Block and Interlocking Signals

Elliott W H
Title: Block and Interlocking Signals

Author: Elliott W H

This is an exact replica of a book. The book reprint was manually improved by a team of professionals, as opposed to automatic/OCR processes used by some companies. However, the book may still have imperfections such as missing pages, poor pictures, errant marks, etc. that were a part of the original text. We appreciate your understanding of the imperfections which can not be improved, and hope you will enjoy reading this book.
Block and Interlocking Signals.

By W. H. Elliott, Sig. Eng.,
C., M. & St. P. R. R.

Fig. 8.

What they are for.
What they do.
How they do it.

Locomotive Engineering,
New York.
1896.
Copyrighted, 1896, by Sinclair & Hill.
New York.
CONTENTS.

CHAPTER I. Block Signaling: What it is for, What it does, How it does it .............................................................. 1

CHAPTER II. Methods of Operation and Rules ................. 17

CHAPTER III. Construction—The Telegraphic Systems......... 33

CHAPTER IV. Construction—The Controlled Manual Systems... 51

CHAPTER V. Construction—The Automatic Electric Systems .... 65

CHAPTER VI. Construction—The Automatic Electric Systems, continued ................................................................. 83

CHAPTER VII. Construction—The Automatic Mechanical and the Staff Systems .......................................................... 101

CHAPTER VIII. Installation and Care of Automatic Electric Signals, with a Comparison of the Cost of the Different Block Signal Systems .............................................................. 123

CHAPTER IX. What They are For and How They are Operated... 143

CHAPTER X. For Junction Points and Drawbridges—Construction of the Improved Saxby & Farmer Interlocking Machine .......... 165

CHAPTER XI. The Stevens Machine, and How a Switch is Moved and Locked ............................................................ 183

CHAPTER XII. Details of Construction ................................. 199

CHAPTER XIII. The Westinghouse Electro-Pneumatic and the Gibbs Electric Street Railway Systems ....................... 220

CHAPTER XIV. Agreements, Contracts, Specifications, Installation and Repairs ....................................................... 241

CHAPTER XV. Switch Signals ........................................... 257
CHAPTER I.

"What are we stopping for, conductor, out here in the woods? This is a limited train. What! stopped by a signal, a block signal, you say? Why, what is that? Oh, I see! You have a red blade projecting from the top of a pole to indicate to the engineer when the blade is moved up or down whether he may enter the block or not, the block being the piece of track extending to the next signal. So, then, when we are stopped by such a signal it means that another train is in the block, and we will have to wait until it has passed out."

And thus it is that to-day trains are being run through towns and cities, over mountains and prairie, through bridges and tunnels, in cuts and around curves with absolute safety, a fact not fully appreciated by the traveling public, but which becomes to the engineer, whose responsibility is lightened and from whom anxiety is removed, a guiding star, telling him that the track is his and that there will be no one to dispute it with him, for such little arguments, you know, are sometimes disastrous.

Block signaling, though limited in extent in this country, in proportion to the miles of track operated, is so rapidly being extended, not only from the natural increase of business and conse-
quent demands for a safe method of operation, but from the general knowledge being acquired of the advantages to be gained from such a system, that I believe an article on the subject would be both interesting and instructive. To the man well posted on signal matters, little that is new will be found, as this article is written more for those who are constantly guided by a signal, but have little idea of its construction.

The commencement of signaling may be said to begin with the use of the locomotive, for it soon became manifest that something would have to be devised, not only to prevent collisions between trains, but to give information to engineers regarding the position of switches and the right to go ahead. Many forms and devices were used in these early days, few of them being seen to-day, but which, as in the development of the locomotive, became stepping stones to things much better.

As each engineer pre-

1. Home Block Signal—"All Clear."
2. Home Block Signal—"Danger, Stop."
3. Distant Signal—"All Clear."
4. Home Block Signal—"Danger."
ferred his own devices to those of others, it followed, as a matter of course, that the practice was very varied, so much so in some cases that the safety signal on one road became the danger signal of another. Naturally enough, this state of things brought about many serious accidents, and finally resulted in a meeting being held by those interested, for the adoption of a standard form of fixed signal to be used by all the roads. The choice fell upon the "semaphore," a signal designed by Mr. Gregory in 1841, which indicates—by position and not by its form—whether the track is clear and the train has a right to proceed.

It was decided that a horizontal position of the blade should indicate "danger" or "stop;" a vertical position, "all clear" or "go ahead," and a position midway between these two, making an angle of forty-five degrees with the horizontal, "caution" or "proceed carefully."

