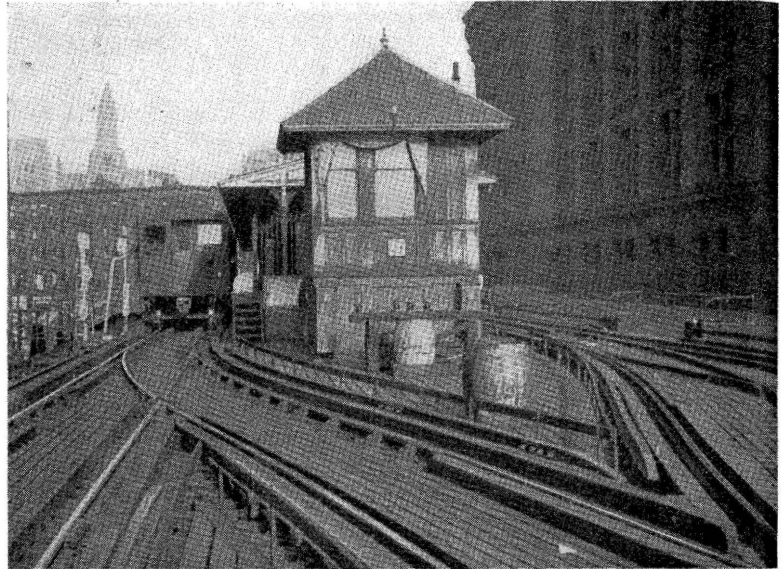


# Semi-Automatic Interlockings

## ON THE BOSTON ELEVATED

By Henry B. Brainerd

Motorman operating control L6 at Tower J automatic plant. He has just reversed crossover 5 and is pressing the clear button for signal LA6



THE Boston Elevated Railway, which operates a unified system of elevated, subway, and surface rapid transit lines, covering Boston, Mass., and vicinity, has recently converted three

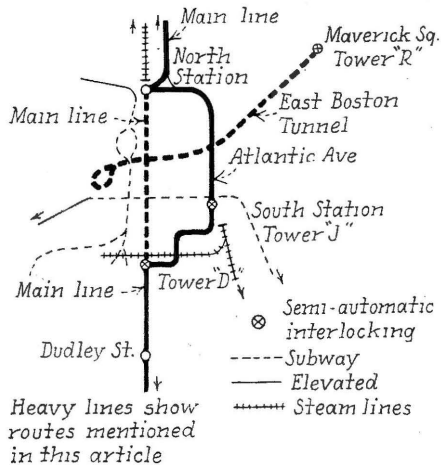


Diagram showing location of plants interlocking plants to semi-automatic operation under control of the motormen. Two of these plants handle traffic on the Atlantic Avenue branch elevated line. This branch runs along the waterfront, connecting the two downtown steam railroad terminals, the North Station of the Boston & Maine and the South Station of the

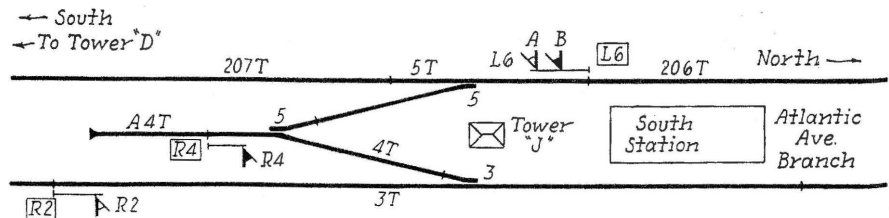
Boston & Albany and the New York, New Haven & Hartford, also the main line elevated at the North Station, and several subway, trolley, and coach lines at various points. During off hours, the branch trains terminate at Tower J, South Station, while in rush hours, they continue to Tower D, rejoin the main line, and terminate at Dudley street. The third plant is Tower R, located at Maverick Square, East Boston terminal of the East Boston tunnel, a separate short subway across downtown Boston and Boston Harbor. The accompanying sketches show the layouts involved at the various towers.

