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# CLEVELAND INSPECTION BUREAU CLEVELAND, O.



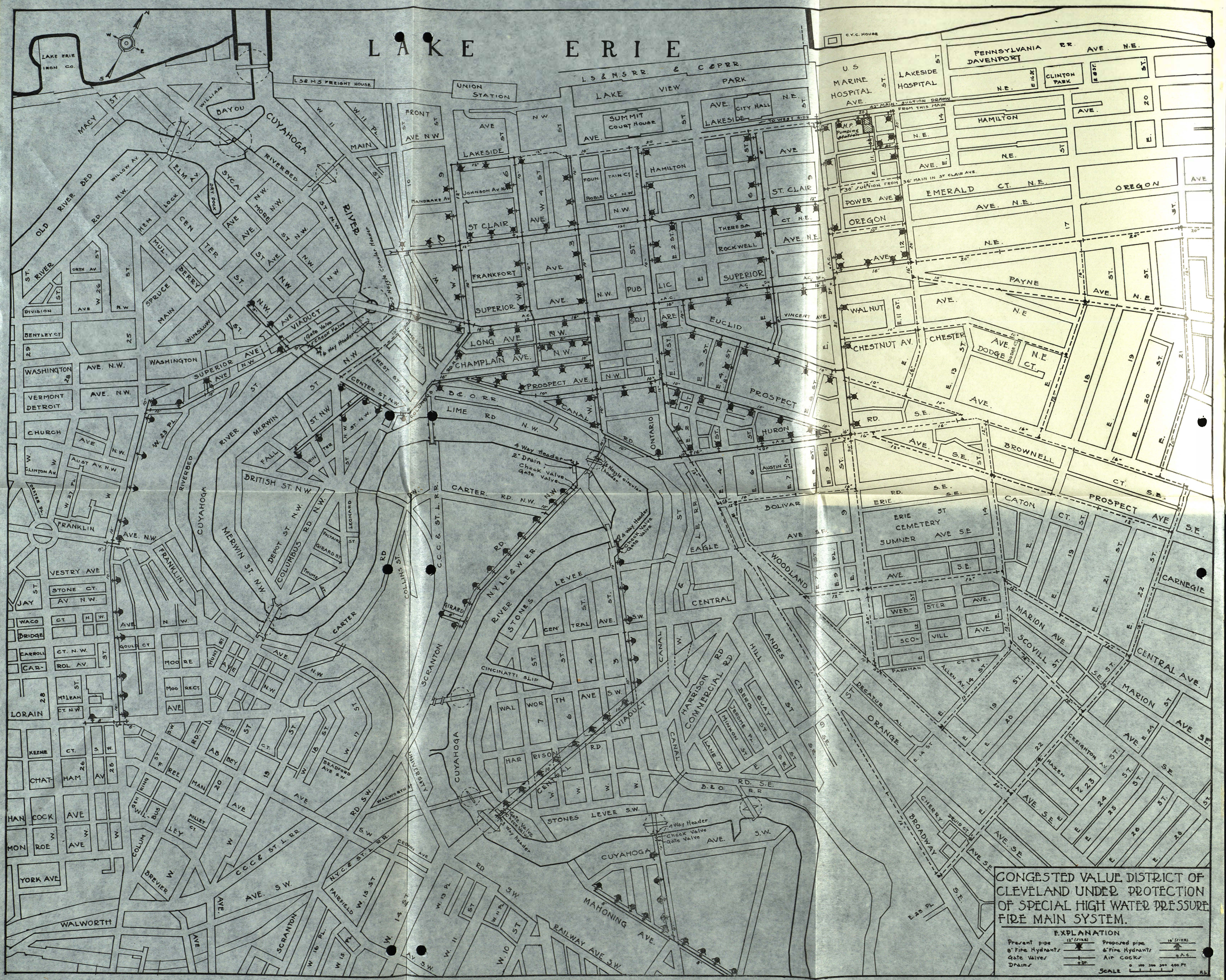
CLEVELAND HIGH PRESSURE STATION.  
(1108 Lakeside Avenue N. E.)

