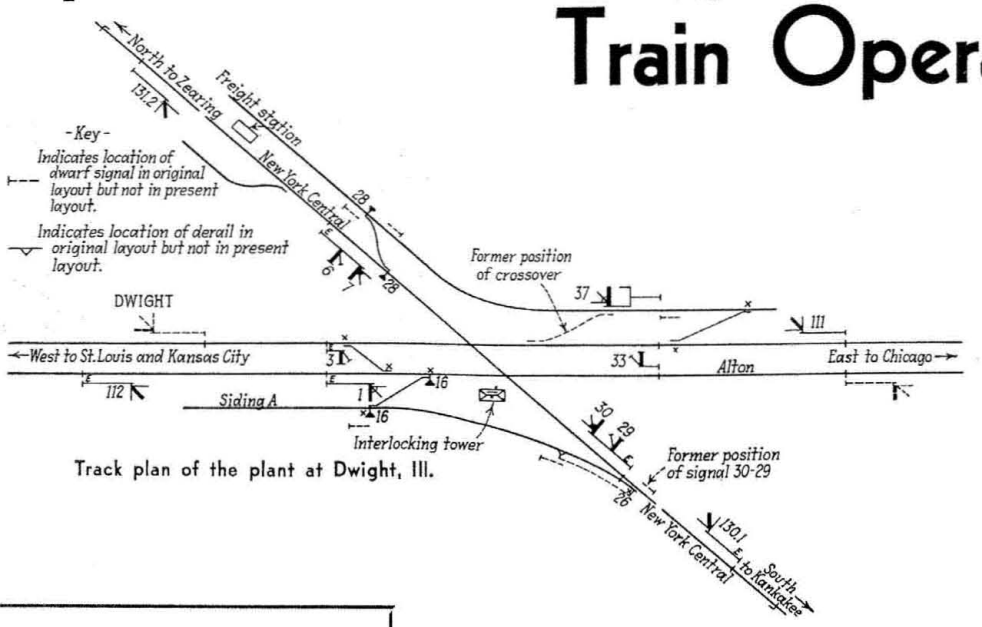
Simplified Interlocking Speeds Train Operation



Track plan of the plant at Dwight, Ill.

All-relay type of interlocking, with table-lever control machine takes place of mechanical plant formerly used .... Derails and undesirable functions eliminated .... Switching movements made faster, with no sacrifice of safety

NUMEROUS advantages, especially from the standpoint of train operation, are credited to the greatly simplified table-lever interlocking which the Alton railroad recently installed at a grade crossing of the Alton's double-track main line and a New York Central branch line, at Dwight, Ill. Formerly, this crossing, which is in automatic-block-signal and train-stop territory on the Alton, was protected by a mechanical interlocking plant. In May, 1931, an Alton freight train, derailed near the crossing, demolished the interlocking tower, two cars running directly through the tower, one of them carrying away the roof and the other tearing out a side wall. The towerman, who happened to be on the outside stairway at the time, was not seriously injured.

Delay Permitted New Design

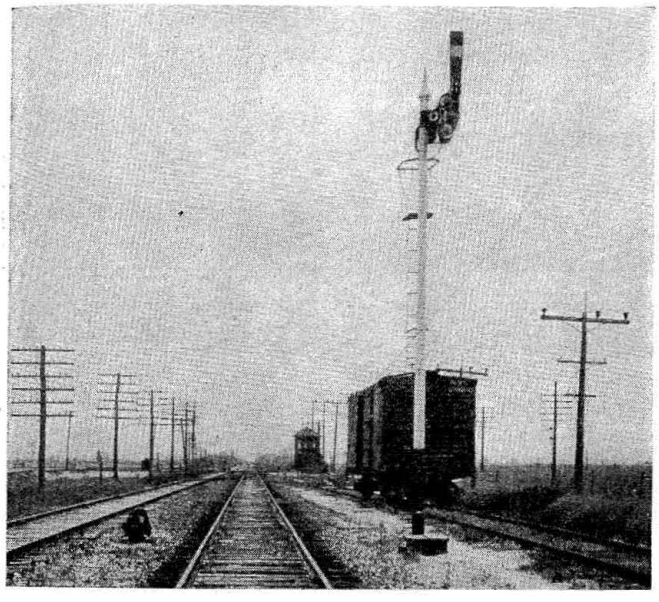
For eight months following the destruction of this old plant, all trains were required to stop before proceeding over the crossing under flag protection. In considering various plans for installing suitable interlocking protection, the signal department eliminated automatic operation from consideration, because of the complexity of the track layout and the relatively large number of switching moves on the interchange tracks. It was not considered necessary to operate the track switches from the tower, as was done under the former system of mechanical interlocking. However, it was desirable to control, manually, the operation of the signals and to provide electric locks for the crossovers *16* and *28*. In view of these conditions and the nature and frequency of the switching moves at the crossing, it was necessary to reestablish a three-trick interlocking tower at the crossing. A five-lever table interlocking machine, without mechanical locking, was selected as the means of controlling the operation of the signals, as well as the electric switch locks at both ends of crossovers *16* and *28*.

