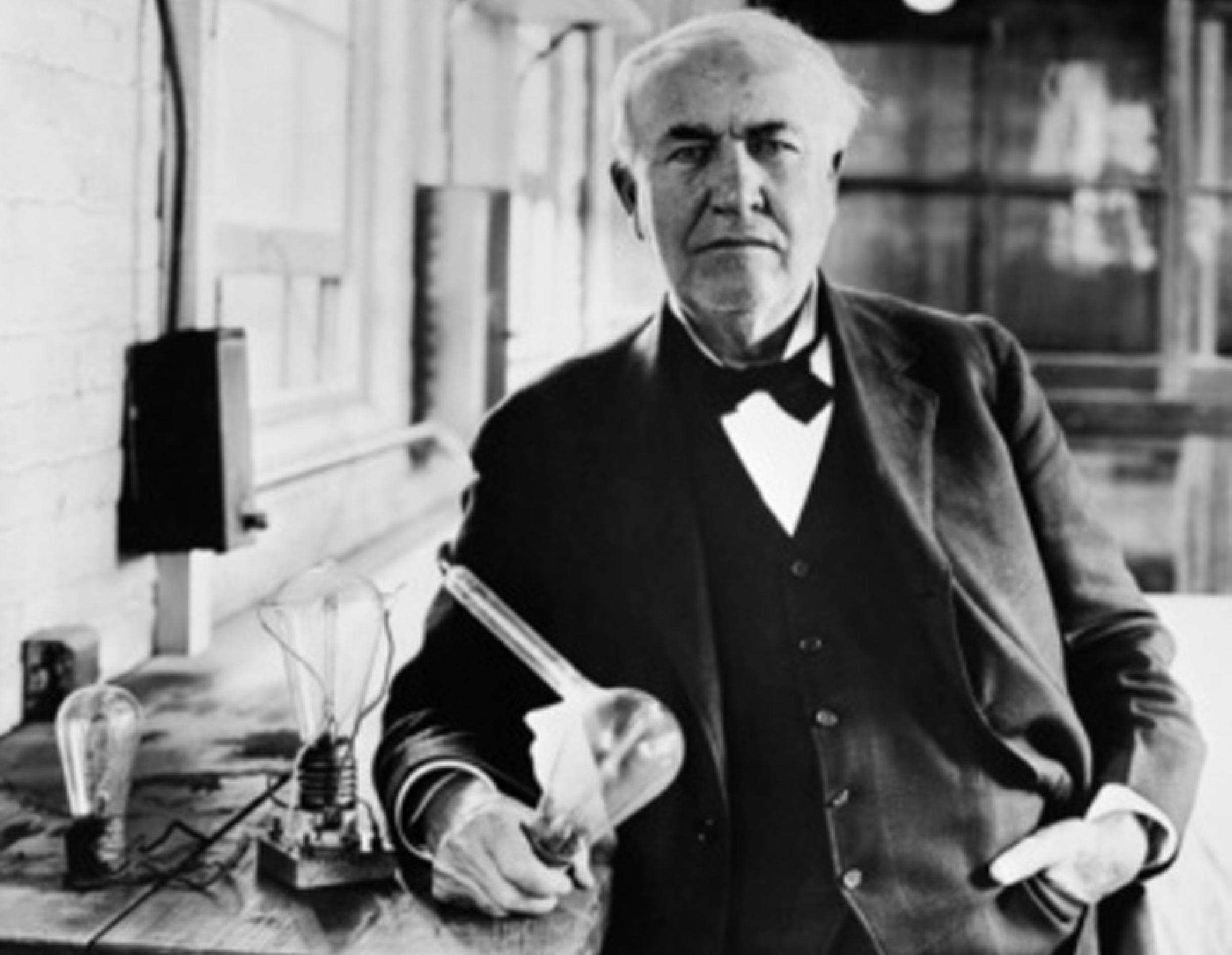


# Part II:

## Electricity and Expansion



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### Electricity and Expansion

“The present period of power plant development is marked both by the number of plants being built and the new ideas incorporated in the design of these plants.”

--- Powerfax, October 1923

The beginning of the 20th century was the beginning of the age of electricity. Thomas Edison developed the first practical light bulb in 1879, and he began operating the first commercial electrical power plant in 1882 in New York City. Edison was convinced that a form of electricity called direct current (DC) was the safest and most promising for public use. After the commercial superiority of alternating current (AC) was clearly established by George Westinghouse, Nikola Tesla and others, the electrification of American industry, businesses and homes accelerated rapidly. Private power plants and municipal utilities expanded across the country, and power generation exploded from 5.9 million kilowatt hours (kWh) in 1907 to 75.4 million kWh in 1927. Most of the power generation plants in these early days were small and localized. The homes and businesses in one town might have electricity from a municipal electric company, but others just a short distance away in a neighboring community might not. Large institutions, such as colleges and hospitals, and mills and factories like Elliott Company in Jeannette, often installed electrical generators to produce their own power.