A description and map of the recently completed high pressure fire main and pumping system protecting the congested mercantile and light manufacturing value districts of Cleveland, together with report of demonstrating tests made the Ninth day of October, 1913

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JANUARY, NINETEEN HUNDRED AND FOURTEEN

# LAKE ERIE



**CONGESTED VALUE DISTRICT OF CLEVELAND UNDER PROTECTION OF SPECIAL HIGH WATER PRESSURE FIRE MAIN SYSTEM.**

EXPLANATION			
Present pipe	12" (12/12)	Proposed pipe	16" (16/16)
6" Fire Hydrant	6"	6" Fire Hydrant	6"
Gate Valve	GV	Air Cocker	A.C.
Drain	D		

SCALE 1" = 100 FT.

**CLEVELAND INSPECTION BUREAU**

PUBLISHERS OF FIRE INSURANCE SURVEYS  
AND ESTIMATES.

CHARLES H. PATTON, PUBLISHER

PLAIN DEALER BUILDING

CLEVELAND, O.

This Report is published for the use of Fire Insurance Companies interested in Cleveland, in order that a record of this valuable system of fire protection may be in their possession. Our Subscribers should have a correct idea of the merits of this fire protection service, which affects large value districts of Cleveland, in which they are more or less interested.

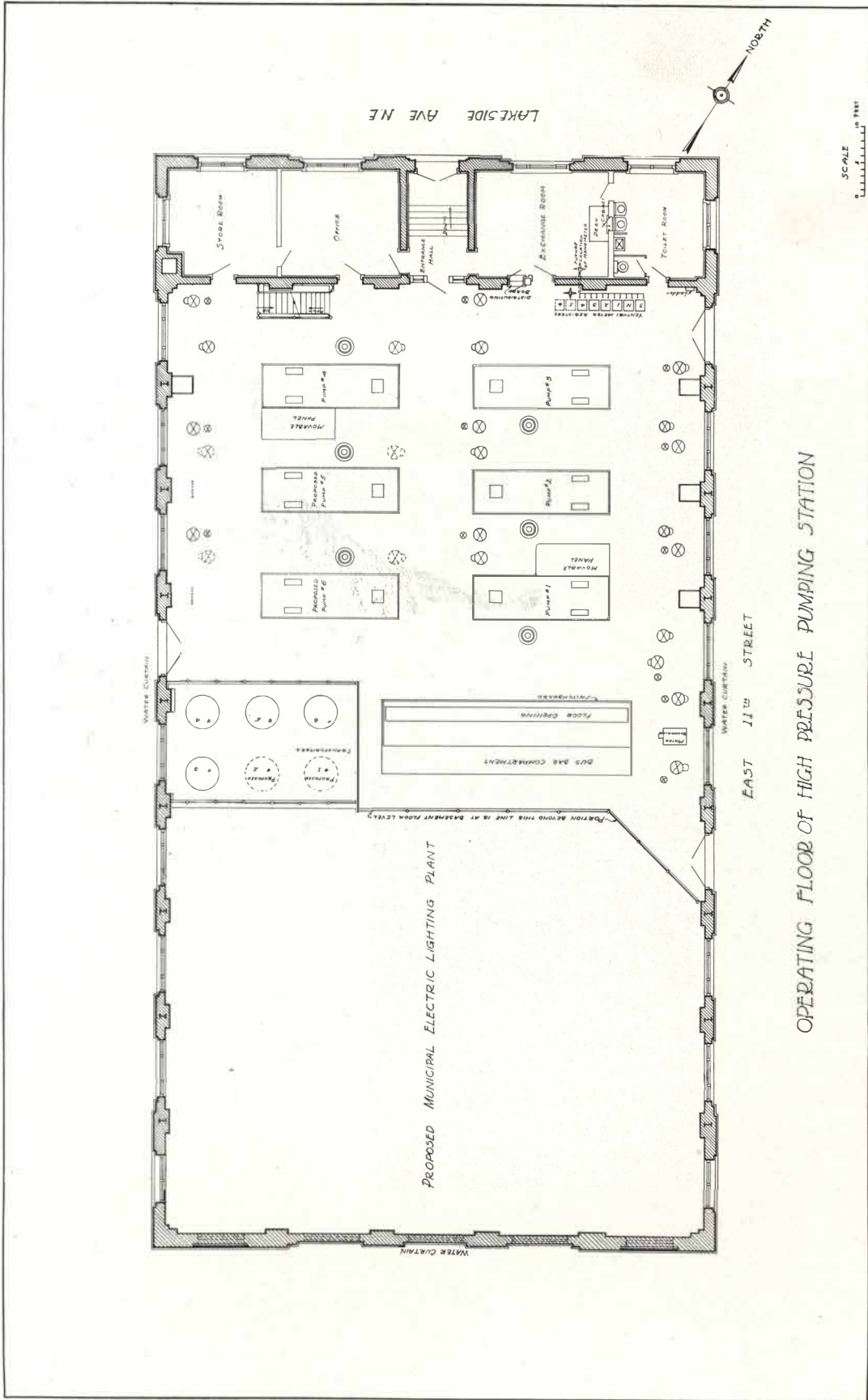
The thorough demonstrating tests herein reported gives assurance that this system withstood a severe trying out, the results being highly satisfactory.

