

Interlocking 71 at crossing H.B. & T. and H.E. & W.T. is now controlled from Tower 26

Consolidation of Interlockings at Houston, Texas

Five plants and outlying switches combined in two interlocking—Automatic signals added—
Outlying telephones, loud-speaker and whistle signal used

By W. A. Stahl

Assistant Engineer Signals, Missouri Pacific Lines

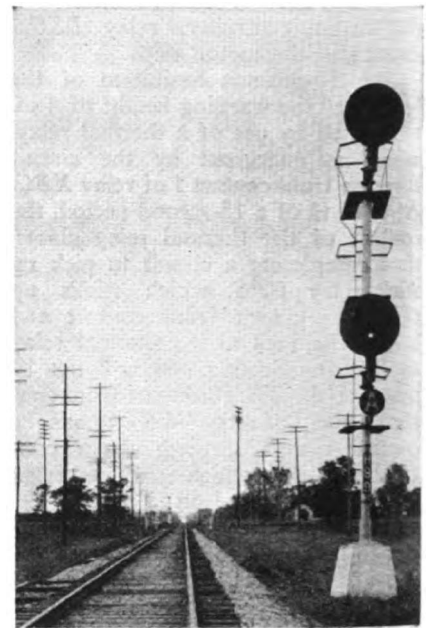
IN THE vicinity of Houston, Tex., there were some 20 interlocking plants at crossings or junctions of the several railroads entering this city, and within the past few years considerable progress has been made in consolidating the control of certain plants.

The International-Great Northern and the Gulf Coast Lines, both a part of the Missouri Pacific System, enter Houston and run to the Union Station over the tracks of the Houston Belt & Terminal Railway. The line of this latter company crosses the tracks of the Texas & New Orleans, Southern Pacific Lines, at three points, and also crosses a freight line of the I.-G.N., and this freight line also crosses the T. & N.O. The entire layout is shown in the accompanying plan. The first two crossings mentioned were previously protected by mechanical or electric type interlocking plants, No. 26, No. 76 and No. 71, and the next crossing mentioned,

by interlockings No. 80 and 25. These five plants were in continuous 24-hour service.

Interlocking No. 80, a mechanical plant, not only protected the crossing but also included the switches and signals for the diversion of passenger trains of the Gulf Coast Lines and the International-Great Northern, to their respective routes. Train orders were handled at this point for these trains when necessary, this tower being the initial station for the I.-G.N. freight trains.

The consolidation of interlockings was started in 1928 by the elimination of Tower 25, the control of this layout being placed in Tower 26. The plant at No. 25 was of the all-electric type, including 30 operating levers, and the plant No. 26 was of the same type with 40 working levers. The consolidation, handled by T.&N.O. signal department forces, consisted of moving the interlocking machine from Tower 25 and placing it in

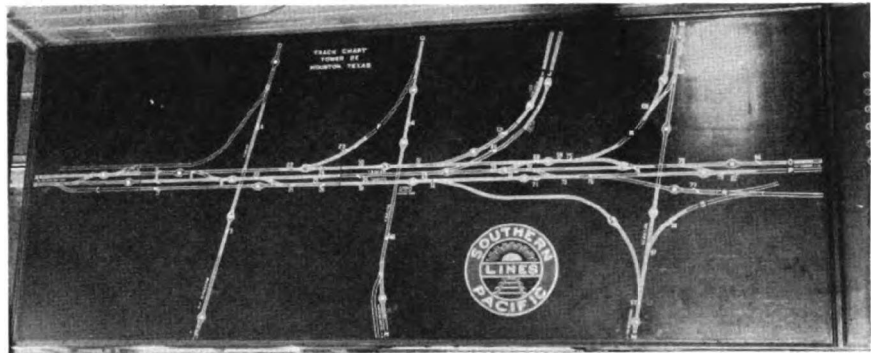


Westward home signal at crossing 76 now controlled from Tower 80

Tower 26 so as to form a continuous machine of 70 levers. An interesting fact is that Tower 26 previously controlled the crossing of the T. & N.O. with the H.B. & T., and later the control of the Houston East & West Texas (S.P.) crossing was included in Tower 26, this latter crossing being about 6,000 ft. from the tower. Therefore, with the completion of the consolidation, the interlocking No. 26 controlled three crossings and several junctions, as indicated in an accompanying illustration showing the illuminated track diagram. In view of the fact that train movements in this area must of neces-

sity be coordinated, it has been more satisfactory to control the entire layout from one machine rather than endeavoring to get three or more towermen to co-ordinate their efforts.

