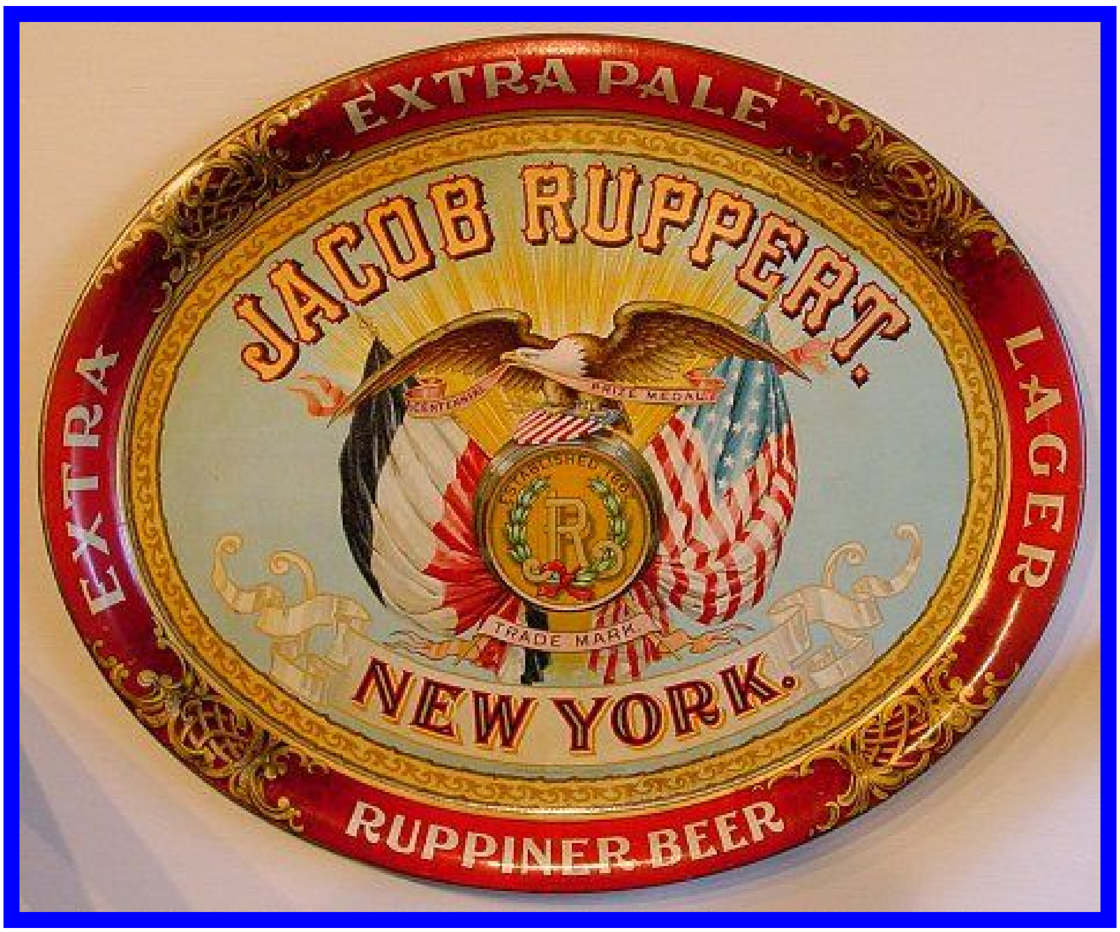
American Refrigeration
Cold Storage & Ice-Making 1875-1915

Ruppert's Ice Plant

NEW YORK



ICE AND REFRIGERATION, January 1901

ICE AND REFRIGERATION ILLUSTRATED

A Monthly Review of the Ice, Ice Making, Refrigerating, Cold Storage and Kindred Trades.

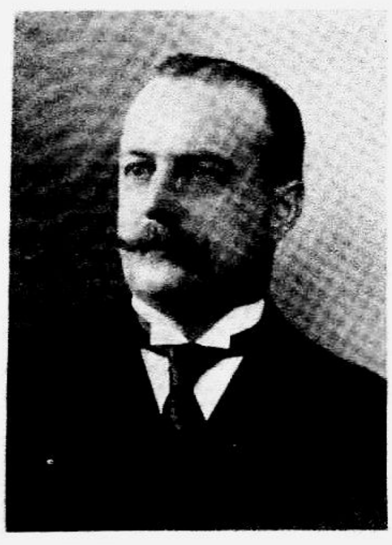
VOL. XX. No. 1. CHICAGO : NEW YORK : JANUARY, 1901. $2.00 PER ANNUM.

[*Written and Illustrated Expressly for* ICE AND REFRIGERATION.]

Jacob Ruppert's Ice Plant in New York.

DETAILED DESCRIPTION OF THE LARGEST ICE MAKING PLANT IN THE WORLD—CONSTRUCTION OF BUILDINGS—DETAILS OF MACHINERY INSTALLED—WATER DISTILLING AND OTHER SPECIAL APPARATUS—PROPOSED COLD STORAGE ADDITION—PORTRAITS, VIEWS AND DIAGRAMS.

ONE of the most instructive and interesting sights for the visitor to New York, and for the ice man in particular, is the new ice factory built by Mr. Jacob Ruppert, located between Lincoln and Alexander avenues and facing 132d and 133d streets. Mr. Ruppert, universally known for his push, energy and sterling business qualities, is one of the pioneers in the manufacturing of ice in New York city.



GEORGE KINKEL, JR., *Manager.*

JACOB RUPPERT.

E. FRIEDMANN, *General Superintendent.*

As early as 1878 he realized the possibilities of the ice machine, which then was in its infancy as far as general use was concerned, although the principles upon which it is constructed were well known long before that time. He had then an absorption ice machine erected in his brewery, which he later on replaced by compression machines, still in use there.

About ten years ago, realizing that the natural ice would sooner or later be superseded in all large cities by ice manufactured according to hygienic principles, owing to its sanitary qualities, as outlined by some of our most eminent scientists, such as Prof. Mitchel Pruddens and Prof. Denton, etc., Mr. Ruppert built an ice plant of fifty tons capacity on Third avenue, to which he afterward added a second plant of 250 tons daily output.

The success which he met with, and the constantly increasing demand for his Hygeia ice, stimulated him to erect the largest plant of its kind in the world. Any one connected with ice manufacturing will realize what amount of work and time and ability it takes to conceive, design and build a plant of such gigantic dimensions as the one in question, and very few men indeed would undertake such an enterprise single handed, as Mr. Ruppert did, who is the sole owner of this new plant, as well as the ones previously mentioned. It required considerable preliminary work to determine the nature of the ground which was to

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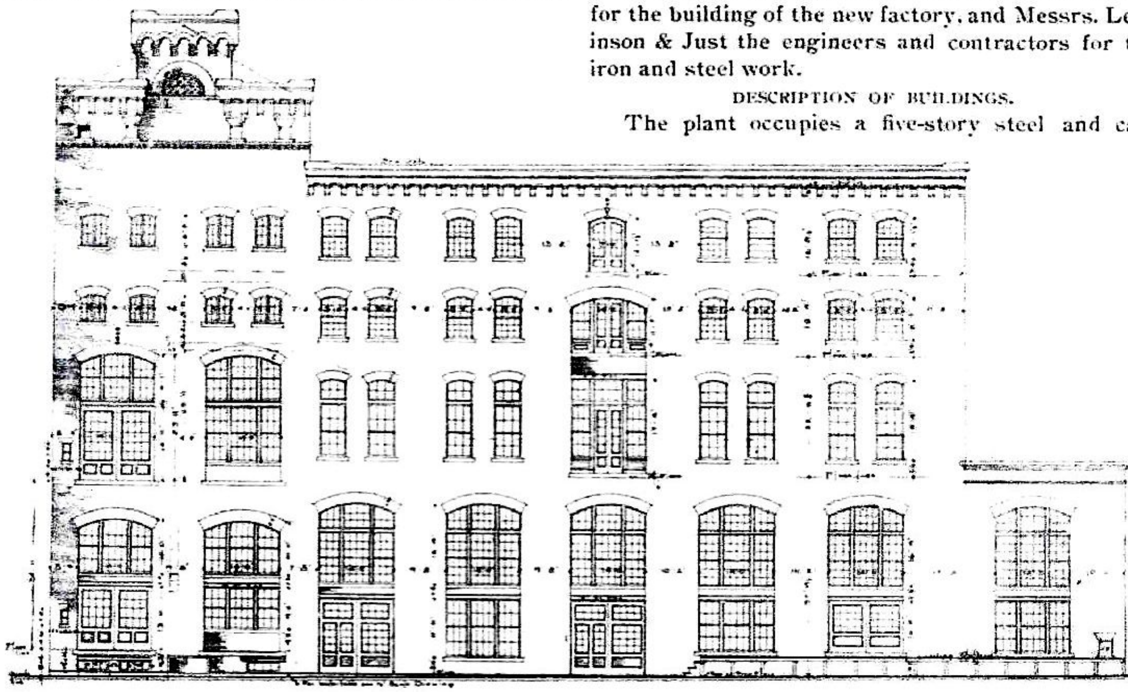
carry such enormous weights, to drill for wells, to arrange to get water from the Harlem river, etc., and considering all this, and in spite of delays due to the scarcity of iron in the market at the time when the progress of the building mainly depended on its prompt delivery, the factory was erected and ready to produce ice at the beginning of May, 1900, a monument to the indefatigable energy of Mr. Ruppert, rarely excelled.

Mr. Jacob Ruppert was born in New York, in 1842. He learned the brewer's trade, and at the age of twenty-five started out to build up a business of his own. From small beginnings he soon developed his business, and through strict attention to all details of the manufacturing as well as the selling of the product of his brewery, he increased his output from year to year, until he now ranks among the foremost brewers of this country. He employs a large force of men, and takes a very active part in the management of his brewery, as well as in that of the ice factories and numerous other enterprises in which he is financially and otherwise interested.

Messrs. Julius Kastner & Sons were the architects for the building of the new factory, and Messrs. Lewinson & Just the engineers and contractors for the iron and steel work.

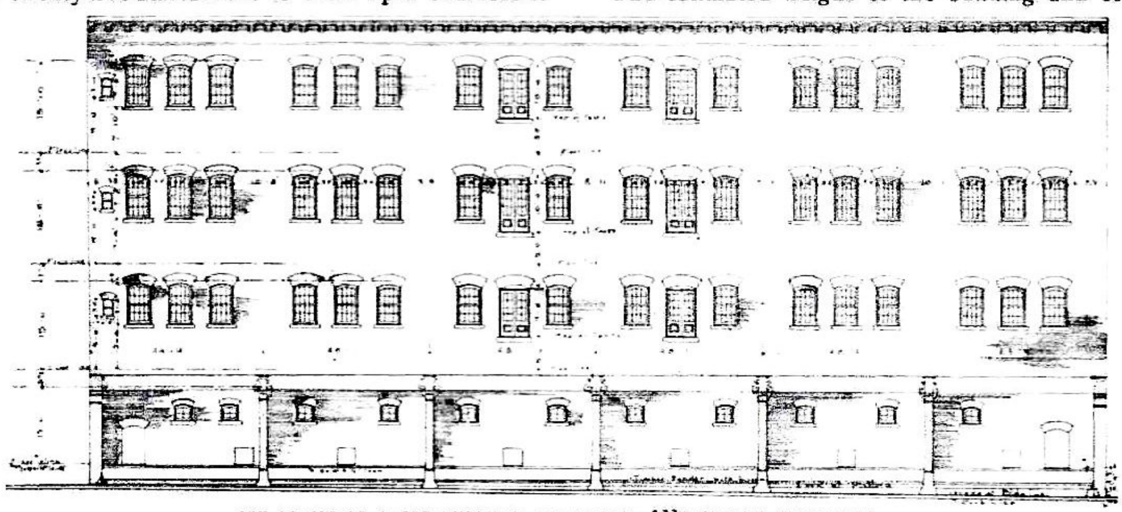


ICE PLANT OF JACOB RUPPERT, NEW YORK, 132D STREET ELEVATION.

DESCRIPTION OF BUILDINGS.

The plant occupies a five-story steel and cast iron cage construction building, about 200 feet square. The provision for heavy storage, the operation of massive machinery on the upper floors, and the construction of large coal bins above the boilers, have developed some interesting features in the design and structural details.

