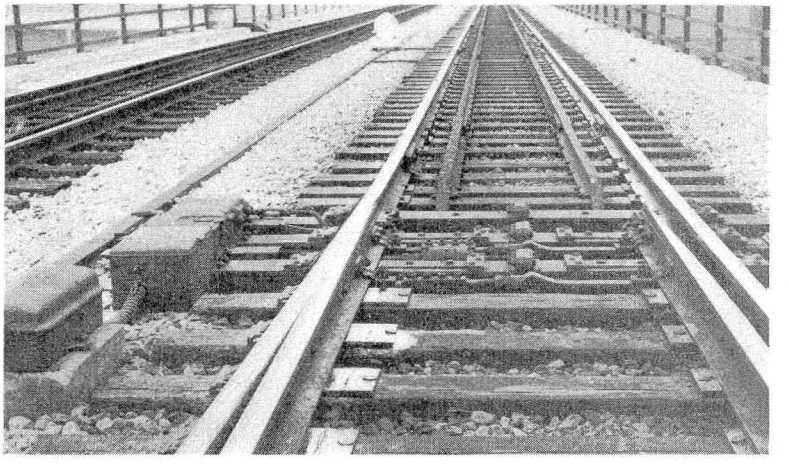
One Electric Interlocking for Two Drawbridges

Straightening of Chicago river responsible for construction of all-electric plant for protection of Baltimore & Ohio Chicago Terminal and St. Charles Air Line drawbridges

Color-position-light home signal on the B. & O. C. T.



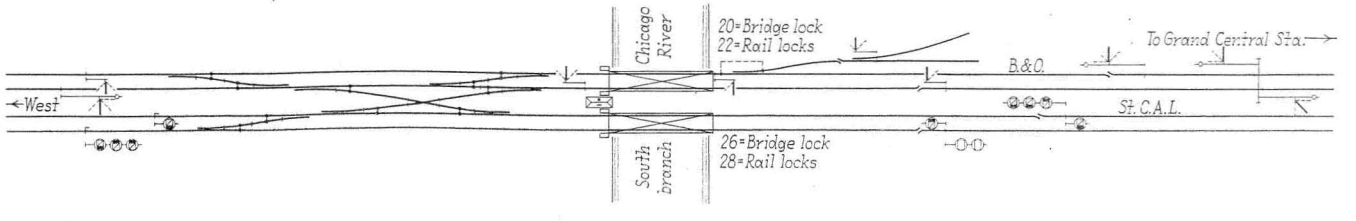
Right—Power switch and dwarf signal location on same line

ON July 23, the Baltimore & Ohio Chicago Terminal placed in service the third and final stage of an important interlocking for the two double-track drawbridges over the new channel of the South branch of the Chicago river, at Sixteenth street in Chicago. The installation of this interlocking marks the completion of an outstanding municipal engineering enterprise that had its origin years ago.

At Polk street, just south of the Loop area, the south branch of the Chicago river originally made a bend to the east for about 850 ft., then turned south for about 1,200 ft. and again took a turn to the west at Eighteenth street, thus forming a long bend in such a way as to prevent the extension of streets through this area in the early days of the city. Gradually the railroads built up the land and constructed tracks and terminals on both sides of the river throughout the entire area.

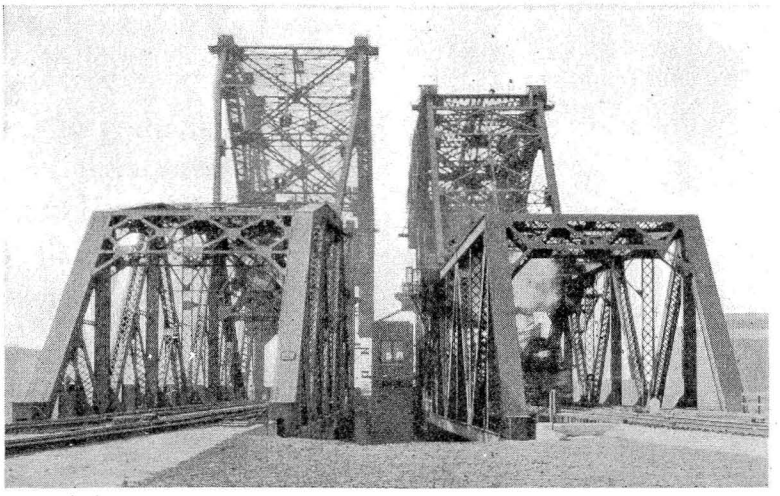
In 1909 the mayor of Chicago appointed the Chicago Plan Commission to guide the development of the city, and one of the most important features of the program was to extend the streets southward from the Loop, these streets long having been blocked off by the long bend in the river and the railroad facilities in this area. On account of delays in arriving at an agreement between the city and the various railroads involved, the digging of the new channel was not started until September, 1928; it was opened to river traffic on December 15, 1929. The railroads involved had to perform the various changes in their track facilities to co-ordinate their work with that of digging the new channel.