Liberty Manufacturing, and later Elliott Company, directly benefited from the rapid growth of the power industry. Almost all electricity at that time was produced with steam. As the number of power plants using boilers increased, the sale of Elliott tube cleaners, water strainers, grease extractors, oil filters and separators also rose. The Elliott product line expanded to include more of the components that power systems required, including condensers, ejectors, superheaters and deaerators.

Electricity wasn't the only new technology transforming the American economy and contributing to Elliott's success. In 1909, Henry Ford sold his first Model T car, and America fell in love with the automobile. By 1927, Ford's assembly lines in Detroit had produced more than 15 million Model Ts. The steel mills that produced the metal for countless cars, bridges, ships, locomotives, factories, offices, and appliances were powered by huge numbers of boilers. Vast numbers of cars required rivers of gasoline, and the many new oil refineries needed tube cleaners not only for their boilers, but also to remove coke deposits from their new pressure stills, introduced in 1919.

As W.S. Elliott studied the economic trends producing major growth and profit for his company, he saw an opportunity for Elliott Company to become a supplier to the power industry that was reshaping the world.

# Meeting Your Turbine Requirements Up to 2500 Kilowatts

Kerr design combines high efficiency, mechanical excellence, and unusually rugged construction. Some inherent advantages of Kerr construction, all making for dependability in operation, are:

- Low steam velocities—minimized bucket erosion.*
- Small wheel diameters—low stresses.*
- No steam expansion in moving buckets—negligible end thrust.*
- Nickel steel drop-forged buckets—individually removable.*
- Three-part arch bound carbon ring packing.*
- Large running clearances—safety.*

Kerr Turbines are built in all types, high pressure condensing, non-condensing, low pressure, mixed pressure, and automatic bleeder; direct connected or geared to the driven machine through Kerr Reduction Gears of the herringbone type.

Kerr engineers specialize in equipment to meet unusual operating conditions. Experience extending over many years has resulted in many novel applications that have been very successful. For instance, turbines for driving dredge pumps, turbines driving sheave pulleys, turbines for paper machines, ship propulsion, etc.

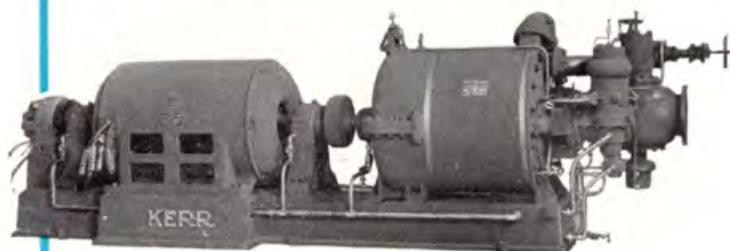
Let us discuss the application of Kerr Turbines to your particular conditions.

## ELLIOTT COMPANY

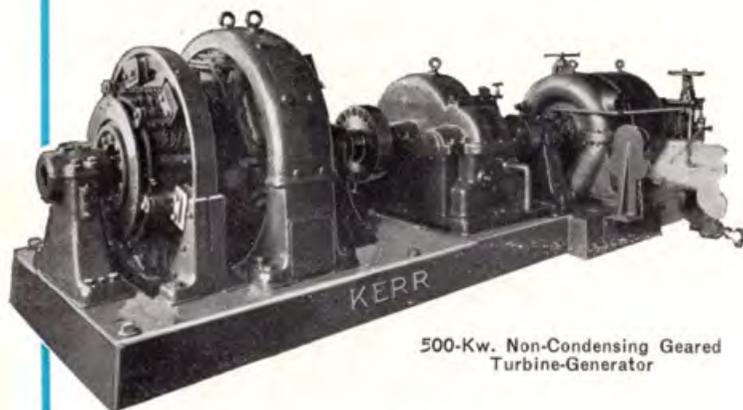
TURBINE SALES DEPARTMENT  
WELLSVILLE, N.Y.  
DISTRICT OFFICES: ATLANTA, BALTIMORE,  
BOSTON, CHICAGO, CINCINNATI, DETROIT,  
CLEVELAND, NEW YORK, KANSAS CITY,  
PHILADELPHIA, PITTSBURGH, ST. LOUIS



