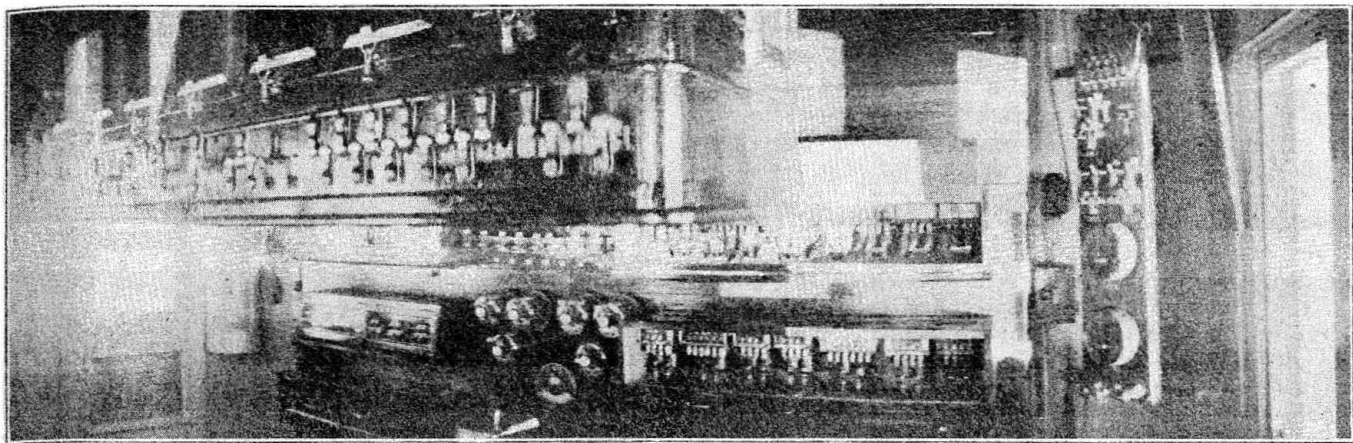




Interior of New Butler Tower Operating Room.

Electric Plant Replaces Three Mechanical Interlockings

Apparatus of Abandoned Power Installation Reconstructed to Control from a Single Tower at Another Location, All Units Previously Included in Three Separate Mechanical Layouts

By R. M. Phinney

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CHANGING conditions on the railroads have brought about many situations where the equipment in use is not efficient, according to present day standards. The high cost of labor has demanded that more labor saving devices be installed and that forces be reduced to the minimum needed to operate satisfactorily.

A change made recently on the Chicago & North Western at Bain, Wis., furnishes a typical example of this tendency toward the reduction of labor in the maintenance and operation of signal facilities. At this location a single track line from Kenosha, Wis., to Harvard, Ill., formerly crossed the double track freight line from Chicago to Milwaukee, Wis. When the latter line was built an electric plant was installed by the General Railway Signal Company at this crossing to include a number of crossovers and turnouts as well as the railway crossing. All trains stop for coal and water at this point and in addition the train crews obtain meals while stopping. As a consequence very few trains went through Bain interlocking without stopping. However, on account of the crossing it was considered necessary that the plant remain in service. An analysis showed that the traffic on the cross line had reduced to only a very few trains per day. It was, therefore, decided to remove the railroad crossing and the interlocking plant. The track layout was changed to bring some of the switches used by the cross line trains close enough to permit the operators handling them. These cross line trains now use two wye tracks crossing the main line on crossovers. As all of the operators were retained, the main saving made was the maintenance expense of the interlocking plant and crossing frogs. In addition, the trains accumulating at this point now do their work with less interference and delay than before. Automatic signals are in service on the main tracks.

Just north of the New Butler yard lying to the west of Milwaukee, Wis., is a double track wye connection with the double track line from Milwaukee to St. Paul. The three corners of these wyes, about 3,000 ft. apart, have been operated by three mechanical interlocking plants, a leverman being employed for each trick at each tower. By substituting an electric plant for the three mechanical plants, one set of levermen can operate all the switches without any difficulty eliminating six levermen, but without any change in maintenance force.

Novel Ideas in Using Old Apparatus

To carry out this program the plant at the east corner "EW" was first put out of service with the levermen throwing the switches by hand. The home signals of the plant were connected so that they operated automatically. Tower building "EW" was then moved to a point on high ground in the center of the wyes where a good view of all directions was obtained. The building was moved without mishap and the necessary changes made by the division bridge and building forces under the direction of B. R. Kulp, division engineer, and E. C. Vandemburgh, superintendent of bridges and buildings. The east section was completed and put in service first. The west plant "BJ" was then handled the same as "EW" and then the south corner, "SY", was treated in the same way.

