Train Operation by Means of Signal Indications

A Busy Stretch of Single Track is Operated Without Train Orders By the Installation of a Traffic Locking Scheme

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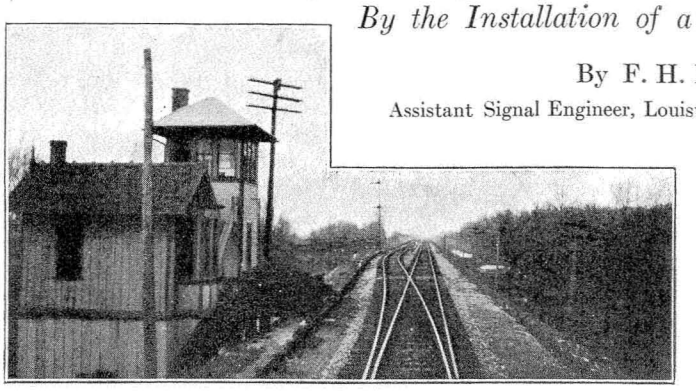
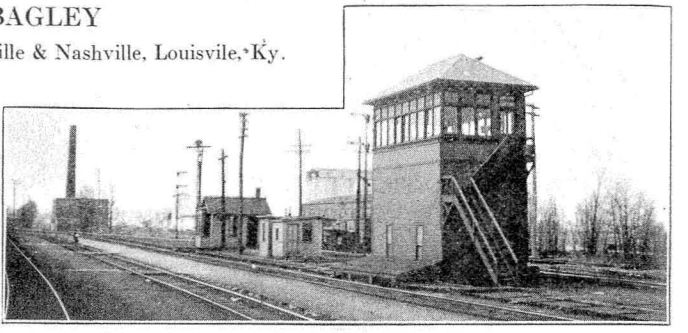


"F. S." Tower, End of Double Track



Henderson Tower and Telegraph Office

THERE is a growing inclination among railroad officers to consider methods of operating trains by signal indication, instead of by written orders. Where traffic is congested, this plan presents attractive possibilities in saving delays, increasing the capacity of the track and in reducing operating expenses. Train operation by signal indication was established in October, 1919, on a very busy stretch of single track between Henderson, Ky., and F. S. Tower, Ind., on the Henderson division of the Louisville & Nashville. At Henderson, a mechanical interlocking controls the junction of the Louisville & Nashville, the Louisville, Henderson & St. Louis, and Illinois Central, and the traffic from all three roads is sent over this single track to Evansville, Ind. The double track from Evansville ends at F. S. Tower which controls the southbound traffic to the single track towards Henderson. This stretch of single track is approximately 4½ mi. long and is on a trestle across the low flat lands bordering on the Ohio river at this point. The crossing of the Ohio river is made over a single-track truss bridge, which is located just north of Henderson.

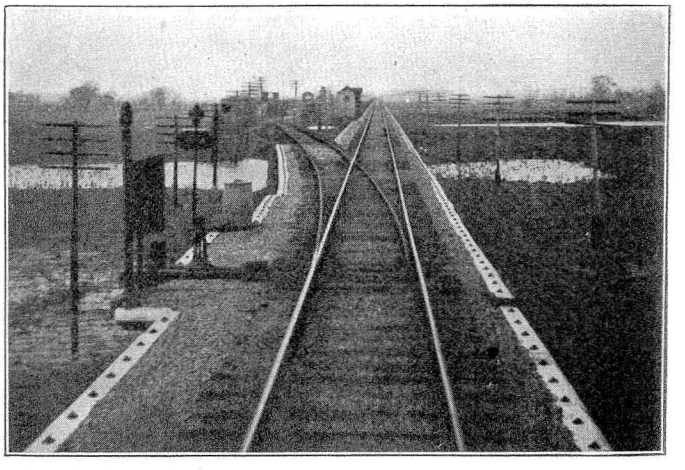
How Trains Were Operated Formerly

Automatic signals operating on the overlap scheme, together with a time block and written orders, have controlled the traffic over this track for the past eight years, and there was a very noticeable increase in track capacity after the automatic signals were first installed. The traffic increased to such an extent as to make it necessary to further increase the capacity of the track or resort to the only other alternative—double track. As a double-track trestle of such proportions would be very expensive, other means were considered.

