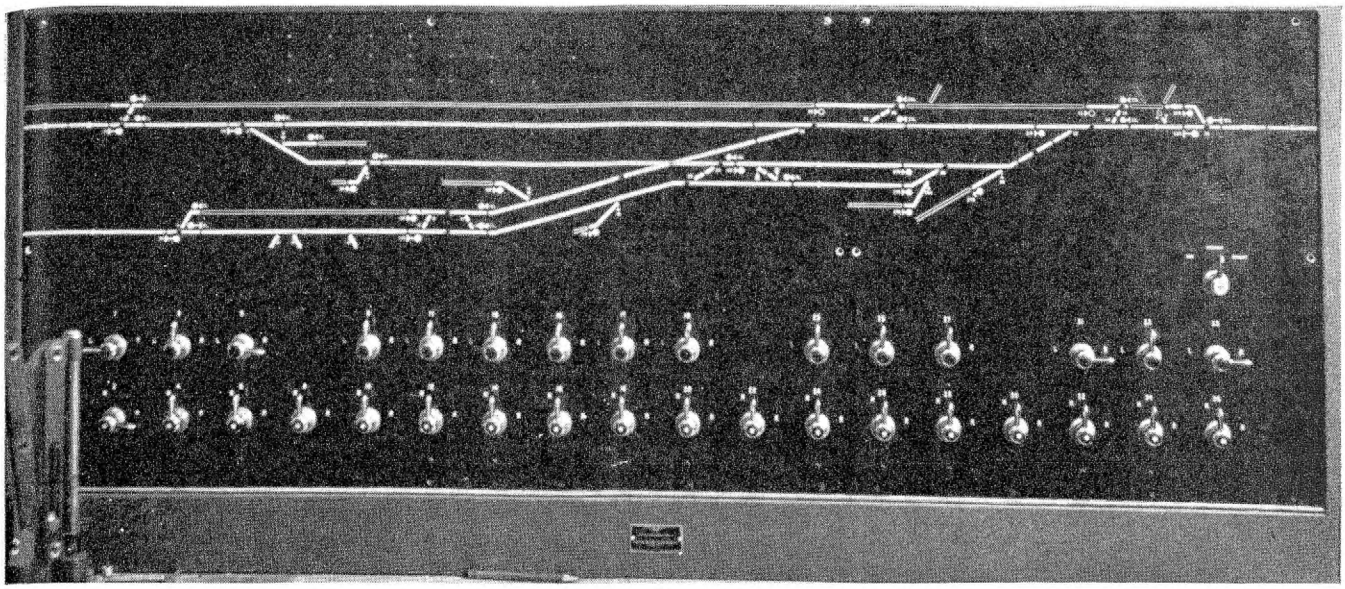


The new interlocking machine is of the all-relay panel type and is in an office in the passenger station

Texas & Pacific

New All-Relay Interlocking

Train movements expedited by plant which includes use of red-over-lunar-white aspect to authorize switching moves over hand-throw switches and certain power switches

At Longview, Tex., the Texas & Pacific has installed a new all-relay electric interlocking which includes numerous features of modern construction as well as special aspects to expedite certain train movements. Longview is 127 mi. east of Dallas on the Texas & Pacific main line between New Orleans, Shreveport and Texarkana on the east, and El Paso on the west. At Longview, there is a junction with the International-Great Northern, Missouri Pacific Lines extending south and west to Houston, Austin and San Antonio. Trains of the Missouri Pacific Lines are operated over the Texas & Pacific between Longview and Texarkana, via Marshall.

Numerous Trains

On the average, the traffic daily through Longview includes about 8 passenger trains and 16 freight trains of the Texas & Pacific through route, and about 6 passenger and 4 freight trains on the joint route branching off at Longview. Prior to the installation of the new interlocking, the junction switch and various other switches and crossovers were operated by hand-throw stands, which necessitated numerous train stops and delays, practically all of which have now been eliminated by the new interlocking.

