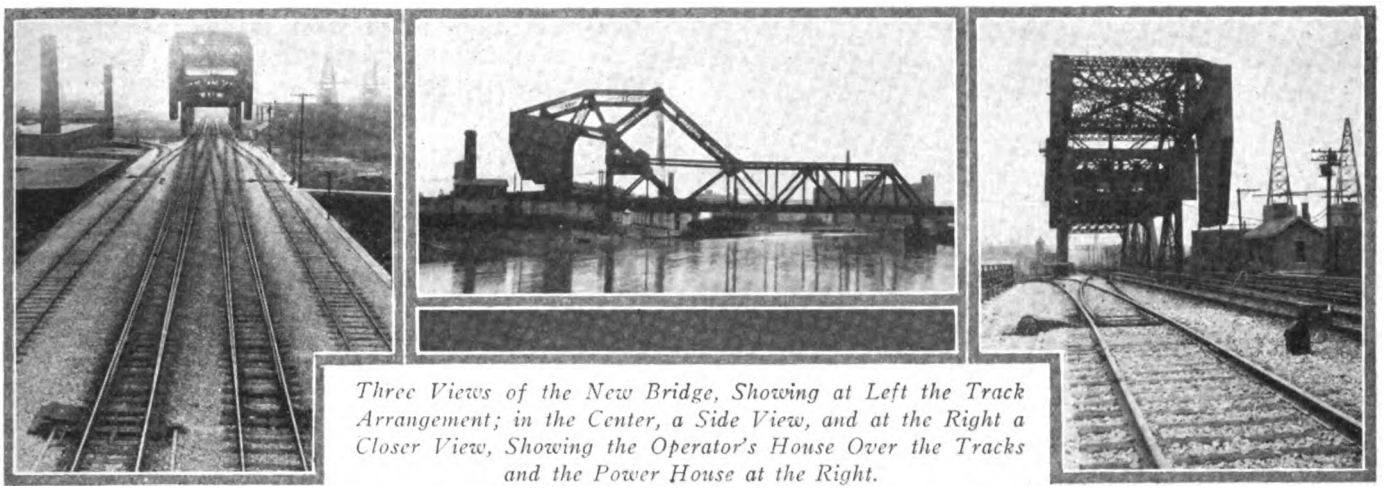
New C. & N. W. Bascule Bridge Interlocking



Three Views of the New Bridge, Showing at Left the Track Arrangement; in the Center, a Side View, and at the Right a Closer View, Showing the Operator's House Over the Tracks and the Power House at the Right.

Electric Plant Protecting Structure Over North Branch of the Chicago River at Deering Station

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THE three-track bascule bridge carrying the Milwaukee division of the Chicago & Northwestern over the North Branch of the Chicago river at Deering station, Chicago, is protected by a new electric interlocking plant. This bridge, of the Strauss heel trunnion type, replaces a double-track swing bridge built in 1887, which was too light and practically worn out. The old bridge was protected by an electric interlocking plant installed in 1907 by the General Railway Signal Company, and previous to that time an electro-pneumatic plant installed in 1899, was in service on the bridge.

The new bridge was erected almost completely in the open position without interrupting traffic, either on the railway or the river. To this end the counter-weights were placed outside of the tracks, as shown in the illustrations. Traffic was interrupted for 18 hours while the old bridge was dismantled enough to allow the new bridge to be lowered into position for erecting the approach spans and alining and raising the tracks, as the grade of the tracks on the new bridge is two feet higher than on the old. The old bridge was swung at right angles to the railway, supported on false work, and the middle portion cut out with oxyacetylene torches.

The track arrangement over the old bridge provided for the junction of the two-track system on the south and the three-track system on the north, at a point just north of the river. This fixed the north limits of the interlocking plant so far north that while trains were standing at the Deering station, other trains could not pass through the plant to and from the center track. With the new installation, the third track is carried across the bridge and merged into the two-track system just south of the bridge. This brings the north limits of the plant far enough south to allow the use of the center track while trains are standing at the station platforms on the outside tracks. The industry switches in the vicinity of the bridge are connected into the plant. The turnouts used for the junction are 1 in 20, with the center line of the double track coinciding with the center line of the three-track section. This makes the curvature equivalent to a 1-in-40 turnout, or 45 minutes. This is clearly shown in one of the cuts. The speed over these switches is restricted to 45 miles per hour.

