Safety is another advantage of the employment of hydrolith. The transportation of highly compressed gases requires special precautions, and is subjected to elaborate and rigid regulations by railway companies. In war these great tube wagons would be easy marks for the enemy, and if a tube charged to 135 atmospheres (210 in Italy) should be hit by a shot, it cannot be doubted that its explosion would involve that of all the other tubes in the vicinity. The balloon station would be annihilated, and a large area swept clean by the explosion of so tremendous a mine.

No such accident is possible with hydrolith, which is as harmless as a mass of pebbles until its hydrogen has been liberated by the action of water.

The manufacture of hydrolith comprises two operations: the preparation of metallic calcium, and the combination of the metal with hydrogen. The metal is obtained by the electrolysis of fused calcium chloride. About 300 kilowatts of electrical power (7,800 amperes at 40 volts) produce 100 kilogrammes (220 pounds) of metallic calcium in 24 hours. Commercial electrolytic calcium is furnished in cylindrical ingots of a few pounds' weight, which are slightly oxidized on the surface, are very hard and brittle, and give a clear metallic tone when struck. When polished the surface has a white silvery luster. The density of the metal is 1.85, its melting point 760 deg. C. (1,400 deg. F.). It scratches lead, but does not scratch Iceland spar. The hydrolith is prepared by exposing metallic calcium to a current of hydrogen in horizontal retorts heated to a high temperature. The calcium gradually aborbs the gas, and is soon converted into calcium hydride, or hydrolith.

Chemically pure hydrolith forms a white crystalline mass, of the density 1.7, which has no known solvent. It dissociates when heated to 600 deg. C. (1,100 deg. F.). Commercial hydrolith occurs in irregular lumps of a slate gray color. Its impurities, which amount to about 10 per cent, consist chiefly of oxide and nitride of calcium.

The reaction which takes place when hydrolith is mixed with water is indicated by the following equation:

$$\underset{\text{Hydrolith}}{CaH_2} + \underset{\text{Water}}{2H_2O} = \underset{\text{Slaked lime}}{Ca(OH)_2} + \underset{\text{Hydrogen}}{2H_2}$$

From this equation it may be calculated that 1 kilogramme of pure hydrolith evolves 1,143 liters of hydrogen, measured at the ordinary atmospheric pressure and temperature. The 10 per cent of impurities in commercial hydrolith reduces the yield of gas to about 1 cubic meter per kilogramme, as was stated above.—Translated for the Scientific American from La Revue Génerale de Chimie Pure et Appliquée.

### Nicotineless Tobacco.

Upon an American request, Consul-General Frank H. Mason, of Paris, has prepared the following report on the introduction of "nicotineless tobacco" in France:

What is popularly known as "Caporal Doux," or the so-called "nicotineless tobacco" in France, is simply ordinary caporal tobacco which has been treated by washing with water until the ordinary proportion of 2½ per cent of nicotine has been reduced to 1 per cent. In this form it is used for smoking in pipes and for the manufacture of cigarettes, which find a certain favor among smokers who prefer a light flavor or who, by reason of nervous or cardiac weakness, are wary of nicotine.

Ordinary caporal is a mixture of French, American, and oriental tobaccos, prepared by the "Régie," or government establishment, which has a complete monopoly of the manufacture of tobacco, cigars, and cigarettes in France. It has a somewhat rank, but not unpleasant flavor, and is the cheapest, most popular form of tobacco used in France for smoking purposes.

About eight months ago the French government, finding that there was a growing demand for a so-called "nicotineless tobacco," which had been made on a small scale by certain druggists, and which was also manufactured in Belgium, began the manufacture of a similar product by denicotinizing caporal tobacco through the action of water, which, in reducing the proportion of nicotine from 2½ to 1 per cent also washes out other ingredients, so that the weight of the tobacco is reduced, according to the quality of the leaf, from 15 to 30 per cent. It is this loss of weight rather than the actual expense of the process which constitutes the cost of denicotinizing and explains the fact that ordinary caporal tobacco, which sells at $2.41 per kilo (2.2 pounds), is advanced in value when denicotinized to $3.08 per kilo. The process of washing is simple, and is facilitated by the use of automatic machinery, but it requires careful and constant supervision by a skilled and trustworthy operator in order that a uniform product, containing the specified percentage of nicotine, may be obtained. "Caporal Doux" is retailed at the government tobacco shops in packages of 50 grammes for 80 centimes, or 16 cents per package, equal to about $1.46 per pound avoirdupois.

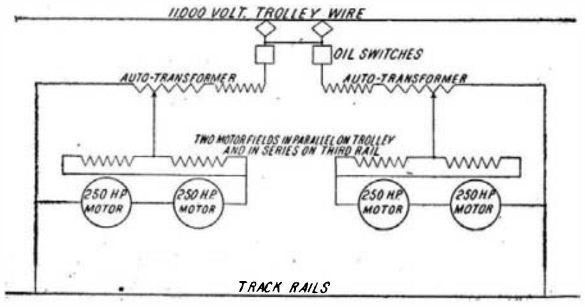
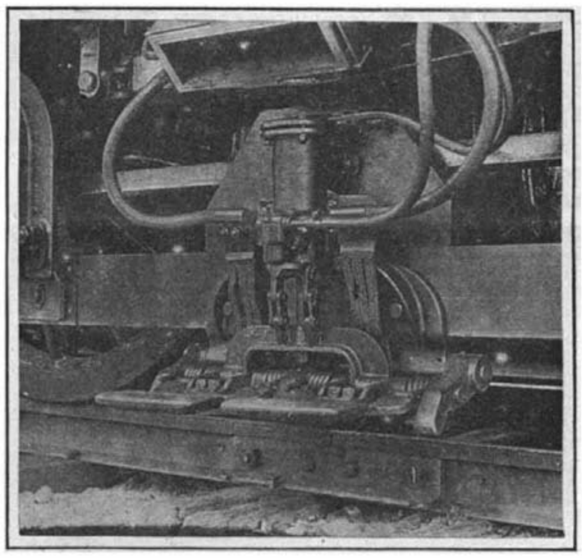



**Diagram Showing the Wiring of the Locomotives.**

Cigarettes of the same tobacco are sold in packages of ten each for 35 centimes, or 7 cents per packet, whereas ordinary caporal cigarettes of the same number and size retail for 30 centimes, or 6 cents per packet.

