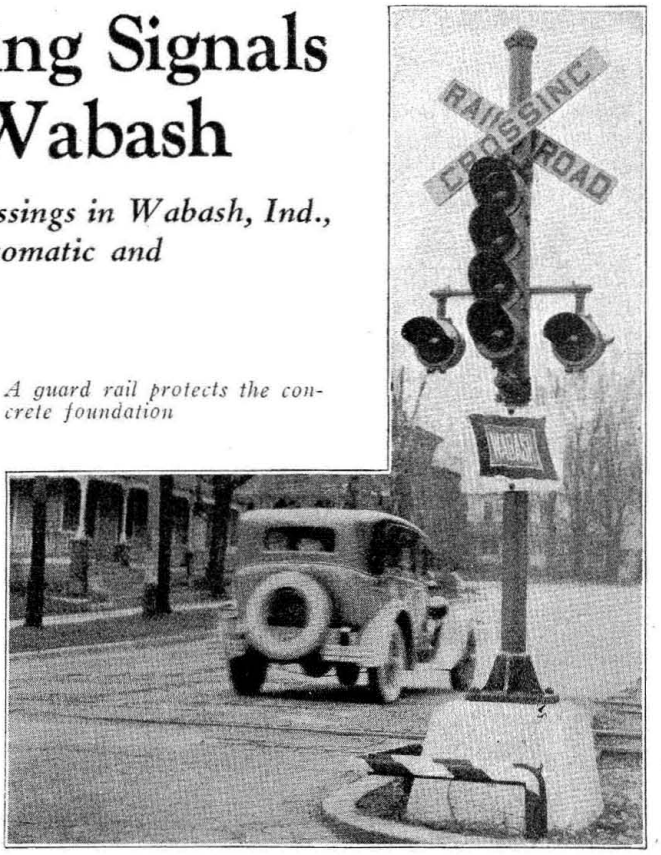
Flashing-Light Crossing Signals Save Money for Wabash

Twenty-four hour protection afforded at 13 crossings in Wabash, Ind., includes unique combination of automatic and manual control

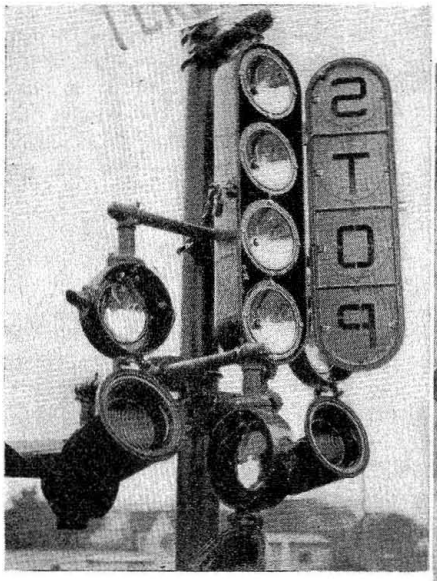
THE Wabash has recently placed in service, flashing-light highway crossing signals at 13 street crossings in Wabash, Ind., which replace gates and flagmen at 9 of the streets, and flagmen at 2 streets, while protection is now given at 2 streets where none was provided before. The payroll saving for the 11 gatemen and flagmen relieved is about $7,800 a year, which will pay for the new installation in about two and one-half years. Wabash, Ind., is a town of about 10,000 population, located on the main-line of the Wabash, running from St. Louis, Mo., to Detroit, Mich. The traffic includes 8 passenger and about 12 freight trains daily and a local freight each way and an average of about 4 extra freights per day, or a total of about 26 train movements daily in addition to the switching. All passenger trains make the station stop and, therefore, the speed is restricted while the through freight trains operate not to exceed 20 miles per hour.

After a study was made of the advantages to be gained by a change in the crossing protection, the division superintendent asked for a hearing before the city council and city engineer, at which time it was explained that the gates were in service only 12 hr. each day, whereas the flashing-light signals would give protection for the full 24 hr. Likewise, the gates, being manually operated, depended on the human element, whereas the signals would be controlled automatically.