Before any work was done toward erecting the new bridge it was necessary to move all wires of the former plant to a place where the shifting of the tracks and erection of the bridge would not disturb them, as they had been installed in lead-covered cables in wooden boxing under the ground, along and between the old tracks. Connections to units were made with trunking running into wooden junction boxes, in which the cables were opened. These cables were hung upon a pole line erected on the east right-of-way line for the permanent cables and temporary extensions were made to branch runs.

It was also necessary to change the location of the power house used for the old plant to house the storage battery and gasolene engine generator equipment. As the old building was of wood and did not suit the new requirements, a building was erected at the location shown on the plan. The new power house is of two stories—the first of concrete and the second of brick, with concrete floors. The retaining wall of the track elevation forms one side of the first story. The first floor is used mainly for storage of materials, while the second houses the storage batteries and generating equipment.

New 120 a.-h. storage batteries of the chloride accumulator type were installed to replace cells of the same type which had become worn out. The interlocking units are operated by 57 cells; 2 cells in duplicate are provided for the auxiliary and automatic control apparatus, and 7 cells in duplicate for track circuits and an automatic signal located on the northward home signal bridge. The generating equipment consists of a motor-generator set in duplicate operating from 220-volt, 3-phase a. c. Service is supplied at 440 volts, 3-phase a. c. for operating the bridge, and transformers are supplied for stepping this voltage down to 220. The switchboard is so arranged that the 57-cell set or either of the 7-cell sets can be charged alone or together, and the 2-cell sets can be charged in series with either of the others.

The tracks were rearranged as much as possible while keeping the old plant in service, which was done up to three days before the bridges were changed. When the old plant was taken out of service everything not required for the new plant was removed. As much of the material in the old plant as possible was used in the new. New wires were installed for the new plant, being made up into cables on the ground and hung on the pole line mentioned above. The wires for 110-volt circuits were separated from those carrying lower voltage and hung

on separate messenger wires and terminated in separate junction boxes. The wires were carried under the river in a steel-armored lead-covered cable laid in a trench about five feet below the bottom of the channel. This cable was not installed until after the old center pier had been removed and the channel dredged. The ends of the submarine cable are protected by hexagonal concrete houses manufactured by the C. F. Massey Company. The outlets for the aerial cables consist of three-inch conduit with bushings at each end set at an angle of 45 deg. with the horizontal, the outside end being lowest. There are eyebolts in the concrete just above the outlets on both the inside and outside to which the cables are tied with marline. The submarine cable is brought in through the floor. All wires entering these houses are terminated on R. S. A. terminals on vertical boards, mounted away from the walls to allow access on all sides.

