92; and has been with the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., from 1892 to date, in the engineering department, 1892–95; salesman and engineer in the New York office, 1895–1900; in a like capacity, in charge of business in the Maritime Provinces of Canada and Newfoundland, in the New York export office, 1900–02; and in a similar position in the Detroit office from 1902 to date.

Wright, Ernest Neall (M.E., '83), was born in Germantown, Pa., March 27, 1861; son of James A. and Mary Cook Wright. He was a student at the Technische Hochschule, Hannover, Germany, 1883–86, and at the University of Göttingen, Göttingen, Germany, 1886–87. Upon his return to the United States he entered the employ of the Spiral Weld Tube Co., East Orange, N. J., remaining with the company about a year; after which he went with Westinghouse, Church, Kerr, & Co., New York and Boston, 1889–93. He was located at Monticello, Fla., 1893–1901, and has been at Boston, Mass., since the latter year, being now engaged as consulting engineer. He is a member of the American Society of Mechanical Engineers.

Wright, Harry (M.E., '98), has been in the employ of Zindars & Hunt, and the H. Krantz Manufacturing Co., Brooklyn.

Wuichet, Edward (M.E., '91), was born in Dayton, O., in 1868. He was vice-president of the Miami Valley Boiler Co., Dayton, O., 1892–96; salesman with Alexander Gebhart & Co., lumber-dealers, Dayton, 1897–1903; and has been treasurer and manager of the Union Storage Co., Dayton, from 1903 to date. He is a member of the Chi Phi fraternity, and of the Scottish Rite Masonic Order.

Mr. Wuichet is the son of Eugene and Blanche (La Rose) Wuichet, of Swiss and French extraction. He married Martha Alice Rench, June 14, 1894, and they have one child, Joseph Edward Wuichet.

Wurts, Alexander Jay (M.E., '84), was born in Carbondale, Pa., March 3, 1862. He was brought up in France until ten years of age, and he graduated from Yale in 1883, and from Stevens Institute in 1884. He studied electricity under Prof. Kohlrausch in Germany, 1884–86; was apprentice with the United States Electric Lighting Co., Newark,

N. J., 1886; electrician with the Julian Storage Battery Co., Camden, N. J., 1886–87; and



A. J. Wurts

has been on the technical staff of the Westinghouse Electric & Manufacturing Co. from 1887 to date. His work has been along the lines of original research and design. While with the latter company he has taken out about 100 patents. During the four years following 1897 he directed the development of the Nernst lamp in America up to a satisfactory commercial basis. He was then appointed manager of the Nernst Lamp Co. organized by Mr. Westinghouse. He has lectured on this lamp before technical audiences in many cities in the United States, and his lectures have been widely published in the technical press. He has also lectured before the Art Society of Boston, at Yale, Columbia, and Cornell universities, and the Franklin and Armour institutes. In 1904 he joined the staff of the Carnegie Institute, Pittsburg, retaining his interests with the Westinghouse Electric & Manufacturing Co.

He is the author of the following papers:

"Lightning Arresters and the Discovery of Non-Arcing Metals," read before the American Institute of Electrical Engineers, 1892.

"The Tank Lightning-Arrester as an Adjunct for Street Railway Power Houses." *Electrical Engineer*, 1892.

"A Photographic Study of Non-Arcing Metals." *Ibid.*, 1892.

"The Commercial Success of Non-Arcing Metal Lightning-Arresters." *Ibid.*, 1893.

"Some Experiments with Disruptive Discharges." *Ibid.*, 1893.

"Notes on Lightning Protection." *Ibid.*, 1893.

"Lightning-Arresters in the United States." *Electrician* (London), 1893.

"Discriminating Lightning-Arresters and Recent Progress in Means for Protection Against Lightning," read before the American Institute of Electrical Engineers, 1894.

"Lightning-Arresters and Why They Sometimes Fail." *Journal of the Franklin Institute*, 1895.

"A Method of Increasing the Striking Distance of a Given Electro-Motive Force." *Electrical Engineer*, 1896.

"Protection Against Lightning for High Potential Power Transmission Circuits." *Ibid.*, 1896.

"The Current Strength of a Lightning Stroke." *Ibid.*, 1898.

"Experiments with Electrical Lightning Arresters." *Engineer*, 1898.

"The Development of the Nernst Lamp in America," read before the American Institute of Electrical Engineers at the Pan-American meeting, 1901, and printed in numerous technical journals.

He is a member of the American Institute of Electrical Engineers; the American Philosophical Society, the American Association for the Advancement of Science; and of the Academy of Science and Arts, Pittsburg.

Mr. Wurts is the son of Charles Pemberton and Laura Wurts, and on his mother's side is a direct descendant of John Jay, first chief justice of the Supreme Court of the United States. He married Jeanie Lowrie Childs, July 30, 1890, and they have two children, Thomas Howe Childs and Laura Jay Wurts.

Wyant, Robert E. (M.E., '89), was in the employ of the Derby Gas Co., Derby, Conn., 1889–94; superintendent of the Colorado Springs Gas & Electric Co., Colorado Springs, Colo., 1894–96; and has been superintendent of the electrical department of the Derby Gas Co., Derby, Conn., from 1896 to date.