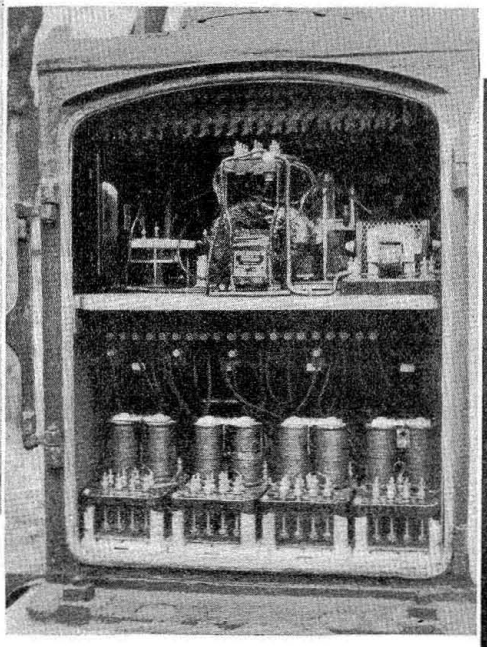


A guard rail protects the concrete foundation

Because of several small industries, warehouses and grain elevators in Wabash, the two daily local freight trains each spend about two hours switching. It was the opinion that with automatic control only, that the signals would indicate stop for such long periods while the local trains were switching, that the automobile drivers would soon learn to disregard the signals. A combination control was, therefore, arranged so that the signals are normally

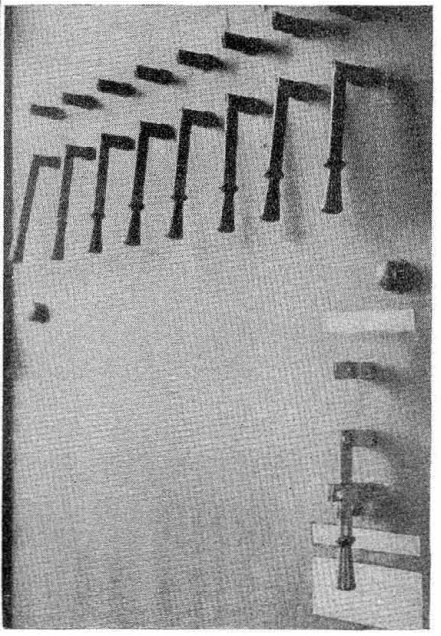


Above—Signal with covers removed to show reflectors and cover glasses

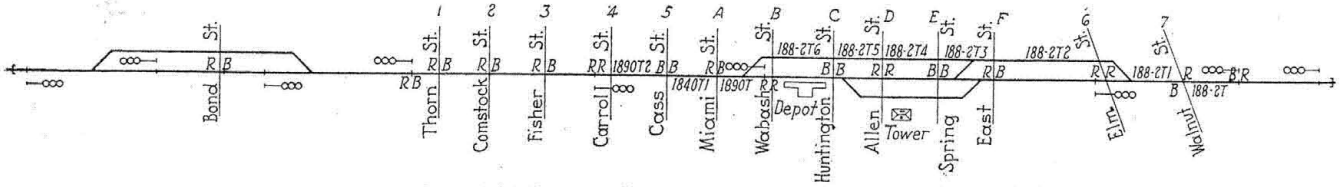


Above—Large sheet metal cases for instruments

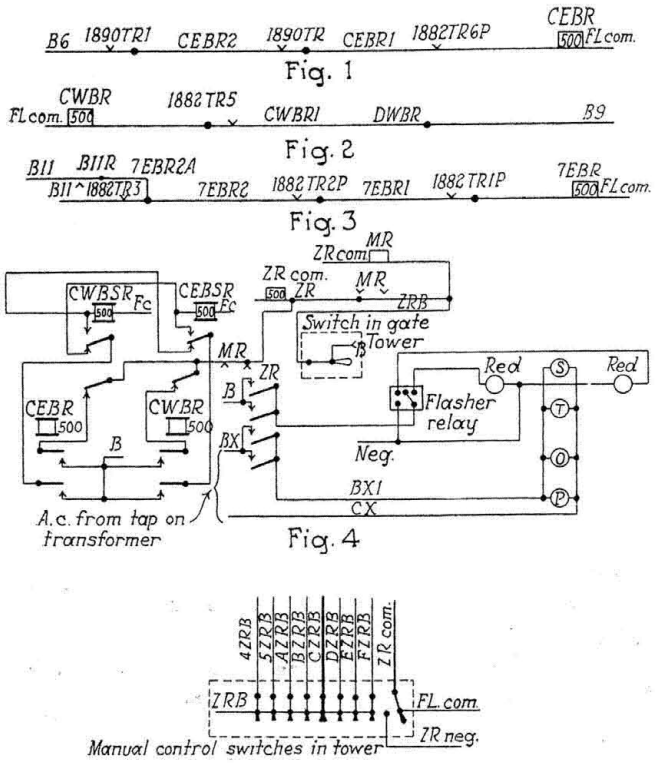
Below—The knife switches for the manual control are mounted on a slate panel



controlled automatically by the track circuits. However, during the time the local freight trains are switching, the signals at the eight crossings in the switching area are controlled manually by the signal helper in an elevated tower, which is so located that he can see the crossings involved. It was also agreed that, in addition to the standard Signal Section, A. R. A., alternate flashing-light signal, that the Wabash should provide a vertical sign between the flashing lights, which would be illuminated during the operation of the signal to read "STOP." Having agreed to fulfill these requirements, the railroad proceeded with the installation, the city engineer cooperating by locating the signals with reference to curb lines, etc. The signals were placed in service on November 2, 1928, and the city authorities have given their official approval of the installation and of the protection afforded.



