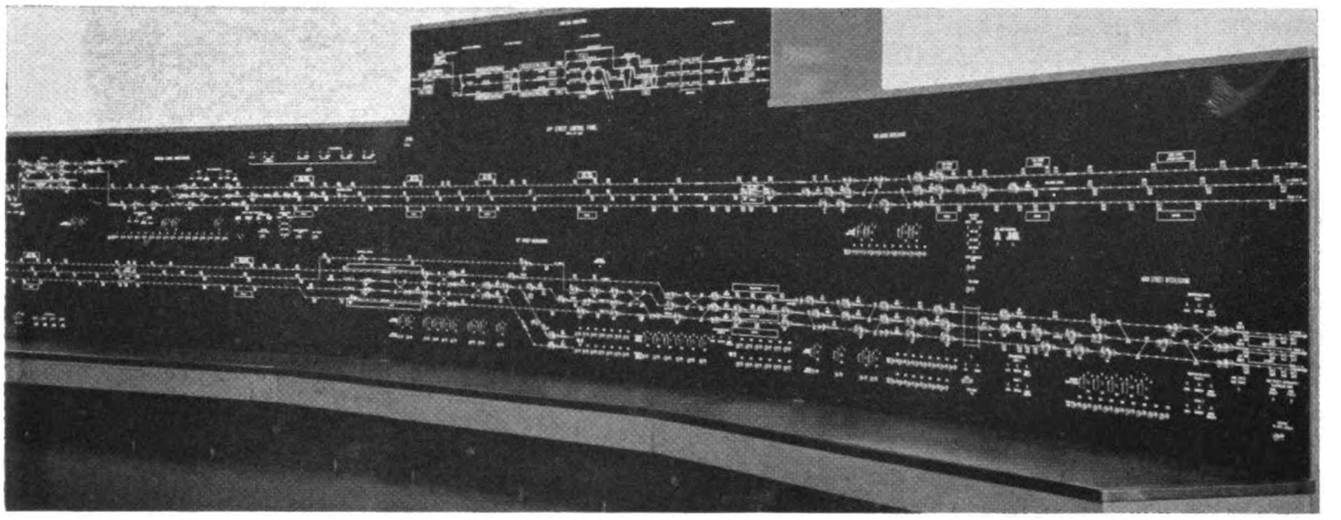
August, 1958

Railway Signaling and Communications



Route-type, line-of-light control machine at 111th street controls seven interlockings

Subway Consolidates Interlockings

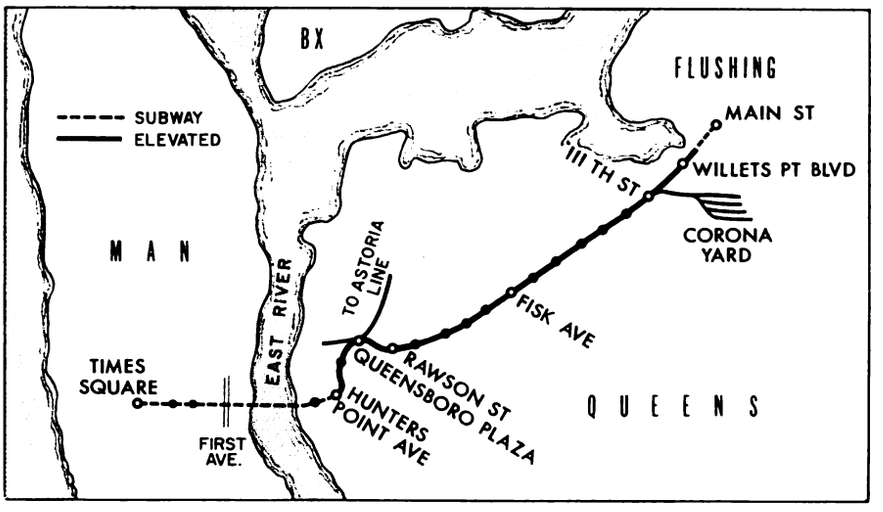
New York Subway puts control of seven plants into one machine and three into another. Project includes electronic train identification system for automatic control of facing point switches at interlockings

THE NEW YORK CITY TRANSIT AUTHORITY has completed extensive modernizing of the signal system on the Flushing Line, at a cost of approximately $9.5 million. The 10-mile line has its west terminal in Times Square, New York. A two-track subway line runs under the East River to Hunters Point in Queens; from there it goes on elevated structure to Rawson street, becomes three tracks all the way to Main street in Flushing, where it terminates underground. It carries some of the heaviest traffic on the transit system, due to the sharp population increase in Queens during recent years. The daily traffic consists of 275 trains in and out of the Times Square terminal, operating on a schedule of 90-sec intervals during the peak rush periods. In the past, trains were made up of nine cars; with completion of the new signaling and platform extensions 11 cars may be operated.

Automatic Control of Facing Point Switches and Crossovers

One of the new and novel features of this project is an electronic train identification system which is used not only for selective control of facing point switches, but also for announcing the class of trains at station waiting rooms and on indicating panels for dispatchers. The train identification is known as the "Identra" system.

Rawson street interlocking provides for automatic control of the switch layout at the start of the three tracks, indicated on the track plan. The middle track carries the express service westbound to New York in the morning and eastbound to Queens in the evening rush periods. This interlocking is controlled from either of two machines; the operation is described later in this article. Automatic operation may be established by operating a lever on the machine that has control of the interlocking.



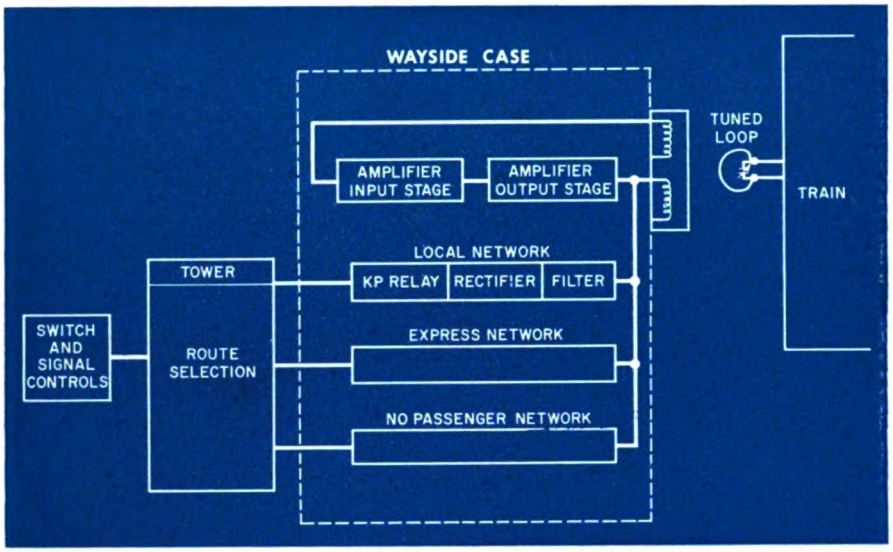
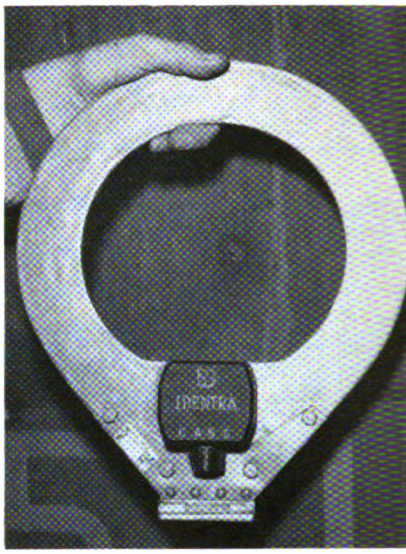


