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MARKET PIPE LINE AND COLD STORES

IN the October, 1900, issue of COLD STORAGE AND ICE TRADE JOURNAL there appeared an article descriptive of the then new plant of the Kings County Refrigerating Company, situated in Hall Street, Brooklyn, New York, within 300 feet of Wallabout Market. Although the original intention was to put a pipe line throughout the market, supplying the produce and meat dealers with refrigeration, it was not until August, 1907, nine years after the completion of the warehouse, that the plan was put into execution and the pipe line laid as per the franchise granted to the company. The pipe line naturally possesses the greatest interest, being one of the most successful in existence to-day, operating with an economy and efficiency second to none. A brief review of the important points of structure and maintenance of the warehouse, however, will not be amiss.

The Warehouse Proper

Known familiarly as the Wallabout Stores, the main building is 100 x 100 feet in ground area, and is seven stories high, with a basement under all. The power house adjoins the warehouse proper, and is 50 x 100 feet, with three stores and basement. The power house is limited strictly to boilers (located in the basement), refrigerating machines, coal pockets, machine tools and pipe shop. Ample room is provided for additional machinery as occasion arises. Both buildings are built of solid brick. The posts and girders in the warehouse are of wood.

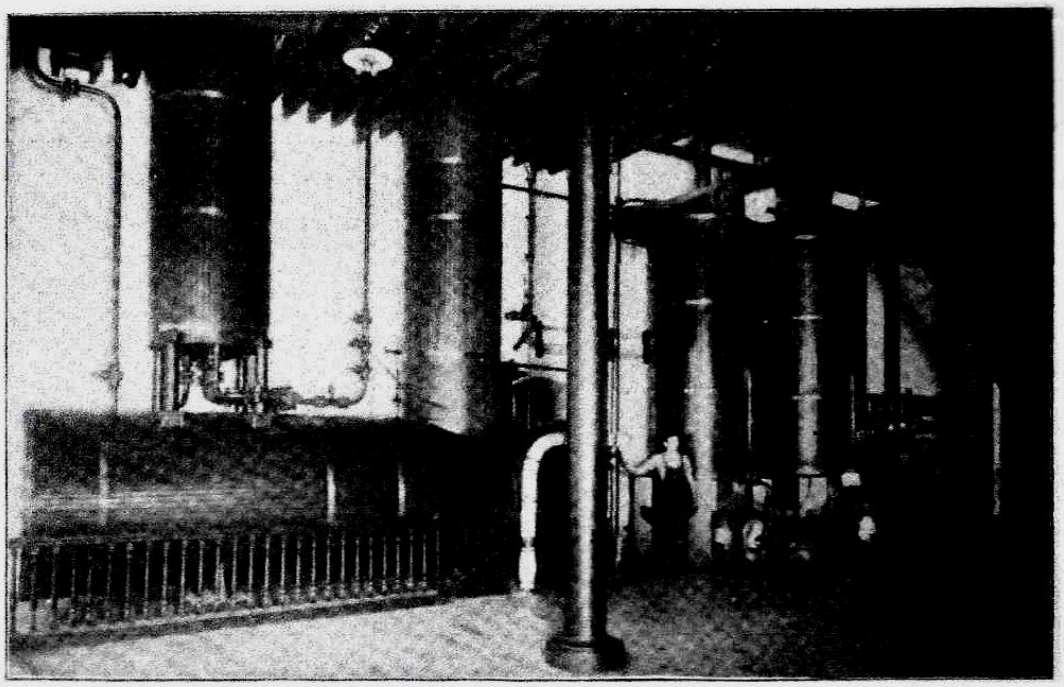
Owing to the great variety of products carried and the different lengths of storage, the arrangement of the rooms and the disposition of the piping were planned to permit of the greatest flexibility. Each floor is divided into rooms ranging from 1,500 to 20,000 cubic feet content and averaging six rooms to the floor. A considerable portion of the warehouse is equipped with overhead meat rails, to facilitate the carrying of meat carcasses.