It is too soon to form any conclusion as to the extent to which denicotinized tobacco and cigarettes may be used in this country. It is now on sale in Paris, and in eighty other municipalities throughout France. During the four months from January 1 to April 30 there were sold by the Régie to dealers in Paris 26,000 kilos of denicotinized tobacco, and 5,000 kilos, or 50,000,000 cigarettes, made from the same material. To smokers accustomed to full-flavored tobacco the smoke of Caporal Doux is somewhat insipid. Its one advantage is that 25 cigarettes made of it contain only the



**The Collector Shoes for Taking Current from the Third Rail. When Not in Use the Shoe is Drawn Up Clear of the Rail by the Compressed-Air Cylinder Shown Above the Shoes.**

same amount of nicotine as 10 of ordinary caporal, and its narcotic action upon the heart and nervous system is proportionately reduced.

### "Touching Up" Faulty Places in Electroplated Coatings.

It often happens that articles which have been electroplated show spots that are badly or not at all coated. This is caused by imperfect cleaning, by the adherence of particles of dirt, contact of two articles in the bath, or by the wires which are used to hang the articles. No matter what the cause, the result is the same—an imperfect coating. To replace the entire article in the bath and let it stay there the requisite time for plating as at first would be a great loss of time, and would also be expensive. As sometimes it is only necessary to give the faulty spots a light coat, it is well to have a process by which they may be "touched up" without an entire repetition of the ordinary process. Sometimes these faulty places are not discovered before polishing the articles; in this case they would have to be cleaned again most carefully, before being put into the bath. Sometimes it has been found necessary to remove the entire coating, before starting over again.

A process which will enable the defective places to be covered is as follows:

First there is provided a sponge dipped in the bath liquor. The article on which there are faulty places in the plating is connected by a suitable conductor with the dynamo in the same manner as though it were lying in the bath. Around the sponge there is wound, as anode, a thin strip of the metal which is to be deposited. The entire arrangement then represents the conditions of the ordinary bath; and the current being turned on, the local plating can take place by the mere application of the sponge to the faulty places.

The German journal which describes this process (Deutsche Metall Industrie Zeitung) states that the process is admirably adapted to plating with silver, gold, copper, and brass; but that with nickel the results are far from being satisfactory.

The necessary apparatus consists of a pipe of glass or other material which does not conduct electricity, and on one end of which is placed the sponge; at the other end there is a rubber bulb containing some of the bath liquor. Through the bulb and the tube passes a rod which at the outer end of the tube ends in a clamp, so that the sponge and anode may be readily attached. On the other end of the rod, inside the glass tube, is fastened the anode rod, reaching into the sponge. The best material for this rod is platinum, so as not to be attacked by the bath liquor.

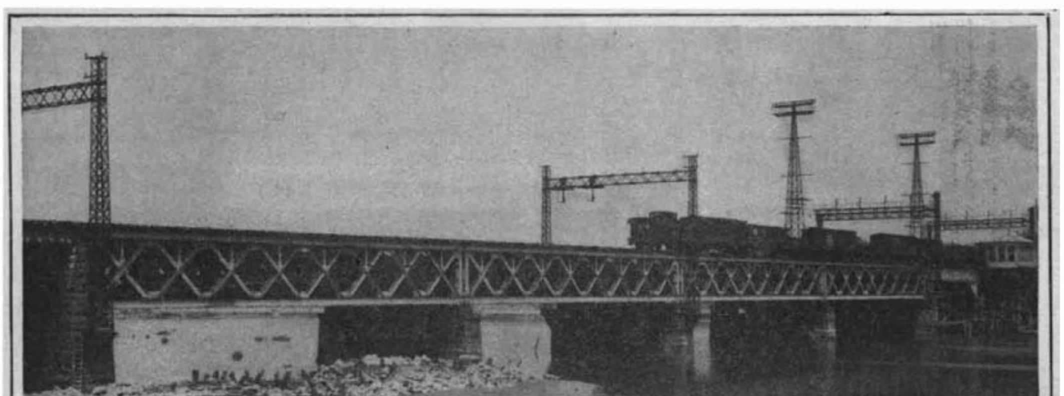
The operator's hands do not come into contact with the solution. Pressing the bulb causes a supply of bath liquor to penetrate the sponge, replacing what is used up in the plating process.

### THE INAUGURATION OF THE NEW HAVEN RAILROAD ELECTRIC SERVICE.

Because of the fact that the inauguration of electric service on the New Haven system marks the first application of an alternating current system to the operation of a trunk line railroad in this country, the event will necessarily command widespread attention. It is true that the alternating current has been so used for several years in Europe, notably on the Valtellina line in Italy. In this country, also, single-phase current has been in successful operation on certain interurban lines. The New Haven Railroad equipment, however, is the first instance of the application of single-phase traction to an important trunk railroad; and the fact that, throughout the whole of the 22-mile electric zone, the road is equipped with four tracks, and carries an unusually heavy suburban and express service, gives this service an importance equal to that which attaches to the third-rail equipment of the New York Central lines, which has now been in successful operation for over six months. The electric zone of the New Haven system extends from Stamford to Woodlawn, a distance of 22 miles. From this point to the Grand Central terminal station in New York, the trains run over the tracks of the New York Central Railroad.

