

Burlington Installs Extensive Interlocking at Kansas City

AT Kansas City, the Chicago, Burlington & Quincy has installed a new NX all-electric interlocking which includes two junctions, a drawbridge, four-yard entrances and provisions for a new railroad crossing, thus incorporating a rather extended area, including 10 switches, 6 crossovers, 2 movable-point frogs, 2 double slip switch layouts, 4 de-rails, 2 spring switches and 52 home signals. The plan herewith shows relative locations, but is not intended to be to scale. At Ustick there was previously a mechanical interlocking including the junction of the St. Joseph division north to St. Joseph, and the Hannibal division east to Hannibal and Chicago.

Includes Drawbridge

Between Ustick and Broadway, the Burlington has a double-track main line which includes a drawbridge over the Missouri river. At

New all-electric plant with NX control includes a drawbridge and two widely separated junctions and four entrances to yards

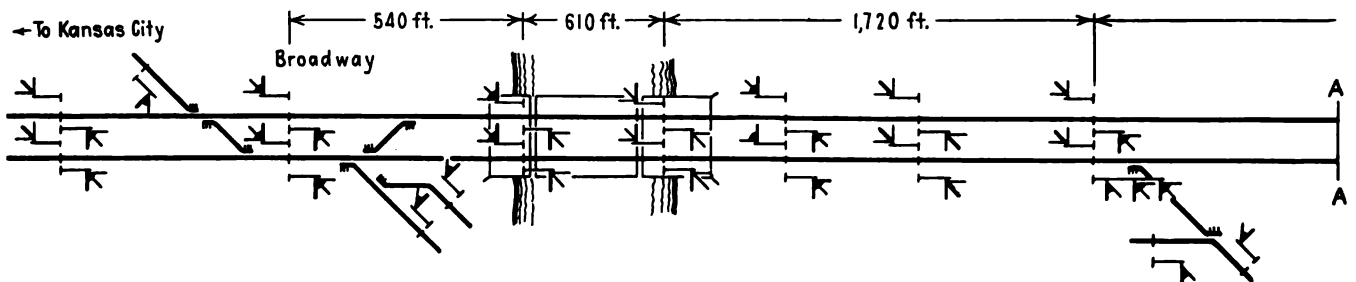
Broadway just south of this bridge, there are junctions with the Kansas City Southern, and the Kansas City Terminal Railway. This junction layout, and protection for the drawbridge, were formerly included in a unit-lever electric interlocking known as Broadway, with the tower east of the Burlington track just north of the K.C.T. junction switch.

The Burlington's new Murray freight yards are located to the east of the St. Joseph division main line and north of Ustick tower. The south end of this yard connects through Ustick junction layout to

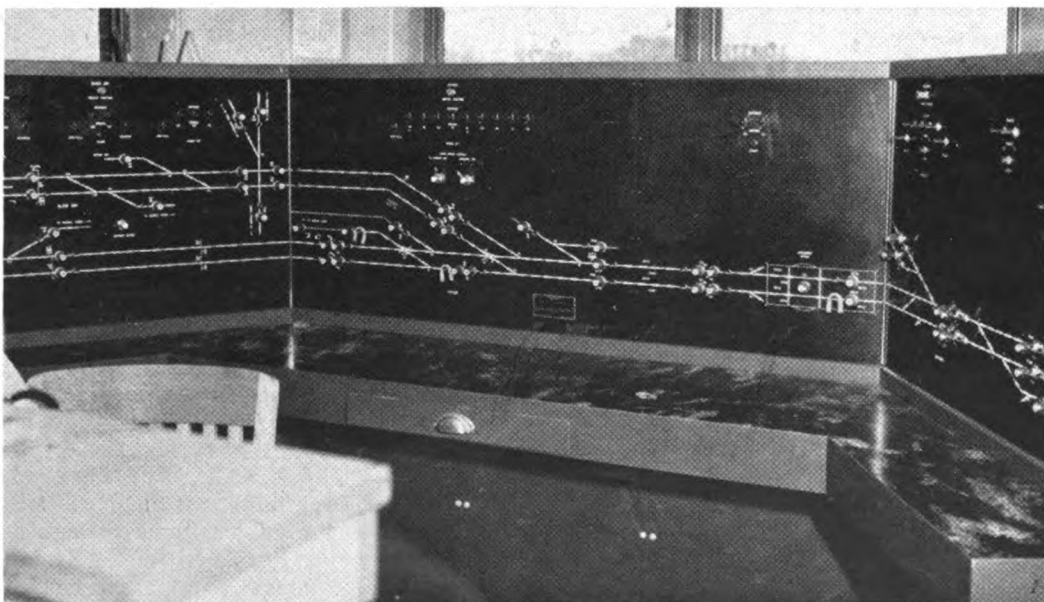
the double-track main line over the bridge to Kansas City. The north end of this yard connects to the St. Joseph division main line at a new interlocking layout known as Block 4 which includes one switch, one crossover, one spring switch and eight home signals. This layout is about 3.5 mi. north of Ustick.