Fig. 1 Block diagram shows basic components of "Identra" electronic train identification system with route selection as used at Rawson street



Detachable train-carried coil has four-position tuning capacitor

Each train is equipped with an inert loop mounted on the first car. The loop has a four-position tuning capacitor. Capacitor positions are Off, Local, Express and No Passenger. At selected locations a wayside case is equipped with a pair of coils mounted at a height which places them opposite the train-carried coil at a distance of approximately 18 in. The case contains an amplifier, power supply and frequency selective networks. The block diagram in Fig. 1 shows one wayside coil connected to the output of the amplifier and the other to the input. When the train-carried loop passes the wayside coils, the output of the amplifier is coupled to its input. The frequency of the resultant oscillation will be determined by the resonant frequency of the train-carried, coil capacitor combination. The signal is sent to the selective networks. The network which accepts the signal will rectify it and apply the resultant d.c. to a style KP relay. This relay will then call for a stick relay in the tower. The stick relay will in turn call for the switches in the route. Once the switches are in position the signals will clear over the initiation relays. A call for a route is held until the train passes the home signal and the cancellation coil. These cancellation coils have a wide band network which will accept all classes of trains, regardless of the position of the tuning capacitor. The relay in this network will drop the stick relay that called for the route.

Either of two wayside identification units may call for the route; both are located in approach to the interlocking signals. The first one will normally call for the route. This wayside case was located to give ample time for a route to clear before the train comes to the automatic signal marked "A" in the track diagram. This was done so the train will normally pass the automatic signal when it displays a green aspect. Should the route not be available, the train may pass the automatic signal displaying a yellow and thus clear the route at the next wayside coil. The automatic selection circuits prevent a second train calling for a route before the first train has accepted and canceled its route.

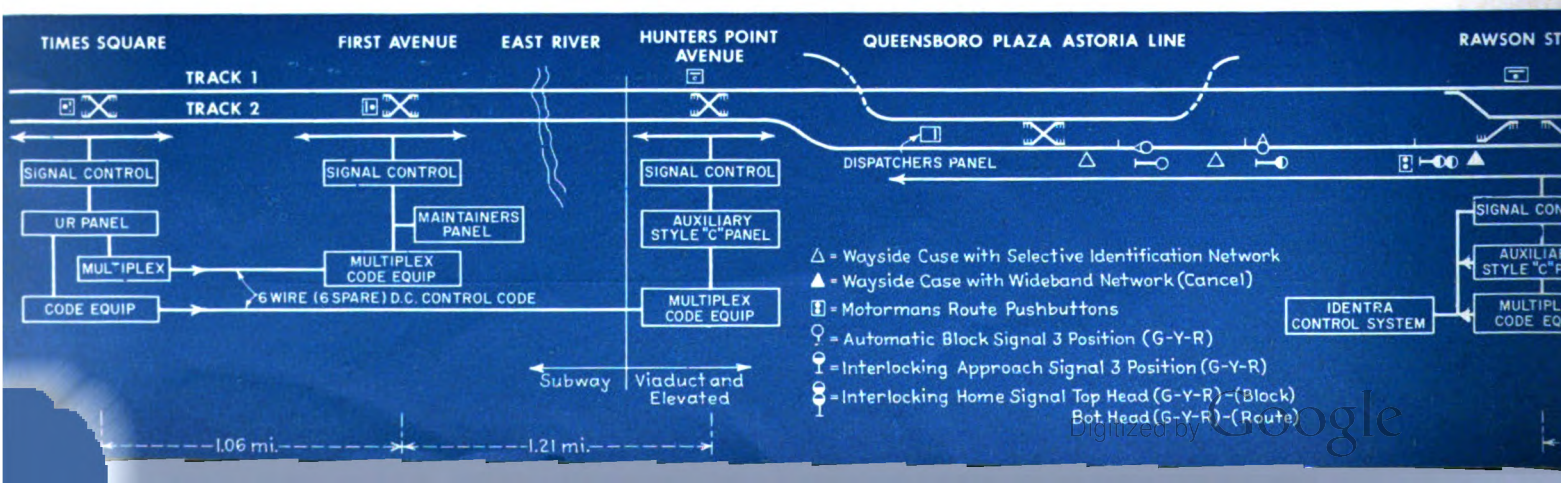
Pushbuttons are located at the home signals to allow the motorman manual selection in case he finds his route improperly lined. This selection is effective only when interlocking is on automatic operation. An illuminated indicator on the pushbutton unit informs the motorman when the interlocking plant is controlled automatically

Normally, preconditioning and switch storage is prevented on all switches. But since preconditioning is inherent in the automatic operation, loss of shunt protection is provided by a 5-sec delay timer in the detector circuit. When the automatic operation is in effect, the circuit must be clear for this time before the switch locking is released.

The "Identra" system is used to the commuters' benefit. Identification signs and warning bells are provided in waiting rooms. Wayside coils are mounted on their cases in the approach to stations as the trains pass they will announce their class of service. Stick relays and timers provide adequate ringing time. At the terminals, check coils are located to inform the dispatcher of the classes of arriving and leaving trains.

New Control Panels

The first phase of the project was the installation of the signaling from Times Square to Hunters Point. This included the new "UR" route type control machine at Times Square. The panel has track occupancy indications and control



for all the interlocking signals up to Queensboro Plaza station, a distance of 3.1 miles.

The machine at Times Square controls a diamond crossover and associated signals by direct wire. The diamond crossovers at First avenue and Hunters Point avenue are controlled by separate code systems. At First avenue a spotlight type panel was provided for the maintainer. It provides indications within the interlocking limits, switch position indicators, a master lever key lock, and auxiliary switch pushbuttons for testing. The new PN-50 relay racks and code equipment are in the old tower, at the entrance to the tunnel under the East river.