### Operation at Tower J

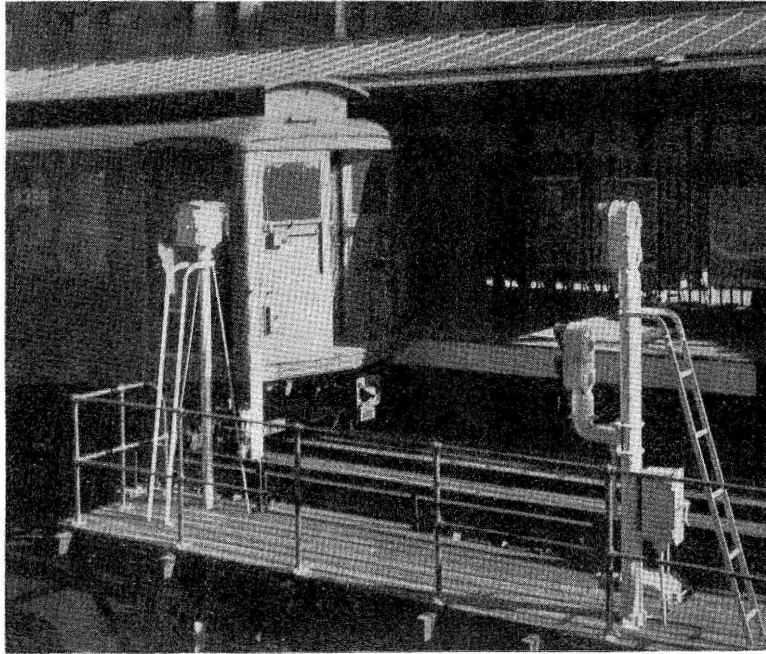
Referring to the layout at Tower J, South Station, assume that a southbound train finds all switches normal and signal L6 indicating stop. Beside

the motorman when he stops in the station is control box L6, consisting of two buttons, marked "Change" and "Clear", respectively, a switch control lever and two indicator lights, marked "Ave" and "Sdg", respectively. The avenue indicator is illuminated. Reversing the lever, from whichever position it happens to be in, reverses crossover 5, extinguishes the avenue light, and lights the siding indicator. Pushing the clear button clears the lower signal unit, LB6, for the train to enter the siding. When the train is ready to leave the siding, a similar operation at box R4 restores crossover 5 to normal and reverses switch 3, then clears leaving signal R4. After the train has left the station and cleared circuit 3T, switch 3 automatically returns to its normal position.

When trains are passing through Tower J to Tower D and Dudley



Layout at Tower "J"

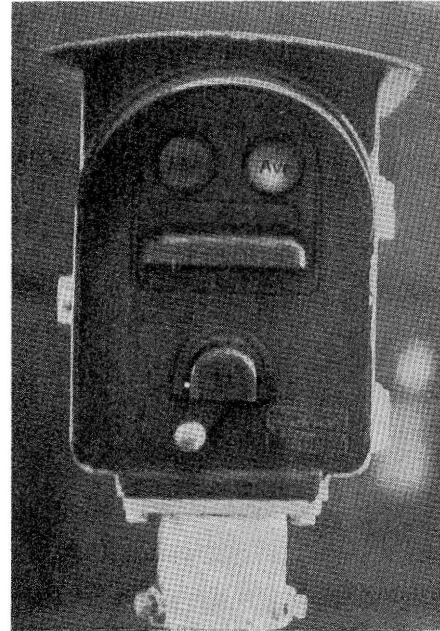


Train at South Station, Tower J. The motorman, who is hidden by the signal control box, has opened his door to operate the switches and signals.

street, the motorman of the first through southbound train presses the clear button at L6 without operating the switch lever and at once obtains a clear indication on upper unit LA6. Similarly, the first through northbound train must operate the clear button at R2. After the first through trains, LA6 and R2 operate non-stick and clear automatically.

