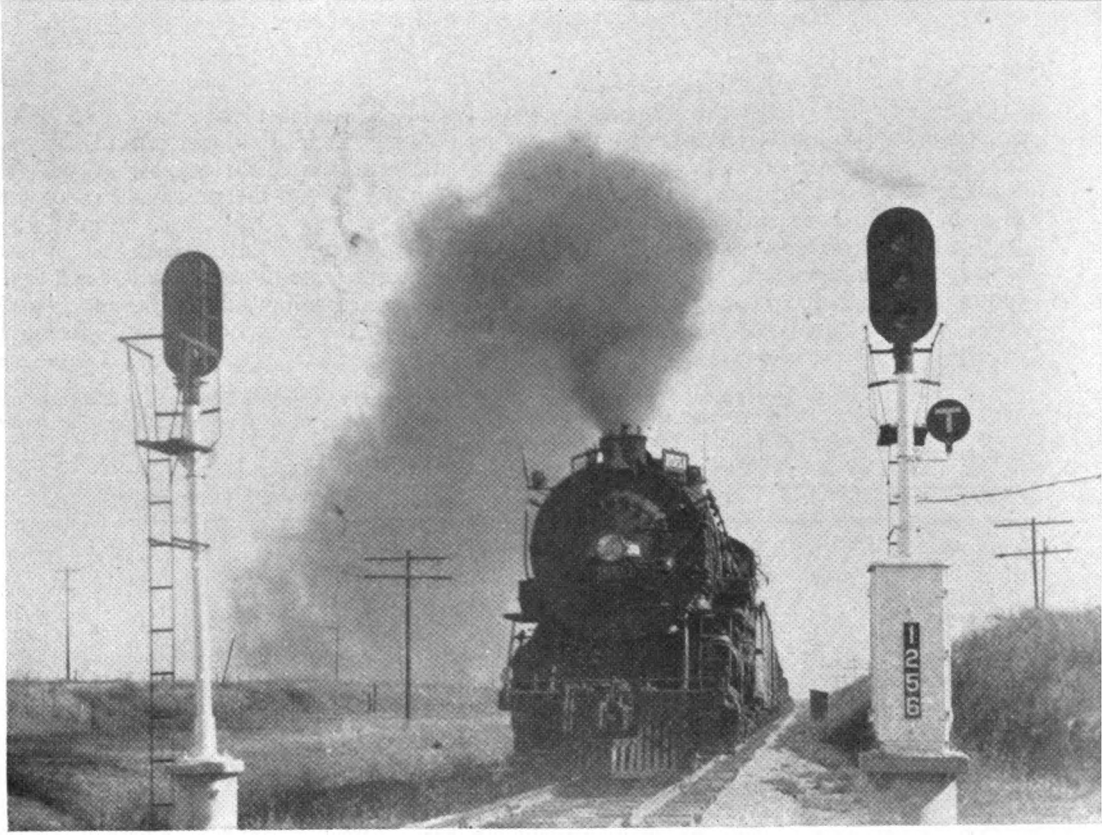


Southbound freight train passing a typical intermediate signal with a "T" grade marker

New Signaling In Texas

On Missouri Pacific Lines

Project on 143 mi. between Palestine, Tex., and Taylor, completes signaling on entire route of 923 mi. between St. Louis, Mo., and San Antonio, Tex.

DURING the last few years the Missouri Pacific Lines in Texas has been making extensive installations of automatic signaling, so that this form of protection is now in service throughout on 340 mi. between Longview, Tex., and San Antonio via Palestine, as well as on 150 mi. between Palestine and Houston. Missouri Pacific trains are operated over the Texas & Pacific on the 90 mi. between Longview and Texarkana, Ark., again returning to Missouri Pacific rails at Texarkana, en route to St. Louis. With the new signaling recently installed in Texas, the entire route of 923 mi. between St. Louis and San Antonio is now signaled, as is also the line to Houston.

The section of line between Palestine and San Antonio handles traffic to and from a large area in central and south Texas as well as an interchange of traffic with the National Railways of Mexico at Laredo, Tex., on the Rio Grande river. Four passenger trains and six freight trains are scheduled daily, and extra trains are operated as required, so that ordinarily about 18 trains are operated daily. The track is in good condition, and passenger trains are operated at speeds up to 65 m.p.h., and freights up to 45 m.p.h. The final section of automatic block installed in 1947 between Palestine and Taylor, Tex., 143 mi., is typical of the construction during the last few years, and the following explanation applies to this 1947 project.