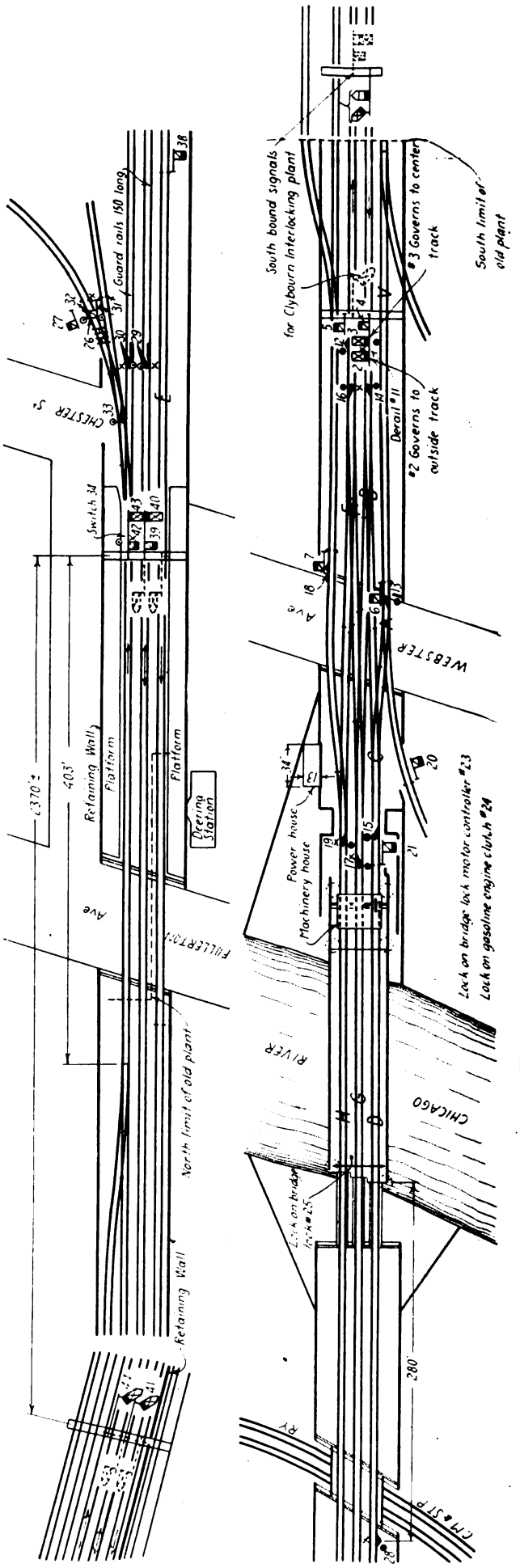
The wires from operated units are carried in trunking to the nearest pole, where they are connected to the wires in the cables through small iron junction boxes in which the wires are brought through holes in a board and spliced. The wires entering the tower, which is located over the tracks in the bridge superstructure, are brought from the concrete terminal house by overhead cables to a terminal box located on the bridge structure just in front of the house. From this box the wires are carried in conduit and a trough built into the house to the back of the interlocking machine. All other wires in the tower are enclosed in metal conduit.

A new interlocking machine of the unit type, manufactured by the General Railway Signal Company, was installed containing 18 levers for 18 signals, 16 levers for 8 switches and 8 derails, 3 levers for special locks between the bridge and interlocking apparatus, and 7 spare spaces, totaling a 44-lever frame. This machine is located near the controllers for the bridge-operating machinery.

The slot indicators showing the condition of the automatic blocks on the tracks leaving the plant, annunciators indicating the condition of the tracks approaching the plant, and the track circuit indicators, are arranged in a group on the wall back of the machine. The relays are located in a case below the indicators. The hand screw releases and emergency switches are located on a separate board to the right of the interlocking machine within easy access of the operator.

Advance, route and section locking are provided. The advance locking is accomplished by permitting the indication of the high speed signals only while a train is within the home signal limits. The route and section locking are accomplished by means of magnetic blowout relays of model 1 type which open the bus bars feeding current to the switches. These relays are so controlled that all routes are locked ahead of and behind a train while the train is within the limits of the plant. No stick relays are used. Hand screw releases of Federal Signal Company design are used for releasing the routes of the high signals in case a train has not arrived. Knife switches enclosed in individual boxes are provided for each track circuit to provide a release in case of track circuit trouble.

The operating machinery for the bridge is located in the operator's room and consists of two 150-hp. motors operating from a 3-phase, 440-volt a. c. circuit. For emergency, a 50-hp. high speed gasolene engine is provided. Electric brakes are applied to the shafts of the motors with emergency air brakes on the operating struts of the bridge. The bridge is locked in the closed position with two plungers located on either side of the

