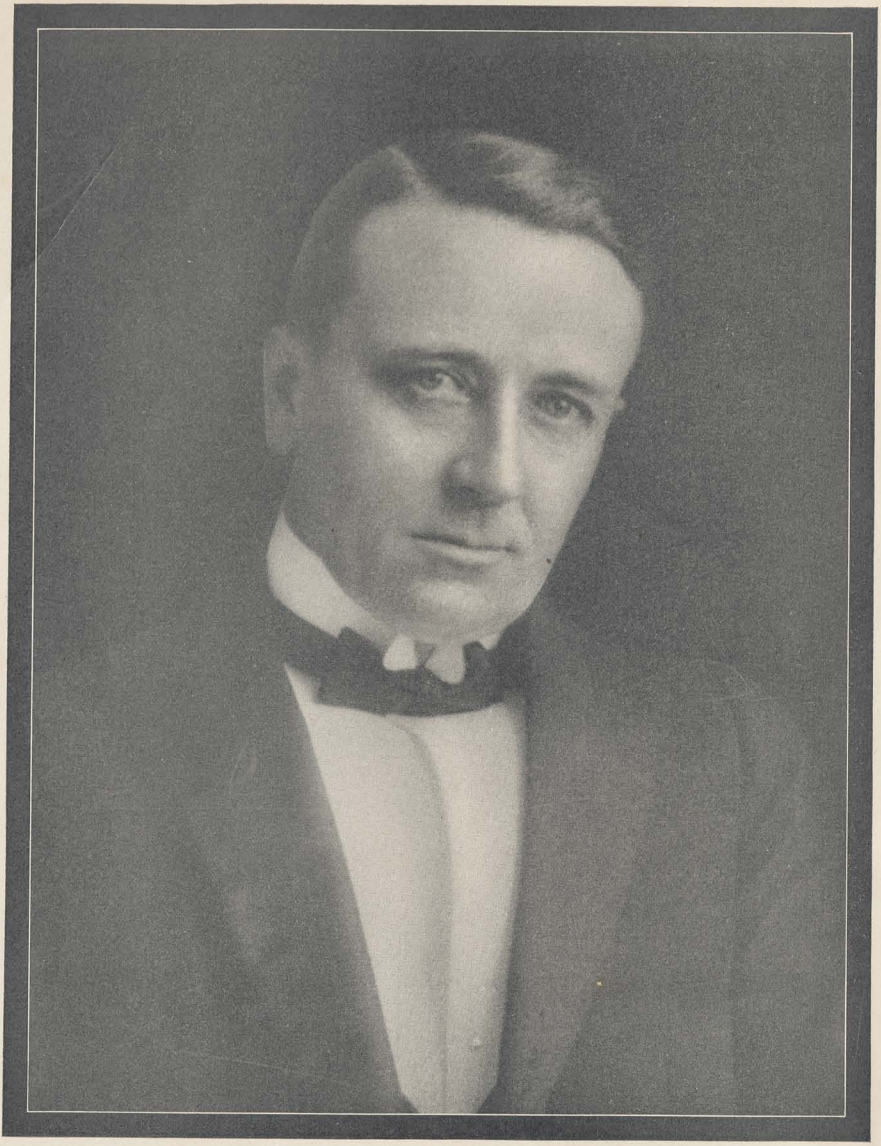
REPORT

OF THE

New Jersey Interstate Bridge and Tunnel Commission

1926

Mary C Caffrey



John C. McEnroe.

REPORT

OF THE

New Jersey Interstate Bridge and Tunnel Commission

TO THE

Senate and General Assembly of the State of New Jersey

THE HOLLAND TUNNEL

THEODORE BOETTGER, Chairman
THOMAS J. S. BARLOW
JOHN F. BOYLE
ISAAC FERRIS

JOHN B. KATES, Vice-Chairman
WELLER H. NOYES
ROBERT S. SINCLAIR
FRANK L. SUPLEE

E. MORGAN BARRADALE, Secretary
ROBERT CAREY, Counsel
OLE SINGSTAD, Chief Engineer



DATED JANUARY 2, 1926

MacCrellish & Quigley Co
Printers
Trenton, New Jersey

New Jersey Interstate Bridge and Tunnel Commission

ANNUAL REPORT

To the Honorable Senate and General Assembly of the State of New Jersey:

The New Jersey Interstate Bridge and Tunnel Commission respectfully submits its Annual Report for the year ending December 31, 1925, dealing with the construction of the Hudson River Vehicular Tunnel, now known at "The Holland Tunnel." The Commission is also charged with the responsibility of constructing the Delaware River Bridge from Camden to Philadelphia. Its activities with respect to the bridge will be accounted for in a report to be submitted by the Delaware River Bridge Joint Commission. Harmonious relations prevail between this Commission and those of New York and Pennsylvania. The Commission is extremely pleased to report the progress on these two great structures looking to their early completion.

The Commission reorganized March 10, 1925, at its offices in the Woolworth Building, New York City, with the re-election of Theodore Boettger, of Hackensack, as Chairman, and John B. Kates, of Collingswood, as Vice-Chairman, and the re-appointment of John C. McEnroe, of Newark, as Secretary. Hon. Robert Carey, of Jersey City, has continued to act as Counsel to the Commission.

The Commission held twenty-two stated meetings during the year, all of which were open to the public and were devoted exclusively to tunnel matters. In addition, the Commission has held two special meetings devoted exclusively to the consideration of the tolls problem confronting it with respect to the Delaware River Bridge.

The year 1925 has been marked by the completion of work of constructing the iron lining in the under-river tunnels, the completion of the New York approach sections, the practical completion of the concreting of the tunnel and the progress on the New Jersey approach section under Contract No. 6 let in December of last year. Sections of the tunnels can now be seen in a practically completed state, roadways paved, sidewalls tiled and light boxes installed, all of which justifies the expectation that the completed tunnel will not only be an important facility for traffic, but an exceedingly attractive one as well. During the year there were let eight contracts. These include: Contract No. 7, for the tile lining and interior finish of the tunnel; Contract No. 9, for transformers and oil switches; Contract No. 10, for the granite block tunnel roadway pavement; Contract No. 12, for the ventilation fans, motors and control; Contract No. 13, for the construction of the New York land and river ventilation buildings and the interior finish of the New York land and river ventilation shafts; Contract No. 14, for the construction of the New Jersey land and river ventilation buildings and the interior finish of the New Jersey land and river ventilation shafts; Contract No. 20, for the

power cables for carrying the power required for the operation of the tunnel; and Contract No. 24, for the pumping equipment.

Bids for these contracts were publicly advertised and publicly opened, as follows:

CONTRACT No. 7

	L. Del Turco & Bros., Inc., Harrison, N. J.	Rodgers & Hagerty, Inc., 70 East 45th St., N. Y. City.	Dooley Stapleton Corp., 257 Adelphi St., Brooklyn.	Frederick Snare Corp., 114 Liberty St., N. Y. City.	Alexander & Reid Co., 355 West 36th St., N. Y. City.
Total of bid with 100% domestic tile, ...	$909,180.45	$1,219,725.75	$1,233,831.35	$1,254,502.50	$1,375,030.40
75% domestic and 25% foreign, ...	895,492.95	1,196,000.75	No bid	1,246,290.00	No bid
50% domestic and 50% foreign, ...	881,805.45	1,172,275.75	No bid	1,238,077.50	No bid
25% domestic and 75% foreign, ...	No bid	1,148,550.75	No bid	1,229,865.00	No bid
100% foreign, ...	No bid	1,124,825.75	No bid	1,221,652.50	No bid

Overrun over Chief Engineer's 1923 Estimate—$128,241.45.

CONTRACT No. 9

Name and Address of Contractor	*Amount of Bid*
General Electric Company, ... 120 Broadway, New York City.	$298,166.00
Westinghouse Electric & Mfg. Co., ... 150 Broadway, New York City.	310,220.00

Underrun under Chief Engineer's 1923 Estimate—$62,505.00

CONTRACT No. 10

Name and Address of Contractor	*Amount of Bid*
W. J. Fitzgerald, ... Grand Central Terminal, New York City.	$329,655.00
John Meehan & Son, ... 90 West Street, New York City.	331,290.00
Booth & Flinn, Ltd., ... 17 Battery Place, New York City.	338,475.00
Poirior Contracting Co., Inc., ... 1476 Broadway, New York City.	353,330.00
Public Service Production Co., ... Park Place, Newark, New Jersey.	357,060.00
E. J. Flaherty Constr. Co., ... 76 Montgomery Street, Jersey City, N. J.	369,125.00

Overrun over Chief Engineer's 1923 Estimate—$25,715.00

CONTRACT NO. 12

Name and Address of Contractor	*Amount of Bid*
B. F. Sturtevant Company, Boston, Massachusetts.	$571,631.00
Wagner Engineering Co., Inc., 598 11th Avenue, New York City.	655,130.00
Buffalo Forge Company, 39 Cortlandt Street, New York City.	684,095.00
Green Fuel Economizer Co., 90 West Street, New York City.	776,975.00

Underrun under Chief Engineer's 1923 Estimate—$119,833.00

CONTRACT NO. 13

Name and Address of Contractor	*Amount of Bid*
DeRiso Construction Company, 921 Bergen Avenue, Jersey City, New Jersey.	$1,277,953.00
D. C. Serber, Inc., Grand Central Terminal, New York City.	1,291,130.00
George Colon & Co., Inc., 81 East 125th Street, New York City.	1,359,227.00
Emil Diebitsch, Inc., 70 East 45th Street, New York City.	1,380,580.00
Thos. J. Waters Co., 210 East 33d Street, New York City.	1,395,183.00
Fred Snare Corp., 114 Liberty Street, New York City.	1,465,015.00
Lustig & Weil, 103 Park Avenue, New York City.	1,477,415.00
Niewenhous Co., Inc., 16 East 43d Street, New York City.	1,544,890.00
John T. Brady & Co., 103 Park Avenue, New York City.	1,738,056.00

Overrun over Chief Engineer's 1923 Estimate—$500,635.00

CONTRACT NO. 14

Name and Address of Contractor	*Amount of Bid*
DeRiso Construction Co., 921 Bergen Avenue, Jersey City, New Jersey.	$1,577,953.00
G. DeKimpe, Inc., 30 Church Street, New York City.	1,587,331.00

The English Construction Co., Inc., 15 West 91st Street, New York City.	1,677,151.00
Thomas J. Waters Co., 210 East 33d Street, New York City.	1,710,000.00
George Colon & Co., 81 East 125th Street, New York City.	1,712,698.50

Overrun over Chief Engineer's 1923 Estimate—$879,033.00.

CONTRACT NO. 20

Name and Address of Contractor	*Amount of Bid*
Standard Underground Cable Co., Pittsburgh, Pennsylvania.	$128,670.00
James Sugden Company, 17 East 42d Street, New York City.	139,750.00
Erickson Engineering Co., Inc., Grand Central Terminal, New York City.	144,350.00
Safety Cable Company, 114 Liberty Street, New York City.	149,030.00
Fox Reynolds Company, Inc., 81 East 125th Street, New York City,	153,410.00
John W. Hooley, 70 East 45th Street, New York City.	186,590.00

Underrun under Chief Engineer's 1923 Estimate—$26,974.00.

CONTRACT NO. 24

Name and Address of Contractor	*Amount of Bid*
Booth & Flinn, Ltd., 17 Battery Place, New York City.	$37,700.00
Shevlin Eng. Co., Inc., Maspeth, Long Island.	41,629.00
Peerless Engr. Co., 71 8th Avenue, New York City.	41,632.00
Wagner Engr. Co., Inc., 598 11th Avenue, New York City.	42,735.00
Erickson Engr. Co., Inc., Grand Central Terminal, New York City.	45,850.00
Hart & Early Co., Inc., 18 East 41st Street, New York City.	51,650.00
John W. Hooley, 70 East 45th Street, New York City.	58,000.00
Fox Reynolds Co., Inc., 81 East 125th Street, New York City.	64,200.00

Underrun under Chief Engineer's 1923 Estimate—$7,903.00.

A comparison of the bids on each of the above contracts will show the marked range between the low and high bids, which is evidential of the uncertainty to be met in estimating the cost in planning and conducting public works of this character. There are nine contracts yet to be let. The planning and preparation of these contracts is well under way, so that they can be awarded in time for construction work under them to commence on schedule. Barring interruption by unlooked for delays, the tunnel will be ready for operation early in the year 1927.

REAL ESTATE AND PLAZAS

During the course of the year, negotiations have been conducted and agreements reached with the New York Telephone Company, the Western Union Telegraph Company, and the Postal Telegraph Company, for the leasing of duct space in the low-tension ducts in the tunnel walls for the service of this important line of operation.

One of the most important steps in the progress of the year has been the satisfactory negotiation with the Delaware, Lackawanna and Western Railroad Company for the necessary lands and easements for the construction, maintenance and operation of the tunnel in the terminal yard properties of that company. A large number of important conferences were held during the course of the negotiations, and the Commission is gratified to report the successful negotiation upon a basis materially to the advantage of the State.

The property required for the needs of the plazas in New York City and Jersey City have now practically been acquired, with the exception of four parcels in New York City and sixteen parcels in Jersey City. Condemnation proceedings have been commenced and the right to actual possession acquired, so that no delay will be met with in the development of these plazas for tunnel purposes. The negotiations with the authorities of the City of Jersey City for the vacation of 11th Street, though not yet consummated, in all probability will be amicably adjusted to the satisfaction of all interested parties.

ORGANIZATION

The Commission regretfully recalls the sudden and unexpected death of Milton Harvey Freeman, its Chief Engineer, on March 24, 1925, and of John C. McEnroe, its Secretary, on June 2, 1925. On April 7, 1925, the Commission named Ole Singstad, of Brooklyn, New York, as Chief Engineer, to fill the vacancy caused by the death of Mr. Freeman. Mr. Singstad had been Engineer of Designs under both Mr. Holland and Mr. Freeman. It was another evidence of the sterling qualities of Mr. Holland in forming an engineering organization so competent as to enable the Commissions to fill the vacancies caused by his death and of Mr. Freeman from the staff. On July 7th, the Commission named E. Morgan Barradale, of South Orange, New Jersey, as Secretary, to fill the vacancy caused by the death of Mr. McEnroe.

MILTON HARVEY FREEMAN

The Commissions had not fully recovered from the shock of the loss of its first Chief Engineer, Clifford Milburn Holland, when it sustained a further blow in the sudden death of Milton Harvey Freeman, Chief Engineer to the Commissions, who died at his home at Valhalla, New York, on March 24, 1925, less than five months after his assumption of the heavy duties of Chief Engineer. Mr. Freeman had been with the tunnel project from the organization in July 1, 1919, and was recognized in the engineering profession as an unusual tunnel engineer. His indefatigability and sincerity of purpose were hidden behind a modesty which permitted but few to enjoy a complete realization of his sterling worth and high talents. It can be truly said that he gave himself completely to his professional work, and paid the great sacrifice through his sincerity of purpose. His loss was keenly felt by the Commissions and the staff, which had learned his real worth, his quiet and unassuming manner of accomplishing great results, and his high purpose. At a joint meeting with the New York State Bridge and Tunnel Commission, held on April 7, 1925, the following resolution was adopted:

> Again the New York and the New Jersey Bridge and Tunnel Commissions meet in special session with a vacancy in the office of Chief Engineer. Milton H. Freeman, Chief Engineer to the Commissions, answered the final summons on Tuesday, March twenty-fourth, nineteen hundred and twenty-five, midway in the fifty-fifth year of an active, useful life. Appointed Chief Engineer December 1, 1924, to succeed the late Clifford M. Holland, he brought to the office eminent qualifications of education, trained judgment and wide practical experience. It may be said that he gave himself too unsparingly to the building of the Holland Tunnel. His service was intensive and untiring, his ways so quiet and unobtrusive, his words so considerate and his manner so courteous as to inspire respect and affection, making every member of our Commissions sensible to a personal loss and of the loss to the great undertaking in which we are engaged.
>
> *Resolved,* That the foregoing be adopted and inscribed in the minutes of the New York and New Jersey Commissions as an appropriate tribute to the late Milton H. Freeman, and that an engrossed copy of this resolution be sent to Mrs. Freeman, with a suitable expression of our sincere sympathy.

JOHN C. McENROE

At its meeting on June 2, 1925, the Commission received the sad news of the death, that morning, of its Secretary, John C. McEnroe, of Newark, New Jersey. Mr. McEnroe had been at the office the day before attending to his duties, and with practically no hint of his impending end he died in the midst of a very active life. Mr. McEnroe had served the Commission as Secretary for a little more

than a year. He had come to the Commission with a high reputation for integrity and ability, having served his City and State in various capacities which demonstrated his ability and purpose. On the date of his death, the Commission adopted the following resolution, and adjourned out of respect to his memory:

> It has pleased the all-wise power of Providence to visit its unknowable purpose again by removing from our midst John C. McEnroe, Secretary of the New Jersey Interstate Bridge and Tunnel Commission, and translate him to the greater life.
>
> Mr. McEnroe served the Commission and the people of New Jersey in his present position since March, 1924. He had enjoyed the acquaintance and friendship of many men and women in public life, had served his native City as Deputy Commissioner of Public Safety, his State in the Department of Institutions and Agencies and finally through his connection with the Interstate Bridge and Tunnel Commission. In all his relations, both private and public, he earned the esteem of those with whom he served and the well earned commendation of those for whom he served. His capacity for endeavors and his sustained interest in his work wherever he found his interest, marked him among his fellowmen as a leader whom all enjoyed to follow. His ability in carrying on the work in which he was engaged for the Commission has left its impress and marked him as an upright, honest and capable public servant.

DELAWARE RIVER BRIDGE TOLLS

Reference to the 1924 Report of the Delaware River Bridge Joint Commission will show that the New Jersey Interstate Bridge and Tunnel Commission had taken the position that the collection of tolls on the Camden-Philadelphia Bridge rested upon a legal and moral obligation to the citizens and bondholders of the State of New Jersey for the amortization of the cost of the structure. In May, of 1925, the Pennsylvania Legislature adopted a statute providing for a Commission to operate the bridge, and defined its powers, declaring for a toll-free bridge, and took from its operating Commission the power to levy tolls. The New Jersey Interstate Bridge and Tunnel Commission immediately took steps to establish New Jersey's rights. It is the decision of the Commission to let no new contracts until the impasse now existing between the States has been closed to the satisfaction of the Commission.

With respect to the question of collecting tolls on the Delaware River Bridge, this Commission calls attention to the statutes under which it is now operating, and particularly to paragraph 8, of Chapter 69, of the Laws of 1919, which provides as follows:

> 8. The Interstate Bridge Commission, *upon the completion of such bridge,* is authorized and empowered to enter into agreements with the State of Pennsylvania, or its properly constituted agency or authority, to provide for the joint operation, maintenance and repair of such bridge,

for regulating its traffic and policing and protecting the same, for the fixing and collection of tolls and charges for the use of such bridge and for the regulation of such other matters as are incidental thereto, which agreements the said commission is authorized to alter, amend or repeal from time to time, upon agreement with the State of Pennsylvania, or its agency as aforesaid, as in the opinion of the commission may be proper.

Under existing statutes, this Commission must await the completion of the bridge before it has authority to enter into an agreement with the State of Pennsylvania for the joint operation, maintenance and repair of the bridge and for the fixing and collection of tolls. The Commission respectfully invites the attention of the Legislature to the necessity for authority to enter into such an agreement at once.

In the year 1923, revised estimates of the cost of the bridge and of the cost of the tunnel were submitted to the Legislature as the basis for the bond issue of 1924. Since that time, eleven important contracts have been let for the construction of the tunnel, which have developed an overrun of $1,028,938.45, and twenty-two contracts have been let for the construction of the bridge which have developed overruns. There are still nine contracts to be let on the tunnel and five contracts on the bridge. Based on these overruns, there will be required for New Jersey's share for the completion of both projects the sum of $2,500,000, and recommendation is made that this sum be made available at the very earliest moment, so that there may be no delay in the completion of these two most important structures, which will, upon their completion, become income producers for the State.

Respectfully submitted,

Chairman



Milton H. Freeman

NEW YORK STATE BRIDGE AND TUNNEL COMMISSION

AND

NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION

REPORT OF CHIEF ENGINEER

DECEMBER 31, 1925

TABLE OF CONTENTS

Report of Chief Engineer for 1925.

I. Summary of Work Done by the Commissions' Staff and by the Contractors During 1925.

II. Construction Progress in Detail under Individual Contracts, with Descriptions of Certain Phases of New Portions of the Work not Heretofore Covered.

III. Designs, Studies and Investigations of the Designing Department.

IV. Miscellaneous Investigations and Special Studies.

V. Inspection of Materials, including Tabulation of Amounts of the Principal Materials Manufactured for Use in the Work.

VI. Accidents and Decompressions.

VII. Ferry Traffic Studies.

VIII. Program of Work for 1926.

IX. Organization.

LIST OF PLATES

Plate No. 1.—Partially Completed Concrete Tunnel Lining in South Tunnel West, New Jersey, Showing Upper and Lower Air Ducts, Conduits and Concrete Details, Contract No. 4.

Plate No. 2.—Closer Ring at Junction of Shields, North Tunnel, Contract No. 4.

Plate No. 3.—Construction Progress Chart.

Plate No. 4.—General View of Operations West of Portal of North Tunnel, New Jersey, Constract No. 6.

Plate No. 5.—Concreting Tunnel Lining.

Plate No. 6.—New Erie Railroad Pier, New Jersey.

Plate No. 7.—Table of Decompressions.

Plate No. 8.—Caisson Sinking Operations for Foundations for Land Ventilation Building, New Jersey, Contract No. 6.

