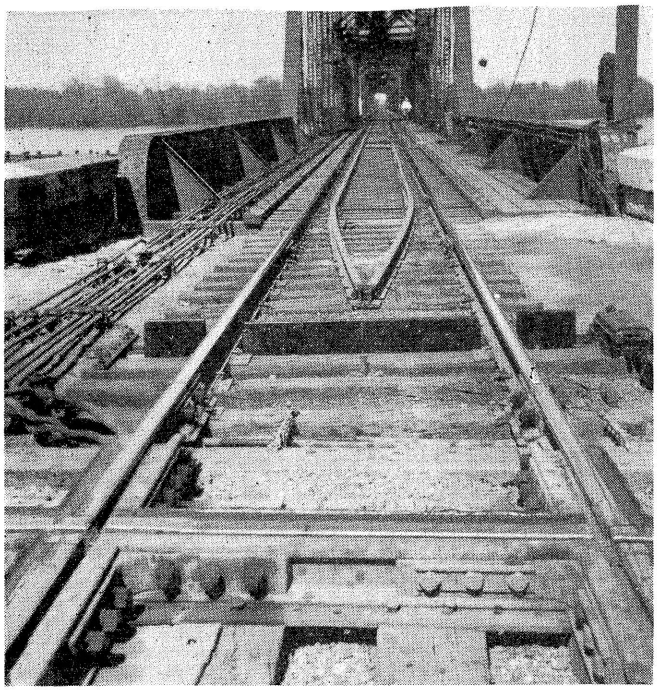
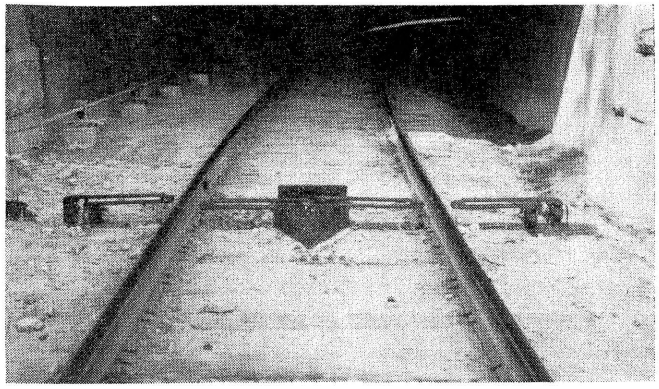


Left—View looking east on the bridge showing in foreground the railroad crossing and self-restoring dragging - detector

Below—View looking east at the west end of the tunnel on the eastward approach showing the bracket type dragging-detector



Audible Warning Sounded

When Dragging-Equipment Detectors Operate

Wabash project on bridge over Mississippi river at Hannibal, Mo., has advantage of immediate and continuous indication to stop trains

THE Wabash has developed and installed an interesting system of audible horn signals in connection with dragging-equipment detectors for protection on the approaches to and on the bridge across the Mississippi river at Hannibal, Mo. From the west, the approach to this bridge is on a slightly ascending grade, and on a 9-deg. 30-min. curve through a deep cut, and then through a tunnel 308 ft. long to a point 86 ft. from the west end of the bridge. In this 86 ft. there is a highway and a single-track main line of the Chicago, Burlington & Quincy. From the east, the approach to the bridge is on a long 6 deg. curve and slightly ascending grade. The bridge is 1,378 ft. long, including a swing-type draw span 360 ft. long.

A mechanical interlocking with electric signals protects train movements over the railroad crossing and the drawbridge. The interlocking machine is in the bridge operating room above the track in the steel structure of the drawbridge span. The highway crosses the Wabash track just east of the end of the tunnel, so that a person on the highway cannot see an eastbound train approaching. On account of this condition, protection had previously been installed in the form of two gates, one on each side of the track, all the way across the width of the highway. These gates are the Model-S type made by Transport Products Corporation. This bridge is on a main line of the Wabash between Decatur, Ill., and Moberly, Mo., this 206 mi. being a portion of a Wabash direct route of only 713 mi. between Kansas City, Mo., and Detroit, Mich. No through passenger service is operated on the Decatur-Moberly section, but from 4 to 6 through freight trains are operated each way daily.

Chances for Dragging Equipment

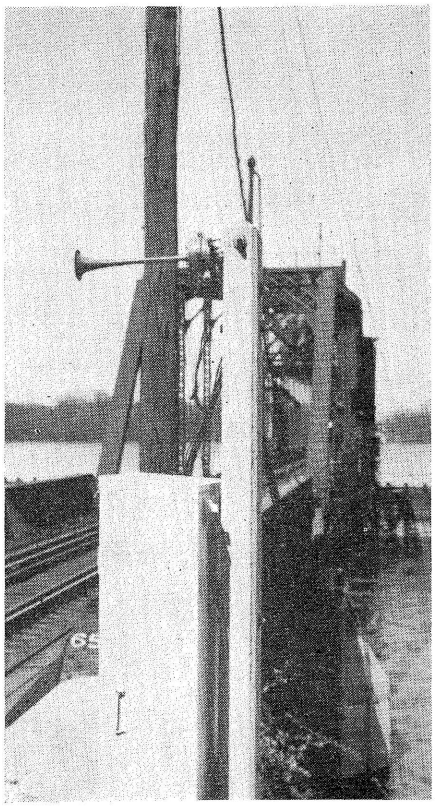
The curves, tunnel, highway crossing and railroad crossing on the west approach to the bridge are all conditions that contribute to the chances for brake beams or other loose equipment to be jarred free and start dragging. Such dragging equipment might cause a derailment in the tunnel or on the bridge which could result in very serious damage. Thus the problem was not only to detect equipment that is dragging when approaching this general vicinity, but also to quickly detect equipment that starts dragging on the approaches right up to entering on the bridge. To solve this phase of the problem, five detectors were installed. On the approach from the west, one detector is 674 ft. from the end of the bridge, the second is at the west end of the tunnel about 394 ft. from the bridge, and a third detector is about 20 ft. from the end of the bridge. On the approach from the east, one detector is 830 ft. from the end of the bridge and the second is 140 ft. from the end of the bridge. The detector at the west end of the bridge will be operated by any equipment jarred loose from a car in an eastbound train when it passes