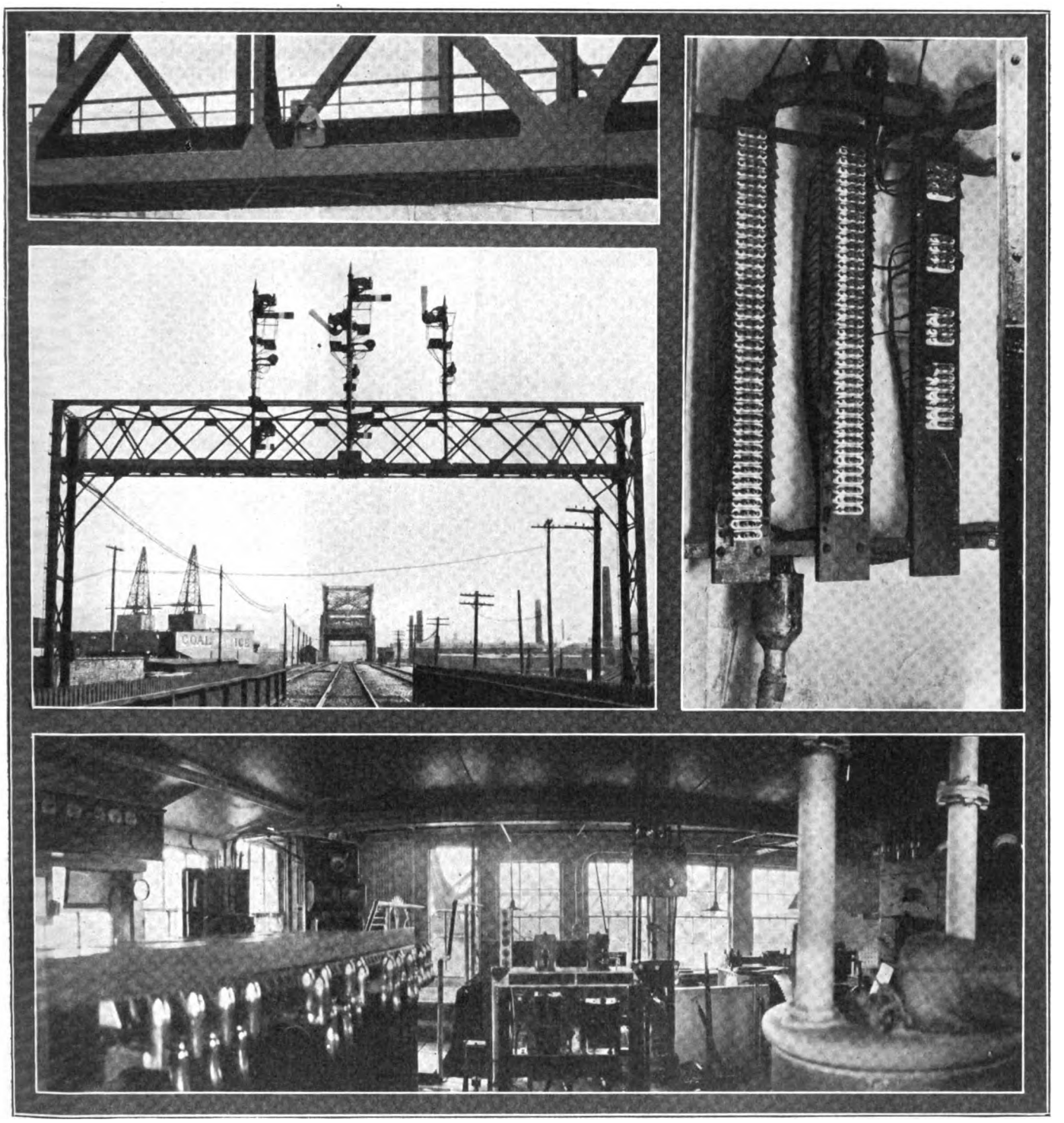


Track and Signal Layout of the New Deering Bridge Plant

bridge which engage slots in members anchored to the abutment. These plungers are operated by an a. c. motor located at the end of the bridge.

The controllers for the operating and lock motors are mounted on a common frame, shown in the interior view of the tower. The controllers are electrically interlocked by means of solenoid locks mounted on each controller and controlled as follows: The lock on the bridge lock motor controller is controlled by a contact on the lift motor controller in the off position, by a circuit breaker located on the end of the bridge which closes when it strikes the abutment and by contacts on the detector locks operated by the interlocking machine, mentioned later. The lock on the lift motor controller is controlled by a circuit breaker on the bridge lock motor which closes only when the bridge is unlocked and by a contact on the bridge lock motor controller in the off position.