Plate No. 9.—Steelwork in Steel Bent and Concrete Section of South Tunnel, New Jersey, Contract No. 6.

Plate No. 10.—Pipe subsurface Changes at East Side of Hudson Street at Spring Street, North Tunnel, New York, Contract No. 5.

Plate No. 11.—Laying Granite Block Pavement, Contract No. 10.

Plate No. 12.—Completed Tiling in North Tunnel, New York Approach, Contract No. 7.

Plate No. 13.—Tiled Refuge Niche, North Tunnel, New York, Contract No. 7.

Plate No. 14.—Land Ventilation Building, New York, Contract No. 13.

Plate No. 15.—Contractors' Average Week-Day Force.

Plate No. 16.—Tunnel Lining Erected in 1923, 1924 and 1925.

Plate No. 17.—Construction Progress.

Plate No. 18.—Plan and Profile.

Appendix.—Tabulation of Bids, Contracts Nos. 7, 9, 10, 12, 13, 14, 20 and 24.

December 31, 1925.

REPORT OF CHIEF ENGINEER

New York State Bridge and Tunnel Commission and New Jersey Interstate Bridge and Tunnel Commission:

GENTLEMEN—Submitted herewith is my report for the year 1925. Prior to March 24, 1925, the work of this year was under the direction of the late Milton H. Freeman, Chief Engineer of the Commissions.

The year 1925 was marked by the preparation and awarding of a large number of contracts, eight in all. These include the more important of the equipment and finish contracts, and were scheduled so that construction work under them could be started as soon as the progress under the earlier contracts would permit. The eight contracts involved the preparation of 347 contract drawings and the publishing of contracts and specifications comprising a total of 1252 pages of printed matter, all of which represents nearly twice the number of contract drawings and nearly 80 per cent of the printed matter contained in all previous construction contracts and extending over the preceding four years of tunnel construction. These contracts include tiling the tunnel walls, tunnel roadway pavement, ventilation fans and motors, electrical transformers and oil switches, tunnel power cables, pumping equipment, and the four buildings to house the ventilation equipment.

The work of constructing and equipping the Holland Tunnel is being done under twenty-three contracts. Six of them, namely, those comprising the tunnel structure proper, with the under ground portions of the approaches, had been let and prosecuted prior to 1925, one of which, Contract No. 1, for the land shafts, New York, had been fully completed and accepted by the Commissions and the final estimate approved.

Two of these six contracts were let in 1924, the one for the New Jersey approach from the westerly limit of the tube construction to the points where the tunnel meets the street surface; and the other for the New York approach from the portals to the easterly limits of the tunnel at its junction with the street grades. The outstanding feature of tunnel construction during 1924 was shield driving. With the exception of a comparatively short stretch in the north tunnel west, New Jersey, the bores of both tunnels were practically completed from their easterly limits at the land shafts, New York, to their westerly limits beyond the land shafts in New Jersey. The two shields in the north tunnel, one driven westward from New York and the other eastward from New Jersey, had been brought together in November. Those in the south tunnel were within 2.2 feet of each other on January 1, 1925. These were brought together and the compressed air was discontinued in the south tunnel on February 22, 1925. The last shove of a shield in any section of the tunnel occurred in the north tunnel west, New Jersey, on March 6, 1925, and compressed air was removed from this section on March 23, 1925.

During the year 1925, in addition to the preparation and awarding of contract work previously outlined, construction work on existing contracts continued and was begun on most of the contracts let this year.

These construction activities included completing, except for minor details, the under-river tunnel contracts, Nos. 3 and 4. The closer rings were placed at the junctions of the shields, most of the special connecting rings between the tunnels and the shafts were placed, and the concrete tunnel lining and interior construction, which had been started in 1924, were carried practically to completion. The placing of concrete necessitated the exercise of exceptional care and skill because of the smooth finish required for all air passages, the occurrence of niches of various sizes, manholes and other interior details which both complicate and interfere with the placing of forms. The small clearances, existing between the cast-iron flanges and the finished surfaces of the concrete lining, present further difficulties in concreting.

The construction work on the New York approaches, Contracts Nos. 5 and 5-A, including the completion of the tunnel structure and the restoration of numerous surface and subsurface structures, was carried to a point where there now remain only a few minor items of cleaning up to be done.

Early in the year, construction work was started under Contract No. 6. This contract is for the tunnel approaches, the foundations for the land ventilation building and the air duct construction between this building and the land shafts in New Jersey. By a coincidence, the use of compressed air required for the sinking of the thirty foundation caissons for the land ventilation building, New Jersey was started on the same day that the compressed air was removed from the last tunnel section, March 23, 1925. Compressed air has been used, with few interruptions, for this work throughout the year. The work under this contract carried both tunnels over and in close proximity to the tunnel structure of the Hudson & Manhattan R. R. in the Erie and D., L. & W. railroad yards. Special precautions had to be taken in prosecuting the work at these points so as to avoid damage to the Hudson & Manhattan tunnels, and in carrying out this work the full co-operation of the Chief Engineer of the Hudson & Manhattan R. R. Company has been accorded us.

The work under Contracts Nos. 3, 4, 5 and 5-A will be completed early in 1926, and work is now in progress on the preparation of the final estimates for all of these contracts. The construction work under Contract No. 6 is more than half done, and will be completed during the summer of 1926.

Work has been in progress on all of the eight contracts let this year, except the last two, No. 14, Ventilation Buildings, New Jersey, and No. 20, Tunnel Power Cables, which were awarded on December 22, 1925. Work under Contract No. 7, Tile and Tunnel Finish, has proceeded to a point where about 44% of the tile has been manufactured, and tile has been placed on the walls of the north tunnel from the portal almost to the river shaft, New York, and in the south tunnel from the portal half way to the land shaft, New York. Under Contract No. 10, Tunnel Roadway Pavement, work has been progressing rapidly, nearly one-half of the tunnel roadway has been paved with granite block, and a considerable quantity of granite block is on hand and will be laid as soon as the work of tunnel construction permits.

Construction plans of steel and concrete details and the checking of contractors' shop drawings have been in progress during the year for Contracts Nos. 3 to 7, inclusive, 9, 12 and 13. Work has been in progress on the preparation of contract plans and specifications for the remaining nine contracts, most of which will be let during the first half of 1926. Maps and descriptions were completed for lands still needed for tunnel plazas.

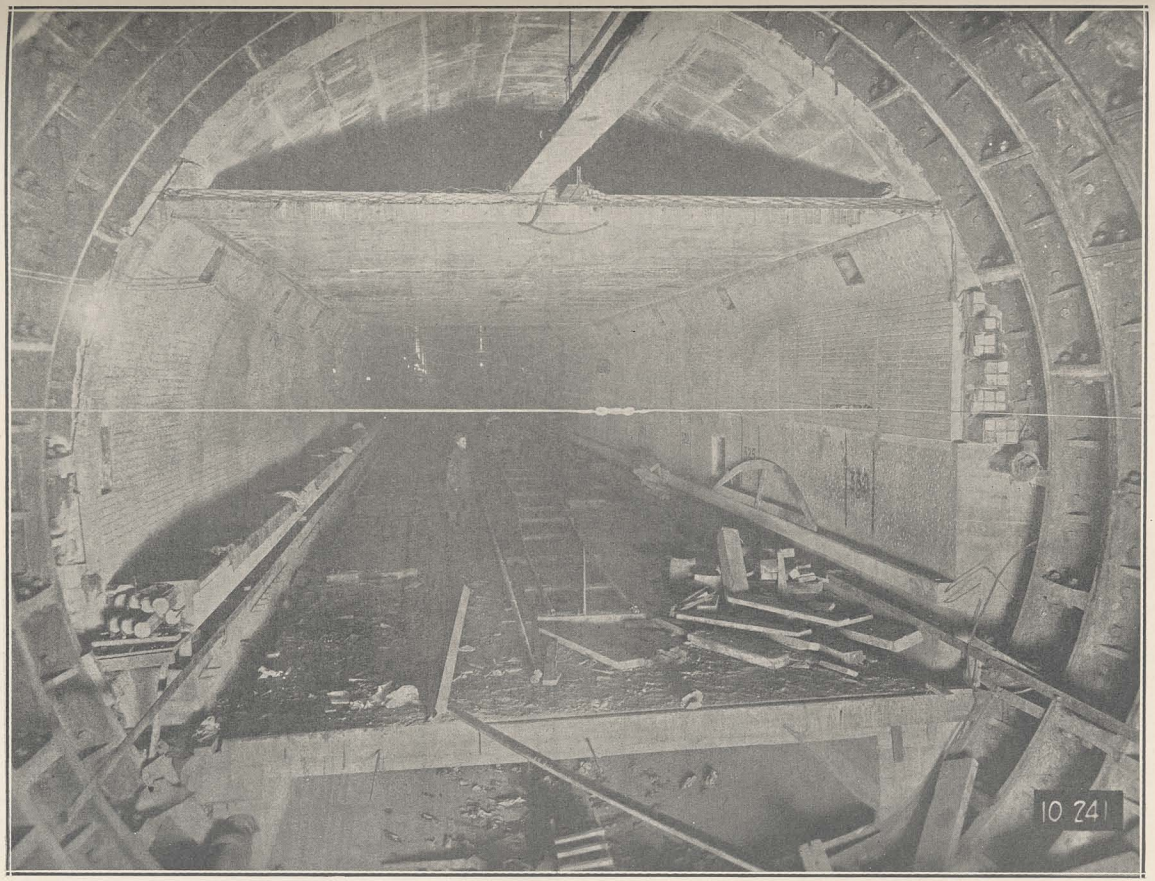


PLATE No. 1—Partially Completed Concrete Tunnel Lining in South Tunnel West, New Jersey, Showing Upper and Lower Air Ducts, Conduits and Concrete Details.

Studies and investigations have been continued on the architectural, mechanical and electrical features of the tunnel, protective coatings for steel, earth pressure on the tunnel lining and caissons, including physical properties of silt, and other subjects which aid in explaining tunnel movement phenomena.

The Contractor's plant and equipment in Canal Street, Spring Street, on the land shafts and on Pier 35, New York, were removed; the power house dismantled and the building razed, marking the completion of the work for which they had been installed. Nearly all the temporary clay blanket over the tunnels, 174,626 cubic yards, was removed from the river channel to conform with the requirements of the permit from the Secretary of War.

The lease from the City of New York for Pier 35 was terminated and a new lease was entered into for a 20-foot roadway over this pier to provide access, for construction purposes, to the river shaft. An agreement was negotiated with the Delaware, Lackawanna & Western Railroad Company for permanent and temporary rights-of-way in the Company's yards in Jersey City. Agreements were entered into with the Erie Railroad Company modifying the provisions for the support of warehouse loads on the air duct structure at the land shafts in the Erie Railroad yard; to provide four temporary pile clusters to serve as a protection for the New Jersey river shafts during the construction of the Erie Railroad pier around the shafts and over the tunnel and a lease was negotiated with the Erie Railroad Company for the rental of plant site in the Erie Railroad yard required for the prosecution of the construction of the ventilation buildings, New Jersey, under Contract No. 14.

Negotiations have been in progress with New York City and Jersey City relative to adjustment of street grades and other matters related to the paving of the plazas, and with the power companies on both sides of the river for the supply of electric power to operate the ventilation and other equipment of the tunnel.

The co-operation of the Fine Arts Commission of the State of New York was obtained and the final plans and architectural treatment of the ventilation buildings, New York, received the approval of that Commission.

Plans of the Erie Railroad Company for their new pier to be constructed over the tunnel and around the river shafts, New Jersey, were approved in accordance with the agreement between the Commissions and that Company. Work has been in progress on the construction by the railroad company of this pier and special precautions have been required to be taken by the Company to avoid damage to and undue displacement of the tunnel in the silt. This work has been carried on with the fullest co-operation between the Chief Engineer of the Erie Railroad Company and your Chief Engineer.

SCHEDULE OF CONSTRUCTION AND EQUIPMENT CONTRACTS

CONTRACTS LET PRIOR TO 1925

Contract	*Date of Delivery*	*Time in Mos.*	*Contractor's Bid*
No. 1. New York Land Shafts,	Oct. 7, 1920	12	$650,802.50
No. 3. New York River Tunnel and Shafts,	April 11, 1922	36	7,199,623.00
No. 4. New Jersey River and Land Tunnels and Shafts,	April 11, 1922	36	12,132,100.50
No. 5. New York Approach—Steel Concrete Section,	July 28, 1923	24	3,467,413.50
No. 5A. New York Approach—Open Section,	Dec. 13, 1924	10	301,312.25
No. 6. New Jersey Approach,	Dec. 17, 1924	18	2,582,969.25

CONTRACTS LET DURING 1925

Contract	Date of Delivery	Time in Mos.	Contractor's Bid
No. 7. Tile and Tunnel Finish,	May 6, 1925	16	$881,805.45
No. 9. Furnishing Power Transformers and Oil Switches,	July 31, 1925	11	298,166.00
No. 10. Tunnel Roadway Paving,	June 4, 1925	14	329,655.00
No. 12. Fans, Motors, Transmissions and Control,	Sept. 26, 1925	14½	571,631.00
No. 13. Ventilation Buildings and Interior Shaft Construction, New York,	Oct. 24, 1925	14	1,277,953.00
No. 14. Ventilation Buildings and Interior Shaft Construction, New Jersey,	Dec. 29, 1925	12	1,577,953.00
No. 20. Tunnel Power Cables,	*Dec. 22, 1925	10	128,670.00
No. 24. Pumping Equipment,	Oct. 26, 1925	6	37,700.00

CONTRACTS REMAINING TO BE LET

Contract	Contract to be Delivered	Contract to be Completed
No. 15. Architectural Work at Entrance, Exit and Plazas, New York,	No date set	No date set
No. 16. Architectural Work at Entrance, Exit and Plazas, New Jersey,	No date set	No date set
No. 17. Emergency Equipment Buildings, New York,	May 15, 1926	Jan. 15, 1927
No. 18. Emergency Equipment Buildings, New Jersey,	June 1, 1926	Feb. 1, 1927
No. 19. Lights, Traffic Signals, Supervising System, Tunnel and Plaza Wiring, etc.,	May 15, 1926	Jan. 15, 1927
No. 22. Emergency Trucks,	June 15, 1926	Dec. 15, 1926
No. 23. Plaza Pavement, New York,	April 1, 1926	Nov. 15, 1926
No. 25. Fire Extinguishers and Miscellaneous Equipment,	Aug. 15, 1926	Dec. 15, 1926
No. 26. Plaza Pavement, New Jersey,	Mar. 15, 1926	Nov. 15, 1926

II—CONSTRUCTION PROGRESS

Progress of construction is described in detail under the different contracts.

CONTRACTS NOS. 3 and 4

Contractor, ... Booth & Flinn, Limited
Date of Contracts, ... March 28, 1922
Date of Delivery of Contracts, ... April 11, 1922
Contract Time, ... Three Years

	Contract No. 3.	*Contract No. 4.*
Contract Bid Price,	$7,199,623.00	$12,132,100.50
Contract Bid Price plus estimated over-run,	7,649,623.00	
Estimated Value of Contract to date,	7,432,795.90	11,935,532.55

TUNNELING—

The shield driving in the portions of the tunnels to be built under Contract No. 3 was completed during 1924, but for reasons of convenience the New York shields were driven over the dividing line between the two contracts and the junctions of the New York and New Jersey shields were made within the limits of Contract No. 4. In the North Tunnel the last shove was made on December 9th, 1924, the compressed air was removed on

* Date awarded—not yet delivered.



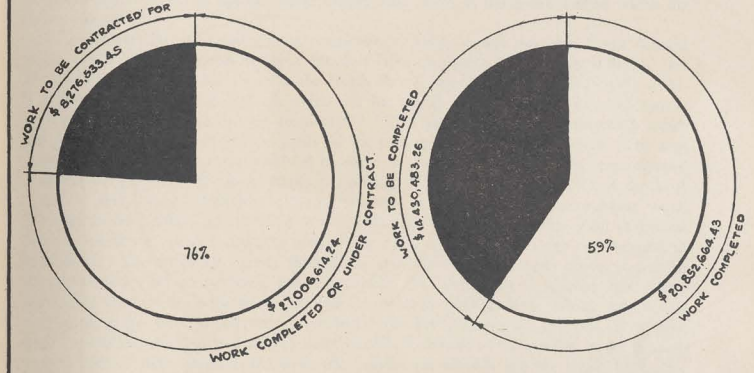
PLATE No. 2—Closer Ring at Junction of Shields, North Tunnel.

PLATE Nº 3

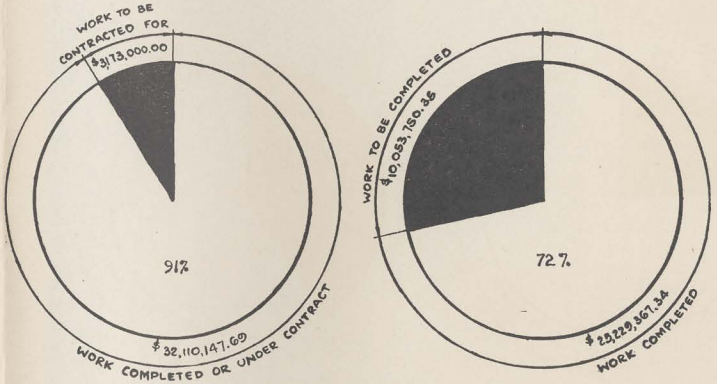
THE HOLLAND TUNNEL

CHART SHOWING

CONSTRUCTION PROGRESS DURING 1925



STATUS AS OF JANUARY 1, 1925.



STATUS AS OF DECEMBER 31, 1925.

	Nº OF CONTRACTS	AMOUNT
CONTRACTS AWARDED PRIOR TO JAN. 1, 1925.	6	$27,006,614.24
" " DURING YEAR 1925.	8	5,103,533.45
" YET TO BE AWARDED	9	3,173,000.00
TOTAL	23	$35,283,147.69
CONTRACTS COMPLETED & FINAL ESTIMATE APPROVED TO DATE	1	$643,105.24

DECEMBER 31, 1925.

PLATE No. 3—Construction Progress Chart.

January 3d, 1925, and the last regular cast-iron ring was erected on January 27th. In the South Tunnel the last shove was made on January 10th, 1925, the compressed air was removed on February 22d and the last regular ring was erected on February 28th. The two shields which met in each tunnel were dismantled, the outside cylindrical portions or "Skins" being left in place and the cast-iron lining erected inside them. The narrow space left between the last two rings erected in each tunnel was closed in the North Tunnel on June 30th, by means of a special cast-iron ring, where the space was considerable, and on or about March 15th, by special wedge shaped steel plates in the South Tunnel where the space was smaller.

In Contract No. 4 tunneling was completed in 1924, except for the North Tunnel West, which had been advanced about 610 feet from the North Land Shaft, with 172 feet still to be driven. The last shove in the North Tunnel West was made on March 6th, 1925. The nature of the material through which this last tunnel was progressing was such that it slowed down the rate of driving considerably. This tunnel shield passed diagonally under the 8-foot steel sewer in the Erie yards on the prolongation of Twelfth Street. The supporting material of this sewer consisted of stone fill, which had apparently been dumped here for the purpose. The large stones comprising this fill extended down for a depth of about 15 feet, below which was a 5-foot stratum of silt overlying fine running sand. The top of the heading was so close to the surface of the ground at this point that none but the lowest air pressure could be used. This made it impossible to dry out the sand in the bottom. The air escaped freely through the spaces between the stones above, so that an abnormally large air consumption was unavoidable. The shoving of the shield pushed stones up against the bottom of the sewer, heaving its invert as much as three feet in some places and allowing the water to pour into the tunnel. The low pressure air, gas and water lines under which the shield passed had to be by-passed on account of the heaving of the ground.

In spite of these obstacles the work was finished successfully and the tunnel built close to line and grade. Before taking the compressed air from the heading the Contractor constructed a sump of pea gravel under the shield, with the idea that this sump would help him in draining the ground for the section of the North Tunnel to the west of this work and included in Contract No. 6. Concrete cut-off walls were built under the north and south lower quarters of the cast-iron lining with a view to expediting the excavation for the North Tunnel under Contract No. 6.

SUMMARY OF PROGRESS IN NORTH TUNNEL WEST—NEW JERSEY

	Station	*Date*	*Time Days*	*Act. Work Days*	*Prog. Feet*	*Feet Work Day*
Shield erection begun,	.....	7/21/24	...	...	.....	...
Shield erection completed,	.....	9/2/24	43	36	.....	...
Compressed air applied,	.....	9/2/24	...	...	.....	...
Removal of west bulkhead of land shaft begun,	.....	9/2/24	...	...	.....	...
Removal of west bulkhead completed,	.....	9/9/24	7	6	.....	...
Shield advanced excavation begun,	24/24.9	9/10/24	1	1	.....	...
Iron erection begun,	24/28.0	9/11/24	1	1	.....	...
Iron erection completed,	16/42.5	3/5/25	175	145	785.5	6.7
Shield at end,	16/29.4	3/6/25	...	...	795.5	6.8
Compressed air removed,	.....	3/23/25	202	168	.....	...

Materials encountered were Hudson River silt, sand, gravel, clay, wooden piles and boulders.

CONCRETING TUNNEL LINING.

The conspicuous work of 1925 was lining the tunnel with concrete. Therefore this feature will receive more detailed treatment than in last year's report.

At the first of the year, under Contract No. 3, the concrete lining of the tunnel between the Land Shafts and the River Shafts, New York, was about 85% completed in the North Tunnel and 60% in the South Tunnel. No concreting had been done west of the River Shaft. Under Contract No. 4, the lining was begun in 1924 in the South Tunnel West and in the River Tunnels between the Land and River Shafts, New Jersey.