The track layout after the first installation of automatic signals is shown in the diagram. The block was handled by the telegraph operators located at F. S. Tower and at Henderson. The operators at Henderson are located in a small office adjacent to the interlocking tower. The operators at this telegraph office were provided with a train order signal with which to govern the trains, while the operators at F. S. Tower controlled movements to the single track by means of the southbound interlocking home signal.

The scheduled traffic between Henderson and F. S. Tower is 24 passenger and 22 freight trains a day. A considerable number of extra passenger and freight trains are run daily, however, and the actual daily traffic lately has averaged 26 passenger and 48 freight trains. trestle which tend to aggravate the conditions prevailing. The despatchers have frequently been required to issue an average of 50 train orders for each 24-hour period. As a rule there was an average delay of 14 minutes to each southbound freight train and a delay of 12 minutes to each northbound freight. The delays to some of the trains were, of course, less than the stated average, while others were greater and quite serious, tending to disorganize the regular schedules.

In order to expedite movements and save delay at either Henderson or F. S. Tower, the conductor of a freight train usually left the caboose in time to reach the head-end as the engine neared the telegraph office on



Rahms Switch, Showing Electric Lock and Telephone Housing

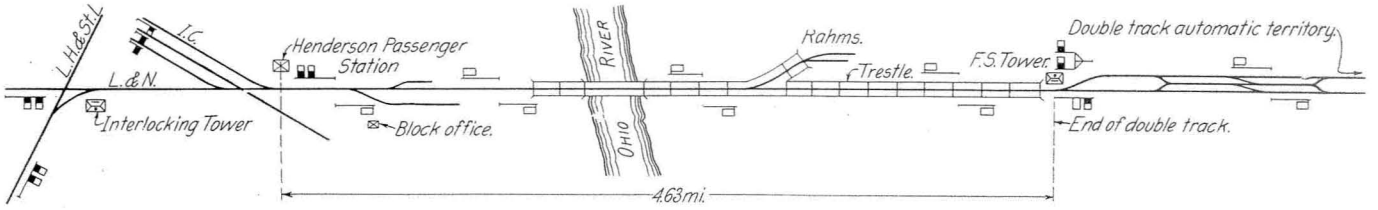
approaching the single track. This resulted in the saving of considerable time and oftentimes eliminated serious delays.

One great cause for delay was the fact that the I. C. and the L. H. & St. L. joined with the L. & N. tracks at Henderson and the traffic of all three roads between Henderson and Evansville was handled over the single track. As the L. & N. despatcher had no information about I. C. and L. H. & St. L. trains bound for Evansville until their arrival at Henderson, it was frequently necessary to change orders for freight trains at Henderson or at F. S. Tower because of the arrival of a superior I. C. or L. H. & St. L. train at Henderson. This delay, due to obtaining orders, was very ob-

be eliminated, train movements would be greatly expedited. It was evident that some scheme of operation was needed that would decrease the delay at each end of the single track by providing means, if possible, to allow trains to enter the single track without stopping.

Changes Made in Signal System

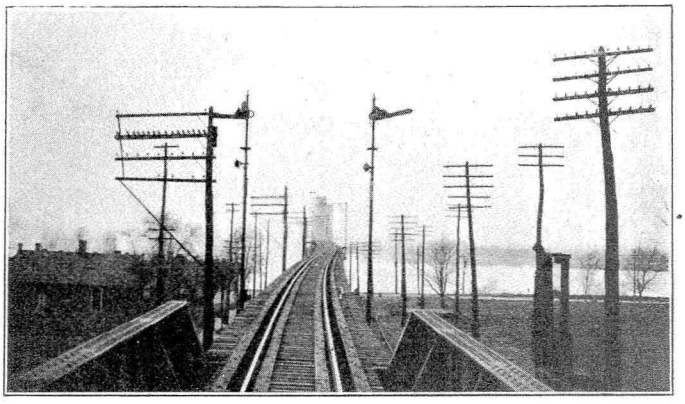
It was finally decided to install a traffic locking arrangement between Henderson and F. S. Tower, to be handled by the telegraph operators located at these points. The operators were instructed to arrange with each other for movements over the single track and when the route was set up for a movement in one direction, a "traffic" lever in the interlocking machine would lock up the route so that the operator at the other end of the block could not set up the route for an opposing movement, and vice versa. It was also planned, in addition, that trains would not be required to stop for orders, but could pass onto the single track by signal indication and be governed over it by the automatic signals.



