THE STORY OF BRICK

By Charles Ellery Hall

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BRICKS OF ANCIENT BABYLON

The investigations of Dr. James Edgar Banks, a famous American Assyriologist, were described and illustrated recently in a Sunday issue of the **New York Herald.** In excavating at Bismya close to the site of ancient Babylon, Dr. Banks described the bricks which prevailed as building material with the Babylonians as follows:

"Just beneath the surface the mound was filled with fragments of square Babylonian bricks, showing the remains of a fallen staged tower, and a few strokes of the pick revealed half of one upon which was inscribed the name of King Dungi, King of Ur, 2,750 B.C. Although nothing but the name was legible, yet it proved conclusively that we were excavating a city, and not a modern Arab ruin, and that the city was of no mean age, for almost on the surface were the remains of a temple constructed 4,650 years ago. Indeed, this brick and others from the same wall were, with a very few exceptions, the most recent inscriptions discovered at Bismya.

"This brick inscription was but a forerunner of others more ancient which were soon to follow. Just beneath it appeared a short inscription of Naram Sin, the son of the famous Sargon, who, according to Nebonidus, lived about 3800 B.C., but to the Assyriologists of a few years ago was a mythical character. Less than a meter below a structure 4,650 years old was therefore another a thousand years older.

"The trenches were dug into the hill until the side of the lower stage of the tower was reached, and then continued about the wall in the hopes of finding a doorway. Shafts were sunk at the corners, and at less than a meter below the stratum of Sargon and Naram Sin we came upon a platform of a temple built of plano-convex bricks in shape like a loaf of bread, flat on the bottom and rounded at the top. These bricks were also found in the very oldest strata at Telloh and Nippur had been assigned by Assyriologists to a period not far from 4500 B.C. My own subsequent discoveries at Bisyma confirmed this opinion."

DEDICATION

Dec. 1971

Some giants of a
giant industry.
Daniel de Noyelles

Dedicated to Brickmaking, an art born in the dawn of early civilizations, centuries ago and to the thousands of laborers and brickmakers who reached the culmination of inventiveness and prosperity in the years 1815 to 1942.

Then, our vain belief in the perpetual success of our industry was rudely shattered as the Art and the Men passed into oblivion, at least here in the Hudson River Valley.

This is a record of their impressive accomplishments.

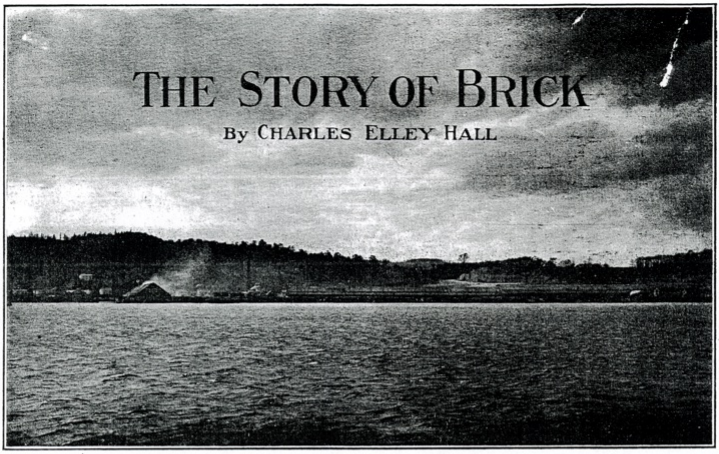
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From
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By CHARLES ELLEY HALL

UNDER FAIR SKIES ON THE HISTORIC HUDSON RIVER —PHOTOGRAPHS BY WILLIAM THOMPSON.

So far as concerns the non-metallic parts of buildings, the trend of architecture in these days seems to be decidedly towards an increased use of clay products. As a result, the term, "brick," has so extended its signification a sto include many forms of terra cotta which our forefathers, if they could come to life and inspect the frequent heaps of material to be found nowadays on the sidewalks of New York would call either drain pipes or ornamental tiles. The original hexahedral block of baked clay, however, which was the atom, or unit, of architectural design when the children of Israel helped to raise the pyramids, is even yet with as in undiminished importance—the common brick. The present article will concern itself with the manufacture—as practiced on the Hudson River—of this common brick, which is neither a section of fireproofing, nor a drain pipe, nor a decorative tile—which looks so extremely simple that the uninitiated would never suspect any mystery in its production. "A common brick," says an old hand at the business, "is fireproof, waterproof and weatherproof." A report of the Committee on Fire-Resisting Construction of the Underwriters' Association, made on the great Baltimore conflagration, declares that "good terra cotta wall trim . . . is superior to stone, but not so desirable as brick." in fire resistance,—and it adds: "Ordinary well-burned brick of good quality is the most satisfactory fire-resisting material now used in building construction." Upon the perfection of this common brick largely depends the stability of our buildings, and the use of inferior grades, or of a carelessly prepared lot, of common brick has been the effective cause of more than one fatal collapse of new buildings within recent years. To what an unsuspected degree this manufacturing industry has increased in the Hudson River Valley may be inferred by the estimate of the New York State Education Department in a bulletin to be issued this year, which places the number of brick plants in the entire State at 187, the output of which for 1904 was over 1,299 million brick, valued at $7,473,122. Of this gross value the share monopolized by the Hudson River Valley was $5,846,097.

Before attempting to follow the successive processes of brick-making, it will be as well, at the very outset, to warn the lay reader that in the present article there is no intention of describing any particular plant. Consequently, as the exigencies of varying localities and markets require considerable variation of details in manufacture, it will be practicable to treat only the broadly essential features of each process. These essential features are to be found in the workings of every brickmaking plant of any consequence, however widely the methods

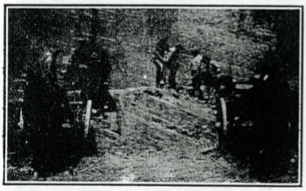
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of operation and the mechanical apparatus may differ in details which the expert eye would recognize.



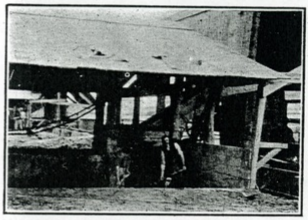
HORSES, CARTS, DRIVERS AND A GROUP OF HAPPY CHILDREN.

In the making and delivery of common brick as many as 78 operations may be distinguished: —(1) Removal of waste material from the bank, (2) Cutting the sods of clay, (3) Loading the clay upon carts, (4) Transportation to the pit, (5) Dumping into the pit, (6) Leveling in the pit, (7) Shoveling into the elevator, (8) Removal to the machine, (9) Tempering, (10) Forcing under the "packer," or press, (11) Bringing moulding sand to the kiln shed, (12) Building "sand works," (13) Placing moulding sand in "sand works," (14) Drying sand, (15)



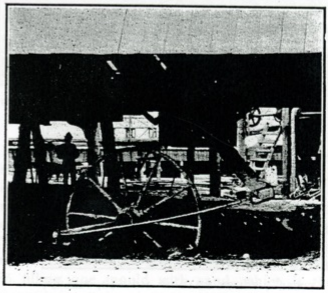
MINING CLAY, CUTTING AND LOADING "SOD."

Removal of sand to cool, (16) Putting sand through a fine sieve to remove all foreign matter and coarse particles, (17) Wheeling sand to mixing box, (18) Pouring sand into mixing box, (19) Mixing with yellow ochre or other pigments, (20) Removal of mixed sand from mixing box to wheelbarrow, (21) Its transportation to supply box at machine, (22) Shoveling into "sanding box," (23) Placing moulds in mould box to soak up and clean, (24) Removal of moulds from mould box to truck, (25) Trucking from mould box to sand box, (26) Removal from truck to sand box, or sanding machine, (27) Filling mould with sand, (28) Pouring sand from one mould to another, (29) Mould pushed into machine by "sander," (30) Mechanical delivery of mould under "clod-cutter," (31) "Mud" pressed through "clod-cutter" into mould, (32) Filled mould delivered on table, (33) "Strike" sanded in "strike box," (34) "Striking off" of mould, (35) Cleaning mud from "strike," (36) Accumulated mud thrown back into tub of machine, (37) Removal of moulds from table to truck, (38) Trucking from machine to yard, (39) "Luting" the yard, (40) Setting "yard lines," (41) Removal of moulds from truck and "dumping" on yard, (42) "Spatting." (43) "Edging," (44) "Spatting" or "stomping" on edge, (45) Bricks taken up from yard by "hacker," (46) Carried to "hack," (47) "Hacked," (48) "Sad-



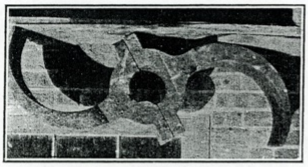
SOD PIT. CHAIN ELEVATOR CARRIES MIXTURE TO MACHINE.

died," (49) "Battened," (50) Taken from "hack" to barrow, (51) Wheeled to kiln ground, (52) Tossed in twos to "setter" on kiln, (53) "Set," (54) Leveled while setting, (55) "Double coal" brick placed, (56) "Platten" placed, (57) Kiln walled, (58) "Daubed," (59) The burning, (60) "Daub" removed, (61) Wall removed, (62) Brick "tossed out" from kiln, (63) Passed by tosser-out to "stager" on middle bench, (64) Passed to men on kiln ground, (65) Loaded on



"TEMPERING" SOFT MUD IN A CIRCULAR PIT.*(1)

wheelbarrow, (66) Wheeled to barge, (67) Taken from barrow, (68) Stowed on barge, (69) Transported to market, (70) Passed from barge to dock, (71) To truckman, or brick-handler, (72) Placed on truck, or piled on wharf, (73) Transported to building, (74) Dumped at building, (75) Sprinkled with water by the mason tender, (76) Placed in the hod, (77) Carried to bricklayer, (78) Laid by him in the mortar—And, taking the price current of common brick

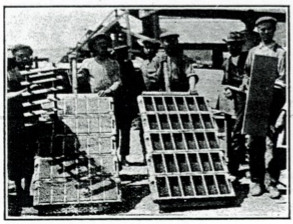


THE MACHINE OR "S" WIPER.

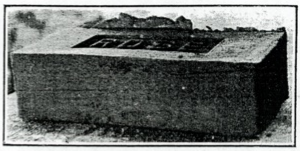
in New York at present writing ($10 per thousand), all this is done for each brick, practically at the cost of one cent.

CLAY BANKS.

The shores of the Hudson River, among its many contributions to the greatness of the commercial metropolis, provide many "banks" of clay from which comes the chief material of the bricks, which in their turn make New York City. Along this stretch of the river not less than $15,000,000, at a moderate estimate, is invested in brick plants. Economically, it makes an enormous difference whether the "banks" near a brick plant offer thick layers of pure, homogeneous clay, or thin layers interspersed with fragments of sand and gravel and from which it must be artificially purified. Above all it is essential that there should be no admixture of lime in the clay, to bring on a chemical reaction which would split and crumble



"EDGER"; TRUCK LOAD OF MOULDS, FILLED; ONE EMPTY, AND "SPATTER."



GREEN BRICK SHOWING "WING" BEFORE "SPATTING" OPERATION.

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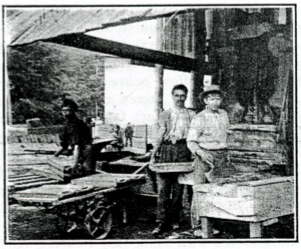


GREEN BRICK AFTER "SPATTING" OPERATION.

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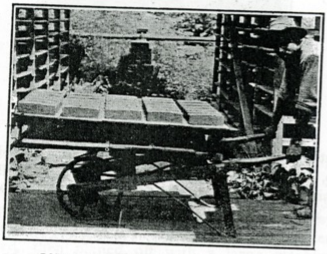
SOD PITS.

The clay once cut from the "bank" in sods of about 14 inches by 10, and 8 inches thick, its first treatment is that of mixing. For this a



MACHINE FRONT: SHOWS PRESS, "STRIKE," SAND BOX AND TRUCKS.

"sod pit" is prepared, in which are, first, a thin layer of coal dust, then a layer of yellow loam. Upon this coal dust, or "culm," and loam, the clay is placed in layers of blue and of yellow, alternating with layers of coal dust, and topped with yellow loam. The contents of the "sod pit" are next removed to the mixing machine, into which the as yet heterogeneous mass is thrown, with a certain quantity of water, while two shovellers sprinkle sand over it. The general constructive principle of the mixing machine is that of a vertical cylinder, within which revolves a vertical shaft carrying some thirty knives projecting like spokes. At the bottom of the cylinder is a great tub, containing three stationary cross knives, while the apparatus of revolving knives in the shaft ends at the bottom with two curved blades, forming a letter S, and known as a "wiper." The weight of the mud, fed in from above, carries it down to the wipers, which force it out through a "clod-cutter" or die, and into a press box, and this last in its turn drives the mass into the moulds each of which is to turn out six bricks. In many yards, however, a large part of the process of mixing is performed by the "tempering wheel," which revolves on a horizontal axis in a "circular" pit. This "circular-pit" process goes on for hours.



DOUBLE-DECK PALLET TRUCK. (2)



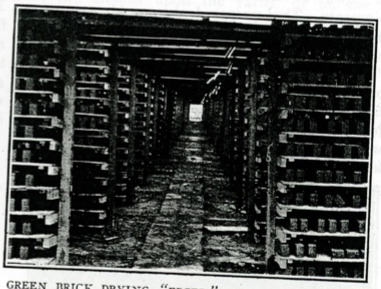
STEAM DRYING IRON PALLET CAR ON TRANSFER TRUCK. (3)

HOW THE MOULDS ARE PREPARED AND FILLED.

The moulds (generally made of cherry wood) have to be got ready to receive their charges.



TRUCKING AND DUMPING; GREEN BRICK DRYING ON OPEN YARD.

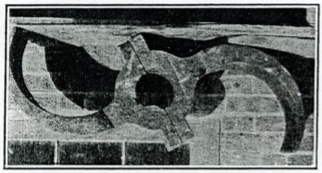


GREEN BRICK DRYING, "EDGED," ON WOODEN PALLETS ON PALLET YARD. (4)

For twenty-four hours or so they have been soaking in water, in order to tighten the joinings of the sides. From this bath they pass to the hands of a workman who performs the delicate and important operation of "sanding." This process, intended to prevent the "soft mud" from sticking to the wet moulds, consists in filling one mould with sand, which is then poured from that into another mould, and so

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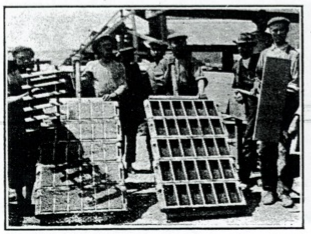


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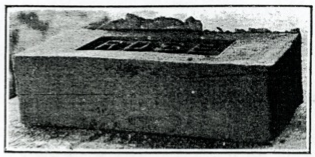
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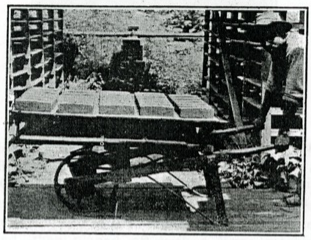
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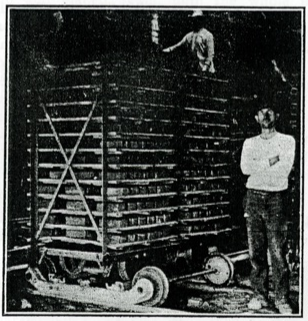


MACHINE FRONT: SHOWS PRESS, "STRIKE," SAND BOX AND TRUCKS.

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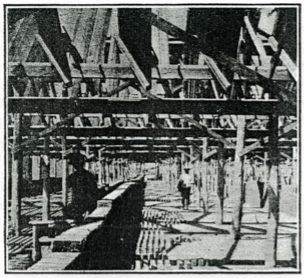
TRUCKING AND DUMPING; GREEN BRICK DRYING ON OPEN YARD.



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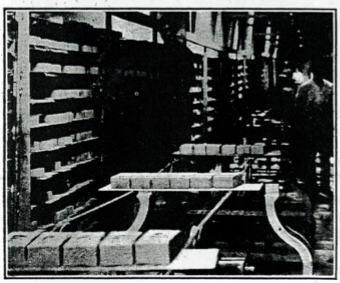
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GREEN BRICK DRYING ON COVERED YARD. SHUTTER SYSTEM SHED SHOWN. (5)

on in succession. In some establishments the "sanding" is done by machinery. In order that just enough sand for the required purpose may be left lining the moulds, and no more, each mould is then lightly tapped or jarred as soon as emptied, to get rid of the superfluous sand. The symmetry and general finish of a brick very largely depend upon the perfection with which its mould is sanded before being filled; moreover, many brickyards contribute to the beautiful coloring of street architecture by the skill with which the sand used in this process is powdered and mixed with ochre or other pigments. Thus prepared, the moulds are automatically delivered under the press, filled, and passed on to another workman, who with a "strike" trims off all superfluous clay that may project above the level of the face. Here again labor decidedly of the skilled order is called for; the surface of the "strike," or implement with which this trimming is done, has to be kept scrupulously free of foreign matter, and



GREEN BRICK DRYING BY STEAM—FROM MACHINE TO RACKS BY CABLE. (6)



BOY "LUTING" THE SURFACE OF AN OPEN YARD

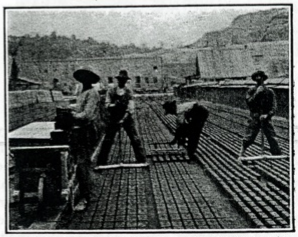
must at the same time be properly sanded; also, the stroke must be given with uniform precision, to produce the required uniformity and neatness of finish in the output.

FROM MACHINE TO YARD.

The brick is now formed. What follows belongs to the work of giving permanency to its form by the action of heat. This is effected, first, by drying in the yard ("open yard" or "pallet"); secondly, by burning in the kiln. The freshly filled moulds have to be conveyed from the tables under the press in such a manner as to eliminate every chance of marring their contents. This of course necessitates great care in placing them on the vehicles, which are built on springs, so as to avoid jolting in the transit.

PREPARATION OF THE YARD.

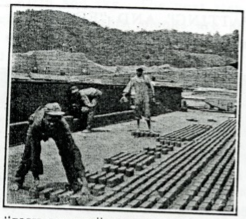
Like other parts of a brickmaking plant, the drying yards differ somewhat as to constructive



"SPATTING" BRICK "FLAT" AND ON "EDGE"; "EDGING"; LOADING FROM "HACK" ONTO BARROW.

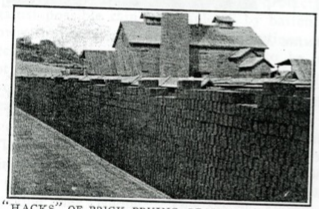
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details in different establishments. The typical "open yard" is a rectangular space, with ditches bounding its two longer sides, called the "head" and "foot" respectively. It is slightly convex,



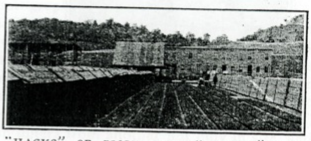
"PICK UP SIX"; "PICK UP SIX AND CARRY TWO"; STARTING NEW "HACK."

sloping up to a ridge in the middle. Over this area is spread (1) from eight to ten inches of gravel, (2) six or eight inches of blue clay, (3) about four inches of yellow clay. The clay should be broken or chopped very fine, then rolled, then planed off with a large machine technically known as the "lute," then rolled again and planed again, until the whole be-



"HACKS" OF BRICK DRYING, READY TO "SADDLE" AND "BATTEN."

comes as smooth as a billiard cloth. It is hardly necessary to say that all this elaborate preparation is not merely for the sake of appearance. The gravel and clay, and the sloping surfaces have the effect of rapidly shedding all the water which may fall in a sudden shower, thus minimizing the delay in drying on an open yard system, caused by unfavorable weather conditions. The smoothness of surface also insures against strains that might bend, or otherwise damage, the as yet malleable blocks of green brick which have to rest there. Lastly, the smooth surface of yellow clay is sprinkled with fine, carefully screened sand--for much the same reason as the moulds were sanded before being filled. Another system in use is that of the "pallet." In this system the bricks are "dumped" at the machine on boards, or "pallets," each holding six bricks. These "pallets" are then placed upon double-decked trucks and so removed to drying racks, which are built under cover, capable of holding 12 layers of bricks with an allowance of 6 to 8 inches between layers. The "covered yard," in all other respects exactly like an "open yard," differs from the latter in being protected against the weather by a permanent shed, to which sun and wind are admitted by adjustable shutters. The process next described applies as will be seen, mostly to open



"HACKS" OF BRICK; ONE "SADDLED"; ONE "SADDLED" AND "BATTENED."

yards, and where "pallets" and drying racks are used it is, of course, somewhat modied.

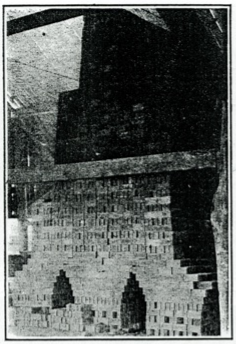
DUMPING.

The process of "dumping" the soft bricks from the moulds upon the yards, or on the "pallets," is by no means the rough-and-ready



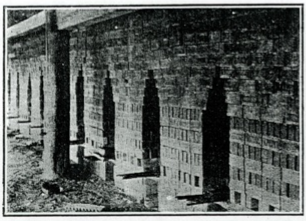
WHEELER TAKE "TOSSING UP" SUN-DRIED BRICK TO KILN "SETTERS."

business which its name might suggest. The contents of the moulds must be extracted, and, this necessitates the use of some force; on the other hand, there must be no such violence as



"BLAZE" OR CENTER ARCH OF GREEN BRICK KILN, BUILT FOR WOOD FUEL.

would spoil the shape of the brick. Then again, while every inch of the prepared area in an "open yard" must be utilized, there must be no overcrowding. To guide the workmen in their orderly arrangement of the fresh brick lines are stretched from the "head" of the open yard to the "foot." Each mound of six brick is laid, face down, in such a position that the straight edge which divides the half-dozen into



GREEN BRICK KILN ARCHES, BUILT FOR COAL FUEL. (7)

three and three shall exactly coincide with the "yard line," and the dumping is then done with just enough force to make the soft brick drop from the matrices in which they fit tightly. As a general rule, each row holds the contents of 265 moulds (1,590 bricks). After the laying of every row the empty moulds must be jarred with a "jarring iron"—a flat piece of steel, 5 feet long—to remove whatever sand or particles of clay may be left sticking to the insides. In addition to this, the moulds should be washed after every third row—i. e., after the third, sixth, ninth, twelfth, and fifteenth rows have been laid.

"SPATTING" AND "EDGING."

Supposing the weather tolerably fair, the new brick will be left on their faces for some three hours, before being "spatted." The object of "spatting" is to rid the brick of projecting particles of clay ("wings") that have been produced by the heavy pressure driving the mass into the vents in the moulds. The "spatter" must contrive to "spat" just six brick at each blow with the flat surface of his instrument, or its edge may mar the symmetry of the still tender brick. Next comes the nice operation of "edging," or turning the brick on their



BURNING A GREEN BRICK KILN WITH COAL. (8)

edges, so that the faces which have been underneath may dry in air. It will readily be seen what confusion might be produced in a full yard by the intrusion of an unskillful "edger." The brick have to be turned on edge six at a time or twelve at a time. This done, another wait of two, three, or four hours follows, according

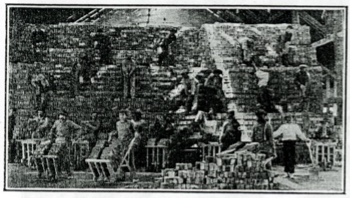


BURNING A GREEN BRICK KILN WITH OIL—LARGE PIPES ARE FOR AIR; SMALL PIPES ARE FOR OIL. (9)

to the weather, until the foreman decides that it is time to "hack.'

"HACKING."

So far, the hardening process has gone on between earth and sky. The next step is that of "hacking." For this, planks are laid from end to end of the yard, each plank being of a



A GOOD, EVEN "BURN." "TOSSING OUT" BURNT BRICK TO "WHEELERS."

width about equal to the length of a brick. Upon these planks the brick are laid so that two bricks support a third, allowing the air to circulate about their surfaces. A complete hack contains 10,000 to 12,000 brick. Readymade "saddles," or roofs, are then placed over the "hacks," or planked rows, and the protection against possible rain is completed by battening down the open sides. These precautions are necessary because the brick are now to be left not for two, or three, or six hours, but for one, two, or three days and nights, according to weather.

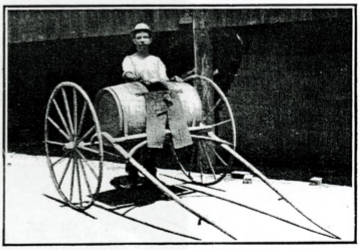
STEAM DRYING.

There are brick plants, however, where no such thing as a yard (in any natural sense of that term) is to be found. In such plants there is neither "hacking" nor "edging." This system, known as "steam drying," is in operation at more than one Hudson River plant, and the larger manufacturers are beginning to introduce it into their establishments in all parts of the country. It may be concisely described as an arrangement by which the fresh brick get the desiccating effect of heat radiating from many miles of steam pipes threaded through and about the chambers of a shed. Instead of a number of days, varying with weather conditions, which the average brick yard must allow for drying, this system demands ascertained periods of 18 to 36 hours for the process. The element of chance is to that degree eliminated from the making of brick, much as steam power, generations ago, eliminated it from navigation. But what more closely concerns the market value of the output, the brick made by steam-drying process necessarily have a uniformity of substance, due to the equal drying of equal masses in the same time, which can hardly be secured in brick dependent upon the vagaries of meteorology. From the "hacks," or the steam dryer, as the case may be, the brick are removed to the kiln.

In all that has been said thus far it is to be hoped that the patient lay reader will have borne in mind our initial warning that this brief general account of brickmaking is intended to be only typical, or composite, not by any means reflecting the methods of any particular yard. Consequently, it has been impossible to avoid in the picture something of that haziness which one notices in the outlines of a composite photograph. Perhaps this haziness may be all the more noticeable in parts of what is to follow, on the final stage of brickmaking—the kiln stage. Few, if any, contrivances of industry have afforded so large a field for apparently small improvements which are in reality important products of ingenuity and experience. One kiln differs from another not only in size, and in particulars of detail the significance of which would be intelligible only to an expert, but also in wholesale modifications of method. An average up-to-date kiln, however, is made, and should be operated, on somewhat the following lines.

