Automatic Signals on the Pennsylvania

Describing the Power Equipment in Connection with the Signals Installed During 1913 and 1914

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A resume of the automatic block signal installation on the Pennsylvania appeared in the May issue and this is a continuation of the article describing the power transmission system.

The power for operating the signal system is supplied from the railroad company's power houses located at various points along the line. On the New York division a power house at Bristol Pa., supplies power between Holmesburg Junction and Milham Junction, 22.8 miles. An emergency supply can be obtained from the railroad company's Trenton shops, or from the Public Service Corporation at Holmesburg Junction.

Power stations at Ruthby, Stony Run and Edgewood, on the Maryland division, supply power to the line from Wilmington to Washington, a distance of 97.8 miles. The emergency supplies are obtained from the company's power stations at Wilmington, Perryville, Bay View and Baltimore, and from the Washington Terminal Company's power station at Washington.

On the Middle division, power houses at Bellwood, Warrier Ridge and Bailey furnish power to 68.59 miles of line between Marysville and Mifflin, and from Huntington to East Altoona. Emergency connections can be made with the railroad's Altoona shops, or with the Philadelphia division supply at Marysville.

The Pittsburgh division power houses are located at Lockport, Conemaugh and Derry, and furnish power to the line between Summerhill and Latrobe, 28 miles. Each end of the line has an emergency connection to a commercial power line.

The Philadelphia division has plants located at Atglen, Dillerville and Harrisburg, which supplies 64 miles of line between Atglen and Marysville, and an emergency plant at Branch Intersection. This plant is equipped with a gasoline-electric generating set, operated in emergency by the signal maintainer. The power houses are equipped with duplicate sets of 35 K. V. A., 220-volt, 60-cycle, single-phase, alternating-current generators, direct connected to a 40 horsepower, horizontal steam engine, a switchboard and 35 K. W. transformers. The engines and generators were furnished by the Ridgeway Dynamo & Engine Co. The current from the generators is stepped up from 220-volts to 3,300-volts, and fed through oil switches to the transmission line. The switchboard equipment, as well as the transformers and the aluminum lightning arresters which protect the station equipment from potential surges and lightning disturbances, were furnished by the General Electric Company. Fig. 1 shows one of the steam generating sets. Fig. 2 shows the gasoline set. The switchboards are equipped with an a. c. voltmeter, a. c. ammeter, frequency indicator, synchronizing device consisting of indicator and lamps, watt-meter, ground detector and parallel buses which enable the switchboard operator to throw the load in either direction on either of the machines, or in parallel on one or both, or to cut out either end of the system. Voltage regulation is secured by means of automatic voltage regulators and hand operated rheostats. The power is fed to the transmission line in both directions through oil switches equipped with overload tripping coils.

The power for operating the motors, relays, etc., for the signal system is fed over an underground transmission line at 3,300 volts.

