

excessive drop in the line, which would affect the operation of the other track circuits.

In addition to the mechanical detector bars operated by the switch movements, all switch levers in the machine are equipped with detector locks controlled by standard detector circuits, which removes any possibility of the switch being inadvertently operated under a train.

All high and medium speed signals are two-position semi-automatic, while the route and dwarf signals are two-position (not semi-automatic), the control of the route signals being arranged so that by the operation of a push button these route arms can be cleared for movements over high-speed routes which may be occupied.

All of the high-speed signal levers are arranged for approach locking control, which insures that the signal lever cannot be restored to the complete normal position after it has once been reversed if a train has passed the first automatic signal in advance of the distant signal. The lever can at all times be restored to the normal latch, thus putting the home signal at stop, but cannot be restored to the complete normal position, so as to release the locking which holds the switch levers, until the train has either passed the home signal or the hand-operated time release has been fully reversed, which operation requires two minutes.

The relays used in this installation are of the Union 9-C type. Those used on the track circuits within the interlocking limits are wound to 12 ohms resistance, and are so arranged that the armature will release much more quickly than in the standard type. Those used on the track circuits outside of the interlocking limits are wound to four ohms resistance. The line relays are wound to 1,000 ohms resistance.

The switch movements are of the Union Switch and Signal Co.'s standard for electric interlocking work, with countershaft reduction gears and double-wound motor armatures for d. c. indications.

The high signals are of the Union style "S" type, operating from 0 to 60 deg. in the lower quadrant, and provided with motors to operate on 110 volts d. c., and to give direct-current indications.

The dwarf signals are of the solenoid type, operating from 0 to 60 deg. and they are arranged to give direct current battery indications.

This interlocking was installed by the Union Switch & Signal Co. under the supervision of W. H. Higgins, signal engineer of the Central Railroad of New Jersey. The plant is situated in the territory between Bound Brook, N. J., and Cabasaqua, Pa., which territory is in charge of J. Fred Jacobs, supervisor of signals.

A NEVADA MINING newspaper furnishes the following not unintelligent account of the horn lightning arrester "While waiting for supplies to finish up his job of connecting the substation of the power company with the machinery at the Nevada Wonder shaft Mr. Halpenny has kept busy making improvements about the plant. The most conspicuous and probably the most important job is the installation of a lightning arrester. It is a curious thing in appearance and anyone with half a mechanical eye could tell that it is a lightning arrester, because it couldn't possibly be anything else. It is mounted on staging at the rear of the power station and consists of a curious system of wiring and six long, slightly curved pieces of small iron pipe. The idea is, as nearly as the lay mind can grasp it, that when a bolt of lightning attaches itself to the wire it will follow it till it finds a good jumping off place. These great horns of iron pipe, pointing toward the sky, are good conductors as far as they go, and when the lightning comes along it follows the line of least resistance. Three of the horns, near their bottoms, are near but do not touch those connected with the three main lines. The current or lightning bolt jumps across this space, follows the detached gas-pipe horn upward toward its tip, and, having no other place to go, just goes out into the sky, whence it came."—*Electrical World.*"

## A SUMMARY OF SIGNALING PRACTICE.

The following information as to the signaling practices on the railways of the United States and Canada was obtained in the form of replies to a circular mailed during the latter part of July. Only the replies received up to September 1 are given. The totals are, therefore, necessarily incomplete, so that the summary fails to indicate to how great an extent recent developments in signaling practice are being adopted. It is planned to publish more complete information, when replies have been received from a number of the remaining roads which had not submitted the information requested before September 1.

