Reconstruction of New Haven Signals

Upper Left-Hand Quadrant, All-A. C. Signals to Be Installed on 60 Miles of Electrified Line

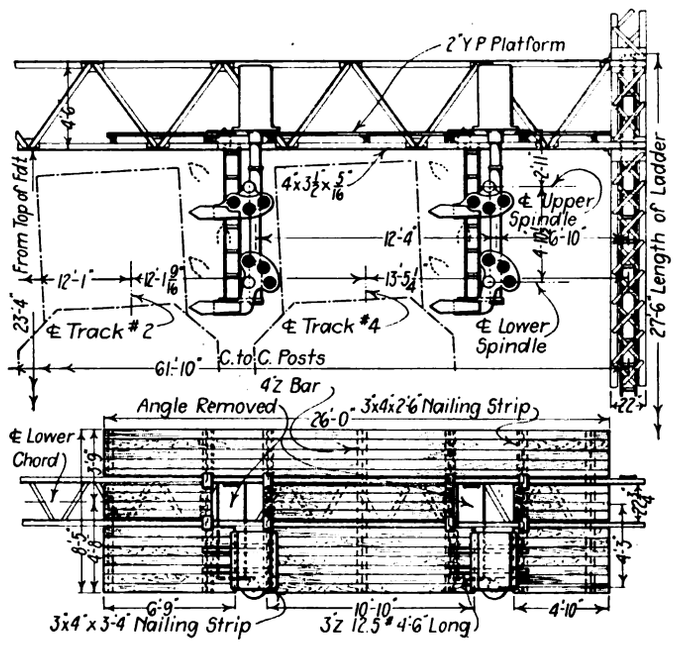
The New York, New Haven & Hartford has plans well under way for a new signal system from Woodlawn Junction, New York, to New Haven, Conn., covering 60.52 miles of the New York division. At the present time the line from Woodlawn Junction to Stamford, a distance of 21.29 miles, is equipped with the Coleman manual controlled system reconstructed for use in connection with a. c. 25-cycle, single-phase propulsion. From Stamford to New Haven, a distance of 39.23 miles, the present system is of the automatic, two-position, two-arm, all-a. c. type, designed for 25-cycle propulsion. The new system, which will displace both of the old, will, of course, be operated entirely by alternating current. The signals will be of the upper left-hand quadrant, three-position type, and arranged to display the aspects outlined in the Proceedings of the session of the American Railway Association, held in Chicago, November 17, 1915.

In laying out the new system provision has been made, by the relocation and reconstruction of the interlocking plants, to divide the territory into approximately five-mile sections between points where universal crossovers between all four tracks are to be installed. At each such interlocking point there will be an anchor bridge located approximately in the center of the crossover layout to make it possible to de-energize the catenary propulsion wires east or west of the tower. By this arrangement, one pair of crossovers between the two outside tracks will still remain energized and available for traffic.

SIGNAL POWER SYSTEM.

Energy for the entire system from New Haven to Woodlawn and also from New Haven north for a distance of 2½ miles and from New Rochelle Junction to Harlem River, a distance of 12 miles, will be furnished from the signal power units located in the Cos Cob power house. Under normal operation this energy is generated by a 450-kv. a., single-phase, 60-cycle alternator, driven by a 500-hp., 25-cycle motor. As an alternative in case of necessity, the signal system may be furnished with energy from two steam-driven, single-phase, 60-cycle, turbo-generators, which may be connected up and operated in parallel with each other, or in parallel with the motor-generator. All of these units generate current at a potential of 2,300 volts. There will be three transformers located at Cos Cob, each of 225-kv. a. capacity. Under normal operation one of these transformers will feed the system to the west, and one to the east, the third being held in reserve and so arranged that it may be connected in to feed either to the east or to the west. These transformers increase the voltage from 2,300 to 11,000 volts, at which potential the energy for the signal system will be transmitted along the right of way. The power transmission system consists of two pairs of transmission lines, one on the north side, and one on the south side of the catenary system, and each pair of wires will be sectionalized and cross-connected at each interlocking station, so that the operators in the towers may de-energize between any two stations either the north feeders or the south feeders without interfering with the continuity of the signal power service. At each interlocking station and at each signal location there will be two step-down transformers with a ratio of 11,000 to 110 volts. One of these will be permanently connected to the north feeders, the other permanently connected to the south feeders. To the secondary side of these transformers there will be an automatic switch so arranged that under normal operation, the switch being energized, current will be fed to the 110-volt bus-bars through a pair of front contacts. If, however, this source of energy is cut off by the tower operators, the switch will automatically change to the bottom contacts and energize the signal system from the other pair of feeders. With the resumption of energy on the normal operating side the switch will automatically cut back to the front contacts, from which arrangement, obviously, it is possible to de-energize either the north feeders or the south feeders between any two towers with only a momentary interruption to the signal system.

