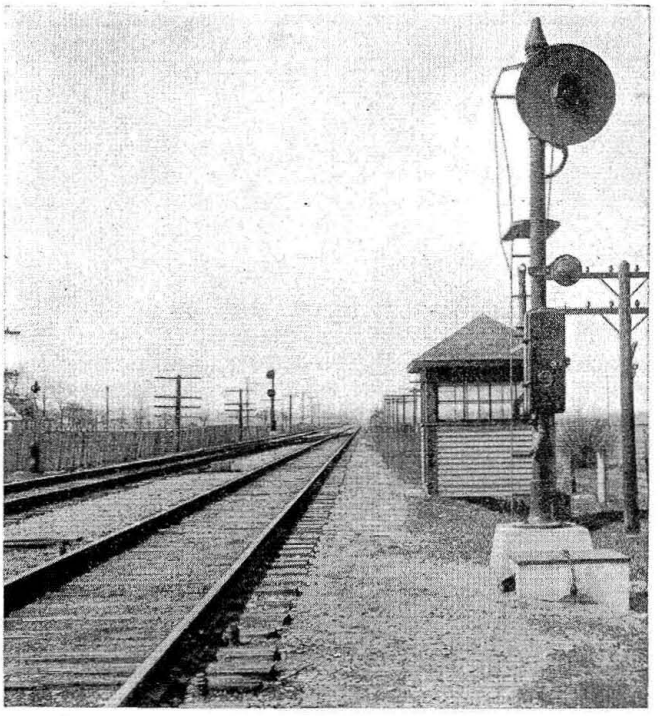
Remote Control on Soo Line

End-of-double-track interlockings, remotely controlled from a central point, permit converting a 2.5-mile section of double track to single track around a busy freight yard . . . "Pronouncer" annunciation and superimposed circuits are technical features . . .



View of signals and switches at one of the two similar junctions

REMOTE CONTROL of the power switch and related signals at each end of the 2½-mile section of single track on the otherwise double-track main line of the Minneapolis, St. Paul & Sault Sainte Marie, at Schiller Park, Ill., has aided materially in the economical solution of an important problem in train operation. Spring switches, also, aid in expediting freight-train moves out of the adjacent freight yard and onto the double track. Of importance from a design standpoint is the use of one of the control wires for seven functions. Other economy features contributed to reduce materially the cost of this installation as compared with others of its kind.

At Schiller Park the Soo Line operates a flat-switching classification yard of 33 tracks. Prior to 1928, the non-signaled double-track main line ran through the middle of this yard, virtually splitting the freight yard into two separate sections. Obviously, this was undesirable, and for a long time consideration was given to various proposed plans for overcoming this condition, but the opportunity did not arise until 1928, when the railroad, at the insistence of the village and county authorities, initiated a grade-separation project at Lawrence avenue and at Irving Park boulevard.

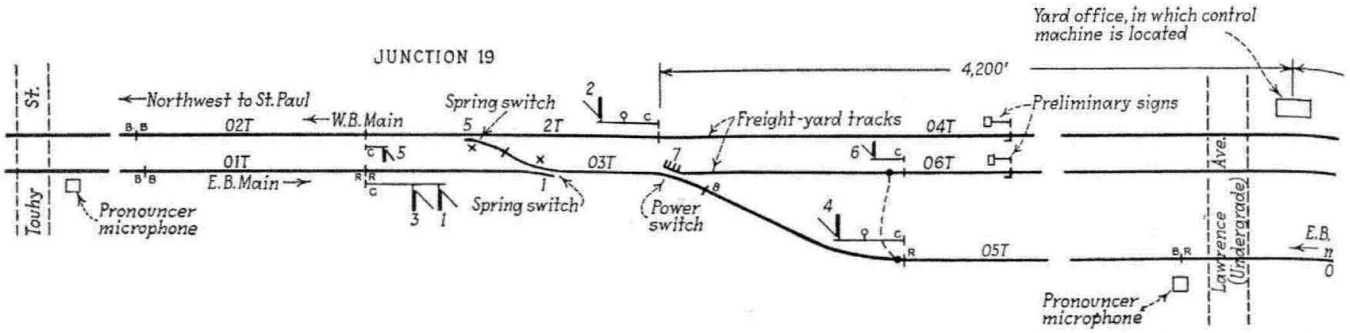
This project, which was completed in March, 1929, involved the revision of the grade and trackage throughout the entire length of the yard, as well as other major changes, including the removal of the depot-and-yard-office building from Irving Park boulevard to Lawrence avenue. As a part of all these changes the main line was established on the west side of the freight yard, so as to be, in effect, entirely separate from the yard. Because of a lack of space for tracks—which in turn was due to the expense of raising the grade—and because modern developments in automatic interlocking made the plan feasible and attractive, the main line was converted at this time from double to single track throughout its length along the freight yard, which is approximately 12,500 ft.