THE KILN.

Under a shed extending about 100 feet in width and with a maximum height of about 50 feet, is laid a kiln ground about 40 feet wide. The length of the shed and the ground is de-



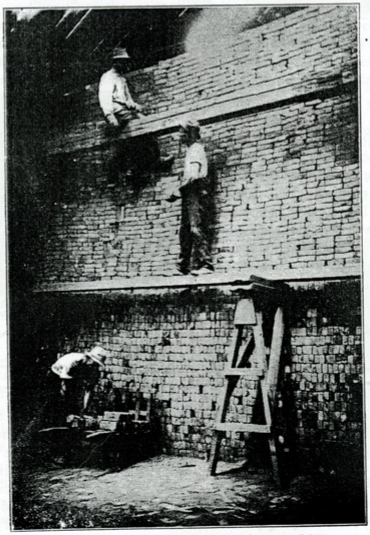
A TYPICAL BRICKYARD WATER CART. (10)

termined by the quantity of brick to be burned. For good practical reasons which will be better understood later on, the ground is laid concave. It is "hearthed" with burnt brick laid on edge, in rows across the concave space, to form bases for the arches and to absorb moisture from the new, or "green" brick; moreover, it

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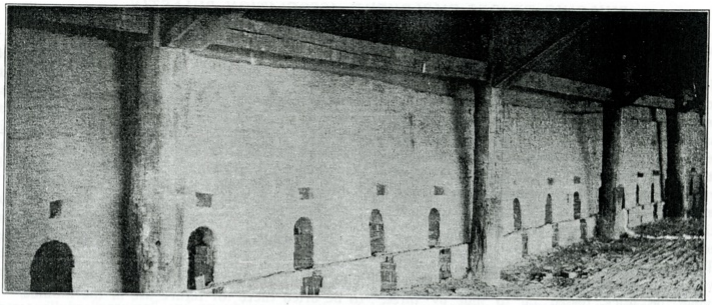
Brick Molding on Lynch Yards, Haverstraw, N.Y.*



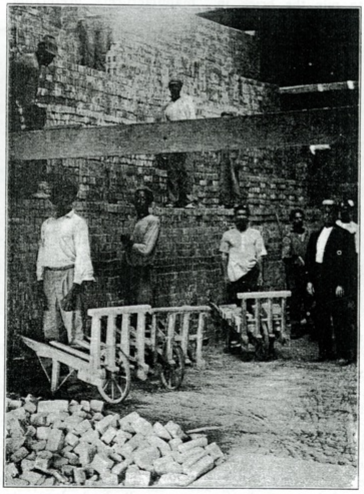
Preparing Brick Kiln for Burning —
Ready to Daub with Mud.*

*From Brick, a monthly magazine published October 1910 by Kenfield-Leach Co., 45-47 Plymouth Court, Chicago, Ill.

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Kiln Daubed and Ready for Firing —
Lynch Brothers Yard.*



Taking Kiln Down for Loading —
Mr. John Lynch at Right*

*From Brick, a monthly magazine published October 1910 by Kenfield-Leach Co., 45-47 Plymouth Court, Chicago, Ill.

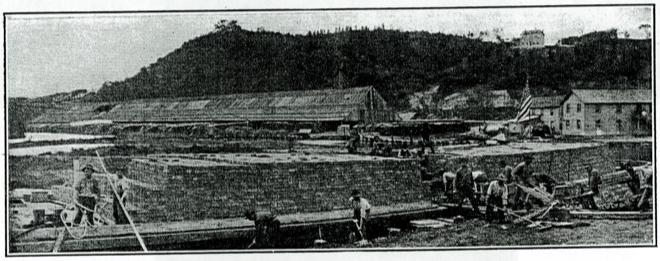
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is usual to protect the sides with a low bulwark or parapet of burnt brick.

It is to be observed that there is this difference between a brick kiln and, say, a pottery kiln; that the latter is practically a furnace into which the substance to be burned is put, like bread in an oven, while brick are not put into, but built into, their kiln, and in fact, are their own kiln. Hence the "setters," who arrange the "green" brick in a kiln, must be, if not artists in the strict sense, at least highly specialized artisans.

The "setting" of a kiln is generally done by several setters to each "arch," each "setter" having the brick tossed up to him by three "wheelers." The "green" brick are brought on barrows by a number of "wheelers" proportionate to the number of "hacks," each "wheeler" working at one hack of 6,000 or 7,000 brick. The object is, of course, to pile the brick in such fashion that the same heat shall reach every brick, even to the topmost row. The "setter," therefore, must exercise great care to leave proper event spaces between the brick, which he sets "three over three." He must also keep the faces of the piles or walls smooth and level, using improvised chocks or wedges of clay at the bases of the piles ("mudding up"). in which ticklish work he is assisted by the inward and downward slope of the ground. So much for the difficult masonry of the kiln; in general architectural design it is a system of parallel tunnels, called "arches." These "arches" are the ovens, so to speak, in which the fire is laid. The center arch of a kiln is called the "blade." There may be from 8 to 40 "arches" in one kiln, allowing 50,000 brick in and above each "arch," where, accordingly. 400,000 to 2,000,000 brick are burnt at once.

The kiln having been built, it has to be sealed, or finished off on the top and sides. This is done by setting on the top of the kiln a course of brick in which a very great proportion of coal dust has been mixed ("double-coal"), then a course of "single-coal" brick, laid flat, and, finally, a course of burnt brick ("platten") also laid flat. On the ends and sides brick are piled on edge, with their ends toward the kiln, nineteen brick high, and far enough from the kiln to allow the heat to pass between the wall and the "heads," or sides of the kiln. The walls are then sealed with "daub" or mud, and a "sand works" is built at the ends of the kiln, and filled with moulding sand, to be dried there for future use in the moulds. The arches are next cleaned out, and their openings closed with iron doors, the fuel is introduced, and the fire started. There is much variety in methods, and in choice of fuel, some manufacturers preferring wood, others using only coal. The great aim of the brickburner—evenness of heat—is sought by whatever methods appear most likely in each individual case. The fires must be made to burn in such a way that the brick shall not be brought to a red heat too rapidly. Brick which has not been properly dried before burning is of a grey color where it should be a good bright red; if allowed to heat too quickly, it is likely to swell and lose its shape (classed as "lammies" or swollen brick). It is interesting to note, too, that, even within the Hudson River brick fields, the difference between clay is such that the burning will expand and contract a kiln of one clay as much as four inches, while a kiln of material from another bank will vary only two inches in bulk, under the same heat. In all this the foreman is guided by several different indications, some of them rather too complicated to attempt their description here, but in-



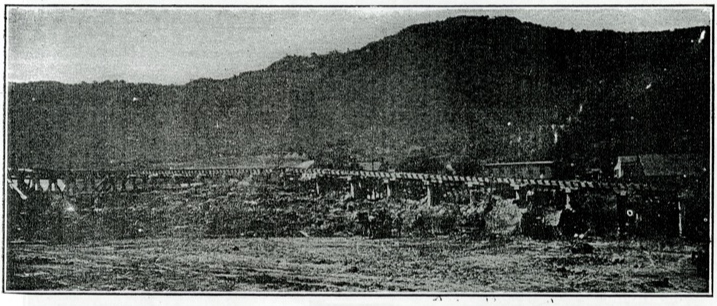
ALMOST READY FOR NEW YORK. LOADING BURNT BRICK ON MAMMOTH BARGE IN CANAL.

HAVERSTRAW BRICK MUSEUM

cluding the appearance of the steam given off at the top of the kiln, and the character of the gases which arise from the heated mass. When at last steam ceases to rise from the top of the kiln, the brickburner knows that no tmore than six or seven additional hours will be needed to complete the process.

The time required for a burning of brick is, more or less, one week. Two gangs of experienced men work alternately night and day as long as the kiln burns. The personal skill of the brickburner is a most important factor in the success of the firing. The temperature of the kiln must be allowed to fall graduallly, or there will be "popping" and crumbling of brick. It takes about a week after the fires have gone out for the brick to cool sufficiently to be handled. Then comes the work of pulling down and inspecting, to be followed by loading. To the mechanical labor of the first of these processes the second adds a high degree of technical knowledge, as well as, perhaps, a high degree of commercial honor and regard for the reputation of the plant. The "culler," in other words, must be able to recognize at sight a faulty job, or a patch of "pale," or of "lammied" brick; if he respects his employer's reputation he must absolutely reject these. So the varying grades are "culled" out from the hundreds of thousands in the new pile and loaded upon barges for shipment.

This brings us to the end of our brief, popularly worded review of a most ancient art as it is practised in this twentieth century in this most progressive of all countries. Yet we cannot close without one curious antiquarian glance at the mysterious survival in brickmaking of at least one tradition the origin of which must be, as genealogical writers are fond of saying, "lost in the mists of antiquity." This is the obstinate adherence of brickmakers to certain numbers for the employment of which no evident reason exists in the nature of their business. Be it said, to avoid misconstruction, that there is no intention of criticising this interesting conservatism; on the contrary, the picturesqueness of it seems to make it praiseworthy, to say nothing of its probably venerable origin. The reader may have noticed here and there in the course of the article the mention of numbers for which no explanation was offered. Moulds, for instance, are always made to hold six brick; the brick are "spatted" in sixes; they are "edged" by sixes or twelves, but "hacked" in sixes or eights, and "one over two." The "wheelers" load brick on the barrows from the "hacks" in bunches of five or ten, and toss them to the "setters" in twos and fours, to be "set" "three over three" in "benches" of eight or of seventeen. After burning, they are taken from the kiln to the barrow in alternate "benches" of seventeen and eighteen. The kilns are "set" forty-five, fifty-one or fifty-four brick high, while the double wall about the kiln is built nineteen brick high, laid on edge. When the barges reach their destination the brick are handled, in removal from barge to track, by sevens; and at the building the hod-carrier takes fourteen at a time. It is impossible to say that no practical reasons exist in any of these cases for the persistence of the numbers, but the reasons, whatever they may be, are not apparent to the casual student of the art in its home on the Hudson River. and we prefer to



SOUTHERN HAVERSTRAW — D. F. & S. BRICKYARD
GREAT TRESTLE AND PIT, WHERE CLAY DREDGED FROM HUDSON RIVER LAST FALL IS NOW BEING USED. (11)

think that every one of these numbers was fixed for all ages by some master brickmaker at Nineveh or on the shores of the Nile.

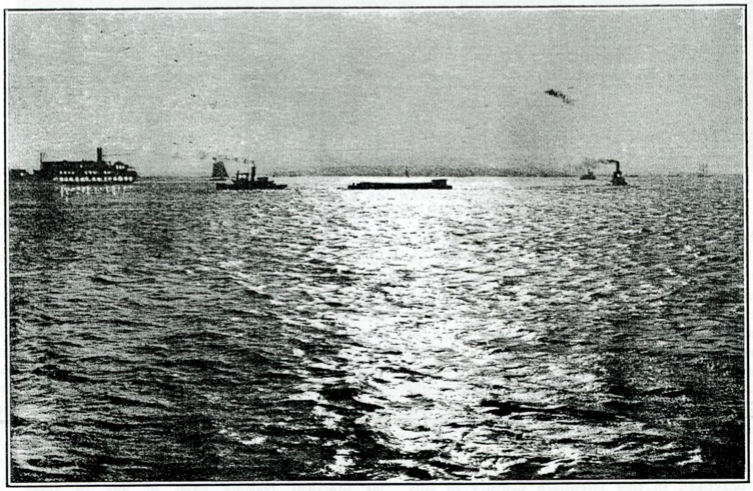
It is obvious to remark that the Hudson River brick plants enjoy enormous advantages in respect to transportation. It is not every factory of building material that has a clear waterway from its gates to the most rapidly growing of all the world's large cities, and that, too, at an insignificant distance. Even this short distance has been much shortened by the present general use of steam tugs, instead of the old-fashioned, though picturesque sailing vessels. A modern brick barge, towed by a steam tug on the Hudson River, carries on an average 350,000 brick (700 tons), and it takes a number of these barges to complete a "tow" for one tug. With these advantages, the Hudson River brickyards—which are, whether by mere accident or not, mostly under the management of active, energetic young men—not only supply a large volume of the material out of which young New York City is daily growing, but export millions every week—from that country where, in George Washington's time, it was the boast of the well-to-do that their dwellings were built of imported brick.

The following articles, describing the principal plants of the Hudson River districts, are the results of personal investigations made on the spot by the writer. Particular attention is called to the illustrations by the North American Engraving Company, which are engraved plates of the first systematically undertaken series of photographs ever made of these marvelous industrial processes. The readers of the BUILDING TRADES EMPLOYERS' ASSOCIATION BULLETIN will, doubtless, readily admit that Mr. William Thompson, the artist who has executed this work, has succeeded in obtaining results worthy his theme.

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*The illustrations accompanying "The Story of Brick," from photographs, are published by courtesy of Mr. John B. Rose and the following named gentlemen:

(1) Mr. H. H. hultz, (2) Mr. Theo. G. Peck, (3) Mr. W. N. Cary, (4) Mr. H. J. Jova, (5) Mr. Everett Fowler, (6) Mr. Wm. R. Martin, (7) Mr. U. F. Washburn, (8) Major Homer Ramsdell, (9) Mr. John P ck, (10) Mr. Daniel De Noyolles, (11) Mr. Everett Fowler.





PART OF ROSETON'S GREAT CROP—CLASSES OF MERRY SCHOOL CHILDREN.

The Rose Yards.

About five miles from Newburgh-on-the-Hudson are the largest brickyards and brickmaking plant of all the Hudson River group, those of the Rose Brick Company, John B. Rose, President. This establishment counts upon turning out 75,000,000 brick as its product for the season of 1905. It is not, however, upon the bulk of its output that this company relies for the fame of the building brick that bear the brand "Rose," but rather the quality which has created the demand which, in its turn, has made the enormous production commercially feasible. The President, a young man who left Yale not so many years ago to take up the burden of a great industrial administration, modestly says that he "thinks they make a good brick at Roseton"; and then he goes on to explain why the brick should be good.

In several respects the Rose methods of brickmaking are individual. It is hardly necessary to say, where results have been so thoroughly approved by the market, that these individualities of method are in no case due to either slavish adherence to tradition, to timidity about adopting recent improvements, or to parsimony. Every step in the long and complex process here is carried out in a way deliberately chosen after careful thought and experiment as the best way to attain the best results with the material and in the general conditions of that plant. If, for instance, no coal is used as fuel in the Rose Company's kilns and the company has closed a contract with Mr. E. H. Harriman for 35,000 cords of fuel wood, it is simply because close observation has convinced the management that wood burns the clay at their disposal more evenly and in all respects more satisfactorily than coal.

Close observation and care for detail carried to a degree which less ambitious manufacturers might call extravagant, are the law and gospel of these yards. To this admirable policy of the managers Nature has joined her aid in the magnificent banks from which the raw material of the "Rose" brick is mined. Within the area of 700 acres covered by the plant is a deposit of clay so pure that never a pebble is found embedded in the sods taken from it. This valuable bed of clay is covered by a natural layer of sand, which, when screened and sifted in the thorough, painstaking fashion characteristic of the whole plant, supplies an excellent quality of sand for moulding purposes. The coarser parts thrown off from the sieves are reserved to be sold for garden and park walks. It is from the Rose plant that the material is supplied for graveling all the walks in Central Park, in Prospect Park, Brooklyn, and in the whole park system of Newark, N. J.

One of the individual features of this plant is the absence of circular pits. The Rose doctrine is that efficiently constructed sod pits need no circular pits to help out their work. Not every brick plant, it is true, operates any part of its apparatus with the minute care invariably exercised in laying these pits and keeping the soft mud duly sanded. At Roseton they believe also in plenty of pressure on the sod-cutter to insure a good, homogeneous filling for the moulds; the

all-pervading thoroughness of the system appears again in the work of the "sander," who never seems to tire in his scrupulous attention to both his work and the condition of his tools. As every one knows who has anything to do with building, bricks intended for employment in architectural designs of any pretensions must look well. This important detail is provided for here at every stage of the making. In preparing the moulds the Roseton moulding sand is mixed with a judiciously calculated proportion of ochre to give a fine color. The greatest care is insisted upon in "jarring" the freshly emptied moulds at the yard, so as to be sure that no left-over lumps shall mar the symmetry of the next lot.

experienced onlooker, but to many an old hand whose experience has been gained in a more rough-and-ready school. It is a matter of admiration, too, for the visitor to note the conscientious care with which the employees in these yards perform all such minutiæ of their work—a spirit which is accounted for by what will be said later on about the labor conditions of the plant.

Of the kilns nothing very distinctive in method can be remarked, the apparatus in this department being distinguished only by their great extent and, as everywhere else in the plant, the exactness of execution with which every least operation is attended. It is in the kilns, perhaps, that the good will of the employees can do most for the success



EXECUTIVE STAFF.

John B. Rose, Pres. and Gen'l Mgr.; P. A. Northrup, Cashier and Ass't Mgr.; Geo. H. Terwilliger, Book-keeper and Time keeper; Herman Rossin, Supt.; Melville DeBaun, Ass't, and John Dolan, Sr., Jos. Lent, Eli Rabidue, Jos. DeTeurs, David Bradbury, Fred Reed, Chas. Odell, Peter Rickey, Henry Strong, Joe Mocko, Thos. Dixon, Emery Beauchamp, Geo. Ducharme, Emery Fitzsimmons and Louis Shaeffer.

The drying system here in use is principally that of the open yard, and pallet. The company's executive officers have their own reasons for preferring the open-yard system, and the results they have secured are their ample justification for the preference. Here again, however, success depends upon attention to detail as an abbsolutely necessary condition. The yards are laid with (1) 8 to 10 inches of gravel, (2) 6 to 8 inches of blue clay, (3) about 4 inches of yellow clay—a disposition of the successive layers not commonly followed. The surface is then chopped very fine before being "luted." The sweepings, "lutings" and rollings to which these yards are subjected would appear excessive not only to the in-

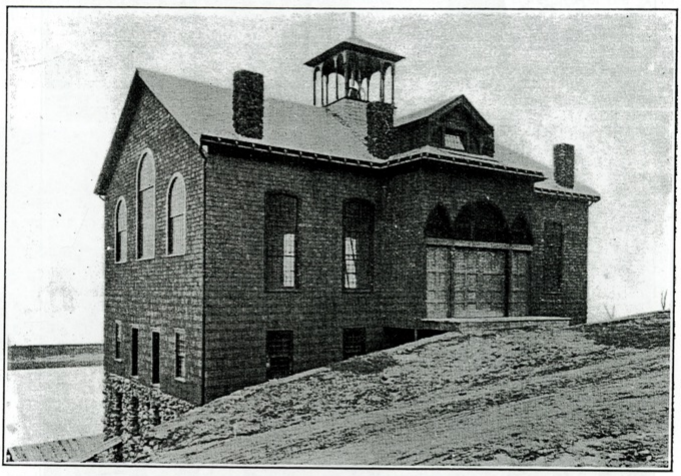
of a plant; no amount of supervision can make an efficient brickmaker out of an unskilled or a careless one; the man himself must both know his business and do it as well as he knows, of his own good will, for he is the master of the situation while the kiln burns. Here, therefore, one sees the satisfactory results of the relationship which the Rose Brick Company's management have been broad-minded enough to foster between their employees and themselves. It showed breadth of mind to recognize the full value of the human—the psychological—factor in the success of the industry. As a result, the brickmakers in their degree, like the sanders, machine tenders, "spatters" and the rest in their respective degrees,

work their best because they take a pride in the value and the reputation of the product.

The last of the material advantages of this plant to which it will be worth while to call attention here is the specially constructed docking facilities. The barges by which the bricks are conveyed down stream are brought to within a few yards of the kilns by a system of channels cut from the river large enough to admit barges of from 250,000 to 500,000 brick capacity. This is a labor-saving and time-saving arrangement; but the very last thing to be noticed in these yards is not a labor-saving device, but one by which the company makes sure that, even if a faultily moulded, a badly "edged" or an ill-burnt brick should find its way past all precautions to the contrary to the edge of the channel, it shall never reach

of humanity than these 800 employees of the Rose Brick Company could hardly be found anywhere else, even in this heterogeneous republic—Aborigines, Yankees, Germans, Italians, Frenchmen, Negroes, Irishmen, Slovacks, Magyars, Poles, Bulgarians, Roumanians, Syrians, Swedes and Hebrews. If they all spoke their respective languages while at work Roseton would be a reproduction of the first brickmaking plant recorded in history. But, various as their native tongues may be, they are all human, and it is universally human for a workman to demand of his employer —not coddling, indeed, nor incessant flattery, but substantially fair treatment, and a recognition of his human, his more-than-animal needs.

The material part of man is given due recognition at Roseton. The dwellings erected on the



ROSETON'S ORNATE HALL AND CLUB BUILDING—PECK, PHOTOGRAPHER, NEWBURGH, N. Y.

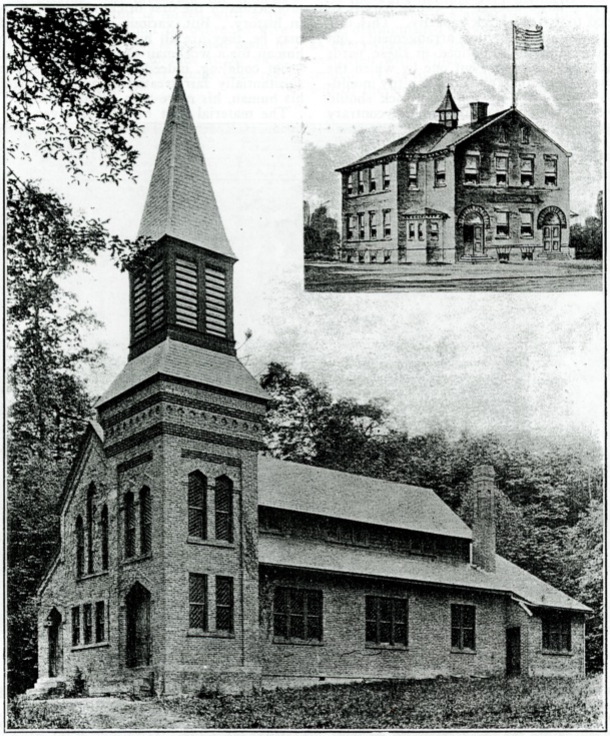
the builder. The "culling," or selection, of the brick is done here by the kiln men and their foreman, also by the barge crews and their captains—a double check before the brick starts on its voyage. When the barge laden with "Rose" brick reaches its pier at the city the cargo is not simply landed there, it has to pass another examination—one last "culling"—before being delivered to the purchaser, all of which helps one to understand the brand's market eminence.

And now a word as to the happy relations which prevail here between employers and employees. One hardly hears of labor troubles in these yards. As has already been observed, the management understand the value of the human factor in turning out good work, therefore they treat their men as human. A more heterogeneous assemblage

Rose brick plant—all painted rose color—for the use of the workmen are commodious, with plenty of light and air in their interiors; not least important, the houses are kept in thorough repair, for honest, cheerful work can hardly be expected of a skilled laborer who sleeps and eats in a dismal, tumble-down hovel. As to supplies, the company contrives to carry on the store system without any of the hardships which, under careful management, it may involve upon employees; the stores, with their prices lower than current retail prices, are there for the employees to patronize if they choose—the best of eatables, with tobacco, cigars, soda water and such comforts, though not including alcoholic beverages in their stock—but if the men prefer to trade in Newburgh or with the peddlers who visit the yards no

black mark is allowed to stand against a man's name for exercising his legitimate choice in favor of outside enterprise. Then, there are clubrooms for those who will comply with the fairly easy conditions of club members; and besides the facilities for reading, which are so much a matter-of-course in these days, the club affords amuse-

olic. Protestant and Greek Orthodox communities all having opportunities for their respective forms of worship. But of these matters it is enough to speak here in a general and summary way. This article is about the Rose brick plant, not the Rose object lesson in sociology, and the life of the employees when off duty only concerns



ROMAN CATHOLIC CHURCH, ROSETON—ROSETON'S NEW SCHOOLHOUSE.

ment in the form of billiards, cards and other games. For special entertainments there are the "ladies' days" and the fairs, the school festivals and the annual series of genial festivities which Christmas always brings at this remarkable little industrial settlement. It is a settlement well supplied with churches and Sunday schools, the Cath-

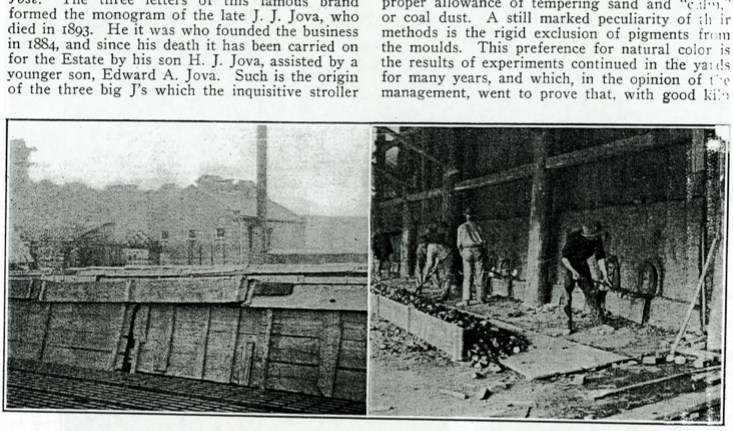
the main theme as explaining why those employees turn out good brick with a reliable uniformity which could never be hoped for if their only motive were the slavish fear of "losing a job."

It may be interesting to state in closing that the pay roll at the Rose plant averages about $30,000 a month in season.

The Jova Yards.

Adjoining the Rose Brick Company's plant is that of the Jova Estate, known as The Jova Brick Works. The brick produced here bears the brand "J.J.J." and commands a higher price than any other brand in the market, except that of their nextdoor neighbors. Before speaking of the magnificent facilities, natural and artificial, which combine to produce this splendid result, it will be interesting to glance at the personal beginnings of the enterprise. The family origin is sufficiently indicated by the fact that the name is pronounced in the Spanish, not the Englis' way, the initial being the "jota," like that in *San Juan* and *San Jose*. The three letters of this famous brand formed the monogram of the late J. J. Jova, who died in 1893. He it was who founded the business in 1884, and since his death it has been carried on for the Estate by his son H. J. Jova, assisted by a younger son, Edward A. Jova. Such is the origin of the three big J's which the inquisitive stroller last it 200 years longer, with tempering and moulding sand enough for half a century's brickmaking supposing the works to be continued at their present capacity.

