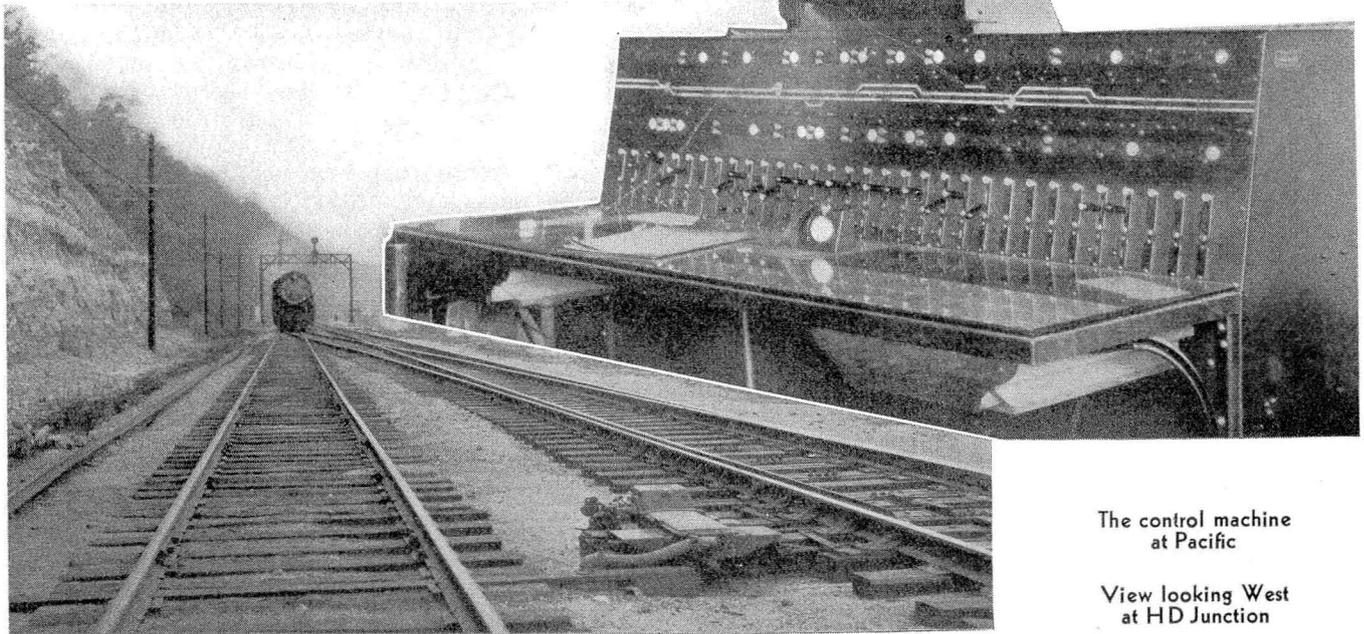


Missouri Pacific Installs

Centralized Traffic Control

On 32 Miles of Double Track

Either-direction operation on each track and elimination of train orders facilitate operation



The control machine at Pacific

View looking West at HD Junction

THE Missouri Pacific has installed centralized traffic control for the direction of train movements in either direction on each track on a 32-mile section of double track between HD Junction and Valley Park, the latter point being about 18 miles west of St. Louis, Mo. This territory is on the Eastern division and is a portion of the St. Louis district extending from St. Louis to Jefferson City, 125 miles, which was all single track, until a second-tracking program was started in 1925, prior to which time the line had been protected by single-track semaphore automatic-block signals. When the second-tracking was started, a program was worked out to provide complete signal protection for the operation of trains in either direction on both main tracks. On some of the sections of second track completed early in the program, the old semaphore signals were used for left-hand running and new color-light signals for right-hand running. Train movements were directed by train orders, the signaling being provided as a means of increasing

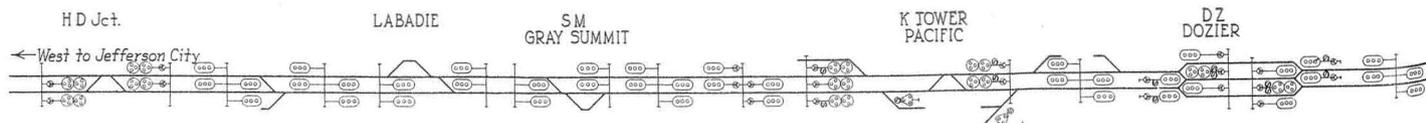
the track capacity and affording safety.