In this Palestine-Taylor territory, the railroad traverses rolling prairie country. The grades for the most part are not long, and do not exceed 1.3 per cent. The longest grade varies from 0.5 to 1.0 per cent for about 4 mi. In some places, the line is tangent for long sections, while in other places, the curves are numerous, but are usually not sharp enough to necessitate reductions from maximum speeds.

Number of Sidings Reduced

When planning the signaling, several changes were made in the sidings not only to improve train operations but also to reduce the cost of installing the signaling. By eliminating Easterly and New Baden as sidings, and by constructing a new siding called "AN" at a location between Easterly and New Baden, three short zones, 4.2 mi., 3.3 mi. and 3.0 mi., were replaced by longer siding-to-siding blocks, 6.4 mi. and 5.4 mi. The previous siding at Keechi, about 2.5 mi. west of Peeler, was discontinued, leaving a siding-to-siding distance of 10.6 mi. between Peeler and Buffalo. With these changes, the distances between sidings range from 4.6 mi. to about 6 mi., with one such distance 7.7 mi. between Milano and Rockdale, 8.0 mi. Buffalo to Jewett, and 10.6 mi. between Peeler and Buffalo.

Ordinarily the headblock signals are located approximately 100 ft. from the point of the switch at the end of a siding. This 100 ft. is used instead of a shorter distance, such as 20 to 30 ft., for several reasons. One objective is to locate the insulated rail joints at joints other than those including stock rails in the switch. Where curves or high banks are involved, the signals may be located several hundred feet from the switch in order to provide a longer sighting distance from locomotives of approaching trains. Where high fills or bridges are involved, the signal location may be shifted to get it on solid ground. At locations where there is considerable switching, the headblocks are set farther from the switch, in some instances up to 1,200 ft., so that switching moves can be made on this 1,200 ft. without holding the signals at the next siding at Stop.

In 15 of the siding-to-siding layouts, ranging from 4.6 mi. to 7.7 mi., there are two sets of double intermediate signal locations. In such layouts, the first and third blocks are considerably shorter, the minimum being train-stopping distance plus a safe margin. The middle block is at least twice train stopping distance, and, of course, can be much more as may be required, depending on the overall distance between sidings.

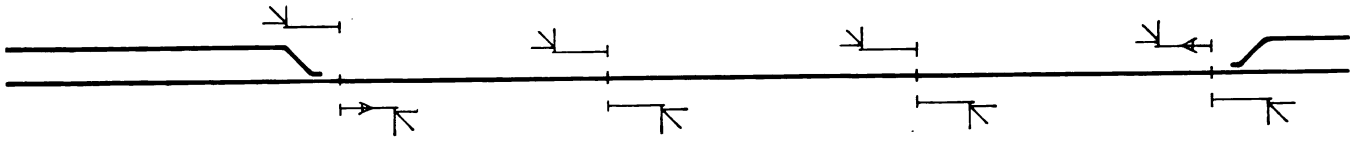
Figure 1 shows a typical layout with two sets of intermediate double signal locations between sidings, and the data below shows the distances which apply to the 15 such layouts between Palestine and Taylor. By thus making the first and third blocks as short as practicable, a train just getting in the clear on the siding has more time to do so without stopping an approaching train. Also, when a freight train on a siding is waiting for a passenger train of the same direction to pass, the freight can get under way sooner than if the first block were longer. While the freight is pulling out of the siding and getting under way, the passenger train can easily clear the longer center block before the freight arrives at the first intermediate. Thus the arrangement, with minimum end blocks and longer blocks in the middle, is not only adapted to operation but also it permits the omission of at least one set of intermediate signals. Where the distance between sidings is 8.0 mi. to 8.5 mi., there are three intermediate locations with the end blocks about 6,000 ft. to 10,000 ft. and the three other intermediate blocks about 2.5 mi. to 3 mi.

In a siding-to-siding layout which includes a siding no longer used for the passing of trains, one set of the intermediate signals is staggered to protect the switches, as for example at Easterly, as shown in Fig. 3.

This signaling is controlled by the conventional absolute permissive block system, using d.c. track circuits and polar line circuits. The track circuits are the d.c. neutral type, using 2-ohm relays, and these circuits range in length up to a maximum of 5,300 ft. The signal line circuits include 300 and 450-ohm polar relays. The signal repeaters are slow-release, slow-pick-up 500-ohm relays, and the directional sticks are 450-ohm relays. All these relays are the Type-K, with spring-bracket mounting. In the case at each signal, the relays, low-voltage transformer and line arresters are mounted on the track side, and the storage batteries and rectifiers are on the field side.