This plant comprises eleven sod pit machines The daily capacity of the works is 250,000 brick, or 33,000,000 per season. Machinery is extensively employed in the two yards, in the larger of which the motive power is supplied by a Fish' ill Corliss engine of 350 horsepower, while another engine of the same make, of 100 horsepower, is used in the smaller yard. The Jovas use blue clay almost exclusively in their pits, with, of course, the proper allowance of tempering sand and "culm," or coal dust. A still marked peculiarity of their methods is the rigid exclusion of pigments from the moulds. This preference for natural color is the results of experiments continued in the yards for many years, and which, in the opinion of the management, went to prove that, with good kiln

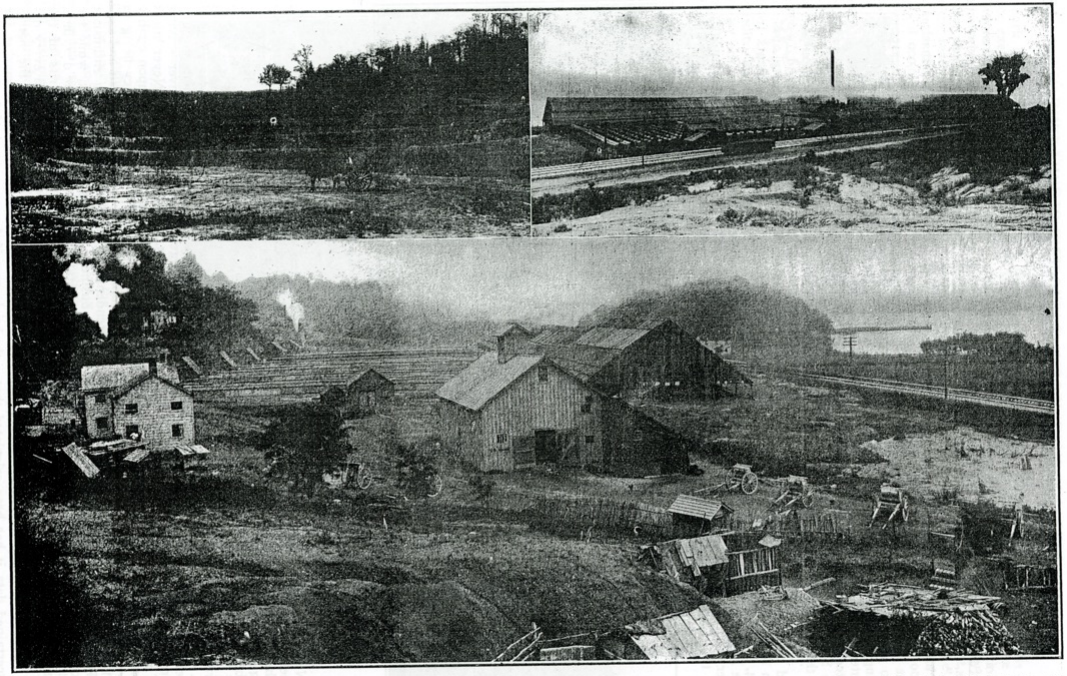


ENGINE HOUSE, CONTAINING 400-HORSE-POWER ENGINE.—BURNING 1,000,000 BRICK WITH COAL ON THE JOVA YARDS

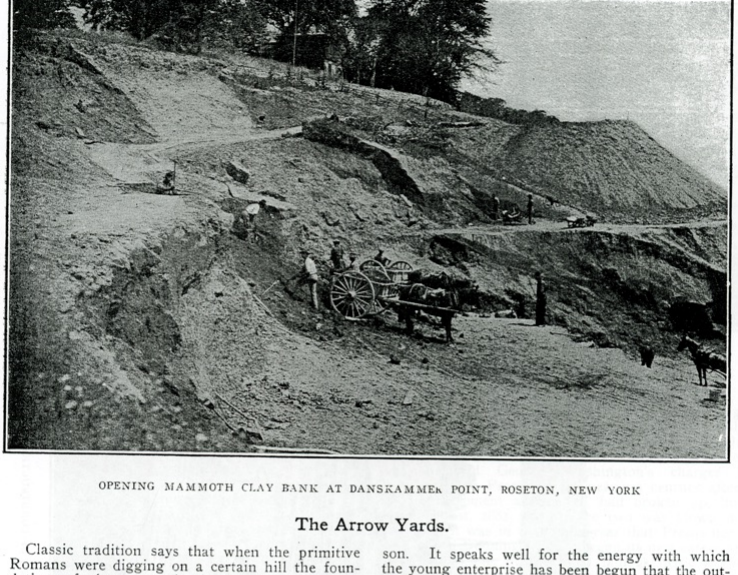
about New York City may, if he begins investigations before the mortar has covered them, find upon the bricks of the new Custom House at Bowling Green, of the Brooklyn Navy Yard buildings, the new Public Library building of the City of New York, and (exclusively) the great new Trinity Office building, next to old Trinity Church. The same brand has been used in the construction of New York's foremost hotels, the Hippodrome, and many of the most famous erections of recent seasons.

In character the clay deposits of the Jova plant are like those of their neighbors the Rose Company, with which the strata are geographically identical. In extent their undeveloped banks alone cover 100 acres. The Jova banks are the highest on the Hudson River, rising 140 feet above the level of the water, while borings made there for artesian wells prove that the deposit continues for a depth of 126 feet below the same level. Upon these ascertained data it has been calculated that the plant has enough material on its premises to work, the native oxides of the minerals give results both more pleasing to the eye and more lasting than could be obtained from added pigments.

Everything in the Jova plant is on a large scale. In drying, both the open-yard system and the pallet are employed. Coal is used exclusively in the kilns. The kiln shed, on their lower yard, of the regulation width, is 1,000 feet in length—probably the longest on the Hudson River—giving a capacity of 15,000,000 to the kilns. Never bitles the reliance of the plant is far more upon quality of output than upon quantity, its policy being to employ only first rate experts as foremen and superintendents, while Mr. H. J. Jova, an enthusiast in his business proudly maintains that, while the great reputation of the three J's would suffice, perhaps, to sell the brick on the merits of the brand, the elaborate care expended upon every detail of the making and the excellence of the material at their command would create a market for the brick, even if the past record of the brand were entirely forgotten.



CLAY BANK OF THE JOVA BRICK WORKS; LARGEST DEPOSIT ON THE HUDSON RIVER—VIEW OF SOUTH YARD AND KILN SHED, 1,000 FEET LONG—VIEW OF NORTH YARD



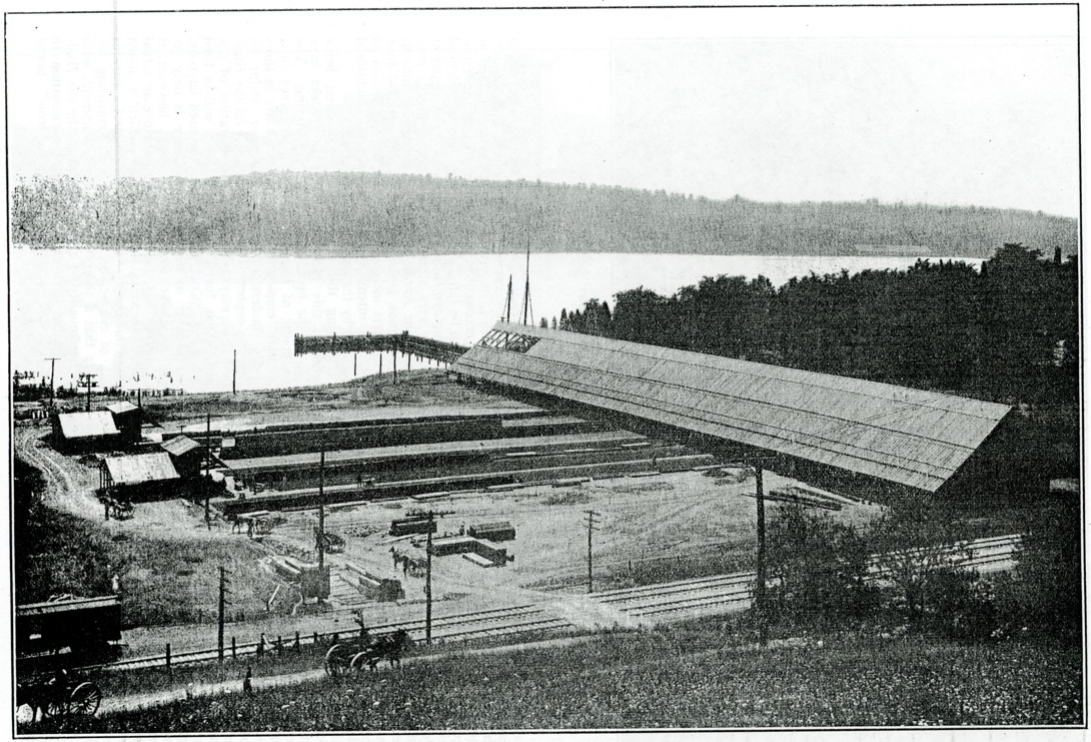
OPENING MAMMOTH CLAY BANK AT DANSKAMMER POINT, ROSETON, NEW YORK

The Arrow Yards.

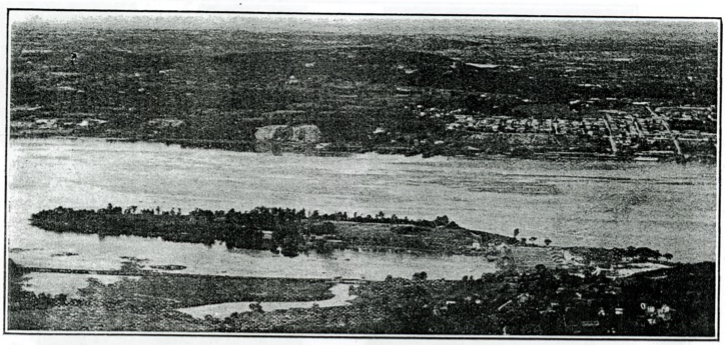
Classic tradition says that when the primitive Romans were digging on a certain hill the foundations of what was to be the most famous citadel in the world, they found a horse's head and accepted that as a sign that their nation should ever be victorious in war. They called the temple-citadel built there "Capitol," from the Latin word "head," and the Roman name has since then been consecrated to the chief governmental buildings of our own Republic and its constituent States. In something of the same spirit the Arrow Brick Works have taken their name from the finding of certain old Indian arrowheads in the course of the excavations which were made at Danskammer Point, on the Hudson, preparatory to the laying out of their yards. Those old arrowheads were accepted as a sign that the product of the new yards should go straight and swift to the bulls-eye of popularity, and the beginning of operations made there in March, 1905, under the direction of the owner, Mr. E. Maitland Armstrong, indicates that the "Arrow" brand will fairly justify the good omen.

Hard by the Roseton and the Jova yards, the Arrow Works enjoy all the geological advantages of that district. The clay banks which supply them are 40 acres in extent, and rise to a height of some 200 feet, the clay lying at an average depth of 25 feet below the surface. With this excellent blue clay, and the sharp sand found with it, as material to begin upon, the Arrow Works have opened with four machines, capable of turning out from 10,000,000 to 12,000,000 brick in the season. It speaks well for the energy with which the young enterprise has been begun that the output for this, its very first, season is estimated at about 5,000,000 brick. Mr. Armstrong's determination to be fully abreast of the times is evidenced in his employment of electricity as a motive power from the very start. The machines already running at the Arrow Works are driven by individual dynamos, and when the present outfit of four machines is increased to seven for the season of 1906 the intention is to operate the additional machines by the same modern means.

Following the example of other great brick plants in this vicinity, the Arrow Works have adopted the open-yard system for drying. The fine points of brick-workmanship involved in a successful employment of this system are as thoroughly understood at Danskammer Point as might be expected from its situation on the river. The same may be said of the operation of the kilns, which, for the present at least, will be fired with wood. Coal will doubtless be used later on. The number of employees this year is only 80, with ten horses and carts; in 1906, however, it is expected that these works will achieve an actual output of 20,000,000 brick, for which a much larger number of employees and general apparatus will, of course, be needed. Mr. Armstrong believes that a thoroughly modern equipment, with the best quality of clay and sand in the the Hudson Valley, and an invincible determination to succeed, will surely carry the "Arrow" brand to its mark.



YARD AND DOCK OF ARROW BRICK WORKS IN PROCESS OF CONSTRUCTION AT DANSKAMMER POINT, ROSETON, NEW YORK

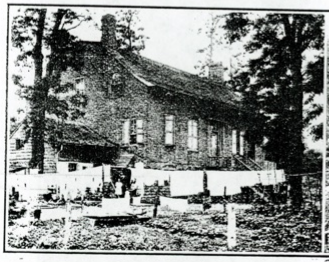


"PRESQU'ILE," GEORGE WASHINGTON'S RETREAT IN 1782—PHOTOGRAPH FROM MT. BEACON

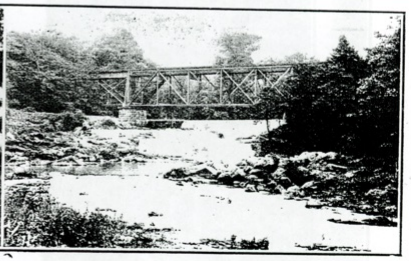
The Denning's Point Yards.

Even the hard, dry facts of industrial enterprises must sometimes be lighted up with the glow of romantic tradition. The Denning's Point Brick Works, owned by the Ramsdell Estate, occupy historic ground about one mile south of Fishkill-on-Hudson, and memories of the nation's early infancy hang about it still, for between the spring of 1782 and the autumn of 1783 General Washington's army was encamped upon Fishkill Plains, near to which encampment a long, low peninsula jutted out into the river. This point of land, then commonly known as "Presqu'ile," was convenient for the Commander-in-Chief's landing. Horses would be held in readiness there for him and his staff, and they regularly mounted to ride to camp, and dismounted on their return under two great oak trees on Presqu'ile. The principal member of the staff was Adjutant-General William Denning, who sometimes brought with him his son, William Denning, Jr., then only 14 years old. When this lad returned to Fishkill forty years later, after a life of travel and adventure, he recalled these early associations of his own life with the great past of his country, and purchased thhe low-lying strip of ground from a member of the Verplanck family. The two old oaks which had so often sheltered George Washington's charger both stood on Presqu'ile for nearly a century after his encampment at Fishkill had broken up, but in August, 1881, one of the two was blown down, and it was in that same year that Presqu'ile, now called Denning's Point, began its new career as the site of one of the most famous brick works of the Hudson River district.

The Denning's Point plant, now occupying 103 acres, was founded in 1881 by the firm of McLean & Co., with two machines. Those two machines have now increased in number to seven, with a daily output of 154,000 brick. The plant employs 150 men, with 22 horses and 18 carts, not a large number considering that the actual number of brick sold in 1904 was 17,000,000. Little did General Washington, practical and shrewd observer as he was, suspect the latent wealth of that little peninsula which afforded him so convenient

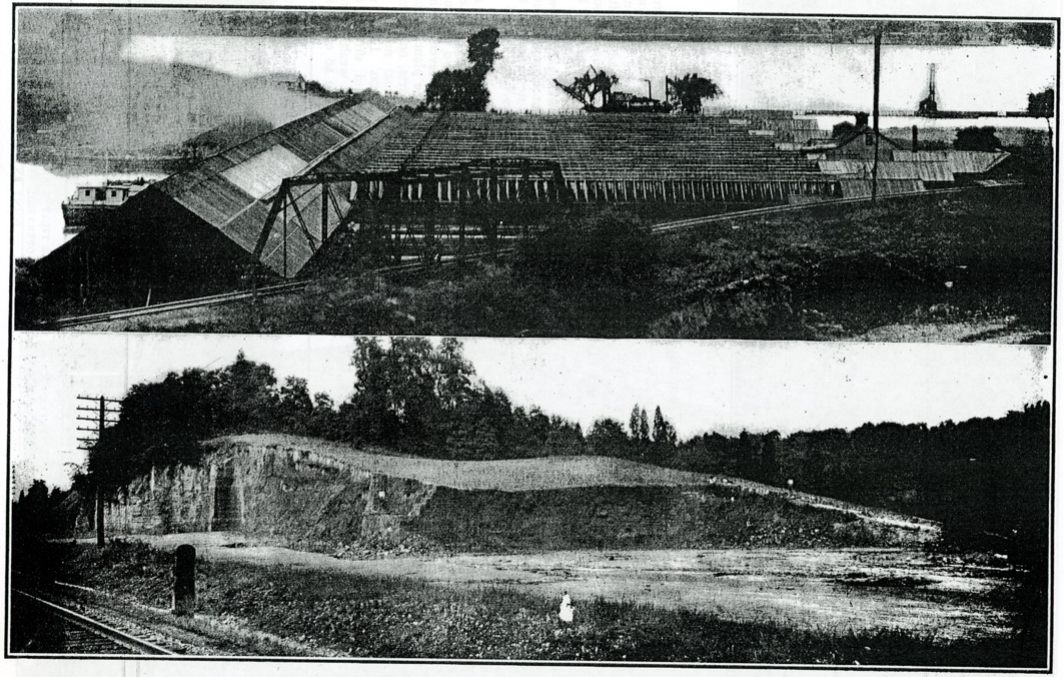


THE NEWKIRK MANSION, NEAR DENNING'S POINT, BUILT WITH HOLLAND BRICK IN THE 17TH CENTURY

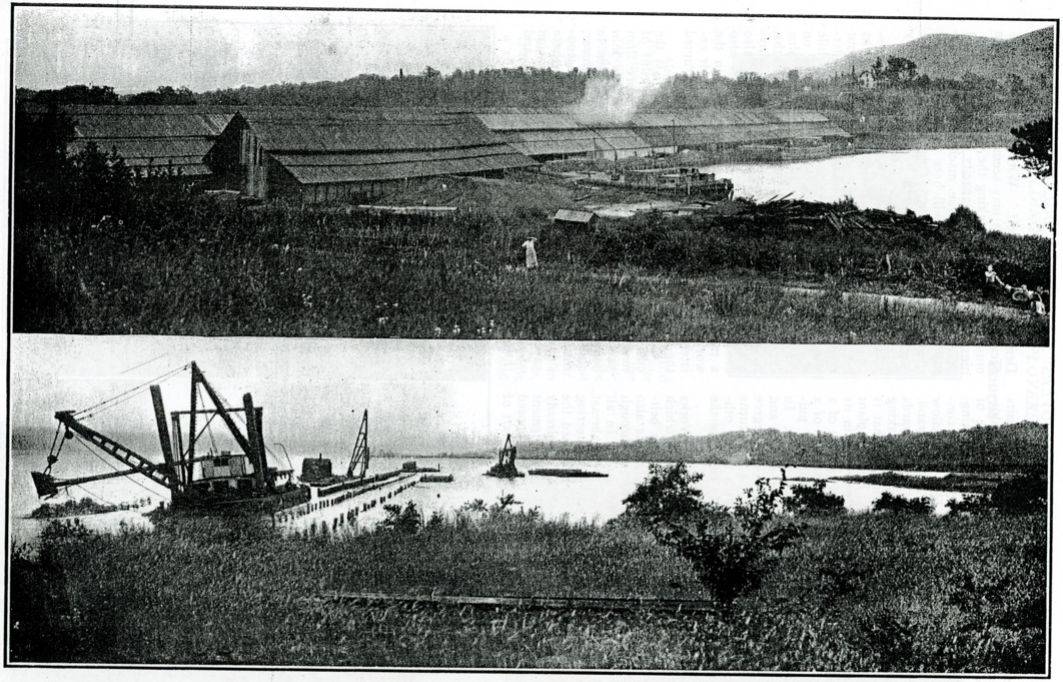


WATER POWER THAT WILL FURNISH ELECTRICITY FOR THE OPERATION OF THE DENNING'S POINT ENTERPRISES

Property of
HAVERSTRAW
BRICK MUSEUM



THE DENNING'S POINT YARDS—ONE OF THE CLAY BANKS



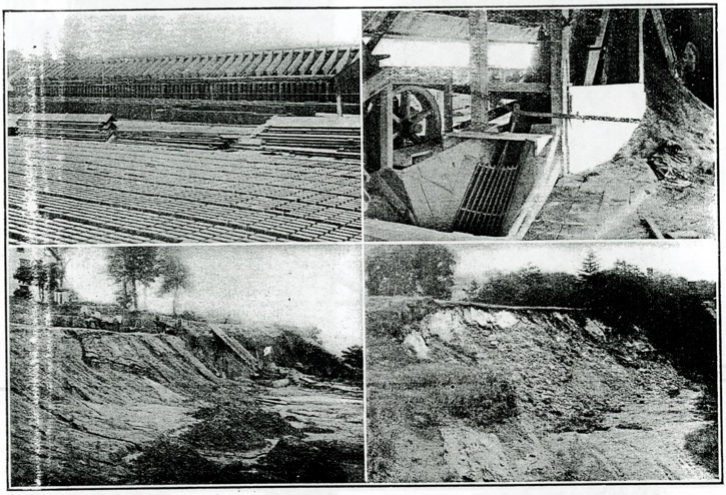
WHERE THE GREAT BARGES ARE LOADED AND SHIPPED—NEW DOCK AND PLANT UNDER CONSTRUCTION; DREDGES AT WORK FILLING IN NEW YARD

a rendezvous for his horses. The clay deposits have run from 25 feet to 75 feet in depth, in addition to which the river affords an abundance of quicksand, which is of greatest value for mixing. This, as well as pit sand, loam and "culm," contributes to aid the stiff, "strong" blue and yellow clays in making the famous "D. P. B. W." brand. No pigment is added, the shale of the yards (which was formerly used as material for making a red paint) being trusted to produce all that is desirable in the way of fine color. But this plant illustrates the economic value of enterprise in its use of gravel, shale and old brick, by means of a crushing apparatus. This apparatus consists of a "Champion" road crusher and a Williams pulverizer with a capacity of six tons per hour. In this powerful machine the mass of stones and other refractory material is reduced to any degree of fineness desired, and the result not only turns to good account much material which would otherwise be useless, but also decidedly enhances the strength of the material.

For mixing, the Denning's Point Brick Works use a double soak pit, filled in layers, from which the mud is conveyed to the pug mills by a belt-and-bucket machine. The "sanding" here is also done by machinery, and the mud forced through the pug shaft by bevelled rotary knives. In all these respects everything here is decidedly abreast of contemporary mechanical and engineering progress, but the works have not yet reached the full growth at which they aim. Clay is already being dredged from the river bed to supplement the product of the higher level. It is proposed also to make the works eat up the greater part of Denning's Point itself. With the present capacity of the works it may seem that such a fate must be long in overtaking the historic little peninsula, but the present capacity is to be increased by the addition of eleven machines, and in the new yards electricity will here take the place of steam as a motive power. This augmented plant is expected to be, either wholly or in part, ready for operation in the season of 1906.

Within the present year the "open-yard" system previously in use for drying at these works has been modified to the extent of covering about three-quarters of the drying space. On the latter are now made all the No. 1 hard brick, while the "double-coal" brick are made exclusively on the open yard. In the Denning's Point kilns one noteworthy feature is the stationary hearths, which were introduced here earlier than anywhere else on the river. These kilns were also among the first to use coal for fuel. It is also a remarkable fact, and a source of pride in the works, that in the quarter of a century of their existence no such thing as a strike has interrupted the prosperous evenness of their progress.

One reason of this immunity, it is said, is the custom followed in the Denning's Point kilns of never allowing the brick to be piled more than 54 brick high, excessive height in piling a kiln being a grievance which often causes the men to quit work at inconvenient times. This, however, is only one instance of that system of mutual consideration and fair dealing which prevails in these yards under the wise and efficient administration of the estate, under Maior Homer Ramsdell, and the yard manager, Mr. D. C. Lent.



OPEN AND COVERED YARD—THE GREAT CRUSHER—SAND BANK—SHALE BANK

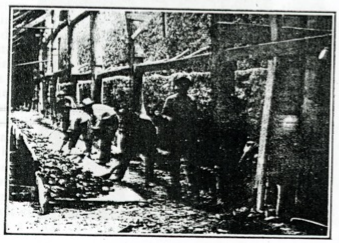
The Bourne Yards.



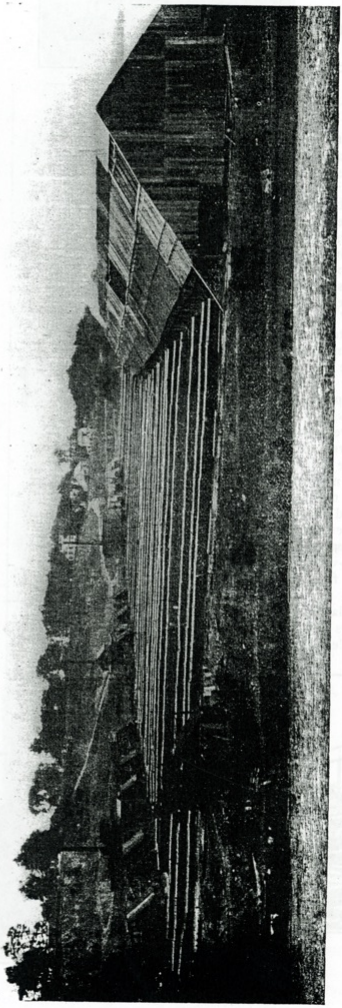
THE BOURNE CLAY BANK

About two miles north of the New York Central Railroad depot at Fishkill-on-the-Hudson is the compact and up-to-date community where the "Bourne' brand of brick are manufactured. Occupying an approximate area of 300x900 feet these yards are owned, and flourish under the direct personal supervision of Mr. C. C. Bourne. Mr. Bourne came to the district in 1889 and set up in business on the ground which he still occupies. During the intervening sixteen years he has built a village, comprised of forty tenement houses, and his product has increased fivefold, the total capacity of the yards at the time of their opening having been only 5,000,000 brick annually, as against the present average daily output of over 200,000, or 25,000,000 per season. His fleet of six barges transport the brick to market.

