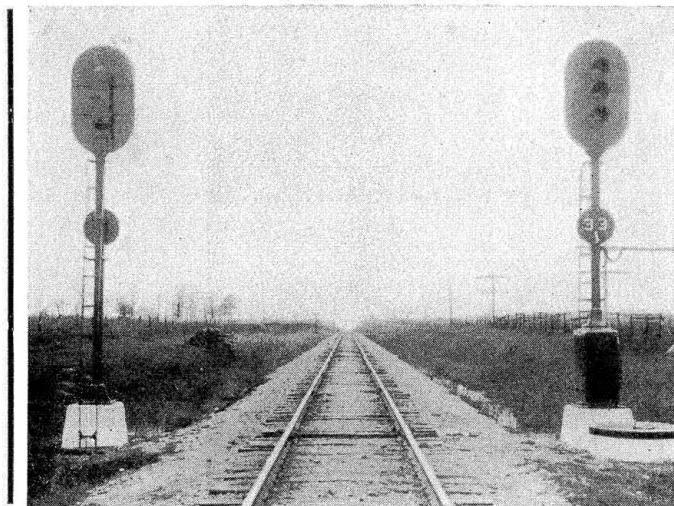


Color-light Automatic Block Signals and Automatic Interlocking



An automatic block signal location

Installed on the Janesville Line of the Milwaukee

Recent eighteen-mile installation includes trial sections of different methods of power supply for signals and track circuits

By L. B. Porter

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THE Milwaukee road recently placed automatic signals in service on its single-track line between Rondout, Ill., and Fox Lake, a distance of about 18 miles. This section of the line serves the lake region northwest of Chicago near the Wisconsin State line, and handles considerable suburban business. Rondout is a junction point on the main line between Milwaukee and Chicago. From there the line extends northwest through Janesville to Madison, west from there to the Mississippi at Prairie Du Chien, and on across Iowa and South Dakota to the Black Hills.

Traffic on this line consists of 16 passenger trains, 6 of which terminate at Fox Lake, and 4 regular freight trains with occasional extras. Additional freight traffic is being routed over this line on account of the grades being favorable. Considerable local business such as ice, sand and gravel is handled.

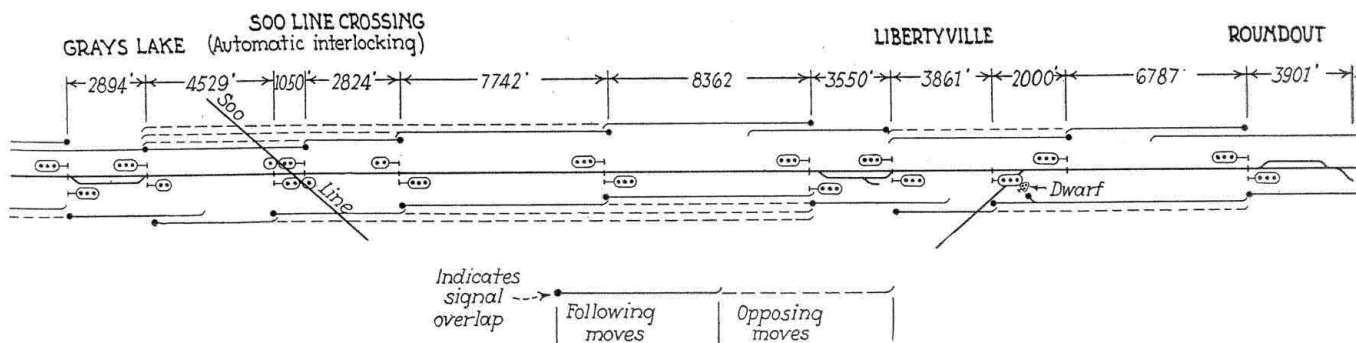
The track is laid with 100-lb. rail, and is ballasted with gravel. The maximum grade on this particular stretch is 0.7 per cent. As there is considerable curvature, the view approaching several of the stations is short. On account of the restricted view, and the neces-

running time, saving in overtime and fuel, greater protection against open switches, broken rails and cars fouling the main line, and the benefits from the additional sources of information regarding train movements that would be made available to the dispatcher, lead to the decision to carry out this installation.

To the somewhat indeterminate savings from these features, was added a direct saving of about \$5,000 annually made possible by the substitution of an automatic interlocking in place of a mechanical plant at a railroad crossing where the three operator-levermen were eliminated. The automatic signals permitted the discontinuance of the manual block, and therefore telegraph service was no longer required at that point. These savings were sufficient to warrant the cost of automatic signals on an economic basis.