Respectfully,

Cleveland Inspection Bureau,

C. H. Patton, Publisher

Cleveland, Ohio, January 1, 1914



LAKE SIDE AVE NE

EAST 11th STREET

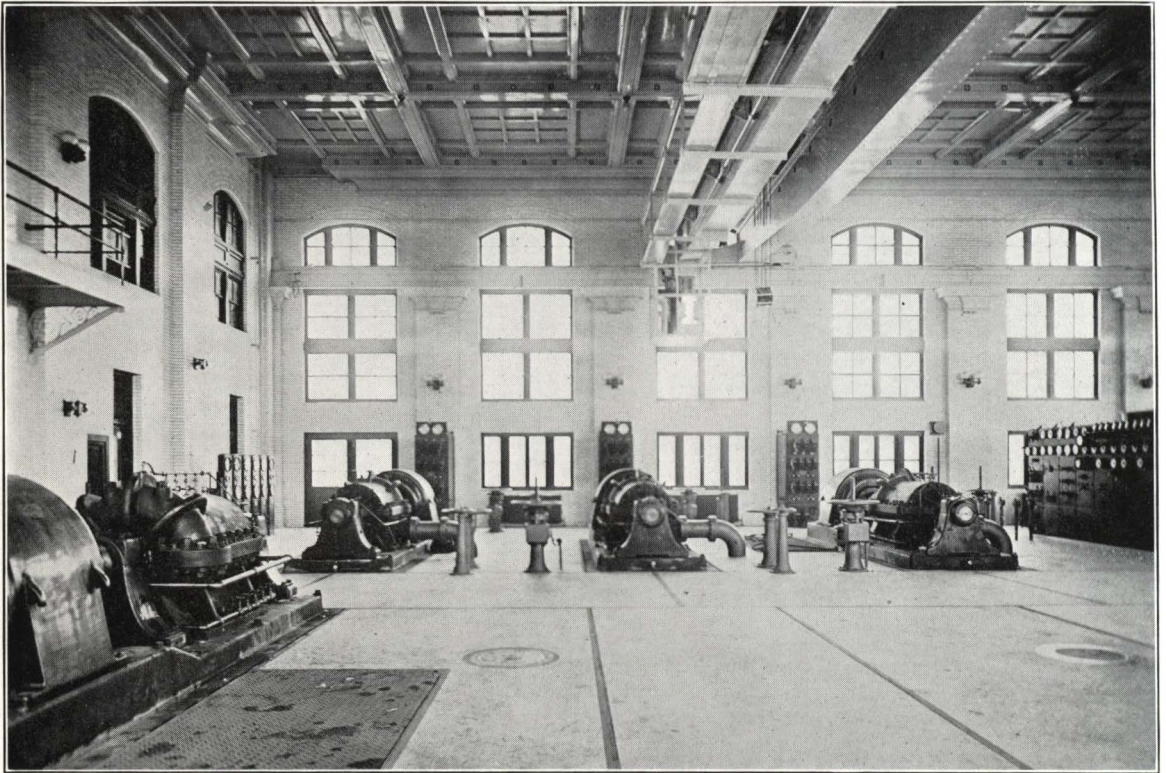
OPERATING FLOOR OF HIGH PRESSURE PUMPING STATION

SCALE  
1" = 10'

PROPOSED MUNICIPAL ELECTRIC LIGHTING PLANT

PORTION BEHIND THIS LINE IS AT BASEMENT FLOOR LEVEL





INTERIOR VIEW.