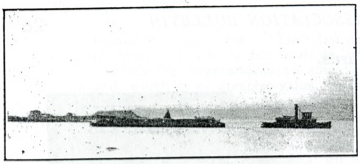
The raw material of this plant is taken from a clay bank which rises to a height of about seventy feet above the river level. In extent this deposit covers between twenty-five and thirty acres. The clay is of a good "strong" quality, distributed as to color in the proportion of three-fourths blue to a brick of such perfect color as to justify the abandonment of added pigments. This extremely promising material Mr. Bourne manufactures on



BURNING A KILN WITH COAL



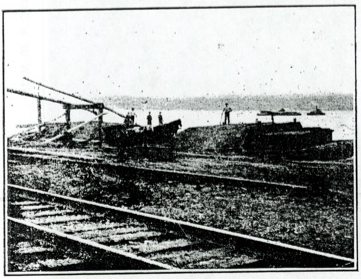
VIEW OF BOURNE YARD SHOWING MACHINES AND CLAY BANK



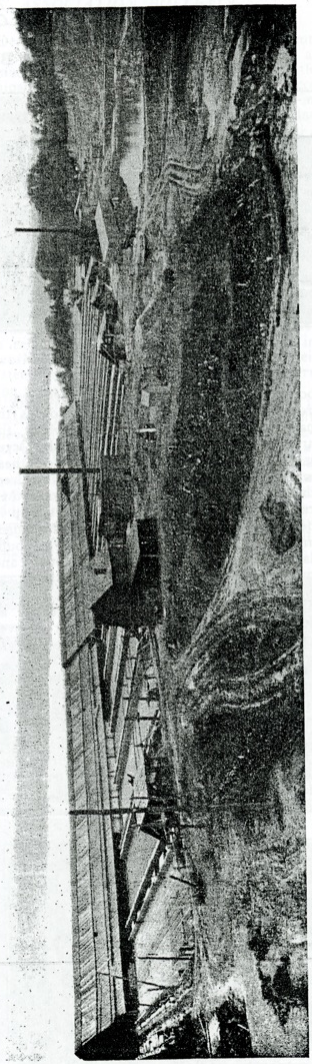
BARGE "BOURNE" NO. 4, BOUND FOR NEW YORK

a system combining the advantages of the latest mechanical improvements with all those features of the older methods which experiment has shown to be the best practicable in handling this particular character of clay. The owner and manager of the yards is neither a reckless innovator nor a hide-bound adherent of tradition, but a careful and enlightened eclectic, deciding the expediency of this or that change purely upon consideration of its tested fitness for his particular purposes.

The Bourne yards are operated upon the "open-yard" system, elaborated with that minute attention to detail which is indispensable for securing the maximum of drying effect of sunlight and while not risking the least damage to the green brick by exposure to rain. Perfect handling in transportation from the machines, in "dumping," "hacking," and all the other critical processes insures the uniformity of outline, square edges, and remarkably small percentage of spoiled brick at the kiln upon which the yard prides itself. The nine machines in use here are of the Wiles make. For mixing and tempering, sod pits alone are found to give the best results with the clay used in these yards. The power plant comprises a 150-horsepower Corliss engine and a 75-horsepower slide-valve engine. Lastly, the kilns are run with coal fire exclusively a detail to which, together with the skill and scrupulous care exercised in regulating draughts, the manager and owner ascribes much of the success attained in the finished article which bears the "Bourne" brand.



UNLOADING BARGE OF SAND



RIVER VIEW OF THE BOURNE YARD

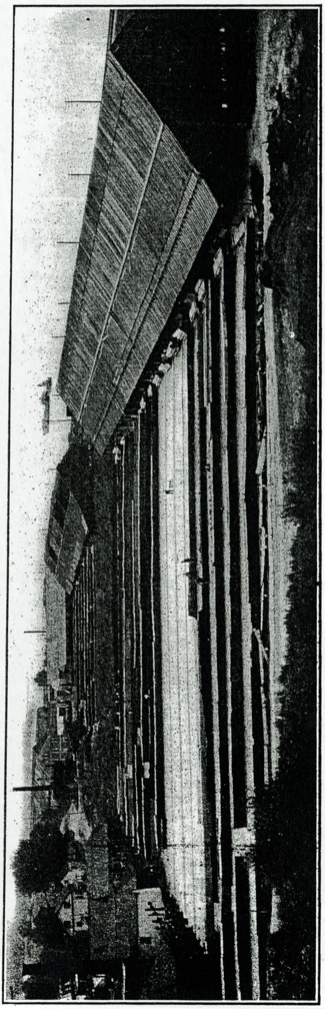
The Lahey Yards.

The personal element has been a specially important factor in the success of the "Lahey" brand of brick. Mr. William Lahey not only enjoys a high reputation for fair and honorable dealing, but as a manufacturer he has achieved much through his own industry, as well as by his gift of "knowing how." Owning and operating two yards on the Hudson River, with a total output of 165,000 brick per day, he has never ceased to give to every detail of the work the same zealous and thoroughly informed attention which enabled him to raise his yards to their present high importance in the brick industry.

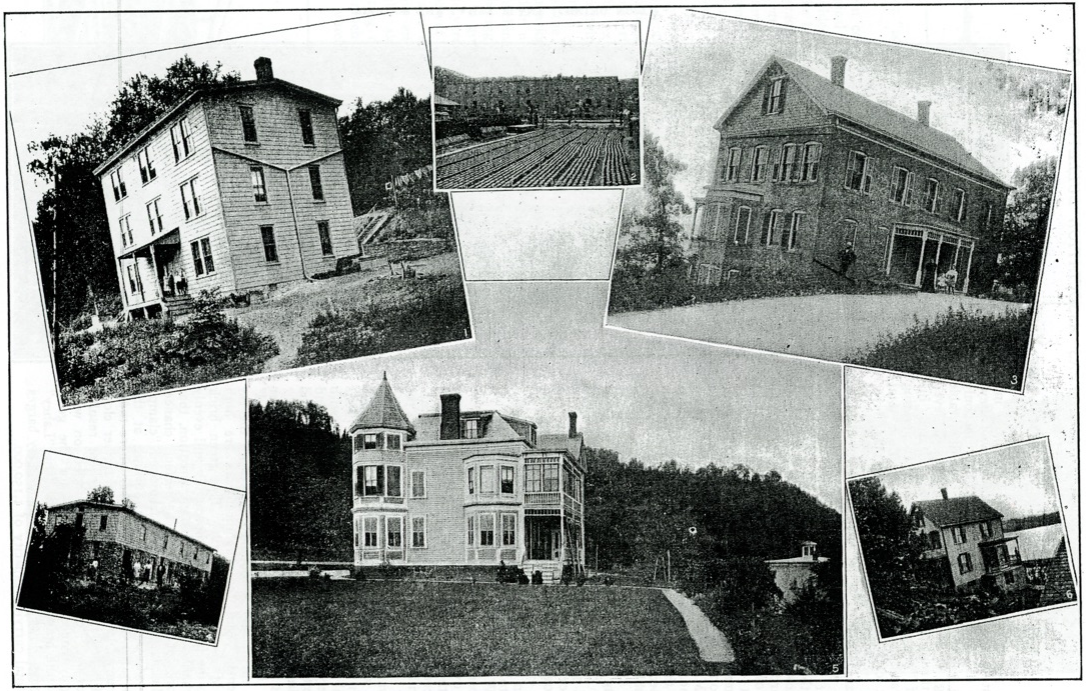
Of these two yards, one is situated at New Windsor, the other at Fishkill. The New Windsor yards, near Newburgh, cover an area of 40 acres, owned by Mr. Lahey, including clay banks and a handsome residence, adjoining. Here brick manufacturing was begun as early as 1850, and continued by Lewis Carpenter until 1880, when Mr. Lahey began to operate them with one machine. Three machines are now busy on those yards, the daily 30,000 brick of 1880 having now increased to 75,000 per day. Mr. Lahey founded his Fishkill yards in 1889, and in 1893 the output of the two machines there was 50,000 brick per working day; these yards, covering 25 acres, occupied on a ten-year lease, now run four machines, producing 90,000 brick daily. The New Windsor and Fishkill yards at the present time have together a season capacity of nineteen millions; eighteen to twenty horses and carts are used in operating them, and they give employment to 170 men. Mr. Lahey's third yard at East Windsor Hill, Conn., is managed by his son, Joseph Lahey, and Mr. M. M. Hayden.

The owner of these plants, himself a past master in the art and craft of brickmaking, attributes the success of his product most especially to care and skill in mixing and drying. As regards the former of these processes, the system of both these yards is that of the circular pit, but thoroughly supplemented by the pug mill. The clay on both plants is part blue and part yellow. This material is thoroughly tempered and ground with a nicely adjusted proportion of sand and sufficient "culm." No coloring matter is used in producing the "Lahey" brick.

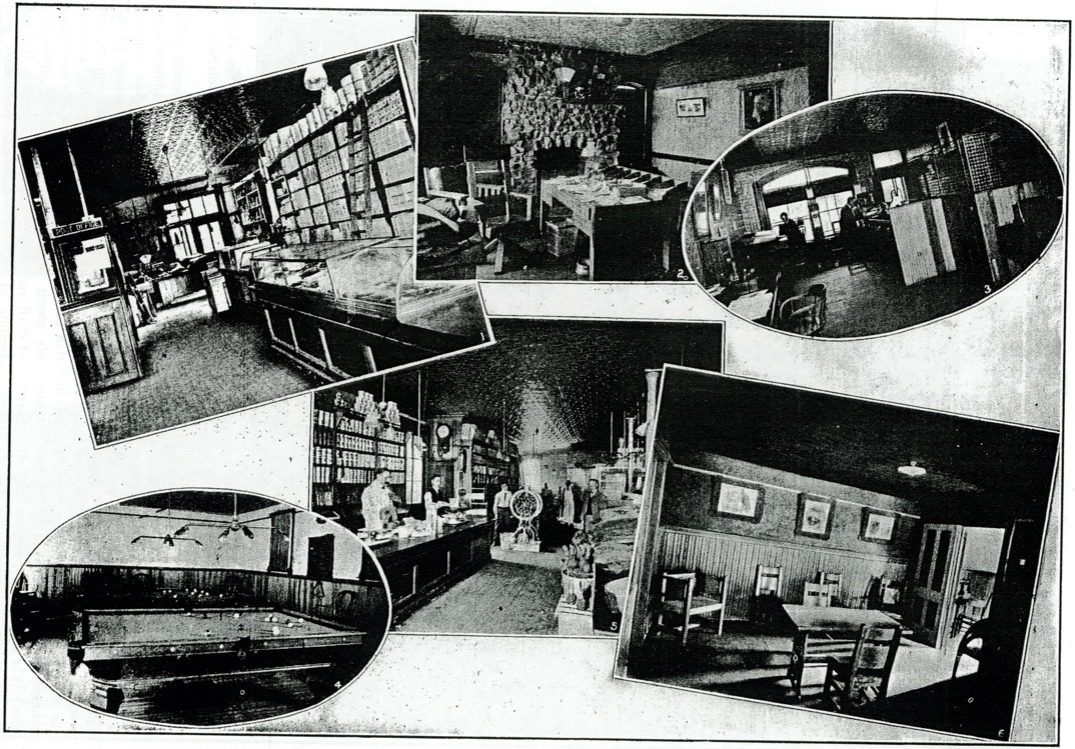
As to the means by which this manufacturer attains his results in drying, the "open-yard" system exclusively is found to answer all the requirements. And these requirements are high under Mr. Lahey's direction. The green brick come to the Lahey kilns so thoroughly and evenly dried, thanks to care and constant attention, that the work of the fires has a perfect chance. The kilns are built on the old-fashioned "clamp" system. Coal is used for the burning at the Fishkill yards, but at New Windsor, where there is a remarkably abundant supply of timber close at hand, wood is found to give excellent results. The work of "culling" is here carried on with thoroughly conscientious thought for the good name of the brand in the market. The "Lahey" brick comes down the river on four Lahey barges with a total carrying capacity of 1,150,000.



VIEW OF THE LAHEY PLANT LOOKING NORTH



ROSETON VIEWS—(1) SUPERINTENDENT'S HOUSE—(2) "WALDORF-ASTORIA" HOME OF EMPLOYES—(3) HOME OCCUPIED BY ASST. SUPT. AND MANAGER OF STORE—(4) QUARTERS OCCUPIED BY NEGRO EMPLOYES—(5) THE "HOMESTEAD"—(6) HOUSE OF ASST. MANAGER



ROSETON INTERIOR VIEWS—(1 AND 5) THE STORE—(2) OFFICE OF THE PRESIDENT—(3) GENERAL OFFICE (CASHIER AND BOOKKEEPER)—(4) BILLIARD ROOM AND (6) RECEPTION ROOM IN ROSETON CLUB

Compliments
Charles Elley Hall

"Brick without Straw" at Haverstraw

by Charles Elley Hall



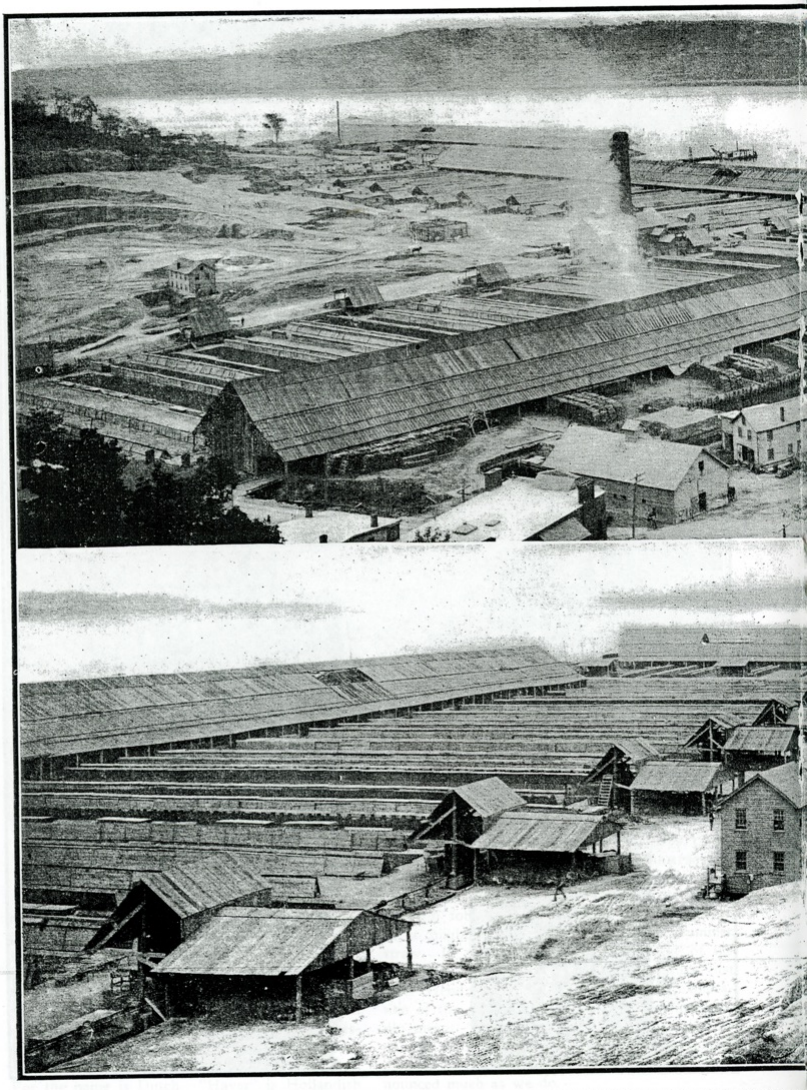
BIRDSEYE VIEW OF HAVERSTRAW, GRASSY POINT AND STONY POINT IN 1884, SHOWING KILN SHEDS, CLAY BANKS AND COFFERDAM. (X) SHOWS "TREASON HOUSE."—PHOTOGRAPHS BY WILLIAM THOMPSON

The name of the place certainly suggests a connection with bricks, if one's mind happens to be properly saturated with Old-Testament lore—Is it not recorded that the Israelites complained against Pharaoh, saying that they could not make bricks unless they had straw?—But then again, if the true etymology of the name be considered, in connection with what is known of the early history of the place the connection between its name and its present chief interest is not so obvious. For the name is Dutch. "Haver" is Hollandish for "oat;" in the Lowland Scotch dialect, so closely resembling those of the Low Countries, "havers" means more particularly that part of the oats which is winnowed away—the chaff, or rubbish—so that "Havers, mon!" is a Scotch colloquialism for "Sir, you are talking rubbish"—or, as it might be, talking through your summer straw. In the sober, temperate language of the Hollander settlers of the seventeenth century, just after Hendrick Hudson made his first exploration of the great New York river, the word simply meant "oat" or "oaten," without distinction of chaff and kernel, and "stroo" was the Holland spelling of "straw," which the Hollanders pronounced much as we do.

It was a likely enough name to be given by agricultural settlers, and such were the Dutchmen who settled that strip of the Hudson River's right bank. The district, including Grassy Point and

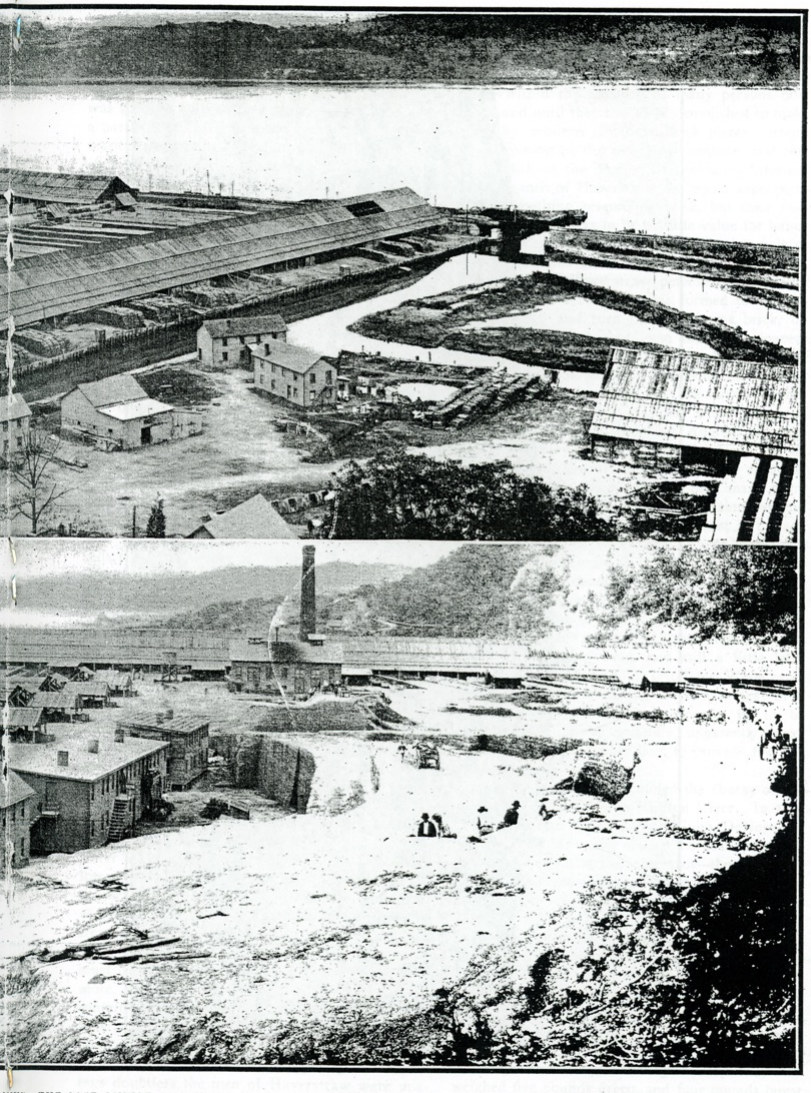


OFF FOR THE CLAY BANK—THE ROSE COMPANY STORE AND OFFICES—VIEW OF STAGE IN ROSETON HALL



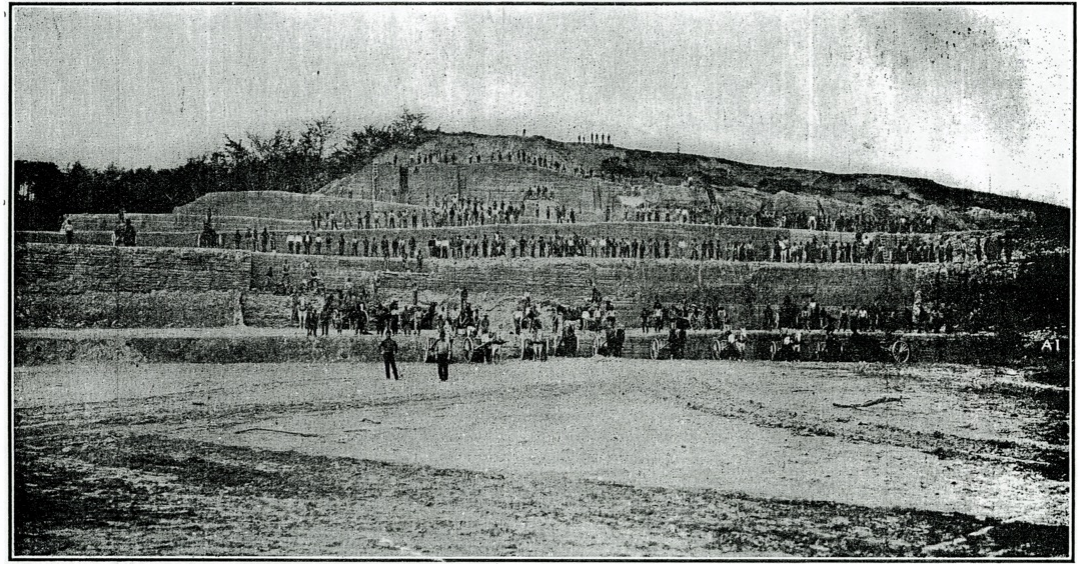
VIEWS OF ROSETON; THE LARGEST BRICK MANUFACTURING PLANT ON THE HUDSON RI

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IVER—THE ROSE MIDDLE AND UPPER YARDS—LOOKING SOUTH FROM THE GREAT CLAY BANK

BRICK MUSEUM



MINING CLAY IN THE ROSE CLAY BANK

Stony Point, was regarded as arable land of sorts when its name first appeared on a map in the year 1616. Half a century later much of the district was granted by patent to one DeHarte, and when a part of the DeHarte grant passed into the possession of Captain Cornelius Kuyper early in the eighteenth century, attempts at farming had been the only use to which the white man had ever put the land there. No one thereabouts seems to have yet realized the vastness of the mineral wealth which lay beneath their feet; the Dutch farmers of Haverstroo probably regarded the beds of clay simply as so much ill luck for them, in the shape of cold barren soil. Cornelius Kuyper passed away in the year 1731, and his son Claus inherited the acres which were to play so great a part in the development of a republic yet undreamed of. From Claus Kuyper, when he died in 1760, the property passed to his six sons and two daughters. Within ten years these six sons had sold most of it to a certain John DeNoyelles, a man of that Huguenot stock which France about those days was scattering like seeds of power, not suspecting how in centuries to come it would bear fruit to the glory and profit of other nations. Nicholas, one of these same Kuyper brothers, then sold an adjoining tract to John Allison. And thus the two families which have been so closely and gloriously associated with the development of the brick industry at Haverstraw—and, indirectly, throughout America—gained the hold upon the DeHarte patent most of which their descendants still keep, to the no small benefit of the community.

John DeNoyelles lived many years after this; he had the distinction of a seat in the Continental Congress, but departed this life (January 11, 1775) before its glorious work had been fully done. He left his Haverstraw property to two sons, John and Peter, jointly. John Allison had died in 1754, leaving his purchase to his son Joseph, by will. On May 29, 1792, John and Peter DeNoyelles agreed upon a partition of their co-heritage; that portion which was assigned by this agreement to Peter has since been sub-divided into building lots, and has no further direct concern with the subject of this article. A decade or more then elapsed before the brick manufacture of Haverstraw fairly began.

As to why it ever should have begun, the reason must be sought in geological ages unthinkably remote. Briefly, the primary rock of this region, containing much oxide of alumina in some form or other, decomposed in the tertiary period into the dust which in a tightly packed, but not stony, form, is called clay. Of these geological happenings doubtless the men of Haverstraw were unaware, when they built them those houses with great chimneys of imported Dutch brick, which stood within the memory of many persons now living and until they had to be demolished to make room for modern American brick plants. About the beginning of the nineteenth century, and certainly without the impulse of geological information, the men of Haverstraw did try, it appears, to make something resembling brick, but their output was so crude as to be of little value for building purposes, although an authenticated sample of it might nowadays be highly prized as an antique.

The men of Haverstraw persevered, nevertheless. In 1810 a company was formed to work a regular kiln, and turn out real burnt brick, on Minisceongo Creek, but even then the pioneers were discouraged, and the attempt abandoned. It was important, however, as preparing the way for the coming of James Wood, the father of the American brick business. Born in the Parish of Ardly, Colchester, in the East Anglian shire of Essex, February 8, 1773, James Wood was left an orphan at the age of four, and had to shift for himself when he could not have been many years older. He learned the trade of a brickmaker and with it for his principal capital set out at the age of twenty-seven for New York. Every known circumstance connected with it tends to show that his coming to this country was with the deliberate purpose of developing a brick industry in the New World. Landing in New York City, April 4, 1801, he was soon after engaged in attempts to manufacture brick at Sing Sing, and still a little later again at Georges Island. At last James Wood came to Haverstraw and there noted two things; first, an abundance of clay exceptionally fit to be moulded into brick; secondly, apparently inexhaustible tracts of timber land to provide fuel for his kilns.

This fair prospect determined the course of the pioneer brick man of the Hudson River. In 1815 he leased a bit of land from John DeNoyelles, opened a clay bank, and started the business which is still carried on at the same spot—though under inconceivably enlarged and improved conditions. As a lineal descendant of James Wood remarked to the writer, "If you were now to take a cargo of the brick they made then to New York City, you couldn't give it away." To note only one feature of that primitive enterprise, the moulds were mere frames, filled by hand, each mould to hold three (not six) brick. The outcome of those moulds would hurt the eyes of any Haverstraw man in these latter days. The brick were clumsy at best, and they needed much "culling;" except that they weighed five pounds green, and four pounds burnt

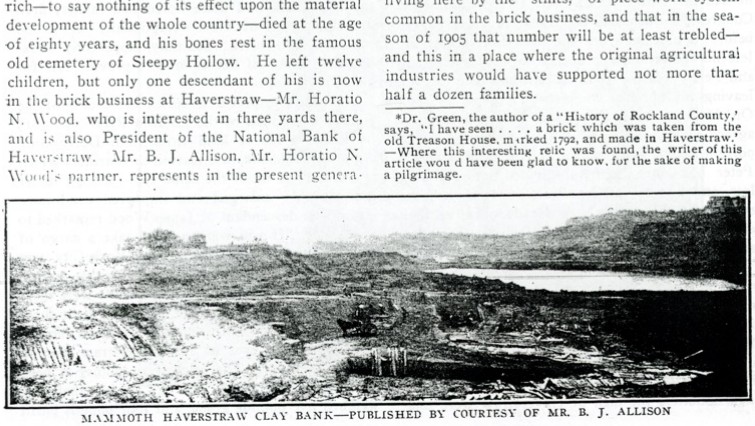
—the unaltered standard of all American brick—and that they were made of Haverstraw clay, there was nothing about them in common with the hundreds of millions of brick which that busy centre of the industry is sending down stream in this year of 1905. But improvement was not long in coming to a man of the type of James Wood. A kindred spirit vaguely indicated by ungrateful local history as "a workman from Tarrytown," came and showed him how a mould might be made with a bottom to it and a "vent."