Wynkoop, Hubert Schuurman (M.E., '88), was born in Yonkers, N. Y., September 20, 1866. He was employed in the engineering department of the Leonard & Izard Co., Minneapolis and Chicago, 1888–89; in the engineering department of the United Edison

Manufacturing Co., Chicago, 1889–90; was assistant district engineer with the Edison General Electric Co., Chicago, San Francisco, and Atlanta, 1890–92; railway expert for the General Electric Co., Rome, Ga., 1892–93; technical expert and treasurer of the Electrical & Mechanical Engineering Co., New York, 1894–95; gas and electric inspector, 1895–96, and assistant in charge of electricity and gas in the Bureau of Construction and Repairs, 1896–97 in the Department of City Works, Brooklyn, N. Y.; inspector in charge of the Bureau of Electricity and Gas, Department of Public Buildings, Lighting, and Supplies, Borough of Brooklyn, 1898–1902; and has been electrical engineer in the Department of Water Supply, Gas, and Electricity, Brooklyn, from 1902 to date.

From 1888 until 1895 his work covered principally the designing and erecting of electrical plants for lighting, railways, power-transmission, etc. In 1894, in conjunction with Mr. J. H. Vail, formerly assistant engineer-in-chief of the Edison General Electric Co., he wrote a paper on "The Use of the Booster on Electric Railway Circuits," which was read at the thirteenth annual convention of the American Street Railway Association. Although, at the time, the suggestions made in this paper were deemed impractical, the "booster" has since come into general use in railway power houses.

From time to time he has contributed articles to the technical journals, among which may be mentioned: "Electrolysis" in Appleton's *Popular Science Monthly*, 1900; "Electric Fire Risks," *Cassier's Magazine*, 1900; "Gas Distribution as Viewed by an Electrical Man," *American Gas Light Journal*, 1901. In 1899 he read a paper before the American Society of Municipal Improvements on "Electrolysis from the Standpoint of the Municipal Electrician."

He is a corporate member of the Brooklyn Engineers' Club, and a charter member of the Municipal Engineers of the City of New York. He is at present commissary (captain) of the 23d Regiment of Infantry National Guard of the State of New York, and was formerly a member of the Theta Xi fraternity.

Mr. Wynkoop is the son of Richard and Lydia Belcher (Strang) Wynkoop, and is descended from Cornelius Wynkoop, who settled at Albany, N. Y., in 1657. He married Sarah Matilda Zabriskie, June 24, 1890, and they have three children, Marjorie Zabriskie, Natalie, and Ruth Wynkoop.

Yamada, Yokichi (M.E., '75), was located in Japan, 1876–78; Professor of Engineering, Yeddo, Japan, 1878–79; in the Imperial College of Engineering, Tokio, Japan, 1879–92; and was connected with the Akabane Engineering Works, Tokio, 1884–92, in which latter year he died.

Yeaton, Samuel Charles (M.E., '99), was born in Brooklyn, N. Y., April 14, 1874. He



S. C. Yeaton

attended Norwich University Military Academy, Northfield, Vt., for two years and a half. He was with the Edison Electric Illuminating Co., New York, 1899; with the Gas Engine Power Co., Morris Heights, N. Y., 1899–1900; with the De Dion Bouton Motorette Co., Brooklyn, N. Y., 1900; and general agent for the same company at Boston and Newport in the same year. He graduated with the degree of Bachelor of Laws, with honors, from the New York Law School in 1903, and was admitted to the New York Bar. He is a member of the Theta Chi fraternity.

Mr. Yeaton is the son of Samuel Cobb and Alma H. (Sylvester) Yeaton. He married Estelle Babcock, August 8, 1899, and they have one child, Abbie Alma Yeaton.

Yereance, William Burnet (M.E., '88), was born in New York city November 21, 1866. He has been employed in the Dickson Locomotive Works; as inspector of coal and locomotives for the New York Central & Hudson River Railroad; in the Altoona shops of the Pennsylvania Railroad; Instructor in Engineering at New York University coincidently with private engineering practice; assistant to the general manager of the Brooklyn Elevated Railroad; secretary to the general superintendent of the West Shore Railroad; executive secretary to the vice-president and general manager of the West Shore Railroad, vice-president of the Cleveland, Cincinnati, Chicago, & St. Louis Railroad, and general manager of the Beech Creek Railroad; assisted in the reorganization of the Morris & Essex Division of the Lackawanna Railroad; assistant for three years to the general superintendent of the Brooklyn Heights Railroad; and at present is engaged with Ford, Bacon, & Davis, consulting engineers.

In 1897, in conjunction with Mr. C. M. Large, he made a committee report to the Association of Railway Bridges and Buildings on the subject of "Railway Ice Houses." The report was printed in full in *Ice and Refrigeration*, 1898. He is an associate member of the American Society of Civil Engineers; and a member of the American Society of Mechanical Engineers; of the Association of Railway Superintendents of Bridges and Buildings; and of the Transportation and New York Railroad clubs.

Mr. Yereance married Annie E. Scribner, May 16, 1889, and they have five children, Alexander W., Jeannie O., Anita L., Edith De G., and Virginia Yereance.

