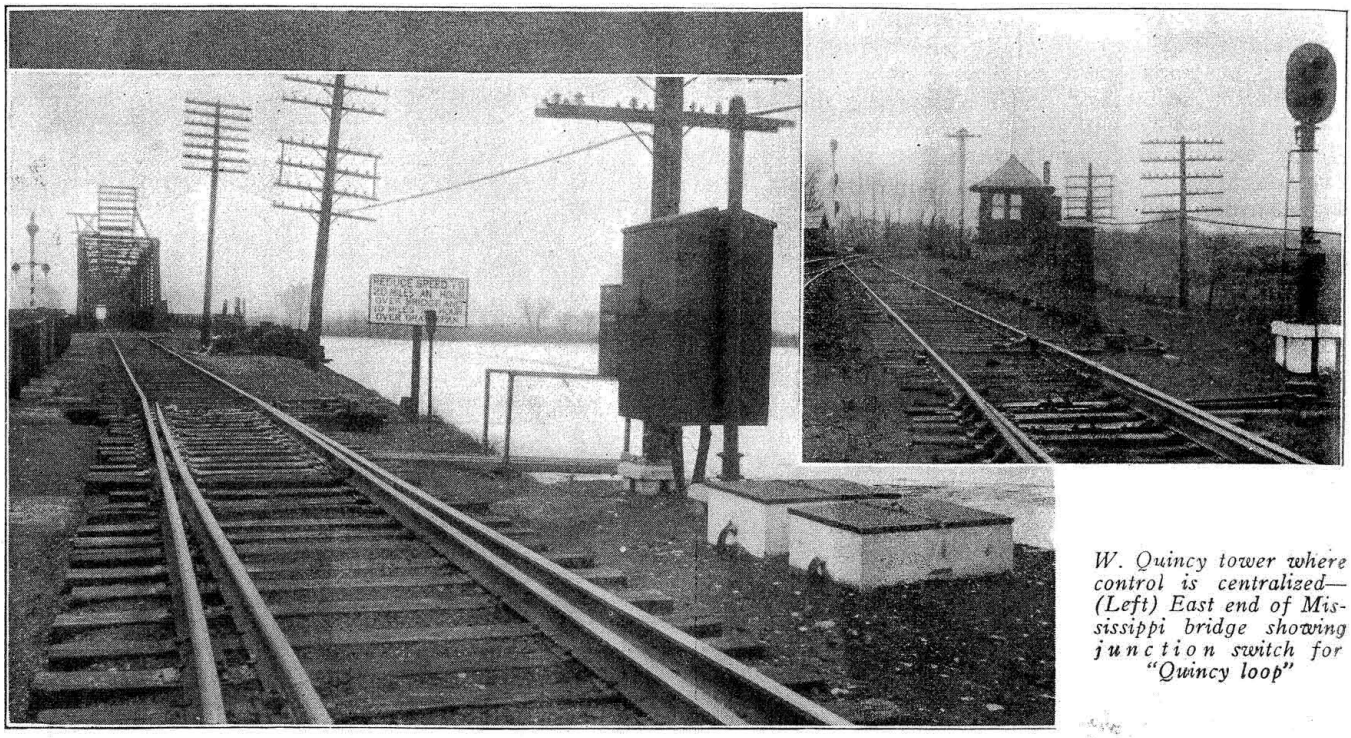
Centralized Control on Burlington Saves $16,200 a Year



W. Quincy tower where control is centralized—(Left) East end of Mississippi bridge showing junction switch for "Quincy loop"

Low-voltage installation at West Quincy, Mo., relieved nine operators and replaced four mechanical plants

A TOTAL saving in operators' wages and maintenance supplies amounting to $16,200 annually has been effected by the consolidation of four mechanical interlockers into one low-voltage remote control plant on the Chicago, Burlington & Quincy at West Quincy, Mo. The present facilities cost $54,300 and are operated by the dispatcher who is located in the interlocking tower, thus dispensing with the services of nine telegraph operators who were used formerly as levermen in the four mechanical interlockers. An annual operating saving of 30 per cent of the total cost of the new facilities is thus being realized. While there has been some additional saving, because of the speedier handling of train movements possible under centralized control and operation of interlocking facilities stretched out over a territory approximately seven miles in length, no definite figures are available.

No train orders are issued to govern train movements within this remote control territory, and this, together with the operation of the plant by the train dispatcher, lends particular interest to the installation, for it has several features in common with the recent development of dispatcher-controlled signaling systems. Operation of the interlocker has in no way interfered with the manifold duties of the dispatcher whose territory embraces the single-track main line from Burlington, Iowa, to Hannibal, Mo., 101 miles, and a branch line running from Keokuk, Iowa, to Mt. Pleasant. The dispatcher was formerly located at Hannibal, 18 miles south of West Quincy.