In order to minimize or eliminate train delays that would otherwise have been caused by this single-track section, spring switches were at this time installed at switches *1*, *5* and *7*, at Junction 19, and at switches *7* and *10* at Junction 16, (Switch *8* remained of the hand-throw type), and, with the exception of one Union searchlight signal, the General Railway Signal Company's Type-S signals were installed, exactly as shown in the diagram of the present layout, the circuits being similar to those found in a gauntlet automatic interlocking, that is, the first train to approach the single-track section received automatically, through track-circuit control, a clear signal to proceed through the single-track section, provided of course that the switches were properly alined, that the conflicting signals at both junctions were at Stop, and that other conditions permitted. Of course, under this system it was frequently necessary for trains entering or leaving the yard to stop at one or more of the switches. For example, approximately 6,000 train stops were made annually at the hand-throw switch (No. 8) alone, the latter switch having been, of necessity, set normally for movements to and from the single-track main line.

These delays proved to be undesirable and costly, and therefore in March, 1930, the railroad converted Junction 19 to a remote-control layout, and in November, 1932, converted Junction 16 to a similar, although separate, installation, both, however, controlled by the telegraph operator in the 24-hour telegraph office in the yard-office building at Lawrence avenue, which is approximately 4,200 ft. south of the power switch at Junction 19 and 8,300 ft. north of the power switch at Junction 16.

In changing Junction 19 from automatic to remote-control operation, the spring switch at *7* was removed and a G. R. S. Model-5B 20-volt switch machine, equipped with a lock rod and a point detector, was installed in its place. A G. R. S. one-lever table interlocker was installed as the control medium at Lawrence avenue, to control this switch. The signals were left in the same locations they occupied formerly, and even the circuits were allowed to remain essentially, although not exactly, the same as they were under the automatic operation.

In changing Junction 16 from automatic to remote-control operation, a G. R. S. Model-5 110-volt switch machine, which had formerly been in service in an elec-

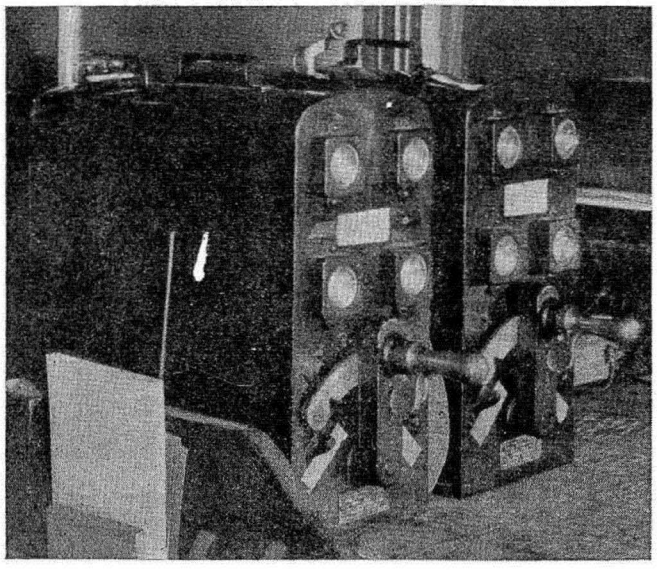


Track-and-signal diagram of the

tric interlocking plant at another point on the Soo Line, was installed at switch *8*, in place of the hand-throw mechanism formerly employed there, and another one-lever table interlocker was installed beside the unit which controls Junction 19, to control switch *8*. As at Junction 19, the signals were left in the same location they formerly occupied, and the circuits remained essentially, although not exactly, the same. All of the signals are approach-lighted.

