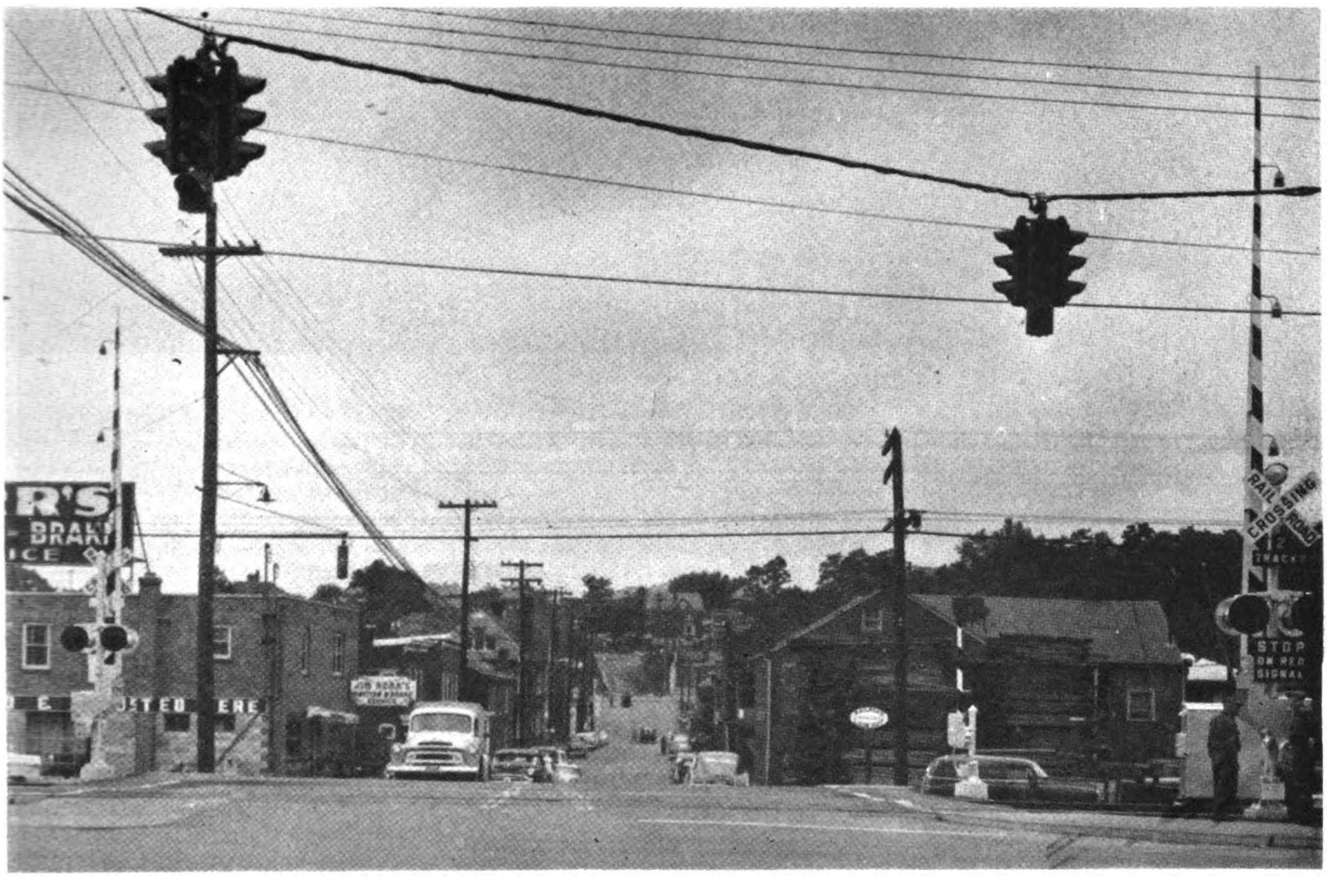


Valley street at Henderson avenue, looking south on Valley; traffic lights are over Henderson at intersection

Traffic Signals and Crossing Gates

Coordinated in Cumberland, Md.

The city, the state and the Baltimore & Ohio cooperate in planning complicated project including gates where streets cross tracks, and traffic signals at street intersections

SEVERAL NEW IDEAS are included in a recently completed project at Cumberland, Md., which includes interconnected automatic control of gates to protect crossings of streets and tracks, and traffic signals to direct traffic on Henderson Ave., and at the intersections of streets adjacent to railroad tracks.

