

View looking east with switch No. 4, in the foreground, lined for the river track

# Signals Direct Trains at Junction

## On the Denver & Rio Grande Western

## and the Denver & Salt Lake

**Levers on small panel control signals, thus reducing number of train stops and improving safety within junction area where train speeds are slow**

IN 1943 the Denver & Salt Lake installed 28 miles of automatic block signaling between Kremmling and Orestod, Colo., and in conjunction therewith installed a semi-automatic signaling arrangement at a junction at Orestod. The D. & S.L. extends from Denver, Colo., via the Moffat Tunnel to Orestod, 128 miles, and then northwest to Craig, Colo. Certain trains of the Denver & Rio Grande Western are operated over the D. & S.L. between Denver and Orestod, from which point the D. & R.G.W. has a line extending 38 miles down along the Colorado river to Dotsero where there is a junction with the D. & R.G.W. main line extending

from Denver through Colorado Springs, Pueblo and the Royal Gorge to Dotsero. West of Dotsero, the main line extends to Salt Lake City and to Ogden, Utah.

### Trains Stop at Orestod

All trains are operated at slow speed through the junction at Orestod. The D. & R.G.W. trains stop at the coal and water station about 2,000 ft. west of Orestod; engine crews and freight train crews change at this point. Thus the westbound D. & R.G.W. trains, when passing through the junction at Orestod, are at slow speed prepared to stop at the coaling station, and likewise east-bound trains are just getting under way when pulling through Orestod. Similarly the D. & S.L. trains are operated at slow speed through this junction. Interchange track No. 1, leading off the Orestod siding, is used to hold cars that are set out by the D. & S.L. to be picked up by the D. & R.G.W. The interchange track

No. 2 is used to hold cars set out by the D. & R.G.W. to be picked up by the D. & S.L.

Prior to the installation of the signaling arrangement, train movements and switching moves through this junction were made primarily on hand signals, which was rather confusing when two or more trains were present. The purpose of the signaling is to have a specific fixed signal to direct and authorize each possible train movement. The signaling has thus improved safety and eliminated delays caused by confusion or uncertainty on the part of enginemen.

Automatic block signaling on the D. & R.G.W. extends from Orestod westward, and automatic block signaling on the D. & S.L. extends eastward from Orestod. From the standpoint of signaling, as well as train operation, the problem was to connect the automatic controls of signals through the junction and to provide a control arrangement by means of which the operator in the office at Orestod can set certain signals to dis-

play the Stop aspect, thereby holding trains out of the junction, until other train movements or switching operations were completed.

**Signal Controls Selected Through Switches**

All of the switches shown in the accompanying diagram, are equipped with ordinary hand-throw stands, and, in addition, switch No. 12 at the east end of the "River" track also has a spring switch mechanism.

Switch No. 6, the junction between the D. & S.L. main line and the D. &

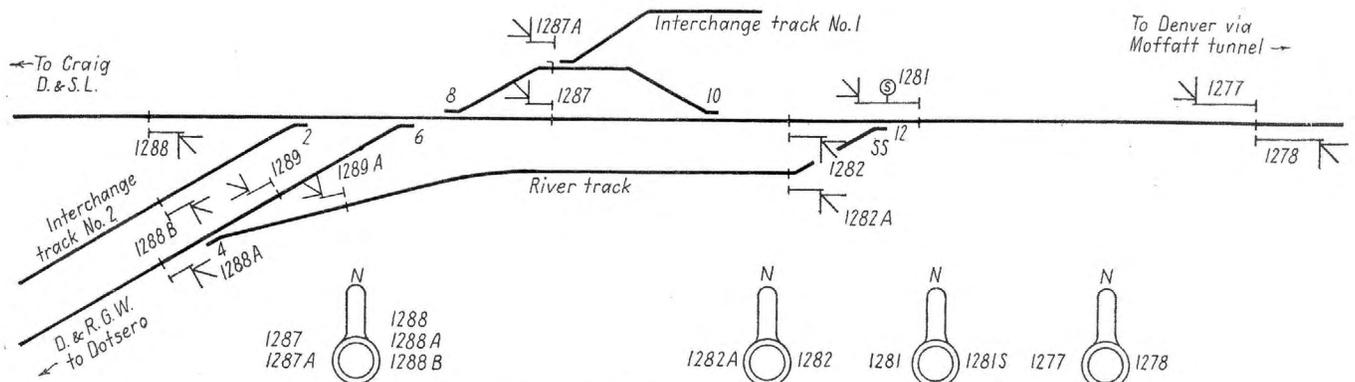
reversed to the D. & R.G.W. Automatic block signal 1289, is the first D. & R.G.W. westward signal, and this signal is controlled by track occupancy of track circuits ahead except that if hand-throw switch No. 4 is reversed then signal 1289, is controlled to the Stop aspect, and signal 1289A takes over the controls which previously applied to 1289.

