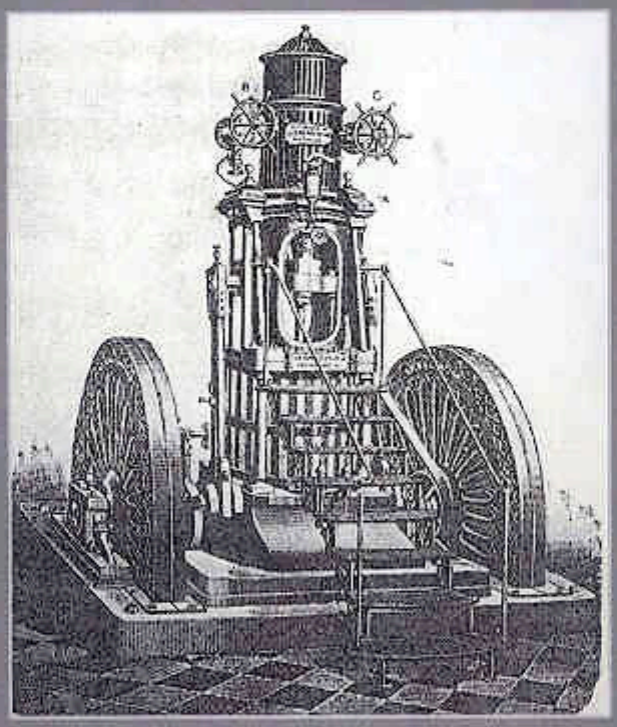
Industrial Refrigeration and Air Conditioning



Part 1.6 A History of Early Firms

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Histories in the following order

York Ice Machinery Corporation

Frick Company

The Carbondale Machine Company

Henry Vogt Machine Company

The Vilter Manufacturing Company

Carrier Engineering Corporation

General Electric Company

Westinghouse Electric and Manufacturing Company

Kelvinator Corporation

What the Refrigerating Machine Companies Have Contributed

It is a common method of review to consider progress in terms of various applications or technical branches of the art. It is perhaps more rational, however, to review progress in terms familiar to the business man. The technical art of refrigeration has been largely in the hands of the companies. Space permits us to print only ten contributions, supplied by as many firms, but the limitation is not intended to imply any less importance to the part played by some 20 other active manufacturers, or indeed to a large number no longer active.—Editor.

ANY survey of the refrigeration industry in this country brings to mind at the outset the names of leading manufacturers of refrigerating machinery —York, Carbondale, Frick, Vogt, Vilter and Carrier (to name those who are probably most familiar in the industrial field), and, similarly, Kelvinator, Frigidaire, General Electric, Servel, Westinghouse and Norge, in the more recent group turning out household and commercial equipment.

Many other firm names are fully as well known as these—manufacturers of insulation, refrigerants, valves, controls, tubing, and what not have been equally indispensable in the growth and progress of the industry. But the word refrigeration no doubt conveys first of all these manufacturers of machinery, whose very names are synonymous with the industry itself. For this reason, the following detailed historical notes of these outstanding firms are of vital importance in the summary of thirty years of progress in refrigeration which this publication presents.

Each company's history corresponds strikingly with the development of the industry as a whole—the small beginning, the gradual technical improvement of the product, the adaptation and enlargement of lines to meet new needs, and the rapid expansion of facilities. Like all American industry, the growth of these refrigerating firms has a vivid and romantic aspect—in the case of the manufacturers of industrial machinery the men who opened small machine shops some fifty years ago could then scarcely have dreamed of the present size and scope of the concerns which still bear their names.

York Ice Machinery Corporation

THIS company was founded in 1874 in York, Pa., under the name of the York Manufacturing Company, with an original shop and office personnel of 14 people and one building 40 x 75 ft. in size. From 1874 to 1889 Jacob Loucks was president, and in the latter year P. H. Glatfelter, a paper manufacturer, purchased the business and served as president until his death in 1907. He was succeeded by his son, W. L. Glatfelter, who had been treasurer of York since 1889, and who held the office of president until 1927, when the original company was merged with nine others to form the York Ice Machinery Corporation. The same family name is still conspicuous in the personnel—P. H. Glatfelter (the son of W. L. Glatfelter) has been vice president of the corporation since 1930.

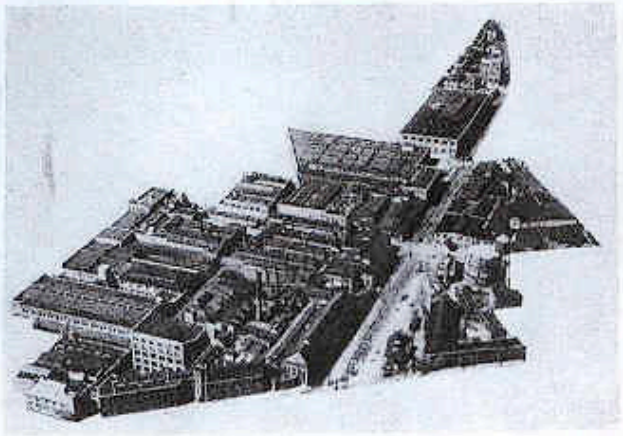
Thomas Shipley came to York as general manager in 1879. In 1901 he became vice president and general manager, held these offices until 1927, when the corporation was formed, with him as president. He was president until his death in 1930.

William S. Shipley was elected vice president and general manager of the Shipley Construction & Supply Company of Brooklyn when it was founded in 1907, and held this position until 1927, when the York Ice Machinery Corporation was formed. The development of York's world wide export division is principally due to his organizing ability. He was vice president of the corporation and general Eastern manager from 1927 to 1930, and has been president since that date.

The products first manufactured by York were water wheels, washing machines, farming machinery, repairs and alterations for flour mills. These products, with the addition of steam engines, were made and sold for the first ten years. In 1884 the plant was enlarged and the company added paper mill machinery to its line. York built and installed its first ice making machine for a client in Louisiana in 1886. In 1891 Stewart St. Clair was engaged to develop the ice making and refrigerating products. The company devoted most of its attention to manufacturing and selling this kind of equipment until Thomas Shipley was employed in 1897 as general manager. One of the first policies established by Mr. Shipley was to eliminate every product except ice making and refrigerating machinery from the York line.

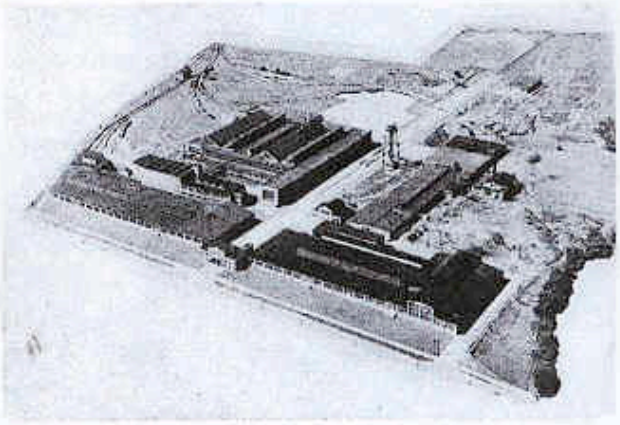
Prior to 1889, when it was purchased by P. H. Glatfelter, the growth and success of the company was negligible. In 1890 the great ice famine occurred and gave the first real impetus to mechanical refrigeration. Orders for ice making machinery and refrigerating machinery increased the volume of business to such an extent that a machine shop, boiler shop and foundry were built in 1895 on the site of the present West York plant. Sales of products, approximately $250,000 in 1895, by 1900 had risen to $1,250,000. In 1906 the sales had risen to $2,500,000, and in 1920 $8,000,000. The peak of sales volume was reached in 1929 with approximately $19,000,000. In 1923 due to the growth of the West York plant, an 80-acre tract of land about one-half mile south was

[Refrigerating Engineering, December 1934, p.295]



AIRPLANE VIEW OF WEST YORK PLANT AT YORK, PA.

FIRST HOME OF YORK ON PENN STREET, YORK, PA. THIS SMALL BUILDING LATER BECAME THE PATTERN SHOP.



AIRPLANE VIEW OF THE GRANTLEY PLANT, YORK ICE MACHINERY CORPORATION, YORK, PA.

purchased. Here extensive shops and buildings were erected to form what is known as the Grantley Plant.

Distribution of York products was begun through the opening of sales offices. From 1897-99 sales offices were opened in New York, Cincinnati, Houston, Pittsburgh, St. Louis and Atlanta. From 1900 to 1904 additional offices were opened in Chicago, Boston, Memphis and San Francisco. Prior to 1907 all orders were sent to York for execution and delivery, but at this time the York Manufacturing Company began organizing construction and supply companies. These companies were independently owned operating units; fourteen of them were organized to cover the United States and Canada. Each of these carried complete stocks of fittings and supplies and each had its own engineering staff and erecting crew.