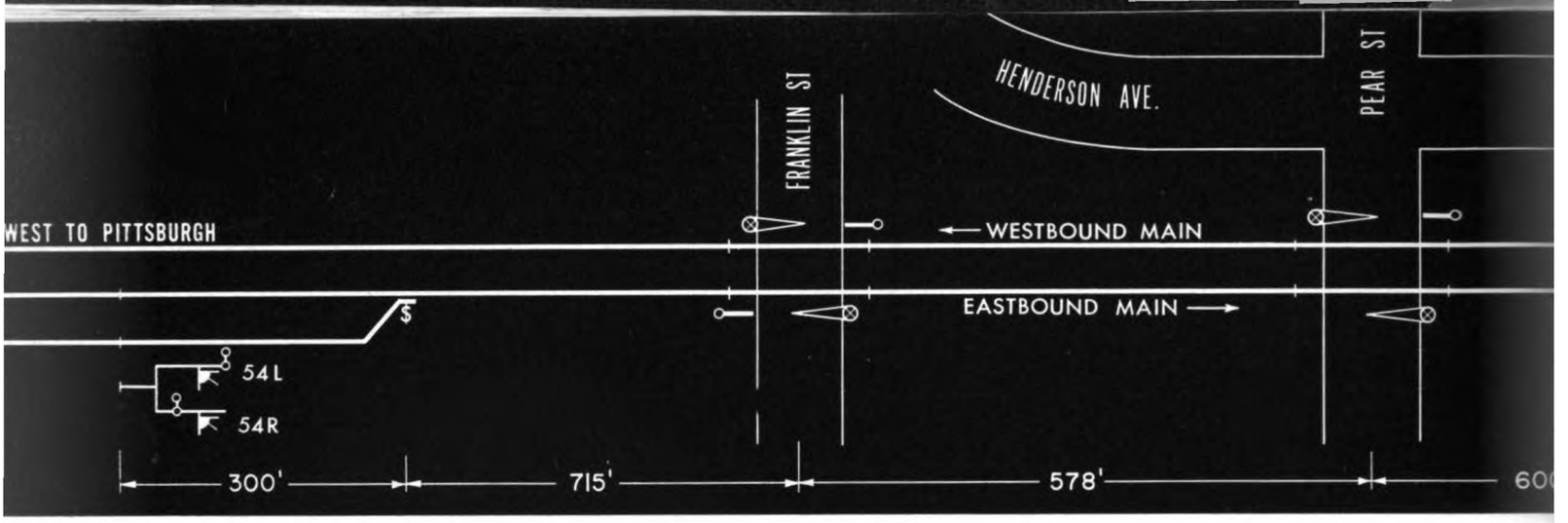
Through this section of Cumberland, the B. & O. has a double track main line extending east and west, which handles approximately 30 trains daily. In this part of the city Henderson Ave., (U.S. Route 40) runs east and west, parallel with and just north of the B. & O. tracks. In this area the three north-and-south streets which cross Henderson Ave., and the railroad at grade are: Knox, Valley and Pear. A little farther west, Franklin St. crosses the tracks, but passes beneath Henderson Ave., at that lcoation.

Previously the grade crossings of the four north-and-south streets with the railroad tracks were each protected by a crossing flagman on duty 24 hours daily. The intersections of Henderson Ave. with the three north-and-south streets were each protected by STOP signs at all corners.

The street vehicle traffic on Henderson Ave. is very heavy, especially during the morning and evening rush hours. The stopping of all these vehicles at STOP signs at Knox, Valley, and Pear streets, resulted in much useless delay as well as congestion. Valley street carries considerable north-and-south traffic, because it is the only street in this neighborhood that extends over a bridge across Wills Creek. Moves on the other three north-and-south streets are not heavy, being primarily local traffic.

Thus the problems were: (1) to reduce delays to the through traffic on Henderson Ave., (2) Improve safety at the intersections of this avenue and the cross streets, and (3) Improve safety where the north-and-south streets cross the tracks.

The solution was to install automatically controlled traffic signals at the intersections of streets and Henderson Ave. and to install automatically controlled short-arm gates with flashing-light signals at the grade crossings of the tracks and streets. An important factor which contributes much to the success of the project is that the controls of the street traffic signals and



the railroad crossing gates are interconnected to give maximum protection, with minimum delay to street traffic when both systems are in effect.