Throughout the entire distance, all aerial lines will be in cables carried by extra heavily galvanized steel messenger attached to the southerly side of the catenary system. There will be two cables most of the distance, one cable carrying the line control wires to be continuous from one end of the division to the other. The circuits in connection with interlocking plants out to the distant signals will be in a separate cable. The construction of the catenary system west of Stamford is such that each catenary bent is insulated from its neighbor, and therefore each catenary bent must be individually grounded, the



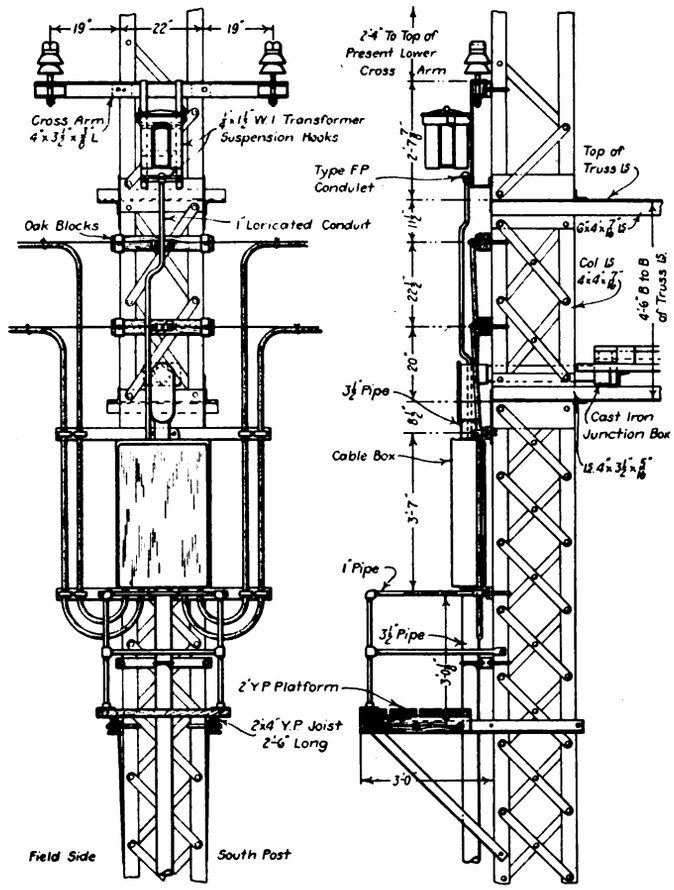
Elevation and Plan of One-half of a Typical Catenary Bridge With Suspended Signals.

only available ground for such construction being one of the running rails. Therefore, the south rail of the southerly track has been assigned for this purpose. Inasmuch as metallically connecting the south rail to the catenary bent makes it prohibitive to connect the catenary bents together metallically, it is necessary to insulate the cable messenger from each catenary bent. At each point where it is necessary to break the cables, either at interlocking stations or at signal stations, the cables terminate in a suitable cast-iron terminal case, from which point the circuits are carried through pipe to a relay and terminal box at the base of the catenary bent. From the relay and terminal case at the foot of the bent, circuits distribute to the signals and other signal units.

SIGNALS.

All of the signals will be suspended from the catenary bridges. The signal mechanism will be mounted on a platform attached to the lower chord of the catenary bridge, and from the under side of the mechanism case will be suspended the signal mast carrying the up and down rods for driving the spectacle castings. All signals are to be designed to give the upper left-hand quadrant, three-position aspects, and so located in relation to the track as to permit ample clearance for the top of the cars and pantographs of the electric locomotives, having given due con-

sideration to the elevation of the track at curves. All of the signals in connection with the interlockings will have two arms and vertical lights with the exception of the rear home or distant signal, which will be permissive and have two arms and staggered lights. Purely automatic signals will have but one arm and one light. Each signal arm will be driven by an individual signal mechanism operated by a single-phase, induction motor. and with a separate and fully independent set of contacts for the control of signal circuits. The signal mechanisms for signals on the same mast will be duplicates, except that the design will be for right-hand or left-hand operation. The signal masts will be carried to one side of the center line between tracks, in order to provide clearance for the signal arm, but the platforms and ladders will be suspended in the center of the inter-track space, so as to allow ample clearance for the signal attendant to get down to the signal lights without hazard from the pantographs of the electric locomotives. On account of the limited clearance between tracks it is absolutely necessary to use a short blade, the projection of which will be but 23 inches from the spectacle casting. This, however, is supplemented as viewed from the direction of traffic, as the blade will extend back under the first roundel, and, therefore, have the appearance of being longer than it is.