In Station Area

All passenger trains stop at Longview. As shown on the plan, station platforms are provided for three through tracks, the main line, Track No. 1, and Track No. 2. If the main line is not occupied, the through east-west route Texas & Pacific trains use this station track, otherwise they use Track No. 1. The passenger trains to or from the I.G.N. use tracks No. 1 or No. 2. Most all of the freight trains to or from the I.G.N. line enter and depart from the yard, which means that these trains are routed via junction switch 24 and crossover 26. The second track on the I.G.N. extends through to switch No. 4 with a new pair of crossovers, No. 12 and No. 14, midway, so that run around moves can be made.

There is considerable interchange of cars of freight from one route to another at Longview and, therefore, a large percentage of the trains set out and pick up cars at this point. Also there is an interchange connection with a branch line of the Santa Fe. Within the limits of the interlocking, there are two stub-end station tracks and several spurs to serve industries.

Yard and Station Tracks

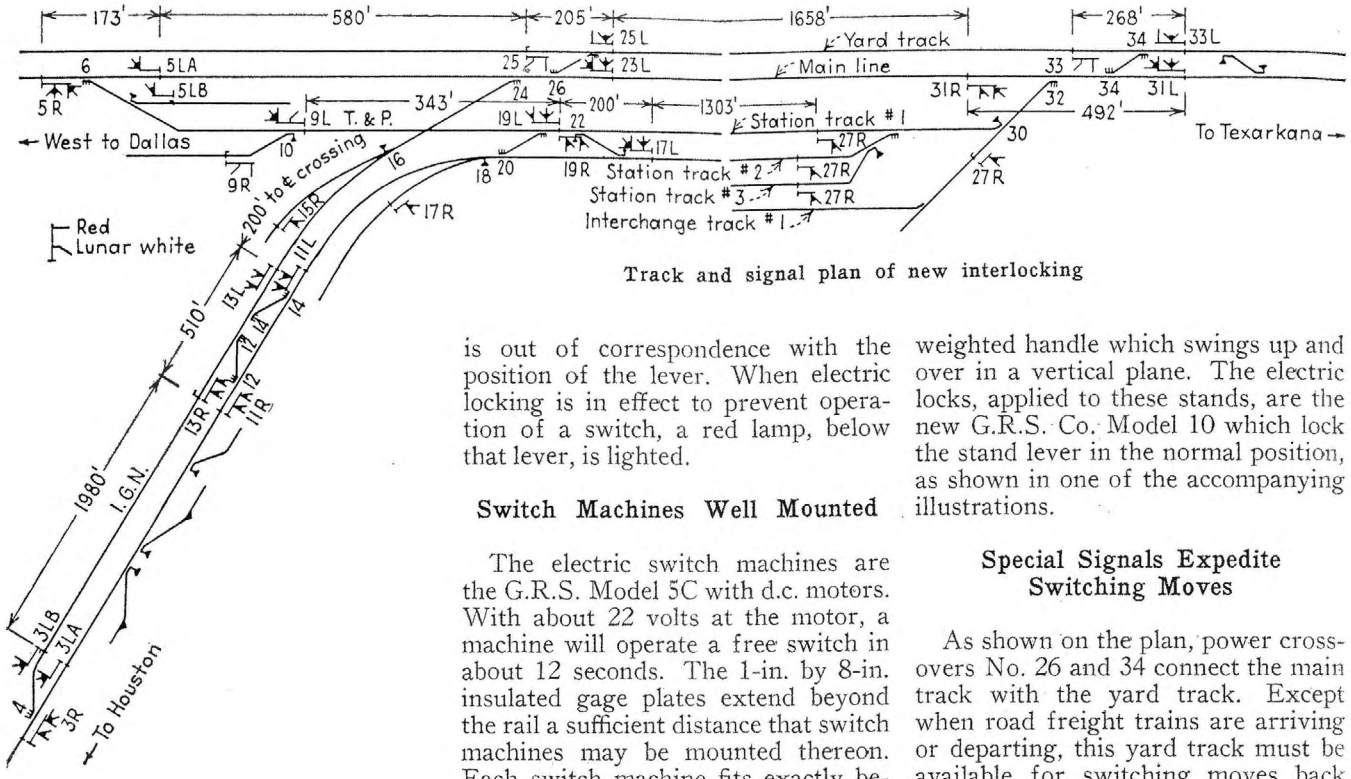
As shown on the plan, the track marked "yard track" extends throughout the interlocking. Beyond the area shown in the plan, this track is connected to the single-track main line with power-operated switches which are also controlled by the leverman at Longview. The new interlocking is within centralized traffic control ter-

