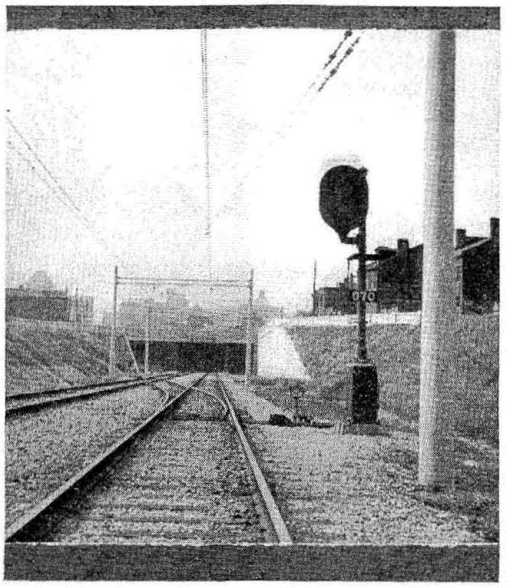
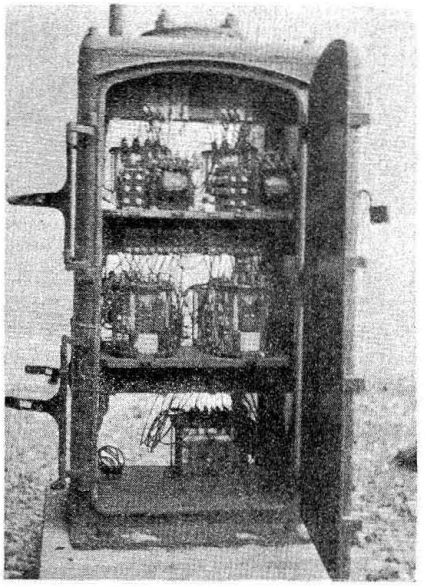
# Signaling of New Terminal

## Illinois Terminal Railroad installs interesting automatic signal arrangement in new subway and underground terminal in St. Louis

Switch indicator and time-element release at switch



Signal 070 with subway portal in background



A-C. relays and transformers at signal location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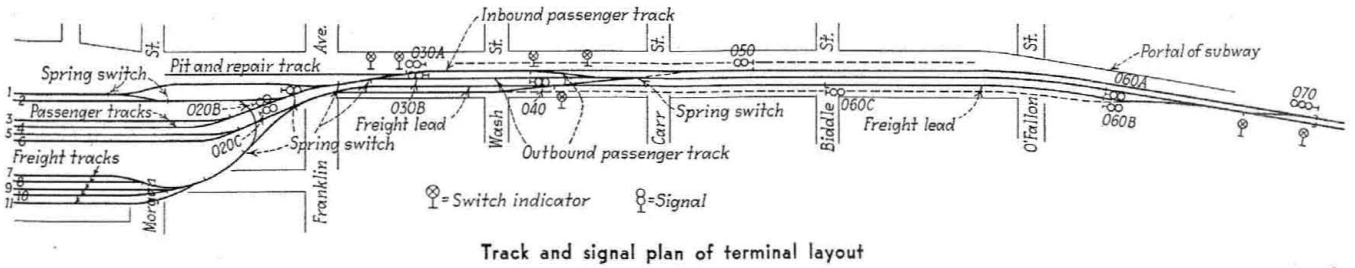
AN INTERESTING example of what can be done with automatic signals for controlling train movements, is in the new subway and terminal building layout of the Illinois Terminal Railroad in St. Louis, Mo. Usually it would be thought necessary to install a complete interlocking plant to handle the number of train movements made in this terminal daily, especially when the unusual track arrangement is considered. However, in view of the condition existing at the time this development neared completion, it was decided to install as simple an automatic layout as was possible. The factors influencing this decision were that in view of the general business conditions in the Fall of 1932, the original plans, which included additional tracks and a more extensive passenger depot layout, had been curtailed somewhat, and, furthermore, on account of general conditions the greatest possible operating economy was desired.