Description of Equipment and Control Scheme

The signal equipment for this installation was furnished by the Union Switch & Signal Company, and the work was carried out by railroad forces. Style



Location plan of territory from Rondout to Grays Lake

sity of doing considerable switching on the main track, it was felt that signal protection should be provided at several points. The advantages from automatic signaling such as closer spacing of trains, increased track capacity, reduction in the number of train orders, faster

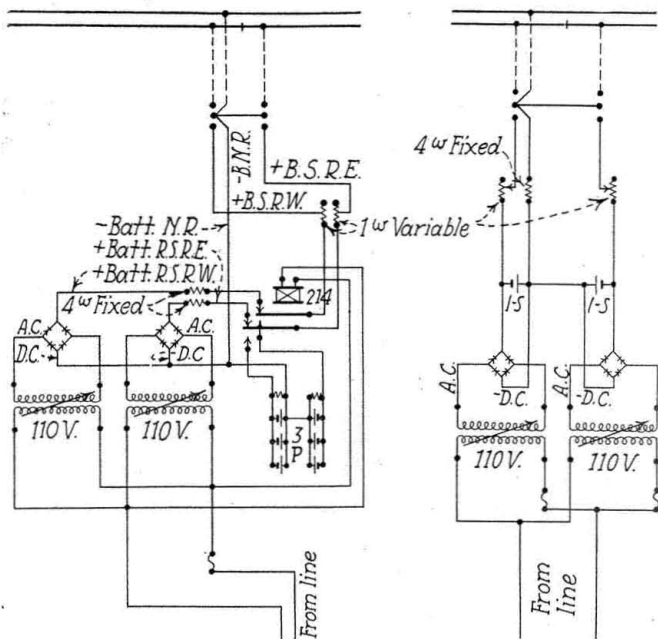
P-4, three-indication, color-light signals, equipped with 18-watt, 8-volt, single-filament lamps were used. The signals are provided with instrument cases where housing for apparatus is necessary. The distance from the base of the signal to the center of the

bottom lens is 12 ft. 2 in. Special lenses with wide spread are used on signals which are located on curves. DN-11 relays are used for track and line circuits. The switch instruments are Type-U3, and are wired to shunt the track circuits except in a few cases where this might cause unnecessary operation of highway crossing signals, at these places the line circuits are broken. Switch indicators are not used on this installation, but at one special location, at Libertyville, a color-light dwarf signal was provided at the leaving end of a yard track.

The signals are located and overlaps are arranged as shown on the accompanying diagram. The stations in this territory are located rather close together, and therefore the signal blocks average about 6,000 ft. in length. The absolute permissive system of circuits is used so as to shorten the block for following movements, and still give full head-on protection from station to station. The operating rules as to flagging on this section are the same as used on this road for the standard overlap system, and consequently all signals being made "Stop and Proceed" are equipped with number plates and no markers are used.

Lighting System and Power Supply

The color-light automatic signals heretofore installed on the Milwaukee have been on electrified lines where straight a-c. lighting and control circuits have been employed. Inasmuch as it was the thought



Circuit diagrams for track feed locations. Left—Rectifier feed with primary battery standby. Right—Rectifier floating storage battery

that the new installation on the Janesville line would eventually be extended westward, it was considered advisable to try out different schemes of signal lighting. Accordingly the a-c. storage battery floating scheme was used for half of the signals on this initial installation, and the a-c. primary battery system on the other half.

With the former, Exide lead-plate batteries, on floating charge by means of Union Type RX-21 rectifiers, are used for signal lighting. Under the latter scheme, the signal lighting circuits are normally connected to the a-c. line, and in case of failure

of the power supply, they are automatically cut over to 500-a.h. Edison primary batteries through power-off relays. The batteries are housed in shallow cir-