Eastward signal 1288A normally displays the Stop aspect, but if switch No. 6 is reversed and the lever is thrown, this signal displays a proceed aspect. On the other hand, if switch No. 4 is thrown to the reverse posi-

1282A governs trailing moves from the "River" track to the main line through the spring switch. Signal 1281 normally governs on the main track.

Signal 1281 has a lower unit which when illuminated displays the letter "S". When the letter "S" is illuminated, only possible with upper unit displaying Stop; it indicates: "Westward D. & R.G.W. trains take siding via River track and westward D. & S. L. trains take siding via Orestod siding."

Very long westbound D. & R. G. W. freight trains are directed to make



Track and signal diagram of the interlocking with symbols showing the lever numbers

R.G.W. main line west from Orestod, is normally set for train movements through the junction on the D. & S.L. track. This No. 6 switch is located directly in front of the office, and is thrown to the reverse position by the operator when a D. & R.G.W. train in either direction is to pass through the junction.

Signal 1287 governs westward train movements via switch No. 6 normal to the D. & S.L., or via switch No. 6

tion, then signal 1288A displays a proceed aspect, independent of lever control. The switching moves out of the two interchange tracks are governed by signals 1287A and 1288B.

**Spring Switch and "S" Signal**

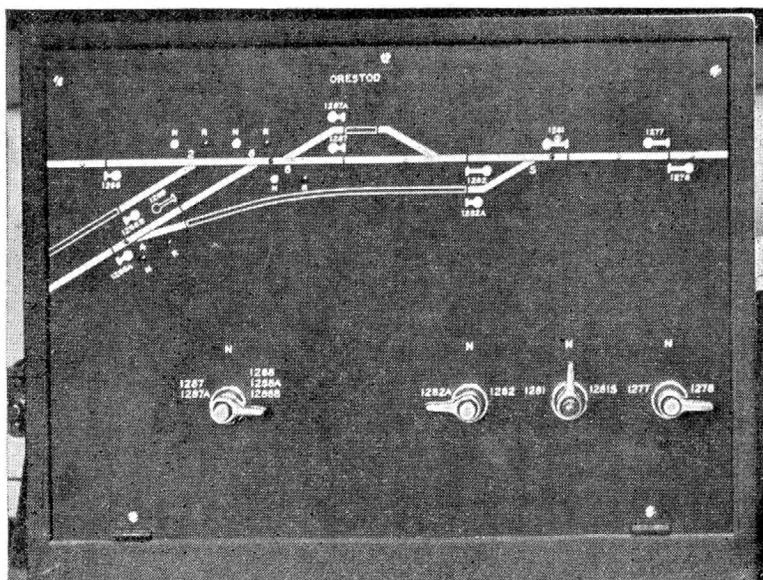
At the east end of the "River" track, eastward signal 1282 governs eastbound main line moves, and

this move because otherwise when the locomotive stopped at the coaling station, the rear of the train would block the junction if the train had been routed via switch No. 6 in the usual manner.

The double signal location 1277 and 1278, is approximately 2,000 ft. east of the No. 12 switch. These two signals are under the control of the operator so that he can hold the westward signal 1277 at Stop to hold any westbound approaching train during periods when switching moves are being made in the junction layout. Likewise signal 1278 is lever controlled.

**Arrangement of Lever Controls**

The 10 semi-automatic signals and the take-siding "S" indicator are all controlled by only 4 three-position levers. The levers normally stand in the center position to control the corresponding signals to the Stop aspect. The first lever when thrown to the left controls signal 1287 or 1287A, depending on the selection established by the position of switch No. 8. The same lever when thrown to the right controls signal 1288, 1288A or 1288B, the selection between 1288 and 1288B depending on the position of switch No. 2, with No. 6 normal, and the selection between 1288 and 1288A depends on the position of switch No. 6



Face of panel on the interlocking control machine

with No. 2 normal. When switch No. 4 is reversed, signal 1288A is independent of lever control.

The second lever when thrown to the left clears signal 1282A, or when thrown to the right clears 1282. The third lever when thrown to the left clears 1281, or to the right causes the "S" take-siding indicator to be lighted. The fourth lever when thrown to the left clears signal 1277 or when to the right clears 1278.

The track diagram includes lamps which are lighted when the corresponding track sections are occupied.

