

THE SCIOTO VALLEY TRACTION COMPANY

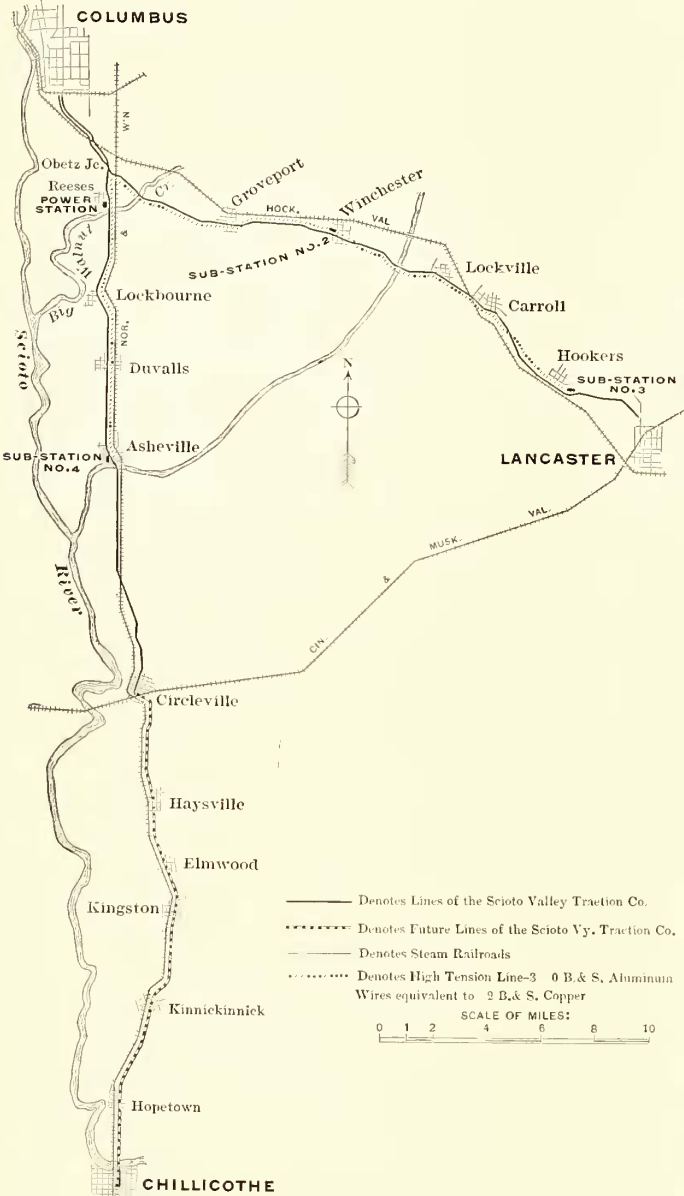
Another and important addition to the already extensive network of electrical interurban roads in Ohio was completed during the past summer, and is now in successful operation. This consists of the lines of the Scioto Valley Traction Company which connect the city of Columbus with Lancaster to the southwest, and with Circleville to the south. An extension is also planned to connect Circleville with Chillicothe, further south. A special interest attaches to this system because it is the only line in Ohio which is operated by a third rail.

The country through which the Scioto Valley Railway is

themselves of the improved facilities for visiting Columbus. There are extensive stone quarries in the vicinity, and the town owns its own natural gas wells. Near Lancaster is the Boys' State Industrial Home and the camp meeting and assembly grounds of the Methodist Episcopal Church, where many Columbus people have erected summer cottages.

The town of Circleville has over 7000 inhabitants, and is the county seat of Pickaway County. Its interests are largely manufacturing, and it operates several paper mills, flouring mills, canning factories and a carriage factory.

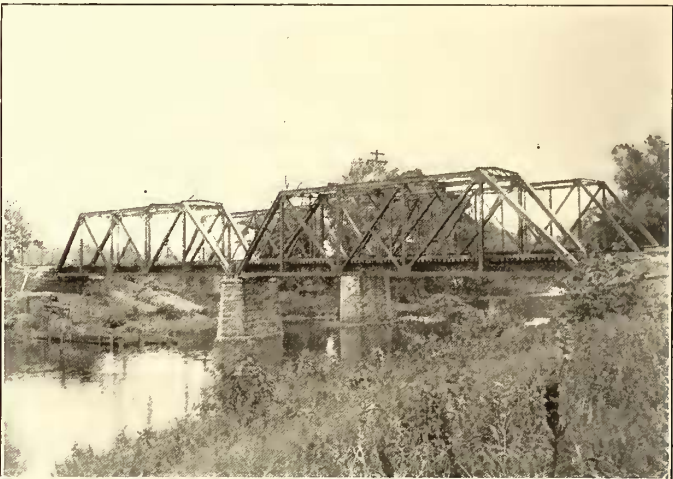
The electric line from the city limits of Columbus to that of Lancaster is about 26.3 miles in length, and practically paral-



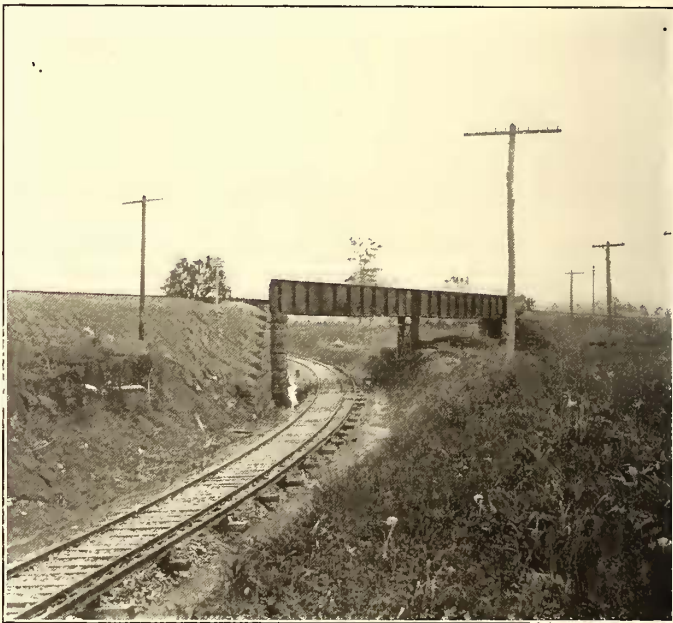
MAP OF THE LINES OF THE SCIOTO VALLEY TRACTION CO.

constructed is thickly settled with a population that is financially able to avail itself of the opportunities afforded by a first-class interurban road. The population tributary to this new road averages about 1100 per mile of route, exclusive of Columbus, which has a population of 135,000. A large part of these people are in the habit of doing business in Columbus. Throughout the year there are theater parties and sightseers, and during certain seasons the State Fair, horse races, baseball games and kindred attractions draw many people from the surrounding territory into the city of Columbus.

Lancaster is the county seat of Fairfield County, and has a population of over 9000. It has large glass factories and shoe factories, with well-paid employees, who will naturally avail



DOUBLE-SPAN TRUSS BRIDGE OVER BIG WALNUT CREEK—NORFOLK & WESTERN—SCIOTO VALLEY



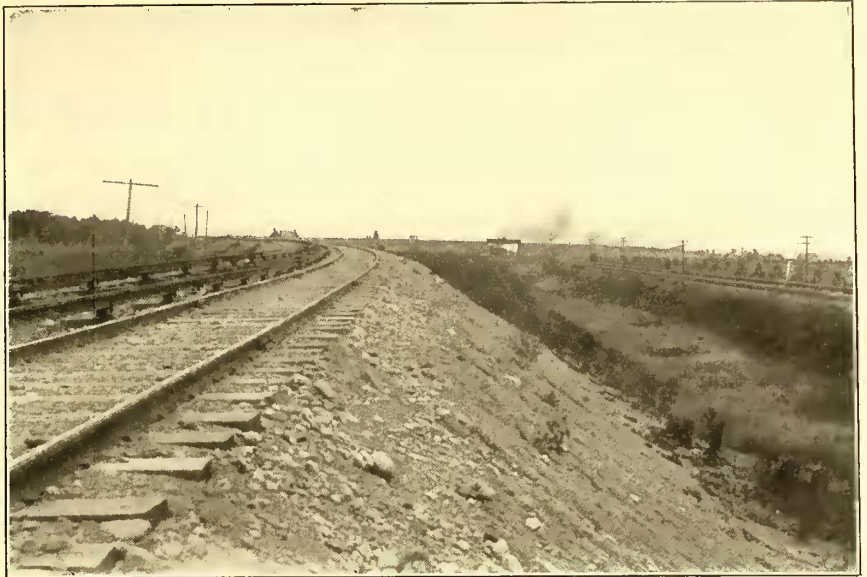
UNDERGRADE CROSSING—SCIOTO VALLEY AND NORFOLK & WESTERN RAILWAYS

els for this distance the route of the Hocking Valley Railroad, while between Columbus and Circleville, the electric road follows the line of the Norfolk & Western Railroad. It is believed that much of the large traffic, which has hitherto been enjoyed by these steam roads, will naturally come to the more convenient and accessible electric road. The speed is substantially the same as that made by the steam roads, while the electric road has the advantage of entering the heart of the cities and affording much more frequent service.

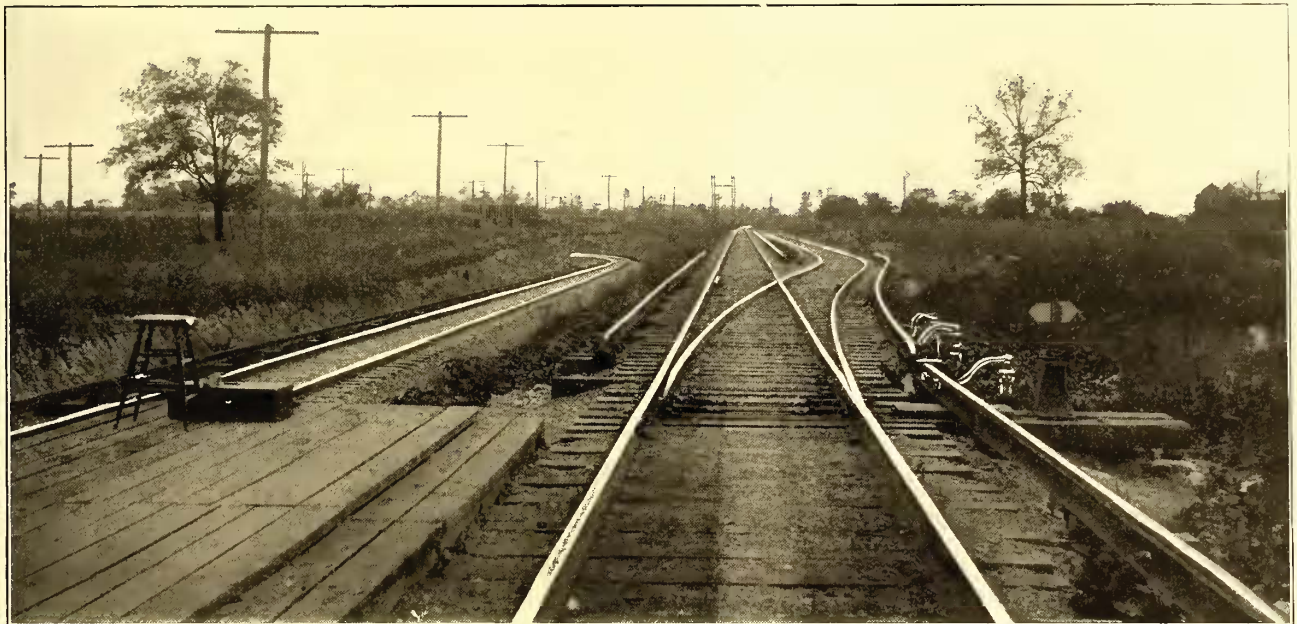
In the city of Columbus the cars start from the Interurban Station on the loop of the Columbus, London & Springfield Railway, passing to the city limits over the tracks of the Central Market Street Railway, a distance of about 4 miles. From

this point the road is double-tracked to Obetz Junction, a distance of about 3 miles. From the Junction, one single-track line runs in a southeasterly direction to Lancaster, and another single-track line southward to Circleville. The distance from Obetz Junction to Lancaster is about 23 miles, and from Obetz Junction to Circleville about 20 miles. The projected extension from Circleville to Chillicothe will add about 20 miles to the route.