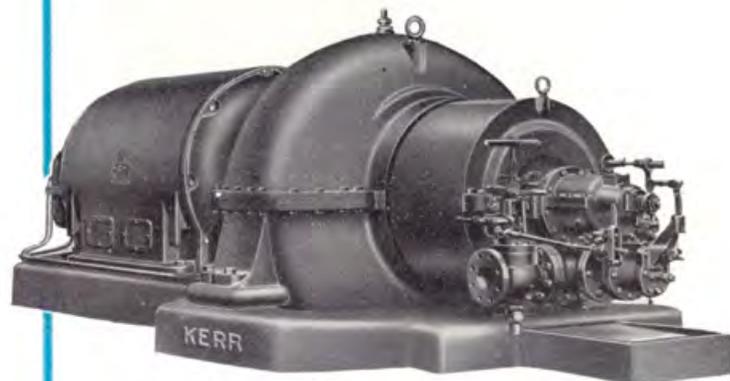
EXECUTIVE OFFICE—PITTSBURGH, PA.  
PRODUCTS  
TURBINES, REDUCTION GEARS, CONDENSERS,  
AIR EJECTORS, DEAIRATORS, HEATERS,  
AUTOMATIC VALVES, BLOW-OFF VALVES,  
STRAINERS, SEPARATORS, GREASE EXTRACTORS



300-Kw. Mixed Pressure Turbine Generator



500-Kw. Non-Condensing Geared Turbine-Generator

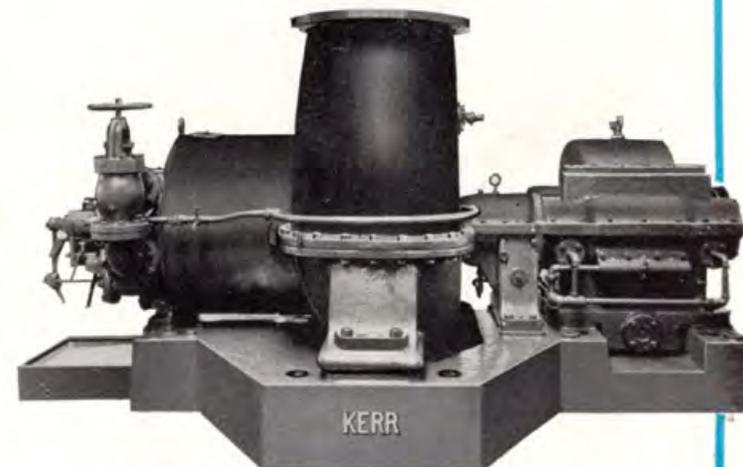


1000-Kw. Condensing Turbine-Generator

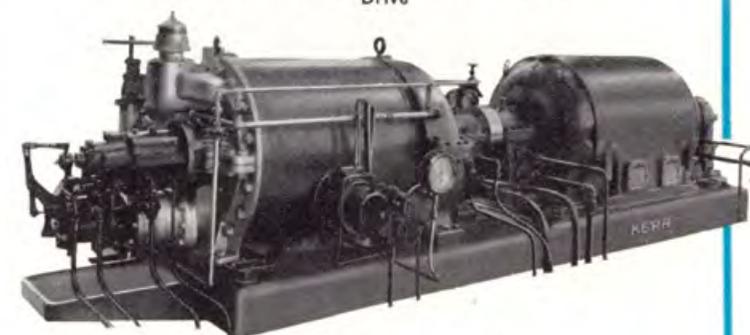
# KERR



2000-Kw. Condensing Turbine-Generator



800-Hp. Condensing Geared Turbine as used for Pump Drive



300-Kw. Bleeder-Type Turbine-Generator

# TURBINES



Kerr Turbine for mechanical drive. It has many unusual and desirable features. Write for Bulletin H-1. Just off the press.

