

Southbound Train on Left-hand Track Passing Home Signal Bridge at Otto

# Signaling Two Tracks to Capacity

## Illinois Central Installs Colored Light Signals on Twenty Miles of Double Track With No Normal Direction

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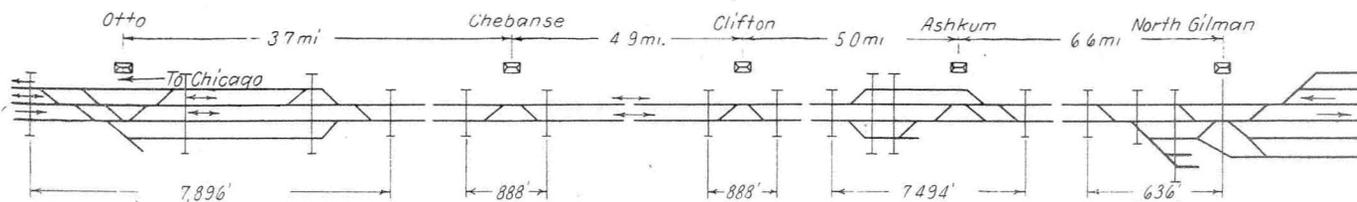
**F**OLLOWING the extension of its three-track road to Otto, Ill., 60 miles from Chicago, the Illinois Central has provided a system of signaling and interlocking for the adjoining section of double track which has a number of interesting features. At Gilman, Ill., 80 miles from Chicago the double-track main line from Memphis, Tenn., and New Orleans, La., and the single track main line from Springfield, Ill., and St. Louis, Mo., converge forming a very busy 20-mile section of double track between Gilman and Otto. To increase the capacity of this double-track section, interlocking plants with No. 18 crossovers were provided at Otto, Chebanse, Clifton, Ashkum and North Gilman, at approximately five-mile intervals.

Both tracks were signaled in both directions with block spacings permitting following moves at one-mile intervals

The sections of track between interlocking plants are provided with entrance signals at each end, which in addition to their function as automatic block signals, serve as traffic direction signals. In order to let a train in any section the operator at the entrance end must 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 opposing direction. Where there are switches between interlocking plants these 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.

### Running Time Has Been Decreased

This system of operation has greatly reduced train



Layout of 20-Mile Section of Track Signaled Both Directions

so that there is no normal direction of traffic, but trains may move with equal facility in either direction on either track. The control of all movements is in the hands of the levermen at the towers so that operation is by signal indication without train orders.

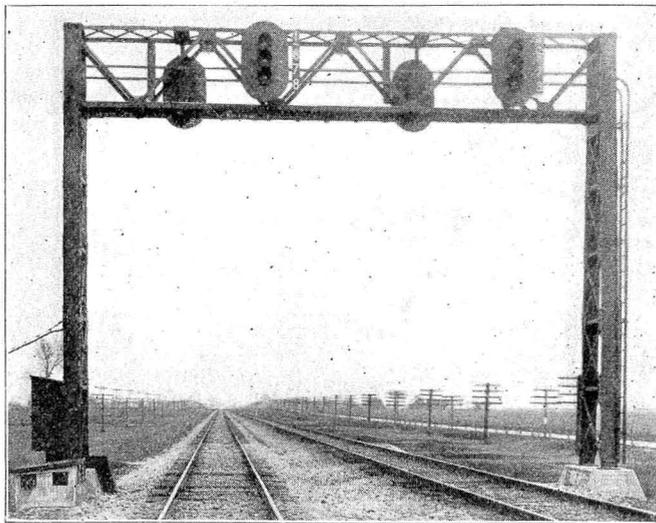
delays. There are 22 scheduled passenger trains and 2 local freight trains daily and from 30 to 40 through freight trains. Under the previous arrangement with standard double track automatic block signaling the average running time of freight trains was considerably

longer than at present. It has also been found that the handling of the local freight has been facilitated, as trains which are to pass it are simply run on the other main to the next tower, and the local does not have to clear the main.

A comparison of the time of through freight trains under the old and new arrangements shows the following:

	August 1922	August 1924
Trains northward.....	472	417
Trains southward.....	471	449
	943	866
Average time northward.....	60 min.	51 min.
Average time southward.....	74 min.	50 min.

These two months represent the same total tonnage, that for August, 1924, being about 2 per cent greater than August, 1922. The average tonnage per train under



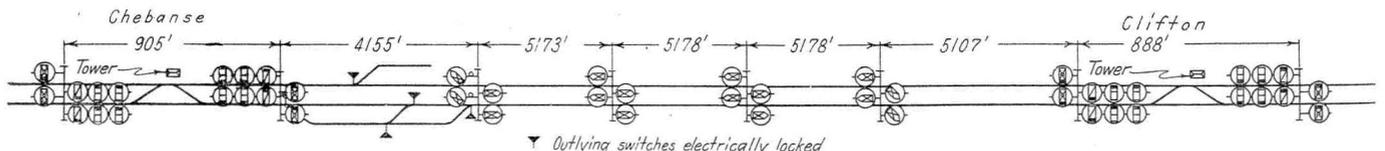
Typical Automatic Signal Bridge Showing Signals for Both Tracks for Both Directions

the new arrangement was 11 per cent in excess of that handled under the old arrangement. This increase of tonnage per train was made possible by the reduction of grades elsewhere on the district.