ritory, with control machine located at Marshall, 23 miles east of Longview. When trains are to depart in either direction from Longview on the Texas & Pacific, the leverman at Longview cooperates with the man at Marshall.

Power or Hand-Throw as Required

Of importance is the fact that when planning this interlocking, power switch machines or hand-throw stands were applied according to the operating requirements, thus reducing overall costs materially. On the routes used by road trains, power switch machines were installed on five single switches and five crossovers. Where switching moves only are involved, hand-throw switches with electric locks were installed on nine single switches and three crossovers. In addition to lever control of the electric locks, train or switching moves over hand-throw switches are governed by signals.

The interlocking, which extends 3,036 ft. east and west on the Texas & Pacific, and 2,860 ft. south on the I.G.N., is all controlled by one panel-type machine on the operator's desk in the office in the passenger station. The panel of this machine is 18 in. high and 50 in. long. The track diagram includes lamps which are lighted to indicate occupancy of corresponding track sections. The 15 signal levers, as shown in the upper row of the accompanying picture, normally stand on center and are thrown to the right to control eastward signals, or to the left to control westward signals. A green lens, in the face of the barrel of each lever, is lighted when the corresponding signal clears. The switch levers, in the bottom row, are thrown to the right to reverse a corresponding power switch or to release a lock on a hand-throw switch. A white lamp in the face of the barrel of each switch lever is lighted while the switch is out of correspondence with the position of the lever. When electric locking is in effect to prevent operation of a switch, a red lamp, below that lever, is lighted.



Track and signal plan of new interlocking

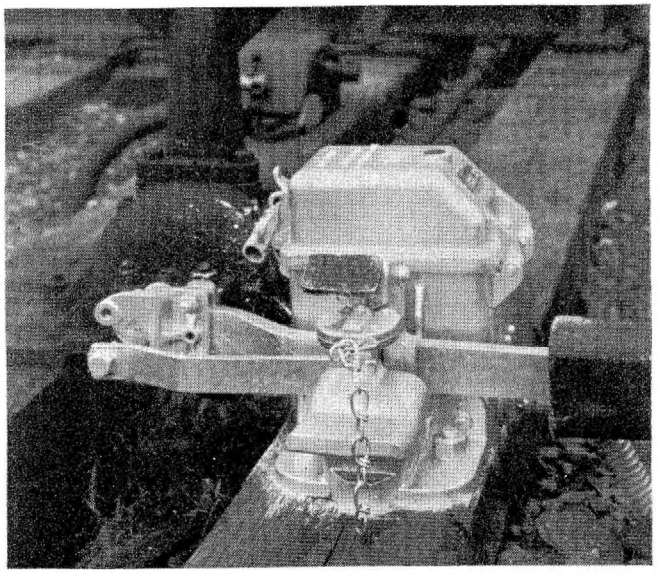
Switch Machines Well Mounted

The electric switch machines are the G.R.S. Model 5C with d.c. motors. With about 22 volts at the motor, a machine will operate a free switch in about 12 seconds. The 1-in. by 8-in. insulated gage plates extend beyond the rail a sufficient distance that switch machines may be mounted thereon. Each switch machine fits exactly between toe blocks which are welded to plates, and lost motion is thus prevented. The ties are dapped and these plates are offset 3 in. which places the base of the switch machine 2 in. below the level of the base of the rail. This permits the use of rods without offsets. Insulated gage plates with Racor adjustable rail braces are used on three ties, with adjustable braces also on the gage side of the rails on the No. 0 tie. These extra "inside" braces prevent "rolling" of the rail.