The layout is a part of the new entrance of the Illinois Terminal Railroad System into the heart of downtown St. Louis. This includes a new double-track elevated structure 9,258 ft. long, starting at the McKinley bridge in North St. Louis. From the end of the elevated structure, the tracks extend on the surface of the ground for 1,000 ft. to the north end of the new subway shown at the right-hand edge of the general plan. At this point the tracks enter a subway, and the entire layout shown on the accompanying plan is underground. The tracks shown as dotted lines are to be installed later, and those used primarily for passenger or freight service are so marked. A portion of the property abutting High street on the east has not yet been developed and in this area an open cut slopes to the tracks so that a certain amount of daylight is admitted.

The passenger traffic includes that of the main line of the Illinois Terminal Railroad (electrified lines) from



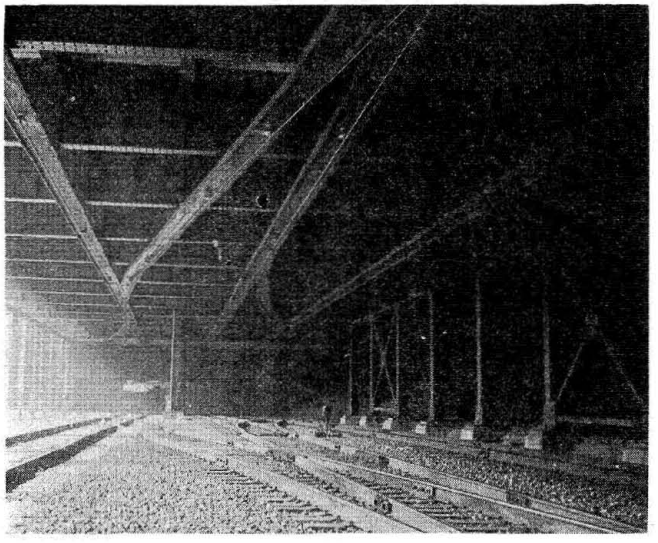

Track and signal plan of terminal layout

Illinois points; that of the St. Louis & Alton, a high-speed suburban line extending to Alton, Ill., and the inter-city service over the Mississippi river to Venice, Madison and Granite City. In addition to the passenger traffic, which involves 185 movements daily, freight traffic is moved in and out of the new freight terminal and warehouse building. All operation, both freight and passenger, is electrified, the over-head trolley system being used.

The normal movement is for inbound passenger trains to enter the terminal on track No. 1, unload its passengers south of the crossover switch under Morgan, and after crossing over this crossover, load on track No. 2, then leave within a few minutes. If two inbound trains follow so closely that this movement is not possible for both trains, the second train may unload north of this crossover, and then, after loading, reverse its movements on track No. 1. The signals are arranged so that this movement can safely be made. Trains that are to lay over for some time are moved in on tracks No. 3 and No. 4 or stored on the extreme south end of tracks No. 1 or No. 2, depending on their length. A great many of the movements of passenger trains are of single-car units only, and all of these have practically no layover time at this terminal. The longer trains of two or four cars may have from 15 min. to several hours before they again leave.

A small proportion of the passenger-train movements are made with cars of the single-end type and to turn these required the installation of the wye. Movements are made on this by hostlers under flag protection, without affecting trains entering or leaving on track No. 1. The track farthest west, which ends north of Morgan street, is a pit and repair track on which inspection and repairs are made to all cars laying over at this terminal.

Tracks No. 5 to No. 11, inclusive, are used for spotting cars when unloading and loading freight, the combined capacity being 75 cars. Exceptionally large elevators are provided to handle freight from the track level to either the receiving or delivery platforms at ground level, or, if for storage, to the upper floors of the warehouse, each floor of which has approximately 75,000 sq. ft. of storage space.