Service is now established from the city limits of Columbus to Lancaster and to Circleville, and the trains make a schedule speed of 24.5 miles an hour, including intermediate stops. It is also proposed to inaugurate a limited service with few local stops, making a schedule speed of about 36 miles an hour. The present round-trip fare between terminals over either branch is \$1, which is considerably less than the prevailing fare over the steam roads, previous to the inauguration of the electric service. Despatching is effected verbally over



OVERHEAD CROSSING WITH HOCKING VALLEY RAILWAY—1½ PER CENT GRADE ON APPROACHES



ARRANGEMENT OF THIRD RAIL AT SIDING



OPERATING HEADQUARTERS OF COMPANY AT OBETZ JUNCTION

the company's private telephone wires, conductors being required to record their instructions in writing and repeat back to the dispatcher's office at Obetz Junction for confirmation. There are two distinct telephone circuits, both carried by the high-tension poles. The despatching circuit connects the dispatcher's office at Obetz Junction with each sub-station and with telephones located at each siding. Means are provided for connecting the telephone circuits with the public service of Columbus.

#### ROADBED

It has been the policy of the company to spare no reasonable expense in obtaining a roadbed of the highest class, and the construction throughout has followed steam road practice wherever possible. Steep grades and sharp curves have been eliminated wherever feasible, and in some few cases this has necessitated large cuts and fills. This is true especially on the Lancaster line, where the country is more hilly than on the Circleville line.

The ballasting along the road consists of a liberal foundation of high grade gravel for a depth of 8 ins. below the bottom of the ties and crowned up between the ties. The roadbed is drained at intervals by vitrified clay conduits extending under

road and grade crossings, and by parallel side ditches extending the full length of the line.

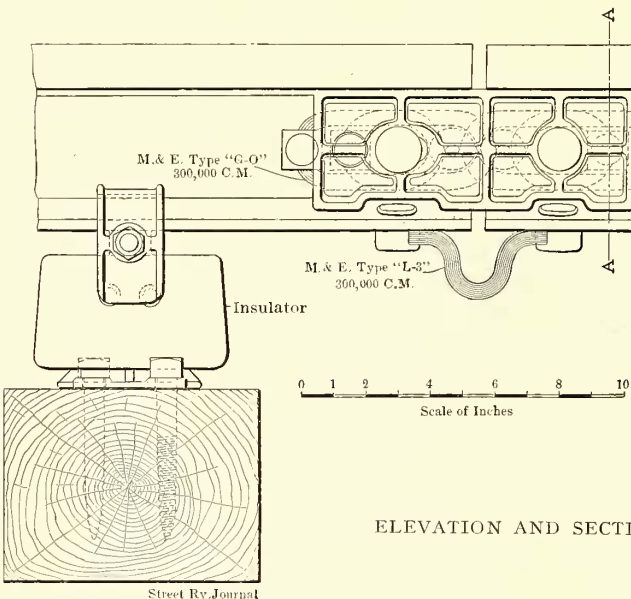
All bridges are of substantial steel construction, resting on stone masonry abutments. To avoid the dangers and delays of steam road grade crossings, the company has constructed two under-crossings at its intersections with the Norfolk & Western Railroad, and one under and one over-crossing where it crosses the tracks of the Hocking Valley Railroad.

The ties are of oak and chestnut, 6 ins. x 8 ins. x 8 ft., spaced

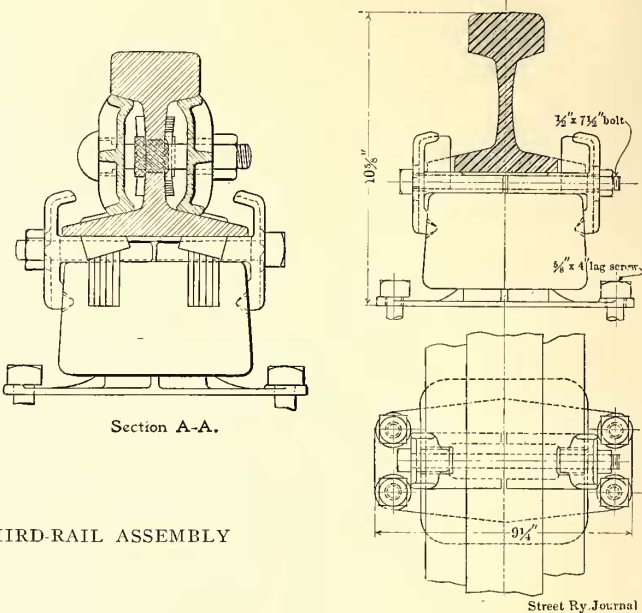
section of the third rail, connections between ends of the rail are effected by means of lead-covered cable laid underground in vitrified clay conduits, the cable being connected to the rail by Keystone cable terminals. At sub-stations the feeders are connected to the third rail by the same method as at crossings.

ROLLING STOCK

The company has eleven passengers cars and two baggage cars, which were supplied by the American Car & Foundry Company. The passenger cars measure 60 ft. over buffers,



ELEVATION AND SECTION OF THIRD-RAIL ASSEMBLY

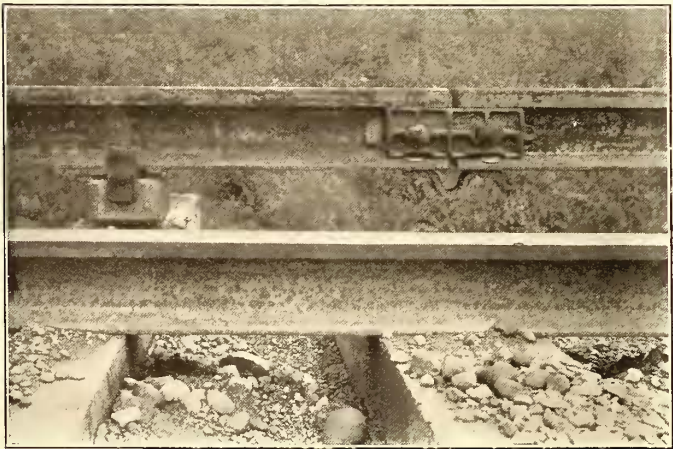


2 ft. apart. Every fifth tie is 10 ft. in length and supports the third rail.

The track rails are 33 ft. long and 70-lb. A. S. C. E. section. They are bonded with two Mayer & Englund bonds, each of 204,000 circ. mils at each joint, and the track is cross-bonded every 1000 ft. with stranded No. 0000 copper bonds.

THIRD-RAIL CONSTRUCTION

The road is third rail throughout with the exception of 3500 ft. through Groveport and 7000 ft. through Circleville, where the track is located on the streets and necessitated the installation of a trolley wire. The third rail is of special steel, and

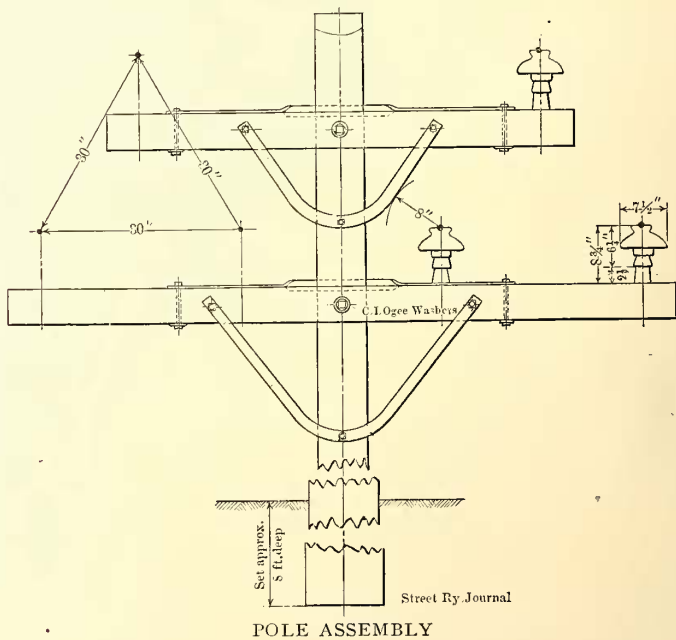


THIRD RAIL, SHOWING INSULATOR, JOINT AND BONDING—SCIOTO VALLEY TRACTION COMPANY

weighs 100 lbs. to the yard, and is laid in lengths of 60 ft. It is elevated 6 ins. above the track rails, and the distance from the gage line of track rail to center line of third rail is 28 ins. It is mounted upon special vitrified clay insulators, with malleable iron bases and clips. The total cross-section of bonds at third-rail joints is equal to 1,500,000 circ. mils of copper.

At highway crossings where it is necessary to leave out a

and are 8 ft. 6 ins. in width at the eaves, and the extreme height for clearance from top of rail with trolley pulled down is 14 ft. 4 1/2 ins. When fully loaded and equipped, they weigh about 47 tons. The cars contain a smoking compartment and toilet room. The smoker will seat sixteen passengers, the total seating capacity being seventy-two. The cars are finished in



POLE ASSEMBLY

oak and are furnished with rattan seats. The seats are of the Hale & Kilburn style No. 99-B. The trucks are of the Brill 27-E-2 type, upon which are mounted four GE 66 motors rated at 125-hp each. The motors are controlled by the type M multiple-unit system, which permits the operation of two or more cars in a train. Each car is provided with four third-rail shoes of the Potter type, and two trolley poles.

The cars are equipped with combined straight and automatic air brakes, supplied by the Westinghouse Traction Brake Company. The heaters were supplied by the Consolidated Car

and Hookers on the Lancaster Division, and at Ashville on the Circleville Division.

The poles are set fifty-two to the mile, and are of well sea-



GROUND CONNECTION OF TRACK RAIL AT POWER HOUSE

Heating Company. Each car is fitted with whistle, gong, an unusual number of incandescent lights, and fire extinguishers.

