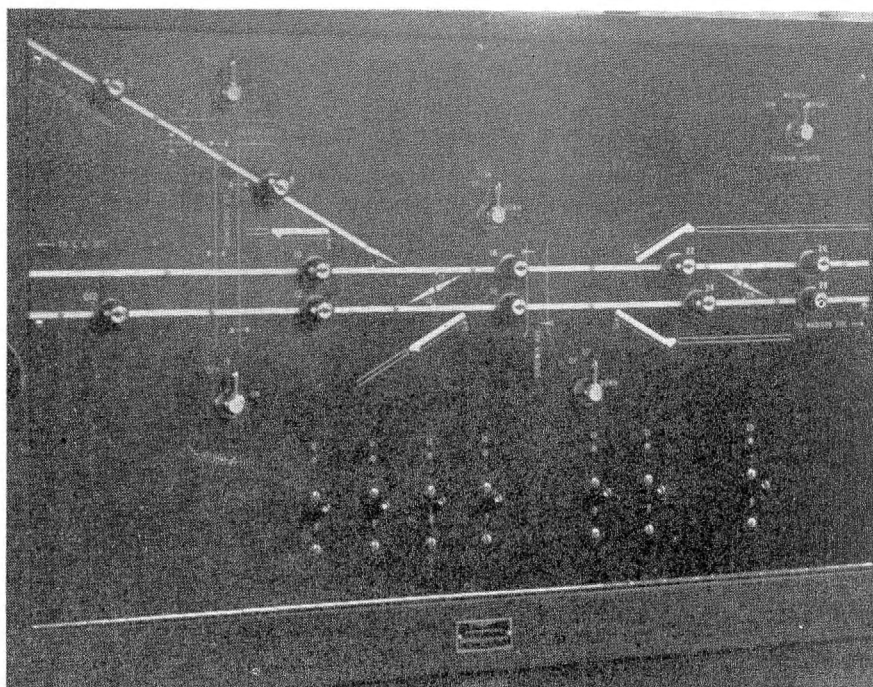


The new control machine, in addition to the signal, switch and lock levers, has levers for control of highway crossing gates and flashers



## New Interlocking in Louisville

**All-electric installation on the Kentucky & Indiana Terminal Railroad Company includes panel-type machine for control of signals and switches, as well as highway crossing protection**

AS part of an extensive signaling modernization program on its entire railroad, the Kentucky & Indiana Terminal—a 125-mi. belt and terminal line in Louisville, Ky.—has placed in service a new all-electric interlocking at Virginia Avenue in that city. The track and signal layout of the plant, known as “FG”, is shown in the accompanying diagram.

### Crossing Protection Included

Of interest in the installation is that four highway grade crossings are involved in the layout. As part of the project, the existing protection at three of these crossings was modernized by the installation of new flashers, and that at one crossing by the installation of short-arm electric gates and flashers. The flashers at two of the crossings and the gates and flashers at the one

crossing, in addition to the signals and switches of the interlocking, are controlled from a new panel-type machine at Virginia Avenue.

### Lot of Switching

The Kentucky & Indiana Terminal is owned jointly by the Baltimore & Ohio, the Southern, and the Chicago, Indianapolis & Louisville (Monon), being the home terminal of these railroads in Louisville. In addition to being a belt line, it also includes an extensive network of yards and tracks which connect with all other roads entering Louisville and serve some 285 industries in the Louisville area.

As shown in the accompanying sketch, the layout of the new interlocking at Virginia Avenue involves that portion of the K. & I's double-track main-line extending north and south between “M” interlocking, at

Madison Street, and “JN” interlocking, at L. S. Junction, 12th Street. At Virginia Avenue, a single-track branch leaves the main line, and extends west to the Kentucky State Fair Grounds, in the vicinity of which there are many industrial plants. The layout as a whole is in the heart of Louisville's industrial district which, consequently, necessitates numerous switching movements. There are approximately 120 switching and through freight and passenger train movements daily through the plant.

