the point to the word indicating what he wants to report and then pulls the handle down. By means of a selector sending arrangement inside the case, this sends in a code which causes the central station equipment to ring a bell and operate a perforating tape to indicate the box number, the time, and a code explaining the condition or circumstance being reported, such as broken rail, slide or fire, or to call track men. When no danger is to be reported, the watchman sets the point to either West or East, depending on the direction in which he is going, and sends in the report as a matter of record. In case a dangerous condition is being reported, an alarm is sounded and the operator at Norden checks the tape. For example, if a fire is reported, he takes steps to stop the trains on the line and calls out the fire train, which is maintained at Norden under steam and fully manned, ready for immediate dispatch.

Either-Direction Signaling on Double Track

On the line descending the west slope of the mountains, between Norden and Emigrant Gap, 20 miles, there are several tunnels and numerous snow sheds. On account of the frequent occasions when fire, slides, or other trouble interfere with clearances on one track or the other, it is highly important that arrangements be provided so that trains can be operated in either direction on each of the two main tracks in this territory between Norden and Emigrant Gap. Normally trains are operated right-hand running, but if one track or the other is blocked between two stations, the other track can be used to run trains in either direction the same as on a single-track road.

At Norden, as well as at Emigrant Gap, crossovers and sidings are available for routing trains to either main track. Likewise, at two intermediate stations, Troy and Crystal Lake, there is a center passing track with connections to both of the main lines at each end so that trains can be crossed over from one track to the other through hand-throw switches.

When it is necessary to run trains against the normal direction of traffic, such movements are directed by train-orders and signal indications, the signals being controlled by check locking arrangements, using desk levers at the intermediate stations. Automatic block signal protection is provided for trains moving in either direction on each track. However, the automatic blocks for reverse running are somewhat longer than those for normal direction operation. Color-light automatic signals are used throughout this territory. At the locations where signal bridges were not available, the signals for reverse running were located on ground masts between the two tracks which are spaced on 17-ft. centers, thus allowing clearance for a signal mast, but the usual background had to be eliminated.

The interlocking and signaling described in this article were designed and installed by the signal forces of the Southern Pacific.

Accident at Drawbridge

On February 12, 1935, there was a derailment of a passenger train on the Florida East Coast near Jupiter, Fla., which resulted in the injury of 73 persons as well as the wrecking of a drawbridge. The following information was abstracted from the report of the investigation made by the Bureau of Safety of the Interstate Commerce Commission.

The accident occurred on the double-track line that extends from Fort Pierce to Miami, Fla., over which trains are operated by train-order and time-table authority, with automatic block signals. The point of the accident was at the end of the draw span of a steel-girder drawbridge over the Jupiter river.

The signals involved are of the color-light type, there being a home signal near the bridge, an approach signal 2628 ft. away, with approach-locking circuits extending 9,695 ft., in the approach to the home signal. In addition, a smash-board signal is located 9 ft. beyond the home signal.

Special time-table instructions restrict the speed for passenger trains to 65 miles per hour on tangent track, 55 m.p.h. on curves, and 45 m.p.h. over Jupiter drawbridge.

The passenger train was a second section of the Florida Special, consisting of 11 cars and the locomotive, and was running approximately 12 minutes behind schedule. This train passed the approach signal displaying an approach indication, passed the home signal displaying a stop indication, struck and broke the smash-board and then struck the lifted draw span while traveling at a speed between 10 and 25 m.p.h.

This accident was caused by the failure of the engineman to operate the train in accordance with signal indications. During the investigation, the engineman narrated various details of his observance of the signals and his subsequent action. However, the facts in the case do not support his statements. His principal explanation was that the distance from the approach signal to the home signal was not as great as he had thought. According to his statements, he reduced the speed of the train from 60 to 45 m.p.h. after passing the approach signal and later to 30 or 35 m.p.h. After seeing the home signal at stop, he applied the brakes in emergency, too late to avert the accident. It was also evident that he had a faulty understanding of the meaning of an approach indication, and that he thought he was closing up on the first section of the train which he was following.

The signals involved were installed in 1926, when the speed limit for passenger trains was 50 m.p.h.; but in 1930 this limit was increased to 65 m.p.h., with no change in the spacing of these signals or in the signal indications. The engineman was examined on the rules when he was employed, but he did not then thoroughly understand the speed limit clauses in the rule requiring proper observance of caution signals. At the distant signal he should have been running not over 27½ m.p.h., but he made no definite attempt to observe this limit.

The conclusion drawn from the investigation is that the engineman was not well enough acquainted with the road and the operating rules. To insure adequate protection at this point, some alternative other than a rule interpretation should be adopted, such as respacing of signals, providing an "approach-restrictive" indication when the drawbridge home signal is at stop, or a restriction of the maximum speed for a sufficient distance approaching this drawbridge, to insure adequate stopping distance between the approach signal and the home signal, which is located near the drawbridge.

It is a matter of common knowledge that on many railroads maximum authorized speeds have been increased and faster train schedules adopted. Before such changes are made, however, in order to insure an adequate margin of safety, the spacing and location of signals should be thoroughly checked and necessary revisions made to provide adequate stopping distances under all circumstances.