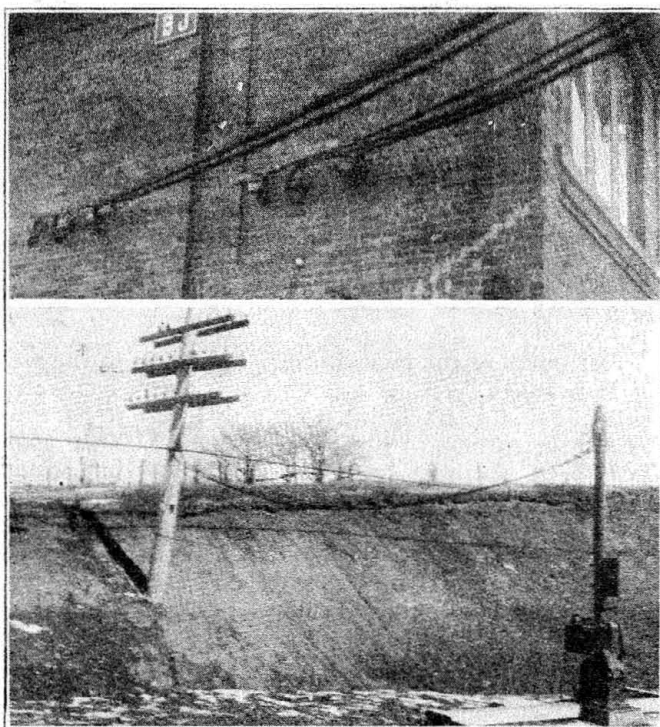
Interlocking Apparatus Salvaged at Bain Was Used at New Butler

The interlocking machine from Bain was used together with switch machines and other parts salvaged. It was necessary to practically rebuild the machine on account of the entirely different track layout.

To avoid the necessity of dismantling the 57 cells of

storage battery, some of which were in open glass jars, Type D-5 and the rest Type EMG-5, they were carried to New Butler on a 6 h. p. motor car and trailer, a distance of 45 miles, during one working day. A small motor car followed to give flag protection. This expedient resulted in the saving of a great deal of time and labor and was accomplished without breaking any of the jars or spilling any electrolyte. The battery was kept charged at Bain until it was needed at New Butler.

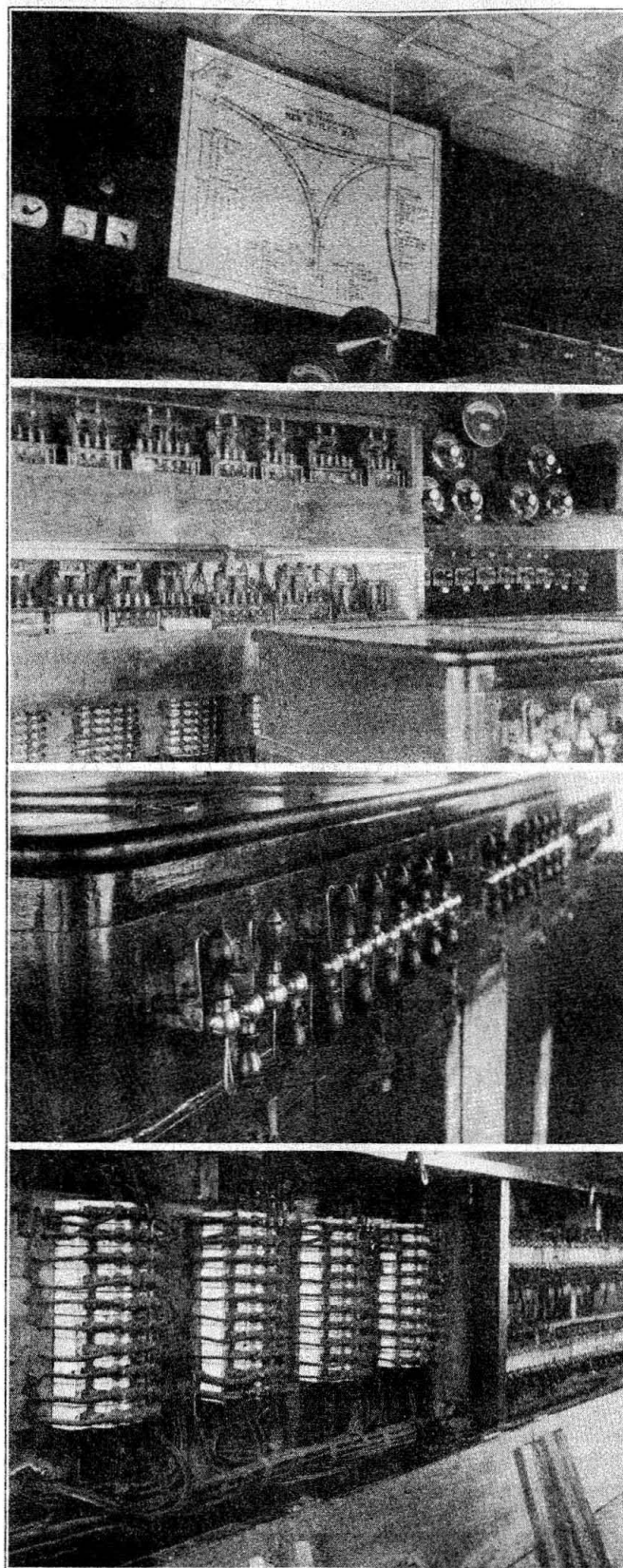
New storage cells were provided for all the track circuits formerly operated with primary battery and for all lines and signal motor batteries. All the tower batteries are located in the west end of the first floor of the tower. The cells are accessible from both sides and to save room the partition was built close to one of the racks with removable doors for access to all jars. The low-voltage control battery is charged by floating it from a Leich mechanical rectifier mounted on the charging panel in the room adjoining the battery room. The main interlocking battery of 57 Exide