Spring Switches Used

Spring switches were installed at the points mentioned, and were allowed to remain there when the changeover to remote control was made, because in normal operation it is not necessary to reverse these switches. At Junction 16, for example, the only moves that could require a train to stop and reverse one of the spring switches would be that of a train heading out of the yard, past signal *9*, and moving through the crossover to the westward main, against the current of traffic; and that of a



The control machine is of the table-lever type

westbound train entering the yard through switch *7*. Since these moves are rare, the use of spring switches is not only entirely logical, but also very economical.

As stated above, the control machine comprises two table-interlocker units which, although mounted side by side, as shown in the illustration, are completely separate, both electrically and mechanically. One controls power switch *7* at Junction 19 and the other controls power switch *8* at Junction 16. The levers operate to three positions: Left (L), center (C) or normal, and right (R).

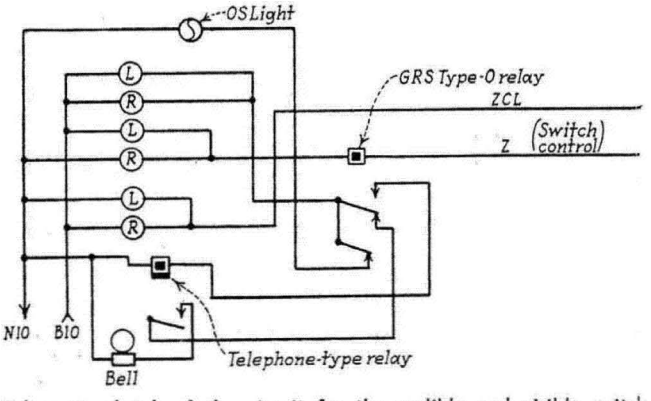
The desired signal clears automatically on the approach of a train, provided that the table-interlocker switch lever is in either the *L* or the *R* position, depending upon which position the switch should occupy for that particular move. If, however, the switch lever is left in the center position, the signal cannot clear even though the power switch is properly alined and locked and other conditions are suitable for the move.

Standard code rules, time-table instructions, and a 25-m.p.h. speed restriction, govern train operation through the two junctions. Train orders are not required for moves through the single-track section, signal indications being the supplanting authority, as in centralized traffic control. The signals are of the absolute type, the high signals being designated as such by a red rounde mounted on the mast, as shown in the photographic illustrations.

If a train is stopped by a signal, one of the trainmen must telephone the operator at the yard office, to determine why the train is being held. If it develops that the stop was caused by a signal failure, the trainman must put the selector lever of the dual-control switch machine in the "Hand-Throw" position to insure against the possibility that the signal was at Stop because of improper functioning of the switch or improper adjustment of the points. A train that has been stopped by a signal must proceed through the affected switches and block under flag protection.