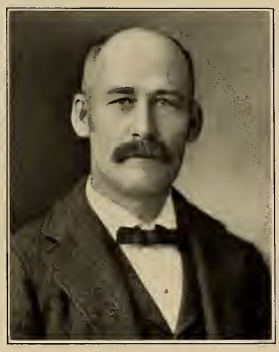
Youngblood, Frank James (M.E., '02), was born in Morristown, N. J., March 14, 1880; son of James Cooper and Mary Frances (Lawrence) Youngblood. He is in the employ of the British Westinghouse Electric & Manufacturing Co., Manchester, England. He is a member of the Delta Tau Delta and Tau Beta Pi fraternities.

Younglove, Roy Sylvander (M.E., '01), was born in Chicago, Ill., October 30, 1878; son of Ira S. and Lizzie (Quirk) Younglove. Samuel Younglove, his first American ancestor, came to this country from England in 1635. His mother's family are of Manx descent.



R. S. Younglove

He was employed in the South Works of the Illinois Steel Co., South Chicago, Ill., 1901–04, at first in the mechanical engineering department and then in the plate mill. He is now with the American Radiator Co. He is a member of the Chi Phi fraternity.



Robert Zahner

Zahner, Robert (M.E., '78), after graduating, fitted himself for the practice of law, and

has since followed this line of work at Cincinnati, O., and Atlanta, Ga., in which latter city he is now attorney and counsellor-at-law.

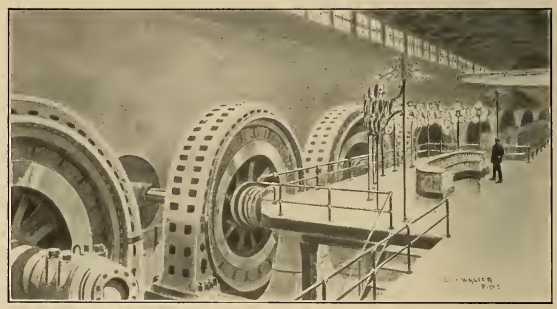


L. B. Zusi

Zimmermann, Hans Christian (M.E., '95), was born in Brooklyn, N. Y., April 2, 1873. He was with Westinghouse, Church, Kerr, & Co., New York, 1895–98. During the war with Spain he served as a member of the 2d Battalion of the New York Naval Reserve on the U.S.S. "Sylvia." He was with the Edison Electric Illuminating Co., of Brooklyn, N. Y., 1898–1901; and has been with the United Coke & Gas Co., from 1901 to date.

Mr. Zimmermann is the son of William and Louise Zimmermann. He married Marie Eloise Trott, April 7, 1900.

Zimmermann, William F. (M.E., '76), was born in Snug Harbor, Staten Island, N. Y., July 24, 1857. He was engaged in the shops of the Rogers Locomotive Works, Paterson, N. J., 1876–77; in the Mechanical Laboratory of Stevens Institute, 1877; assistant master mechanic of the New York & Oswego Midland Railroad, Middletown, N. Y., 1877–79; and subsequently was employed in the Pittsburg Car Wheel Works and with the firm of Witherow & Gordon, blast-furnace engineers, at Pittsburg, Pa. In 1882 he organized and started, in connection with Mr. William Kent, the Pittsburg Testing Laboratory, and in connection with this a bureau of inspection. While connected with the Laboratory he was appointed sales manager for the Pittsburg district of the Babcock & Wilcox Boiler Co. It was while connected with this company that he advocated (and eventually sold to the Lucy Furnace Co.) water-tube boilers for blast furnaces, and introduced this class of boiler into blast-furnace practice. In 1885 he became the manager of the Pittsburg office of Westinghouse, Church, Kerr, & Co., contracting engineers, and it was while connected with this firm that he contracted for and built the first alternating-current plant in this country, at Greensburg, Pa. His connection with this firm brought him into contact with the Westinghouse interests, and



Interior of Power House, St. Lawrence Power Co., Massena, N. Y.
William F. Zimmermann

from that time until 1899 he was connected therewith, having been successively engineer of the Fuel, Gas, & Electric Engineering Co., general superintendent of the United States Electric Light & Power Co., and assistant general manager of the Westinghouse Electric & Manufacturing Co. In 1899 he became vice-president and general manager of the

St. Lawrence Power Co., a company developing a large power in the northern part of New York State. He resigned from this company in 1902, and the following year accepted his present position with the Westinghouse Electric & Manufacturing Co. He is a member of the American Society of Mechanical Engineers; the Engineers' Club of New York; the Lawyers' Club; the Theta Xi Club, and the Theta Xi fraternity.

Mr. Zimmermann is the son of Charles Frazier and Susan B. (Johnston) Zimmermann. He married Stephanie Carr Lake in May, 1881, and they have two children, Howard D. and Eleanor J. Zimmermann.

Zusi, Leonard Borschneck (M.E., '02), was born in Newark, N. J., January 8, 1881; son of Edward and Celestine (Borschneck) Zusi. His grandparents on both sides were Alsatians. He has been with the American Radiator Co., Chicago, Ill., as draughtsman; has engaged in experimental and investigation work in Newark, N. J.; and is now in the foundry business with Edward Zusi, Newark, N. J. He is a member of the Tau Beta Pi fraternity.

