

proceed, must be limited to display either the approach or proceed indication.

14. Circuits shall be so arranged that in no case will a stop signal, or a stop and proceed signal indicate approach until the rear of a train is under the protection of the next signal governing in the same and approach direction.

15. The positive and negative sides of track circuit repeating relays used for controlling signal apparatus shall be broken by the controlling track relay where relayed cut sections are used, the track relay at the cut section shall open the control circuit of and shunt the other relay.

16. The positive and negative sides of signal slots or holding coils shall be broken by a relay, or relays, protecting the entire block.

17. The control of signal shall be such as to provide:

(a) That each train is protected in the rear by at least one stop, and one approach indication, or by one permissive signal denoting block occupied by a train running the same direction, and one approach indication.

(b) That where a track is signaled in both directions, each train is protected against opposing movements by at least one approach and one positive stop signal.

(c) An approach indication before reaching a stop indication, excepting at the first signal of an installation or at the starting signal from meeting points, where traffic direction signaling is used, when trains may receive a stop indication without previously receiving an approach indication.

(d) Against misplaced switches or derails by at least one stop and one approach indication in each direction signaled.

(e) That where traffic direction signaling is used, the reversing or misplacing of a switch located between meeting points will set all signals governing toward the switch between it and both meeting points to the stop position.

(f) That two opposing signals governing over the same track will not display approach or proceed indication, simultaneously authorizing two trains to move opposing each other.

(g) That the proceed indication of each signal will be directly controlled by the next signal governing in the same direction.

(h) That, as far as practicable, apparatus shall be so constructed and circuits so arranged that the failure of any part controlling the operation of a signal shall cause it to display its most restrictive indication.

(j) That the battery or power supply for line circuits be placed at the end of circuit farthest from the function operated.

18. Circuits controlling permissive signals, which denote block occupied, shall provide:

(a) A slow speed indication to follow a train into an occupied block.

(b) A stop indication against opposing trains in the same block where tracks are signaled in both directions.

(c) That opposing signals governing over the same track shall indicate stop when a permissive signal indicates approach.

19. Take-siding indicators, when displaying an indication to take siding, shall cause the next signal in the rear to indicate approach and the automatic signal on the same mast to indicate

Discussion

Mr. Rudd moved an amendment to paragraph No. 6 to make the first line read *hand thrown* derails and that the last two words in the third line should be cut out, making the clause read ". . . normally closed point or with a plunger-locked circuit controller."

This motion was carried. The committee accepted the suggestion that paragraph 9 should read "Each track circuit shall, as far as practicable," etc.

On motion of Mr. Fugina paragraph 11 was cut out. A proposal to eliminate the last three words in paragraph 10 was voted down.

The committee accepted suggested changes in paragraphs 16 and 17; and, on motion of Mr. Rudd, paragraph 17a was amended to read "that each train is protected in the rear by at least one stop and one approach indication, or by one permissive and one approach." There was a long discussion on paragraphs f and g but it resulted in no action. Paragraph 19 was cut out, as dealing with a point which is covered elsewhere.

The report was accepted for submission to letter ballot for inclusion in the Manual.

Report of Committee X—Signaling Practice

THE committee submitted a report on the various types of light signals for day and night indications.

Position Light Signals

Since the last report all position light signals on the Pennsylvania System have been changed from four lights to three lights in a row, 18 in. centers. This signal is entirely satisfactory as to visibility and a decided reduction in cost of construction, maintenance and operation has been effected.

The large unsymmetrical and somewhat unwieldy background, which had been adversely criticized by many signal engineers, is reduced to a circle 54 in. in diameter, so that it requires less clearance space than a semaphore. With this reduced background size, the large platform is unnecessary, and the wind pressure is lessened, so that, instead of special 7 in. and 8 in. masts, the A. R. A. Signal section standard masts, ladders and platforms (with a slight modification in the railing) are used, thus reducing cost of construction.

The elimination of three lamps in a three-position unit reduces the cost of maintenance and, as the current consumption is reduced 25 per cent, the cost of operation is less.

