

A NATIONAL HISTORIC MECHANICAL ENGINEERING LANDMARK

EDGAR STEAM-ELECTRIC STATION

WEYMOUTH, MASSACHUSETTS

1925

**The First Commercial 1,200 Psi
Steam Plant In the World**

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS



Boston Edison Company
Weymouth, Massachusetts
May 1976



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THE EDGAR STEAM-ELECTRIC STATION
WEYMOUTH, MASSACHUSETTS

In the early 1920's, the Boston Edison Company (then known as the Edison Electric Illuminating Company of Boston) acquired in Weymouth, Massachusetts, a piece of property consisting of 20 acres of land and 40 acres of flats on the banks of the Fore River. The area included a deep water harbor for handling large coal barges that could unload directly at the wharf, and an inexhaustible supply of water for circulating through the power plant condensers. The location made it possible to reach suburban territory without running transmission lines through the city of Boston.¹ This was, in short, an ideal site for a new station to provide electricity for its expanding business.

At that time, steam pressures ranged in the neighborhood of 300 psi, while the first plant for 500 psi was reportedly in early stages of design. It would be some time before the development of molybdenum and, later, chrome-molybdenum alloys would permit raising steam temperature appreciably, but the materials then available could be used at higher pressures if someone would take the lead. Mr. Irving Fdwin Moulthrop, then Assistant Superintendent, Construction Bureau of the Edison Electric Illuminating Company of Boston, long active in work of the ASME Boiler Code Committee, guided his company and the electric utility industry on a major step forward into the higher pressure range of 1,200 psi steam.

After studying the gains in efficiency to be had from higher steam pressures and temperatures, and confined by the limits of then available commercial equipment, it was decided to include in the original development at Weymouth one 1,200 psi boiler and turbine acting as a unit, in conjunction

with a 350 psi system consisting of three 350 psi boilers supplying steam at 700° F to a header feeding steam to two 350 psi turbines.² The high-pressure steam at 1,200 psi and 700° F expanded down to 375 psi and 500° F in the General Electric high-pressure turbine, rated at 3,150 kw. Exhaust steam from this turbine returned to the boiler for reheat to 700° F, then was discharged to the 350 psi header for supplying the "normal pressure" (350 psi) turbines for expansion to one inch Hg absolute. The two 350 psi turbines were each rated 32,000 kw.

The 1,200 psi steam boiler was a modification of the conventional Babcock & Wilcox cross drum type.³ Its heating surface consisted of two-inch tubes, 15 feet long, arranged in three passes. The drum, a solid steel forging 32 feet long, four feet in diameter, and with walls four inches thick, came from the gun works of the Midvale Steel Company.

The first phase of construction at Weymouth went into commercial operation in December, 1925, establishing a new record for economy by producing a kilowatthour of electricity from less than one pound of coal.⁴ At that time it was common for other "electric light" plants to burn five to ten pounds of coal for one kilowatthour. This record-making high-pressure unit was the first one of its kind operating in the world. Bailey Meter controls were provided for operating the high-pressure boiler.

Another "first" was the X-raying of all steel piping used for this 1,200-pound steam service, as well as the casings of the turbine itself, to insure a flawless sub-surface. Interestingly, this general method is standard procedure in engineering specifications today.

The station was designed and built by Stone & Webster, Inc., Boston engineers, under Mr. Moulthrop's direction. Although his name appears on

all drawings of the project as Assistant Superintendent, Construction Bureau of the Edison Electric Illuminating Company of Boston, very shortly thereafter he became Chief Engineer.

After nearly two years of operation, it was reported that no difficulty had been experienced in handling the high-pressure unit, and the first extension of the station included two more high-pressure (1,400 psi) boilers with a 10,000 kw high-pressure turbine and a 65,000 kw "normal pressure" (350 psi) main generating unit. Other electric utilities across the country observed the experiences at Weymouth with interest, and higher pressures continued to be specified from this time forward.

The station is named for Charles L. Edgar, an electrical engineer, who studied under Thomas Alva Edison and served as president of Boston Edison for 32 years. During his presidency, Edgar Station set a United States commercial record for the efficient use of high-pressure steam for electric generation.⁴

Predating its status as a National Historic Mechanical Engineering Landmark, Edgar Station has long been a center of community interest in the Weymouth area. It was the subject of a picture postcard by the Tichnor Bros. Company of Boston in the mid-1950's.