The interlocking between the electrical operating machinery and the interlocking machine is effected by another lock on the bridge lock motor controller operating from the interlocking machine. This lock is made by using an electrical pole changer unit from a model 2 switch machine, and works a dwarf signal lever with battery indication. The circuits are so arranged that the



Autoflag Mounted on Lower Chord of Bridge to Warn Boats
The Southbound Home Signal Bridge
Interior of One of the Terminal Houses, Showing Cable Connections
Interior of Operator's House, Showing, from Left to Right, Indicators, Interlocking Machine, Emergency Switches, Bridge Operating Mechanism, Autoflag Indicators and Main Switch Board

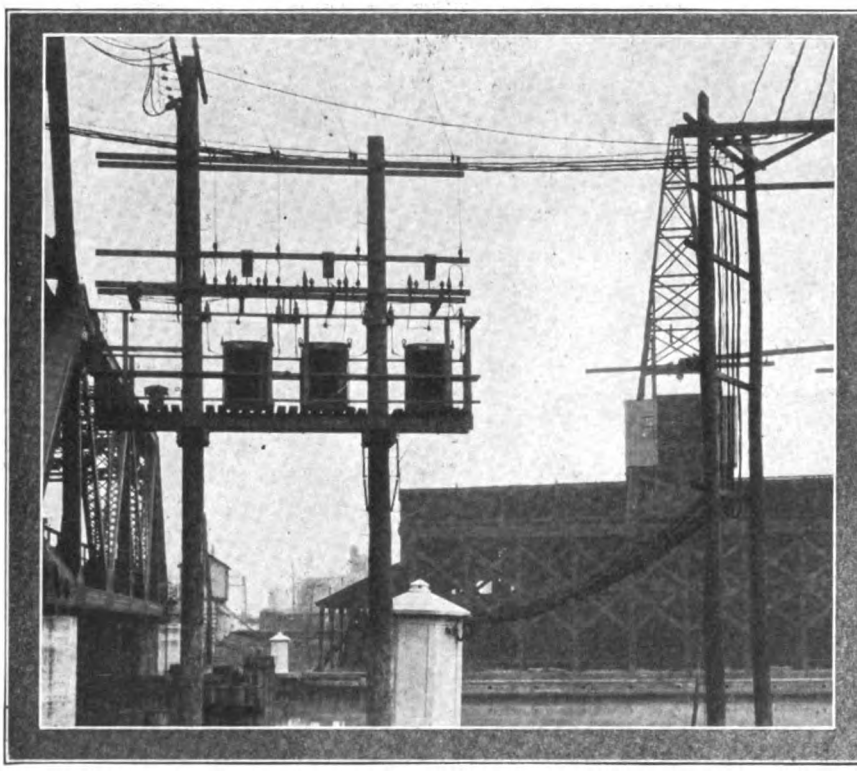
lock will not reverse and lock the controller handle, unless both of the solenoid lock plungers are seated and locking their respective controller handles. When the lever is reversed there is current in the reverse coils of the lock reduced by a 1,000-ohm resistance. This prevents any vibration from working the plunger out of its locking slot. Should the plunger be forced away from its locking position the resistance is shunted and full current goes through the magnets to force it back to locking position. The lever in the interlocking machine is locked by derail levers so that the bridge and its operating machinery must be normal before a derail can be reversed.

A lock of this same design and controlled in the same way is mounted on the shaft between the gasolene engine clutch and its control wheel. This clutch is locked in the neutral position.

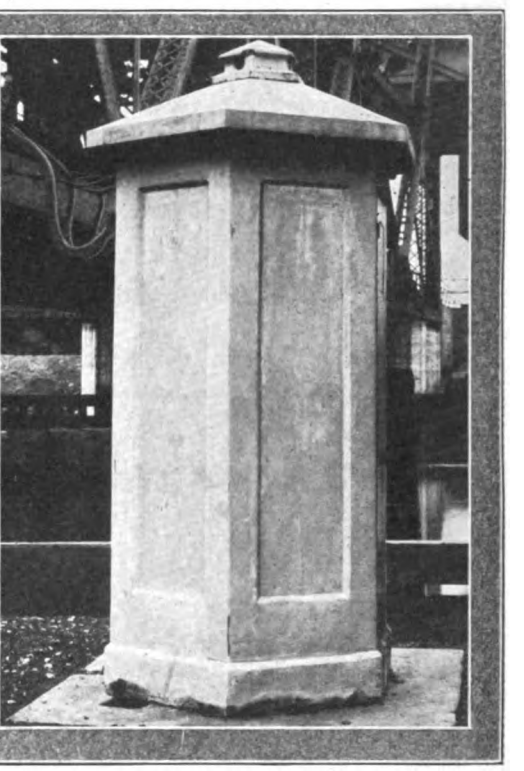
In addition, detector locks were applied to the bridge locks located at the end of the bridge. These are plunger locks of R. S. A. type with circuit controllers and the plungers enter holes in the bridge lock bars which slide in the grooves provided for lock rods. The adjustment on the plungers which operate the contacts was modified so that the contacts are closed only when the plungers are disengaged. If the plungers are removed the contacts will open also. The contacts control the lock on the bridge lock motor controllers as mentioned above. These plunger locks are operated by a model 2 switch machine located on the ties between the tracks. The control wires from the interlocking machine to the switch machine pass through the submarine cable and a Stiles circuit breaker operated by the bridge lock motor, providing an extra check on proper operation.