During 1925, under Contract No. 3, the concrete lining was completed except for a few tunnel rings at the River Sump and River Shaft, New York. High and low tension electric ducts were also placed. The tunnel was cleaned in preparation for the work of tile setting under Contract No. 7.

Under Contract No. 3, immediately following the lowering of the air pressure to normal in the North Tunnel, the demolishing of the concrete bulkhead and the removal of the air locks and equipment was begun. The corresponding bulkhead in the South Tunnel was removed later. The work of concreting was started in the North Tunnel at the New York River Shaft and proceeded westward, while simultaneously similar work was begun near the middle of the river and carried eastward. This concreting was in the portion of the tunnel below the sidewalk level.

Upon the completion of this portion of the lining in the North Tunnel, the forms used were transferred to the South Tunnel and the concreting accelerated by increasing the form length from 60 feet to 75 feet. Searching out and stopping leaks in the concrete, begun in the spring, had to be discontinued in the warmer months because of the water of condensation in the tunnel. This moisture, condensing upon concrete and exposed metal interfered with locating leaks as well as painting of metal surfaces. Resumption of this activity in the fall, however, permitted the Contractor to finish 1,000 feet of this tunnel ready for tile setting by the end of October last.

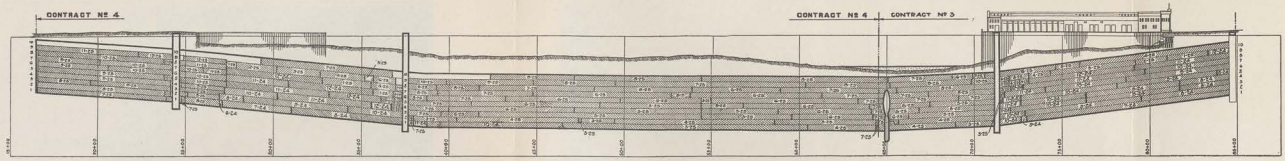
Under Contract No. 4, concreting in the South Tunnel West was begun at the western end and proceeded easterly toward the Land Shaft. Next the North Tunnel East, between the Land and River Shafts, was prepared for concreting. This last concrete work was started just east of the air lock bulkhead used for driving the North Tunnel West and then in place. The work in both North and South Tunnels East progressed from the Land Shafts eastward to the River Shafts, thus permitting the moving of the forms, except those for the ceiling slab, toward the mixer at the river shafts while transporting the concrete by an elevated trackway. Meanwhile forms were started at the middle of the river and progressed westward. The entire tunnel, under Contracts Nos. 3 and 4, has been lined with concrete except for a few rings at the west end of the South Tunnel West, New Jersey, and at the tunnels' junctions with the shafts, to permit the erection of special connecting rings and for joining the work more advantageously with that of future contracts. There also remains to be poured the concrete in approximately 140 feet of the roadway ceiling slab in various parts of the tunnels west of the River Shafts, New Jersey.



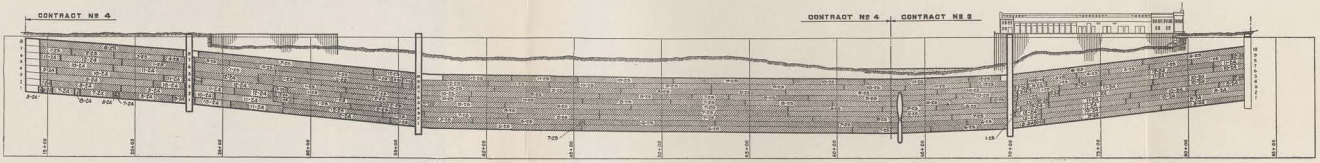
PLATE No. 4—General View of Operations West of Portal of North Tunnel, New Jersey.

NEW JERSEY

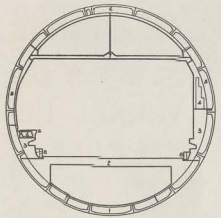
NEW YORK



NORTH TUNNEL



SOUTH TUNNEL



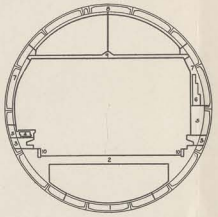
CONTRACT Nº 4
CONCRETING SCHEDULE

This method of Construction was used up to December 1924 after which the method used for Contract Nº 3 was adopted

THE HOLLAND TUNNEL

CONTRACTS Nos. 3 AND 4
CONCRETE TUNNEL LINING
PROGRESS PROFILES

DECEMBER 31, 1925



CONTRACT Nº 3
CONCRETING SCHEDULE

NEW YORK STATE
BRIDGE & TUNNEL COMMISSION
and
NEW JERSEY INTERSTATE
BRIDGE & TUNNEL COMMISSION

PLATE No. 5—Concreting Tunnel Lining.



PLATE No. 6—New Erie Railroad Pier, New Jersey. Looking East from Bulkhead.

Throughout the tunnel the iron was cleaned and caulked and made water tight, preparatory to concreting the lining. The placing of concrete, which was begun in 1924, was continued during 1925 with greater activity, as the Contractor was able to improve his organization and methods from his previous year's experience.

The arched portion of the tunnel, besides the usual difficulties of concreting as experienced in all tunnels, was particularly subject to most of the complications heretofore mentioned, and an attempt was therefore made to deposit this portion of the concrete lining, and later the ceiling slab, by blowing it into place with compressed air, but due principally to the scant clearances, this method did not prove satisfactory and hand shoveling was resumed. In the case of the ceiling slab the Contractor abandoned the method of blowing, because the general delays incidental to this method more than offset the speed of actual depositing.

MIXING AND TRANSPORTING—

The mixing plants were constructed in the river shaft caissons with timber bins for storage of aggregate placed above them. The cement storage was on the top of the shafts, convenient to barge shipment and the cement was conducted to the loading hoppers through pipes into the tops of which the bags were emptied. A track high enough to be out of the way of the progress of all forms except the arch form was hung from the top of the tunnel iron, over which elevated railway the concrete was delivered to the different parts of the tunnel. This railway was taken down after serving the arch form and concrete for the ceiling was delivered on a track laid on the completed roadway of the tunnel, and raised to the ceiling slab by means of an elevator at the point of deposit.

Specially designed collapsible concrete forms, 60 feet in length, carried on a movable steel frame, were employed in this work. There were five types of forms for the different parts of the lining.

Plate No. 5 will assist in what follows.

The procedure of concreting consisted of nine distinct steps, beginning, first, with the pouring of the invert concrete in the lower air duct. This was done without the use of a form. Second, Form No. 1 served from this point for the roadway slab, and the sides to the bottom of the expansion chambers. The third step, for which a detached portion of the No. 2 Form was used, brought the concrete to the high tension duct bench on the one side and to the nosing level on the opposite side. The fourth stage of the procedure consisted of laying the high tension ducts below the sidewalk level. Fifth, the No. 2 Form was employed to concrete the sidewalk on one side and the low tension duct bench on the opposite side of the roadway. The sixth stage comprised laying the low tension ducts and pouring concrete behind them. The seventh stage was carried on by Form No. 3, for side walls to the top of the ceiling slab level. Eighth, Form No. 4 serves for the arch concreting at the top. The ninth and last stage was the pouring of the ceiling slab for which Form No. 5 was put in place.

Subsequent to lining the tunnel with concrete the granite curb was laid and the space behind it concreted. Approximately 24,070 lineal feet of granite curb have been set, about 5,850 lineal feet still remaining to be placed.

Six days were required for the setting of the concrete in the ceiling slab before drawing the forms. In order to compensate for the resulting delay, the ceiling forms were lengthened from 60 to 120 feet.

MIDRIVER SUMP—

At the beginning of the year excavation for the sump had been practically completed. The concrete invert, sidewalls and pump chamber floor were placed. The cast-iron for the arch was erected and grouted, and also the special cast-steel taper ring at each end which joins the sump iron to the tunnel iron. A special ring at each end joins the cast-steel taper ring to the straight cast-iron sump rings. A certain amount of caulking and the lining of the arch with concrete remains to be done.

Just before the compressed air was removed from the North Tunnel, a temporary concrete bulkhead was built at the north end of the sump, sealing this sump opening. Compressed air was removed from the sump when taken off the South Tunnel. The concreting of the sump and pump chamber walls and bench had been completed by this time and the straight cast-iron roof rings of the pump chamber had been erected. A temporary waterproof seal was placed between the sump iron and the tunnel iron, so that compressed air could be removed before the special rings were made and placed.

LAND SHAFTS, NEW YORK—

Between the first of August and the latter part of October the roofs of the land shafts, New York, were completed.

REMOVAL OF CONTRACTOR'S PLANT, CONTRACT NO. 3—

Early in the year the overhead gantries in Spring and Canal Streets, New York, and the Contractor's equipment except the concrete mixers in the River Shaft, New York, were removed from the tunnel and from the top of the land shafts and the cages and head frames are now being removed from the River Shafts. The power-house on the Canal Street park site was dismantled, the building razed, concrete foundation removed, the sidewalks and roadway restored, and the Canal Street park graded. This included the bypassing of conduit, water and gas lines and the restoration of street surface. The Contractor removed his materials and equipment from Pier No. 35 and the pier was turned over to the City, the Contractor retaining the use of a portion of the west end and a 20-foot strip on the north side from West Street to the west end of the pier.

TEMPORARY CLAY BLANKET—

On August 19 dredging to remove the temporary clay blanket over the tunnels began, and by November 14 a total of 174,626 cubic yards had been removed toward bringing the river bottom in the 2,000-foot channel to the depth required by the War Department. Material dumped into the slip between Piers 34 and 35 was left in place by arrangement with the Department of Docks of the City of New York, as the City expects to build the new pier on this site during 1926.

Plate No. 7

TABLE OF DECOMPRESSIONS AT VARIOUS PRESSURES AND CASES OF COMPRESSED AIR ILLNESS (BENDS) UP TO DECEMBER 31, 1925

Pressure Lbs. per Sq. Inch	Contract No. 1 (New York) Completed				Contract No. 3 (New York) Completed						Contract No. 4 (New Jersey) Completed						Completed								Total Completed		Contract No. 6 Foundation Caissons		Grand Total	
	(North) Land Shaft Caisson		(South) Land Shaft Caisson		North Tunnel (Spring Street)		South Tunnel (Canal Street)		River Shaft Caisson		North Land Shaft Caisson		South Land Shaft Caisson		North River Shaft Caisson		South River Shaft Caisson		North Tunnel East		South Tunnel East		North Tunnel West		South Tunnel West							
	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends	Decompressions	Cases of bends
	Note No. 1		Note No. 1		Note No. 1		Note No. 1		Note No. 2		Note No. 1		Note No. 1		Note No. 2		Note No. 2		Note No. 1		Note No. 1		Note No. 1		Note No. 1				Note No. 2			
1	.....	.....	.....	.....	30	.....	179	.....	.....	.....	.....	.....	241	.....	113	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	209	.....	.....	.....	209	.....
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	200	.....	413	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	354	.....	33	.....	387	.....
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	182	.....	143	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	613	.....	163	.....	776	.....
4	264	.....	86	.....	28	.....	.....	.....	.....	.....	.....	.....	220	.....	215	.....	.....	.....	.....	.....	.....	.....	29	.....	.....	.....	741	.....	369	.....	1,110	.....
5	133	.....	.....	.....	11	.....	333	.....	248	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7,124	.....	2,455	.....	10,799	.....	256	.....	11,055	.....
6	110	.....	125	.....	154	.....	125	.....	.....	.....	241	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10,328	.....	2,729	.....	13,687	.....	220	.....	13,907	.....
7	245	.....	410	.....	.....	.....	106	.....	.....	.....	219	.....	111	.....	.....	.....	.....	.....	.....	.....	.....	.....	462	.....	5,579	.....	7,133	.....	260	.....	7,393	.....
8	.....	.....	123	.....	206	.....	184	.....	.....	.....	276	.....	333	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,640	.....	2,593	.....	6,355	.....	329	.....	6,684	.....
9	126	.....	.....	.....	256	.....	443	.....	.....	.....	42	.....	110	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,229	.....	4,466	.....	9,691	.....	268	.....	9,959	.....
10	231	.....	.....	.....	3,037	.....	695	.....	.....	.....	298	.....	244	.....	.....	.....	.....	.....	.....	.....	2,088	.....	3,008	.....	97	.....	9,668	.....	212	.....	9,910	.....
11	135	.....	146	.....	2,772	.....	1,152	.....	.....	.....	153	.....	333	.....	.....	.....	.....	.....	21	.....	.....	.....	3,842	.....	2,874	.....	11,428	.....	120	.....	11,548	.....
12	26	.....	.....	.....	4,861	.....	2,872	.....	.....	.....	237	.....	119	.....	37	.....	.....	.....	.....	.....	3,448	.....	5,105	.....	944	.....	17,679	.....	177	.....	17,856	.....
13	137	.....	145	.....	2,793	.....	1,797	.....	.....	.....	407	.....	338	.....	.....	.....	.....	.....	.....	.....	2,626	.....	108	.....	2,199	.....	10,550	.....	80	.....	10,630	.....
14	.....	.....	.....	.....	3,839	.....	2,021	.....	.....	.....	279	.....	407	.....	.....	.....	.....	.....	7,594	.....	5,592	.....	.....	.....	3,154	.....	22,086	.....	179	.....	22,265	.....
15	141	.....	.....	.....	5,623	.....	5,979	.....	.....	.....	307	.....	341	.....	.....	.....	58	.....	10,697	.....	11,931	.....	137	.....	1,382	.....	36,596	.....	84	.....	36,680	.....
16	.....	.....	.....	.....	7,466	.....	2,471	.....	388	.....	739	.....	.....	.....	.....	.....	60	.....	2,731	.....	2,515	.....	472	.....	723	1	17,545	1	56	.....	17,601	1
17	141	.....	142	.....	3,157	.....	3,747	.....	372	.....	768	.....	112	.....	115	.....	.....	.....	5,345	.....	2,168	.....	255	.....	444	.....	15,866	.....	73	.....	16,939	.....
18	.....	.....	.....	.....	5,134	.....	2,743	.....	.....	.....	98	.....	228	.....	344	.....	108	.....	5,115	2	2,502	.....	47	.....	.....	.....	16,321	2	19	.....	16,340	2
19	141	.....	277	.....	8,906	1	10,416	1	.....	.....	17	.....	93	.....	38	.....	443	.....	14,339	1	37,108	.....	.....	.....	100	.....	71,877	3	19	.....	71,896	3
20	143	.....	134	.....	15,601	.....	28,331	.....	413	.....	.....	.....	447	.....	314	.....	106	.....	42,767	6	15,291	.....	.....	.....	.....	.....	103,547	6	.....	.....	103,547	6
21	.....	.....	.....	.....	4,376	.....	3,168	.....	64	.....	.....	.....	246	.....	.....	.....	.....	.....	10,956	10	2,701	.....	.....	.....	.....	.....	21,511	10	.....	.....	21,511	10
22	921	.....	.....	.....	544	2	292	.....	913	.....	.....	.....	.....	.....	359	.....	112	.....	215	.....	.....	.....	.....	.....	.....	.....	3,356	2	39	.....	3,395	2
23	.....	.....	157	.....	242	.....	586	.....	2,086	.....	.....	.....	.....	.....	388	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,356	.....	48	.....	3,407	.....
24	.....	.....	.....	.....	905	4	556	.....	2,315	.....	.....	.....	.....	.....	377	.....	952	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,105	4	.....	.....	5,105	4
25	.....	.....	.....	.....	1,530	2	474	.....	5,337	5	17	.....	.....	.....	609	.....	311	.....	.....	.....	.....	.....	.....	.....	.....	.....	9,978	7	67	.....	10,045	7
26	.....	.....	56	.....	6,039	3	4,453	5	1,183	3	115	.....	154	.....	176	.....	367	.....	409	.....	.....	.....	.....	.....	.....	.....	13,859	11	30	.....	13,889	11
27	.....	.....	553	4	8,624	13	6,830	16	487	.....	284	4	.....	.....	636	3	.....	.....	356	1	274	2	.....	.....	.....	.....	18,124	43	103	1	18,227	44
28	.....	.....	.....	.....	18,771	16	5,838	13	.....	.....	333	9	132	.....	295	1	.....	.....	4,462	14	1,395	4	.....	.....	.....	.....	34,036	54	288	.....	34,324	54
29	.....	.....	.....	.....	56,173	71	89,472	161	.....	.....	.....	.....	388	2	945	.....	677	2	14,416	31	15,074	23	.....	.....	.....	.....	175,145	280	256	1	175,401	291
30	.....	.....	.....	.....	359	.....	530	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,034	1	385	.....	.....	.....	.....	.....	2,308	1	67	.....	2,375	1
31	.....	.....	.....	.....	397	1	552	.....	.....	.....	.....	.....	.....	.....	127	.....	602	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,676	1	77	.....	1,755	1
32	.....	.....	.....	.....	2,084	3	.....	.....	.....	.....	.....	.....	.....	.....	127	.....	.....	.....	3,740	7	3,114	6	.....	.....	.....	.....	9,074	16	61	.....	9,135	16
33	.....	.....	.....	.....	.....	.....	971	2	.....	.....	.....	.....	.....	.....	.....	.....	152	.....	12,979	21	1,073	.....	.....	.....	.....	.....	15,175	23	81	1	15,256	24
34	.....	.....	.....	.....	.....	.....	8,739	9	.....	.....	.....	.....	.....	.....	158	.....	.....	.....	5,352	7	15,122	12	.....	.....	.....	.....	29,371	28	125	.....	29,496	28
35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	339	2	339	2
36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	179	.....	755	.....	379	.....	.....	.....	.....	.....	.....	.....	1,313	.....	253	.....	1,566	.....
37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	186	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	186	.....	145	.....	344	.....
38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	749	.....	.....	.....	.....	.....	.....	.....	.....	.....	749	.....	.....	.....	749	.....
39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
41	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	290	1	378	.....	.....	.....	.....	.....	.....	.....	.....	.....	568	1	.....	.....	568	1
42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	503	2	301	.....	.....	.....	.....	.....	.....	.....	.....	.....	853	2	.....	.....	853	2
43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	352	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	352	2	.....	.....	352	2
44	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
46	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,178	13	2,257	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,435	13	.....	.....	5,435	13
47	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33	1	1,641	2	.....	.....	.....	.....	.....	.....	.....	.....	1,674	3	.....	.....	1,674	3
Total	2,904	.....	2,238	4	164,818	116	113,804	207	14,991	8	5,602	10	5,219	2	9,817	23	10,428	4	142,629	101	125,517	47	37,886	.....	29,740	1	740,983	523	4,899	5	745,882	528

Note No. 1
Pressure, Hours of Work, Etc., Caisson & Tunnel Construction

Pressure	Work	Rest	Work
0-21	4	½	3½
21-30	3	3	3
30-35	2	4	2

Note Nos. 1 and 2
Time of Decompression

Pressure	
1-15 lbs.	3 lbs. per min.
15-20 lbs.	2 lbs. per min.
20-30 lbs.	3 lbs. per 2 mins.
30 lbs. up	1 lb. per min.

Note No. 2
Pressure, Hours of Work, Etc., Caisson Construction

Pressure	Work	Rest	Work
0-18	4	½	3½
18-26	3	3	3
26-33	2	4	2
33-38	1½	5	1½
38-43	1	5	1
43-48	¾	5	¾

Note No. 1
Pressure, Hours of Work, Etc., Caisson & Tunnel Construction

Pressure	Work	Rest	Work
0-21	4	½	3½
21-30	3	3	3
30-35	2	4	2

Note Nos. 1 and 2
Time of Decompression

Pressure	
1-15 lbs.	3 lbs. per min.
15-20 lbs.	2 lbs. per min.
20-30 lbs.	3 lbs. per 2 mins.
30 lbs. up	1 lb. per min.

Note No. 2
Pressure, Hours of Work, Etc., Caisson Construction

Pressure	Work	Rest	Work
0-13	6	½	3½
18-26	3	3	3
26-33	2	4	2
33-38	1½	5	1½
38-43	1	5	1
43-48	¾	5	¾

...ishing. There remained principally the erection of steel and placing of waterproofing

ERIE PIER—

On the Jersey side, Piers Nos. 8 and 9 of the Erie Railroad were demolished during the summer and dredging for the new Erie pier completed. On August 13th the driving of piles for the new pier over the North and South tunnels was begun. Timber piles 85 to 110 feet in length are being driven closely together from the river bulkhead to the pierhead line in three groups, one group north of the North Tunnel, one between the two tunnels and the third south of the South Tunnel. The total number of piles required is 8,686, of which 65% have been driven to date. Daily surveys and close inspection accompany the driving of these piles to observe the effect upon the tunnels. As the piles drop of their own weight through the silt to the spring line of the tunnel or below it, the chance of driving a pile against the outside of the tunnel is remote. But there has been observed some vertical movement of the tunnel together with some lateral movement. By careful control of the order of driving in the three different groups, the lateral motion of the tunnel has been kept within two inches. During the pile driving the tunnel rises for a length extending back of the pile driver about half-way to the bulkhead, and then settles gradually. The maximum rise has not exceeded four and one-half inches to date, and subsequent settlement has reduced this amount to about two and one-half inches. The removal of the old piers and construction of the new is being done by contractors for the Erie Railroad Company.

The demolition of the working platform constructed by the Contractor for Contract No. 4, in 1922, around the site of the river shafts, was begun in November and has been completed so as to permit the construction of the new pier about the river shafts.

