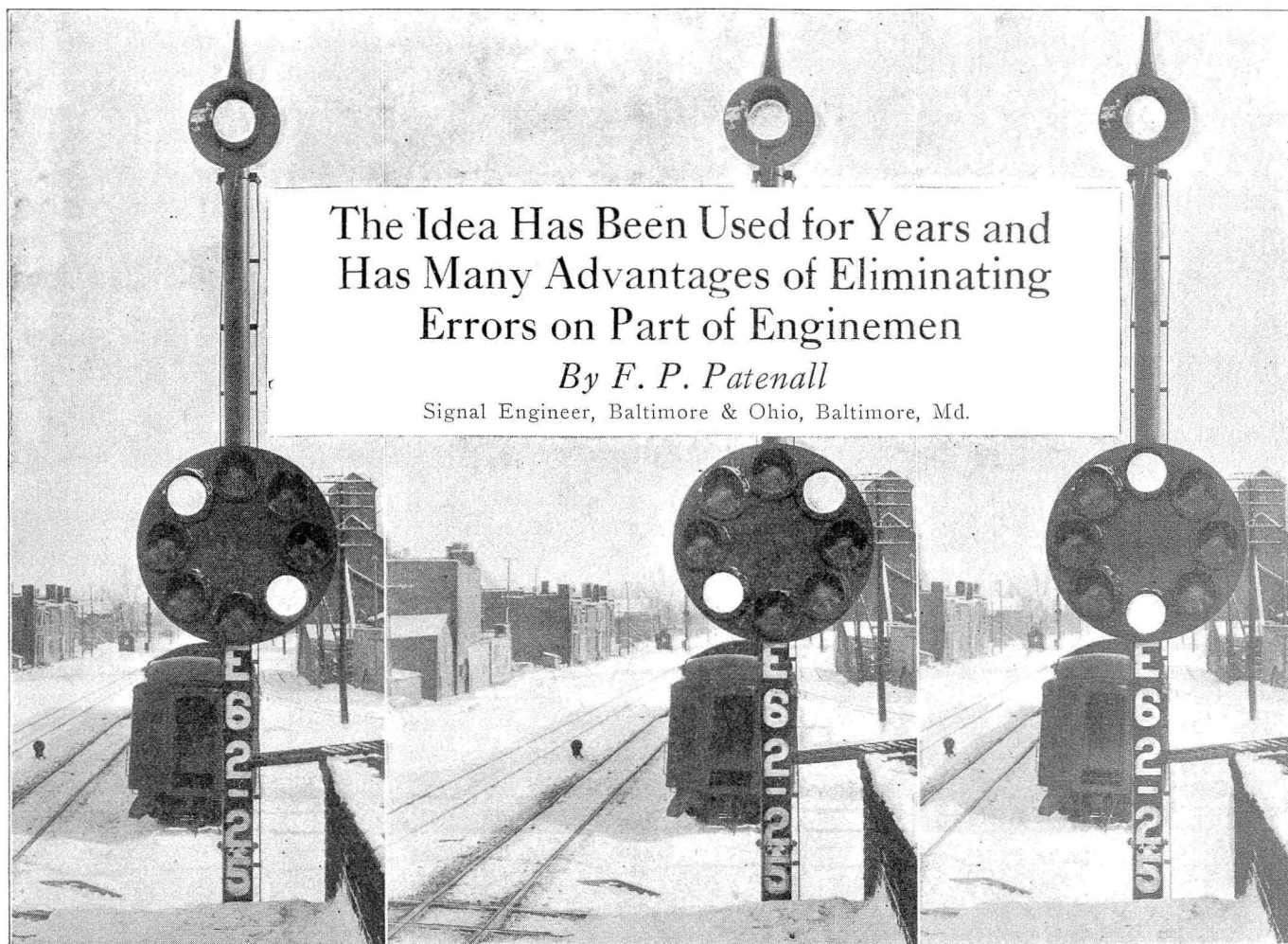


# B. & O. Color-Position-Light Signals



The Idea Has Been Used for Years and  
Has Many Advantages of Eliminating  
Errors on Part of Enginemen

*By F. P. Patenall*

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*Top White Marker and Two Lunar  
White Lights Displayed*

*Top White Marker and Two Yellow Lights  
Displayed*

*Top White Marker and Two Green  
Lights Displayed*

**T**HE use of white and colored lights for night signal indications dates back many years, the instructions transmitted having been found to be readable and understandable and the results obtained cannot be questioned.