The Texas & Pacific hand-throw switch stands on this interlocking are the Pettibone-Mulliken hub No. 5 type, operated by a long lever with a weighted handle which swings up and over in a vertical plane. The electric locks, applied to these stands, are the new G.R.S. Co. Model 10 which lock the stand lever in the normal position, as shown in one of the accompanying illustrations.

Special Signals Expedite Switching Moves

As shown on the plan, power crossovers No. 26 and 34 connect the main track with the yard track. Except when road freight trains are arriving or departing, this yard track must be available for switching moves back and forth. A unique arrangement of signals was provided so that such switching moves can be made under

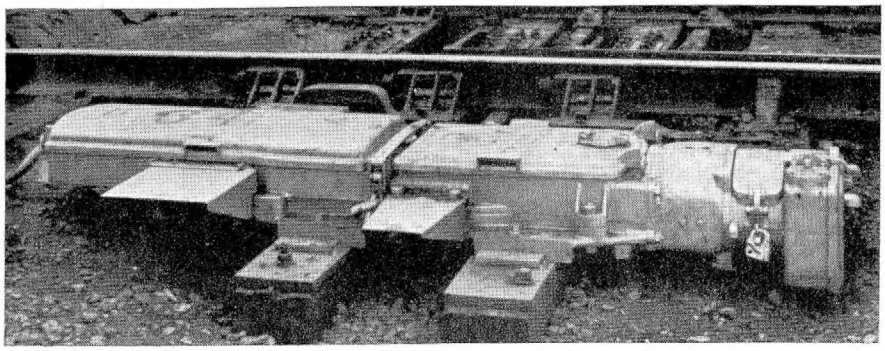


An electric lock was installed on each of the hand-operated switches

View looking east showing dwarf signal 19R which governs over hand-throw crossover for switching

authority of proceed aspects on signals 25 and 25L, and 33 and 33L without bothering the leverman to clear a signal for each move. This, of course, is in effect only when the crossover, over which the signals control, is in the normal position. The aspect, displayed under these circumstances is red-over-lunar-white; Rule—Proceed at restricted speed without stopping, expecting to find route occupied and prepared to stop short of train or obstruction.

As an example of the operation, when the operator wants to reverse crossover 26 to line up for an incoming road train, he throws the lever for crossover 26 which causes the aspect on signals 25 and 25L to change to red, but the crossover does not operate until a time-element relay operates for 1½ min., then the crossover operates, if the track circuit between the two signals is not occupied. Operation of crossover 34 and signals 33 and 33L is identical.



Switch machines fit between blocks welded on tie plates

Also for Hand-Throw Crossover

Crossover No. 22 is used only on rare occasions when making switching moves to set on or take off cars from passenger trains. Or, this crossover may be used rarely if necessary to route an east-and-west Texas & Pacific passenger train through station track No. 2. On account of this crossover being used but seldom, it was equipped with hand-throw stands rather than power switches.

When this crossover is to be used, the operator throws the lever which releases the electric locks on these switches, if other conditions permit. After crossover is reversed, other conditions permitting, signal 17L may be lined to display a red-over-yellow aspect, thus authorizing movement through the crossover. Each of these hand-throw switches has a target which indicates the position of the switch. Because a lamp on a switch stand would be directly in front of and in line with signal 25L, a low color-light "target" is used. This target is made with 5⅜-in. color glasses, faced both directions along the track—the red, which is to the left, is lighted when the switch is reversed, and the yellow which is to the right, is lighted when the switch is normal. The "target" is thus constructed with four separate compartments for four lamps, thus preventing phantom.