Other improvements quickly followed, among them the introduction of coal as fuel for the kiln. An Englishman, who must have recognized in Wood the inquisitive mind essential to a leader of the world's progress, sent him a lump of anthracite coal, as a curiosity. The new thing interested Wood very much, but of course in its practical, rather than it aesthetic, bearing. "If this stuff will burn," he said, "it will burn brick."—and he made it burn brick. Moreover, he pulverized it and, on the spur of a brilliant inspiration, mixed it with his sand and clay; and, behold, a new ingredient—"culm"—was found to give the brick the much-desired qualities of lightness and porosity, besides reducing the time necessary for burning from thirteen or fourteen to six or seven days. It was James Wood, too, who introduced at Haverstraw the circular pits, for tempering, which are so commonly used today, though, to be sure, the circular pits of that time were not exactly what they have since become.

This man who had inaugurated in his adopted home an industry that should make it famous and rich—to say nothing of its effect upon the material development of the whole country—died at the age of eighty years, and his bones rest in the famous old cemetery of Sleepy Hollow. He left twelve children, but only one descendant of his is now in the brick business at Haverstraw—Mr. Horatio N. Wood, who is interested in three yards there, and is also President of the National Bank of Haverstraw. Mr. B. J. Allison, Mr. Horatio N. Wood's partner, represents in the present generation another forefather of Haverstraw who, together with the founder himself and John DeNoyelles, deserves to be honorably remembered. The Allison yard, owned by the descendants of that John Allison who had bought part of the DeHartland from Nicholas Kuyper, was the next brick plant after James Wood's (in which John De Noyelles shared as lessor) to enter upon the business which has made the prosperity of the town.

Haverstraw, in the commercial history of this country, may almost be said to mean brick. Yet the town has interesting historical associations which are not commercial—unless Benedict Arnold's transaction with the British Government may be classed as a business deal. At the south end of the DeNoyelles yard the spot is shown where Arnold left the soil he had betrayed and boarded a boat of King George's ship "Vulture." Some three miles distant stands the old Mansion, so closely connected in history with this miserable episode as to have earned the nickname of "Treason House," by which it is still locally known.* But above all other facts in the history of Haverstraw this undoubtedly stands pre-eminent; that here grew an art of peace without which America could never have become the land of fair and populous cities which it is. What proportion of the 1,299,538,000 brick made last year on the Hudson River came from this erstwhile humble settlement of Dutch farmers, it is impossible to say here with any exactness; but in the broader, humanitarian aspect of the matter, it is more important to note that, in 1883, 2,400 men earned their living here by the "stints," or piece-work system common in the brick business, and that in the season of 1905 that number will be at least trebled—and this in a place where the original agricultural industries would have supported not more than half a dozen families.

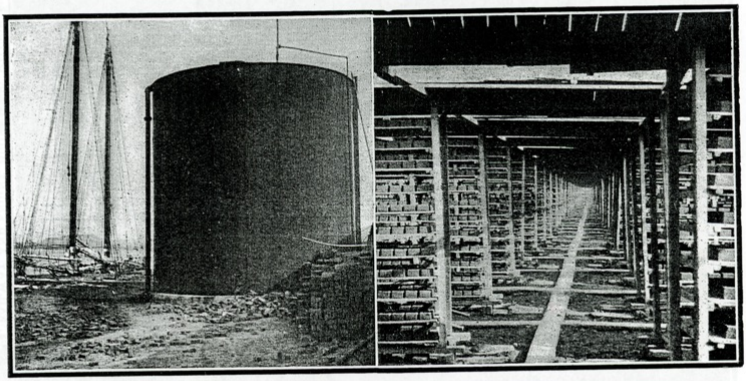
*Dr. Green, the author of a "History of Rockland County,' says, "I have seen . . . a brick which was taken from the old Treason House, marked 1792, and made in Haverstraw.' —Where this interesting relic was found, the writer of this article would have been glad to know, for the sake of making a pilgrimage.



MAMMOTH HAVERSTRAW CLAY BANK—PUBLISHED BY COURTESY OF MR. B. J. ALLISON

The Garner Yards.

The yards of the Garner Brick Works, under the management of Mr. John Peck, are among the oldest and best-known Hudson River establishments. The length of these yards and sheds together is 740 feet. The location is on the river front, and the brick are loaded on the barges direct from the kiln. The "Garner" product has held its high reputation in the market for now at least a generation, and while Mr. Peck by no means aspires to produce anything that could be called a "cheap brick"—nor does the market opinion of the brand place it in that category—at least two distinctive features of the Garner methods may be said to exhibit a fine, far-sighted economy in operation, secured at a comparatively small initial outlay. These two features are the oil fuel system and the Koppel narrow gauge railway, the former of which is used on this plant exclusively and the latter on several other Hudson River plants.



OIL TANK ON DOCK, CAPACITY 47,000 GALLONS; SAILING SCHOONER "AMOS BRIGGS"—GREEN BRICK DRYING FLAT ON PALLETS IN PALLET YARD

The system of railway here installed for conveying the raw material from the bank to the pits comprises 4,400 feet of track. As showing that the economy which dictated its employment was not of the short-sighted kind, it is to be noted that instead of the 16 lbs to the yard of rail commonly considered good enough for truck systems of this order we have here steel rails weighing 20 lbs. to the yard. The track runs, of course, from the bank to the pits, but its plan includes a series of short branches running along the edges of the pits, at right angles to the main track, connected with it by turntables. By this means a car can be cut out from its train, switched off and emptied directly into the pit for which its contents are intended without interfering with the working of the main line. The cars are built of standard steel, are capable of holding each 2 cartloads (36 cubic feet) of clay or sand, and swing on horizontal pivots so as to be easily dumped. The weight of each of these vehicles when empty is 900 lbs.; when filled, somewhere about 6,300 lbs.; so that a train of three full cars has a weight of little less than 19,000 lbs. Part of the journey—about 500 feet—is made by force of gravity. Thus the whole weight of between 18,000 and 19,000 lbs. is hauled most of the way—thanks to the facility which a good even track affords—by one mule. To transport the same quantity of clay and sand by carts in the same time would require four mules, allowing one to each cart. Moreover, each mule, in the old system, would require a driver; in the rail system one man, standing on the head car and handling the brake, manages the whole train, an arrangement which saves over 70 per cent. of the human labor of transportation. There are 30 of these steel cars altogether at work on the narrow-gauge track in the Garner yards, 24 for clay and 6 for sand, besides a few extra cars held in reserve for unforeseen emergencies. With the old horse-and-cart system the work of this outfit would be done by about 15 carts, with as many horses and mules and not fewer than 15 drivers.

"Sand and clay and coal, with knowledge, make good brick here." It is not easy to say whether the good material or the knowledge which directs or the efficient labor employed in the yards contributes most to the grand result. The labor is supplied by the most diverse elements,—Irishmen and Hungarians, Poles and Negroes, all working harmoniously together. Mr. Peck thinks that this medley of races, far from being a drawback, produces more satisfactory results than would be obtained with workmen all of a kind. And Mr. Peck has reason to know whereof he speaks; he himself has had much experience, having been born and reared

Property of
HAVERSTRAW
BRICK MUSEUM

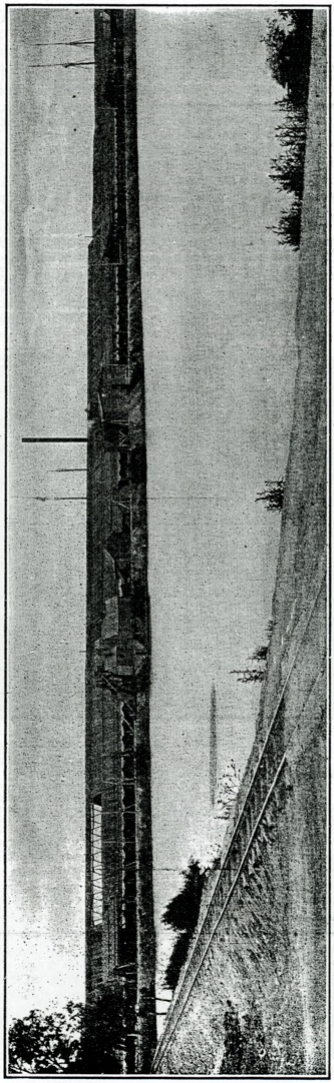
in this brickmaking place. Then, as to material, the Garner yards have at hand just that stiff quality of clay which is demanded by the pallet system. A clay lacking in stiffness will be likely to lose shape when the brick is dropped from the moulds upon the hard wood of a pallet, and pallets are in vogue here. This clay, as well as a fine, sharp tempering sand, is supplied by a bank forty feet in height, topped with a ten-foot stratum of sand and gravel, the proportions of the argillaceous and siliceous components being about 6 to 1 in the whole mass. It is calculated that this deposit will last the yards for another century. At the same time the yards can be supplied by dredging operations in the bed of the river, while a certain quantity of the mixing sand used in the pits is brought from Jones' Point, about eight miles up the river, and the moulding sand is mostly purchased outside.

After the account already given of the narrow-gauge railway in use here, it is hardly necessary to say that this establishment is one of the brick-yards which are carried on on a large scale. For the season of 1905 it is expected that the output of the Garner yards will reach 20,000,000 brick. The pallet being used here, the machines of the plant are kept employed all day, and as much stuff can be manufactured with them as could be done with twice as many if the open or covered-yard system were used with a half day's moulding. The average daily capacity of the machines, run by a 120-horse-power Newburgh Corliss engine, is from 130,000 to 175,000. It has been found that the solid foundation of cement, stone and brick upon which the shafting is laid not only gives more satisfactory working in general than would a less substantial structure, but is more economical.

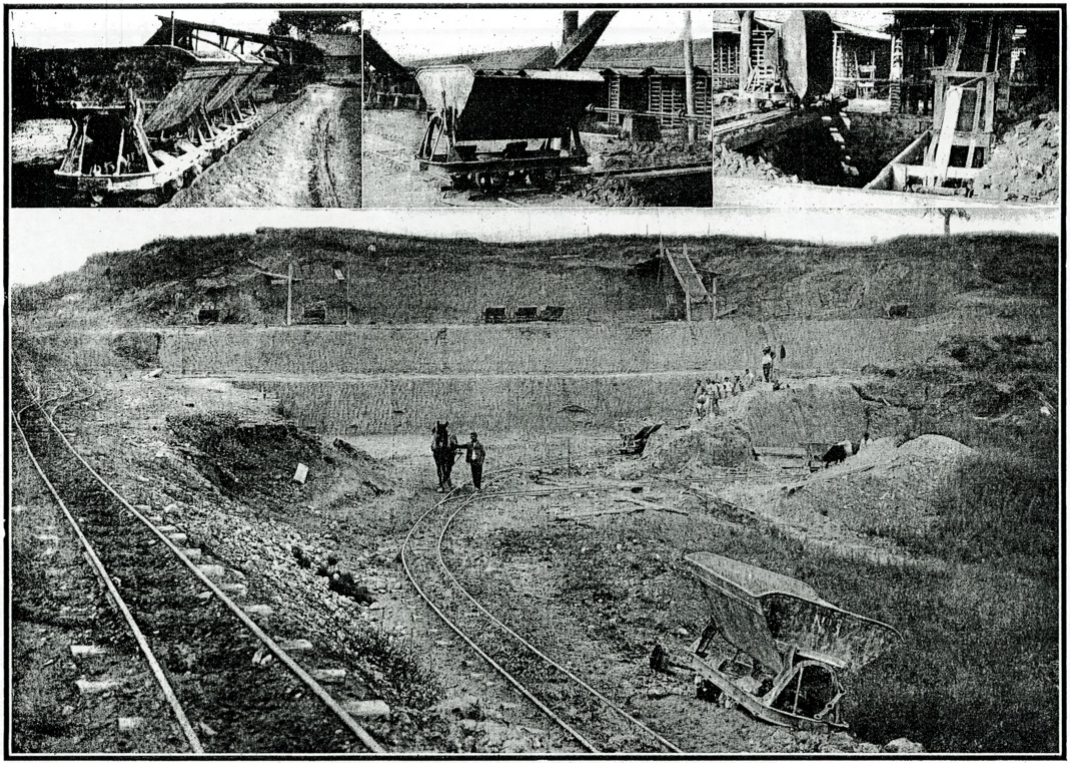
The pride of the Garner yards, so far as concerns the methods of its production, is in being the only plant on the river to use oil for kiln fuel. The close proximity of the river makes it possible for barges of the Standard Oil Company to come up alongside of a permanent tank which holds as much as 47,000 gallons. Into this tank the oil is pumped from the barge, usually in quantities of 40,000 gallons at a time. The process of transferring this quantity occupies 40 minutes. When a kiln has been "set" and is ready to commence burning a certain small quantity of soft coal is used to start the fires, and the oil fuel is introduced into the arches in the form of petroleum vapor. Instead of the high-pressure-steam method of vaporizing, the Sturtevant blower is here employed, with its low pressure of air through a standpipe. With the coöperation of thoroughly skilled workmen, and with at the same time the constant exercise of care, such as Mr. Peck contrives to secure under his management, the happiest results have been obtained in the way of evenness and general perfection of "burn."

The Garner Works have been using the oil-fuel system since 1898, immpovements having of course been introduced into its details as experience has dictated, and they are satisfied that neither coal nor wood could be made to yield better results.

However, the best argument for this and all other details in the Garner methods is the quality of the finished brick.



THE GARNER YARDS, MACHINES, KILN SHEDS, RAILWAY AND ENGINE HOUSE. 126 MILLION BRICK HAVE BEEN MADE FROM CLAY TAKEN FROM AREA WHERE LAKE IS SHOWN



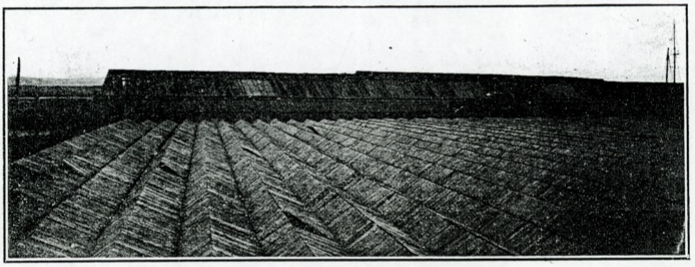
CLAY CARS ON MAIN RAILWAY LINE AT REAR OF SOD PITS—TURN TABLE FOR TRANSFERRING CAR AT RIGHT ANGLE ALONGSIDE PIT—CAR DUMPING CLAY INTO PIT AT REAR OF MACHINE—THE GREAT CLAY BANK AND NARROW GAUGE RAILWAY IN OPERATION

The Washburn and Fowler Yards.

About one mile and a half above the town, near Grassy Point, are the largest yards under one business management in the Haverstraw Bay district. The combined Washburn yards, on the Worrall property at this point, have a river frontage of 1,600 feet, employ 500 men, and operate altogether 23 machines, four of which are Wiles machines of extra large type. The motive power is supplied by four steam engines of 175, 125, 80 and 80 horse-power, respectively. Here the combination is not an affair of leases. The principal concern is the firm of U. F. Washburn & Co., in which Messrs. L. H. Washburn, H. C. Blair and D. Fowler, Jr., are the partners. The brand of this firm is "W. & Co.," the system being open yard. In an adjoining yard three machines are run by Mr. L. H. Washburn individually, on an open-yard system, producing the brand "M. & L. W." A third and a fourth yard operated by the Messrs. Washburn & Fowler produce the brands "D. F., Jr., & Co." and "W. & F." (pallet system). The several capacities per season are as follows: U. F. Washburn & Co., 30,000,000 brick; Mr. L. H. Washburn's individual yard ("M. & L. W." brand)), 6,000,000 to 7,000,000; Washburn & Fowler, 10,000,000; D. Fowler, Jr., & Co., 10,000,000, giving an aggregate capacity of about 57,000,000. Eight barges, each with a capacity of from 250,000 to 500,000, owned and operated by the above-named concerns, are used in transporting this product to New York.

In all these enterprises the individual members of the firm of U. F. Washburn & Co. are interested exclusively, and the whole combination works in harmony practically under one business management. For the last thirty-seven years the brick manufactured on the Worrall property have had a most enviable reputation in the market. They have always commanded, as they still command, the highest prices, and are sought after by first-class buyers in New York City, where, to mention only one, the World Building, in Park Row, is a good example of the lasting qualities and presentable appearance of this product. In the construction of the great glucose factory at Shadyside, N. J., brick from these yards were used exclusively, the number supplied for that structure having amounted to 13,000,000. Much of this success has doubtless been due to the "strong" quality of the clay here. It is, like other Haverstraw clay, blue, but with a certain percentage of yellow, and a good quality of sand is found with it. The clay of the Worrall property also gives a fine natural color on burning, and the mud tempers easily in the pits. The mixing proportions in these yards are two parts of clay to one of sand, with the addition of about a bushel of "culm" for every thousand brick.

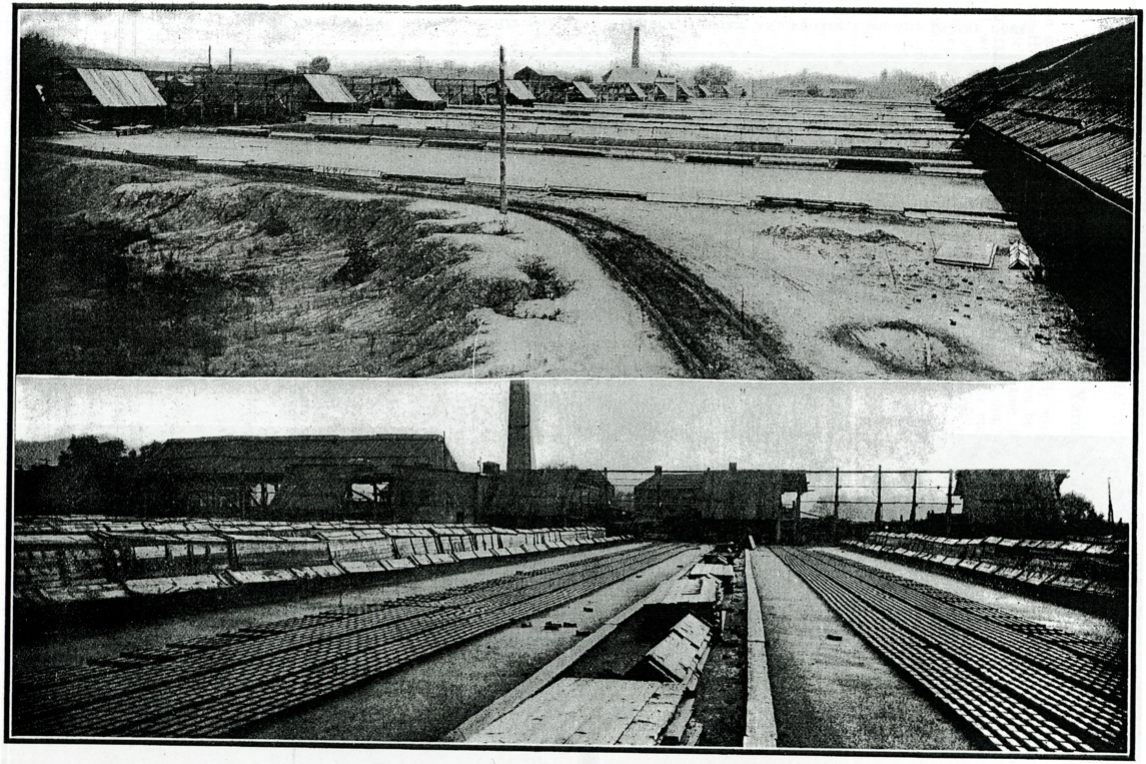
One of the niceties of the brick business is the adjustment of mixing processes for drying. A much stiffer mud is necessary where the paliet system obtains than where the open yard is used. On these combined yards both systems are to be seen in operation; that is, the "W. & Co.," "M. & L. W." and the "D. & F., Jr., Co." brands are from open yards, while the "W. & F." is from pallets. Hence, the last-named yard runs a pug mill, while for the others sod pits are found to afford ample preparation for the machines. In either case, with the splendid material at the manufacturers' hands, the best results have always been secured, such things as crooked, blunt-cornered or imperfect brick being practically unknown here. Coal is used as fuel in the kilns.



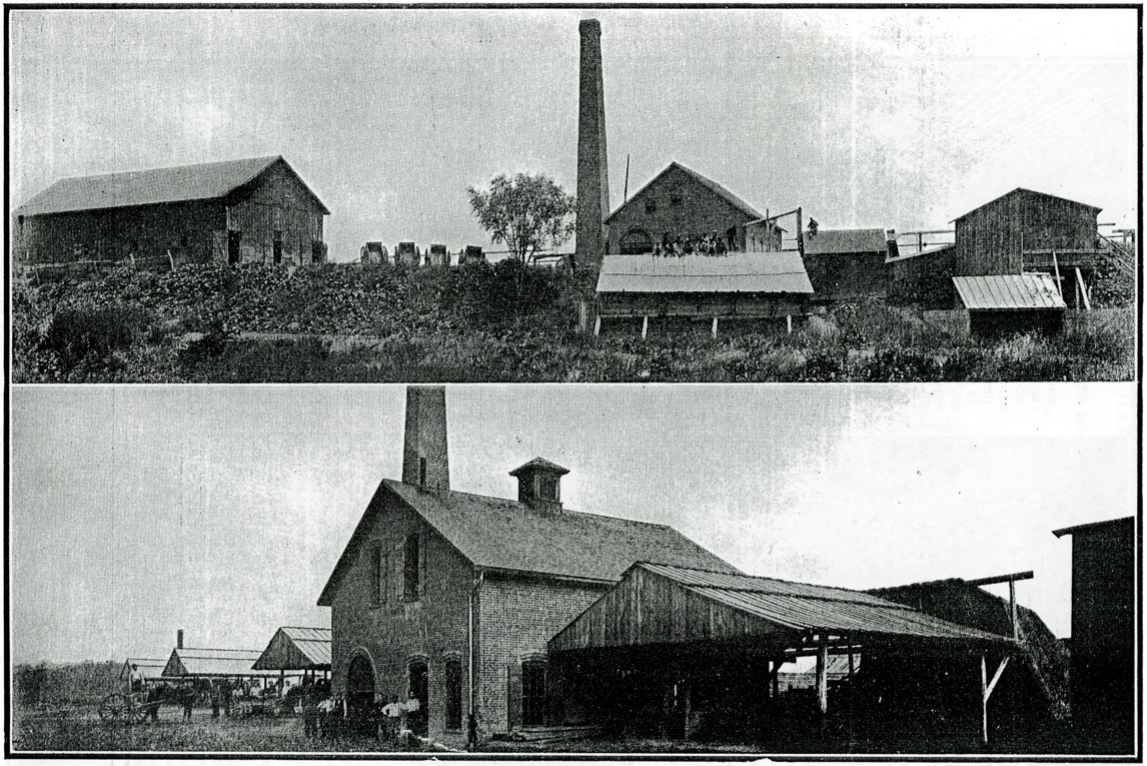
WASHBURN AND FOWLER PALLET RACKS AND KILN SHED

Asked to say frankly what particular detail, in their opinion, has done most to advance their brick to its high position in the market, the managers on all these yards appeared unanimous that, whatever might be said about the immense natural advantage of the Worrall clay banks, the chief factor of success here has been the personnel; not only is there an excellent working system in every department of every yard, from bank to barge, but there are thoroughly practical men at the head of the business and excellent skilled workmen employed as foremen. Most especially is this the case in the kilns, where the great science of burning has been refined to the very highest pitch, while the handling and the "culling" are exhibitions of indefatigable care in minutiæ.

Mr. H. C. Blair takes an especial pride in the 50 horses forming part of the outfit of these yards. He himself is no mean connoisseur of horseflesh, and makes a point of going to Chicago every year to replenish the stock by fresh purchases. The big animals, ranging from 1,600 to 1,700 pounds in weight, are a feature well worth the particular attention of all visitors.



WASHBURN AND COMPANY YARD—D. FOWLER, JR., AND COMPANY YARD



WASHBURN AND COMPANY YARD, ENGINE HOUSE, CRUSHER AND STABLE—THE WASHBURN AND FOWLER YARD AND ENGINE HOUSE

The Peck Yards.

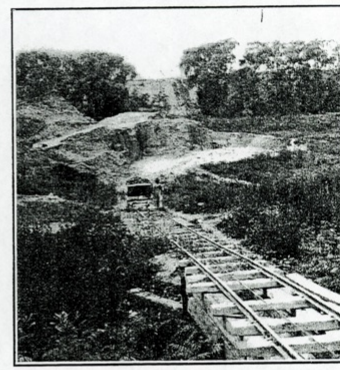
One of the best-known brands of brick made on the Hudson River is the "Peck," which comes from the yards of the Peck Brick Company at Haverstraw. This brand is most generally associated with a fine, dark-red building brick, of notably uniform quality, very smooth and square, and free from whitewash. But in addition to such staple product, the company has had marked success in the production of special shapes for corners, ornamental designs, bay windows, and of the special character of brick known as "washed front" and "washed end." It is obviously superfluous in a brief article like this to enumerate the structures which have been erected with these brick. It is sufficient here to say that they are numerous. Especially are they used in schoolhouses, private residences, factories, and in other work requiring a brick good enough in color and finish to be used as "fronts." In a word, the "Peck" is of the highest grade of common brick, and commands the highest market price.