CONTRACT NO. 5

Contractor	Rodgers & Hagerty, Inc.
Date of Contract	July 17, 1923
Date of Delivery of Contract	July 28, 1923
Contract Time	Two Years
Contract Bid Price	$3,467,413.50
Estimated Value of Contract to Date	$3,294,785.57

The work under this contract included the construction of two tunnels, one beginning at the shaft in Canal Street, and extending eastward under Canal Street to the east side of Hudson Street, and the other beginning at the shaft in Spring Street and extending eastward in Spring Street to Hudson Street, thence curving southward to the north side of Dominick Street. The work also included the foundations for the Ventilation Building on the west side of Washington Street between Canal Street and Spring Street, the construction of ventilation ducts between the Canal Street and Spring Street shafts and the Ventilation Building, and the removal of certain buildings.

The tunnel structure in general is of steel bent and concrete construction. The actual work under this contract was successfully completed during the year, except for a few minor items of cleaning up. The north structure was practically completed in the previous year, together with a portion of the south structure and the excavation for the Ventilation Building. There remained, principally, the erection of steel and placing of waterproofing and concrete for the foundation and basement of the Ventilation Building on Washington

Mary Jo Caffrey

Street; the completion of concreting and waterproofing of the south structure and the restoration of subsurface structures interfered with during the work of tunnel construction.

In general, the Contractor's methods and the chief difficulties encountered in the prosecution of the work were described in the last report. No additional difficulties were met with, except for a break in the bottom of the 16-foot Canal Street sewer at Washington Street, which occurred on February 7th, and caused the flooding of both tunnels east of the shafts, resulting in delaying the work about one week.

The restoration of subsurface structures involved considerable work, since, in addition to the Contractor's obligation to replace structures to their original condition, many changes were required on account of interference with the tunnel structure. Plate No. 10 illustrates in part the condition encountered at Spring and Hudson Streets and is typical of conditions met elsewhere.

In order to provide adequate protection against fires which may occur in the tunnel or Ventilation Building, a separate system of six-inch water mains is provided. These were laid along Canal, Washington and Spring Streets and in the Ventilation Building. The water pipe was placed in the streets instead of within the tunnel structure, wherever practicable, to prevent freezing. They are interconnected and tap the city mains at three different points to insure a supply of water at all times. These independent mains are connected to the tunnel at intervals of about 120 feet, where hose connections are provided.

The construction of new sewers was required in Desbrosses, Hudson, Canal and Spring Streets. These varied in size from 15-inch vitrified pipe to two feet eight inches by four feet six inches, egg-shaped concrete sewers cast in place and, with the exception of the Desbrosses Street sewer and that on the north side of Spring Street between Greenwich and Washington Streets, were located under the sidewalks.

The raising of Hudson Street from Vestry to Watts Street, and Canal Street from Watts Street to about 200 feet east of Hudson Street, was accomplished with but minor inconvenience to the public, the work being done in sections as far as possible in order to permit operation of traffic.

Finally, the Contractor's plant was entirely removed and the tunnel cleared and cleaned for the use of other Contractors, especially in preparation for the setting of tile under Contract No. 7, and the roadway paving under Contract No. 10.

The work of preparing the final estimate for this Contract is now under way.

CONTRACT No. 5-A

Contractor	Rodgers & Hagerty, Inc.
Date of Contract	November 25, 1924
Date of Delivery of Contract	December 13, 1924
Contract Time	10 months
Contract Bid Price	$301,312.25
Estimated Value of Contract to Date	$259,260.18

The work under this Contract comprised the construction of two approaches in open cut, including a short stretch of subway construction, one beginning at the tunnel portal in Canal Street near the east side of Hudson Street, and extending eastward along Canal Street to grade at the west side of Varick Street, and the other beginning at the north side of Dominick Street and extending under Dominick Street to the northerly building line of Broome

Street. This Contract also included the retaining walls and backfill necessary for raising the grades of Dominick Street and the extension of manholes up to the new grades.

The tunnel structure under Dominick Street is of steel bent and concrete construction. The open approaches are of reinforced concrete, with provisions for securing a facing of granite masonry to be included in a future contract.

The actual construction work under this Contract was completed according to schedule. A small amount of cleaning up remains to be done.

Excavation for the north approach was begun on March 9th and for the south approach on April 27th. Steam shovels were used on both sections, being supplemented at Dominick Street by a derrick operating an orange peel bucket, and by a locomotive crane on the south approach using a similar bucket. New sewers were built in Varick and Dominick Streets and on the south side of the structure along Canal Street. Ground water was encountered in the excavation for the north approach, but was easily taken care of by subdrains leading to a sump.

The buildings at Nos. 38 and 46 Dominick Street located on each side of the cut, were required to be underpinned, as well as No. 576 Broome Street.

The roof of the tunnel crossing Dominick Street was required to be built above the existing street grade, thereby necessitating the raising of the street about 5½ feet, dropping to the old grades at Hudson and Varick Streets. This grade change entailed the altering of all the areaways and stoops as well as the raising of a gas main and electric conduits. To insure sufficient water supply for the tunnel service a new 12-inch main was laid from Hudson Street to Varick Street, replacing the old 6-inch main.

By agreement between the city of New York and the Commissions, a new granite curb was placed to the new grade on the south side of Canal Street from Hudson to Varick Streets, the new street pavement being provided by the city.

The Contractor has removed his plant and, except for a few minor items of cleaning up, has left it in an acceptable condition for the use of other contractors.

The work of preparing the final estimate for this Contract is now under way.

CONTRACT No. 6

Contractor	Booth & Flinn, Limited
Date of Contract	November 25, 1924
Date of Delivery of Contract	December 17, 1924
Contract Time	Eighteen Months
Contract Bid Price	$2,582,969.75
Estimated Value of Contract to Date	$1,396,412.23

This Contract provides for the construction of two tunnels westward from the ends of the cast-iron tunnels constructed under Contract No. 4, about 1,000 feet west of the river bulkhead in the Erie and Delaware, Lackawanna & Western railroad yards, Jersey City. The north tunnel consists of a covered section, 675 feet long, constructed of steel bents and concrete, passing under the Delaware, Lackawanna & Western railroad yards, and an open approach section, 470 feet long, terminating at grade in Fourteenth Street at the east side of Provost Street, Jersey City. The south tunnel consists of a covered section, also of steel bents and concrete, 400 feet long, and an open approach section of reinforced con-

crete, 513 feet long, terminating in Twelfth Street at the east side of Provost Street. In addition to the tunnels, this Contract includes the construction of air ducts below the surface of the ground in the vicinity of the New Jersey land shafts and the sinking of thirty small caissons in the same locality for foundations for these and for the Land Ventilation Building. The tunnel construction necessitates the reconstruction and relocation of several large sewers in the vicinity of the entrance and the exit.

During the year 1924 and in the early part of 1925, the Erie Railroad cleared a certain part of their yards to accommodate the construction of the south tunnel. Similar work was begun by the Lackawanna Railroad December 9, 1924, and completed January 29, 1925.

SOUTH TUNNEL—

A program for the construction of the south tunnel was decided upon in conference with the Erie Railroad with a view to allowing the railroad to operate trains on certain essential sidings. This program called for immediate work on the covered section, the part west of the portal being postponed until the covered section was completed. One track is to be maintained over the cut near the east end. This track is supported on timber piles that will carry it until the steel bents have been placed for the tunnel, after which the load will be transferred to the tunnel.

Excavation was begun March 13, 1925, with a dragline, a cut of about ten feet being made. This was followed by driving wood sheeting and placing its bracing. Derricks were erected at the sides of the cut and excavation continued to subgrade. At the east end of the Contract the cut reaches its greatest depth. Here steel sheeting was driven from the surface of the ground to about five feet below subgrade before excavation was begun.

The presence of the tunnel of the Hudson & Manhattan Railroad close under the subgrade of our structure required special precautions in driving sheeting and in pumping operations to reduce to a minimum the disturbance of the ground around the tunnel. Surveys at regular intervals have been made in co-operation with the engineers of the Hudson & Manhattan Railroad to watch for any movement in their structure.

The deeper excavations presented difficulties in drainage. The material encountered was cinders and other fill for a depth of ten feet from the surface and below this, a stratum of silt about fifteen feet deep. Under the silt is a fine quicksand, the drainage of which necessitated the exercise of utmost care. A sump constructed of steel sheeting driven to a depth of twelve feet below subgrade was built before general excavation was begun. As soon as the sand was reached in the sump, it boiled up. No pumping device attempted served to remove the water without the sand. However, by sinking a number of sumps, each one only a few feet below the depth to which the general excavation had advanced, the water was eventually drained off and the excavation was completed without the surrounding structures or the tunnel structure suffering settlement or other disturbances.

The progress to date in the steel bent and concrete covered section of the south tunnel may be summarized as follows:

Excavation 100% complete, steel 77% erected and 75% riveted, concrete 65% complete. The 8-foot steel sewer, located in Twelfth Street, has been reconstructed in a new position to avoid interference with the tunnel. The reinforced concrete bulkhead, constructed under Contract No. 4, at the west end of the cast-iron tunnel, has been removed and a wood-and-mud bulkhead built in the tunnel as a safeguard against flooding.

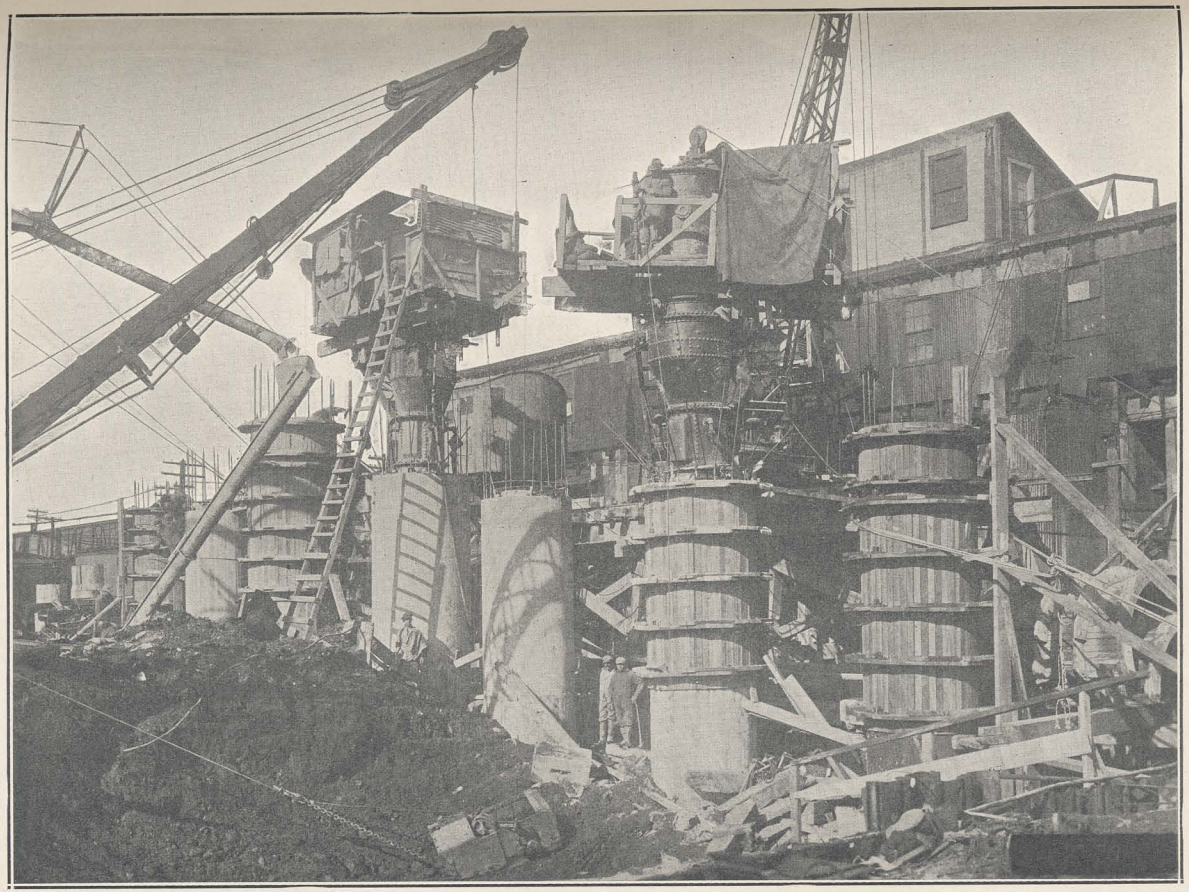


PLATE No. 8—Caisson Sinking Operations for Foundation for Land Ventilation Building, New Jersey. Contract No. 6.

The Erie Railroad shops on the south side of Twelfth Street east of Provost Street have been underpinned with steel cylinders filled with concrete.

NORTH TUNNEL—

The Contractor began excavation for the open approach of the north tunnel on April 15, 1925. A five-foot steel sewer located in Thirteenth Street and a five-foot six-inch steel sewer running south on Provost Street from Fifteenth to Thirteenth Street and turning there into Thirteenth Street, were reconstructed in new positions lying north of the north tunnel. The five-foot six-inch steel sewer carries water from the higher section of Jersey City, west of the Palisades formation, and is under a heavy pressure in a rainstorm. Special by-passes of three-foot diameter pipe instead of the usual open flumes were employed during construction. The relocation of the five-foot sanitary sewer has presented no special difficulty. An abandoned section of the five-foot six-inch sewer, 200 feet long, was again put in service and thus utilized in the reconstruction of the five-foot sewer.

Excavation for the open approach section of the north tunnel was carried on simultaneously with the sewer work. The greater part of this section was excavated without sheeting. After digging through the filled-in ground that underlies this part of Jersey City, a material composed of partly decayed roots and grasses was encountered. This was deemed to be an unsatisfactory foundation for the tunnel structure and so wooden piles were driven for a length of 280 feet of the tunnel.

The construction of the reinforced concrete roadway and retaining walls has been carried forward rapidly. West of the portal, excavation is now practically complete and 90% of the concrete is poured.

Excavation for the covered section of the north tunnel was delayed pending protracted negotiations among the Commissions, the Contractor, the Lackawanna Railroad Company and the receivers of the Philippine Vegetable Oil Company, over arrangements for providing facilities for the operation of the Oil Company's plant. This plant has been closed down for some time. The negotiations resulted in an agreement whereby the Railroad Company took over the Oil Company's lease and the Contractor was allowed to undertake construction without the necessity of maintaining the plant in a condition for operation.

As in the south tunnel, the first step was the digging of a trench by dragline methods. Sheeting and bracing the excavation followed immediately. The part of the covered section of tunnel attacked did not include the east end, since the location of the eight-foot steel sewer here interfered. The by-passing of the sewer could not be undertaken at that time without cutting off access to the work in the vicinity of the land shafts. The west end also had to be left untouched until the relocation of the large sewers on Thirteenth Street had been completed.

Where work has been in progress, the draining of the fine sand encountered under the silt presented the same difficulties as in the south tunnel. The surrounding ground has proved very unstable, and movements causing damage to sheeting and timbering have had to be overcome. Work is now well under way. Excavation of the steel bent and concrete covered section is 58% complete, 34% of the steel has been erected, practically all of which is riveted, and 12% of the concrete has been poured.

AIR DUCT STRUCTURE

Large air ducts and other passageways are to connect the land shafts with the site of the Ventilation Building. These ducts are all below the surface of the ground. Thirty concrete foundation caissons and about three hundred timber piles form the foundation for the air duct structure, the Ventilation Building, and certain structures to be constructed by the Erie Railroad Company.

Sinking of these caissons was started January 20, 1925. Up to the present time, eight caissons have been put down to bedrock, and all but six of the remaining ones are under way. Certain of these caissons go down through an old crib filled with riprap and now completely covered over by filled-in ground. Compressed air was used on these cylinders during the time that the cutting edges were passing through the crib. Other caissons encountered nothing but filled-in material and silt. These latter were sunk by excavating with a small orange-peel bucket in normal air. At about elevation 228 the cutting edges entered the stratum of sand, gravel and boulders overlying bedrock. Air locks were then put on and the remainder of the sinking done under compressed air, as required by the Contract, with pressures up to 37 pounds per square inch. Bedrock, which is serpentine, was met at various elevations between 205 and 212.

The caissons are reinforced concrete cylinders of from five-foot to six-foot six-inch diameter. The working chambers are of steel. The caissons were all sealed with concrete to the rock under compressed air and in most instances the sealing and the filling of their interiors with concrete were done in one operation, the air pressure being gradually reduced as the column of concrete was poured. The cylinders were relatively light so that they were sunk by jetting and weighting with pig iron. In some cases the skin friction was broken by raising the air pressure beyond that actually required for the given depth to cause the air to blow out around the cutting edge. This procedure was effective but rendered the ground above porous, thereby making it difficult to hold the air during later sinking.

Excavation for the air ducts and Land Ventilation Building has been partly completed. In the chamber east of the land shafts, the erection of steel and pouring of concrete is well under way. West of the land shafts foundation piles have been driven, and the six-inch base of concrete has been poured and ply-waterproofing applied. In the area between the site of the Land Ventilation Building and the north land shaft, driving of foundation piles is progressing.

All concrete for the north and south tunnels is mixed in a central plant. Fine and coarse aggregates are raised to elevated bins in bucket elevators. Bags of cement reach the mixer platform on an endless belt. The inundation method of sand and water measurement is being used with excellent results. Mixed concrete is transported to various parts of the job in Ford trucks. Concrete for the caissons and the air ducts is mixed at a second plant and is distributed from a tower by a chuting system.



PLATE No. 9—Steelwork in Steel Bent and Concrete Section of South Tunnel, New Jersey. Contract No. 6.

CONTRACT Nº 7
NEW YORK STATE BRIDGE AND TUNNEL COMMISSION
AND
NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION
THE HOLLAND TUNNEL
CANVASS OF BIDS RECEIVED APRIL 7 1925.