Post-war developments brought about the former policy of centralized control, and in 1927 the York Ice Machinery Corporation became operative, with the following companies comprising the new merger: York Manufacturing Company, York, Pa., Arctic Ice Machine Company, Canton, Ohio, Bay State Construction & Supply Company, Boston, Mass., Central Construction & Supply Company, Philadelphia, Pa., Greenwood Construction & Supply Company, Pittsburgh, Pa., Southern Construction & Supply Company, Atlanta, Ga., York-Ohio Ice Machine Company, Cleveland, Ohio, York Oil & Chemical Company, York, Pa., York Milk Machinery Company, York, Pa., York Products Corporation, St. Louis, Mo.

A year later the U. S. Freezer Corporation of Brooklyn was purchased in order to complete the line of dairy and ice cream manufacturing equipment.

The widespread application of commercial refrigeration during recent years caused York to organize a commercial division in 1932, with a distributor-dealer organization independently owned which now covers the United States through 80 sales outlets.

The company has grown from 14 employees in 1874, and a shop area of 3,000 square feet with no sales outlets, to the 2500 to 3000 employees on the payroll and a total of 1,396,225 square feet of floor area in its manufacturing plants at York and Canton, Ohio. The factory owned sales and service organization now consists of 71 branches throughout the U. S. and 23 in foreign countries.

Beginning with five 5-ton installations in 1886 and three more machines of the same size in 1890, York progressed to an 8-ton icemaking machine for the Mathieson Alkali Works at Saltville, Pa., in 1895, the latter installation including tanks, evaporating coils, condensers and pressure gages. In the long history of a large company like York of course hundreds of important jobs have been sold—only a few may be mentioned here, because of the limitations of space.

1900—Ruhel Coal & Ice Corporation, New York City, bought their first York refrigerating machines—three units each of 90 tons. Since that date 169 additional machines have been ordered. Total refrigerating capacity, 13,335 tons.

1908—Eastman Kodak Company, Rochester, N. Y., placed its first order two machines. Since then 39 more machines have been sold to Eastman by York, with a total of 8,958 tons of refrigeration.

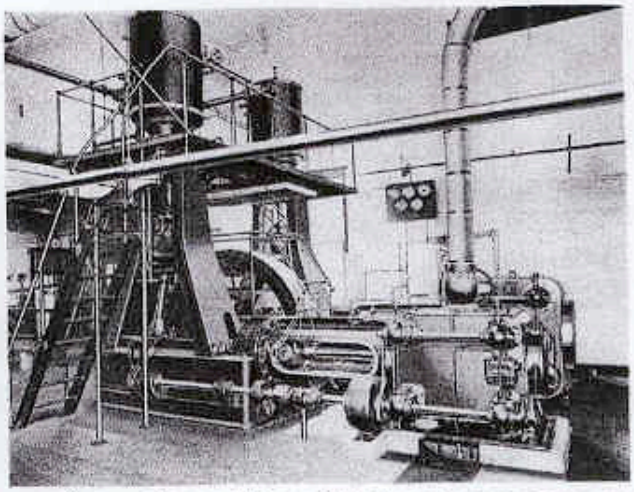
1903-4—Two standard vertical Corliss (22½" x 28½" x 36") machines for the Carnegie Steel

Corporation, Isabelle Furnace, Etna, Pa. This was the first large installation with a steel plant. It was also York's first air conditioning installation, as the equipment was used for taking moisture out of the air before delivering it to the furnaces.

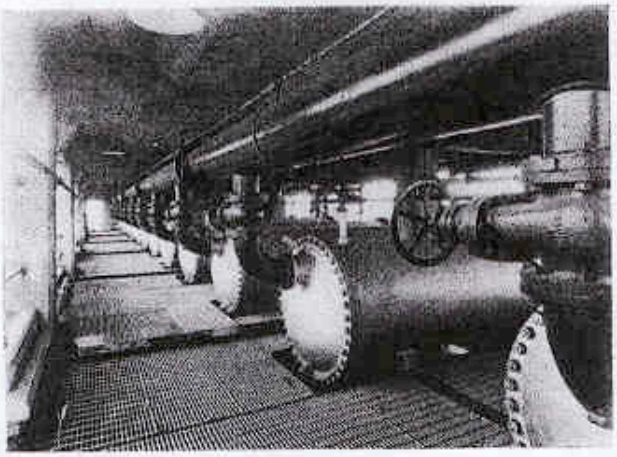
1901—Armour & Company, Chicago, Ill., placed their first order for two machines each of 600 tons capacity. Forty-five additional machines have been delivered to Armour since that time, totalling 9,165 tons of refrigeration.

1912—Since 1912, when the E. I. Du Pont de Nemours & Company ordered two 9" x 12" Refrigerating Machines, 27 York machines have been purchased, having a total of 1663 tons of refrigeration.

1914—The Great Atlantic & Pacific Tea Company, since their initial order in 1914, have ordered 52 York machines, totaling 1,188 tons of refrigeration, for 35 of their warehouses.



YORK 18 IN. x 18 IN. x 31 IN. x 28 IN. VERTICAL SINGLE-ACTING CROSS COMPOUND POPPET VALVE MACHINE, HOME ICE COMPANY, WASHINGTON, D. C.



HORIZONTAL SHELL-AND-TUBE CONDENSERS INSTALLED BY YORK FOR ARMOUR & COMPANY, KANSAS CITY, MO.

In addition to these machines hundreds of retail A & P stores have purchased York refrigeration equipment.

Other important York installations include the B. & O., Gulf Refining Company, Hotel Pennsylvania, Clyde Mallory Lines, Procter & Gamble, General Motors, Goodyear Rubber Company, General Sea Foods, the U. S. Library of Congress, Thos. J. Lipton Company, and F. W. Woolworth, to mention only a few; the complete list reads like a roster of big business, with scores of different types of applications represented.

During the World War 787 York refrigerating machines for direct war purposes, with refrigerating capacity of 9283 tons, were manufactured.

York's first factory test plant was established in 1900; prior to that date little authentic information on actual refrigerating installations was available. Early difficulties of application and installation were solved by field experience. All fitting and bending of pipe was done on the job, often under difficult conditions. As in all new industries, there was a scarcity of skilled labor.

In 1902, at the request of the Ice Machine Builders of the United States, York installed a 40-ton compression plant to operate in conjunction with its test plant to determine the amount of ammonia to produce a ton of refrigeration. Investigations were made and publicity given on deductions of tests made by York engineers on horse power per ton, effects of clearance, varying speeds, jacketing compressor, leaky valves and pistons, heat transmisstion, etc.

In 1921 the York management bought a brewery plant adjoining their West York plant and remodelled the building into a permanent test plant of the research department. Here new equipment is developed and given rigid tests before adoption as standard. Since that time improvements and additions have been frequently made. Although York is constantly adding new equipment to its widely diversified line, the development of the research department has gone ahead even faster. A corps of specialty and development engineers, chemists and metallurgists have been kept working to establish better methods and better equipment.

Thirty years ago the products made by York were limited to a comparatively few applications, principally ice making, cold storage and beer cooling. Today there are more than 100 products of commercial and industrial refrigeration; human comfort and industrial air conditioning; dairy and ice cream plant equipment; ice cans, cold storage doors; oil refinery products; Flakice machines; Dry Ice equipment; lubrication oils; brewery equipment, and a long list of refrigeration accessories and supplies.

Three decades ago the refrigerating machines were very large and heavy. Today, through precision manufacturing methods and advanced engineering design, equivalent equipment in terms of horse power occupies much less space and the weight is correspondingly less. Today York's sales organization is world wide but thirty years ago there

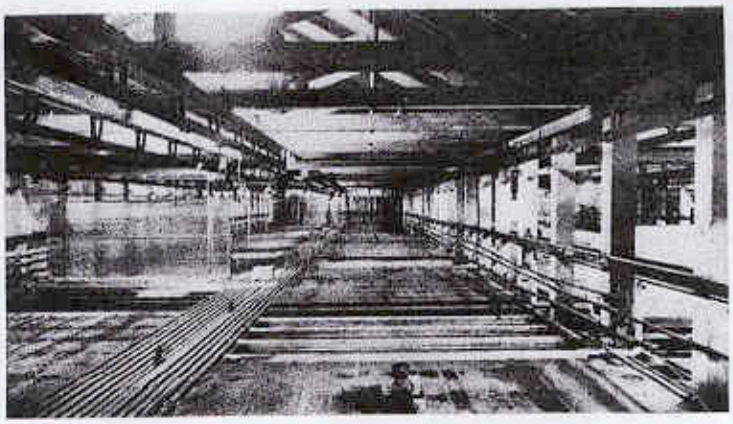
[Refrigerating Engineering, December 1934, p.297]

were only a few sales representatives in the field, nearly all of them having the home office as headquarters.