The baggage cars measure 44 ft. 3 ins. over buffers, 8 ft. 4 ins. over the eaves, and the extreme height for clearance

soned chestnut, 40 ft. long, except where the high-tension line crosses the steam railroad and telephone lines, or in passing through towns, where poles 50 ft. and even 60 ft. in length have been installed. The cross-arms are of yellow pine. This con-

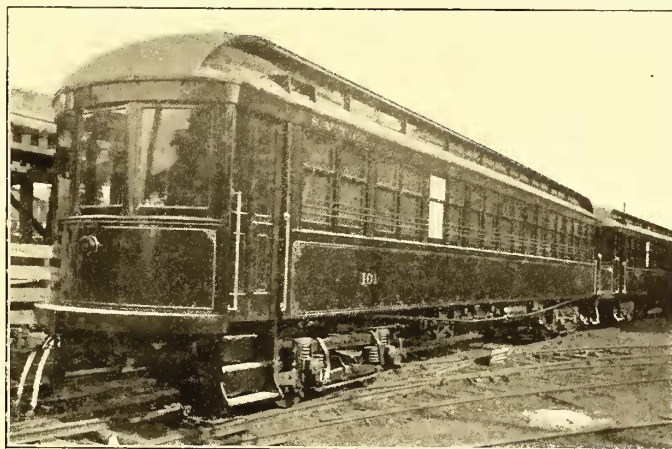


HIGH-TENSION LINE AND ROAD CROSSING

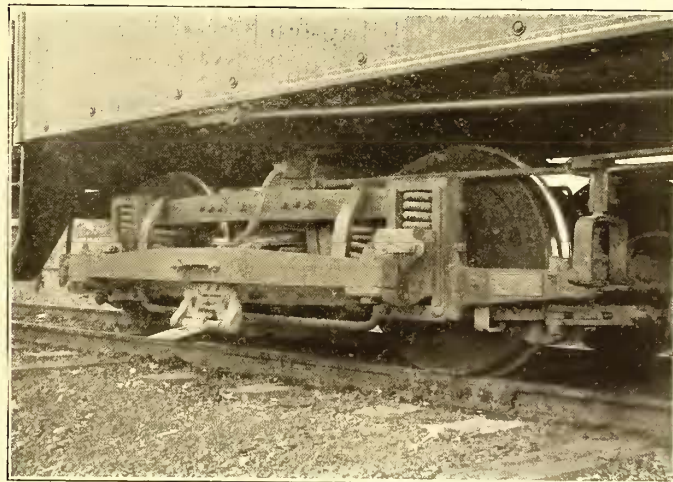
from top of rail with trolley pulled down is 13 ft. 7 ins. The electrical equipment is identical with that of the passenger cars.

#### TRANSMISSION SYSTEM

Power is generated in a central station, located at Reeses, near Obetz Junction, and is transmitted at 27,000 volts, three-phase, 25-cycle to sub-stations located at Canal Winchester,



STANDARD PASSENGER COACH



TRUCK AND THIRD-RAIL SHOE

struction will accommodate two three-phase transmission lines, although at present only one is installed.

The high-tension conductor is of seven-strand aluminum, and the three cables, forming an equilateral triangle with 30-in. sides, are not transposed. The section of each conductor is 106,000 circ. mils, equivalent to 66,000 circ. mils of copper. The insulators are of brown porcelain, type "Locke No. 307,"

and are mounted on locust pins, supplied by the Ohio Brass Company.

POWER STATION

The main power station is located at Reeses, near the junc-



INTERIOR OF BAGGAGE CAR

tion of the two divisions. In the arrangement of the machinery an attempt has been made to carry out the "unit system" as far as advisable. This has been departed from in the case of the



BOILER ROOM, SHOWING FUEL-HANDLING OUTFIT AND STOKERS

chimney, one only having been provided, also in the condensing apparatus, where the advantages of a central plant were recognized by the installation of a single apparatus to serve two units.

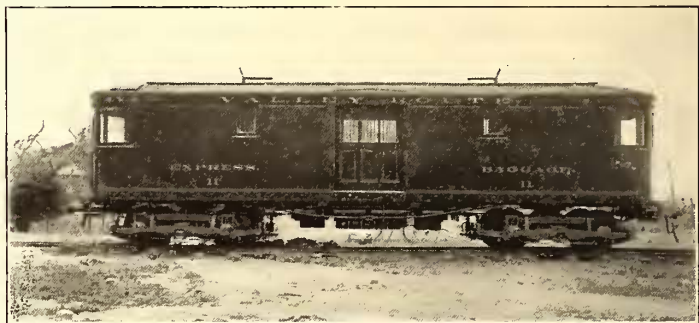
Each main unit consists of a battery of two boilers and an engine-generator set, two of which are now in operation. The building has sufficient capacity for four of these units without further extension.

In such a system a well-defined plan can be followed whereby each unit receives

its coal at one side of the building and the generation and delivery of power take place across the station, while the longitudinal elements act in the nature of an equalizing system.

The general arrangement of the machinery may be briefly described as follows:

The four units are divided into two groups. Between these groups there is a space occupied in the boiler room by a coal supply pocket and the chimney; in the engine room, on the main floor, by the exciter sets; and the rotary converters and transformers forming one of the sub-stations of the system;



EXPRESS AND BAGGAGE CAR

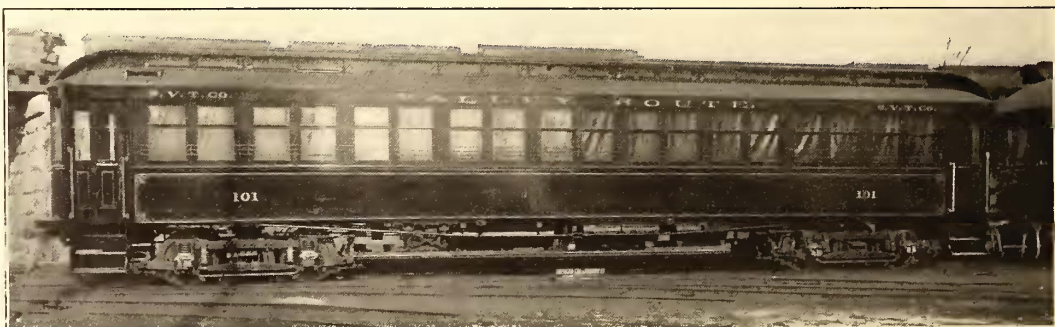
and in the basement by the boiler feed-pumps and heaters, the condensing pumps and the oil filters and pumps.

The building is of red brick and steel construction, with stone trimmings, and measures 186 ft. x 112 ft. The foundations are of concrete and the floors of concrete-steel construction. The monitor roof is of tar and gravel laid on porous book tile, and the main roof of Ludowici tile. A partition wall divides the building longitudinally into boiler room and engine room, 46 ft. and 64 ft. in width, respectively. A gallery, upon which is located the switchboard and the offices, extends the entire length of the engine room on the side opposite the division wall. Under the gallery, on the main floor, are the transformers and oil switches, and beneath, in the basement, is the bus-bar compartment.

BOILERS AND STACK

The boilers are of the water-tube type, built by the Franklin Boiler Works Company, and rated at 450-hp each. Each boiler has two drums, 48 ins. in diameter x 22 ft. 1½ ins. long, and there are 138 tubes, 3½ ins. in diameter x 18 ft. in length for each drum. The heating surface is 4884 sq. ft. They are designed for a working pressure of 200 lbs. per square inch, and are being operated at 160 lbs.

They are equipped with Roney mechanical stokers, each having 90 sq. ft. of grate surface. The stokers are driven by a 5-hp Westinghouse engine of the single-acting, double-cylinder enclosed type. The stack, built by the Alphons Custodis Chimney Construction Company, is



SIDE VIEW OF STANDARD PASSENGER CAR

200 ft. in height and 10 ft. internal diameter at the top. It has an octagonal base of red brick to a height of 4 ft. over the tops of the flue openings, surmounted by a radial brick column of circular section. Connection to the boilers is made by an overhead sheet-steel flue. There is one main damper at the flue opening into the stack, and individual dampers at each boiler.

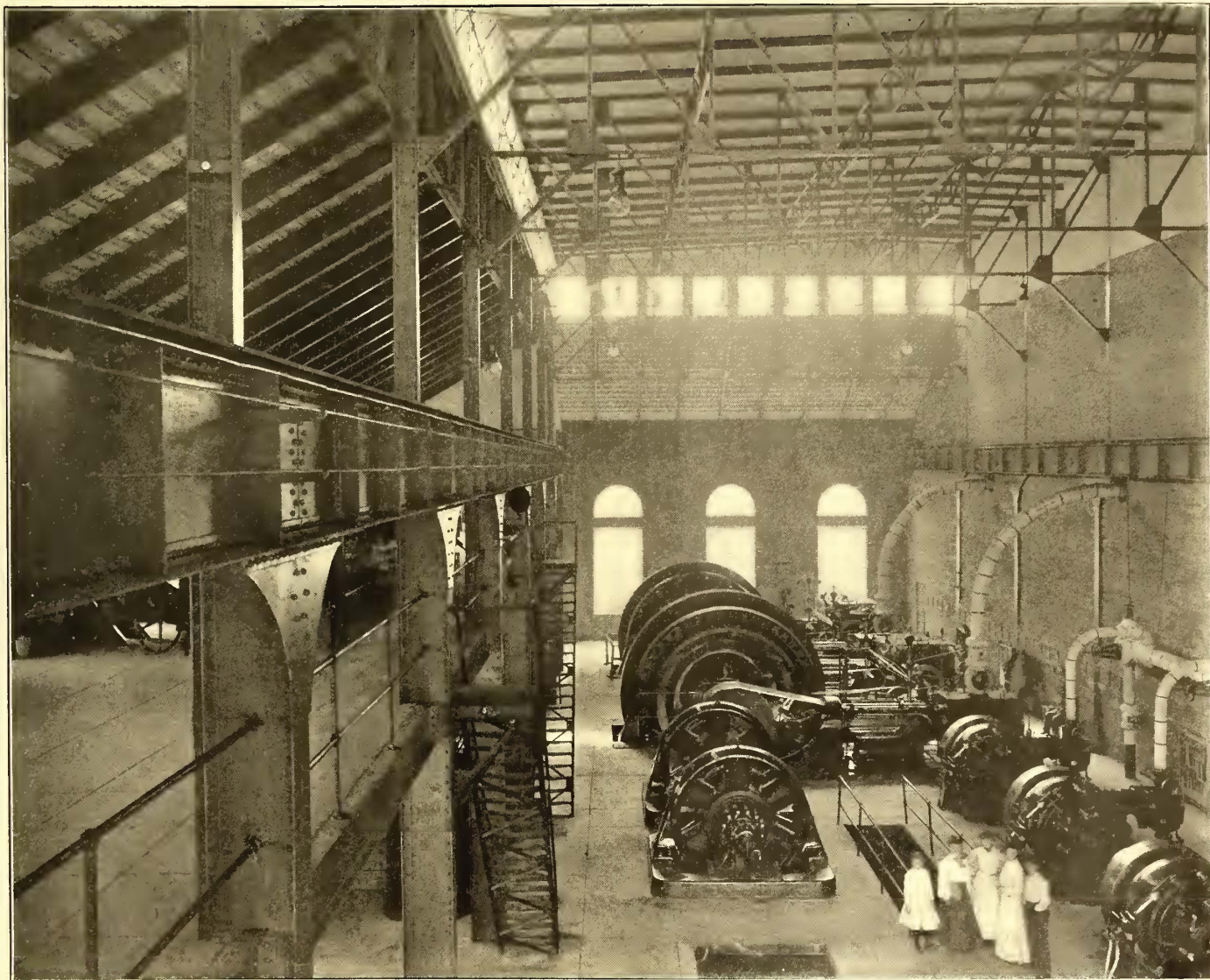
#### COAL AND ASH-HANDLING MACHINERY

In selecting an apparatus for the handling of coal and ashes at this plant, a radical departure has been made from the method usually employed in a locality where a large percentage

with a 5-hp motor for traversing it on the runway. The apparatus is controlled by an operator from a cab on the trolley. A 25-hp motor operates the crusher, and the traveling hopper is provided with a 2-hp motor controlled from the boiler room floor.