Yard Entrance

Freight trains to and from the Hannibal division enter and depart from the yard at a point known as Block 224, which includes a single switch and one crossover located

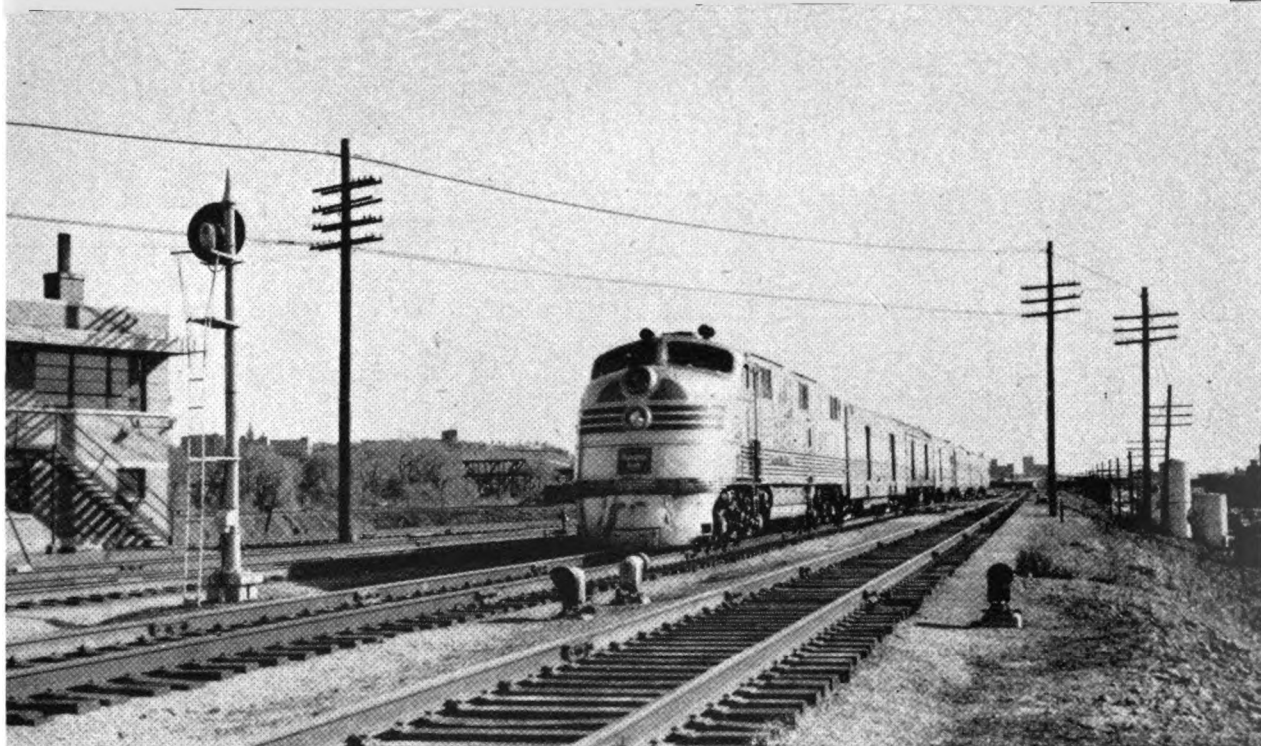


This plan of the new interlocking extends across to the next page



The panels of the control machine are 24 in. high, with a center section 58 in. long and a 38 in. section at each end

An outbound Zephyr train on St. Joseph division, passing the Ustick tower



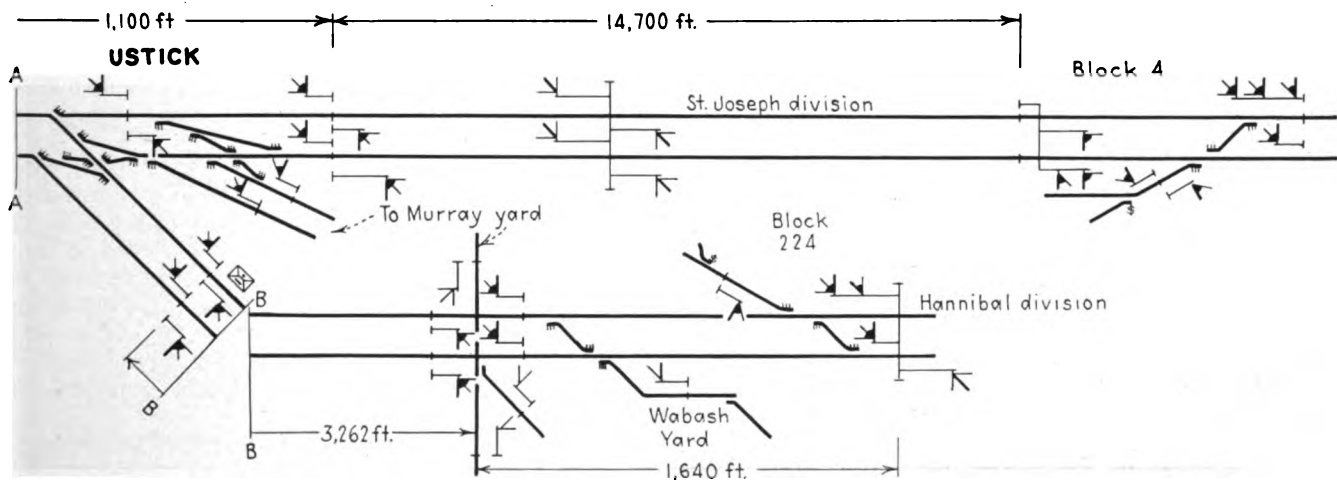
about 2,325 ft. east of Ustick. About 1,575 ft. east of Ustick, there is a crossover and a single switch for entering the Wabash yard. The Wabash uses the Burlington tracks from this point through Ustick and across the river, and from there to Kansas City Union Depot. All of the locations discussed above are now included in the layout of the new electric interlocking which has NX control, with the machine in a new brick tower at Ustick. This

and leave the yard at Block 224. A total of approximately 24 to 30 road freight trains enter and leave this yard daily on these routes. In addition to road trains, a large number of switching moves and interchange moves are made through the new Ustick plant. Most of these moves are between Murray yard and points in Kansas City, and therefore use the tracks in the interlocking between Ustick tower and Broadway. The Burlington interchanges

numerous instances these moves are close together and therefore the facility with which line-ups can be changed with the new NX control is an important factor in saving train time.