#### THE COS COB POWER STATION.

The electric zone, throughout its entire length, is served from a power station located on the water front at Cos Cob, some three and a half miles from Stamford, Conn. The site selected is a picturesque point of land, which was formerly the summer home of the celebrated tragedian Edwin Booth. The architectural treatment of the building is simple and dignified, and harmonizes well with the natural features of the site. Unlike many of the later power stations, the structure rises only one story above ground level; although there is a deep excavation below the engine and boiler rooms for the accommodation of the coal bunkers and various auxiliary machinery. The boiler house occupies the westerly portion of the building, while the easterly bay is given up entirely to the turbines and generators. The whole build-



**Cos Cob Bridge, Showing the Tall Towers for Carrying the 11,000-Volt Transmission Lines Over the Rolling Lift Bridge.**

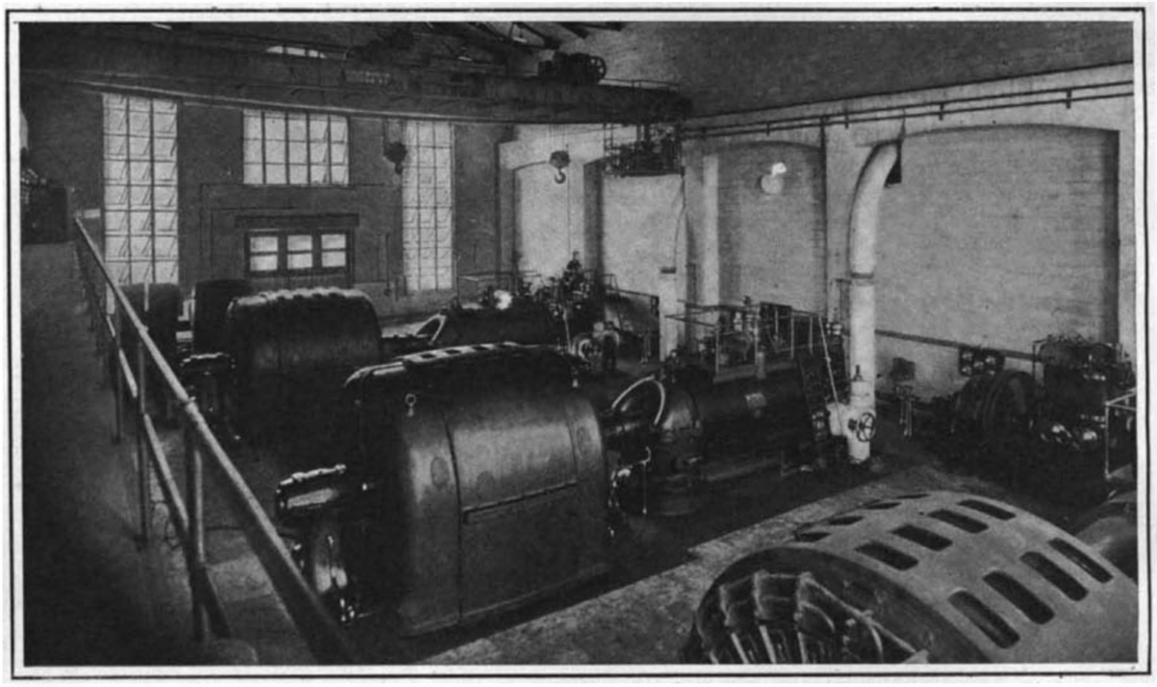
INAUGURATION OF THE NEW HAVEN RAILROAD ELECTRIC SERVICE.

ing is abundantly lighted, and all the windows, from top to bottom, are provided with swinging sashes, with a view to providing ample ventilation. The boiler house is equipped with sixteen Babcock & Wilcox boilers of 520 horse-power each. The coal is delivered at a wharf situated at a distance of about 400 feet from the power station. Here it is lifted from the barges and delivered to the top of a receiving tower, where, after being crushed, it is delivered to the cars of an inclined cable system, which runs from the tower to the roof of the boiler house. It is then delivered into a hopper, and taken away by a flight conveyer, either direct to the boilers or to the bunkers in the basement of the building. From the bunkers it is taken by a bucket conveyer and returned to the flight conveyer for transport to the boilers, where it is delivered direct to the Roney mechanical stokers in the furnaces.

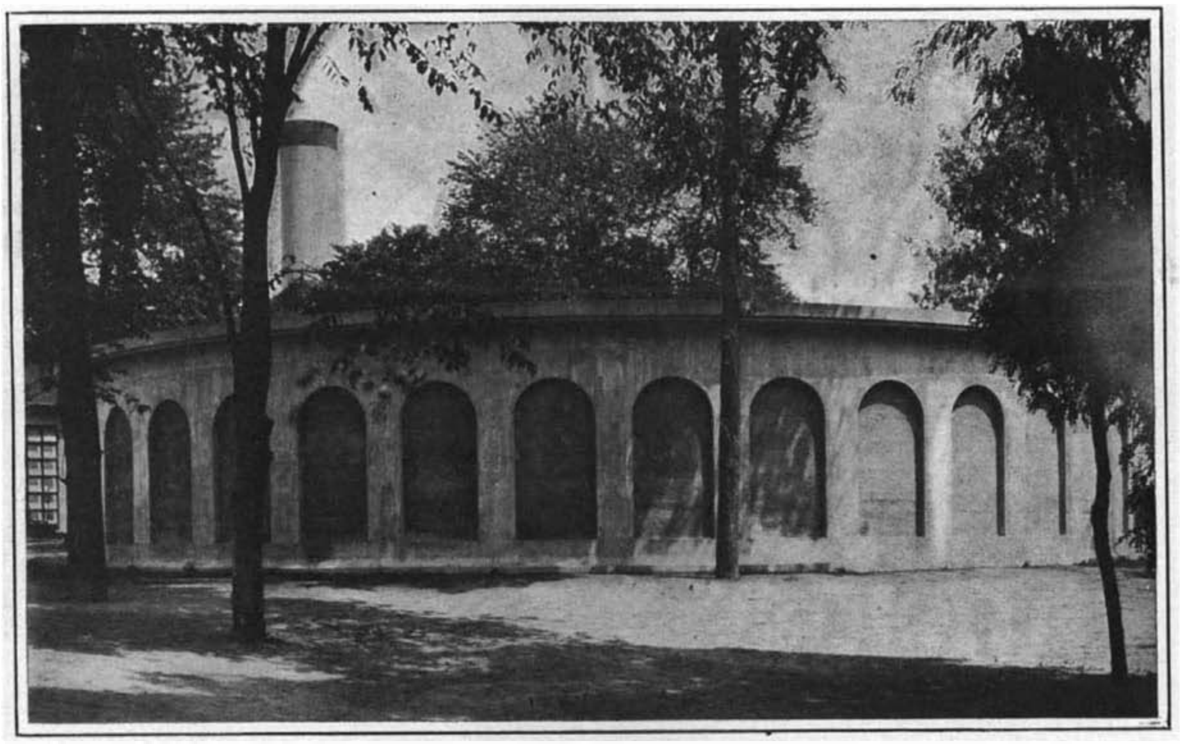
The engine room contains four 3,750-kilowatt turbo-generators of the Westinghouse-Parsons type. The turbines receive the steam at 200 pounds pressure and 100 degrees of superheat. They run at 1,500 revolutions per minute, and deliver single-phase current to the trolley system under a tension of 11,000 volts. The engine room equipment also includes two 13-inch Westinghouse compound steam exciters and one motor generator set exciter. The turbo-generators are among the latest built by the Westinghouse Company, and they are splendid specimens of the engine builder's art. In spite of the fact that the rotating parts of each set weigh 56 tons, and that the speed of revolution is 1,500 per minute, there is practically no vibration.