Frick Company

IT was in the early 50's that George Frick, a young millwright operating near Waynesboro, Pa., began building steam engines. His first engine was made largely by hand and was mounted on wooden sills. By 1856 he was producing engines, in considerable quantities. Twenty years later Frick engines, together with the various kinds of equipment they were used for driving, had gained an international reputation.

When, therefore, an engineer in the nearby city of Baltimore wanted to convert a steam engine into an ammonia compressor, it was natural for him to turn to the Frick Shops in Waynesboro. The work of designing and constructing the ammonia cylinder, piston and valves was completed in 1882.



INTERIOR VIEW OF ONE SECTION OF FREEZING TANK—100-TON SMITH PLATE SYSTEM INSTALLATION BY FRICK FOR CONSUMERS' ICE COMPANY, NEW ORLEANS, LA., IN 1888.

The following year a complete two-cylinder steam driven refrigerating machine was built upon designs drawn largely by A. O. Frick, one of the sons of the founder of the firm. A wood cut made from an early photograph of this first complete Frick ammonia compressor, together with an outline of the details of the machine, was published in REFRIGERATING ENGINEERING in April, 1932. The article in that issue furthermore told how Edgar Penny came to Waynesboro from the Corliss Steam Engine Works and developed the Frick open type steam driven refrigerating machine, which remained in a sense the standard for the industry until after the opening of the World War. The article also described the largest Frick machine ever built, a gigantic tandem-compound steam engine driven compressor with ammonia cylinders measuring 27 in. dia. by 48 in. stroke, which has been in service in the Armour plant in Kansas City since 1896.

The genius of George Frick was the guiding spirit in the development of Frick Company from its establishment in 1853 until the death of the founder in 1892. In 1904, A. O. Frick became president of the company, later serving as chairman of the board. Ezra Frick was made president in 1924.

The first 100-ton ice plant in America, erected by Frick Company in New Orleans in 1888, made raw water ice by the plate system. The first group lift ice plant was installed at St. Louis in 1897. Thirteen cans—every other one in a row of 26—were handled at a time, each can being connected to an I-beam suspended from an electric crane by two chains with hooks.

Three years earlier the East St. Louis Ice and Cold Storage Company had installed a complete Frick 125-ton ice making system, the plant also including 300,000 ft.^{3} of cold storage space. This work represented the largest sum ever invested in an ice-making and refrigerating plant up to that time. Two vertical compressors, each with a 36-in. stroke and driven by a compound condensing engine, were installed. A third engine of the same type supplied power for the auxiliaries through a large jackshaft.

In the 90's many refinements were introduced in the design of the machines. Single-column units, with either one or two cylinders, were now offered, and a compressor with direct connected motor was built early in 1900.

In the period which followed, the distilled water ice making system reached its greatest popularity. By 1910 ice making tanks were being operated on the flooded system of ammonia expansion, and electric drive was beginning to appear. As it became apparent that the day of steam drive was waning, Frick began the arduous development work which finally resulted in the efficient raw water ice making equipment known as the Frick-Pendulum System, which is used in perhaps a sixth of the ice making plants operating today. The early raw water plants used low pressure air and a drop pipe in the center of the can; apparatus was later used for cooling and drying the air. A further step was the placing of the tube in the corner of the can, the air pressure being raised sufficiently to force a passage through the ice as it froze. This developed into the medium pressure air system, which was very generally used up until the season of 1923 and 1924, when the F-P system came into the field.

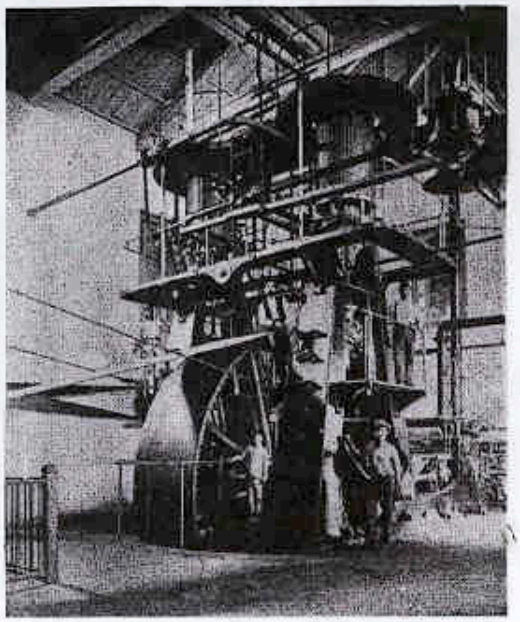
In 1911 Frick added to its line of machines the horizontal double-acting compressor, and shortly thereafter built some very large machines of this design with duplex ammonia cylinders direct-connected to cross-compound Corliss engines, on an H pattern. Twenty years of improvement in this class of equipment produced the modern Type J horizontal compressor of today.

OVERPRODUCTION

In 1888 a secret meeting was held in New York of the leading six manufacturers of refrigerating machinery. The point of the meeting was to show that the sales of the previous years had gone way beyond the normal demand. One outfit had 72 compressors in New York breweries—and there were no more breweries. The way out, so the charts showed, was to consolidate with one large firm in the West and one in the East. The newly passed Sherman Act meant caution.

The idea was received and accepted. But who should be the one, or the two, to absorb the rest? Who was to bell the cat? Months of subsequent argument failed to find an answer, but the next winter the ice crop failed utterly and the building of ice plants started on a generation or more of great activity.

The World War threw great responsibilities upon the Frick organization. No less than 69 men left the company to join the U. S. forces, while the urgent demand for refrigerating equipment by explosives and munition manufacturers, hospitals, camps, steamships, and others, added to the already increasing need for refrigeration. More than 60 large compressors were furnished on rush orders for one manufacturer of high explosives alone. Hundreds of small plants were installed on ships, and several large vessels were fully equipped for refrigerated cargo.



FRICK MACHINE (17 IN. X 36 IN.) IN OPERATION AT LA TROPICAL BREWERY, IN HAVANA, SINCE 1892. ARRANGED FOR DRIVING BY EITHER STEAM ENGINE OR BELT FROM A WATER WHEEL.

Between 1915 and 1920 the new enclosed type compressor developed so rapidly that it has since superseded all other designs in popular favor. Three influences, electric drive, the enclosed machine, and automatic control, have done more to broaden the field of application of refrigerating equipment since that time than all the improvements that were made in the 80 years following the invention of Jacob Perkins' first practical machine (1834).

After the rush of the war period Frick took the opportunity to rebuild and enlarge its works, adding a great new foundry, pattern shop, wood shop, and modern departments for automatic machines, crank shafts, grinding, tool making, etc. At the same time the sales and service organization was broadened both in this country and overseas. Today the firm has branch offices, sales representatives, and distributors located in principal cities throughout the United States and Canada, as well as in foreign countries.

Through the years the Company has contributed to the refrigeration fraternity a great deal of research and educational work, both in developing new equipment and in applying it to the needs of particular industries.

Its present line of equipment includes refrigerating, ice making and air conditioning systems, and machines using either ammonia, carbon dioxide, methyl chloride or Freon in a full range of commercial and industrial sizes.

The Carbondale Machine Company

THE Carbondale Machine Company started operation in 1899 in a comparatively small plant located on Dundaff Street in the city of Carbondale, Pa., but in 1906 moved to a newly constructed plant in Simpson, a suburb of that city. The shops were modern in design at that time and equipped with up-to-date machine tools, providing first class facilities. Since then, the shops have been added to and improved, keeping the plant up-to-date.

The first president of the company was the late A. F. Trautwein, for many years a prominent figure in the industry. He was succeeded by N. H. Hiller, and the president at this time is Henry Torrance. Both of these men did much for the development of the refrigerating machine industry in general, and are, in a large measure, responsible for the important position of Carbondale in the industry today. Both men are members of The American Society of Refrigerating Engineers and have served as presidents of the Society.

Although 1899 is the date of founding of the present company, Carbondale really had its inception when the late E. E. Hendrick purchased the English Pontifex patents and commenced to build absorption refrigerating machines about the year 1882. Many machines were built and installed, but the design remained practically unchanged until 1899, when The Carbondale Machine Company was incorporated and the real development of the absorption refrigerating machine commenced.

Up to this time, practically all the machines were of the high pressure steam type, but shortly after the formation of Carbondale, the exhaust steam type of machine was developed. This type of machine using steam in the generator coils, at a pressure as low as one pound, or even less, made it possible to utilize exhaust steam for the production of refrigeration that otherwise would be wasted.