Owing to the track arrangement at West Quincy, Mo., and Quincy, Ill., on the other side of the Mississippi river, it is necessary for all passenger trains running via Quincy to pass through the West Quincy interlocking plant twice. It will be seen from the track plan that all trains running between Burlington, Iowa, and St. Louis, Mo., via Hannibal, are operated over the single-track drawbridge into Quincy station, and returned over the other side of the Quincy loop to West Quincy interlocker; similarly all trains from the Kansas City line enter the interlocking plant at Mark, and loop into Quincy over the single-track draw. This plant also handles all traffic from Galesburg destined for St. Louis, Kansas City, or points west and south of Quincy. West Quincy, Mo., is also the eastern terminus of the Quincy, Omaha & Kansas City, a subsidiary of the Burlington, but operated independently. Traffic on the latter line is light.

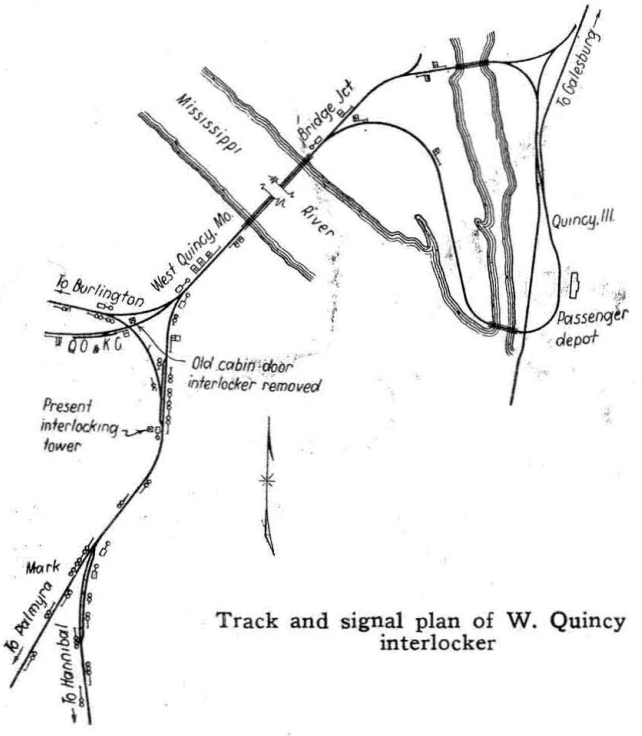
Four Mechanical Plants Replaced

An old cabin door mechanical interlocker had been used formerly to protect the Q.O. & K.C. crossing, another mechanical plant had been in service at Mark to control the junction of the Kansas City and St. Louis lines, another had been in service at Bridge Junction on the east side of the river to control the signaling in connection with the operation of the Mississippi river drawbridge and a third mechanical plant had been in service at West Quincy to control the Q.O. & K.C. junction, and the junction of the Burlington line and the line to Kansas City and St. Louis.

The frame building, which housed the cabin door interlocker at the Q.O. & K.C. crossing, was moved

to the west junction of the Kansas City and Burlington lines. In its present location, the tower is, in effect, a two-story structure. The first floor, which is also the foundation of the building, is of concrete, and houses the relay rack and storage battery. The dispatcher who operates this plant, when seated at his desk on the second floor, faces the junction switch in front of the tower, while immediately behind him is located the 17-lever G-R-S table interlocking machine. All telegraph and telephone communication facilities for the dispatcher are in front of him or on his desk.

A neat arrangement of table lever units is secured by mounting all of them on a cast-iron bench