Top—Cable Entrance Outside of North Wall of Tower.
Below—Control Wires Are Carried in Open Cable About Three Feet Below Bottom Crossarms.

cells is charged by floating it from a 200-watt Wotton motor-generator set manufactured by the Electric Products Company, Cleveland, Ohio, who also made the switchboard.

It will be noticed that there is only one switch on this switchboard, which is the a. c. power switch. Opening this switch shuts down the motor-generator set and the rectifier. Fuses are used for all other connections and are used for disconnecting when desired. There is a relay energized from the power source whose front point is in the charging circuit. This provides that the generator is connected to the battery only when the a. c. is on the motor. The motor-generator set starts from the battery, the d. c. generator running as a motor. When nearly up to speed the motor takes hold and speeds up so that the generator will charge the battery. Ammeter jacks and voltmeter switches are provided for all circuits. The board

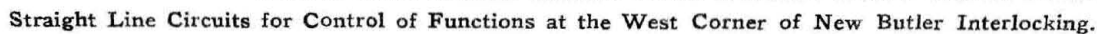


Novel Design of Illuminated Track Diagram Built by Company Forces.

Relays, Time Releases, Indicators and Emergency Track Circuit Switches Are Mounted on Wall Behind Machine.

Close-Up of Rebuilt G. R. S. Electric Machine, Formerly Installed at Bain, Wis.

Terminal Boards Immediately Back of Interlocking Machine, to Reduce Wire Requirements.



is made with or without the top panels. This board has a spare panel as there were fewer batteries to take care of than had been planned when the board was ordered. The motor-generator is equipped with R. S. A. bonding posts so that a spare generator can be substituted whenever required. The motor-generator set is run continuously at such current as will keep the battery at 2.15 volts per cell or 122 volts total.

The interlocking machine being of a quite old type had only two terminals per lever. In order to have a terminal for every wire going to the machine, R. S. A. terminals were mounted on wooden boards below the

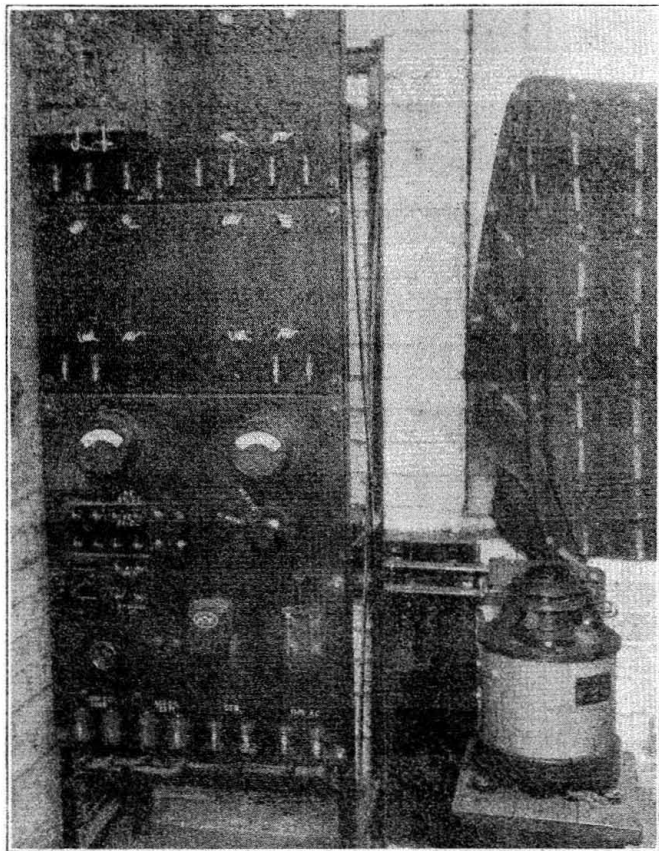
dwarf signals on the ground are the Model-2 solenoid type operating on 110 volts.