Operating floor, showing Electrically Driven Pumps, Switchboard, Control Boards, and Venturi Meters.  
(Vacant space to right for two additional pumps.)

## Summary of High Pressure Fire Protection Plant and System, and Districts under its Direct Protection

Owned and operated by The City of Cleveland, this System was formally opened for constant and active service on October 9th, 1913, on "Fire Prevention Day."

The demand for and value of an independent high pressure fire main system for the protection of the congested value districts of Cleveland was instigated by this Bureau and The Cleveland Chamber of Commerce, during April, 1904, shortly after the conflagration at Baltimore.

When presented, the City Officials favorably endorsed the project, and instituted the necessary measures of procedure to eventually have the system provided.

Finances of the City Treasury were such at the time as to necessitate some delay in providing funds for this elaborate and costly system of fire protection. It was not until the summer of 1907 that the first appropriation of money was wholly available for use. At that time the underground main system (both water and telephone mains) was installed. The underground system in question, up until the present time, was supplied by two Fire Boats, the "Cleveland" and "John Farley," stationed in the Cuyahoga River.

The new Pumping Plant and additional underground system of mains were installed during the summer of 1913. It will be noted that it has required a period of nine years, from 1904 when the project was first submitted, to finance and complete this important and necessary means of fire protection for the conflagration centers of Cleveland. The contemplated extensions, as shown on the accompanying Map, it is hoped, will be completed and ready for operation within the next six months.

The districts under this protection comprise the principal Wholesale and Retail Mercantile and Light Manufacturing centres, representing large property valuations.

The principal value district under this protection is within and bounded by East 12th Street on the *East*; by Huron and Canal Roads on the *South*; by the Cuyahoga River on the *West*, and by Lakeside Avenue on the *North*. This may be considered as the "inner district." In addition to this, an outer territory is also protected, and will eventually be extended so as to establish what may be known as an "outer district," or circle, of protection.

In addition to the above, the present high service mains protect *West 25th Street*, from Detroit Avenue to Lorain Avenue; the *Lumber Districts* in the vicinity of West Third Street, West 4th Street, Scranton, Canal Road, and Mahoning Avenue. The mains in this latter named territory are now supplied by the Fire Boats, through headers, along the Cuyahoga River frontage. All property along the River frontages has direct protection from the Fire Boats.

The new Pumping Station is an isolated modern fireproof building, with outer walls protected with labeled wired glass windows and metal sash, and open sprinklers. The building is used exclusively for the purpose named, and is conveniently and centrally located.

The Pumping Machinery, and all apparatus used in connection therewith, was especially designed for this system, and is therefore of the most modern and highest type. Four pumping units, of 2,500 gallons capacity per minute each, electrically operated from two reliable sources of current, supply the system, a total minute capacity of 10,000 gallons being available from

the four pumps. The pumps may be operated individually or together. Under endurance tests made, the pumps proved that they could deliver at least 25% more than their rated capacity. The water supply to the pumps is adequate, is in duplicate, and may well be considered as always reliable and ample.

Hydrants, mains, valves, independent hydrant telephone service, and fire-fighting apparatus are all of modern types, and appear to meet present demands.

The Pumping Station is well maintained and manned by competent men at all times. Fire Department Stations are centrally located in the districts under protection, with closely located additional stations in the outer districts.

Further details and description of the system as a whole are contained in this publication under respective headings. (For additional information concerning fire-fighting facilities of City of Cleveland, see Report No. 10 of the National Board of Fire Underwriters of October 1912.)

Mr. L. W. Theis, Engineer, Cleveland Inspection Bureau, contributes the details of this Report.

This Bureau is also indebted to the Officials of the Cleveland Water Works Department, and others, for courtesies extended toward compiling the details and demonstrating tests for this publication.

CLEVELAND INSPECTION BUREAU,

C. H. PATTON, Publisher.

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### **FIRE INSURANCE RECOGNITION.**

In anticipation that this System would be fully completed and in active operation within a few months after the underground mains were laid, this Bureau, in September, 1907, in recognition of the additional fire protection to be thus afforded, bulletined a reduction in fire insurance estimates.