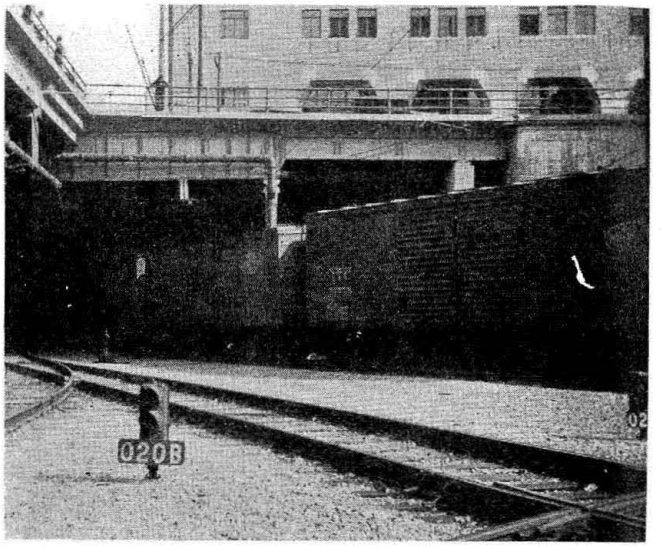


View looking south in the subway from a point under Carr street

These seven freight tracks are served by one main freight lead, track No. 3, movements being made in either direction, and, as only one switch engine is assigned to this service at one time, few conflicting movements arise. In order to facilitate certain switching movements, a short section of second track, 350 ft. long, was provided just north of Franklin avenue. When necessary, freight movements can be crossed over to the outbound passenger track at the crossover south of Carr street, and such moves are made frequently.

With spring switches provided at the switches, as marked on the plan, the arrangement permits movements from either the inbound or outbound passenger track to any of the four unloading tracks, without the use of slip switches or other complicated special track layouts which would have required the use of switch-tenders or the installation of an interlocking.

On the passenger tracks, signal protection extends from the ends of the passenger platforms continuously throughout the subway, eight signals being required. On the freight tracks, signal protection is provided to direct outbound freight trains from the freight lead to the outbound passenger track over the switch near the portal of the subway. Two signals—060-B at the clearance point, and 060-C, located about 650 ft. in the approach—were installed for this track. The automatic signaling is for single-direction operation only, except, of course, where single-track sections are involved.




View looking north from leaving signal at terminal—Freight train being switched into terminal

Where required, switch indicators were installed at certain switches, as shown on the plan, and at some of these switches where a time delay is necessary, a clockwork time release mechanism is provided.

The track circuits are of the single-rail type inside the subway and of the double-rail type on the approaches. The signals are of the "two-position" subway color-light type, except for signal 070, which is a standard high signal for high-speed traffic and uses 8⅜-in. lenses. Wherever practicable the signals were supported from the columns. However, concrete bases were required for the leaving signals at the ends of platforms, as well as for signals 060-B and 060-C on the freight track and signal 070.

The supply for the signal system is at 2,300 volts, 60 cycles, single-phase. The transformers feeding the 2,300-volt mains are located in the transformer room, under the terminal building, and are fed at 13,800 volts from duplicate lines which also supply power to the entire development. The 2,300-volt signal supply cable is run in a duct line built along and below the tracks, taps being run out at manholes to standard distribution transformers, located as necessary and hung from the columns supporting the overhead steel work. These transformers

feed at 115 volts into two No. 6 insulated wires supported in cable rings hung from messenger wire, which is run overhead along the columns in the subway, west of the inbound passenger track. These same cable rings support the control wires for the signals—the number of these varying in each section. The 2,300-volt supply does not extend beyond the subway portal and the control wires between signal 070 and the portal are run in Trenchlay cable buried outside the ballast line in the subgrade. At signal locations, or where it is necessary to break the control cable for any reason, terminal boxes were used, mounted on the columns or on foundations.

Most of the signal lighting is at 115 volts, and all line relays, or the local phases of two-element track relays, were supplied directly from these low-voltage mains. Where a lower voltage is required for a track-circuit feed or for lighting the low-voltage signal lamps, an air-cooled track or lighting transformer is used.

The complication of crossovers, with their protection, involved the use of numerous relays, some of which have as many as six front and six back contacts. The relays, together with the track transformers, track resistors and other equipment, were housed in standard instrument cases mounted on concrete foundations.

