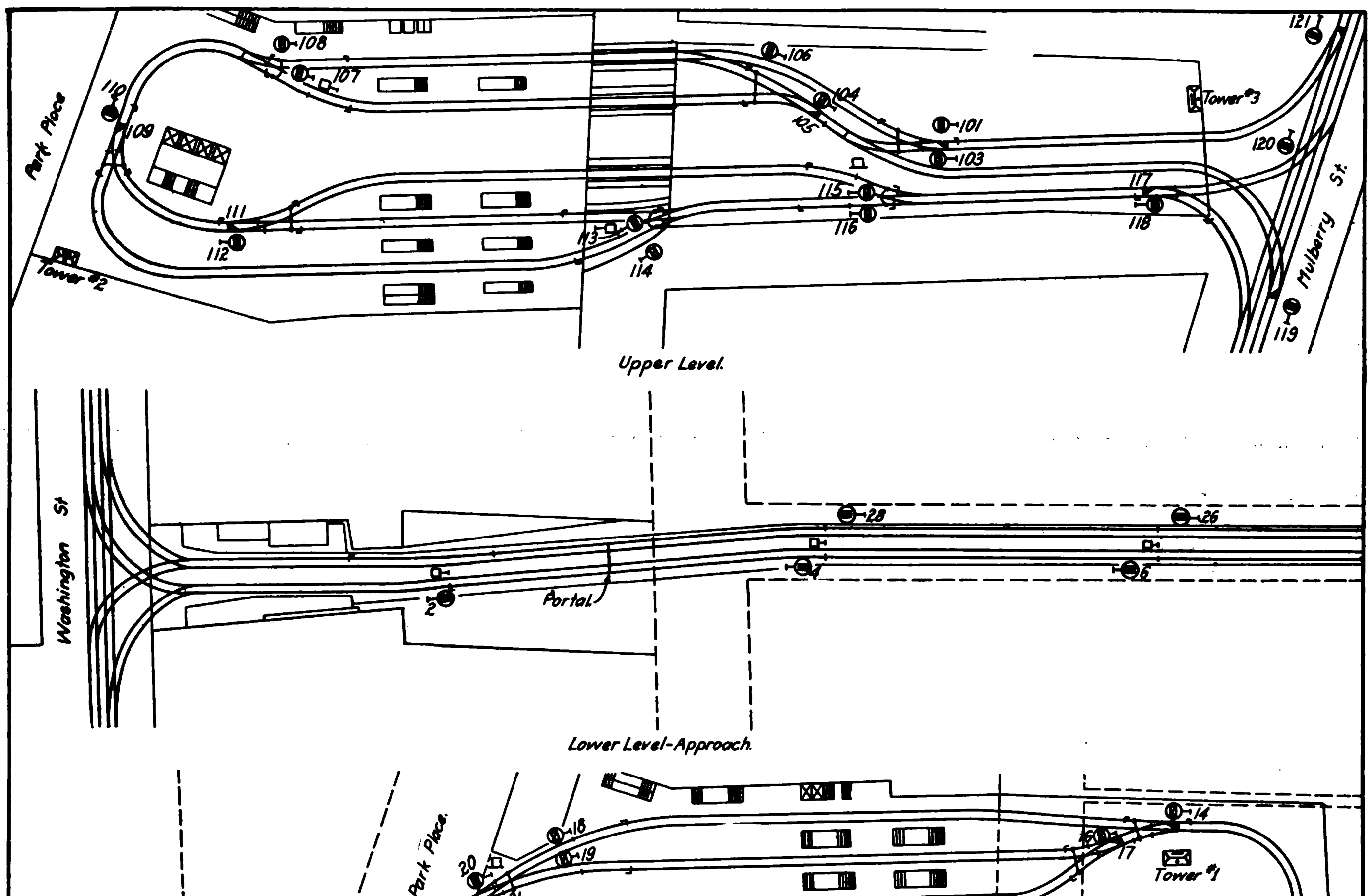
Signaling a New Street Car Terminal

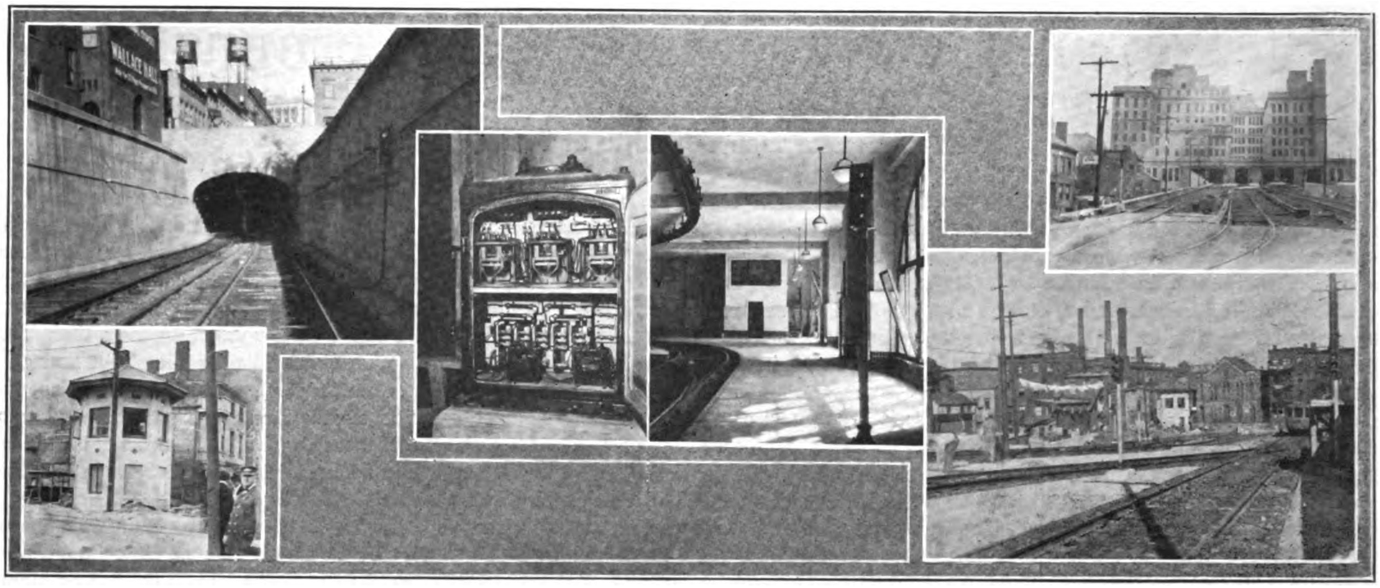
Electro-pneumatic Interlocking and Light Signals Used to Handle Dense Traffic at Newark, N. J.

A unique problem in signaling was presented by the new terminal of the Public Service Railway in Newark, N. J., recently opened. This company operates a network of trolley lines radiating from Newark, in addition to local service in the city, and the new building is designed to form a center for this interurban system and to facilitate transfers between some of the most important city lines. The building faces on Park Place just off Broad street, in the heart of the business district, but no cars enter from these streets. One group of lines is brought into the rear of the building on the second floor level from Mulberry street, two blocks east, and another group enters the front at a level below the street through a subway from Washington street, three blocks west of Park Place. The street level floor is reserved for a concourse, from which stairs and elevators lead up and down to the loading and unloading platforms. The upper level is handling about 115 cars per hour during the rush hours and on special days this number is considerably increased. Provision is made on the lower level for a much greater capacity, although it will not be needed until traffic increases or some additional lines are re-routed to enter the terminal.

The track and signal layouts on the two levels are shown on the accompanying plan. On the upper level there are two inbound tracks leading to two unloading platforms. These tracks converge to a single track loop, which again diverges to three loading tracks alongside the platforms, these tracks joining again outside the building in a single outbound lead. All facing point switches on this level and the signals governing over them are controlled from two towers, one located near the street and one inside the building near the Park Place end. Each plant is necessarily small, the inside one handling two switches and two signals, but on account of the fact that part of the layout is inside and part out of the building, it would have been impossible to locate a single tower from which a view of all switches could be obtained. Thirteen lines of cars pass the Mulberry street tower, all of which enter the terminal. Extra rush hour cars, special cars and cars diverted from other streets in case of block which do not enter the terminal are controlled by the signals governing over the diverging switches. No attempt is made to separate incoming cars except to run around "cripples" or "layovers." Each of the thirteen lines using the terminal on this level is assigned to one of three loading platforms, however, and all cars must be properly routed on the loop in order to pick up



Track and Signal Layout on the Two Levels of the Newark Public Service Terminal.

