The Northwest Power Station Railway of the Commonwealth Edison Company

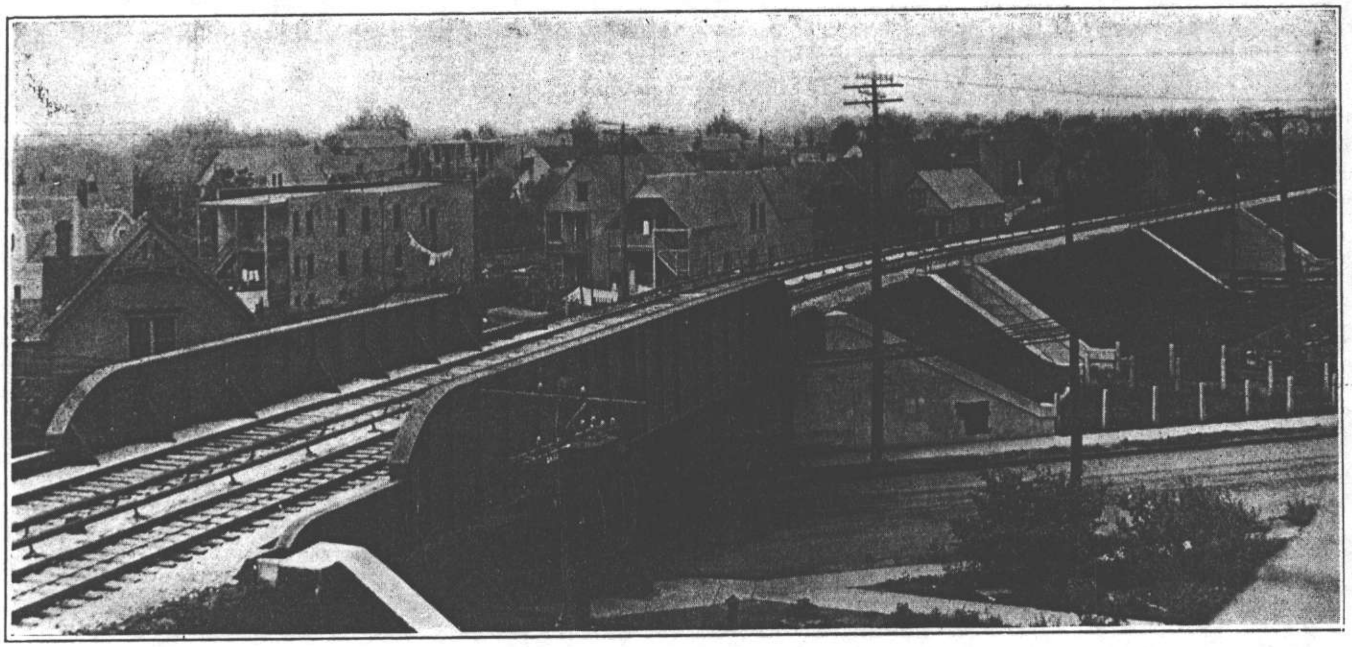
A Novel Electric Railway Built and Equipped for the Sole Purpose of Transporting from a Nearby Steam Railroad the Necessary Coal, Supplies and Machinery for a Large Power Station in Chicago

An unusual electric railway has recently been completed by the Commonwealth Edison Company. It was constructed and equipped in order to connect the Northwest power station, which is located on the banks of the Chicago River, with the tracks of the Chicago & Northwestern Railroad, about 1 mile distant. The construction of the new Northwest station, which is the latest and most extensive of the power plants of the Edison company, was described in detail in the Convention Section of the ELECTRIC RAILWAY JOURNAL for Oct. 5.

The Commonwealth Edison Company is noted for the foresight displayed in the planning of its stations, and the electric railway is undoubtedly part of a general scheme much larger than the present construction indicates. Otherwise the elaborate track construction and electric locomotive equipment would seem out of proportion to the work which it is now called upon to accomplish, which consists primarily in handling coal, ashes and construction materials. The layout of the plant and electric railway trackage is shown in the plan on the opposite page. It comprises three main divisions—the present and contemplated track in the power plant grounds; the double-track line on a private right-of-way, and the company's projected yard contiguous to the Chicago & Northwestern Railroad tracks. At present there are approximately 5 miles of single track installed, which includes the main line, connecting with the railroad company's yard, and a portion of the contemplated trackage in and about the power plant.