The low-voltage signals are controlled by polarized relays on individual return wires as 1-3-H. Two conflicting signals are controlled from opposite sides of one relay, however separate levers are used for each unit. In order to simplify the indication circuits, relays repeat certain combinations of signals as 1-2-3-EF and 33-41-EF. The indication circuits of the signal levers are carried through the proper relays to get control of the zero position of the home signal and the 45-deg. position of the distant signal.

Three of the differential relays were used, one for each section of the plant. One of the cut-out relays controls one section of the plant and the other, which was added, controls the other two sections of the plant. The ground lamps were changed to operate on a switch. The ammeter was removed and placed in front of the machine with the relay group, as shown in one of the illustrations.

Electric Locking Features of Plant

Detector locking is accomplished by cutting the bus bars feeding current to the switches. The control of the bus bars is through magnetic blowout relays Z which in turn are so selected that all routes are locked when a train passes a signal until it clears the signal governing in the opposite direction, except that for high signals the route is locked when the high signal

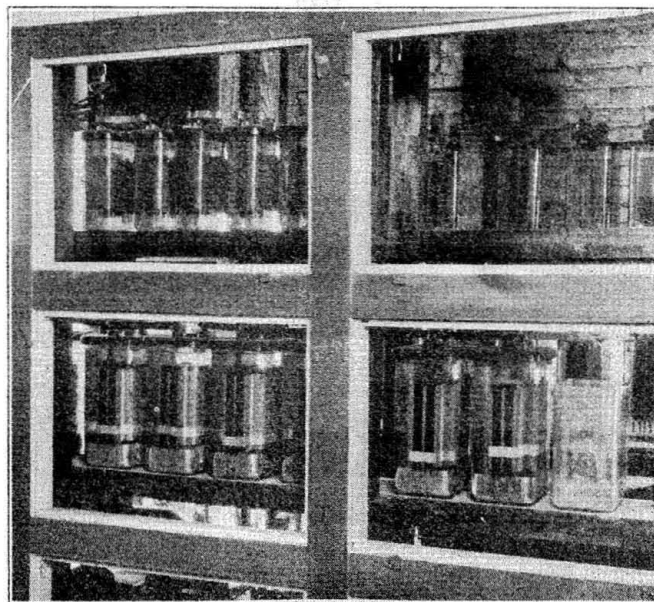


Charging Panel and Wotton Motor-Generator Set for Float Charging Both Low-Voltage and Operating Batteries.

regular terminal board. The usual slack box was removed and the wires laced in open cables. This is being done at all interlocking plants where new work or rebuilding is done.

Low-Voltage Signals Are Controlled by Polarized Relays

The operating board was of the differential relay type requiring indication commons, there being four of the differential relays but only one cutout relay. The board contained an ammeter and two indicating ground lamps without a switch. In connection with the use of this board consideration had to be given to the type of signal to be used. Model-3 signals had been used at Bain and as these signals required considerable current to operate they could be operated on the differential relays with the switches. The Model-3 signals could not be used as 3-position signals. Three-position upper quadrant 10-volt signals were in use at New Butler. To use 110-volt Model 2-A signals would have required three new cut-outs with individual polar relays. We, therefore, decided to use the low-voltage signals, controlling them as has become more or less standard with color-light signals. The



Main Operating Storage Battery Mounted Behind Removable Partitions.

lever is pulled. It will be noticed that stick locking is produced without the use of a relay by withholding the indication until the train enters the track section. Release of the high signal lever is made by a clock-work time release. The operation of the releases is checked with normal contacts controlling the lever which locks the route. Emergency release switches are provided to release the levers in case of track circuit failure. Reverse contacts shunt the track relay contacts. Normal contacts control the current to the signals so that no signal can be clear when an emergency switch in its route is reversed. The emergency switches are a new design of the push and pull type provided with means for sealing when in the out position. They were furnished by the Railroad Supply Company.