THE OVERHEAD TROLLEY SYSTEM.

The construction of the overhead trolley line is unquestionably the most novel feature of the New Haven Railroad equipment, at least from a constructive point of view. It was realized, when designing the system, that in view of the high speed of many of the trains, which frequently reaches from 70 to 75 miles an hour, it would be necessary to provide a trolley wire which would remain in true line and level, as distinguished from the loose and swaying wires of the ordinary trolley-car service. The system is built as follows: At about every 300 feet, the tracks are spanned by heavy latticed bridges erected upon massive concrete foundations. The bridges consist of two end posts and a deep latticed truss spanning the entire width of the tracks. The wires of the transmission line and signal service are strung upon the posts, and the four catenary trolleys are hung from the trusses. Each catenary consists of two half-inch steel "messenger" cables, which are cradled in the same way as the cables of a suspension bridge, and from these, and midway between them, is suspended a $\frac{5}{8}$-inch copper trolley wire, the attachment being made by a series of triangles, which decrease from 6 feet on a side at the trusses to 6 inches at the center of each span. The triangles are formed of $\frac{3}{8}$-inch galvanized pipe, and they serve to hold the copper wire firmly in alignment and level. At intervals of two miles the place



**Interior View of Power Station ; Showing Three of the Four Turbo-Generators.**



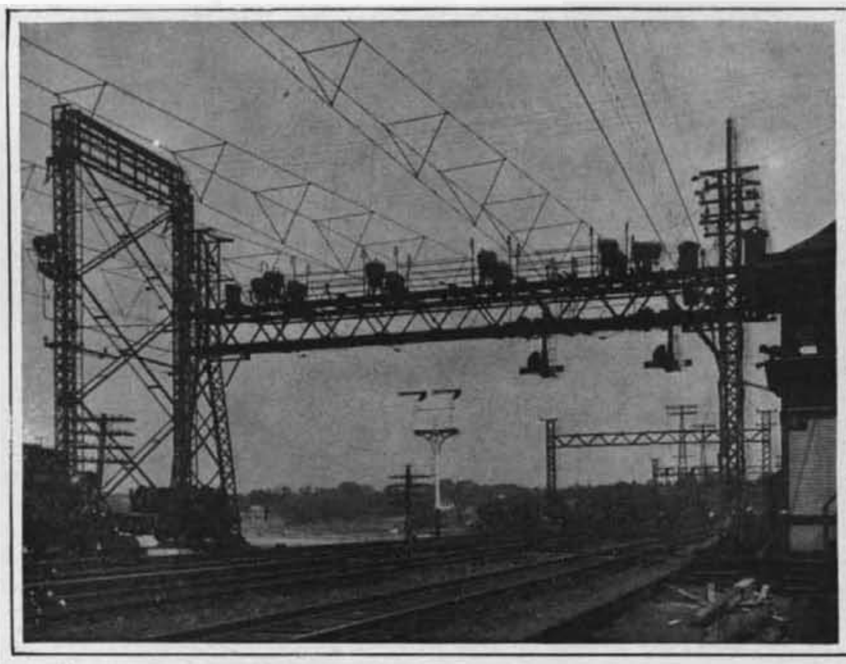
**The Ferro-Concrete Condenser Water Tank.**

of the ordinary bridge is taken by a special tension bridge of much heavier construction—sufficiently heavy to enable it to take up the slack of the wires when adjustment of that kind is necessary. Upon these bridges, also, is carried a set of section brake switches for cutting out the two-mile section of the road which they serve. One of our illustrations shows a bridge of this kind, as viewed from the entrance to the Cos Cob railroad bridge. To the left is shown a tall tower, from which the feeder lines are carried across the tracks to the power station. Another view, taken from the floor of the section brake switch bridge, gives an excellent view of the switches, which are here shown in the open position. When the switches are closed, the hinged cover serves to protect the whole mechanism from the weather.

From the foregoing description and the illustrations, it will readily be understood that the overhead trolley line construction is of a very costly character, and as a matter of fact, the average expenditure for this work has worked out at about fifty thousand dollars per mile.

THE ELECTRIC LOCOMOTIVES.

