UNION SWITCH AND SIGNAL COMPANY'S INSPECTION TRIP

Monday, May 24th, witnessed an event of considerable importance in the development of signaling. On the morning of that day the signal engineers of most of the important railroads in America, or their representatives, assembled at the Hollenden in Cleveland, Ohio, at the invitation of the Union Switch & Signal Co. to visit two interlocking plants recently installed by that company. After breakfasting at the hotel the party boarded a special train and were taken to Akron, where the first of the plants was located. Several hours were spent inspecting this plant, which is situated near the Union Station and governs the junctions of the B. & O., Erie and C., A. & C. Railroads. The machine is of the Union all-electric type, and has 46 working levers in a 53 lever frame. The operating current is D. C., and is furnished from storage batteries, which are provided in duplicate sets of 55 cells. A 5 h. p. motor direct connected to a 3 kw. generator and a 5 h. p. gas engine set are available for charging purposes, the city current being used for the motor generator. The indication is obtained by means of an alternating current which is furnished by the switch motor during the period of revolution after the driving current has been cut off. The armature brush connections are broken at the instant the movement of the function is completed, and the indication circuit is at the same instant closed through a collector ring on the armature shaft.

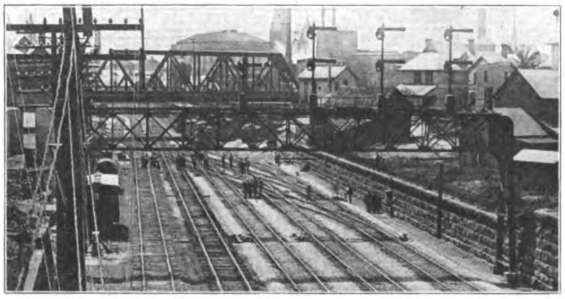


Fig. 1.

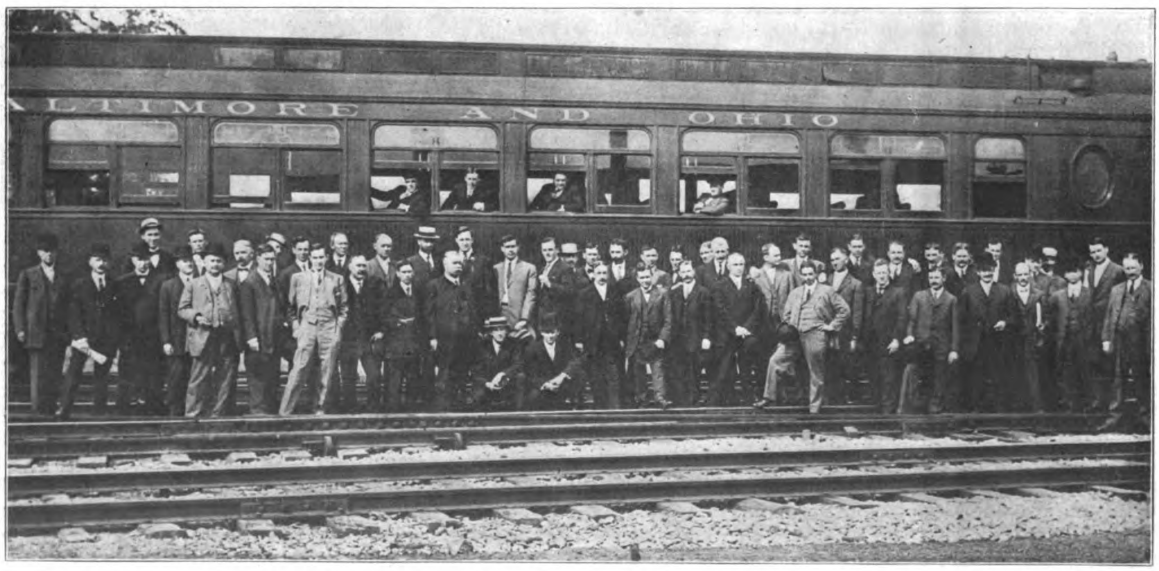
Fig. 1 shows a view of the cross-overs and connections at Akron taken from the viaduct near the tower, and Fig. 5 shows the tower.

Having completed the inspection of the Akron plant, lunch was served at a local hotel, and in the early afternoon the run to Sterling was made.