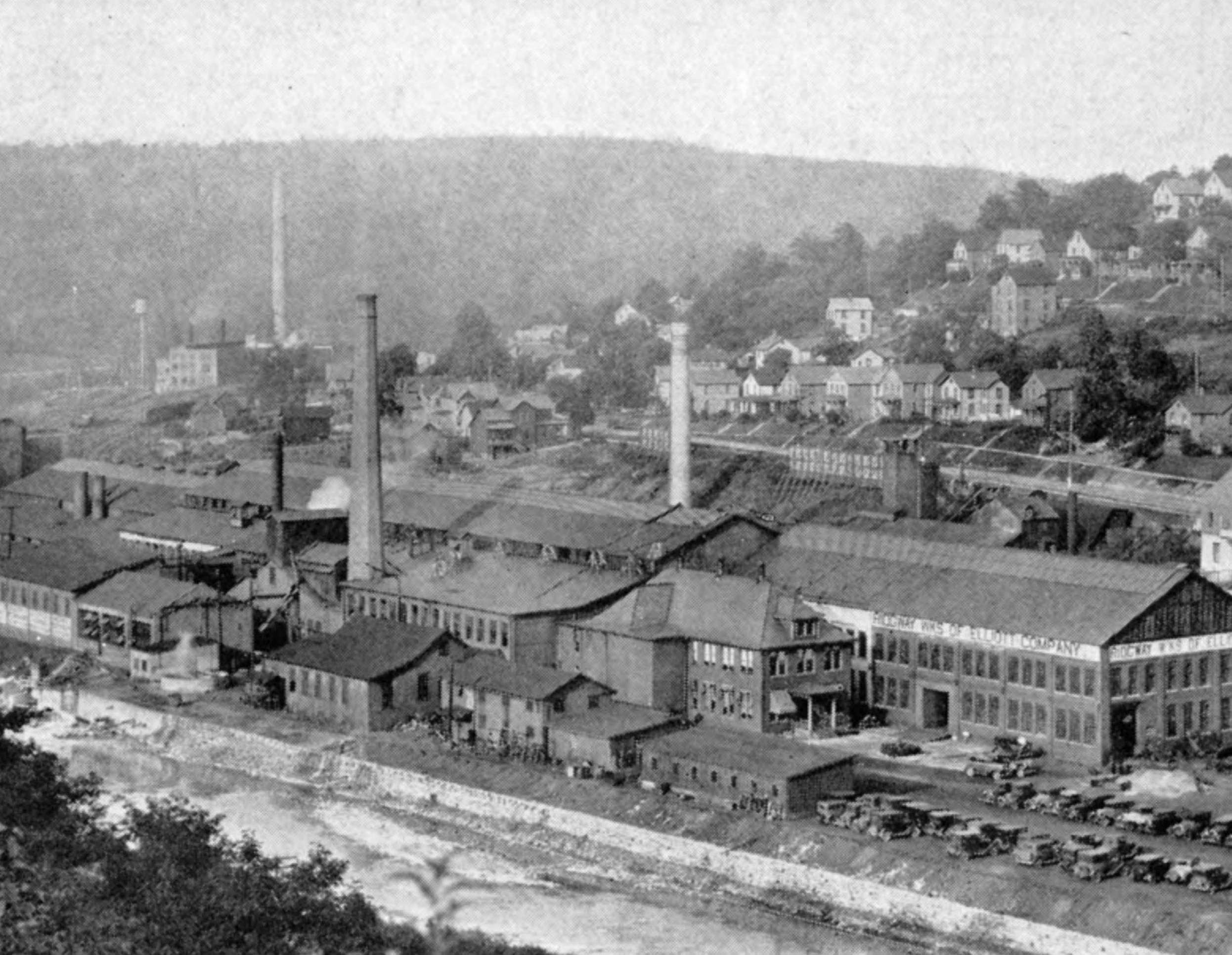
## Elliott buys the Kerr Turbine Company

Charles Volney Kerr was born in western New York in 1861. An inventor and a mechanical engineer with a degree from the University of Pittsburgh, Mr. Kerr was one of the first to recognize that small steam turbines could be used to drive industrial machinery such as pumps and blowers, instead of the piston engines then in use. Mr. Kerr produced and patented a so-called Pelton bucket turbine, which adapted the Pelton water-wheel principle to a steam turbine. Mr. Kerr's steam turbine design employed multiple stages. This was the first commercially successful, small multi-stage turbine built in the United States. The machine was later displayed at the Franklin Institute in Philadelphia. In 1904, Mr. Kerr opened a factory in Wellsville, New York to produce mechanical drive steam turbines.

At about the same time, Charles Curtis was beginning to revolutionize electrical power generation with his design for a steam turbine driven generator. Working with Curtis's design, W.L.R. Emmett at General Electric Company in Schenectady, New York developed the first commercial power generation turbine, a 1,500 kW machine for Port Huron (Michigan) Power and Light Company in 1902. This steam turbine generator required one-tenth the space and weighed one-eighth as much as a reciprocating engine of comparable power output.

In 1923, Elliott Company made "an announcement of importance to the power plant world" with the purchase of Kerr Turbine Company. The Kerr acquisition marked a significant expansion of Elliott's product line and its first step into the market for power plant rotating machinery. Until then, Elliott had supplied only auxiliary equipment for the steam-powered industries. But with this purchase, Elliott Company began to parlay its experience in the steam business into a role as a manufacturer of primary equipment for power generation. The Kerr plant in Wellsville operated as a separate division of Elliott Company until 1927, when most of the machinery and personnel were transferred to Jeannette.