Location plan of highway-railway grade crossings at Wabash, Ind.



Simplified circuits for control of highway signals at Huntington street

The Control Is Combined Automatic and Manual

The track circuits of the automatic block signals in this territory were cut with insulated joints at each street crossing. The automatic control of each flashing-light crossing signal is so arranged that the signal starts to operate when a train approaches within about 2,000 ft. of the signal and continues to operate until the rear of the train passes. The lights of the signal flash alternately 30 times each minute, and the "STOP" sign is illuminated continuously while the signal is in operation.

The working schedule for the signal maintainer's helper is so arranged that he will be in town when the local freight trains are due, and upon arrival, he consults with the train crew to get a general idea of the switching to be done. He then climbs to the control tower, where he throws a switch on the control board, which cuts out the automatic control of the flashing signals at eight of the crossings. He then watches the switching movements and, when the locomotive or a cut of cars approaches a crossing, he throws the individual switch for that crossing, which operates the signal as long as he leaves the switch closed. When the train departs from town, he opens all of the individual switches and closes the main switch, which returns the control to the track circuits.

Automatic Control Circuits

Following is a description of the control circuits at Huntington street. The signals are controlled by relays *CEBR* for eastward moves and *CWBR* for westward moves. These relays are normally energized and held up through front contacts of the track relay or track relay repeater through the section of track they are controlled.

When the track sections *1890T1*, *1890T* or *1882T6* are occupied for eastward movement, relay *CEBR* is de-energized. The circuit is made to energize the *ZR* relay through the back contact of the *CEBR* relay and back contact of stick relay *CWBSR*. When the *ZR* relay is energized the d-c. circuit is completed through the flasher relay to the red lamp (flasher lamps) and also the a-c. circuit is completed to the stop unit. When *CEBR* is de-energized, it also energizes *CEBSR* the directional stick relay, and battery is connected through the back contacts of *CEBR* and *CWBSR* to the coils of *CEBSR* to common. When the engine passes over the joints at Huntington street it shunts track relay *1882T5* which in turn de-energizes *CWBR*. *CWBR* holds stick relay *CEBSR*. When the rear of the train passes the joints at Huntington street, *CEBR* relay picks up, cutting battery off of the *ZR* relay de-energizing it and cutting the circuit off of the light units. Although relay *CWBR* is de-energized, the *ZR* relay cannot get current through the back contacts of *CWBR*, because stick relay *CEBSR* is held energized through its own contact. Thus the operation of the flasher signal is effected on the approach of the train and cut out after the rear of the train has passed the insulated joints, by the use of directional stick relays rather than interlocking relays. The train movements in reverse direction are controlled similarly.

Manual Control

In the manual operated signals, the *ZR* relay common breaks through a hand switch (called master switch) in the tower. When the master switch is thrown for manual operation, the *ZR* common is broken and a separate battery is applied to the *ZR* relays through individual knife switches. To operate Huntington street manually, the master switch is thrown to the point

marked "manual." Individual knife switch *CZRB* (marked Huntington street in tower) is thrown in, and with this circuit closed, battery (ZRB) is connected from the tower through switch *CZRB* to relay *MR*, returning by the *ZR* common wire back to the master switch and *ZR* negative at the tower. When the *MR* relay is energized, the *ZR* relay is energized from battery *ZRB* at the tower through switch *CZRB*, through the front contact of relay *MR* to *ZR* common, then through master switch to *ZR* negative at tower. When the *ZR* relay is energized, current is fed directly to the flasher relay which operates the flasher lights and also directly to the "STOP" lights. The *MR* relay was inserted in the circuit to prevent automatic flashing when manual control is in use.