The capacity of the unloading plant is 20 tons per hour; of the storage pocket, 1000 tons, and of the supply pocket, 60 tons, sufficient to carry the plant over night.

Ashes are removed in hand cars from the hoppers in the basement located under the boiler grates, dumped into a pit, and loaded by the grab bucket on cars for removal. Photographs



GENERAL INTERIOR VIEW OF ENGINE ROOM FROM CRANE

of the coal supply is delivered in gondola cars rather than in those of the bottom dumping type. The arrangement may be briefly described as follows:

Cars are set into the position indicated on the drawing on page 983, and, if of the dumping type, are emptied into the pocket under the track. Gondolas are unloaded with a grab bucket suspended from a trolley, traveling on an elevated runway. The coal can be delivered either to a storage pocket outside or to a supply pocket inside the building. Over the supply pocket a screen in the shape of an inverted pyramid receives the coal from the bucket, passing the small sizes and delivering the lumps to a crusher through an opening at its apex. A traveling hopper running in front of the boilers receives the coal from the supply pocket and delivers it to the stokers.

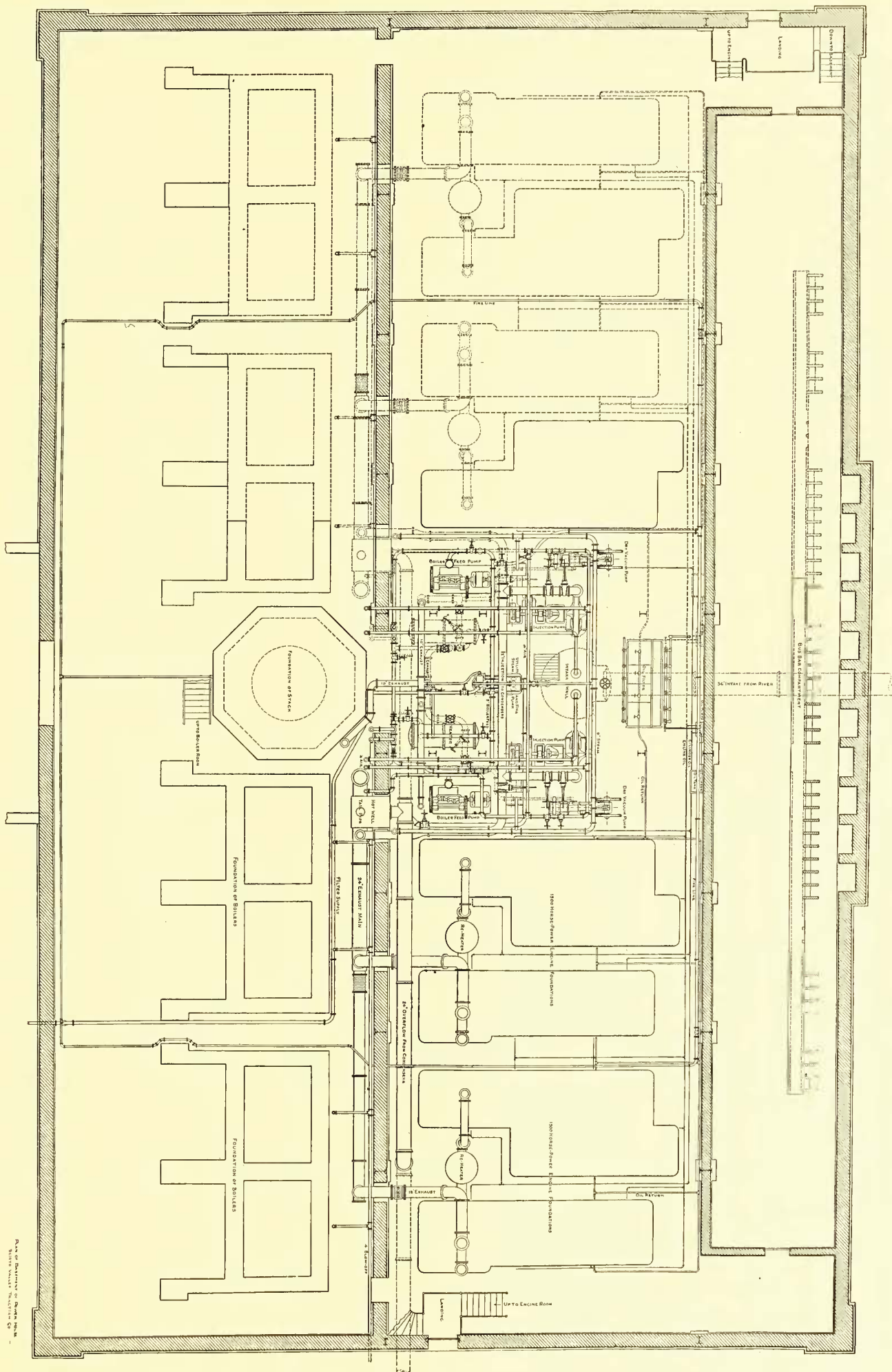
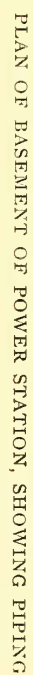
The grab bucket is of 1½ tons capacity, and is suspended by a steel cable from its hold and hoist mechanism on the trolley. A 20-hp motor operates the bucket, and the trolley is equipped

and details of some of the interesting features are shown. The apparatus was installed by the Jeffrey Manufacturing Company.

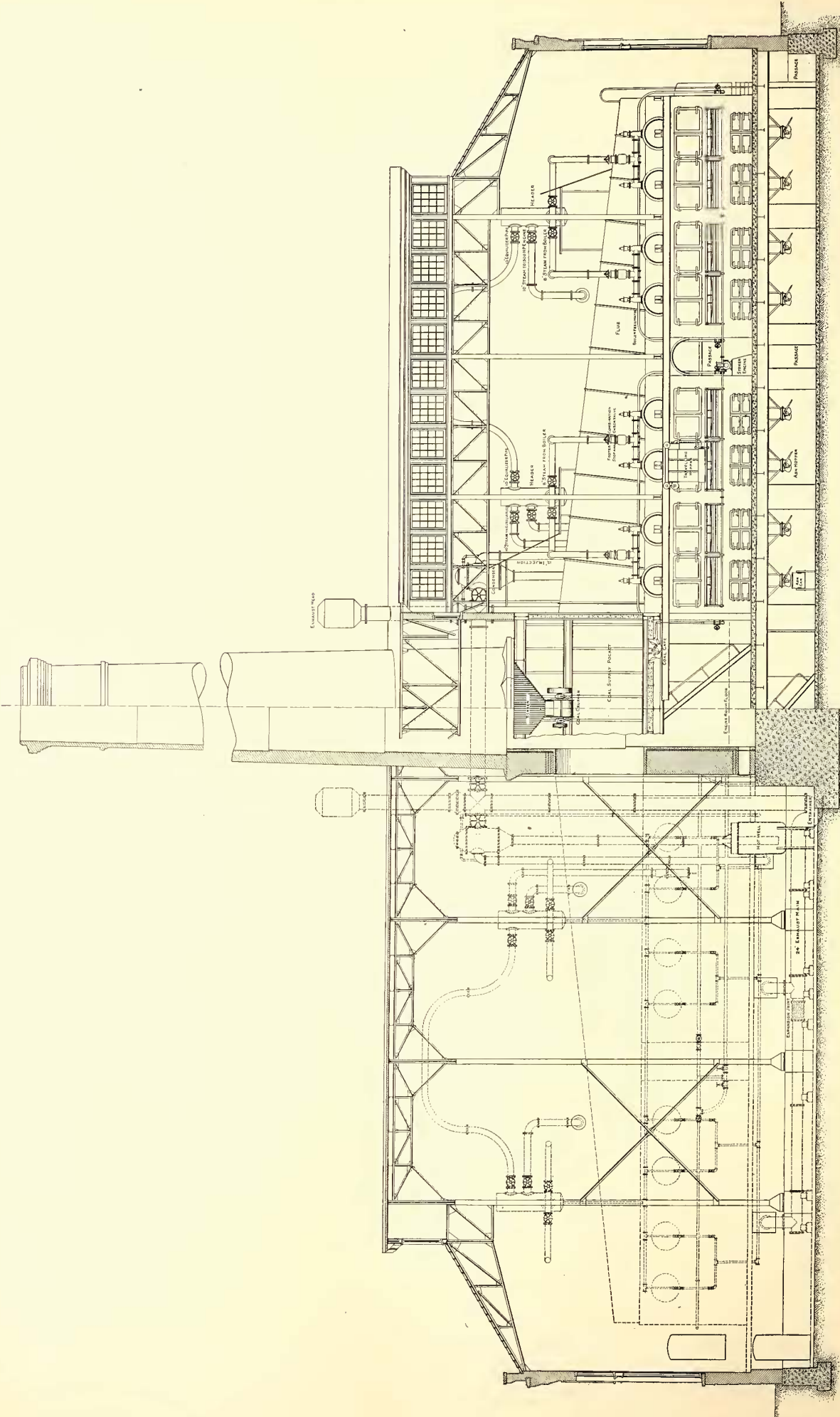
#### FEED-WATER AND PUMPS

The water for the station is taken from Big Walnut Creek, and is brought through a 36-in. pipe into a well in the engine room basement. The entrance to the well is provided with screens and a cut-off valve, the river end of the pipe being protected by a crib work of timber and concrete. An analysis of the water of the creek showed its unfitness for use for boiler-feeding purposes, and a purifying plant was provided. This was installed by the New York Continental Jewell Filtration Company. The water is raised from the well by a steam-driven duplex pump, furnished by the Dean Brothers Steam Pump Works, and delivered to a tank, where it is treated with chemicals and allowed to settle. It then passes through a sand filter, after which it is stored in a "clear well." Two motor-driven triplex pumps, one being in reserve, furnished by the