Old Machine Replaced by New Type

Originally, the interlocking at the crossing was fully mechanical, but changes were made at various times since its installation, and at the time the tower was destroyed, the interlocking was partly mechanical and partly power operated. The standard mechanical interlocking machine had 37 working levers for the operation of four Wharton derails, 6 switches and 10 signals on the Alton, 2 derails, 3 switches and 7 signals on the N. Y. C. With the exception of the two G. R. S. Model-2A home signals on the Alton and four Model-2A home and dwarf signals on N. Y. C., which were power-operated through circuit controllers actuated by levers in the mechanical interlocking machine, the functions were mechanically operated, and electric detector locking was employed to insure against the possibility of any switch within interlocking limits being thrown inadvertently. The distant signals were Model-2A semaphore, controlled automatically through their respective home signals.

In January, 1932, the present interlocking was put in service. Its installation involved, chiefly, the following work: Home signal *30-29* on the N. Y. C. was moved from the "outside" to the "inside" of switch *26*, as shown in the track diagram, in order to permit switching moves to be made on the interchange track without requiring call-on signal *29* to be cleared. Call-on units, G. R. S. Model-2A, were added to the N. Y. C. home signals, as this road does considerable switching back and fourth over the crossing and wanted call-on signals to expedite such moves. The (mechanical) call-on signals that had formerly been used on the Alton home signals were re-

moved and nothing was substituted in their place. Power-operated G. R. S. Model-2A dwarf signals were substituted for two of the mechanically-operated dwarf signals that had formerly been used on the Alton for back-up moves over the crossing. However, the remainder of the ten dwarf signals that had been used in the former mechanical interlocking were removed from service and no signals whatever were substituted in their place; as will be explained later, this is one of the significant features in effecting improved switching operation in this plant. With the exceptions here noted, all of the signals that were used in the former plant are still used and are in the same locations they formerly occupied. As stated, all of the (Model-2A) distant signals were power-operated and automatic, and they were not affected by the



Northward home signal on the Alton

reconstruction, except, of course, in a minor way as regards circuits and wiring. A frame tower that had formerly been used in another interlocking was disassembled and moved to the crossing, where it was reassembled. The telegraph equipment was installed on the second, or top, floor of this tower, and the G. R. S. five-unit table-lever interlocking machine was mounted on the operators' desk, as illustrated. One lever in this machine controls the G. R. S. Model-9A electric switch locks at both ends of crossovers *16* and *28,* which were installed as a part of the new installation. Crossovers *16* and *28* are now of the hand-throw type, but can not be moved until the tower operator has released the electric switch lock by properly manipulating lever No. 5 in his control machine. The crossover between signals *37* and *111* was formerly inside of the home signal *(37)* limits, between home signal *37* and the crossing, and was moved back to the position in which it is shown, in order to simplify the layout.. The automatic-train-stop system, which the Alton has in service in this territory, was not affected by these changes in the interlocking.

Economies Effected

The new plant, as it now stands, involved an expenditure of approximately $6,500 in the additional equipment required, including the cost of labor for installing it. This cost, of course, had to be borne entirely by the Alton, as it was occasioned by an Alton train derailment for which the N. Y. C. was in no way at fault. Operating costs for the new plant are practically the same as for the older plant; they are divided equally between the Alton and the N. Y. C. Maintenance costs are appreciably less than they were formerly; they also are divided equally between the two roads. Most important, economically, however, is the fact that definite—although intangible—savings are being effected by reason of the improved switching operation that obtains as a result of the simplification of the interlocking.