The company owns an area of 100 acres, and the yards are among the largest establishments of their kind. They have a total present daily capacity of 200,000, and the company expects to record an actual output of 25,000,000 brick for the year 1905, while, with the additions and improvements now in progress on the yards, their capacity will be increased next year to 245,000 daily, or a possible output of 35,000,000.

This plant has grown in extent and elaboration of details beyond anything that could have been anticipated at its inception, and the impulse of its growth appears at the present writing to be limited only by the room necessary to add new machines, of which there is sufficient to enable the present capacity to be doubled. Brick have been made on this property for over fifty years, and it has been owned by the Peck family for seventy-five years, having been purchased by the grandfather of the present owner in 1830. But it was not until 1879 that Mr. Theo. G. Peck, then recently out of Yale College, went into the business, and later associated with him his brother, Mr. G. H. Peck, and made it what it is to-day.

Every visitor to the Peck yards should try to secure a seat—or at least standing room—on one of the Samsondale Railroad trains. Favored guests may enjoy the dignity and ease of a "special." The ease of it, to tell the truth, might be made more unequivocal if the trains were made up of Pullmans instead of the flat cars actually in use. But as a matter of hard fact, the comfort of passengers was not considered in the construction of this line, for the Samsondale exists exclusively for the transportation of brick one way and various material the other. It is a standard-gauge road, one mile long, connecting the original No. 1 and the No. 2, or annex, yards with the dock, and also has switch connections with the Erie and West Shore Railroads. Practically, this distinguishing feature of the Peck yards is a great convenience and saving of time, and it enables the company to make a specialty of shipping its brick by rail as well as down the river on barges, of which it owns four, having capacities from 250,000 to 300,000 brick each. By means of this railroad the finished product can be shipped by either land or water, and the same trains on their return trips bring coal, "culm," sand, machinery, lumber, or whatever else may be necessary for the use of the plant.

With this considerable market advantage at its back, the Peck Brick Company nevertheless relies for success mainly on keeping up the quality of its product. President Theodore G. Peck is a strong believer in the value of a good name, and the Peck Brick Company spare neither pains nor expense in fostering the excellent reputation which the "Peck" brand has already acquired, and which has been gained by not sacrificing quality

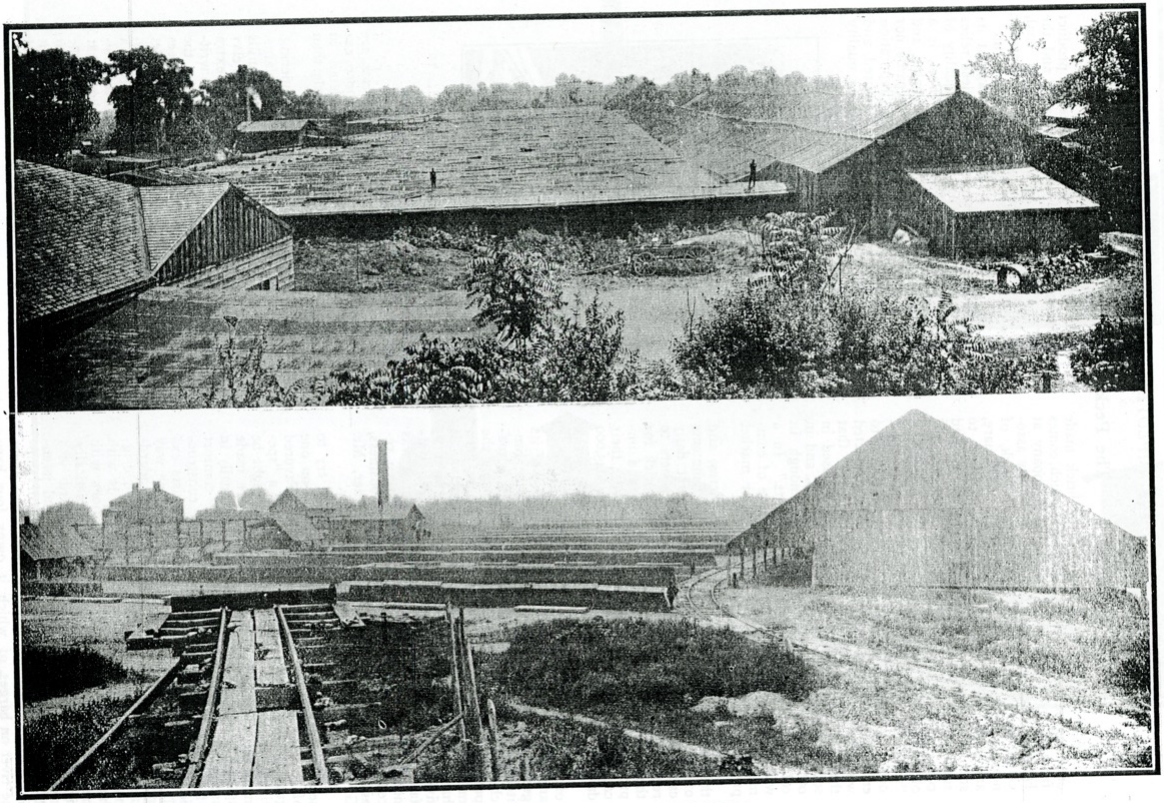


HAULING CLAY BY RAIL FROM BANK TO MACHINE

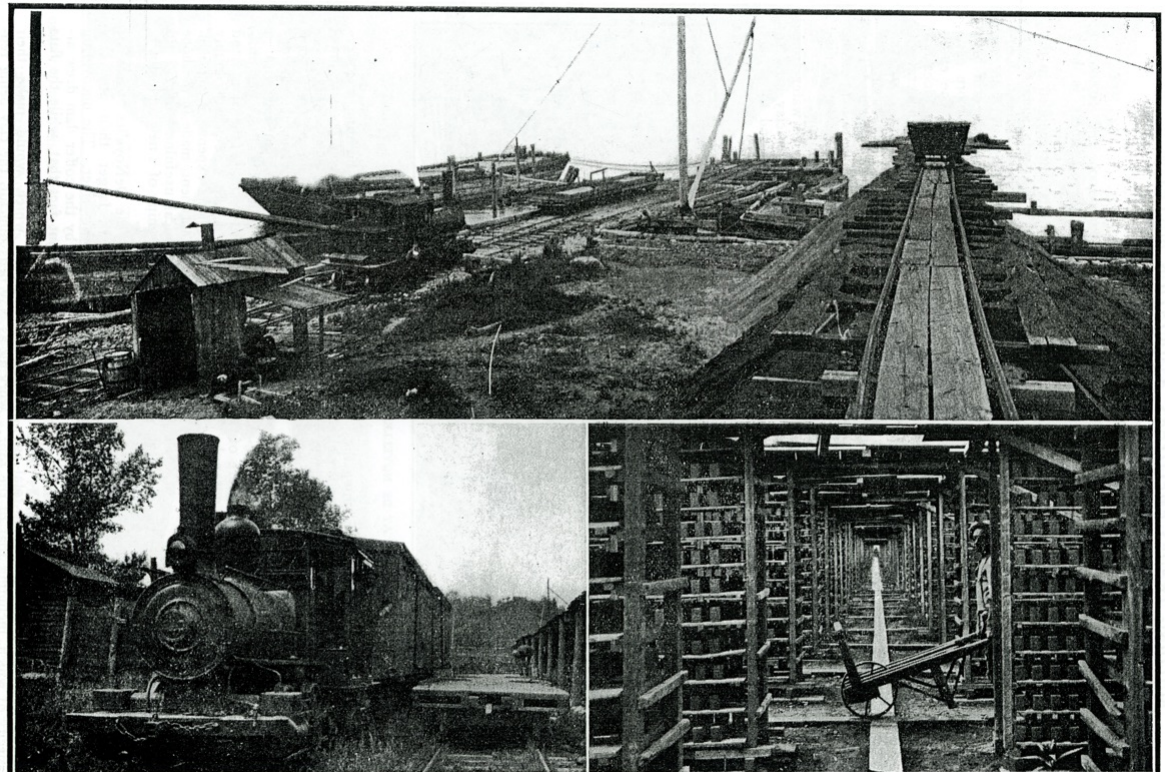
for quantity, as three-fourths of all the brick are made on pallets, which system, while more expensive and requiring more care of detail in manufacture, produces a much better article than the ordinary open-yard brick.

Great care is exercised in mixing and tempering. No pits are used here, as in nearly all other plants. The clay and sand are put into the "pug" mills as desired. And thus every cubic inch of clay which passes into the machines has been extra tempered in the "pug" mills. At the present writing* three double machines are running on the pallet yards, though the full equipment comprises four. Of this number, one, supplying the pallet yard in No. 2 (the annex), is run by electricity, while the rest derive their motive force from a Newburg Corliss steam engine of 120-horse power. It may not be out of place to say here that the Peck brick have stood the highest Government tests for absorption of any brick made on the Hudson, and are used by the Government in its Army and Navy work at various places, and have never yet been rejected.

*Early in June, 1905



PECK BROTHERS' UPPER YARD—THE LOWER YARD



PECK'S DOCK AND RAILROAD—LOCOMOTIVE ON YARD NO. 1—PALLET YARD

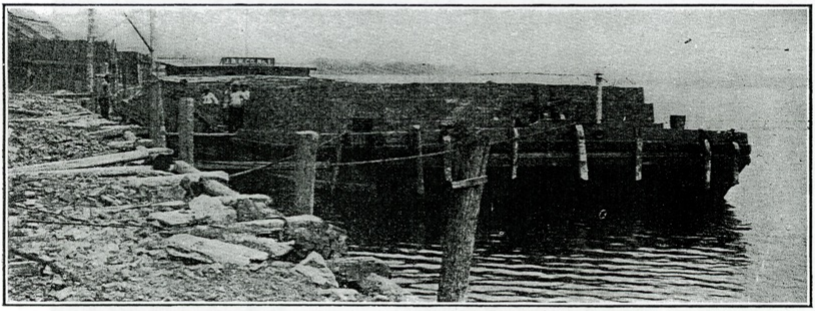
The De Noyelles Yards.

On a part of the original DeNoyelles landed estate, which was acquired by John DeNoyelles, Esquire, in 1760, the original pioneer of that distinguished old Huguenot family, Mr. Daniel DeNoyelles, a sensible, progressive latter-day American scion of the old stock, together with M. R. Anness and John DeNoyelles, are now carrying to its full modern development that same brick business which Daniel DeNoyelles, father of the above mentioned Daniel, began about eighty years ago. The DeNoyelles brickyards extend at the present time three-quarters of a mile along the river front of Haverstraw and half a mile inland —as far as the summit of the heights which here face the river. Mr. DeNoyelles, as becomes a man whose name is so intimately and honorably associated with the industry, is an enthusiast for its fame, so far as in him lies to maintain it. The chief business of his life seems to be to take care that the good reputation which the brand "DeN. & Co." has borne for now nearly a century shall lose none of its lustre while he lives; and this end, he believes, can be attained only by combining the best material means known to modern industrial progress with the greatest human skill and good will. He believes that the quality of machinery can do much in a brick plant, he believes most firmly in clean yards, but he also sticks to the tenet that a good foreman is an absolutely necessary condition of success in the manufacture of brick. He demands of his employees not only faithful service, but a certain degree of enthusiasm, taking the form of a personal pride in the brand they work to produce.

Besides the business actually under the direction of Mr. DeNoyelles himself, three very flourishing concerns carry on business here upon a royalty basis. Of these three Lynch Bros. run five machines, the Bennett Estate four and the Malley Estate seven. Their brands, respectively, are "Lynch," "Bennett" and "Malley." They enjoy the use of the splendid quality of blue clay which supplies the whole combined plant, the total annual capacity of which, including that of the four "DeN. & Co." machines (twenty machines in all), amounts to between 50,000,000 and 60,000,000 brick. Thus the DeNoyelles business is both manufacturing and leasing.

Material for these yards is still supplied in the main by the bank from which it was being drawn by Daniel DeNoyelles when the Nineteenth Century was in its 'teens. So far the deposit has been cut to a depth of 60 feet, and the stiff blue clay still promises to outlast several more generations of brick manufacturers. But the enormous natural wealth of the ground here does not consist merely in the quality of the mineral; it appears, comparing year with year, that the longer the excavation goes on and the deeper the cutting, the better the quality of the clay. This fortunate state of affairs was already a long-established fact when a happy accident led to the discovery of yet another source of supply.

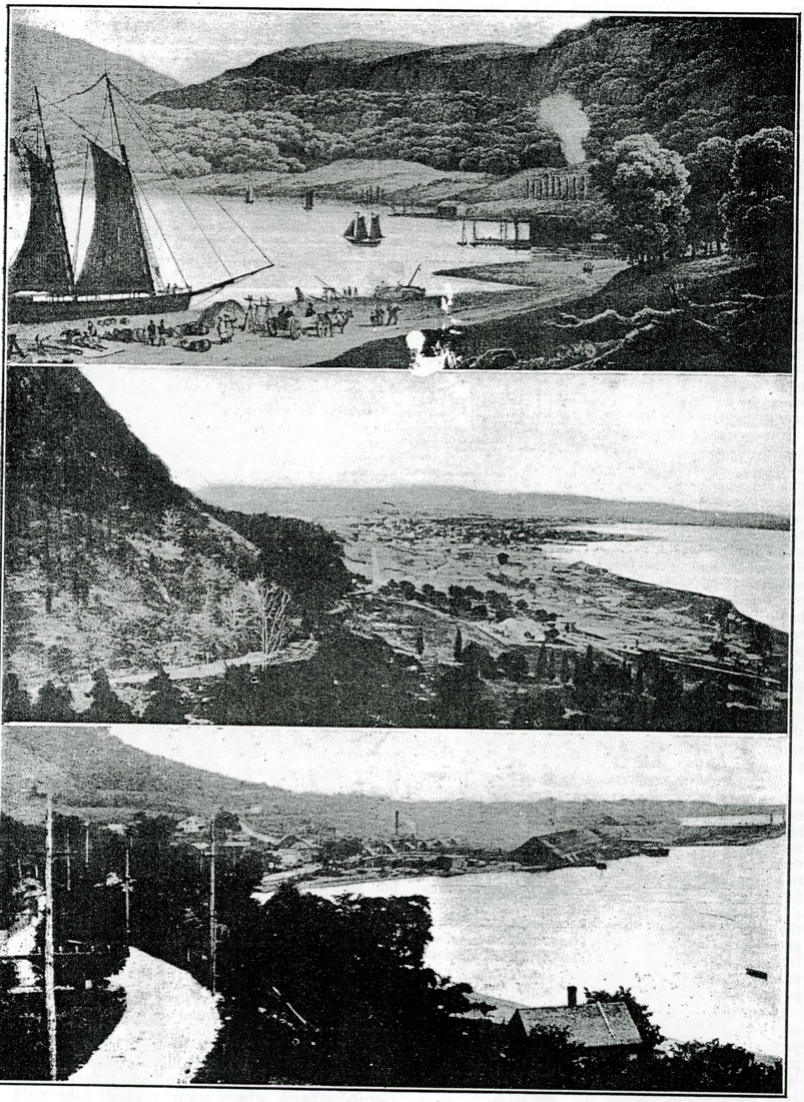
About the year 1881 the seeping of water from the river threatened the DeNoyelles clay bank so seriously that means had to be found to obviate the trouble without delay. The plan adopted was the bold and scientific one of building a cofferdam off the river shore. This was put into practice, and in 1883, after a year's hard work, a coffer dam with an area of 2,000 feet long and 500 feet wide had been completed opposite the clay bank. Two pumps, with a capacity of from 1,500 to 1,800 gallons per minute, were set to work draining the dam, and the result of the experiment more than doubly justified all the trouble and expense it entailed. It had been only an experiment, made in the hope of preserving the practical usefulness of the old deposit; it led to the opening of a new and equally valuable deposit.



BARGE LOADED AT DE NOYELLES DOCK WITH 350,000 BRICK

Off the shore of the DeNoyelles yards is a stretch of clay flats larger than any other in this part of the river. The uncovering of a part of the flats by the coffer dam drew attention to the important fact that, while the flats everywhere else on the river are covered with river sand and silt, which would make their working as clay beds difficult, the clay being ren-

(*Continued on page 176*)



ORIGINAL DENOYELLES PROPERTY IN 1790, SHOWING SITE OF PRESENT COFFERDAM, HAVERSTRAW, NEW YORK—DENOYELLES PROPERTY IN 1865, SHOWING BRICK PLANT WITH SEASON CAPACITY OF 12,000,000—DENOYELLES PROPERTY IN 1905, SHOWING BRICK PLANT (WITH SEASON CAPACITY OF 50,000,000), AND FAMOUS COFFERDAM

The Fowler Yards.

For the stranger seeking an illustration of the lengths to which American enterprise has been carried in the present generation, few industrial exhibits in all the length and breadth of these United States would be better worth a visit than the two great brick plants which are situated side by side at Haverstraw under the ownership of Everett Fowler and the Excelsior Brick Company. The latter company was organized in 1890 by Messrs. George H. Smith, J. M. Hedge, U. F. Washburn and Denton Fowler. In 1892 the interest of the last-named was purchased by his son, Mr. Everett Fowler.

Mr. Everett Fowler is one of the best-known and most highly regarded of the younger men now engaged in the brick business of this country, and the two yards (known respectively as the D. F. & S. and the diamond (◈) present several features which are either unique or shared by very few other establishments in any part of the world.

Absolutely unique is the Fowler system of mining the clay. Unlike any other brick plant in the world, these two yards obtain all their material, not from banks lying visible above the surface, but from a deposit—possibly inexhaustible—which lies at the bottom of the Hudson River opposite their water front. This sub-aqueous clay mining is carried on by means of enormous steam-driven bucket dredges which empty themselves into specially constructed cars floated out on barges to the scene of operations. Each car has a capacity of 270 cubic feet, and weighs two tons when empty. The wet clay weighs 3,800 pounds to the cubic yard, so that each car when loaded to its full capacity of 10 cubic yards has a gross weight of more than 21 tons. Five cars are the burden of each barge. With its load of something like 110 tons the barge is towed to the river end of one or other trestleway, over which the whole train of five cars is hauled to the pits.

The trestles in these two yards are in themselves engineering works of no slight importance, one of them being 500 feet in length and 35 feet high. In supplying the D., F. & S. yard the barges are towed through an artificial channel 35 feet deep. This channel has been made by dredging to a distance of 1,200 feet out in the river through flats on which the water originally stood only 4 feet in depth, and by digging 30 feet in through the solid bank. The principle of the inclined plane is employed in hauling the laden cars up from the barges onto and over trestles; the steam power used is applied by cables connected with powerful double-cylinder stationary engines.

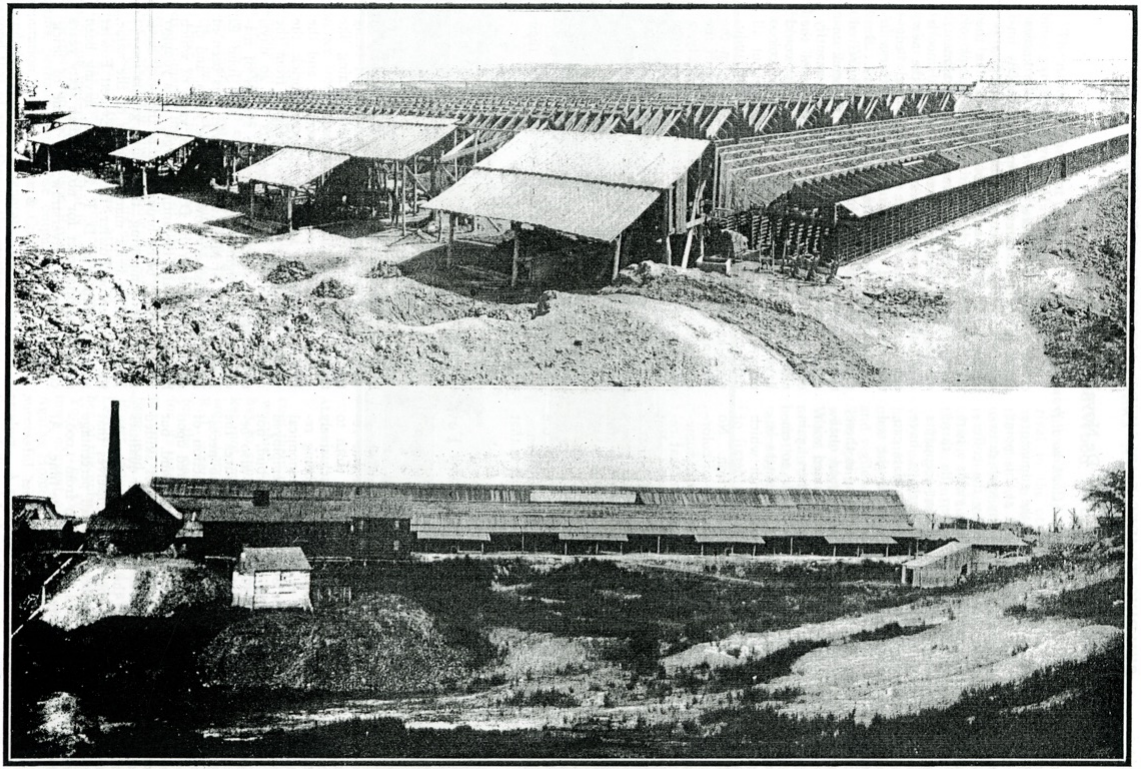
In quality the dredged clay of the Fowler yards well repays the elaborateness and costliness of the process by which it is mined. It is a blue clay, peculiarly sticky, and comes up intermingled in layers with a fine, sharp, black quicksand, which adds very materially to the strength of the brick. The proportions in which clay and sand are used in the Fowler yards are two of clay to one of sand. The sand used is obtained from Jones' Point. To this mixture is added a certain percentage of "culm" for porosity. No extraneous coloring matter is used in either of the yards. Incidentally, it is of interest to note here that when the contractors engaged upon the work of tunnelling the Hudson River for the New Jersey and New York Tunnel Company were confronted with the serious danger of water bursting into their workings they tried this same Fowler blue clay for stopping the leakages, and eventually succeeded in making it answer their purpose. The mechanical method used in tempering this excellent material is that of the "pugging" machine, or "pug mill," operated on a large scale by steam power. The "pugging" is done by a system of knives set in a revolving shaft which occupies the axis of a horizontal cylinder. No "soaking" is found necessary, only the common sod pits being used, as the quality of clay brought up by the Fowler dredging machines lends itself very readily to the process of tempering.

If not absolutely unique, the "covered-yard" system of drying employed on these plants is as yet shared by only three others, or at most four. The newly-moulded brick are trucked to the yards, where they are placed to dry. To secure at the same time that perfect action of sun and wind which recommends the "open-yard" system, the sheds, being planned so as to place every row and "hack" within reach of whatever sunlight enters the enclosure, are fitted with a patent shutter of a peculiar type. Each of these shutters turns on a pivot in such a manner that the openings on every side can be adjusted by means of levers to suit the position of the sun at every hour of the day and let in the greatest possible amount of sunlight in the twenty-four hours, while on the other hand, at a moment's notice the whole interior of the shed can be rendered impervious to a driving rain or the diffused moisture of a dull, sunless day.

The product of the Excelsior Company's yard has been known for the last quarter of a century by the copyrighted diamond (◈) which it bears, while that of Everett Fowler's yard is marked with the initials "D., F. & S," which also serves as the common designation of the plant itself. Of the two, the Excelsior yard, under the direct management of D. F. DeBaum, is, perhaps, the more interesting, and that for reasons not always strictly connected with the business prose of modern brick manufacturing. For one thing, it was necessary in laying out this yard to pull down two old houses, both dating from a period long before the Revolution and both containing fireplaces built of brick imported from Holland about 150 years ago. The builders of those old homesteads surely had no idea that the ground whereon they stood would one day furnish brick for exportation to the old country. On this yard, too, the kiln sheds, 750 feet in length, stand mostly on ground reclaimed from the river by a process of filling in. The material used for this purpose was ballast taken from the holds of ships which had entered the Hudson River in quest of cargoes; some of that ballast is earth from Germany, with which many tons of "the ould sod" of Ireland, and perhaps of England and Scotland, too, are packed down in typical modern American promiscuosity.

Upon this nationally emblematic foundation

(*Continued on page 176*)



Property of
HAVERSTRAW
BRICK MUSEUM

VIEW OF FOWLER COVERED YARD, SHOWING FOUR MACHINES AND SHUTTER SHED SYSTEM, OPEN—VIEW OF EXCELSIOR YARD, ENGINE HOUSE AND MACHINES

The De Noyelles Yards.

(*Continued from page 172*)

dered comparatively worthless by the admixture of unworkable matter, the flats just at this point are unique by their freedom from any such drawback. The river bottom drained by the cofferdam was worked for clay, and it still yields a part of that used in the yards. When the third and fourth generations after the present occupants of the DeNoyelles property shall, perhaps, have exhausted the old bank, then the river flats can, and no doubt will, be dredged to supply the sod pits.

Sod pits are the method used for mixing in these yards. In these pits the exceptionally good quality of clay afforded by the ground is mixed with sand—a layer of sand first, then clay, then again sand, then clay—the rule of the yards to employ only workmen who know their business being exemplified in the skill and care with which the mixing is done, even to the critical detail of adding "culm" in just the right proportion. No hard-and-fast rule as to the employment of coloring matter is followed, the brick being sometimes left to its own natural resources in that respect, sometimes treated with pigment. But whether artificially colored or not, it is remarkable with what uniformity the finished product here shows a handsome, healthy red. Out of the 20 machines 13 are run by one engine of 250-horse power, and the remaining 7 by an engine of 200-horse power. The number of men employed is 450, with 50 horses to do that part of the work which needs less than human intelligence.

The system of drying in use at this plant is that of the open yard. Here, as everyone who knows anything of brick manufacturing will readily understand, the proprietor's zeal for perfection in details is an immensely important factor in the success of the work. No intrusive lumps of loose clay, no sticks or straws or stray fragments of chipped brick are allowed to mar the smooth evenness of the prepared surface when the new brick are "dumped." The "hacking" and "edging" are carried out with a care and deftness in keeping with the preparation of the yard. But perhaps the sight which most of all impressed the writer was the storage of 15,000,000 brick under the various sheds. It was not the quantity of material under treatment that produced the effect on one's mind—for the same sheds would have accommodated from 5,000,00 to 10,000,000 more—but the evidence displayed throughout all that vast piece of workmanship of sound judgment and skill matured by good training, in the "setting" of the kiln and the manipulation of the coal fires. The result of all this is, naturally, a fine, uniformly red brick, wonderfully free from either "grey" or "light" exceptions to the rule of excellence. Ten barges, with capacities of from 250,000 to 400,000, are employed to transport the product of the DeNoyelles yards, and though the "culling" is done with the most exacting care, it is doubtful if any brickyard in the world can show a smaller percentage of "culls" or waste when the barges pull out into the Hudson River bound for New York City, with their loads of passed material.