Track and signal plan of W. Quincy interlocker

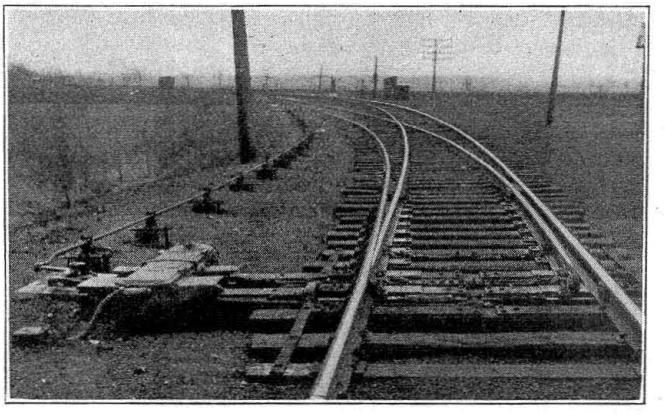
about two feet above the floor. Centralized operation of this comparatively large plant, extending as it does nearly seven miles from its extreme western to its extreme eastern limits, is made possible by this 17-lever table machine in conjunction with an illuminated track diagram mounted above it. By means of this board, the dispatcher is able to follow the operation of any train through the interlocking plant, and to check the position of all signals. Normally, none of the diagram lights are energized, but the presence of a train in any of the track circuits will light up the respective lamp located in the center of that particular track circuit. Whenever a signal is cleared, a green light so indicates. The main panel of the diagram is made of transite and is covered on the front with linen. The Railroad Supply Company, Chicago, furnished the illuminated model board according to Burlington specifications.

Four clockwork time releases are mounted between the illuminated track diagram and the table lever interlocker. These operate within a time interval of approximately 55 sec., and provide for the changing of any route when, for some reason or other, the dispatcher finds it necessary. A single-stroke bell is mounted on the board, beneath the track diagram, and functions as an annunciator for eastbound trains approaching Mark.

On a shelf, immediately in front of the dispatcher, is mounted a lock controller and indicator, by means of which the dispatcher is enabled to lock the operating control of the Mississippi river drawbridge. This controller effects the necessary interlocking protection between the bridge operating machinery and the low-voltage interlocker at West Quincy. Once the bridge is unlocked, the dispatcher cannot clear any conflicting signals or remove any of the derails until the bridge operator gives him an "unlock." Similarly the bridge operator can do nothing until the dispatcher gives the bridge operator an "unlock." A switch lock controller and indicator is mounted next to the bridge lock controller, and is for the purpose of controlling the electric switch lock on a manually-operated switch at the east end of the short siding at West Quincy. This electric switch lock control will be referred to in more detail later.

Color-light and Semaphore Signals Used

The operating facilities outside of the tower comprise the G-R-S color-light and Hall semaphore signals, the G-R-S Model-5A low-voltage switch machines for switch and derail operation, and the aerial cable and parkway cable distribution system, together with the necessary control relays and batteries. All the new signals are G-R-S two-indication (green and red) color-light type. At the junction, three of these two-indication units are mounted vertically, or a total of six lamps on one home signal. The dwarf signals are also of G-R-S make and provide two indications, purple and red. The incandescent lamps, in both the home and dwarf signals, are 18-watt, 10-volt size and are lighted continuously by alternating current with the provision, through a power-off relay, of burning them on direct current



Switch machine with pipe connection to derail

storage battery reserve in case of an a-c. power failure.

A number of semaphore home signals were used, because the equipment was available and in good operating condition. These signal mechanisms are all Hall lower-quadrant type, and are electrically lighted with 13.5 volt, ¼-amp. lamps.

Fourteen Model-5A Switch Machines Employed

To effect the power operation and control of all important switches and derails, it was necessary to install 14 G-R-S Model-5A low-voltage switch machines. One of these machines, when operating from a 20-volt storage battery, will operate a switch from full normal to full reverse or vice-versa in a period of 12 to 15 sec. Where a power switch machine is installed at the end of a passing track, it is pipe-connected to the derail on the passing track. In making the installation at West Quincy, the new

Burlington standard of separated tie plates was adhered to. No derails are provided on any of the main line tracks, except of course at the drawbridge, where it is essential that they be retained. There is also a split-point derail operated by a Model-5A switch machine on the Q.O.&K.C., north of the crossing with the Burlington line. This is, however, not a main line derail as the traffic on the "O. K." line, as it is called, is normally two trains a day.

In the east end of the West Quincy plant the track circuits are operated from one cell of Exide KXH-7 80-a.h. storage battery, while primary battery operation is used between Mark and West Quincy tower, as well as for all of the approach sections in advance of the distant signals. All primary track cells are Edison, 500-a.h. capacity. The track circuits are bonded with two No. 8 copperweld wires, 40 in. long, bonded to the rail with ⅜-in. duplex channel pins. All track battery and track relay leads are in parkway cable.