Dwight is on the Alton's main line from Chicago to St. Louis and Kansas City. Twelve passenger trains and 14 freight trains, daily, are run over this crossing by the Alton. Traffic on the N. Y. C. consists of 8 freight trains daily, as this is the branch line between Kankakee and Zearing. All of these trains on the N. Y. C., as well as several of the freight trains on the Alton, stop at Dwight and do some switching at the crossing.

Train orders to N. Y. C. trains are issued from the interlocking tower; a color-light train-order signal with yellow-aspects is located at the tower. No train-order signal is used on the Alton at this point, as Alton train-orders ordinarily are handled through the agent or telegraph operators at the Dwight depot, located approximately one mile south of the tower.

Switching Simplified

It is in connection with the switching moves at and over the crossing that the greatest improvement in train operation has been effected. An example of this follows: Suppose that an eastbound freight train on the Alton is to set out some cars on siding *A*. Under the former set-up, it was necessary for the locomotive, with these cars, to proceed across the N. Y. C. track and be entirely clear of the back-up dwarf signal *(33)* before the interlocking operator could reverse crossover *16* and clear the back-up signal, to permit the train to reverse its direction and proceed over the crossing and into siding *A*. This, of course, conforms with common interlocking practice, but the unnecessary loss of time resulting from such operation is apparent, and it was just this sort of thing that the Alton wanted to avoid in the new plant.

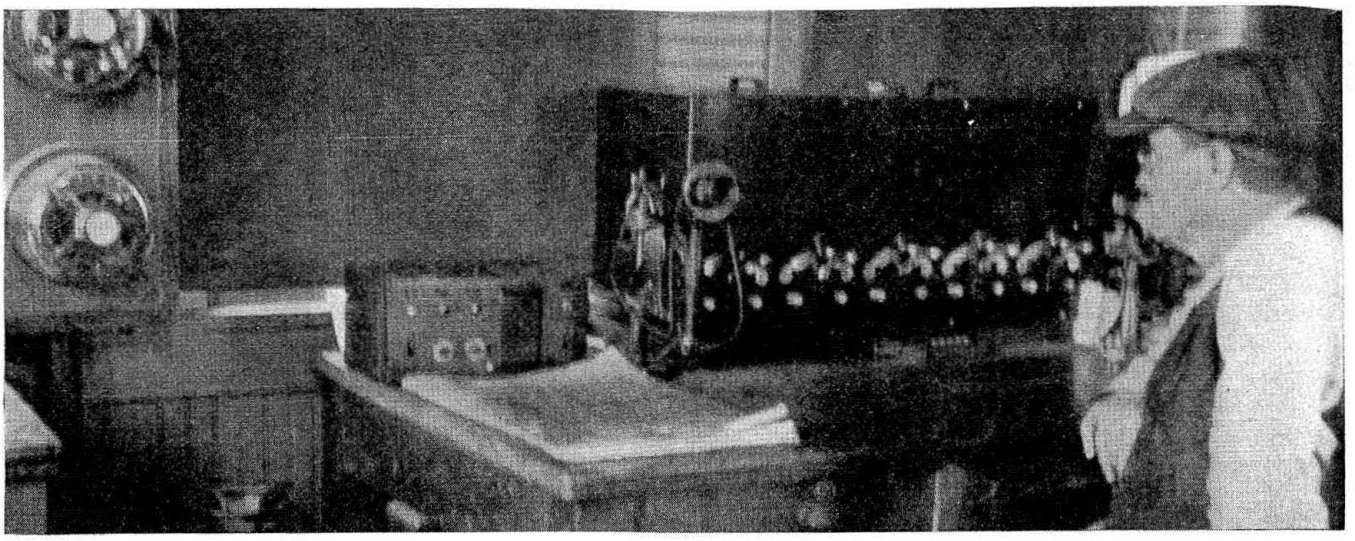
That this advantage is being avoided is evident from the following description of the same train movement under the present set-up: The east-bound train can now proceed, with signal *1* clear, to a point where it just clears crossover *16,* and, assuming that the interlocking operator has unlocked the switch, a trainman can reverse the crossover, and the train can back into the siding without benefit of dwarf signal. Thus, approximately five minutes' time is saved on each such movement into and out of siding *A,* and comparable savings are being made in the case of nearly every switching move in the plant. An examination of the track-and-signal plan will suggest numerous examples of the greater flexibility of switching operation afforded under the new system, due primarily to the substitution of hand-throw switches for mechanically-operated, detector-locked, switches, and the elimination of all derails, and secondarily to the use of call-on signals on the N. Y. C.