The display of both white and colored lights at certain predetermined angularities to the mast for night signaling on some American railroads was found to be expedient in the '80's as in 1888 it is noted that the Boston & Albany and the Old Colony railroads used the following aspects in connection with their night signaling, viz.:

#### **Boston & Albany**

Home signals, two white lights in horizontal line, Stop; distant signals, two green lights in horizontal line, Caution; home and distant signals, two green lights in vertical line, Clear.

#### **Old Colony**

Home signals, two red lights in horizontal line, Stop; distant signals, two green lights in horizontal line, Caution; home and distant signals, two white lights in vertical line, Clear.

This shows that the theory of producing for night indications a similarity in the positioning and displaying of lights at certain angularities to the mast is logical, in that by day the arms being so displayed in their various angles to the mast, have been read, understood and effectively acted on by enginemen as indicating the various required conditions.

Since it has been definitely demonstrated after many years of use that at night colored and white lights have satisfactorily provided the means of transmitting various degrees of information and instructions to trainmen, it is safe to assume that a continuation of a system of colored night signals is in line with good practice and can be relied upon as a distinct means of indicating to trainmen what action in the handling of their trains should be taken by them when such indications are displayed.

#### **Present System, Combination of Arms and Colored Lights**

Colored lights having proved their utility as night signals, there is no good reason why such a system cannot be expanded and use the same colors for daylight service, eliminating the arms and other moving parts, provided sufficient volume and intensity of light is displayed, and if, without any possibility of a doubt, such distinctness in colored lights for daylight signaling is now available, there is no argument against such a system being largely used and standardized and thus produce a means of simplifying the reading of indications as well as to reduce the cost of construction and subsequent maintenance and operation.

Our present system is such as to require for daylight signaling the use of arms, variably positioned according to track conditions or such other information re-

quired to be transmitted to trainmen, viz., horizontal, diagonal or vertical.

At night these arms, while required to operate in conjunction with the lights displayed, are not of use, as the instructions and information transmitted to trainmen are through the medium of colored lights, viz., red, yellow, green:

Red being the equivalent of the arm horizontal.  
Yellow being the equivalent of the arm diagonal.  
Green being the equivalent of the arm vertical.

It will be recognized at once that these day and night indications differ from each other very materially in that by day the position of the arm transmits the information, whereas, at night the color of the light serves the same purpose. The use of both, consequently, is not such as to simplify the language of signals, but instead complicates it.

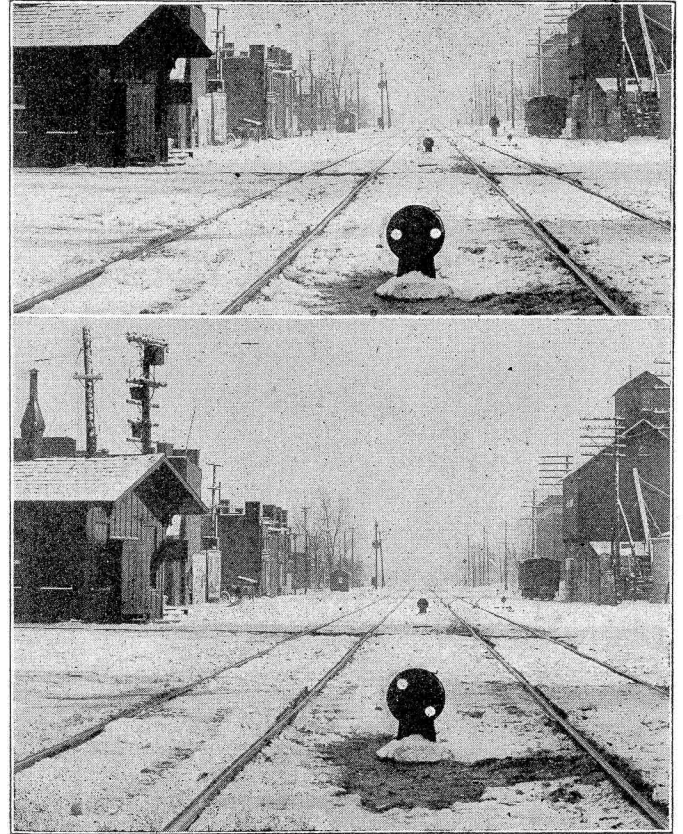
The present combination system of using arms by day and lights by night requires the memorizing of innumerable aspects. One red light, or two, or three red lights in a vertical line now constitute the night stop indication, whereas, by day such arms are displayed horizontally for the stop indication, hence a variance which is not consistent, and while it is thoroughly understood, does not by any means prove its correctness.