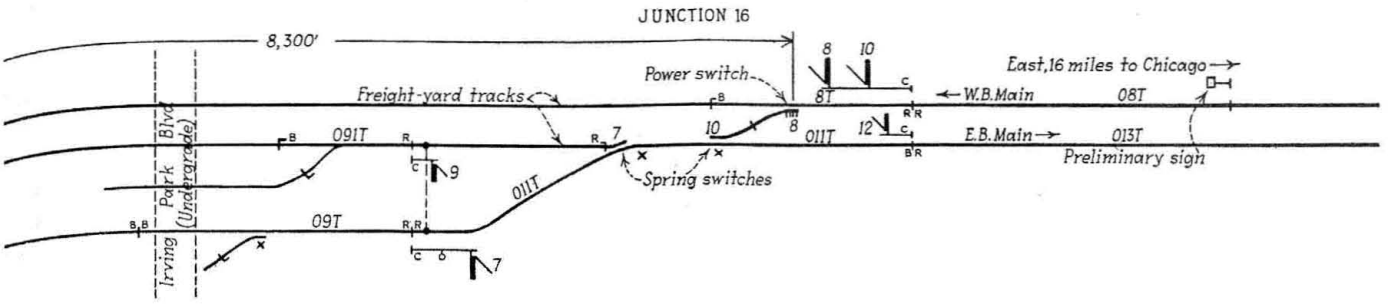
Annunciator and OSing System

Adequate approach and OS annunciation for the operator is provided by the indication lights in the table interlockers. All four of the lights in the Junction-19 unit are used. One of the lights is displayed whenever a train is on the main line between Lawrence avenue and Junction 16; another is displayed when a westbound



Schematic sketch of the circuit for the audible and visible switch indication system

train is approaching signal *4;* another when an eastbound train is approaching signals *1* and *3;* and the fourth, and OS light, is displayed when a train is occupying the track



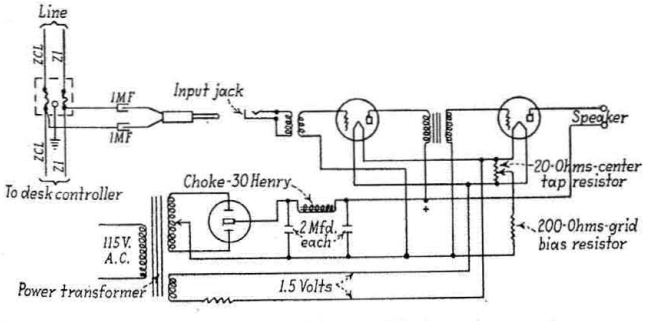
volved in both remote control layouts

circuit in which switches *1* and *7* are located, or when power switch *7* is in transit.

Two of the four lights on the Junction 16 unit are used. One announces a westbound train approaching signals *8* and *10;* and the other, an OS light, indicates the presence of a train on the track circuit in which switch *8* is located.

"Pronouncer" System

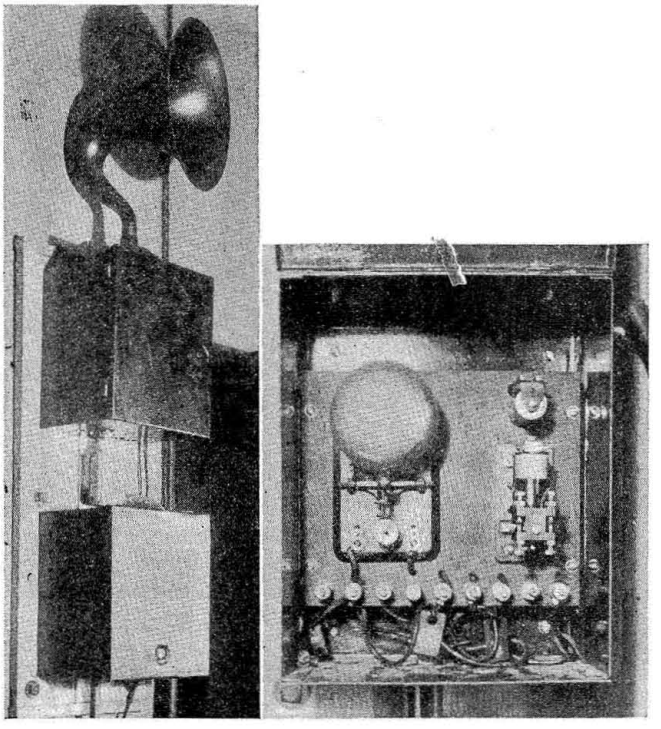
In addition to these visual annunciators, an audible indication system, called a "pronouncer," has been installed. In effect, this consists of a loud speaker in the control office, and a Western Electric Type-232W telephone microphone located at a selected point on the line, the latter being superimposed—automatically on the approach of a train—upon the switch control circuit, in order to transmit to the loud speaker the sound of the approaching and passing train. In this installation two such microphones are used. One is located in a wooden relay case at Touhy avenue, approximately 2¼ miles north of Junction 19, and the other in a similar housing at Lawrence avenue, across the yard from the control office. Enginemen of southbound trains passing the latter point are instructed to sound their whistle, provided that their train is complete and intact, thus indicating to the operator at the control point that the train has cleared the block next in advance of Junction 19.