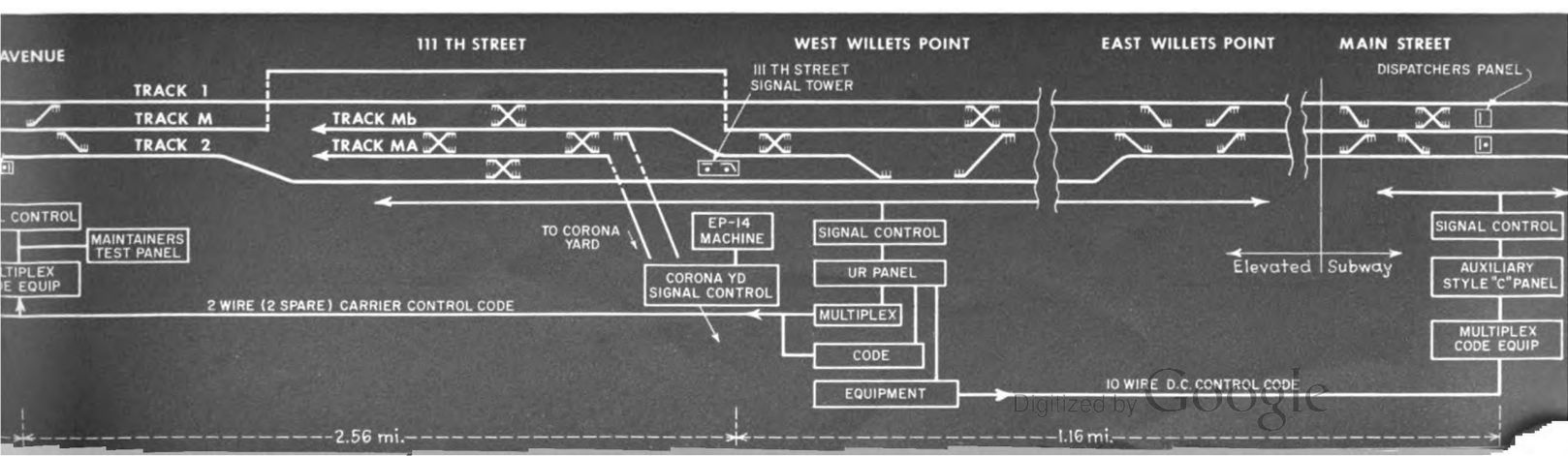
At Hunters Point avenue a Style "C" miniature lever machine provides auxiliary control in case of emergency. The new tower was built overlooking the crossovers on the viaduct, where the line comes out of the subway and goes on elevated structure. The auxiliary control machine duplicates all the signal controls which the Times Square panel normally performs. In addition, the auxiliary machine also provides for emergency releases on the switch detector circuits. The "UR" panels that control remote switch layouts are not provided with the emergency release, since the operator is required by rules to check the switches for occupancy before using this feature.

The operator of the auxiliary machine may take control of the interlocking at any time. The master lever is a key lock on the Style "C" machine, which is normally in a position to give Times Square control. Turning the key in the lock will cause a control indicator light to flash on both machines if any lever at Hunters Point is out of correspondence with the routes set up by Times Square. The operator of the auxiliary machine must position all his levers to agree with his indication lights. Once this is accomplished the control will transfer to the auxiliary machine. This correspondence check avoids "kicking off" signals in making the transfer.

City-bound train initiates calls for trailing-point switches at Rawson street

The Hunters Point machine has red spotlights to indicate track occupancy. Each miniature signal lever has a red lamp to indicate the signal at danger, a yellow lamp to indicate when the signal is clear. Both lamps are normally dark. Switch levers have three lamps: (1) white—illuminated when the detector circuit is clear; (2) yellow—flashes when the switch is traveling reverse and steady when indicating full reverse; (3) green—flashes when the switch is traveling normal and steady when indicating full normal.

The second important phase of the overall project was in the Queens area, where the control of seven interlockings was consolidated into one new route type control machine in an expanded tower at 111th street. The seven interlockings are at Queensboro Plaza, Rawson street, Fisk avenue, 111th street, Willets Point East and West, and Main street. The 111th street, Willets Point East and West plants are controlled by direct wire, the remaining remote plants are controlled by high speed multiplex code. Auxiliary control machines, similar to the one at Hunters Point, are provided at Rawson street and Main street, At Fisk avenue a maintainers test panel was pro-



vided similar to the one used at First avenue.

The signal controls are based on the "single block overlap" system. In this system a signal will not change from the red aspect until the rear end of a train has passed the second signal in advance. Signals are located to provide braking distance plus a safety factor in each block.

Protection is enforced by an automatic train stop or trip arm at every interlocking and automatic signal. When the signal is displaying a red aspect the trip arm is in the raised position. If the motorman does not observe the restrictive red aspect of the red signal the trip arm will come in contact with the "trip-cock" on the train. This "trip-cock" is mounted on each car at a level where it will encounter the wayside trip arm when it is in the raised position, and cause the emergency brakes to be applied by exhausting the air brake supply. When the signal displays a yellow or green aspect the trip arm is down and will not engage the "trip-cock" on the train.

The caution control includes two entire blocks, as shown by the line

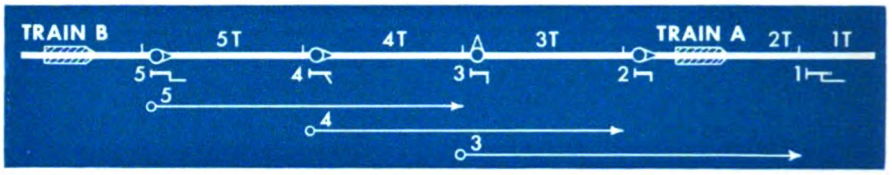


Fig. 2 Caution controls for automatic signals in the single-block overlap system

marked 5 on the diagram (Fig. 2). Signal 5 will display red when either or both the blocks 5T or 4T are occupied. When the rear of the train passes signal 3, signal 5 will go yellow. When train passes signal 2, signal 4 will go yellow and 5 green.

This sequence of aspects is required in coordination with the automatic train stop, to have a minimum of an entire unoccupied block length between the rear of a train and the second red signal in approach to it, with its stop in the up, or trip position.

Automatic Key-By

In order to provide flexibility in case of circuit failure, or train trouble, the new automatic and interlocking approach signals are provide with an automatic key-by feature. An "AK" sign, mounted below the signal head informs the motorman which signals are equipped with this feature. At these locations the insulated joint is about 8 to 10 ft in approach to the signal and the automatic trip arm. The motorman coming upon a red signal must come to a halt, then proceed slowly across the insulated joint. This will cause the trip arm to be lowered to clear before it engages the trip-cock on the train. He may then proceed at reduced speed according to rules.

The automatic signals not affected by the new work provide a manual key-by. This feature requires the motorman to leave his cab and insert a key in the electropneumatic stop valve to clear the trip arm.

The H control circuits provide a cycle check of the stop mechanism.

