Signaling System of the Hudson & Manhattan

Describing the Alternating Current Track Circuits in the Tunnel, and the Track Models

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Alternating current track circuits have been in use since 1903, the original conception and later improvements in that system having been brought about largely on account of the rapid developments and extensions made in recent years in roads using high speeds and electric traction. At the present time, however, steam roads not thinking of electrifying are seriously considering the use of alternating current for track circuits on account of its ultimate cheapness as compared with direct current. In all installations up to the time that the Hudson & Manhattan system was put in service, direct current only had been used in the operation of interlockings, with the necessary storage batteries and generating sets, the maintenance of which, in time, runs to a considerable amount. The Hudson & Manhattan, a pioneer in many ways, has used, in its latest installation of signals, alternating current for the control of the interlockings as well as for the automatic signals. In this system, two 5 k.w. transformers are hung either in or near the tower, one being fed from the high-tension line in one tunnel, and one from that in the other. Current at 1,100 volts is supplied to the primaries, and the three secondary taps give 55, 57½, and 60 volts. The secondaries feed through a switch, by which either transformer may be cut into service, then through fuses to the signal and switch busses and the relays. The interlocking machines used are the standard Union Switch & Signal Co.'s electro-pneumatic vertical type, the magnets being specially designed and wound for alternating current. The contacts on the lever latches were also altered so as to get a better rubbing contact than that usually obtained with the old direct current type.

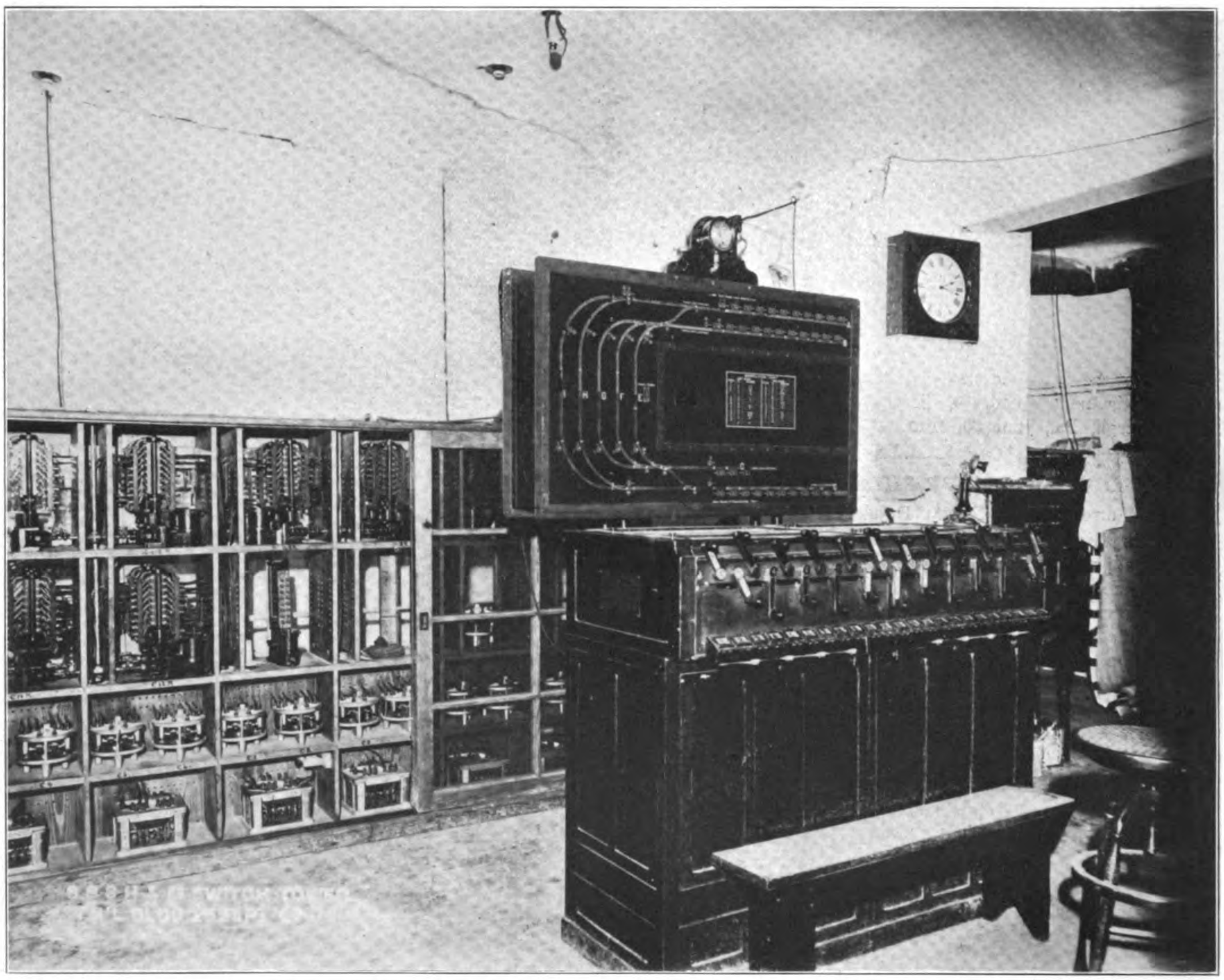

Fig. 1. Church Street Terminal Tower.