A summary similar to this was compiled in February, 1910, by A. H. Rudd, signal engineer of the Pennsylvania. That summary gave the following information:

Total mileage in the United States and Canada.....	255,357
Lines using green for clear.....	117,808
Lines changing to green for clear.....	2,515
Lines considering the change to green for clear.....	33,673
Lines using white for clear.....	36,506
Lines using upper quadrant for new work and renewals....	69,624
Lines using part upper quadrant for new work and renewals.	16,152
Lines considering the adoption of upper quadrant.....	11,788
Lines using the lower quadrant and contemplating no change	65,520
Lines using purple for dwarf signals in stop position.....	14,569
Lines partly using purple.....	9,941
Lines using blue.....	957
Lines changing to purple.....	10,608
Lines considering the change to purple.....	24,176
Lines not reporting as to green for clear.....	64,855
Lines not reporting as to upper or lower quadrant.....	92,273
Lines not reporting as to purple or blue.....	195,106

The reports given herewith represent 121,523 miles of road.

Some of the total figures compiled to date are as follows:

Lines using green for clear.....	91,617
Lines changing to green for clear.....	12,800
Lines considering the change to green for clear.....	17,204
Lines using white for clear.....	43,071
Lines using the upper quadrant for new work and renewals.	64,998
Lines considering the adoption of upper quadrant.....	14,601
Lines using the lower quadrant and contemplating no change.	73,424
Lines using purple for dwarf signals in stop position.....	5,338
Lines partly using purple.....	11,157
Lines using blue.....	3,737
Lines considering change to purple.....	5,321
Lines considering change to yellow.....	4,590

Comparisons of the totals to September 1, 1911, with some of those in the summary of February 1, 1910, show a less number of miles using the upper quadrant than previously. This, however, is due to the incompleteness of the present information; and the final comparison, which will be made in a later issue will undoubtedly reveal considerable progress in this respect.

In addition to the information given the following changes are contemplated by various roads:

The Buffalo, Rochester & Pittsburgh is planning to change its night indications from red and green and white to red and green and yellow. This road will eventually have two-arm interlocking and one-arm automatic signals.

The Chicago, Indianapolis & Louisville will use green, red, and yellow for its night indications, and two-position upper quadrant day indications.

The Chicago & Eastern Illinois is contemplating the change from white to green for clear, with the substitution of yellow for green for caution.

The Chicago Great Western will use green for clear on the entire road and the new work will be upper quadrant.

The Chicago, Milwaukee & St. Paul will use the upper quadrant for new signaling.

The Chicago, Rock Island & Pacific will use the upper quadrant for renewals and new work.

The Louisville & Nashville is planning to use yellow for its dwarf signals, and will standardize the three-position upper quadrant signal.

The Missouri, Kansas & Texas is planning to change its night indications. This road has now 1.6 miles of three-position upper quadrant signals under construction.

The New York, Ontario & Western is changing from white to green for clear.

The Pennsylvania Lines West of Pittsburgh have standardized the upper quadrant, and will use upper quadrant signals for new work and renewals.

The Metropolitan West Side Elevated uses red and green lights together for "slow lights" on curves.