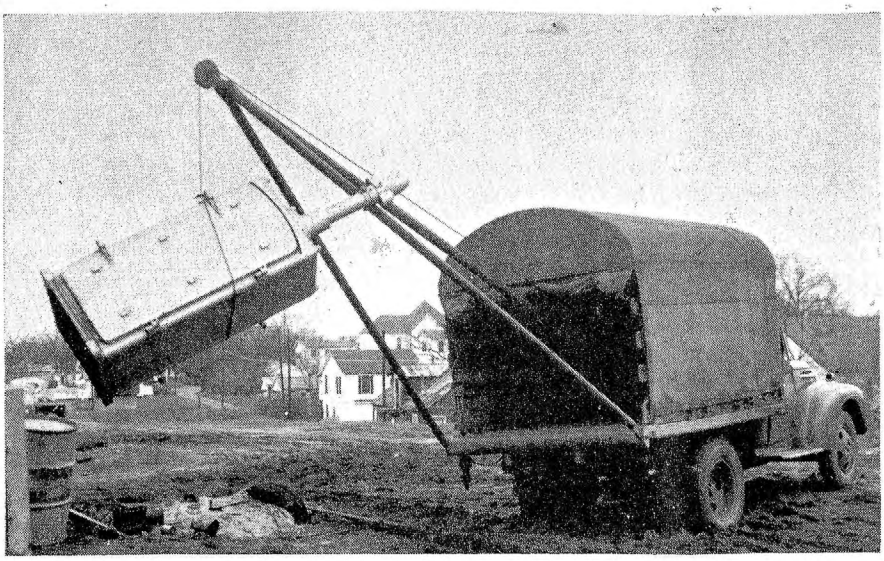
In or Out of a Spur

As shown on the plan, this interlocking includes several dead-end spurs to serve industries, these switches being hand-thrown and equipped with electric locks. For example, switch 10 leads to a spur. Normally signals 9L and 9R display a single red. If a switch engine on station track No. 1 is to enter this spur, the operator throws the lever to send out a control to release the lock on the handthrow switch stand, and after the switch is thrown, signal 9L displays an aspect of red-over-lunar-white. If a switch engine on the spur is to pull out onto the main track, the operator sends out a control to release the electric lock. Then when the trainman throws the switch, signal 9R displays a red-over-lunar-white aspect.

At locations where signals controlling train movements into spur tracks are some distance from the switches, to allow yard engines to proceed on signal indication without the necessity of waiting for a switchman to walk from the signal to the switch and reverse it, the circuits are so arranged that the operator may operate the lock lever to unlock such switch, and then display a red-over-lunar-white aspect on the signal controlling the movement to the switch. The engine may then proceed to the switch, and unlock and operate it to enter spur track. Locks on switches 16, 28 and 30 operate in this manner.

Mostly Aerial Cable

Between the office and the outlying instrument houses, the circuits are in insulated aerial cable with Hazard performance insulation and Hazaprene outer covering. These cables are each attached to a 7-strand ⅜-in. Copperweld messenger with a spiral wrapping of copper strip ¼-in. wide and 1/16-in. thick, with the wraps about 3 in. apart. The cable, with messenger and spiral strip come complete from the factory. At the office, a high steel pole made of old signal masts and base casting was set on the sidewalk at the rear of the building. The cable, from the line taps, runs down through the pipe pole, then under the concrete and up into the building, thus eliminating an open cable drop. The use of aerial cable in connection with this special pipe pole



Truck, with "A" frame and winch, was a big help

eliminated the necessity for using a lot of underground cable, the installation of which would have been very difficult and expensive because of the sidewalks, paved streets, and station platforms. The main runs of aerial cable are 30-conductor, including one No. 6 stranded and 29 No. 14 solid.

Underground cable is used from the instrument houses and cases to the signals and switch machines. The cable for track connections is single-conductor No. 9 stranded. The switch operating circuits are No. 6, and the controls and repeater circuits are No. 9. Wire inside the instrument houses is No. 14 stranded. The insulated wires and cables on this project were furnished by the Okonite Company.