In 1930, the 16-lever mechanical interlocking No. 76 at the crossing of the H.B. & T., and the H.E. & W.T. was eliminated, the control being transferred to a set of desk levers placed in Tower 80. As the crossing at old No. 76 involved only two single-track lines, it would seem at first consideration that an automatic interlocking would be satisfactory. However, certain complications would have been introduced in the operation of an automatic plant, chiefly arising from the fact that such a plant cannot "use judgment." Furthermore, the fact that Tower 80 was only $\frac{3}{4}$ miles away offered an excellent opportunity to use lever control, thereby affording a means of giving prefer-

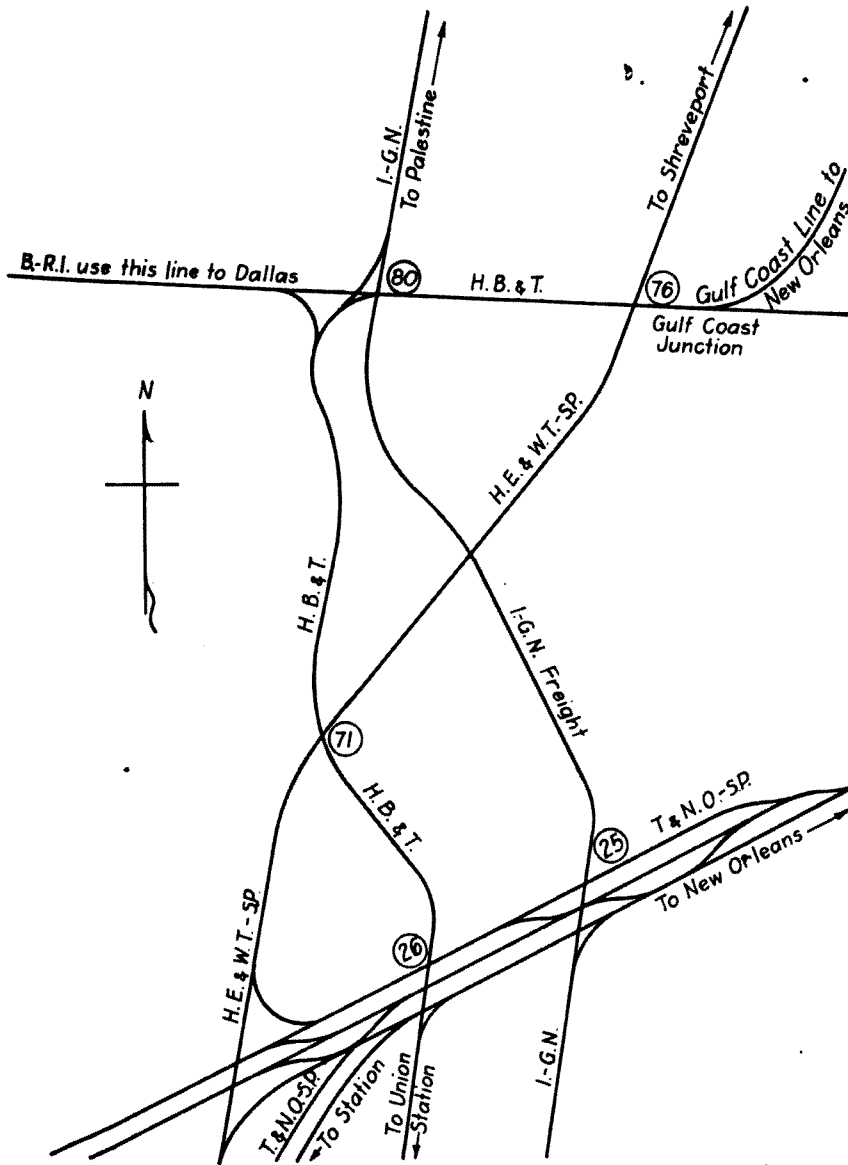


The illuminated diagram in Tower 26 shows the general layout of crossings and junctions

ence to passenger trains over transfer freight trains.

