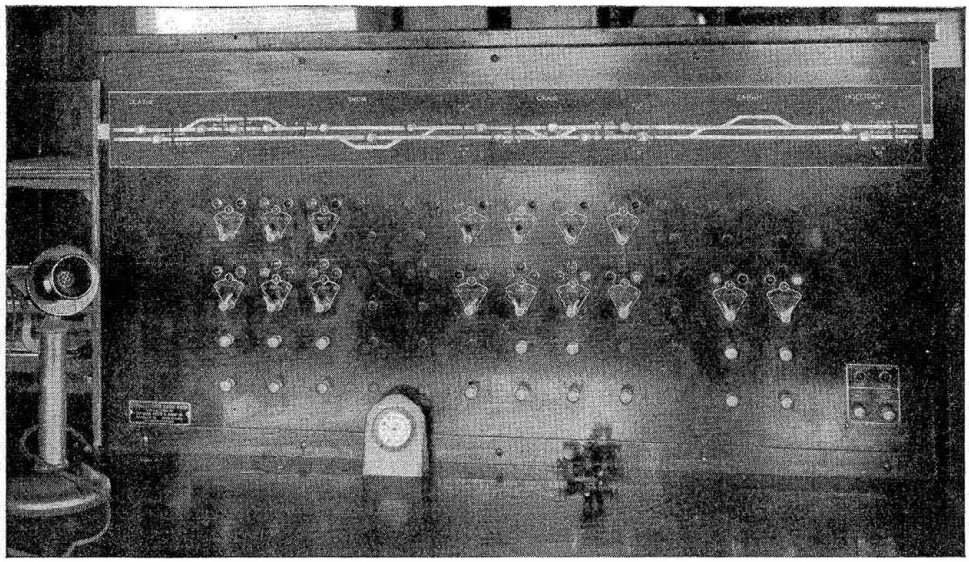

The control machine at Holliday

Centralized Traffic Control Saves Time on the Santa Fe

Trains operated in either direction on double-track grade—Tonnage trains save 9 minutes in 12 miles

By D. W. Fuller

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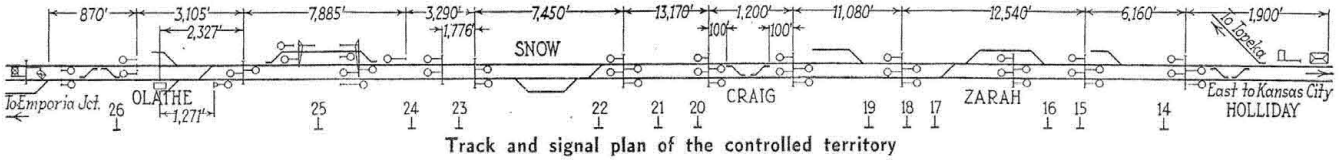
THE Atchison, Topeka & Santa Fe has installed centralized traffic control, including signals for directing train movements in either direction on both tracks of a 12.2-mile section of double track between Holliday, Kan. and Olathe. This territory is a section of the main line handling traffic to and from the west coast, the gulf and intermediate points. Starting at Holliday, 13 miles west of Kansas City, Mo., a single-track line runs via Topeka, Kan., to Emporia Junction, 113 miles, while the double track line runs directly to Emporia Junction. A number of important passenger trains, as well as most of the through freight trains, are operated over this double track cut-off, and the daily average traffic in 1929, at which time consideration was given to this installation, included 20 passenger trains and 14 freight trains.

The line ascends at an average grade of 0.6 per cent practically all the way from Holliday to Olathe. Under the previous method of operation, with automatic block signaling for left-hand running only, train delays were frequently encountered. For example, if a freight train did not have time to run to Olathe ahead of a train on a faster schedule, the freight was held at Holliday. The same circumstances were true to a certain extent for eastbound trains out of Olathe. In other words, this Holliday-Olathe section, involving a long grade which retarded the movement of westbound tonnage trains, was the "bottle neck" of the operating district. The solution of the problem was to increase the track capacity so that any train could be accepted and operated through the section without delay, even with other trains ahead or following. Previous to the development of centralized control, studies were made to determine the best possible method of increasing the track capacity between these two points, consideration being given to the construction of a third track. Based on an investigation made in 1929, it was decided to install centralized traffic control.