The track construction is of the same general character as that of the Northwestern Railroad with which the system connects. In appearance it is like the New York Central & Hudson River Railroad's electrified track, having the same general arrangement of protected third-rail. The track is A. S. C. E. standard T-rail, weighing 80 lb. per yard, and the ties are of white oak, 6 in. x 8 in. x 8 ft. in dimensions, spaced 22 in. between centers. The track is heavily ballasted with trap rock crushed to pass through 1½-in. mesh screen, giving as substantial a foundation as it is possible to obtain. The rails are raised to such a height above the level of the surrounding ground that excellent drainage is secured.

Every sixth tie is of 1½ ft. extra length and carries the third-rail insulator bracket. The inverted third-rail is a 70-lb. bullhead rail of special composition, similar to that used by the New York Central Railroad. It is insulated from the brackets by porcelain insulators and is covered with yellow-pine planking treated with carbolineum. The use of carbolineum for this purpose instead of creosote resulted in the saving of several thousand dollars, and, as far as can be determined from present indications, it will give entirely satisfactory results.



Power Station Railroad—General View Showing Bridges and Embankment of Main Line

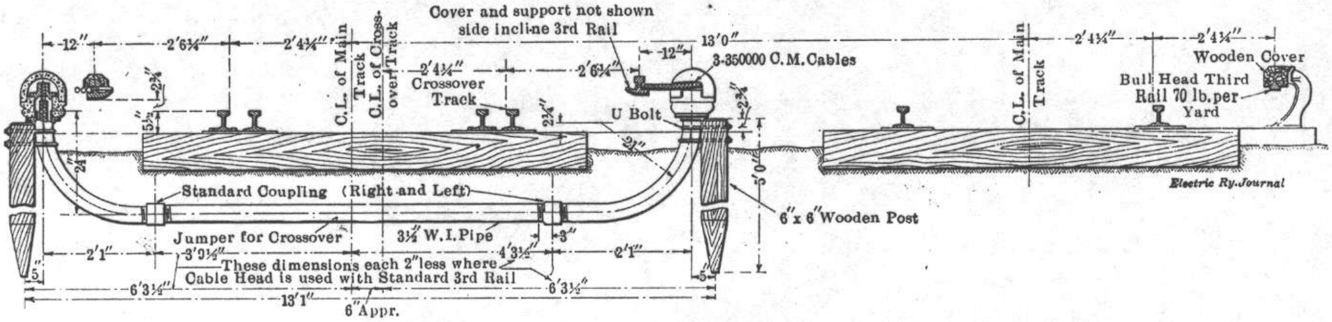
Power is transmitted to the third-rail by means of lead-covered, paper-insulated cables of 1,000,000-circ. mil total area located in iron conduit beneath the track. There are four of these large feeders from the substation to four sections of the contact rail. The two contact rails along the main line to the Chicago & Northwestern tracks are fed through two separate feeders. Another feeder supplies the third-rail in the boiler room and the fourth connects with the third-rail located in the coal-storage yard. The cables are brought out through iron conduit terminating in porcelain cable heads, supported by wooden posts, as shown in the accompanying line cut. This also shows details of a cross-over with the arrangement of jumper connecting the contact rails on the two sides of the track. The center line of the third-rail is 2 ft. 4¼ in. from the gage line of the track, and its under surface is 2¾ in. above the track surface.

Referring to the general plan it will be noted that at the railroad end of the line a storage trackage of about ¾ mile is provided. This will permit the storage of several thousand tons of coal or construction material in cars. This yard is electrically equipped, but steam locomotives are used by the steam road to bring cars to the boundary of the Edison company's property. Between the storage yard and the power plant grounds the line is double-tracked, and it crosses several streets, including four wide ones. Over these streets plate girder bridges, of strength sufficient for the heaviest steam traffic, were constructed.

