

# B&M Takes Up Track and Installs Traff

**At Ipswich, Mass., the Boston & Maine has installed flashing-light signals and automatic gates at three highway crossings, replacing watchmen previously in service. An important feature of the project was conversion of 14.5 miles of double-track to single-track CTC with one passing siding.**

EAST OUT OF BOSTON is the mainline to Portland and a commuter line to Portsmouth. On a 14.5 mile section of this commuter line between North Beverly and Newburyport West, the Boston & Maine has been able to effect operating economies through the installation of centralized traffic control and resultant removal of one main track for 13.7 miles. At three highway-railroad grade crossings in the town of Ipswich flashing-light signals and automatic gates were installed, replacing gatemen on the ground. The crossing protection equipment is controlled in the conventional manner by track circuits, being completely automatic. However, because of switching moves and station stops during daylight hours, Monday through Friday, supervisory manual control was provided for these three crossings as well as two existing automatic gate installations. A watchman's tower is located just east of the Ipswich depot, affording a view of two of the most heavily traveled highway crossings, Topsfield road and Washington street.

Commuter traffic consists of 9 eastbound and 9 westbound trains daily, except Sunday. Sunday schedules include 4 eastbound and 4 westbound passenger trains. The trains are Budd RDC, operating either singly or in

multiple. All make a station stop at Ipswich, which is in the single-track CTC territory. Station stops at North Beverly and Newburyport are in double-track sections of the line. North Beverly is 21 miles east of Boston and Newburyport is 37 miles from Boston. Four freight trains travel this territory between Boston and Portsmouth, with extra trains as necessary. A daily switch run operates between Boston and Salem and Portsmouth, making pick-ups and set-outs. No switching moves are made on Saturday or Sunday.

Formerly this North Beverly-Newburyport West line was double track, right-hand running. Train operation was by timetable and train orders, with automatic block signal protection in the form of searchlight signals.

When installing CTC, the double track was left in place through the station area at North Beverly to a point 2,500 ft east of the depot. At the end of double track, the eastbound main track swings over to join the westbound main through a No. 15 turnout. The turnout is a spring switch consisting of a Pettibone-Mulliken mechanical switchman and GRS facing point lock.

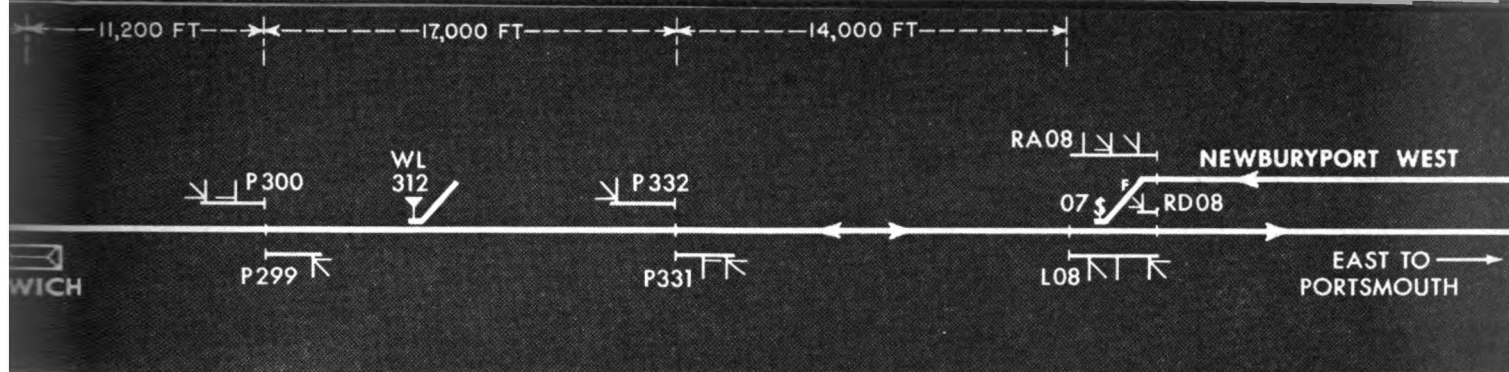
At Ipswich siding the turnouts are No. 15 with a model 5 dual-control

switch machine, operating on 110 volts d.c. The Newburyport West end of double track is identical to that at North Beverly. The eastbound trains hold the straight route and the westbound trains trail out through the spring switch. The spring and power switches are equipped with Rails Co. snow melters.