One of the chief economical advantages of the use of the alternating-current system is that it is not necessary to build, at stated intervals along the railroad, the costly sub-stations which form a necessary part of a direct-current installation. Instead, the stepping down of the current is done by transformers carried upon the locomotives. The provision of these transformers, of which there are two for each locomotive, adds greatly to the weight, which, in the case of the New Haven, reaches the high figure of 95 tons, although the rated power is only 1,000 horse-power. This is about the same weight as that of the New York Central direct-current locomotives, which have a normal rating of 2,200 horse-power. An interesting feature in these machines is that they have been arranged to take either single-phase current from the overhead line, or direct current from the third rail;



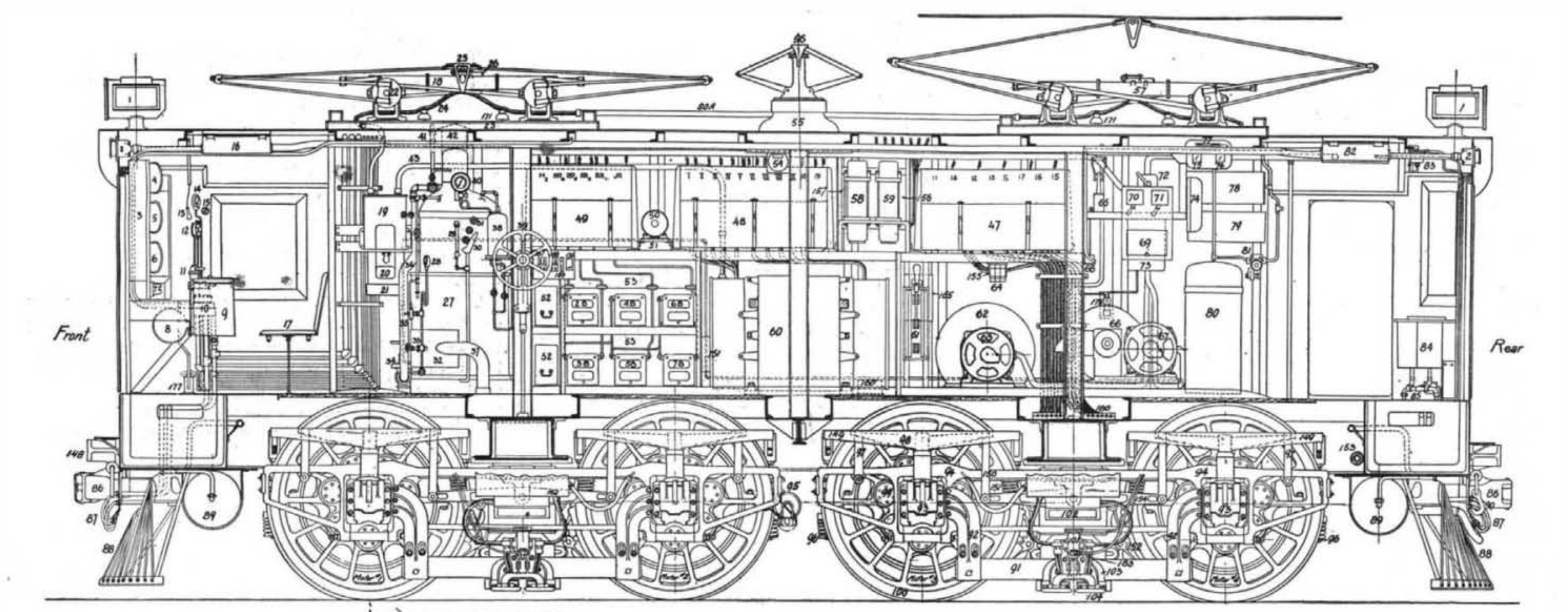
**A Bridge Carrying the Section Break Switches for Cutting Out a Two-Mile Section of the Line.**

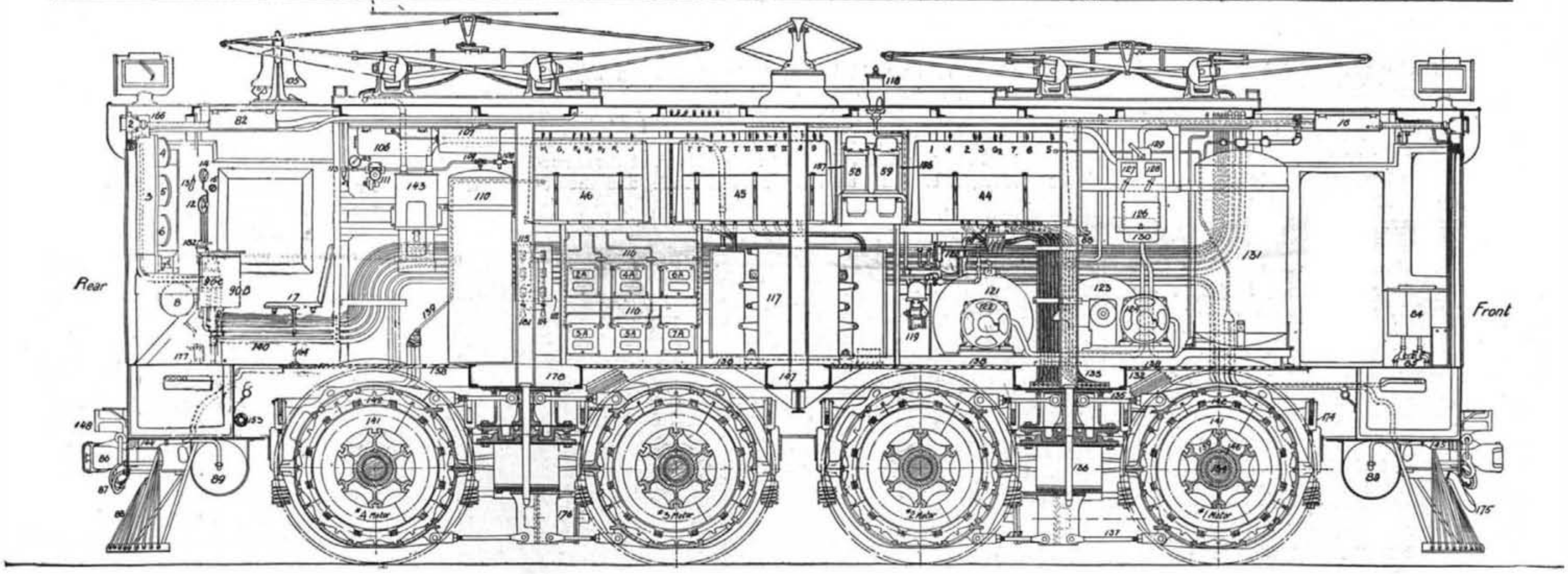
**Set of Section Break Switches Shown in the Open Position.**

**INAUGURATION OF THE NEW HAVEN RAILROAD ELECTRIC SERVICE.**

and with a view to making our readers familiar with the internal construction, we present two sectional views with numbered references, covering the whole of the internal construction.