## Ridgway Dynamo and Engine Company: An electrical pioneer

Michael Faraday, an Englishman, invented the first electric generator in 1831. Thirty-five years later, Dr. Werner Siemens in Berlin and Charles Wheatstone in London independently and simultaneously introduced “dynamo-electric machines.” These dynamos made possible high power electric generation and led to the first commercial uses of electricity. Electric lights were first installed in the display windows of the John Wannamaker Store in Philadelphia, Pennsylvania in 1878.

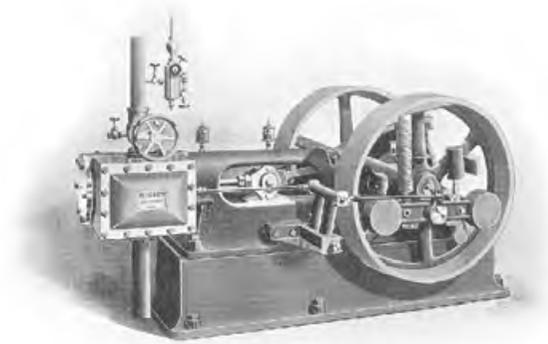
In 1885, the McEwen brothers in Ridgway, Pennsylvania formed a company to build steam engines and other machinery. Ridgway was a town of 1,600 people along the Clarion River, 75 miles northeast of Pittsburgh. McEwen engines had a reputation for remarkably good speed control, due to the flywheel governor designed by an employee, Julius Begtrup. The McEwen brothers guaranteed that an engine with a Begtrup governor would always run at the proper speed or they would sell it for \$1.00. No customer ever claimed that a McEwen engine failed to meet the guarantee. A McEwen engine won a gold medal at the World's Columbian Exposition in Chicago in 1893.

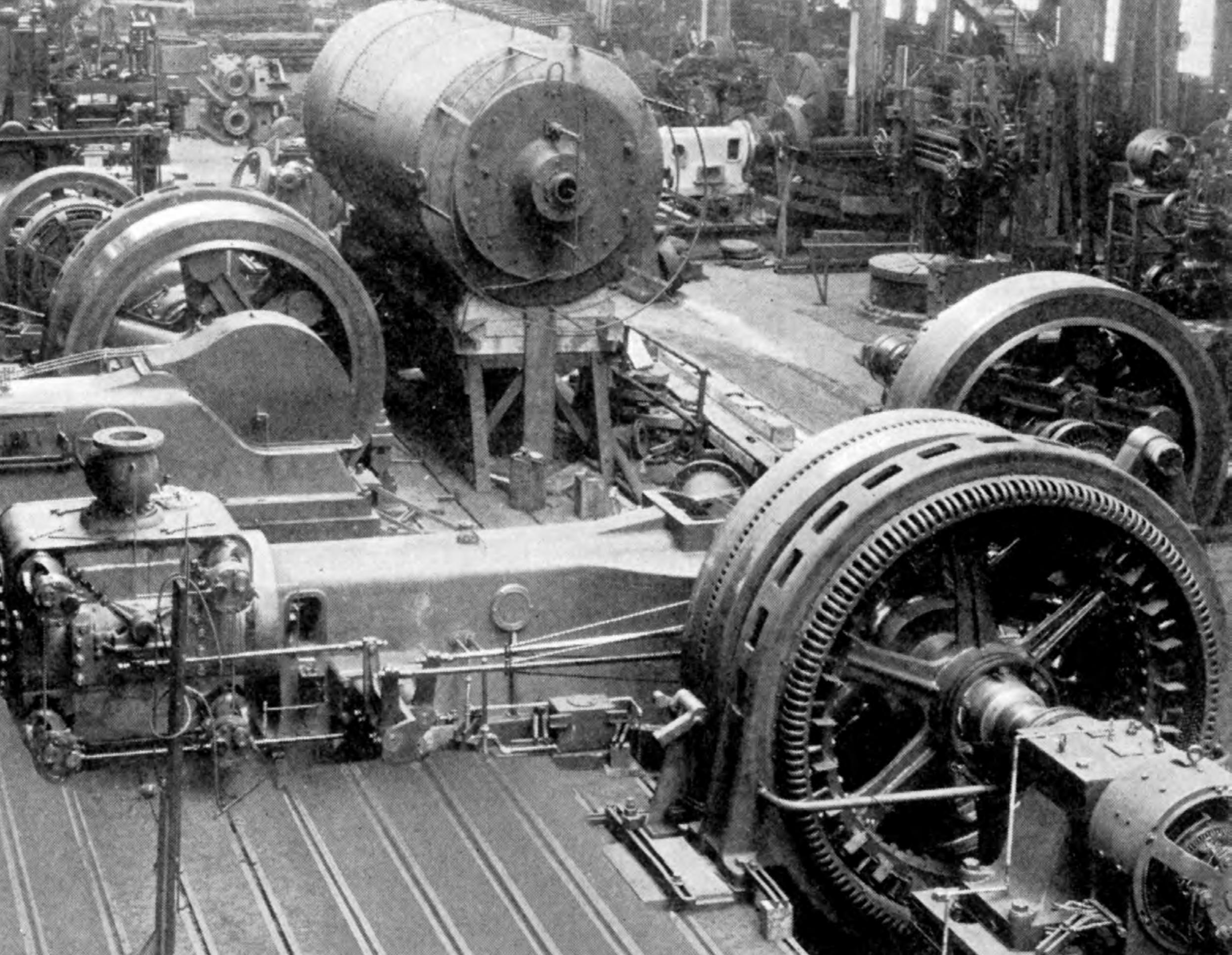
McEwen steam engines were soon driving the dynamos that powered the expanding electricity market. An early customer was just down the street. The Ridgway Electric Light Company installed generators driven by McEwen steam engines in 1892. In 1897, McEwen Manufacturing was reorganized as the Ridgway Dynamo and Engine Company.

