View looking north on northward driveway of the Heights boulevard showing gate at right and second flashing-light signal at the left of this pavement

Special Gate Circuits in Houston

Time cut outs and special short-rail track circuit arrangement provides automatic restart and back-out clearing of gates at the crossings where switching moves are involved

An interesting arrangement of automatic control circuits has been included in a project of crossing protection in Houston, Tex., by the Southern Pacific Lines in Texas and Louisiana. This project includes electric gates and flashing-light signals at two crossings, Harvard street and Heights boulevard, approximately 400 ft. apart, and about 2 mi. northwest of the passenger station in Houston. These crossings are on the main line, over which traffic is routed to and from Dallas, Ft. Worth, Waco, Austin, San Antonio, El Paso, Corpus Christi and Brownsville.

As shown in the accompanying sketch, these crossings include a double-track main line. At Harvard street, there is also an industry spur and two tracks leading to the west end of a yard. The crossing at Heights boulevard includes the two main tracks and one industry spur. The daily traffic over these crossings include 20 passenger trains, an average of 25 through freight trains and approximately 100 switching moves.

In order to avoid congestion through the main business section of Houston, freight trains are routed via a belt line which connects with the main line at spring switch SS2, east of Harvard street, and spring switch SS1, east of Heights boulevard. The two spring switches, the power-operated crossover and the nine home signals, as shown, constitute an interlocking which is remotely controlled from Eureka interlocking station, 2.5 mi. northwest of the Heights boulevard crossing.

The crossing at Harvard street consists of a paved roadway 20 ft. wide. At Heights boulevard there are two paved roadways, each 30 ft. wide, separated by a parkway 60 ft. wide. Previously the crossing at Heights boulevard was protected by mechanically-operated gates, controlled by a man at the crossing. This man also controlled electrically-operated gates at the Harvard street crossing.

Fast Operation of Gates

As shown in the accompanying picture, there is a gate combined with flashing-light signals for each roadway at Heights boulevard. Street traffic moves east on the south roadway and west on the north roadway, the gates being located on the near side of tracks as viewed from approaching vehicles. Each gate arm is of sufficient length to span the roadway. In addition to the flashing-light signal on the gate mast at the right of each roadway, there is also a second flashing-light signal at the left of each roadway. At Harvard street the gates and flashing-light signals are at the right of the roadway, the gate arms extending to center of the roadway. The four gates are the Model-10, furnished by the Western Railroad Supply Company.

On account of the numerous switching moves in this area, and because unnecessary delays to street traffic must be held to a minimum, the gates were arranged to operate quickly. As an aid in this respect, the gates were ordered for 75-deg. operation rather than for 90-deg. This is a factor in

reducing the clearing time to only 5 sec. When operation of the protection is initiated by the approach of a train, the flashing-light signals and the lamps on the gate arms are operated for 3 sec. before the gate arms are released, and then the gate arms descend to the lowered position in 10 sec. When the rear of a train clears the crossing, the gate arms are raised in 5 sec.

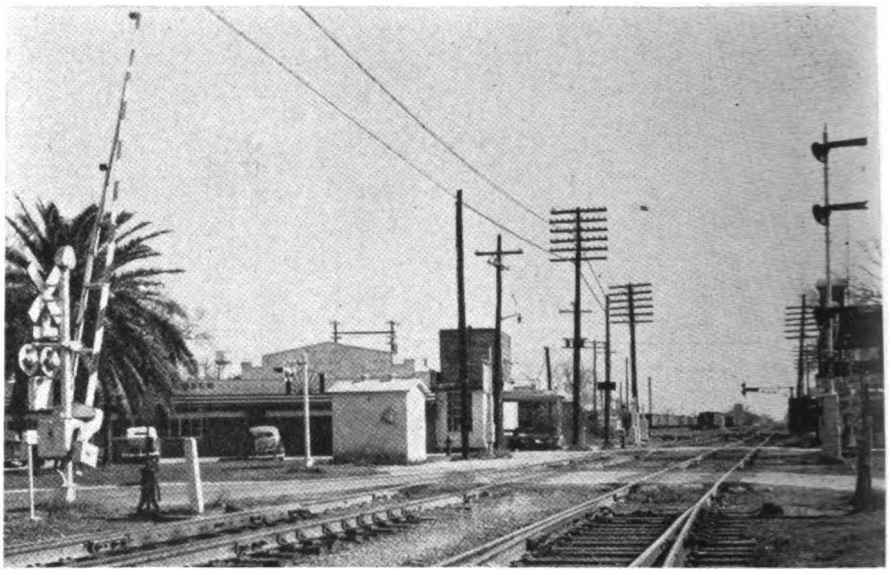
Special Requirements

Due to the mixed nature of the traffic, the control points for operation of the gates are located at various distances from the crossings, those for passenger and freight-train movements being further away than those solely for switching movements. Due to the many routes leading to the crossings, numerous control points were necessary, the design of which permits considerable flexibility in operating the gates with the least delay.