The estimated weight of the building and contents gives the following unit loads on the entire lot area under different parts of the building: Machine house, 2,800; freezing house, 3,400; boiler house, 5,100 pounds per square foot. The soil consists of an upper layer of sand resting on a stratum of mud, which reaches to a bed of sandy gravel, into which piles



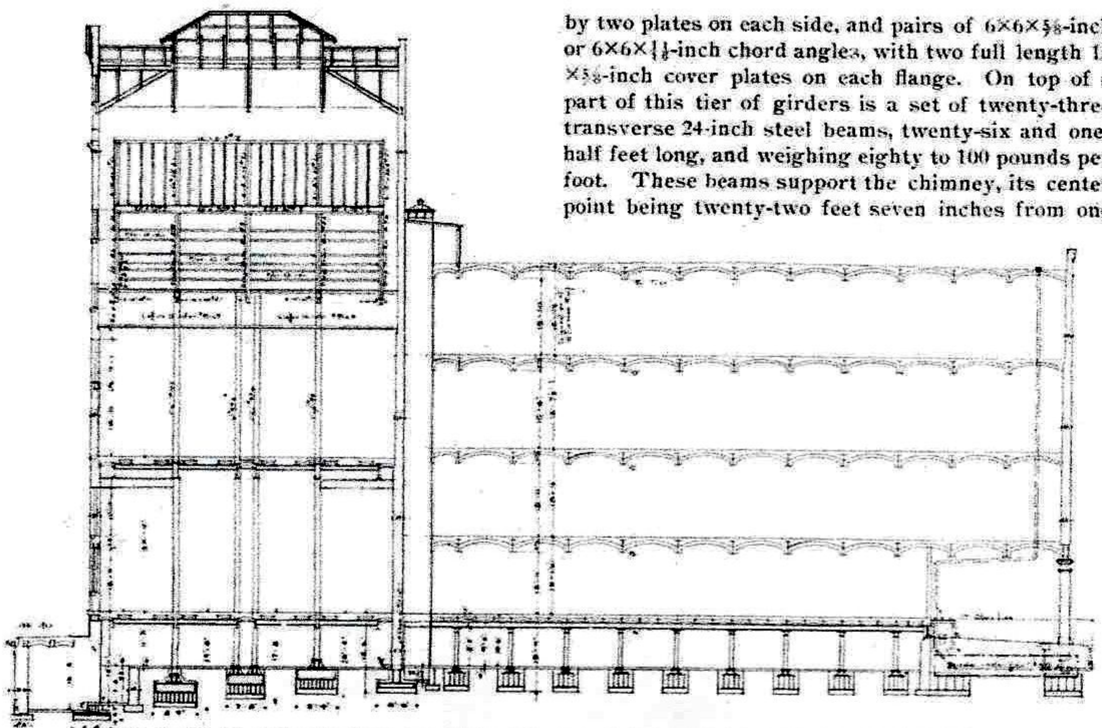
ICE PLANT OF JACOB RUPPERT, NEW YORK, 133D STREET ELEVATION.

were driven to secure satisfactory support for the foundations. The piles were driven close together in rows from eighteen to thirty-one inches apart, and were capped with 12×8-inch timbers, on which platforms of 3-inch planks were laid. These platforms occupied about one-third of the total lot area, and were designed for single columns and groups of columns. An 18-inch bed of concrete was laid on each platform, and on it was set a steel grillage, bedded in concrete. Some of the largest grillages for single columns have twenty-six 15-inch I beams, cases the grillage consists of six 32-inch plate girders, thirty-one and one-half feet long, with short transverse distributing beams to support the columns at each end.

The steel smokestack, 250 feet high and ten feet in width, is made of steel and lined with hollow tiles, leaving a 4-inch air space between steel stack and tiles. It is self-supporting, and has proved to be well built, showing very little vibration, even during a gale. It has a base twenty-two feet in diameter, carried by a grillage foundation 40×35⅓ feet. The

ICE PLANT OF JACOB RUPPERT, NEW YORK—VIEW OF THE FACTORY FROM NORTHWEST.

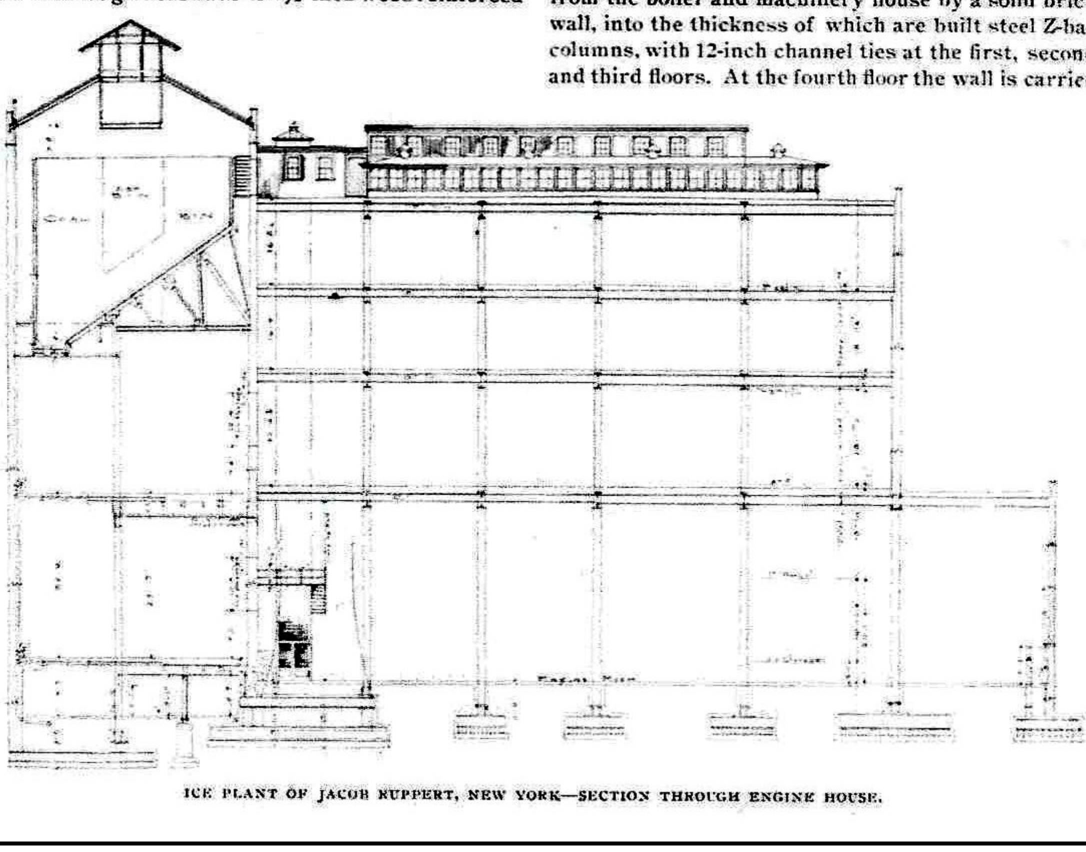
thirteen feet four inches long, with three 20⅔-foot plate girders on top. These girders are thirty-two inches deep, and distribute the column load over the middle portions of all the grillage beams. Other footings are made with two distributing girders, and still others with a grillage of fifteen 15-inch 50-pound I beams, twelve feet ten inches long, and six 24-inch 80-pound I beams, fourteen feet long, to distribute the column load. Some of the columns are in pairs, symmetrically placed on grillages composed of a large number of short transverse I beams with two or three longitudinal distributing plate girders on top, and in some lower tier of this grillage consists of twenty-five transverse plate girders, thirty-four feet eight inches long, resting on a 1-foot bed of concrete on a timber platform carried by 217 piles. The concrete extends four inches beyond the grillage proper on all sides. Each of the beams in this tier has a 32×⅜-inch web, and four 6×4×⅜-inch chord angles. The spaces between the girders of this tier are filled with concrete. The second tier of girders is in two sections. One consists of three girders twenty-eight inches apart, the center line of the outer girder being twenty-three inches from the adjacent ends of the lower tier of



ICE PLANT OF JACOB RUPPERT, NEW YORK—SECTION THROUGH BOILER HOUSE AND TANK HOUSE.

beams. There are but two girders in the second set of this tier, spaced eighteen inches apart, and with their center line 8 feet 5 inches from the ends of the girders in the bottom tier on that side of the foundation. All five girders have 43×½-inch webs reinforced by two plates on each side, and pairs of 6×6×⅝-inch or 6×6×¾-inch chord angles, with two full length 13×⅝-inch cover plates on each flange. On top of a part of this tier of girders is a set of twenty-three transverse 24-inch steel beams, twenty-six and one-half feet long, and weighing eighty to 100 pounds per foot. These beams support the chimney, its center point being twenty-two feet seven inches from one end of the foundation and fourteen feet one inch from one side. This makes the loading on the foundation eccentric.

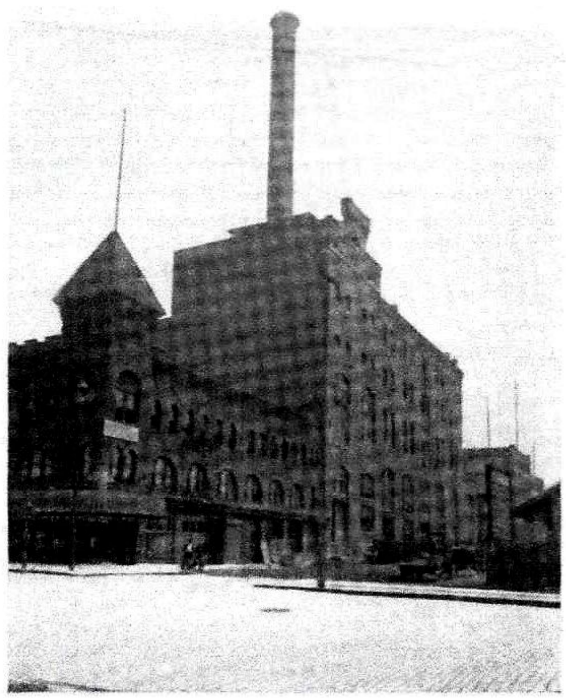
The 136½×172-foot freezing house is separated from the boiler and machinery house by a solid brick wall, into the thickness of which are built steel Z-bar columns, with 12-inch channel ties at the first, second and third floors. At the fourth floor the wall is carried



ICE PLANT OF JACOB RUPPERT, NEW YORK—SECTION THROUGH ENGINE HOUSE.

by I beam and plate girders. Commencing with the basement, the clear heights of the successive stories are nine feet, thirteen feet, fifteen feet, fifteen and one-half feet and fifteen feet ten inches. The basement floor is solid concrete and asphalt, filled in around the columns, to six inches above the tops of the first tier of floor beams. The first floor, for ice storage and delivery to wagons, is calculated for a live load of 450 pounds per square foot over its entire area, and is made of flat hollow tile arches on 12-inch I beams. The next three floors are each calculated for 350 pounds per square foot of live load, and the next, or present roof tier of beams, for 400 pounds. The columns and foundations are proportioned to carry two more tiers of beams, which may be subsequently added, and are estimated to carry weights of 400 and of fifty pounds per square foot, respectively. The dead load weight of each floor is estimated at 150 pounds per square foot. All of the upper floors are made of segmental hollow tiled arches supported on plate girders and filled level with cinder concrete. Each floor is thirty-seven and one-half inches thick from lower side of girder flange to wearing surface. The roof construction is similar to that of the upper floors, but lighter, and is covered with a waterproofing coat of asphalt.

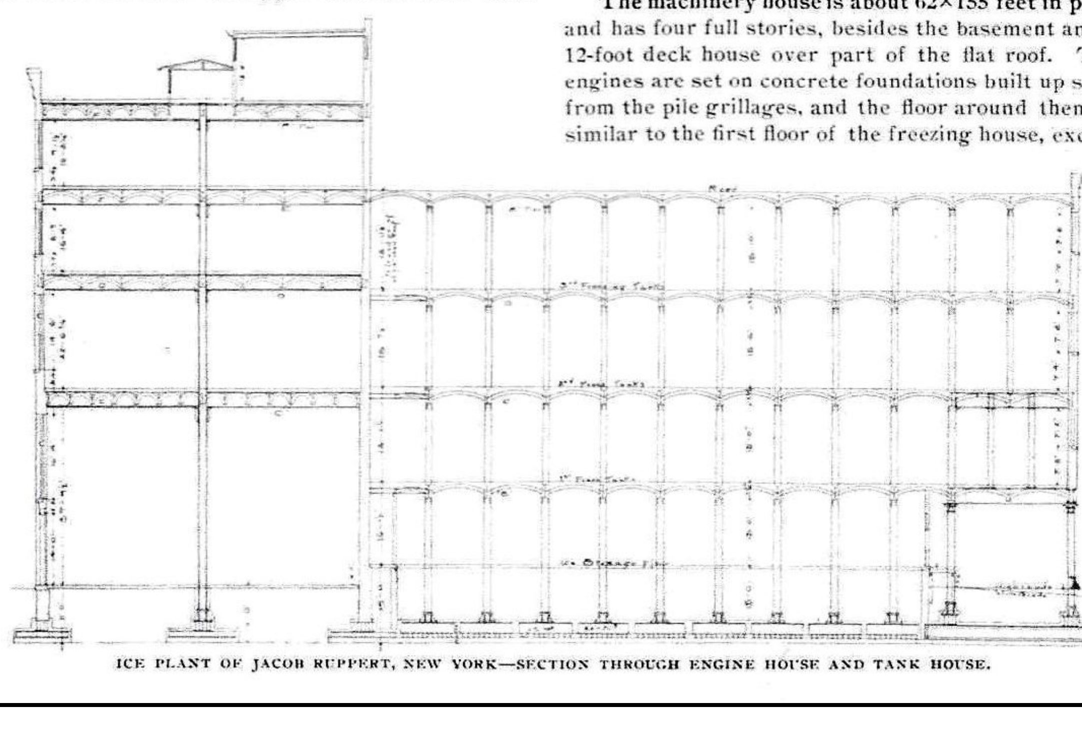
The floors and roof are supported by eighty-four rectangular cast iron columns, eleven feet two inches apart in seven rows about twenty-eight feet apart. In the first story the last two columns next the outer wall are omitted in each row, to leave a clear passageway about twenty-three feet wide for wagons to drive along the loading platform across the building inside. Over this passage the two rows of second-story columns are carried on transverse plate girders, three feet deep, with top and bottom flange plates and heavy reinforcement plates riveted on both sides of the web at the ends. The longitudinal girders which support the 11-foot arches of the upper floors on their lower