### Trains Expedited

At “FG”, there are two power-operated crossovers, one power switch, four electrically-locked hand-throw switches in interlocking limits, and 10 home signals. As a means of expediting and facilitating through northbound train movements in particular, the two power crossovers shown are located approximately 400 ft. apart. The reason for this is that two industrial spurs are located on the northbound main, and on which considerable switching is done. Consequently, the spacing between the crossovers now enables through northbound train movements to be run around from the northbound main to the southbound



Southward home signals 16 and 18 at Virginia Avenue, showing Diesel-electric switcher at work on the northbound main track

main, and back to the northbound, thereby enabling them to proceed and switching operations to continue without delay to either.

The facilities at "FG" formerly included color-light signals and pipe-connected, mechanically-operated switches, which were worn and had become uneconomical to maintain. Thus, in addition to modernization factors, the new signaling has resulted in reduced signal maintenance costs and increased overall railway operating efficiency and safety. In many instances, the new plant is expediting train movements and saving time.

#### Yellow and Red Only

The new high home signals are the Type-SA searchlight, and the dwarf signals are the Type-MD color-light. They are wired to display aspects not more favorable than Restricting—yellow on dwarfs, and yellow-over-red or red-over-yellow on high signals—a 15 m.p.h. speed restriction for all trains being

in effect in the territory through the plant.

#### What Aspect Means

The Restricting aspect on the K.&I. authorizes a train to proceed to the next signal, switch or rails of a connecting line at restricted speed, expecting to find another train ahead. Under the aspect, trains are permitted to follow each other through blocks, providing due consideration is given to obscured or reduced vision around curves and other places.

#### Hold-Out Signal

On the branch line to the Kentucky State Fair Grounds, there are several industrial spurs between Dumesnil and 32nd Streets. Consequently, a considerable amount of switching is done in this stretch of track and, occasionally, it becomes desirable to hold out a northbound train approaching "FG" on this line. For this reason, signal 2, which is on a cantilever bracket just west of

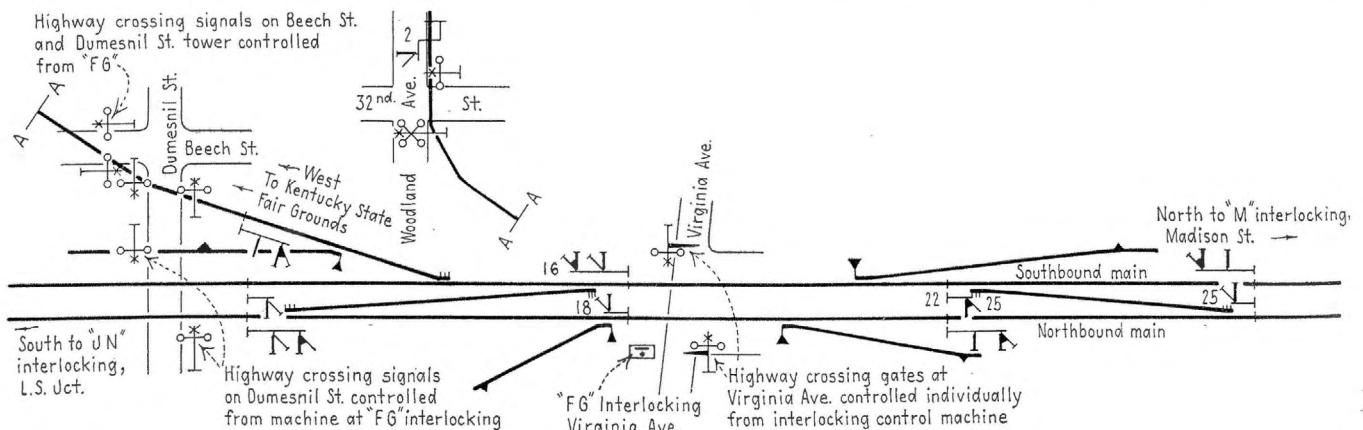
32nd street, is a controlled signal. It is normally held at Stop, and displays yellow for Restricting when cleared.

The switch machines, which are mounted on the top of the ties, are the General Railway Signal Company's Model 5C with outboard brakes, designed for operation on 110 volts d.c. The power crossovers and turnouts are No. 10's with 10-ft. points. Each hand-throw switch in interlocking limits is equipped with a G.R.S. Model-10 electric switch lock. These locks are controlled individually by separate levers on the machine; the controls are not grouped as in some installations.