The availability of the signal where primary battery with approach lighting employed has been greatly extended, in that the cost of maintenance and operation is less than that of a motor, if the approach lighting circuit is not occupied more than 6 hours per day, and very few, if any, circuits are occupied more than two or three hours

per day, while, on account of the small current consumption, tricklers or small farm lighting outfits make them available for use as interlocking home signals.

Lamps are 12 volt, 7½ watt, burned under voltage. The total energy required for three lights is 18 watts. The dwarf signal uses two 6 volt 12 watt lamps under voltage; actual consumption for the signal, 16 watts. There is no peak load as required by motor signals—the consumption being practically constant.

Advantages, as previously set forth, are four positions vs. three positions of motors and three distinct colors in colored-light signals; saving in economic waste of transmitting light through colored lenses or roundels; elimination of dangers due to color blindness; failure of two lights before signal ceases to be distinctive; extinguishing of lights resulting in less favorable indications, and reductions of "improperly displayed proceed indications" due to elimination of moving parts.

Color Light Signals—Unit Type

A comparatively recent addition to the field of color-light signal was made when the single unit type was placed upon the market.

This signal uses but one lamp and lens for the three indications, thereby considerably reducing the size and weight of the signal case and hood.

The lamp which is varied in candle power according to the range required is of the concentrated filament type, and is mounted in a special bayonet base, in order to insure proper focusing. The filament may of course be doubled to protect against burnouts if desired.

An elliptical reflector with a highly polished silvered surface is used in order to secure the greatest possible benefit from the candle power available. The use of a reflector, without danger of false indications, is made possible by the use of the single lens, the indications being changed by passing between the lamp and this clear lense, colored roundels, which are mounted in the vane of the relay.

These roundels are approximately 1 in. in diameter and 1-16 in. in thickness. The outer lens is of clear glass $10\frac{1}{2}$ in. in diameter and 6 in. in focal length. It is of the Fresnel type and is provided with a toric formation which gives a downward spread of light for short range indications. Different lenses may, of course, be used for special conditions. The standard lens provides for a spread of 8 ft. in 100. A sheet metal background 3 ft. in diameter is used as well as hood $15\frac{1}{2}$ in. in depth.

A polyphase vane relay is used for alternating current operation. There are no moving parts other than the vane and its counter-weight. The whole movement is sealed in a metal case.

The d.c. relay is constructed on the motor principle, no winding being used on the moving element, which is directly connected to the member carrying the roundels. The a.c. and d.c. relays are interchangeable.

The lamp is connected in multiple with the field winding in both the a.c. and d.c. signals, control of the indica-

tion being obtained by energizing or de-energizing a secondary winding, the mechanism being designed to drop by gravity to the red position when de-energized.

The relay mechanism is of the three-position type, biased to a neutral control position to give the red indication. It is known that the retina of the eye retains an image, once it has been impressed upon it, for a period of approximately one-sixteenth of a second and in view of the fact that the mechanism changes color in a shorter period than this, the eye will retain the image of the yellow rays through the period which is consumed in passing through the red and will not readjust itself until the green has been reached. It can be seen that under these conditions the image of the red in passing is never seen; the signal therefore does not display a red light when passing from yellow to green.

Committee: W. J. Eck (Sou.), chairman; W. M. Vanderluis (I. C.), vice-chairman; W. E. Boland (S. P.), A. M. Burt (N. P.), C. A. Christofferson (N. P.), C. E. Denney (N. Y. C. & St. L.), C. A. Dunham (G. N.), W. H. Elliott (N. Y. C.), J. V. Hanna (K. C. T.), C. J. Kelloway (A. C. L.), H. K. Lowry (R. I.), J. C. Mock (M. C.), F. P. Patenall (B. & O.), J. A. Peabody (C. & N. W.), F. W. Pfleging (U. P.), A. H. Rudd (Penn.), T. S. Stevens (A. T. & S. F.), E. G. Stradling (C. I. & L.), F. B. Wiegand (N. Y. C.).