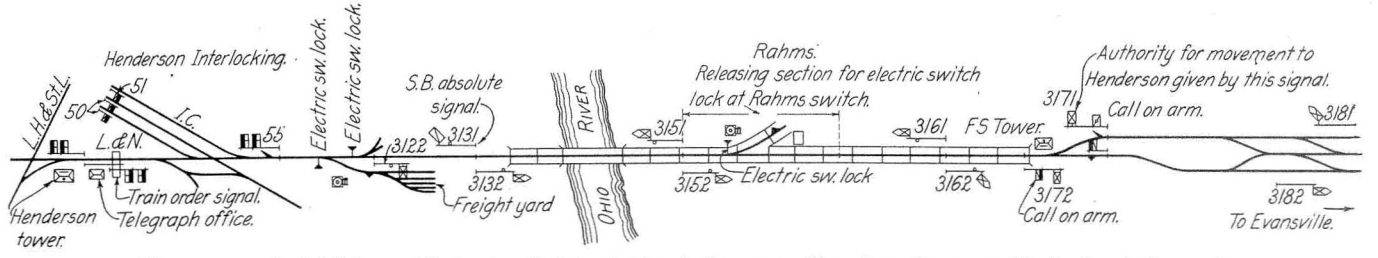
The Track Layout After the First Installation of Automatic Signals

The changes and additions made in the signaling arrangement are shown in the second track layout and were as follows: The automatic signals between Henderson and F. S. Tower were changed to operate in the upper quadrant and their control changed to the "Absolute-Permissive-Block" scheme, thus providing absolute protection for opposing movements and permissive protection for the following movements. This change alone increased the capacity of the track considerably. The old interlocking arrangement at F. S. Tower was entirely rebuilt, making the protection complete and modern. This necessitated the building of a new tower and the installation of a new electro-mechanical interlocking, equipped with derails and semi-automatic home signals with "call-on" arms. Route locking was also provided with this arrangement.

A two-lever set of interlocked circuit controllers was installed on the telegraph operator's table at Henderson. One of these levers controls the northbound absolute semi-automatic signal No. 3122 at Henderson. The other lever is used as the traffic lever and controls movements southbound from F. S. Tower. There is a traffic lever in the machine at F. S. Tower also, to control movements northbound from Henderson. When the traffic levers are normal, it is impossible to clear the northbound absolute signal No. 3122 located at Henderson, or to clear the southbound home signal at F. S. Tower, which is the southbound absolute signal governing southbound movements to the single track. However, if the traffic lever at F. S. Tower is reversed, the lever controlling the northbound absolute signal No. 3122 at Henderson may be reversed and this signal cleared. When the traffic lever at Henderson telegraph office is reversed, the lever controlling the southbound home signal at F. S. Tower—i. e., signal No. 3171—may be reversed and this signal cleared. In this way it is assured that the route can be given for one direction of traffic only. No additional operation is necessary for following movements, as these may be made according to the indication of the automatic signals. Trains proceed onto the single track on signal indication only, so that no time is lost in stopping for orders, as was formerly the case. An independent telephone circuit was installed between the Henderson telegraph office and F. S. Tower so that the operators could arrange for train movements. This line was made independent of all other circuits to prevent no chance of delay in arranging for these movements as would occur if other telephones were connected to the line.



Signal Location 3131-3132 at Henderson, Ky., Looking Towards Ohio River, Showing Signal 3132 Clearing



Changes and Additions Made to Original Track Layout, Showing Present Method of Operation

How Switching Movements Are Handled

As switching movements at Rahms siding are such that the main track is cleared at times, an electric switch lock with a telephone was installed at this switch. This

control of the operator at F. S. Tower. The switching at Rahms is done by a pusher engine which is regularly used to help southbound trains over the bridge, there being a steep grade southbound on the trestle approaching the bridge. This pusher engine on its return movement stops at Rahms to do any necessary switching. Before leaving F. S. Tower, the conductor of the switching crew advises the operator at F. S. Tower of the work he wishes to do at Rahms and the operator then arranges with the Henderson operator for the movement and instructs the conductor accordingly. Arriving at Rahms switch, the conductor telephones the operator at F. S. Tower, who then presses a button which unlocks the switch and enables the train to enter the siding. If the train entirely clears the main track, and the switch is again set for the main line movement, the switch will automatically become locked. When the train is ready to come out, the conductor of the crew must call F. S. Tower on the telephone and secure permission to do so. After the operator at F. S. Tower has arranged for the protection of the movement, he unlocks the switch by pressing a button, allowing the trainmen to throw the switch and come out onto the main track. The switch will be locked again automatically when it is set for the main line movement. If the trainmen should enter Rahms switch and leave the switch open, it would be impossible for either the operator at F. S. Tower or at Henderson to line up for through movements.