Written train orders are not required except under unusual circumstances. A check of the first 26 days of February, 1925, shows that only two written train orders were issued during that period.

**Signaling Between Towers**

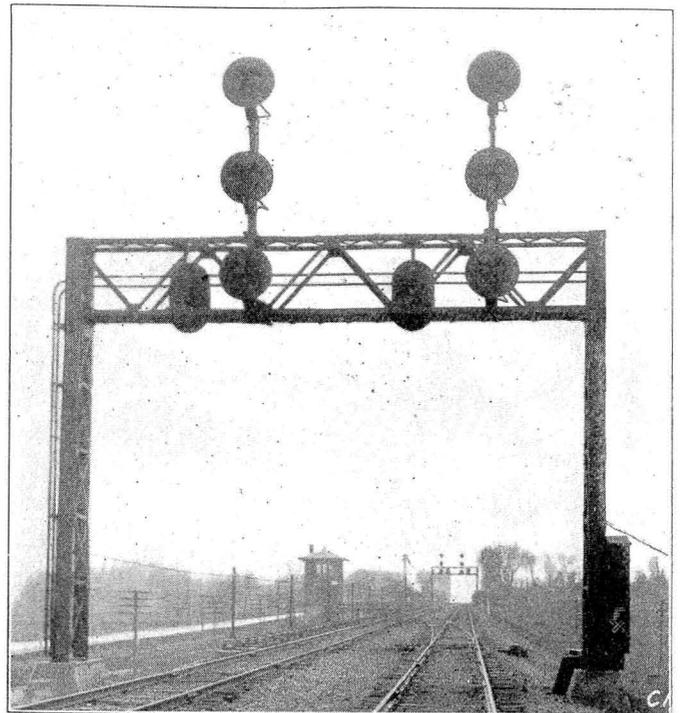
The traffic direction entrance signals for one direction are mounted on the opposite side of the bridge from the



Signaling of Typical Section Clifton to Chebanse

interlocking home signals for the other direction, as shown in the illustration of Chebanse. The signals differ from the automatic block signals only in the fact that they have no number plates. Trains may not pass these signals when a stop indication (red light) is displayed without a train order or under flag protection. The automatic block signals are mounted two on each side of the signal bridges and are distinguished by number plates as shown in the illustration.

Track circuits extend from signal to signal. Two switch circuit controllers are used at each switch, one connected to each point arranged for shunting only. This means that except where highway crossing signals are installed, all control apparatus is located at the signal bridges. A wood relay box on the bridge leg houses all



Chebanse Interlocking Showing Two Cross-Over and Both Home Signal Bridges

control apparatus including the low voltage lightning arresters, mechanical rectifiers and emergency cutover relays. All wires from the relay box to the signals are in conduit. Parkway cables are brought in from the ground in a wooden box. Storage batteries are housed in an A. R. A. concrete box. Two sets of 5 cells of Exide KXH-7 battery in multiple normally operate the line circuits and light all four signals on the bridge in the case of a power failure.

**Typical Interlocking Plants Consist of Two Crossovers**

The typical interlocking plant in this arrangement consists of two No. 18 crossovers for facing moves in each direction. The plants at Chebanse and Clifton are typical, as shown in the illustration of Chebanse. Home signal indications are given by three light signals in a vertical row giving the same indication as a standard three-arm

semaphore signal gives at night. Enginemen have not been obliged to learn any new indications at the interlocking plants.

The light signals have the light units in a triangular group. The red units are at the bottom of each triangle so that a yellow or green light displayed by one signal is slightly out of the vertical line of the other two red lights. This feature, thought to be objectionable at first, has proved to be an advantage in making the yellow or green

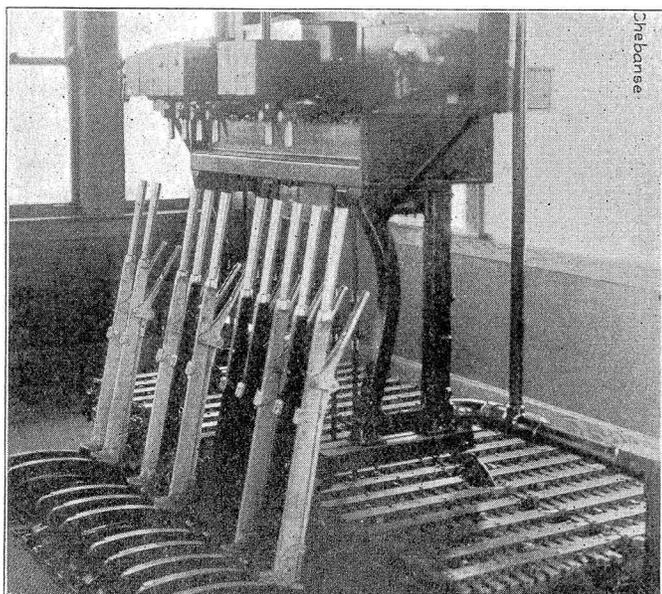
light more distinctive. All light signals are Union Switch & Signal Company Type R, each unit being provided with a 10-volt, 18-watt, double filament lamp, burned at 8 volts or less. The lamps in the home signals at the interlocking plants are burned at approximately half voltage at night, a dimming switch being provided in the tower. This prevents blurring of the three lights in a vertical row.