Extensive Use of Dwarfs

An outstanding feature of this large interlocking is the extensive use of dwarf signals. In a complicated track layout, one advantage of dwarfs is that they can be placed at



project includes signals for train movements in both directions on all tracks throughout the entire interlocking area.

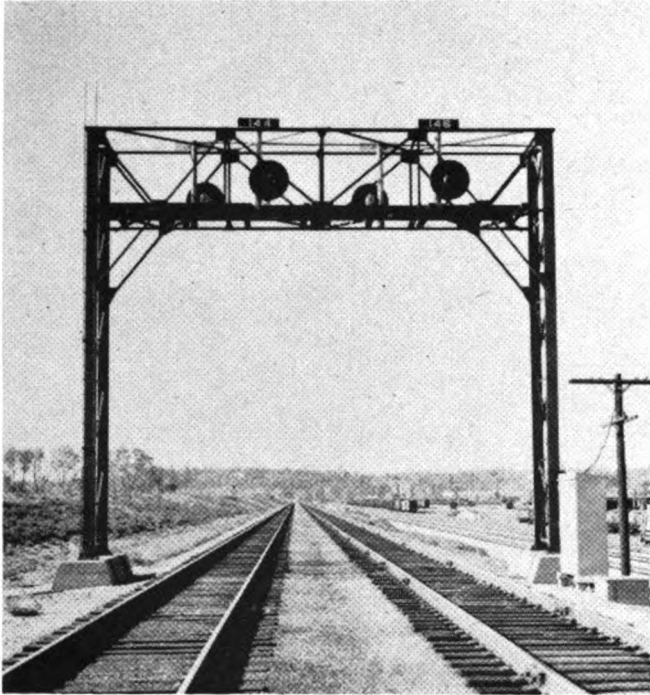
Heavy Traffic

More than 350 train movements, interchange runs, and switching moves are made through this interlocking daily. This traffic includes 14 scheduled Burlington passenger trains and 4 Wabash passenger trains. Road freight trains of the St. Joseph division enter and leave the yard at Block 4, and road freight trains of the Hannibal division enter

freight with 10 railroads at various yards and connections in Kansas City, south of the Missouri river. These interchange operations require approximately 40 to 50, or more, moves daily through the interlocking. In addition, the Burlington makes numerous switching moves to deliver and pick up cars at the freight house, stock yards, and industries in Kansas City. These operations require about 20 to as many as 30 moves daily. Thus, a total of 350 to 375 line-ups are made to establish routes through the new Ustick plant every 24 hours. In

the exact locations as may be required to utilize sections of track to the greatest benefit. A secondary advantage is to save the expense of constructing expensive signal bridges which at best would not place the signals to as good an advantage as is possible with dwarfs. Throughout much of this new interlocking the maximum permissible speed is 15 m.p.h., and on some short sections on sharp curves at Broadway, the limit is 8 m.p.h., thus making the use of dwarf signals particularly adaptable to operations.

One exception is signal 74 at



The intermediate signal bridge between Ustick and Block 4 on this St. Joseph division

Ustick which is a high signal with three "arms". The top arm governs to the St. Joseph division main line, the second "arm" governs to the Hannibal division main line, and the third "arm" to any other route. Northward signal 102 at Ustick is a high signal because it governs to the main track outbound where normal road speeds are in effect. For the same reasons, high signals are used, as shown on the plan for certain signals at Block 4 and at Block 224. Therefore, of the total of 52 interlocking home signals, only 8 are high signals, and the remainder are dwarfs.

The NX Control Machine

The panels of the control machine are 24 in. high, the center section is 58 in. long with a 38-in. section at each end set at an angle of 120 deg. with the center section. This ma-

chine includes some interesting features which are different from other NX machines described recently in these columns. On this Ustick machine the tracks are represented by what appears to be a white line $\frac{1}{8}$ in. wide. Actually these white lines are a series of white glass inserts, each being approximately $\frac{3}{4}$ in. long. Each home signal at which a train can enter the plant is represented by an entrance knob, and at each location corresponding to an exit from the home signal limits there is an exit button.