ASSOCIATE MEMBERS OF THE ALUMNI ASSOCIATION

THE biographical records under this heading are of former students who, while in good standing, voluntarily severed their connection with the Institute at some period previous to the graduation exercises of their respective classes. In each case the subject has done creditable work in his chosen profession, and has retained an active interest in the affairs of his Alma Mater through associate membership in the Alumni Association.

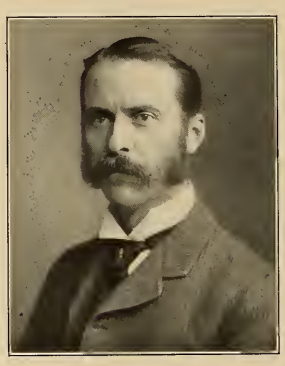
Ball, Bert Charles, was born in Grand Island, N. Y., June 22, 1870; son of Frank H. and Katharine B. Ball. He studied with the Class of 1895 at Stevens. He was chief engineer with the Ball & Wood Co., Elizabeth, N. J., 1891–97; passed assistant engineer in the United States Navy, 1898; consulting engineer in the firm of Ball & Corbett, New York, 1899–1901; and is now secretary and chief engineer of the Willamette Iron & Steel Works, Portland, Ore. He is a member of the American Society of Mechanical Engineers; the American Society of Naval Engineers; the Seawanhaka Corinthian Yacht Club; and of the Beta Theta Pi fraternity.



B. C. BALL

Dickinson, Gordon K. (M.D.), was born in Jersey City, N. J., December 14, 1855. He was the first to pass the entrance examination for the Class of 1875. He took two years of the regular course of study at the Institute and one year of special preparation for a position on the Transit of Venus Expedition, laying a foundation at the same time for the study of medicine. He entered the Bellevue Medical School, New York, in 1874, graduated in 1877, took a postgraduate course, and entered active practice in 1879. He is a member of the American Academy of Science; the American Medical Association;

the New York Academy of Medicine; is surgeon of the City and the Christ hospitals,



G. K. Dickinson

of Jersey City, and consultant at Bayonne (N. J.) Hospital.

Dr. Dickinson is the son of William L. and Celia (Goss) Dickinson. He married Louise Waterman in June, 1888, and they have five children, Louise, Claire, Ruth, Marie, and Celia Dickinson.

Parsell, Henry Van Arsdale, was born in Newburgh, N. Y., June 3, 1868. At an early age he engaged in experimental and mechanical work in his own home, where he had unusual facilities in the way of engines, machines, instruments of research, books of reference, etc., the collection of which was begun by his father and continued by him, until at the present time it is perhaps one of the most complete and valuable private installations of its kind.

In 1880 he began the study of electricity by making all the experiments given in Tyndall's "Lessons in Electricity." In the same year he entered M. W. Lyon's Collegiate Institute where he attended until 1885, during which period, in addition to his studies, he continued work in the shop at home in various electrical branches, such as telephony, electric gas-lighting, and other domestic applications. In 1884 he began experiments with photographic apparatus, culminating in May, 1885, with a patent on a hand camera which was the forerunner of the leather-covered camera now in general use. In the latter year he entered the shop of the Stout-Meadowcroft Co., New York, makers of electric novelties and agents for miniature Edison lamps. While with this company he installed in the laboratory in his home a battery of twenty-eight chromic acid primary cells capable of running eight 16-candle-power lamps of 24 volts each. After one year he replaced this plant with 14 cells of Gibson storage battery, charged by a dynamo and a Shipman steam engine. Later this steam engine was replaced by an Otto gas-engine of four horse-power. In 1887 the Stout-Meadowcroft Co. was succeeded by E. S. Greeley & Co., with whom he remained a short time while the latter firm was familiarizing itself with the new line of goods. He then spent six months with the Gibson Electric Co., working on storage-battery construction. In 1888 he constructed and installed a galvano-faradic apparatus operated on the 110-volt Edison current. This displaced a sixty-cell gravity battery and, so far



H. V. A. Parsell

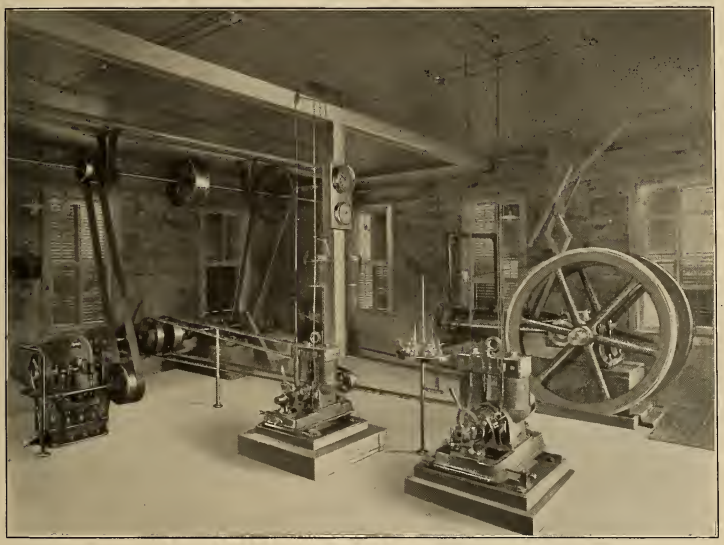
as is known, was the first apparatus of this kind ever built and operated.