The locomotives are carried upon two four-wheeled trucks, and are provided with four 250-horse-power motors, one to each axle. The motors are of the compensating gearless type. They are suspended from frames, which fit over the trucks and rest upon the journal boxes, the motors being supported on four bolts pro- which serve to transmit the power from the motor to the wheels without jar. Similar springs are disposed between the ends of the pins and the bottom of the pockets. This construction provides for a certain amount of vertical and lateral movement, while the motor is centered axially by the compression of the springs between the end walls of the pockets and the flanges of the quill. In order to prevent the motors from pressing against the wheels under the action of centrifugal force on curves, they are arranged to keep the motor free from dust. Each locomotive has been designed of sufficient power to handle an ordinary local train of from six to eight cars at the service speed. For hauling the through express trains, two locomotives will be coupled up in tandem. It is estimated that in local service, a 200-ton train can be operated at an average speed of 26 miles per hour with stops about two miles apart, the maximum obtainable speed between stations being about 45 miles an hour.




1 Headlight
2 Train Line Receptacles, Type 444D-E & F.
3 Support for Mounting Meters.
4 Speed Indicator Meter.
5 D.C. Ammeter.
6 A.C. Ammeter.
7 Temperature Indicator Meter.
8 Equalizing Reservoir.
9 No. 1 Master Controller.
10 No. 1 Automatic Brake Valve.
11 No. 1 Independent Brake Valve
12 Duplex Gage—Main Res. & Train L.
13 Whistle Handle.
14 Single Pointer Air Gage.
15 3-way Snap Switch in light circuit.
16 ‡ 1 Junction Box Type 427
17 Motorman's Seat.
18 ‡ 1 AC. Pantograph Trolley.
19 ‡ 2 Oil Circuit Breaker.
20 Overload Trip.
21 Oil Tank on Circuit Breaker.
22 Insulators for Pantograph Trolley.
23 Support for Pantograph Trolley
24 High Tension Cable from AC. Trolleys.
25 Pantograph Trolley Shoe.
26 Pantograph Trol. Lock Cyl.
27 Steam Heating Boiler.
28 Gage—Air Press. on Burner.
29 Water Gage.
30 Drain Cup.
31 Try Cocks.
32 Fire Door.
33 Burner.
34 Gold Car Co. Regulating Valve
35 Mason Regulating Valve.
36 Steam Line from Boiler.
37 Air Inlet to Fire Box.
38 Water Feed Regulator.
39 Hand Brake Wheel.
40 Steam Gage.
41 Safety Valve.
42 Stock for Boiler.
43 HT Conduit from Oil Sw. to Transf.
44 Switch Group No. 1 Type 259
45 Switch Group No. 2 Type 251E
46 Switch Group No. 3 Type 257A
47 Switch Group No. 4 Type 259
48 Switch Group No. 5 Type 251E
49 Switch Group No. 6 Type 257B
50 Motor Gen. Set for Battery Charging.
51 Base for Motor Generator Set.
52 Storage Battery.
53 ‡ 2 Set of Resistance Grids.
54 AC Integrating Wattmeter.
55 Base for DC Collector.
56 DC Collector.
57 ‡ 2 AC Pantograph Trolley.
58 Preventive Coil 100 V. 250 amp.
59 Preventive Coil 50 V. 500 amp.
60 ‡ 2 Transformer.
61 Main DC Switch.
62 ‡ 2 Blower Motor Fan Casing.
63 ‡ 2 Blower Motor.
64 Field Shunting Resist. ‡ 2.
65 Hand Air Pump for Raising AC Trolley.
66 ‡ 2 Air Compressor.
67 ‡ Air Compressor Motor.
68 Relay Magnet Valves Type 386D.
69 ‡ 2 Fuse Box.
70 Canopy Switch for ‡ 2 Blower Motor.
71 Canopy Switch for ‡ 2 Compressor Motor.
72 ‡ 2 Motor Control Cutout.
73 ‡ 2 AC DC Change Over Switch.
74 Relay Box.
75 Snap Switch for Cab Lights.
76 Snap Switch for Head Lights.
77 SPDT Switch for Light Cir.
78 Control Reservoir.
79 Cover for Resistance Grid.
80 Oil Tank.
81 Slide Valve Reducing Valve.
82 No. 2 Junction Box Type 427.
83 Signal Valve.
84 Sand Box.
85 Electro Pneumatic Sander.
86 Coupler.
87 Hose Couplings.
88 Pilot.
89 Main Air Reservoir.
90 Hook for Safety Chains.
90A Cable connecting AC Trolleys.
90B No. 2 Master Controller.
90C No. 2 Auto. Brake Valve.
91 Third-rail Shoe Beams.
92 Third-rail Shoe Bracket.
93 Journal Box.
94 Truck Frame.
95 Driving Mechanism for Speed Indic.
96 Motor Suspension Springs.
97 Spring Hanger.
98 Elliptical Springs.
99 Wheel Pocket Cover.
100 Main Driving Wheel.
101 Third-rail Shoe Cylinder.
102 Third-rail Shoe Fuse Box.
103 Main Casting for Third-rail Shoe.
104 Third-rail Shoe.
105 Bell.
106 AC DC Change Over Sw, Heater Circ.
107 Fuse Box Heater Circuit.
108 Gov. Valve for Emergency Contl. Resr.
109 Three-way Cock.
110 Emergency Control Reserv.
111 Slide Valve Reduc. Valve.
112 Balancing Transt. (back of ST DT Sw.)
113 Combined Strainer and Drain Cup.
114 SP DT Switch ‡ 1 Heater Circuit.
115 SP ST Switch.
116 ‡ 1 Set Resistance Girds.
117 ‡ 1 Transformer.
118 Whistle.
119 Governor.
120 Distributing Valve.
121 ‡ 1 Blower Motor Fan Casing
122 ‡ 1 Blower Motor.
123 ‡ 1 Air Compressor.
124 ‡ 1 Air Compressor Motor.
125 ‡ 1 Field Shunting Resist.
126 ‡ 1 Fuse Box
127 Canopy Switch for ‡ 1 Blower Motor.
128 Canopy Switch for ‡ 1 Compressor Motor.
129 ‡ Motor Control Cutout.
130 ‡ 1 AC DC Change Over Switch.
131 Water Tank.
132 Air Connection to Motors.
133 Motor Leads for ‡ 1 and ‡ 2 Motors.
134 Axle of Main Driv. Wheels.
135 Upper Torque Rod.
136 Center Pin.
137 Lower Torque Rod (long).
138 Trap Doors over Motors.
139 Heater Circuit Leads.
140 Air Brake Piping.
141 Armature ‡ 130 Motor.
142 Field Frame ‡ 130 Motor.
143 ‡ 1 Oil Circuit Breaker.
144 Bus Line Socket Heater Circuit ‡ 2 Sw.
145 Bus Line Socket Heater Circuit ‡ 1 Sw.
146 Quill.
147 Tool Box.
148 Bumper Block.
149 Motor Suspension Cradle.
150 Spring Hanger.
151 Equalizer Spring.
152 Brake Shoe.
153 Steam Line.
154 Equalizer Bar.
155 Series Transf. for AC Amm ‡ 3 & ‡ 4 Motors.
156 Preventive Coil 100 V. 250 amp. (back of ‡ 59).
157 Permanent DC Fld Sw. Grid (back of ‡ 58).
158 Ser. Transf. for AC Amm. ‡ 1 & ‡ 2 Motors.
159 Armature Spider.
160 Air Inlet to Transformer.
161 Air Inlet to Resist. Grids.
162 Third-rail Shoe Leads.
163 Gage Control Line Pressure.
164 Support for Motorman's Seat.
165 DC Wattmeter.
166 Blind Lights.
167 DP DT Switch for Battery.
168 DP DT Switch for Battery.
169 SP ST Switch for Motor Gen. Set.
170 Snap Switch for Motor Gen.
171 Insulators Supporting AC Trolley Cable.
172 Shunt for DC Ammeter Motors 1 & 2.
173 Lower Torque Rod (short).
174 Motor Suspension Hanger.
175 Steam Hose Coupling.
176 Brake Cylinder.
177 Foot Push Button Switches.
178 Air Conduit.
179 Shunt for DC Ammeter Motors 3 & 4.
180 Motor Leads for ‡ 3 & ‡ 4 Motors.
181 SP DT Switch ‡ 2 Heater Circuit.
182 No. 2 Independent Brake Valve.
183 Third-rail Shoe Unlock Cyl.