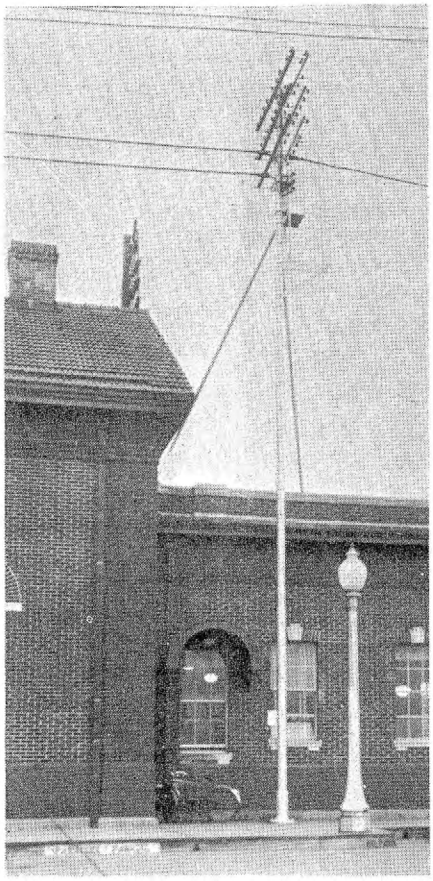
Truck with Winch and A-Frame

The aerial cable was installed by using a chain roller near the top of each pole, and then extending a ⅜-in. flexible steel cable through the rollers to pull in the insulated wire cable as the steel cable was wound up by a power winch on a 1½-ton Ford truck. Using old boiler tubes and special shop-made fittings, the signal crew made an A frame for use on this Ford truck, in connection with the power winch. One of the accompanying pictures show how the A-frame cable and winch can be used to lift an instrument case.

The two side members of the A frame are made of 3-in. boiler tubes about 14 ft. 4 in. long. The center member includes a 3-in. section of boiler tube which slides into a 4-in. section. Sets of matched ½-in. holes, 2-in. apart, are provided for using a through bolt to adjust the length of this member and thereby adjust the working height of the frame. The far end of the center member fits into a base casting which is bolted to a cross member of the bed of the truck. The end fittings, which are welded to the ends of the tubes, are made of ½-in. iron. The sheave on the A frame is 6 in. in diameter.

As a part of the arrangement, a section of 8-in. steel pipe was welded across the rear of the bed of the truck. This section of pipe contains the mountings for the bases of the two side members of the A frame. Also an advantage of this 8-in. pipe is that when the winch is used, without the frame, to pull ties or other objects up into the truck, they slide up over the round surface easily. The winch, which is mounted on the floor in the forward end of the bed of the truck, is connected by special gears to be driven at either of two speeds by the truck engine. This is a Braden winch, rated at 12,000 lb., and the spool has a capacity of 500 ft. of ¼-in. stranded steel cable.

This Ford truck has dual wheels on the rear, so that it can be driven over rails and up and down rather steep banks. Therefore, it was used for many jobs on this Longview project, such as to set switch machines, concrete foundations, instrument cases, signal masts, signal heads and ladders. When digging trenches for underground cable, the winch and steel cable was used to pull a "street" plow to tear up the dirt and thus save a lot of hard digging with a pick. This practice eliminates hard work and gets the trenches dug in about half the time previously required.



High pole made of signal mast

Power Supply

This plant operates on d.c. from storage batteries which are on floating charge from rectifiers. Each group of switch machines is operated by a set of 22 cells of A8H-battery. Each signal battery includes seven A4H cells, and each track circuit is fed by one B4H cell. These are Edison batteries.

On this plant, all the relays in the control office and at the field locations are the modern quick-detachable plug-in type. At the principal outlying locations, the relays and batteries are in concrete houses. A special telephone circuit, with phones at each instrument house and other locations, as well as on the control machine, extends throughout the entire plant. In each concrete instrument house, the telephone is mounted in a small sheet-metal box. Trainmen have access to the phone by unlocking and opening a small steel door in the front wall of the house. The maintainer, working inside the house, has access to the phone by removing a hasp and pulling the box around on hinges at one edge. Thus, one phone, at each location, serves all parties.

This interlocking was planned and installed by signal forces of the Texas & Pacific, under the jurisdiction of J. L. Weatherby, signal engineer. M. T. Belvin, general inspector, supervised the installation, and R. L. Thomas was foreman of the construction crew. The major items of interlocking equipment were furnished by the General Railway Signal Company.