In 1934 the Burlington-Rock Island added two fast passenger trains to their schedule between Houston and Dallas. These trains operate into and out of Houston over the H.B. & T.

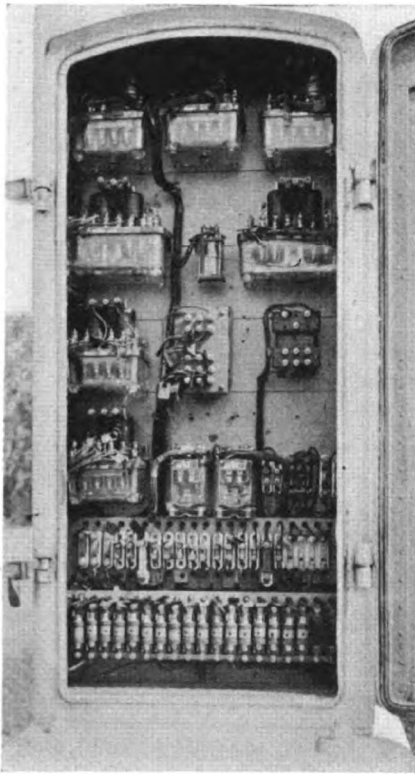
track, diverging to their own line over hand-throw switches located about 1500 ft. northeast of Tower 80. In order to obviate the delay occasioned by handling these switches, two dual-control electric switch machines, G.R.S. Model-5D, were installed at these switches, and the home signals were moved back so as to direct the operation of trains in this area, thus including this complete junction in the interlocking limits. These new facilities are of special assistance in handling train meets. When the southbound B.-R.I. train is a few minutes late, it encroaches on the time of northbound I-G.N. train No. 26. When this occasion arises, the dispatcher sends a "hold" order directing the operator at Tower 80 to leave the home signals at stop against the B.-R.I. train until the I.-G.N. train passes. Thus the meet is made without any special movements on the part of either train.



Six interlockings in this territory are now consolidated into two

Automatic Signals Provided

Along with the various changes in interlockings, automatic block signals were installed on 20 miles of the I.-G.N. single-track main line from Spring, Tex., to Tower 80, and on the single-track of the H.B. & T. on in from Tower 80 to Quitman street in Houston, not far from the Union station. While this installation was being made, the mechanical signals in the plant at Tower 80 were replaced with color-light signals. Automatic signals were installed on the 35 miles of single track main line of the Gulf Coast Lines between Kenefick, Tex., and Gulf Coast Junction, the latter point being on the H. & B.T. two miles from Tower 80. This would have left a gap of two miles in the automatic block system. However, as old Tower 76 was located in the center of this gap, the changeover from a mechanical plant to remote-control protection for this crossing introduced new color-light home and distance signals which completed the



Instrument case at signal near Tower 80

automatic block signal protection throughout the two-mile gap.

Special Communication and Whistle Signals

The Missouri Pacific automatic block signal rules make it necessary to provide a telephone at each absolute signal for the use of trainmen. The telephones located at the home signals in the Houston area, as discussed in this article, are all connected to a line which extends to loud speakers in Towers 26 and 80. At Tower 80 switches are provided to connect the entire telephone system to the dispatcher's line or to the city telephone system.