Fig. 3 Station Time Controls

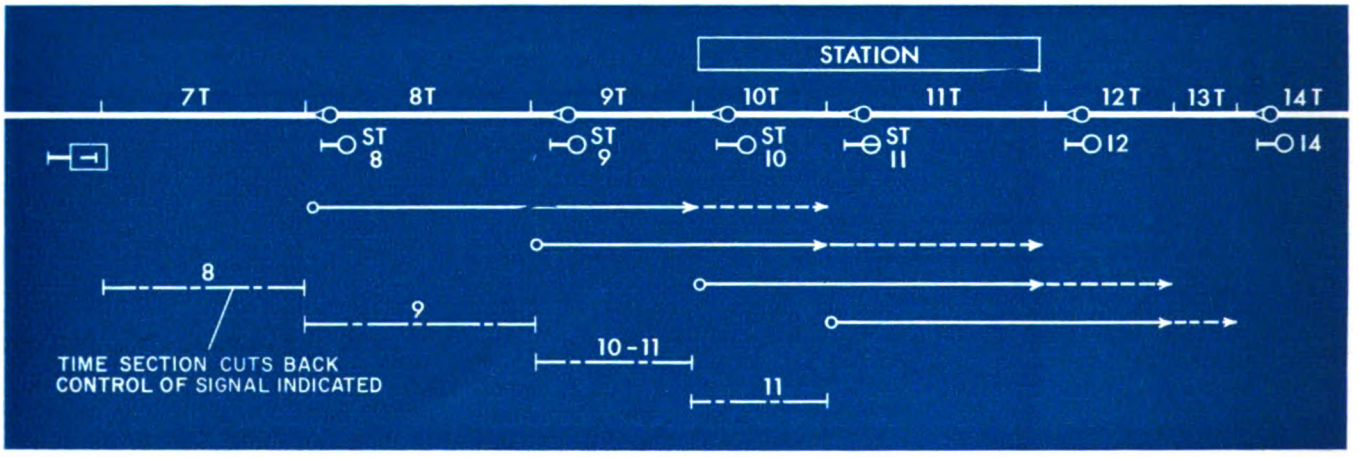
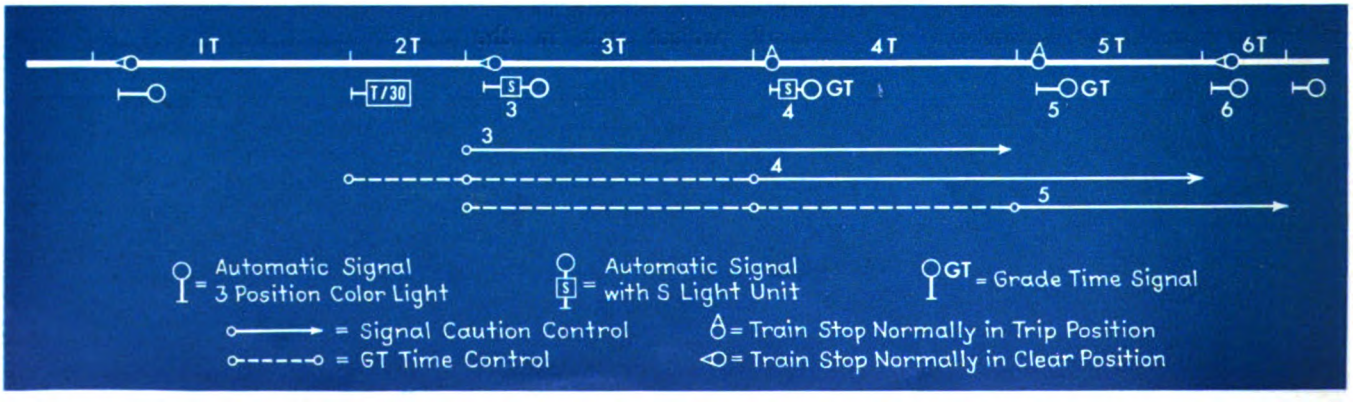


Fig. 4 Grade Time Controls



This feature insures the trip arm coming to the up or trip position each time a train passes. If it does not come up the signal will not clear for the next train and thereby is reported to the maintainer.

Station Time Control

The density of traffic during the rush hours and the additional time required for loading at stations dictated the entensive use of Station Time signals. Keeping the trains moving, at reduced speed, is the function of the system.

Normal controls of the signals are arranged to have sufficient braking distance between a train and the second red signal behind the train. The distance is based on the grade and alignment of the tracks and the maximum attainable speed.

In order to maintain the operating headway with maximum safety, special consideration in the signal layout is required at stations. As the designed headway is 90 seconds, it is necessary to provide "closing-in" controls.

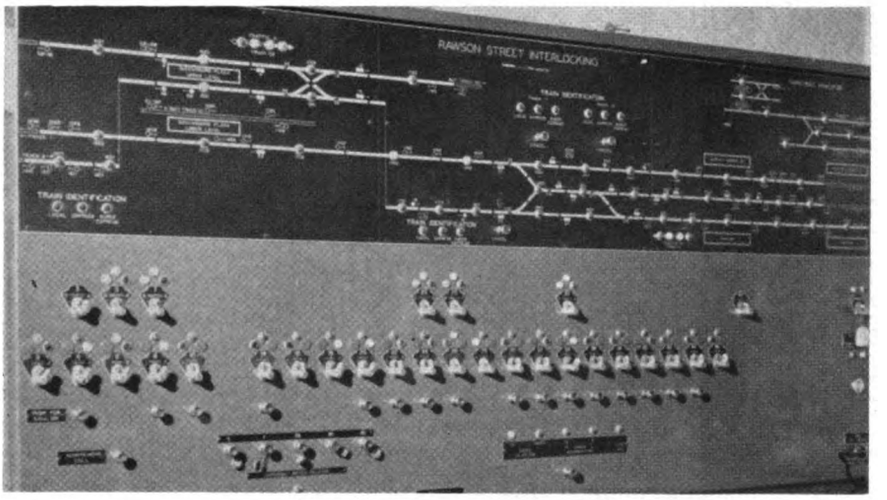
Referring to Fig 3, the control line for the normal operating speeds is represented by the solid and dotted line.

With a train standing in the station, a portion of the control of certain of the signals will be occupied. As the train moves out of the station it will continue to occupy portions of signal controls. A method of cutting back the controls of the signals entering the stations is provided in order to bring the approaching train as close as possible to the station and to permit it to enter as the leaving train moves out.

The dotted portion of the normal control is cut out of the circuit by means of time relays. The solid portion of the controls represents the "cut back" control of the signal.

The solid portion represents the length of control line that is necessary to provide safety when the speed of the train is kept below a predetermined value. This predetermined value is always much lower than the normal through speed in the area.