The control machine for this North Beverly to Newburyport West CTC project is at Salem, Mass., interlocking tower, four miles west of the end of double track at North Beverly. The 20 in. panel was added to the existing Salem interlocking control machine. A blank portion is reserved for a future installation of CTC between Salem and the end of double track at North Beverly, four miles. This territory is presently controlled by a table-interlocking machine. There is also room for expansion of the CTC from Newburyport West to Portsmouth, 20 miles, at the end of this line.

To clear the signal to direct a train to leave double-track territory and enter single-track territory, the train director (interlocking operator) at Salem tower positions the switch lever at the spring switch to reverse. He is then able to clear the leaving signal.

Signals are the type SA searchlight. Main track controlled signals have three heads—the top signal head for the straight route, the middle head for the diverging route, and the bottom head for slow speed or restricting. For a train entering single track from double track one of three aspects can be displayed: (1) red-green-red, which directs the engineer to move his train out over the spring switch at not exceeding 30



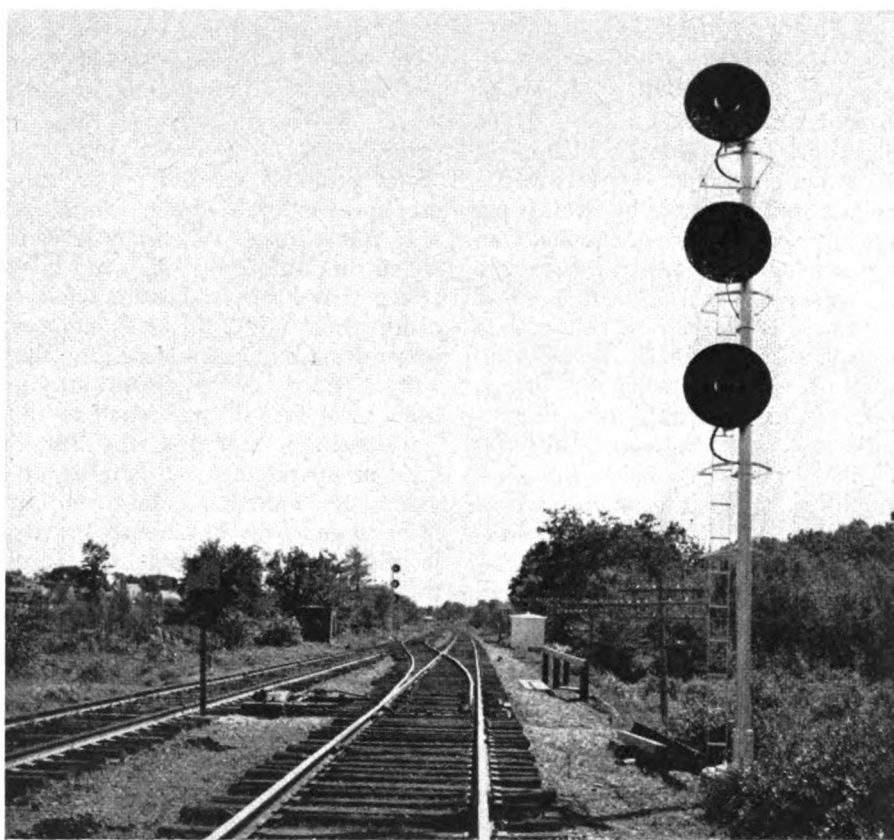
## Control, Gates and Flashers

mph; (2) red-yellow-red, which indicates he may trail out, prepared to stop at the next signal; (3) red-red-yellow, which tells him to move out at slow speed, prepared to stop short of a train or obstruction. The latter aspect is given when it is desired for switching operations or getting engines onto trains. This aspect is not displayed for any following or through train movement except in emergency.