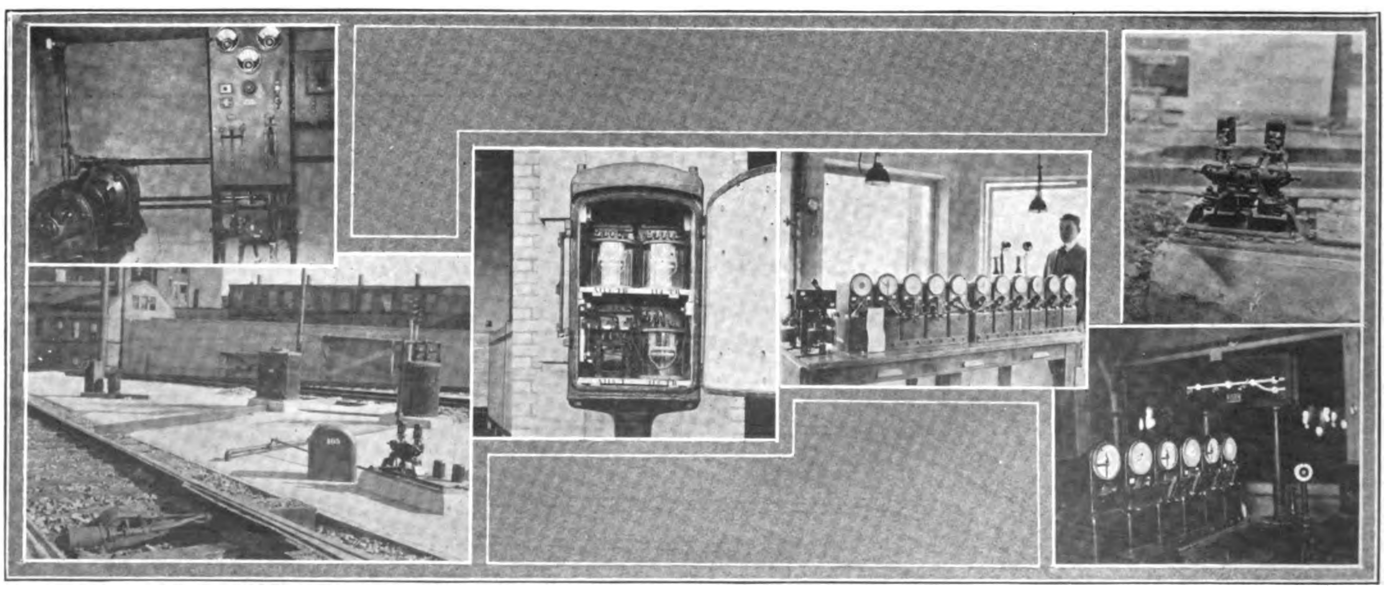


Entrance to Subway. Typical Relay Case. Tower No. 2. Approach from Mulberry Street.
Tower No. 3. Two Exterior Signals.

the waiting passengers, as fences between the tracks prevent crossing.

Spring switches are used for trailing points and normal danger automatic signals with short signal clearing track sections are arranged to give the car entering one of the sections first a clear signal over the switch. A third short track section, which includes the switch, is used to set the signals at stop. While all movements in the building are at low speed and the braking distance for the single cars is very short, it was thought advisable to install this protection as the pillars in the building interfere with the clear view of the tracks in many cases and the uncertainty between motormen as to right-of-way would otherwise lead to frequent delays and perhaps collisions. No distinction is made in the rules between automatic and interlocking signals, a stop indication being positive in both cases except when a signal is "evidently out of order," when the motormen can "proceed with caution upon receiving a hand signal from a signalman, starter or other authorized person."

On the lower lever a single inbound and a single outbound track connect the Washington street line with a loop in the terminal building. There are two unloading and three loading platforms the same as on the upper level. The subway through which these cars enter is divided into four 200-ft. blocks, protected by three-position automatic signals with light indications. A double crossover is provided between these tracks near the entrance to the building to allow cars to be shifted in any desired manner. These crossover switches are operated by dwarf mechanical levers located between the tracks. A single tower on the lower level controls the three facing switches and the three signals governing over them. The tower is located opposite the switches leading to the loading tracks, since it is essential for the operator to have a clear view of the approaching cars in order to route them properly. This makes it impossible for him to see the switch at the other end of the layout leading to the two unloading tracks, and for this reason it was necessary to install a small illuminated track diagram in the tower, which indicates when the two blocks ahead of the switch, the one over the switch, and a short section immediately beyond it on each unloading track are occupied. The switches leading from the Washington street line into the subway are not interlocked and are controlled by trolley contactors, the position of the switch



Motor-Generator Set in Tower No. 1. A Relay Case on the Upper Level. Interlocking Machine in Tower 3. Switch Magnets With Cover Removed.
A Switch Layout and Air Tank. Interior of Tower No. 1.

depending on whether a motorman uses power or coasts under the contactor.

The interlocking machines consist of a circuit controller similar to those shown in U. S. & S. Bulletin No. 72 for each switch and signal with mechanical locking preventing improper movement of the switches and the clearing of signals for conflicting moves at the same time. Each signal lever is equipped with a mercury time release to secure approach locking and a semaphore indicator to show when the lever can be placed to center, or normal, after a train has passed the signal. Each switch lever is provided with an electric light type indicator to indicate the presence of a train on the track circuit in which the switch is located. Switch levers are provided with detector locking and switch indication is secured through a special control of the lever for the signal leading over the switch. The track circuit control for signals, except in the subway, extends only over the switches, the desire being to allow cars to maintain as close a headway as possible. Tower No. 1 contains six controllers, No. 2 four, and No. 3 thirteen. Tongue switches, used for all facing points, are operated by single, direct-acting, pneumatic cylinders and equipped with Universal circuit controllers for indication purposes. The advance signal on the southbound track in Mulberry street, which is also controlled from the tower, allows the operator to clear signal 121 for a car proceeding down Mulberry street and hold it at signal 120 until it can pass the three tracks into and out of the terminal, thus preventing delay to following cars on the southbound track, which may want to enter the terminal. During a normal rush hour this tower handles about 300 lever movements per hour.