ITEM	CLASSIFICATION	UNIT	QUANITY	L. DEL TURCO & BROS INC. PRICE	L. DEL TURCO & BROS INC. AMOUNT	RODGERS & HAGERTY INC. PRICE	RODGERS & HAGERTY INC. AMOUNT	DOOLEY STAPLETON CORP. PRICE	DOOLEY STAPLETON CORP. AMOUNT	FREDERICK SNARE CORP. PRICE	FREDERICK SNARE CORP. AMOUNT	ALEXANDER & REID CO. PRICE	ALEXANDER & REID CO. AMOUNT	ENGINEER'S ESTIMATE PRICE	ENGINEER'S ESTIMATE AMOUNT
26-a	Cement cove for tiled walls	Lin.Ft.	34000	20	6800 00	11¼	3910 00	11	3740 00	22	7480 00	11	3740 00	20	6800 00
-b	" base without gutter	"	17000	15	2550 00	12½	2125 00	12	2040 00	22	3740 00	12	2040 00	20	3400 00
-c	" " with "	"	17000	30	5100 00	25	4250 00	24½	4165 00	33	5610 00	26	4250 00	30	5100 00
37	Hollow tile masonry	Cu.Yd.	270	45 00	12150 00	50 00	13500 00	43 00	11610 00	45 00	12150 00	30 80	8316 00	40 00	10800 00
86-h	Galvanized steel boxes for type A sand niches	Each	57	22 00	1254 00	23 00	1311 00	27 50	1567 50	23 00	1311 00	85 00	4845 00	70 00	3990 00
-i	" " " " " B " "	"	26	44 00	1144 00	48 50	1261 00	21 00	546 00	47 00	1222 00	90 00	2340 00	50 00	1300 00
-b	" " " BDE3 " " " " " "	"	196	6 30	1234 80	6 10	1195 60	4 50	882 00	6 00	1176 00	10 30	2018 80	3 00	588 00
-c	" " " C6 " " " " " "	"	422	8 30	4000 60	8 40	4048 80	5 50	2651 00	8 50	4097 00	7 40	3566 80	4 00	1928 00
-c	" " " C6 " " " " " "	"	116	10 30	1194 80	10 70	1241 20	8 40	974 40	10 50	1218 00	15 00	1740 00	8 00	928 00
-d	" " " D4 " " " " " "	"	222	9 00	1998 00	9 30	2062 60	5 40	1198 80	9 00	1998 00	9 25	2053 50	5 50	1221 00
-e	" " " D5 " " " " " "	"	222	9 60	2131 20	9 90	2197 80	6 60	1465 20	9 50	2109 00	9 80	2175 60	6 75	1498 50
-f	" " " D8 " " " " " "	"	1310	10 20	13362 00	10 60	13886 00	7 50	9825 00	10 50	13755 00	10 40	13624 00	8 00	10480 00
-g	" ceiling plates, type B3, with fastenings	"	100	9 00	981 00	9 20	1002 80	7 50	817 50	9 00	981 00	11 25	1226 25	5 25	572 25
95-d	Cast-iron relay boxes type A	"	32	39 00	1248 00	40 00	1280 00	16 700	534 40	15 00	2400 00	56 50	1808 00	75 00	2400 00
-e	" " " " B	"	12	42 00	504 00	40 00	480 00	16 400	196 80	90 00	1080 00	51 30	615 60	85 00	1020 00
-f	" " fire alarm and telephone boxes	"	88	100 00	8800 00	40 00	3520 00	37 00	3256 00	24 00	2112 00	17 65	1553 20	50 00	4400 00
-g	" frames for air outlets at refuge niches	"	64	4 00	256 00	20 00	1280 00	3 80	243 20	20 00	1280 00	5 20	332 80	4 00	256 00
108-a	Applying neutralizing wash to ceiling	100 Sq.Ft.	37 50	1 25	46 87 50	60	2250 00	48	1800 00	1 00	3750 00	70	2625 00	2 00	7500 00
-b	" each coat of paint " "	"	75 00	1 50	112 50 00	75	5625 00	66	4950 00	1 40	10500 00	1 40	10500 00	2 00	15000 00
108-c	Double bronze doors for gate valve and cleanout niches	Set	36	187 00	6552 00	305 00	10980 00	198 00	7128 00	310 00	11160 00	450 00	16200 00	18 500	6660 00
-d	Single " " " fire alarm or telephone niches	Each	88	17 50	1540 00	40 00	3520 00	18 15	1597 20	50 00	4400 00	33 00	2904 00	20 00	1760 00
-e	" " " type A fire extinguisher "	"	127	61 25	7778 75	142 00	18034 00	66 25	8413 75	140 00	17780 00	240 00	30480 00	45 00	5715 00
-f	Double " " " B " "	Set	39	143 00	5577 00	208 00	8112 00	155 10	6049 00	300 00	11700 00	360 00	14040 00	165 00	6435 00
-g	" " " " C " "	"	39	130 00	5070 00	264 00	10296 00	140 80	5491 20	265 00	10335 00	335 00	13065 00	120 00	4680 00
-h	Four-door set for large low tension splicing chambers (tunnel)	"	32	425 00	13600 00	801 00	25632 00	462 00	14784 00	800 00	25600 00	1475 00	47200 00	600 00	19200 00
-i	Two-panel " " small " " "	"	26	160 00	4160 00	337 00	8762 00	175 00	4550 00	325 00	8450 00	410 00	10660 00	175 00	4550 00
-j	Bronze doors of L.T. splicing chambers (shafts) and misc. bronze	Lb	15000	72	10800 00	1 25	18750 00	1 17	17550 00	1 55	23250 00	1 52	23400 00	1 00	15000 00
-k	Single bronze doors for relay boxes	Each	44	53 25	2343 00	106 00	4664 00	57 50	2530 00	195 00	8580 00	87 50	3850 00	100 00	4400 00
-l	Double " " " " type A sand niches	Set	57	200 00	11400 00	325 00	18525 00	218 00	12477 30	340 00	19380 00	560 00	31920 00	200 00	11400 00
-m	" " " " " B " "	"	26	207 00	5382 00	332 00	9932 00	225 50	5863 00	370 00	9620 00	435 00	11310 00	270 00	7020 00
-n	" " " " pump niches	"	4	193 00	772 00	283 00	1132 00	210 65	842 60	280 00	1120 00	452 00	1808 00	175 00	700 00
-o	" " " type A fire hose niches	"	116	141 00	16356 00	236 00	27376 00	153 33	17714 68	230 00	26680 00	422 50	49010 00	90 00	10440 00
-p	" " " " B " "	"	25	131 00	3275 00	230 00	5750 00	142 38	3558 75	220 00	5500 00	422 50	10562 50	100 00	2500 00
-q	Single " " " A flushing "	Each	116	30 00	3480 00	110 00	12760 00	38 10	3723 60	100 00	11600 00	160 00	18560 00	30 00	3480 00
-r	" " " B " "	"	25	31 00	775 00	110 00	2750 00	33 18	831 75	100 00	2500 00	180 00	4500 00	30 00	750 00
-s	" " to pump room & H.T. splicing chambers (shafts)	"	10	178 00	1780 00	202 00	2020 00	187 00	1870 00	300 00	3000 00	350 00	3500 00	250 00	2500 00
-t	" " for light boxes	"	1774	17 00	30158 00	26 00	46124 00	17 80	31222 40	40 00	70960 00	24 75	43906 50	5 500	97570 00
-u	Double " " " single air duct manholes	Set	6	122 00	732 00	234 00	1404 00	132 00	792 00	220 00	1320 00	422 50	2535 00	85 00	510 00
-v	Bronze screens, type A6 for exhaust air ports	Each	196	11 00	2156 00	10 50	2058 00	10 38	2030 56	17 00	3332 00	12 50	2450 00	11 00	2156 00
-w	" " " BE3-2 " " " "	"	215	11 00	2365 00	7 90	1698 50	11 10	2386 50	15 00	3225 00	10 50	2257 50	8 00	1720 00
-x	" " " B3-3 " " " "	"	100	19 00	1900 00	15 50	1550 00	13 72	1905 48	16 00	1600 00	10 50	1144 50	8 00	872 00
-y	" " " C6 " " " "	"	116	26 00	3128 32	16 50	1914 00	23 57	3514 12	30 00	3480 00	20 50	2378 00	18 00	2088 00
-z	" " " D3 " " " "	"	158	10 57	1670 06	7 70	1216 60	10 52	1662 16	12 00	1896 00	9 00	1422 00	8 00	1264 00
-aa	" " " D4 " " " "	"	222	15 62	3467 64	9 30	2064 60	16 05	3564 76	17 00	3774 00	12 50	2775 00	10 60	2331 00
-ab	" " " D8 " " " "	"	222	19 13	4246 86	12 00	2664 00	20 00	4440 00	20 00	4440 00	14 50	3219 00	13 00	2886 00
-ac	" " " D6 " " " "	"	1310	22 64	29653 40	15 00	19650 00	23 80	31178 00	23 00	30130 00	17 50	22926 00	15 00	19650 00
-ad	" air outlet covers at refuge niches, tube section	"	64	7 00	448 00	15 80	1011 20	7 48	478 72	23 00	1472 00	13 75	880 00	12 00	768 00
-ae	" " " grilles " " steel bent section	"	13	5 68	67 40	3 50	42 00	5 11	61 32	18 00	216 00	2 30	27 60	5 00	60 00
117	Cutting out and draining concrete contraction cracks	Lin.Ft.	5000	1 50	7500 00	1 00	5000 00	1 08	5400 00	2 00	10000 00	1 00	5000 00	1 00	5000 00
161-a	Galvanized and painted hand rail, posts and fastenings	"	8465	1 15	9734 75	1 25	10581 25	1 08	9142 20	1 10	9311 50	1 15	9734 75	1 20	10158 00
-b	Baked enamel hand rail, posts and fastenings	"	8465	1 35	11 66025	2 10	17776 50	1 80	15237 00	1 80	15237 00	1 90	16083 50	2 25	19046 25
	TOTALS ALL ITEMS EXCEPT 38				288 620 45		380 225 75		288 481 36		440 552 50		480 780 40		354 451 00
38i	Totals all items except 38				288 620 45		380 225 75		288 481 36		440 552 50		480 780 40		354 451 00
	White glazed tile & enamels 100% domestic source	Sq.Ft	365000	1 70	620 500 00	2 30	839 500 00	2 59	945 350 00	2 23	813 950 00	2 45	894 250 00	1 90	693 500 00
	38i TOTALS ALL ITEMS				909 120 45		1 210 725 75		1 233 831 36		1 254 502 50		1 375 030 40		1 047 951 00
	Totals all items except 38				288 620 45		380 225 75				440 552 50				354 451 00
38ii	White glazed tile & enamels 75% domestic source	"	273750	1 70	465 375 00	2 30	629 625 00			2 23	610 462 50			1 90	520 125 00
	25% foreign "	"	91250	1 55	141 437 50	2 04	186 150 00		No bid	2 14	195 275 00		No bid	1 70	155 125 00
	38ii TOTALS ALL ITEMS				895 432 95		1 196 000 75				1 246 290 00				1 028 701 00
	Totals all items except 38				288 620 45		380 225 75				440 552 50				354 451 00
38iii	White glazed tile & enamels 50% domestic source	"	182500	1 70	310 250 00	2 30	419 750 00			2 23	406 975 00			1 90	346 750 00
	50% foreign "	"	182500	1 55	282 875 00	2 04	372 300 00		No bid	2 14	390 550 00		No bid	1 70	310 250 00
	38iii TOTALS ALL ITEMS				881 806 45		1 172 275 75				1 238 077 50				1 011 451 00
	Totals all items except 38						380 225 75				440 552 50				354 451 00
38iv	White glazed tile & enamels 25% domestic source	"	91250			2 30	209 875 00			2 23	203 487 50			1 90	173 375 00
	75% foreign "	"	273750		No bid	2 04	558 450 00		No bid	2 14	585 825 00		No bid	1 70	465 375 00
	38iv TOTALS ALL ITEMS						1 148 550 75				1 229 865 00				993 201 00
	Totals all items except 38						380 225 75				440 552 50				354 451 00
38v	White glazed tile & enamels 100% foreign soure	"	365000		No bid	2 04	744 600 00		No bid	2 14	781 100 00		No bid	1 70	620 500 00
	38v TOTALS ALL ITEMS						1,124 825.75				1 221 652.50				974,951.00

CONTRACT No. 7

Contractor	L. Del Turco & Bros., Inc.
Date of Contract	April 21, 1925
Date of Delivery of Contract	May 6, 1925
Contract Time	16 Months
Contract Bid Price	$881,805.45
Estimated Value of Contract to Date	$144,361.56

This Contract provides for lining the tunnel with tile, placing bronze doors and other trim, erecting sidewalk handrail, and painting the ceiling.

The specifications for tile lining the walls of the Holland Tunnel are unique, in that they provide requirements more rigid than those usually satisfactory in tiling work. The maximum permissible absorption is five per cent. by weight. The tests specified are severe, in order to insure a product that withstands extremes of temperature and freezing action, or a tile that will be non-crazing and non-spalling.

The tunnel tile is square, 4¼ inches by 4¼ inches. The decision as to size was reached after the completion of an extended series of investigations, including the placing of sample sections on the tunnel wall, the sections being laid up in tile of different sizes. The light reflection characteristics of tile of several makes were carefully determined and an appropriate standard fixed as a specification for the tunnel tile, in order to secure an increased efficiency of the tunnel lighting system.

The color of the tile is white, care being taken to eliminate tile containing blue, green or red tints. These tints were declared unfavorable, in the expert advice of a color psychologist, because of their depressing effects. The color of the borders was arrived at by a process of elimination of suggested colors, rejected for various reasons, until the choice finally settled upon light orange.

NORTH TUNNEL—

Work was begun on this Contract in the north tunnel on August 6th near the portal of the New York approach, the first operation being the placing of hollow tile in the side walls of the steel bent section. After this was completed the mortar scratch coat was applied.

On September 1st, the first shipment of glazed wall tile arrived and the work of setting was begun on September 7th, being completed from the portal to about 155 feet east of the river shaft by the close of the year. Tile for the north tunnel is being furnished by the American Encaustic Tiling Company, Zanesville, Ohio.

About September 15th, the work of setting bronze frames was begun, those for the light boxes being the first placed. After this work had been completed as far as the New York river shaft, bronze frames for the other niches were set; also cast-iron frames for relay boxes and fire alarm boxes. This work was completed to the river shaft by December 31st.

SOUTH TUNNEL—

Work was begun erecting the hollow tile in the side walls of the south tunnel about September 1st, being completed on October 6th. The placing of the scratch coat was started on November 23d, and about December 1st the setting of glazed wall tile was started near

the portal, being completed to about 508 feet east of the Canal Street shaft by the end of the year. Tile of foreign manufacture is being used in the south tunnel and is furnished one-half each by Villeroy & Boch, Mettlach, Germany, and Rakovnik and Unter Themenauer Ceramic Works, Rakovnik, Czechoslovakia.

GENERAL—

The delay in beginning work on this Contract was primarily due to the difficulties experienced by the manufacturers of the tile in turning out a product which met the stringent requirements of the specifications for this work. These difficulties appear to have been successfully overcome and deliveries are now being made regularly.

CONTRACT No. 9

Contractor	The General Electric Company
Date of Contract	July 7, 1925
Date of Delivery of Contract	July 31, 1925
Contract Time	11 months
Contract Bid Price	$298,166.00
Estimated Value of Contract to Date	———

This contract provides for the furnishing and delivering, but not installing of the power transformers for transforming the high tension current supplied by the power companies to the voltages required for the various motor units, and for the oil switches for the main control system.

The current which is to be provided by the power companies will be delivered at a nominal voltage of 13,200 volts. The transformers to be furnished under this contract will reduce this incoming pressure to the nominal operating voltages of 2,200 and 440. The oil switches included in the contract will be used to control the distribution of this current both before and after transformation.

The Contractor has begun to assemble material for the manufacture of this equipment, and shop drawings have been submitted by him for approval. These have been checked and returned to him. To date, no payments have been made on this contract.

CONTRACT No. 10

Contractor	William J. Fitzgerald
Date of Contract	May 19, 1925
Date of Delivery of Contract	June 4, 1925
Contract Time	14 months
Contract Bid Price	$329,655.00
Estimated Value of Contract to Date	$141,323.10

This contract covers the paving of both tunnel roadways, including the approach sections, and comprises a total area of about 44,500 square yards.

The qualities of granite block pavement, as regard durability, minimum amount of maintenance and quick repair governed the choice of surfacing. Existing granite block pavements long subjected to continuous heavy traffic were carefully studied, and data were

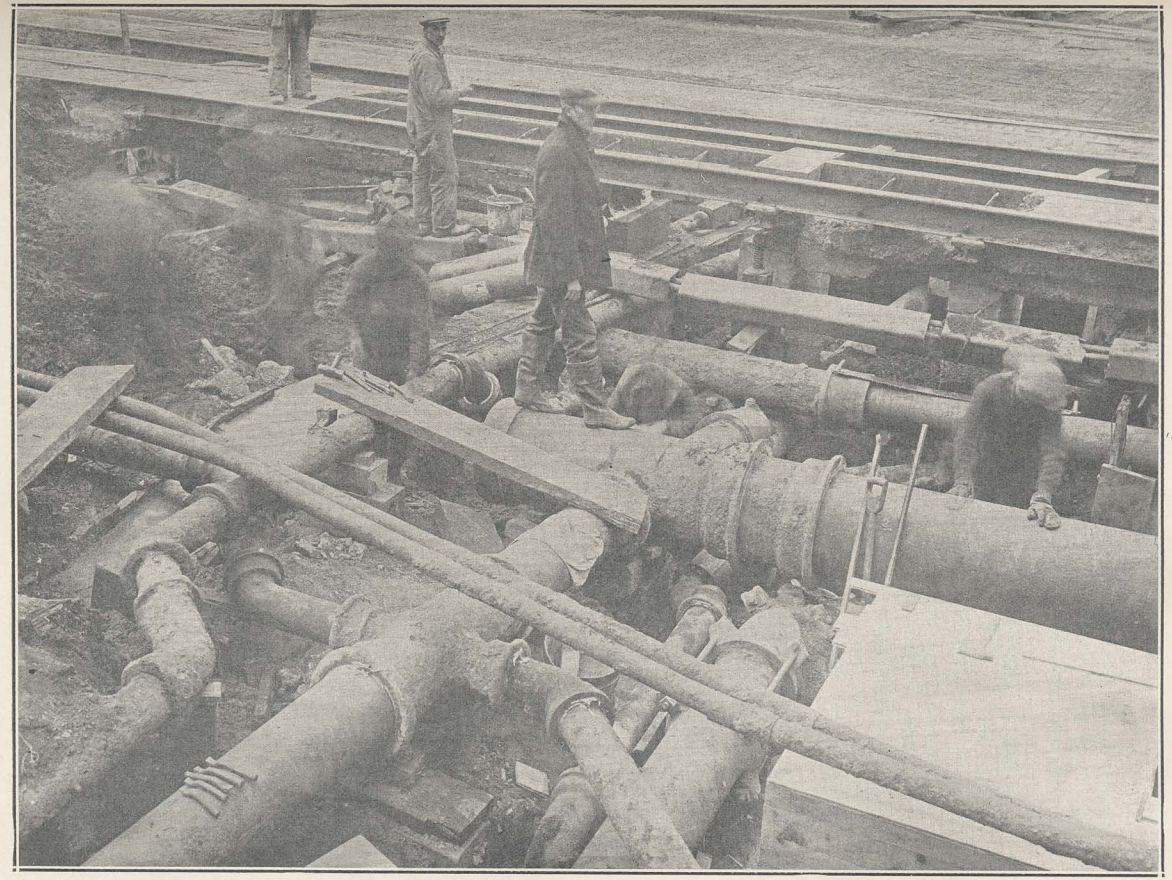


PLATE No. 10—Pipe Subsurface Changes at East Side of Hudson Street at Spring Street, North Tunnel, New York. Contract No. 5.

collected from various sources, of actual experience in use and maintenance of several standard types of road surfacing. Finally, the experience of the United States Bureau of Roads was also drawn upon and studied and conference was held with that Bureau's best qualified personnel, early in the year.

The chief limitation in the size of the block adopted was that of depth. A limit was necessary in this dimension, so that sufficient depth of cushion could be provided between the block and the concrete floor and still not encroach upon the limited vertical clearances of the tunnel. Further study was made in the proportion of the block to minimize breakage due to impact on the surface of the pavement and to conform as far as possible with standard dimensions followed in cutting at the quarry. The resulting dimensions adopted were as follows: length 7 to 11 inches; width 3¾ to 4½ inches and depth 4 to 4½ inches.

The smoothness of the wearing surface of the paving was considered to be of prime importance in reducing the effect of vibration with resulting noise. For this reason the top surface of the block has been specified to be somewhat smoother than that required in ordinary paving block practice.

The blocks are laid in the usual sand cement cushion layer, about one inch thick.

For filling the joints between blocks, asphalt is applied hot, after being mixed with heated sand. The mixture is poured in between the blocks and the joints completely filled. Then, by means of squeegees, a thin coating, later sprinkled with sand, is left upon the surface. The resulting pavement provides a smooth resilient, long wearing surface, that will help deaden the sounds due to traffic and at the same time can be more quickly repaired than a concrete road.

With the lack of ventilation in the tunnels while this paving proceeds, it is necessary to heat the asphalt and sand outside, to avoid the smoke and fumes. The hot asphalt is delivered in motor truck tank wagons to the site of the work, where it is kept at the required temperature in a 500 gallon heating kettle. An oil burner furnishes sufficient heat for this kettle with but little or no smoke. A portable mixer is used to mix the hot sand and asphalt immediately before it is applied to the paving block. As the work of filling the joints takes but a small part of the time in laying the block, the heating kettle with its attendant fumes, needs to be kept going only at infrequent intervals.

The granite block is obtained through J. Leopold & Co., Inc., from quarries at Vinalhaven, Hurricane Isle and Long Cove, Maine, where it is cut to size and shipped by barge to New York City. Sufficient space is allowed the Contractor to store a whole shipment of block at a time, so that no delay can occur from lack of material. The first shipment of block was received about August 15th, and the placing of the block was started on September 14th in the north tunnel just west of the open approach section of the New York side. Work was started October 27th on the paving of the south tunnel at the New York end. By the end of the year the paving was completed from the eastern limits of both open approaches to a distance of about 1,700 feet west of the New York river shaft in the north tunnel and to the east side of the New York river shaft in the south tunnel. Sufficient block is stored to supply the work to be carried on throughout the winter season, mainly in the under-river stretch between the river shafts.

CONTRACT No. 12

Contractor	B. F. Sturtevant Company
Date of Contract	September 22, 1925
Date of Delivery of Contract	September 26, 1925
Contract Time	14 months 2 weeks
Contract Bid Price	$571,631.00
Estimated Value of Contract to Date	

This contract provides for the furnishing and installing of the ventilation and transformer blower fans and the motors, transmission and control for same.

The fans to be provided under this contract are of the backward curved blade type. Under different conditions, one, two or three ventilation fans may be operated on one tunnel duct at any one time and the fans must have characteristics that will insure their satisfactory operation when run in parallel without the danger of any one fan assuming more than its share of the load and thereby overloading the motor. They must also maintain satisfactory efficiency for any stage of loading from 35% to full load.

The motors for driving the ventilating fans are to be of the wound rotor, 3 phase type, the larger ones to operate at 2,200 volts and the smaller at 440 volts. This type was chosen because of the possibility of speed variation inherent therein. Further flexibility is obtained by the use of a chain drive instead of direct connection between motor and fan.

The smaller fans to be used for cooling the power transformers will be direct connected to 440 volt 3 phase squirrel cage motors, the load on these units being uniform.

The Contractor has begun to assemble material for this equipment, tests have been made on sample fans to check up performance data submitted with the proposal and shop drawings have been submitted for approval. These have been checked and returned to the manufacturer.

Work on the actual fabrication of the fans is scheduled to begin shortly after the first of the year.

To date no payments have been made on this contract.

CONTRACT No. 13

Contractor	ReRiso Construction Company
Date of Contract	October 20, 1925
Date of Delivery of Contract,	October 24, 1925
Contract Time	14 months
Contract Bid Price	$1,277,953.00
Estimated Value of Contract to Date	

This contract provides for the construction of the two buildings on the New York side of the river in which the ventilation equipment is to be housed and also for the finishing of the interiors of the New York ventilation shafts.

The buildings to be constructed under this contract will be of steel frame construction, five stories in height, with brick curtain walls, granite base, granite and limestone trim, reinforced concrete floors with steel beams and girders and reinforced gunite and hollow tile partitions.

CONTRACT Nº 13
NEW YORK STATE BRIDGE AND TUNNEL COMMISSION
AND
NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION
THE HOLLAND TUNNEL
CANVASS OF BIDS RECEIVED OCTOBER 6, 1925.