The principal portion of the house is cooled by circulation of chloride of calcium brine. This brine is pumped through the coolers and then to a standpipe running to the top of the building. This standpipe is large at the bottom and diminishes in size toward the top. From this riser branches on each floor lead to the room coils. The return branches from the coils are brought on each floor to another riser, which empties into a brine tank on the roof. From this tank the suction drops direct to the pump. It will thus be seen that the static load on the pump is balanced, and the only duty performed by the pump is to overcome the friction of the brine. The rooms are heavily piped, so that any room in the house can be operated as a freezer. The coils, however, are sub-divided, so that any amount of the surface can be used and any temperature from below zero to 60 degrees above easily maintained.

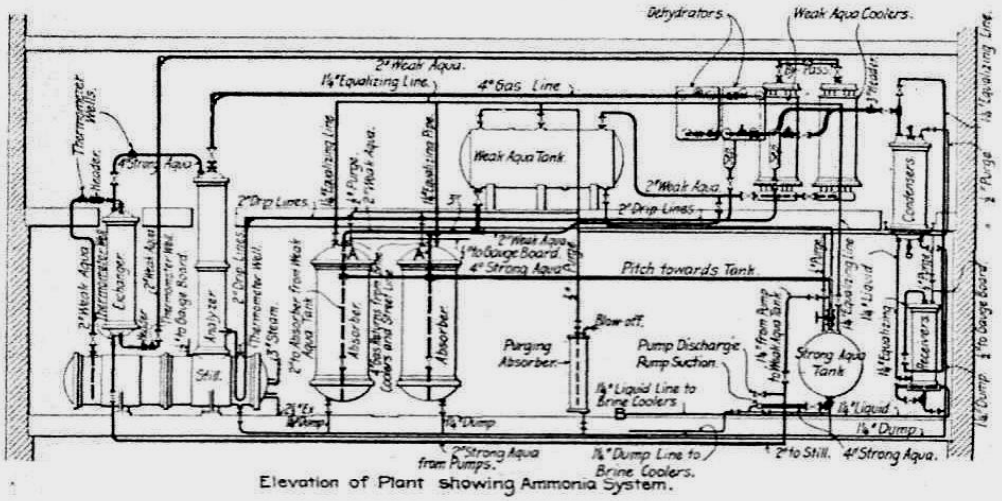
Air Circulating System

In all rooms not specifically devoted to freezing work are placed bulkheads and false ceilings, so that a constant circulation of the air may be maintained. This circulation may be either a natural movement, guided by proper bulkheads and ducts, or it may be forced by means of fans placed in each room, secur-

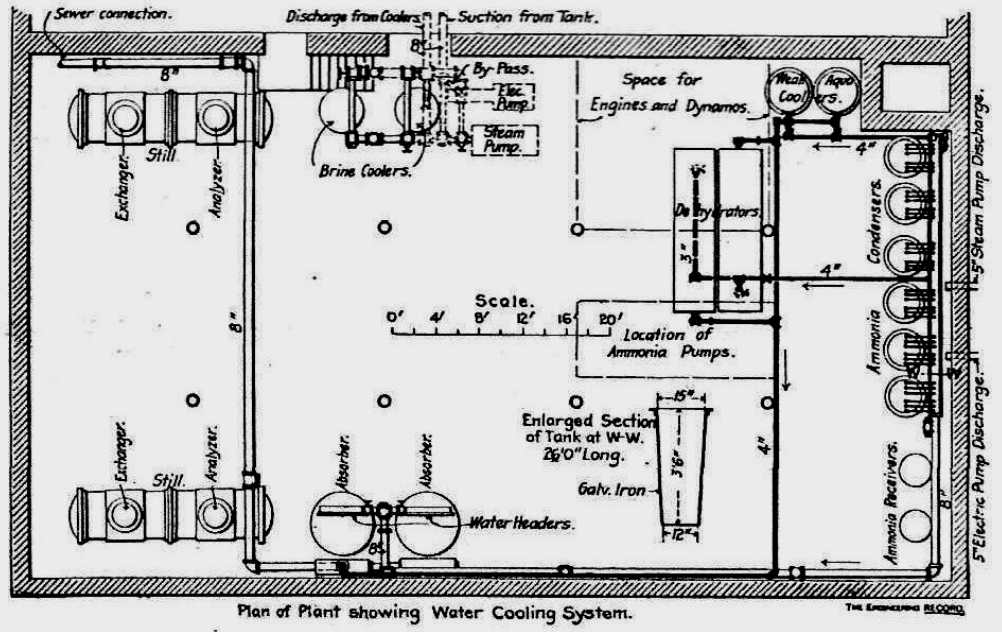
WAREHOUSE AND POWER HOUSE. KINGS COUNTY REFRIGERATING CO., BROOKLYN, N. Y.



