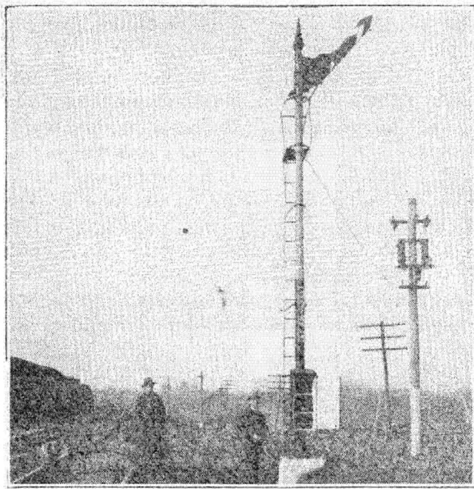

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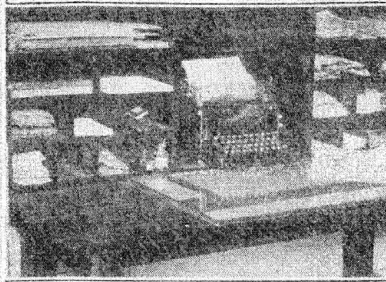
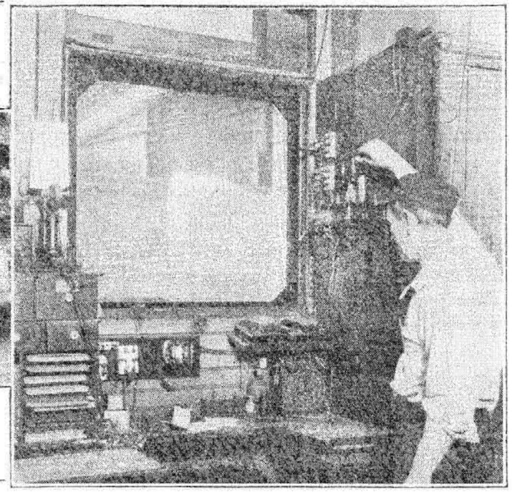


Answer?



An open forum for the discussion of maintenance and construction problems encountered in the signaling field. *Railway Signaling* solicits the co-operation of its readers both in submitting and answering any questions of interest.

To be answered next month

(1) *Do you have a regular schedule of maintenance work for each day in the week? What part do you do and what does your helper do?*

(2) *When operating motor cars on your road what rules must be observed to insure proper safety to employees? What other safety measures should be carried out?*

(3) *How do you adjust track circuits to obtain maximum life from primary batteries?*

Semaphore or Light Signals?

"For new installations of automatic signals, do you prefer semaphore or light signals? On single track? On double track?"

"A Question of Opinion and Who Shall We Find to Arbitrate the Matter?"

After reading the opinions of the various signal engineers in your valuable issue of July 1926, as to light signals versus semaphore signals, it seems to me to be late in history to attempt to support one as opposed to the other, particularly, as we know that opinions differ so widely. There is no doubt that the semaphore for time immemorial, has satisfactorily fulfilled the requirements, but only to a certain point, and as it never was required to provide equivalent functioning as that now used in present light signals, compared with such light signals, we find the added requirements entirely too cumbersome, complicated and difficult to accomplish in all the phases of semaphore control.

Certainly, the operation of a relay has been, from all the records now before us, more reliable, less wearable, and less affected by ulterior conditions than any other type of mechanism designed to date, and for that reason, the results must strengthen our belief that a lesser number of moving parts to maintain in a signal system, is a very desirable advantage.

As before referred to in *Railway Signaling*, the use of colors, with distinctive positioning of such colors, has been given unadulterated publicity, and has for years undergone intensive tests, by comparison with other types of signals, all with the desire and the necessity of telling the engineman the real truth, in all cases; so after all, whether disc, semaphore, color, color-light, color-position-light, or position-light signals are used, the opinion is still open.