When making a line-up for an approaching train, the leverman first pushes the entrance knob and then the exit button for the proposed route. A green lamp in the entrance knob starts to flash green and the switches start to operate. The switches and crossovers are represented on the diagram by short sec-

tions of the track diagram which flash white while the corresponding switches are in operation. If a switch is already in the position called for, the track lamp sections representing that switch are illuminated with a steady white light. When all the switches are in the position called for by a route being established, all the track lamp sections throughout the entire route are lighted white. Then when the signal clears, the lamp in the face of the entrance knob changes from flashing green to steady green.

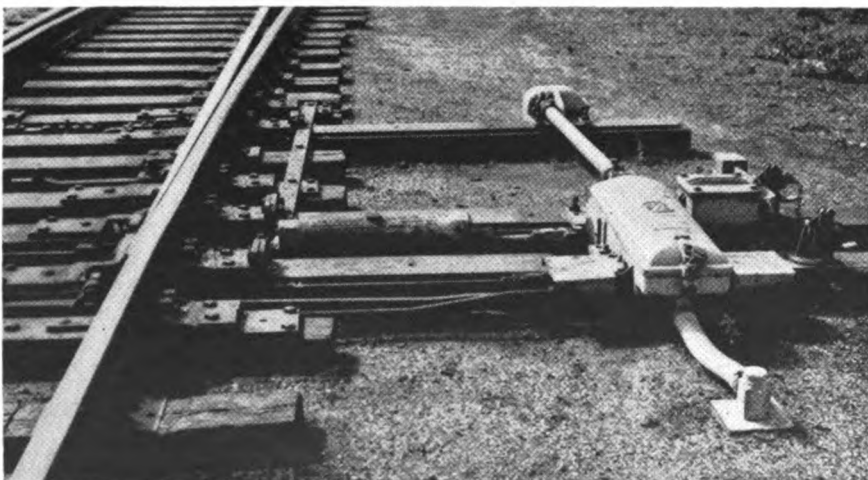
When a train accepts and passes the signal, the lamp in the entrance knob is extinguished, and the lamp sections representing the track circuits being occupied are lighted red instead of white. When the rear of the train clears a track circuit, the red track lamps are extinguished except those lamps which represent switches on which electric locking is still in effect. After the locking is released these lamps are extinguished.

If an occasion arises to cancel an established route before a train accepts the signal, the towerman pulls the entrance knob, and the lamp in the signal and in the "track" go out. If the track lamps stay lighted, this indicates that electric locking is in effect under approach or time control, and, therefore, the route is being held. When the route is released, the track lamps are extinguished.

Individual Control

As previously explained, the switches are normally controlled automatically as part of the NX system. However, when making tests or adjustments, each switch may be controlled individually. This is accomplished by small toggle levers—one for each switch or crossover—which are mounted in rows on the panel.

Each individual signal can be controlled, as explained previously, by its respective entrance knob and corresponding exit buttons. Also, for a train movement through the entire interlocking, the whole route can be established by operating the entrance knob representing the first home signal, and then the exit but-



This spring switch with mechanical facing-point lock, is on the yard lead near dwarf in the new layout at Block 224

The power switch layouts are well constructed with adjustable rail braces and plates on the ties extending to the switch machines



ton at the far exit of the plant as a whole. This is known as "through routing", and is in effect with no special action by the towerman.