The approaching train enters the time section marked by an illuminated "T" sign. With a train in the station, 10T and 11T occupied, the approaching train must proceed at a predetermined speed, through section 7T, in order to clear signal 8 to a yellow aspect. As the train in the station moves ahead, the following train may proceed at the prescribed reduced speed through section 8T to cut back on the control for signal 9. Signal 9 will clear to yellow with the train ahead on section 11T. During non-rush hours the signals will generally clear on their normal controls, due to the greater time between trains. Time element relay circuits are designed to prevent operation when not needed.



Style C miniature lever machine for auxiliary control. Train identification lamps on panel are actuated by "Identra" system. All control machine functions automatically start code system without pushing a code start button

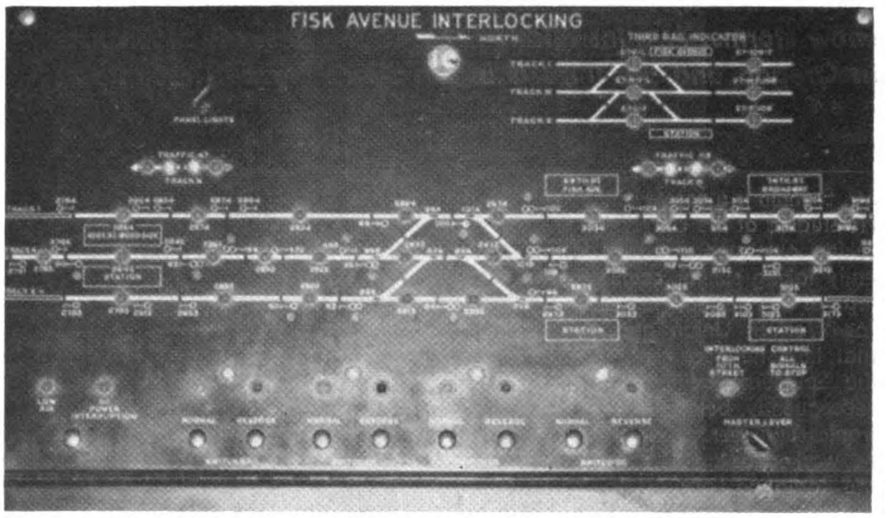
Grade Time Control

Wherever excessively high speeds could be attained, a system of normally-danger speed control (G.T.) signals are used. Steep downgrades, sharp curves and long runs where the attainable speed may be dangerous, or where the comfort of the riding public is to be considered, are examples of where the G.T. signals are applied. For example, east of First avenue, where this Flushing line "dives" under the East River and then goes up on the elevated structure.

Restricted speed is enforced by timers started over track relays dropped by the approaching train. The timers must run their full time within the prescribed section to clear the signals. The train has two chances to clear each signal. This two-block clearing system allows for smoother operation of trains than the conventional one-block type, where the motorman must always run a timer in approach to a red signal.

The Grade Time controlled territory is designated by a sign at the entering point as shown in Fig. 4. This sign will show the prescribed speed required in the territory, 30 mph in this case. The entering signal is not G.T. and will display yellow with an illuminated "S" unit

(*Continued on page* 34)



Fisk avenue maintainer's test and indication panel provides switch control when all signals at the interlocking are put full-normal (Stop). Signals are normally controlled by UR control machine at 111th street

IRT Consolidates Interlockings

(*Continued from page* 19)

Reading from top to bottom: G, Y, R in top head of interlocking home signal are for block indications. Number plate 1962 indicates location on "C" line. "S" unit indicates signal in advance will clear on grade time control. G, R in lower head are for route indications. "X 42" indicates interlocking control lever. Call-on Y in bottom unit. Electro-pneumatic stop mechanism located between rails and trip arm at right hand side of rail. Box by middle signal head used by motorman for manual clearing of trip arm when call-on aspect is displayed

below the signal head. The "S" aspect indicates that the two blocks in the control of signal 4 are clear, and that signal 4 will clear on time control. If the train travels through section 2T at 30 mph, signal 4 will clear to yellow and signal 3 to green. If the train exceeds 30 mph and passes signal 3 at yellow, it must reduce speed in the 3T block to allow signal 4 to clear on the second chance timer.

With this type of control, under certain conditions the trains may pass all green signals if the proper speed is observed.

The new "line-of-light" route type control machines installed at Times Square and 111th street contain some different and interesting features when compared to machines on other railroads. The panels are made of heavy gauge sheet steel, painted black, with the symbols lettering and track plan engraved and filled with white.

Route pushbuttons are located on the panel in the center of the track line. The buttons control the entrance and exit points for all routes. Small round lights (spot lights) located in the track line adjacent to a route button are provided for each interlocking signal. In the track diagram are oblong plexiglass lenses which are normally dark, but will light white when a route is established within the interlocking, red when the track is occupied.

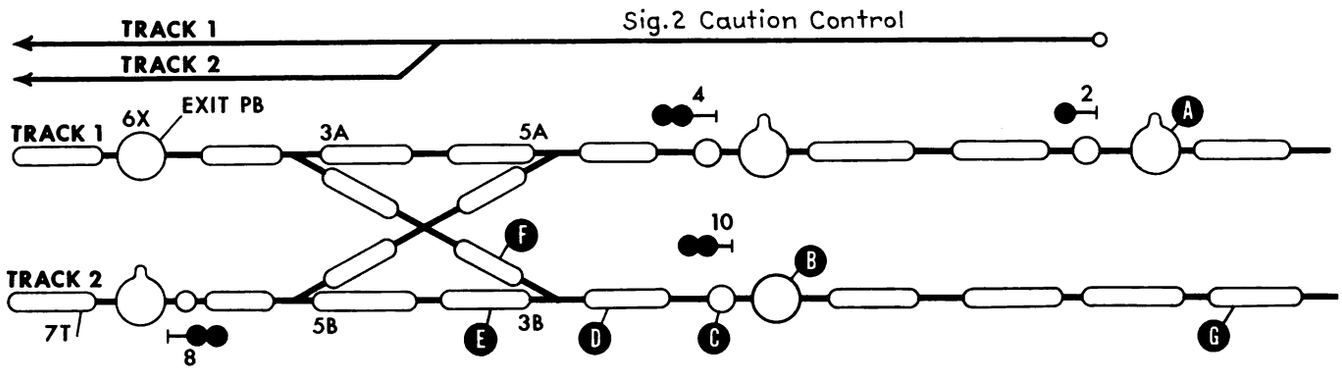
In order to initiate a route the operator pushes a button at the desired entrance point. The signal indication light will show red and all the available exit points will be shown by a white light in the track diagram. Pushing a button at the selected exit will cause all other exit lights to go dark and indicate the entrance with a white light. All switches in the route will travel to their selected position at the same time. While in transit the route lights over the switch will flash red at a 75-cpm rate. Once the switches in the route are lined and locked, a continuous white line of lights will be displayed from the entrance to the exit. The clearing of the entrance signal will be shown by its indication light going yellow.