The absorption machine lent itself very easily to the production of distilled water ice and, following this, ice plants using the evaporator system were developed. These plants were economical in operation and produced ice of high quality. A great deal of money and effort was spent by Carbondale perfecting this type of machine, and for many years a test plant was maintained where new designs were thoroughly tested and perfected under actual running conditions, practically every part of the machine being improved in some way or other.

Up to the year 1919, The Carbondale Machine Company had installed comparatively few machines of the compression type, but with the development of the large central electric stations and raw water ice, Carbondale decided to enter the compression field actively. It was especially interested in the development of the two-stage compression machine, the high speed machine, making possible the use of direct-connected synchronous motors, internal combustion engines and the more economical types of steam engines, operating at relatively high rotative speeds. Types and designs of machines were constantly improved to keep pace with the progress of the industry.

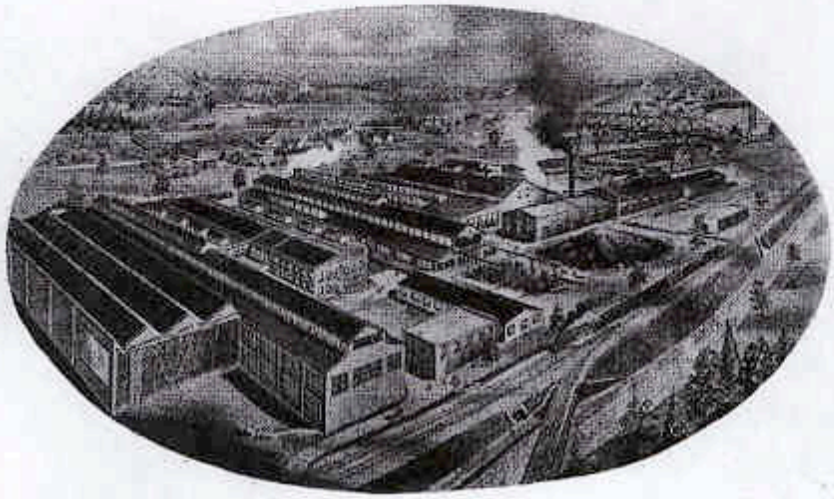
The heat exchange apparatus in the beginning was largely of the shell and coil type. Among the first machines to use straight tube apparatus were the Carbondale absorbers, generators, coolers and other heat exchange apparatus. The vertical shell and tube ammonia condenser came into use and its many advantages made an unusual appeal to the trade, and the many improvements made by

[Refrigerating Engineering, December 1934, p.299]

Carbondale are still outstanding features of this type of condenser.

For many years, the Carbondale shell and coil type of cooler was recognized as almost standard in the industry, but later on straight tubes were developed and here, again, Carbondale was active in the development of the horizontal multipass brine cooler, which found much favor at that time, especially in the larger installations.

One of the early uses of refrigeration was in the refining of petroleum. Carbondale machines were probably the first used for this purpose, and subsequently were widely accepted in the



PRESENT PLANT OF THE CARBONDALE MACHINE COMPANY, CARBONDALE, PA.

ORIGINAL SHOP OF THE CARBONDALE MACHINE COMPANY, PHOTOGRAPH TAKEN ABOUT 1899.

industry. The particular requirements of the oil industry necessitated its own design of exchange equipment. The apparatus for the application of refrigeration to the oil refining processes was distinctly a Carbondale development and the original ideas embodied in the first Carbondale chilling machines are widely used in connection with the most modern methods of oil processing today.

One phase of the industry in which Carbondale took a leading part was the development of the carbonic acid refrigeration machines, and also complete plants for the production of liquid CO_2, the company having made some of the largest installations of both refrigerating and CO_2 production plants now in use.

Air conditioning, considered by many the next great industrial development, is not a recent idea with the Carbondale Machine Company. More than 30 years ago, Carbondale machines were installed in the Hanover Bank and the New York Stock Exchange, New York, for this very purpose. At an even earlier date, Carbondale machines were used to condition the air in the dipping rooms of chocolate factories. Many of the present ideas in air conditioning are little more than refinements of apparatus or equipment installed in some of these early plants. For example, the unit cooler of today is simply a refinement of the coil bunker used in the larger plants thirty years ago.

The difficulties encountered in early installations of refrigerating machinery of the absorption type were probably less numerous than those encountered with compression type equipment. In the absorption system, the only moving part in the refrigerating cycle is the ammonia pump for transferring the strong ammonia liquor from the absorber to the generator, whereas with the compression system, the whole plant depended upon moving parts.

The developments in the metal industries were reflected in the design of refrigerating apparatus. The earlier pressure vessels were almost universally made of cast iron, but many years ago they were replaced with vessels of steel construction. Of course, many of the theories advanced in favor of the use of cast iron in preference to steel have since been discarded. The use of alloy steels has made breakage of crankshafts, connecting rods, and valves almost unknown in the compressors of today and is doubtless responsible, in great measure, for the success of the high speed machine.

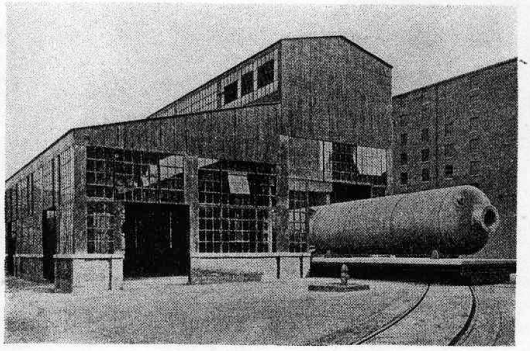
In recent years the absorption system seems to have been eclipsed by the compression system, but this has been largely due to the development of the smaller compression machines. However, the absorption machine is still an up-to-date machine, as evidenced by the fact that some of the most successful household machines now in use are of the absorption type. Some of the most modern installations embody the combination of absorption and compression machines, where the use of exhaust steam from the engines driving the compressors can be most economically utilized in the operation of the absorption units in this type of combination plant.

For a number of years the Carbondale Machine Company was rather closely affiliated with the Worthington Pump & Machinery. Recently they merged their interests in the refrigerating line and the operations of the company were transferred to Harrison, N. J., under the name of the Carbondale Machine Corporation, where even better manufacturing facilities are available.

[Refrigerating Engineering, December 1934, p.300]

Henry Vogt Machine Company

WHEN the Henry Vogt Machine Company of Louisville, Kentucky, celebrated the fiftieth anniversary of its founding in 1930, the man responsible for the growth of this concern made a brief statement in a publication sketching the history of the company. In this he mentioned "the cooperation of those who have appreciated the value of Vogt products sufficiently to remain our customers year after year." Henry Vogt has a gratifyingly long list of these "year-after-year" patrons, and he remains in charge of the company he started 54 years ago. He is a charter member of the A.S.R.E., and an outstanding individual in the refrigeration industry.



VOGT HAS BEEN A LEADER IN WELDED PRESSURE VESSELS

The initial effort of the company was devoted to a general machine shop business and to the manufacture of elevators. In 1885 a foundry and boiler shop were added and in the same year the Vogt absorption machine was developed and marketed.

As the personnel grew and newer equipment was added from time to time, increasing demands were made on the plant capacity for a larger output as well as for more diversified products.

Inquiries for tubular boiler capacities were received that were considered in excess of good practice and it was decided in 1898 to add a special department for the construction of the Vogt water tube boiler. Today the combination of trained workmen, modern equipment, engineering knowledge, and supervision is exceeded by no other manufacturer in the country for building this type of boiler.

Prior to 1885 the company had been accepting orders and general repair work for ice plants in the immediate vicinity of Louisville. After careful thought, it was determined definitely to enter into the design and manufacture of the Vogt absorption refrigerating machine. The first plants turned out were devoted wholly to the manufacture of ice. In spite of doleful prophecy of the pessimistic ones who considered artificial ice as something against nature, the new plants were a success from the start.

From this modest start has grown the present Refrigeration Department, thoroughly organized with a competent engineering staff and manufacturing facilities.

Specializing in the application of refrigeration to manufacturing processes in many industries, it was natural that Vogt should be among the first to supply refrigerating machinery to the oil refiners, where it was used in the manufacture of lubricating oils.

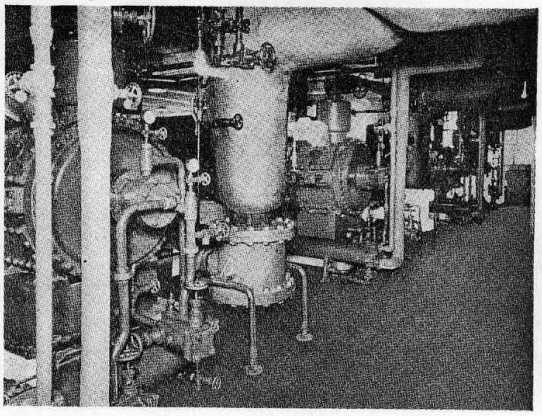
Closely related to refrigeration is the conservation of energy by heat exchange, and to all phases of refining processes Vogt heat exchangers have been applied. Through this association the company gradually expanded into the various branches of oil refinery work until today it builds special apparatus for nearly every department of a modern refinery, from the cracking of crude oil to the manufacture of modern wax free lubricating oils and paraffine wax.

