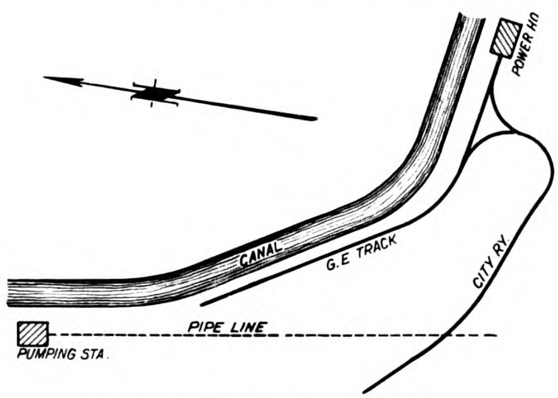
formation of calcium sulphate (gypsum) and zinc hydroxide (hydrated oxide of zinc). It is apparent from this that after the surface has become thoroughly dry again, it will contain within its pores a mixture of gypsum and zinc oxide. These materials have no bad influence on linseed oil and, in fact, are frequently used as paint pigments. The reason why such treatment should be necessary before applying a paint coating to the surface of concrete must be apparent to everyone. When Portland cement sets a certain amount of lime is set free in a hydrated condition as calcium hydroxide. This is a strong alkali, and tends to saponify the oil in the paint coating and thus destroy it. The work done by the application of zinc sulphate is to destroy this alkalinity, and change the calcium hydroxide into a mixture of calcium sulphate and zinc oxide. I do not know of anything that would answer this purpose better than zinc sulphate."

STRAY CURRENTS.

BY G. F. BLISS.

In view of the interest which is being shown in alternating current signaling for steam railways at the present time the following may be of value in showing how far trolley currents will depart from their regular return path, and how difficult it is at times to determine just where such stray current comes from.

The General Electric Company has at its Schenectady plant a standard gauge railroad, which extends along the Erie Canal for about two miles, known as the "test track." This track is equipped with a third rail and high tension catenary trolley, and is used for testing locomotives, cars, signals and other apparatus. During the autumn of 1905, while signal apparatus was being tested on this track, it was discovered that there was a direct current, varying from ½ ampere to 5 amperes, in the rails, which could not be accounted for. The third rail and all feeders were cut off at the power house without affecting this current, which proved it to be something more than leakage, as was first supposed. The nearest trolley line was nearly a mile away, with no connection to the "test track" except at the power house. It was thought that the stray current could not possibly come from this trolley line.



Plan of Test Track and Vicinity.

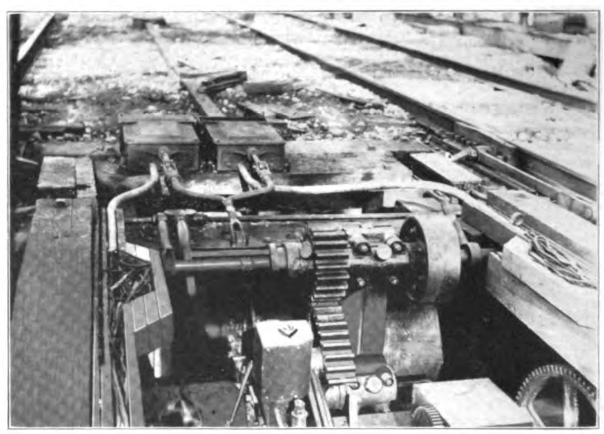
Careful measurements with electrical instruments seemed to indicate that the current was flowing into the track from the water of the canal nearby. By means of a private telephone line and a voltmeter, the drop between different points in the canal and the power house was taken. The maximum drop found was between the city pumping station (see map) and the power house, which fluctuated between 4 and 6 volts. This drop was the same, whether measured in the water of the canal or on a hydrant of the pumping station pipe line. A 1,600 ft. section of the track was insulated with Weber joints in the usual way. An ammeter placed across the joints of the rails showed 2 amperes in the one nearest the water, and ½ ampere in the other. All of this current was leaking from the canal into the track in a distance of 1,600 ft. A longer stretch of track showed a corresponding increase in current. There was no direct current used at the pumping station. The only way to account for its presence there was to assume that it leaked into the pipe line from the trolley line shown on map. This was found to be the case. By making tests at night when there was but one car on the line at a time, the position of this car with respect to a steep hill in the line could be told by watching the ammeter across the Weber joint. About 2 a. m. all cars were taken off this line and the flow of current in the test track ceased.