Typical relay case at signal location

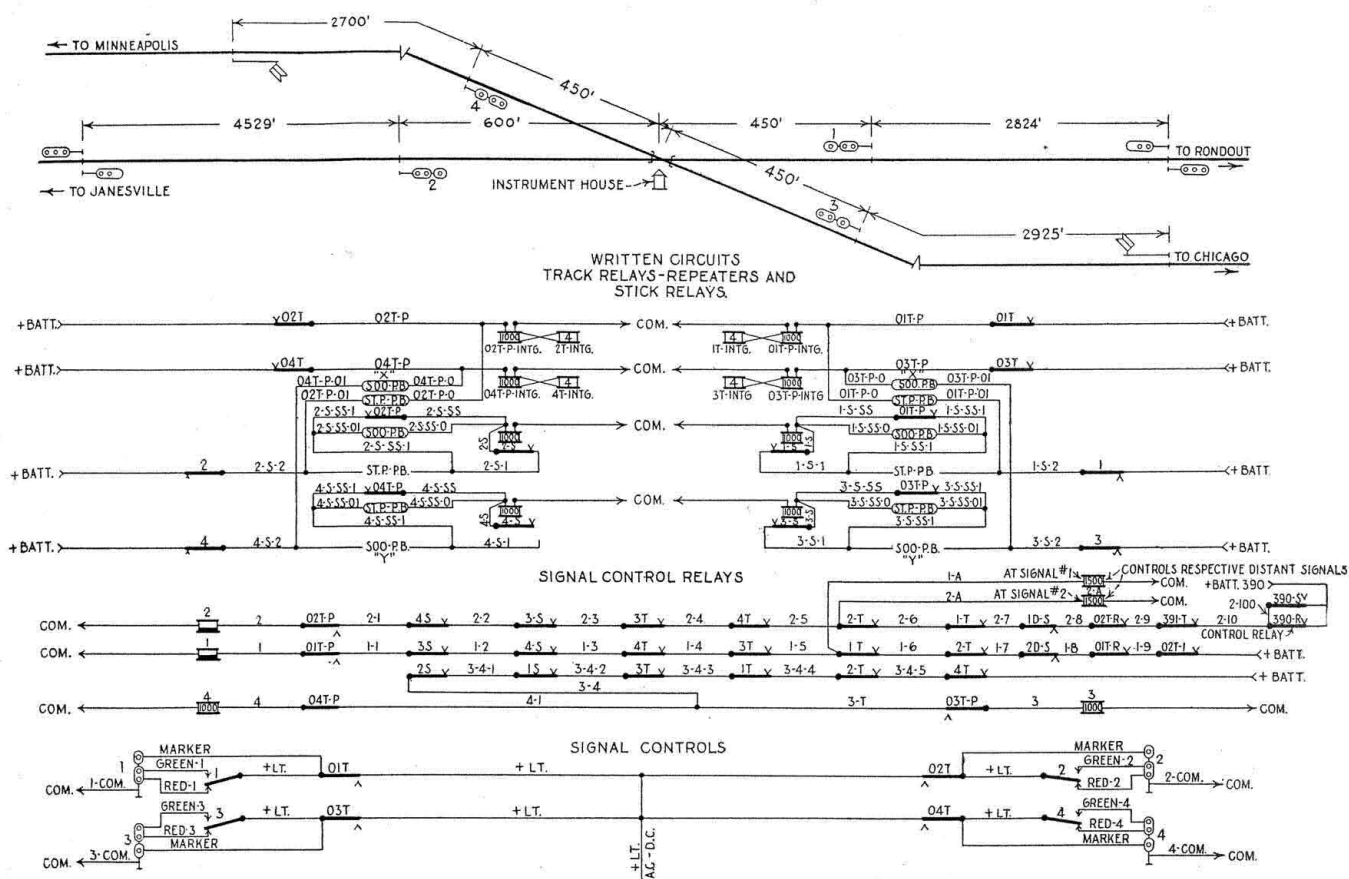
cular concrete tubs. The signals under both systems of operation are approach-lighted.

Sixty-cycle, single-phase power is secured locally at each station and is transmitted over the line at 110-120 volts on two No. 10 weatherproof, copper line wires. These wires are placed on two adjacent pins of the crossarm carrying the d-c. signal circuits on the Western Union pole line. These circuits are protected by Type-LC Crystal Valve lightning arresters mounted on the pole. The power circuits do not run continuously from station to station as there is usually a gap between two signals about midway. Number 14 wires with 4/64-in. wall Kerite insulation are used for all cable drops. Type W-10 transformers of 250-v.a. capacity, and with four secondaries with various taps, are provided for signal lighting and rectifying purposes.

Polar line control is used except at stations where it was desired to have the automatic signal repeat the position of the train-order signal and in a few other special cases where neutral circuits are used. The method of changing the polarity of the line circuit is somewhat different from the usual pole-changing circuit. The controls are checked through back contacts of the stick relays controlling the permissive feature so as to prevent the simultaneous display of proceed indications on opposing signals. Line circuits are fed from the signal operating or lighting batteries.*

Control circuits are carried over No. 10-weatherproof copper line wires. Type-LA Crystal Valve lightning arresters mounted on A.R.A. terminal blocks are used on these circuits. The control and

* On request to the editor prints of these typical control circuits will be sent to the readers who are interested.