**Longitudinal Sections, Showing the Internal Construction of the New Haven Electric Locomotives.**

**INAUGURATION OF THE NEW HAVEN RAILROAD ELECTRIC SERVICE.**

vided at their lower ends with coiled springs. The armature is not directly connected to the axle of the truck, but is mounted on a quill which surrounds the axle, which it clears by ⅝ of an inch. Upon this quill are mounted the bearings of the wheels. The quill is formed with a wide flange at each end, and projecting from the face of each flange is a series of stout pins, which engage a series of pockets formed in the hub of the adjoining wheel. A series of coiled springs is interposed between the pins and pockets, bring up against rails mounted on the truck frames. With the exception of the driving wheel axles and journal boxes, the entire locomotive is spring-supported. Particular attention has been paid to the ventilation of the motors. To this end, the channel beams, which form part of the framework of the car, are made to serve as conduits, through which air is driven, by means of a fan in the cab, to the motors and transformers. The air current, in addition to carrying off the heat generated by resistances, also serves to

The service was opened on Wednesday, the 24th of July, by the operation of all the local trains, twelve in number, running between New Rochelle and New York. In two weeks' time service will be extended to include the Port Chester locals, of which there will be twenty-three. Soon after that, the Stamford local service will be added; and, finally, the express service will make the change from steam to electric locomotives at Stamford; after which no more steam locomotives will enter the Grand Central Station.