Over the next decades, the Ridgway Dynamo and Engine Company sold hundreds of direct current (DC) generators driven by Ridgway steam engines. Many of these machines were used for the electrification of coal mines in Pennsylvania and West Virginia, as well as to supply power to municipal street railways, public buildings, schools and hospitals. There was a tremendous expansion of the U.S. coal mining industry in the years leading up to the First World War. Mines installed Ridgway steam engine-generator sets to produce DC power; others bought AC power from a utility and used Ridgway motor-generators to convert it to DC.

Ridgway Dynamo and Engine Company also pioneered the development of electric motors. The first motors used direct current, but as alternating current became the public standard, Ridgway also began to manufacture AC-powered induction motors. In 1908, Ridgway built the first induction motor in the United States. Ridgway's reputation for well-designed, carefully built machines led to a license in 1911 for General Electric to build Ridgway's generators and motors.

Ridgway began to manufacture steam turbines in 1912. The first order was from the U.S. War Department for three turbine generator sets using a turbine design of Rateau, Battu, Smoot and Company. Based in New York, Rateau, Battu, Smoot and Company was the U.S. representative of a French engineering firm founded by Dr. A.C.E. Rateau, whose name is associated today with Rateau stages in steam turbine design. The other principals were Leonce Battu, a French engineer and expert in boiler systems, and Charles Smoot, a Harvard educated mechanical engineer with several patents related to steam turbines, electric generators, high-speed turbines, and turbo blowers. Rateau, Battu, Smoot and Company subcontracted manufacturing to companies such as Ridgway, General Electric, Brown Boveri, Westinghouse and Terry Turbine.





## Elliott, Ridgway and Kerr

In July 1926, Elliott Company purchased Ridgway Dynamo and Engine Company. This acquisition was noteworthy because Ridgway was the older company and well established in its field. The Ridgway Dynamo and Engine Company's extensive works sprawled along the banks of the Clarion River and included a large foundry and machine shops. Ridgway was a supplier of electrical equipment to public utilities, mines and mills across the United States and as far away as Chile and Peru.

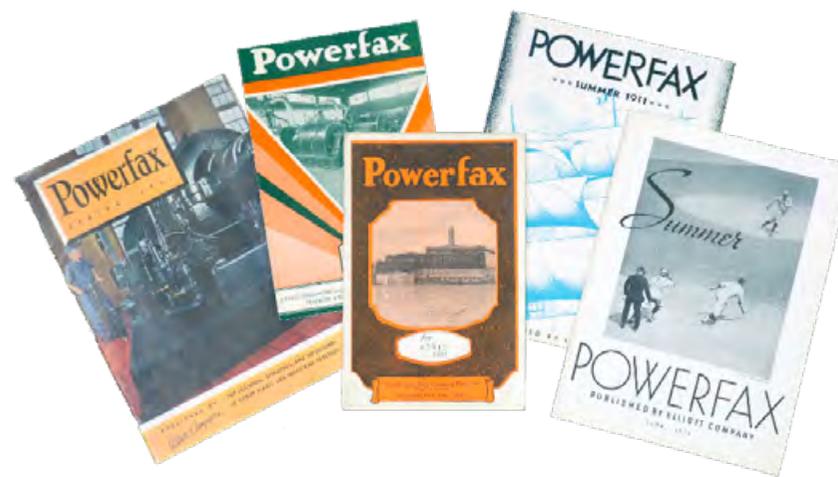
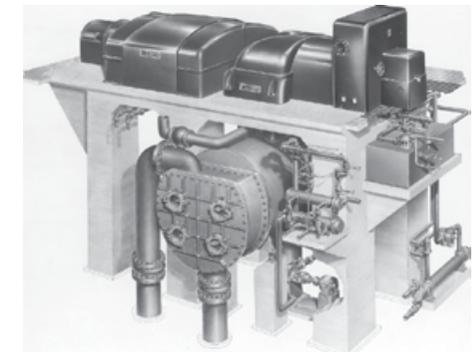
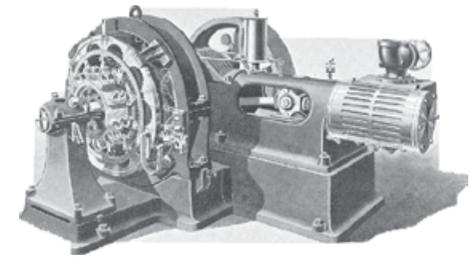
The acquisitions of Kerr Turbine and Ridgway Dynamo and Engine Company were evidence of W.S. Elliott's vision and drive. The new acquisitions complemented and extended Elliott Company's existing product lines. Elliott's announcement at the time noted:

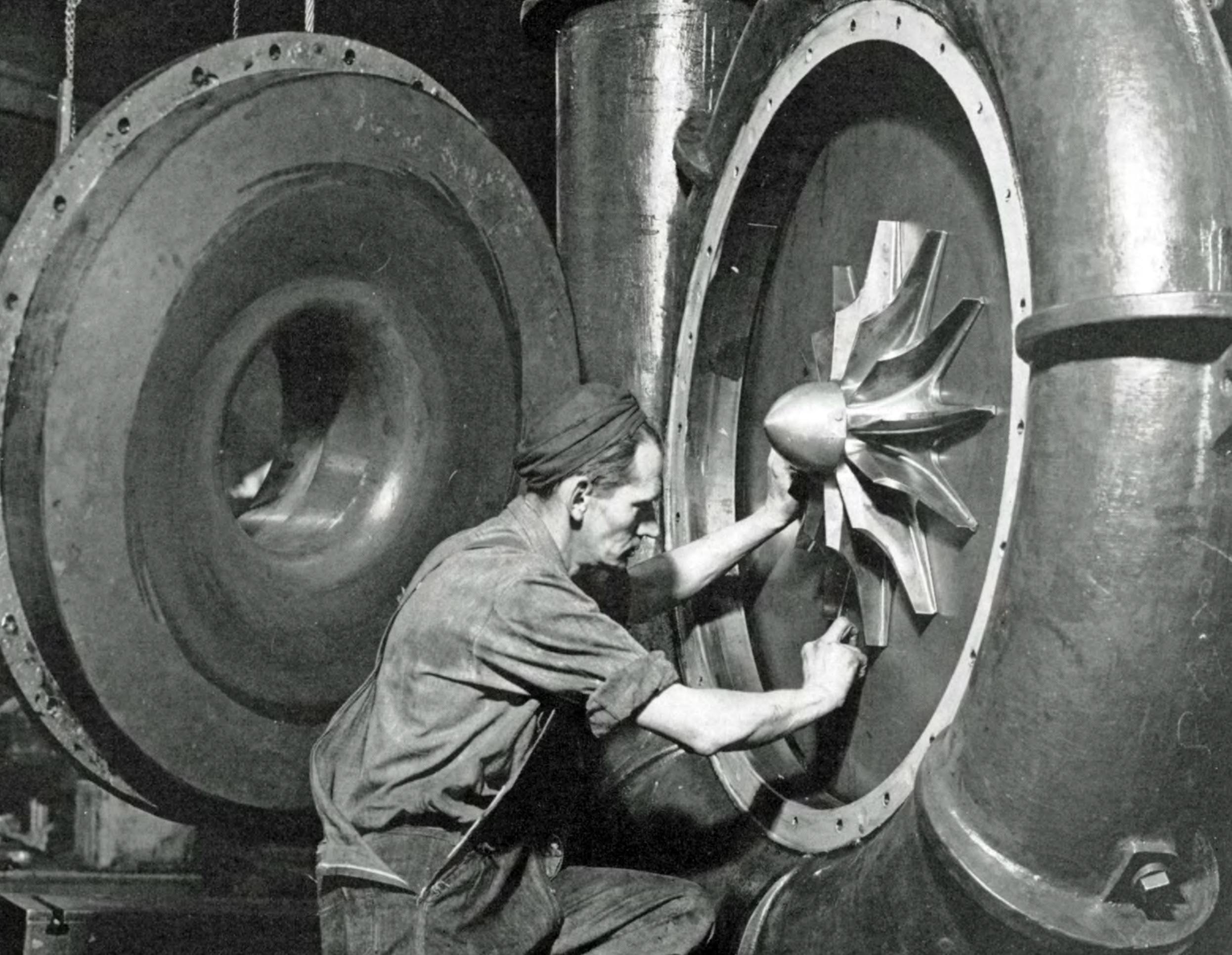
"With the addition of the Ridgway line, the Elliott Company organization is manufacturing a very complete group of power equipment, including steam turbines and generators, several different types of engines, all types of condensers, feed water heaters, air ejectors, deaerators, motor and electrical machinery, as well as smaller items such as strainers, filters, valves, and boiler tube cleaners. This broadening of the field makes possible a more complete service to power and industrial plant. We believe that this new addition to the company can be developed to several times its present volume."