ONE OF THE ABSORPTION UNITS. KINGS COUNTY REFRIGERATING CO., BROOKLYN, N. Y.



Elevation of Plant showing Ammonia System.



Plan of Plant showing Water Cooling System.

ELEVATION AND PLAN OF REFRIGERATING PLANT. KINGS COUNTY REFRIGERATING CO., BROOKLYN, N. Y.

ing an even distribution of the flow of air through the stored goods and over the coils.

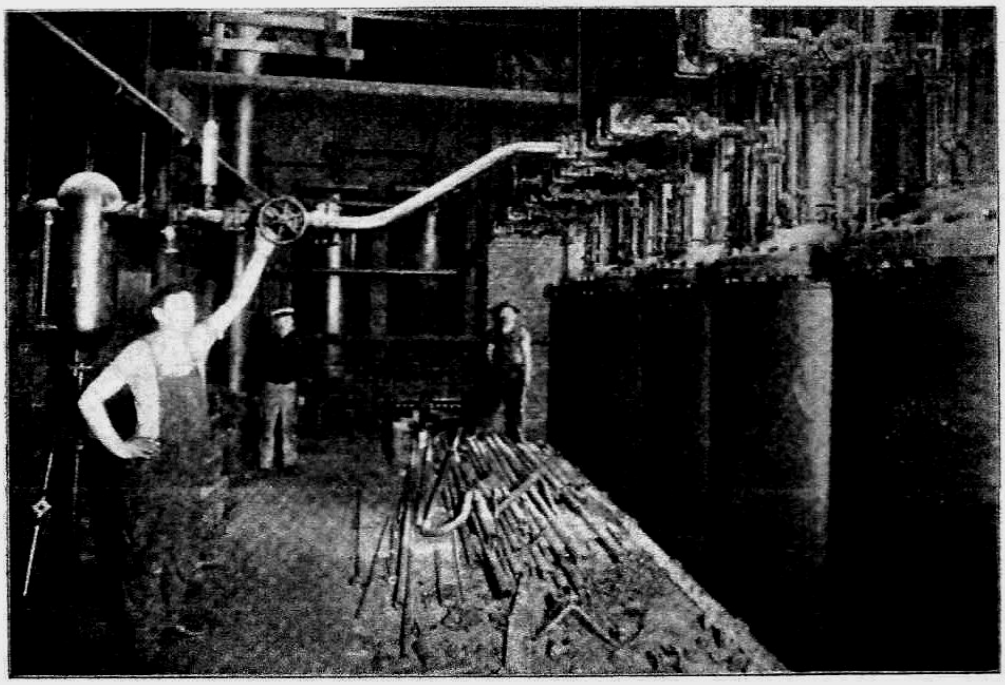
To accomplish the control of the quality of air, a very complete ventilating system has been installed. The system consists of a large suction air pipe running from top to bottom of the building, connected by branches with each room. These branches open into the rooms near the floor. An inlet air main also runs from the top to bottom of the house and connects with each room by branches, which open near the ceiling at the corner opposite the outlet branches. The inlet main takes the air from an insulated room at the top of the house. In this room brine coils are so arranged that fresh air from above the roof will pass back and forth over the coils, and the air is not only cooled, but dried and purified, as the moisture and impurities are frozen on the surface of the coils.