The main-line tracks coming from the Grand Central passenger station of the Baltimore & Ohio crossed the old channel on a double-leaf bascule bridge near Twelfth street and from this point ran south to about Fourteenth street where the line turned west. Under the new arrangement, the old bridge over the old channel was, of course, to be abandoned, the tracks were to run south on the east of the new channel to about Sixteenth street where they were to turn west over a new bridge to be constructed over the new channel.



Track and signal plan

The St. Charles Air Line is a connecting line about one-half mile long, connecting with several roads east of the Chicago river at a point near Sixteenth street and Clark street, and with other roads west of the river at a point near Canal street and Sixteenth street. This connecting line is owned jointly by the Burlington, North Western, Michigan Central and the Illinois Central, the latter having charge of the construction and maintenance.



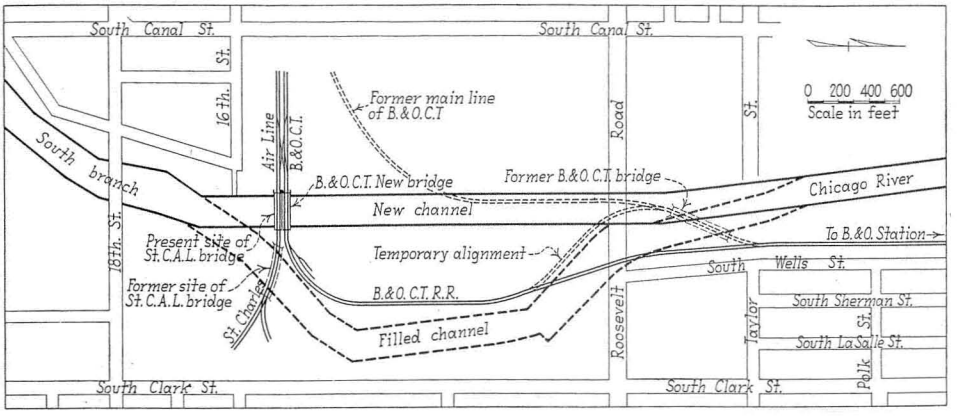
St. Charles Air Line bridge on left—B. & O. C. T. bridge on right. Tower between

The St. Charles Air Line bridge across the old river channel at Sixteenth street was of the bascule type of modern construction and in good repair. It was, therefore, decided to move this bridge to a new location over the new channel alongside the new B. & O. bridge. The Air Line bridge at its old location was protected by interlocking facilities included in an existing plant at a crossing of the New York Central at Sixteenth and Clark streets.

The first project in the program, so far as this story is concerned, was to construct the new double-track B. & O. bridge over the site of the proposed new channel at Sixteenth street. The main-line tracks of both the B. & O. and the Air Line were then reconstructed via this bridge. At this time an oddity might have occurred to a passenger on the observation car of a passing train, in that he was passing over a large bridge that had evidently been constructed over solid dry ground. This then completed the first interlocking plant arrangement at the new bridge which was placed in service on December 5, 1929.

The next stage included the digging of the new channel throughout the section spanned by the new bridge, the entire new channel being ready for river boats on December 15, 1929. At this time the old channel was abandoned and the Air Line constructed a temporary trestle around its old bridge over the old channel. The bridge was then taken apart and reconstructed over the new channel at a point just south of the new B. & O. bridge.