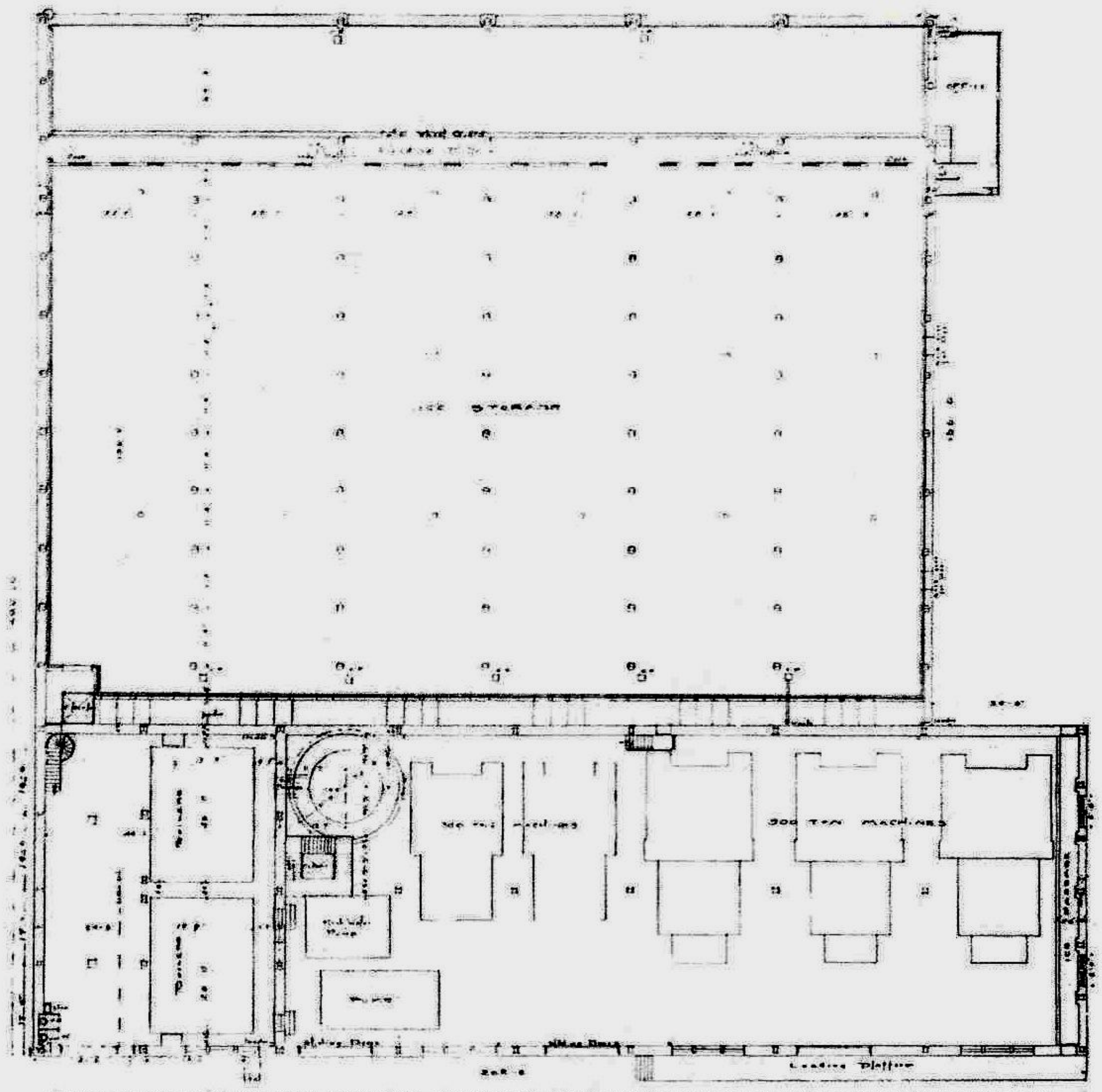
ICE PLANT OF JACOB RUPPERT, NEW YORK—VIEW OF FACTORY ON 132D STREET.

flanges are about twenty-seven feet long, and are each made with a $30\times\frac{3}{8}$-inch web, four $6\times6\times\frac{7}{16}$-inch chord angles, and two $14\times\frac{1}{2}$-inch cover plates twenty feet long. The longitudinal wall girders are similar; the transverse ones each consist of a pair of 6-inch 8-pound channels. The second, third and fourth stories are filled with freezing tanks, and the ice is removed from them by trolleys on I beam tracks, supported from brackets cast on the sides of each intermediate column.

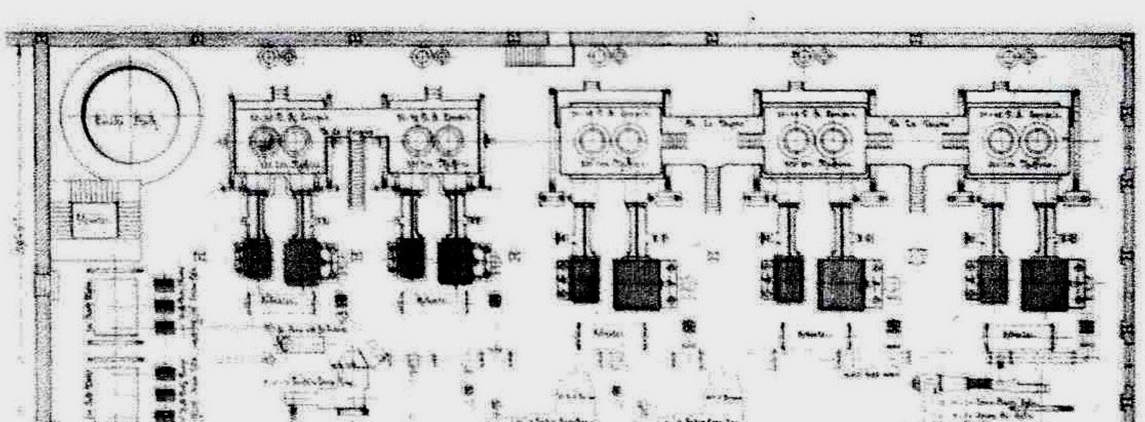
The machinery house is about 62×155 feet in plan, and has four full stories, besides the basement and a 12-foot deck house over part of the flat roof. The engines are set on concrete foundations built up solid from the pile grillages, and the floor around them is similar to the first floor of the freezing house, except



ICE PLANT OF JACOB RUPPERT, NEW YORK—SECTION THROUGH ENGINE HOUSE AND TANK HOUSE.



ICE PLANT OF JACOB RUPPERT, NEW YORK—DIAGRAM OF FIRST FLOOR PLAN OF ENGINE HOUSE AND ICE STORAGE.

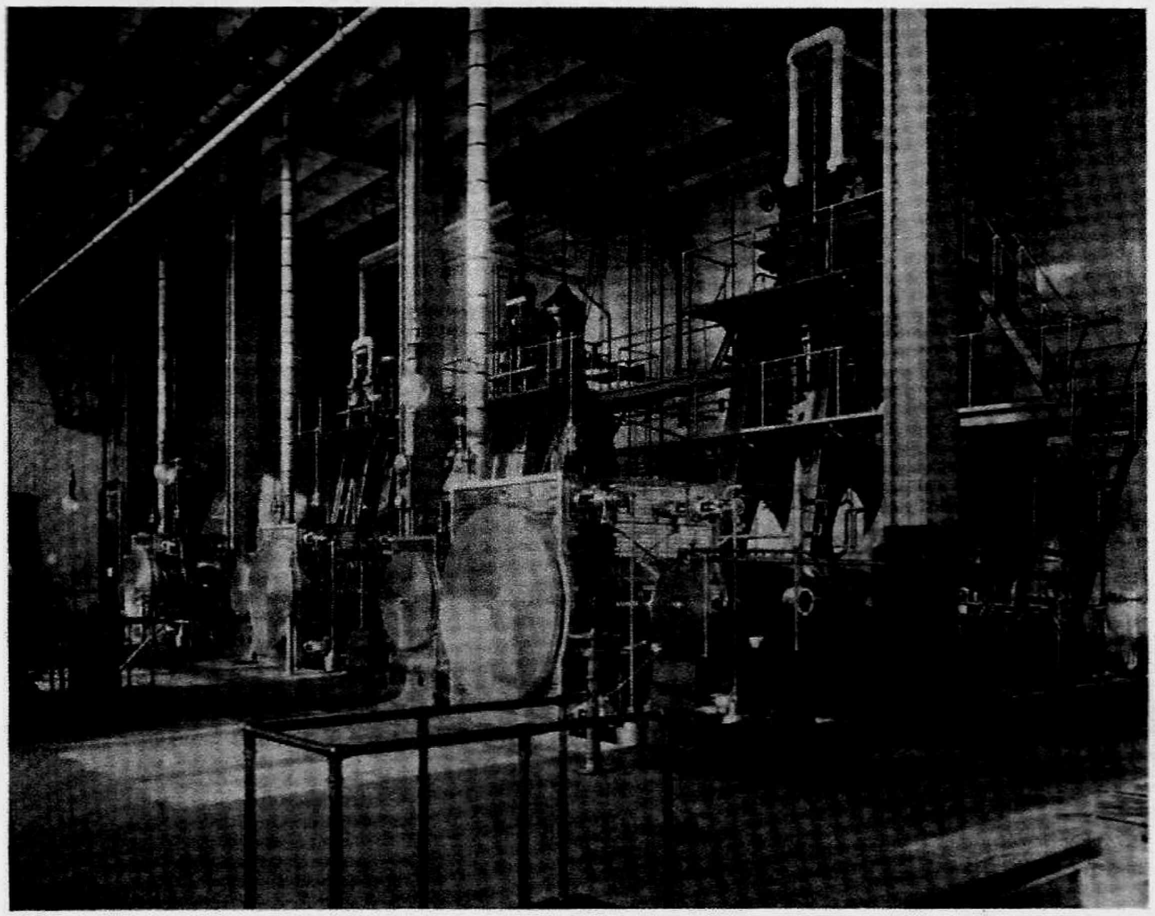


ICE PLANT OF JACOB RUPPERT, NEW YORK—PLAN SHOWING LOCATION OF ICE MACHINES, DYNAMOS, ETC.

between the ice machines and the south wall, where it is calculated for 150 pounds dead load and seventy-five pounds live load, and is supported on 9-inch cast iron columns with 12×12-inch base plates on concrete footings. The second floor and roof are calculated to carry 550 pounds per square foot, including their own weight; the other floors, 350 pounds each. All these floors are built of segmental terra cotta arches, supported on the lower flanges of the I beams and leveled up to their top flanges with cinder concrete. Many of the floors are covered with asphalt, which was laid by the Sicilian Asphalt Co., of New York.

The roof and floors are supported by twenty-two steel Z-bar columns, from twenty-two to thirty feet Z-bars, one 14×¾-inch, two 12×½-inch, and two 6×¾-inch center web plates, six 20×¾-inch side web plates, four 3½×3½×⅝-inch corner angles, and two 25×¾-inch cover plates. In this column the girders are seated on reinforced shelf brackets and connected by web rivets; in another, of which details are also given, the girders are supported wholly by web connection rivets, and the cross-section is much simpler and lighter, being made up of four 6×3½×¾-inch Z-bars, one 14×⅞-inch web plate, and four 20×¾-inch and two 20×{}-inch cover plates.

The 62×47-foot boiler house is separated from the machine house by a heavy brick wall, and its sixteen steel Z-bar columns are arranged to support the coal