ITEM	CLASSIFICATION	UNIT	QUANITY	DE RISO CONSTRUCTION CO.		D.C. SERBER INC.		GEORGE COLON & CO. INC.		EMIL DIEBITSCH INC.		THOS. J. WATERS CO.		FRED SNARE CORP.		LUSTIG & WEIL		NIEWENHOUS CO. INC.		JOHN T. BRADY & CO.		ENGINEER'S ESTIMATE.	
				PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
ET-d	Concrete and mortar top course	Cu.Yd.	4000	27.00	108,000.00	30.00	120,000.00	36.75	147,000.00	37.00	148,000.00	23.00	112,000.00	34.00	136,000.00	50.00	200,000.00	51.13	204,800.00	20.00	80,000.00	24.00	96,000.00
ET-e	Cinder concrete	"	350	11.00	3,850.00	16.00	5,600.00	29.75	10,412.50	19.00	6,650.00	19.00	6,650.00	12.00	4,200.00	15.00	5,250.00	13.00	4,550.00	23.00	8,050.00	15.00	5,250.00
ET-f	3" Gunite slabs	Sq.Ft.	1,400,000	1.31	1,834,000.00	1.30	1,820,000.00	1.30	1,820,000.00	1.32	1,848,000.00	1.20	1,680,000.00	1.30	1,820,000.00	1.00	1,400,000.00	1.32	1,848,000.00	1.25	1,750,000.00	1.00	1,400,000.00
ET-h	4" " "	"	5000	1.38	6,900.00	1.20	6,000.00	1.37	6,850.00	1.20	6,000.00	1.21	6,050.00	1.40	7,000.00	1.20	6,000.00	1.40	7,000.00	1.32	6,600.00	1.08	5,400.00
ET-i	4" " "	"	8,500	1.41	11,955.00	1.50	12,750.00	1.95	16,575.00	1.15	9,775.00	1.19	10,115.00	1.60	13,600.00	1.20	10,200.00	1.38	11,730.00	1.46	12,410.00	1.10	9,350.00
ET-j	4" " "	"	300	1.58	474.00	1.80	540.00	1.53	459.00	1.56	468.00	1.46	438.00	1.55	465.00	1.30	390.00	1.26	477.00	1.40	420.00	1.17	351.00
ET-k	1/2" Gunite coating	"	2,2000	.61	13,420.00	.45	9,900.00	.65	13,520.00	.68	14,960.00	.67	14,740.00	.68	14,960.00	.60	13,200.00	.55	12,100.00	.55	12,100.00	.67	14,740.00
ET-l	2" Gunite protection	"	1,0000	.95	9,500.00	1.00	10,000.00	.98	9,800.00	.97	9,700.00	.85	8,500.00	.85	8,500.00	.85	8,500.00	.87	8,700.00	.91	9,100.00	.75	7,500.00
ET-m	Gunite column protection	Cu.Yd.	350	125.00	43,750.00	120.00	42,000.00	112.86	39,501.00	115.92	40,572.00	113.00	39,550.00	115.00	40,250.00	123.00	43,050.00	130.00	45,500.00	125.00	43,750.00	100.00	35,000.00
10-a	Built-up steel and tie-rods	Ton	1,350	117.00	158,040.00	112.00	151,200.00	119.00	160,650.00	112.00	151,200.00	113.00	152,550.00	130.00	175,500.00	135.00	182,250.00	129.80	175,230.00	110.00	148,500.00	120.00	162,000.00
10-b	Miscellaneous steel and iron	"	1.5	335.00	502.50	400.00	600.00	441.00	661.50	465.00	697.50	400.00	600.00	330.00	495.00	333.00	499.50	330.00	495.00	400.00	600.00	250.00	375.00
11	Steel beams and channels & connections	"	800	92.00	73,600.00	115.00	92,000.00	84.00	67,200.00	82.50	66,000.00	95.00	76,000.00	105.00	84,000.00	100.00	80,000.00	129.00	103,200.00	102.00	81,600.00	110.00	88,000.00
13	Steel rods and bars for reinforcing	"	80	110.00	11,900.00	120.00	9,600.00	126.00	10,080.00	120.00	9,600.00	120.00	9,600.00	120.00	9,600.00	135.00	10,800.00	125.40	10,032.00	80.00	6,400.00	110.00	8,800.00
14	Expanded metal and wire mesh	"	180	234.00	42,120.00	236.00	42,480.00	262.00	47,160.00	240.00	43,200.00	250.00	45,000.00	250.00	45,000.00	241.00	43,380.00	238.00	42,840.00	240.00	43,200.00	220.00	39,600.00
15-h	Special steel structures	"	1,125	335.00	376,875.00	360.00	405,000.00	358.50	403,312.50	340.00	382,500.00	360.00	405,000.00	360.00	405,000.00	355.00	399,375.00	340.00	382,500.00	350.00	393,750.00	350.00	393,750.00
148	Engineer's field office services	Per Mo.	10	100.00	1,000.00	100.00	1,000.00	105.00	1,050.00	215.00	2,150.00	100.00	1,000.00	300.00	3,000.00	1,000.00	10,000.00	200.00	2,000.00	120.00	1,200.00	300.00	3,000.00
151-a	Completing interior Caring St. shaft	Lump Sum			7,000.00		5,000.00		4,203.50		161,183.00		118,996.00		5,000.00		12,310.00		4,998.00		30,009.00		5,000.00
151-b	" " Canal St shaft	"			8,960.00		5,000.00		4,293.00		181,183.00		118,996.00		5,000.00		12,310.00		4,998.00		30,009.00		5,000.00
151-c	" " North River Shaft	"			14,000.00		12,500.00		11,200.00		24,641.00		27,000.00		23,000.00		13,320.00		10,100.00		30,009.00		5,000.00
151-d	" " South " "	"			13,000.00		11,800.00		9,196.50		24,641.00		28,000.00		20,000.00		15,140.00		8,000.00		31,009.00		7,000.00
171	New cement sidewalk	Sq.Yd.	600	3.50	2,100.00	4.00	2,400.00	4.78	2,868.00	3.00	1,800.00	4.00	2,400.00	3.00	1,800.00	4.50	2,700.00	5.00	3,000.00	5.00	3,000.00	4.00	2,400.00
172	" granite Corbing	Lin.Ft.	400	8.00	3,200.00	8.00	3,200.00	7.35	2,940.00	6.95	2,778.00	6.00	2,400.00	4.50	1,800.00	6.00	2,400.00	5.90	2,360.00	4.50	1,800.00	5.00	2,000.00
181	General Construction Land Vent. Bldg.	Lump Sum			273,300.00		231,500.00		277,253.00		338,048.00		306,000.00		330,000.00		322,199.00		305,340.00		311,000.00		321,000.00
183	" " River " "	"			172,600.00		188,800.00		194,709.00		205,800.00		200,000.00		220,000.00		206,094.00		224,530.00		307,000.00		185,000.00
218	Plumbing, heating, water supply	"			33,000.00		37,000.00		40,068.00		49,842.00		44,000.00		48,000.00		44,207.00		41,150.00		43,000.00		42,000.00
220	Elec. Contl. for land bldg & land shafts	"			26,000.00		30,000.00		29,877.00		36,125.00		29,000.00		29,000.00		31,600.00		26,500.00		28,000.00		23,000.00
222	" " " river " "	"			28,000.00		30,000.00		30,068.00		28,215.00		28,000.00		27,000.00		28,000.00		29,000.00		28,000.00		28,000.00
	TOTALS				1,277,853.00		1,291,130.00		1,356,227.00		1,380,250.00		1,325,183.00		1,483,015.00		1,471,410.00		1,544,890.00		1,733,038.00		1,137,345.00



PLATE No. 11—Laying Granite Block Pavement. Contract No. 10.

CONTRACT Nº14
NEW YORK STATE BRIDGE AND TUNNEL COMMISSION
AND
NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION
THE HOLLAND TUNNEL
CANVASS OF BIDS RECEIVED DECEMBER 15, 1925.

ITEM	CLASSIFICATION	UNIT	QUANTITY	DE RISO CONSTRUCTION CO. PRICE	DE RISO CONSTRUCTION CO. AMOUNT	G. DEKIMPE INC. PRICE	G. DEKIMPE INC. AMOUNT	THE ENGLISH CONSTRUCTION CO. INC. PRICE	THE ENGLISH CONSTRUCTION CO. INC. AMOUNT	THOMAS J. WATERS CO. PRICE	THOMAS J. WATERS CO. AMOUNT	GEORGE COLON & CO. PRICE	GEORGE COLON & CO. AMOUNT	ENGINEERS ESTIMATE PRICE	ENGINEERS ESTIMATE AMOUNT
27d	Concrete and mortar top course	Cu.Yd.	6000	35 00	210 000 00	36 00	216 000 00	57 00	342 000 00	35 00	210 000 00	39 78	238 680 00	28 50	171 000 00
27e	Cinder concrete	"	550	15 00	8 250 00	10 00	5 500 00	17 00	9 350 00	15 00	8 250 00	18 27	10 048 50	11 00	6 050 00
27f	3" Gunite slabs	Sq.Ft.	120000	1 85	222 000 00	1 80	216 000 00	1 81	217 200 00	1 65	198 000 00	1 71	205 200 00	1 31	157 200 00
27g	3½" " "	"	500	1 70	850 00	1 90	950 00	1 87	935 00	1 70	850 00	1 53	765 00	1 38	690 00
27h	4" " "	"	10000	1 75	17 500 00	1 90	19 000 00	1 92	19 200 00	1 75	17 500 00	1 88	18 800 00	1 67	16 700 00
27i	4½" " "	"	300	1 80	540 00	2 10	630 00	1 98	594 00	1 80	540 00	1 93	579 00	1 56	468 00
27j	¼ and ⅜" Gunite coating	"	14500	1 00	14 500 00	1 10	15 950 00	1 10	15 950 00	90	13 050 00	1 07	15 515 00	51	7 395 00
27k	2" Gunite protection	"	1750 0	1 50	25 875 00	1 65	28 875 00	1 65	28 875 00	1 40	24 080 00	1 61	27 892 50	95	16 340 00
70a	Built-up steel and tie-rods	Cu.Yd.	600	120 00	45 000 00	130 00	52 000 00	132 00	52 800 00	120 00	48 000 00	139 00	51 600 00	125 00	50 000 00
70b	Miscellaneous steel and iron	"	1700	127 00	215 900 00	135 00	229 500 00	132 00	224 400 00	120 00	204 000 00	131 50	224 050 00	125 00	212 500 00
72	Steel beams & channels & connections	"	18	415 00	4 980 00	470 00	5 640 00	498 00	5 964 00	440 00	5 280 00	505 00	6 060 00	335 00	4 020 00
73	Steel rods & bars for reinforcing	"	700	110 00	77 000 00	120 00	84 000 00	132 00	92 400 00	98 00	68 600 00	106 21	74 347 00	100 00	70 000 00
74	Expanded metal and wire mesh	"	70	160 00	11 200 00	120 00	8 400 00	176 00	12 320 00	150 00	10 500 00	161 00	11 270 00	120 00	8 400 00
75h	Special steel structures	"	190	500 00	45 000 00	350 00	66 500 00	330 00	62 700 00	290 00	55 100 00	332 00	63 080 00	254 00	48 260 00
188	Engineers field office services	Per Month	7	200 00	1 400 00	100 00	700 00	165 00	1 155 00	100 00	700 00	140 00	980 00	100 00	700 00
181e	Completing interior N. Land Shaft. N.J.	Lump Sum			10 000 00		55 500 00		50 000 00		41 000 00		34 489 00		9 000 00
181f	" " S. " " "	" "			10 000 00		5 539 00		50 000 00		42 000 00		5 462 00		9 000 00
181g	" " N. River " "	" "			18 000 00		16 072 00		158 720 00		31 000 00		17 067 00		10 000 00
181h	" " S. " " "	" "			211 580 00		16 072 00		136 382 00		36 000 00		27 019 00		12 000 00
182	General construction Land Vent. Bldg. N.J.	" "			255 000 00		234 932 50		283 141 00		332 000 00		282 005 00		223 562 00
184	General construction River " " "	" "			215 000 00		188 828 50		188 646 90		158 000 00		223 000 00		167 900 00
216	Plumbing, heating, water supply	" "			31 000 00		30 000 00		36 942 00		38 800 00		35 500 00		15 500 00
221	Elec. cond. for land Bldg. & Land Shafts	" "			51 000 00		36 000 00		43 690 00		41 500 00		42 730 00		32 300 00
223	Elec. " " River " River "	" "			38 000 00		36 000 00		38 350 00		37 850 00		37 850 00		34 600 00
	TOTALS				1,577,953.00		1,587,331.00		1,677,131.00		1,710,000.00		1,712,698.50		1,325,000.00

The buildings are to be erected complete with heating and hot water plants, plumbing, elevators, ash hoists, Evase' stacks, damper equipment, trolley beams, electric conduits with necessary boxes but excluding wiring and fixtures which are to be furnished and installed under Contract No. 19.

The work in the shafts includes the erection of stairs, landings, parts of floors, gunite air duct partitions, gunite wall protection, conduits, piping, reinforced concrete and structural steel.

Work has been begun on the fabrication of the structural steel, some of it has been delivered on the site and erection has been started in the Canal Street shaft. Shop drawings have been submitted by the various subcontractors for approval. These have been checked and returned either approved or with notations of necessary corrections marked thereon.

To date no payments have been made on this contract.

CONTRACT No. 14

Contractor	DeRiso Construction Company
Date of Contract	December 22, 1925
Date of Delivery of Contract,	December 29, 1925
Contract Time	12 months
Contract Bid Price	$1,577,953.00
Estimated Value of Contract to Date	

This contract provides for the construction of the two buildings on the New Jersey side of the river in which the ventilation equipment is to be housed and also for the finishing of the interiors of the New Jersey ventilation shafts.

The work to be done under this contract is, except for minor details, identical in scope with that called for under Contract No. 13.

Nothing has been done on this contract to date.

CONTRACT No. 20

Contractor	Standard Underground Cable Co.
Date of Contract	December 22, 1925
Date of Delivery of Contract	
Contract Time	10 months
Contract Bid Price	$128,670.00

This contract provides for the furnishing and installing, in the tunnels and ventilation buildings, of the cables required for the distribution of the power for the ventilation equipment, pumps and lighting systems.

These cables will convey power furnished by the power companies on both sides of the river to step-down transformers located in the two land ventilation buildings. From these points the cables will carry power through ducts located under the tunnel sidewalk up to the various shafts to the four ventilation buildings where it will be distributed to the ventilating fans, lights and miscellaneous tunnel equipment.

The contract has been let but has not yet been delivered.

CONTRACT NO. 24

Contractor	Booth & Flinn, Ltd.
Date of Contract	October 20, 1925
Date of Delivery of Contract	October 26, 1925
Contract Time	6 months
Contract Bid Price	$37,700.00
Estimated Value of Contract to Date	

This contract provides for the furnishing and installing of the pumping equipment, including motors and control in the various pump chambers at the foot of each shaft and at the midriver sump.

The pumps are of two kinds, drainage pumps, automatically controlled by floats in the sumps, to remove all water finding its way into the tunnel and shafts, and booster pumps which are to take water from the city mains and deliver this water at an increased pressure to high pressure mains extending throughout the tunnels and ventilation buildings.

The Contractor has placed orders for valves and is preparing to begin work shortly after the first of the year 1926.

III. DESIGNS, STUDIES AND INVESTIGATIONS

As in previous years, the work of the Designing Department has consisted of studies, investigations and designs, preparation of contracts and specifications, making of contract, construction and record drawings, checking shop drawings, preparing estimates of cost of the various contracts, preparing condemnation maps and descriptions and making studies of mechanical, electrical and architectural features of the tunnel and its appurtenant structures.

Work has been continued during the year on Contracts Nos. 3, 4, 5, 5-A and 6, furnishing construction drawings of steel and concrete details, water supply and subsurface changes, and checking, correcting and approving drawings submitted by the Contractor. These contracts cover the construction of the tunnels and the approaches thereto.

Surveys of the tunnel air ducts were completed and previous calculations of power requirements for the ventilation fans were modified to meet the actual duct areas available.

Curves for the adjustment of the fresh air and exhaust air ports are in course of preparation. Air measuring apparatus which will be installed in the ducts will serve as a check on the amount of air flowing, thus insuring the correct setting of the ports to provide proper distribution of air throughout the tunnel.

Specifications were prepared and contract drawings made for Contract No. 7, Glazed Tile, Bronze and Other Interior Finish; Contract No. 9, Furnishing Transformers and Oil Switches; Contract No. 10, Tunnel Roadway Pavement; Contract No. 12, Fans, Motors and Control; Contract No. 13, Ventilation Buildings, New York; Contract No. 14, Ventilation Buildings, New Jersey; Contract No. 20, Power Cables, and Contract No. 24, Pumping Equipment. The above contracts, a total of eight, have all been let. Construction drawings were made for Contracts Nos. 7, 12 and 13.

The preparation of contract drawings for the ventilation buildings involved an unusually large amount of work, there being 140 drawings required for Contract No. 13 and 144 drawings for Contract No. 14. Changes in the ventilation equipment, to meet

CONTRACT Nº 24
NEW YORK STATE BRIDGE AND TUNNEL COMMISSION
AND
NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION
THE HOLLAND TUNNEL
CANVASS OF BIDS RECIEVED, OCT. 6, 1925

ITEM	CLASSIFICATION	UNIT	QUANTITY	BOOTH & FLINN LTD. PRICE	BOOTH & FLINN LTD. AMOUNT	SHEVLIN ENG. CO. INC. PRICE	SHEVLIN ENG. CO. INC. AMOUNT	PEERLESS ENG. CO. PRICE	PEERLESS ENG. CO. AMOUNT	WAGNER ENG. CO. INC. PRICE	WAGNER ENG. CO. INC. AMOUNT	ERICKSON ENG. CO. INC. PRICE	ERICKSON ENG. CO. INC. AMOUNT	HART & EARLY CO. INC. PRICE	HART & EARLY CO. INC. AMOUNT	JOHN W. HOOLEY PRICE	JOHN W. HOOLEY AMOUNT	FOX REYNOLDS CO. INC. PRICE	FOX REYNOLDS CO. INC. AMOUNT	ENGINEER'S ESTIMATE. PRICE	ENGINEER'S ESTIMATE. AMOUNT
27	Conc. floor & pedestals, incl. mortar finish	Cu. Yd.	30	25.00	1,250.00	55.00	2,750.00	22.00	1,100.00	18.00	900.00	108.00	3,400.00	65.00	3,250.00	30.00	1,500.00	40.00	2,000.00	40.00	2,000.00
86	Galv. misc. steel work, incl. wire screen enclosure.	Lb.	3000	.30	900.00	.368	1,104.00	.25	750.00	.40	1,200.00	.35	1,050.00	.20	600.00	.02	60.00	.40	1,200.00	.20	600.00
100	C.I. Pipe & specials, incl. placing but not furnishig valves & strainers	Ton	30	250.00	7,500.00	325.00	9,750.00	320.00	9,600.00	398.00	11,820.00	500.00	15,000.00	300.00	9,000.00	600.00	18,000.00	300.00	9,000.00	350.00	10,500.00
108	Brass pipe & fittings - " " " " valves	Lb.	2000	.60	1,200.00	.375	1,150.00	.65	1,300.00	.56	1,120.00	1.00	2,000.00	.90	1,800.00	.45	900.00	.50	1,000.00	.50	1,000.00
140	23 pumps furnished and installed complete	Lump		28,350.00		26,375.00		23,832.00		27,635.00		22,400.00		37,000.00		31,800.00		31,000.00		27,000.00	
	TOTALS			37,700.00		41,629.00		41,632.00		42,735.00		43,850.00		51,650.00		58,000.00		64,200.00		41,100.00	

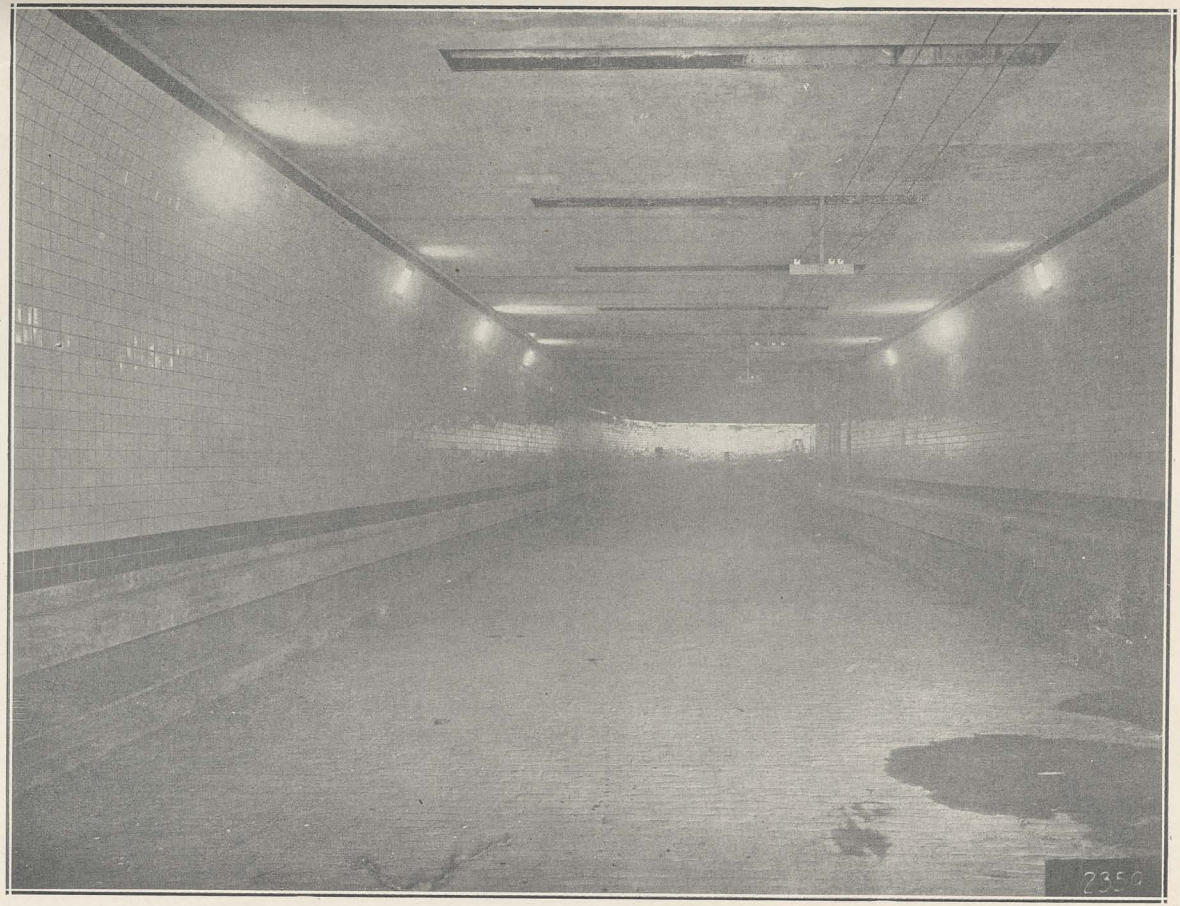


PLATE No. 12—Completed Tiling in North Tunnel, New York Approach. Contract No. 7.