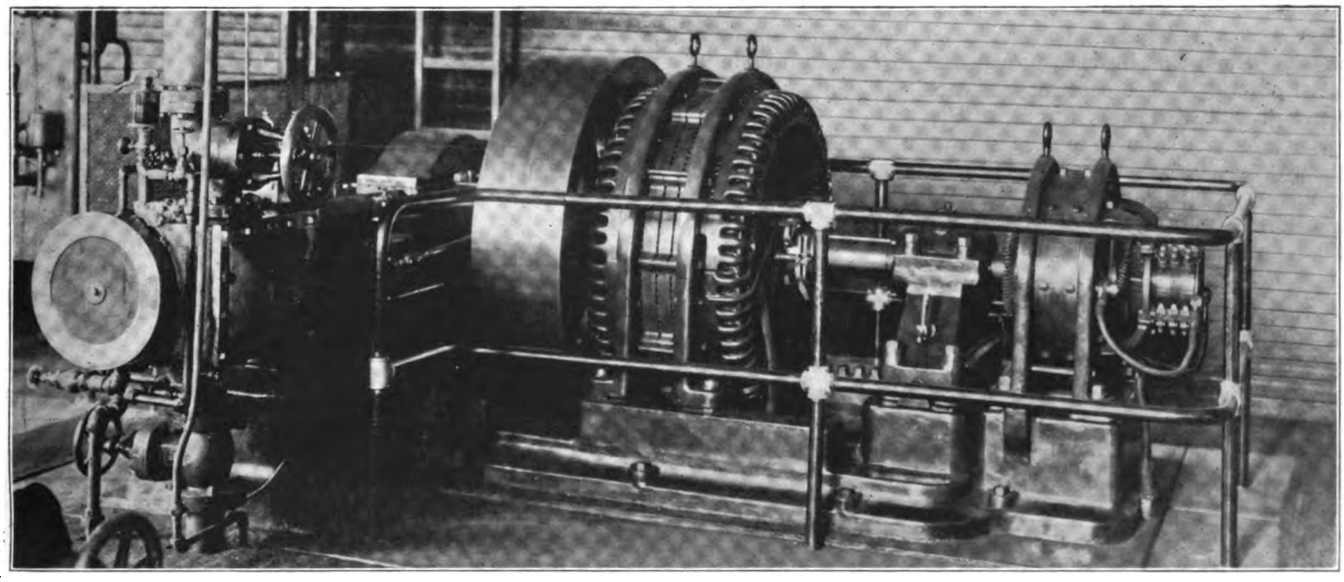

Fig. 1. Showing Steam Generating Set.

The line consists of two single conductors, No. 4 or No. 6 B. & S. gauge, depending on the distance that the power is to be transmitted. This wire has ⅛-in. wall insulation taped and braided.

The wires are laid in trunking which is placed about 2 ft. below the surface of the ground, and runs either along the outside of the tracks or in the intertrack space. The trunking is of cypress or white cedar with a groove 2¼x2¾ in. The capping is 1⅜ in. thick. Before the trunking is laid, the groove is partly filled with petroleum asphaltum. The trunking is then laid in the ditch and securely fastened together. The two wires are laid in the groove about ⅜ in. apart, and then the groove is filled with petroleum asphaltum. The wires are completely surrounded and protected from moisture.

The wire was furnished in lengths of about 2,000 ft. The joints in the line are made in waterproof concrete joint boxes. (See Fig. 3.) The wires are brought into the joint boxes near the bottom and are looped up and clamped to two porcelain in-

sulators near the top of the box. The insulators are fastened to two separate iron supporting plates which are imbedded into the concrete sides of the box. The joint is made between the two porcelain insulators by Dossert connectors, having hard rubber sleeves over which is wound several layers of tape and then painted with an insulating paint. To prevent any water that might collect in the bottom from running back into the trunking, the bottom of the joint box is filled with asphaltum.

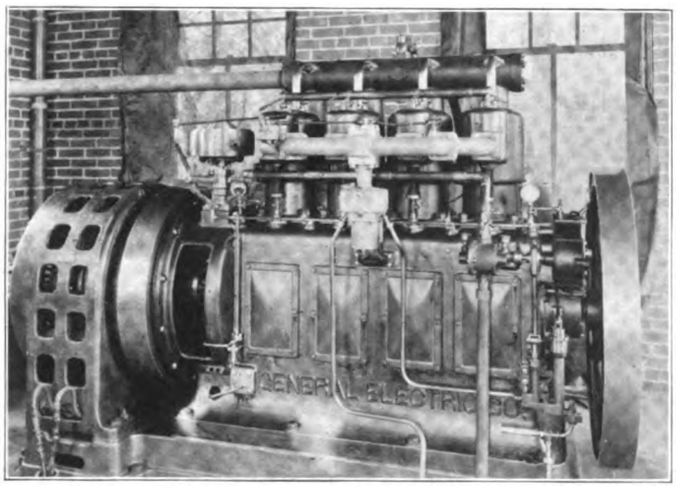

Fig. 2. Showing Gasoline Generating Set.

The box cover, which is bolted down to the box, is made of 1x3 in. yellow pine matched boards and covered with a tinned metal covering. This construction places the joints in the line above ground where they are accessible.

At each signal location the line is brought into an iron sectionalizing case, which is mounted on a concrete foundation, 2 ft. 10 in. x 3 ft. 5 in. x 3 ft. The sectionalizing outfit consists of a transformer for stepping down from the 3,300-volt line to 110-volts, an oil switch (see Fig. 4), and a short circuit indicator.

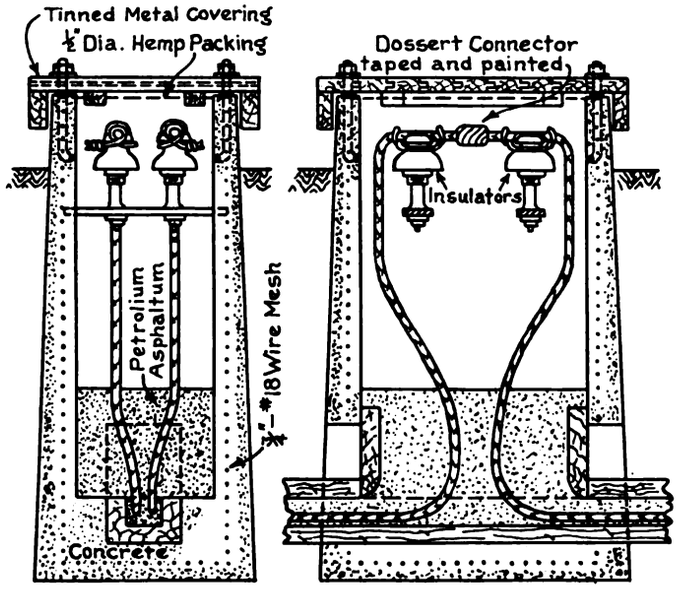

Fig. 3. Waterproof Concrete Joint Box.