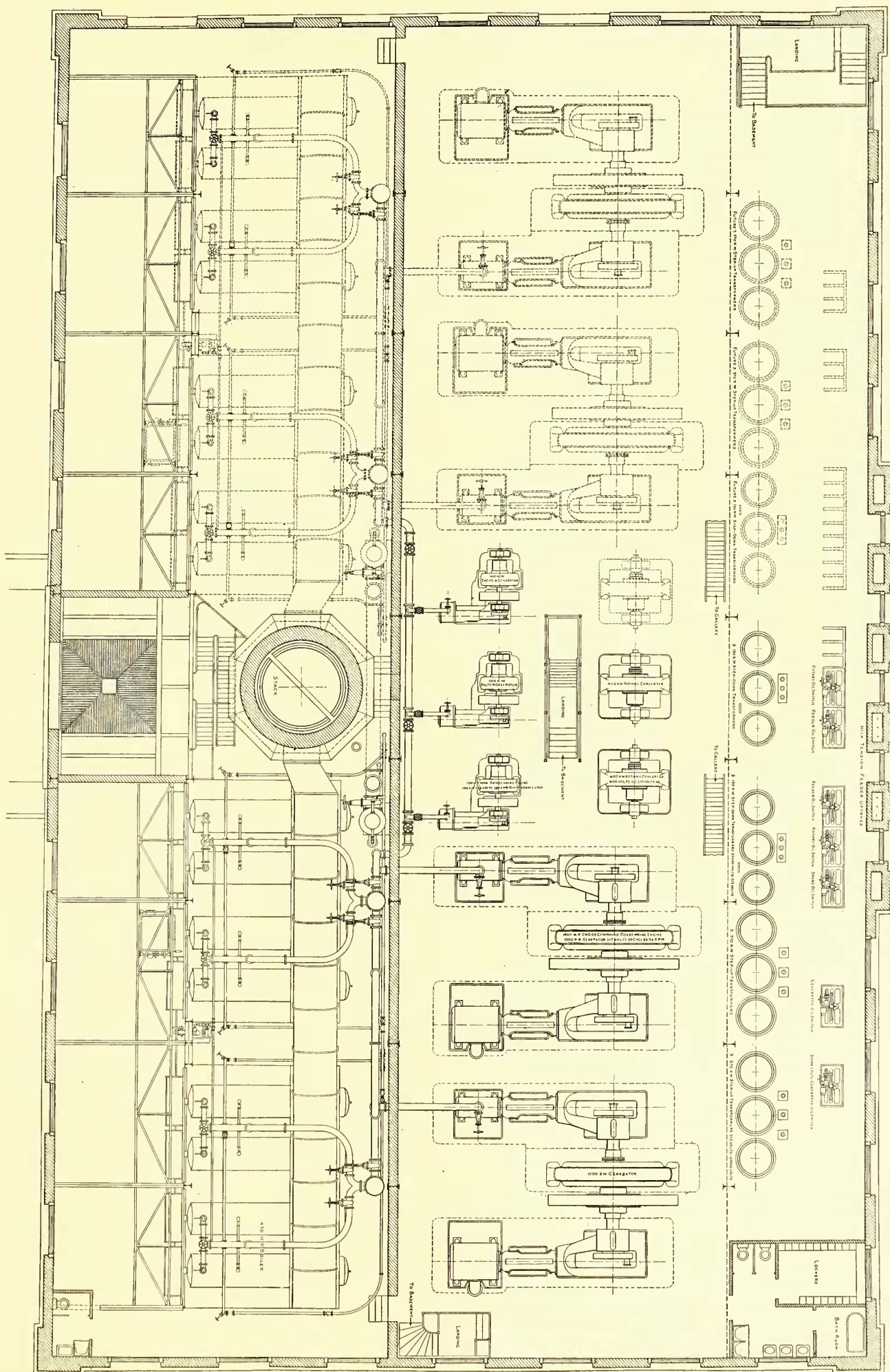




RAN OF EASTMAN OF DOWEN HOUSE  
 DISTRICT VALUERS TRADING CO



LONGITUDINAL SECTION OF POWER STATION THROUGH BOILER ROOM



PLAN OF POWER STATION, SHOWING ARRANGEMENT OF UNITS

Goulds Manufacturing Company, delivers the water from the clear well to the boilers through a Wainwright heater.

Arrangement has also been made whereby the steam pump may be used for this service in case of emergency, by-passing

ins. and 52 ins. in diameter, with 48-in. stroke. The speed is 94 r. p. m.

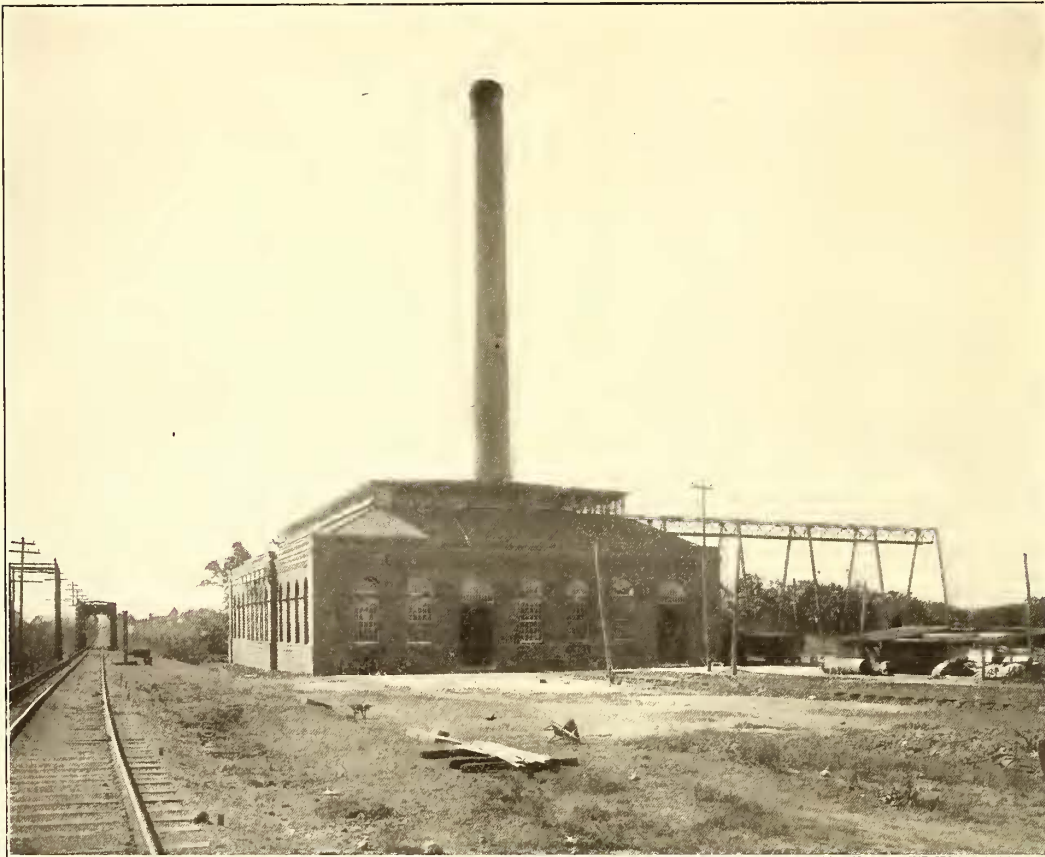
The Siegrist oiling system, by which the oil is delivered to the engines under pressure, is employed for lubricating. After use it is returned by gravity to a filter and pumped back to the engines.

The condensing apparatus was furnished by the Alberger Condenser Company. It consists of one barometric condenser serving two engine units, and of duplicate sets of water and dry vacuum pumps.

#### PUMPS

The condensing water pumps are of the centrifugal type, each having a capacity of about 3000 gals. per minute at 300 r. p. m. Each is direct connected to a simple, non-condensing, horizontal Harrisburg engine. These are fitted with throttling valve governors to act as a safety speed limiting device, but the actual speed of the engine, and hence the quantity of water delivered to the condensers, is controlled by a balanced Foster valve in the steam line, operated by a water regulator in the pump delivery.

The dry vacuum pumps are of the horizontal, double-acting, fly-wheel type, with 8-in. x 16-in. steam and 12-in. x 16-in. air cylinders. In addition to their usual function of removing entrained air from the condenser, these pumps are cross-connected to the suction pipes of the centrifugal pumps. This serves to prime the latter, when necessary, as the suction lift varies considerably, being about 18 ft. under usual conditions,

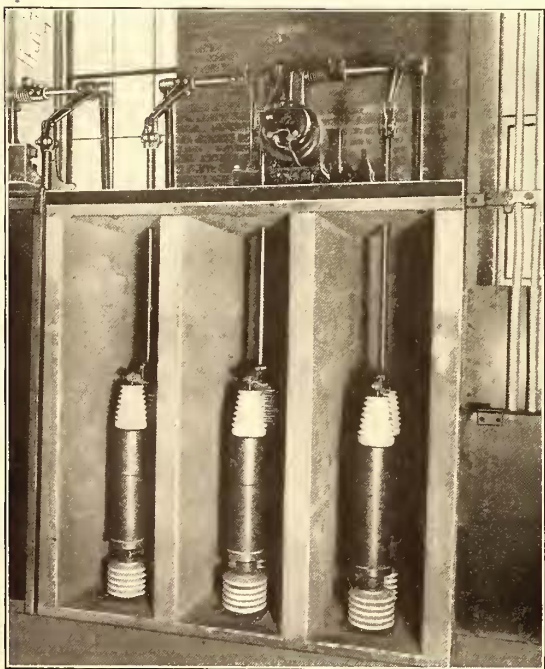


EXTERIOR OF POWER STATION

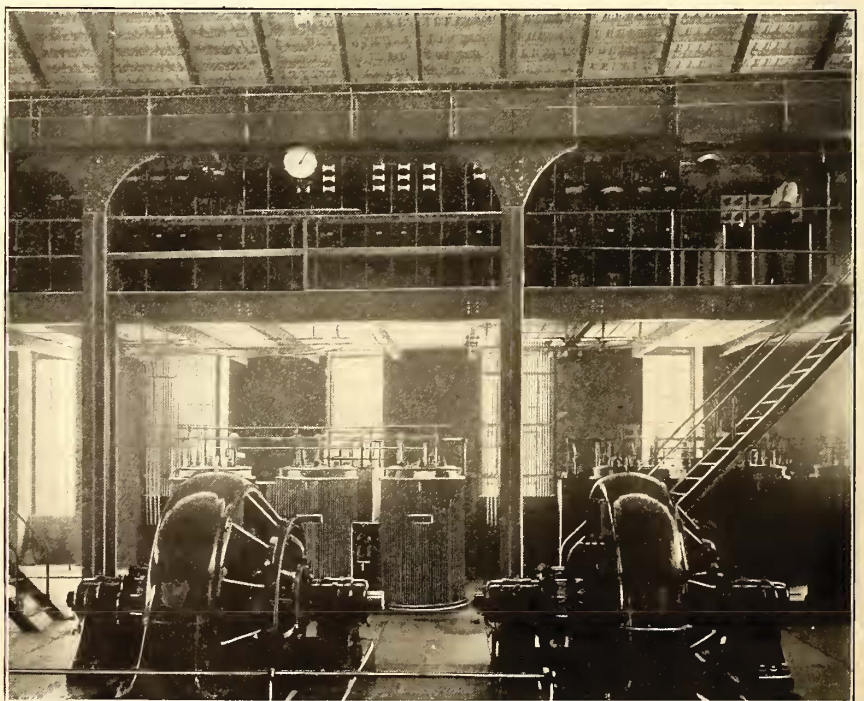
the water from the well around the filters, directly to the boilers. It also serves as a fire pump and for general utility purposes.