When the station was fueled by coal, its yards held nearly 300,000 tons of coal. The slanting coal chute spanning the access street to the Fore River Bridge is a landmark for lost travelers. Today, Edgar Station's coal yards have been replaced with residual oil storage tanks, although the long-familiar coal chute remains. The days of 12,000-ton colliers docking and unloading coal at the rate of 800 tons an hour are history.

What remains is Edgar Station itself, a monument to the far-sighted thinking of Boston Edison engineers and a station emulated for its efficiency and reliability.

Irving Edwin Moulthrop

1865-1957

Mr. Moulthrop was born in Marlborough, Massachusetts,⁴ in 1865. After graduating from high school, he worked as an apprentice with the Whittier Machine Company, Roxbury, Massachusetts. In that organization, he rose to the position of chief draftsman when he resigned to join the Edison Company in the same capacity in 1892.

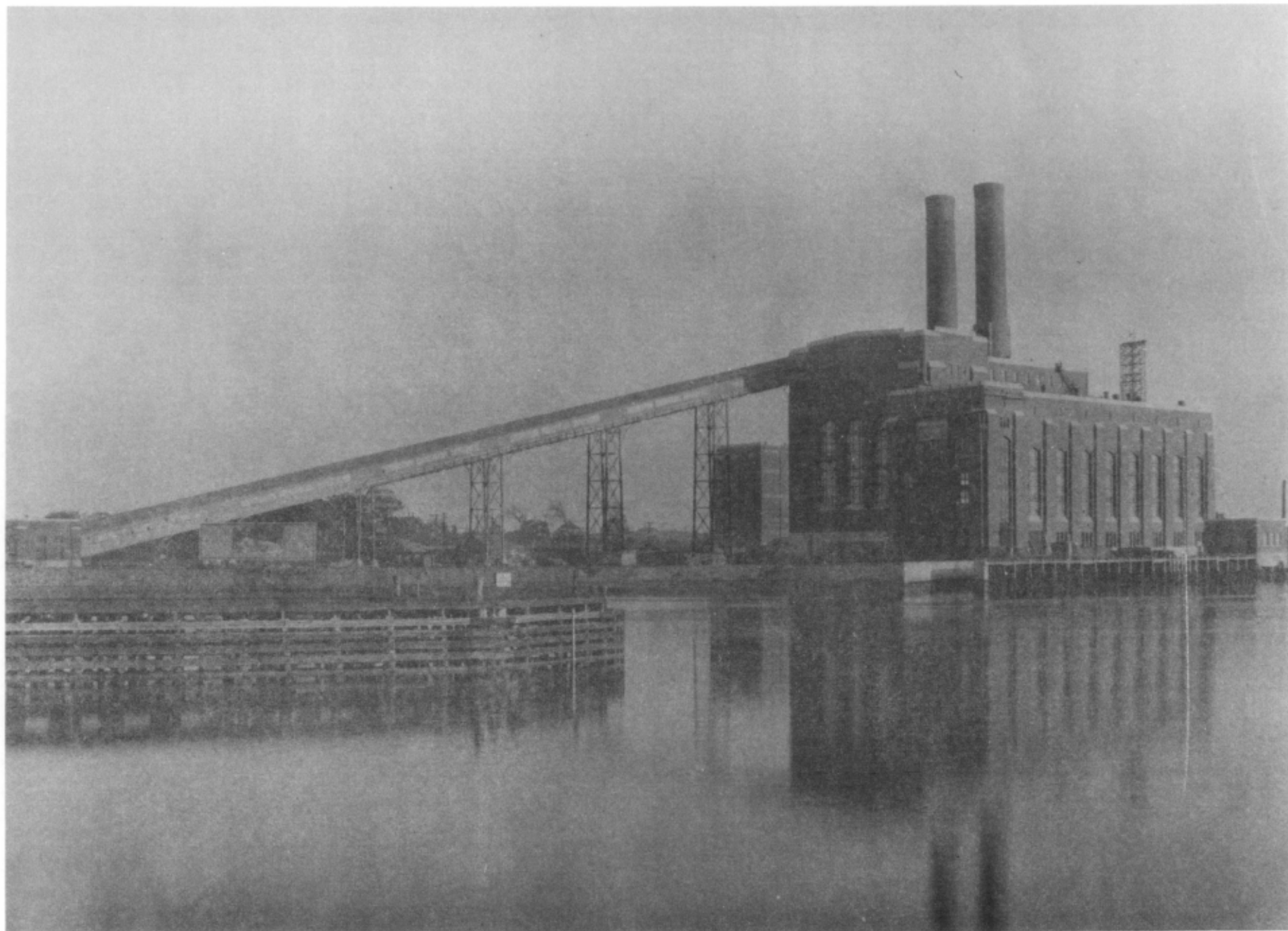
Meeting the challenges of the growing electric utility business, Mr. Moulthrop became a leader in the power field, both in his own organization where he held the position of chief engineer for many years, and in the related engineering societies. He held various offices in the Boston Section of The American Society of Mechanical Engineers and the Engineering Societies of New England. He was active in the work of the ASME Boiler Code Committee,⁵ having helped to formulate the first Boiler Code Committee in 1912 and continued over 30 years until his resignation in 1943. Following the successful operation of Edgar Station, Mr. Moulthrop contributed numerous papers to engineering societies in the U.S.A., Canada, and the United Kingdom, largely in consideration of the use of higher pressures in steam power plants. He was President of the Engineers Club of Boston from 1925 to 1937, when this organization was striving to bring all Boston engineers together with a common meeting place and library.