The additions of Kerr and Ridgway remade Elliott Company and laid the foundation for the company's growth for decades to come. The additional capacity to build steam turbines, electric motors and generators, and to provide turnkey generator packages, positioned Elliott to supply essential equipment to the burgeoning electrical power industry.

It was at this time that Elliott began to publish Powerfax, "a magazine of information for engineers and operators of steam power plants, devoted mostly to the field covered by power equipment as manufactured by Elliott Company." Following the first issue in August 1923, Powerfax appeared without interruption through 1960. The articles mirrored the growth of the electric power industry and the evolution of steam technology. The only advertising was for Elliott's various lines of equipment. At first, the content was entirely supplied by Elliott engineers and sales managers, but as time went on, customers and other outside parties eagerly submitted articles. The long-time editor of Powerfax was C.W. Kalbfus, who had begun his career with Lagonda Manufacturing. Publication of the magazine was discontinued following his retirement.

Demand for power was growing rapidly. By the end of the 1920s, Elliott was in a strong position to capitalize on the boom, providing municipal power plants, mines, factories, hospitals, universities and other large facilities all over the U.S. with "everything but the boiler." Elliott turbine generators operated in plants from California to Maine. Elliott equipment kept the lights on at the White House.





## Turbines and compressors

Both Kerr Turbine and Ridgway Dynamo and Engine Company added steam turbine designs to Elliott's product line. At the same time that Elliott was completing its acquisition of Ridgway, it closed the Kerr plant in Wellsville and moved the turbine manufacturing operations to Jeannette. Elliott also began to redesign the Kerr turbine.

By 1930, Elliott had integrated and redesigned the Kerr and Ridgway turbines into a new product, introduced to the market as the Elliott "Y" line of steam turbines. The "Y" design was a single-stage turbine which contained one, two or three rotating stages but only one nozzle ring. Steam turbines continued to be built in Ridgway as generator drivers until 1934, when all steam turbine manufacturing was consolidated in Jeannette.

In 1927, Elliott also bought Rateau, Battu, Smoot and Company. By that time, the firm was struggling to compete against the larger equipment manufacturers in the market, many of which were also their subcontractors. Like the Ridgway and Kerr turbines, the Rateau, Battu, Smoot turbine design was integrated into the Elliott turbine lines manufactured in Jeannette.

The addition of Rateau, Battu, Smoot also added the first centrifugal compressors to Elliott's product portfolio. Along with his contributions to the development of steam turbines, Dr. A. C. E. Rateau built the first centrifugal compressor around the turn of the century. In 1904, Dr. Rateau had a steam turbine-driven air compressor in service at the Bethune Collieries in France. By 1911, Ridgway Dynamo and Engine Company was manufacturing these air compressors, or blowers, under license with Rateau, Battu, Smoot.

Elliott engineers recognized the need to modernize the Rateau, Battu, Smoot compressor design to remain competitive. Elliott's "Type O" blower was introduced in 1927, and the single-stage, single-inlet, overhung design quickly became widely accepted. Many Elliott design innovations are still used in single-stage compressors today. A key improvement was the change from closed impellers to radial blade open impellers, which required close tolerances but could be operated at higher speeds. Elliott sold hundreds of these compressors for applications such as nickel and copper smelting, sewerage aeration, and the manufacture and distribution of artificial gas. Longevity was a hallmark of these machines. There are reports of Elliott blowers operating for more than 70 years. Blowers continued to be manufactured at Ridgway until 1934, when production was transferred to Jeannette.

The additional production of turbines and compressors, along with increasing sales of other large Elliott apparatus such as condensers, ejectors and deaerators required the expansion of the factory in Jeannette. A large addition to the main shop was completed in 1930. Employment then stood at nearly 1,100, and revenues had doubled since the Kerr acquisition.