The track of the trolley line was well bonded, yet a large amount of current, considered from the standpoint of a track relay, leaked into the pipe line, out to the pumping station, into the canal, down the water of the canal, and into the General Electric "test track" instead of returning to the power house directly through its own rails.

It happens very often that electric roads which run along streams ground their tracks in the wet earth of the bank at points along the line and at the power house, to secure better return circuit. It would seem from the above that steam roads which pass near streams, the tracks of which intersect those of trolley lines, as so many of them do, are fortunate if they do not experience considerable trouble from stray currents.

ELECTRIC DRAWBRIDGE INTERLOCKING.

The new Kensington & Eastern, recently constructed by the Illinois Central to form the connecting link between the end of the Chicago, Lake Shore & South Bend, at the Illinois and Indiana state line, and the Illinois Central at Pullman, Ill., crosses the Grand Calumet River at a point south of Calumet Lake near Hegewisch, Ill. The two tracks of the new line, one equipped for electrical operation and the other

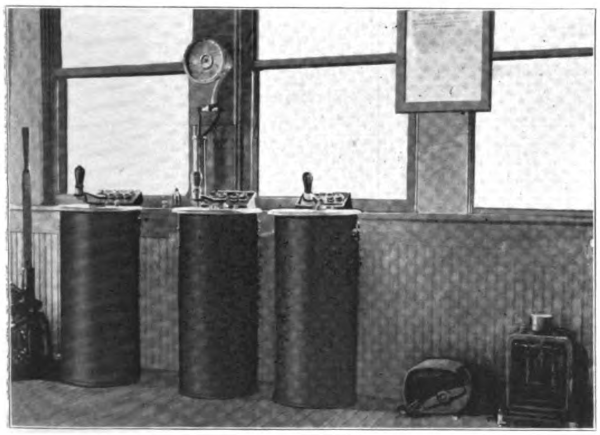


View of Rail Locking Machinery and Circuit Breakers.

reserved for steam service, cross on a swing draw 228 ft. in length supported by a hollow concrete reinforced circular center pier, and two concrete abutments. The electrical equipment is for single phase operation. The trolley wire is supported by a catenary cable, which in turn is supported on the pole brackets by high tension porcelain insulators tested to 20,000 volts. The trolley carries current at 6,600 volts. A battery house containing a rectifier and transformer room is situated east of the bridge. Here the trolley current is stepped down and rectified for the direct current motors which are used in the operation of the bridge mechanism. The draw movement is effected through two 25 h.p. direct current motors, conected in multiple, and placed below the deck of the bridge. The bridge wedges are operated by two

15 h.p. motors connected in multiple, and the rail locks, which are of sliding bar type, are handled by two 2½ h.p. motors, connected in multiple, one at each end of the bridge. The operating current for these motors is obtained at 250 volts, from the storage battery of 116 cells. This current is used also for the bridge lights. There is one rectifier for the bridge operating battery and another for the signal plant storage battery which consists of 56 cells.

The operating tower contains three controllers, the main circuit breaker, an electric interlocking machine of the type manufactured by the General Railway Signal Co., and the necessary switch boards. One controller is provided for the rail locks, one for the bridge wedges, and one for the turning of the span. The circuits are so arranged that these controllers must be operated in proper sequence, and upon completion of each of the operations governed by the controllers an automatic circuit breaker on the switch board cuts off the current from the mechanism. Thus the rail locks must be operated first, then the bridge wedges which correspond to the "end lifts," and then the span. Red and white lights are provided on the rail lock and bridge wedge controllers. When the rail locks are normal the white lights will burn upon the closing of a local switch in the tower.