The Fowler Yards.

(*Continued from page 174*)

(completed in 1892) is built a system of sheds and kiln ground which represent the last work of scientific construction in that department—a remark which, indeed, applies with equal truth to both the yards. Anthracite coal is exclusively used for burning in the two plants, this being regarded by the Fowlers as the most economical fuel obtainable. The type of steel grate employed is one of which the firm is particularly proud, not merely on the score of its economy, but also because of the perfection with which it ensures the adjustment and regulation of draughts so necessary to successful burning. The satisfaction of the management, however, is not all centered upon the mechanical apparatus at their command, but extends to a particularly efficient force of skilled workmen. It is as much to the personal qualities and the faithful care of the kiln hands as to the thorough modernity of the kilns themselves that credit is due for the extremely small percentage of loss regularly incurred here, when from 1,000,000 to 2,000,000 brick are burned at one time. At the Excelsior yard the dock where the barges are loaded for shipment is only 15 feet from the kiln shed. This dock enjoys the distinction of being the first on the river to be built on anything like the same substantial and enduring order.

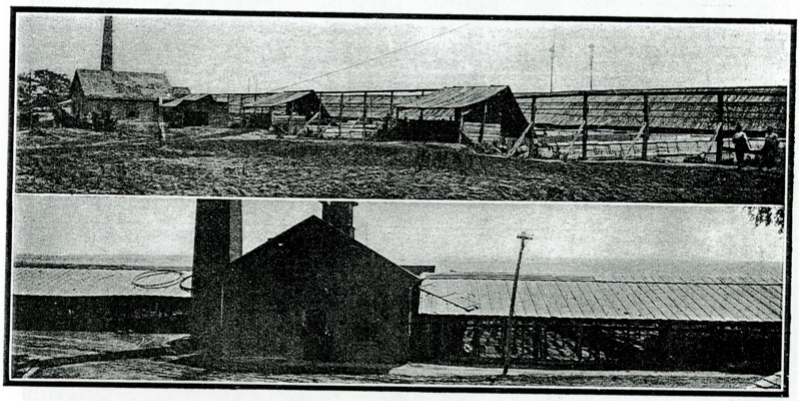
The season's output of the Excelsior and the D.. F. & S. yards totals up 35,000,000 brick, the whole material for which is dredged from the river, hauled and laid in the pits for 40 days, thanks to the singularly effective system of machinery and engineering in use. Mr. John E. Fowler, a son of Mr. Everett Fowler, has been in his father's business now for three years, and directs operations in the D., F. & S. yard, of which he has practically the entire charge. His younger brother, too, is being brought up to the brick business, thus completing the third generation of Hudson River brick manufacturers of the name, the late Denton Fowler, father of Everett Fowler and grandfather of D. F. DeBaum, having been a brick manufacturer for no less than sixty years continuously in Haverstraw, the home of brick

The Allison and Wood Yards.

The names of the joint proprietors of these combined yards preserve in Haverstraw the most honorable traditions of the brickmaking business. Mr. B. J. Allison represents that family which first engaged in the business at Haverstraw after it had been set going by James Wood on the De-Noyelles property, while Mr. H. N. Wood is a descendant of the great pioneer brickmaker himself. These two bearers of honored names, together with Mr. G. S. Allison, son of B. J. Allison, are partners in the three firms of (1) B. J. Allison & Co., manufacturing the "B. J. A. & Co." brand; (2) G. S. Wood & Allison, manufacturing the "W. & A." brand; and (3) Allison & Wood, manufacturers of the "A. W."

It is unnecessary to say that all of these brands have been well known in the building trade since Haverstraw first came into notice as a center of the brick industry. The three yards, coverin · side of Philadelphia, while the "A. W." is a close rival to the other two brands. The open-yard system is in use by the first of these three, while the other two have covered yards. Sod pits are used throughout the whole combined plant, wood is the fuel used for the kilns, and the coloring is entirely that naturally produced, after burning, by the excellent quality of material employed.

The good reputation gained by these plants might very well have been in ruins a generation ago had not the members of the firm and the foremen they have employed exercised constant care and vigilance in every detail of their manufacture. The spirit of "We have Abraham to our faith," which might have led either Mr. Allison or Mr. Wood into laxity of method and management, has never had any such effect here. On the contrary, both these gentlemen have evidently been actuated rather by the maxim "Noblisse oblige," ever spur-



ENGINE HOUSE, MACHINES AND KILN SHED OF B. J. ALLISON & CO—COVERED YARD OF WOOD & ALLISON

an area of 53 acres, including clay banks, have a capacity of 24,000,000 brick per season, running in the aggregate fourteen machines with power supplied by two engines of 150-horsepower each. They employ 200 men and own 25 horses and carts. The secret of the popularity which attaches to their output is, doubtless, to be found in the extraordinarily fine quality of the clay mined from their bank, which originally rising to a level of 30 feet above the river, is now 60 feet below it.

This same bank, besides its earlier use (briefly alluded to in the preceding article on Haverstraw), has now for forty consecutive years been supplying material for what is said to be the best brick made on the Hudson River. Of the three firms, perhaps that whose output has the widest reputation is B. J. Allison & Co. The "W. & A." brand, however, has a reputation as a face brick beyond that of any other in the market made outring them to fresh activity in making their output worthier of the two names whose reputation it has to support. Their product has a large market, not only in New York City, but also in Atlantic City, N. J., and Providence and Newport, R. I., where fine brick is so constantly in demand for the new villas of the wealthy residents. As for its use in public buildings, it is enough to mention as among the structures in which it has been used the New York Post Office, the great Power House in Third avenue, the Hide and Leather Bank, the Vanderbilt Clinic, and a number of the public school buildings of Greater New York. The Westchester Protectory, the Tarrytown convent of the Sisters of Mercy and the St. Agatha Home at Nanuet are also examples of the successful employment of this fine Haverstraw product. A specialty of these yards is the production of "special shapes" to order.

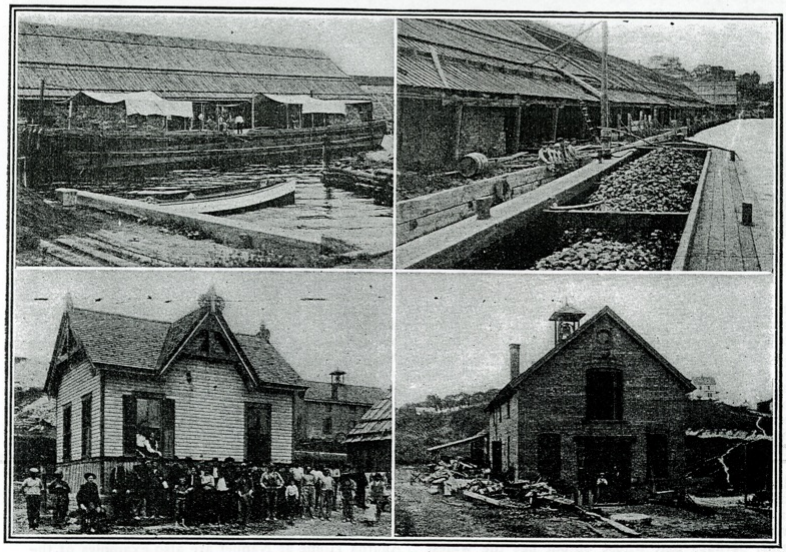
The Shultz Yards.

The brick which bears the highly popular brand, "Shultz," is the product of the Shultz Yards at East Kingston, near Rondout, N. Y. Henry H. Shultz, the present manager of the concern for the Shultz Estate, represents the third generation of a family which has been in the brickmaking business since the earlier half of the last century. At that period Charles Shultz owned, at Keyport, N. J., an interest in what would now be considered a very modest plant, operated with horses, and having a daily capacity of 40,000, or, for the season, 6,000,000 bricks. This passed to his son Charles A. Shultz, who before long realized that the banks of the Hudson River not only afforded enormous adantages in the matter of shipping, but provided a better quality of the raw material, and in tempting abundance. Accordingly, in 1876, Charles A. Shultz removed to East Kingston and began, at first in a comparatively small way, a business which has been growing ever since, and which, under the management of his son, Henry H. Shultz, has reached a position of the highest importance in the building-material industry.

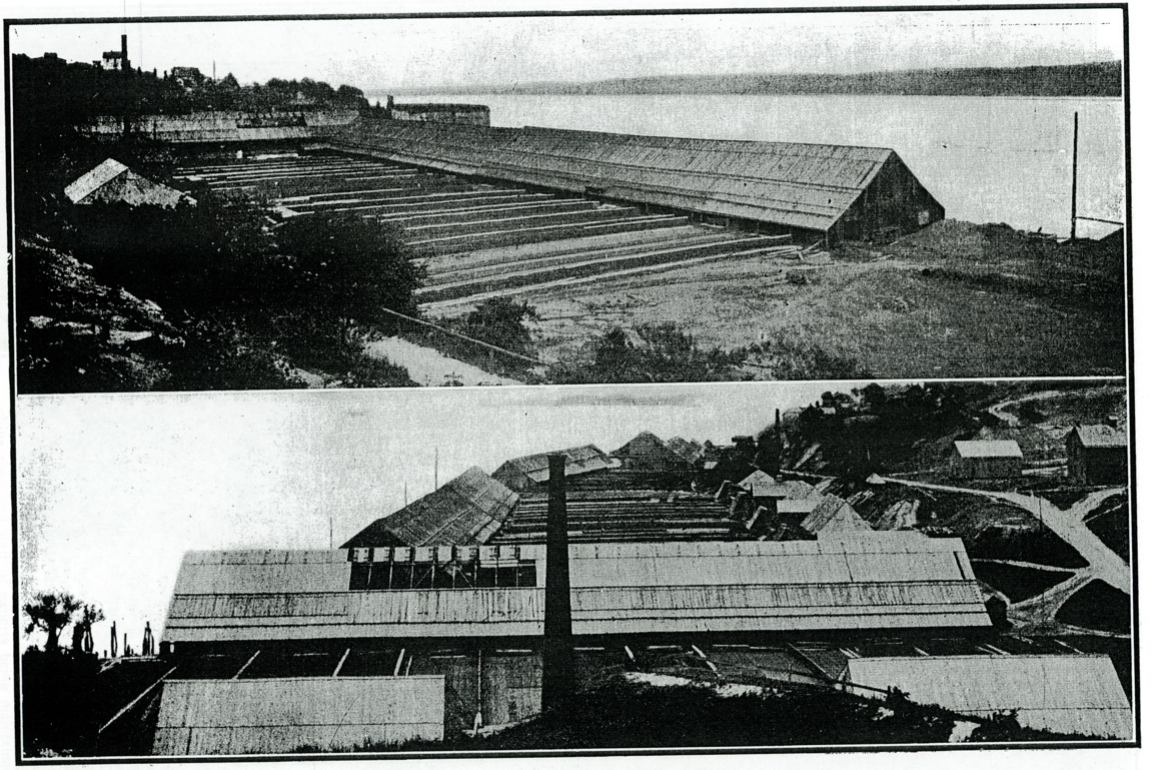
The first notable step in the development of the Shultz Yards on the Hudson River was when steam power was substituted for horses. This was in 1878, and from that time the business of the plant, increasing yearly with the recognized value of the "Shultz" brand has climbed without one serious check, until, at the present writing, it employs a plant the capacity of which is 138,000 per day, or 18,000,000 brick per season. These commercially satisfactory results have been in great part due to sheer persistence; but a particular "strong" quality of their clay banks, and the incessant exercise of thought and care, with constant alertness to seize upon every chance of improvement, had quite as much to do with the reputation which the brand has earned of an almost perfect brick for general building purposes.

The clay banks adjacent to the works yield also quantities of sharp sand. This, with "culm" in the proper proportions, is used on the Shultz yards to form a brick in which there is both yellow clay and blue, one-third of the former and two-thirds of the latter. Special attention is given to the processes of mixing and tempering. The latter is carried on in a circular pit with a "tempering wheel" worked by steam power. So far there is no secret in the composition of the Shultz brick. But in the precedent process of mixing the case is somewhat otherwise; the strength, beauty, and evenness of color for which this brick is noted has not been secured without years of thought and experiment, both by the late Mr. Shultz and the present manager of the Estate.

The expenditure of time, thought, and capital



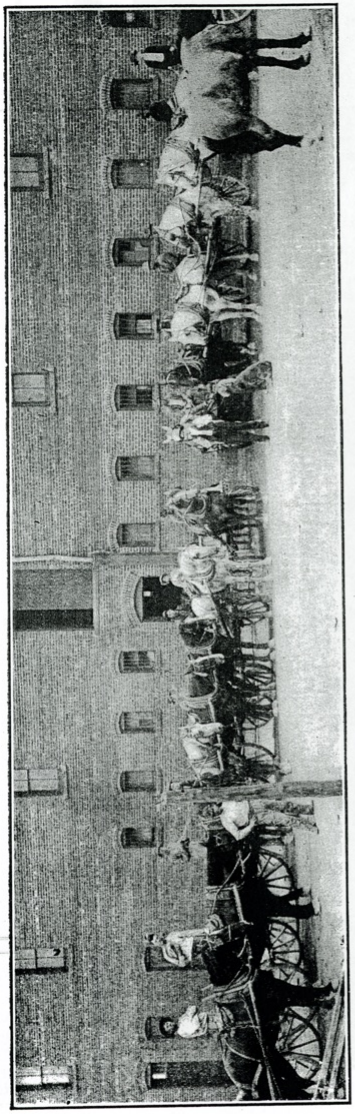
LOADING A GREAT BARGE—UNLOADING COAL BARGE— PAYDAY AT THE OFFICE—SHULTZ MACHINE SHOPS



HUDSON RIVER VIEWS OF THE SHULTZ PLANT

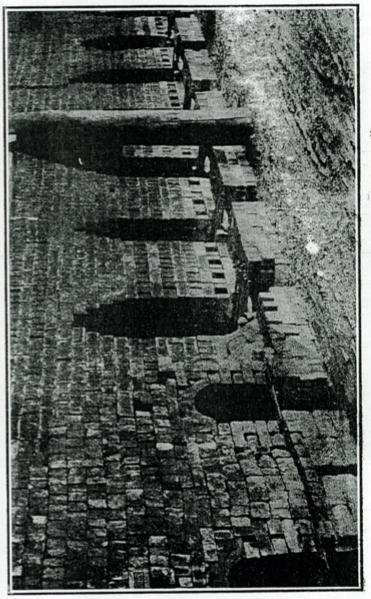


ONE OF THE SHULTZ CLAY BANKS



PART OF THE SHULTZ CLAY BANK OUTFIT

upon all this repays itself in more than one way. There is the enormous saving involved in the fact that here the percentage of waste arising from spoiled brick, is lower than in almost any modern plant where brick are made on anything like the same large scale. The economy is continuous from the very first moulding to the finished product. It is based on—apart from the careful and skillful mixing already referred to—a system of special attention in the details of "jarring" the moulds, of "dumping," "edging" and "hacking" upon the open yards which are in use here; then again, it is a principle of the Shultz Works that good drying is half the battle, if the manufacturer cares to produce an output of good color, and not



"MAKING READY" COAL ARCHES FOR A "BURN"

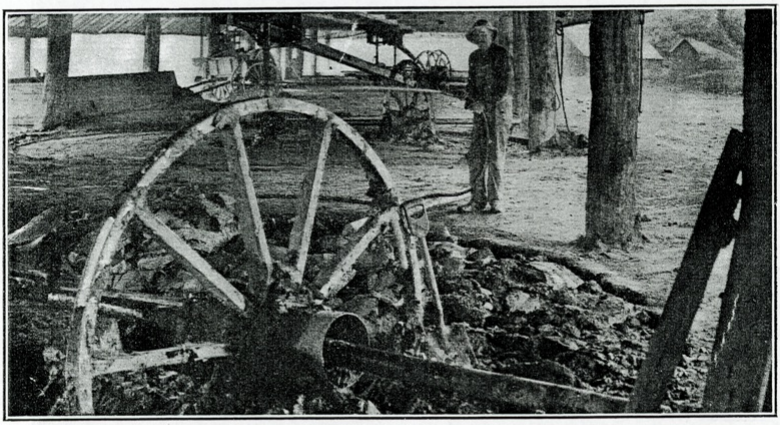
the ugly grey which results from burning half-moist brick. Eternal vigilance is the price of success in these matters, and, to complete the chain, after watching the brick like delicate infants from "hack" to kiln, the "setting" is there done like a work of art, so as to ensure the perfection of draft for the burning.

The fuel used in these kilns is hard coal, the kiln consuming, on an average, 100 tons to each 1,000,000 brick. Another notable feature in the Shultz Works is their system of repairing all machinery and tools on the premises, a complete machine shop and staff of experts being maintained for that purpose.

Property of
HAVERSTRAW
BRICK MUSEUM

The Terry Yards.

The well known corporation of The Terry Bros. Company is represented in the market by two highly respected brands of brick: the "Terry" and the "Terry Bros." The latter is made from blue clay alone; the former from mixed blue and yellow. The company's banks at Kingston and East Kingston, where the two plants are situated, are of enormous extent. These deposits run mostly to blue clay, the East Kingston banks showing a large percentage of yellow, those at Kingston containing only blue. The banks are overlaid with an excellent quality of sand for both moulding and mixing. The company's plant includes eleven machines with an aggregate daily capacity of 250,000 or 30,000,000 bricks per season. Both circular pits and improved sod pits are used here—eight of the former and three of the latter.



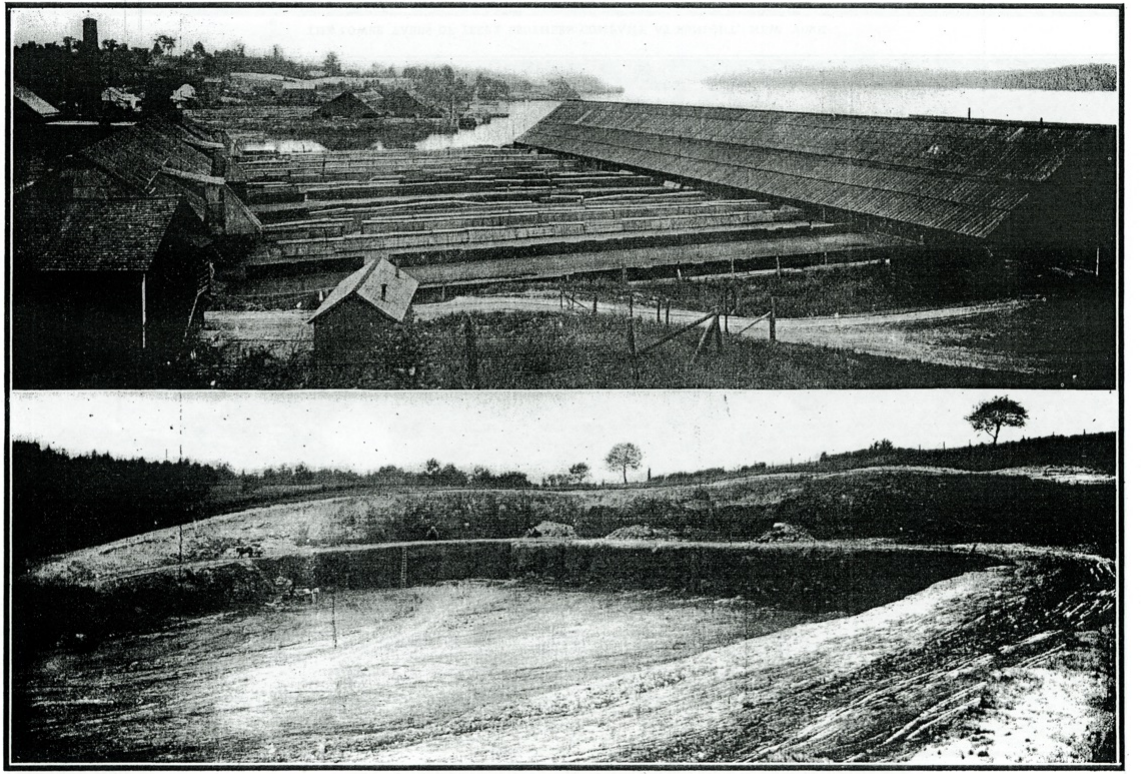
"TEMPERING" WHEELS AND CIRCULAR PITS

The product is shipped down the river on the company's own barges, of which it owns seven, varying in capacity from 200,000 to 325,000 brick per barge.

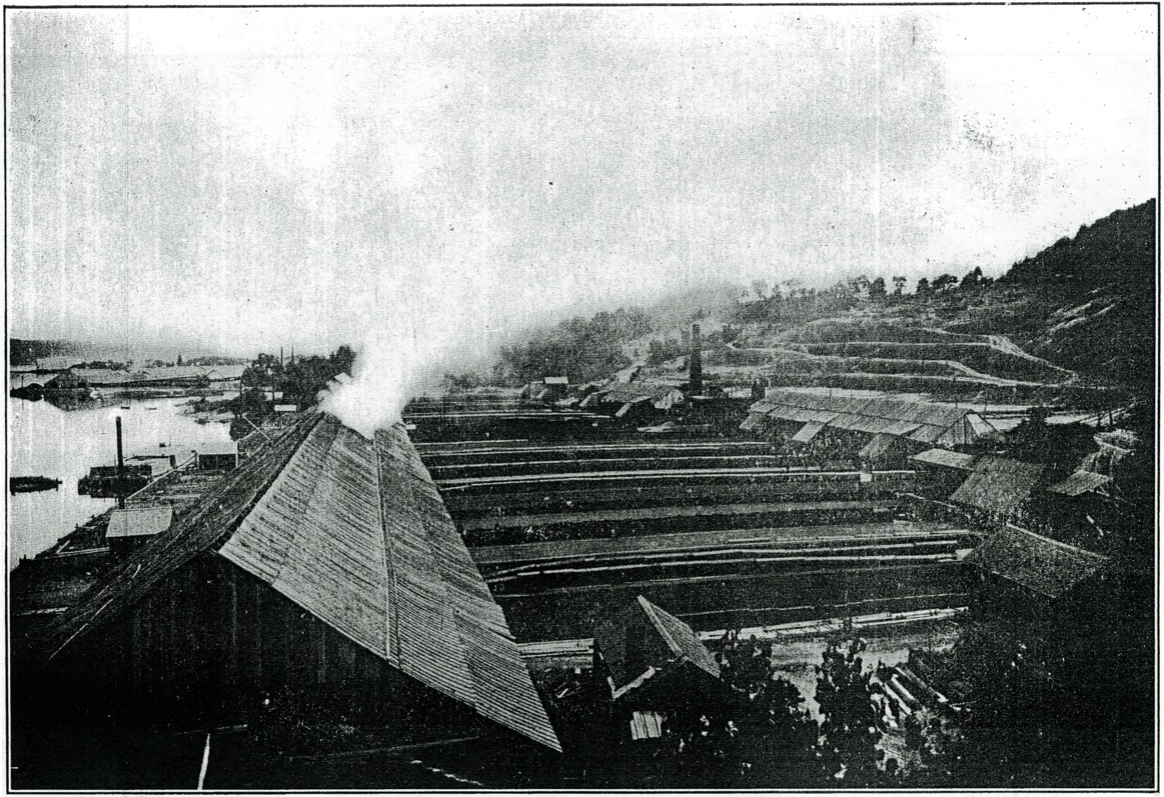
The Terry Bros. Co. enjoy the distinction of being the first concern on the Hudson River to burn brick with coal for fuel. This innovation was begun in 1884, and has been continued ever since. After more than twenty years' experience with mineral fuel in their kilns, the management maintain that it gives a more uniform burn than can be obtained with wood fuel. In addition to this important point of uniformity, they believe that coal is more manageable, more amenable to nice adjustments and in every practical respect more satisfactory than wood.

Besides the honor of being the pioneer coal-burners of the Hudson River yards, The Terry Bros. Co. claims a smaller percentage of broken brick than any other plant. This very favorable condition for a concern using only open-yard systems, which no doubt operates to the advantage of the consumer by reducing the waste for which the consumer has to pay in the long run—whether he knows it or not—is secured by a system of exceptionally careful handling, both of the green brick and of the burnt, in every one of the processes from moulding to culling. The dumping here is performed very gingerly, the edging is done as if the brick were so much porcelain, though with great speed, which can only be consistent with extreme care when, as is the rule of this establishment, the workmen are all thoroughly practised in their business. Lastly, the cullers lay down the selected brick taken from the kiln so deftly that very few foremen of buildings have ever had good cause to complain of ragged edges on the "Terry" or "Terry Bros." material since these brands appeared on the market. Artificial coloring material is not used in either brand, the natural color alone being relied upon to produce a good red brick.