One feature of the circuits is that the crossing protection will not operate with a train traversing a control point unless the interlocking signal is clear for the train to proceed over the crossing. For example, eastbound freight trains are routed over the crossover reversed and spring switch SS2 to the eastward freight track. Therefore, if an eastward freight train is approaching when a westbound passenger train is due, the freight train is held at home signal No. 2, and it stops west of Heights boulevard. In such an instance, this freight train will not cause the crossing protection to operate until signal No. 2 is cleared for it to proceed. A corresponding explanation applies with respect to other trains traversing control points in approach of other home signals in the Stop position.

Timing Relays

The control points are so located that, for trains operating at normal speed, the engine will be on the crossing before the time relay, set into operation by the approaching train, has performed its function to raise the gates. The timing relay begins to operate after the last car has passed over a control point. Thus a switch engine without cars on the eastward main track lowers the gates when control point "C" is traversed, but if due to its slow speed, the timing relay functions to raise the gates before the crossing is reached, the gates are then again lowered when control point "D" near the crossing is traversed. For westbound main-track movements, this is accomplished in a different manner. The gates are lowered when control point "H" is traversed, and, if the timing relay raises the gates before the crossing is reached, they are again lowered when track circuit 1XT is occupied if signal 3LA indicated proceed. The timing relays are adjusted for 1 min. 4 sec.



View looking east along tracks across Heights boulevard

Conventional track circuits for approach circuits could not be used because their occupancy when no hazard existed, such as slow movements or trains and switching which had come to a stop or backed up after stopping, would cause serious interference with the flow of street traffic. To overcome these objectionable features, 16 control points each consisting of a special track-circuit arrangement were installed. These consist of two abutting track circuits, each 11 ft. long with relays normally on open circuit connected thereto. The relays are ordinary 4-ohm track relays with the coils connected in multiple. The contral points are designed for movements in one and two directions. Control points "C", "K", "D" (two in multiple), "G", "H", "P", "O" and "N" (three in multiple) are one directional, while "E", "F", "J", "L" and "M" are two directional. The typical circuit for one-directional control is shown in Fig. 2, and the circuit for two-directional control is shown in Fig. 3.

Action of Control Points

The action of the control points is as follows: For westward movements on the westward main track, for example, when control point "H" is reached, the "a" relay picks up momentarily to drop quick-releasing stick relay 1XAS, which in turn opens the circuit to HEG to open the hold-clear slot of the gate mechanisms, and after a short delay during which gate lamps and flashers operate, the gates

