Lakeview Pumping Station
Clarendon Ave. at Montrose Ave.
Chicago
Cook County
Illinois

HAER No. IL-4

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
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HISTORIC AMERICAN ENGINEERING RECORD

IL-4

Lake View Pumping Station

Location:	At the corner of Clarendon Avenue and Montrose Avenue on the North Shore of Chicago
Date of Construction:	1907-1915
Owners at Time of Demolition:	City of Chicago
Significance:	The station supplied a large portion of Chicago's water needs throughout the first half of the 20th century. Equipment at the site included 3 Nordberg pumping engines and a Bethlehem Steel Co. pumping engine, all with a capacity of 25 million gallons per day.
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The Lake View Pumping Station (Fig. 1) (Photo 99) was constructed on the site of an existing pumping station erected by the city of Lake view in 1875. Photo 3 shows a 1904 photograph of the original station. Lake View was annexed to Chicago in 1889.

Equipment in the original 1875 station (Fig. 1) consisted of a 2.5 million gallons perday "Flanders" high pressure condensing engine having two 15" steam cylinders with 15" stroke as well as two double acting pumping ends with 14" diameter plunges and 20" stroke. In 1884 a Worthington duplex horizontal compound condensing engine of 5MGD capacity was installed. This unit had two high pressure cylinders of 21" diameter, two low pressure cylinders of 36^{5}" stroke and two 22" pump plungers with 36 stroke. In 1888 a Gaskill compound condensing engine was added having a capacity of 12 MGD. The high pressure cylinders were 27" diameter, the low pressure cylinders were 54" diameter with 30" plunges by 40" stroke. During 1892 an additional Gaskill 12 MGD unit was installed and it was almost a duplicate of the one installed in 1888. At this time an entire new building was constructed surrounding the old one with room for the new engine and boilers. On December 10, 1912 an ad appeared in POWER MAGAZINE soliciting proposals for the purchase and removal of the engines.

A new engine house was started in 1907 east of the existing pumping station with space for four vertical triple expansion pumping engines of 25 MGD capacity each at 130' head. This building was completed in 1909. During 1909 an Allis Chalmers engine was installed in the north or No. 1 location (Photo 3) and put in service. The Allis Chalmers pumping engine was a duplicate of two units purchased and installed at the same time for the Roseland Station on the Chicago southside.

Three Nordberg pumping engines were then installed in locations 2,3 and 4. A fourth engine costing $89,900 and manufactured by Bethelhem Steel Co., a duplicate of the Nordbergs, was installed in the No. 1 location after the Allis Chalmers unit was moved to Roseland (Photo 4). See photos 6-22 for this phase of engine erection. Photos 60-70 show Nordberg Mfg Co. shop photographs of the Lake View engines.

During construction of the new Lake View Station continuity of service was maintained by a temporary plant on the site made up of two turbine centrifugal pumps with a capacity of 20 MGD each. Photos 22, 23 and 24 were taken in 1912 and 1913 and show these pumps located on a foundation between the bottom of the pump room and the operating gallery. These pumps took suction from one of two already constructed suction wells that were to serve each pair of new pumping engines (Fig. 3). The turbine driven pumps were supplied with steam from a temporary boiler house erected to the east of the new engine house (Photos 26). The boiler house contained four used watertube and two Scotch marine boilers.

In 1913-1914 the old station was demolished (Photos 27-28) and a new boiler house erected to the west and parallel to the new engine house (photos 29-51). An indoor coal storage bunker was constructed at the same time to the north of the engine room (Photos 52-56).

Five boilers were assembled in the new boiler house along with a separately fired superheater. The boilers were Sederhelm return fire-tube units of 320 hp each. Design pressure was 180 PSI. The boilers had four transverse furnace drums of 30" diameter by 12' long. The boiler shells were 16'-9" long by 90"

diameter. Each shell contained 202 tubes 16' long stokes were driven by vertical engines located on the operating floor. All stokes were connected by common line shafting extending the length of the boiler fronts. This shafting was, of course, located under the floor (Photo 92). The boiler room was put in service in July 1915.

The superheater (photol00) was a Schmidt type rated at 28,000 #/hr. of saturated steam at 180 psi. The final temperature was 560° to 580° Faranheit. Total heating surface was 1600 sg. ft. with a grate area of 21 sq. ft. Like the original boilers the superheater was furnished with a chair grate stoker driven by the same line shaft serving the boilers.