#### ENGINES AND CONDENSERS

The main engines are rated at 1500 hp. They are of the horizontal, cross-compound, condensing type, built by the Hoovens, Owens, Rentschler Company. The cylinders are 26

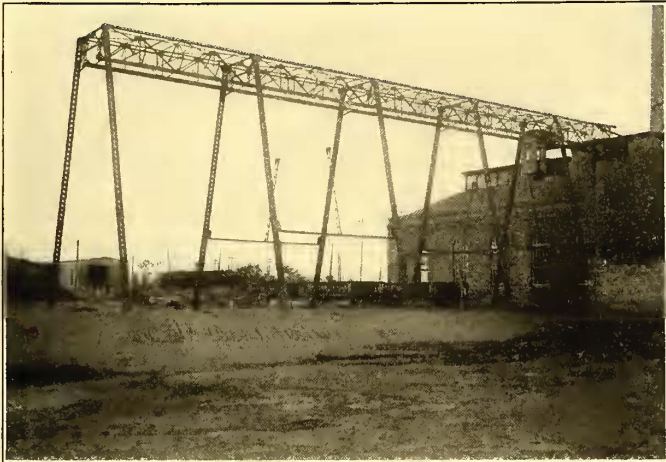


OIL SWITCHES IN SOLID CONCRETE COMPARTMENTS

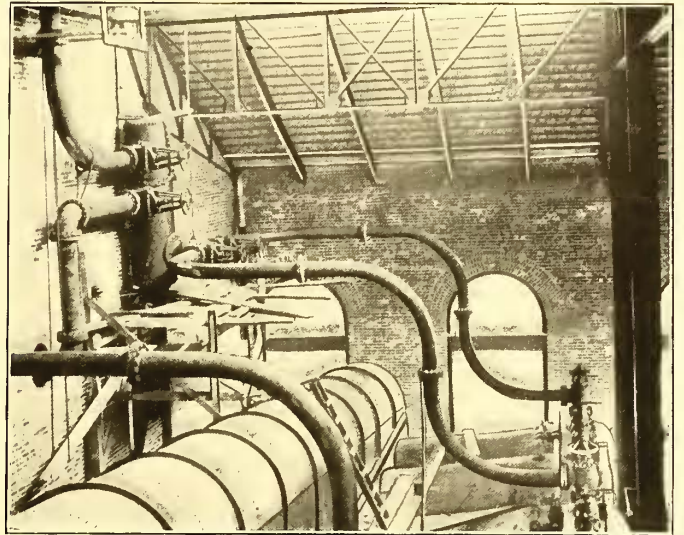


MAIN STATION, SHOWING SWITCHBOARD IN GALLERY

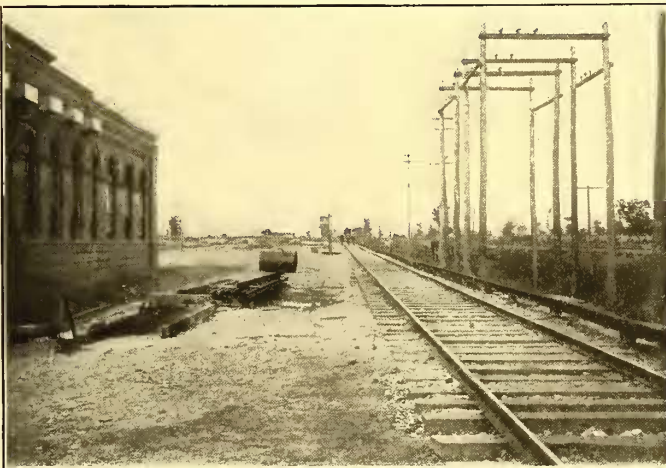
but diminishing to a few feet during spring freshets. A safety or relief valve protects the system by opening the main engine



RUNWAY FOR GRAB-BUCKET AND TROLLEY OVER STORAGE POCKET



VERTICAL STEAM HEADER IN POWER STATION



STRAIN TOWER AT POWER STATION

exhaust to the atmosphere in case of trouble with the condensing apparatus.

#### PIPING

There are several features in the design of the piping system which are believed to be novel, notably in the steam piping, where the departure from the usual practice has given excellent results. The arrangement may be briefly described as follows:

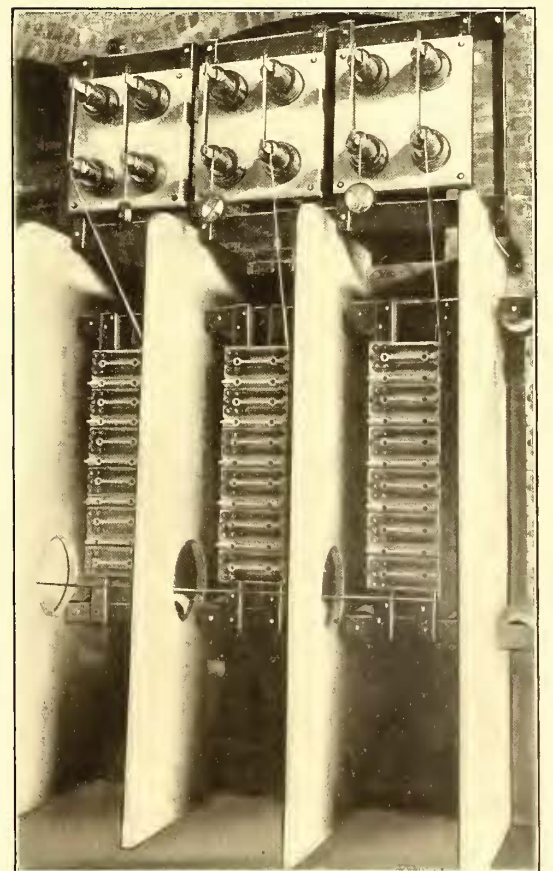
The steam is taken from the two boilers forming a battery, through long radius sweeps, to a vertical drum placed on the division wall back of the boilers. This drum acts as a separator, and is placed at sufficient height to return all condensation to the boiler

by gravity. From the drum the steam passes through a long radius bend to the engine throttle. Each unit is provided with a drum, and pipes connect them in series. Between the first and second units this pipe acts as a pressure equalizer and a means through which one engine may be furnished steam from the boilers of another. Between the second and third, in addition to these functions, the pipe passes through the division wall into the engine room, forming a header for the purpose of furnishing steam for the auxiliaries. The exciter units take steam from this header, and a loop from it to the basement serves the pumping machinery.

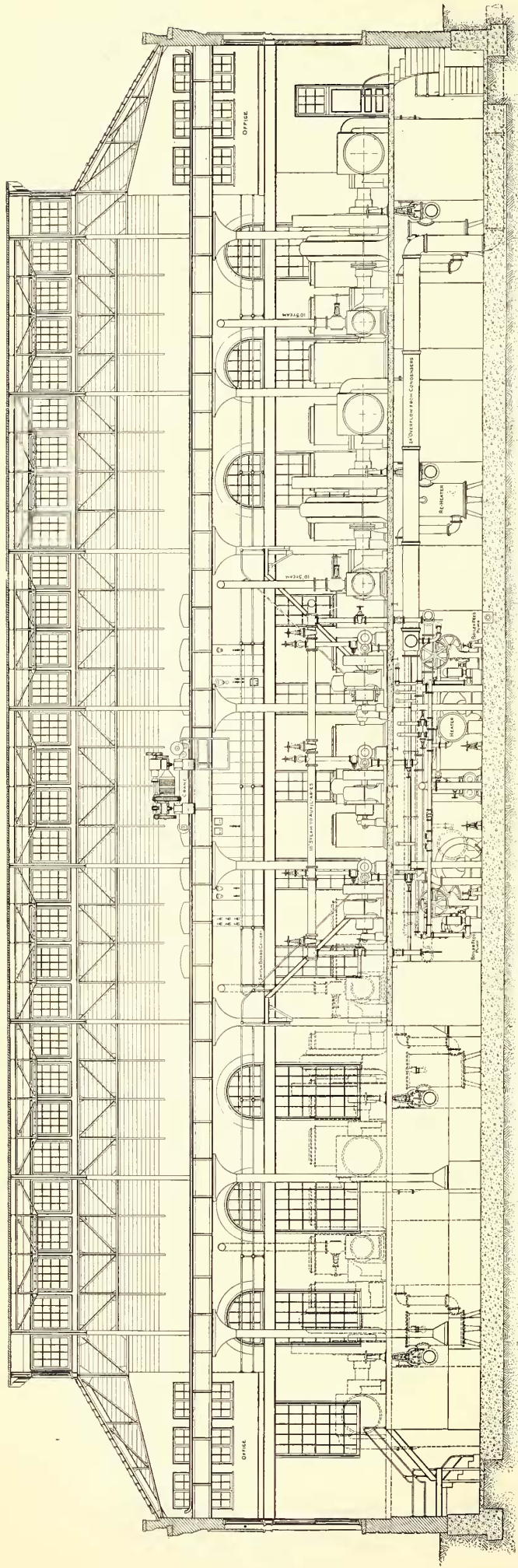
The feed-water is delivered to the boilers through two mains carried along the division wall back of the boilers. From each main a lead is taken to one boiler of each battery. These



370-KW OIL-COOLED TRANSFORMERS IN MAIN POWER STATION



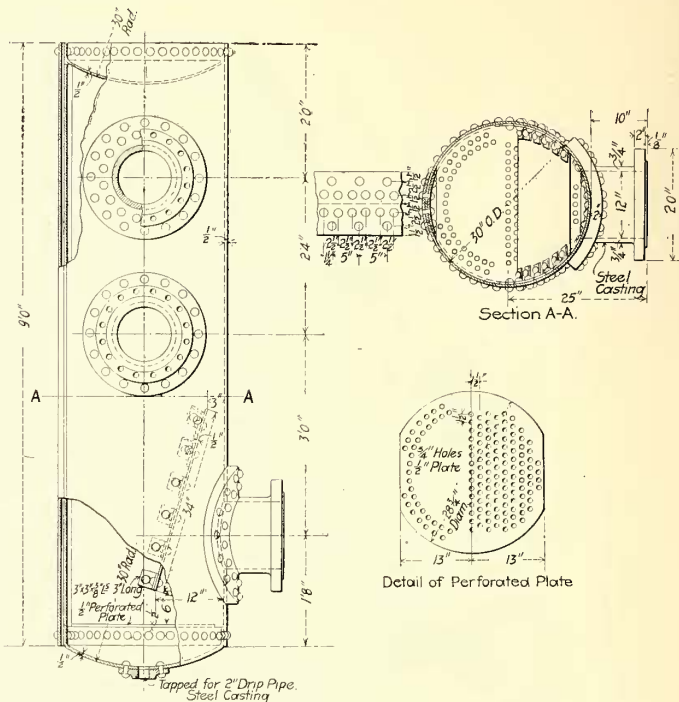
LIGHTNING ARRESTERS WITH DISCONNECTING SWITCHES AND TELLTALE DEVICES



LONGITUDINAL SECTION OF STATION THROUGH ENGINE ROOM

leads are connected, forming a loop. The mains are also cross-connected at the end, thus allowing any boiler to be fed from either main. Both mains are supplied from a ring in the pump room which the boiler feed-pumps supply.