In 1911 the idea was conceived to make a forged steel valve and fitting for ammonia service, largely on account of the difficulty experienced in securing castings that would hold tight. Beginning in a conservative way, production soon outstripped immediate demand so it was necessary to seek other fields of application; now the products are used in oil refineries, chemical plants, super power plants, high pressure hydraulic lines, big buildings, shops and railway cars.

As the newer methods of extracting gasoline were developed involving extremely high pressures and temperatures, Vogt drop forged steel valves and fittings were in great demand. Close collaboration with the trade has developed what is today the largest drop forged valves and fittings shop in the country, making what the company advertises as the most complete line to be found anywhere.

The Vilter Manufacturing Company

THIS company was started in 1867 by Peter Weisel, as a small machine repair shop. The business prospered and in 1879 Ernest Vilter, father of Emil, Theodore and William, purchased a half interest in the business from Mr. Weisel and the firm name of Weisel and Vilter was adopted. The company was then doing a general machinery manufacturing business, building engines, pumps, brewers' machinery, etc.



ONE OF VILTER'S RECENT CONTRIBUTIONS WAS THE ROTARY AMMONIA COMPRESSOR

In 1886 the company was incorporated and the firm name changed to Weisel & Vilter Manufacturing Company. In 1890 Mr. Weisel was bought out by the Vilter interests and Edward F. Goes, Mr. Weisel retiring from business.

Theodore O. Vilter became president of the company, William O. Vilter secretary and treasurer and Emil

Vilter general superintendent. Edward F. Goes was made vice-president.

In October, 1892, the entire shops and equipment of the company were completely destroyed in a large fire, which destroyed an extremely large area in Milwaukee. The company was then located in a downtown area known as the Third Ward. After the fire, the company moved to its present location on the South Side of the City of Milwaukee and constructed a new plant, consisting of a machine shop, blacksmith shop, pipe shop, power house and new office. The name was then changed to The Vilter Manufacturing Company, which has been retained ever since.

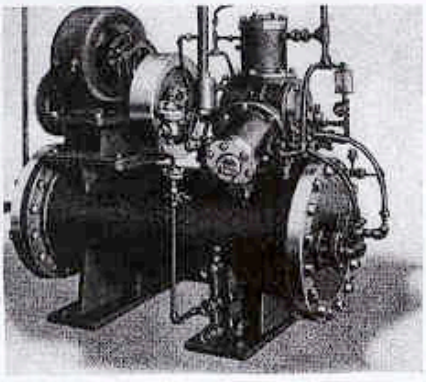
As the years went by Vilter continued to grow; new shops were added, new buildings constructed until today the plant covers an area of thirteen and one-half acres and maintains a complete system of shops required in the successful manufacture of refrigerating and ice-making machinery.

The first Vilter refrigerating machine was built in 1882. It was of a horizontal double acting design and was operated by a Vilter horizontal Corliss engine. The company began specializing in the manufacture of refrigerating machinery from that time on.

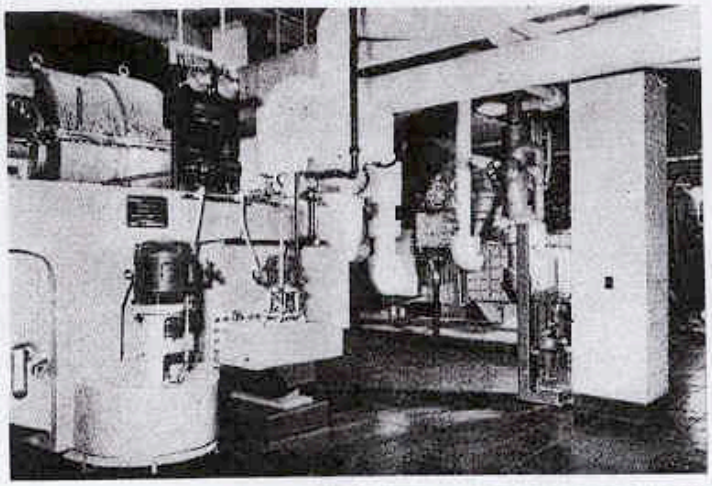
In September, 1919, Theodore O. Vilter passed away and his brother Emil succeeded him as president. Edward F. Goes died in the fall of 1932, and Fred C. Trubshaw succeeded him as vice-president of the firm.

Vilter has during its history built a number of large and outstanding plants and has pioneered in development work in applying refrigeration in different industries, a typical example of this being the first pre-cooling plant for cooling and icing trains of fruit cars in San Bernardino in California, twenty-six years ago. In recent years Vilter installed a large rotary booster compressor in the Reid Ice Cream Company in New York, for the economical production of low temperatures.

The company has done considerable export work, especially for the large meat packing plants in South America and ice making equipment for Japan.



FIRST COMMERCIAL REFRIGERATING UNIT DEVELOPED BY BRUNSWICK-KROESCHELL COMPANY (NOW PART OF CARRIER CORPORATION). IT WAS GIVEN THE HIGHEST AWARD AT THE PAN-AMERICAN EXPOSITION, 1901.



CARRIER CENTRIFUGAL REFRIGERATION IN BASEMENT OF METROPOLITAN LIFE BUILDING

Carrier Engineering Corporation

CARRIER Engineering Corporation formed at Buffalo, N. Y., in 1915. In 1930 Carrier Corporation was formed by a merger of Carrier Engineering Corporation, Brunswick-Kroeschell Company, New Brunswick, N. J. and York Heating & Ventilating Corporation, Philadelphia, Pa.

Present officers of Carrier Corporation are: W. H. Carrier, chairman of the board, J. I. Lyle, president, Thornton Lewis, vice president, C. R. Lyle, vice president, E. T. Murphy, vice president, Sydney B. Carpender, vice president, H. P. Gant, vice president, Donald French, vice president, M. S. Smith, vice president and treasurer, Charles J. Staples, secretary.

Among others associated with the company since its founding are L. L. Lewis, chief engineer; E. P. Heckel, manager of the Chicago office; A. E. Stacey, Jr., research consultant.

The technical control of indoor air conditions began in 1906 with the invention of the dew point control and differential thermostat and hygrostat, and with the discovery that the moisture content of air in an enclosure could be definitely regulated by subjecting a circulated portion of the air to a water spray of proper volume and regulated temperature.

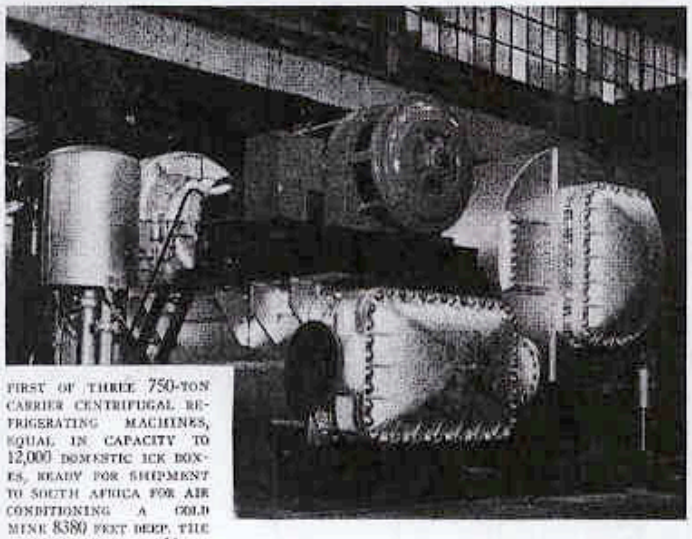
Useful applications were found in many industries, but the art was new and the industrial management required education. This was particularly true in the older established industries, such as those engaged in cotton and tobacco manufacture, which had progressed for decades without it and who were not inclined to innovations in processes or method of manufacture.

Many applications for human comfort were installed in connection with heating systems largely for humidification and air cleaning. A few installations were made with refrigeration for summer ventilation, as in the office of the Swift Packing Company. Systems of refrigeration then available were expensive and not well adapted to the purpose. There was also considerable objection to the use of refrigerants, such as ammonia, in connection with ventilating systems. However, the principal obstacle to the rapid growth of the application of air conditioning for human comfort was undoubtedly the relative cost as compared with the heating systems, and the fact that the pub-

[Refrigerating Engineering, December 1934, p.302]

lic generally required time to be educated to higher economic standards.