#### Crossing Protection Controls On Machine Also

The interlocking machine at "FG" has three switch levers for the control of two crossovers and one switch, four electric switch lock levers, and 10 signal levers for 10 signals, and one spare signal lever. In addition, there are 2 flasher signal levers for Beech and Dumesnil streets, and two gate levers for the gates and flashers at Virginia Avenue. The controls for this protection, which will be discussed later, are straight manual for the main-line crossing at Virginia Avenue and Dumesnil Street, and are automatic for Beech Street, designed so that the operator cannot take away the protection so long as the crossing track circuit is not clear.

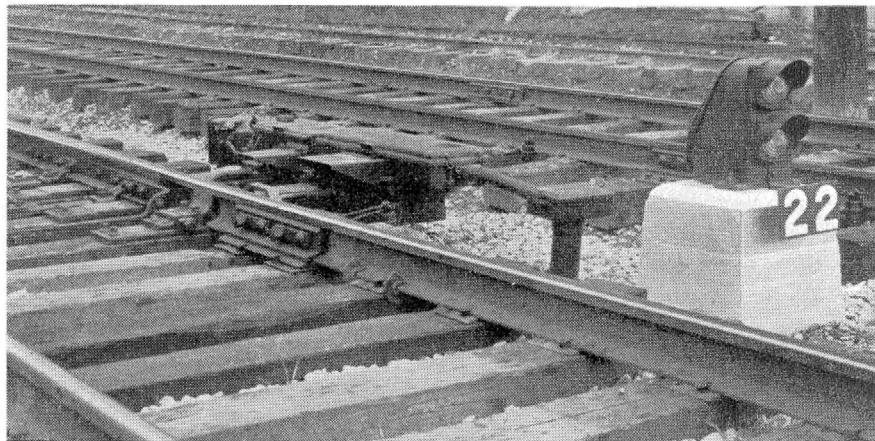
The high home signals are controlled in two ways, either as semi-automatic stick or non-automatic



Layout of the tracks, signals and crossing protection in the vicinity of Virginia Avenue



View of a typical power switch machine and two - indication color-light dwarf signal at Virginia Avenue. Switch machines are mounted on top of the ties



signals. The levers controlling these signals are known as the push-pull rotory type. To clear a signal as a semi-automatic signal, the lever is pushed. To cancel this signal manually, the lever is pulled. To clear the signal as a non-automatic, the lever is turned either to the left or right, depending on the direction of traffic. Signals governing northbound traffic are turned to the right; southbound to the left. The only way to cancel a non-automatic signal is manually, and this is accomplished by turning the lever back to stop. The option of making the signal either semi-automatic or non-automatic depends on whether a train is being moved into an unoccupied or occupied block.

All dwarf signals, except signal 22, are normally controlled by turn-

ing of the signal levers, these signals not being provided with the semi-automatic feature like the high signals.

In the case of signal 22, it is semi-automatic with push-pull lever manipulation for a train movement in the normal direction of traffic through crossover 25 reversed, and non-automatic with turn manipulation of the lever for a reverse train movement on the southbound main through the crossover normal. The non-automatic feature of both the dwarf and high signals, and what

it entails in the manipulation of their control levers (turning), serves as an extra reminder to towermen as to what they are doing in lining up routes against the normal direction of traffic or into occupied track sections.