All relays are located on the wall back of the machine. Below the relays are the terminal boards for all field wires which come through the wall in conduit from the outside. The cuts show the cables on the outside as well as the conduit ends inside and outside. The relay cases are mounted on a backboard in a fixed position. Between the relay boxes and other fixed apparatus are four-inch boards which are removable for access to the wires. All wire in the tower is Pullman Special No. 16 with 2/64-in. wall of insulation, except the power and common wires.

Novel Design of Illuminated Track Diagram

The illuminated track diagram was made by company forces and has some novel features. A box was made of transite board, the front being 3-8 in. thick and the remainder 1-4 in. The box was put together with metal angles and corner pieces, using stove bolts. Two identical black line prints were made and one was mounted on the face of the diagram case. Holes were then drilled in at the proper places for the lights of a size to make a snug fit for fibre tubes about 1 1-4 in. long and an inch in diameter. These tubes are identical with those used for bushings in insulated joints. The tubes were forced in until they projected inside of the case and were enameled white inside. Care was taken to see that the edges against the print were sharp. The print was then removed and the duplicate print was mounted, but no holes were cut over the tubes. After the second mounting the surface was glazed with a coating which made it waterproof. Both mountings and the glazing was done by the Fred Wild Company, map mounters, Chicago. Candelabra lamp bases were then mounted on the back in the proper places so that the lamps entered the tubes.

The indication of this diagram consists of an illustrated circle of the print paper, about an inch in diameter, which can be seen at any angle, no bulls-eye lenses being used. There are two lamps per track circuit. The lamps are lighted only when the circuits are occupied. This is believed to give the most effective indication as well as conserving power and increasing the life of the lamps. The lamps are fed from the tower low-voltage battery. If they were lighted all the time they would have been fed from a c. with a power-off relay.

A motor-driven Federal siren is mounted on the signal bridge just east of the west corner. This siren is misnamed as it has a snubbing relay which stops it almost instantaneously when current is removed so that code signals can be given. It is controlled by a relay on the telephone circuit and was installed to call the maintainer to the nearest 'phone whenever the towerman wants him. The relay responds to the operation of the hand generator on the telephone. Telephones are located at nearly all of the signal bridges, in the maintainer's work room, which is the old tower at the west end, and the maintainer's dwelling just a short distance away.

There being fewer 110-volt wires than low-voltage wires, the 110-volt wires were carried as open wires on two cross-arms and the low-voltage wires, in hand made cables, about three feet below the bottom cross-arms on the pole line. The top arm is used for telephone wires. Where these open cables are carried overhead across the tracks just north of the tower, they were covered with a protective layer of lead tape and then sealed with a heavy coating of Rabok cable paint. This lead tape is about 1-32 in. thick and 2 in. wide. All rubber covered wire is Okonite No. 14, having 3-64 in. wall of insulation.

Very few of the old mechanical fittings were scrapped, the majority of them being shipped to the storehouse at Crawford avenue shops in Chicago to be reclaimed for possible future service.

The construction of the interlocking plant was under the direction of C. W. Biggers, general signal foreman.

Sudden Ravings

THE *Equipment* which a railroad seeks
To plug its *Economic* leaks
A plain and simple language speaks
(Will quote for those who heed)
It says "I am a faithful guy
Who, day and night, will always try
To function good and qualify,
So traffic can proceed."

II

"There's nothing freaky, strange or new
In the stunts which you know I can do,
But the choice of me—*that's* up to you;
So plant me where I fit:
Maintenance costs I can reduce;
Save labor, worry, grief and juice—
Your job perhaps—and much abuse;
Where I can do my bit."

III

"When some long-winded oily guy
Has substitutes for you to buy
At a cheaper price and (maybe) *try*
To save your pike some dough:
Remember that you never choose,
By price alone, when buying shoes
Or sox or pants or boot-leg booze—
For reasons we all know."

IV

"If a thing is punk, it's simply *punk*:
He can't talk quality into junk
And words along this line are bunk—
For service is the proof—
The *Equipment* which you get from him
Pay dividends which pan out slim
And when you yelp; he'll go and trim—
Some *other* easy Goof."

V

So if they catch you fast asleep—
You build a job that's "offal" cheap;
Don't feel that other men are sheep
And ask they follow you,
For if they do, I'm free to say—
That in no far and distant day,
Some snappy, pop-eyed *protegé*
Will paddle *their* canoe.

VI

Then, if you would economize,
Don't be too quick to compromise
Two factors which antagonize—
When figuring expense:
First costs are ofttimes but a bait
For future costs which do inflate—
So while you sit and meditate—
Employ your common sense.

W. H. F.