After years of close study of the entire question, and taking into consideration the requisites to be met by present day requirements of operation, we decided that a more comprehensive system was necessary, and particularly one from which all the so-called frills of signaling is obtainable, without loading it to a point beyond which its reading became difficult and complicated, and for that reason, we launched into the system known as color-position-light signals, so-called, because they transmit by the display of colored lights, disposed at certain angles, the required information to trainmen, whether the train is to stop, stop and then proceed, proceed prepared to stop at next signal, proceed without restriction, or proceed permissively. In fact, we get so much more from this system than is possible to obtain with the semaphore system, viz: the possibility of using a color-position-light signal, for any purpose required, either a positive signal (stop), or a lesser restrictive signal (stop and proceed), or any other combination needed. As an example, on single track against opposing trains a stop indication will be displayed, for following trains a stop and proceed indication will be displayed, and all with lesser complication of installation, maintenance and operation.

By the use of top and bottom white marker lights, in this system, the main route and restrictive route are selected respectively as required. Therefore, in combination with the markers, the center group of lights is available for any and all purposes.

The present day three-arm semaphore signal, having three lights, in vertical line, functions properly as follows:

Top signal—main route; including block indication, except the permissive indication.

Middle signal—restricted route, including the block indication, except the permissive indication.

Bottom signal—all routes at slow speed, and is also used as the permissive indication.

Hence, a proceed indication, on either the top, middle, or bottom arms respectively, carries with it (although not so referred to in the rules), a restriction in the way of two red lights, those being displayed in consonance with a proceed indication, and this is not in the direction of simplification.

There seems to be considerable advantage therefore in the use of color-position-light signals, in that a distinctive permissive indication is provided; and moreover, it is possible to display this permissive indication either to the main route, the restricted route, or the slow speed route, respectively, of course, selected under all conditions according to the necessities, when indicating proceed.

It is therefore evident, from an analysis of this color-position system, that the following requirements are well fulfilled, but are not all met by the semaphore:

(a) One colored light extinguished, still leaves one colored light burning.

(b) The marker light not displayed, indicates slow speed.

(c) The loss of any light imposes a restriction.

(d) The provision of a distinctive permissive indication.

(e) The means of providing proper block indications, either for main route, restricted route, or slow speed route, without the use of three arms.

(f) A distinctive approach indication, by the use of staggered upper or lower marker lights.

(g) The display of a red light means stop.

(h) No red lights are displayed with proceed indications.

(i) The absence of all lights, indicates stop.

(j) Dwarf signal aspects are the same as those of the high signals.

(k) The greatest of all fundamentals is the result, viz: Simple, understandable and easily memorized.

(l) The colors displayed are those of long standing, and found to be basically correct.

(m) The additional color used, viz: Lunar white (for permissive) is absolutely distinctive.

(n) The colors used are each for a distinctive purpose, and it is not necessary to use one color for two purposes.

(o) Under obscure conditions such as fog, or smoke, better and more distinct indications are the result.

So it becomes finally a question of opinion, and who shall we find to arbitrate the matter?

Baltimore, Md. F. P. PATENALL,
Signal Engineer, Baltimore & Ohio.

Experience Has Demonstrated That the Color-Light Signal is Safer and More Effective Than the Semaphore

THE Great Northern commenced to use the colored-light signal during 1923, and its use has been continued to date, resulting in 1,141.3 miles of track now so equipped.

In making the change from the semaphore to the colored-light signal for automatic block signal purposes, on the Great Northern, the management gave consideration to the advantages and disadvantages of both the light signal and the semaphore as per the following report, and after due consideration the use of the colored light was approved, as stated:

LIGHT SIGNAL ADVANTAGES

(1) Great simplicity and reliability of indication, there being no rotary or moving parts subject to derangement in operation or to freezing in the *Clear* position.

(2) Railway signals, of necessity, are displayed by colors during the night time and during heavy weather and it therefore is consistent to use colors also by day, now that it is feasible to do so. This produces uniformity of indication thrughout the 24 hours of the day.