Wherever conditions did not require operators at the temporary ends of double track, the switches and signals at such points were remotely controlled from the nearest office. (For an engineering description of the reconstruction of this line, see *Railway Age* for April 11, 1931.)

Experience With Centralized Control

These installations kept pace with the completion of the various sections of second track up to and including 1928. It had been planned to construct the same type of signaling on the remaining 32-mile section between HD Junction and Valley Park, providing an electric interlocking plant for the operation of the double crossovers at HD Junction and another plant for a similar layout at Pacific, as well as a smaller interlocking at the east end of double track at HI Junction.

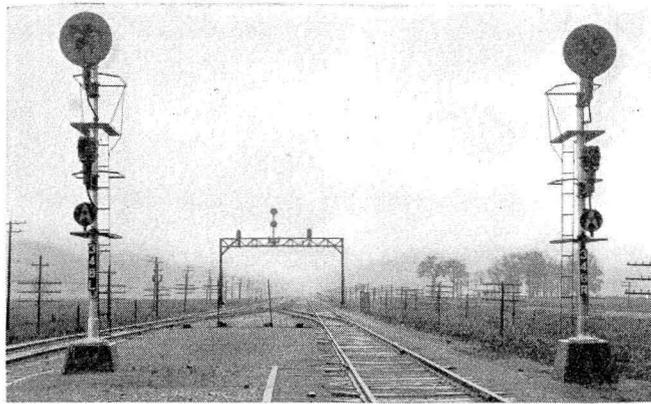
However, in the meantime, the centralized traffic con-



Track and signal plan of

trol system of operating switches and signals for the direction of trains had been installed extensively, a successful installation being in service on 43 miles of single track on the Missouri Pacific between Kansas City, Kan., and Atchison. Based on the results being obtained from

of the indicator light, the operator inserts this token in a hole located at the corresponding location on the track diagram. This action automatically operates the corresponding needle on the train graph, which makes a record of all train movements.



View at West end of center passing-siding—
Note that second unit is the "S" light

this and other similar installations, it was decided to change the original plans and to install centralized traffic control on the territory from HD to HI Junctions.

As installed, the new system provides signals for the direction of train movements without written train orders. Seven crossovers and the end of double track, which are used regularly, are power-operated and are controlled from the centralized machine. Fifteen switches at passing tracks and junctions are hand-operated, but signals controlled from the machine are provided to direct train movements at such points. The remaining main-line switches leading to house tracks, industry spurs, etc., are equipped with switch circuit controllers and shunt fouling to afford automatic block signal protection. Movement to or from such tracks can be made only on the authority of the operator.

The traffic on this line includes 16 passenger trains, 2 local freight trains, and from 8 to 12 through freight trains daily, making a total of 26 to 30 trains daily.

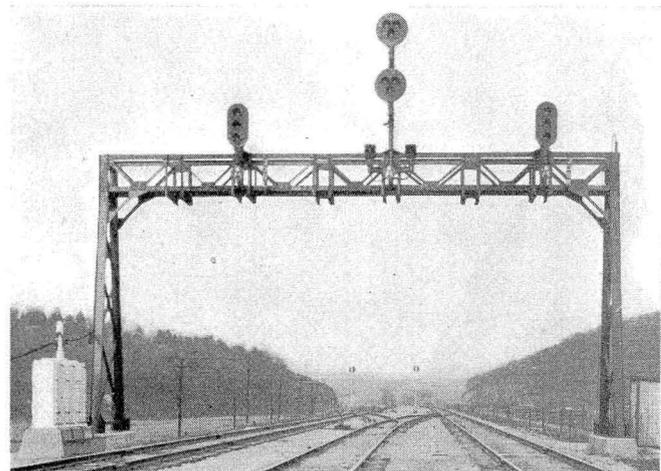
Control System

The General Railway Signal Company's "single-wire" control system is used on this installation, the control machine at Pacific being equipped with annunciators, indicators and a train graph. The dispatcher informs the operator in charge of the machine regarding the location of trains destined for the controlled territory, and the immediate approach is announced by a bell and by lights on the machine.