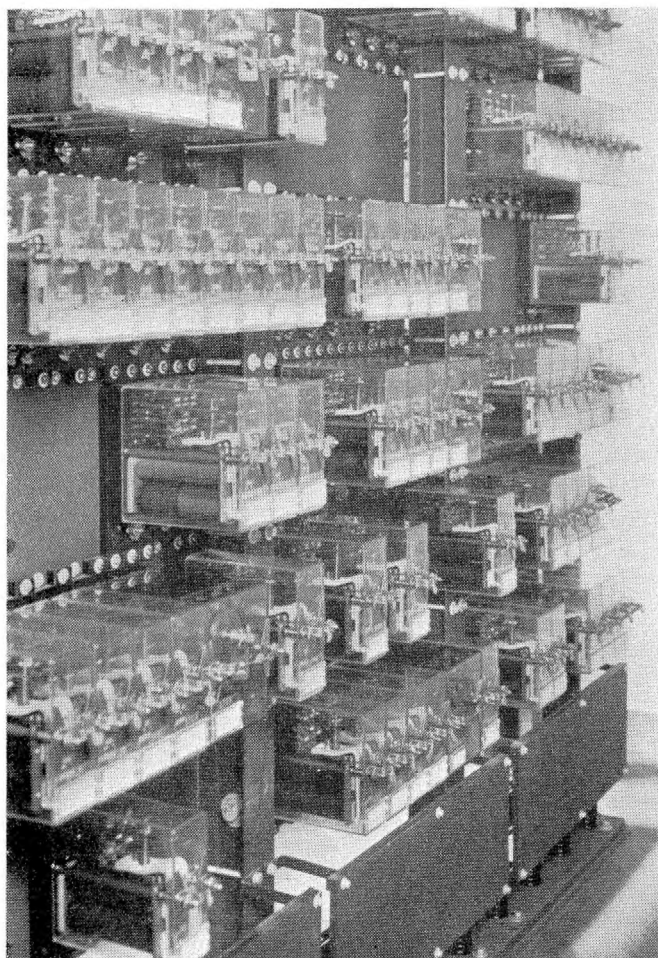
#### Other Machine Features

Each signal lever has a normally-extinguished white light in the barrel of the lever. When the lever is manipulated, the lamp flashes until the signal clears, and then it changes to a steady light. Should the signal fail to clear, the lamp will continue to flash.

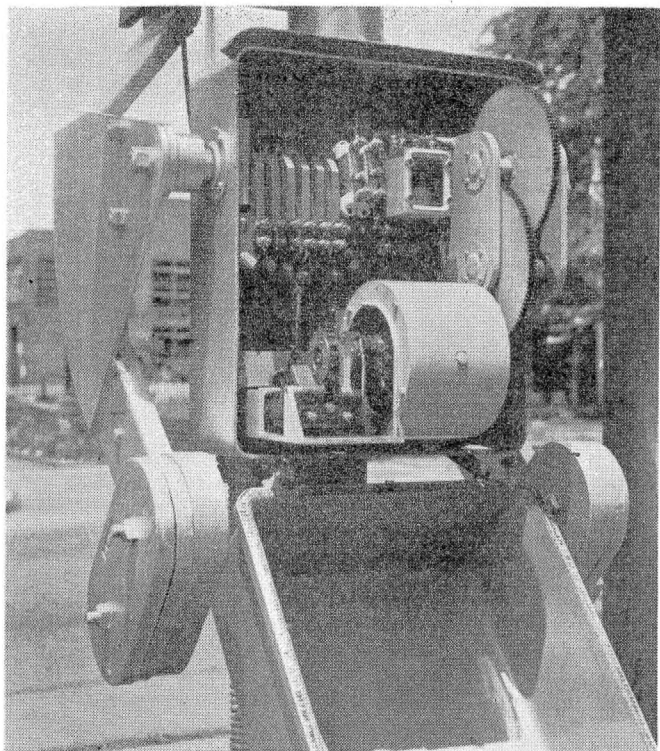
The switches and electric locks are controlled by individual toggle or keytype levers on the lower front of the machine panel. When the switches and locks are locked up, a small red lamp is lighted above the levers. Another white lamp above each of these lamps is lighted whenever a switch is not in the same corresponding position as its control lever, or an electric switch lock is unlocked. Magnetic switch-point indicators, located in the track diagram of the control machine panel, indicate the position of the switches and crossovers in the field. Normally-extinguished opal track lamps are provided to indicate track occupancy.

#### Gates and Flashers

As part of the interlocking project, modern Transport Products Corporation Model-S short-arm crossing gates and back-to-back flashing-light signal assemblies were installed at the Virginia Avenue crossing. These gates are designed for operation on 10 volts d.c., drive all the way up, and drive down to about 45 deg., dropping by gravity from that point to the lowered position. Each gate has a 16-ft. arm which extends over the approach



All relays in the tower at the new interlocking are the rack - mounted plug - in type



Mechanism with cover opened on one of the gates at Virginia Ave.

lane of the highway only. There are three 10-volt red lamps mounted on each arm, the outside lamp burning steadily when the arm is lowered, and the two inside ones flashing alternately with the flashers. Obsolete air-operated gates were formerly in service at this crossing.