It is interesting to note that the original installation of boilers lasted only a short time. Replacement was started in 1919 and continued until 1924. Whether lack of capacity, a major failure, or high maintenance costs made this change necessary cannot be determined at this time. It is the author's belief that lack of capacity was probably the reason for the replacement. It is also possible that the Sederholm design was sensitive to poor feedwater conditions, if indeed, this was a problem.

The two original boilers No. 4 and No. 5 were replaced with a 650 hp Edge Moor water tube boiler in 1919. The unit was then called No. 3 (Photo 72). In 1920-1921 No. 1, No. 2 and the original No. 3 boilers were replaced with two 350 hp Babcock & Wilcox water tube boilers moved from the 68th Street Pumping station (Photo 72). These B&W boilers were replaced in 1924 with two 650 hp Edge Moor boilers (Photos 72-79).

The three Edge Moor boilers continued in service until the plant shut down in the 1960's. These were vertical sectional-header longitudinal drum water tube boilers (Photo 78). Each boiler had three longitudin al drums. Underfeed stokers were provided for these units.

Six original coal hoppers for five boilers and the superheater were still in place at the end of operations. Parts from the two surplus weigh coal hoppers had been cannibalized over the years for use on the remaining units.

Above each boiler and above the superheater were located two hoppers. The upper had a capacity of 70 tons and the weigh hopper below it held 20 tons. Coal was dropped to the weigh hopper through a hydraulically operated gate. The gates were operated by a manually operated cock on the same level (3rd floor) as the scale beams.

A feature of the coal/ash system was that coal supply and ash removal could be maintained even with a complete breakdown of the conveyor system. In the basement floor in front of the boilers was a set of narrow gauge tracks on which could be operated small industrial type push cars for ash removal. These cars could also be routed from under the coal storage building to a hydraulic elevator and then to the 3rd floor gallery where the narrow gage tracks passed in front of the weigh hoppers. Coal could be dumped into these hoppers through auxiliary doors. Ash from the boiler settings in the basement could be loaded into the cars and routed to the hydraulic elevator and then to the ash tank. From the ash tank the ash was loaded on trucks from a spout over the truck weigh scale.

Normally the ash was raked from the bottom of each boiler (Fig. 92) setting to a vacuum system conveyor and then to the ash storage tank located 65' above the basement floor level.

The Lake View Pumping Station was the only one in the Chicago system (except for Chicago Ave.) to have all coal delivered by truck. Trucks entered the west building section between the boier room and coal storage/maintenace shop area where it was weighed and dumped. From this point the coal would go through a crusher and then to one of two conveying systems. One system supplied the storage bunker while the other supplied the hoppers located in the boiler room. The capacity of the coal bunker was approximately 3000 tons. Both of the bucket conveyor systems and the crusher had a capacity of 40 tons per hour. Each conveyor was driven by a 15hp, 120 volt d.c. motor.

The boilers and superheater exhausted to a chimney resting on four caison piers. These piers were 5' diameter and extended 42' below the basement floor elevation. The bottom of each pier flared to 10' diameter. The top of the chimney was 6'-6" interior diameter and the interior diameter at the base was 18'-06" . The chimney was 215'-06" above the base at the basement floor line or 172' above the bottom of the smoke breeching. During 1950, 50' was added to the top of the chimney. During 1974 the chimney was considered to be unsafe and the section starting at 5' above the roof was removed. Debris was dropped in to the interior of the remaining section. A 5" concrete slab cap was used to cover the opening.

Originally each boiler had its own feed water metering pump with a capacity of 24 gpm at 200 psi. These pumps took suction from either of two 1000 hp open heaters located on the boiler room operating floor adjacent to the chimney. On emergency steam turbine driven centrifrugal feed pump of 500 gpm was also installed. During 1921 a single recipricating duplex feed pump was installed to serve the boilers (Photos 79&102).

Maintenance shops, storage and a machine shop were located in the west end of the coal storage building. The machine shop contained a drill press, power hack saw and an 8"x48" lathe, all belt driven from an overhead line shaft. The line shaft was belt driven by a 3hp, 900 rpm floor mounted d.c. motor.

Located on the south side of the engine room gallery were to 75 KW 120 volt d.c. turbine generator sets with a nameplate of 2400 rpm (Photo103). A slate switchboard had the usual open circuit breakers and knife-type distribution switches. The generators appeared to be manufactured by Allis Chalmers. The turbines were manufactured by the Kerr Co. The turbine generators were probably put on stand by status as a General Electric metallic rectifier set was installed alongside the switchboard and appeared to be of 1950's vintage.