He then prepared for Stevens Institute and entered in the fall of 1889 with the Class of 1893. In the spring of 1890, during his spare time, he was connected with the Edison

exhibit in the Lenox Lyceum where he installed a model electric railway with automatic signals, also arranging a "Chamber of Illusions," and acting in an advisory capacity regarding effects of lighting in the main hall. In the spring of 1891 he installed at Schroon Lake in the Adirondacks, the first electric lighting plant to use the Otto gasoline engine in this country. In 1905 this plant is still in successful use. Upon the completion of this latter installation he discontinued his studies at Stevens Institute, and became associated with the New York agency for the Otto gas engine.

In 1892 he entered the decorative and miniature lamp department of the Edison Lamp Co., at Harrison, N. J., as shop superintendent, in which position he was engaged for two years in the devising and construction of various electrical effects, electric signs, automatic switches, etc. The next five years he spent in experimental and consulting work. During this time he was one of the early workers with the X rays, and he devised and built a new apparatus for dental cataphoresis. In the fall of 1899 he formed, with Mr. Arthur J. Weed, the firm of Parsell & Weed, for the construction of models for inventors and experimenters, and established the Franklin Model Shop in New York city for carrying on the work. The "Franklin Model Dynamo" designed and built by this firm was awarded a diploma at the Pan-American Exposition in 1901. In addition to his connection with this firm he is president of the Baldwin Calculating Machine Co., and treasurer of the New Amsterdam Eye and Ear Hospital, both of New York; a director of the Norris-Peters Co., photolithographers, Washington, D. C.; and a director of the Taylor House Association, Schroon Lake, N. Y.

Mr. Parsell has written, anonymously, appendices to a well-known electrical dictionary



First Electric Plant in America Run by Otto Gasoline Engine
H. V. A. Parsell

and to several smaller works, and in collaboration with Mr. A. J. Weed has written a book on "Gas Engine Construction." He is a past vice-president of the New York Electrical Society; an associate member of the American Institute of Electrical Engineers; a member of the International Electrical Congress, St. Louis, 1904; the American Association for the Advancement of Science; the American Museum of Natural History; the Municipal Art Society; the New York Botanical Gardens; the Society of American Magicians, of which he is archivist; the Aldine Association; and the Republican Club. He is a Royal Arch Mason, having attained the thirty-second degree of the Scottish Rite and the ninetieth degree of the Rite of Memphis; and a member of Mecca Temple of the Mystic Shrine.

Mr. Parsell is the son of Henry V. A. and Hannah H. (Peters) Parsell. He married Maud E. Collins, January 31, 1893.

Streeter, Lafayette Pinkney, was born in Brooklyn, N. Y., December 25, 1875. He



L. P. Streeter

studied for three years with the Class of 1900, and received a certificate from the Institute, issued June 11, 1900, signed by the late President Morton, certifying to his successful completion of the special course pursued. He entered the employ of the New York Air Brake Co., at Watertown, N. Y., as assistant to the mechanical engineer, on January 1, 1901; was appointed first assistant mechanical engineer of the company in June, 1902, and was the acting head of the mechanical engineer's department for a period of about three months during that summer. On January 1, 1903, upon the reorganization of the mechanical engineer's department, he was appointed to the newly created position of engineer of tests, having charge of the physical laboratory and the testing of purchased material, as well as of special tests of machinery and of brake apparatus in general. He is an associate member of the American Society of Mechanical Engineers; a member of the American Society for Testing Materials; and a member of the Sigma Nu fraternity.

Wilcox, Frank, was born in Pittsburg, Pa., May 26, 1854. He spent three years at Stevens, studying with the Class of 1880. He then became assistant master mechanic in the shops of the Pittsburg, Fort Wayne, & Chicago Railroad, at Fort Wayne, Ind., 1880–81; was engaged in the machine and foundry business in Pittsburg, building hydraulic and Bessemer mill machinery, 1881–83; mining and smelting lead in Montana, 1883–84; engineer of the Philadelphia Co., Pittsburg, producers and carriers of natural gas, 1884–90; superintendent of the Pittsburg Water Department under E. M. Bigelow, Director of the Department of Public Works, 1890–92; and has been engineer and director of the T. A. Gillespie Co., being engaged in large contract work, more especially the building of waterworks reservoirs and steel pipe-line work, from 1892 to date. He is a member of the American Society of Civil Engineers; and the Engineers' Society of Western Pennsylvania.

Mr. Wilcox is the son of Lemuel and Eliza Fleming Wilcox, and is descended from John Wilcox, who landed in Connecticut from Boston, England, in 1628. He married Annie Brett, of Brookline, Mass., November, 1886, and they have one child living, Winthrop Wilcox.

THE CLASSES OF 1903 AND 1904

When it was decided to change this work from a Twenty-fifth Anniversary Volume to a Memorial to the late President Morton, it was planned, as being the most appropriate arrangement, to include in the regular order of the Alumni biographies the members of all classes down through the Class of 1902, which was the last to complete its course under him.