Centralized Control and Either-Direction Operation

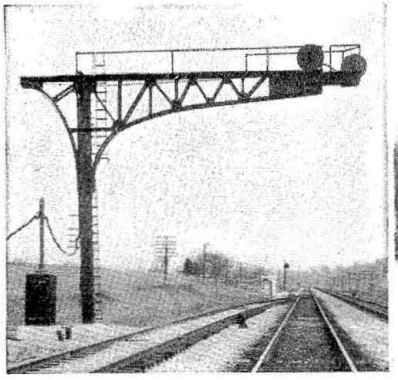
By installing centralized traffic control, including either-direction operation on both tracks, the necessary increase in track capacity on the existing two tracks has been effected satisfactorily.

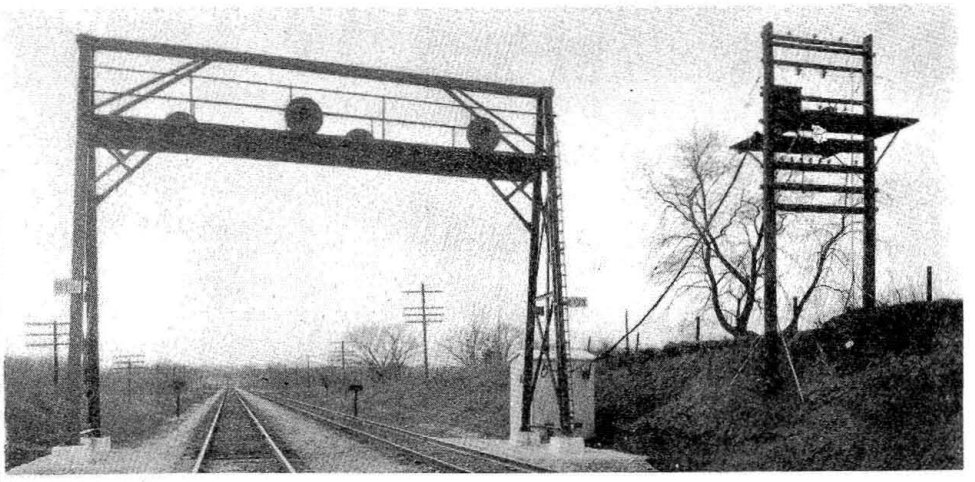
In order that trains might be diverted from one track to the other readily, two No. 20 crossovers were installed at Holliday, which is the east end of the section, and two were installed at Craig, which is located centrally, while two No. 14 crossovers were installed at Olathe, where slow-speed movements prevail. The passing siding at Olathe will hold a train of 156 cars and is, therefore, an important part of the track layout. The siding at Zarah



Track and signal plan of the controlled territory

Cantilever and bridge signal locations





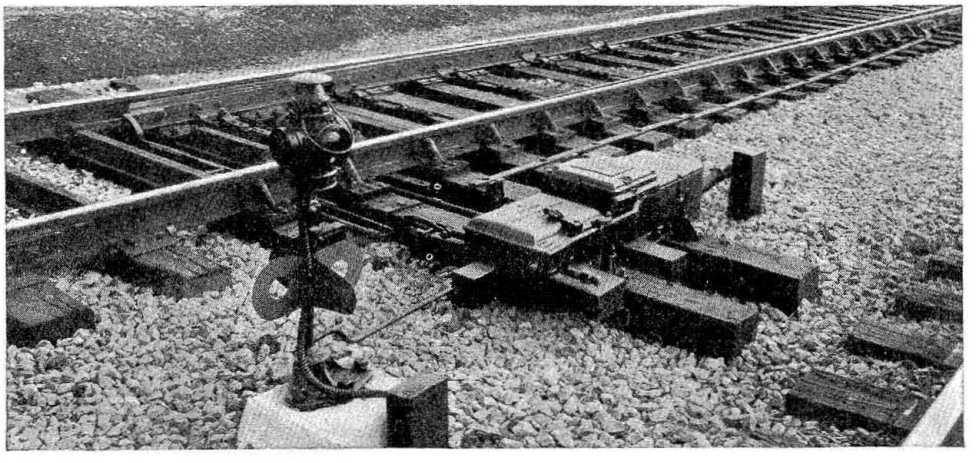
is not long enough to hold a tonnage train and is little used except by the local freight when switching the elevator track. Likewise, the short siding at Snow is used only by the local freight when switching. These switches, as well as the crossovers at these stations, are operated by hand-thrown stands, the same as previously. Switch indicators are provided at these switches to inform trainmen of approaching trains on the main tracks.

The switches for the six crossovers at Holliday, Craig and Olathe and for the two ends of the passing siding at Olathe, are power operated and, together with the signals for directing train movements and the automatic signaling, constitute the new operating facilities. The crossovers in Olathe at the west end of the territory are controlled from a desk-lever interlocking machine handled by the operator in the Olathe station. The control of the crossovers at Holliday is included in the existing electric interlocking plant at that point. A centralized traffic control machine, also located in this Holliday tower, controls the crossovers at Craig, the passing track at Olathe, and the signals which direct train movements on the entire territory between Holliday and Olathe.