The Sterling plant has 73 working levers in an 88 lever frame. The ground work at this point is similar to that which has been installed by the Union for some years. The machine, however, is of the new "multiple unit" type. Each lever is an independent unit in itself and may be removed from the machine by taking out a few screws. The indication is accomplished as follows:

The motor armature has two sets of coils, each connected to a commutator and acting in series during the driving movement of the mechanism. Upon completion of the stroke the driving current is switched over to one set of coils, and the potential of the two sets in series is thereby raised, this potential being higher than exists at the battery. The current flows then towards the positive pole of the battery through one coil of the indication magnet. The other coil of the indication magnet is energized by the current which drives the motor. The levers in the machine complete their stroke automatically when the indication is received.

Figure 3 shows a section of a machine at Sterling, and Fig. 4 shows a switch mechanism in place. Fig. 6 is a reproduction of the manipulation chart.



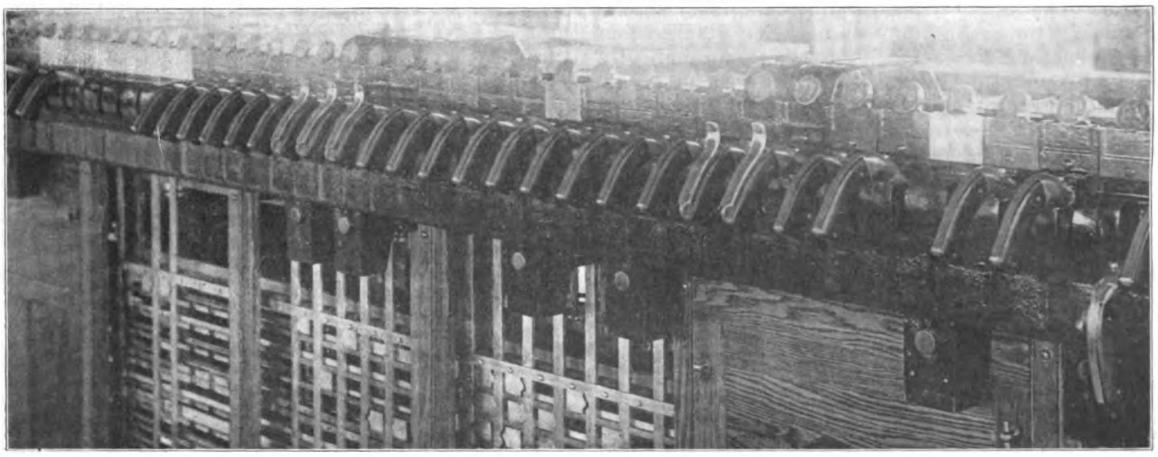


Fig. 3.

Leaving Sterling in the late afternoon the party arrived at Cleveland in time for dinner at the Hollenden.

The inspection trip was conducted by the following representative of the U. S. & S. Co., viz., W. E. Foster, Western Mgr.; J. S. Hobson, Asst. Gen. Mgr.; S. G. Johnson, Eastern Mgr.; T. H. Patenall, Sig. Engr.; W. W. Young, Pur. Agt.; W. M. Vandersluis, Asst. Western Mgr.; and W. H. Cadwallader, Sig. Engr. The installations representing the latest improvements in electric interlocking were of great interest to the members of the party; and the expedition as a whole reflects great credit upon the U. S. & S. Co.

DESCRIPTION OF THE MULTIPLE UNIT ELECTRIC INTERLOCKING MACHINE AT STERLING, OHIO.

The apparatus on the ground in its general construction and appearance is very similar to that which has been installed by the U. S. & S. Co. for some time past. The switch and lock movement is the same in all respects, except in the construction of the motor armature. This has two independent series of coils, each connected to a commutator. During the movement of the switch, the two sets of coils are in series and act jointly as a motor to drive the mechanism. At the end of the movement the driving current is switched over to one set of coils, which results in raising the potential of the two sets in series, so that a higher potential is produced at the motor than exists at the battery. This results in a current flowing towards the positive pole of the battery through one coil of the indication apparatus. The other coil of the indication magnet is energized by the current which drives the motor.