This reduction amounted to about eight percent in the then prevailing insurance estimates in force, and principally affected Wholesale and Retail Mercantile and Light Manufacturing risks. Roughly estimated, this reduction in the cost of insurance probably netted the insuring public a yearly saving of at least \$50,000, and placed the City of Cleveland in a minimum class of its own with respect to the future basic cost of insurance.

Inasmuch as six years elapsed before this System was finally completed, it will be observed that the reduction in cost of insurance extending over this six years period amounts to a large contribution towards paying for the cost of this installation, and may be considered as a future annual contribution.

Under these conditions, no additional reduction in fire insurance estimates is contemplated at the present time for this specific improvement.

CLEVELAND INSPECTION BUREAU.

# THE SYSTEM IN DETAIL.

## CONSTRUCTION OF HIGH PRESSURE PUMPING STATION.

**Height.**—One story, basement and attic, extending 43 feet above street level.

**Size**—Exterior dimensions, 80' 8½" x 155' 8½".

**Foundation.**—Concrete footings and shale brick.

**Walls.**—Independent, steel wall columns, enclosed by red shale pressed brick on the exterior, and white enamel brick on the interior. The inside space of the brick walls enclosing the small rooms on first floor, and on mezzanine floor, are constructed of hard burned hollow brick. All exterior walls parapetted above roof and coped.

**Roof and Supports.**—Reinforced concrete slabs, supported by steel trusses and purlins, which are resting on steel columns in side walls and columns encased in brick. The concrete roof is coated with a cement binder, followed with a coat of asphalt cement, and covered with three layers of asbestos felt, saturated with asphalt, extending up the wall, turned in and counter-flashed with copper.

**Floors and Supports.**—Basement, concrete cement finish; main or operating floor is constructed of structural beams, brick arches, cinder concrete backing, and finished with tile.

**Ceilings.**—Metal drop ceiling, suspended on metal supports, extending from roof trusses. Plaster on brick and tile in the various rooms at north end of building. Cement finish in basement.

**Floor Opening.**—Open stairs from basement to first floor, and one from first to mezzanine floor, having iron stringers with angle iron brackets and cast iron treads.

**Partitions.**—Of hollow tile. The reinforced concrete foundations for pumps are self-supporting and entirely independent of main or operating floor.

## EXTERIOR OPENINGS AND EXPOSURES.

All window openings are protected with labeled wired glass, metal frames and sash. Open sprinklers over all openings in east, south and west walls, supplied by a separate 4-inch connection with the city street main in Lakeside Avenue. Static pressure at street level about 40 pounds. Each wall system has independent valve control. Direct exposure not serious.

## THE EQUIPMENT.

The High Pressure water service equipment was installed during the summer of 1913, by the Allis-Chalmers Company, of Milwaukee, Wis., and under their direction, and was made subject to the approval and specifications of the Director of Public Service and Superintendent of the Water Works Department. Following is a detail of the entire equipment as now installed:

**Pumps.**—Four Allis-Chalmers, five stage centrifugal pumps, having a rated capacity of 2,500 gallons per minute each, connected in such a way that each unit can be operated entirely independent of each other, with necessary gates and cross connections.



**Suction.**—Each of the above-mentioned pumps have a 12-inch suction nozzle, equipped with an electrically controlled valve. These suction nozzles are connected in basement to a series of piping 24 inches in diameter, with necessary electrically operated valves, so that the suction for pumps may be taken through the 24-inch connection to 42-inch street main in Lakeside Avenue, the latter being a direct main running from East 49th Street (formerly Kirtland Street), through tunnel under river, furnishing the domestic supply for the West Side. In addition to the above, there is a 24-inch suction line, with an electrically operated valve, enlarged to 30 inches in East 11th Street, Hamilton Avenue, and East Ninth Street, and tied to the 36-inch main in St. Clair Avenue.

**Discharge.**—10-inch discharge nozzle from each pump (equipped with electrically operated valve), connected to a system of piping in basement, which is tied to the general underground main supplying the High Pressure System.

**Motors.**—Each pump is directly connected by a flexible shaft, to a 550 horsepower 440 volt, three phase alternating current, enclosed type induction motor, of the Allis-Chalmers Company Bullock type, and is designed to operate at a speed of approximately 1,180 R. P. M. The motors are fan-cooled, ventilating air taken in at both ends of motor, and discharging into basement. The motor and pump of each unit are mounted on one solid bed plate.