PLATE No. 13—Tiled Refuge Niche, North Tunnel, New York. Contract No. 7.

the requirements of the manufacturers necessitated revision of the structural steel with its attendant changes in not only the steel drawings but of all related drawings as well. Suggestions of the Fine Arts Commission of the State of New York, to whom the drawings of the buildings were submitted for criticism, also resulted in a number of revisions. The drawings for the ventilation buildings, New York, as finally issued, received the approval of the Fine Arts Commission. Contracts Nos. 13 and 14 also include, in addition to the buildings proper, the completion of the interiors of the ventilation shafts and certain items of ventilating equipment such as flue dampers, motors for operating them and the control for the motors.

Estimates and studies are being made and specifications are in course of preparation for Contract No. 15, Architectural Work at Entrance and Exit Plazas, New York; Contract No. 16, Architectural Work at Entrance and Exit Plazas, New Jersey; Contract No. 17, Emergency Equipment Building, New York; Contract No. 18, Emergency Equipment Building, New Jersey; Contract No. 19, Lights, Traffic Signals and Supervising System; Contract No. 22, Emergency Equipment; Contract No. 23, Plaza Pavement, New York, and Contract No. 26, Plaza Paving, New Jersey. All the remaining contracts, required for the completion of the tunnel, are scheduled to be let during the early part of 1926.

The scope of this work previously listed and to be completed in 1926 may be briefly summarized as follows:

Contracts Nos. 15 and 16, for the architectural treatment of the entrances, exits and plazas will cover the pylons, granite facing of the open approach sections, open plaza railings, together with their footings, foundation walls and granite bases, and include the installation of light fixtures around the open approaches.

Contracts Nos. 17 and 18, for the Emergency Equipment Buildings in New York and New Jersey, will provide for their complete construction and equipment. These buildings, besides housing the emergency trucks and their equipment, to be furnished under Contract No. 22, will contain the offices for the executive heads of the tunnel's operating force, locker, rest and lunch rooms for employees, showers, carbon monoxide recording apparatus, and electrical and telephone equipment necessary.

Contract No. 19, provides for the installation of the power transformers and oil switches furnished under Contract No. 9; lighting of the tunnel plazas and buildings complete, including reflectors, receptacles for lights and distribution wiring, except for the lighting of the open approaches as noted above; secondary wiring for lighting the plazas and lighting fixtures for the same; traffic signals complete, telephone and fire alarms, complete; supervisory system, complete, including control boards and connections at the various shafts; and a central control board and apparatus for recording continuously the amount of carbon dioxide in the tunnel.

Contracts Nos 23 and 26, for the paving of the plazas, will include provision for razing of buildings, changing necessary pipes and subsurface structures, resetting old pavement and curb to new grades, new paving and curbing, modification of buildings to conform with new grades, together with regrading and possibly some electrical conduit installation for lighting on the New Jersey side of the river.

Contract No. 25 includes the furnishing and placing of fire extinguishers in the niches provided in the tunnel and miscellaneous fire extinguishing equipment, such as fire hose and racks for each fire hydrant in the tunnel and buildings, as well as flushing hose, buckets and shovels for sand niches, trolley hoists and electric hoists in all buildings.

Negotiations have been initiated with the power companies, one in New York and one in New Jersey, for the power supply required for operating the ventilating and auxiliary equipment. The principal items of the electrical equipment have been decided upon and most of them are under contract. Step-down transformers of the air blast type will be used to reduce the high tension power supply to the voltages required for operating the motors and lights. Motors of the wound rotor type will drive the fans and pumps, permitting variations of speed where required. The switches controlling the power are to be of the oil immersed truck type, insuring maximum safety of operation and ease of replacement when repairs are necessary. The layout of the power cables has been planned to provide maximum flexibility and assurance of continuity of the power supply. Power is to be furnished by the power companies through three independent cables from each side of the river, there being at least two different sources of supply on each side, and the cables will be operated radially, each bus being sectionalized into three parts, one for each cable. The various groups will be operated by control apparatus operated from a central switchboard situated in each building and ultimately a single control board may be used for controlling all the equipment from one place.

The investigation of the tile to be used for lining the tunnel was continued during the early part of the year, for the purpose of determining the most suitable size and a specification for this important item which would insure the permanence of the tile finish. After this work was placed under contract, studies were made of decorative ceramics, also other details of the tile, bronze doors and trim.

An understanding was reached with the Erie Railroad Company extending and clarifying the Commission's right to the use of the new pier as it was conferred under the original Erie Agreement, and a lease was entered into with the Railroad Company for the use of certain portions of the railroad yard, all for the purposes of the construction of the ventilation buildings.

Negotiations are now under way with the City of Jersey City and the Erie Railroad Company in connection with the regrading and paving of the areas to be included in the New Jersey entrance and exit plazas. The purpose of these negotiations is to insure that the work to be done by the Commissions will conform to the contemplated operations in the vicinity of the plazas by the above named parties.

Similar negotiations are also under way with the City of New York regarding the New York plazas.

During the year maps and descriptions were drawn up covering all the parcels of land needed for the purpose of constructing the tunnel, buildings and plazas, both in New York and New Jersey, which had not been acquired in previous years, and an agreement negotiated with the Delaware, Lackawanna and Western Railroad Company covering the temporary and permanent easements required for the North Tunnel and approach which are being constructed under Contract No. 6.

IV. MISCELLANEOUS INVESTIGATIONS AND SPECIAL STUDIES

During the year, studies previously begun were continued, including seawater tests on cement, protection coatings for steel, daily record of weather, air temperatures and the temperature of Hudson River water, investigations of earth pressures upon the tunnel lining and caissons, including the physical properties of silt and other phases of the subject which aid

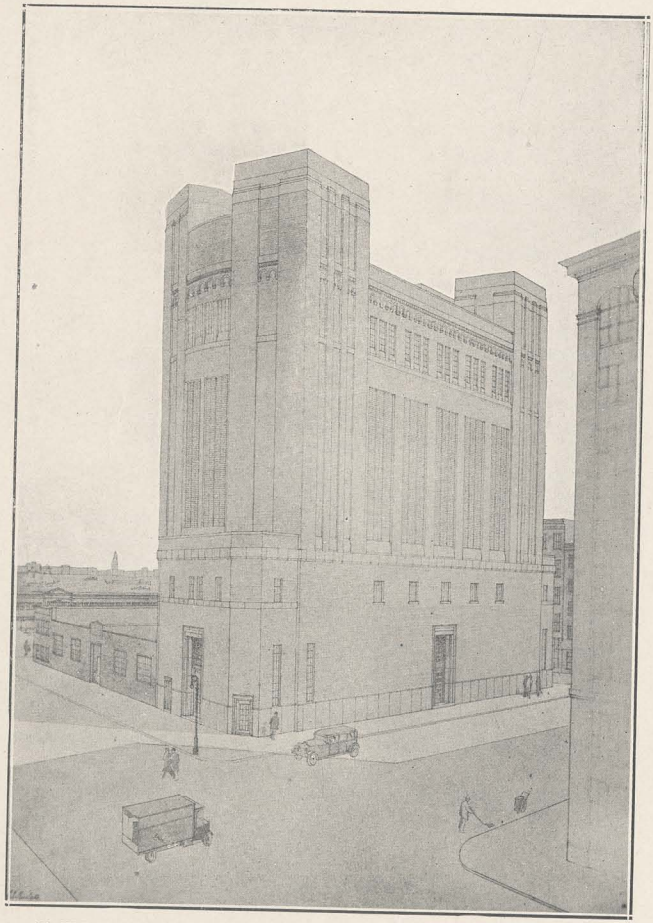


PLATE No. 14—Land Ventilation Building, New York. Contract No. 13.

in explaining tunnel movement phenomena. In addition to this many other tests and studies were conducted primarily to determine the quality and physical properties of the materials used and proposed for use in the works. The more important of these investigations were:

(a) Determination of the strength and deflection of tunnel ceiling slab in order to fix the minimum time that should elapse before stripping the forms.

(b) An investigation of the physical properties of Lumnite cement concrete to determine the advisability of its use in the ceiling slab, because of its early strength developing properties. These were demonstrated, but the time interval for stripping the forms was shortened sufficiently with the use of Portland cement, by lengthening the forms for each concrete pouring section.

(c) Finishing a portion of the tunnel for the purpose of determining a suitable size and color of tile, width of border, type of handrail, effectiveness of lighting system, etc.

(d) Investigations of strength and deflection of gunite concrete slabs for the purpose of determining safe unit stresses and other data for the design of the air ducts of the ventilation buildings.

(e) A study of the effect on the tunnel of dredging and the driving of piles for the new Erie Railroad Company Pier No. 9, in Jersey City. This study included the measurement of pressures, against the New Jersey river shafts, caused by the pile driving, to forestall possible movement of the shafts by properly controlling the pile driving accordingly. The operation of dredging over the tunnel in the slip was also carefully supervised to prevent possible rising of the tunnel due to insufficient cover.

(f) Exhaustive tests were made and are still under way to determine a suitable paint for coating the tunnel ceiling. The conditions of alkali and moisture which obtain in the ceiling slab have subjected the paints to a severe test and most of them have, under these conditions, proven unsatisfactory for the purpose.

(g) Tests to determine the adhesion of the different makes of tile used to the setting mortar specified for the work.

(h) Determination of the correct percentage of moisture to be used in the sand cement cushion of the granite block roadway pavement, and tests of the physical properties of mixtures, containing different percentages of moisture.

(i) Miscellaneous and routine tests on asphalt, cement, cementing materials, expansion joint material, lime, liquid waterproofing materials, sand and tile.

(j) Investigation of the earth pressures on the outside of the tunnel structure have been continued.

Photographs were taken during the year of the various phases of the construction work for record purposes and also of all features having special interest.

V. INSPECTION OF MATERIALS

The quantities of the principal materials required for work now under contract as supplied by the subcontractors and the approximate quantity manufactured during 1925 and the quantity manufactured to date are listed herewith:

Material	*Unit*	*Approx. Quantity*	*Subcontractor*	*Mfd. During 1925*	*Total Mfd. to Date*	*% Completed 12/31/25*
Cast-iron tunnel lining,	Ton	37,852	Davies & Thomas Co., Catasauqua, Pa.,		37,852	100
Cast-iron tunnel lining,	Ton	69,140	Bethlehem Steel Co., Bethlehem, Pa.,		69,140	100
Cast-steel tunnel lining,	Ton	7,784	Bethlehem Steel Co., Bethlehem, Pa.,		7,784	100
Structural steel for caissons,	Ton	4,507	Bethlehem Steel Co., Steelton, Pa.,		4,507	100
Structural steel for cut and cover section, Contract No. 5,	Ton	4,315	American Bridge Co., Trenton, N. J.,	36	4,315	100
Structural steel for cut and cover section, Contract 5-A,	Ton	121	American Bridge Co., Trenton, N. J.,	121	121	100
Structural steel for cut and cover section and air ducts, Contract No. 6,	Ton	3,545	McClintic-Marshall Co., Pottstown, Pa.,	3,300	3,300	92
Structural steel for New York ventilation buildings and shafts, Contract No. 13,	Ton	2,130	Phœnix Bridge Co., Phœnixville, Pa.,	100	100	5
Tunnel bolts, Contracts Nos. 3 and 4,	No.	437,385	Pittsburgh S. & B. Co., Pittsburgh, Pa.,	2,380	437,385	100
Tunnel bolts, Contracts Nos. 3 and 4,	No.	439,623	Bethlehem Steel Co., Reading, Pa.,	2,829	439,623	100
Granite facing,	Cu. Yd.	401	H. E. Fletcher Co., W. Chelmsford, Mass.,		401	100
Granite curbing, Contracts Nos. 3, 4 and 6,	L. Ft.	31,430	H. E. Fletcher Co., W. Chelmsford, Mass.,	2,604	27,762	87
Granite curbing, Contracts Nos. 5 and 5-A,	L. Ft.	5,339	J. Leopold & Co., W. Sullivan, Maine,	2,682	5,339	100
Glazed tile and enamels, Contract No. 7, foreign,	Sq. Ft.	182,500	Villeroy & Boch, Mettlach, Rakovnik, Czecho,	78,000	78,000	43
Glazed tile and enamels, Contract No. 7, domestic,	Sq. Ft.	182,500	Amer. Encaustic Tiling Co., Zanesville, Ohio,	80,100	80,100	44
Bronze work, Contract No. 7,	Pcs.	5,400	The Gorham Co., Providence, R. I.,	540	540	10
Granite block pavement, Contract No. 10,	Sq. Yd.	44,500	J. Leopold & Co., Vinalhaven, Maine,	29,943	29,943	67

The manufacture of steel and cast iron necessary for the river tunnels is practically completed.

The inspection of the ordinary items of iron and steel, such as tie-rods, tunnel bolts, sheet metal air flues, copper steel plates, floor beams, ceiling angles, caisson connecting rings, cast-steel shackles and structural steel for the cut and cover section, with the exception of rolling of steel and also the tile and bronze work and granite block, was done by the engineering staff of the Commissions. A ceramic expert has been on inspection

duty for the Commissions at the tile manufactories in Mettlach, Germany and at Rakovnik, Czechoslovakia and another at Zanesville, Ohio.

Sand and gravel, washers for tunnel bolts, rolling of steel, lead for caulking, grommets, cast-iron water pipe for tunnel service lines, waterproofing fabric and asphalt, non-corrosive metal, brick and paints have been inspected through the Materials Inspection Department of the Transit Commission and Board of Transportation of the City of New York as in 1924.

The sampling and testing of cement have been continued through the State Engineer's office at Albany. Approximately 146,794 barrels of Portland cement, of which 6,504 barrels were inspected by the Board of Transportation, and 2,007 barrels of mixed cement have been tested and received to date.

The continuation of the arrangement for inspection by the forces of the Board of Transportation of the City of New York and the State Engineer's office has placed the services of these experienced organizations at the disposal of the Commissions and avoided the duplication of facilities already available at a considerable saving to the Commissions.

VI. ACCIDENTS AND DECOMPRESSIONS

During the year, three fatal accidents occurred on the work and a fourth man died of bronchial pneumonia while in the hospital under treatment for partial paralysis brought on by work in compressed air. This last fatality is the only one, to date, traceable to compressed air illness, which in this case was the secondary cause of death. A certain number of accidents, while much to be regretted, seems unavoidable on a work of such magnitude in spite of the most careful supervision and attention as to safeguards and preventative measures. Minor accidents, usual in work of this character, occurred, but, having received prompt and adequate medical attention, no serious after effects resulted.

The total number of decompressions that have occurred to date is 745,882 with 528 cases of "bends." Of these, there were 27,499 decompressions with 19 cases of "bends" on all compressed air work during the year 1925; 4,899 decompressions with five cases of "bends" were on the foundation caisson work for the New Jersey land ventilation building, under Contract No. 6. Plate No. 7 presents decompression data in detail.

VII. TRAFFIC

Study of the vehicular traffic over the ferries crossing the Hudson River has been continued. No count was made this year, the figures given below being based on data obtained from the operating companies. Distribution and classification have been determined from these data where applicable, but where the necessary figures were not available, estimates were made using percentages determined from the Commissions' counts made in previous years modified to agree with the data which were furnished.

In making summaries, the ferries have been grouped as in previous reports, namely:

FIVE FERRY GROUP

(Nearest the Holland Tunnel)

Ferry	*New Jersey Terminal*	*New York Terminal*
Pennsylvania R. R.	Exchange Place	Desbrosses Street
Pennsylvania R. R.	Exchange Place	Cortlandt Street
Erie R. R.	Pavonia Avenue	Chambers Street
D., L. & W. R. R.	Hoboken	Barclay Street
D., L. & W. R. R.	Hoboken	Christopher Street

SIX FERRY GROUP

(Remaining Ferries South of 42d Street)

Central R. R. of N. J.	Communipaw	Liberty Street
Central R. R. of N. J.	Communipaw	West 23d Street
Erie R. R.	Pavonia Avenue	West 23d Street
D., L. & W. R. R.	Hoboken	West 23d Street
D., L. & W. R. R.	14th St., Hoboken	West 23d Street
West Shore R. R.	Weehawken	Cortlandt Street

FOUR FERRY GROUP

(Ferries at and North of 42d Street)

P. S. Corp. of N. J.	Edgewater	130th Street
West Shore R. R.	Weehawken	42d Street
West Shore R. R.	West New York *	42d Street
Dyckman St. and Englewood	Englewood	Dyckman Street

The volume of traffic for 1925 as compared with that of previous years is shown in the table following. In this table the traffic for the months of November and December, 1925, has been estimated, as complete data for these months are not yet available.

TRAFFIC

FIVE FERRY GROUP

Year	*Total Yearly Traffic*	*Horse Drawn*		*Motor Driven*		*Total Daily Traffic*	*Percent Annual Increase*
		No.	*Percent of Total*	*No.*	*Percent of Total*		
1914, ...	2,839,055	7,655	86.9	1,159	13.1	8,814	....
1915, ...	2,811,249	7,137	82.7	1,497	17.3	8,634	—2.0
1916, ...	3,042,756	7,218	78.0	2,038	22.0	9,256	7.1
1917, ...	3,297,019	6,785	68.7	3,093	31.3	9,878	6.7
1918, ...	3,496,620	6,270	59.9	4,193	40.1	10,463	5.9
1919, ...	3,731,032	5,093	50.9	5,484	49.1	11,177	6.8
1920, ...	3,853,793	4,904	43.4	6,509	56.6	11,503	2.9
1921, ...	3,889,994	4,532	39.3	7,098	60.7	11,540	0.3
1922, ...	4,220,717	4,575	37.2	7,727	62.8	12,302	6.6
1923, ...	4,458,449	4,053	31.2	8,951	68.8	13,004	5.7
1924, ...	4,379,556	3,332	26.9	9,058	73.1	12,390	—4.7
1925, ...	4,507,917	3,019	23.6	9,792	76.4	12,811	3.4

* Not operating.

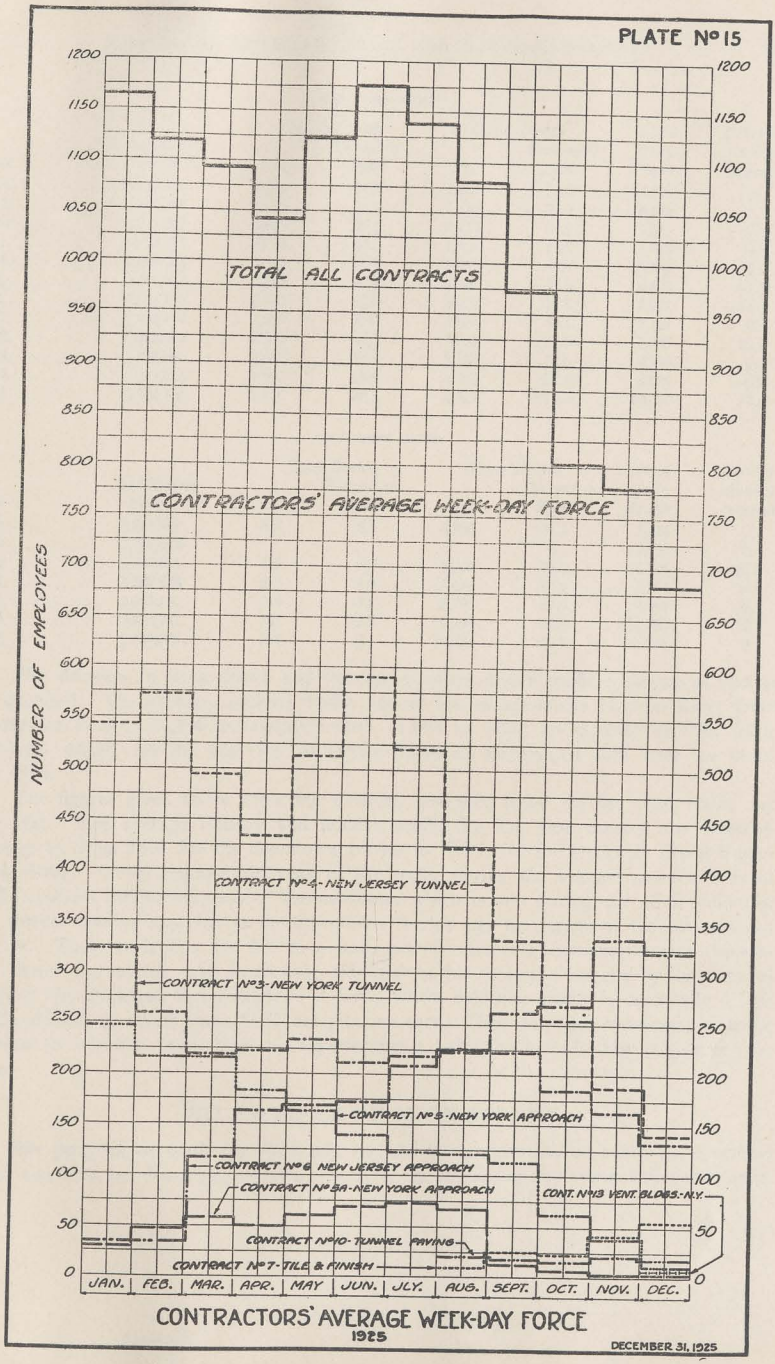


PLATE No. 15—Contractors' Average Week-day Force.