Then again, in certain instances the same position of arm and color of light are used to indicate two different conditions which, while permissible, cannot be accepted as the best practice and these differences and

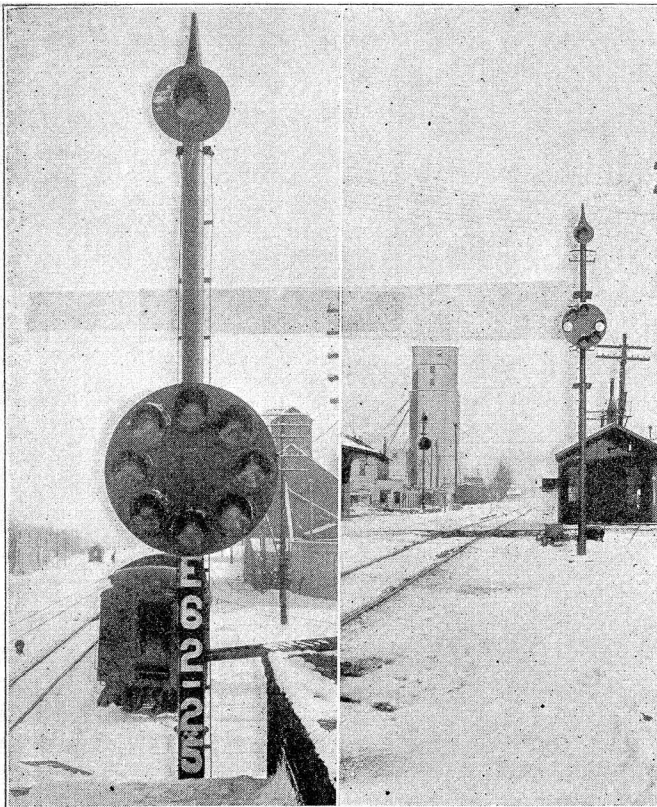
signal." Hence, there is here room for improvement, and it will be seen that the *color-position-light* signal can be made to more clearly define the action required under the respective indications displayed.

#### Proposed System Color Position Light Signals for Both Day and Night Use

There seems to be no doubt but that the use of colored lights for night signaling has successfully and



Top—Dwarf Signal With Two Red Lights Displayed  
Bottom—Dwarf Signal With Two Lunar White Lights



View of Signal With No Lights Displayed      Two Red Lights Displayed at Home Signal

discrepancies are corrupted and the requirements fully covered in the new system of *color-position-light* signals.

Under the present system we have no distinctive permissive indication, as in the use of the ordinary manual block signal, the arm at 45 degrees, the same color light (yellow) is displayed, indicating "proceed, block occupied," as is displayed in automatic block signal territory indicating, "prepare to stop at next

safely met the requirements; they are now used and will continue as standard practice for many years; their efficiency, therefore, needs no further substantiation. This being the case, and seeing that we are now able to apply a system of distinct readable colored light aspects for daylight signaling, there is no valid reason why we should continue to install complicated mechanisms, either mechanical or electrical, for the purpose of moving signal arms to predetermined positions now required.

The colored lights in the proposed system will be the same as those used in the present system, viz., red, yellow, green, with the addition of lunar white (a new distinct color signal proposed to be used in permissive operation for slow speed movements), thus assigning and holding for the three primary needs the three colors first mentioned and now used.

Granted that arms displayed at various angles properly transmit the desired information to trainmen, it being conceded that present practice in day signaling is good, distinct and understandable, it is, therefore, logical to assume that to display these indications by means of the various angularities of lights is following along the lines of good practice. With this as a basis, the following angularities of lights can readily be accepted as better filling our needs, both for day and night signaling, viz.:

Two red lights in horizontal line, Stop.

Two lunar white lights in diagonal line in the lower quadrant, proceed at slow speed; permissive.

Two yellow lights in diagonal line in the upper quadrant, proceed, prepared to stop at next signal.