**Incoming Electric Power Mains.**—Two 11,000 volt high tension A-C underground cables from the Cleveland Electric Illuminating Company, entering basement in two bottom cells of the high tension compartments, equipped with single throw disconnecting switches. All primary oil switches for the control of the 11,000 volt current, are enclosed in cells, above the pump floor, which are constructed of brick having fire-proof barriers for separating the different phases. All primary oil switches are electrically operated with D. C. control. Each switch is controlled by a master switch, located on the main switchboard, having two indicating lamps.

**Transformers.**—From the oil switches the 11,000 volt lines are connected to four three phase self-cooled transformers, having a primary voltage of 11,000, and a secondary voltage of 460, with sufficient oil in these transformers to completely immerse the core and windings. These transformers are so connected that each motor for operating pump has its own individual transformer, and in case of a breakdown of any one of the transformers, switches are so arranged on main switchboard that the motor can operate from either transformer.

**Main Switchboard.**—The board is of the polished slate panel type, having a total of eighteen panels, two panels for each pump having necessary controlling devices such as circuit-breakers, ampere meters for each phase, and volt meter, control for operating motors on suction and discharge valves, switch for automatic controlling board, pilot lights and overload relays. Two panels, on which are mounted instruments for the incoming high tension line. These instruments consist of ampere meters, K-W meters, pilot lights, showing whether current is on or off, and an oil circuit switch. One D-C panel, on which are mounted circuit breakers, volt and ampere meters, six double pole knife switches for controlling the current to motors operating valve, solenoids, pilot lights and control boards, fan and crane, and a double throw switch for rotary convertor, so that in case the D-C current, which is supplied by the Cleveland Electric Illuminating Company, should fail, the rotary convertor will supply the current for the D-C motors. Upon another panel or board are mounted the instruments for controlling the rotary convertor, and an additional panel for water gauges connected to the suction and discharge lines, which are of the recording and observing type; six switches for the remote control of motors operating valve on the suction, discharge and crossover main in basement. Five blank panels for the two proposed pumps, and an additional incoming high tension line.

**Controller Boards.**—Each unit has an independent finished black <sup>man</sup> slate board of the same height as the main switchboard, on which are mounted controlling devices of the Cutler-Hammer type, suction and discharge gauge. All wiring and bus-bars at rear of board are protected by a heavy wire screen. The resistances for these controlling boards are located in basement.

**House Lighting.**—D-C 220 volt from the Cleveland Electric Illuminating Company, used for pilot lights on switchboards, motors operating valves, and fans and crane. Rotary convertor used in case of emergency. All power and lighting wires are installed in conduit. Separate service for house lighting.

**Venturi Meters.**—Of the recording type, installed on suction and discharge from pump, so that the input and output in gallons may be determined at all times. A manometer is installed in connection with the Venturi meters, so that the Venturi meters can be checked by this apparatus.

**Water Pressure Regulators.**—A 10-inch Ross pressure regulator is installed in the discharge line from pumps, so that the pressure may be regulated between the limits of 100 and 270 lbs. A pilot valve for controlling the pressure regulator for each pump is located on main operating floor in front of pressure gauge panel of the main switchboard.

**Water Pressure.**—The underground mains in the congested value district are kept full of water at all times by a 2-inch connection at the High Pressure Pumping Station at ordinary city pressure of about 40 lbs. When pumps are operating, the discharge pressure is regulated by the pressure regulators between the limits of 100 and 270 lbs.

The fire boat mains protecting the manufacturing and lumber districts and the West Side mercantile district, are kept full of water except during the cold weather, and are operated under 100 to 150 lbs. pressure. It is proposed to connect these mains with the central system.

**Method of Operation.**—When an alarm of fire is sounded in the district under High Pressure fire service protection, the attendant in charge immediately closes D-C switches on main switchboard. These switches have control of the electrically operated valve, solenoids, control board and pilot lights, on main switchboard. The electrically operated valve on discharge of pump No. 4 is then opened, and the attendant in charge ready and waiting for orders to operate pumps.