Power pack and two-stage amplifier for loud-speaker used in tower as part of the "pronouncer" OS-and-switch-indication system, which is superimposed on the switch-and-signal control circuit

When a southbound train approaches Touhy avenue, the microphone at that point, the circuit for which is selected through a back contact on the track relay, is automatically superimposed upon the switch-control circuit, and, when the engineman whistles for the crossing, the sound of the whistle, as well as the sound of the train itself, is transmitted to the loud speaker in the control room, thus giving the operator an audible approach and passing indication in addition to the visible indication provided by the light in the table interlocker.

Considered collectively, these microphones are an important part of the OSing and approach-annunciation system. However, this is not their only function. The microphone at Junction 19 is used also as a means of transmitting information regarding the movement of the power-switch point, this information being additional to



Left—Loud-speaker used in the "pronouncing" system and, below it, the cabinets in which the switch annunciating relays and bells are mounted . . . Right—Interior of one of the cabinets

the visible OS-light indication. A buzzer is connected so that whenever the WP, or switch-repeating, relay is de-energized—which it is whenever the switch is in transit—the buzzer is automatically connected to the primary of a telephone repeating coil whose secondary is superimposed on the switch control, or *Z,* wire and common. Thus, whenever this switch is in transit the operator "hears" the switch moving.

In addition to this "in-transit" indication for switch *7,* bell indicators are provided for both switches to inform the operator of the beginning and of the completion of the movement of either switch. The equipment used for this purpose is mounted in the two metal cabinets shown under the loud-speaker in the illustration. The interior of one of these cabinets is illustrated. At the left in this view is shown a bell, supplied by the General Railway Signal Company, which gives a single-stroke sound when the switch points unlock and does so again when the switch is over and locked. The large relay at

the right in this illustration, a G. R. S. Type-O relay, in combination with the slow-release telephone type relay shown above it, is the medium through which the bell and OS light are controlled, this Type-O relay being in series with the switch-control relay.

It is interesting at this point to review the multiplicity of functions performed by the two wires (one of which is common) over which the *Z*, or control, circuit for switch *7* is carried. In addition to their primary purpose—i.e., the control of the switch-operating relay—these two wires have the following functions superimposed upon themselves: Visual indication of the movement of the switch, audible indication—both by bell and by buzzer—of the movement and locking of the switch, approach annunciation through the pronouncer, audible and visual OSing of trains, and control over the signals, the latter being an indirect function.

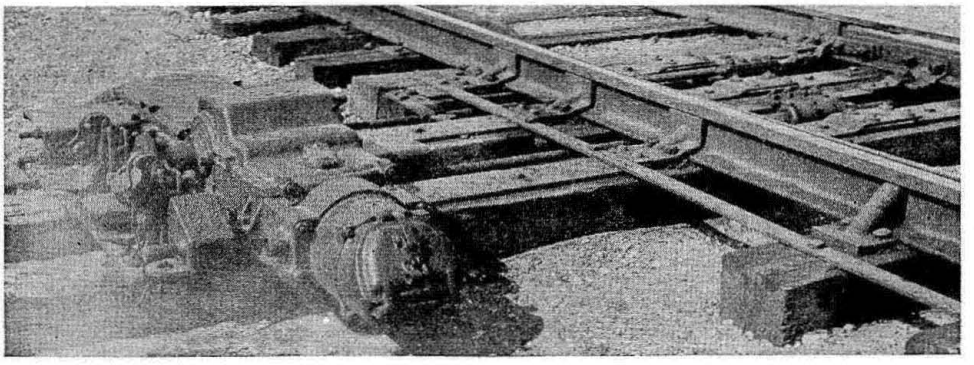
The installation at Junction 16 is unique in that, although this is a low-voltage plant, it embodies a high-voltage switch machine. This is a G. R. S. Model-5 110-volt 4-sec. movement, which, as stated in a foregoing paragraph, was formerly used in an electric interlocking plant at another point on this road and was adapted to this installation to reduce installation costs. This layout, besides comprising a unit-type dual-control selector, is novel also in that over-and-locked protection is provided without the use of a point detector. This is accomplished by means of two switch-circuit-controllers, one of which is attached to the point of the switch and the other to the cam bar of the switch machine.