(3) The light signal has the important advantage of greater visibility during the night time, also during the twilight zone preceding sunrise and succeeding sunset. When most needed this type of signal is at its best.

(4) The colored signal by day, under all of the varying conditions of backgrounds, has an average visibility superior to the semaphore.

(5) During cloudy weather, or in the presence of fog or smoke, the light signal has far greater penetrability.

(6) The light signal is mounted on a metallic background of an area appreciably in excess of the semaphore mechanism and arm and therefore is visible from the approaching train at a great distance even when the light is out. It is the practice to make the light signal lower than the semaphore, which brings it into more direct line of the vision of the man in the engine cab. This is an advantage and a practice which could not be followed uniformly with semaphores, for clearance reasons.

(7) The light signal may be installed, operated and maintained at a cost much below the semaphore.

LIGHT SIGNAL DISADVANTAGES

(1) The light signal has the disadvantage of a rather limited visibility when located on curves. This difficulty, however, can be minimized by the use of a wide angle lens affording greater spread. This results in a decrease in range, which, however, at such locations is not objectionable.

(2) The light signal affords less information to track men or others on the right of way concerning the approach of trains.

SEMAPHORE SIGNAL ADVANTAGES

(1) The semaphore has the advantage of duplicating the day and night indications, thereby making it safe for train to proceed at night time on the day indication. This is made possible from the use of electric headlights.

(2) The semaphore used as a block signal on single track affords good information to track men or others on the right of way concerning the approach of trains.

SEMAPHORE SIGNAL DISADVANTAGES

(1) The semaphore used as a block signal requires an operating mechanism with a large number of rotary and working parts, subject to mechanical and electrical derangement.

The semaphore was used as far back as 1767 for the transmission of messages at considerable distances. At a later period an adaptation of such semaphore was made to serve railway signaling purposes, and its use doubtless will continue until the demand and market for the semaphore ceases. In the art of railway signaling the use of electricity has become general only during recent years. The electric telegraph came into use about the year 1840.

It appears probable that if the signal officers of 30 or 40 years ago had been in possession of the electrical discoveries of these recent years for railway signaling purposes they never would have gone into the more cumbersome and expensive mechanical semaphore and manual block system.

In closing I would state experience with the colored-light signal demonstrates that it is a safer and more effective signal than the semaphore for railway signaling purposes.

St. Paul, Minn. C. A. DUNHAM,
Superintendent of Signals, Great Northern.

Simplification of Inspection, Fewer Failures and Lower Maintenance Cost, Claimed

IN answer to the above query, so far as it relates to two or more tracks, I need only suggest a trip over the New York Central at points where color light signals are being substituted in place of semaphore signals. The reasons are:

(1) Moving parts, the source of trouble, are removed.

(2) Simplification of inspection.

(3) Better night indication.

(4) Fewer failures.

(5) Lower maintenance cost.

It may be said that in case of a lamp failure, with the semaphore, trains may be governed by the position of the arm, whereas with the color-light signal there is no indication to govern the movement of trains.

Failures being few and far between this argument carries but little weight. With the color-light signal, as with the semaphore, on the New York Central the absence of a signal (light) at a place where a signal is usually shown must be regarded as the most restrictive indication that can be given by that signal. At "stop and proceed" signals, the trains stop and then proceed at slow speed through the block. At "stop and stay" signal, they stop until authorized to proceed.

On single track the same advantages apply and, within a few months, we will have color-light automatic signals on single track.

Cleveland, Ohio. F. B. WIEGAND,
Signal Engineer, New York Central, Lines West.

Light Signals on Single Track Afford Better Protection at Night to Roadway Employees or Others on Motor Cars

FOR new installations of automatic signals, I prefer light signals on single track or double track. My experience leads me to compare color-light signals with semaphore signals about as follows:

Indication.—The indication of the light signal is generally better than that of the semaphore, especially under weather conditions when a good indication is most needed. It is of course obvious that an electric lamp with a reflector may be used with a semaphore signal to give light indications as good as a light signal but this is not done as general practice with semaphore signals.