Likewise when a train enters the short track-circuit at each control point, the fact is announced by an annunciator bell, and an indicator light for that respective track circuit or control point is lighted and stays lighted until the entire train passes. A record of the location of each train on the road is maintained by means of a token, consisting of a small metal peg with a tag on it giving the number of the train. When the arrival of a train is announced at a particular switch, by the lighting

The operator throws the levers controlling the operation of the switches and signals, to direct the movement of the trains as he desires. Normally all switches are kept set for the main line, and controlled signals at "Stop." Throwing a lever down causes the corresponding track switch to move to the normal position, while throwing the lever up causes it to move to the reverse position. With the lever on center, the switch remains in the position to which it was last operated. Moving a lever down causes the signal to display a proceed indication for a main-line movement, while if the lever is thrown up, an indication is displayed for a movement to or from the siding or junction. All of the signals are of the color-light type, displaying three aspects: red, yellow and green.

At those switches which are not provided with a power machine, but where signals are located to direct train movements, special light units are attached to the heading-in signal and to the leave-siding signal. When the operator is ready for a train to leave such a siding, he places the lever for that control point in the up position,

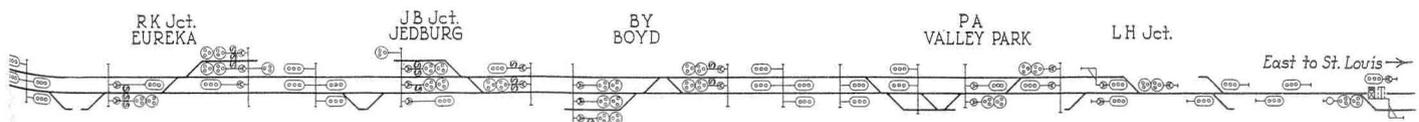


View looking east at east end of same siding

which causes the special unit to be illuminated, thus displaying a large letter, "S." This gives the trainman authority to throw the switch, after which the leave-siding signal indication changes from red to either yellow or green, depending on whether one or two blocks ahead are clear. When it is desired to have a train head in at one of these sidings, the lever is placed in the up position, causing the "S" to be displayed below the signal giving a "Stop" indication. This directs the trainmen to operate the switch, and the train to take the siding.

Protection at Industry Spurs

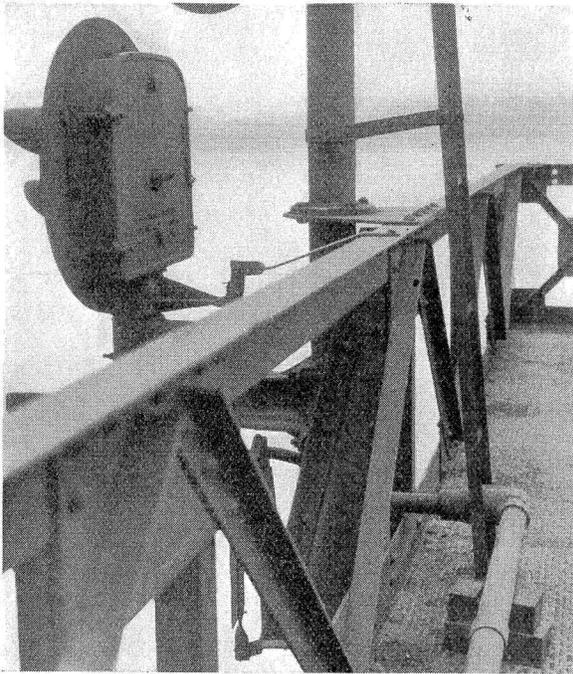
When a movement is to be made into or out of one of the house tracks or industry spurs, where signals are not provided for the direction of train movements, the conductor calls the operator for authority to switch be-



territory controlled from Pacific

tween certain limits for a certain time, and during this time the main line is held, either by leaving part of the train on the main line, or by leaving the main-line switch open. In addition to the protection afforded by the operator holding the controlled signals at danger, on both sides of the territory being used, the automatic signals also operate to protect such a movement. Before the time-limit expires, the train gets in the clear and the conductor informs the operator to that effect, or, if the movement is completed, he gets permission to move on the main line.