Because of the pioneering aspects of his career, especially concerning Edgar Station, many honors were bestowed on him, including the Elliot Cresson Gold Medal of the Franklin Institute of the Commonwealth of Pennsylvania in 1930 and an honorary degree of Mechanical Engineer from Stevens Institute of Technology in 1931, also the New England Award of the Engineering Societies of New England⁶ in 1942.

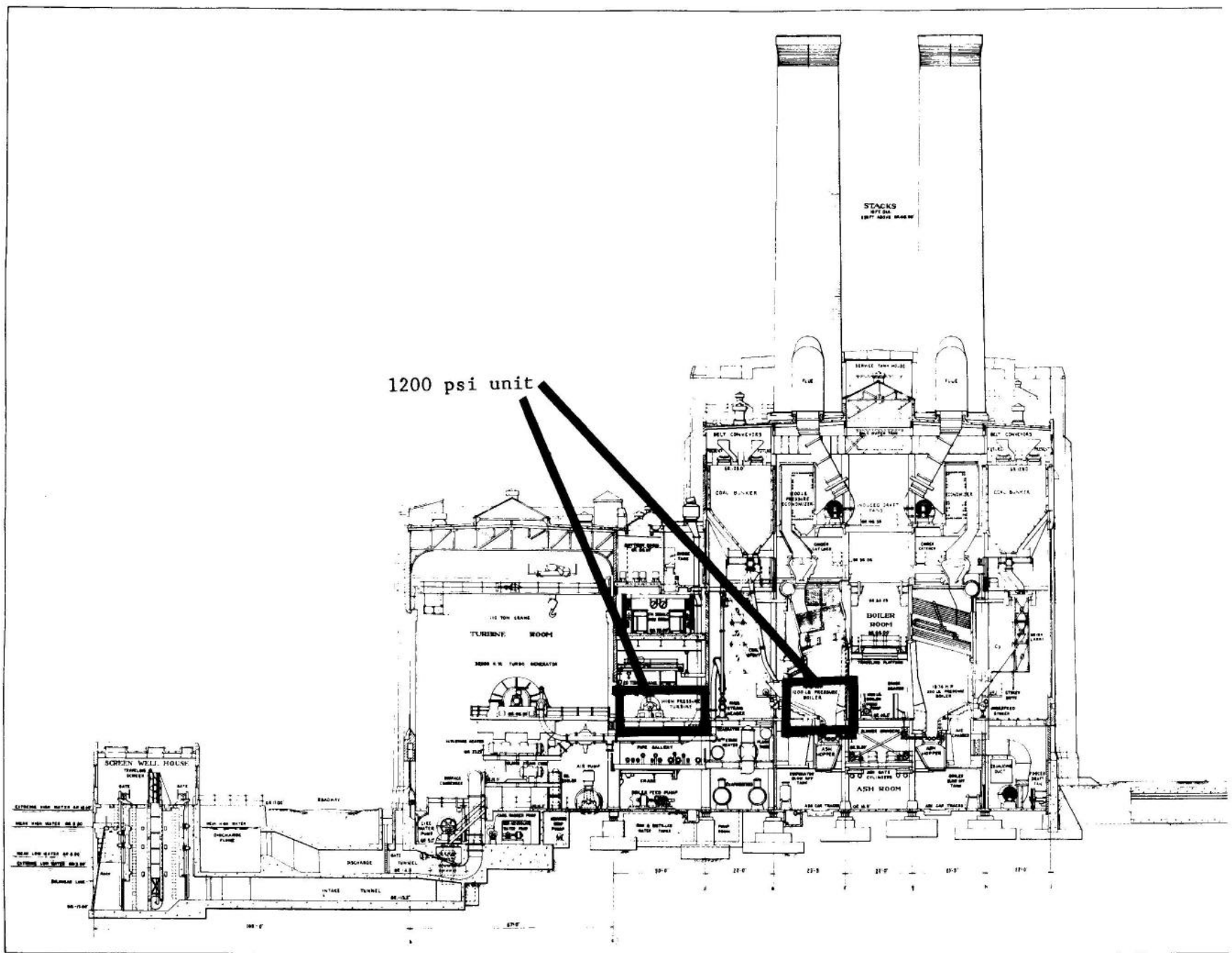
The citation for this award read as follows:

"An engineer, typical of New England Courage and Industry, who by his own effort attained distinction among his fellows. A pioneer builder and operator of high pressure steam electric generating stations; an executive with large responsibilities, but with time to give to his profession's technical and social advancement - a public spirited citizen."





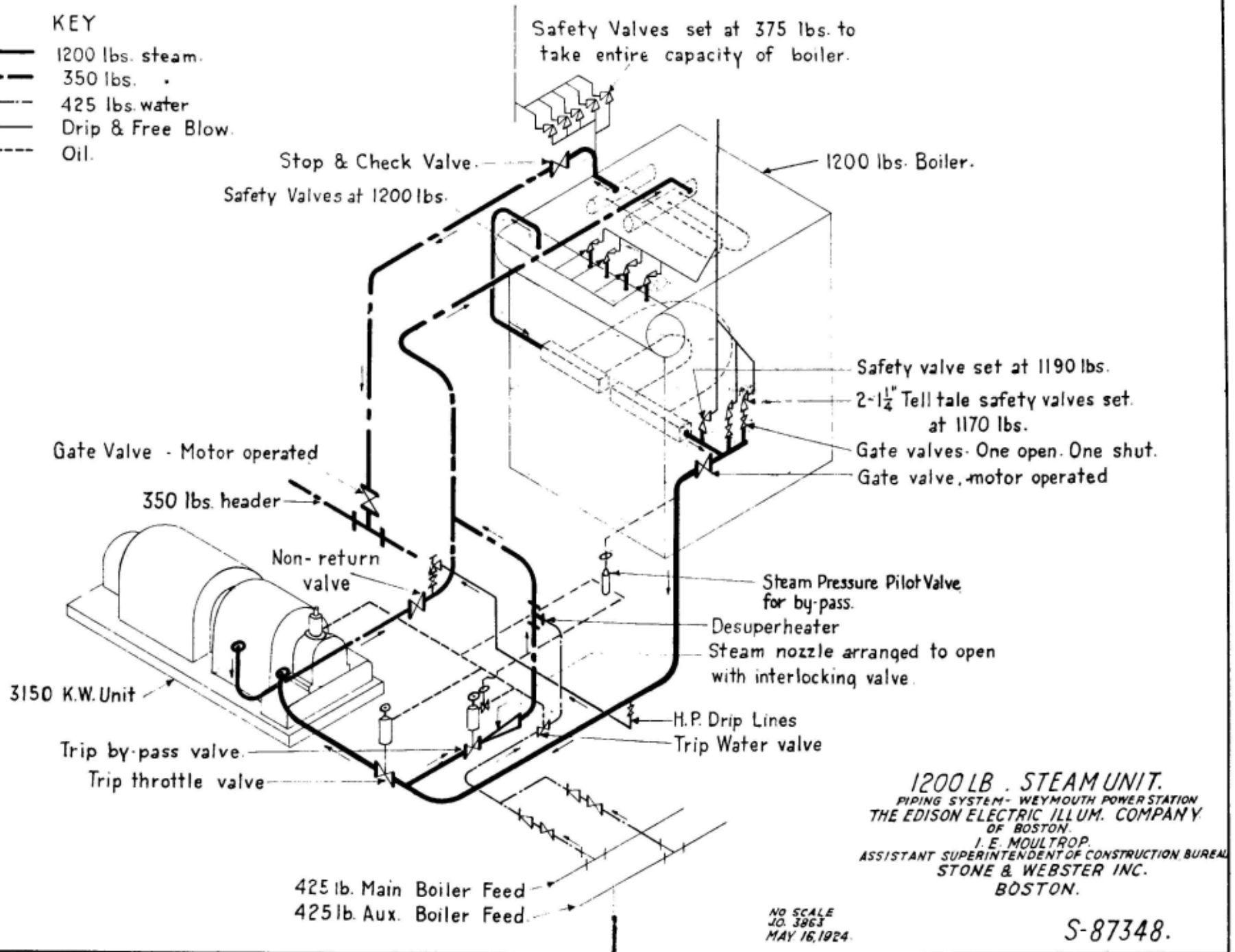
Weymouth Station - Initial Installation



Cross-section, Edgar Station, 1925

KEY

- 1200 lbs. steam.
- - - 350 lbs. "
- · - · 425 lbs. water
- Drip & Free Blow.
- - - Oil.



Safety Valves set at 375 lbs. to take entire capacity of boiler.

Stop & Check Valve.
Safety Valves at 1200 lbs.

1200 lbs. Boiler.

Safety valve set at 1190 lbs.
2-1/2" Tell tale safety valves set at 1170 lbs.
Gate valves - One open. One shut.
Gate valve, motor operated

Gate Valve - Motor operated

350 lbs. header

Non-return valve

Steam Pressure Pilot Valve for by-pass.

Desuperheater
Steam nozzle arranged to open with interlocking valve.