In the meantime the roads involved had reached an agreement to eliminate an important railroad crossing where the B. & O. and Air Line crossed the Pennsylvania, Alton, and Burlington tracks at Sixteenth street, near Canal street, a point about 2,000 ft. west of the new bridges over the new river channel. In this project the B. & O. and the Air Line tracks were to be elevated, which necessitated that the bridge over the new river channel be raised 11 ft. This change had been determined in time to set the Air Line bridge at the new higher level but the B. & O. bridge had to be raised and in order to do this, traffic had to be taken off the bridge. This meant that connecting tracks were constructed so that B. & O. trains could be routed over the Air Line bridge while the B. & O. bridge was being raised. These new connections were included in the interlocking plant, which meant another extensive change, which was completed and placed in service April 3, 1930. Finally, after the B. & O. bridge was at the new level and the tracks again connected, the plant was again revised, to the final layout, and placed in service on July 23, 1931.



Plan showing changes involved

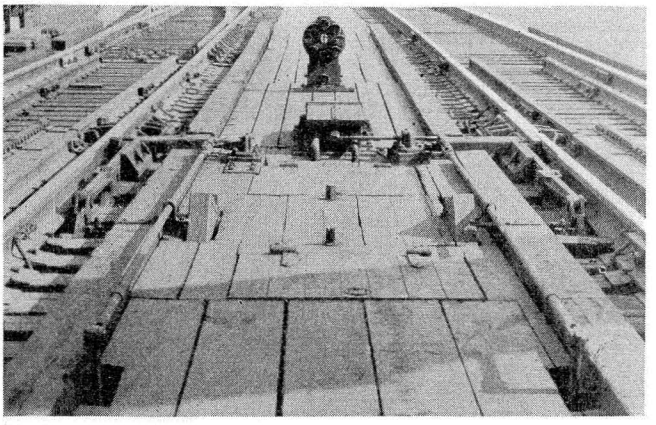
The fact that all these track and interlocking changes were made under traffic further complicated the work. The Grand Central Station and tracks leading thereto are used not only by the B. & O. but also by the Chicago Great Western, the Pere Marquette and the Soo Line. As the coach yards are located west of the river, the number of passenger train movements over the

bridge is double the number of scheduled trains, the total being about 75 daily. The freight terminals of all the roads mentioned above, with the exception of the Soo Line, are on the east side of the river so that the freight traffic includes about 30 trains daily. The traffic on the Air Line consists of about 40 freight trains daily and, in addition, this line is used for the interchange of Pullman and other passenger cars between the various roads, from 4 to 8 such movements being made daily in heavy traffic seasons. Further complications are caused by opening the bridges for boats about six times daily during the season of navigation.

One Interlocking for all Functions

The tower, a fireproof brick structure 12 ft. 8 in. by 24 ft., with four floors, is located on the east bank of the river between the two bridges.

The interlocking plant is the Union Switch & Signal



Rail locks on open end of B. & O. draw

Company's Type-F all-electric. The 47-lever Model-14 interlocking machine, located near the west end of the top floor of the tower, includes 26 working levers, 4 of which are for 8 switches, 5 for 5 derails and 1 switch, 3 for 3 high signals, 3 for 3 dwarfs, 2 for 2 high signals and 3 dwarfs, 4 for check locking, 2 for 2 bridge locks, and 2 for 2 rail locks. The machine is equipped with the various indications ordinarily employed with this type of interlocking.

The controllers for controlling the motors which operate the bridges and locks are located along the east wall of the tower in front of windows which afford an adequate view of the bridges. In addition, complete light-type indications are provided to indicate the position of the bridges. As an example, when the bridge is down and locked, a white light is displayed, one for each end of each bridge; when the rails are unlocked red lights are displayed. Lights are also shown to indicate to the operator that the bridge is nearly closed, fully closed, nearly open, etc.

In order to raise the drawbridges, the operator must first place all of the interlocking machine levers in their normal position. This causes the electric lock circuit controller (attached to the bridge controllers) to be unlocked, and the latter can then be operated manually to release the bridge controllers. The operator is then free to raise the bridges. After a bridge is unlocked and before it is raised, a siren sounds automatically to warn all concerned that the bridge is about to be raised.