While there has been normal growth in industrial applications which have become more and more economically important, and more generally accepted as a necessity to various industries, yet the real future of air conditioning undoubtedly lies in controlling conditions for human comfort. Real progress in this direction was not made until 1922, when the Carrier centrifugal refrigerating machine was brought out.



FIRST OF THREE 750-TON CARRIER CENTRIFUGAL REFRIGERATING MACHINES, EQUAL IN CAPACITY TO 12,000 DOMESTIC ICE BOXES, READY FOR SHIPMENT TO SOUTH AFRICA FOR AIR CONDITIONING A GOLD MINE 8380 FEET DEEP. THE REFRIGERANT IS F11.

Air conditioning for human comfort was first applied largely to moving picture theatres, and through this the public generally became educated to what air conditioning could accomplish. Department stores were next to become interested and more recently office buildings.

Practically all of the railroads freely admit that air conditioning is a real necessity and is bound to come on all of the best passenger equipment. The Carrier Research Corporation has developed a system for steam operated railroads which is said to cut the present installation cost practically in half and meet all of the requirements for operation whether the car is in operation or standing. . . . Railroad equipment in itself may be considered a sizeable industry in the future, and the Carrier Corporation, with its previous developments and patents resulting therefrom, should be in excellent position in regard to this business.

Air conditioning must be viewed as a new industry, Carrier engineers believe, especially with reference to its application to human comfort in public buildings, in offices, in transportation and in the home. Not only will it increase human efficiency as well as industrial efficiency, but it will create a demand for new equipment which will act as a takeup for labor thrown out of employment by increased efficiency in production in older industries.

In commercial refrigeration the important fields for future development lie in the marine and foreign field, in low temperature quick freezing, and in the return of the brewing industry. Brunswick-Kroeschell Company installations of refrigeration equipment in the former field represent upwards of 90% numerically of the vessels so equipped.

A representative list of Carrier installations is striking for the wide variety of concerns which have made use of air conditioning or cooling: banks, broadcasting studios, department stores, offices, public buildings (including the U. S. Capitol, Department of Commerce Building, U. S. Supreme Court and the White House offices), restaurants, theatres, printing companies, tobacco plants, textile plants, confectionery manufacturing plants, breweries, bottling plants, dairy products, meat packing plants, water cooling, hospitals and institutions, meat markets and groceries, fruit and produce establishments, and fur storages. The number of foreign countries where Carrier equipment has been installed is equally far-flung: Australia, Brazil, England, France, India, Porto Rico, Siam, China, and Japan.

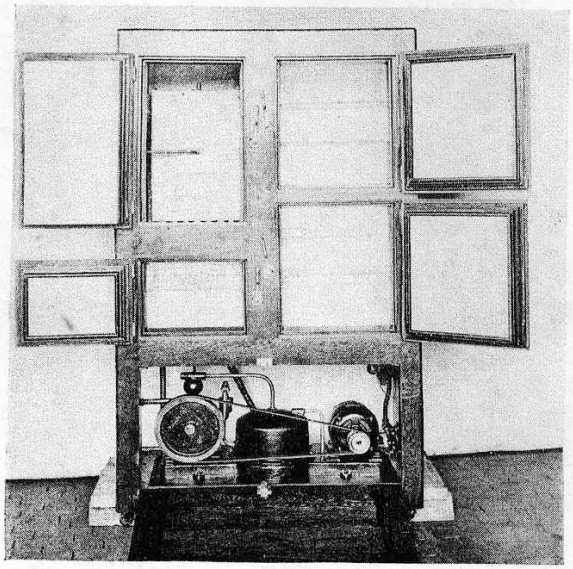
General Electric Company

IN 1886 Thomas Alva Edison moved his Edison Machine Works from New York City to a location available by pure chance in Schenectady, N. Y. Thus the foundation was laid for what was destined to be the principal works of the General Electric Company. In 1892 the General Electric Company was founded, mainly through the efforts and vision of one man, a New England shoe manufacturer named Charles A. Coffin. Mr. Coffin succeeded in linking together under the one name a number of struggling electrical enterprises, including those of the Edison Machine Works, which had been consolidated with all the Edison electric light companies into the Edison General Electric Company of Schenectady, and the Thomson-Houston Electric Company of West Lynn, Mass., founded by Prof. Elihu Thomson—now director of the company's Thomson Research Laboratory.

It is a far cry from the two buildings acquired by the Edison Machine Works in Schenectady in 1886, housing a mere handful of men, to the 365 buildings in the present Schenectady Works alone, with over 6,000,000 square feet of floor space occupying an area of 651 acres and housing

AIRPLANE VIEW OF ERIE WORKS OF GENERAL ELECTRIC COMPANY

[Refrigerating Engineering, December 1934, p.303]



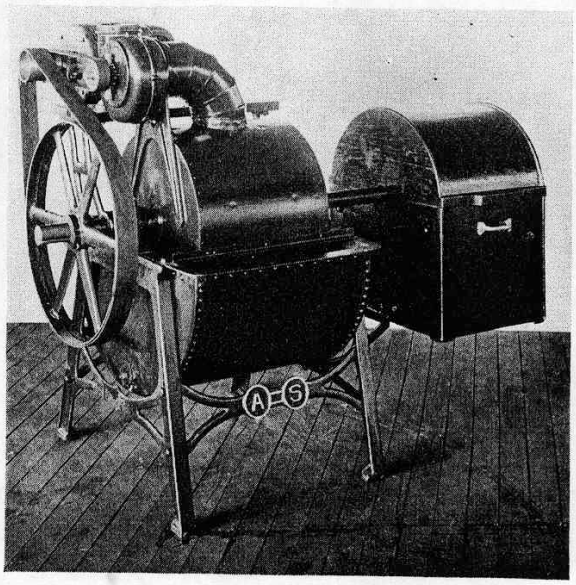
ONE OF THE EARLY GENERAL ELECTRIC REFRIGERATING MACHINES—MODEL "OC"-2, FORM B, WATER COOLED

normally a daily population of 20,000 to 25,000 workers —not to mention the peak employment of more than 75,000 employees in General Electric factories located in some 25 cities of the United States and sales offices and service shops over the entire country. Added to the romance of this striking growth is the fact that the two original Edison buildings are still an active part of the present complete Schenectady Works.

Not alone to Edison and his inventive genius, nor to Steinmetz and his electrical wizardry, nor to the General Electric Research Laboratories organized in 1900, but to the combined research, engineering and manufacturing skill and talent of many, plus the business leadership of such men as President Gerard Swope, Board Chairman Owen D. Young, former President and now Honorary Board Chairman E. Wilbur Rice, Jr., T. K. Quinn, Vice President in charge of Appliance Sales, is due the company's present growth to the world's largest electrical workshop.

An important part of the history of General Electric is the development of General Electric refrigeration. In the late 1890's and early 1900's a French monk, Abbe Audiffren, began and completed a series of experiments in an effort to develop a refrigerating machine which would be rugged, dependable and free from all of the features of conventional machines, which up to that time had been sources of trouble and failure. After making many models, testing this feature and discarding that, he finally fixed upon a design which included many novel and ingenious features, most of which were new to the art. An SO_2 (sulfur dioxide) compression type of machine with an hermetically-sealed principle for the operation of the refrigerant and the lubricating oil was developed; it was the prototype of later General Electric refrigerating units with basic differences which included external bearings and a conventional motor drive not built into the case. After some ten or fifteen years of manufacture in France, a group of Americans secured the American rights to the patents and the General Electric Company agreed to undertake its manufacture for the American Audiffren Refrigerating Machine Company, who contracted to market the product through the Johns-Manville Company.

General Electric, in its Fort Wayne Works, began the manufacture of this machine in 1911—in four sizes; one-fifth ton, one-half ton, one ton and two ton, and continued at an average annual rate of 150 to 200 machines a year for seventeen years until 1928, when this production was transferred to another plant. Many of these machines are still operating satisfactorily, according to the company,



THE AUDIFFREN MACHINE SET UP WITH "NO. 3 ECONOMIZER," GENERAL ELECTRIC COMPANY

after more than 20 years of service, without ever having the refrigerant or oil changed.

As a result of the experience gained with the Audiffren machine, General Electric began in 1915 and 1916 the consideration of a domestic refrigerator of less complicated design and lower cost, and the elimination of open water cooling, brine tanks, bearings and external motor. Then began the development of a long series of domestic models for test purposes until 1918 or 1919, when the idea was conceived of a motor built into the compressor case and taking the current in through insulated leads, thus obviating the necessity of a stuffing box and making possible a hermetically sealed domestic refrigerator. The Schenectady Research Laboratories developed the metal glass leads for carrying the current into the machine and the first hermetically sealed domestic refrigerator was realized. The only essential difference from the present design was that it was water cooled and the copper coil evaporator was submerged in a brine tank in the upper part of the cabinet. One of these machines ran for five years without attention.