Track and signal plan and written circuits for automatic interlocker at Grays Lake

operating circuits are carried across under the tracks in parkway cable.

The track circuits are end fed, two-ohm relays being used. At double battery locations, a single insulated rail joint was installed, the common sides of the batteries being connected to the through rail. Four different arrangements are being tried for feeding the track circuits: (1) trickle-charged storage battery, (2) straight primary battery, (3) rectifier floating across primary battery, and (4) rectifier with power-off relay and primary battery for reserve.

Rails are bonded with two 34-in. cable type bonds made up of six No. 12-B.W.G. galvanized iron strands with a No. 10-A.W.G. annealed copper core and are secured to the rail with $\frac{3}{8}$ -in pins and P.&M. protectors. This same kind of cable with pin connections is used for fouling circuits. Number 9 solid copper wire with 5/64-in. wall Kerite insulation and covered with two underground jutes and submarine finish, laid in the ground, is used for track circuit wiring. No surface trunking was used on this installation.

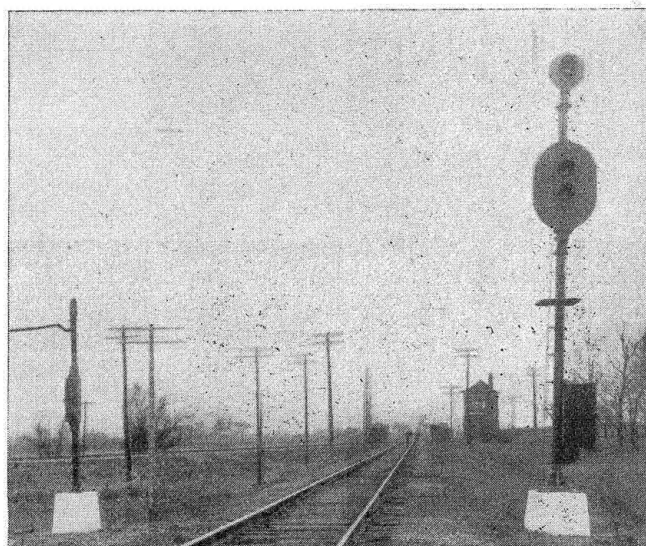
Automatic Interlocking

At the Soo Line crossing, east of Grays Lake, a 16-lever mechanical interlocking plant with full-time manual attendance was replaced with automatic signal protection. The Milwaukee now has 35 such installations in service on its lines at various points, several of which have been described in previous issues of *Railway Signaling*. In this particular installation the home signals on both roads are of the color-light type. The circuits are shown in the drawing and the operating instructions are as follows:

All train movements over the Soo Line crossing, 1.1 mi. east of Grays Lake, Ill., will be governed by color-light type

home signals with indications in accordance with Rules 601-A and 602-G, located on the right-hand side of track and approximately 450 ft. from the crossing. Automatic distant signals with indications in accordance with Rules 501-AA and 501-B, are located approximately 2,800 ft. east and 4,600 ft. west of the home signals.

All trains will approach the home signals under control and,

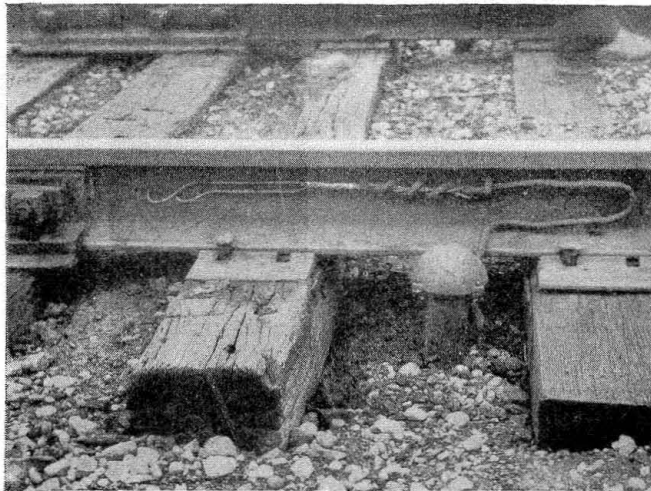


Westbound home signal on Milwaukee at Grays Lake automatic interlocker

if proceed signal indication is obtained, may proceed over the crossing at a speed not to exceed 20 m.p.h.