**Signalling System.**—Direct underground telephonic signal service between all hydrants (on High Pressure System), and Central Fire Exchange and Pumping Station. Open metallic circuit, 30 volt potential, supplied from storage batteries at Central Station. Direct underground lines from Central Fire Exchange to Pumping Station. Stations at hydrants are of the ordinary fire alarm box type, equipped with plugging device, to which a portable telephone is attached. Fire Department Chiefs and companies carrying high pressure equipment, are supplied with portable phones. The alarms at the station are received on a stamp register and by a loud sounding gong, with one man at desk at all times ready to answer telephone calls from stations at hydrants to operate pump.

**Attendants at Pumping Station.**—Four men and one electrician on duty at all times, with sleeping quarters at station. Relief:—One day off in four.

**Area Protected by High Pressure Service Mains.**—The boundary mains are laid in East Ninth Street and north of Superior Avenue in East 12th Street on the east; Huron Road and Canal Road on the south; Lakeside Avenue on the north, and West Ninth Street and Columbus Road on the west; together with a spur in St. Clair Avenue and Superior Avenue extending to Cuyahoga River frontage, and in Center and Fall Streets, N. W. A gridiron system of mains within this boundary takes care of the interior territory.

## LOCATION AND SIZE OF MAINS.

Location.	Size
East Ninth Street from Lakeside Avenue to Huron Road.....	20 inch
East 12th Street from Superior Avenue to Lakeside Avenue.....	20 inch
Lakeside Avenue from East Ninth Street to East 12th Street.....	20 inch
Superior Avenue from East 12th Street to West Ninth Street.....	16 inch
Huron Road from East Ninth Street to Ontario Street.....	16 inch
Superior Avenue from East Ninth Street to East 12th Street.....	16 inch
St. Clair Avenue from East Ninth Street to West Ninth Street.....	12 inch
West Ninth Street from Lakeside Avenue to Superior Avenue.....	12 inch
Ontario Street from Huron Road to Prospect Avenue.....	12 inch
Lakeside Avenue from West Sixth Street to West Ninth Street.....	12 inch
Ontario Street from Prospect Avenue to Lakeside Avenue.....	10 inch
Canal Road from Huron Road to West Third Street.....	10 inch
Euclid Avenue from East Ninth Street to Superior Avenue at Public Square...	10 inch
Prospect Avenue from Ontario Street to Champlain Avenue.....	10 inch
Prospect Avenue from East Ninth Street to Ontario Street.....	10 inch
Champlain Avenue from West Third Street to Columbus Road.....	10 inch
Columbus Road from Champlain Avenue to Center Street.....	10 inch
West Third Street from Canal Road to Lakeside Avenue.....	10 inch
West Sixth Street from Champlain Avenue to Lakeside Avenue.....	10 inch
East Fourth Street from Euclid Avenue to Prospect Avenue.....	8 inch
East Sixth Street from Euclid Avenue to Lakeside Avenue.....	8 inch
St. Clair Avenue spur.....	12 inch
Superior Avenue spur.....	10 inch

Note.—The proposed High Pressure Service extension mains are shown by dotted lines on the accompanying map.

## FIRE BOAT SERVICE MAINS.

A 10-inch main in **West 25th Street** from river frontage at foot of Center Street N. W. to Lorain Avenue, with a 10-inch spur one block westward in **Lorain Avenue**, and an 8-inch spur two blocks westward in **Center Street**.

A 10-inch main in **Scranton Road N. W.** extending to and one block westward in **Girard Street**.

A 10-inch main in **West Third Street** extending south from river frontage at foot of West Third Street to river frontage at foot of Stone's Levee S. W.

A 10-inch main in **West Fourth Street** from river frontage to Mahoning Avenue, and an 8-inch spur several blocks east and west in **Mahoning Avenue**.

The system of mains is supplied by two fire boats, the "Clevelander," which was built in 1894 (having a wooden hull), located at the foot of Superior Avenue, having a rated capacity of 4,000 gallons per minute.

The "John Farley," installed in 1886 (and completely overhauled in 1909), located at West Third Street and Cuyahoga River, having a rated capacity of 3,500 gallons per minute. (For full details, see page 15 of Report on the City of Cleveland published by the National Board of Fire Underwriters, October, 1912.)