In the station yard the tracks have been laid out as symmetrically as possible with a view to accomplishing

service. The general appearance of one of these is shown in the accompanying halftone. It has the following dimensions: Length inside knuckles, 33 ft. 2 in.; length over cab, 26 ft. 6 in.; height over cab, 12 ft. 6 in.; width over all, 10 ft.; height with trolley down, 14 ft. 6 in. The total weight is made up of that of the electrical equipment, 26,000 lb.; the air brake and compressor, 5000 lb., and the mechanical equipment, 89,000 lb.

The trucks are of heavy locomotive type with framing

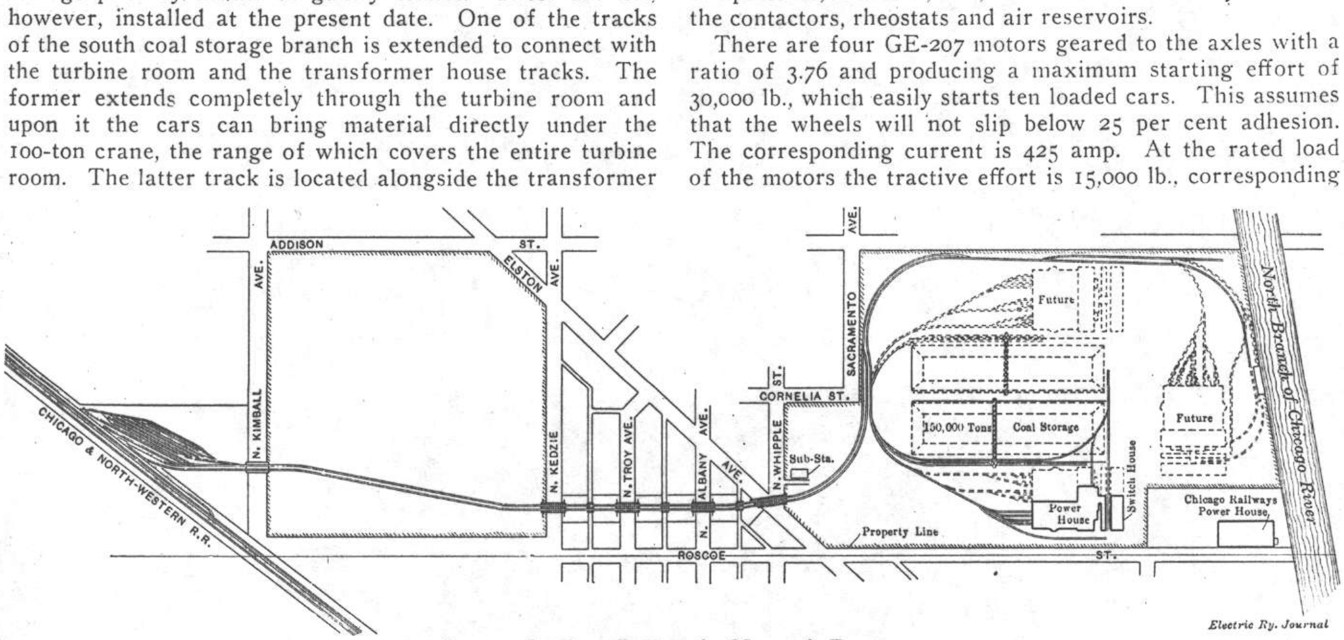


Power Station Railroad—Details of Third-Rail Construction at Cross-Over

several purposes. The track enters the southwest corner of the property and follows the west, north and east boundary to a point on the bank of the North Branch of the Chicago River convenient for the unloading of material from barges if that should be found desirable. From a point on the west boundary a branch leads along the south side of the power house for the purpose of carrying construction and repair material. From this line branches lead also to the ground floor of the boiler house, four tracks to each third of the building. The inside two of these are for coal supply, the outside two for the removal of ashes. A double-track branch from the main line also leads along the north and south side of the coal storage of 300,000 tons capacity and permits the ready removal of coal from the cars to the storage piles by means of gantry cranes. These are not, however, installed at the present date. One of the tracks of the south coal storage branch is extended to connect with the turbine room and the transformer house tracks. The former extends completely through the turbine room and upon it the cars can bring material directly under the 100-ton crane, the range of which covers the entire turbine room. The latter track is located alongside the transformer