In 1923 the air-cooled machine was developed, and as the research and engineering work went on, a total of several thousand refrigerators of 19 different types were made and field tested in the homes of G-E officials and employees in widely scattered cities at the expense of millions of dollars. Further improvements and refinements were developed in 1926, and then began the manufacture of the famous Monitor Top unit on a large scale production.

In rapid succession the company then developed commercial refrigerating equipment—bottle water coolers, pressure coolers, milk cooling equipment, display cases, ice cream cabinets, beer cooling equipment, conditioned air

(Continued on page 356)

What the Companies Have Contributed

(Continued from page 304)

refrigeration for a variety of commercial requirements, room coolers and air conditioning equipment.

A complete description of General Electric activities would fill volumes; they ramify in so many directions of scientific research, engineering development and manufacture, that space will not even permit a bird's-eye. The company's work in the refrigerating industry has been well received; it is recognized as sound and thorough, like other activities of General Electric.

Westinghouse Electric and Manufacturing Company

WESTINGHOUSE Electric & Manufacturing Company is an old company. Old as American businesses go, for it antedates by a decade or more the innumerable corporations formed about the turn of the century. Old in its industry, for it began electric manufacturing in 1885 in Pittsburgh, Pa., and steam in 1880. Of all the manufacturers whose names were prominent in the first years of electric light and power, Westinghouse alone remains. Starting with 200 employees, in normal years the payroll now numbers about 50,000.

To the electrical man in American industry, the Westinghouse name means the older of the two great manufacturers who have dominated the development of electrical energy, the originator of the present universal power system; a tradition of new ideas and technical imagination. To the mechanical engineer, the name recalls engines, turbines, stokers, condensers, each in its day outstanding; and those who sailed the salt sea remember that it was Westinghouse gear which made turbines available for ordinary ships.

The following are among the important early achievements of Westinghouse:

In 1885, Westinghouse introduced the alternating current, today universal, and developed practically all its essential elements during the period 1885-92.

In 1893, the company carried out the illumination of the Chicago World's Fair with alternating current, demonstrating a complete polyphase power system including practically every essential device now used in the art. This Exposition was by far the greatest use up to that date of electricity and of artificial light. It had a profound effect on the country's use of electric power.

In 1892, at Pomona, Calif., Westinghouse installed a 10,000 volt transmission line, using oil filled transformers. This installation may be considered the parent of all high tension transmission trends.

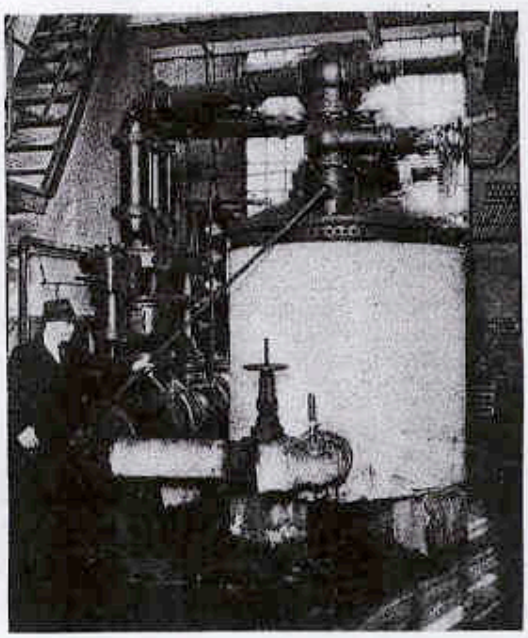
The Chicago Exposition had demonstrated alternating power transmission; Niagara was the commercial embodiment on a vast scale. The mere magnitudes involved were unprecedented. The Westinghouse generators were five times as large as the largest built heretofore; switches, instruments, bus bars, and lines were all on a similar huge scale.

In 1889 the company built and installed its first mechanical refrigerating plant. One of the first of these plants was installed for the Medical School of Harvard University in 1889.

In February, 1930, Westinghouse put on the market its first refrigerator after many pioneer years of research. The first chest type low priced refrigerator received its first test in June, 1931.

Westinghouse engineering also has accomplished such feats as the first high voltage railway electrification, the first Diesel electric ship, the first commercial radio broadcasting, and the rest of a list too long to detail.

The first officers of the Westinghouse Electric & Manufacturing Company were George Westinghouse, president; H. M. Byllesby, vice president; Guido Pantaleoni, general manager; John Caldwell, treasurer, succeeded in



IN ITS 16 YEARS OF OPERATION THIS WESTINGHOUSE 35-TON STEAM JET REFRIGERATION UNIT INSTALLED BY THE UNION SWITCH AND SIGNAL COMPANY HAS SERVED COOL DRINKING WATER THROUGHOUT THEIR LARGE PLANT AT SWISSVALE, PA., WITH NEGLIGIBLE MAINTENANCE.

1892 by Ph. Ferd. Kobbe; A. T. Rowand, assistant treasurer; Charles S. Pease, general superintendent; Albert Schmid, superintendent of shops and O. B. Shallenberger, chief electrician. Present officers include A. W. Robertson, chairman, F. A. Merrick, president.

The commercial steam turbine was introduced into America by Westinghouse about 1895. A 120 KW. D.C. set was built at Pittsburgh in 1896, the steam end being quite satisfactory. In 1899 three Westinghouse 400 KW. alternating current sets were put in operation at Wilmerding, Pa.—the first serious installation in America. A year later, a 2000 KW. unit was installed at Hartford, Conn., at least twice the size of any other in the world. It is safe to say that without steam turbines and their high efficiency and relatively low first cost, it would be impossible for the central stations to have developed their production of widespread electrfications at a constantly reducing price.

About 1888, Westinghouse brought to this country a Serb, Tesla, to encourage him to develop his ideas of the induction motor, and finally made it possible for Westinghouse engineers to put this brilliant, though impractical idea, into true commercial shape. The induction motor was in commercial use by 1890 and is now practically the universal means of electric power.

(Continued on page 358)

[Refrigerating Engineering, December 1934, p.356]

What the Companies Have Contributed

(Continued from page 356)

Kelvinator Corporation

SOME time prior to September 14, 1914, two Detroit men, A. H. Goss, a broker, and E. J. Copeland, purchasing agent for an automotive concern, became interested in the work of one Nathaniel B. Wales, an engineer who since his graduation from Harvard in 1905 had spent much time in developing an idea for a practical domestic refrigerating unit.

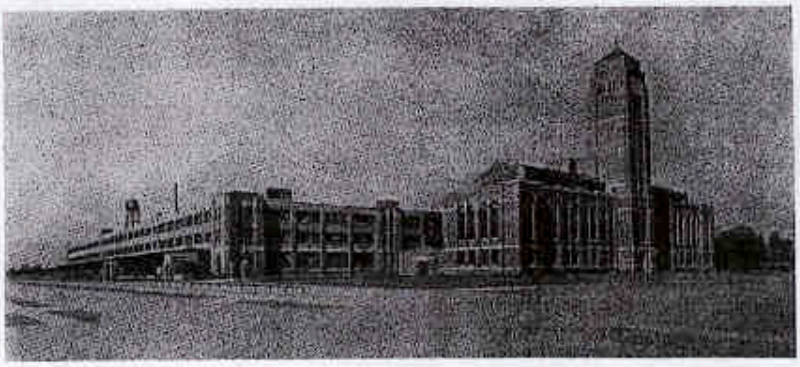
Convinced that Mr. Wales' designs incorporated valuable possibilities not theretofore discovered by others who had been interested in the subject of refrigeration, the Detroiters negotiated a contract with the engineer for the promotion and development of an absorption type of refrigerating machine.

There were many obstacles to be overcome. Anhydrous ammonia at that time was the only refrigerant that could be handled with any real success, and this had serious drawbacks, including the facts that it could be condensed only under heavy pressures and that it was a suffocating gas. Any ammonia machine, it appeared, would have to be a rather cumbersome device, and so in the interests of price and economy of operation, and in consideration of ammonia's inherent shortcomings, it was discarded. The promoters then attempted to produce satisfactory refrigeration by compressing air and discharging it into a tank in the ice compartment of the refrigerator, but the power requirements of a unit sufficient in size to compress the large volume of air necessary ruled out this idea. Finally their search for a suitable refrigerant brought them to sulfur dioxide, whose low working pressures and non-poisonous, non-inflammable and non-explosive qualities made it highly desirable.