All signals for directing train movements, that is, main-line signals at each end of sidings, as well as the signals on the junction lines, and on the sidings, are absolute Stop signals and are so designated by a large letter, "A", mounted on the mast. This letter is backed up with a Stimson reflecting glass, causing the letter to be readily visible in the daylight, and to stand out plainly by light reflected from a locomotive headlight at night. When a train stops at an absolute signal displaying a "Stop" indication, the conductor or engineman at once enters the phone booth, which is located nearby, and calls the operator, who explains the cause of the train being stopped and the approximate time before it will be allowed to move again.



Conduit extends to each signal head and mast is set in special brackets attached to the bridge

The power switch machines are equipped with dual-control levers. If a train has entered the locking section approaching a switch for movements over which a Proceed indication is being displayed, the switch can not be operated until the signal has been restored to the Stop indication and a time interval of two minutes has elapsed.

Method of Operation

The regular method of operation is to run all trains on the right-hand track until it is apparent to the operator that a fast-moving train can be switched over and run around slower trains. Usually, the freights are left on the right-hand track and the passenger trains are run around them. Especially in the morning, when the preponderance of traffic is eastbound toward St. Louis,

it is a regular occurrence to let the eastbound freight trains run on the right-hand track and divert the passenger trains to the left-hand track to run around the freights.

Between Jedburg and Eureka, the old main line diverges from the new line to serve two small towns. As only the local passenger and way-freight trains are required to use these junctions, the switches for the junctions and crossovers were not equipped with power machines, although all movements are directed by signal indications. In most cases it is possible to eliminate the use of the main-line crossover for these train movements, by running the train on the correct track to accomplish the desired result. For example, if no through trains conflict, an eastbound local train will be crossed over at Pacific to run left-hand to Eureka, thus eliminating the necessity of handling the crossover.

Power Supply System

The a-c. floating system of power supply is used for the operation of the power switches and signaling system. A new pole line was constructed, using creosoted Southern pine poles and fir crossarms. The two No. 4 A. C. S. R. stranded aluminum conductors for the 4,400-volt power circuits are carried on Pyrex glass insulators on the top arm. The No. 10 hard-drawn bare copper wires for the line-control circuits are carried on porcelain insulators on the lower arm.

A 0.6-kv. a line transformer is located on the line pole at each signal location, being protected by G. E. fuse cut-out plugs and lightning arresters. A 110-volt power circuit is extended from each signal to the intervening track cut-sections.

Alternating current, transformed to the proper voltage, is used for the normal lighting of the signals and for charging the storage batteries by means of rectifiers. A battery of 10 Exide 75-a.h. cells is provided at each power switch location, while four such cells are furnished at each signal for the line circuits and emergency power supply for the signal, and one cell is furnished for each track circuit.

In case the a-c. power is cut off, the system continues to operate on the storage batteries, without interruption. However, an annunciator is provided in the operator's office, which rings when the a-c. power goes off, so that he can notify the maintainer at once.

Results Obtained

As this centralized control installation was provided as a part of a new second-track improvement, there is no basis of comparison to show the improvement in train operation resulting from the signaling system alone. However, a study of the train operation shows that the convenience of running trains in either direction on either track is a decided advantage in keeping all trains moving in this territory. As stated, ordinarily the freight trains are run on the right-hand track and the passenger trains are run around on the other track. Such movements are being made regularly, to the extent that, with the present traffic, the passing tracks are seldom used. These results further justify the policy of providing power switch machines for the crossovers but not for the center passing track at this time. As traffic increases, more switch machines can be added as required.

The equipment for this centralized traffic control installation, including the switch machines, signals, relays, etc., was furnished by the General Railway Signal Company and was installed by the signal department forces of the Missouri Pacific.