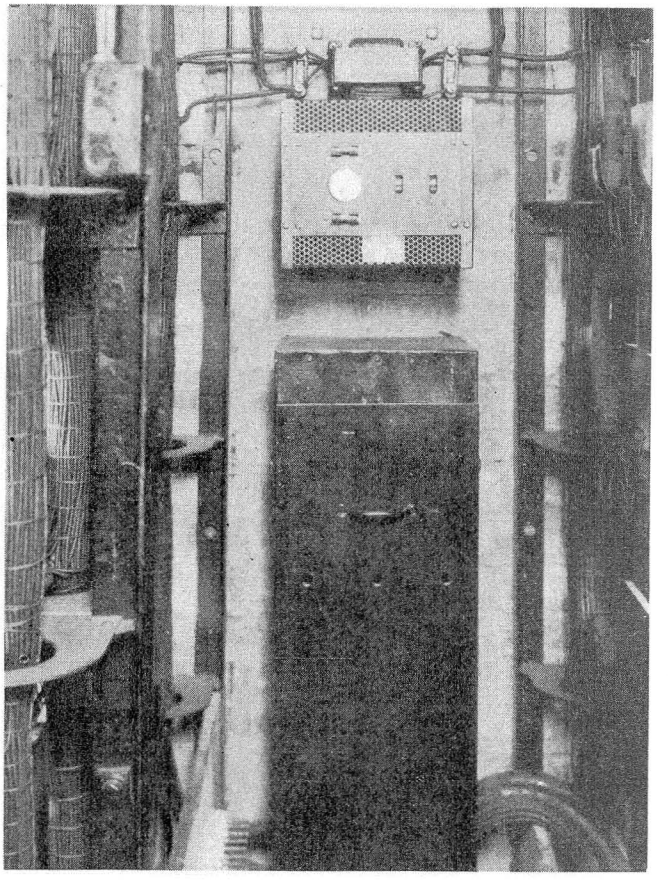
Approach locking on the B. & O. prevents raising the bridge in the face of an approaching train. Time locking accomplishes this end on the Air Line. In the event that the operator, for any reason, is unable to raise the bridge for an approaching boat, he may, by operating a toggle switch, start the operation of Railroad Supply Company flashing-light signals each of which is mounted on the lowest bridge girder above midstream facing in each direction up or down the river. There are four such signals, one for each side of each bridge. These flashing lights are repeated on the bridge controller.

Rail Locks

Rail locking on each end of the Air Line bridge is effected by four rail plunger locks operated by a Union Style M-2 switch machine and Type F controller. A Stiles circuit controller also operated by a connection to the switch machine, carries the indication circuits and bridges the track circuits around the rail ends.

Similar protection is provided for the B. & O. bridge, with the added safeguard that a floating rail tongue is provided for each rail end. This rail tongue carries the weight of each car wheel as it passes over the ends of the bridge rail, this preventing the battering of the stock rail. All four rail tongues at each end of the bridge are operated by a 5-h. p. motor which in turn is controlled by the bridge controller.

Power for the entire layout is taken from the Commonwealth Edison Company at 2,300 volts 3-phase and is transformed to 220/110 volts for the interlocking re-



Copper-oxide rectifiers for operating battery

quirements, and to 440 volts for the operation of the bridge machinery.

Fifty-five cells of 240-a. h. Exide Ironclad battery housed in the first floor of the tower are used for the operation of the switch machines. This type of battery has a capacity of 245 a. h. at the 10-hr. rate. The battery is charged by two Union RP-41 copper-oxide rectifiers. A separate battery of six Ironclad cells supplies the power for the operation of the 12-volt locks and relays. Each track is fed by one Exide type EMGO-7

cell, floated across a Union RX-10 rectifier.

Most all of the relays on this plant are the Union Type DN-11, although the Saco flasher relays are used for the river flashing lights. The tower relays are located on the first floor below the operating room, the racks being constructed of angle-iron with shelving of asbestos board. As will be noted in the illustration, the hooks for carrying the hand-made cables through the racks are made of hard fiber so as to prevent chafing of the insulation and to prevent grounds in case the insulation is defective.

An interesting feature of this plant is the extensive use of lead-covered underground cable. The cables under the river are laid in three-inch steel duct with welded joints imbedded in the river bottom; thus the use of submarine cables was dispensed with. On the remainder of the plant the main runs are in lead-covered cable laid in vitrified duct imbedded in concrete. The lead cable is Hazard. Parkway is used for the local runs.

It will be noted that derails are used on each of the five approaches to the bridges on the east side. Derails were not used, however, on the west side, as the bridges are pivoted on that side and the bridge itself, when raised, obstructs the path of a train. Split-point derails are used on the B. & O. while Wharton lift-point derails are used on the Air Line.