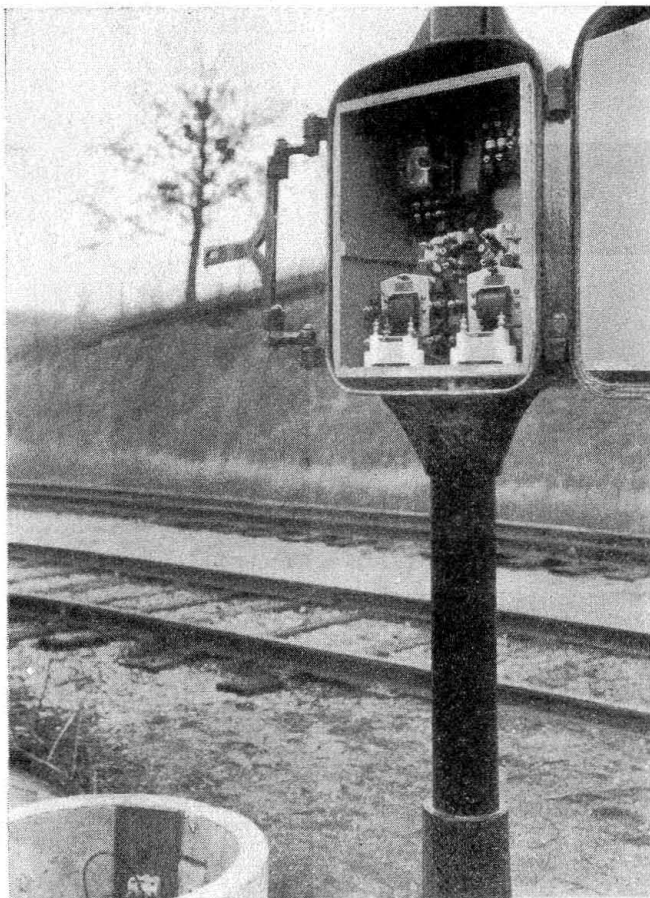
If a train is stopped at a home signal and no conflicting train movement is evident, a trainman shall proceed to the crossing and operate hand release marked "C.M.St.P.&P. Re-

lease," locked with a standard switch lock. Instructions for operating the release are posted inside the release box. In case the operation of the hand release does not clear the home



Parkway boot-leg outlet at rail

signal, the trainman at the crossing, upon having made certain that the home signals on the conflicting road are at "Stop" and no immediate train movement is evident on such line, may signal the train to proceed over the crossing. Movements



Instrument case at rectifier track feed

under such conditions must be made at slow speed and must be protected against conflicting movements. Flagging Rule 509-A also applied to these home crossing signals.

Failure of the home signal must be promptly reported to the train dispatcher at the first open telegraph office where regular stop is made.

Sudden Ravings

FOR many months my lyre has hung
On a rusty nail with strings unstrung;
So you have been forsaken,
But at last month's "Show" I heard a squawk
And some pessimistic talk
That slandered your vocation.
Now in defense I'll grab my quill
And homely words of solace spill
To help this situation,
Wherein some Dud I fear now feels
That *Railroads* all are but *flat wheels*
Beneath a *Busted Nation*.

II

If you but think you will agree
That what was lost by you and me,
Through stock manipulation,
Meant only what we hoped to win
While what we won was our chagrin
With this word "*speculation*."
The assets of our land remain
All scattered through this vast domain,
But they suffer from stagnation,
So what our Railway really needs
Is just a few good horse-sense creeds
To renew the circulation

III

Don't watch too close the purchase price
When maintenance costs are nearly twice
Above your expectation;
The cheap and shoddy "little things"
An aftermath of trouble brings
With costs and aggravation.
Don't let some Bird now promise you
An extra car of traffic—or two—
With this one stipulation,
That in return your road will buy
Some certain goods from a certain guy
Through such reciprocation.

IV

Among these creeds is "Don't get tight"
And squeeze a dime with all your might
In pure premeditation;
For every circuit has an end
Where you receive just what you spend—
As per an old equation.
So roll the bones and take a chance
Bet your wad, your job and pants
On that rehabilitation
That keeps your cars upon the run
Or moves an extra sluggish ton
Towards its destination.

V

Now let me say, do not forget
That mob-led minds can still beget
Some serious irritation,
But the way that such opinions swing
Depends upon one single thing
That's known as "*propagation*."
So smile and tell this skeptic gium
That better days are sure to come
Without much hesitation.
If he will only look above
And help us give a little shove
To gain acceleration.

—W. H. F.