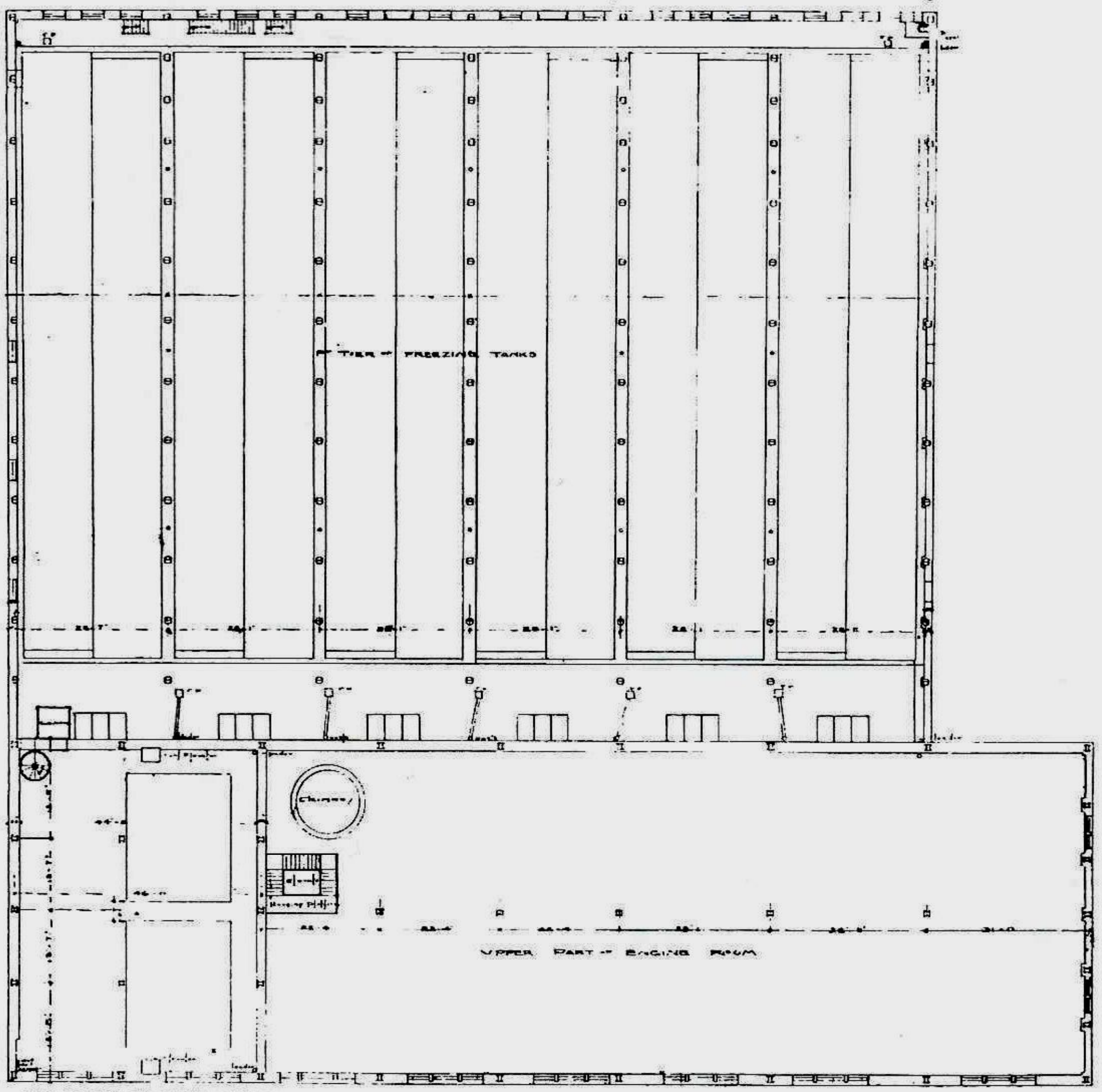
ICE PLANT OF JACOB RUPPERT, NEW YORK—ENGINE ROOM, VIEW FROM THE SOUTHEAST.

apart, in three longitudinal rows, thirty feet ten inches apart centers. The regular columns are connected by transverse girders about thirty feet long, which have single webs of varying thicknesses up to ¾-inch, four 6×6¾-inch chord angles and six 14-inch flange cover plates. The longitudinal steel beams carrying the brick arches are twenty and twenty-four inches deep and fifty-one and one-quarter inches apart in the regular panels of the second floor, but are spaced much farther apart in the upper floors. The columns are made in two-story sections, and are very heavy, the webs being built up of several thicknesses of plates riveted together. In the special heavy column, the principal materials consist of four 6×3½×¾-inch

bin and boilers, which are carried on a system of special beams and girders.

The coal bin is, in plan, a 38×54-foot rectangle, and has vertical sides from fourteen to thirty-eight feet in height. The finished inside surface of the bottom of the bin is an inclined plane about forty-one feet wide and fifty-three feet long, which slopes from the front of the bin, up and back with an inclination of about thirty-three horizontal to twenty-three vertical. At the foot of this slope the surface is made into small hoppers for four cast iron scuppers, and a parallel row of eight more scuppers without hoppers are set flush in the slope above. The bin is supported on sixteen of the columns which carry the two-story battery of boilers below. Four of these columns terminate at a series of transverse plate girders and trusses, on which the bin is built with twenty vertical columns arranged in four longitudinal rows twelve feet eight inches apart. This arrangement gives six interior columns and divides the bin into twelve rectangular horizontal panels, one of which is occupied by the ash bin, which is about twelve feet square inside and has a total depth of about twenty-three feet.

attention. The boiler room, which is 62×47×27½ feet high, contains on the lower floor four boilers built for a working pressure of 150 pounds per square inch, each of 450 horse power capacity, and are equipped with mechanical stokers and with "Reliance" safety water columns of polished brass. The contract for the steam plant was awarded to the Stirling Co., of Chicago, Ill. The Stirling boiler is of a type peculiar to itself, in that all parts under pressure are cylindrical in form and of wrought metal. Thus



ICE PLANT OF JACOB RUPPERT, NEW YORK—PLAN OF TANK ROOM, AND UPPER PART OF ENGINE AND BOILER ROOM.

stay bolts, necessary where flat surfaces are used, are dispensed with, and the cast metal headers, employed in many other forms of boilers, are done away with. The removal of a manhole plate from the end of each of the four drums renders all parts of interior accessible for examination, cleaning, etc., while the removal of scale from the tubes is easily effected by means of a turbine tube cleaner.

The boiler room also contains two boiler feed pumps of the compound type, furnished by the Barr Pumping Engine Co., of Philadelphia, Pa. One of these pumps is of ample size to supply all the water

DETAILS OF MACHINERY INSTALLED.

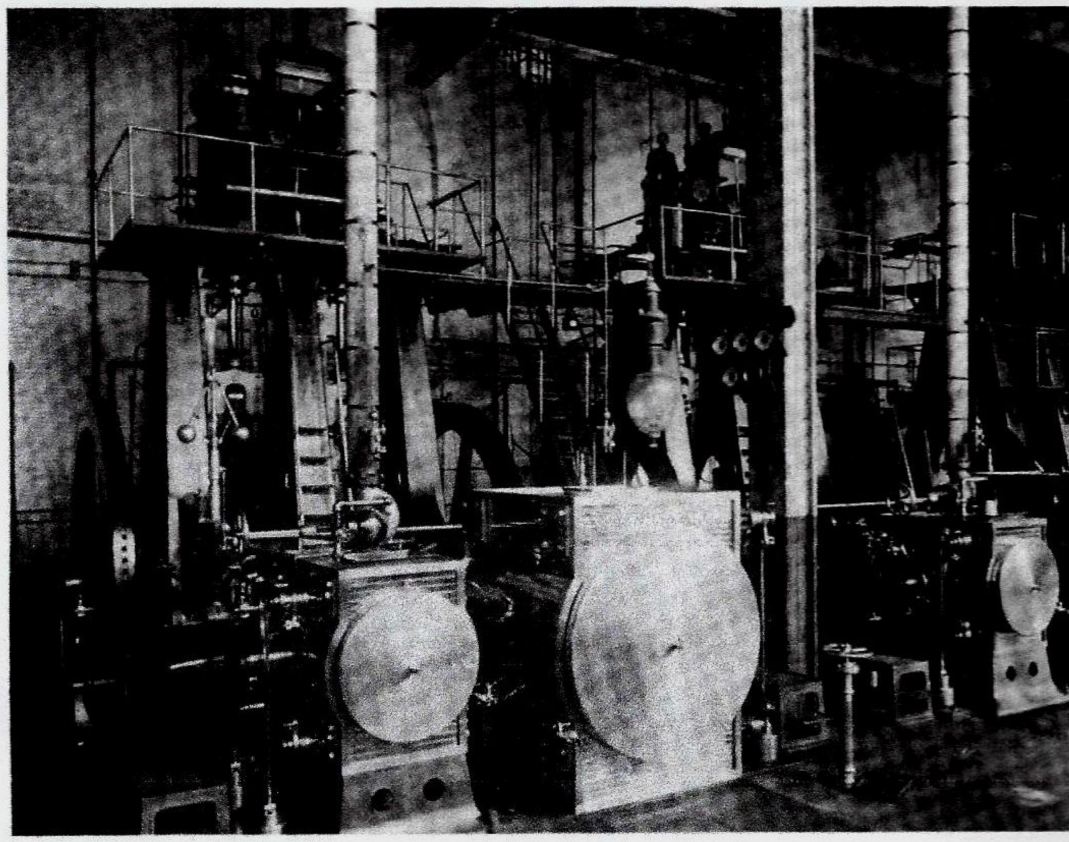
In the selection of the many and various machines and contrivances necessary for his factory, Mr. Ruppert carried out the idea of having nothing but the best, of having in duplicate such parts of the plant as are liable to get out of order, and of having everything of ample size. The breakdown of any essential part of the outfit, necessitating shutting down, would mean a loss not of hundreds, but of thousands of dollars, considering that when fully equipped the plant will turn out 1,000 tons per day.

The steam generating plant received very careful necessary for the present four boilers, and also for the additional four, which may be placed on the second floor of the boiler house. The other pump is held in reserve, ready to start at a moment's notice, should anything happen to the one in use. Above the second floor of the boiler house is the coal bin, located as above described. In front of the boiler house on 132d street, and under the sidewalk, is a coal crusher for the purpose of breaking up any large lumps of coal and delivering it into the bin in as uniform size as possible.

The coal is received either in cars, which may be dumped directly into the crusher, or it may be brought in boat loads to the near-by docks, and from there hauled by teams. From the crusher, which is driven by a 15-horse power electric motor, the coal is taken up by a conveyor, consisting of 180 buckets, elevated and discharged into the coal bins. This conveyor runs across the bottom of the basement of the boiler house, up one wall, across the top of the coal and ash bin, and down the other side wall to the starting point, following the cross-section of the building. From the coal bin the coal is delivered to the stokers through eight chutes.

The ashes are discharged through four vertical chutes into small hoppers suspended from the basement ceiling. Whenever these hoppers are full, gates are opened which allow the ashes to drop on to the horizontal part of the conveyor, by which they are elevated and delivered into the ash bin. From here the ashes may be discharged into cars or trucks through a gate which is controlled from the ground.

In the basement of the boiler house are two duplex pumps of an aggregate capacity of about 2,000,000 gallons per day. They are held as a reserve in case of breakdown of any of the larger pumps, and also for fire protection. There are two doors leading from the boiler room into the engine room. This room is by far the most impressive in the whole building, its dimensions being, as above stated, sixty-two feet wide, 155 feet long and thirty-five feet high. The arrangement of the machines is shown on the ground plan accompanying.

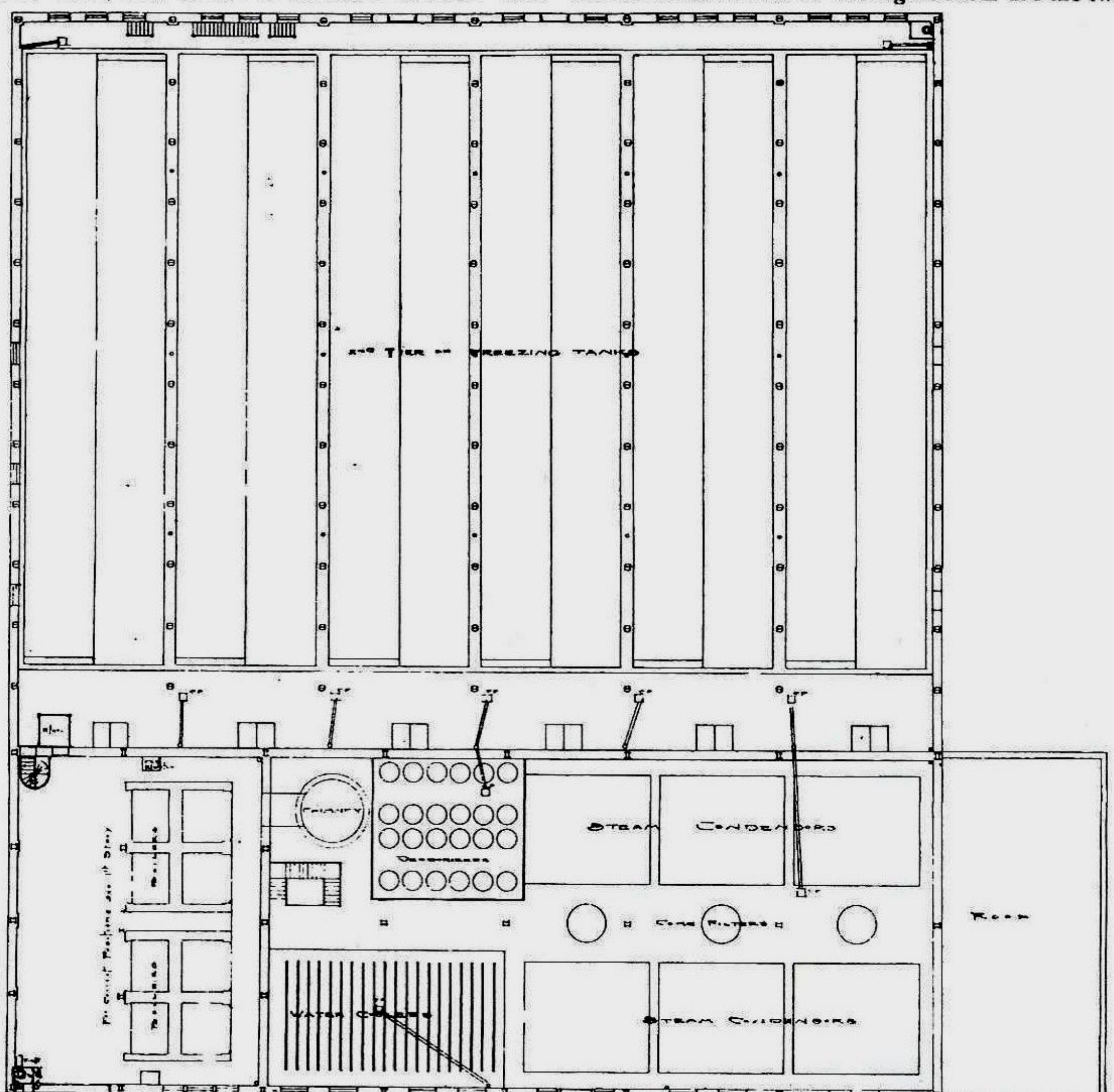


ICE PLANT OF JACOB RUPPERT, NEW YORK—FRONT VIEW OF ICE MACHINES.