built up of steel castings rigidly bolted together. These frames are supported upon equalized semi-elliptical journal-box springs. The trucks are connected by a heavy hinge, and the drawbars are carried on the outer truck-end frames, the makers claiming that by this construction the draft and buffing strains from drawbars and buffers are transmitted directly through the truck frames, instead of through the center pins, which carry in consequence only the strains due to the weights of platform and cab. The platform is laid upon a frame made up of channels riveted firmly together, the flooring being of heavy steel plates extending the full width of the platform and riveted to the sills. The cab is in three parts, as usual in this type of locomotive. The center section contains the engineer's seats, brake valves, air compressors, switches, etc., while in the auxiliary cabs are the contactors, rheostats and air reservoirs.

There are four GE-207 motors geared to the axles with a ratio of 3.76 and producing a maximum starting effort of 30,000 lb., which easily starts ten loaded cars. This assumes that the wheels will not slip below 25 per cent adhesion. The corresponding current is 425 amp. At the rated load of the motors the tractive effort is 15,000 lb., corresponding



Power Station Railroad—Map of Route

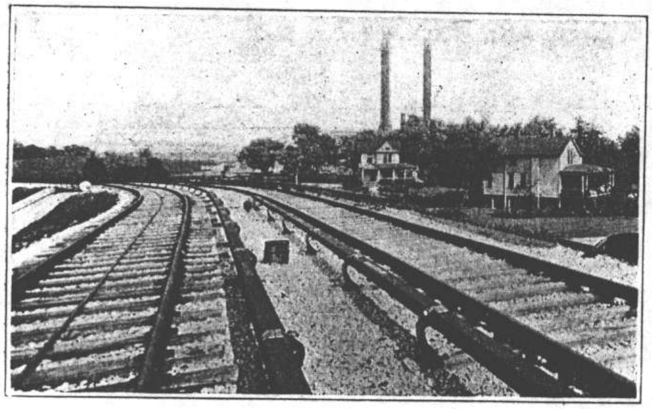
house. The transformers, or compensators, are on wheelbases located on short tracks perpendicular to the line of the building and therefore the railroad track outside. Thus the transformers can be readily rolled outdoors and loaded upon flat cars. In fact, every provision has been made for the greatest possible ease of handling fuel and machinery parts.

The motive power for the freight train consists of 60-ton electric locomotives designed for slow-speed switching

to a speed of 8.2 m.p.h. and an input of 460 amp at 600 volts. At 5000 lb. the speed is 11 m.p.h. The maximum speed of the equipment on level, tangent track is about 16 m.p.h. with a train of 230 tons gross weight and assuming 8 lb. per ton train resistance. The maximum allowable coasting speed is 40 m.p.h.

The control equipment is of the "M" type single unit, with seven series and five series-parallel steps and known as a two-speed control. It is not arranged for parallel operation of the locomotives. There are four third-rail shoes located 32 in. outside the gage line and 2¾ in. above the running rail, as previously explained. The locomotives are also provided with pantograph collectors having a range from 18 ft. to 22 ft. in height. These collectors are controlled by means of air from the brake system.

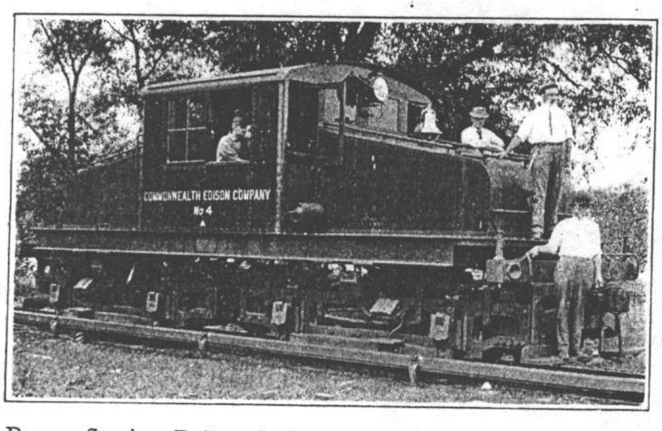
The air-brake equipment comprises two compressors of the GE-LT type and two main reservoirs 35 in. by 46 in. in dimensions. There are four 8-in. cylinders. The compressors have a displacement capacity of 50 cu. ft. per



Power Station Railroad—View of Tracks Showing Third Rail

minute at 90 lb. per square foot delivery pressure. The piping is arranged for use either as a straight-air or an automatic system.