Fleeting Control

Normally a home signal will not clear again after a route has been used by a train. If two or more following trains are to use the same route, special "fleeting" control can be set up as follows: pushbuttons for entrance and exit in the normal manner, then go back and turn the button used for entrance in the direction of train movement. Fleeting a signal will allow it to clear automatically as a train moves out of its control limits.

To cancel a signal manually, the route button corresponding to the signal is pulled. The signal indication light next to the button will go dark, the white route lights will remain as long as approach or time locking is in effect.

Call-On aspects are provided on all home signals. This aspect, Red, Red, Yellow, may be used in the event of a track circuit failure, to allow closing in on a preceding train or when a slow speed move is desired. To clear a Call-On when the track in advance is occupied, the proper buttons are pushed for entrance and exit, then a CO pushbutton is pressed. CO pushbuttons are grouped on the machine and labeled according to the number of the signal. When the Call-On is displayed, the signal indication light on the panel will flash yellow. When the motorman reaches out of his cab to operate his key-by lever, the automatic train stop will clear, causing the indication light on the panel to go steady yellow. This type signal cannot be fleeted, it must be established each time it is



A Interlocking Approach Signal Control P.B. with Fleet Feature
B Home Signal Control (without Fleet Feature) also Acts as Exit P.B.
C Signal Indication Lamp
D Route Lamp: Also Acts as Entrance and Exit Indicator
E Route Lamp: Also Illuminates White for Switch Position Indication
F Route Lamp: Also Illuminates White for Reverse Swith Position Indication; Also Flashes Red for Switch Transit Indication
G Line-of-Light Unit - Indicates Red for Track Occupancy

Fig. 5 Typical panel indications used on UR line-of-light control machine

required. Another restriction is that the approach track must be occupied before the operator pushes for the Call-On.

To clear a Call-On with the track in advance clear, the button used for entrance is pushed first; the CO button pushed second; then the button used for exit. When work is being done on the track this signal will let the motorman know that he must proceed at a restricted speed.

Because of overlap controls, interlocking approach signals are lever controlled. They are cleared by pressing their associated route button; since they require no switch selection, no exit need be pushed. If the control line of the signal requires switches to be positioned, it will be done automatically when the route button is pushed. Once the required switches have indicated, white route lights will show from the approach signal to the next signal in advance.

Flashing White

For example, in Fig. 5, if switch 3 were reverse, pushing the route button at signal 2 will automatically control crossover 3 to normal. The route will light white from signal 2 to signal 4. To inform the towerman that the switch is locked if he pushes any route button that would initiate a conflicting move, route lights over the switch will flash white. In the above example, pushing the route button at signal 10 will flash 3 switch, also signal 2 indication light will flash at this time to indicate that this signal has the switch locked. The flashing will persist until a non-conflicting route is set up, from 10 to 8, or the locking signal 2, is canceled.

The flashing indication is also used to inform the towerman of an overlap lock condition on a facing-point switch. The control line for signal 2 includes 7 track circuit when crossover 5 is reversed. If signal 2 is clear over switch 3 and 5 normal, and 7 track occupied, allowing switch 5 to go reverse would cause signal 2 to go red, the automatic trip arm to come up, possibly in the face of an oncoming train. This is prevented by holding the switch locked normal, until the train moves off 7 track circuit, or signal 2 is canceled. To remind the operator when this condition exists, the locked switch, 5 in this case, will flash white when the button at signal 4 is pushed. Since the switch is not locked by the immediate detector, preconditioning is allowed. Pressing the button at signal 4 will cause exit lights to appear at Signals 6 and 8; if the exit is selected at 8, the selection relays will allow the switch to be "called" reverse. However, switch 5 will not move until track circuit 7 is unoccupied.

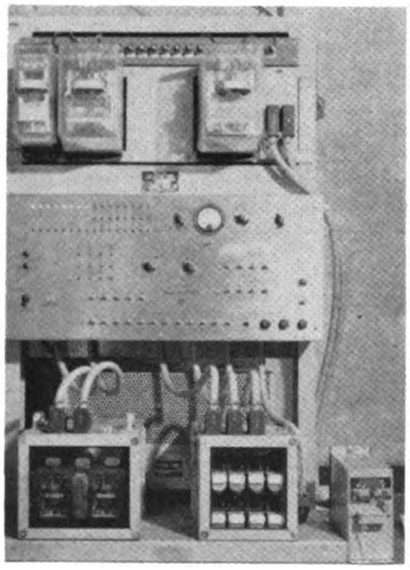
Auxiliary switch levers are provided on the panel: (1) To establish a route should a switch fail to respond to the selection relays. (2) To preset, lock a switch in position, before a signal is cleared. (3) To call for an alternate route, other than normally called for by the selection rays. (4) For test operation.

The switch lever is normally in center position, pushing and turning—to the left will cause the switch to go normal, to the right reverse. Switch light sections will flash red while the switch is in transit and a steady white light will show when locked in the called position. Routes can now be set up only in the position indicated by the white lights.

An emergency switch release feature is provided to bypass the detector circuit. To operate, all signals with controls over the switch must be at stop, with all time locking released. The auxiliary switch lever must be placed in the position in which the switch is to be thrown. After removing the wire seal on the switch emergency release button, it is pushed. If all the proper routes are canceled, their time locks released, a red light will show on the panel. The operator must now pull the button and hold for 45 sec. The light will flash and the switch will go to its called position. After the switch has operated the light will go out. The complete cycle must be repeated for each operation and with only one switch in the plant at a time. No releases are provided for switches controlled by code on the UR machines.

Complete Track Indication Coverage

Pin-point location of every train on the line is provided on the UR control machines and dispatcher indicator panels. The track indications are received from three sources: (1) From track repeater relays in the tower when the territory to be covered is within the direct wire control. (2) From the



Test set-up for 519A indication system. Code transmitter (style PC57), transmitting and line repeating relays (style PCP) are mounted on top of rack. Test panel provides power and indications for registry (left), storage and field units

Multiplex Code for indications within remote controlled interlockings. (3) From a two-wire code system for indications between interlockings. This equipment was used for the first time on this installation. It is called the Type LM Form 519A Coded Indication System (see Fig. 6). It is designed to provide miscellaneous information, such as track indications, etc.

The system supplies up to 32 indications over one pair of line wires. Office units may be tapped off the line at a number of locations to decode the line pulses. All the units are adapted to easy maintenance by being plug coupled and interchangeable with other units of their type. A complete system consists of four units, Field, Registry, Storage and a power supply. The number of each unit used depends on the number of indications and at how many locations they are required.

Field units are plug connected and can be mounted in the space of a PN-50B relay. The unit contains 10 style LM miniature relays, which follow the line pulses and transmit the indications to the office. Registry and Storage units are Jones plug coupled and shelf mounted on the tower racks. Registry units contain 16 style L relays and two style KP relays to interpret the information sent in by the field units. Storage units contain 16 style L relays, each used to remember a decoded indication.