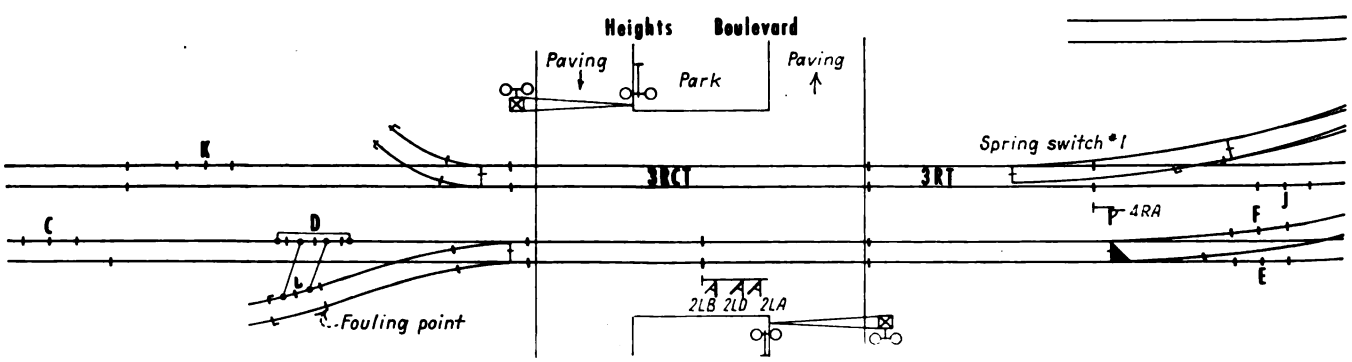
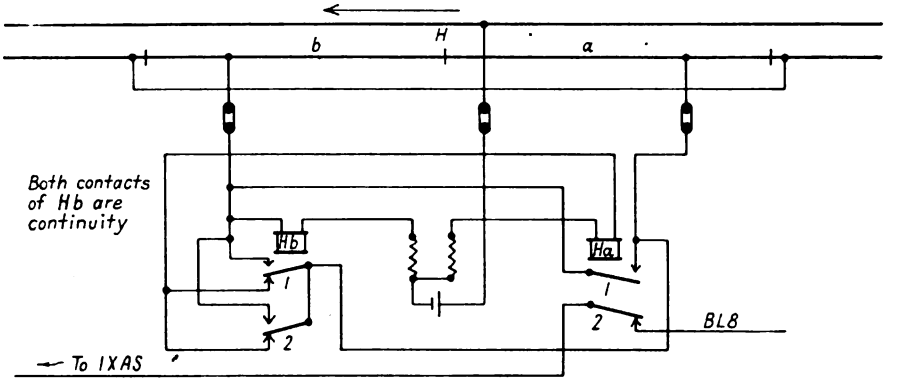


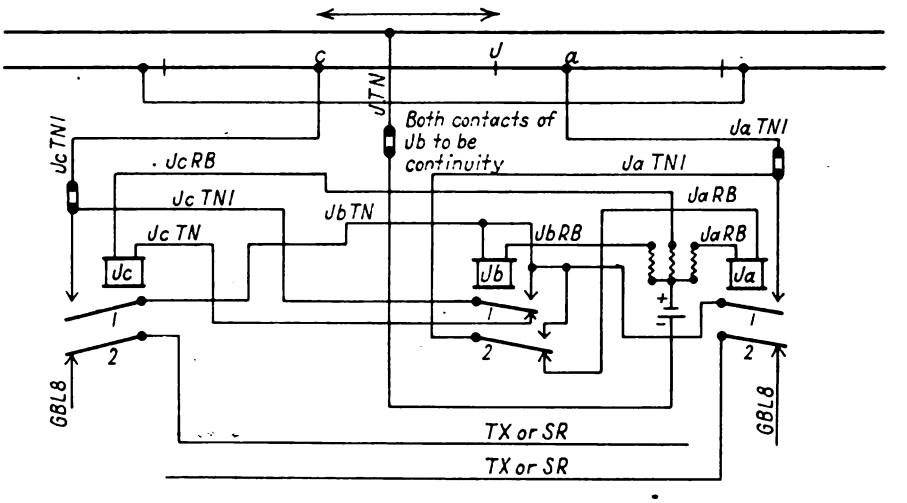
Fig. 1—Track and signal plan showing locations of special track circuits controls to permit

lower by gravity. The circuit to 1XAS is also wired through the "a" relays of control points "F" and "J" to drop it for movements in opposite direction. If the train stops while on control point "H", the timing relay HTE operates and the gates raise after 1 min. 4 sec. If the train now backs up to go away from the crossing, the gates remain up because the "a" relay cannot pick up for the reverse movement. If, after having stopped on "H" and the train again moves toward crossing, the gates again lower when the "a" circuit is occupied after the "a" and "b" circuits have been wholly included by inner axles of the first car moving over "H". If signal 3LA had indicated Stop, control point "H" would have been by-passed by NP, which repeats the Stop indication of this signal, and 1XAS would then have dropped when track circuit 1XT was entered on the clearing of 3LA. When "H" was traversed, it also dropped H3RCTX which in turn dropped stick relay 3RCS to open the circuit to BEG to lower the gates at Heights boulevard.



Above—Fig. 2—Circuit diagram of special control circuit for single-direction operation

Below—Fig. 3—Circuit for two-directional control



Two-Directional Operation

The circuit of control points for two-directional operation, as shown in Fig. 3, are similar to that for one-directional control, as shown in Fig. 2, except that a third track relay is required which is interdependent on the entering relays "a" and "c". For eastward switching movements, the Harvard street gates are lowered when an "a" circuit of control points "E", "F", "J", "L" or "M" is entered. For westward switching movements, the Heights boulevard gates are lowered when a "c" circuit of the same control points is entered.