There are two 300-ton and one 500-ton refrigerating machines of the De La Vergne double-acting type, with the well known oil injection, all furnished by the De La Vergne Refrigerating Machine Co., of New York. The steam ends are of the cross-compound type, provided with reheaters between high and low pressure cylinders, and situated under the engine room floor. The above company also furnished the general outfit for ice making, ammonia condensers, etc. These machines, while of an enormous size, are so well proportioned that they fully harmonize with the building, and present a beautiful sight with their nickel plated laggings. There is enough space left for two more 500-ton machines, which may be added shortly, as also additional freezing tanks and cold storage rooms.

Next to the wall between the boiler room and engine room is the 3,000,000-gallon pump. This pump, of the crank-and-fly-wheel type, is constructed with three single-acting pumping cylinders, each connected to a Corliss steam cylinder. The middle steam cylinder is the high pressure, the two outside ones the low pressure cylinders. A reheater is placed under the steam cylinders. The water is supplied to this pump through a 16-inch cast iron pipe line running directly to the Harlem river under the tracks of the New York, New Haven & Hartford railroad. It is scarcely necessary to mention that this water is used exclusively over the ammonia condensers and steam condensers, and does not in any way come in contact with the water used directly for ice making. There is, furthermore, a connection between this pump and the six 6-inch wells which are located under the western part of the ice storage room, the water of which is used for ice making, and also a third connection to the hydrant system. This also refers to the two pumps under boiler room. It was necessary to put in these connections in order to be protected against any possibility of being shut off from water supply, which would mean a total shutting down of the factory, with all the enormous losses connected therewith. Every practical ice man knows that there is nothing so important for the proper running of an ice plant as the water supply, and for this reason still an additional safeguard, in shape of a 3,000,000-gallon pump, will be installed in this plant in the near future. All these pumps are of the compound condensing type.

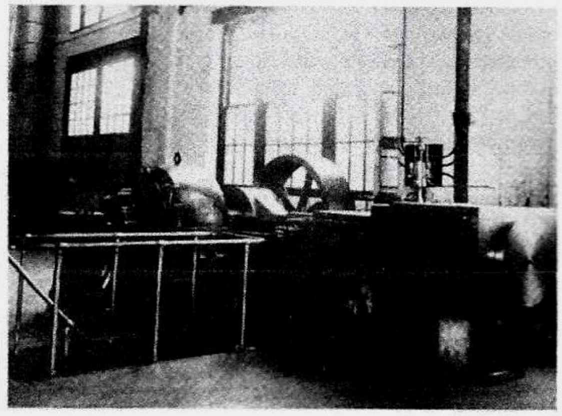
In front of the refrigerating machines and alongside of the south side of the engine room are the two dynamos. The smaller one is a 50-K. W. Bullock generator, connected to a 75-horse power Watertown engine. The larger one is a 100-K. W. Bullock generator, with a 175-horse power Fischer engine.



ICE PLANT OF JACOB RUPPERT, NEW YORK—PLAN OF SECOND FLOOR OF ENGINE HOUSE, SECOND FREEZING TANK.

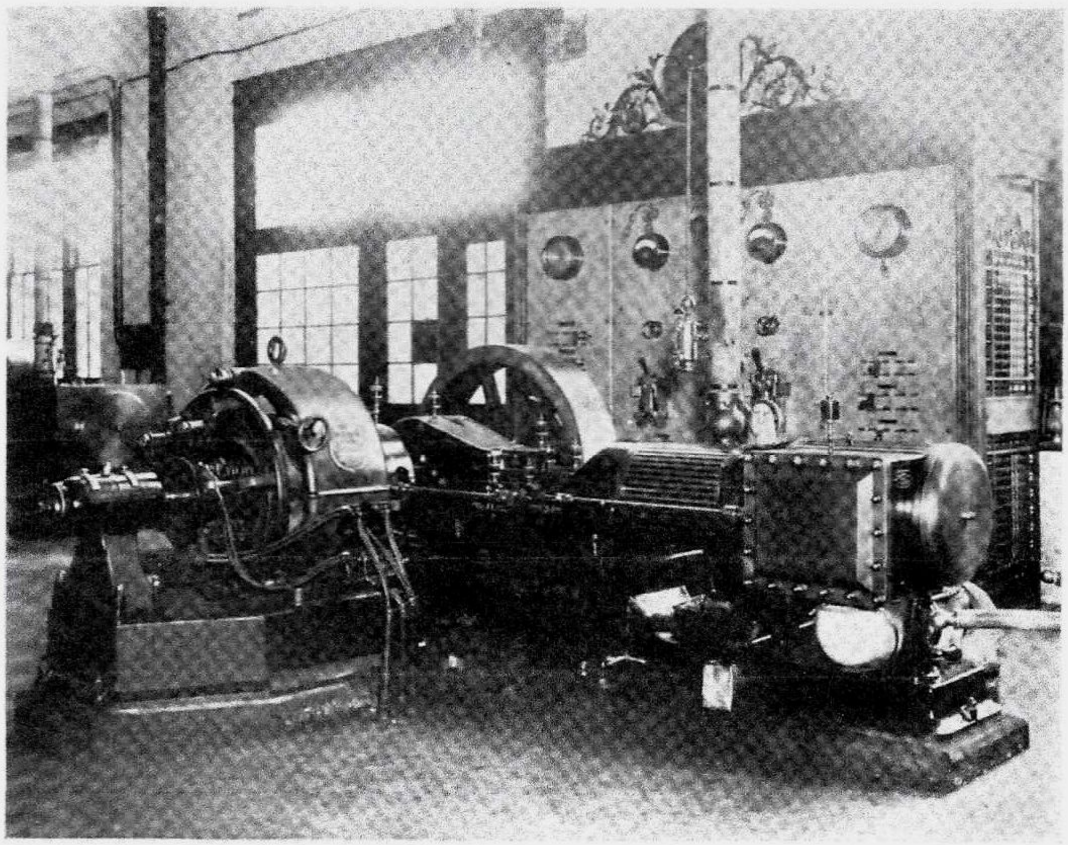
BULLOCK ELECTRIC LIGHT AND POWER GENERATORS.

These generators are compact, highly efficient and of pleasing outline. The field casting consists of the conventional circular yoke, carrying inwardly projecting pole pieces of laminated soft steel. The castings are divided horizontally, the upper half being provided with eyebolt for convenience in dismantling. The poles are of laminated soft steel, the punching being of a form that produces a uniformly distributed field in the air gap. These generators are over-compounded for a rise in potential of 3 per cent from no load to full load, but when required this may be varied from any lower voltage up to the standard voltage of the machine. The armature core is built up from thin sheet steel of special manufacture. This steel possesses a high magnetic permeability, and after the sheets have been carefully annealed, the discs are punched from them and the discs again annealed. The windings, which are let into slots provided in the periphery of the armature core, are made of either copper bars or wire, as best suits the requirements. Each conductor is taped its entire length with closely woven tape, half lapped. The conductors are then grouped according to the number intended for one slot, and the whole taped together. The coil is then dipped into insulating varnish, after which the slot portion is insulated with red rope paper, mica, oiled bond paper, and armored with red fiber or leatheroid. They are then baked in steam heated forms while under pressure, the temperature being about 350° F., which removes all moisture and produces a perfect coil. The commutators are built from drop forged bars of pure lake copper, with selected soft mica insulation. The brush holder consists of a brush holder ring supported upon three trunnions. This ring carries the brush holders, which are electrically connected to heavy copper rings, and these rings are connected to the terminals of the machine.



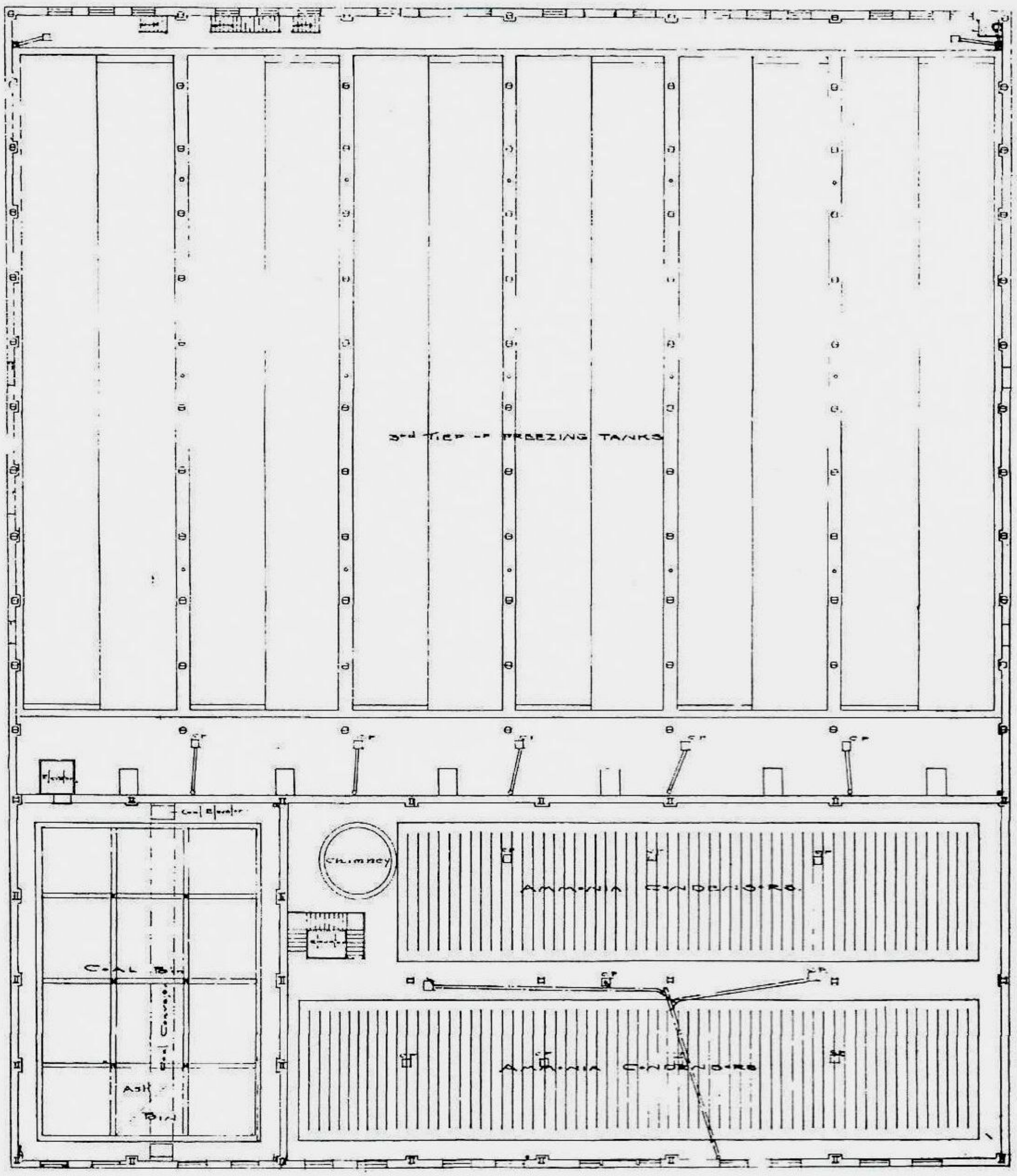
VIEW OF 100-KILOWATT DIRECT-CONNECTED DYNAMO.

Adjustment of all the brushes is accomplished simultaneously by a hand wheel, which may be adjusted to operate either in a horizontal or vertical plane, as best suits the location of the generator. During construction all the machines are subjected to rigid tests and a series of careful inspections, and when completed are run for a period of ten hours under full load. The machines are of superior finish, very durable and not easily defaced. In operation these engine type generators run cool and without sparking, although the variation of load may be the full capacity of the machine.



ICE PLANT OF JACOB RUPPERT, NEW YORK—VIEW OF THE 50-KILOWATT DIRECT-CONNECTED DYNAMO.