The Classes of 1903 and 1904 form a peculiarly fitting link between the past and the present administrations, the former completing the major part of its work under Dr. Morton, and the latter its major part under Dr. Humphreys. The transition from the old regime to the new is strikingly shown in the two Class photographs on pages 636 and 640 respectively. In the former, the Class of 1903, taken in its graduating year, shows the members in civilian dress, in which the Graduates and the Faculty had always appeared on Commencement Day, adapting themselves, of course, to the conventions of the hour, the exercises being usually held in the evening. On page 640 will be found the photograph of the Class of 1904, with the Trustees, Faculty, Guests, and Members of the Class robed in the traditional cap and gown, which were adopted by the Institute in the spring of 1904. This photograph was taken immediately after the graduating exercises on the morning of the 16th of June of that year.

In thus presenting the Classes of 1903 and 1904 it is deemed advisable, in view of the recent graduation of the members, not to attempt complete biographical sketches, but rather to give merely the present employment. These two Classes will furnish a fitting starting-point for a future historian.

CLASS OF 1903



MEMBERS OF THE CLASS

SCHMIDT MURPHY BACKUS JALIEN
MONTALVO MERTLEMEYER SQUIER JOHNSON QUIGG KIERNAN
SCHUETZ RIVERO WRIGHT BENNITT KRANTZ
HAGERTY CHADWELL FURMAN DREYFUS MAPLESDEN
WHITEHOUSE VAN HOUTEN RABBE LAFETRA
MARVIN SMITH CHEWNING ROESER
J. D. ALDEN PRATT BURKE LOTT
BALDWIN FREEMAN J. W. ALDEN BRADLEY NORTH BUNJE CABRERA
WOODBURY STRING VAN ETTEN BRAY CHAMBERLAIN
BUTLER ASSMANN
DUER PRAHL ALLEN CLARK

FACULTY

Sitting in Front Row—From Left to Right

PROFESSORS FURMAN, BRISTOL, GEYER, WEBB, KROEH, AND MACCORD, PRESIDENT HUMPHREYS, AND PROFESSORS DENTON, JACOBUS, STILLMAN, AND GANZ

Standing in Second Row—From Right to Left

ASSISTANT-PROFESSORS KNAPP, GUNTHER, SEVENOAK, AND MOORE, AND INSTRUCTOR LE PAGE, AND AT EXTREME LEFT ASSISTANT-PROFESSOR PRYOR

THE CLASS OF 1903

Graduated with the Degree of Mechanical Engineer, June 18, 1903

Alden, J. Douglas, with the Connecticut Railway & Lighting Co., South Norwalk, Conn.

Alden, James W., with the Public Service Corporation of New Jersey, Jersey City.

Allen, Miner W., with the Consolidated Gas Co., New York.

Assmann, Frederick P., secretary and treasurer of the Continental Can Co., Syracuse, N. Y.

Backus, Russell G., with the Worthington Steam Pump Co., Harrison, N. J.

Baldwin, Raymond S., with James Stewart & Co., contractors, Baltimore, Md.

Bennitt, George E., special apprentice at the Baldwin Locomotive Works, Philadelphia, Pa.

Bradley, Chester E., inspector with the Astoria Light, Heat, & Power Co., Astoria, Long Island, N. Y.

Bray, William J., with the Consolidated Gas Co., Baltimore, Md.

Bunje, Charles, Jr., in the street railway department of the Public Service Corporation of New Jersey, Hoboken, N. J.

Burke, Robert E., with the Rhode Island Co., Providence, R. I.

Butler, Joseph F., cadet engineer with the United Gas Improvement Co., stationed at the Merion & Radnor Gas & Electric Co.'s works, Ardmore, Pa.

Cabrera, Frederick, practising as a consulting and contracting engineer, Managua, Nicaragua, C. A.

Chadwell, George H., assistant engineer with the Safety Car Heating & Lighting Co., Jersey City, N. J.

Chamberlain, Harry T., with the Erie Railroad, Meadville, Pa.

Chewning, Walter L., cadet engineer in the gas department of the Public Service Corporation of New Jersey, stationed at Newark, N. J.

Clark, Howard B., with the A. D. Granger Co., contracting engineers, New York.

Dreyfus, Edwin D., with the Allis-Chalmers Co., Milwaukee, Wis.

Duer, John Van Buren, with the General Electric Co., Schenectady, N. Y.

Freeman, Frederick C., constructing engineer in the employ of the United Gas Improvement Co., Philadelphia, Pa.

Furman, George B., with L. O. Koven & Bro., manufacturers of boilers and heavy sheet-iron specialties, Jersey City, N. J.

Hagerty, Walter W., with the New Amsterdam Gas Co., New York.

Jalien, John J., special apprentice at the Baldwin Locomotive Works, Philadelphia, Pa.

Johnson, Harry W., Instructor in Mechanical Drawing and Designing at Stevens Institute of Technology, Hoboken, N. J.

Kiernan, Peter H., assistant manager of the Jersey City district of the New York & New Jersey Telephone Co.

Krantz, K. Theodor, with the Alphons Custodis Chimney Construction Co., Philadelphia, Pa.

La Fetra, Harry L., transitman, in the Topographical Bureau, Borough of Queens, New York.