All of the signals are a-c. lighted without a d-c. reserve, those on the Air Line being continuously lighted, while those on the B. & O. are approach lighted. Ten-volt 18-watt lamps are standard on the Air Line, 13½-volt 17-watt on the B. & O. Power for the signal lighting is taken from the 110-volt distribution line, which is carried in cable to each signal location. Union Style M-2 switch machines, with point detectors and Type-F controllers, are used throughout for the operation of the switches. Copperweld messenger wire and cable rings are used for the cable drops. Ohio Brass welded bonds are used throughout for rail bonding, the Air Line being 90 lb., the B. & O. 130 lb.

Three maintainers and one assistant maintainer comprise the maintenance staff, these men handling not only the interlocking maintenance but also make light repairs on the bridge machinery. The interlocking plant was installed under the jurisdiction of G. H. Dryden, signal engineer of the Baltimore & Ohio, plans being furnished by his office. C. O. Seifert, signal supervisor of the Baltimore & Ohio Chicago Terminal, had supervision of the construction and J. J. Clancy was the general foreman.

C. T. C. on the B. & M.

(Continued from page 380)

relay cases, directly from the line. All main line runs of wires from the houses to the switch machines and the signals were carried in parkway cable. Parkway cable runs to all signals. When located on signal bridges the cable terminates in junction boxes under each signal, between which and each mechanism loose wires extend in flexible conduit. Wires for other branch wiring were run in redwood trunking.

The 550-volt power wires are No. 6 triple-braid weatherproof copper wire. East of East Deerfield the power line carries power for the train stop as well as for the signaling system. In this territory, automatic switching is provided, so that if power fails at one source the other end of the line is automatically connected. Additional switch-boards were required, inasmuch as the load for the signaling system was added. West of East Deerfield the power is used for signaling only, consequently there is no automatic switching. Here the lines radiate from a source of power and end midway between two sources.

The junction boxes used in connection with the parkway cable are of welded steel, mounted on concrete foundations. Terminal boards were used for the distribution of the wires. The Type-R relay is used for the control of the 20-volt switch machine. Exide storage batteries of 60- and 80-a.h. capacity, were used and G. R. S. dry-plate rectifiers are in use throughout for charging the storage batteries.

Sand Causes Signal Failure

SAND on a fouling track section in an interlocking plant was the cause of a false-clear signal failure resulting in a collision between a switch engine and a passenger train, near the Union station at St. Louis, Mo., on August 21, at 10:28 p. m. The report of the Bureau of Safety of the Interstate Commerce Commission states that the sand had evidently been deposited on the rails by a locomotive at some time prior to the collision. One employee was killed and two were injured.

The collision occurred a short distance south of the St. Louis Union station, where two of the north-and-south station lead tracks converge, at switch No. 285, on a sharp curve, the westerly track being known as track D and the easterly one as track C. Color-light dwarf signals were involved. The entering signal, governing facing movements through switch 285, consists of two 2-color units mounted vertically one above the other. The indications of the upper unit are red for Stop, and green for a movement through the switch to either track C or D. The indications of the lower unit qualify the Proceed indication of the upper unit; i. e., a green on the lower unit indicates that the track for which switch 285 is set is clear, while a yellow indicates that this track is occupied. Thus, green over green indicates that the track which is being entered is clear. In addition to this entering signal, an outbound starting signal on track D was involved. Train movements in this area are governed entirely by signal indications, the switches and signals being controlled from the interlocking tower. Speed is restricted by time-table rule to 15 m. p. h. on main tracks and to 8 m. p. h. on station tracks.

A T. R. R. A. switch-engine had pushed six cars of a Missouri Pacific train in on track D, uncoupled, moved a few feet away from them, and stopped to await a Proceed indication on the starting signal, the crew being unaware of the fact that the engine was fouling track C. In the meantime an Illinois Central passenger train was being backed into the station on track C, under the authority of a green-over-green indication on the entering signal, and while so doing struck the tender of the switch engine which was fouling track C.

The evidence disclosed the fact that sand on the fouling track section prevented the switch engine from shunting the track relay, and with this relay falsely energized, it was possible for the towerman to clear the entering signal. The rules provided that sand should not be used over movable parts of an interlocking plant unless absolutely necessary. Subsequent to the collision, a general notice was issued by the T. R. R. A., modifying the rule to exclude entirely the use of sand in interlocking plants.