Protection of Drawbridge

The protection for the drawbridge over the Missouri river includes derrails and signals for train movements in both directions on both tracks. On the control panel, in the center of the symbol for the drawbridge, there is a knob. When the bridge is to be opened for river traffic, the leverman turns this knob 90 deg. so that the arrow points up.

are placed normal, the track-occupancy lamps on the NX machine, which were red all that time, are turned off. Then the leverman turns the knob on his bridge symbol which places electric locks in effect on the bridge operating levers. When the leverman operates the

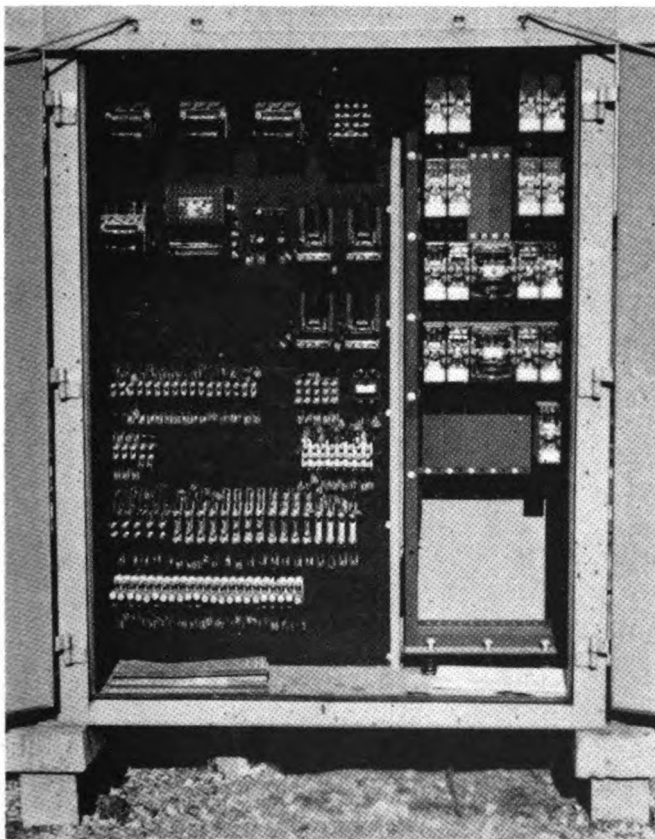
ment operating on two wires is used to handle the outgoing controls and incoming indications between the control machine and the layout at Broadway including the drawbridge. A second line code system known as a double-end, has one two-wire leg extending from the tower north to the layout at Block 4 and a second leg extending east on the Hannibal division to the layout at Block 224. At each of these outlying locations, the relays and battery are in concrete instrument houses, 6 ft. by 9 ft. The relays in these houses, as well as those in cases at signals, and in the main tower at Ustick, are all the Type B plug-in type.

Switch Layouts Well Constructed

The switch machines are the Model 5C. The switch machines in the Broadway layout and in the immediate vicinity of Ustick tower have 110-volt d.c. motors, and the switch machines at outlying places, such as Block 4, have 30 volt, d.c. motors. The principal junction turnouts are No. 20 with No. 20 frogs and 30-ft. switch points. To prevent flexing of these long switch points, there is an operating pipe connection extending to a second operating rod located 16 ft. from the switch points. Each switch layout has a M type head rod, and four Type-M Racor vertical-pin type switch rods, which minimize the rolling effect of the switch points. Racor L type adjustable rail braces are used on nine ties in each switch. On two ties the rail plates extend out and are bolted to the switch machines.

Spring Switches

Two main leads extend from Murray yard toward the connection to the main line of the St. Joseph division at Block 4. These two leads connect at a spring switch which is approximately 240 ft. from the junction.
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Plug-in type relays are on racks in cases at home signal

This causes the signals to be set at Stop and the derrails to be operated on the derailing position. At that time the track lamps on the NX control machine for the bridge are lighted red. Then after the prescribed time, the locks are released so that the bridgetender, in his cabin on the bridge, can operate the rail locks and turn the bridge.

After the bridge is returned to its normal position, and the rail locks

entrance knob and exit button for the next route over the bridge, the derrails are operated to the non-derailing position and the signal clears.