The engine room crane had a capacity of 15 tons and ran the entire length of the building. This was manufactured by the Case Co. of Columbus, Ohio. It had of course, a d.c. drive and a d.c. hoist.

The four vertical triple expansion engines (photos 80-87) were similar to the ones designed by the Bureau of Engineering (Chicago) and installed in the Chicago Avenue Pumping Station in 1904. The inlet and exhaust values for the high pressure cylinder were double beat poppet type actuated by a Corliss-type releasing mechanism. The intermediate and low pressure cylinders were provided with conventional Corliss valves (Photos 112-113). Throttle conditions were 175 psi and 560° F.T.T. Reheat coils were provided in the intermediate and low pressure receivers. The pumps (3 per engine), which were driven from each crosshead with two push rods, were single acting with Riedler-type valves. (Photos 89&109).

Photo 84 shows the guard railing around the engine area. This was removed before demolition and later part of this railing was put around the Water Tower at Michigan and Chicago Avenues. On the boiler room side of the wall dividing the engine and boiler rooms each 4" steam line to an engine was provided with an electrically operated value. Inspection of the engine area at the operating walking showed what was probably an "emergency" duplex pushbutton station for each pair of engines. It is assumed that these switches were for the emergency trip values.

Each VTE pump had a 42" suction gate value and four 30" discharge gate values. These were manufactured by the Chapman Valve Co. One of the discharge pipes is shown in the foreground of photo 106. All of the gate valves were cylinder operated and controlled from a master panel located on the south operating gallery (Photo 110). One of the 30" discharge valves is shown in photo 111 to the left of an air/condensate pump engine.

The outlet of each 42' suction value was connected to the surface condenser cooling water inlet for each VTE engine to condense the exhaust steam (Photo 90). The low pressure cylinder exhaust from No .1 and No. 2 VTE's had an 8" valve on the exhaust line to atmosphere. It's likely that such an arrangement made it possible to exhaust either engine to atmosphere if the condensers were out of service.

Each VTE engine was served by a separate air/condensate pump (photo111) taking suction from it's condenser though what appeared to be a 6" or 8" line. This could not be determined accurately as the level of ice in the pump pit during inspection of the station was above these lines. These pumps were vertical double acting steam end pumps manufactured by Nordberg. The serial number on the one remaining nameplate found (Unit No. 1) was 28233.

According to one man who had worked at this station there was very little if any condensate returned to the steam cycle from the VTE engines because of the oil contamination problem. It would seem that the same problem of oil contamination existed with the stoker engines and boiler feed pump. The only source of "clean" condensate would be from the exhaust of turbine driven equipment such as forced draft fans and turbine generators. The remainder of boiler made up water would come from the water mains or headers.

Table 1. Miscellaneous engine data:

HP cylinder bore	- 15"
IP cylinder bore	- 29"
LP cylinder bore	- 50"
Engine stroke	- 48"
Piston rod diameter	- 4-1/2"
Crankshaft diameter	- 11"
Design engine revolutions	- 62 rpm
Water plunger speed	- 500 ft./min.
Plunger diameter (3)	- 24-1/2
Displacement per revolution	- 12.7 ft^3
surface condenser	- 1100 ft^2

Table 2. Miscellaneous Equipment Costs

Three VTE pumping engines Five boiler feed pumps One air compessor Two FS KW turbo-generators Discharge piping and values	$274,050
One VTE pumping engine	$ 89,900
Five 320-hp boilers Superheater Chain grate stokers Breeching uptakes	$ 73,075
Chimney	$ 10,051
Steam and water piping	$ 29,848
Coal hardling equipment	$ 35,970

Table 3. Chicago System Statistics - 1952

Number of pumping stations	12
Population served	4,226,000
Gallons per day pumped	967,937,000
Rated pumping capacity, GP $x10^6$	2,560
Tons of coal used	151,095,000
Electric power used-KWH	15,933,000

During 1952 Lake View pumped 2.9% of the system requirements. Costs of operation and maintenance over this period was $345,655 or 7.5% of the total for the Chicago system. This was the second most expensive station during this time; cost was $33.6 per million gallons following 22nd Street at $47.48 per million gallons pumped. The most efficient station during 1952 was Cermak (an all electric station) at $8.05 per million gallons.