The line on each side of the sectionalizing case is brought up to an oil switch which contains two knife switches. These knife switches may be operated independently so that the line on either or both sides may be cut out of service between any two signal locations in case of trouble on the line. The primary of the line transformer is tapped off between the two knife switches, thus keeping the transformer working in case the line should be out of service on one side.

The short circuit indicator is connected in series with one of the power wires, and is so arranged that it will show when a heavy ground or short circuit comes on the line. At each interlocking the indicator nearest the cabin is repeated in the cabin by an electric light operated by a d. c. battery. By means of these indicators, trouble on the line may be located very

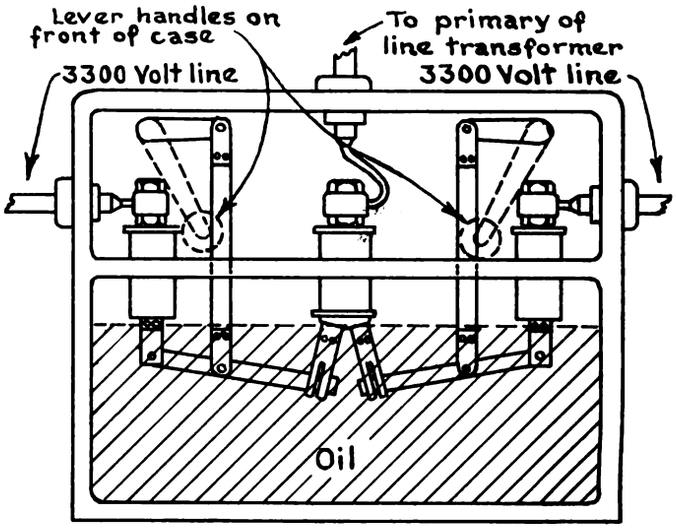

Fig. 4. Schematic Diagram of Oil Switch.

quickly. Those between the point of trouble and the power house will pick up and latch as soon as the trouble comes on, and those beyond the point of trouble will remain open. Fig. 5 shows one of these sectionalizing outfits.

The power houses are so arranged that power may be supplied to the line at either end, but normally is furnished from one end or the middle of the line. Should trouble come on the line, the section where the trouble is located is easily found by means of the indicators. This section is then cut out by throwing the knife switches at each end of the section. Power is then fed up to this section from the power house at the end of the line, thus throwing only out of service one section of line, and all signals are kept in operation.

The sectionalizing cases are grounded by a No. 9 wire from

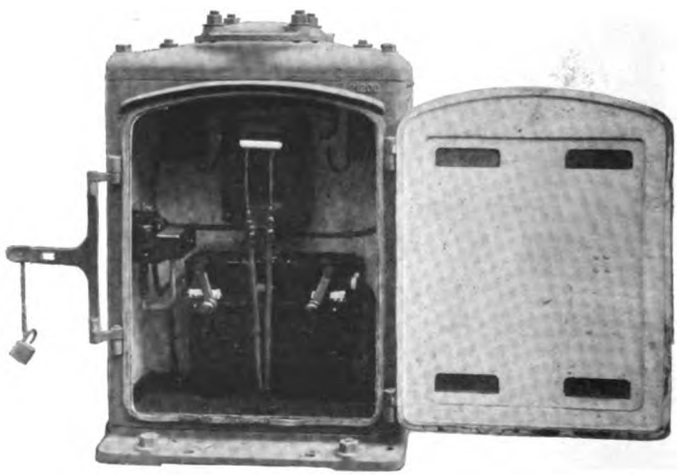

Fig. 5. Showing Sectionalizing Outfit.

the case to a pipe sunk into the ground. The sectionalizing outfits were furnished by the General Electric Company and the Westinghouse Electric Company.

AUGUST B. MILLER, an engineer charged with involuntary manslaughter as the result of the wreck on the New Haven road at North Haven, Conn., last September, was found not guilty by a jury at New Haven recently.