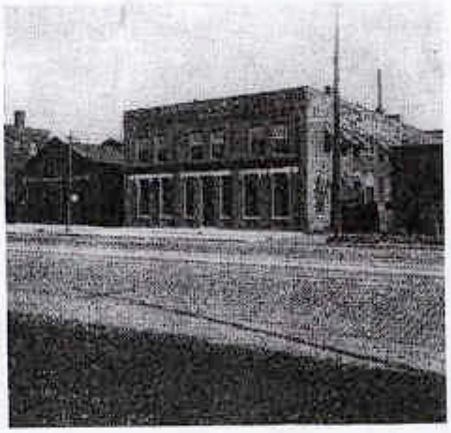
Completion of this first sulfur dioxide machine brought into being a device that was fundamentally automatic in operation. To it was given the name "Kelvinator," in honor of Lord Kelvin (1824-1907), the distinguished Scottish physicist.

Until early in 1918 none of the machines produced by these pioneers were sold, but many were installed experimentally in private residences in and about Detroit, where they could be watched carefully. For the first several years following 1914 several problems still remained unsolved, one of them the matter of automatic control, and the other the problem of gas leakage. Both of these difficulties were successfully surmounted in 1917, however.

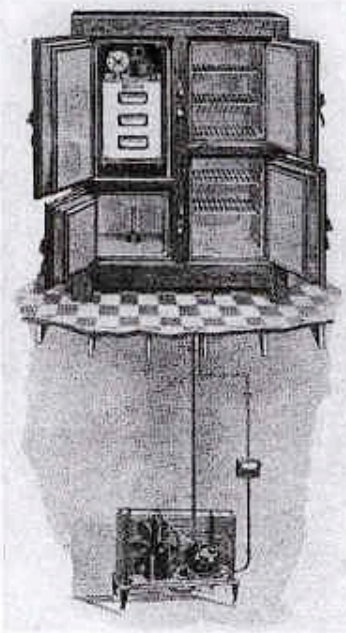
(Continued on page 372)



KELVINATOR CORPORATION'S PRESENT DETROIT PLANT, 14250 PLYMOUTH ROAD. PLANTS ALSO IN LONDON, ONTARIO; LONDON, ENGLAND; AND GRAND RAPIDS, MICH.



ORIGINAL FORT STREET (DETROIT) PLANT OF KELVINATOR CORPORATION, 1917



TYPICAL "REMOTE" INSTALLATION, THE TYPE USED UNIVERSALLY UNTIL ABOUT 1925. KELVINATOR EQUIPMENT, WITH COOLING UNIT INSTALLED IN CABINET NOT OF KELVINATOR MANUFACTURE.

[Refrigerating Engineering, December 1934, p.358]

What the Companies Have Contributed

(Continued from page 358)

and so, having successfully terminated its carefully conducted program of experimentation and field testing, the promoters opened a sales office in Detroit in the spring of 1918.

Goss and Copeland on May 13, 1916, had organized the Electro-Automatic Refrigerating Company, incorporated in the state of Michigan to promote the refrigeration developments that previously had taken place and those that were contemplated. Copeland was elected president, Goss vice president and W. T. Utley secretary and treasurer. On July 28, 1916, the name of Electro Automatic Refrigerating Company was changed to Kelvinator Company. On September 24, 1917, Kelvinator Corporation of Delaware was organized, and to this new group Electro Automatic Refrigerating Company was sold on August 18, 1918. Kelvinator Corporation of Delaware was reorganized as Kelvinator Corporation of Michigan on December 23, 1924. The year 1926 was one of great physical expansion for Kelvinator, and also involved the changing of the company's name to Electric Refrigeration Corporation. The name "Kelvinator Corporation" was taken back in October, 1928, and has been used ever since.

Wales remained with the company as an engineer and designer from 1914 until 1916. Copeland remained until 1921, and during his seven years of service held several executive positions, in addition to directing much of the engineering work. Goss continued with Kelvinator until 1929.

With the beginning of actual sales in 1918, Kelvinator's progress was rapid. Sixty-seven units were sold in 1918. By the end of 1920, 600 Kelvinators were operating in homes in Detroit and vicinity, and national and international distribution had begun in earnest. All of the installations were of the "remote" type, with the condensing mechanism usually located in the basement and the cooling unit operating in the ice-compartment of the refrigerator. It was not until 1925 that Kelvinator brought out its first self-contained unit.

For several years Kelvinator sales increased by approximately 100% annually, but with the advent of the self-contained unit public demand sky-rocketed. By 1929 annual shipments had passed the 100,000 mark, and five years later this record was more than doubled.

Physically Kelvinator has kept pace with its rise in other lines. The first work in 1914 had been carried on in a small second-story workshop on Franklin Street, Detroit. Outgrowing these humble surroundings, the organization took over factories in other parts of the city including one on Fort Street, which later was greatly expanded and now is used as the company's service headquarters.

At present the demand for Kelvinator products taxes the facilities of four huge factories—in Detroit and Grand Rapids, Mich.; London, Ontario; and London England. The Detroit plant is one of the finest and most completely equipped manufacturing establishments in the world. Completed in 1927, it is a marvel of "straight line" production efficiency rivalled only by the automotive concerns. The Grand Rapids plant, where the Kelvinator cabinets are made, has more than 1,000,000 square feet of floor space, and includes the world's largest and most thoroughly modern porcelain factory.

No more convincing evidence of Kelvinator's growth since 1929, when George W. Mason, its present president and chairman of the board, took over the corporation's

(Continued on page 374)

Willis H. Carrier to Receive A.S.M.E. Medal at 1934 Meeting

The 1934 medal of The American Society of Mechanical Engineers will be awarded this year to Willis H. Carrier, past president of the A.S.R.E., "in recognition of his research and development work in air conditioning," officials of the society have announced. Four other annual awards of the Society also will be made at the Annual Meeting in December.

Mr. Carrier is chairman of the board of the Carrier Engineering Corporation, the Carrier Corporation, the Carrier Manufacturing Corporation and the Carrier Engineering Company, Ltd., London. He is a graduate of Cornell University and the author of numerous scientific works, dealing principally with theories of moisture evaporation. A former president of The American Society of Refrigerating Engineers, he also has served as president of The American Society of Heating and Ventilating Engineers.

Ralph E. Flanders, of Springfield, Vt., will receive the Worcester Reed Warner gold medal for his "contributions to a better understanding of the relationships of the engineer to economic problems and social trends." Mr. Flanders, who is president of the Jones & Lamson Machine Company, and a member of the Business Advisory and Planning Council of the Department of Commerce, was recently elected president of the society for 1935.

All the awards will be presented during the Annual Meeting of the Society, December 3 to 7, at the Engineering Societies Building, 29 West 39th Street, New York.

What the Companies Have Contributed

(Continued from page 372)

leadership, may be given than that seen in the company's financial history, as told in the following figures:

	1929	1930	1931	1932	1933
Cash	$ 550,498	$ 1,561,866	$ 3,051,939	$ 3,421,112	$ 4,367,221
Working Capital	6,008,890	5,960,296	6,107,468	6,451,388	6,309,705
Surplus	650,691	2,251,203	3,209,484	3,312,245	4,035,940
Net Worth	12,934,461	14,562,187	15,247,595	15,206,703	15,946,337
Funded Debt	4,210,000	2,922,500	1,073,000	928,000	none
Unit Shipments	103,841	104,049	115,541	116,607	182,503

Although figures are not yet available on the company's operations during the past fiscal year, it is well known that Kelvinator has enjoyed by far the greatest 12 months in its history, with unit shipments well above the 225,000 mark.

Kelvinator products have been installed all over the world, from the ships of the Byrd Expedition in the Antarctic to the headquarters of the French Foreign Legion in Meknes, Morocco; from the palace of the King of Siam at Bangkok to the Gap Rock lighthouse 40 miles off the coast in the China Sea; from the airplane-carrying U.S.S. "Saratoga" to the great new federal prison on Alcatraz Island in San Francisco Bay.

Kelvinator's products are no longer confined to household refrigerators. The company is now a leader in the field of liquid cooling and general commercial cooling equipment, and during the past year announced complete lines of air conditioning and automatic heating equipment.

[Refrigerating Engineering, December 1934, p.374]

The names of the machinery by their manufacturers are not what they are today: Common ones we know as well as ever are to be found, but what of the following, which are no longer on the market?

Mayer
Barber
Atlas
Pictet
Case

Consolidated
Wolf-Linde
Columbus
Blymyer
Healy

Featherstone
Wilson
Krausch
Kilbourn
Castle
International
Hercules
Reading
Erney
Van Winkle
Croft
Pictet
Frank
Sulzer-Vogt
Case
Western
Spiess
Warwic
German-American
Ott
Hill
Dillenburg
Empire
Boyl
Consolidated
Weisel
Haslem
Wegner
Stillwell
Huetteman
Kuhn
Woodcock
Guild

JOHN E. STARR AS SKETCHED BY A MEMBER AT THE FIRST A.S.R.E. BANQUET

Disappearance of early refrigeration manufacturers
[Time I Speak of....., December 1934, p.288]