A semaphore may be seen against a sky background on a clear day much farther than is required, likewise a light signal may be seen much farther than is required on a clear night.

Performance.—Separate performance records are kept for semaphore and light signals on the Illinois Central. These records show a better performance for light signals. Our rules permit enginemen to accept the indication given by a semaphore blade when the light cannot be seen, so that the comparison is based on the reliability of the semaphore mechanism and the light signal lamp.

A careful record of false clear failures covering ten years showed half the total to be avoidable by elimination of the semaphore mechanism. This includes failures due to signals freezing in the clear position, and all causes which would not result in a false clear indication with a light signal.

Cost.—The installation cost of light signals is ten per cent less than that of semaphore signals under similar standards. The maintenance cost of light signals is less than that of semaphore signals, for the same standards of performance.

The advantage most commonly claimed for the semaphore signal is the information afforded roadway employees on single track lines by the back of the blade. Practically all new semaphore installations are approach lighted so no information whatever is given to roadway employees at night. Our color-light signals on single track are constantly lighted and a back light is provided in the red unit so that employees are given some information in the daytime and are much better protected at night than with semaphore signals.

Chicago. H. G. MORGAN,
Signal Engineer, Illinois Central

Proper Charging Rate for A. C. Floating System

"What is the best method of determining the proper charging rate for batteries in an a. c. floating system?"

Adjustment of Rectifiers on Voltage Floating Principle Recommended and Fallacy of Overcharging Cells Explained

A STORAGE battery as employed in the a.c. floating battery system performs two functions. First, as a reservoir of energy to take care of the intermittent demands for power over and above the rectifier output such as supplying the excess current to the track circuit when the rails are shunted by a train, and furnishing power for signal and switch movements. Second, as a reservoir to furnish energy in case of failure of a.c. power supply or of the rectifier.

In order that a battery may successfully perform these two functions, it should be maintained at or very close to a fully charged condition. To keep the battery fully charged at all times, it is necessary to put back into it the amount taken out intermittently when operating signal motors, etc., plus an amount to make up for the small internal discharge or local action within the battery. A current delivered to the battery by the rectifier that will just compensate or make up for the total discharge from the battery is the charging or floating rate desired. Of course, it is not practical to adjust the rectifier to the exact or ideal rate of charge, as the amount of work done by the battery at different locations varies. At locations where the traffic is light the battery will not require as much charge as where the traffic is heavy and it would be impracticable to work out the voltage required at each location separately and find the minimum floating voltage at each location, therefore in setting a figure averaging 2:15 volts per cell, it has been found that this voltage is sufficiently high to meet all conditions encountered in automatic signaling. For some grade crossings and yard signals where trains may occupy the tracks more frequently and over quite long periods, it may be found necessary in such cases to float a little higher than 2:15 volts per cell. With the rectifier adjusted to maintain an average of 2.15 volts per cell at the battery terminals the battery will be held approximately fully charged. Voltage readings should always be taken with the rectifier in operation and directly at the battery terminals.

The a.c. floating battery system may be likened to a water pump and stand pipe or tank wherein the a.c. supply and rectifier may be thought of as the water and the pump, and the tank as the battery. Ordinarily the pump supplies the steady demand for water as the rectifier supplies the steady demand for current for holding the track relays and the signals at clear. As the full tank acts as a reservoir to supply heavy intermittent demands for water and in case of failure or stoppage of the pump, so also the battery supplies the intermittent demand for current in case of failure of the rectifier or a.c. supply.

Nothing Is Gained by Overcharging the Battery

In a water supply system the speed of the pump should be regulated so that it will supply the normal demand for water and keep the tank full, with as little overflow of the tank as possible, as the overflow or waste from the tank will not be available or helpful in case of emergency such as a breakdown or lay off of the pump for repairs. When the tank is kept full any