The signals on this project are the

Fig. 1—Typical layout of signals between sidings including two double locations of intermediates, the table below giving distances which apply between sidings as named



Miles Between Sidings	Siding	Distance	Distance	Distance	Siding
5.9	Palestine	9,900′	11,200′	9,800′	Tucker
4.9	Oakwood	6,300′	12,300′	7,500′	Peeler
4.6	Jewett	7,000′	9,700′	7,400′	Van
5.1	Van	8,900′	10,900′	7,100′	Marquez
7.7	Marquez	9,900′	20,400′	10,200′	Ridge
6.2	Franklin	10,200′	13,500′	8,800′	Elliot
5.1	Elliot	8,000′	10,800′	8,000′	Hearne
5.2	Valley Junction	8,300′	10,700′	8,600′	Gause
4.6	Gause	6,800′	10,700′	6,600′	Bailie
4.0	Bailie	5,250′	10,700′	4,900′	Milano
7.7	Milano	10,100′	23,800′	7,000′	Rockdale
4.6	Rockdale	6,400′	10,700′	7,200′	Handy
6.2	Handy	10,700′	15,500′	6,700′	Thorndale
4.8	Thorndale	7,000′	10,700′	7,900′	Thrall
5.6	Thrall	9,500′	13,200′	7,000′	Taylor

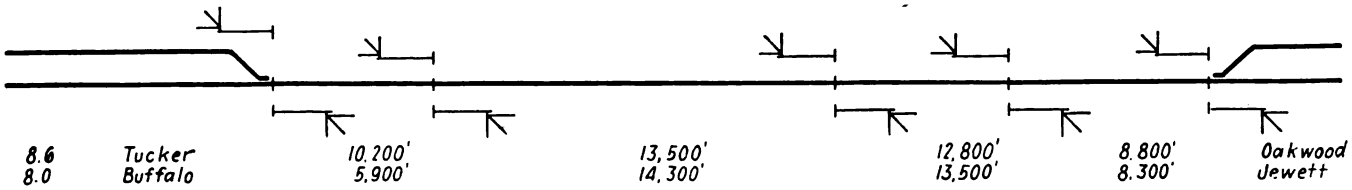


Fig. 2—Plan showing spacing of signals within three double locations of intermediates between sidings

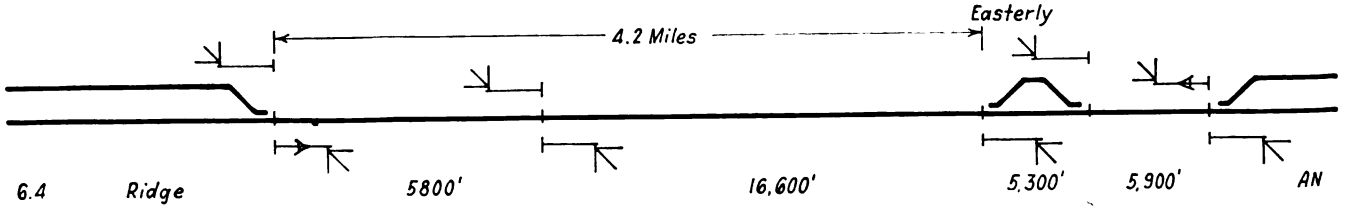


Fig. 3—Plan showing how intermediate signals are used as single locations to protect spur at Easterly