The operator in charge of the centralized control machine at Holliday receives directions from the dispatcher at Emporia. The illuminated track diagram on the centralized control machine indicates continuous track occupancy on both tracks between Holliday and Olathe, so that the operator knows just where each train is and can so inform the dispatcher. A track diagram with the same signal-and-track layout and lettering is provided in the dispatcher's office; thus, the operator, by calling the name of a letter, can advise the dispatcher of the location of each train at any time such information may be requested.

Ordinarily trains are operated on the right-hand track, and in case two trains going in the same direction are involved, the faster train is diverted to run left-handed around the slower one. In most cases this arrangement makes it possible to eliminate delays on freight trains which may be running on short time ahead of faster trains. The saving in train time is of benefit not only on this territory, but also on the adjacent sections. For example, it is often possible for a tonnage train not only to run ahead of a passenger train on the Holliday-Olathe section, but, due to the time thus saved, to run on over to Ottawa Junction, 31 miles west of Olathe, where the freight can take water, do certain switching and be ready to follow the passenger train from that point. In such cases, considerable time is saved by freight trains as compared with the previous operation in such cases in which the freight would have been delayed on account of being held for other trains to run around it. The freight trains average 90 cars each, and are handled by the same locomotives formerly used on this territory.

A typical switch layout



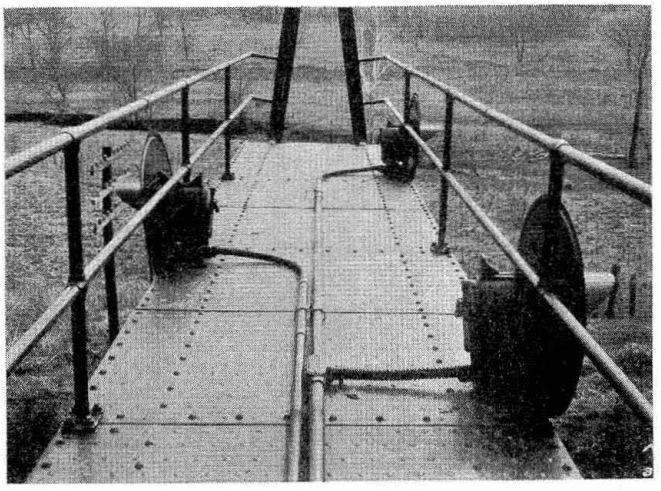
Therefore, when there is no interference between trains, there is, of course no opportunity to save time.

In order to get the facts as to the benefits effected by the new system of operation, the dispatchers have kept a record of the time saved. For example, an investigation of the operation for one month, June 15 to July 15, 1931, as compared with the corresponding period for 1929 showed an average saving of 9 min. in the time required to operate a westbound train up the grade; this is a 20 per cent reduction. For the 282 freight trains operated

in the month, the total saving was 42 hr. 18 min. and further reductions in delays resulted from the closer meets made at points beyond the limits of the territory, and from savings in fuel and water, etc.

Type of Equipment

The double-track automatic block signals formerly in service on the Holliday-Olathe territory were of the semaphore type. These old signals were removed and



Arrangement of conduit on deck of signal bridge

all of the new automatic signals, as well as those used for directing train movements, are of the searchlight type. On most of the territory, the main-line signals are located on bridges, as shown in the illustrations. However, through Olathe there was not sufficient right-of-way to erect the bridges, therefore searchlight-type dwarf

Table Showing Results of Train Operation
June 15 to July 15, 1929-1931

	Number of Trains Run					
	1929			1931		
	Pass.	Frt.	Total	Pass.	Frt.	Total
Carded passenger trains.....	651		651	620		620
Total freight trains.....		429	429		282	282
	651	429	1080	620	282	902
Total No. freight cars handled..		38,460			25,482	
Average No. of cars per freight train		90			90	
Time consumed by freight trains.		325 hrs. 2 min.			168 hrs. 41 min.	
Average time per freight train..		45 min.			36 min.	

signals were used. As the tracks are in the city street in this section, the speed of trains is limited, and therefore the use of dwarf signals has proved satisfactory.