The track circuits are carried across the break in the floor of the bridge at the trunnion end by a flexible cable suspended outside of the bridge in such a manner as to produce the least possible bending. All wires are stranded and in duplicate. At the other end of the bridge the wires are carried through a Stiles circuit breaker operated by the bridge lock motor. This circuit breaker is located on the opposite side of the tracks from the one used for the control of the switch machine operating the plunger locks.

The city of Chicago has an ordinance requiring that a bridge tender shall, upon the approach of a boat, whenever he cannot immediately open the bridge, wave a red flag by day and a red light by night until the boat has stopped, and then continue to display the signal until the bridge is opened. To comply with this requirement and at the same time not tie up the bridge tender so that he cannot use his time in preparing to open the bridge, special "autoflags" were installed on each side of the bridge near the center of the channel, as shown in one of the illustrations. The autoflags were manufactured by the Bryant Zinc Company, being standard apparatus modified to provide a waving red light in front of a black background. The lights are 25-watt, 55-volt tungsten lamps behind standard signal lenses with the lamp closer to the lens than the focal point, thus increasing the spread of the rays. This light can be seen through a very wide angle in daylight as well as at night, its range being increased by a hood. In order for the operator to know that these autoflags are operating properly, a control board was installed just above the controller stand with a lamp in series with each of the lamps of the autoflag and a disc indicator of the Z armature type in series with each of the motors. A double-pole, snap switch is provided to control the autoflags.



Cables from Transformers to Bridge and from Terminal House to Bridge and to Line



Near View of One of the Hexagonal Concrete Terminal Houses

Northward, a two-arm approach signal is used with a two-arm home signal giving advance information for both routes. All signals on bridges are model 2A. Dwarf signals are model 2 solenoid and switch machines are model 2. Detector bars are used only on facing points of high speed routes. The signals were changed to three-position upper-quadrant from two-position lower-quadrant. The slow speed arms on masts of high signals are used for "call-on" purposes. All signals are electrically

lighted. Telephones are located on each signal bridge for communication between trainmen and operators in the tower.

As there was no room near the signal bridge south of the river to install a battery well, wires were run out from the seven cells of storage battery in the power house, to operate the low-voltage automatic signal located on this bridge. Seven track circuits also take current from this set of battery. A closed loop for both the positive and negative wires runs from the battery to the junction boxes on the cable poles, where the local connections to the track are made. Resistances are used on both sides of the circuits between the local feed wires and the loop which are adjusted for the particular section. A main adjustable rheostat is used between the battery and the loop, which is adjusted from day to day to take care of weather conditions. A voltmeter connection is made to one of the relays operating from this loop and the rheostat is at all times adjusted to give the required voltage on this relay which acts as a pilot. The relays connected to this system are of approximately 11 ohms resistance.

The material for this plant was furnished by the General Railway Signal Company and installed by railway company forces under the supervision of E. C. Carroll, superintendent of construction, signal department. The bridge was placed in service on July 30, 1916, and the new plant on September 15.

CONFESSIONS OF AN EX-MAINTAINER

BEING ruminant and reminiscent, I shall digress for a moment and analyze a typical character of the old-time signal fraternity. We might as well start this in the regular old-time style by saying ambiguously that he was born a Smith, christened John Henry and afterwards called "Red" by the bunch, due to his vermilion-tinted top-knot. Red grew up in a small town that was short on "kultur" and ultra-violet ideas, but long on yellow dogs, Hirams and Hatties. He was really a pretty kid and his folks never lost an opportunity of letting him know about it. In early youth he was some pet of the community, but when one considered the community this distinction was about as much of an asset as the title of admiral in the Swiss navy.

