

Northbound train on remotely-controlled plant at Chebanse

The switch machines are of the dual-control type

# Change of control for two plants accomplishes saving of \$11,000 representing 31 per cent on investment—Approach and signal-clear indications on machine—Unique superimposed a-c. circuits used

HE 20 miles of main line of the Illinois Central from Otto, Ill., to Gilman is the busiest piece of double track on the road. In 1922, a daily traffic of 54 to 60 trains forced the management to study means of increasing the capacity of this section of line. Consideration of the construction of a third track was abandoned when an investigation revealed that the desired increase in capacity could be accomplished, at a great saving compared with the cost of a third track, by utilizing both tracks for the operation of trains in either direction. In order to facilitate run-around movements two crossovers, one facing in either direction, were provided at Chebanse, Clifton and Ashkum, these towns being located approximately five miles apart. Number 18 crossovers were used to permit train speeds of 45 m. p. h. An electro-mechanical interlock-ing plant was installed at each of the points mentioned; the ones at Chebanse and Clifton handled only the crossovers and signals, while at Ashkum the passing-

in addition to their function as automatic block signals, served as traffic-direction signals. In order to let a train in any section the operator at the entrance end was compelled to secure an unlock from the operator at the leaving end, permitting him to clear the entrance signal and making it impossible for the operator at the other end to clear his entrance signal for a train in the opposite direction.

Switches between interlocking plants are electrically locked, and in case one of the switches is to be used, it must be unlocked by the nearest interlocking tower operator. Therefore, an absolute check is provided for all train movements between towers.

#### An Opportunity to Reduce Operation Expenses

The above system, described on page 139, *Railway Signaling*, April, 1925, proved to be sufficiently flexible, and gave the desired results from an operating standpoint. However, with the recent development of cen-



track switches at the south end were operated mechanically, and the switches at the north end were operated by electric switch machines controlled remotely from Ashkum.

Train movements were made on the authority of signal indication without written train orders. Each track was equipped with automatic block signaling for train movements in either direction on either track, in other words, the same as two single-track roads side by side.

The sections of track between interlocking plants were provided with entrance signals at each end, which tralized traffic control systems, it became apparent that very appreciable savings could be effected by placing the control of several interlocking plants in the hands of a single operator and operating the switches electrically, with option of hand control, as in centralizedcontrol systems.

In view of the fact that there were only the four crossover switches at each of the plants at Chebanse and Clifton, the expenditure for the power switch machines and the control equipment necessary, could easily be justified by the saving in wages accomplished by the release of the three operators at each plant. However, as there are seven switches operated mechanically at the Ashkum plant, the expenditure for power machines was not justified at this plant. It was, therefore, decided to change over the plants at Clifton and Chebanse and place the control machine in the tower at Ashkum. In order to standardize the operation as much as possible, the control of the passing-track switches and attendant signals at the north end of Ashkum was also included in the centralized machine.

## Changes in Signaling

No changes were made in the track layout. The home interlocking signals formerly had three arms, the top for the through route, the second for the crossover movement, and the bottom arm for the call-on. At Clifton and Chebanse the call-on unit was removed. Likewise, cuits were added. The six-lever control machine located at Ashkum is of conventional type, but, as will be noted from the illustration, certain indication lights, not ordinarily used with this type of machine, were provided.

In order that the operator would have time to line up the route desired for a train, the Illinois Central considered approach annunciators necessary. These annunciators appear as small lamps mounted on the line representing the track on the track diagram as shown in the illustration. The control circuit for these approach annunciators is unique, the control for two annunciators being accomplished over one wire together with a connection to common. When one of the approach tracks is occupied, current of one polarity is transmitted to a special polarized relay in the control machine, while if the other track is occupied, current of the opposite



The control machine has several new features

the signals at the leaving end of each plant, which functioned jointly as automatic block and traffic-direction signals, giving authority to enter a block, were removed. Under the new arrangement the home interlocking signal not only conveys authority to move over the plant, but also serves as a traffic-direction signal for entering the block. This change reduced the number of signals to be controlled, thus simplifying the control, and at the same time subtracted nothing from the safety or facility of train operation. As before, check locking is provided between opposing signals for the entrance to a block. The control of the power-operated switches includes approach and detector locking according to standard practice.