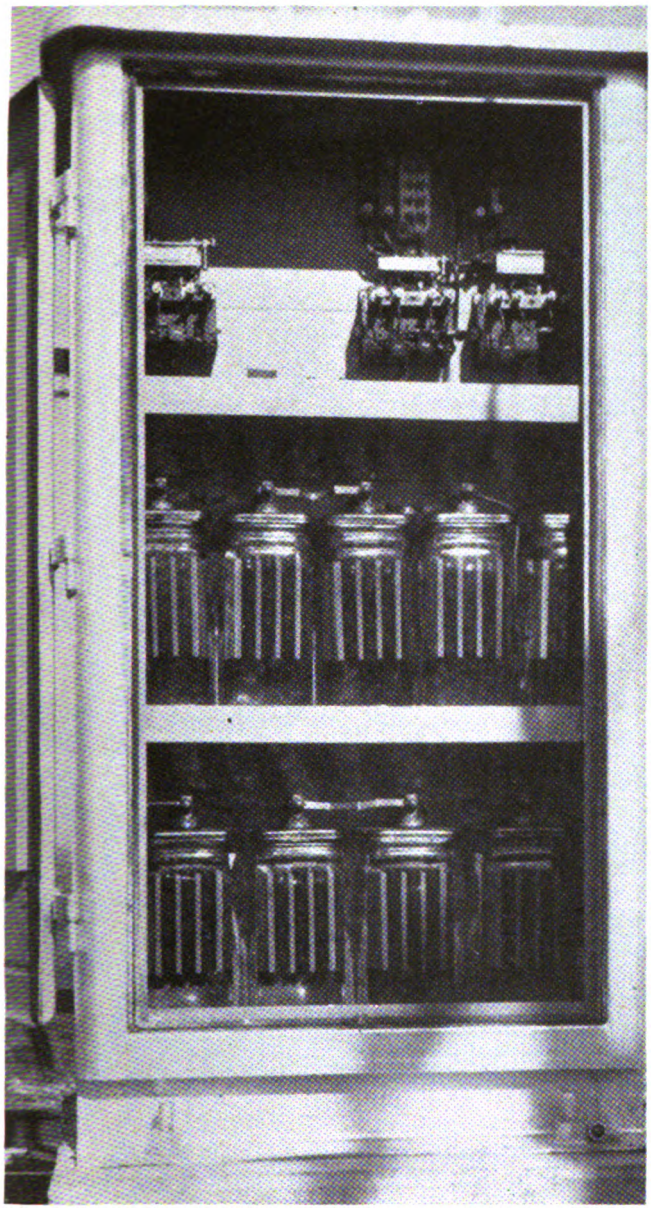
color-light type, displaying green, yellow or red. By utilizing circuits through the directional stick relays, two signals in succession display the Approach aspect when opposing trains are involved. When trains are following each other, the Approach aspect is displayed on only one signal in approach to the signal displaying the red aspect, except where short distances between sidings require variations. The signal lamps are the double-filament type rated at 10 volts, 18 watts. The headblock signals at sidings are lighted continuously and the intermediate signals are approach lighted.

The line wires for this signaling were installed on new 10-pin crossarms which were added in the third gain on the pole line already in service for communication wires. This line is in good condition, consisting mostly of new Southern pine poles, creosoted full length.

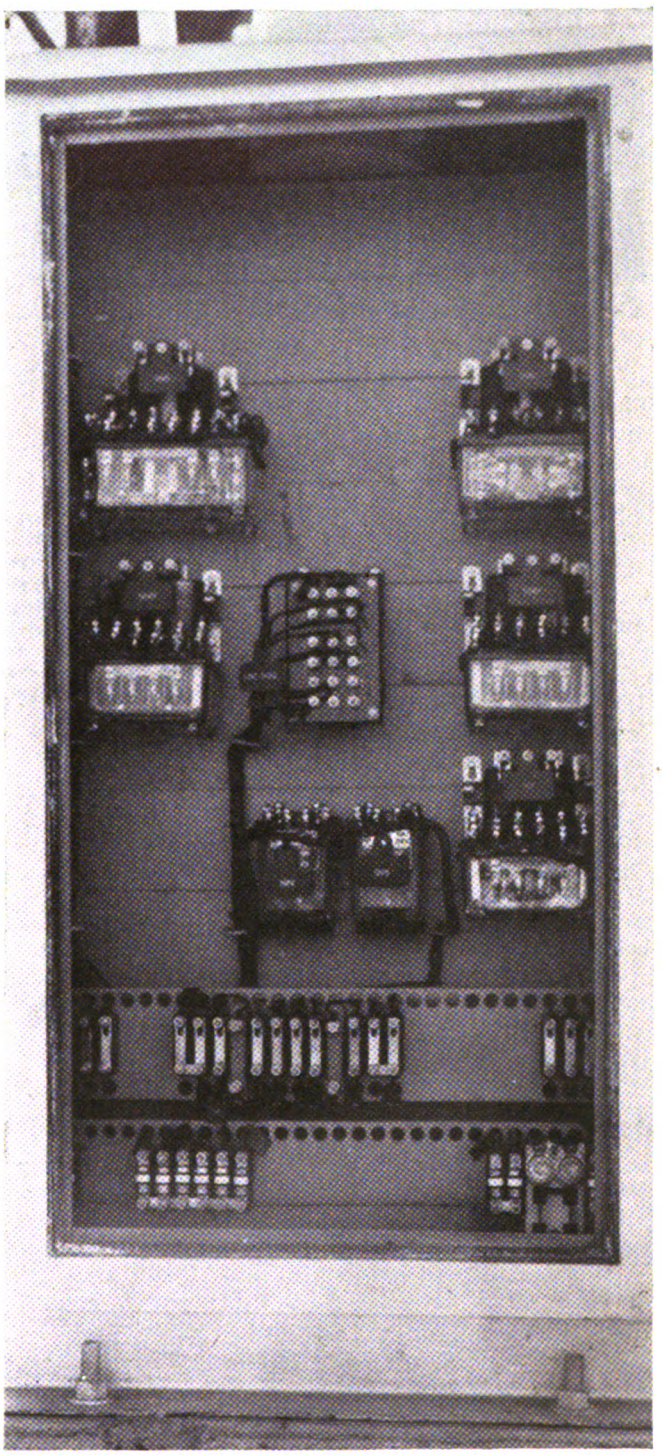
The three line wires for the signal line circuits are No. 10 hard-drawn copper, and the two wires for the 550-volt a.c. distribution circuit are No. 6 hard-drawn copper. These five wires have weatherproof covering. The signal line wires are on porcelain insulators, and the 550-volt circuit is on Pyrex glass insulators.