Lake View was placed in stand-by service February 27, 1964 and pumped for about an hour at a time on only 15 days during the remainder of the year. No pumping was done after December 1, 1964. This station was offically retired from service after May 31, 1965. Demolition was started by the Bongi Wrecking Co. of Cicero, Ill. in 1978 and completed in 1979.

Operation of Lake View was based on four shifts. Shift work was organized per shift as:

Oilers	3
Firemen	2
Assistant Chief Engineer	1
	6
	x4
	24

Day shift was organized as:

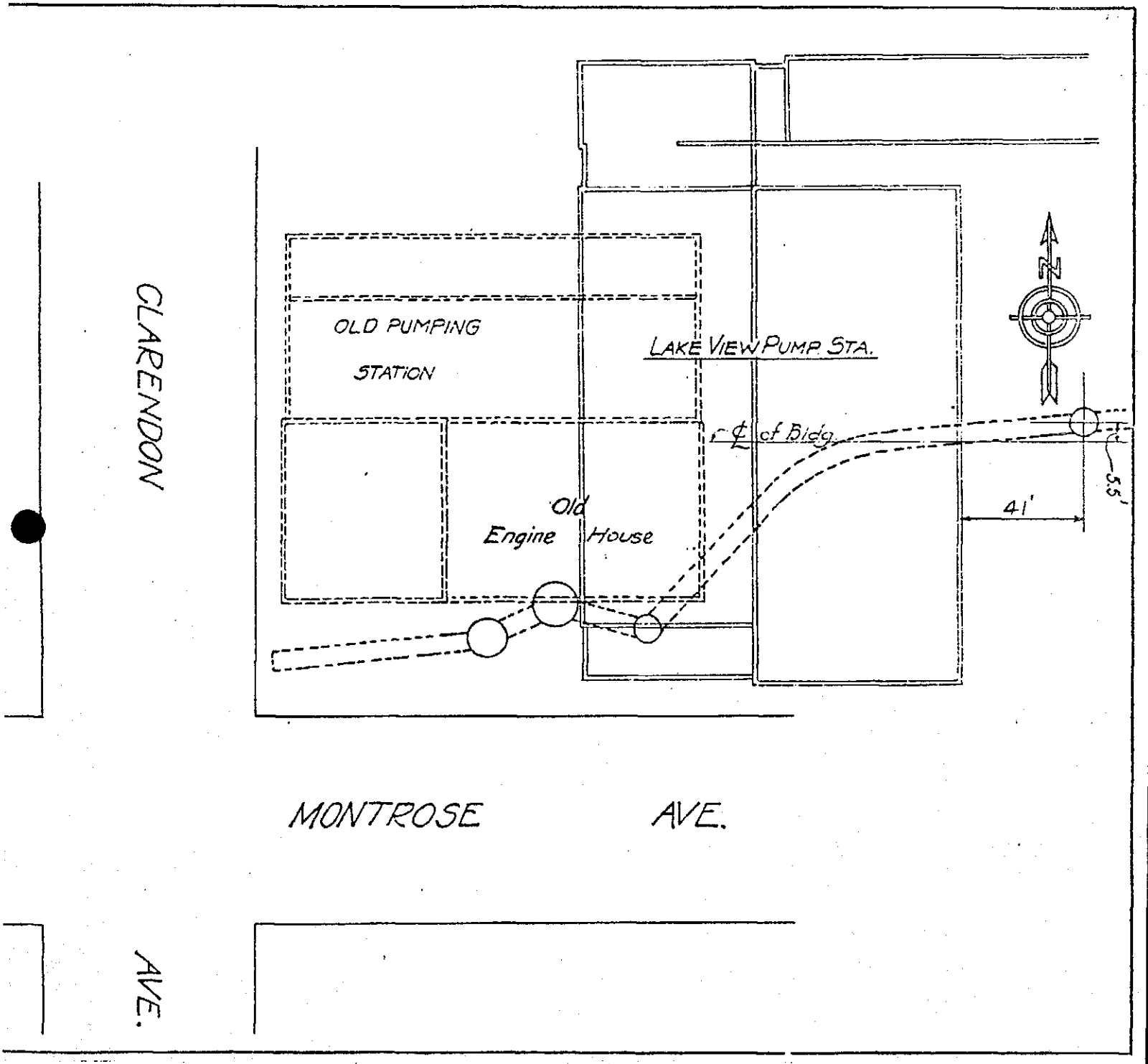
Mechanic	2
Steam Fitters	2
Laborers	9
Chief Engineer	1
Electrician	1
Boiler Washer	1
	16 men.