#### Additional Indication on the Control Machine

The centralized control equipment, including the power switch machines, was furnished by the General Railway Signal Company, the regular one wire per junction and common control circuit being used. However, several additional indication and annunciator cirpolarity is transmitted. Closure of one polar contact in turn energizes a slow-release neutral relay, through the front contacts of which a single-stroke bell and the correct annunciator light is controlled. If both tracks of a group are occupied, the polar relay oscillates, thus holding both of the corresponding slow-release neutral relays energized and displaying both indications involved.

Another special feature used on this installation is the signal-clear indication lamps on the machine, which show the operator that a route is properly lined up and that the signal is clear to authorize a train to proceed through a plant and to enter a block. A green light is used for this purpose and is mounted adjacent to the OS light at each lever. A set of two lamps is provided for each track in each block and one or the other of these lamps is lighted to show an arrow pointing in the direction in which the traffic-direction control is set up. Such a set of lamps is shown in the illustration at the right of the tag on the hook at the top of the view. This set of lamps, with the upper arrow lighted, shows that the line-up is arranged for a movement on track 2 from Ashkum to Clifton, and track 1 from Clifton to Chebanse.

A yellow light is provided above each lever and adjacent to the track, and is used for OS indication and switch operation indication. This is the standard indication provided by the G. R. S. on machines of this type.

Another unusual feature characterizes the small lamp with a button, such as that marked C, mounted just above the lever 7. It will be noted that this button Cis opposite the line indicating the main-line hand-thrown switch C. The button C is for the control of the electric lock on the track switch. When a trainman desires to to use switch C he telephones the towerman at Ashkum. If conditions warrant, the towerman pushes the button C on his machine, which causes the indicator in the electric lock box to pick up, thus permitting the trainman to operate the electric lock. The opening of the door of the electric lock opens a contact that causes the small red light over the button on the towerman's machine to be lighted and to remain so until the switch is restored to normal and the door is closed.

# Special Superimposed Circuits

The switches and signals in this centralized control installation are controled on the regular G-R-S one wire per function and common circuit. However, in order to secure the additional feature of the signal-clear indication and also the switch-lock controls, without installing additional line wires, a unique arrangement of a-c. circuits superimposed on the other d-c. line circuits was devised.

The signal-clear repeater indications are transmitted to Ashkum over an a-c. circuit superimposed on the approach-track annunciator d-c. circuit. By the use of reactor-capacitors especially designed for this purpose, this alternating current is rectified to direct current at Ashkum which is utilized to operate d-c. relays in the control machine. The unlock circuit for the switch locks on the hand-thrown main-line switches is also an a-c. circuit, which is superimposed on one of the d-c.; control circuits.

# Construction Features

Open line construction is used for the control wires extending from Ashkum to the central point of each of the interlocking plants, there being four wires to each plant, one of which is for each of the two switches and

one for each of the two annunciator circuits. The common wire extends throughout the territory. All other control circuits are carried in aerial or parkway cable. From the tower underground cables are carried to the switches, and aerial cables to the wooden relay cases at the signal bridges. Number 9 wire is used in the underground cable to the two nearer switches, while No. 6 is used for the two distant switches; this cable is protected at the ground line by sealing it with a compound of asphaltum, in a 2-ft. soil pipe extending about 6 in. above the ground line.

Twelve cells of 80 a.h. lead storage battery, housed in the tower, are used for operating the four switch machines at each of the two intermediate interlockers. Housed also in each tower, are three sets of 12-volt 40 a.h. storage battery for the line and local control circuits. The battery for the line control circuits consists of 20 cells of 80 a.h. lead storage battery, located at Ashkum. Power is transmitted at 440 volts, singlephase, and is transformed to 110 volts at each signal location. The batteries are charged by rectifiers.

The switches are operated by G-R-S Model-5B dualcontrol switch machines with point detectors. Lock rods are provided with a slot connection between the rod and the machine to permit 2 in. lateral creepage of the point without binding the lock rod and consequently interfering with operation.

At each signal bridge there is a wooden relay case which houses the relays for the local light circuits, etc.; a set of five cells of 40 a.h. lead storage battery for local relay circuits and emergency signal lighting; and a dispatcher's line telephone, accessible to the trainmen and maintainer. The 10-volt, 18-watt signal lamps are normally approach-lighted on a-c., with the d-c. standby battery mentioned above reserved for emergency lighting.

## Savings

In effect, the operation of this stretch of double track is essentially the same as that under the previous system, with the same degree of flexibility, the chief advantage of the new system being the saving in charges for the operators' wages, which is about \$11,000 annually. The maintenance force was not increased when the centralized control was put in service and therefore this figure represents the net savings. Referred to the \$35,000 invested in the new installation, this represents a very attractive return on the investment.