The two No. 6 line wires for the 550-volt a.c. power distribution were installed throughout the entire 143 mi. between Palestine and Taylor, with connections to commercial sources of power at three intermediate locations as well as at the two ends. Switches in this line are arranged to connect the line through if the commercial power is to be cut off for some time at any of the five feed locations.

At each signal and cut-section location, the 550/110-volt line transformer is rated at 75 watts. These are General Railway Signal Company air-cooled transformers, with fused cut-out plugs and lightning arresters, mounted with the transformers on



Left—Field side of a typical case at signal, showing storage batteries and the rectifiers



Right—track side of same case at a signal, showing the wall-mounted relays and wires

the crossarms. At each signal, there is a set of four cells of storage battery which feeds the line circuits and acts as standby to feed the signal lamps if the a.c. power fails. Each track circuit is fed by one cell of storage battery. This battery is the Exide DMGO-7, rated at 60 a.h.

The cables from the line poles to the signal cases are made up of single-conductor No. 14 with 3/64-in. Flamenol insulation, on test. The cable messenger is No. 8 galvanized iron wire with a porcelain strain insulator in the middle. The buried cable from the case to the bootlegs is No. 10 with 19 strands, and 5/64 in. of Flamenol insulation, on test. The bootlegs are the Western Railroad Supply Company box type, and in this box, the stranded underground conductor is soldered to a 133-strand, 3/16-in. bare cable which extends to a ⅜-in. pin in the rail. In order not to disturb the ballast by digging trenches for cable, the bootlegs for both insulated rail joints are on the same side of the track as the case. As applying for the far rail, the 133-strand, 3/16-in. connections extend in staples along the edge of ties between the bootleg box and the rail.

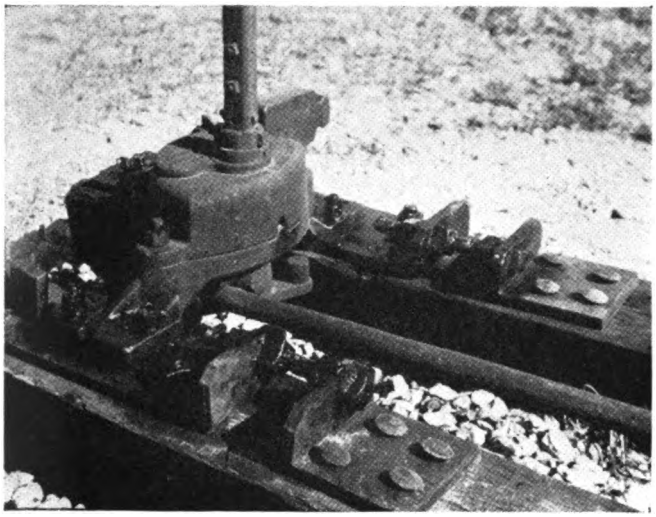
As a part of the signaling project, each main-track hand-throw switch stand was equipped with a micrometer-type switch adjustment by means of which each switch can be adjusted to its correct position without removing the spikes which hold the stand. Dirt will be graded around all signal foundations, and standard motor-car set offs will then be installed at each signal and cut location.