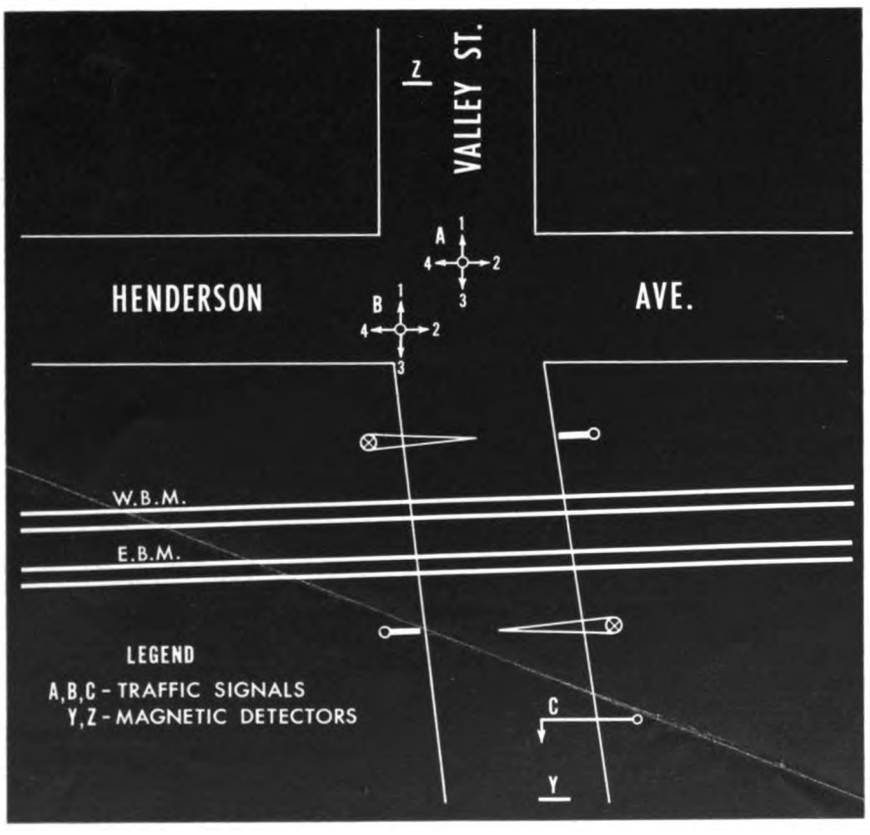
How Traffic Signals Operate

Conventional, red-yellow-green, street traffic signals were installed overhead at the intersections of Henderson Ave. with Knox, Valley and Pear streets. The layout at Valley st., as shown in the plan herewith is typical.

One traffic signal, marked "A" is over the westbound lane on Henderson ave., and another traffic signal, marked "B" is over the eastward lane. Both of these signals display aspects in all four directions. A third traffic signal, marked "C" on the plan, is located south of the tracks on Valley st. This signal directs only northward moves on this street.

Normally the traffic signals "A" and "B" display "green" in both directions along Henderson ave., so that street vehicle traffic keeps moving, without the previous stops at "STOP" signs.

If a southbound vehicle on Valley street approaches Henderson ave., or if a northbound vehicle in Valley street approaches the railroad tracks, such a vehicle passes over or near a directional magnetic detector, buried in the street pavement. This automatically affects the controls, so that, after a fixed interval, the east-and-west aspects of traffic signal "A" and "B" change from green to yellow, and then to red. Then the north-and-south aspects change from red to green. Thus vehicles can move north and south on Valley Street, or turn into Henderson ave. in either direction.



If only one vehicle approaches from north or south in Valley street, the north and south control holds for a cycle of 15 seconds. If a second approaching northbound or southbound vehicle in Valley street passed its magnetic detector within the original 15-sec. period, then the green for north and south would hold 5 seconds longer. This chain-action will hold the north and south lights green for a total of up to 35 seconds. Then the north-and-south traffic lights go yellow, then red, and the east-and-west traffic lights "A" and "B" go from red to green.

With the normal control in effect, i.e., green for east-and-west on Henderson ave., and red for north-and-south on Valley st., if an approaching train enters an approach control section, all traffic lights change, to display yellow for 3 seconds then to red, except faces 3 of signals A and B (northward) which display green for 15 seconds, thus giving time for any northbound vehicles on the tracks to move on off, then these signals display red. Of special note is the fact that in the meantime, signal "C" displays red to stop other approaching northward vehicles on Valley st.

All signals continue to display red until the gates reach their lowered position (approximately 15 seconds). Then signals "A" and "B" display green for east and west on Henderson ave. If a southbound vehicle approaches in Valley st., signals "A" and "B" will display red for east and west traffic, and faces 1 of "A" and "B" will display red with green directional arrows for a southward vehicle in Valley st. to turn east or west in Henderson ave. During this period the approach of a northward vehicle on Valley st. has no effect.