# PARTIAL SUMMARY SHOWING SIGNALING PRACTICE ON THE PRINCIPAL RAILWAYS OF THE UNITED STATES AND CANADA.

	NIGHT INDICATIONS						NUMBER OF ARMS		
	COLOR OF LIGHT USED						On Home Interlocking Signals	On Automatics	Day Indications
	Dist. Sig. Caution	Home Sig. Caution	Home Sig. Permis've	Home or Distant Sig. Clear	High Sig. Stop	Dwarf Sig. Stop			
Ann Arbor.....	Green			White	Red	Red	1 and 2		2 pos. l. q.
Atlantic Coast Line.....	Green	Green	Green	White	Red	Red	1 and 2	1	3 pos. u. q.
Bangor & Aroostook.....				Green	Red	Red	1 and 2	1	2 pos. l. q.
Buffalo, Rochester & Pittsburgh.....	Yellow	Yellow	Not used	Green	Red	Red	1 or more	1	3 pos. u. q.
Canadian Pacific (Western Lines).....	Yellow	Yellow	Not used	Green	Red	Red	1, 2 and 3		3 pos. u. q.
Chicago & Alton.....	Yellow	Yellow	Red	Green	Red	Red	Combination	1	2 pos. l. r. h.
Chicago, Indianapolis & Louisville.....	Green	Red	Red	White	Red	Red	2 and 3	1 and 2	2 pos. l. q.
Chicago, Burlington & Quincy.....	Green			White	Red	Red	1 and 2	1 and 2	2 pos. l. q.
Chicago & Eastern Illinois.....	Green	Green		White	Red	Red	2	1	3 pos. l. q.
Chicago Great Western.....	Yellow	Red	Red	Green	Red	Red	1 and 2	1	3 pos. u. q.
Chicago, Milwaukee & St. Paul.....	Green	Green	Not used	White	Red	Red on sidings Purple main line	Not more than 2	Not more than 2	3 pos. u. q. 358 mi.
Chicago, Rock Island & Pacific.....	Yellow	Yellow	Not used	Green	Red	Red	1, 2 and 3	1	3 pos. l. q. 3 pos. u. q.
Chicago, Terre Haute & Southeastern.....	Green	Not used	Not used	White	Red	Red	1	1	2 pos. l. q.
Chicago & Northwestern.....	Red & Green	Red & Green	Not used	Green	Red	Red	1, 2 or 3	1	3 pos. u. q.
Cincinnati, Hamilton & Dayton.....	Yellow	Yellow	Yellow	Green	Red	Red	Combinations	1 and 2	3 pos. u. q.
Delaware, Lackawana & Western.....	Yellow	Not used	Red	Green	Red	Blue	Usually 2	2 on dbl. track 1 on single track	2 pos. l. q.
Elgin, Joliet & Eastern.....	Green	Not used	Not used	White	Red	Red	1 and 2	1	3 pos. u. q., 4 mi. 2 pos. u. q., 4 mi.
El Paso & Southwestern.....	Yellow	Yellow	Not used	Green	Red	Red	None	1	2 pos. l. q. (10 mi.) 2 pos. u. q. (16 mi.)
Erie.....	Yellow	Yellow	Not used	Green	Red	Purple	1, 2 or 3		
Grand Rapids & Indiana.....	Green	Green	Green	White	Red	Red	2	1	2 and 3 pos. u. q.
Great Northern Ry.....	Yellow	Red	Yellow	Green	Red	Red		1	3 pos. u. q.
Hudson & Manhattan.....	Yellow	Not used	Not used	Green	Red	Red	1		2 pos. l. q. (all dwarfs)
Illinois Central.....	Yellow			Green	Red	Red	1 and 2	1 and 2	2 pos. l. q.
Illinois Traction System.....	Yellow	Not used	Not used	Green	Red	Blue	1	1	u. l. h. q.
Kansas City Terminal.....	Yellow	Yellow		Green	Red	Purple			3 pos. u. q.
Kentucky & Indiana Terminal.....	Green	Green	Green	White	Red	Red			3 pos. u. q.
Lake Superior & Ishpeming..... Muskegon, Marquette & Southeastern.....	Yellow	Not used	Not used	Green	Red	Red	1	1	3 pos. u. q.
Louisville & Nashville.....	Yellow	Yellow	Red	Green	Red	Red	2 where low speed is req.	2 on 2 pos. 1 on 3 pos.	2 and 3 pos. l. q.
Metropolitan West Side Ele., Chicago.....	Not used	Not used	Not used	Green	Red	Red	1 and 2	(See note)	Lower quadrant
Missouri, Kansas & Texas.....	Yellow	Yellow	Not used	Green	Red	Red	Combinations	1	2 pos. auto u. q. 5.5 mi.
Missouri Pacific.....	Yellow	Not used	Not used	Green	Red	Red	1 and 2	1 and 2	2 pos. l. q.
Mobile & Ohio.....	Yellow	Yellow	Green	Green	Red	Red	2	1	3 pos. l. q.
Nashville, Chattanooga & St. Louis.....	Green	Green	Green	White	Red	Red	2	1	2 and 3 pos. l. q.
New York Central—Hudson River.....	Yellow	Yellow	Yellow	Green	Red	Purple	1, 2 and 3	1	2 pos. l. q. (59 mi.) 3 pos. u. q. (47 mi.)
New York, Ontario & Western.....	Green	Not used	Not used	White	Red	Red	1	2 h. and d.	2 pos. l. q.
New York, Philadelphia & Norfolk.....	Green	Green	Green	White	Red	Red	2	1	3 pos. u. q. auto. 3 pos. l. q. manual.
Northern Pacific.....	Yellow	Yellow	Not used	Green	Red	Red	2 or 3	1	
Oregon Short Line.....	Yellow			Green	Red	Red	1 and 2	1 and 2	2 pos. l. q.
Pennsylvania Lines East of Pittsburgh.....	Green	Green	Green	White	Red	Red	3 arm u. q. new work	1	3 pos. u. q. new work
Pennsylvania Lines West of Pittsburgh.....	Green	Green	Green	White	Red	Red	2	1	3 pos. u. q. 276 mi.
Pere Marquette.....	Green	Green	Green	White	Red	Red			
Philadelphia & Reading.....	Green	Not used	Red	White	Red	Purple	3	2	3 pos. l. q.
St. Louis & San Francisco.....	Yellow	Yellow	Yellow	Green	Red	Red	1 and 2	1	2 and 3 pos. l. and u. q.