In this code system only one indication may be delivered at any given time. Each indication is scanned once during every code cycle. The complete code cycle consists of 16 steps, 8 positive and 8 negative for stepping control. This 120-volt stepping pulse is continuously supplied from the office; the cycle period is 4 sec, as shown in Fig. 6. The registry units are self-starting and will follow the stepping pulses; some of the field units will work only on the positive steps, the remainder on the negative. Two indications may be supplied by the field units during the off time between the stepping pulses, and are shown in the diagram as the 16-volt indication pulse. This indication pulse is decoded by the registry units and sent to a pick-up storage stick relay. The storage relay will save the indication until the next time the registry unit scans the assigned step. The storage unit in turn operates the lamp or bell on the indication panel. If the indication pulse does not appear on the next cycle the registry unit will shunt the storage relay, allowing it to drop and turn off the indication on the panel.

High Speed Control Code

Multiplex Code Control System, Type S, Form 516B, sends controls and receives indications at the same time. The high speed system can send 50 controls while receiving 100 indications in one second.

To meet the requirements of different interlockings economically, three different applications of the system were used.

1. Direct current pulse code using six operating wires. Automatic change-over to six spare wires was provided in case of line failure. This application is used between Times Square and First avenue, also between Times Square and Hunters Point.

2. Carrier control using two operating wires with automatic change-over to spares. This appli-

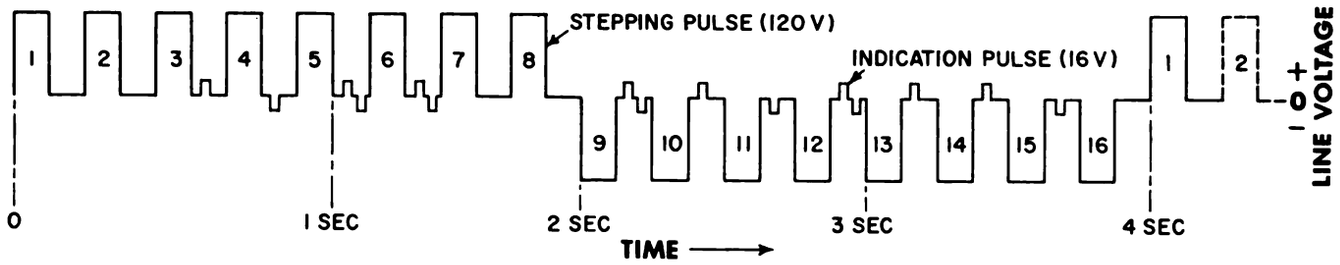
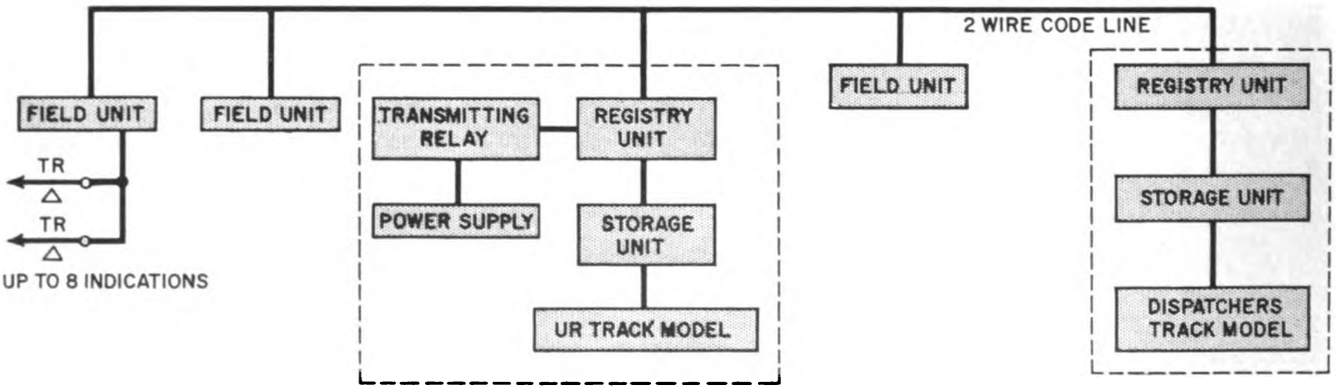
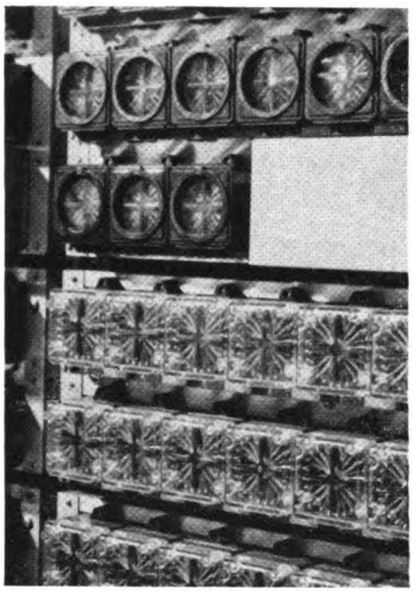
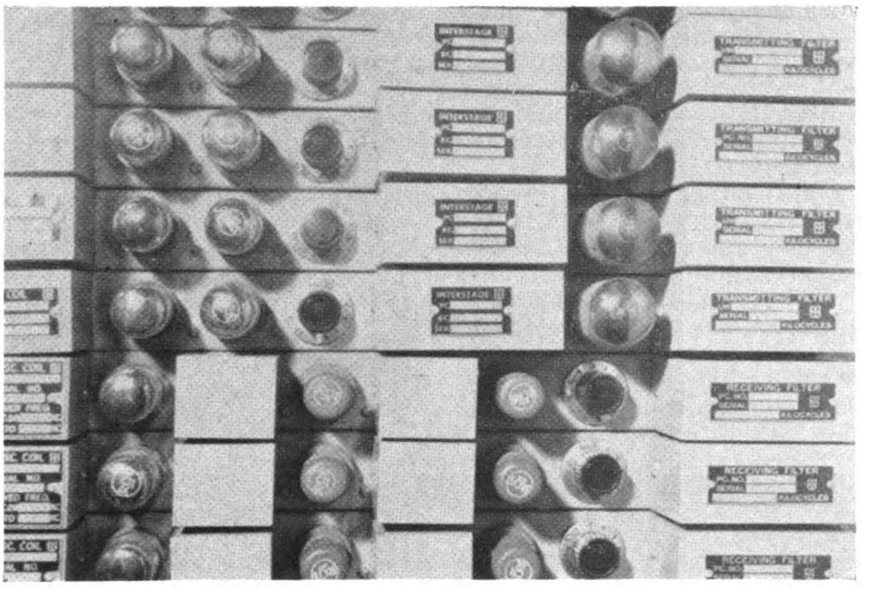


Fig. 6 Block diagram and typical line voltages for 519A simplex code system





New transparent covers (below) replace old, on RD relays in 516B code rack



All industrial red-base vacuum tubes are used in carrier transmitters and receivers mounted on 516B multiplex code rack

cation is used between 111th street and Rawson street with Fisk avenue tapped off the lines. Sixteen separate and distinct carrier frequency channels supply the controls and indications over this pair of wires for Rawson and Fisk. Four spare channels with provision for automatic change-over were supplied.