Flanges for high-pressure work are of rolled steel for all sizes above 8 ins., and the joints are of the Van Stone type. Pipe

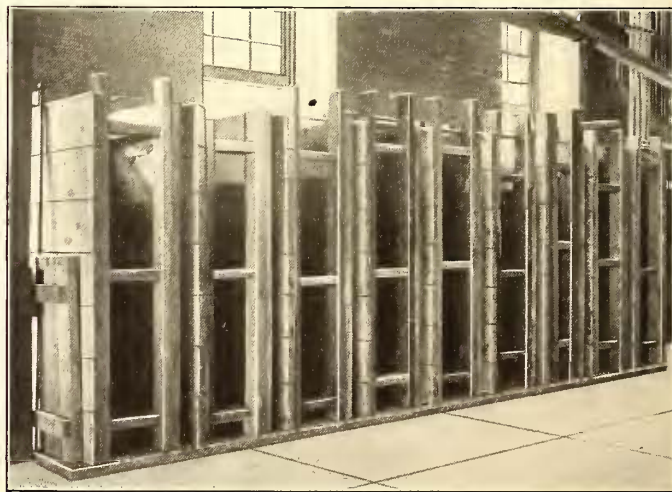


SECTIONS OF SIDE ELEVATION OF VERTICAL HEADER

of 8-in. and smaller have screwed joints and cast-iron flanges. All fittings are of the extra heavy pattern for high, and standard for low-pressure work. The piping was installed by M. W. Kellogg & Company; the high-pressure valves were furnished by Eaton, Cole & Burnham, and those for low-pressure by the Chapman Valve Company.

GENERATORS

There are two main generators and three exciters, built by the Bullock Electric Manufacturing Company. The main gen-

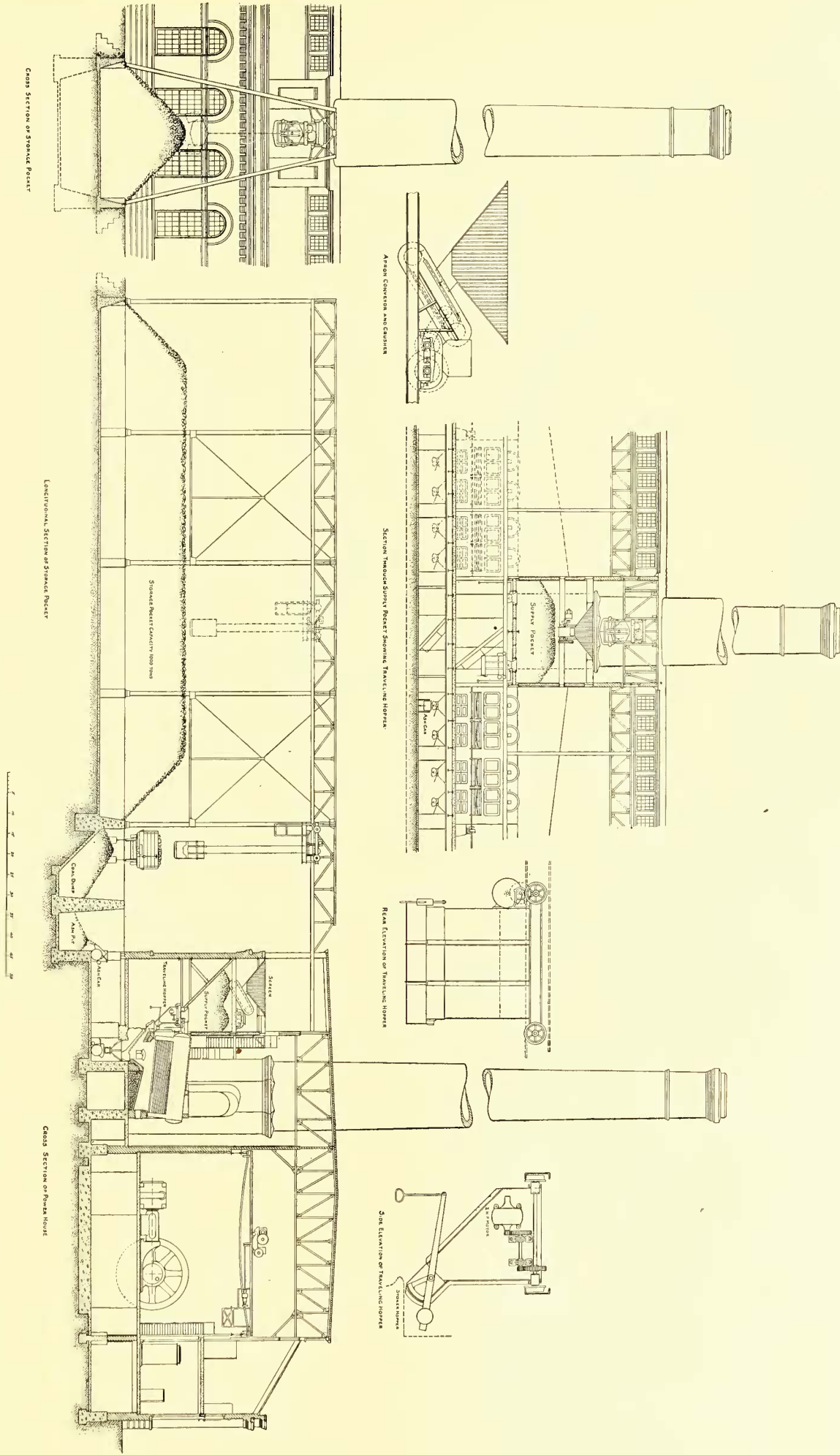


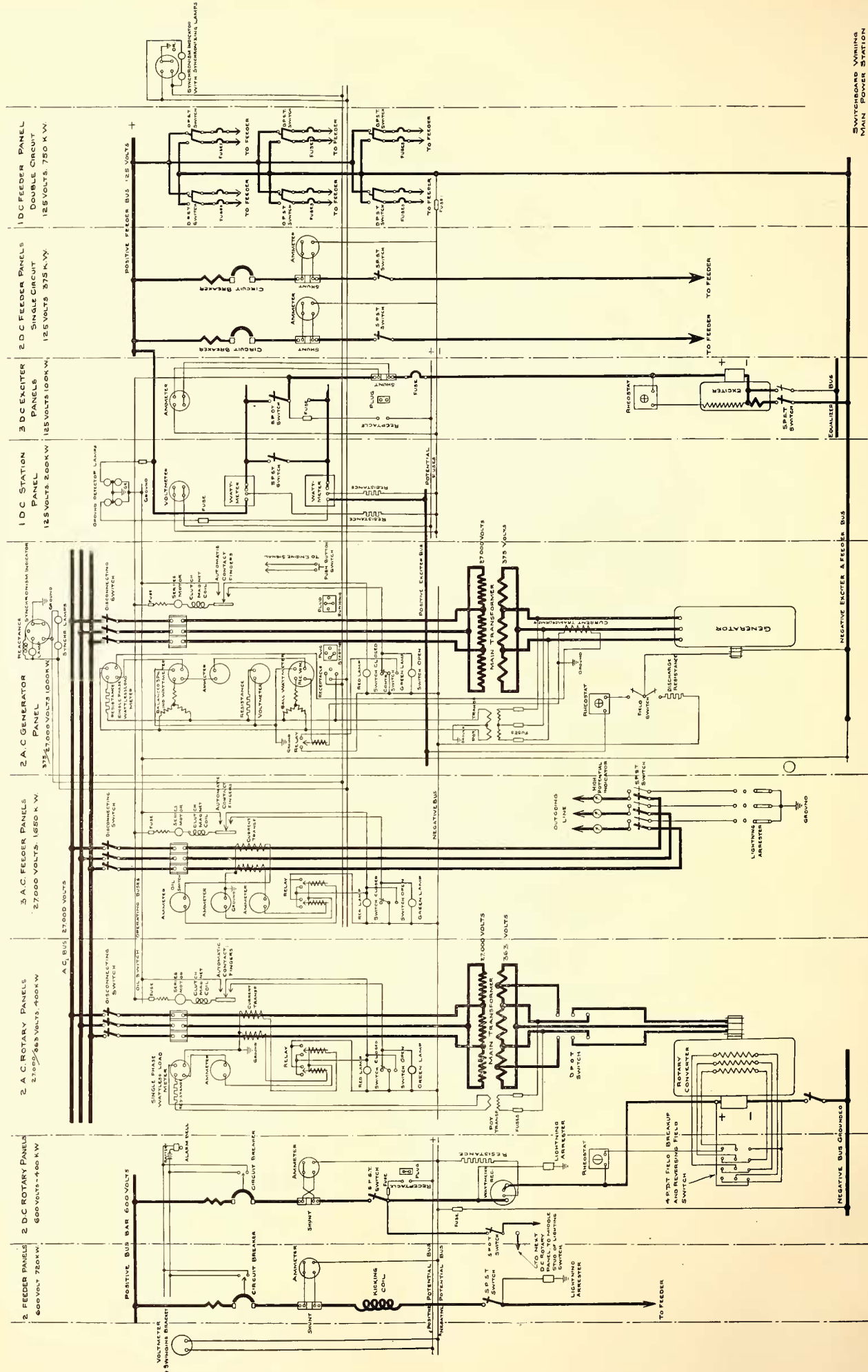
METHOD OF MAKING CONCRETE CELLS FOR OIL SWITCHES

erators are of the engine-driven type, with rotating fields. They are rated at 1000-kw each, have thirty-two poles and run at 94 r. p. m., giving a frequency of 25 cycles per second. They generate three-phase alternating-current at 375 volts.

The exciters are of the engine-driven type, with rotating armature, and are rated at 100 kw, 125 volts, 250 r. p. m. One exciter is used for exciting the fields of the main generators,

COAL CONVEYOR AND STORAGE POCKET





SWITCHBOARD WIRING  
MAIN POWER STATION  
SCOTO VALLEY TRACTION CO

NOTE: SMALL LEADS COME FROM BELOW.

DIAGRAM OF MAIN SWITCHBOARD WIRING

it being of sufficient capacity to handle all four generators; one is used for the auxiliary load, consisting of lighting, motor-driven machinery, etc., while the third is held as reserve. In addition, the station contains two 400-kw rotary converters, with space for a third.