SIX FERRY GROUP

Year	Total Yearly Traffic	Horse Drawn No.	Horse Drawn Percent of Total	Motor Driven No.	Motor Driven Percent of Total	Total Daily Traffic	Percent Annual Increase
1914,	2,089,311	5,346	81.2	1,233	18.8	6,579	....
1915,	2,090,519	4,936	75.1	1,636	24.9	6,572	....
1916,	2,256,501	4,875	69.1	2,184	30.9	7,059	7.4
1917,	2,430,803	4,755	62.5	2,855	37.5	7,610	7.8
1918,	2,669,003	4,594	55.1	3,739	44.9	8,333	9.5
1919,	2,646,042	3,884	47.2	4,344	52.8	8,228	—1.3
1920,	2,361,727	2,972	42.0	4,099	58.0	7,071	—14.1
1921,	2,498,457	2,629	36.9	4,498	63.1	7,127	0.8
1922,	2,903,881	2,842	32.5	5,903	67.5	8,745	22.7
1923,	3,139,119	2,617	27.4	6,929	72.6	9,546	9.2
1924,	3,009,052	2,097	23.6	6,787	76.4	8,884	—6.9
1925,	3,570,302	2,116	20.3	8,323	79.7	10,439	17.5

FOUR FERRY GROUP

Year	Total Yearly Traffic	Horse Drawn No.	Horse Drawn Percent of Total	Motor Driven No.	Motor Driven Percent of Total	Total Daily Traffic	Percent Annual Increase
1919,	2,036,421	444	8.5	4,780	91.5	5,224	....
1920,	2,089,035	....	....	....	....	5,400	3.4
1921,	2,584,691	455	6.7	6,329	93.3	6,784	25.6
1922,	3,007,538	313	4.0	7,474	96.0	7,787	14.8
1923,	3,353,190	274	3.0	8,790	97.0	9,064	16.4
1924,	3,894,387	265	2.6	9,994	97.4	10,259	12.5
1925,	4,334,676	239	2.1	10,877	97.9	11,116	8.4

The decrease in horse-drawn and increase in motor-driven traffic continues as was to be expected. The average weekday traffic for all ferries across the Hudson River from Manhattan is now 34,366 as compared with 31,865 in 1924, an increase of 9%, while the total volume for the year for all ferries shows an increase of 10% over the traffic for 1924.

The figures given above show the weekday averages based on the total traffic for the year. The average Sunday and holiday traffic for the year exceeds the weekday average by from 15% for the downtown ferries to 104% for the Dyckman Street-Englewood ferry. In like manner, the peak of the traffic during the summer months is from 25% to about 200% in excess of the minimum which occurs during the winter months, the smaller number applying to the downtown ferries and the larger to the two uptown ferries. These variations are due to a large extent to the ever increasing stream of pleasure motor car travel. An interesting sidelight on this subject is reported by the management of the Dyckman Street-Englewood ferry whose vehicular traffic is practically 100% motor driven, of which about 90% are pleasure cars. They state that concurrent with the increase in vehicular traffic they are experiencing a reduction in pedestrian passenger revenue.

VIII. PROGRAM OF WORK FOR 1926

The program of work for 1926 will include the preparation of contracts, specifications and contract drawings, and the award of the remaining nine construction and equip-

ment contracts and the prosecution of the construction work under these, as well as under the thirteen which are now under contract.

Before the tunnel can be opened for public use, all the twenty-three contracts involved in its construction and equipment must be completed, except Contracts Nos. 15 and 16. These two contracts, for the architectural work at the open approaches and plazas in New York and New Jersey, respectively, could be carried on after the opening of the tunnel with little or no interference with the tunnel traffic.

Contract No. 6 for the construction of the New Jersey approach was originally scheduled to be let in 1923. The letting of this contract was postponed until December, 1924, due to lack of sufficient funds.

Every effort has been made in the prosecution of the work and the letting of subsequent contracts to make up for the lost time on the New Jersey side. Part of the plant site which is now being occupied by the contractor for Contract No. 6, is essential for the prosecution of work under Contract No. 14 on the Land Ventilation Building, New Jersey, and unless this part of the plant site can be turned over to the Contractor for Contract No. 14 early in the spring of 1926, as is anticipated, there will be a corresponding delay in the completion of the tunnel. Barring such delay and other unforeseen occurrences, it is anticipated that at the end of 1926 the construction and equipment of the tunnel will be very nearly completed and, allowing for a reasonable period for testing out and adjusting the equipment, the tunnel should be ready for public use early in 1927.

To carry out this program additional funds, amounting to $3,283,300.00 will be required. This will make possible the placing of all the remaining contracts. The first of these is scheduled for award about March 15, 1926, and to make this possible the additional funds will have to be made available before that date. Any delay in the award of these contracts, except Contracts Nos 15 and 16, will necessarily result in a corresponding delay in the opening of the tunnel.

IX. ORGANIZATION

Designs were under the supervision of Mr. Ole Singstad, Engineer of Designs, until the end of March, subsequently under Mr. Ralph Smillie, Engineer of Designs; construction under Colonel Frederic A. Snyder, Engineer of Construction; the General Office under Mr. E. Morgan Barradale, Assistant to the Chief Engineer.

Professor William H. Burr, Colonel George L. Watson, Mr. Frederick C. Noble, Mr. Frank M. Williams, Colonel William J. Wilgus, Dr. Edward Levy, Mr. George L. Lucas, Professor Arthur C. Willard, Mr. Lewis B. Stillwell and Professor George H. Brown have been continued as consultants, and Professor C. E. Ferree was retained as special consultant on the lighting of the tunnel and the color effects of the tile and on their interrelated effects in the tunnel. Mr. Sullivan W. Jones, State Architect of New York, has continued to act as consultant on the architectural features.

Being highly sensible of the co-operation and advice received, this opportunity is taken of tendering all these gentlemen expressions of thanks and appreciation for the services in the conduct of the work.

Appreciation of the loyalty and character of service of the entire staff is also expressed.

For the second time within a short period of five months, an irretrievable loss was suffered by the organization when, on March 24, 1925, its second Chief Engineer died. Mr. Milton H. Freeman had quietly assumed his appointed task of completing the work of The Holland Tunnel, when death claimed its first Chief Engineer on October 27, 1924, and was pursuing his course with all of his energy and intense devotion to duty, when he too was compelled to lay down his burden.

His practical experience, training and thoroughness in every detail, his fine sense of justice, his unusual modesty and consideration in his relations with others, his humanity, have made the loss to the organization a keen, personal one to every member with whom Mr. Freeman came in contact.

Respectfully submitted,

OLE SINGSTAD,
Chief Engineer.

APPENDIX

TABULATION OF BIDS

CONTRACTS Nos. 7, 9, 10, 12, 13, 14, 20, and 24

CONTRACT NO. 10.

NEW YORK STATE BRIDGE AND TUNNEL COMMISSION AND NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION, THE HOLLAND TUNNEL, CANVASS OF BIDS RECEIVED MAY 5, 1925

Item	CLASSIFICATION	Unit	Quantity	W. J. FITZGERALD		JOHN MEEHAN & SON		BOOTH & FLINN, LTD.		POIRIER CONTRACTING CO., INC.		PUBLIC SERVICE PRODUCTION CO.		E. J. FLAHERTY CONTRACTING CO.		ENGINEER'S ESTIMATE	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
69	Asphalt coating	Sq. yd.	5,000	$0 16	$800	$0 22	$1,100	$0 50	$2,500	$0 40	$2,000	$0 39	$1,950	$0 40	$2,000	$0 20	$1,000
173	Pavement	Sq. yd.	44,500	7 39	328,855	7 42	330,190	7 55	335,975	7 94	353,330	7 98	355,110	8 25	367,125	7 00	311,500
	Totals	....	.....	....	$329,655	....	$331,290	....	$338,475	....	$355,330	....	$357,060	....	$369,125	....	$312,500

CONTRACT NO. 12.

NEW YORK STATE BRIDGE AND TUNNEL COMMISSION AND NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION, THE HOLLAND TUNNEL, CANVASS OF BIDS RECEIVED SEPTEMBER 8, 1925, FOR FANS, MOTORS, TRANSMISSION AND CONTROL

Item	CLASSIFICATION	Unit	Quantity	B. F. STURTEVANT COMPANY		WAGNER ENGINEERING CO., INC.		BUFFALO FORGE COMPANY		GREEN FUEL ECONOMIZER COMPANY		ENGINEER'S ESTIMATE	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
70-b	Miscellaneous steel	Lb.....	45,000	$0 08	$3,600	$0 08	$3,600	$0 10	$4,500	$0 55	$2,475	$0 12	$5,400
70-c	Trans. chain 0.75 to 0.89 pitch	Per ft. of width	1,000	67	670	80	800	96	960	67	670	1 30	1,300
70-d	Trans. chain 0.90 to 0.99 pitch	Per ft. of width	1,000	84	840	95	950	1 01	1,010	84	840	1 38	1,400
70-e	Trans. chain 1.00 to 1.19 pitch	Per ft. of width	4,000	86	3,440	97	3,880	1 10	4,400	86	3,440	1 50	6,000
70-f	Trans. chain 1.20 to 1.49 pitch	Per ft. of width	2,000	88	1,760	1 00	2,000	1 30	2,600	90	1,800	1 70	3,400
70-g	Trans. chain 1.50 to 2.00 pitch	Per ft. of width	8,000	105	8,400	1 10	8,800	1 56	12,480	1 05	8,400	1 90	15,200
70-h	Transmission guards	Lb.....	30,000	15	4,500	22	6,600	156	4,680	1 45	4,350	30	9,000
185	Ventilating fans with spare parts	Lump sum	84	.....	317,041	.....	464,000	.....	402,150	.....	463,820	.....	507,000
186	Transformer fans	Lump sum	6	.....	2,155	.....	4,500	.....	5,500	.....	4,750	.....	2,800
190	Motors and control	Lump sum	90	.....	229,225	.....	160,000	.....	245,815	.....	286,430	.....	210,000
	Bid amount	.....	.....	.....	$571,631	.....	$655,130	.....	$684,095	.....	$776,975	.....	$761,500
	Brake horsepower x 250	.....	.....	.....	1,565,100	.....	1,565,100	.....	1,780,500	.....	1,853,325	.....	1,481,550
	Comparison bid	.....	.....	.....	2,136,731	.....	2,220,230	.....	2,464,595	.....	2,630,300	.....	2,243,050

	Brake horsepower
B. F. Sturtevant Company	6,260.4
Wagner Engineering Co., Inc.	6,260.4
Buffalo Forge Company	7,122.0
Green Fuel Economizer Company	7,413.3
Engineer's Estimate	5,926.2

CONTRACT NO. 9.

NEW YORK STATE BRIDGE AND TUNNEL COMMISSION AND NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION, THE HOLLAND TUNNEL, CANVASS OF BIDS RECEIVED JULY 7, 1925, FOR FURNISHING POWER TRANSFORMERS AND OIL SWITCHES

Item	CLASSIFICATION	Unit	Quantity	General Electric Company		Westinghouse Elec. & Mfg. Company		Engineer's Estimate	
				Price	Amount	Price	Amount	Price	Amount
205 210	Transformers and switches	Lump sum	1	$287,200 00	$287,200 00	$298,000 00	$298,000 00	$297,800 00	$297,800 00
210a	Excess 2,300-volt, 800-Amp. oil switches	Each	6	1,112 00	6,672 00	1,250 00	7,500 00	1,500 00	9,000 00
210b	Excess type E housing	Each	4	563 00	2 252 00	630 00	2,520 00	800 00	3,200 00
210c	Excess type G housing	Each	2	1,021 00	2,042 00	1,100 00	2,200 00	1,000 00	2,000 00
	Totals	.....	.....	.....	$298,166 00	.....	$310,220 00	.....	$312,000 00

CONTRACT NO. 20.

NEW YORK STATE BRIDGE AND TUNNEL COMMISSION AND NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION, THE HOLLAND TUNNEL, CANVASS OF BIDS RECEIVED DECEMBER 15, 1925

Item	CLASSIFICATION	Unit	Quantity	Standard Underground Cable Co.		James Sugden Company		Ericson Eng. Co., Inc.		Safety Cable Company		Fox Reynolds Company, Inc.		John W. Hooley		Engineer's Estimate	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
193	For three-conductor, paper insulated, lead covered cable, complete, with racks, hangers, tags, cable supports, joints and cable protection in splicing and pull-chambers, as follows:																
	(a) For 500,000 circular mil, paper insulated	Lin. Ft.	37,000	$2 13	$78,810	$2 15	$79,950	$2 55	$94,350	$2 33	$86,210	$2 63	$97,310	$3 19	$118,030	$2 50	$92,500
	(b) For 167,805 circular mil, paper insulated	Lin. Ft.	20,000	1 12	22,400	1 20	24,000	1 20	24,000	1 25	25,000	1 59	31,809	1 64	32,800	1 40	28,000
194	For three-conductor, varnished cambric insulated, lead covered cable, complete, with potheads and their supports, racks, hangers, tags, cable supports, bonds, grounds, clamps, joints, cable protection in splicing and pull-chambers and insulators, as follows:																
	(a) For 500,000 circular mil, cambric insulated	Lin. Ft.	6,000	3 46	20,760	4 10	24,600	3 00	18,000	4 17	25,020	2 94	17,640	4 33	25,980	2 50	15,000
	(b) For 167,805 circular mil, cambric insulated	Lin. Ft.	2,000	2 35	4,700	4 67	9,340	3 00	6,000	5 29	10,580	1 91	3,820	3 37	6,740	1 40	2,800
	(c) For 41,742 circular mil, cambric insulated	Lin. Ft.	2,000	1 00	2,000	1 13	2,260	1 00	2,000	1 11	2,220	1 42	2,840	1 52	3,040	85	1,700
	Totals	.....	.....	.....	$128,670	.....	$139,750	.....	$144,350	.....	$149,030	.....	$153,410	.....	$186,590	.....	$140,000

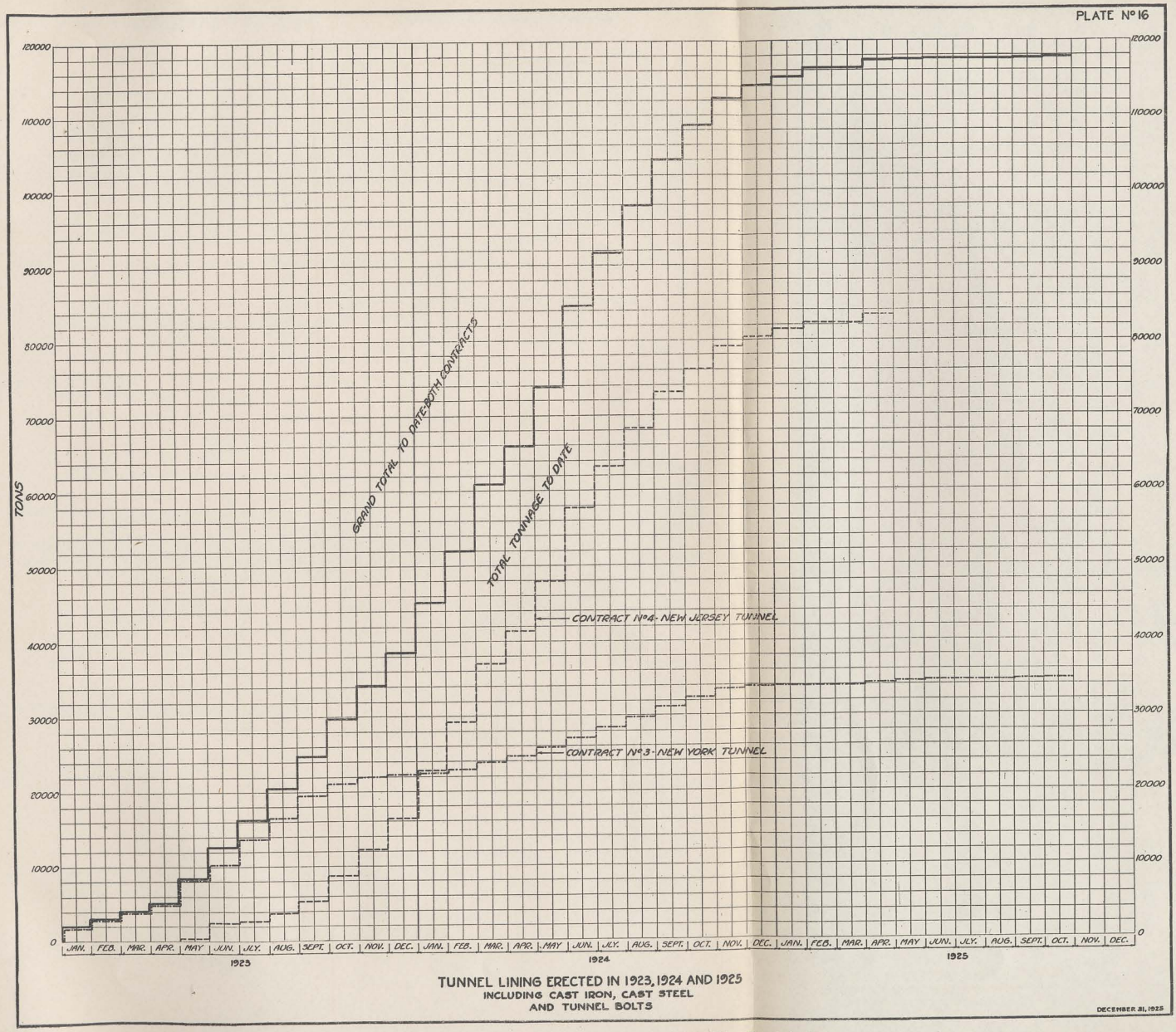
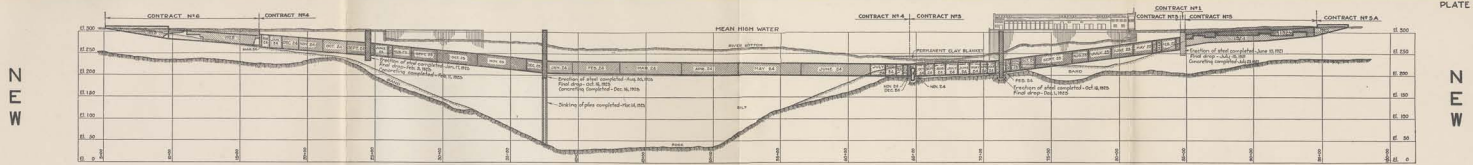


PLATE No. 16—Tunnel Lining Erected in 1923, 1924 and 1925. (Concluded.)



HUDSON RIVER VEHICULAR TUNNEL
CONSTRUCTION PROGRESS

SCALES: 1 INCH HORIZONTAL = 100 FEET, 1 INCH VERTICAL = 50 FEET

DECEMBER 31, 1925

NOTE!
Tunnel progress shown on Contracts Nº 3 and 4 is inclusive of concrete lining.
Progress on Contracts Nº 5, 5A & 6 is excavation only.

PLATE No. 17—Construction Progress.

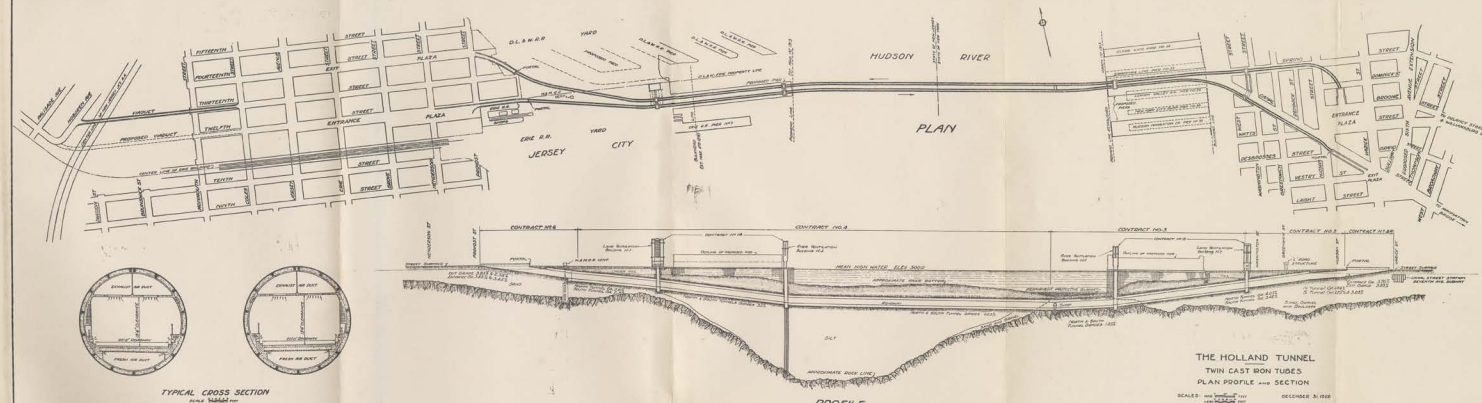


PLATE No. 16—Plan and Profile.