3. Direct current pulse code using 10 operating wires was used to control Main street from 111th street.

All the components and the internal operation of the system are the same for each application.

"RD" radial contact relays are used in the code units and in the office for indications. In the field locations "KP" polar stick relays are used to apply the controls. Where an interlocking is controlled only by code, the "KP" contacts are used directly in the vital circuits. If the interlocking has an auxiliary control the "KP" contacts or miniature lever bands are selected by means of the polar contacts on an "LC," Local Control relay.

Smoke Detector

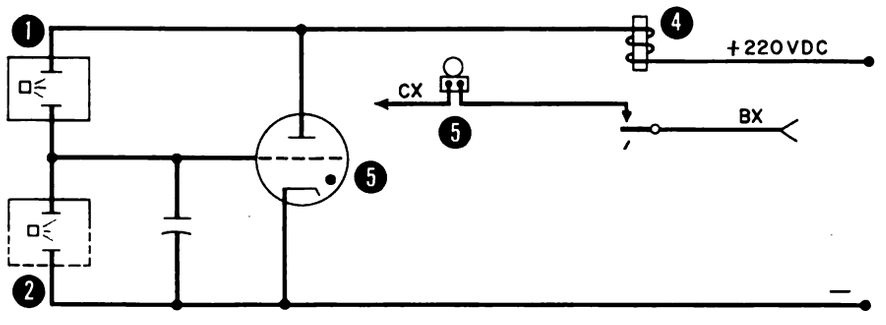
A detecting system that gives an alarm if smoke or invisible combustion gases appear, was used in each relay room.

The sensitive element of the system is housed in a plug-in pre-detector head mounted on the ceiling of the relay room. A radium activated ionization chamber samples the air in the room and compares it to a second sealed reference chamber. The two chambers are normally energized and connected to the starting electrode of a gas discharge tube (Fig. 7). If the outer chamber detects combustive gases its current flow decreases and causes the gas tube to conduct and pick up an alarm relay.

Signal mains are fed by NYCTA sub-stations at several points along the line. The 600-volt, 25-cycle mains are run on both the North and South messenger throughout the line. The mains are sectionalized by switches and provide for tie-in to adjacent mains in case of a sub-station failure.

At each location the high voltage is stepped down with transformers to 55 volts for the signal lighting and the track relay local coil. A separate winding on the transformer provides low voltage for the single rail track circuits.

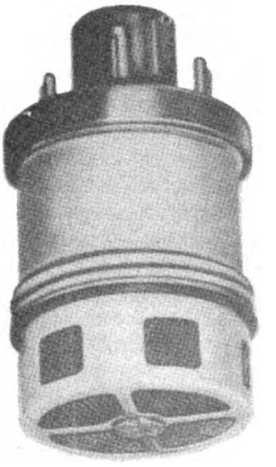
Transformer-rectifier units with standby Nickel-Iron-Alkaline Edison cells are provided at each interlocking tower for the d.c. signal mains. The 16-volt mains are used for signal relays, switch controls,



BASIC CIRCUIT OF 'C-O-TWO' PRE-DETECTOR SYSTEM

1- REFERENCE CHAMBER
2- DETECTING CHAMBER
3- GAS DISCHARGE TUBE
4- ALARM RELAY
5- ALARM SYSTEM

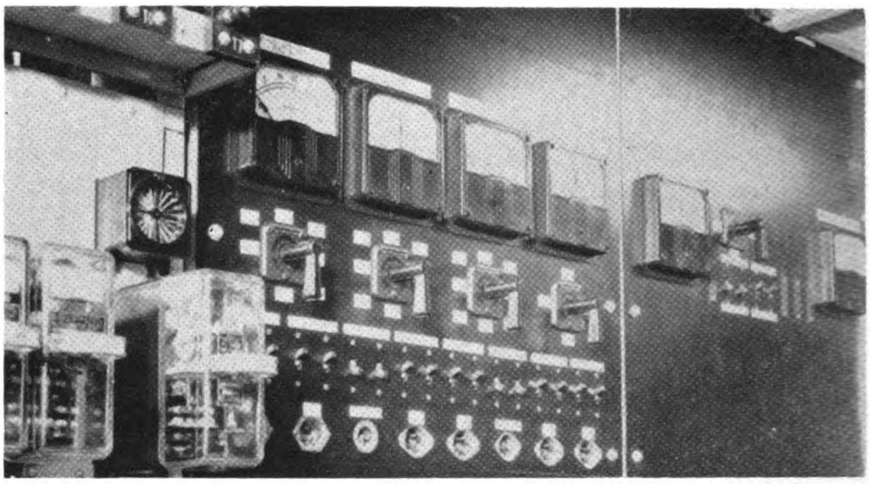
Fig. 7 Simplified circuit diagram of "Pyr-A-Larm" smoke detector system



Detector head is mounted on ceiling

and automatic stop valves. These No. 6 wire mains are continuous over the entire line with sectionalizing switches at designated points, to provide a means for isolating when trouble shooting grounds and crosses.

The same batteries are used to provide directional control of the automatic signals on the middle track. The directional control relays at the interlockings are used to energize a West Battery Main or an East Battery Main according to the direction of traffic desired. These mains run the length of the three-track elevated portion of the line.



Rotary switches on power distribution and test panel provide meter selection. Toggle switches are for rectifier control. Receptacles are for patch cords when substituting spare rectifiers when needed

East and westbound automatic signay control circuits in the middle track are energized only by their respective mains.

Selection battery is provided at the UR panel towers. This energy is used for all selection networks. It provides a means for holding fleeted routes over the established stick circuits in the event of an a.c. power failure.

Power Distribution and Test Panel at Each Plant

A power distribution and test panel was provided at each interlocking, from which all the mains associated with the interlocking may be checked for load and voltage by manipulating selector switches. Toggle switches are provided for all rectifier units located in the tower on the panel. Patching cords with polarized plug and receptacles on the power test panel provide a fast means of substituting a spare rectifier for one found to be defective.

The Union Switch & Signal Division of Westinghouse Air Brake Company designed, installed and supplied the major items of signal equipment. The installation of the equipment, wire and cable, was performed by the Watson-Flagg Engineering Company of New York City, subcontractor to the Westinghouse Air Brake Company. The design of the signal equipment and the installations were made under the direction of C. A. Reed, Engineer of Line Equipment, and his successor, C. E. Chisholm, New York City Transit Authority. Wire and cable were furnished by the Okonite Company.