Near the symbol representing each switch there are two lamps, the one marked N is green and is lighted when the corresponding switch is normal, or the R lamp which is red is lighted when the switch is in the reverse position. A lamp in the face of each signal lever is lighted when the signal being controlled is cleared.

This signaling at Orestod junction was installed by the D. & S. L. forces under the jurisdiction of B. W. Molis, signal engineer, the major item of equipment being furnished by the General Railway Signal Company.

## Head-End Collision In Manual Block

On April 11, 1944, there was a head-end collision between a passenger train and a freight train on the Wabash Railroad near Gallatin, Mo., which resulted in the injury of four employees. An abstract of the report of the Interstate Commerce Commission, concerning this accident, is as follows:

This accident occurred on the 18th District, extending eastward from Stanberry to Brunswick, Mo., 107.5 miles. This was a single-track line over which trains were operated by timetable and train orders, and a manual-block system for following movements only. The accident occurred 42.3 miles east of Stanberry, and, respectively, 1.8 miles and 1.25 miles west of the station and the west siding-switch at Gallatin.

### Discussion

During the 30-day period preceding the day of the accident, the average daily movement in the vicinity of the point of accident was 5.8 trains.

The rules governing operation on this line provide that an inferior train must keep out of the way of opposing superior trains, and an inferior train must clear the time of opposing superior trains not less than five minutes. If an inferior train fails to clear the time of an opposing superior train, flag protection must be provided.

The crews of both trains held copies of train order No. 11, which required No. 11, a westbound passenger train, to wait at Gallatin until 2:15 a.m., and at Jameson, 6.7 miles west of Gallatin, until 2:35 a.m., for

No. 92, an eastbound freight train. No. 92 was inferior by class and was required to be into clear at Gallatin not later than 2:10 a.m., if it proceeded to that station for No. 11. Number 11 departed from the station at Gallatin at 2:15 a.m. and, about 2:18 a.m., when it was 1.25 miles west of the west siding-switch at Gallatin, it collided with No. 92.

As No. 11 was approaching the point where the accident occurred, the speed was about 30 m.p.h. The engineer was maintaining a lookout ahead, and the fireman was tending the fire. The first they knew of anything being wrong was when the engine reached a point about 700 ft. east of the point where the accident occurred, and the engineer saw the reflection of the headlight of the approaching train. He immediately moved the brake valve to emergency position and called a warning to the fireman. Number 11 had practically stopped at the time of collision.

### Engineer Misread His Watch

The members of the crew of No. 92 had compared time, and there was a variation of only a few seconds in their watches. They understood that their train was inferior to No. 11 and that, at the points designated in train order No. 11, their train was required to clear the times specified not less

than 5 minutes. As No. 92 was approaching Jameson, the engineer looked at his watch and read the time as 2 a.m. He was confident that sufficient time remained for his train to proceed to Gallatin to clear for No. 11 not later than 2:15 a.m. The front brakeman, who was on the engine, said that he observed the time as 2:05 a.m. when No. 92 was passing the station at Jameson, and he warned the engineer there was not sufficient time remaining for their train to proceed to Gallatin to clear for No. 11. The engineer said he understood the front brakeman to ask if sufficient time remained to proceed to Gallatin, and he was not aware that he had misread his watch until after the accident occurred.

The front brakeman took no further action to prevent the accident. The fireman was tending the fire and he did not observe the time, nor give any attention to the authority for the movement of the train. The conductor and the flagman were in the caboose. They said their train passed Jameson about 2:07 a.m., and they were aware that there was not sufficient time remaining to proceed to Gallatin to clear for No. 11, but they expected the engineer would take action to stop the train in time to provide flag protection if it became necessary. As No. 92 was approaching the point where the accident occurred, the speed was about 30 m.p.h. The engineer and the front brakeman were maintaining a lookout ahead. They saw the reflection of the headlight of the approaching train about 1,400 ft. distant, and the engineer immediately moved the brake valve to emergency position. The speed of No. 92 was about 18 m.p.h. when the collision occurred.

### Conclusion and Recommendation

The carrier's book of operating rules contains manual-block rules which provide for blocking of opposing movements, but these rules were not in effect in the territory involved. If an adequate block system had been in use in this territory, these opposing trains would not have been permitted to occupy the same block simultaneously, and this accident would not have occurred.

It is found that this accident was caused by an inferior train occupying the main track on the time of an opposing superior train.

It is recommended that the Wabash Railroad Company establish an adequate block system on the line on which this accident occurred.

By the Commission, Chairman Patterson.

W. P. BARTEL, Secretary.