3150 K.W. Unit

H.P. Drip Lines
Trip Water valve

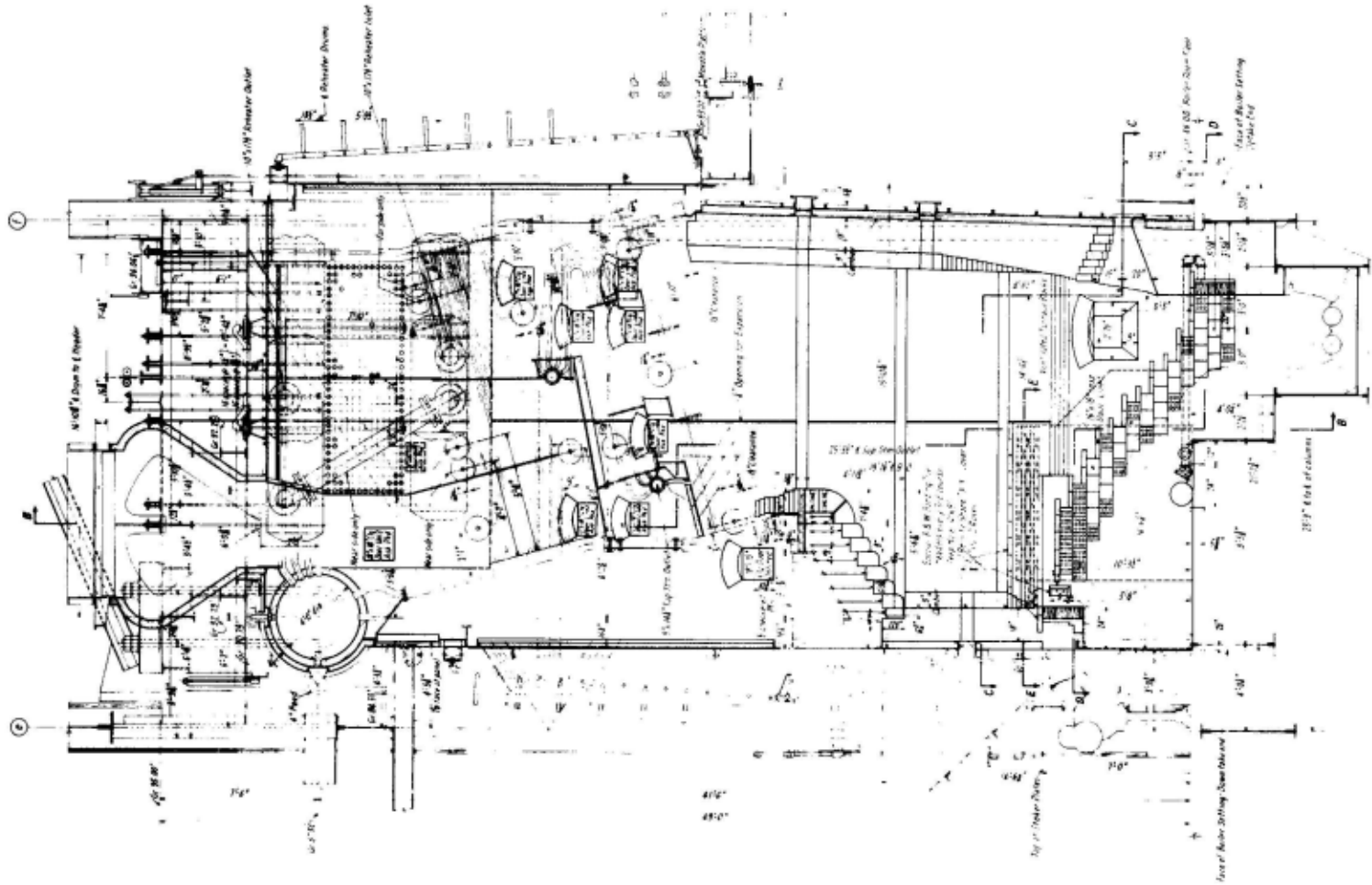
Trip by-pass valve.
Trip throttle valve

425 lb. Main Boiler Feed
425 lb. Aux. Boiler Feed

1200 LB. STEAM UNIT.
PIPING SYSTEM - WEYMOUTH POWER STATION
THE EDISON ELECTRIC ILLUM. COMPANY
OF BOSTON.
J. E. MOULTROP,
ASSISTANT SUPERINTENDENT OF CONSTRUCTION BUREAU
STONE & WEBSTER INC.
BOSTON.

NO SCALE
JO. 3963
MAY 16, 1924.

S-87348.



NO.	DESCRIPTION	DATE	BY	CHKD.