As a part of the 1947 signal program, a set of crossing gates with flashing-light signals were installed at West Martin street in San Antonio. This crossing is about 1,000 ft. north of the passenger station, and the crossing includes two main tracks and three tracks used for switching mail and express cars. Numerous train movements and switching operations are under way much of the time over this crossing. A check made by a counting device shows that these gates are operated more than 8,000 times each month. Previously this crossing was protected by four pneumatic gates, controlled by a man in a tower at the crossing. These old gates extended across the entire roadway. The new gates are about 22 ft. long, which is just enough to extend half way across the paved roadway. Therefore, the other half of the roadway is unobstructed, thus allowing an opening for vehicles on the tracks to depart.

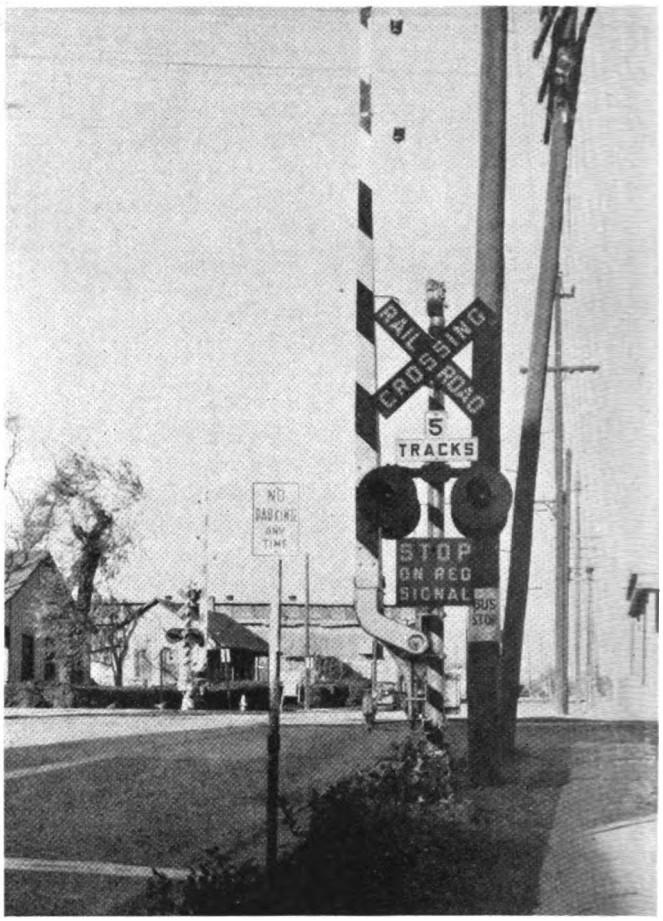
As an aid to influence vehicle drivers to stay on their own right-hand side of the roadway, a white stripe, six inches wide, was painted down the center of the pavement. When the gates were first installed, automobiles parked along the curb obstructed the gates from the view of approaching drivers. With the cooperation of the management of the nearby factory, "No Parking" signs were installed.

On account of the complicated track layout and numerous switching moves, the use of automatic track circuit control was not practicable, and, therefore, manual control electric gates were installed with control panel in existing tower which was previously used in connection with operating pneumatic gates at this crossing. The two gates with gate arm lamps, flashing-light signals and bells are controlled by one lever. When the towerman is ready to lower the gates, he operates the lever. Then the gate lamps, flashing-light signals and bells are operated for four and one-half seconds as a prewarning period. Then the gates are released and lowered to the horizontal position within ten seconds. These gates are the Model-10 type, furnished by the Western Railroad Supply Company. The two gates, signals, lamps and bells are operated by a set of seven cells of 60-a.h. Exide storage batteries.

This signaling project was planned and installed by railroad forces under the general jurisdiction of L. S. Werthmuller, signal engineer, Missouri Pacific Lines, with headquarters in St. Louis, and under the direct supervision of H. L. Robertson, assistant signal engineer, with headquarters in Houston. The major items of equipment were furnished by the General Railway Signal Company.



Left—A micrometer adjuster was installed on each main-track switch



Right—The stripe of white paint at the center of the pavement shows the lanes, and stripe across the right lane is place for vehicles to stop short of the gate