Without exception, the relays for the track circuits within the interlockings, most of which are the single-rail type, are placed in the tower, in a cabinet provided for that purpose. The well known single-rail vane type relay is used as a track relay, picking up an electro-pneumatic line relay, over which the various circuits are broken. This electro-pneumatic relay consists of a small motor of the wire-

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wound armature type, the field coils being mounted on laminated pole-pieces and the armature wire-wound as the name would indicate. The operation depends upon the phase relation of the current in the field and armature windings. This movement is in reality a motor whose armature makes but part of a revolution and whose field and armature are connected in multiple. The motor is mounted on an iron base and enclosed in glass. The armature in revolving operates a pin valve mounted on the cover of the case which admits air to a cylinder, and this, in turn, makes and breaks the contacts, being similar in this arrangement to the track relay described in *The Signal Engineer* for March, 1910.

Galvanometer relays are used in the check-locking between towers and for the control of the distant signals. No mechanical detector bars were thought necessary, as track circuit detector locking was used throughout. By this system each switch or derail in an established route is electrically locked as soon as the first truck of a car passes the home signal controlling that route and is only released as the rear of the train passes the fouling point of the section. This locking is, of course, separate from the usual mechanical locking between switch and signal levers.

Fig. 2. Home Signal at Pennsylvania Station, Jersey City, N. J.

Illuminated track models are used in every tower, and these repeat the condition of the track between the adjacent towers. In this way a towerman is able to watch a train gradually approach his home signal, knowing always just where the train is and the time at which he must clear his signal in order not to display a caution indication at the distant signal. In order that the towerman may know that when he reverses his lever the signals clear as they should, repeaters are provided on the model for all interlocking signals, the repeater being lighted when the clear signal is displayed. Current for track sections in the model is supplied over a separate wire for each section shown. The wire is run out to the track relay of that section, battery being given over a front point of the track relay. The extensive use of the track model is, therefore, very expensive on account of the large amount of wire required, but under the existing conditions, the use of models was thought necessary, and they have proved of the highest value. As an additional precaution against a switch being thrown when the track section is occupied, small pilot lights are provided directly beneath the switch lever on the machine. When the light is lighted the towerman knows that the section is clear and that therefore, he is at liberty to throw the switch for another route. The presence of a train in the section, however, cuts current off the light and when this condition exists, the towerman is instructed to keep his hands off. The general arrangement of the Church Street Terminal tower is shown in Fig. 1.

As a usual thing, at diverging points a separate signal indication is given for each route, the one distant indication answering for both. Fig. 2 shows the home signal at the Pennsylvania station, Jersey City, where there are three possible routes. The route to Hoboken, on the right, is governed by the top lights, the one to the new Newark Ave. extension, to be opened shortly, is governed by the second lights, and the one to a stub-end switching track is governed by the next lower lights; the distant indication for all three routes is given at the bottom.

While there are always changes and corrections to be made after a new installation of any kind, and especially where the apparatus is of a new design, the fact that, during the month of June this year, after the system described in this and previous issues has been in service for less than a year, the record of only one failure, and that one a blown track-fuse, out of 1,600,000 signal and 100,000 switch operations, speaks pretty well for the care used in designing, installing and maintaining a wholly new and untried system.

ROCK ISLAND CROSSING BELL AT SEYMOUR, IA.

The Chicago, Rock Island & Pacific has recently installed at Seymour, Ia., on the Missouri division, two crossing bells which differ very materially in appearance from the standard forms. The essential parts of the bell are a 5-in. iron pipe, 15 ft. long, set in a signal foundation casting which is bolted to a concrete foundation, the bell, and a ladder, as shown in the illustration. The bell is attached to the top of and the ladder is fastened back of the post. The lower end of the ladder is attached to the concrete foundation upon which the post stands. A battery box containing 15 cells is situated adjacent to the concrete foundation, and a relay box containing the interlocking relays is located on the post as shown. The ladder was provided in order that the maintainer might have ready access to his bell at any time. Although it was thought at first that this would afford an easy way for malicious meddling with the bell, experience has proved, nevertheless, that the mechanism is no more likely to be harmed than if the ladder were not used. In fact, no more attention is paid to the post with the ladder than heretofore has been bestowed upon the post without it.

Rock Island Crossing Bell with Ladder.