After the rear of the train passes Valley st., and the gates have been raised, track occupancy no longer affects controls of the street traffic signals, therefore, their controls re-

vert to normal, as previously explained.

Automatic Controls

In this project, the crossing gates are controlled automatically by track circuits which are arranged to give a minimum warning of 30 seconds prior to the arrival of a train at a crossing. Stick circuits are arranged to cut out the operation of the flashing-light signals and to raise the gates after the rear of a train passes. On each track at each crossing there is a separate track circuit not less than 110 ft in length that extends the width of the street and about 10 to 35 ft beyond the property line each direction. Such track circuits are in service not only on main tracks but also on spurs or sidings that extend over crossings. When any such short track circuit at a crossing is occupied, the control is absolute to lower the gates regardless of any time-out or cut-out.

Time-Out Control

In normal operation, the flashing-light signals operate and the gates at Valley st. are lowered when a westbound train occupies track circuit AWT which starts 2,115 ft east of Valley st. However, if this train or a switching move occupies this track circuit for more than 58 seconds, without entering the next track circuit to the west, then the gates at Valley st. are raised to allow street traffic to cross. When the train or switching move is again ready to proceed west, it is required to move at slow speed. When it enters track circuit CWT just west of Knox st., the gates at Valley st. go down again, in plenty of time before the train approaches the crossing. A spur track to the plant of the Paint Spring Company is connected to the main track by a hand-throw switch 374 ft west of Knox st. crossing. If a switch engine is to set out a car on the Paint Spring spur, the 400 foot track circuit DWT is cut out of the crossing protection control when the brakeman throws the hand-throw switch "L" for the spur track. This special result is accomplished by an extra track circuit DWT 400 ft long at the switch, which leaves track circuit CWT 174 ft long. The cut section between these track circuits is marked by a painted sign "CS" located beside the rack.

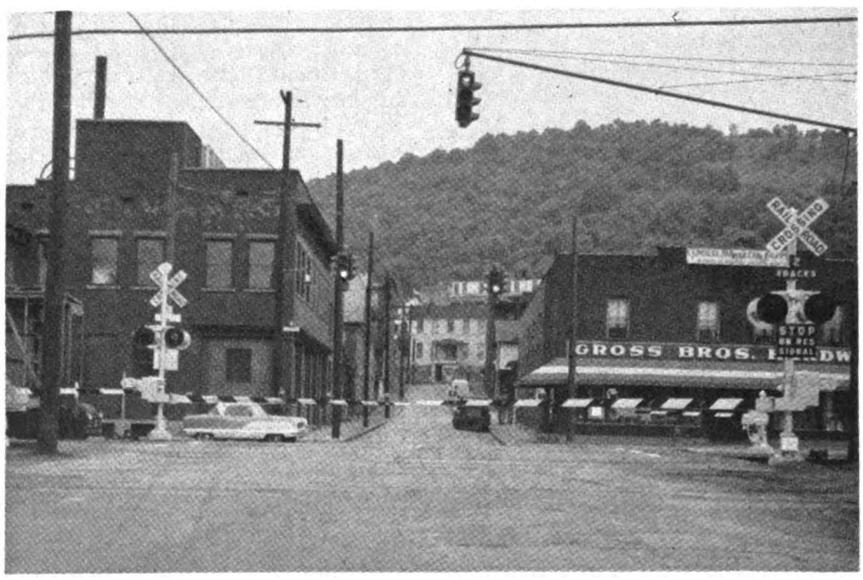
If, after finishing the switching move the switch engine is to move east on the westward main, the engineer is required by rule to take 20 seconds while moving from the "CS" sign to the crossing, and is required to see that the gates are down before entering upon the crossing. Similar arrangements and "CS" signs are used at several other locations on this project.

Connections With Home Signals

An eastward interlocking home signal 52LA is located just west of Knox st. In order to avoid unnecessary delay to street traffic, circuits are interconnected so that this home signal must be cleared before an eastbound train enters the approach controls, in order for the train to set the flashing-light signals in operation and to lower the gates.

If, an eastbound train occupies an approach track circuit, and then the lever man sends out a control to signal 52LA, the flashing-light signals operate and the gates are lowered before the signal 52LA can display the proceed aspect. As part of the project, this signal was moved 190 ft from the east side of Knox st. to the west side, so that trains stopped at the signal will not block the street crossing.