Call-on Signals Used

Regarding the use of call-on signals on the N. Y. C.: These were considered desirable in order, for example, to permit a southbound train on the N. Y. C. to leave some of its cars standing at the N. Y. C. freight station, proceed over the crossing on a clear home signal, switch some cars into siding *A,* and then return over the crossing under the protection of, and governed by, call-on signal *29*. All high signals operate to three positions,

and no speed restrictions are in effect, except, of course, those which are imposed by a restrictive signal indication.

Built especially for this particular installation, the table-lever control machine consists of five lever units, and the track and signal diagram, with its track-occupancy lights, is on the same panel with the levers. The manipulation chart, also, is lettered on this same panel, thus making this principal control unit very compact; the entire unit measures only 36 in. long, by 18 in. high by 12 in. deep. All five levers operate to three positions: Left, center and right. Lever No. 1, left, controls home-signal *7*; right, home-signal *30*. Lever No. 2, left, controls call-on signal *6*; right, call-on signal *29*. Lever No. 3, left, controls home-signal *1*, right, dwarf-signal *33*. Lever No. 4, left, controls dwarf-signal *3*; right, home-signal *37*. Lever No. 5, left, unlocks both ends of crossover *16*; right, unlocks both ends of crossover *28*.



Five-unit table-lever interlocking machine which controls all of the signals and electric switch-locks. . . . Track diagram and manipulation chart on same panel, but because of their colors they did not show up properly in photograph. . . . The push-buttons in the small unit in front of the control machine are used for acknowledging and cutting out the approach annunciators

N. Y. C. Home Signals Used for Manual Block

The home signals operate to three positions, but, in order to operate either of the N. Y. C. home signals to the 90-deg. position, two separate operations must be performed by the interlocking operator. He must first throw table-lever No. 1 to the left or right position, depending upon which signal is to be cleared. This will cause the signal to assume the 45-deg. position, but it will not assume the 90-deg. position until and unless the operator operates a push-button in the small control box at the left of the table-lever machine. This push-button is so used when fast, through, moves are to be made over the crossing and only when the operator knows that there is not a preceding train "in the block" between this tower and the next block office. Thus, the 90-deg. indication serves as a modified form of manual block signal.

At the left of this main control machine, on the operator's table, is a small control box—which is used for the following purposes: The two-way toggle switch in the lower left-hand corner controls the eastward unit of the N. Y. C. color-light train-order signal, while the small indication light above the switch repeats the indication of this signal. The toggle switch and indication light on the right-hand end of this box are for the westward unit of the same train-order signal. The residential type of lighting switch controls the electric lights in the home and dwarf signals. (The distant signals are approach lighted.) The remaining two push-buttons are used for operating signals *7* or *30* to the 90-deg. position when fast, through, moves are to be made on the N. Y. C., as explained in the preceding paragraph.

The three G. R. S. Universal clock-work time releases are set at two minutes. The interlocking is protected by complete approach stick and electric locking. As stated before, there is no mechanical locking between the levers in the control machine; these levers can be thrown at will, as in any all-relay type of interlocking. In fact, this is, in effect, an all-relay interlocking.

Also, on the second floor of the tower, is a buzzer-type approach annunciator which sounds its warning whenever a train approaches the plant on any one of the four principal approach sections. This buzzer is mounted in the box on which the time-releases are mounted. It is connected to the four approach-indication relays in such a way that the de-energization of any one of these relays starts the buzzer, and it continues to buzz until the operator depresses the particular push-button (mounted in the small case immediately in front of the table-lever machine) that corresponds with the approach section.

Power Supply System

In the basement of the interlocking tower are the central control relays, and in a battery box just outside of the tower is the battery of six Exide Type E. M. G. O.-9 storage cells used in the a-c. floating power system. Lightning arresters and terminals for the tower equipment, as well as the rectifier for the six-cell battery, are housed in a separate case, located near the battery box.

The N. Y. C. home signals are operated from the six-cell battery at the tower, while the Alton home signals and all of the distant signals are operated on local batteries consisting of 5 cells of storage battery on a-c. floating charge. Edison type primary battery is used for the track circuits. Underground cable is used for all of the local wire runs, the new cable being furnished by the Okonite Company. Type-K relays are used wherever new relays were required.

The new relays, control machine and signals were furnished by the General Railway Signal Company. The new plant was installed and is maintained by the signal department forces of the Alton.