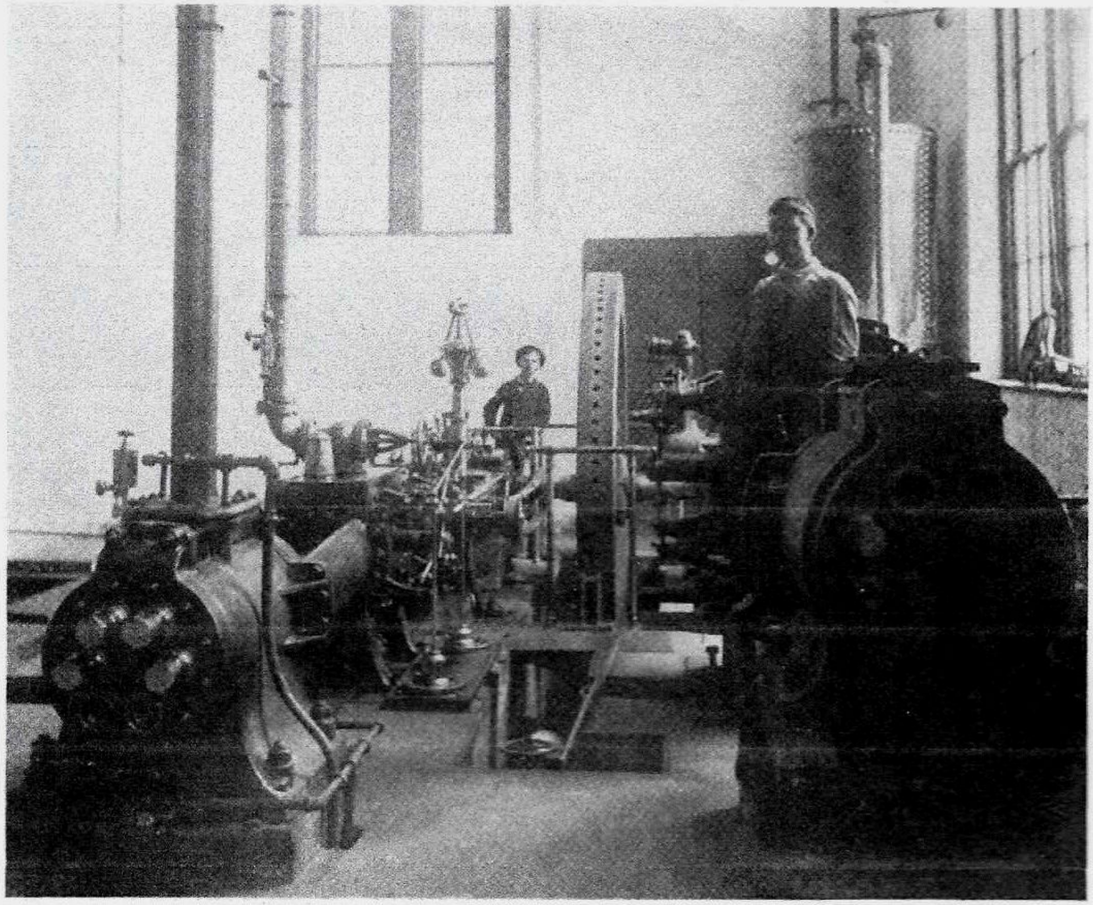
Both dynamos are connected to a mutual switch board arranged in a very tasteful manner. It may be mentioned that the building is provided throughout with electric lights. There are in use 250 incandescent lights and sixty-five arc lights. The dynamos also furnish power for two passenger elevators, each requiring about fifteen horse power, and furthermore, the power for the coal crusher, fifteen horse power, and the conveyor, eighteen horse power. Like the rest of the machines, the engines driving the dynamos are compound condensing. In the southeast corner of the engine room is the air compressor, furnishing the compressed air for the pneumatic hoists, which will be described later on. This machine was furnished by the Rand Drill Co., of New York.



ICE PLANT OF JACOB RUPPERT, NEW YORK—PLAN OF CONDENSER FLOOR AND THIRD TIER FREEZING TANKS.

THE RAND-CORLISS AIR COMPRESSOR.

This form of duplex Rand-Corliss air compressor has a diameter of ten inches for the high pressure steam cylinder, while the low pressure steam cylinder has a diameter of eighteen inches, with a diameter of eleven inches for the low pressure air cylinder, and of eighteen inches diameter for the high-pressure air cylinder, with a stroke of twenty-four inches. The capacity in free air per minute is 600 cubic feet. When running its normal speed of eighty-five revolutions per minute, with 125 pounds steam pressure at the engine, and delivering the above quantity of free air under a pressure of eighty pounds, this compressor will develop 100 indicated horse power. The air cylinders are jacketed for the circulation of water, and The intake air cylinders are fitted with hooded heads connected to a closed conduit for drawing cold air from outside of engine room. The air regulator acts in conjunction with the speed governor. The steam valve

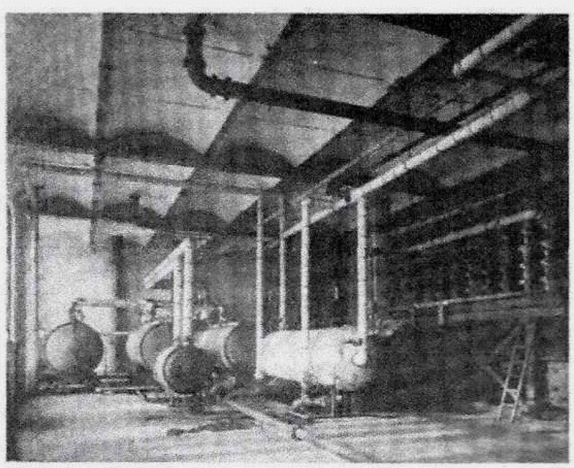


ICE PLANT OF JACOB RUPPERT, NEW YORK—VIEW OF DUPLEX AIR PUMP.

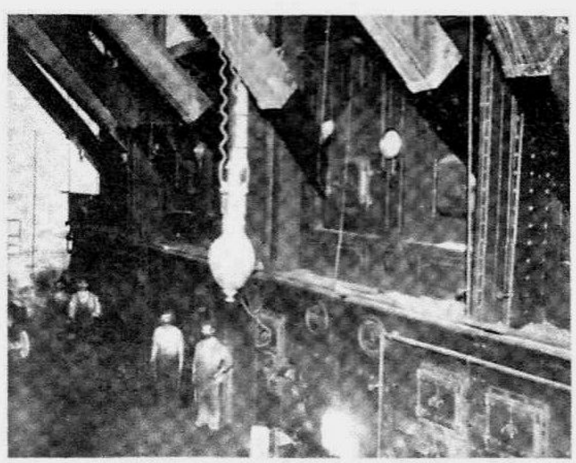
provided with drains for removing foreign substances brought in with the water.

The intercooler, for the compound type, is placed on the two air cylinders, forming an arch, where it is accessible, and ample cooling surface is provided.

gear is of the releasing type, the point of cut-off in both cylinders being regulated by the governor. The dash pots for closing the steam valves are of the vacuum type, with an air check valve in the vacuum chamber. The governor has a sliding weight speed adjustment

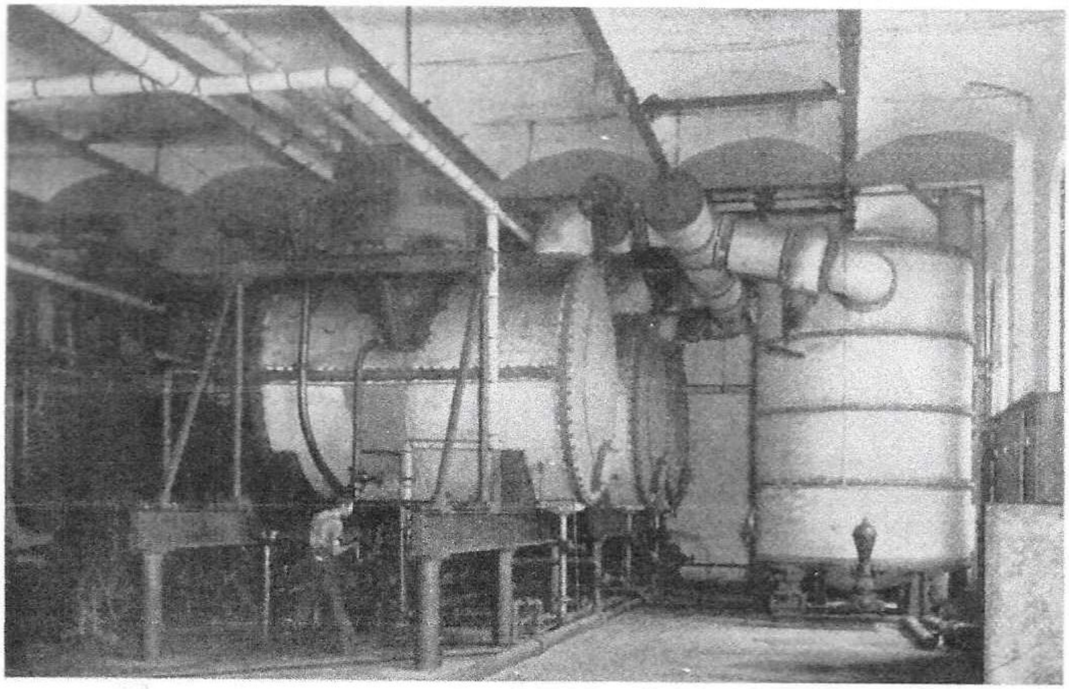


HOPPES PURIFIERS, HEATERS, CONDENSED WATER COOLERS.



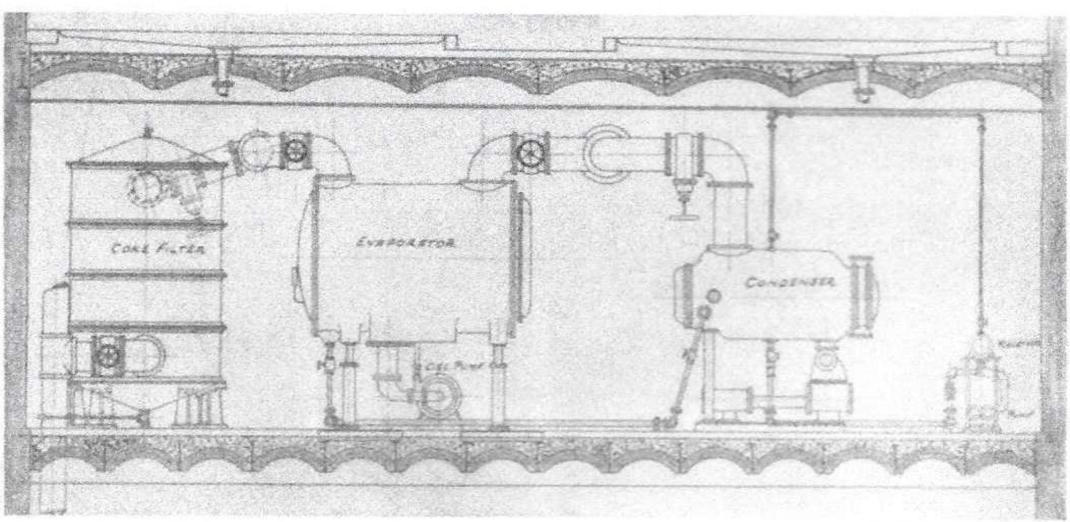
ICE PLANT OF JACOB RUPPERT—FRONT OF STIRLING BOILERS.

and an automatic stop motion which operates in case governor belt breaks. The low pressure steam cylinder is also operated from the high pressure governor, by a mechanism which permits of the adjustment of



ICE PLANT OF JACOB RUPPERT—VIEW OF COKE FILTERS AND "LILLIE" EVAPORATORS.

the receiver pressure, the governor still retaining the automatic control of the cut-off mechanism. The steam and exhaust valves of the low pressure cylinder are operated by independent eccentrics and wrist plates. Exhaust chambers in both cylinders are

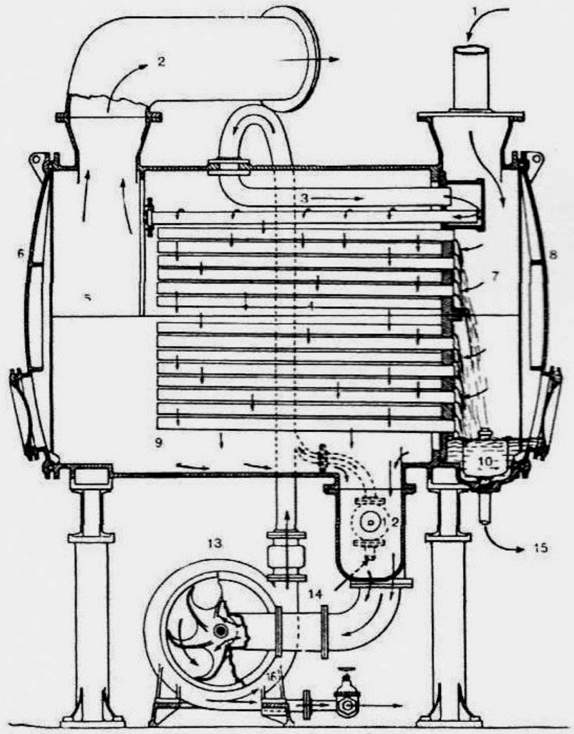


ICE PLANT OF JACOB RUPPERT, NEW YORK—DISTILLING PLANT WITH EVAPORATOR.

separated from the trunk of cylinder and insulated; and the cylinder walls are protected from radiation by a heavy coat of non-conducting material, and are lagged all over with a neat ornamental iron casing. A steam receiver is placed between the high and low pressure steam cylinders.

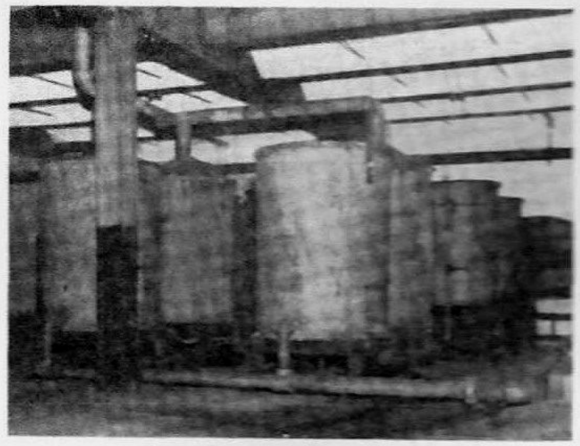
In the basement of the engine room are several small pumps for the purpose of returning the condensed steam of main steam lines to the boilers, etc. Here also are placed the exhaust pipes of all the above engines.