When the gates are lowered by a switching movement, with or without cars, and such movement is reversed before the crossing is reached, the gates will remain down until raised by action of the timing relay. Since such a movement entails no hazard, a circuit is provided to raise the gates when the first car or engine without cars traverses a control point in the reverse direction. Such circuits are provided where there is a preponderance of switching movements. They

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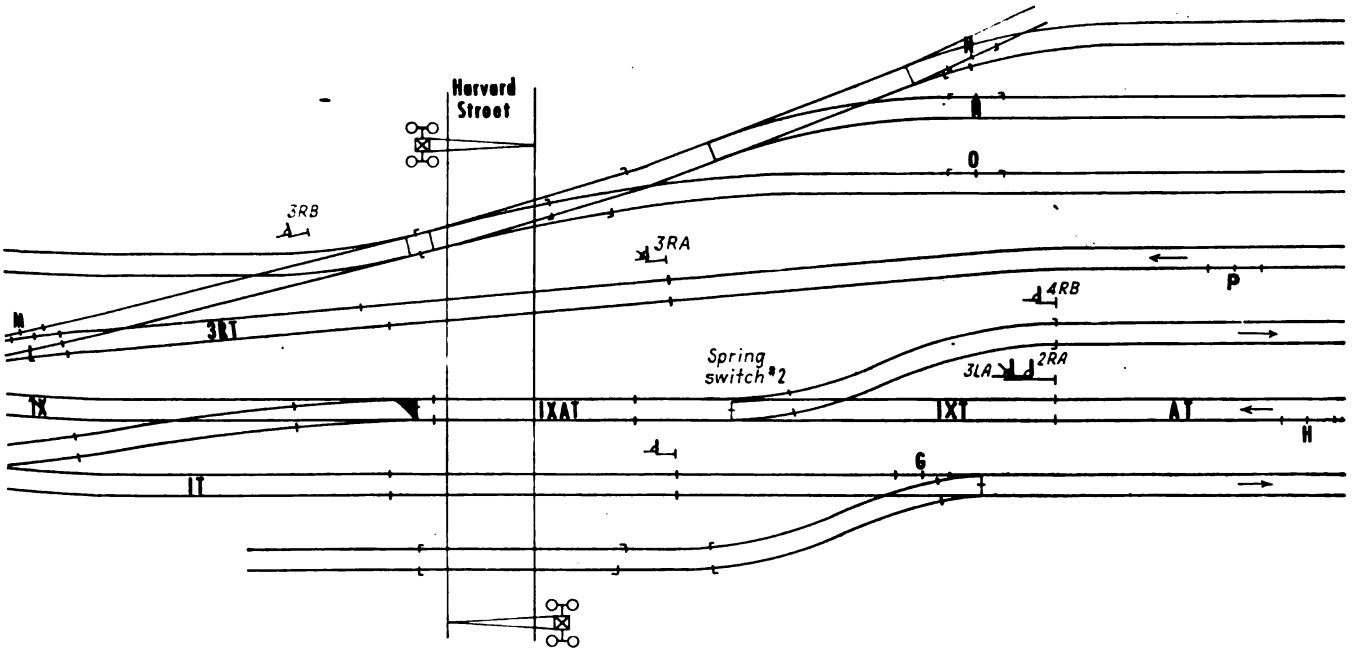

cut outs and restarts of the operation of gates and flasher light signals at Heights boulevard

voice recording in his earphones. As applying to a train being made up for departure, he arranges the waybills and cards used in the teletype system for transmitting the outbound consist in train-check order in accordance with the recording. The transcriber has a foot-pedal control which permits the clerk to stop the "play back" or to reset the transcriber to repeat, either a portion or all of, the disk.

Numerous Advantages

One of the principal advantages of the new voice-recording system is that the yard clerk's check is thus available at terminal headquarters as soon as the last car of the drag has passed the grabber. This eliminates the time formerly required to send the check by tube or messenger to terminal headquarters. According to the New Haven, this minimizes one of the sources of delay to outbound trains.

Another advantage of the new practice is the increased accuracy. With the previous handwritten method, time was available to write down only the car number, not the initial, and legibility of the writing, particularly during rainy or cold weather, was impaired. With the voice-recording system, time is available to give the initial as well as the number, and, furthermore, it is now practicable to thus make a record of main-line trains moving at yard speed via the loop track directly to the departure yard. These checks are thus available in the office before the train arrives in the departure yard.