Fifty-five cells of Exide Type-LX (radio type) 35-a.h. portable battery are used for the operation of this high-voltage machine, the battery being on a-c. floating charge through a G. R. S. Type-BT Size-432 copper-oxide rectifier, rated at 120 volts, 0.30 amp. The battery for the 20-volt machine at Junction 19 consists of 10 cells of Exide Type KXCS-5 battery, also on a-c. floating charge.

All of the spring switches were purchased from the Pettibone-Mulliken Company and all except one are of the older type, in which the spring is in the head rod, and which has a separate buffer cylinder. The exception is a "Mechanical Switchman," the latest type manufactured by the Pettibone-Mulliken Company. This type has two springs, which are under compression and opposed to each other, and which are mounted within the buffer cylinder, from which a piston rod extends and is connected to the head rod, thus making it possible to trail through the switch regardless of the position occupied by the points—a feature which does not obtain where the separate buffer cylinder is used. Each spring-switch layout includes a switch-circuit-controller, and a switch stand on which an oil lamp and spring switch marker are mounted. The lamp displays the colors red and lunar white. The marker is a yellow sheet-meta banner on which a black "S" is painted.

Miscellaneous Details

An interesting detail is found in the fact that all o the storage batteries are of the portable type, which typ of battery is used on this road for most signaling pur poses. Among the reasons given for using this type o battery are: Installation costs are less than for the sta tionary type. The battery may be placed in well-venti lated instrument shelters without danger of corrosiv effects, in battery boxes with primary cells, and in re cesses of signal foundations, thus eliminating the use o separate housings. The battery is convenient to handle permits shipment in baggage cars, and can be handle



The Model-5B switch-machine layou at Junction 19

readily by the maintainers on a motor car. In emergenc the battery can be temporarily replaced by rental batte ies from a garage. The wooden boxes containing t cells provide an insulation which, in the winter, is r sponsible for retaining the heat which results from t floating charge, and which, in the summer, keeps the ce cooler than they would otherwise be, thus probably mai taining a more uniform and constant capacity. In t operation of these batteries, it is found that less flushi is necessary. By observing the specific gravity and vo age of these cells, as well as the periods of flushing, t condition of the cells is determined and, as the occasi may require, the battery is sent to the battery shop Shoreham shops, Minneapolis—where a very compl facility is maintained for car-lighting and other stora battery maintenance—for replacement of the elements for other repairs. Exide batteries are used through Five KXCS-5 cells, on a-c. floating charge through Union Type-RT copper-oxide rectifier, comprise the b tery used at the control point. KXCS-5 cells, on a floating charge through G. R. S. copper-oxide rectifie are used also at the junction points for signal lightin control circuits, etc.

The relays are the G. R. S. Company's Type K a Type 9E. Copperweld ground rods, ground-rod conn tions, and line wire, are used. Underground cable used to the exclusion of wood trunking, a field-ma pothead being used for the bootleg connection to the ra This consists of a 2-ft. piece of 1½ in. pipe at the t of which is a "T" fitting. A wooden plug is screw into one opening of this "T" fitting and the wires carried through this plug to the rail. The pipe is fil with a rust preventive compound.

The control equipment, batteries, etc., at each juncti are housed in a Massey octagonal concrete house whi was formerly used as a watchman's shelter at a highw crossing where flagmen were replaced by automatic pr tection.