**Hydrants.**—Those in the congested mercantile districts are of the Matthews Special Type, with 8-inch barrel, four 3½-inch outlets with 2½-inch reducer caps, standard threads. Each outlet is controlled by an independent valve, with main valve controlling the four. Of double frostproof jacket type, with approved drip valve. Set inside street curb line and connected to the fire main system through an 8-inch branch pipe well laid below frost line. Hydrants are located at an average distance of about 200 feet apart. The hydrants on the fire boat mains have two 3½-inch gated outlets, 6-inch barrel and 6-inch gated connection to mains. These hydrants are supplied by fire boats through headers along the river front.

#### **HIGH PRESSURE FIRE FIGHTING EQUIPMENT.**

4,300 feet of new 3-inch cotton jacketed rubber lined hose; 1,500 feet of this hose is carried on a gasoline driven hose wagon located at Hose Company No. 1 at West Third Street and Cuyahoga River; 1,500 feet on gasoline driven hose wagon at Hose Company No. 3 on Champlain Avenue near Ontario Street; 650 feet in reserve at each station.

The hose wagons were built by the Peerless and White Motor Car Companies. An adequate supply of nozzles ranging from 1¼-inch to 2½-inch in diameter, also a number of High Pressure pipe holders now in use. The city is about ready to purchase eight additional pipe holders of a more modern type. Full equipment carried on each wagon, such as wrenches, spanners, lanterns, gaskets, etc.

**Response to Alarms.**—No. 3 Company responds on first alarm to the congested value district. No. 1 Company responds on first alarm to the flats and West 25th Street congested mercantile districts.

#### **RECOMMENDATIONS.**

Several recommendations of somewhat minor importance, have been invited to the attention of the City Officials, the compliance of which is assured.

## DEMONSTRATING TESTS.

The Pump Manufacturers and the Insurance interests witnessed the following tests given by the City authorities, with results as shown, viz :

### ENDURANCE RUN SEPTEMBER 20, 21, 1913.

Started .....	8:30 A. M.
Finished .....	12:30 A. M.
Duration of Test.....	16 hours
Number of Pumps Operated.....	4
Diameter of Suction Nozzle .....	12 inches
Diameter of Discharge Nozzle .....	10 inches
Average R. P. M. during test.....	1,193
Average quantity of water discharged based on manometer of suction Venturi G. P. M. ....	11,706
Average discharge pressure at pump.....	274.1 lbs.
Average discharge head at pump.....	633.2 feet
Average suction pressure at pump.....	33.1 lbs.
Average suction head at pumps .....	76.5 feet
Increase of pressure due to pumps.....	241.0 lbs.
Increase of head due to pumps.....	556.7 feet
Average suction on supply main.....	33.3 lbs.
Average discharge pressure on fire line.....	181.7 lbs.
Average E. H. P. input to motors including all pumping station losses.....	2,572
Average station efficiency based on discharge Venturi meters.....	67.4%
Average station efficiency based on suction Venturi meter.....	64.1%

On October 9, 1913, "Fire Prevention Day," a test was made of the above pumps with 12 3-inch hose lines varying in length from 150 feet to 300 feet with nozzles ranging from 1 $\frac{3}{8}$  to 2-inch in diameter. Piezometer readings were taken at the nozzle with a minimum pressure of sixty pounds at the 2-inch nozzle, and a maximum pressure of 132 pounds at the 1 $\frac{3}{4}$ -inch nozzle.



"FIRE PREVENTION DAY" TEST, OCT. 9th, 1913.

Twelve, 3-inch hose streams, nozzles varying from  $1\frac{1}{2}$ -inch to 2-inch in diameter, attached to four hydrants, four pumps in operation.



**"FIRE PREVENTION DAY" TEST, OCT. 9th, 1913.**

Twelve, 3-inch hose streams, nozzles varying from  $1\frac{1}{8}$ -inch to 2-inch in diameter, attached to four hydrants, four pumps in operation. The two streams to the right show vertical height obtainable through  $1\frac{3}{4}$ -inch nozzles.



**5 $\frac{1}{2}$ -INCH NOZZLE STREAM.**

Showing a solid stream thrown across Cuyahoga River, at foot of St. Clair Ave.  
A 5 $\frac{1}{2}$ -inch nozzle is attached direct to underground main, all pumps  
in operation. The river is 600 feet wide at this point, and  
stream fell upon roofs of buildings 140 feet beyond.