# PARTIAL SUMMARY SHOWING SIGNALING PRACTICE ON THE PRINCIPAL RAILWAYS OF THE UNITED STATES AND CANADA.—(CONTINUED.)

	NIGHT INDICATIONS						NUMBER OF ARMS		
	COLOR OF LIGHT USED						On Home Interlocking Signals	On Automatics	Day Indications
	Dist. Sig. Caution	Home Sig. Caution	Home Sig. Permiss'v	Home or Distant Sig. Clear	High Sig. Stop	Dwarf Sig. Stop			
Southern.....	Green.....	Green.....	Green.....	White.....	Red.....	Red.....	1, 2 and 3.....	1 u. q. .... 2 l. q. ....	2 pos. l. q. .... 3 pos. u. q. ....
Southern Illinois & Missouri Bridge.....	Yellow.....	Not used....	Green.....	Green.....	Red.....	Red.....	2.....	2.....	2 pos. l. q. ....
Southern Pacific (Atlantic System).....	Yellow.....	Not used....	Not used....	Green.....	Red.....	Red.....	1, 2 and 3.....	1 and 2.....	2 pos. l. q. ....
Southern Pacific (Pacific System).....	Yellow.....	Not used....	Not used....	Green.....	Red.....	Red.....	1, 2 and 3.....	1 and 2.....	2 pos. l. q. ....
Southern Pacific Lines (East of Sparks).....	Yellow.....	Not used....	Not used....	Green.....	Red.....	Red.....	1 and 2.....	1 and 2.....	2 pos. l. q. ....
Terminal R. R. Assn. of St. Louis..... St. Louis Merchants Bridge Terminal.....	Yellow.....	Not used....	Not used....	Green.....	Red.....	Red.....	1.....	1.....	2 pos. l. q. int. sig. .... 3 pos. l. q. auto sig. ....
Toledo, Peoria & Western.....	Green.....	Not used....	Not used....	White.....	Red.....	Red.....	2.....	.....	2 pos. l. q. ....
Union Pacific.....	Yellow.....	Not used....	Not used....	Green.....	Red.....	Red.....	.....	1 and 2.....	2 pos. l. q. ....
Wabash.....	Green.....	Green.....	Green.....	White.....	Red.....	Red.....	2.....	1.....	3 pos. l. q. ....
Wabash-Pittsburgh Terminal.....	.....	.....	Green.....	White.....	Red.....	Not used....	None.....	1.....	3 pos. l. q. ....
Washington Terminal.....	Yellow.....	Yellow.....	Not used....	Green.....	Red.....	Red.....	3 (2 operative) semi. auto....	1.....	3 pos. u. q. ....