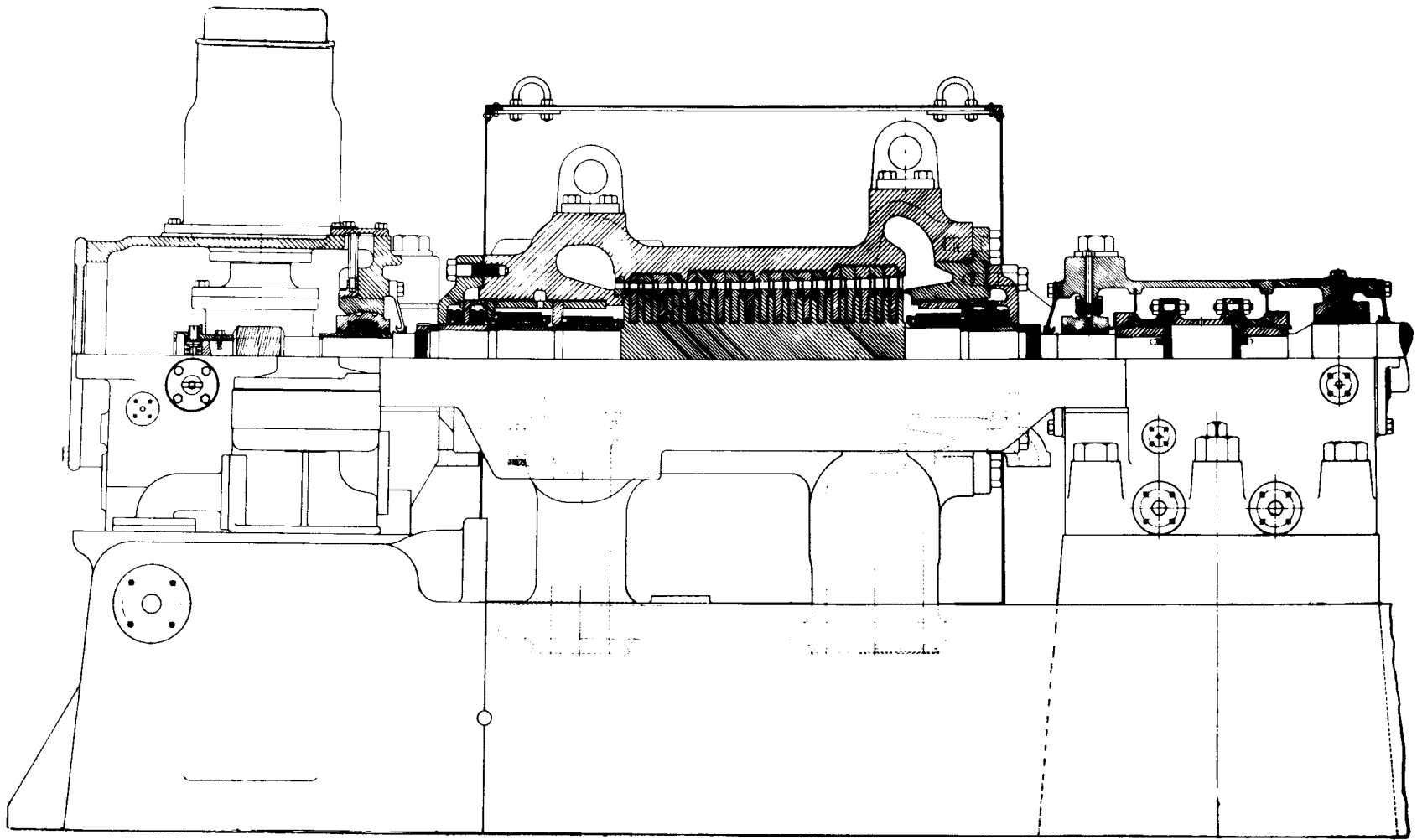
TABLE OF ADDITIONS AND REVISIONS
USE ONLY PRINTS OF LATEST DATE

1200 LB. BOILER SETTING - LONG SECTION
 COMBUSTION SYSTEM - WYOMOUTH POWER STATION
THE EDISON ELECTRIC ILLUMINATING COMPANY
OF BOSTON
 I. E. MOULTROP
 ASSISTANT SUPERINTENDENT CONSTRUCTION BUREAU
STONE & WEBSTER