In addition, flashers which had been in service at the Dumesnil Street crossing on the main line, and at the Dumesnil-Beech Streets and Woodland Avenue-32nd Street crossings on the Fair Grounds line, were modernized by the installation of new Transport Products Corporation Model-F back-to-back flashers, standard crossbuck signs and bells. This protection, with the exception of that at Beech Street and at the Woodland Avenue-32nd Street crossing, is controlled by straight manual circuits from the new interlocking machine at Virginia Avenue. The street crossings are shown on the control panel, and levers are placed in positions on the panel corresponding to those of the facilities in the field which are controlled. The flashers protecting the Beech Street crossing have the ad-

ditional auto-manual feature which prevents the operator from discontinuing protection as long as a train occupies the crossing track circuit, even though he restores the control lever to the off position.

#### Lever for Each Gate

The gates at Virginia Avenue are individually controlled by two levers, which enable the towerman to raise or lower either gate as highway vehicular traffic conditions may require. The flashers at Dumesnil Street on the main line and those at the Beech-Dumesnil crossing on

the Fair Grounds line are each controlled by separate levers, which provides a flexible arrangement in the event either crossing is tied up by a train and the other is not.

The crossing protection levers on the control machine each have an opal colored lamp in the stem which is normally out. When the lever is manipulated to the right and the protection controlled has started to operate, the lamp flashes until the flashers or gates are cut out by return of the lever to its normal center position.

#### Special Annunciator Circuit

Between "FG" and "M" interlockings on the main line, there are several highway grade crossings, the protection of which is controlled from watchmen's towers at Grand Avenue and Greenwood Avenue—two of the crossings involved. As an indication to the watchmen in these towers of an approaching northbound train, when signal 16 or 18 at Virginia Avenue is cleared, a bell is sounded automatically in the towers.

This bell circuit is controlled through back contacts of the red repeater relays for these signals, and the arrangement eliminates the necessity of separate push buttons or levers on the control machine at "FG" to control the feature, according to the railroad.

#### Power Direct from Rectifiers

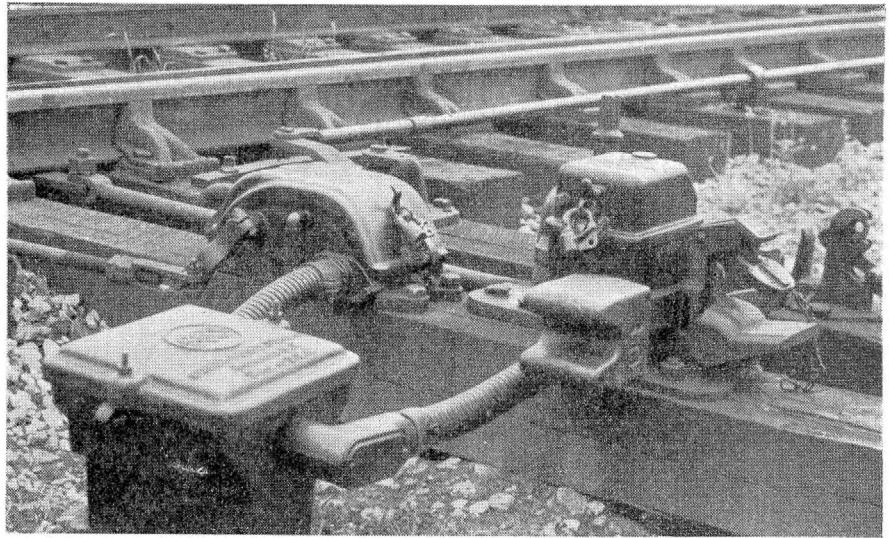
Commercial 110-volt a.c. power is received at Virginia Avenue from the Louisville Gas & Electric Company. All flashers and signals at the

Flashers with gates lowered at the Virginia Avenue crossing. These facilities are controlled from the new interlocking plant





Typical installation of electric lock on hand-throw switch in the plant



interlocking are normally fed from this source through rectifiers and power-off relays. In the event of a commercial power failure, however, the power-off relays cut these flashers and signals over to standby storage batteries which are normally on floating charge. The storage battery at the tower consists of 88 Edison B4H 80-a.h. nickel-iron-alkaline cells for operation of the switches, and 10 A4H 150-a.h. cells for the signals.