It is often necessary for the engineer of an approaching train to give locomotive whistle signals to let a towerman know which train is approaching in order that the proper route may be lined up. Furthermore, switching trains may want to call for a route different from the one set up. Therefore, on account of the extended area controlled, it was desirable to have the whistle signals at the various crossings and junctions repeated in the two towers. After experimenting with microphones, it was found that the desired result could be accomplished simply by energizing the transmitter of the regular telephone in the booth at a signal, this being controlled through a back contact of a track relay. No special ap-

paratus or special location of the telephone was required. When a train passes one of these telephone stations, the transmitter is cut in and the noise of the passing train and the whistle signals are brought into the towers over the loud speakers.

Power Lines and Water Pumps

The a-c. floating system of power supply is used, the energy being supplied by a 4,400-volt distribution line. A set of 4 cells of 60-a.h. storage battery is used at each signal location to supply the line circuits and as a stand-by for signal lamps in case of a power outage. One 60-a.h. storage cell is used for each track circuit. These cells are of the lead type, manufactured by the Exide Company.

The 4,400-volt energy is supplied at Tower 80 and is distributed to Spring and to Kenefick. This power is used for illumination of the building at Tower 80, and for illumination of station facilities at Spring and at Huffman. Spring is 20 miles north of Tower 80 and Huffman is 20 miles east, and at both of the towns named, connections from the 4,400-volt line extend to electric motors for operating pumps for pumping locomotive water. Rotary-type pumps of comparatively low capacity are used, but by means of an automatic float-switch control the required amount of water is pumped, because the tanks are practically on "floating charge" the same as the storage batteries on the signal system.

On the interlocking consolidations and automatic signaling carried out on the Missouri Pacific Lines as explained in this article, the color-light signals, relays, cases, switch machines, desk levers, etc., were furnished by the General Railway Signal Company. The two longer stretches of automatic block signals were installed under contract by the General Railway Signal Company, but the interlocking consolidations and rearrangements were made by the signal forces of the railroad.

Call-on Signal Involved In Accident

On January 29, 1935, there was a rear-end collision between a multiple-unit electric passenger-equipment extra and a multiple-unit electric passenger train on the Delaware, Lackawanna & Western at Harrison, N.J., which resulted in the injury of 79 passengers and 14 employees. Following is an abstract of the report of an investigation made by the Bureau of Safety of the I.C.C.

In the immediate vicinity of the point of the accident this line consists of three electrified tracks over which the trains are operated by time-table and an automatic block signal system.

Opposite the Harrison station is a crossover between the center and westward tracks, the switch points being facing for west-bound trains. This crossover and the signals in the immediate vicinity are controlled from an electro-pneumatic interlocking machine approximately 3,000 ft. distant. The Harrison station is situated about 1,725 ft. east of a drawbridge over the Passaic river. The signals involved are of the four-indication color-light type displaying red for "stop," yellow for "approach," yellow over green for "approach-restricting," and green for "proceed." In addition, pushbutton control is provided whereby the leverman may change the red indication to red-over-yellow as a calling-on signal to advance a train into an occupied block; one of these signals, R-14, is situated 121 ft. in the approach to the place of accident.

Three trains had been advanced into the block governed by signal R-14 by the call-on aspect, while waiting for the drawbridge to be lowered. These trains were closely spaced, the rear of the third train having cleared signal R-14 by only 121 ft.

A fourth westbound multiple-unit passenger train, consisting of four cars, left Hoboken, 7.13 miles east of Harrison, at 8:16 a.m., according to the train sheet, one minute late, passed signal R-6, which was displaying an approach-restricting indication; passed signal R-12 displaying an approach indication; passed the flagman of Extra 2235 at a point approximately 316 ft. behind his train; passed signal R-14 displaying a slow-speed or calling-on indication, and collided with the rear of Extra 2235 while traveling at a speed estimated to have been between 15 and 30 m.p.h.

Had the engineer properly obeyed the approach indication of signal R-12, he would have approached signal R-14 prepared to stop and would then have been in a position to accept the slow-speed or calling-on indication displayed by that signal and close up behind Extra 2235. The evidence indicates that the flagman of Extra 2235 had done all that he could to protect his train within the limited time at his disposal.

According to the report, this accident was caused by the failure of the engineer of the passenger train to obey signal indications.