When going from single track to double track, the signals will display either green-red-red or yellow-red-red for a move on the straight track. The restricting signal, red-red-yellow, can also be displayed for a following move if needed. (As customary on the B&M, circuiting is installed and disconnected to permit this signal to be displayed for against traffic moves when required for track maintenance purposes. Under these circumstances trains are operated by train order or pilot.) Going into Ipswich siding through a power switch a train receives a red-red-yellow aspect, and coming out it gets flashing yellow or green on a searchlight dwarf, depending upon the block occupancy.

### Automatic gates at Ipswich

Three railroad-highway grade crossings at Ipswich were formerly protected by manual gates, flashing-light signals, and watchmen on duty more than two tricks per day, seven days each week. Two other crossings were protected by automatic half-gates and flashing lights. The Department of Public Utilities of the State of Massachusetts required that as long as this was a double-track



End of double track at North Beverly looking west. Track to left of switch is to be taken up.

line, the B&M must maintain watchmen at all three manual crossings. Several factors contributed to this opinion: (1) high density commuter traffic line with a station stop for all trains at Ipswich; (2) heavy vehicular traffic at all crossings, particularly Topsfield road. As the station area itself adjoins Topsfield road, there is considerable vehicular traffic over the road in the station area in the morning and evening rush hours.

Washington street crosses the rail-

road at an acute angle, and at the same location a side street joins it at the crossing, further complicating vehicular movements. Mineral street is in a residential section of Ipswich and has considerable pedestrian traffic, particularly during the school year with children going to one of the grade schools. Thus, with all this vehicular, pedestrian and train traffic on a double-track line, the DPU of Massachusetts felt that watchmen at each crossing were essential. This was

particularly so because of the danger of a second train approaching just as a first train had cleared the crossing.

When the railroad proposed single tracking this line, they requested the DPU for permission to install automatic gates at all three crossings. Because of the heavy switching moves in the area during the day, they proposed to add supervisory manual control for these three crossings, as well as Liberty and Linebrook streets. This manual control would be effective only from 8 a.m. to 4 p.m., Monday through Friday. Special controllers would also be installed in the relay cases at each crossing, so that trainmen would be able to raise gates if they were switching in the area between 4 p.m. and 8 a.m. This would relieve the back-up of vehicular traffic at a crossing. These proposals were approved by the DPU and were carried out by the B&M.

On automatic control the crossing protection equipment operates in the conventional manner by trains occupying approach track circuits. One exception is for eastward movements approaching Topsfield road, because the east end of Ipswich siding is in the approach circuit to the crossing. A train held on the main track at this point would, with conventional automatic control, set the gates and flashers into operation. Thus, to avoid undue delays to vehicular traffic over Topsfield road, the approach controls for the crossing protection were interconnected with the home signal controls. Thus, with signal LAO 6 showing the stop aspect, a train occupying track circuit ALO4T or BLO4T will not cause the Topsfield road crossing protection equipment to begin operating. When the train di-

rector at Salem attempts to clear signal LAO6 the gates and flashers are set into operation. A time delay is introduced so that the signal will not clear for 20 seconds after the gates and flashers are set into operation.

The supervisory control machine for the five street crossings is on the second floor of a watchman's tower just east of the Ipswich depot. The machine has a track model diagram showing the locations of the streets, with amber indication lamps in the track sections, which are lighted to show occupancy of a train. A bell calls the attention of the crossing watchman to the approach of a train at either the east or west extreme ends of the controlled section.

At locations on the panel beneath Topsfield road, Washington street and Mineral street are three-position levers with "up" (left), "auto" (center), and "down" (right) positions. A single two-position lever, with "up" and "auto" positions serves for both Liberty and Linebrook streets, which are only 200 ft apart. When any lever is not in the "auto" position, a red light above that lever is illuminated. Beneath each lever is an emergency gate-raising button. To raise the gates with a train on the approach, the lever must first be positioned to the "up" position, and then the button must be operated. A red lamp is provided to indicate gates-down at Mineral and Liberty-Linebrook street locations, as these streets are beyond the range of vision of the watchman.