A set of 10 cells of Edison A4H 150-a.h. nickel-iron-alkaline battery are provided at the Virginia Avenue crossing for standby operation of the gates and flashers, and a set of 8 cells of Edison Type B4H 80-a.h.

fixed resistance at the battery end of each track circuit, .9 to 1 volt is fed to the rails. This is cut to about 0.4 volt across the relay by a 12-ohm variable resistance.

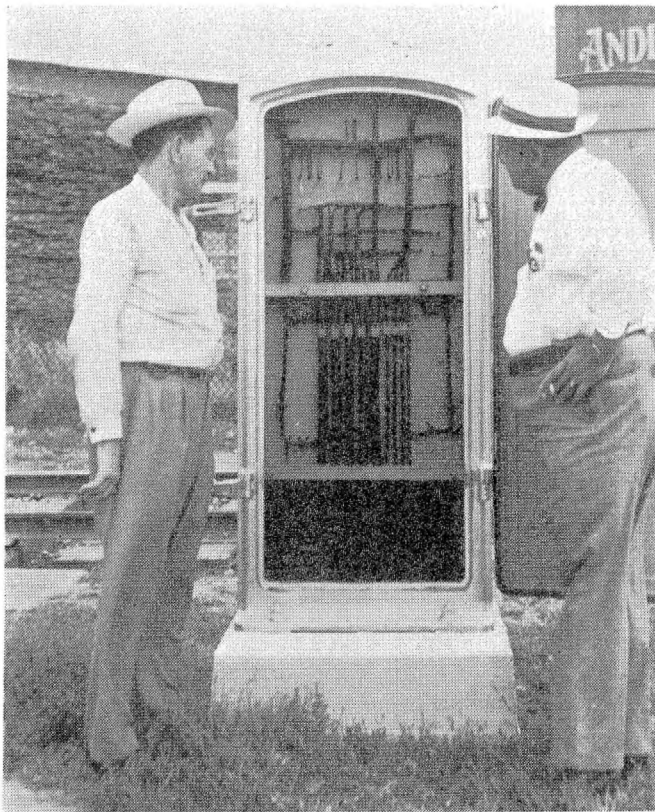
project are of the Okoprene type, furnished by the Okonite Company. Case wiring is No. 12 stranded flexible wire. Track circuit leads are No. 9 single conductor underground. A 9-conductor (3 No. 10 and 6 No. 12) extends to each power switch machine, and a 6-conductor No. 12 to each signal from the nearest instrument housing. Cables entering instrument housings are brought up through runs in the foundations, being enclosed in sand to about 3 in. from the top of the foundation and then sealed by filling the remainder of the run with hot battery sealing compound.

#### Plug-In Relays

All relays in the tower at the new interlocking are the Type-B plug-in type, mounted on racks. The various circuits are protected against lightning by Raco and Western Railroad Supply Company arresters. Foundations for signals are instrument housings on this project were poured with ready-mixed concrete.

This interlocking and highway crossing protection was installed and placed in service by the regular signal forces of the Kentucky & Indiana Terminal Railroad, under the jurisdiction of H. L. Kincaid, electrical engineer, and under the immediate supervisor of assistant signal supervisor M. L. Long and signal foreman C. E. Waterbury. This plant is maintained by maintainer John Schoch and assistant maintainer C. F. Davis. The principal items of interlocking equipment and signaling were supplied by the General Railway Signal Company, and the majority of highway crossing apparatus by the Transport Products Corporation.

M. L. Long (left), assistant signal supervisor, and H. L. Kincaid, electrical engineer, at case, showing back-of-case wiring



battery is in service at each of the other grade crossings for operation of the flashers. These crossing batteries are on floating charge from Fansteel or G.R.S. rectifiers.

Each track circuit is fed by one cell of Edison B4H battery. The track relays are the General Railway Company's Type-K-2 and B1, rated at 4 ohms. Through a 2-ohm

Track circuit connections to the rail are made by means of Transport Products bootleg risers, and the rails are bonded with Hanlon & Wilson plug-type bonds, with 3/8-in. plugs driven into the web. Connections between bootleg risers and the rails are made with 7B-12 standard Copperweld bonds.

All wiring and cables on this