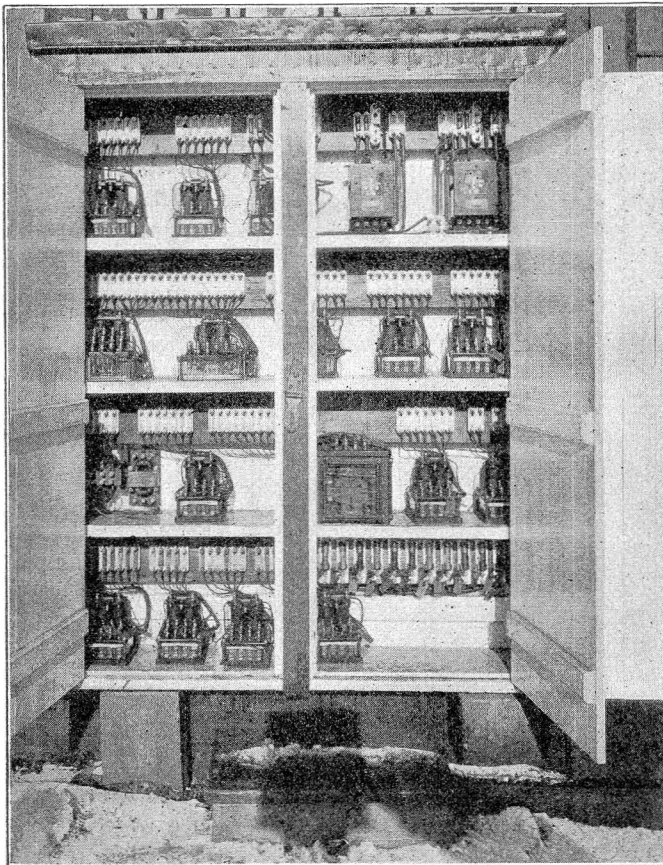
Two green lights in vertical line, proceed.

White marker light above two red lights in horizontal line, stop, then proceed; main route.

White marker light below two red lights in horizontal line, stop, then proceed; restricted route.

In connection with the two latter aspects and indications, trains after stopping are allowed to proceed under the rules at slow speed expecting to find either a broken rail, a train, a switch open, or other obstructions in the block.

With the exception of the additional color "lunar white," it is observed that the same three primary colors for the purposes required are proposed to be used as is now our practice, hence, the ease with which such



View of Relay Box and Other Controlling Apparatus at Deshler, Ohio

aspects and indications can be read and understood by trainmen is apparent.

The proposed system, it is seen, utilizes five colors and four positions to meet the six requirements under the rules, and which cannot be distinctly and properly accomplished otherwise.

Current for *position-color-light* signals can be obtained either by the use of battery or from a power source, and their operation and selection is through the medium of relays and circuit controllers as between the lights and the levers, and track conditions affecting them. The principle involved is that of causing the lights to be extinguished or lighted as the route or block conditions, or both, may require. In brief, instead of applying mechanisms with their connections and intricate gearings and parts, lights are used both for day and night signaling.

From a study of the proposed rules, aspects and in-

dications in comparison with those now our standard, it must be concluded that the new system with its 14 aspects in its entirety is much simpler than the present system with its 135 aspects, as shown in the rules. The underlying color principles of present night signaling are not set aside and this renders it much easier to commit to memory where changing from the old to the new system. A runner having absorbed mentally the present night light indications will find no difficulty in assimilating himself to reading the same colors in daylight.

#### Rules, Aspects and Indications

Then again, the angular positioning of the lights is an added factor of distinctness, four angles of lights being provided for the four primary conditions to be met, and which aside from color lends itself to a more conspicuous display of the indications.

The basic arguments in favor of the proposed system are:

- (1) The day and night indications are the same.
- (2) With aspects indicating proceed at slow speed, proceed at restricted speed, or proceed, no red lights are displayed; therefore, this obviates the necessity of disregarding a stop indication as displayed in conjunction with a proceed indication in our present practice.
- (3) Instead of trainmen being required to memorize 135 diagrams and 34 rules, they will only be required to commit to mind 14 aspects and 6 rules.
- (4) White upper and lower route markers for high speed and restricted speed routes respectively, indicate clearly which route is set, in conjunction with the block indications displayed.
- (5) Reduction in the cost of construction, maintenance and operation.