The first siding train, after through traffic, cancels LA6 by pressing the change button and then operates as usual. A 15-sec. time limit is imposed before crossover 5 can move. Similarly, the first train leaving the siding must use the change button at R4 and wait 15 sec. for switch 3. If any train is approaching R2, it holds its route against R4 change button, but can surrender it with the R2 change button. Tower J was cut over to motorman control on November 24, 1934.

Typical control unit, Tower J. The light at the top indicates AVE. The two buttons for signal control are under the hood marked SIGNAL, with designations CHANGE and CLEAR just below. The switch lever is at the bottom.

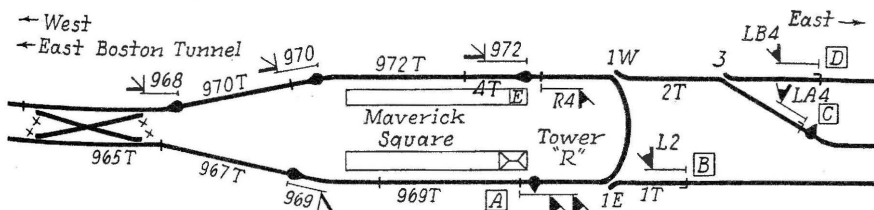


**Operation at Tower R**

At Tower R trains normally use the loop. The double track and stub siding east of the loop serve as yards. Before and after rush hours, when trains are being lengthened or short-

ened, many switching moves in and out of the yards are required. To facilitate switching, back-up signals are provided, and all signals operate stick to avoid the delay caused by cancelling a previous line-up. The two loop switches 1E and 1W are

operated together, like a crossover, by the lever of any of the control units. Each signal is cleared by its own clear button and can be released by its change button. Switch 3 and the switches of the scissors crossover west of the station are operated by hand-throw stands. The crossovers are equipped with two-unit lanterns which show a light back of a transparent L when both switches are lined up for a move to the left, or an illuminated R for a move to the right. Tower R was cut over on January 21, 1934.



Interlocked signals and switches operated by motorman from cab window at five locations designated A B C D E

Tower "R"—Maverick Square—track layout

**Operation at Tower D**

The operation of the other tower is very similar. At Tower D, there are two control units in the tower, in  
(Continued on page 97)

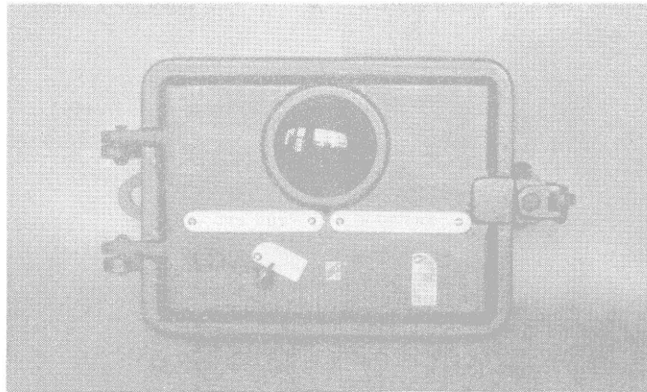
the two street crossings, the train is stopped short of the crossing and a trainman goes to the key box mounted on the mast of the crossing signal adjacent to track No. 4. He inserts his switch key and rotates it one-half turn and leaves it there. This key operation opens a circuit which causes the signals at that crossing

affected is indicated to the trainman by the indicator light being extinguished. At the same time, automatic Signal 271 changes its aspect from "stop" to "proceed," providing the block is unoccupied; and then the train is ready to start. It is not likely that the train would pull out without a trainman operating the

# Boston Elevated Interlockings

(Continued from page 95)

Outside view of cut-in and cut-out control



to operate, independently of the cut-out previously set up for track No. 4. After the trainman observes that the signals are operating, he signals the train to proceed over the crossing and after the crossing is clear, he removes his key from the box, which stops the operation of the signals.