Discussion

The report was accepted by the meeting as information in line with the committee's recommendation.

Report of Committee VI—Standard Designs

THE committee submitted for approval the following revised standard designs and revisions in specifications, with the recommendations that they be approved for submission to letter ballot, for inclusion in the Manual.

- 1015—One inch signal pipe and coupling (revised).
- 1176—Trunking—grooved type (revised).
- 1177—Trunking—built-up type (revised).
- 1299—Switch point drilling (revised).
- 1392—Switch adjustment—insulated (revised).
- 1499—Highway crossing gate lamp (revised).

Specification for One-Inch Soft Steel Signal Pipe

Section 3. Plugs (Revised). Plugs must be merchant bar steel 10 in. long, $31/32$ in. in diam., drilled for $4\frac{1}{4}$ -in. rivets with drill .257; spacing to be 1 in., 2 in., 4 in., 2 in., 1 in., the first and third holes to be in the same plane and the second and fourth holes at right angles thereto.

Specification for One-Inch Wrought Iron Signal Pipe

Section 3. Plugs (Revised). Plugs must be wrought iron or merchant bar steel, 10 in. long, $31/32$ in. in diam., drilled for $4\frac{1}{4}$ -in. rivets with drill .257; spacing to be 1 in., 2 in., 4 in., 2 in., 1 in., the first and third holes to be in the same plane and the second and fourth holes at right angles thereto.

The Best Types of Electric Lamps for Signal Work

The committee reported progress.

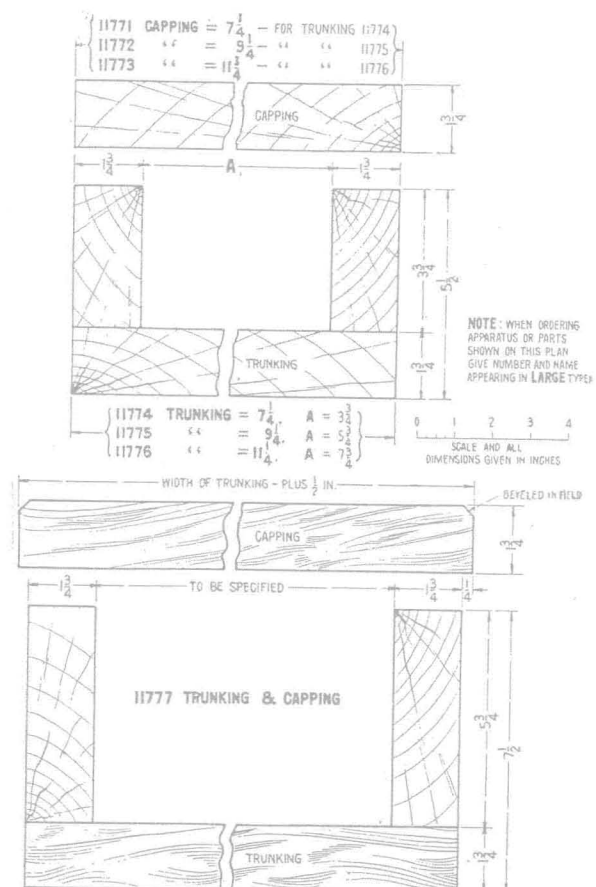
Acting on the information obtained at the December, 1920, New York meeting, the committee has diligently prosecuted this matter to further conclusion, in connection with which valuable assistance has been rendered the committee by the lamp and lens manufacturers. For the purpose of field observations, the committee met at Corning, N. Y., in August and October, 1921, and after making various observation tests in the field, the following conclusions were tentatively agreed to:

Voltage Ratings. 3.5, 8, 10, 12, 13.5.

Current Ratings. 0.3 amp. for the 3.5 volt lamp, and 0.25 amp.

for the 8, 10, 12 and 13.5 volt lamps.

Filament Construction. C-2 for the 3.5 volt lamp, and C-3 for the 8, 10, 12 and 13.5 volt lamps.



New Standard for Built-Up Trunking A. R. A. Sig. Sec. Drw. No. 1177