SCALE - 1/4" = 1 FT
 APR. 4, 1924
 J. O. NO. 3668

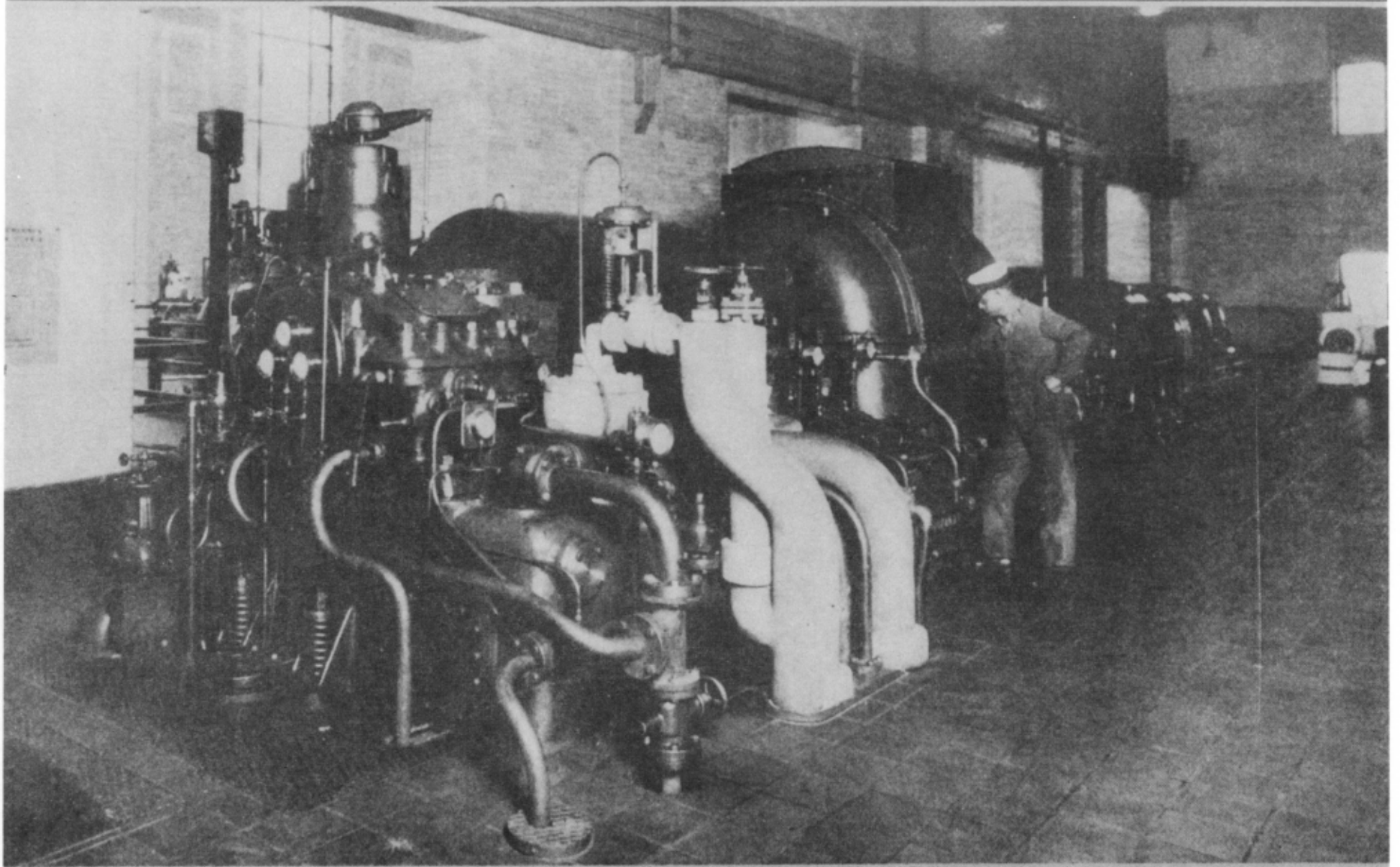
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SECTION			
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3150 kw - 1200 psi Turbine Cross Section

1,200-Lb. Steam Pressure Turbine



CHARLES LEAVITT EDGAR STATION OF THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON



Irving E. Moulthrop
(1865-1957)

REFERENCES

1. "The Boston Edison's Place in the Electrical Industry," by Charles L. Edgar, President, at the Boston Chamber of Commerce, March 11, 1926.
2. "High Pressure Steam at Edgar Station," by I. E. Moulthrop, Chief Engineer, the Edison Electric Illuminating Company of Boston, and E. W. Norris, Engineer, Mechanical Division, Stone & Webster, Inc. ASME Transactions FSP-50-30.
3. "High Pressure Steam at Weymouth," by I. E. Moulthrop, Assistant Superintendent, Construction Bureau, the Edison Electric Illuminating Company of Boston, Stone & Webster Journal, Vol. 35, July-December, 1924.
4. Information provided by the Boston Edison Company.
5. Information provided by the ASME National Headquarters.
6. Information provided by the Engineering Societies of New England.