Lott, Samuel H., Instructor in Mechanical Drawing at Stevens Institute of Technology, Hoboken, N. J.

THE CLASS OF 1903—Continued

Graduated with the Degree of Mechanical Engineer, June 18, 1903

Mapelsden, Harold H., in the turbine-testing department of the General Electric Co., Schenectady, N. Y.

Marvin, Richard H., at the General Electric Co.'s Lamp Works, Harrison, N. J.

Mertelmeyer, Gisbert C. A., draughtsman with the New York Edison Co., New York.

Murphy, Benjamin S., special apprentice with the Pennsylvania Railroad Co., Altoona, Pa.

North, Gilbert, electrical engineer of instruments, electrical engineering department of the British Westinghouse Electric & Manufacturing Co., Ltd., Trafford Park, Manchester, England.

Prahl, Frederick A., with Walter Kidde, M.E., New York. Mr. Prahl married Marie Gilbert, May 18, 1904.

Pratt, Auguste G., in the engineering department of the Babcock & Wilcox Co., Bayonne, N. J. Mr. Pratt married Ruth Nesmith of Brooklyn, January 5, 1905.

Quigg, Edward A., at the North Works of the Illinois Steel Co., Chicago, Ill.

Rabbe, Frederick, Jr., with Jacob A. Zimmermann, general contractor, New York.

Rivero, Ricardo J., assistant manager of the cotton mill of the firm of V. Rivero's Successors, Monterey, Mexico. Mr. Rivero married Blanche M. Kenyon, of Hoboken, N. J., October 12, 1904.

Roeser, Charles J., cadet engineer in the employ of the Hudson County gas department of the Public Service Corporation of New Jersey, Jersey City, N. J.

Schmidt, Arthur H., was erecting engineer and draughtsman with the Hayward Co., New York. He died December 3, 1904.

Schuetz, Frederick F. (A.M., Columbia University, 1904), solicitor of United States and foreign patents, New York.

Smith, Elmer, employed at the Providence Engineering Works, Providence, R. I.

Squier, Harold N., cadet engineer with the United Gas Improvement Co., Philadelphia.

String, Joseph S., Jr., assistant engineer of construction, Astoria Light, Heat, & Power Co., Astoria, Long Island, N. Y.

Van Etten, Herbert B., in the engineering department of the New York & New Jersey Telephone Co., New York.

Van Houten, Charles M., assistant engineer in the Topographical Bureau, Borough of Queens, New York; a city surveyor, New York; and, as holder of the Gould scholarship, New York University, taking a post-graduate course in the School of Pedagogy.

Whitehouse, Louis C., assistant engineer with the Pintsch Compressing Co., New York.

Woodbury, Daniel C., in the electrical department of the New York Central & Hudson River Railroad, New York.

Wright, Donald A., in the estimating department of the North Works, Illinois Steel Co., Chicago, Ill.

THE CLASS OF 1904

Graduated with the Degree of Mechanical Engineer, June 16, 1904

Backus, Richard A., with Post & McCord, Inc., steel constructors, New York.

Barker, Russell D., with the New York & New Jersey Telephone Co., Brooklyn, N. Y.

Bates, Charles J., Jr., employed by the New York Edison Co., New York.

Billings, Andrew W., assistant heating and lighting engineer for the Board of State Armory Commissioners, State Architect's Office, Albany, N. Y.

Blaisdell, Charles O., with M. W. Kellogg & Co., engineers and contractors, New York.

Brachvogel, John K., with Munn & Co., patent attorneys, and proprietors of the "Scientific American," New York.

Buckenham, Archibald G., with the New York Mutual Gas Light Co., New York.

Bunch, David S., superintendent of the Mill River Electric Light Co., Williamsburg, Mass.

Calkins, George N., assistant to the general manager of the Wyoming Coal Mining Co., Monarch, Wyo.

Carpender, Moncure C., taking the post-graduate course in electrical engineering, Cornell University, Ithaca, N. Y.

Carr, Walter A., member of the Neptune Laundry Co., Philadelphia, Pa.

Carroll, Morris B., in the turbine department of the General Electric Co., Schenectady, N. Y.

Cazin, O. K., employed with R. H. Soule, mechanical engineer, New York.

Church, Herbert B., employed by the Consolidated Safety Pin Co., Bloomfield, N. J.

Del Rio, C., engaged in engineering work at Tabasco, Mexico.

Dennis, Henry P., with the Bristol Co., Waterbury, Conn.

Dunlop, Charles W., with the Pintsch Compressing Co., New York.

Fry, L. B., with Humphreys & Glasgow, water-gas engineers, London, England.

Garza, J. M., taking a course in mining engineering at the Colorado School of Mines, Golden, Colo.

Gaylord, Harold B., employed in the crane department of the Niles-Bement-Pond Co., Philadelphia, Pa.

Greve, Edgar E., taking a course in mining engineering at the Colorado School of Mines, Golden, Colo.

Guernsey, Ralph B., with Westinghouse, Church, Kerr, & Co., New York.

Hayes, William G., with the Illinois Steel Co., Joliet, Ill.

Hedden, Clarence Earle, teaching physics, chemistry, and drawing in the Caldwell (N. J.) High School.