Since all movements in the terminal are at low speed, no long distance indications are required and light signals with 5-in. lenses and two 25-watt, 115-volt Mazda lamps are found to be sufficiently distinct. Short hoods are used for the signals located outside the building. On account of the difficulty of locating pipe supports in Mulberry street, the signals are suspended horizontally from the overhead construction. Signals 119 and 121 in the street have three indications, red, yellow and green, the yellow light indicating "proceed, left-hand route clear," and the green light, "proceed, right-hand route clear." On the lower level, the two automatic signals governing the last converging switch on the outbound track and the automatic signals through the subway have three positions. With these exceptions all of the signals show only red and yellow, the yellow indicating "proceed with caution." All signals governing over facing point switches are semi-automatic stick, with a key switch under control of the operator, which makes them purely automatic when the switch is out of use.

Electric power for the signal system is supplied by a motor-generator set using the 600-volt d. c. current from the trolley and delivering 220-volt, 60-cycle a. c. current, which is distributed by a three-wire system. An alternative supply can be secured from the lighting circuit of the building. Compressed air for the operation of the switches can be supplied either by a compressor located in the first story of tower 1, or from the compressor supplying other facilities in the building. Single-rail track circuits with three-position, model 15 U. S. & S. vane relays at operated switches, and single element vane relays for other track sections are used.

The installation of these signals was handled under the supervision of the company's engineers, the material being furnished and the installation made by the Union Switch and Signal Company.

Application and Maintenance of Insulated Rail Joints

By E. F. Schermerhorn,
The Rail Joint Company

The use of insulated joints in track was forced by the adoption of track circuits. In the early days when track circuits were few, and rolling stock comparatively light, it was deemed sufficient to use the simplest form of insulated joint, i. e., a pair of wooden splice-bars, and the resulting weak spots in the track were considered to be a necessary evil connected with the use of track circuits. With the increase of weight and speed of trains and the number of insulated joints in service, the insufficiency of this device was demonstrated. Improvements were made, looking to the increase of strength as a track joint, without impairing the efficiency as an insulating medium, and down to the present time, all improvements to all types of insulated joints have been made with this twofold object in view—efficiency as insulation and efficiency as a fastening and supporting device for the rail-ends.

This line of thought leads directly to the source of much of the trouble now experienced with insulated joints—a division of work and a division of responsibility. The insulated joint is not solely a signal device for which the signal department can be held accountable, nor is it a track device belonging wholly to the track department, but it must do a share of work for each, and it is expected to do each part of its work with perfect satisfaction.

The average track man considers the insulated joint to be primarily a signal device, and consequently more or less out of his jurisdiction, while the signal man is interested only in the insulation afforded by the joint, and leaves its upkeep to the trackman. This division of responsibility leads to the neglect of insulated joints which is so evident on so many railroads, and this neglect results in serious trouble and unwarranted expense to both signal and track departments.

Some roads have taken active steps to secure harmony and co-operation between the track and signal departments, with particular reference to the use of insulated joints, and these roads have fully demonstrated the beneficient results to be obtained through such a course, by decreasing the signal failures and maintenance expenses, as well as improving the morale through the removal of a source of continual irritation between departments. To put this in concrete form: When one finds a road where track foreman works in harmony with signal maintainer, track supervisor with signal supervisor, engineer maintenance of way or chief engineer with signal engineer, one is apt to find also that this road is making definite progress in the proper care of insulated joints, and is securing a definite reduction in the amount of trouble and expense chargeable to insulated joint failures. In view of the fact that any large road has thousands of insulated joints in its tracks, the cost of repairs and renewals as well as the signal failures due to improper application and maintenance of joints are worthy of the consideration of any operating officer who desires the greatest efficiency at the least expense.

It requires only momentary consideration to realize that an insulated joint cannot be made as durable as an all-steel joint, for with the introduction of insulating material between the parts of the joint structure, the durability of the joint is reduced to the basis of the durability of the insulating material, and no known material of this class, suitable for rail joints can be compared with steel as to durability. But insulated joints can be made and are now in use, which, as track fastenings, are fully as strong and secure, and can be maintained to fully as good alinement and surface as the ordinary all-steel joint. However, this joint must not only have all the care and attention which is necessary to properly maintain an all-steel joint, but this care and attention must be given much more frequently, in order to pre-