Typical Arrangement of Apparatus on Catenary Bridge at Point Where Cables Are Broken.

In connection with these signals a special semaphore lamp has been designed, which will to all intents and purposes, give a daytime light signal, thus eliminating the actual necessity of a signal blade. The roundels of the spectacle casting are 8⅜ in. in diameter. The new semaphore lamp designed for these signals is of special interest. The lamp itself is larger than the usual semaphore lamp, and is equipped with a parabolic silvered mirror reflector. In the center of this reflector is a bayonet socket to receive an incandescent bulb. Means are provided for the universal adjustment of the bulb in relation to the reflector. No consideration need be given to any focusing except in regard to the reflector as no lens is used with this lamp. The space usually occupied by the lens is taken by a plain curved glass, the convex surface of which is to the exterior so as to prevent the reflection of external lights. Current will be transmitted to these lamps at 70 volts in the daytime and 35 volts at night. Each lamp is equipped with an auto-transformer which cuts the voltage down to 7 volts in the daytime and to 3½ volts at night. The bulb to be used in this lamp is the equivalent of the General Electric Company's G-18½, 40-watt, 8-volt bulb, equipped with a spiral, horizontal filament. The roundels used in the spectacle casting are high-transmission glass designed by the Corning Glass Works. In actual test the lamp was plainly visible 2,800 ft. across a freight yard during a snowstorm in the daytime. The signal platform carrying the signals and space for the signal attendant is entirely encased in a wire screen to protect the attendant from accidentally coming in contact with the live wires of the propulsion system.

INTERLOCKING STATIONS.

The new interlocking stations will be either of the all-electric or the electro-mechanical type. The towers will be of the New Haven standard design, a brick structure mounted on a concrete foundation and fireproof throughout. All of the electrical apparatus in connection with both the all-electric and the electro-mechanical plants will be entirely a. c. and will operate from transformers as described under the power system. The circuits used in connection with the electro-mechanical as well as the all-electric will be the typical type "F" layout with electric interlocking between signals and switches irrespective of mechanical locking in the machine, the same as adopted for standard practice by the New Haven. This also includes a light repeater for each of the signals. The light is located in the little casing under the lever controlling the signal, and is illuminated when the signal is in the 45 or 90-deg. position. Each tower will be equipped with an illuminated track diagram embracing all of the track within the interlocking limits and also the approach indication circuits. Each of the track circuits shown on this indicator will be illuminated when the track is unoccupied, the presence of a train darkening the section. Both high and dwarf signals will be of the electric motor type and automatically controlled. Approach locking, route locking and electric switch locking will be applied at each plant. In connection with the electro-mechanical plants, switch and lock movements will not be used, but facing point locks will be used for all switches, and at both the electric and the electro-mechanical interlocking plants the electric switch locking will be supplemented by detector bars on facing point switches located in the routes over which high-speed traffic is handled.

The only storage battery auxiliary equipment on the entire division will be at New Rochelle Junction, New York, and at Stamford, Conn. At New Rochelle Junction the existing battery plant of 55 cells of 2,380-ampere-hour battery will continue in service. This battery through a motor-generator is capable of furnishing alternating current for the entire signal system of the Harlem River branch for a period of three hours. At Stamford there will be an auxiliary source of power consisting of a storage battery, motor-generator and automatic controlling equipment, so arranged that in case power is cut off of both the north and south feeders, the storage battery will automatically energize the motor-generator and furnish alternating current to the bus-bars supplying energy to the electric interlocking plant.

The entire work of this reconstruction will be executed by the signal department under the direction of C. H. Morrison, signal engineer.

THE DIVISION OF SAFETY of the Interstate Commerce Commission has issued a report on the accident which occurred on the Nashville, Chattanooga & St. Louis near Rockledge, Tenn., on December 23, 1915. The circumstances surrounding this accident and its possible causes were fully discussed in the February issue of the *Railway Signal Engineer*.