Hedden, Viner J., with V. J. Hedden & Sons Co., contractors, Newark, N. J.

Herb, Arthur, with J. Schwarzwalder & Sons, New York.

Hollins, George G., in the department of tests of the General Electric Co., Schenectady, N. Y.

Hubert, Philip A., with Post & McCord, Inc., steel constructors, New York.

Ingham, William G., foreman with the Warren Foundry, Pipe, & Machine Co., Phillipsburg, N. J.

CLASS OF 1904



MEMBERS OF THE CLASS

BLAISDELL SCHROEDER PROUT VANDERBEEK
PRATT NEEFUS WARFIELD
SCHAUB PATTERSON HUBERT WESTERVELT
PENNY PEARCE PAGE ZUSI HOLLINS ZIMMERMANN
STAPLES MOUNT WILLIS V. J. HEDDEN
JACOBUS MYLIUS JOHNSON
LEDDELL KOESTER LANE GARZA
CREVE HERB DENNIS GAYLORD GUERNSEY
DUNLOP HAYES FRYE CHURCH
INGHAM CARROLL BARKER
DELRIO CAZIN BUCKENHAM BILLINGS BATES
CARPENDER BUNCH BRACHVOGEL BACKUS
CARR CALKINS

TRUSTEES, FACULTY AND INVITED GUESTS

Sitting in Front Row—From Left to Right

PRESIDENT S. B. DOD, OF THE BOARD OF TRUSTEES; PRESIDENT A. C. HUMPHREYS; MR. WALTER C. KERR, WHO DELIVERED THE ADDRESS TO THE GRADUATING CLASS; MR. EDWARD WESTON, WHO RECEIVED THE HONORARY DEGREE OF DOCTOR OF SCIENCE; REV. EDWARD WALL; COL. E. A. STEVENS, TRUSTEE; REV. J. CLAYTON MITCHELL; MR. A. R. WOLFF, TRUSTEE; COL. GEORGE HARVEY, TRUSTEE; MR. W. C. POST, ALUMNI TRUSTEE; PROF. C. W. MACCORD; PROF. C. F. KROEH; PROF. W. E. GEYER; AND PROF. J. B. WEBB

Standing in Second Row—From Left to Right

PROFESSORS RIESENBERGER, JACOBUS, BRISTOL, GANZ, AND FURMAN, AND ASSISTANT-PROFESSORS GRAYDON, PRYOR, SEVENOAK, KNAPP, MOORE, GUNTHER, AND POND

Standing in Third Row—From Right to Left

INSTRUCTORS LE PAGE, SHOUDY, MARTIN, AND JOHNSON

THE CLASS OF 1904—Continued

Graduated with the Degree of Mechanical Engineer, June 16, 1904

Jacobus, Robert F., engaged in special experimental work at Stevens Institute.

Johnson, Joseph E., in the engineering department of the General Fire Extinguisher Co., Providence, R. I.

Koester, Herman, with the Bliss Machine Co., manufacturers of power presses, Brooklyn, N. Y.

Lane, Harold B., in the steam turbine department of the General Electric Co., Schenectady, N. Y.

Leddell, William A., employed by the Power Specialty Co., New York.

Mount, Ralph H., with the New York & New Jersey Telephone Co., Brooklyn, N. Y.

Mylius, R. W., in the gas-engine department of the National Meter Co., Brooklyn, N. Y.

Neefus, Harold, V. H., with James Stewart & Co., general contractors and engineers, New York.

Page, J. D., with the Worcester Salt Co., Silver Springs, N. Y.

Patterson, Warren P., mine wireman for the Gypsey Mine of the Fairmount Coal Co., Gypsey, W. Va.

Paulson, William E., with the consolidated Gas Co., New York.

Pearce, W. H., Graham Court, New York.

Penney, Rupert L., with the Winchester Repeating Arms Co., New Haven, Conn.

Pratt, Harlan A., with the Westinghouse Electric & Manufacturing Co., New York.

Prout, Henry B., in the steam turbine department of the Westinghouse Machine Co., Pittsburg, Pa.

Schaub, Albert H., with the Buffalo Forge Co., New York.

Schroeder, August E., engineering apprentice with the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa.

Staples, William O., with the Rapid Transit Subway Construction Co., New York.

Suhr, Curt, assistant superintendent, Bayway Refining Co., Elizabeth, N. J.

Vanderbeek, J. Wilbur, with the Pierson-Sefton Co., manufacturers of horticultural implements, Jersey City, N. J.

Warfield, Douglas R., with the Westinghouse Electric & Manufacturing Co., East Pittsburg, Pa.

Westervelt, H. Irwin, Instructor in Mechanical Engineering, University of Cincinnati, Cincinnati, Ohio.

Willis, Charles M., cadet engineer with the Westchester Lighting Co., Mount Vernon, N. Y.

Zimmermann, Howard D., in the gas-engine testing department of the Westinghouse Machine Co., Pittsburg, Pa.

Zusi, Norman E., is in the employ of the New York & New Jersey Telephone Co., Newark, N. J.

DOBBS PROS.
LIBRARY BINDING
MAR 70
ST. AUGUSTINE
FLA.
32084

LIBRARY OF CONGRESS
0 030 008 738 3