From this room the air flows into the inlet main. On the outer end of the outlet main is placed a suction fan operated by an electric motor. Suitable gates or valves are placed on all the inlet and outlet branch pipes. Thoroughly to change the air in any room, it is necessary merely to open the valves in that room and start the motor. The foul air is pumped out of the room, creating a partial vacuum, which induces a flow of a current of fresh, purified and chilled air from the inlet duct and purifying chamber. Thus the air in any room may be quickly pumped out and replaced by fresh, pure air at the room temperature; and this operation is carried on

without affecting any other room in the warehouse.

The lower end of the inlet pipe is connected with a heater, so, if it is desired, warm air may be introduced into any room. This is a special precaution against a long-continued cold snap in the winter, when it is possible that outside rooms, containing goods that should be kept above freezing, might become too cold from the influence of outside temperatures between rooms are heavily insulated also, so that the temperature of one room will have little influence on the temperature of adjoining rooms. This gives added flexibility to the use of the rooms.

Waterproof floors are very desirable in cold storage houses, and the waterproofing is generally accomplished by calking the floors. In this warehouse the floors are rendered absolutely watertight



CONDENSER SET MIDWAY BETWEEN FIRST AND SECOND FLOORS.

ature, and also so that ventilation can be had in the coldest weather in rooms carried above 32 degrees.

The Insulation

The brick walls of the buildings were first made moisture and air-proof by coating them with a compound and driving it into the pores of the brick by great heat from charcoal upright grates held against the wall. Against the walls was placed the insulation, consisting of a combination of air space and filled space, separated by tongued and grooved spruce boards in double layers, with a strong moisture-proof paper between. The paper was liberally lapped at all joints and angles in a manner that renders the filled spaces and the air spaces practically airtight and moisture-proof.

The thickness of the filled spaces and number of air spaces varies with the exposure. Dry spruce shavings were largely used in the filled spaces. Mineral wool, in combination with air space, was also used in exposed partitions. The floors and partiby covering them with an inch of asphalt, with a skirting carried up on the partitions and posts. With this construction leakage into the insulation of the floors is absolutely prevented, and water can be liberally used in scrubbing out the rooms.

The Power House

The power house of this company immediately adjoins the warehouse. Its basement is 15 feet high, with ample openings back and rear. The present installation of boilers consists of two 6-foot by 18-foot horizontal tubular boilers, with 5-inch tubes, placed in battery. These boilers are of 150 horse-power each. There is room provided in this basement for adding 450 horse-power more when required. The basement also contains a coal pocket, having a capacity of 1,500 tons.

In the basement are situated also the brine and water pumps. For steady use, a triplex water pump and a Quimby "screw" brine pump are operated, both driven by direct connected motors. Along-

side of these pumps are placed duplex direct-acting steam pumps for spares in case of breakdown or stoppage for repairs of the electric pumps. The electrically-driven pumps require only about the coal consumption called for by direct-acting pumps; but, of course, represent a much larger investment. The direct-acting pumps are, however, only used once in a while for a very short time; hence the combination gives the maximum economy of operation with a minimum fixed charge and insurance of uninterrupted service.

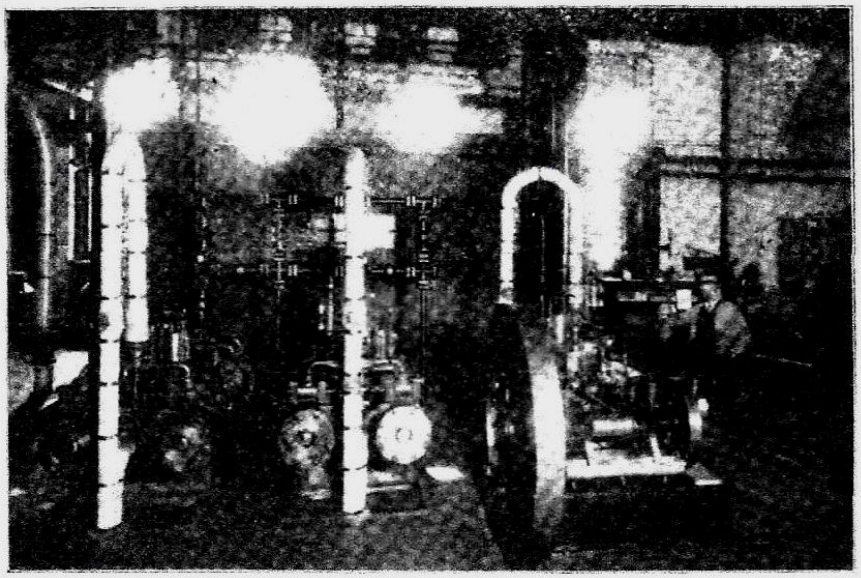
The water supply for condensing purposes is derived from three artesian wells, and is ample in quantity and of good quality, and has a temperature of 56 degrees F.