over the highway crossing or the Burlington railroad crossing. The detector at the east end will be operated by equipment jarred loose as cars pass over the switches and frogs.

Having spotted the detectors, the next problem was to provide an indication of detector operation. Due to the particular conditions at this location, the interlocking home and approach signals could not be used because of the need for an indication available to employees on both the front and rear ends of trains, to towermen and to other wayside employees who might be in the vicinity. Indication of a practically continuous type was needed from the time the engine started across the bridge until the caboose was passing off the other end of the bridge, in order to detect any dragging equipment or derailed car which might enter on the bridge.

Why Audible Signals

Because of the existing 8 m.p.h. restriction while any portion of a train is passing through the tunnel or over the bridge, it is possible to stop a train in a very short distance after the audible signal is given, and thus prevent pulling dragging equipment or derailed cars onto the bridge. These circumstances led to the decision to install audible signals, consisting of electric resonating horns at 14 locations, spaced about 400 ft. apart on the bridge and the approaches 1,680 ft. eastward and 1,900 ft. westward. The control circuits are arranged so that if any one of the five detectors is operated by equipment dragging from a train, all of the horns are set in operation, and continue to sound until shut off by operation of a push button. These horns can also be started or turned on by the operator at the bridge, if he sees a condition that requires stopping a train.



View looking east at west end of the bridge showing one of the 14 electrical type horns which are spaced about 400 ft. on the bridge and approaches, 1080 ft. east and 1900 ft. west

Control Circuits

In the interlocking and bridge operating room there is a sheet-metal case with a panel which has an indication lamp corresponding with each of the five detectors. When a detector operates, the corresponding lamp is lighted, and also, of course, the towerman can hear the horns. When the train has stopped, the towerman can shut off the horns by pushing a button—one button is for the horns west of the tower and the other for the horns east. Also, at the foot of the stairway, from the tower down to the deck of the bridge, there is another panel with two push buttons to shut off the horns.

In the controls, a series circuit through the three detectors west of the bridge, normally energizes a 60-ohm relay. If any detector operates, this relay is released, thereby releasing a stick relay, which stays down until a push button is operated. A circuit through a front contact of the stick relay controls a 500-ohm relay at each of the six horn locations west of the bridge. At each of these locations, the horn is energized through a back contact of the 500-ohm relay. A series circuit through front contacts of these horn control relays controls a 500-ohm relay that controls indication lamps in the tower. A similar circuit arrangement is provided for the control of the horns east of the control tower and bridge. The multiplicity and control of horns in sections, and the availability of the audible signal to all within hearing, minimizes the effect of one or more horns failing to operate.

On one occasion recently, a brake beam on a car on an eastbound train started to drag as the car went over the road crossing or the railroad crossing. This dragging brake beam operated the detector at the west end of the bridge, thus causing the horns to be sounded. As the train was running at not more than 8 m.p.h., it was brought to a stop before the car with the dragging beam arrived at the chairs for the lap joints of the rail at the ends of the swing span. Thus, in this instance, the detectors and horns were effective in avoiding chances for a derailment in a hazardous location on this bridge.

Two Types of Detectors

The detectors at the west and east ends of the bridge are the self-restoring type, one of which, as shown in the picture, consists of sheet-metal vertical panels attached to a horizontal rocker shaft extending between the ties below rail level. Equipment dragging from a train, moving in either direction, will swing the panel and turn the shaft, thus operating a circuit controller which releases a stick relay that, in turn, closes the circuit to operate the horns. The detector is restored to normal position by spring pressure, but the horns continue to blow until a push button is operated. This self-restoring type detector was made by the Union Switch & Signal Company.

The other three detectors, one of which is shown in an accompanying picture, are the bracket type, furnished by the Western Railroad Supply Company. The bracket arms of these detectors are made of special brittle cast-iron which is readily broken if struck by dragging equipment. These bracket arms form a part of a circuit for a normally-energized relay as explained above.

The 14 horns on this project are the weatherproof Model 56 electric type supplied by the Western Railroad Supply Company. The operating coils of these horns are rated at 12-14 volts d.c. 6 amp., supplied by storage batteries, which are on floating charge through rectifiers. The maintainer tests each horn once a week, and if it does not operate properly, he replaces it with a horn kept on hand which was furnished and adjusted by Wabash Signal Shop.

This dragging-equipment and audible warning project was planned and installed by railroad forces under the jurisdiction of G. A. Rodger, superintenednt signals and communications.