The switches at Henderson leading to the freight house and to the freight yard, as shown in the revised layout, also are equipped with electric switch locks, the control of which is in the hands of the operator at Henderson. Switching movements are continually being made through these switches and it was desired not to restrict these movements any more than was necessary. For this reason these switches are arranged to be normally unlocked, but will be electrically locked automatically when a southbound train comes within a certain distance of them. This distance is approximately 7,000 ft., which was considered sufficient because the southbound movements are quite slow up the steep grade approaching the bridge.

The switch locks used were furnished by the Federal Signal Company and are equipped with a mechanical key release for use in case of failure of the electric control of the lock. The key release is kept sealed and the switchmen are governed by rigid rules regarding its use. Switch indicators are installed at the switch locks to give a visual indication to the switchmen when the switches are automatically locked. A bell, operating automatically, is also located at each of the two switches at Henderson, which gives an audible indication on the approach of a train. This enables the switching crews to clear the main track in time to prevent stopping through trains.

It was thought advisable to leave the train order signal in place at Henderson, as it gives the operator better control of a train in the event that it becomes necessary to stop it. Signal No. 3122 continues to be the leaving signal at Henderson. The signal arrangement as described was placed in service October 22, 1919, and seems to be meeting every expectation in facilitating the handling of trains and in eliminating delays.

Report on Butting Collision at Adamsville, Ala.

Disregard of Rule That When Signal is at Stop, Trains Will Stop Before Proceeding, Contributed Toward Accident

THE Interstate Commerce Commission has issued a report, dated November 6, and signed by W. P. Borland, chief of the Bureau of Safety, on a butting collision which occurred on August 9, 1919, between an Illinois Central freight train and a St. Louis-San Francisco work train on the St. Louis-San Francisco near Adamsville, Ala., which resulted in the death of 3 employees and injuries to 28 employees.

The Birmingham subdivision of the southern division of the St. Louis-San Francisco, on which this accident occurred, is a single-track line over which trains are operated by time table, train orders transmitted by telephone, and an automatic block-signal system. Between Birmingham, Ala., and Jasper, a distance of 41 miles, trains of the Illinois Central are operated over the tracks of the St. Louis-San Francisco, under the jurisdiction of the latter company. It was on this joint track that the accident occurred. Between Adamsville and Coal Creek, a distance of 4.8 miles, the line consists of a series of sharp curves and deep cuts, and there is no place between these stations where an approaching train can be seen for a distance of more than 1,500 feet. Approaching the point of accident from the south, there is a tangent about 670 feet long, followed by an 8 degree curve to the left approximately 800 feet long, leading through a rock cut nearly 50 feet deep. The collision occurred near the center of this curve. Approaching from the north, there is a 6 degree curve to the left, about 800 feet in length, followed by the 8 degree curve of vision of engine crews is less than 200 feet. The grade is approximately 1 per cent descending for northbound trains. At the time of the accident the weather was clear.

The trains involved in this accident were St. Louis-San Francisco work extra 1622 and Illinois Central extra 1736. Extra 1622 consisted of locomotive 1622, five empty flat cars, and a caboose, in charge of Conductor Bazemore and Engineman McGowan. This train had been working in the vicinity of mile post 719, between Adamsville and Coal Creek, under authority of train order No. 5, reading as follows:

> Engine 1622 work 6 a. m. to 8:30 p. m. between Pratt City and Dora, protecting against second and third class trains. All trains north except first class wait at Adamsville until 9 a. m.

Pratt City and Dora are located south and north, respectively, of the territory involved in this accident. One flagman of extra 1622 was stationed at Coal Creek and another at Adamsville, the latter flagman having verbal instructions to inform all except passenger trains to proceed under control, expecting to find the work extra at any point between Adamsville and Coal Creek. At about 3:20 p. m., while at Coal Creek allowing southbound extra 1619 to pass, Conductor Bazemore called the dispatcher over the telephone and inquired as to the next train north and was told that there would be nothing ahead of train No. 926, a first-class train due out of Adamsville at 4:48 p. m. The crew then decided to