When the protection has been cut out by supervisory control with a train on the approach, it may again be put into operation by restoring the lever to the "auto" position. The gates at Topsfield road, Washington street

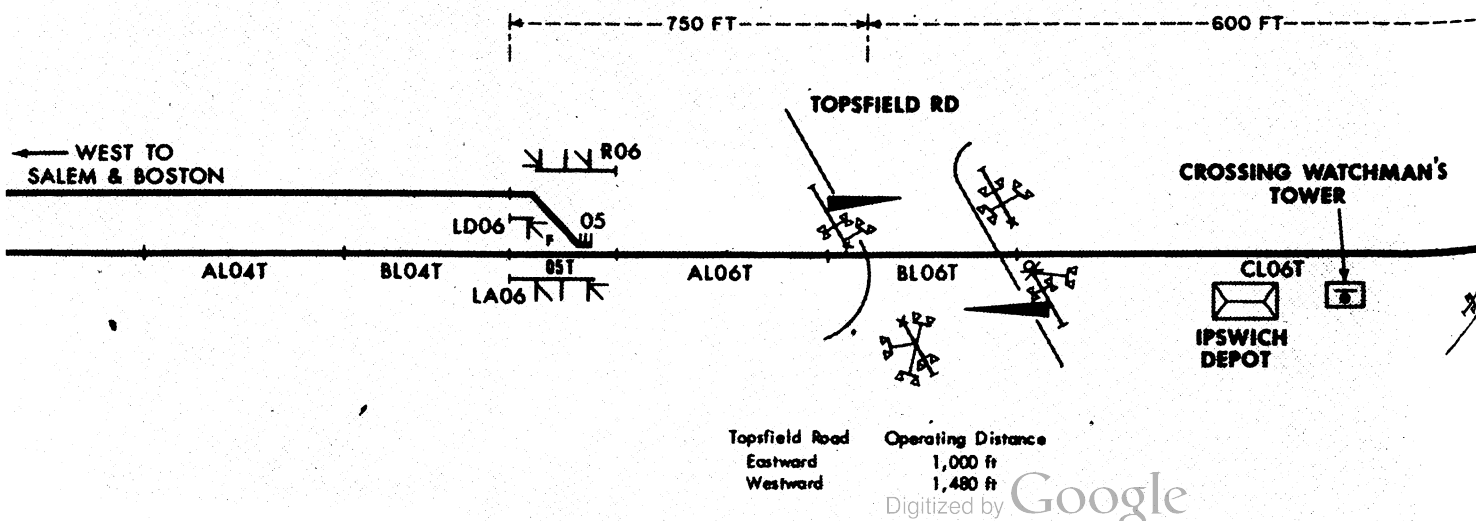
and Mineral street may be lowered without track circuit control by moving the respective lever to the "down" position. This is done when necessary for switching operation and motor car movements.

At the bottom of the panel beneath Topsfield road, Washington street and Mineral street, are pull buttons which allow only the flashers and bells to operate without the gates being lowered. This is provided to permit the watchman to give advance warning during periods of heavy traffic congestion prior to the actual descent of the gates.

A green "power on" light and a red "power off" light serve to indicate the availability of a.c. power. Should the power fail, the watchman notifies the signal maintainer or the train director at Salem Tower. The watchman has a phone circuit to the train director at Salem and a jack plug to connect him to the dispatcher's line.

On the end of a relay case at each crossing are two control boxes which can be opened by a switch key: one is for manual control of the gates, and the other for emergency control. The manual control is used by train crews or motor cars that may be working in the area when the crossing watchman is not on duty. Inside the manual control box is a two-position toggle—"on" for gates down and "off" for gates up. A green indication lamp in this control box is lighted when the a.c. power is on. If it is off it indicates that the gates and flashing-light signals are operating on the battery.