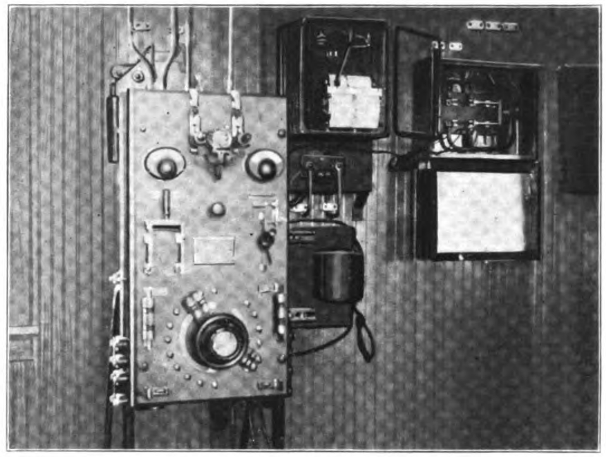


The Controllers. From Left to Right They Are: "Span," "Bridge Wedges" and "Rail Locks."

The red lights indicate the unlocked position of the rail locks. The same is true of the bridge wedges. On the controller operating the span there are five lights, one white, which indicates the normal position of the span; three red, the first of which shows that the span is in the first 30 deg. of its movement through the quadrant, the second of which shows that it is in the second 30 deg. and the third in the third 30 deg.; and the fifth light, a green one, which indicates, when lighted, that the span is in position for a boat to pass. The draw can be turned through 360 deg.

The electric operating and interlocking features on the bridge were installed by Geo. P. Nichols & Bros., Chicago.

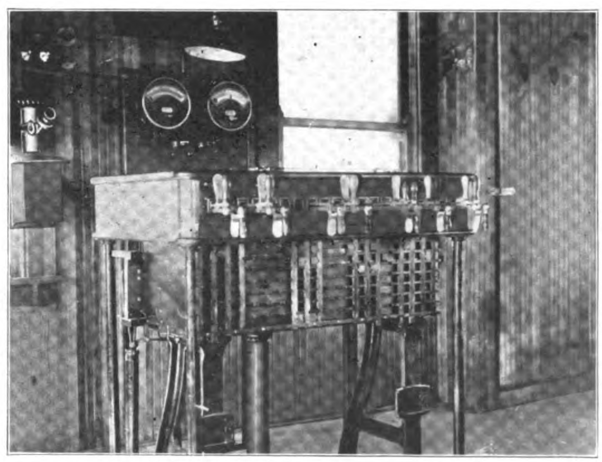
The signaling for this bridge includes derails and home and distant signals on each track for each direction. The two home signals at each end of the bridge are placed on a bracket post, as are the distant signals. At the east end of the bridge the bracket post is situated on the left hand side of the track on account of the interference with a clear view of the signals which the pole line would cause were the bracket posts on the right hand side. The derails are of the unbroken main rail type, operated by the standard electric mechanism made by the General Railway Signal Co. The signals are slotted, the slot circuits breaking through the contacts of relays which are connected in multiple with the white indicator lights on the rail lock controller in the tower. Two relays are provided, one for the slots on the signals at each end of the bridge. By this arrangement the slot coils are opened when the rail locks are out of their normal closed position. When the white lights fail to burn, as they will when the bridge locks are unlocked, the relays controlling the slot circuits are de-energized, the circuits are broken, and the slots cannot be picked up. The relay box and the terminal box for the wires entering the tower



Mercury Arc Rectifier, Graphic Ammeter, and Switch Boxes in Battery House.

are located in a room immediately below the tower.

A 20-lever electric interlocking machine with 15 working levers, handles the derails and signals and the main circuit breaker. Lever 15 operates a dwarf signal mechanism situated in the tower, the plunger of which is adapted to enter a hole in a lock bar. This lock bar is connected to a circuit controller which can be operated by foot pressure. Lever 15 locks all other levers in the machine normal when it is reversed, and at the same time it closes the circuits for the dwarf mechanism. This results in the withdrawing of the



The Interlocking Machine.

plunger from the lock bar and enables the circuit breaker to be closed to complete the bridge operating circuits. As all of the circuits for the operation of the bridge turning mechanism pass through this circuit breaker it will be seen that the interlocking machine and the bridge circuits are very well interlocked. Lever 15 in its reversed position ties up the interlocking machine and releases the bridge mechanism, while in its normal position it ties up the bridge mechanism and releases the interlocking machine.