The Refrigerating Equipment

The refrigerating machines are located on the main floor of the power house. There are two units of the absorption type, one of 125-ton capacity, made by the Isbell-Porter Company, Newark, N. J., and one a 225-ton machine made by Henry Vogt Machine Company, Louisville, Ky. The warehouse uses about 115 tons refrigeration, while the pipe line takes about 100 tons. The layout of the engine room, as shown in the accompanying design, illustrates the ample room provided. The absorbers are of the submerged type, as this sort is best adapted for a fluctuating load. The condensers are located at the rear of the power house, midway between the engine room and the pipe room overhead, and are of the vertical type. The auxiliary apparatus, including brine and water pumps, are electrically driven. The entire plant, including insulation, piping, refrigerating machinery and all apparatus, was installed under the plans and supervision of the Starr Engineering Company.

The Pipe Line

In August, 1907, the time appeared ripe for the laying of the street pipe line, and under General Manager Charles Hackett and Chief Engineer Patrick McDonald the work was started. As originally laid the line was 992 feet in length. Since then some 2,700 feet have been added, and an increasing demand by produce and meat dealers in the market makes it evident that the length must be increased again. The total length at present is about 3,700 feet, with some 45 subscribers on the line.



THE PUMPING SYSTEM FOR PLANT AND PIPE LINE.

The Pipes and Conduit

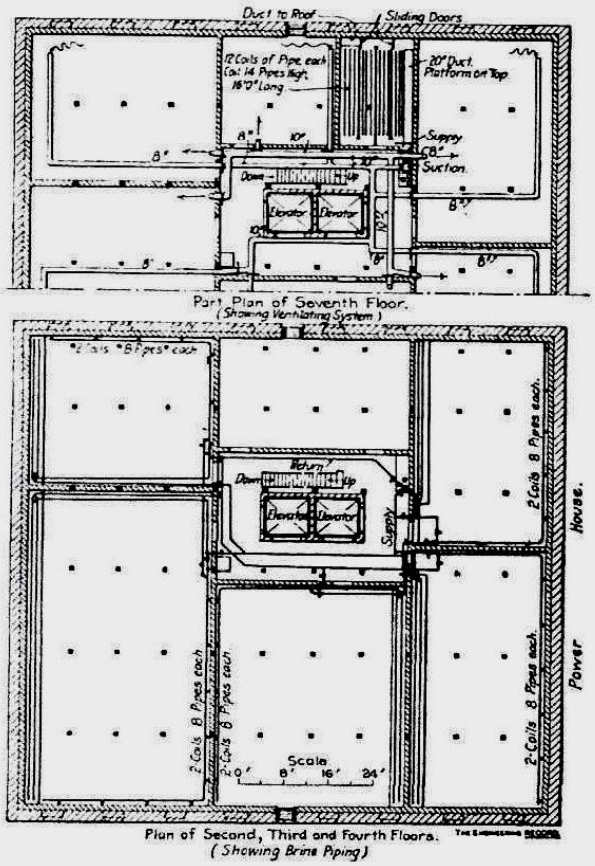
The direct expansion system is used in the line with 130 pounds head pressure. The vapor is returned in a superheated condition at ground temperature. The feed line is 1¼ inches, the main return 4 inches, and the pump-out line 1¼ inches. All the pipes are laid in a 3-inch spruce board conduit covered with "Rubberoid" paint. A concrete bottom is provided and concrete piled around.