Following the exhaust steam line, we arrive at the second floor, which contains some of the most important as well as most interesting apparatus of this factory. In the first place, conspicuous by their size, are three Hoppes purifiers, 850 horse power each, furnished by the Hoppes Manufacturing Co., of Spring-

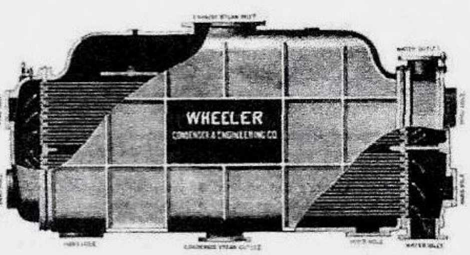


LONGITUDINAL VERTICAL SECTION OF A "LILLIE" EVAPORATOR.

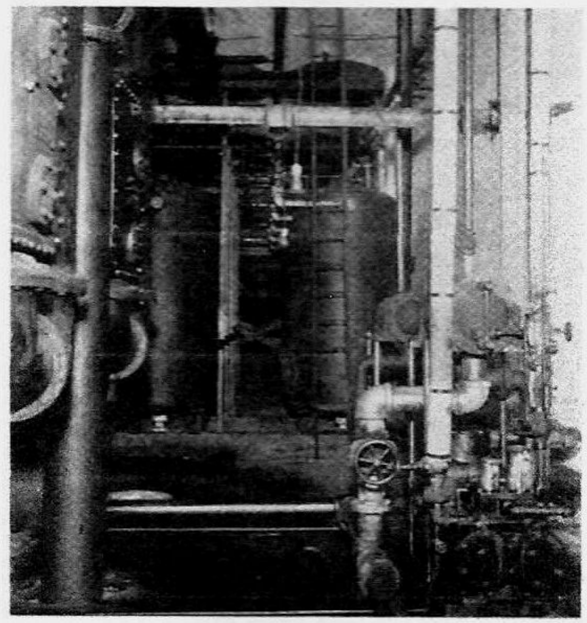
1. Exhaust Steam. 2. Vapor Main to Condenser. 3. Top Vapor Space. 4. Evaporating Tubes. 5. Vapor Space. 6. Front Door. 7. Steam Chamber. 8. Rear Door. 9. Lower Vapor Space. 10. Trap. 12. Float Box. 13. Circulating Pump. 14. Feed. 15. Water of Condensation to Condensers. 16. Discharge.



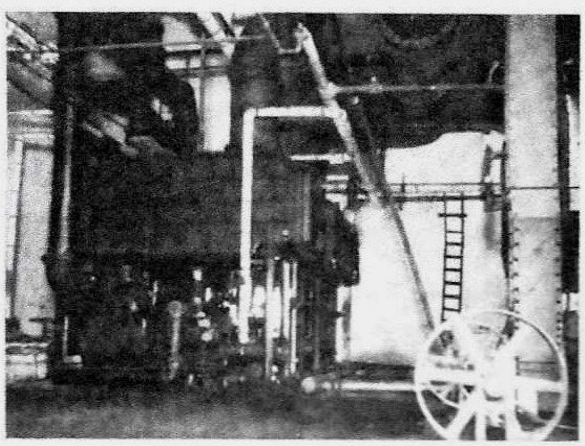
ICE PLANT OF JACOB RUPPERT, NEW YORK.
VIEW OF SKIMMING AND REBOILING TANKS.



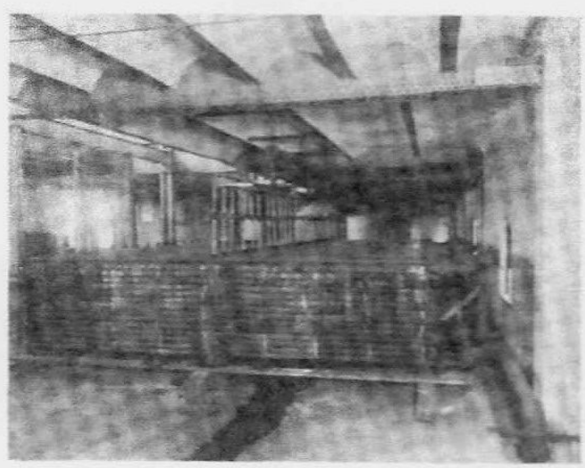
ICE PLANT OF JACOB RUPPERT, NEW YORK.
DETAILS OF STEAM CONDENSING APPARATUS.



ICE PLANT OF JACOB RUPPERT, NEW YORK—VIEW OF DEODORIZERS.



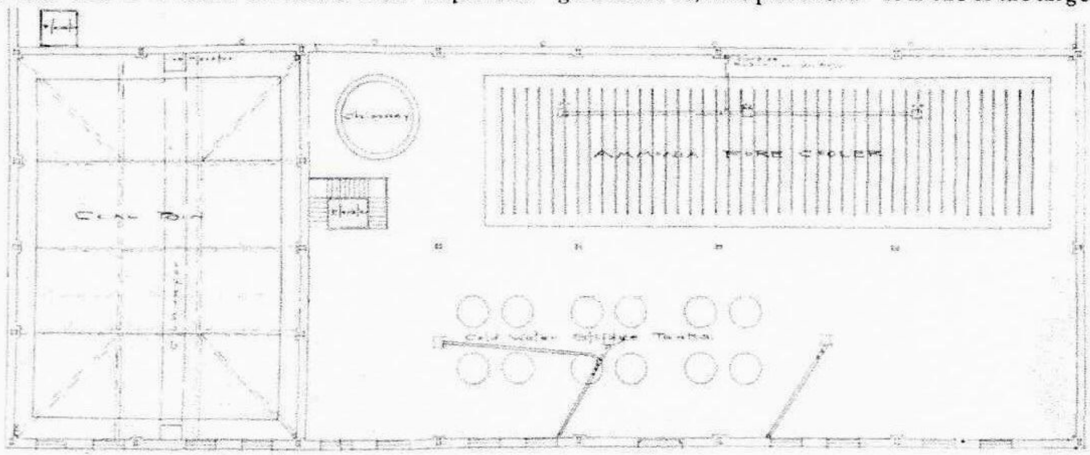
ICE PLANT OF JACOB RUPPERT, NEW YORK.
VIEW OF WHEELER STEAM CONDENSERS.



ICE PLANT OF JACOB RUPPERT, NEW YORK.
VIEW OF AMMONIA AND OIL FORECOOLERS.

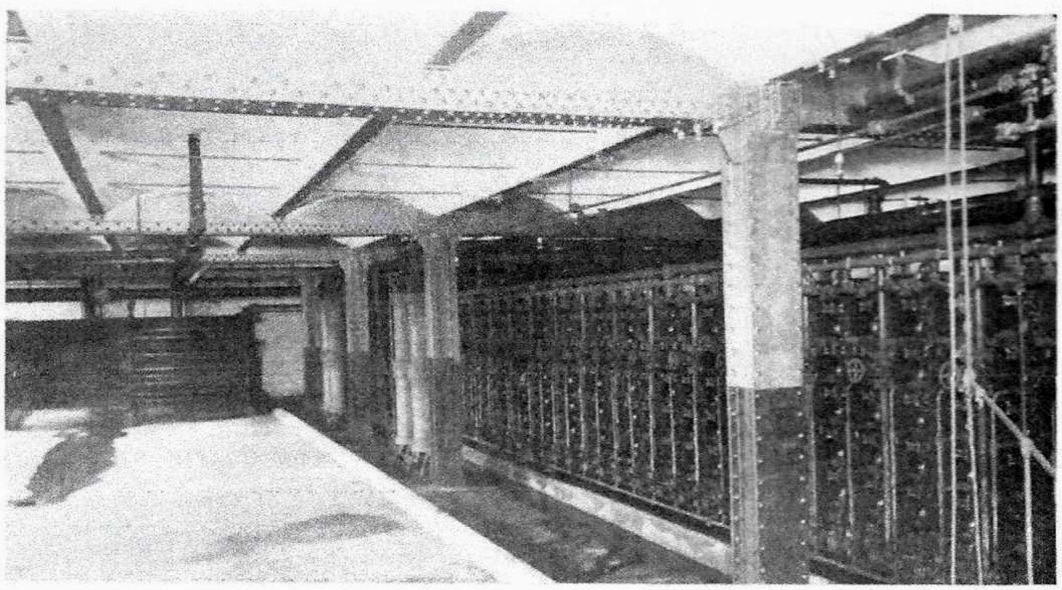
field, Ohio, through which the boiler feed water passes before entering the boilers. There all the mud, scale, etc., is settled, and at regular intervals these purifiers are opened, and the scale and mud removed. It is obvious that it is easier to remove these impurities from an apparatus built especially with this purpose in view, than from the steam boilers proper. These machines are sixty inches in diameter by twenty feet long, inside dimensions, and contain 1,463 square feet of lime catching surface each. The water is highly impregnated with lime and magnesia, which the purifiers remove. A special Hoppes heater of 2,550 horse power is also employed to utilize the exhaust steam from the pumps, making in all a very complete feed water handling apparatus.

These purifiers form practically part of the boilers and are under boiler pressure (150 pounds). They are well insulated, as are all the steam exhaust pipes, wherever necessary. All the steam piping is covered with Keasbey's magnesia sectional covering. The large surfaces, such as the purifiers, heaters and tanks, are covered with magnesia blocks, one and one-half inches thick, and finished with a heavy canvas jacket, sewn on. The entire surface covered aggregates over 10,000 square feet. It is one of the largest works of its kind in New York, and must aid materially in the economical operation of the plant. This covering was furnished and applied by Robert A. Keasbey, of 83 Warren street, New York city.



ICE PLANT OF JACOB RUPPERT, NEW YORK—PLAN OF FOURTH FLOOR OF ENGINE HOUSE.

Now, to return to the exhaust steam, after it passes through three large coke filters, it enters a system of "Lillie" evaporators* of a style as used in sugar refineries. These evaporators are furnished by the Sugar Apparatus Manufacturing Co., of Philadelphia, and their combination with ice making machinery is one of the patents of the De La Vergne Refrigerating Machine Co. By means of these evaporators, the quantity of steam coming from the engines may be doubled and thereby a large saving of live steam effected, in the first place by using com-

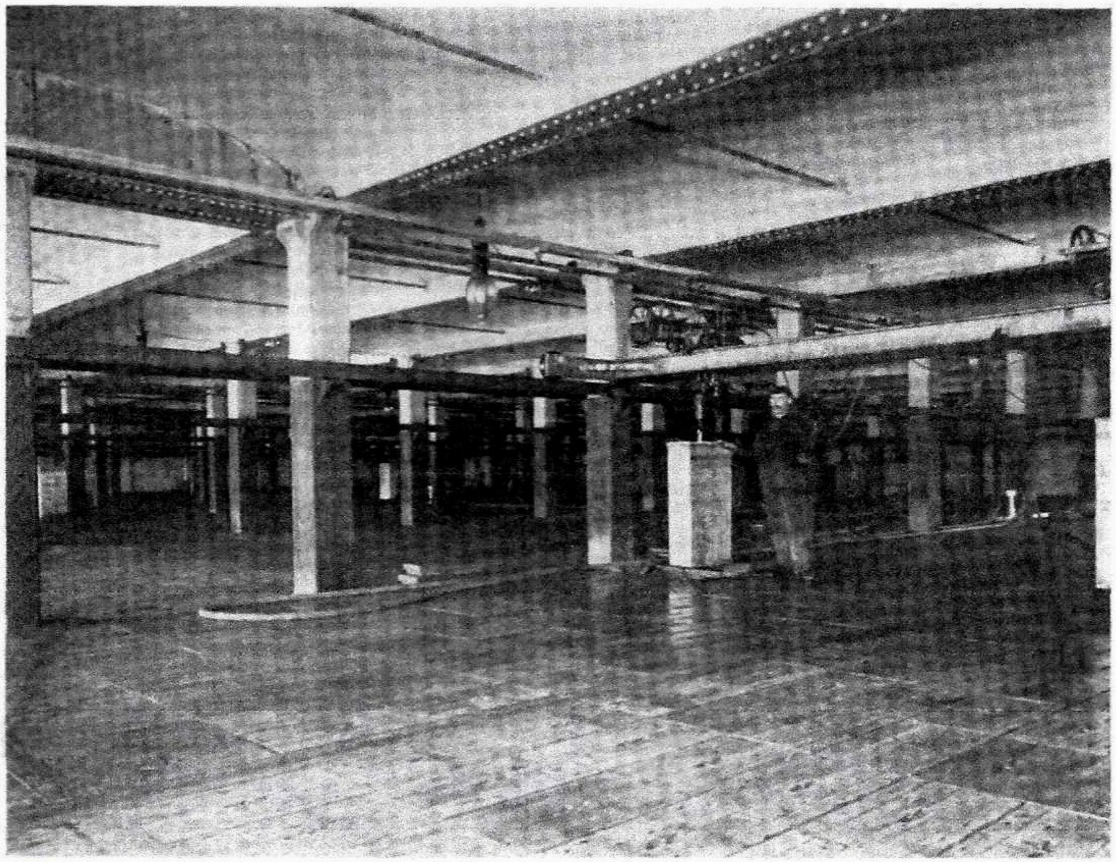


ICE PLANT OF JACOB RUPPERT, NEW YORK—VIEW OF AMMONIA CONDENSERS.