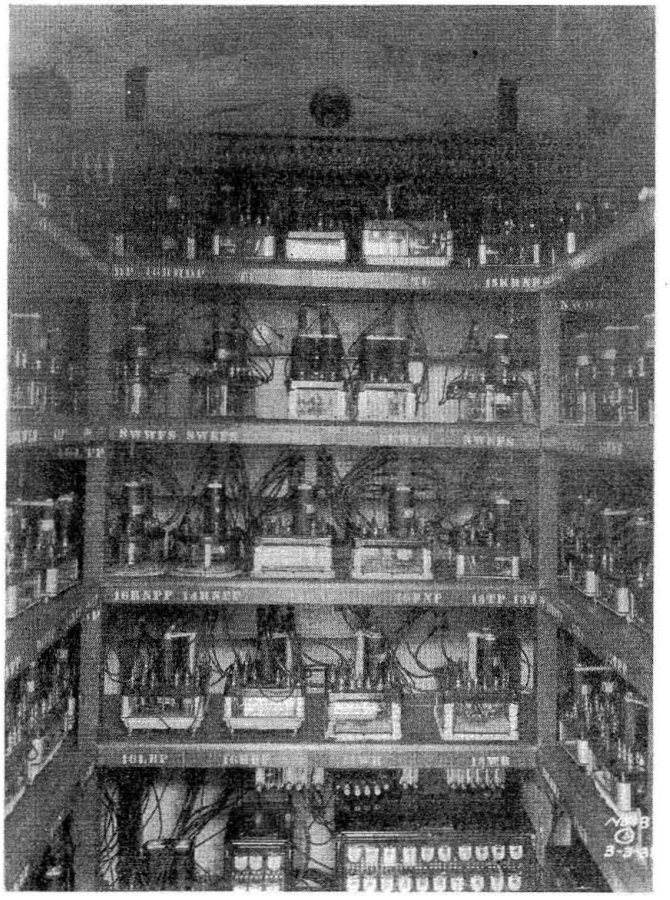
A unique feature of the signals used on this new installation is the fact that the lamp has two separate filaments, one rated at 13 watts and the other at 3.5 watts. The lamp is so designed that the 13-watt filament will burn out first with an adequate factor of safety so that the other filament will continue to burn for an extended period thereafter. The illumination in the signal is, of course, materially reduced so that the enginemen and the maintainers at once notice the difference and a new bulb is installed. However, in the meantime, the 3.5 watt filament gives enough light to afford a signal indication so that no train delays are occasioned by the absence of a signal.

As a part of the new installation, an independent telephone circuit was provided, with a telephone located in a booth near each power-operated as well as near each hand-thrown switch. These phones are useful in case any unusual condition arises, and at hand-thrown switches must be used frequently, as the rules require the trainmen to receive permission from the operator at Holliday before occupying the main line, and the same rule applies for switching operations at the power-operated switches.

The straight alternating-current system of power supply and operation was used on the old semaphore automatic signaling, the distribution system being at 4,400 volts 25 cycles. When installing the new signaling the power supply was changed over to the a-c. floating system, the distribution being changed to 2,300 volts, 60 cycles. Storage batteries charged by rectifiers are used for the operation of the switch machines, track circuits and line-control circuits. The signal lamps are rated at 8 volts and operate normally on a-c., but in case of a power failure are automatically switched to the storage-battery supply.

Details of Layout and Equipment

At various points on the territory where a considerable number of relays, rectifiers, batteries, etc., were required, a concrete battery house was provided in which to house the equipment. These houses are 6 ft. by 6 ft. in size, and were furnished by the Massey Concrete Products Company. At Holliday, space was available in the tower for only the relays and smaller equipment. Therefore,



Interior of relay house at Craig

in order to obviate building an addition to the tower, an 8 ft. by 10 ft. concrete house was provided to house the main interlocking plant storage battery and charging equipment.

The storage batteries used for the operation of the switches, signals and track circuits are the Exide Type

KXHS-15, while those for the line circuits for signals and switches are Type KXHS-9. Type BTM batteries are used for the centralized traffic control line circuit.

On that part of the installation where trenchlay cable was used for the track connections, Raco bootlet outlets were used at the rail. The wires extending to the switch machine, dwarf signals, etc., are run in trunking placed 18 in. underground and filled with pitch. Metal conduit, located on the decks of the signal bridge, is used to distribute the wires to the signals.

All of the equipment required for the new system, including the signals, dual-control switch machines, coded centralized control machine and related apparatus was furnished by the Union Switch & Signal Company. The construction was handled by the Santa Fe signal department forces, an interesting feature of the program being that the old signaling was kept in service until the new system was complete, the change-over being effected without a single train delay.

Uniform Laws and Standards for Crossing Signals

THE adoption of standard signs and signals, and the enactment of uniform laws on crossing protection in all states, is advocated in a report recently issued by the American Railway Association, Joint Committee on Highway Grade Crossing Protection. In the view of this committee, action along the following lines is desirable:

1. That state legislatures which have prescribed different standards for railroad highway grade crossing protection than those embodied in the bulletin, revise such laws.