Manholes are provided at every 300 feet, with room for one and possibly two men to work. To take up any expansion or contraction in the line from whatever cause, expansion joints of the piston type, together with loops, are provided. The

joints are made by means of companion flanges and metal gaskets. There are two expansion joints and two loops in the line. As the line is inspected daily, leaks or frost on the line are promptly discovered, and up to date, frost has been an unknown factor on the line.

The Pumpout Line

That important adjunct, the pump-out line, consists of a 1¼-inch pipe with a 20-inch vacuum always maintained, which would be ample for pumping out in case of accident. By closing the vapor and liquor valves at their entrance to any customer and opening the pumping valve, the box can be successfully cleaned without halting the operation in any other part of the line. By-passes are provided from the liquor line to the pump-out line and thence into the return.



PLAN OF SECOND, THIRD, FOURTH AND SEVENTH FLOORS, SHOWING BRINE PIPING, KINGS COUNTY REFRIGERATING CO., BROOKLYN, N. Y.

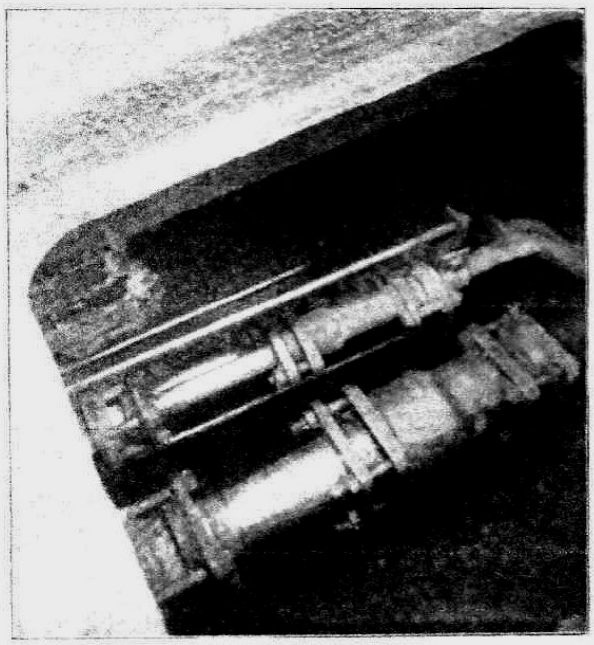
A special feature of the line, and one which provides for any contingency within a subscriber's plant, is the manner in which connections to customers are made. Valves are provided at every street intersection, and, in case of fire on a whole street, that portion is cut off by the street intersection valve. The main line comes up from the ground outside the subscribers' building and goes up outside the wall. A valve box is provided about 6 feet from the base of the side walls, so that in case of fire or accident in any subscriber's building it is not necessary to enter the plant, but the line is closed from the outside. Needle expansion valves are used.

A log is kept of the pipe line and temperatures maintained in the boxes, which vary from 25 degrees F. to 38 degrees F. A complete log is also kept of the operation of the plant, including coal consumption, oil, etc. A sample is produced herewith covering the period of one month:

Total coal used for the month	101¾ tons
Average daily coal used for month, 3 2-5	tons per day
Total refrigeration for month	3,495 tons
Average daily refrigeration	111.5806 tons
City water used for month	1,800 cubic feet
Cylinder oil used for month	9 gallons
Machine oil used for month	14 gallons
Average daily amperes carried	80 amperes

This is with 34 boxes in the street line.

At the present writing the company has started excavations for a new cold storage plant at 20 to 30 Hall Street, which is expected to be completed by September 15. Some $125,000 is to be expended on the new plant.



MAN HOLE, SHOWING JOINTS AND CONNECTIONS.

The personnel of the management of this plant includes: Mr. Ethan Allen Doty, president, formerly president of the Brooklyn Edison Electric Company; Mr. Henry F. Faber, vice-president; Mr. John J. Phelan, secretary and treasurer; Mr. Charles J. Hackett, general manager.