The chief novelty of the plant resides in the interlocking machine. This has been designated by the company as a multiple unit machine, because each lever is an independent unit in itself and may be removed from the machine by taking out a few screws. The lever movements are quite novel, the first movement being a longitudinal movement, which actuates the mechanical locking in the machine. The medial movement is a movement in the arc of a circle, and operates the circuit controller on the switch or signal circuit. The final movement is a longitudinal movement which takes place only after the indication has been received, and results in the release of certain mechanical locking. The final movement is made by a spring, and is auto-

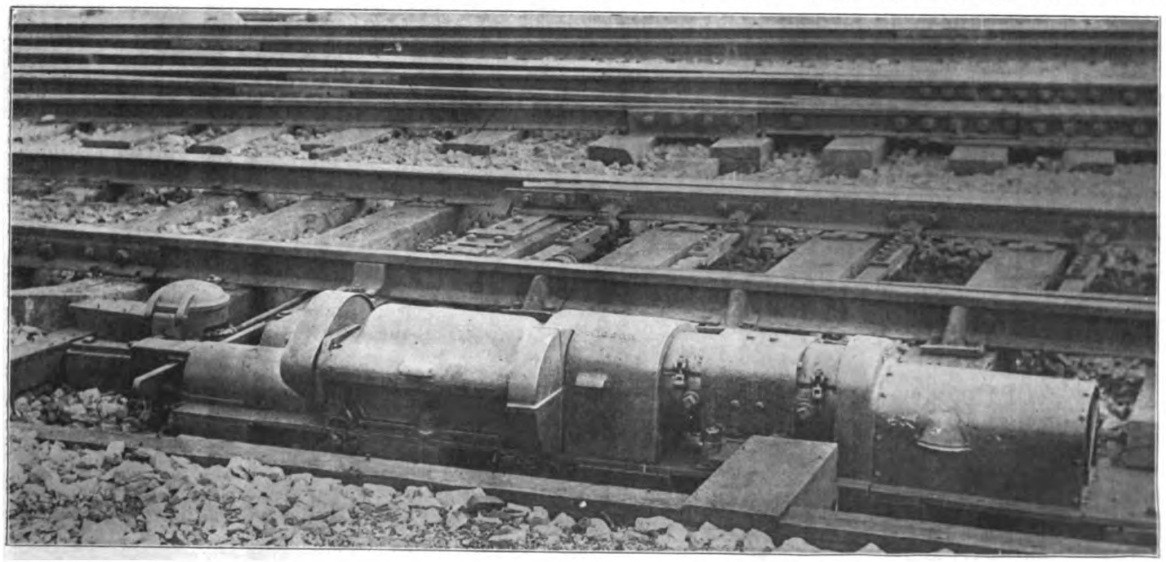


Fig. 4.

matic. The operator makes the preliminary movement, and the medial movement, after which, when the indication is received, the lever automatically goes to its final position.

The indication apparatus comprises a polarized magnet, without permanent magnets, however. The polarization is effected by the driving current to the motor passing through one of the magnet coils.

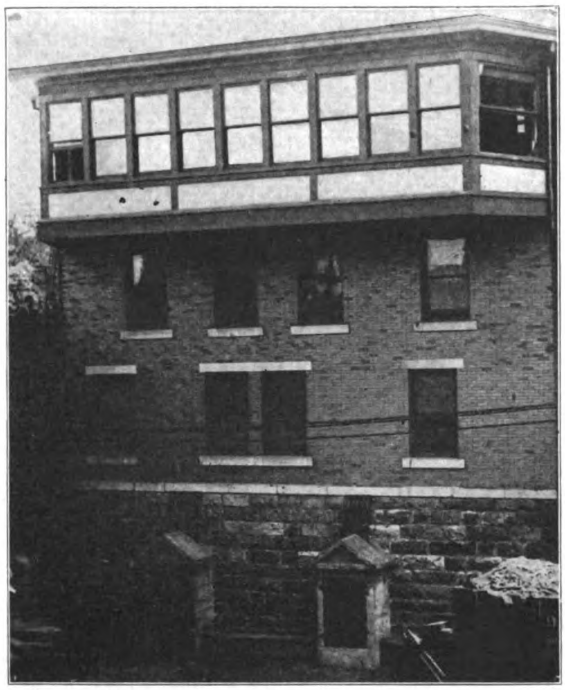


Fig. 5.