After Lake View had been annexed to Chicago a new crib and tunnel was completed. This 6' internal diameter tunnel extended 10,000' into the lake and supplied the pumping station until 1918.

During July 1915 the Wilson Ave. Crib was floated into postion and sunk. The tunnel system from this crib was to supply the new Mayfair Pumping Station. The system was completed in March 1918 and was ready for the official inspection during that month.

A broad tunnel in Clarendon Ave. was completed in 1918 to supply the Lake View Station. This made the Lake View crib and tunnel unnecessary and in 1922 the intake shaft was domed over. In 1924 the Lake View crib was demolished (Photos 93-98).

FIGURE 1 Plan of Puming Station; No date available



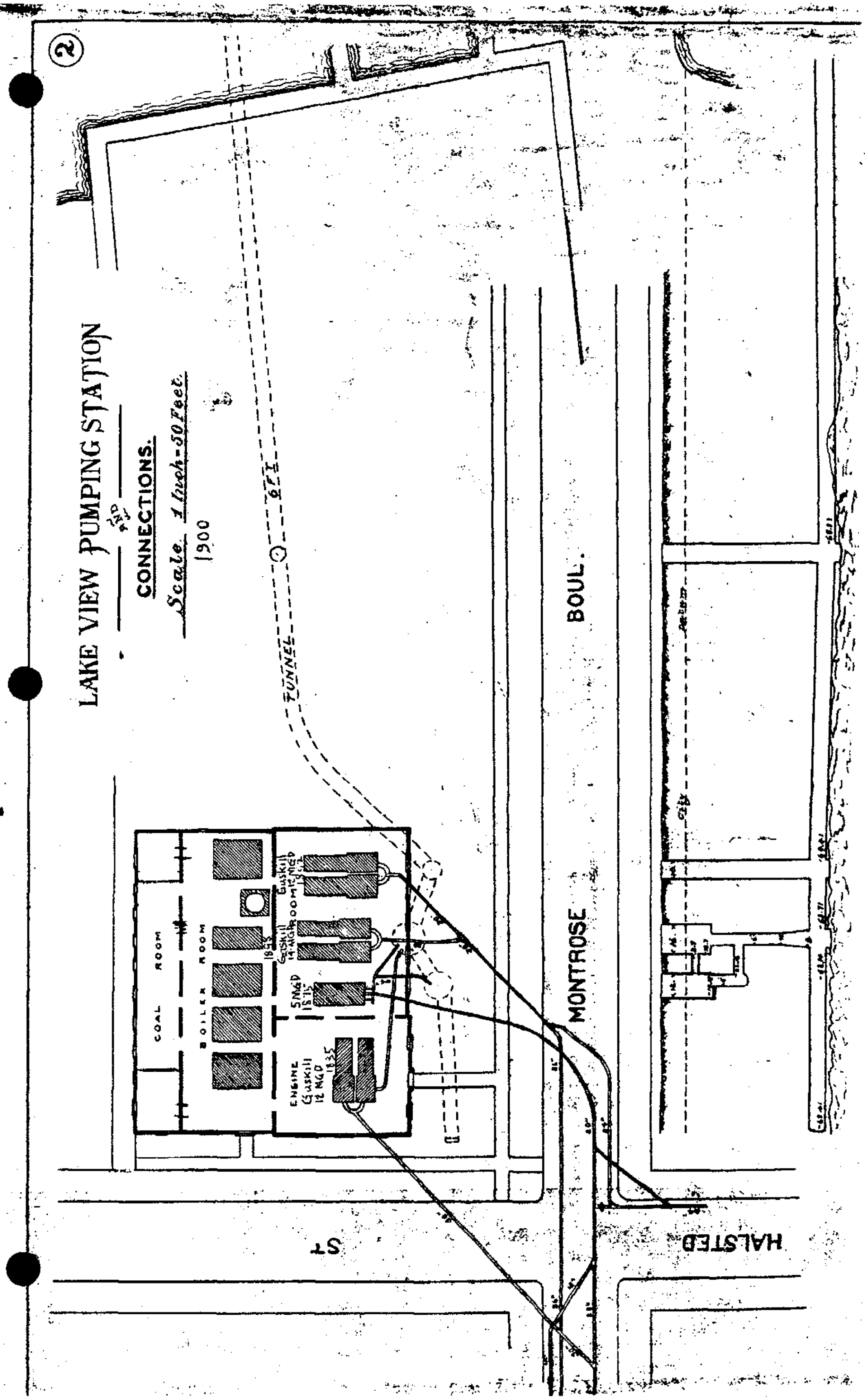


FIGURE 2

Plan of Pumping Station; 1900

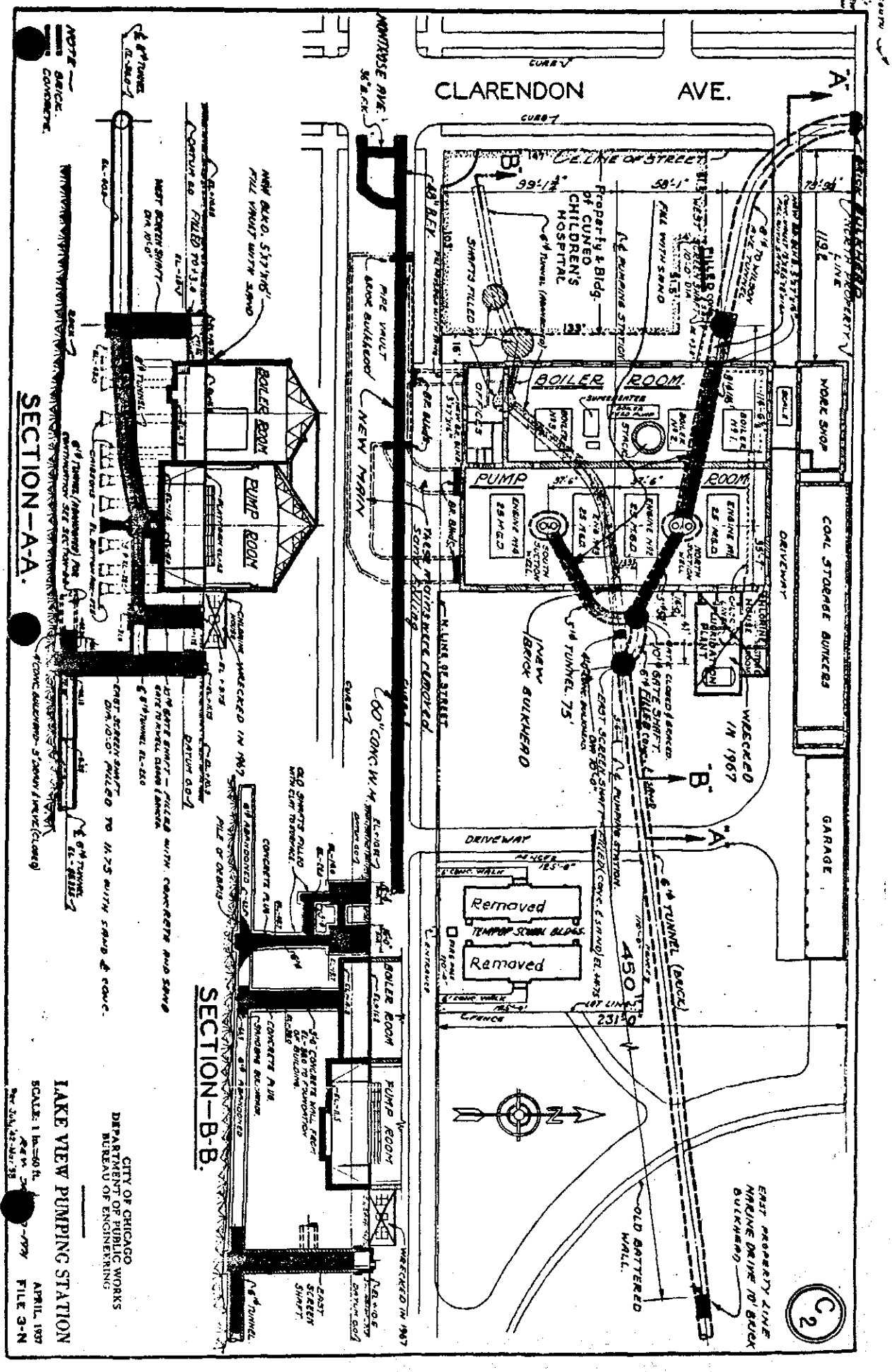


FIGURE 3

Plan and Section of Pumping Sta.; 1971