Combination of Aerial and Parkway Cable for Control Circuits

All control wires leave the tower in multiple-conductor, Okonite or Hazard aerial cable, carried on the pole line to the various wooden relay boxes near the operated functions. The number of conductors in the aerial cable, or course, varies with the number of functions served, the individual conductors all being No. 14 copper. From the relay case, parkway cable enters the ground without any exterior protection at the ground line and is terminated in a cast-iron junction box at a switch machine; while at a rail connection it is terminated in a similar junction box, where further connection is made to single-conductor parkway cables carried to cast-iron bootleg connections at the rail. For these track connections the two-conductor No. 8 parkway cable with lead, steel and jute covering, is carried from the relay case to the cast-iron junction box, where a soldered connection is made to two single-conductor No. 8 parkway cables which run to the rails. The latter cable is brought to the surface through a creosoted oak stake and enters a cast-iron junction box where a soldered and sealed connection is made to a No. 6 bare copper wire for bonding into the web of the rail with ⅜-in. duplex channel pins. In making the connection within the cast-iron bootleg, the armor and lead covering is skinned off of the parkway cable and the end of the latter sealed with Parolite.

For the control of each Model-5A switch machine, a five-conductor No. 8 parkway cable is used, the indication circuits being taken care of with a three-conductor No. 12 parkway cable. The color-light signals are controlled through a multiple-conductor No. 12 parkway cable, while the semaphore signals are controlled through No. 12 parkway cable. At the signal locations, the parkway cables come up out of the ground without any mechanical protection and are carried up the pole a distance of about four feet, into a cast-iron terminal box fastened to the signal pole. This terminal box is fitted with standard A. R. A. porcelain terminals and provision is made for sealing the opened ends of the parkway cable with Parolite. All parkway cable for track circuit, switch machine, and signal operation was furnished by The Okonite Company.

Relays and a-c. floating apparatus, together with the necessary arresters and terminal blocks, are mounted in wood relay cases supported on three-inch iron poles. The batteries are mounted in either concrete battery tubs or concrete boxes above ground. Many of the relays in this installation are of the Burlington standard and were assembled at the company's relay shop at Aurora, Ill. The remaining relays are of the Union Switch & Signal Co.'s manufacture. The power-off relays were furnished by the Railroad Supply Company, Chicago.

A-c. Floating System for Control and Operation

The main low-voltage battery, five cells of Exide KXH-7, 80-a.h. capacity, is housed in the first floor of the tower. These cells are under continuous charge by means of Balkite electrolytic rectifiers. Similarly, the operating battery for each Model-5A switch machine is float-charged from Balkite recti-

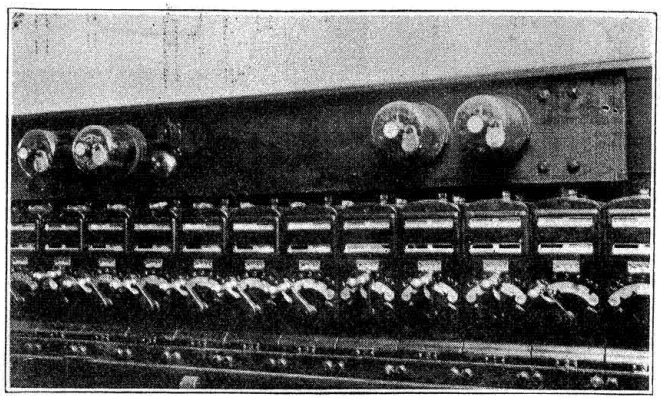


Table lever controllers located in W. Quincy tower

fiers. The same charging arrangement is used at the color-light and semaphore, home and dwarf signals; although the color-light signals, as previously stated, are normally operated on alternating current. Where the track circuits are fed from storage battery, the latter is trickle charged from a Balkite rectifier.

At the east end of the short passing track at West Quincy, it was found advisable to install an electric switch lock instead of a power switch machine. This lock, which is a G-R-S device, is provided with two cast-iron doors and padlocks, one for the signal maintainer and another for trainmen. When it is desired to operate the switch, it is necessary that the dispatcher first unlock it by means of his locking controller and indicator. When he unlocks the switch an indication is received at the switch lock by means of a miniature semaphore indicator as in the ordinary switch type indicator. The trainman then reverses the mechanical unlocking lever on the device and this releases the hand throw switch.

Automatic Crossing Protection Also Provided

There is an important highway crossing at Bridge Junction, because the Mississippi river drawbridge is used for both railroad and highway traffic. Crossing gates were formerly in service to protect this crossing, and these were operated by the Bridge Junction towermen. At the time the Bridge Junction mechanical plant was dismantled, permission was obtained from the local authorities at Quincy to substitute automatic flashing signals at these crossings. Because of the track arrangement in the immediate vicinity of the highway crossing, it was necessary to provide a selective control for two of the automatic flashing signals in order not to delay highway traffic needlessly. The selection of the control is made automatically by means of a switch box connected to the Bridge Junction switch.