### Restoration After Switching

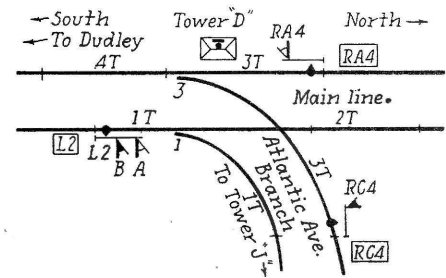
When all of the switching movements are completed and the train is east of Signal 271 and coupled up ready to proceed westward to the next town, a trainman goes to the key control box at signal 271, inserts his key in the hole marked RESTORE and rotates the key one-half turn. This operation opens contacts included in the stick relay circuit, previously mentioned, so that this

RESTORE control, because automatic Signal 271 will not indicate "proceed" until this RESTORE control is operated.

If the trainman neglected to operate the restoring feature of this circuit, the cut-out control arrangement will automatically be restored to the normal operation of the crossing protection when a following train enters the control track section of the stick relay. This control section is located 5,876 ft. east of Signal 271. In fact any following train will automatically restore the crossing protection to normal, but Signal 271 (track No. 4) cannot be cleared unless the key is operated in the lock marked RESTORE.

The operation of this cut-out system has been entirely satisfactory and has met the approval of the

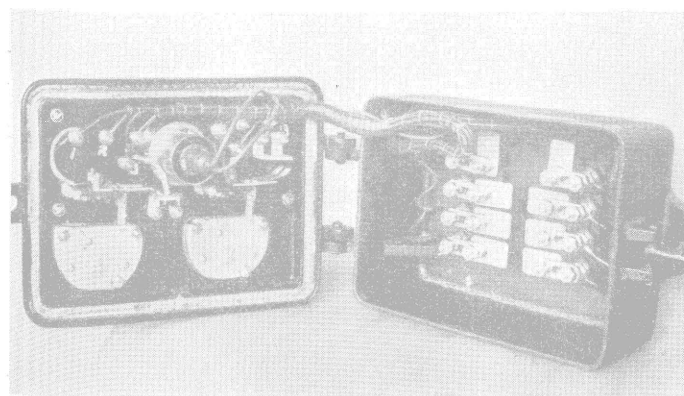
addition to the outside controls, and a cutover switch to place either inside or outside units in service. Normally, a towerman controls the plant from the inside units during the hours when branch trains run through to Dudley street. At other times, the switches ordinarily remain at normal and the signals, being non-stick, clear automatically for successive main line moves. Emergency or work trains using the branch must first wait for any conflicting main line trains to pass, then use a change button to cancel main line signals before a branch route can be set up. When a trailing move is made from signal RC4 over switch 3 reversed, switch 1 is also reversed for protection. When switch



Layout at Tower "D"

1 is reversed for this purpose only, it returns to normal as soon as the move is completed; otherwise, the switches remain in their last used position until operated from some control point. Branch signals are stick and must be cleared by push-button operation for each move. Tower D was cut over on January 26, 1935. Neither Tower D nor Tower J has any provision for back-up moves.

The equipment for these changes was furnished by the Union Switch & Signal Company, and the installations were made by the maintenance department, signal division, of the railway. Features of the old interlockers which were not changed included electro-pneumatic switch machines, color-light signals, electro-pneumatic trip stops, single-rail track circuits for signal control and approach and detector locking, 55-volt, 25-cycle signal circuits, and d-c. polarized switch control relays fed at 16 volts from copper-oxide rectifiers.



Interior of control box showing mounting of key operated switches

relay is de-energized, thus returning the crossing signal control circuits, as well as the control of automatic Signal 271, to normal condition. The fact that these results have been ef-

fective is indicated to the trainman by the indicator light being extinguished. At the same time, automatic Signal 271 changes its aspect from "stop" to "proceed," providing the block is unoccupied; and then the train is ready to start. It is not likely that the train would pull out without a trainman operating the