When Red was 17 he graduated from the grammar school and "accepted a position" in Skinner's toggery shop. It was here that he burst forth into full bloom. Soon the little girlie-girlies could not keep their eyes off of him, and Red became *some* gink.

During this period of youthful bliss and ignorance one little wren with soulful eyes and large bronze freckles fell head over heels in love with Red. This was before the days of moving pictures, so they used to go to the penny arcade and stuff their coppers into the slot in order to hear the latest selections played by the Edison military band.

It takes more than nine bones per week to keep up a reputation as a "good dresser," even though one does get 30 per cent off the list price. In three years Red owed Skinner money, not to say anything about sundry other liabilities that hung around his neck. Everyone lost confidence in him except the little doll with the bronze freckles. About the time Red began to wonder if he should commit suicide or decamp some dark night via the through freight that stopped at the crossing around 11 p. m. something happened that changed his entire career.

The afternoon train spilled out a gang of uncouth-looking individuals and some of them drifted into the toggery shop to purchase red bandanna handkerchiefs and "some of them three for a quarter socks." They told Red they were going to build an interlocking plant at the crossing. They might as well have spoken in Siamese or Sanskrit so far as Red was concerned, but he said "Uh huh," and was nice to them.

The next day Skinner cut Red's hawser and shoved him out into the stream. Jobs were about twice as scarce as hen's teeth in Red's town, but his folks thought he ought to do something that would save the family exchequer from sinking the third time. There being no other alternative, Red decided to go strike these interlocking men for a position.

Red and the foreman connected up all right, but you could not truthfully say that Red secured a position. What he got was just a plain job. He dug holes, mixed concrete, turned the drill press, carried pipe carrier foundations and did other little things that are always wished on the novice who is just being initiated into the fraternity. Under outside pressure Red stuck, and when the plant was put in service and the gang moved westward he packed up his wonderful wardrobe and went along with them.

On the night they left, Red dolled up in his glad rags and slipped over to see his freckled female friend. He tactfully explained to her that he had been threatened with consumption and that the doctor had ordered him to secure outside employment. They swore eternal allegiance to each other on the station platform and Red promised to write to her every day.

Bobby Burns once told about the "best laid plans of mice and men" going to the bow wows. Well, this same thing happened to Red. He became more interested in the articulation of signal material than in trying to find an excuse for bronze freckles and soon forgot all about the little lady with the soulful eyes. In four years Red was a regular guy. He had lost the index finger on his right hand while feeling for a clear hole in a plunger box casting, he had increased in weight and accumulated a new vocabulary and all the finer points of etiquette, as practiced by the "old timers" during that particular period. The original eight or ten good suits of clothes had been worn out under various pairs of striped overalls and his wardrobe had gotten out of synchronism with the seasons.

This pack of pirates finally migrated to a junction point only a few miles from Chicago. She of the silicon-bronze-tinted freckles found out the location of her long lost Red in some mysterious manner while visiting in the Windy City and penned a few burning lines to the effect that he should romp in, stay over Sunday and again get acquainted.

Red perused this letter three times, looked himself over four times, thought of what a sunburst of loveliness he used to be and then answered that he could not make the trip because he was sick in bed. He hinted about a return of his old tubercular trouble and dribbled gobs of gloom on each page. It was a real work of art.

Instead of setting a brake on Girley-Girlie, it accelerated her desire to do some heroic, noble act. Her romantic nature conjured up a mental photograph of poor Red sick and lonesome in some old shack, surrounded with poverty and medicine bottles, so she packed up her little handbag and hot-footed out to the aforementioned junction.

Arrived there, the little lady hoisted her pink parasol and started up the hot, dusty track on her mission of mercy. She finally got to the home signal and was just opening her mouth to ask for Red when an apparition clad in a flannel shirt and excruciatingly dirty overalls came up the bank with a coil of rope, two heavy bars, a pinnacle casting and five days' growth of whiskers. She