*See description in ICE AND REFRIGERATION for August, 1900, pp. 46–48.

pound condensing steam engines, and in the second place, by avoiding the use of additional live steam, as in other ice plants. The construction, which is shown in sectional cut herewith, is very simple and easily understood. The evaporators each consist of a large horizontal cylindrical shell, with a chamber at one end, into which the exhaust steam enters. This chamber connects to a large number of tubes, into which the steam passes. The tubes themselves are kept covered with a film of fresh water by means of a circulating pump. A small hole, $\frac{1}{32}$ inch in diameter, at the end of each tube, which is otherwise closed, permits a connection with the vacuum which is maintained in the vapor end of the evaporator, but

The vapor, after leaving the evaporators, is condensed in Wheeler steam condensers furnished by the Wheeler Condenser and Engineering Co., of New York. Three condensers were put in, each containing 2,800 square feet of cooling surface, and of special design for ice making, and particularly adapted for this duty. The condensers are rectangular in design, with dome roof, affording a large steam storage capacity. The tubes are of best quality seamless drawn brass, tinned all over, and tube heads are of composition. Each condenser is mounted with two columns over a horizontal air pump having 12-inch diameter steam cylinder, 22-inch air cylinder, 24-inch stroke of piston, brass fitted throughout.



ICE PLANT OF JACOB RUPPERT, NEW YORK—VIEW IN LOWER TANK FLOOR.

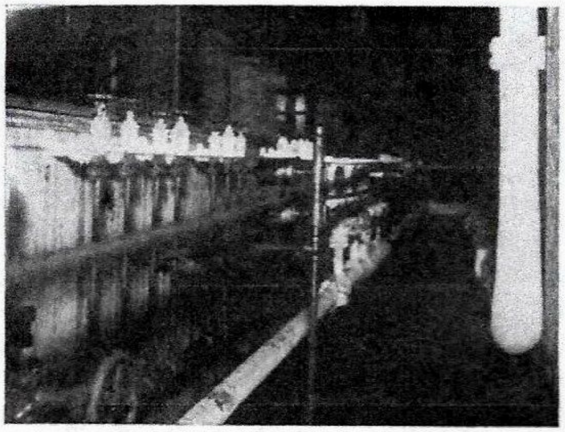
the vacuum thus obtained in the steam end and tubes is not quite so low as that in the vapor end, and the difference in temperature due to the difference of the vacuum in the steam space and vapor end is sufficient to bring about the evaporation of the water which is continually showered over the tubes by means of the circulating pump; consequently the temperature in the water space is lower than that in the steam space, and the steam turns into water, while the water turns into steam. The vapor flows to a steam condenser made by the Wheeler Condenser and Engineering Co., and after condensation is joined to the first condensation to follow the usual course of reboiling, cooling and deodorizing, being delivered into skimmers and reboilers on fourth floor.

Each outfit is of ample capacity to produce 30,000 pounds of distilled water per hour.

The rest of the space of the second floor is taken up by charcoal filters, condensed water coolers, in which the water coming from the water storage tanks on the fourth floor is cooled by means of well water, and also by a large feed water heater, supplied by the Harrisburg Pipe Bending Co., of Harrisburg, Pa. Here also are placed two oil filters, built according to the design of Mr. J. Kerbel, who was the first chief engineer of this plant, and whose experience and ability were also shown in the addition of several improvements in the original outlay of steam lines, etc. The third floor is reserved entirely for ammonia condensers, of which there are sixty-seven in use. They are built in the usual manner, each single coil of twenty-four pipes, provided with inlet and outlet valves. There is enough space left for about sixty additional condensers.

On the fourth floor we find the two skimming tanks, from which the water passes into the reboilers, and from there to the storage tanks, all in the usual manner. The ammonia and oil forecoolers are also erected on this floor. Here also are located the offices of Mr. Ruppert and of the superintendent.

The freezing tank rooms in the northern part of the building, facing 133d street, are accessible from



ICE PLANT OF JACOB RUPPERT, NEW YORK—EXPANSION HEADER OF FREEZING TANK, AND RETURN GAS HEADER.

the different parts of the engine house building, as well as from the boiler house. These rooms are 170 feet wide and 133 feet long. There are three such floors. Two are completed and in full operation; the third is ready to receive the six additional tanks which are necessary to complete the 1,000-tons-per-day outfit.

Each floor contains six tanks of fifty-five tons capacity each. Each tank is provided with two agitators at opposite ends, made under the Friedmann patent, not using any stuffing boxes. The insulation of the tanks consists of two air spaces formed by two layers of tongued and grooved boards with "P. & B." insulating paper between, supplied by the Standard Paint Co., of New York.

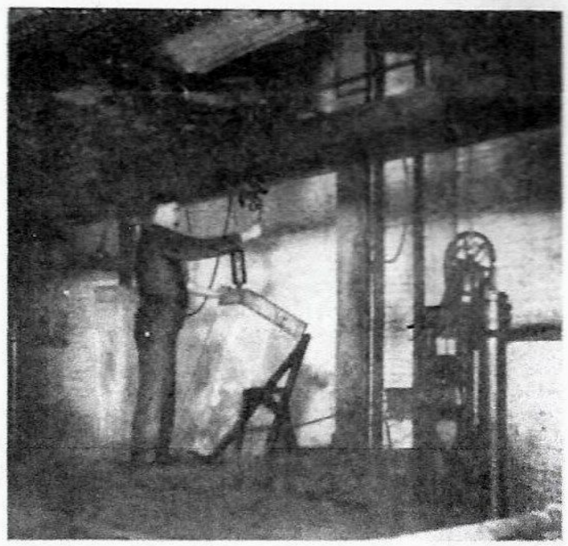
The bottoms of the tanks are insulated with a 1-inch layer of pitch, then tongued and grooved boards with insulating paper between, then 3×3 joists resting on the concrete floor, which is supported by hollow tile arches.

The ice cans are of the standard size, 11×22×44, producing 300-pound blocks. Twenty-four ice can fillers, two to each tank, were put in by Sauls Bros., of Columbus, Ga. Each tank is provided with a hand traveling crane, on which are mounted two horizontal pneumatic air hoists, enabling the ice puller to handle two cans at a time. The horizontal position of the hoists permits the tank rooms to be much lower than would be necessary if using vertical hoists.

Next to the engine room wall are the thawing and dumping apparatus, and the twelve ice lowering machines (furnished by Gifford Bros., of Hudson, N. Y.), one for each tank, which delivers the ice into the ice storage room directly under the freezing tank rooms. This machine is constructed entirely of iron and steel. It consists of a vertical tube, eight inches in diameter, within which a heavily weighted piston, fitting air tight, travels, downward by its own weight, and upward by combined weight of ice and gig. Attached to this piston by wire rope, passing over sheave at top of frame, is the gig cage. This cage is held in position and guided by two upright steel guides, which also serve as the framework of the lowering machine, and the distance traveled is regulated by a stop bar, which is easily adjusted. The ice blocks may be received and delivered at any point.

In taking ice from the floor, the block slides on the cage from the floor run, and at the proper place and time trips a latch which releases the gig. The weight of ice causes an immediate descent, which is rapid until within a short distance of the stopping point, when it "cushions," *i. e.*, the piston compresses the air and the descent is then governed by the volume of air allowed to escape through small vents in the upright tube. A special device tilts the bottom of cage as it reaches the bottom, and the block is carefully and automatically forced upon ice storage floor, without concussion or breakage. Relieved of its load, the cage is again carried to starting point by the weighted piston, and assumes a position for another block. In its ascent a gate, which has held back the block to be next lowered, is raised, and the operation described above is repeated.

While this ice storage room seems very spacious, being of the same dimensions as the rooms above, and



ICE PLANT OF JACOB RUPPERT, NEW YORK—ICE DUMP AND GIFFORD BROS. LOWERING MACHINES.

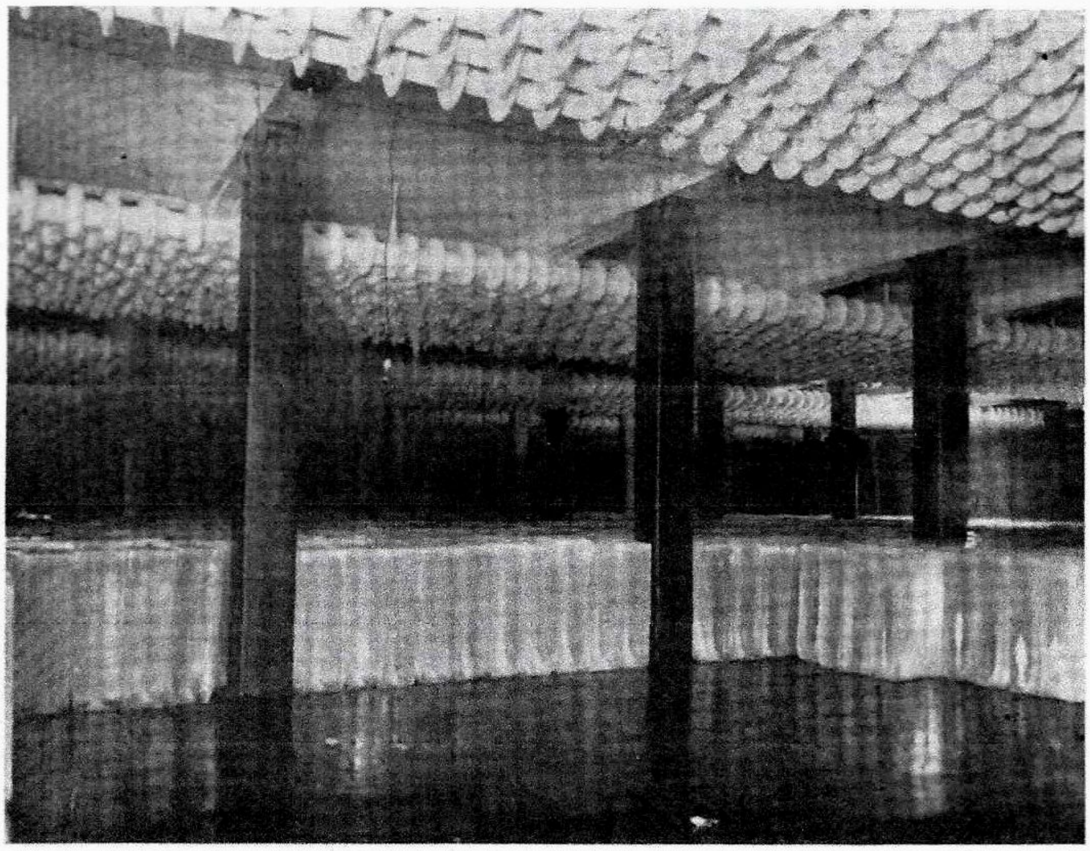
fourteen feet high, still it is none too large, since its capacity of 3,500 tons is only three and one-half days' output when the plant is running at its full capacity. The storage room is provided with six small outlets, and two doors to the loading platform, which extends over the entire length of the storage room and faces one hundred and thirty-third street.

Here again Mr. Ruppert's foresight manifested itself very plainly, since in spite of the enormous length of the platform it is not one foot too large to handle the trade during the early rush hours of hot summer days, where the ice wagons form a line, extending over many of the adjacent streets. The spectacle presented by the distribution of from 1,000 to 1,200 cakes of ice per hour is a sight to gladden the heart of any ice man accustomed to the slow and time honored method of loading of ice from the barges and docks around the city. Here we see the result of modern engineering, art and enterprise, in the transparency, purity and uniformity in weight and size of the hygienic ice, contrasting very plainly with the natural ice, nearly always opaque and very often from sources of doubtful purity.

While this busy scene may be observed on the front platform of the building, at the same time railroad cars are being loaded on the rear platform, adjoining the engine room, to supply the out-of-town customers. By means of a simple device using compressed air and arranged by the superintendent, ice is delivered into the cars at the rate of one ton per minute.

Some idea of the great size of this plant may be gained from the initial charge of ammonia required to start it. For primarily charging the plant 230 cylinders of anhydrous ammonia were required, supplied by the National Ammonia Co., of St. Louis, Mo. To fill the brine tanks required 440 tons of "Retsof" salt. All other supplies were of proportionately stupendous quantity. The plant is well supplied with thermometers throughout, which were furnished by the Hohmann & Maurer Manufacturing Co., of Rochester, N. Y. The steam and ammonia gauges shown in the several illustrations were furnished by Shaffer & Budenberg, of Brooklyn, N. Y. For convenience in making repairs, etc., a pipe cutting and threading machine was put in, which was furnished by the Armstrong Manufacturing Co., of Bridgeport, Conn.

On the now va ant lot adjoining the factory and owned by Mr. Ruppert, a cold storage warehouse may be added to the factory in the near future, the lower story of which may be used as a public market. For this purpose tracks and switches have already been laid, making direct connections with the New York, New Haven & Hartford railroad, and greatly facilitating the receiving and shipping of goods.



ICE PLANT OF JACOB RUPPERT, NEW YORK—VIEW IN ICE STORAGE ROOM.

The business end of the factory is being attended to by Mr. Geo. Kinkel, Jr., who has been identified for the past twelve years with many highly successful enterprises in Montana, and who for the past ten years has been manager of the Manhattan Malting Co., of Manhattan, Mont. The manufacture of the ice of the several factories of Mr. Ruppert is under the supervision of Mr. E. Friedmann, who has made a special study of ice making and refrigerating machines for the last thirteen years, and has had for the last seven years the general supervision of all the plants furnished by one of the largest ice machine concerns in existence.