The other coil must then have current in a certain direction relative to the driving current in order to actuate the latch. This coil is also connected to the positive of the battery, and current must flow towards the positive pole of the battery to be in the right direction to energize the magnet. To cause current to flow in opposition to the battery is the purpose of the two sets of coils on the motor armature. As is well known, the counter-electromotive force of a motor, when running light, is nearly equal to that of the source supplying the current. The difference between the two is due to the fall of potential in overcoming the resistance in circuit. This difference when the motor is running light is not more than 10 per cent of the total voltage of the source. When the motor then is driven through one set of coils on the armature, the counter-electromotive force of this set is nearly equal to that of the battery; and since the other set of coils is rotating at the same speed in the same magnetic field, its counter-electromotive force is the same as that in the set driving the motor. The sum of the two then is nearly double that of the battery. The result is that a potential nearly double that of the battery is produced at the motor, so that current can be readily caused to flow towards the positive pole of the battery, or in a direction opposite to that in which the current should come from the battery. This arrangement of the circuits and motor coil makes the apparatus quite safe against false indications, because the current could not possibly flow from the indication magnet coils in the right direction if it came from a wire which was accidentally crossed up with the indication wire. A false indication could not result from the wire being crossed up with the indication wire to another switch which was in the act of indicating, because unless the switch had completed its movement and a change in circuits been made at the motor, the potential would be held down by the motor which had not reached the proper point for indicating, because the potential at this motor cannot equal that of the battery until after the change in the circuit has been effected by the movement of the mechanical controller at the switch.

The dwarf signal is also a departure from the past practice of this company. It is actuated by a solenoid, and the indication is of a type known as battery indication. This is made safe by arranging it so that current must flow in two wires in certain relative direction in each, in order to actuate the magnet. The signal is protected against being cleared improperly in much the same manner. To clear the signal requires current flowing in two wires in a certain direction, and this could not happen very readily because it would require that one of these wires be connected to a wire leading from the positive of the battery, while the other is connected to a wire leading from the negative of the battery. If these two faults could arise simultaneously, a false clearing of the signal might result; but if either occurs alone, a failure to operate the signal would result and the fault would be discovered. It can readily be seen that it is highly improbable, if not quite impossible, for faulty connnections to occur in this way by accident.

The indication for the high signal is the same as that for switches. These signals are somewhat different from those previously installed by this company, as one slot arm is employed for operating a 3-position signal.

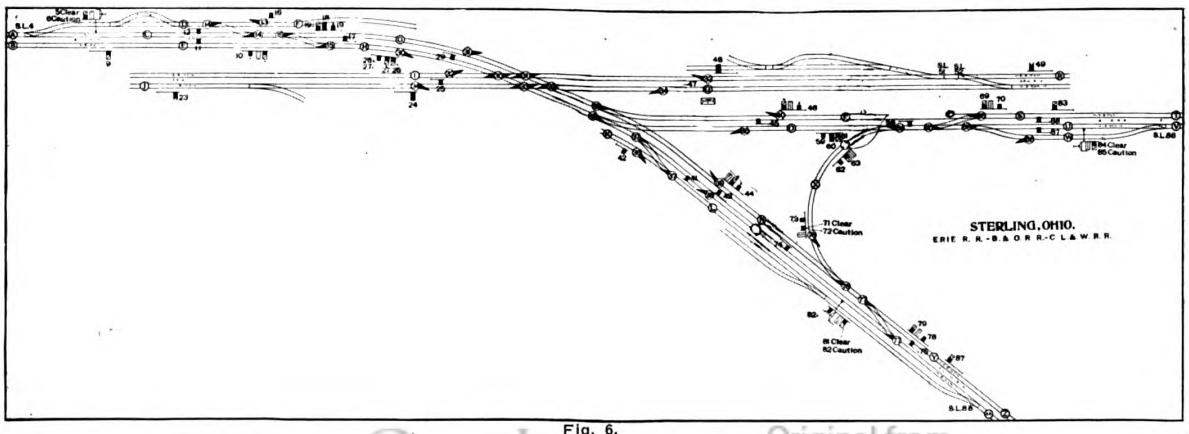


Fig. 6.