The installation of the signals in this particular section, as well as those on the other parts of this development, was handled under contract; the railroad, however, furnished competent men to supervise the work. To simplify the field work, all instrument cases were wired at the signal company's factory, the relays and other equipment being set in place and the wiring carried to the entrance terminal board. Case plans were furnished for each location, which made the work of connection extremely simple.

The placing of insulated joints, switch boxes, impedance bonds and foundations was done by the track department under signal department supervision. The running rails are 100 lb. A. R. A. section, and the track is rock ballasted throughout.

Almost seven months of operation have proved the fact that the arrangement satisfactorily meets the requirements of the transportation department.

# Train Accident on the Erie Railroad

## Use of call-on signal involved in rear-end collision

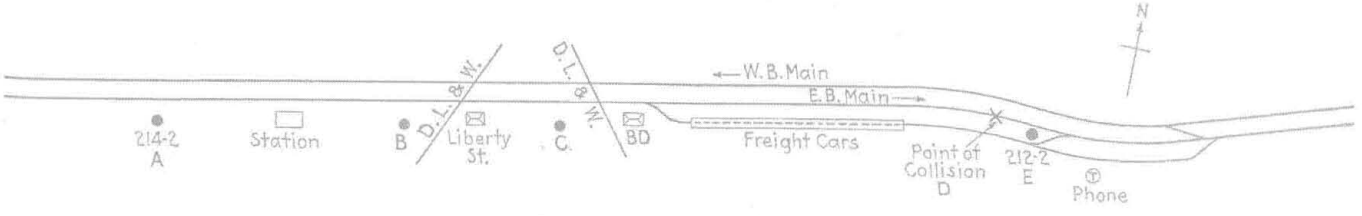
AT 7:43 p. m. on September 5, 1933, there was a rear-end collision between a passenger train and a milk train on the Erie near Binghamton, N. Y., which resulted in the death of 14 passengers, and the injury of 31 passengers and 1 employee. Investigation of this accident was made by the Bureau of Safety, I.C.C., in conjunction with representatives of the Public Service Commission of New York. A summary of the report follows:

This accident occurred on the double-track main-line over which trains are operated by time table, train orders and an automatic block-signal system, supplemented by an automatic train stop of the intermittent inductive type. The signals involved, named in order from west to east, were automatic block signal 214.2 and the interlocking home signals at Liberty street and BD towers, these signals being located 11,759, 7,980 and 5,962 ft., respectively, west of the point of accident; and automatic block signal 212.2, located 893 ft. east of the point of accident. The automatic signals are of the one-arm, three-position, upper-quadrant semaphore type, the night indications being red, yellow and green, for stop, approach and proceed, respectively. The interlocking home signals are of the two-arm semaphore type; the upper arms are of the three-position upper-quadrant, semi-automatic type, displaying the same night indications as the automatic signals, while the lower arms are non-automatic, lever controlled calling-on signals, operating in two positions, the night indications being red and yellow, for stop and proceed at restricted speed, respectively. These calling-on signals were installed for the purpose of advancing a train into an occupied block and for authorizing diverging movements. On account of braking distance of only 2,018 ft. between the home signals at Liberty street and BD towers, an over-lap has been provided so that automatic signal 214.2, west of Binghamton station, will not display a more favorable indication than "approach," unless the home signal at Liberty street is in the proceed position.

The automatic train stop operates in conjunction with the way-side signals, the inductors being located approximately 70 ft. in the rear of each signal.

Eastbound freight train No. 90 passed BD tower at 7:01 p. m. and pulled into the siding. Switch engine No. 78, with 30 cars, followed No. 90 from Binghamton, and after No. 90 had cleared on the siding, engine 78 proceeded on the main track to the crossover east of signal 212.2. The work of setting out the 10 cars on train No. 90 for Binghamton, and in picking up the 30 cars, was in progress when passenger train No. 8 approached on the eastbound track and was stopped by the flagman of the switching crew.

Passenger train No. 8 had arrived at Binghamton at 7:03 p. m. and departed at 7:16 p. m., passed BD tower at 7:18 p. m. and was flagged shortly thereafter as just mentioned. About one minute after having been brought




Sketch of territory in which collision occurred