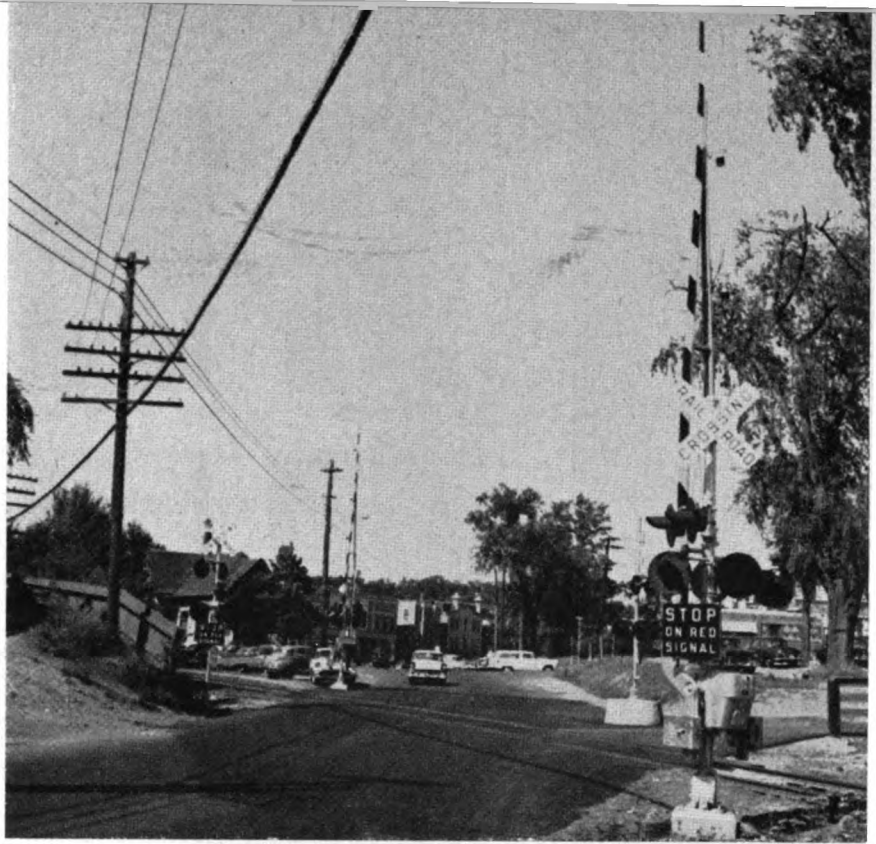
Emergency control is used when the gates are held down. This may be due to a track circuit or line wire failure with no train on the approaches. After opening the door of



this emergency control box, a two-prong plug is removed from the normal jack and inserted in a jack identified as "gates up". This controls the signals governing movements over the crossing to display Stop aspects. Simultaneously, a type KB time element relay is set to run from one to five minutes, depending upon the length of the approach circuit to the crossing and the respective location of wayside signals. At the end of this run-down time, the gates are raised and the flashing-light signals cut out. A red indication lamp inside the box is lighted to indicate that emergency control is in effect. To insure that a trainman or a main-tainer does not go off and leave the emergency control in effect, a block of wood inside the cover of the door prevents the cover from closing when the plug is in the "gates up" jack. For those few occasions of a track circuit failure, this emergency control has been a great help in reducing vehicular traffic congestion at the crossings.

In addition to these gates, automatic gates were also installed at Main street crossing at Hamilton-Wenham on this project.

Planning and installation work on this CTC and crossing protection project was performed by the Boston & Maine's signal department, under the jurisdiction of E. N. Fox, retired, and W. W. Hartzell, Engineer of Communications and Signals. General Railway Signal Co. furnished the signal equipment, and the crossing gates and flashing-light signals were furnished by the Western Railroad Supply Co. Simplex wire and cable were used. Exide storage batteries were used for track circuits and standby at crossings and other points.



Topsfield Road crossing of the B&M in Ipswich is adjacent to the depot (to the left in the photo). Heavy vehicular traffic occurs during morning and evening rush hours when commuter trains stop at Ipswich depot.



Emergency control is used when gates are held down due to track circuit failure. Two-prong plug at right is inserted in holes at left to raise gates.