In addition to the above essential features the usual auxiliaries are found on the locomotives, including luminous-arc headlights. The locomotives have been in operation for some months and the officials of the Edison company are greatly pleased with the results obtained from them as well as from the remainder of the equipment. At present power is taken from a neighboring power house of the Chicago Railways Company, shown on the general plan. There is no 500-volt equipment in the Northwest station, and the Edison company is willing to "take its own medicine" by buying energy in this form from a company which has



Power Station Railroad—Electric Locomotive Used on the Line

500-volt d.c. power available. A duplication of investment in this community is thus avoided.

The form of oil burner which consists of a piece of piping mashed down at the end and coupled to a steam or air line and an oil supply is one of the most wasteful means of burning liquid fuel, as it does not thoroughly atomize the oil and in consequence permits much of it to be passed through the furnace in such large globules as to afford an insufficient time for complete combustion.

USE OF ALLOYS IN STEEL AND IRON

The use of alloys in the manufacture of the better grades of steel and iron is becoming more and more popular because of the improved metal obtained after treatment. The subject is receiving considerable study, especially in its application to rails and castings which require great ductility and abrasive resistivity. Experience with iron and steel thus treated has demonstrated its increased wearing qualities, and it may be of interest to describe briefly the chemical action by which these beneficial results are obtained.

The alloys used for this purpose are found in limited deposits in various parts of the world and are usually combined with iron. This combination not only provides an alloy with a low fusing point but reduces the cost to the consumer to a point where it is not prohibitive for practical purposes. The alloys most commonly used include ferro-titanium, ferro-manganese, ferro-vanadium and nickel-chrome. Each has chemical qualities peculiar to itself, yet in the broad sense each will act as a scavenger or purifier if added to molten steel or iron in sufficient quantities. The ferro-manganese and titanium are used largely as scavengers, being the cheapest of all the alloys because they are most abundant. In the scavenger or purifier action the object is the removal of undesirable impurities. The principal impurity in molten steel is oxygen in the form of iron oxide, which is dissolved in the molten steel. To remove this the addition of any element is effective which has a greater affinity for oxygen than the iron. The addition of silicon to iron oxide results in purer iron and the silicon oxide passes off into the slag. When ferro-manganese or ferro-titanium is added to the molten iron the alloys combine with the impurities and pass off with the slag. Ferro-titanium is a very active alloy, having a greater affinity for oxygen than any of the others, and is, therefore, used in large quantities for purifying steel and iron. Ferro-manganese is also used, but is more expensive and does not have as great an affinity for oxygen as ferro-titanium.

Vanadium is not employed as a scavenger, because it is too expensive when compared with the other two alloys, but it is employed in what are commonly called special alloy steels. In this case the added element remains in the steel as an essential constituent. It does not change into its oxide, as in the former case, but is mixed or dissolved with the steel, though not chemically combined with it. Both manganese and vanadium when alloyed with steel in small quantities produce very desirable results. After heat treatment the metal becomes very hard and at the same time ductile. The manganese is largely employed in the manufacture of rail, special work, gears, pinions, dipper teeth for steam shovels, rock and ore-crushing machinery and, in fact, wherever improved wearing qualities and toughness are desired. The vanadium alloy steels are employed in the manufacture of tools, axles, and in general where the resistance to vibration and often-repeated stresses is important. To obtain the maximum results from vanadium, heat treatment is necessary; this increases the ductility, but does not materially affect the hardness. The high cost of products manufactured from these special alloy steels is not due to the expensive composition particularly, but is due largely to the cost of production of a given article. The molding and core-making require more care and a higher degree of skill in their preparation, because the castings are extremely hard and tough, making them expensive to finish. All finishing is done by grinding, as no machine tool is hard enough to withstand the severe strain.

Both vanadium and titanium are being added to cast iron, and the resulting metal is more homogeneous, more fluid, more uniform, closer grained, cools more slowly and settles more quietly in the mold.