Line Code In NX System

The switches and signals in the vicinity of Ustick tower and at the Wabash yard entrance, 1,575 ft. east thereof are controlled by direct wire circuits. However, line code equip-

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length of time, a scale or scum forms on the inside. When pots have reached this condition, they should be cleaned thoroughly and given a good coat of graphite or stove polish. No metal or slag will then stick to the inside of the pots, and all impurities will rise to the top of the solder and can be easily skimmed off.

Speed-Control

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train if the engineman fails to respond. At the same time, the cab signal warning whistle blows to warn the engineman of each change to a more restrictive indication and must be acknowledged by the engineman. Acknowledgment consists of operating the acknowledging lever and brake valve to make the proper reduction of speed in order to comply with the signal indication. If the engineman is slow to respond, the brakes are applied automatically and may be released only when the train reaches the authorized speed for that signal indication. If the engineman is incapacitated and does nothing, the train comes to a stop.

If the speed of the train increases above that permitted by the signal indication, after having once reduced speed to comply with a signal, the brakes will again be applied automatically. A typical manual brake valve as used on various types of Pennsylvania locomotives has been modified to incorporate the

necessary changes required by automatic speed control.

Also the exhibit in the baggage car includes a speed governor, as shown in the picture herewith. The axle turns at the actual speed of the train; the governor, connected to the axle, represents the authorized speed, and through the braking system, slows the locomotive down to the authorized speed if it is going faster. Speed settings will be 45 miles per hour for Approach Medium signals, 20 m.p.h. for Approach, and 15 m.p.h. for any signal aspect less favorable than Approach.

In the initial stage of the present construction program, 307 Pennsylvania locomotives will be equipped with automatic speed control devices as rapidly as materials can be obtained. When this phase of the program is completed, more than two-thirds of the railroad's passenger train service will have the added protection of this system. It is planned that further extension of this automatic speed control system will be progressed as rapidly as possible thereafter to cover all areas where frequency of train service is such as to warrant the use of this system.

Also displayed in the exhibit car is the nameplate taken from the first interlocking used on the Western Continent. Designed and built in 1874 by the firm of Saxby & Farmer, of London, England, this appliance was placed in service February 11, 1875, at East Newark Junction, about one mile east of Newark in what is now Harrison, N. J.

Burlington

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tion switch with the main line. A second spring switch connects two leads from the south end of the yard toward the junction with the main line of the Hannibal division at Block 224. Each of these spring switch layouts includes a Pettibone-Mulliken spring buffer unit and a General Railway Signal Company automatic mechanical facing-point lock.

A dwarf signal is located about 20 ft. in approach to the facing-point of each spring switch. Such a signal indicates proceed as long as the switch point is within 1/4 in. of its normal position and the facing point lock is normal.

The 110-volt main battery at Ustick tower for feeding the 110-volt switch motors, consists of 55 cells of 200-a.h. Exide lead storage battery. At each of the outlying stations, the 30-volt switch machines are fed by a set of 14 cells of 80-a.h. Exide lead storage battery. Various other sets of battery feed line circuits, lock circuits and line code equipment. Each track circuit is fed by one cell of 120-a.h. Edison storage battery.

Wiring Distribution

On account of the extended area included in this new interlocking, the installation of wires and cables was an important part of the project. Between the tower and remote locations, such as Broadway, Block 4 etc., circuits are on open line wire or in aerial cable. The line code circuit is on two No. 6, 30 per cent conductivity Copperweld wire with tape and 2/64 in. Neoprene covering. The 220-volt a.c. power is on two No. 6 copper wires with the same covering as described above. The aerial cable has braided covering.

The buried cable is made up of various numbers of conductors as required, and most of these conductors are No. 12 copper. The cable to track connections is single-conductor No. 8. The insulated wires are protected by coverings including lead, jute, steel tape and outer layer of jute. The insulated wire and cable on this project furnished by the Okonite Company. This new interlocking was planned and installed by Burlington signal department forces. The major items of interlocking equipment were furnished by the General Railway Signal Company.

CUT IT OUT

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