**Siding Switches Operated from Towers**

All important outlying siding switches are operated by power driven switch machines controlled from the towers. At Otto there are sidings on each side of the mains extending a mile southward. The north ends of these sidings are included in the mechanical connections to the tower, the south switches being power driven. Power is obtained from batteries at the switches, with remote control from the tower. At Ashkum there are two sidings extending northward from the tower and the north switches are power operated with remote control from the tower. At North Gilman the yard entrance switches are located a mile north of the tower. The North Gilman plant is all electric with a 110-volt storage battery. The five switches at the yard entrance are operated from the tower battery, the switch machines being geared down for slow speed operation to reduce the power required. These switch machines were the first of this type ever built. All switch lamps are electrically lighted from the signal power line.

**Electro-Mechanical Interlocking Plants**

The three intermediate interlocking plants consist essentially of two No. 18 crossovers. The crossover switches are mechanically operated and the signals are of the color-light type. The interlocking machines are Union Switch & Signal Company electro-mechanical



Typical Electro-Mechanical Interlocking Located at Chebanse

Type S-8, with S. & F. locking. The lamps of the spot light diagrams are normally out, two lamps being provided in each section to avoid failure due to burnouts. A light is also provided in each diagram to show whether the alternating current power supply is on. Annunciators for both tracks in both directions are provided consisting of a single stroke bell, the location of the train being indicated on the diagram.

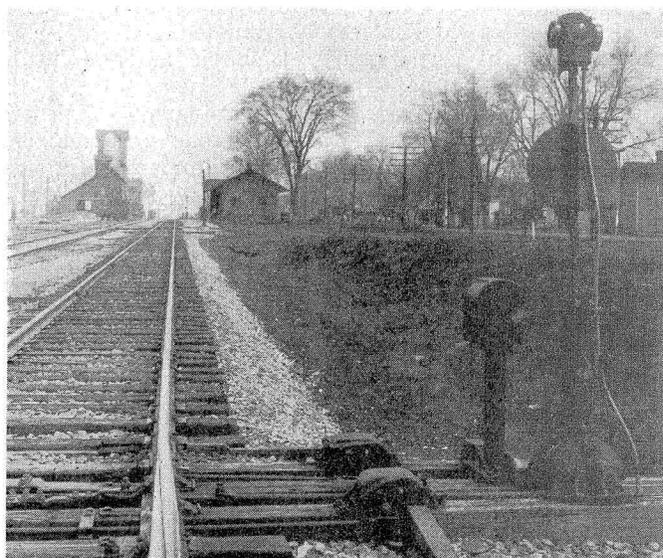
Relays are of the shelf type and are mounted on an

open rack of angle iron with wood shelves located on the first floor of the tower. Storage batteries at these towers consist of five cells of Exide KXH-7 storage battery in a cupboard on the first floor and they are charged by mechanical rectifiers located on the relay rack.

Wires from the tower to the interlocking functions are carried in ready made aerial cables on a line of steel cable posts along the pipe line. These cables terminate in iron relay boxes and all wiring to functions is carried in parkway cables.

**All Electric Interlocking Plant at North Gilman**

The interlocking at North Gilman is a General Railway Signal Company all electric plant. Main wire runs are carried in a built up cypress trunking with concrete supports. All wires are Kerite insulated, with single braid. Junction boxes are provided in the main runs and all connections to rails and to operated functions are in parkway cables. Single conductor cables are used for all rail connections. A cypress bootleg connection is used, the parkway cable being terminated in the vertical wood riser and two wires spliced on and carried out, one to



Hand Throw Switch at Chebanse With Electric Lock

each side of the rail. The double rail connection proved much superior to the single rail connection prior to the use of parkway cables which accounts for retaining the wooden bootleg. Multiple conductor parkway cables are used for connections to switch machines and are terminated in a cast-iron terminal box mounted on a concrete riser.

The interlocking battery consists of 55 cells of chloride accumulator Type E-5, capacity 80 a.h., being charged constantly by a Wooten motor-generator, duplicate charging equipment being provided. The route locking battery consists of five cells of KXH-7 charged by a Leich non-tune rectifier.

A separate pole line was constructed for the signal control wires, the alternating current supply wires and the telephone. This line is built with creosoted pine poles spaced 132 ft. and carries the two 10-pin crossarms. The top arm carries the two No. 6 AWG D.B.W.P. copper wires for 440-volt, 60-cycle transmission on the end pins on the field side and the two No. 9 AWG bare copper telephone wires are on the end pins of the track side.

The control wires which are No. 12 W.P. copper-clad are on the bottom arm. At each feed the supply voltage is reduced to 110 by air cooled transformers of 200-watt capacity. Both the supply line and the telephone line are transposed and no interference has been experienced.