A third main track, used primarily for eastbound freight trains, connects with the eastbound track at a spring switch located 715 ft west of Franklin st. Eastward interlocking home signal 54L controls eastward moves on the main track, and home signal 54R controls eastward moves from the freight track trailing through the spring switch to the eastward main track. Unless the corresponding home signal has been cleared when an approaching



Knox street looking north. Traffic light in foreground is red, while two lights in back over Henderson avenue are green to permit cars to move off crossing

Guard for sidewalk gate is made of old rails and steel plate bolted and painted

train enters its approach track section the gates at Franklin do not go down.

Key Controllers

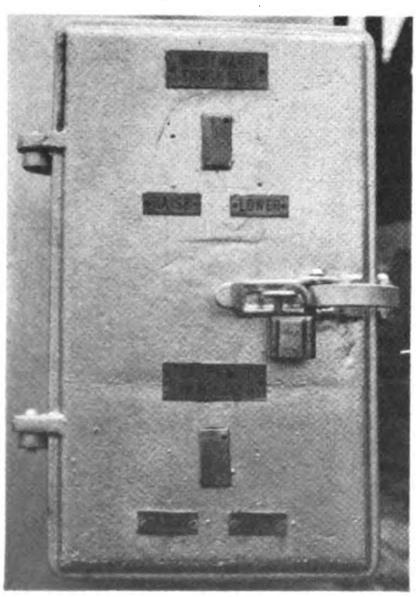
At each crossing there is a controller box which can be used by the conductor or brakeman of a train or switch engine to control the crossing gates manually during special switching moves. One set of controls applies for the eastward main track and the other for the westward main.

A standard switch padlock key fits into a key hole in the face of the box. If the gates are down due to track occupancy by a switch engine that is not to proceed over the crossing, the brakeman puts his key into the controller and turns it to the left, thus causing the gates to be raised so street vehicles can use the crossing. When the switch engine is ready to proceed toward the crossing, the brakeman turns his key to the right position, then to center and removes it, thus allowing the track circuit controls to lower the gate.

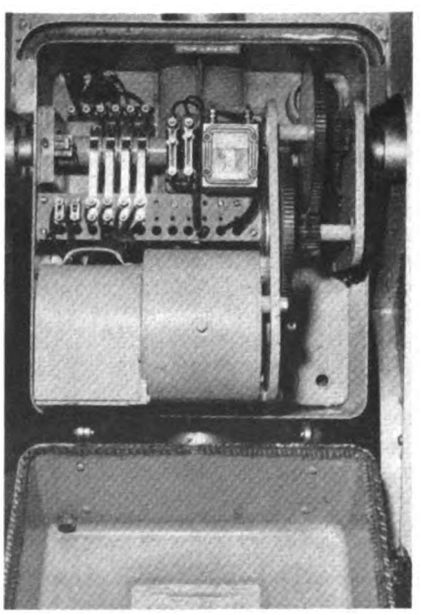
At some locations the gates are raised automatically by "time-out" circuits if a switch-engine stops for more than an allotted time (1 min) in an approach section. In such instances, when the switch engine is ready to proceed toward the crossing the gates are again lowered by one of two methods: (1) brakeman inserts his switch key in the controller at the crossing, and turns it to the right, leaving it there until the engine or cars enter the absolute track circuit across the crossing. (2) The engineman can creep up slowly on the end of the absolute track circuit which extends across the street and 10 to 35 ft beyond in each direction. By placing leading wheels on the end of such a circuit and then stopping, the gates go down without using the manual key controller.

A basic principle of the key controllers as used on the Baltimore & Ohio, is that the key must be in the controller and turned, in order to be effective. As a result, the manual control is cut out automatically when a man removes his key to take it with him.

The flashing-light signals and street crossing gates on this project were made by the Transport Products Corp. The sidewalk gates are operated by remodeled semaphore signal mechanisms. The gate mechanisms are operated by d.c. motors, which at each crossing are fed by a set of 7 Exide lead-type storage cells rated at 200 a.h. Each track circuit is fed by one lead cell rated at 120 a.h. The relays were furnished by the General Railway Signal Company. These flashing-light signals and crossing gates, controlled automatically, are giving improved protection at these four grade crossings. The cost of this new crossing protection was $118,000, which includes $11,500 for removing and rearranging tracks. This crossing protection was planned and constructed by railroad forces, under the direction of A. L. Jordan, signal engineer. The street traffic signal system discussed in this article was installed under contract by an electrical firm in the city of Cumberland, the plans and equipment being furnished by Crouse-Hinds Company, Syracuse, N.Y.



Westward track gate control is at top



Gate mechanism cover drops out of way