In order to allow the clerk an opportunity to remove disks from the Soundscriber and install new ones, the "number grabber" signals the office when the last car of a train or drag has passed. This signaling is accomplished by the "number grabber" turning a crank on a 20-cycle ringer, the output of which is connected to the line circuit. At the office, this energizes a relay which causes a buzzer to sound continuously to attract the attention of the clerks in the office. Then new disks are placed on the Soundscriber recorder for succeeding recordings. After the recording on one side of a disk has been played back to serve the immediate purpose, that same disk is returned to the Soundscriber to use the other side, and when both sides are "filled", the disk is retained as a permanent record.

For this new voice-recording service, a pair of wires is used between the grabber's location and the yard office. Coils were installed at each end to set up a simplex circuit which is used for starting and stopping the Soundscriber, by control of the push-to-talk button on the grabber's handset. The Soundscriber machine is electrically operated from the 110-volt a.c. commercial supply in the office. The only other power supply required is a set of three dry cells talking battery for the operation of the grabber's telephone transmitter.

The operation of this voice-recorder number-grabbing system was planned by J. L. Barngrove, Jr., assistant to general manager, and W. A. Moore, general superintendent of electric transmission and communication, the voice-recording and playback machines being furnished by the Soundscriber Corporation, New Haven, Conn., and installed by New Haven forces under the direction of G. N. Loomis, communication engineer.

Special Gate Circuits

(*Continued from page* 355)

apply to control point "N", three of which are connected in multiple, for Harvard street and "M" for Heights boulevard.

For operating the gates in case of failure of the automatic controls, a special circuit was installed at each crossing which by-passes the automatic controls to permit manual operation until automatic control can be reestablished. In this circuit is a double-pole, double-throw switch normally disconnected from the automatic controls, when reversed controls the gates manually. At Heights boulevard, the instrument house door must be open to operate a door-operated switch to feed battery for the manual control. A red light is also lighted as a further reminder that the gates are not on automatic control.

In rare instances an engine or cars stop just short of a crossing, and the gates have raised due to operation of a timing relay. To protect a crossing for a continuation of such a movement, key-control stations are provided. These house a normally-closed controller which, when opened by a turn of switch key, drops a relay to lower the gates. The gates are held down when such movements occupy the crossing track circuit. There are five such control stations, two at Harvard street and three at Heights boulevard.

This project was planned and installed by the signal department forces of the railroad.

Rock Island C.T.C.

(*Continued from page* 347)

covering. These wires are on the 1st and 2nd pins on the lower arm of the previously existing communications pole line. In siding limits, the 110-volt, a.c. power is extended from the passenger station to the instrument houses at both switches on a line circuit consisting of two No. 6 hard-drawn weatherproof copper wires. The three line wires for local line controls in siding limits are No. 10 hard-drawn bare 40 per cent Copperweld.

Between each instrument house and the switch machine, there are two buried cables, one of which is a six-conductor No. 14 and the other a six-conductor No. 9. To each high signal there are an eight-conductor No. 14 for controls and indication circuits and a two-conductor No. 9 for the lamp circuit. A six-conductor No. 14 cable runs to each dwarf signal. These buried cables terminate on terminals in a box at the base of the mast and from there single conductors extend up inside the mast and out through a flexible metal conduit to the signal. The track leads are No. 9 single-conductor buried cable. All cables connecting to the pole line are underground.

This centralized traffic control was planned and installed by signal department forces of the Rock Island, the principal items of signal equipment being furnished by the Union Switch & Signal Company. The instrument houses and all cases were wired in a shop in Chicago, and were shipped in car loads to construction headquarters. By means of a power derrick the concrete houses were set in place at their final locations. A Fairmont hand derrick on a motor-car trailer, pulled by a gang-type motor car, was used in the remainder of the field work to: (1) Set the precast sectional concrete foundations for signals and instrument cases; and (2) erect the signal masts with ladders attached, and to set the sheet-metal instrument cases. Construction work was started at Caldwell, the center of the project, by two crews consisting of an average of 16 men per crew, one working north and one south. Each crew handled all classes of work except the wiring of cases and houses which was done at a central point. As the sections between controlled sidings were completed they were progressively placed in service.