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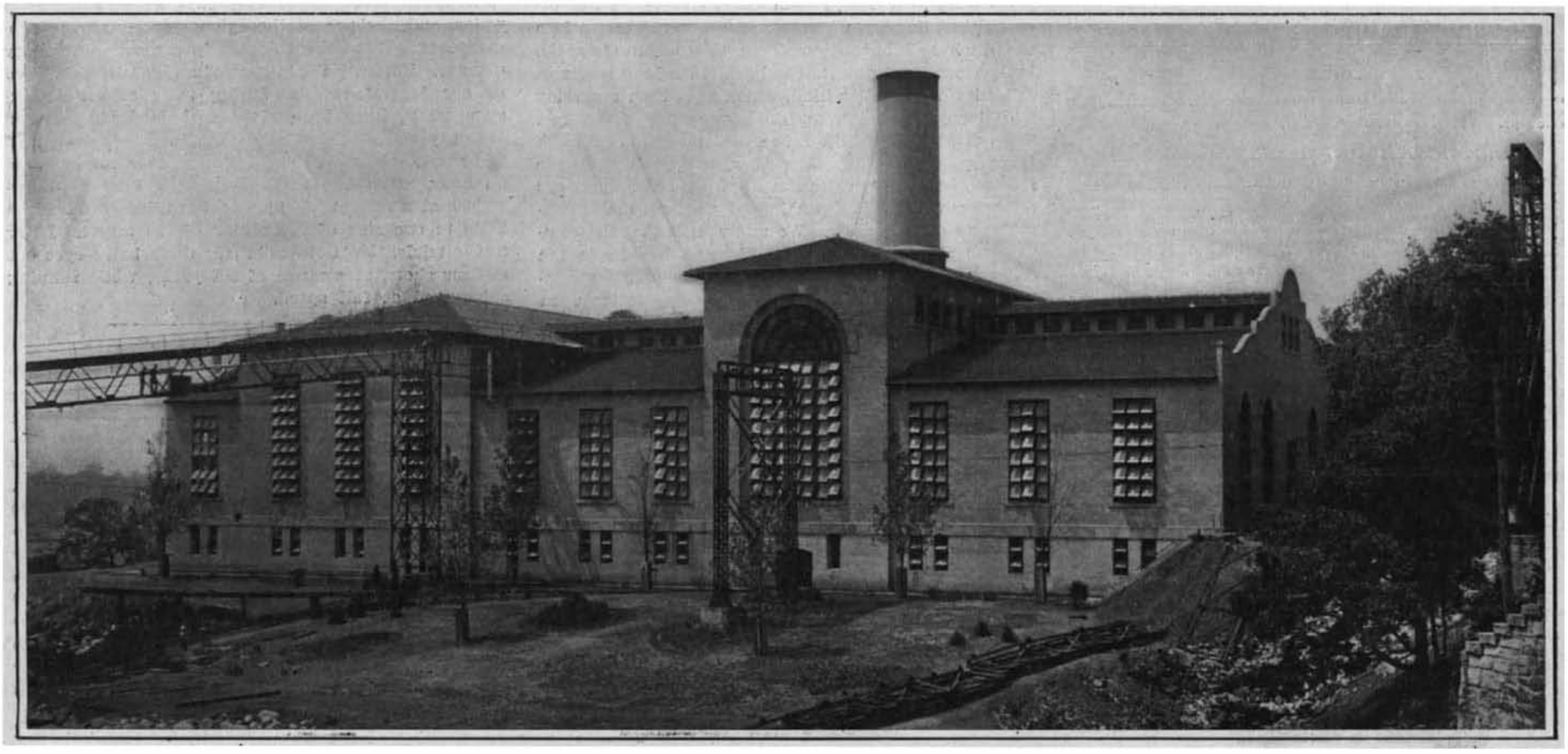
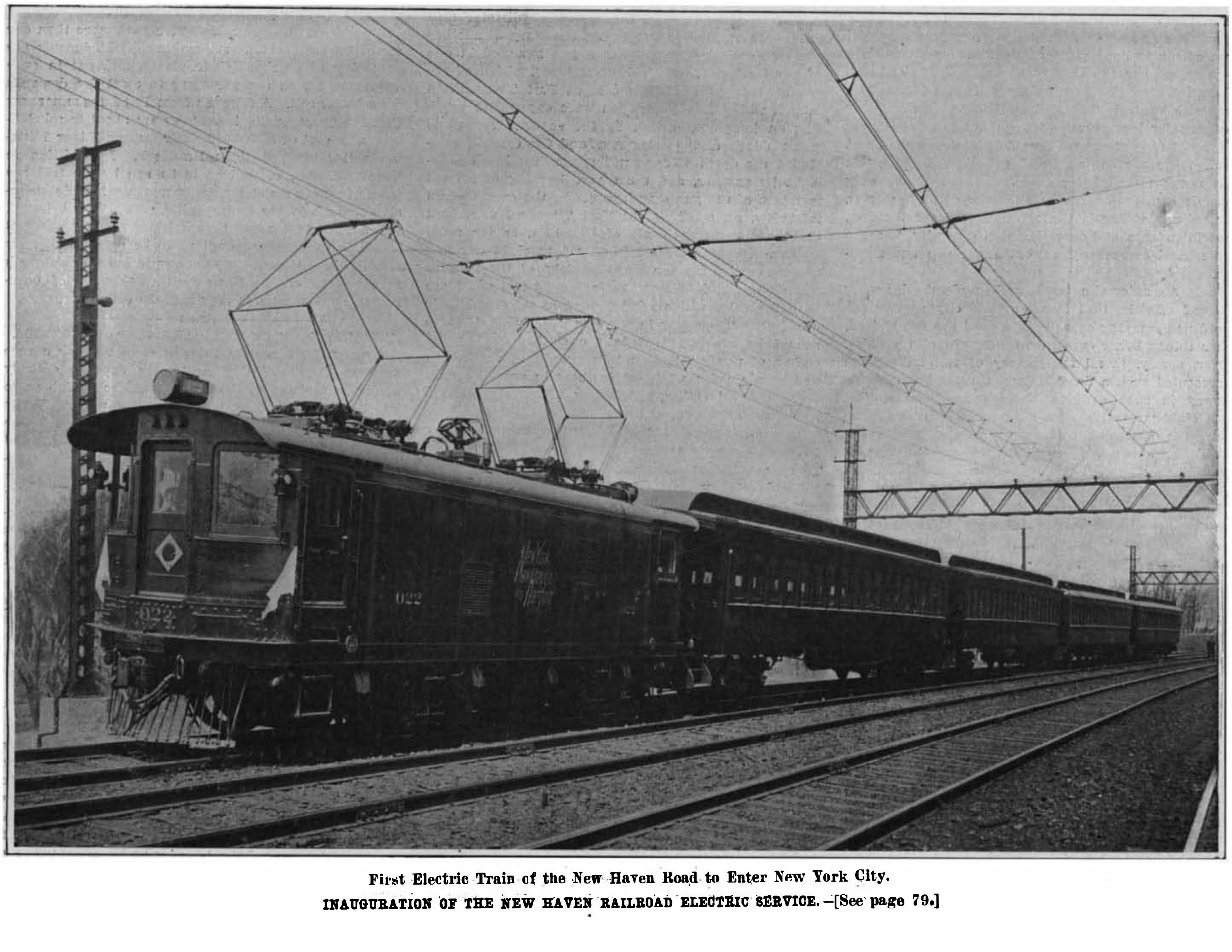


The 25,000 Horse-power Cos Cob Power Station Which Supplies the 22 Miles of Road from Stamford to Woodlawn.



First Electric Train of the New Haven Road to Enter New York City.

INAUGURATION OF THE NEW HAVEN RAILROAD ELECTRIC SERVICE.—[See page 79.]