There is a selective circuit in this scheme of manual control during the switching period. Follow the circuit for relay *7EBR* which controls the flasher signals at Walnut street. Under automatic protection this signal normally operates when an eastward train enters track section *1882T3*, but under manual operation, when the master switch is thrown for manual protection, track section *1882T3* when occupied by a train does not cause the signal at Walnut street to operate. When manual service is in effect, eastward movements do not automatically start Walnut street signals to operate, until the train is in track section *1882T2*. Walnut street signals however are not operated manually, but this selective feature is inserted to prevent continuous operation of the signals when the local freight is switching in track section *1882T3*.

The Construction of the Units

In the flashing-light units each lamp is mounted in a bracket fixture at the focal point of a concave mirror reflector of the Mangin type. A special red cover glass about four inches deep is used. The combination of the reflector and the special cover glass provides not only a long-range indication, but also a close-range indication of 180 deg.

The lamp in each of the stop sign light units is socket mounted with the filament at the focal point of an elliptical concave mirror reflector of the Mangin type, but of a different contour from that of the reflectors in the flashing units. The letters S-T-O-P are cut out in heavy fiber and mounted by clips in the door. The red cover glasses for the sign are 8⅜ in. in diameter and of the convex type, which fills out the letter when illuminated, so that the sign is legible to a driver of a car approaching at a distance as well as up to the time he is near the signal.

The Power Supply for Operation

At each flasher-light signal location, a five-cell Exide KXHS storage battery is provided for the operation of the flashing-light signal and for the line control circuits originating at that point. These batteries are charged by electronic rectifiers on the a-c. floating system. A 110-volt alternating current line extends each direction from a panel located in the station. The local transformer at each signal location has two separately wound secondaries, one for 10 volts to operate the rectifier and the other to feed the four 10-volt lights in the "STOP" sign. Each flashlight unit and each unit of the STOP sign has an 18-watt, 10-volt single-filament lamp.

All of the signals and control equipment for this installation was furnished by the Union Switch & Signal Company and was installed by the signal forces of the Wabash under the direction of H. J. Foale, signal engineer, to whom we are indebted for the information in this article.

C. & N. W. Train Control Approved

WASHINGTON, D. C.

ON December 18, 1928, the Interstate Commerce Commission approved the installation of the General Railway Signal Company's two-speed, continuous induction type of train control on the Iowa division of the Chicago & North Western. The portion of the road equipped under this order consists of two tracks from Clinton, Iowa, to Boone, via Cedar Rapids, a distance of 202.3 miles. In addition, the double-track line between Otis, Iowa, and Beverly, a distance of 4.9 miles, known as the Linn County Railway and used as a freight cut-off around Cedar Rapids, is also equipped. This territory adjoins on the west the territory equipped under the commission's order of June 13, 1922, and on the east the territory voluntarily equipped by the carrier beyond the requirements of I. C. C. orders. The installation was placed in service on July 1, 1927, having been superimposed upon an existing automatic block signal system. On December 21, 1927, all of the roadway block signals, with the exception of home and distant interlocked signals and the automatic block signals between Beverly and Otis via Cedar Rapids, were removed and since that time the operation of the device has been conducted without working roadway block signals except at the points indicated. Seventy-one locomotives were equipped with the device under this order. Sixty-six of these locomotives are operated in freight and five in passenger service. These engine equipments are substantially the same as described in the commission's first order report.

Conclusion of Report

As a result of this inspection and test, the installation was approved except that certain features were disclosed which require further consideration by the carrier, as follows:

"(1) As pointed out in the report covering the inspection of the installation made under the order of June 13, 1922, the governor drive of this device is designed on the open-circuit principle, reliance being placed upon its construction and proper maintenance to compensate for the lack of protection which is inherent in the open-circuit principle. The construction of this part of the apparatus has been modified as described for the purpose of securing a greater degree of reliability. However, should the governor drive shaft become disconnected or otherwise inoperative, the governor-operated cams would not function to open or close the electrical circuits as intended and a false-clear operation might result. The present construction of the governor driving mechanism appears rugged and substantial, but should it be found that the present construction and maintenance are not adequate, other means must be provided for insuring reliability of operation of the device in this respect.

"(2) The train-control circuits at certain interlocking plants are so arranged that a train overrunning a "stop and stay" signal may secure a green cab indication, after passing such signal, with a derail in the derailing position. The principle of continuous train-control should be carried out in these instances, to the end that the most restrictive cab indication would be in effect to the point of obstruction, and that a green cab indication would be obtained within interlocking limits only when a move is made under the corresponding indication of the interlocking signals.

"(3) The arrangements at Cedar Rapids, DeWitt, Wheatland, Marshalltown, and Ames interlocking plants are such that the towerman may display a clear signal for a C. & N. W. train, while a foreign train occupies the crossing. Arrangement should be made to eliminate these potentially dangerous conditions."