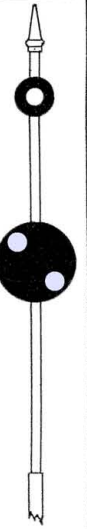
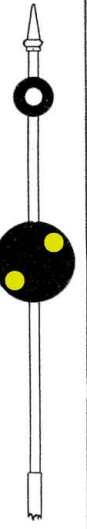
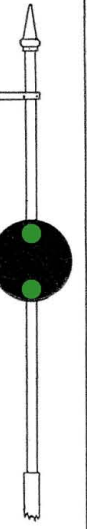
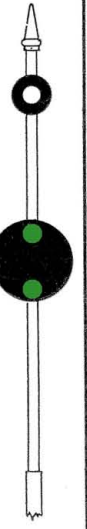


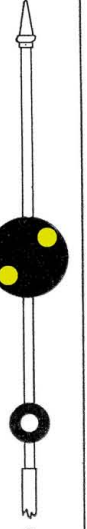
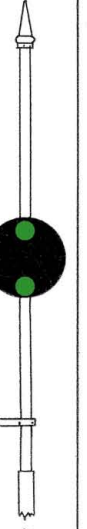
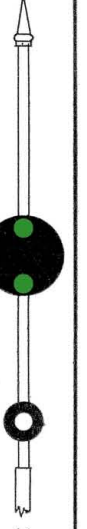


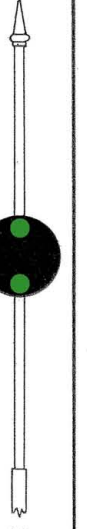
It might here be said that position as well as color light signals, while in our opinion best, do not bind us to the hard and fast rule that color without position cannot be used, because we have demonstrated during 50 years of practice that color alone has reasonably well functioned as the night signal indication, although the angular positioning of such colored lights makes the indications much more conspicuous and definite.

By reason of the required closer spacing of signals in some parts of the territory which naturally shortens up braking distances between signals, this signal system provides the means of expansion whereby through aspects No. 5 or 10 restrictive indications are displayed at the second signal in the rear of the stop signal, and it will be seen, therefore, that by the use of such indications enginemen will be notified in ample time before reaching a stop signal.

### The Ideal Railroad Signalman

THE discussion of standard has brought out the question: What shall be the standard requirements for a railroad signalman? The following has been suggested: He must be proficient in plumbing, carpentry, tinsmithing, masonry, millwright work, painting, ditching, inside and outside electrical work and must have a full complement of tools for all these kinds of work. He must be a small man to facilitate his getting into tight places. He must have three arms, and vacuum feet so that he can stick anywhere like a fly and still use all three arms. He must be able to lift a 10-ton crane and never get tired. He should be able to run at the rate of 50 miles an hour carrying a tool box. He should be able to see in the dark, like an owl. Battery fumes and coal gas should be the same as oxygen to him. With the above qualifications, together with a desire to work continuously, a man would have all the essential requirements of an ideal railroad signalman.

*Contributed from Clifton Forge, W. Va.*

Route.	All Routes.	Main Route					Restricted Route					Slow Route							Revisions.
Day and Night Aspects.																			First installed Mt. Royal and Camden Stations Baltimore, Md. Apr. 1, 1921. <small>R.H.T.</small> Revised Nov. 10, 1922. Signal Aspects changed. See plan 190-L. <small>R.H.T.</small> Revised Jan. 29, 1923. Signal Aspects changed. See plan 190-M. <small>R.H.T.</small> Revised Feb. 19, 1923. Signal Aspects changed. See plan 190-N. <small>R.H.T.</small> Revised Feb. 26, 1923. Signal Aspects changed. See plan 190-O. <small>R.H.T.</small> Revised Feb. 27, 1923. Signal Aspects changed. See plan 190-P. <small>R.H.T.</small> Revised June 17, 1924. Signal Aspects changed. <small>R.H.T.</small>
Indication	Stop.	Stop, Then proceed.	Proceed prepared to Stop short of Train or Obstruction.	Proceed prepared to Stop at Next Signal.	Proceed, Approach Next Signal at Restricted Speed.	Proceed	Stop Then proceed	Proceed prepared to Stop short of Train or Obstruction.	Proceed prepared to Stop at Next Signal.	Proceed, Approach Next Signal at Restricted Speed.	Proceed.	Proceed prepared to Stop short of Train or Obstruction.	Proceed prepared to Stop at Next Signal.	Proceed					
Name	Stop Signal	Stop and Proceed Signal.	Permissive Signal	Approach Signal.	Approach Restricting Signal	Clear Signal	Stop and Proceed Signal.	Permissive Signal.	Approach Signal.	Approach Restricting Signal	Clear Signal.	Permissive Signal	Approach Signal.	Clear Signal.					

BALTIMORE AND OHIO RAILROAD.  
STANDARD  
COLOR POSITION LIGHT SIGNALS.  
Office of Signal Engineer  
Baltimore, Md.  
Oct. 1, 1920.

Designed by F.P. Penhall.  
Drawn by R.W. Taylor  
Traced by "  
Checked by "  
File: - 190-Q