2. That the state regulatory bodies having control of the railroads (Railroad Commission) should have jurisdiction over grade crossing protection on all public streets and highways.

3. That the apportionment of expense for crossing protection should be:

(a) For highways forming part of the federal aid system, between federal aid, the state, and the railroad.

(b) For state and county highways, between the state, the county and the railroad.

(c) For other streets and roads, between the state, the county, the city or other political subdivision, and the railroad.

4. That the Railroad Commission should be authorized and required to prescribe uniform warning signs for use at grade crossings.

5. That no new grade crossings should be constructed except on order of the Railroad Commission following a hearing.

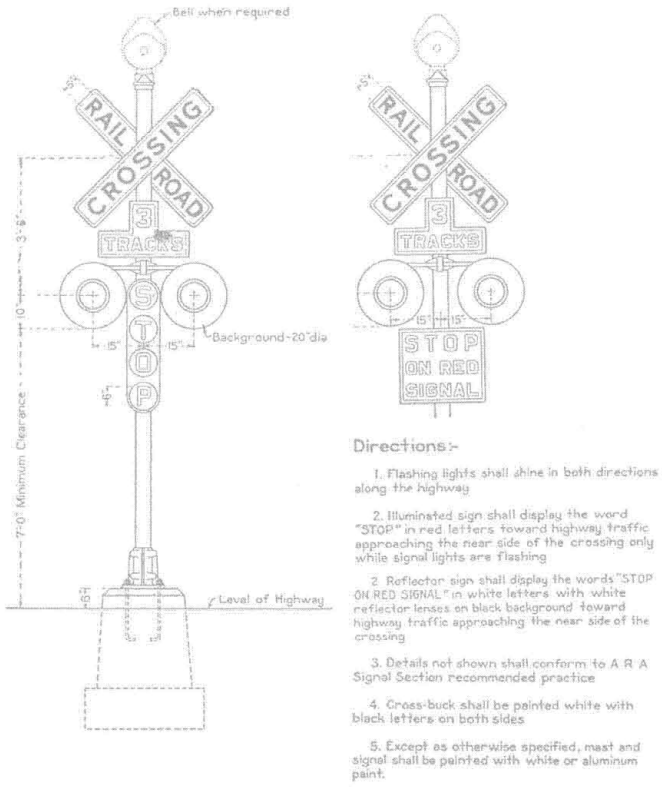
6. That the Railroad Commission should be empowered to designate "Stop" crossings, and the statutes should provide for the creation of same and penalties for failure to stop at such designated crossings.

7. That the Railroad Commission should prescribe the physical characteristics for new crossings with respect to approach grades, width of approaches, planking, etc.

8. That the recommendations of the National Conference on Street and Highway Safety be adopted by the several states.

This report, which is issued as Bulletin No. 1, represents the results of extensive study of the Joint Committee, which was appointed in April, 1930, by the American Railway Association with instructions to prepare standards, co-ordinate the activities of the railroads in conforming to the principles adopted and provide a medium by which public authorities can be acquainted with the most modern thought of the railroads in these matters.

The standard designs, as presented in the report, were adopted by the American Railway Engineering Association as shown on page 528-D40 of the *Railway Age* for March 11, 1931, and in the April, 1931, issue of *Railway Signaling*, a report including these standards being adopted by the Signal Section, A. R. A., at its convention in May. Furthermore, the new standards are in accordance with the recommendations of the National Conference on Street and Highway Safety. In brief, the new standards include the automatically controlled STOP sign and the reflector button sign reading "Stop on Red Signal" which are to be used as in conjunction with the regular wig-wag or flashing-light signals. An additional sign indicates the number of tracks, (i.e.) 3-Tracks. The issuance of the bulletin places the final stamp of approval of the American Railway Association on these new standards.



Flashing light signals for location at side of highway

A supplement to the bulletin includes a general explanation of the highway grade crossing problem as viewed by the Joint Committee. About eight per cent of automobile accident fatalities occur at railroad grade crossings, tables compiled for I. C. C. statistics being given to show that the casualties per 10,000 registered automobiles decreased from 3.18 in 1929 to 2.60 in 1930 in spite of the fact that gasoline consumption increased 6 per cent, which is proof that the signals in service, the safety educational programs, etc., are producing results.

The booklet will be a valuable addition to the library of all operating engineering and signaling officers and is being placed in the hands of state highway commissions, automobile associations, etc., with the idea of securing unified co-operation on the adoption of the standards.