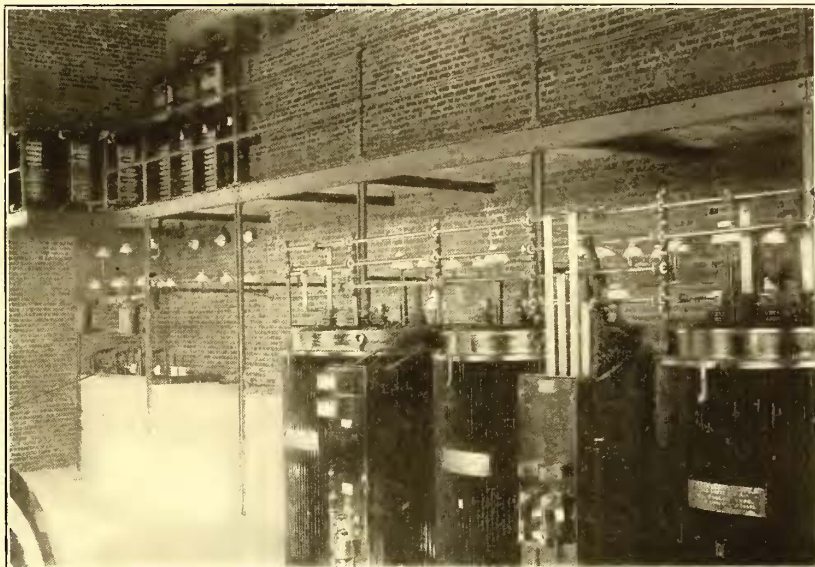
From each generator the current is carried directly to a bank of three 370-kw transformers. These are of the oil-cooled type, built by the Wagner Electric Manufacturing Company. These transformers step up from 375 volts to 27,000 volts.

#### SWITCHBOARD

The switchboard was furnished and installed by the General Electric Company, and is of black enameled slate, 7 ft. 6 ins. high, 40 ft. 4 ins. long. It consists of twenty-four panels, and is of the usual standard construction, containing no radical departures. The indicating and recording instruments are connected through current and potential transformers, and no high-tension lines are connected to the switchboard.

At the south end of the board, mounted on a swinging bracket, is a 750-volt illuminated dial voltmeter, while at the other end, similarly

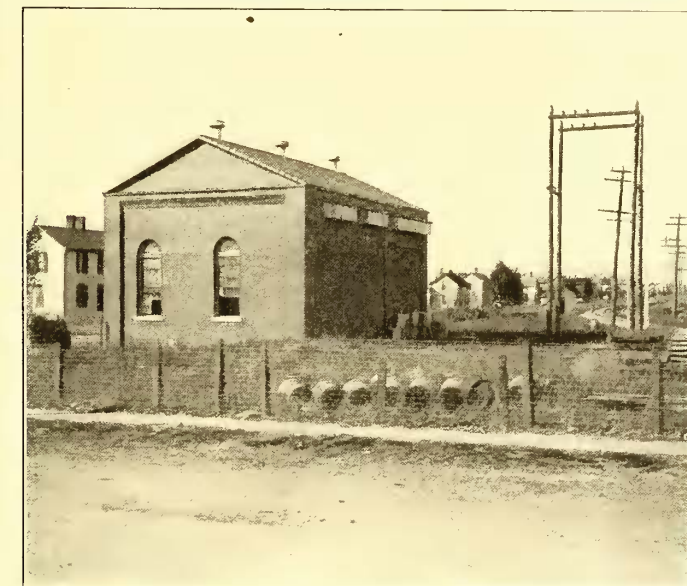
mounted, is a dial synchronizer. A large synchronizer, having an 18-in. dial, is mounted below the crane girder, in front of the



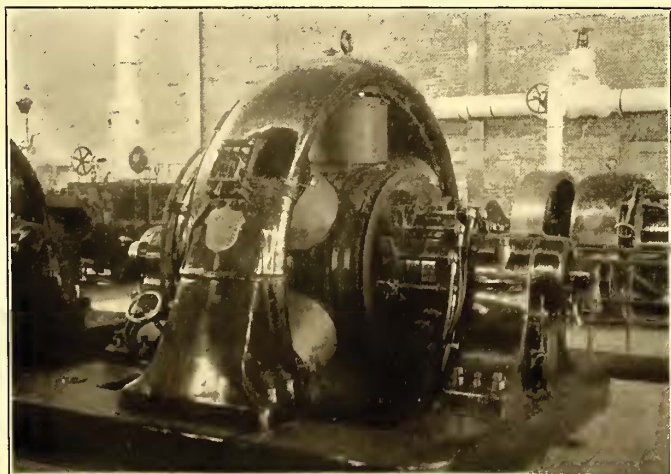
LIGHTNING ARRESTERS, OIL SWITCHES AND 150-KW TRANSFORMERS IN SUB-STATION



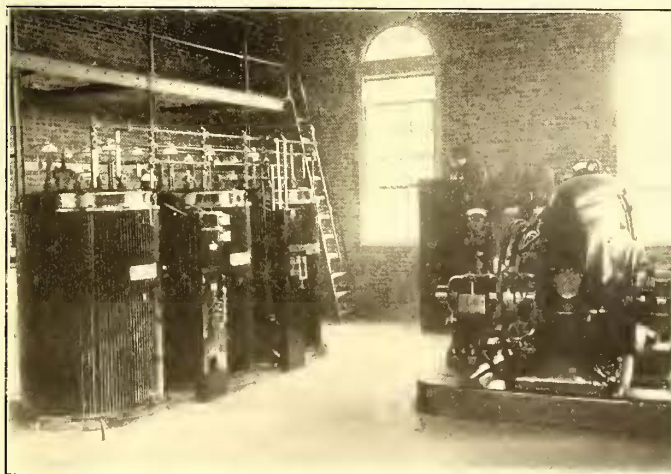
GENERAL INTERIOR VIEW, SHOWING EXCITER SETS



ASHEVILLE SUB-STATION



400-KW BULLOCK ROTARY IN MAIN STATION



INTERIOR ASHEVILLE SUB-STATION

controlled by Form-H motor-operated oil switches, built by the General Electric Company. The switch cells are of concrete, with walls 4 ins. thick. In addition to the oil switches, disconnecting knife switches are used between the oil switches and bus-bars, and between the bus-bars and outgoing lines.

The high-tension lightning arresters are of the 27,000-volt General Electric Company type. They are located on the wall just back of the switchboard and under the opening through which the high-tension feeders leave the building.

From the generators the current is conveyed by asbestos-covered cable, supported on racks beneath the engine room floor, direct to the 370-kw transformers, and thence by No. 00 bare copper cable through the oil and knife switches to the main bus-bars. These, three in number, are contained in a brick and concrete compartment located in the bus-bar chamber. This compartment is made up of three separate ducts, one above the other, separated by concrete slabs, so that all possibility of short-circuit between phases is eliminated.

The bus-bars are divided into sections by knife switches, thus allowing any section to be cut out without interfering with the operation of the plant.

From the bus-bars the circuit passes through oil and knife switches, either to the 150-kw step-down transformers and thence to the rotaries in the main power station, or to the sub-stations, the lines passing up the east wall through enclosed brick ducts and out through openings in the wall near the roof. These openings are protected by feeder hoods, built of Alberene stone, with concrete roofs. All instrument and auxiliary wiring is run in pipe conduit buried in the floor.

#### SUB-STATIONS

There are four sub-stations, one of which is located in the power house. The power house sub-station contains two 400-kw rotary converters, with provision for a third. The remaining three sub-stations at present contain one 400-kw rotary converter, with provision for a second. The three sub-station buildings are substantially alike, being built of red brick, with stone trimmings, and with roofs of Ludowici tile laid on angle purlins, supported by steel trusses which rest on the front and rear walls of the building. The foundations and floors are of concrete. Each building is 54 ft. x 31 ft. 6 ins., and 33 ft. high from the floors to the bridge of the roof. Along the rear wall is a gallery, giving access to the lightning arresters. Under this gallery are placed the oil switches. In front of these stand three 150-kw step-down transformers.

The sub-stations are designed for two incoming and two outgoing high-tension transmission lines, only one of which is at present installed.

In the sub-station in the power house, the oil switches are electrically operated and controlled from the main switchboard, whereas in the other sub-stations they are operated by hand. The switching is done on the high-tension side of the transformers.

#### OFFICERS AND ENGINEERS

The officers of the Scioto Valley Traction Company are: President and general manager, F. A. Davis; treasurer, E. R. Sharp; general superintendent, L. C. Bradley.

The power plant, transmission lines, third rail and cars were designed by W. E. Baker & Company, consulting engineers, New York, and the installation was under their supervision. This paper is indebted to them for the engineering facts contained in this article. The civil engineering was in charge of A. W. Jones, of Columbus, Ohio.

The Western Massachusetts Street Railway Company has asked for the approval by the Railroad Commission of locations in the towns of Westfield, Chester, Huntington, Becket and Lee. The company proposes to build a line 33 miles in length, extending from Westfield to Lee, forming the connecting link between the Springfield Street Railway on the east and the Berkshire Street Railway on the west.

## THE LEEDS, WAKEFIELD AND WEST RIDING TRAMWAYS

An extensive electric system, owned by the Wakefield & District Light Railways Company of England, has been recently put in operation. Although there is a considerable mileage at the moment in operation, the scheme is only partially completed, and when the remaining sections and links are finished the system will embrace wide districts around Leeds and Wakefield, including Horbury, Ossett, Normanton, Castleford, Pontefract, Lofthouse and Rothwell. Eventually it will involve the operation of some 75 miles of single track, linking together, by a frequent service, some of the most populous districts in the West Riding of Yorkshire. A trunk line runs from Wakefield to Thwaite Gate, and there joins the Leeds Corporation Tramways System. Bearing in mind the recent and important discussions on the subject of joint running powers, it is interesting to note that it has been possible for the company to arrive at an arrangement with the Leeds Corporation under which cars can be run to the center of Leeds. Such an understanding must result in the greatest convenience, and should materially add to the efficiency of the District Company's system and prove to be a useful feeder to the Corporation tramways. The total mileage constructed up to date is roughly 32½ miles of single track.

The contract for the whole of the work was given to the



VIEW IN BULL RING, WAKEFIELD

firm of Dick, Kerr & Company, Limited, the consulting engineer for the scheme being B. D. V. Cooper.

Such a system obviously calls for high-tension transmission, as it would be, of course, impossible to work all the routes embraced in the extended scheme from one central station. The main station is situated at Belle Isle, Wakefield, where alternating current is generated at high pressure and transformed at sub-stations to direct current of 500 volts. One sub-station is in use in Wakefield, about 1 mile from the power station, where three 200-kw rotary converters have been erected; another in Rothwell, with two 200-kw rotaries, and there will eventually be another at Castleford, which is about 10 miles from the power station, and ultimately a fourth at Ossett.

The total length of tramways now in operation is approximately 25 miles of single track, laid to standard gage. The usual British tramway construction has been employed on about 9 miles of single track. The roadway has been excavated to a uniform depth of 12½ ins. below the upper surface of the rails, to receive an 8-in. bed of concrete to carry the paving for a width of 8 ft. for single track and 17 ft. for double track. The roadway between the rails, and for an average space of 18 ins. on either side, both for single and double track, is paved with granite sets 5 ins. deep and 4 ins. wide. In the remaining