Abbreviations: *u. q.*, upper quadrant; *l. q.*, lower quadrant; *int. sig.*, interlocking signal; *auto. sig.*, automatic signal; *2 pos.*, two-position; *3 pos.*, three-position; *dist. sig.*, distant signal; *home sig.*, home signal; *req.*, required; *h. and d.*, home and distant; *l. r. h.*, lower right-hand; *semi. auto.*, semi-automatic; *u. l. h. q.*, upper left-hand quadrant.

The Chicago & North-Western, and the Cincinnati, Hamilton & Dayton will use the upper quadrant for new work.

On about 35 miles of the Pennsylvania in the New York and Washington terminals the following indications are used: Distant signal caution—yellow; home signal caution—yellow; home signal permissive—yellow; home and distant clear—green; high signal stop—red; dwarf signal stop—red. Three-position upper quadrant signals are used on all new work, the 45-deg. position indicating "next signal at stop." This signal is also used in permissive blocking. On home interlocking signals on new work three-position upper quadrant arms are used. On old work combinations of one, two, and three arms are employed. The automatic signals on new work will have one arm three-position upper quadrant signals with a diagonal red marker light. The use of green for clear, yellow for caution, double yellow for permissive, and purple for the dwarf signal stop indication, is being discussed.

The replies which have been received since September 1, and additional replies, will be summarized in a future issue of *The Signal Engineer*, when a more complete discussion of the different signaling standards in use on the various railways will be published.

## INTERURBAN BLOCK SIGNALS.

The Indiana Railroad Commission on September 12, 1911, issued the following order to the interurban railways in the state, asking that replies be made by October 31, 1911. A similar circular was issued to the steam roads of Indiana, to which replies were requested by July 1, 1911. The latter order was published on page 281 of *The Signal Engineer* for July, 1911:

"To all interurban railways:—The commission wishes to call your attention to the Block Signal Act, Chapter 118 (page 466. Acts of 1911), approved March 4, 1911, requiring the installation of block signals on all the railways of the state by January 1, 1912, giving the commission the power to relieve any line or part of line, and also to extend the time of installation.

"On account of the fact that the art of block signaling for electric railways is not as fully developed as for steam roads, the commission found it necessary to appoint a committee to investigate the subject. The work of the committee has pro-

gressed sufficiently to indicate that block signals are now to be had to meet the conditions existing on the electric railroads in this state.

"In order that the commission may have complete information as to the conditions on all roads, to the end that the legislative will may be carefully and fully observed, this commission has divided the electric railways into three classes, which are as follows:

- (A) Roads having signals in service, asking for approval of the system now in operation;
- (B) roads installing signals, either automatic or other, asking the commission to approve the proposed system;
- (C) roads asking to be relieved from installing any system.

"And the commission hereby directs that certain information shall be furnished to it, as follows, by classes A and B:

- (1) Territory covered, between what points;
- (2) miles of road, number of blocks, maximum length of block, minimum length of block, average length of block;
- (3) single or double track;
- (4) number of trains per day under normal traffic conditions, dividing trains into the following classes: (a) regular passenger; (b) extra passenger; (bb) extra passenger at heaviest season of the year; (c) regular express or freight; (d) extra or special express or freight; (dd) extra or special express or freight at heaviest season of the year.
- (5) is any part of territory used by trains of a foreign company, and if so, between what points and by what company?
- (6) statement as to system proposed to be used, and if other than automatic, is it proposed to use permissive blocking, at what points and under what conditions?
- (7) if system other than automatic is proposed to be used, will all block stations be operated for 24 hours per day, and if not, state what stations will be closed and between what hours;
- (8) furnish (a) blue print showing main line, passing tracks, junction points, grade crossings, stations, signals, etc.; (b) profile showing grades, curvature and signal locations; (c) detail of any circuits used in connection with signal system, and (d) general and special rules to trainmen and other employees for the operation and maintenance of signals.

"Class C shall furnish information under questions above, one to five inclusive, and shall also make a general statement as to why block signals are not necessary to be installed on their lines, or on any part of their line."

A conference of interurban railway managers and operating officers will be held in Indianapolis on October 31 to discuss operating matters, including block signaling.