

Drag Detectors Protect Bridges

TWO unique applications of dragging equipment detectors have been made by the Missouri Pacific on the double-track main line of the Eastern division extending between St. Louis, Mo., and Jefferson City. Detectors have been installed on each of the two tracks in either direction of approach to the two single-track bridges spanning, respectively, the Gasconade and Osage rivers.

Layouts Involved

The line in question handles through traffic between St. Louis, Mo., and Kansas City, 6 passenger trains and 5 scheduled freight trains being operated each way, or a total of 20 regular train movements, and a number of extras daily. Gasconade is located on the double-track portion of the St. Louis-Kansas City main line, 85 miles west of St. Louis; Osage is 29 miles further west. The home signals and end-of-double track switches at both locations are remote controlled, the circuits being on the direct-wire basis. The Gasconade layout is controlled from the ticket office at Gasconade station, 2000 ft. west of the Gasconade bridge, while the Osage layout is controlled from MM tower, 2 miles west of the Osage bridge. Each track

Missouri Pacific installs equipment designed to prevent double-track main-line tie-ups due to dragging equipment

of the double-track line in this vicinity is signaled for either-direction operation; approaching Gasconade from the east, the tracks are equipped with an absolute permissive block system; the remainder is arranged on the overlap principle. A 30-m. p. h. speed restriction is effective on both passenger and freight trains through the No. 20 turnouts and over the bridges at both Gasconade and Osage, so that trains approach these layouts at moderate speeds.

As will be noted from the accompanying track and signal diagram, the track layouts at both locations are similar. Both consist of end-ofdouble-track layouts at each end of the respective bridges. The signaling is designed to allow trains to be routed from any one track on one side of either bridge to either of the two tracks on the other side. For instance, the top arm of 1174R governs movements from the eastbound main over the single-track bridge to the normally eastbound main on the other side; while the bottom arm of 1174R governs movements from the eastbound main on the west side of the bridge to the normally westbound main on the east side.

An important feature in the design of the dragging equipment detector installation was that the detectors had to be located far enough from each bridge so that an engineman receiving a change in aspects would have adequate time and space to stop before the defective part of his train reached the bridge in question. In view of the fact that defective equipment may exist in one of the cars toward the rear of a long freight train, the length of the longarms, or loops, for each track. The arms are mounted on each side of each running rail. Each detector arm is $\frac{7}{8}$ in. thick, 2634 in. long and $\frac{21}{2}$ in. in depth, overall, and is mounted on a separate post consisting of a 4-ft. piece of timber set on known as a DED (dragging equipment detector) relay at each par, ticular location. A DEDP relay, repeating the DED relay at the home signal location in advance of the detectors, is controlled over line wires. The use of the DED relay at the de-



Track and signal diagrams of Osage and Gasconade dragging equipment detector layouts

est train operated over this territory, approximately 125 cars, was taken as an additional factor in locating the detector devices. With these consideration in mind, the westward detectors at Osage were located 9,635 ft. east of the westward home signals, and the eastward detectors 9,505 ft. west of the eastward home signals. At Gasconade, the westward detectors were placed 9,375 ft. and the eastward detectors 11,880 ft. from the respective home signals. Fairly sharp curves characterize the approaches to the Gasconade River bridge.

Detector Construction

The detectors are of the Western Railroad Supply Company type, and consist of four cast-iron bracket end in the ballast; the top of the post is level with the top of the detector arm, in each case. The top of each detector arm outside the rails is level with the top of the rail, the end of the arm extending to within $\frac{1}{2}$ in. of the head of the rail. The tops of the detector arms in the inter-rail space are $2\frac{1}{2}$ in. below the top of the rail, and the ends of the detector arm, beveled off on top, are placed within 2 in. of the rail web. The center mountings are protected by a V-shaped inclined cast-iron ramp.

The detector arms on both tracks at a particular location are wired in series, using No. 9 AWG single conductor parkway underground cable; the circuit is energized at 8 volts by a four-cell Exide DMG07 battery to normally energize a special relay

Signals 881R and

881L at Gasconade

-Note flashing light indicators tector location allows for complete separation of the line and underground circuits involved.

Operation

Single flashing-light units, of the type commonly used at highwayrailroad grade crossings, are provided on each main-track home sig-



Detector release box at Gasconade-Location 886

nal mast. When a detector is broken by dragging equipment on a train approaching either bridge from any direction on either of the two main tracks, the flashing-light units on the masts of the signals governing movements over the bridge in the direction of the train involved are placed in operation; the signals in question are controlled so that no aspect better than yellow may be displayed by any arm; and the opposing signals are held to display the most restrictive indication. Thus, if a home signal is cleared to display a clear aspect and dragging equip-



ment on the train approaching that signal breaks the detector unit, the flashing light unit is started into operation and the home signal aspect is changed to yellow, opposing signals being held red. A light out (LK) relay is employed to control all signal arms to the stop position if failure of a flashing-light lamp should occur.

Detector Control Release

A cut-out switch known as a "detector release" is located in a box padlocked with a switch lock at each home signal location. Typical circuits showing the control of DED and DEDP relays and signal controls for color-light signal 1174R are shown in the accompanying diagram. This signal is a color-light unit. Where semaphore signals are involved, contacts on the DEDP and light-out repeater (LKP) relays are Signal Bridge 886 at Gasconade — Flashing light indicators on two main-track signals

'Detector Release,' located at signal case on south side of track and operate knife switch, upward to downward position. After operating knife



Typical control features-Circuits above are for Signal 1174R at Osage

inserted directly in the semaphore signal motor control circuits.

The instructions to train crews conveyed by the flashing-light units were described in a General Order placing the detector units in service at Gasconade on March 3, reading as follows, (KK Junction is the end-ofdouble-track switch location east of Gasconade bridge):

"Effective 12:01 p.m. Friday, March 3, 1939, dragging equipment detectors at Mile Post 86 Pole 11 and Mile Post 90 Pole 32 and single color-light units on existing mast of signals 881 and 886 are in service.

"Westward trains at KK Junction or eastward trains at Gasconade finding single color-light unit flashing red will stop and examine train for dragging equipment. After train has been examined, member of train crew will unlock small box marked switch the dispatcher will be so notified and train will be governed by indication displayed by signal."

Operating Rules Applicable

The operation of trains in the vicinity of Gasconade and Osage is further affected by two standard

> T win instrument case location at Signals 881R and 881L at Gasconade

rules appearing in the Missouri Pacific book of rules, reading:

"Rule 98—Trains must approach the end of two or more tracks, junctions, railroad crossings at grade, and drawbridges, prepared to stop, unless the switches are properly lined, signals indicate proceed, and track is clear. Where required by law, trains must stop.

"Rule 516—A home or block signal may assume the 'Stop' position after the distant signal has been passed at 'Proceed'."

The operation of the detector release switch applies battery directly to pick up the DEDP relay, cutting out the dragging equipment detectors until the broken detector units are replaced; when the detector system is repaired the signal maintainer operates the detector release switch to its normally upward positionn.

This installation was made by signal forces of the Missouri Pacific, P. M. Gault, signal engineer.