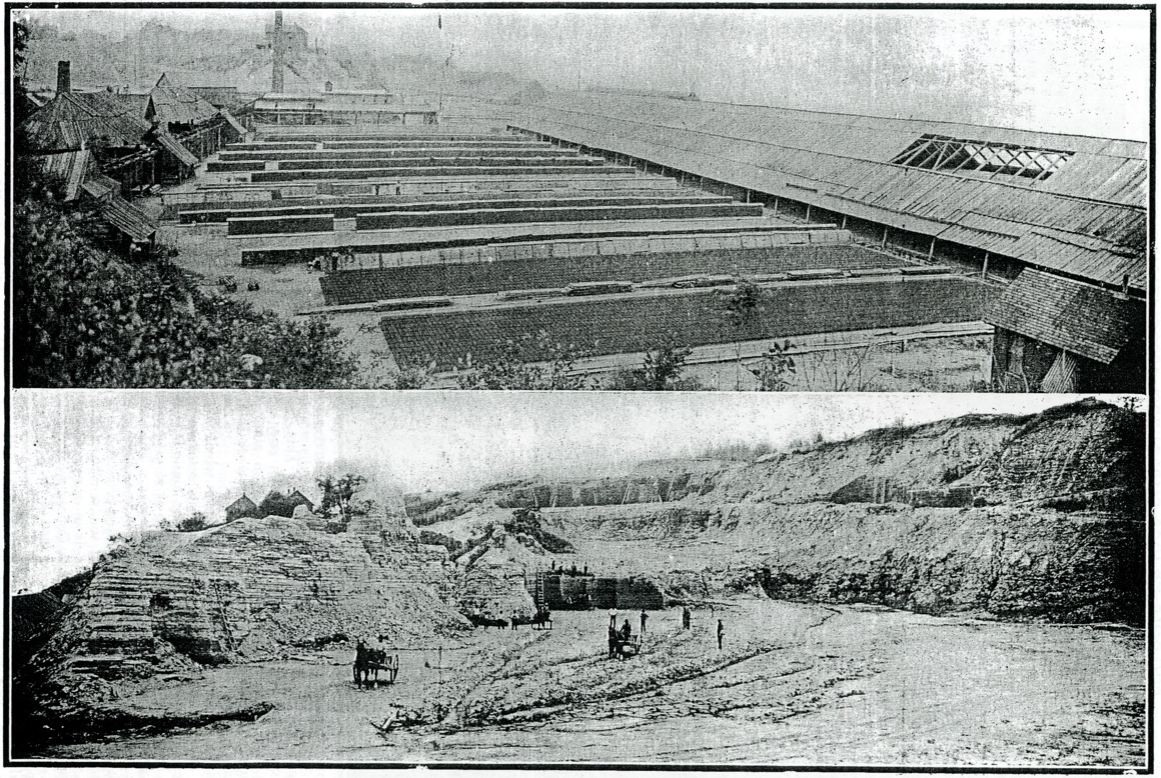
The Terry yards were founded in 1850 by the late David Terry. At his death, which took place in 1869, the business was taken up by his sons Albert and Edwin, who carried it on in partnership until 1902, when Edwin Terry retired and the concern was incorporated as The Terry Bros. Co., Albert Terry being elected president of the newly formed company; Jay Terry, vice-president; David Terry, secretary and treasurer.



UPPER YARD AND ADJOINING CLAY BANK OF TERRY BROTHERS COMPANY AT RONDOUT, NEW YORK



THE LOWER YARDS OF TERRY BROTHERS COMPANY AT RONDOUT, NEW YORK



THE STAPLES YARD AND CLAY BANK AT RONDOUT, NEW YORK

The Cary Yards.

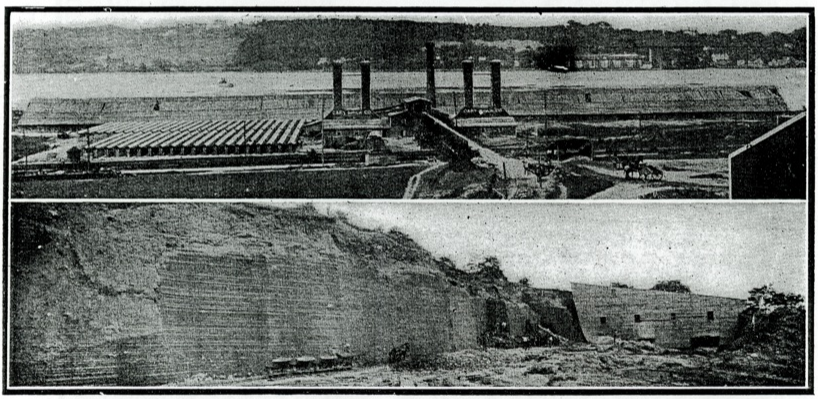
The two establishments of the Cary Brick Company at Newton Hook and Cohoes, respectively, have so much in their equipment that is remarkable that within the limits of space imposed by an article like this it will be impossible to do more than barely enumerate the very special conditions which give the brand "Cary" its reputation.

Among many points well worthy of attention at these yards are the magnificent extent of the blue and yellow clay deposit at Newton Hook—150 acres—and its depth of 96 feet, ascertained by experimental borings. The completed product is transported from the kiln by a canal 2,400 feet in extent, which runs along one side of the shed and out to the main river channel, while the railroad is convenient on the other side; at Cohoes transportation is afforded by the railroad and the Erie Canal. The kiln fuel at Cohoes is wood; at Newton Hook coal is used.

About four years ago Mr. W. N. Cary, President and General Manager of this company, took out a patent for the Cary "clay house." This is a contrivance of masterly simplicity which enables him to continue the mining of clay in all seasons by protecting both the clay and the workmen against rain, snow and frost.

This is one-half of the peculiar equipment which does away with the brick manufacturing season at these plants, or rather, enables them to continue their season through twelve months, so as to give an average of 300 working days in the year. The other essential is the "steam dryer," by means of which the drying of the newly moulded brick can be and is effected independently of sun, wind and rain. This, like the "clay house," is in operation at both the Newton Hook and the Cohoes works. It is manufactured by the Standard Dry Kiln Company, Indianapolis, Ind. As the soft brick are always under cover, no sudden showers can touch them, and the general output is never marred by the appearance of "wash" brick.

The Cohoes yards of the Cary Brick Company have an annual capacity of 16,000,000; those at Newton Hook, 30,000,000. At the former plant 100 men are employed; at the latter 150. But it is of particular interest to note the effect which the all-the-year-round system has upon labor conditions in the Cary yards; high-class workmen naturally prefer positions in which they can ply their skilled labor both winter and summer. Moreover, the physical conditions of the work in these thoroughly up-to-date plants compare favorably with those found elsewhere. Consequently, the Cary people have at their disposal the pick of the Hudson River brickmaking craft; their "burners" are men known as the most skillful in the State, and the qualifications of their other employees are in keeping throughout all the departments. At the same time, it should be added there is no guesswork here about probable output for a season; the company is able to definitely contract with a moral certainty of success for just so many million brick.



STEAM DRYING PLANT OF THE CARY BRICK CO.—CARY CLAY HOUSE, CLAY BANK AND CARS

The steam dryers are kept supplied by three machines, in addition to which a fourth and fifth machine works for the pallet yards, with which the plant is also equipped. The strong mud of the Cary banks is treated for the machines by a compound-geared horizontal granulator and a Potts disintegrator, under the powerful action of which gravel, stones and whatever other hard mineral may accidentally find its way into the mass is reduced to powder. At the Newton Hook plant the clay is brought from the bank by a Koppel narrow-gauge railway 1,800 feet long, the trains of cars working by gravity when loaded, and one horse being sufficient to haul them back when empty. Equally in keeping with the elaborate perfection of these plants is the belt conveyer, which takes the clay from the granulator at Newton Hook, over a distance of 145 feet to the machines, and the splendid dynamo which supplies the current for 400 16-candle-power lights rendered necessary by the system employed here.



THE PRESIDENT (X), OFFICERS AND ASSISTANTS OF THE JOHN B. ROSE COMPANY, NEW YORK, SHOWING MANUFACTURERS' MEETING ROOM

The John B. Rose Commission House.

The largest brick brokerage house in the world has its offices and wharves at the foot of West Fifty-second Street, New York City. This firm, the John B. Rose Company, presided over by Mr. John B. Rose, a young man who left college not so many years ago, was established in 1902. In 1904 it handled as many as 400,000,000 brick; and as the Hudson River output promises a very considerable increase for the year 1905, there can be no exaggeration in putting the estimate of the company's dealings for the current year at half a billion, which will be drawn mainly from the Hudson River yards. The New York State brick handled by this splendid corporation is supplied not only by the great yards as far up as Cohoes and Mechanicville, but also, through the canals, from points above Albany. The firm also represents important plants in the States of New Jersey, Delaware and Connecticut. No fewer than 130 barges and ten sailing vessels are engaged in conveying brick over the great inland waterways to the market, the barges having an average capacity of 300,000 brick, the schooners of 80,000.

Such phenomenal growth during the brief space of this firm's existence has, of course, its special cause as well as the many general causes in details which naturally contribute to business success. The John B. Rose Company has made a special point of supplying its customers with information as to the state of demand and supply in the market, and its circular "To the Brick Manufacturers of the Hudson River and Hackensack," with detailed report of the supply on hand at the beginning of the year, is accepted with implicit confidence by the most experienced and successful business men in the brick interests as a guide. This document refers to a social affair following a meeting of manufacturers representing an output of over 600 million brick annually, and which gathering was called a "Pow Wow, or Hot Air Convention." Here the cares of business were cast aside and verbal "brickbats" hurled good-naturedly at each other's heads. These features of the company's methods have necessarily proved attractive, but much of its popularity results from the reputation of its six expert sellers, and the knowledge that one of its officers gives his whole time to the distribution of the product as it reaches the market. In this way the manufacturers, to whom quick discharge of barges is of scarcely less importance than the securing of the highest market prices, have not been slow to learn that their interests could not be better served than by this great commission house.

An interesting example of that attention to details in which this house so far excels all others is to be seen in the provision made at the New York office for the convenience of manufacturers and others engaged in the business and of barge captains. Here two sets of commodious and completely fitted rooms are maintained, one for manufacturers, who find it an excellent place for business discussions, the other for captains. Literature and every kind of convenience are here

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BRICK MUSEUM

provided for the visitors. The firm sell brick on a banking basis, and transact a banking business for brick manufacturers. They also do a large business in brick manufacturers' supplies, such as yellow and red ochres, coal dust, machinery, lubricating oils, paints and deck varnishes.

Of Mr. John B. Rose, the president of the company, something has already been said. The treasurer, Mr. George S. Shultz, has charge of the enormous sales of the company. Mr. Shultz has been for 37 years engaged in the business of selling brick, and is one of the most successful salesmen in New York City. Mr. William R. Pitts, vice-president, formerly a brick manufacturer, has likewise been successful in the selling of brick for the past 20 years, and by his absolutely fair methods has endeared himself to sellers and buyers alike. Mr. Isaac M. Purdy, assistant treasurer of this company, and formerly of the firm of Purdy & Pitts, enjoys a similar reputation as an operator, and for about the same length of time, or 20 years. Mr. Purdy has entire charge of placing the cargoes, settles any and all disputes, and facilitates in every way the dispatch of boats. Mr. Robert T. Boyd, the secretary, another successful salesman, has served in the important capacity of private secretary to Mr. Rose in Roseton, and also here in New York, for the past eight years. He is an able lieutenant in executing the orders of the president.

The John B. Rose Company bids fair to eventually bring about a general consolidation of all the common-brick manufacturers in this section of the country. Succeeding to the business of the old Manufacturers' and Agents' Consolidated Brick Company, which perished through the obnoxious "rebate" system, it has already effected a most desirable improvement in the feeling between buyer and seller. Up to the present the list of manufacturers whose output it handles comprises the following: Allison, Wood & Allison, Haverstraw, N. Y.; B. J. Allison & Co., Haverstraw, N. Y.; Allison & Wood, Haverstraw, N. Y.; L. H. Brocket, North Haven, Conn.; Cary Brick Co., Mechanicville, N. Y.; Champlain Brick Co., Mechanicville, N. Y.; Central N. E. Brick Co., New Britain, Conn.; D. J. Curtis, Jr., Hartford, Conn.; Harry Corse, Glasco, N. Y.; Corwin & McCollough, Coeymans, N. Y.; Dempsey-Gabriel Brick Co., Albany, N. Y.; Denning's Point Brick Works, Fishkill-on-Hudson, N. Y.; D. DeNoyelles & Co., Haverstraw, N. Y.; Excelsior Brick Co., Haverstraw, N. Y.; East Windsor Hill Brick Co., East Windsor Hill, Conn., D. Fowler, Jr., Co., Haverstraw, N. Y.; Everett Fowler, Haverstraw, N. Y.; Ferguson Brick Co., Troy, N. Y.; Eugene Frost, Croton-on-Hudson, N. Y.; Ed. Furman, South River, N. J.; Philip Goldrick, Saugerties, Route No. 4, N. Y.; Jas. W. Gillies, Hackensack, N. J.; M. B. & L. B. Gardner, Hackensack, N. J.; T. E. Gardner, Hackensack, N. J.; Matthew Gormley, Haverstraw, N. Y.; Garner Brick Works, Haverstraw, N. Y.; Hudson River Brick Mfg. Co., Verplancks, N. Y.; The Hutton Co., Kingston, N. Y., Station R; M. M. Hayden, Newburgh, N. Y.; Robert Kent, Glasco, N. Y.; Lynch Bros Haverstraw, N. Y.; Wm. Lahey, Fishkill, N. Y Mehrhof Brick Co., Little Ferry, N. J.; Philip Mehrhof, Little Ferry, N. Y.; Nicholson & Sons, Haverstraw, N. Y.; Nicholson & Reilly, Haverstraw, N. Y.; A. W. Pettit & Co., New Brunswick, N. J.; The Rose Brick Co., Roseton, N. Y.; J. Roberts, Troy, N. Y.; Ryan & McFerran, Newburgh, N. Y. (Newburgh Bridge Co.); Chas. A. Shultz, Est., Rondout, N. Y.; A. S. Staples, Rondout, N. Y.; Ed. Schmultz, Hackensack, N. J.; Snedeker Bros., Haverstraw, N. Y.; Sayre, Fisher & Co., Sayreville, N. J.; M. E. Turner, Fly Mountain, N. Y.; The Tuttle Brick Co., Middletown, Conn.; The Troy Brick Co., Troy, N. Y.; Wood & Allison, Haverstraw, N. Y.; U. F. Washburn & Co., Haverstraw, N. Y.; Washburn & Fowler, Haverstraw, N. Y.; Westfield Brick Co., Westfield, Mass., and the Newburgh Brick Co. (Sand Lime brick).

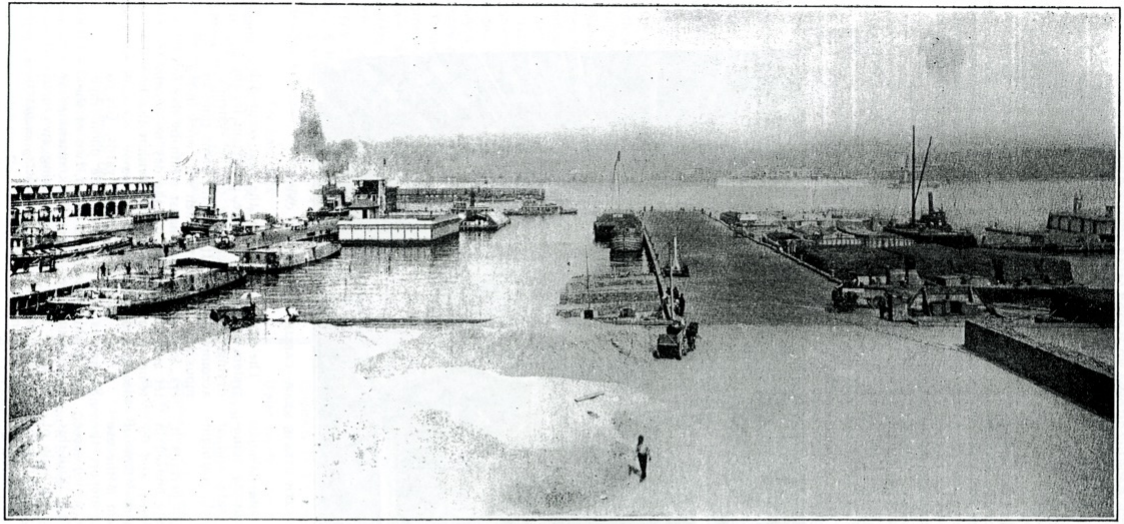


PRIVATE OFFICE OF MR. JOHN B. ROSE IN NEW YORK



ONE OF THE PRIVATE ROOMS OF THE OFFICERS OF THE JOHN B. ROSE COMPANY

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VIEW OF THE ROSE BRICK MARKET IN NEW YORK, SHOWING RECREATION PIER (FOOT OF WEST FIFTIETH STREET) AND U. S. WARSHIP "MINNEAPOLIS"

NOTE.—Generally at this time of the year (July 20th) there are to be found here from forty to fifty barges, holding from twelve to fifteen million brick. The great demand for brick during the past three months has prevented Staff Photographer William Thompson from procuring a view portraying this impressive sight.

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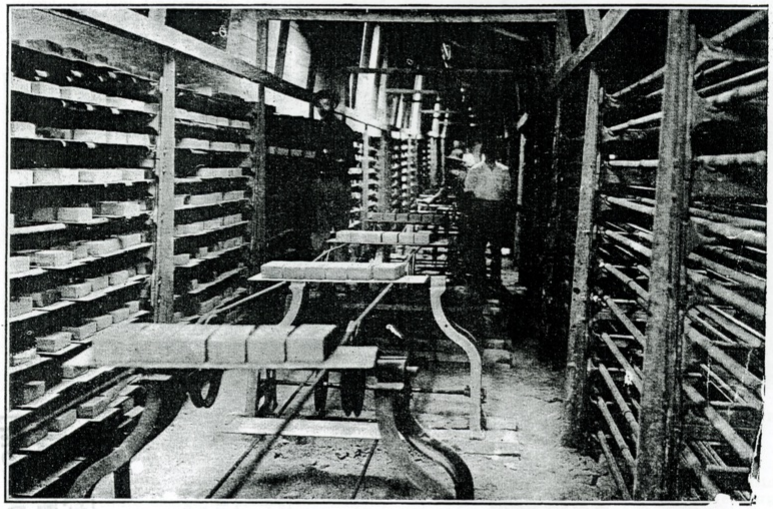
Steam Drying System.

Any system which enables a brick plant to keep running all the year round tends to vastly improve the conditions of the industry. The employee of the perennially working plant is not obliged to find other work in winter; he becomes a specialist, and is, therefore, on a higher industrial plane than his competitor who has to be a Jack of at least two trades.

No modern improvement in brickmaking methods has done more to promote this desirable change than the steam drying system of the Henry Martin Brick Machine Company, of Lancaster, Pa. That enterprising corporation, recognizing that many manufacturers would be deterred from a steam drying process by the idea that the plant must be either costly or else flimsy and liable to loss by fire, have succeeded in producing something at once economical, durable, safe, and at the same time capable of drying brick overnight every night in the year.

Where the arrangement of the yard permits it, the Martin steam dryer may be safely housed in a wooden building. No engine is used, and the heat is always under thorough control. One of the admirable features of their system is the use of the heavy iron columns which support the steam pipes and receptacles for brick, which serve also as supports for the building itself. With this substantial framework the shed can be built of brick and permanently roofed over with fireproof material.

From the machine to the kiln there is in t system no necessity for "hacking" or "edging," any handling of the brick at all. One man moves the moulds and passes them to anotl who "dumps" the brick on steel pallets. The l lets are then carried by a cable—unless tracks preferred—to the receptacles or racks in the dr proper. Here the sections of pipe run lengthw eleven tiers of pipe high and five wide. All t pipe is exposed, so that any leakage can be ea detected and repaired. As everything in the paratus is of steel or iron, the swelling, warp or rotting of wood is avoided. And as there no blowers or fans, the amount of mechanism ble to accident is practically *nil*.



DRYING BRICK WITH STEAM HEAT—CARRIED TO RACKS BY CABLE

The perfect control of the heat secured by system is, in the first place, important for the drying of the brick, one of the system's accommodations. It is at the same time an mous advantage to the men who work in the ers, for using only exhaust steam by day in ter and no steam during the day in summe temperature is kept always within the lin health and comfort.

At the Washburn Bros.' yards, Glasco Saugerties, N. Y., where the photograph trating this article was taken, two of the all-iron-and-steel steam brick machines ar in use. Each machine, having two mou trances and two mould sanders, is practi double-handed machine.

	Machines
Charles E. Walsh, Hackensack, N. J.	1
James W. Gillies, Hackensack, N. J.	1
Edward Schmultz, Hackensack, N. J.	2
M. B. & L. B. Gardner, Hackensack, N. J.	1
M. & L. E. Gardner, Hackensack, N. J.	1
I. & W. Felter, Little Ferry, N. J.	4
Mehrhoff Brick Co., Little Ferry, N. J.	5
N. Mehrhoff Co., Little Ferry, N. J.	3
P. Mehrhoff Co., Little Ferry, N. J.	5
Haverstraw District	
B. J. Allison & Co., Haverstraw, N.Y.	7
Wood & Allison, Haverstraw, N.Y.	4
U. F. Washburn & Co., Haverstraw, N.Y.	11
L. H. Washburn, Haverstraw, N.Y	2
Washburn & Fowler, Haverstraw, N.Y.	3
Garner Brick Works, Haverstraw, N.Y.	6
Malley Brick Co., Haverstraw, N.Y.	7
Excelsior Brick Co., Haverstraw, N.Y.	7
DeNoyelles Brick Co., Haverstraw, N.Y.	13
Everett Fowler, Haverstraw, N.Y.	4
D. Fowler, Jr. & Co., Haverstraw, N.Y.	5
Peck Brick Co., Haverstraw, N.Y.	6
C. & G. A. Archer, Haverstraw, N.Y.	2
T. McGuire & Son, Haverstraw, N.Y.	4
Lynch Bros., Haverstraw, N.Y.	4
Lynch & O'Brien, Haverstraw, N.Y.	2
E. N. Renn & Co., Haverstraw, N.Y.	4
J. Nicholson, Haverstraw, N.Y.	2
James Byrnes, Haverstraw, N.Y.	2
Dunnigan, Mrs. F. L., Haverstraw, N.Y.	3
Bennett, Mrs. William & Sons, Haverstraw, N.Y.	4
T. Shankey & Son, Haverstraw, N.Y.	4
Snedeker Bros., Haverstraw, N.Y.	2
Reilly & Tanney, Haverstraw, N.Y.	2
Tanney & Coyne, Haverstraw, N.Y.	2
T. Tanney, Haverstraw, N.Y.	4
Morrissey & Co., Haverstraw, N.Y.	5
Fowler & Son, Haverstraw, N.Y.	6
Shankey & Morrissey, Haverstraw, N.Y.	4
Archer Yard No. 2, Haverstraw, N.Y.	4
Brophy & Morrissey, Haverstraw, N.Y.	4
Riley & Rose, Haverstraw, N.Y.	3
Riley & Marks, Haverstraw, N.Y.	4
F. Brophy & Brother, Haverstraw, N.Y.	3
The East Bank	
Underhill Brick Co., Verplanck, N.Y.	8
L. H. Lynch Co., Crugers, N.Y.	2
Matthew Gormley, George's Island, N.Y.	7
East Shore Brick Co., Verplanck, N.Y.	3
P. O'Brien, Verplanck, N.Y.	3
Mackey Yards, Verplanck, N.Y.	4
Bonner Brick Co., Verplanck, N.Y.	3
Shaneruck Brick Co., Verplanck, N.Y.	5
Newburgh District	
Rose Brick Co., Roseton, N.Y.	26
Jova Brick Works, Roseton, N.Y.	14
Arrow Brick Works, Roseton, N.Y.	6
William Lahey, Newburgh, N.Y.	7
Atlas Building Material Co., Roseton, N.Y.	9
P. F. Greaney, Newburgh, N.Y.	4
M. M. Hayden, Newburgh, N.Y.	3
C. C. Bourne, Newburgh, N.Y.	5
H. Davidson's Sons, Newburgh, N.Y.	1
Hedges Brick Co., Cornwall, N.Y.	4

	Machines
William K. Hammond, Dutchess Junction, N.Y.	3
Hammond & Freeman, Dutchess Junction, N.Y.	4
Anchor Brick Co., Dutchess Junction, N.Y.	6
Aldridge Brick Co., Dutchess Junction, N.Y.	10
Estate of F. Timoney, Dutchess Junction, N.Y.	10
W. D. Budd Brick Co., Dutchess Junction, N.Y.	5
Nicholson Brothers, Dutchess Junction, N.Y.	4
Dennings Point Brick Co., Fishkill, N.Y.	10
Brockway Brick Co., Fishkill, N.Y	16
Constant De Cesere, Fishkill, N.Y.	4
Jos. Belle Isle, Fishkill, N.Y.	5
Malley Bros., Fishkill, N.Y.	7
F. Watrous, Chelsea, N.Y.	4
Brockway Bros., Brockway, N.Y.	4
McCabe & McGrath, Brockway, N.Y.	3
Shackett & Roubellard, Chelsea, N.Y.	3
Kingston District	
Hutton Co., Kingston, N.Y.	14
Terry Brothers, Steep Rocks, N.Y.	8
Hendricks Brick Co., Kingston, N.Y.	5
Brigham Bros., Kingston, N.Y.	9
Estate of C. A. Shultz, Kingston, N.Y.	6
Fredericks Brick Co., Kingston, N.Y.	3
A. Rose & Co., Kingston, N.Y.	2
Lynch Bros. Co., Kingston, N.Y.	5
Staples Brick Co., Kingston, N.Y.	3
U. F. & J. T. Washburn, Kingston, N.Y.	5
Terry Bros. Yard No. 2, Kingston, N.Y.	3
S. J. & T. J. Smith, Saugerties, N.Y.	4
P. Golderick, Saugerties, N.Y.	5
John Maginnis, Saugerties, N.Y.	3
Gardner & Goldsmith, Saugerties, N.Y.	2
Dwyer Bros., Saugerties, N.Y.	2
Robert Main & Co., Saugerties, N.Y.	4
C Schleede, Ulster Park, N.Y.	6
A. S. Staples, Malden, N.Y.	3
Staples Yard No. 2, Malden, N.Y.	3
Bishop Yards, Malden, N.Y.	3
Empire Brick & Supply Co., Glasco, N.Y.	8
Alpha Brick & Holding Co., Glasco, N.Y.	3
Ulster Landing Brick Co., Ulster Landing. N.Y.	2
Dwyer Bros. Yard No. 2, Ulster Landing, N.Y.	1
The Up-River District	
Empire Brick & Supply Co., Stockport, N.Y.	15
G. W. Washburn & Co., Catskill, N.Y.	8
B. Goldin & Son., Catskill, N.Y.	6
Atlas Building Material Co. Yard No. 2 Hudson, N.Y.	9
Sutton & Suderly Brick Co., Coeymans, N.Y.	4
Sutton & Sinsabaugh, Coeymans, N.Y.	3
Corwin & McCullbugh, Coeymans, N.Y.	2
Ziegler Bros., Coeymans, N.Y.	3
Powell & Minock, Coeymans, N.Y.	5
Robert Lent, Coeymans, N.Y.	4
W. W. Rider, Jr., Athens, N.Y.	4
Edward Brosseau, Schedack Landing, N.Y.	4
Stuyvesant Brick Co., Stuyvesant, N.Y.	5
Cary Brick Co., Mechanicsville, N.Y.	4

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