Its construction was very much the same as that used to-day, consisting of a blade pivoted at the top of a pole and capable of being turned through about a quarter of a circle. The colored glasses for giving the night indications were carried in a separate frame pivoted lower down on the pole, instead of being held, as in modern practice, by the casting to which the blade is fastened. The blades for governing train movements in one direction were always put on the same side of the pole. In this country, the blade projecting on the right-hand side of the signal pole, as looked at from an approaching train, is the one that governs. In England, where all trains run on the left-hand track, signal blades projecting to the left side govern.

The signals were operated under what is called the "time interval system," that is, not allowing one train to follow another into the block until the lapse of a certain period of time. When a train entered the block the signal was put at danger and kept there for five minutes, when it was pulled to a cautionary position, and after the lapse of five minutes more the signal was "cleared," giving the right to the next train to proceed.

Experience with this method of operation soon demonstrated that the principle was not correct. For while a train may have passed, a certain length of time, the signal gave no indication of how far it had gone. The many accidents occurring under this
system stimulated the invention and adoption of electric indicators and telegraph instruments as a means of communication between signalmen, making it possible to keep a space interval between trains, and not allowing a second train to enter a block while it was occupied by the first. This method of blocking, keeping a space interval between trains, is the end to which all the modern systems of signaling are designed, although the methods by which this result is obtained vary considerably.

The next important principle to be developed was that the normal position of a signal should be at danger, not at safety; or, in other words, to assume that danger existed unless known to the contrary. For with a signal constructed as were those first used, on an accident happening to the apparatus, or in case of any of its parts becoming disconnected, it would at once fall to the “all clear” position, and no protection would be afforded a train in the block. An engineer, of course, not knowing that the signal was out of order, would take the indication as one intended for him and proceed accordingly, a result very likely to cause trouble, but for which he could not be blamed.

With the signal always remaining in the danger position, and being so constructed that any accident or breakage of the apparatus would cause it to assume the danger position, no accidents from this cause can happen, as trains would be stopped instead of being allowed to proceed.

In the most approved systems, the signal automatically returns to the danger position immediately upon a train entering the block, thus making it impossible for a second train to enter, as might easily occur—under the old system—should the signalman fail to return the signal to the danger position.

As showing the commencement of block signaling in this country, the exhibit of the Pennsylvania Railroad at the World’s Fair, of a pole and ball signal used on the Newcastle & Frenchtown Railroad in 1832, is very interesting, the following information being obtained from a letter written by Mr. A. Feldpauche, principal assistant engineer of the P., W. & B. Ry., in regard to its use. The road was about 20 miles long, and the signals seem rather to have been used for conveying information from one end of the line to the other than for that of a block.

“When the train was just starting from Newcastle, the man
in charge of the signal at that point raised the ball to the top of the pole. The man at the next station, seeing the white ball raised by the first man, raised his ball to half the height of his pole. The men at the other stations, each on the lookout with his telescope, which, you will see in the cut, were placed in the guides provided for the purpose on the side of the pole, also raised their balls to half mast, thus conveying the information throughout the line that the train had started.

"When the train reached the first station, the man would immediately raise his ball to the top of the pole, as a signal both ways that the train had reached him, lowering his ball when the the train reached the next man ahead, this being repeated successively at each of the four stations.

"When a train, having passed one station, did not arrive at the next, or was seen to be in trouble in any way, the man at the station next nearer Newcastle would lower his white ball and substitute therefor a black ball, kept at hand for the purpose, and
would raise it to the top of his pole as a signal to be successively transmitted to Newcastle, whence a relief train would be dispatched to the assistance of the regular train.”

Block signaling may be said to be practiced in this country in two ways—that of “absolute” blocking, in which one train only is allowed to occupy a given block, and “permissive” blocking, where, under certain regulations, more than one train is allowed to enter.

From the definition of a block—“a section of a track between two signal stations, the use of which is controlled by fixed signals”—it is seen that where absolute blocking is maintained, both head and rear-end collisions are impossible, and were it not for the expense and occasional delay to traffic, such would be more generally practiced. It is a fact, which experience is demonstrating every day, that more trains can be run over a given piece of track and with greater safety by a properly arranged block system than by any code of rules that can be devised, and although one cannot show in figures how much can be saved to a road by immunity from accidents, it will certainly repay any investments made in apparatus and operators’ wages.

More particularly is the problem of block signaling increasing in importance as the traffic on many roads is becoming too dense to be handled without such a system. Managers who thought that the results obtained by the English with absolute blocking could be ignored on account of the different conditions of operation in this country, are gradually finding it to be the only safe way to operate their roads.

In point of fact the means are already at hand, and any road having a telegraph wire and operators can, at a moment’s notice, put the absolute blocking of all trains into effect, should conditions arise under which it would be desirable to do so. That many roads do not take advantage of this and train their operators is much to be regretted, and it is to be hoped that with the spread of information regarding the working of block systems and the safety to be gained by their use, managers will come to a full appreciation of their merits.

With roads using a block system, where, from considerations of expense, the blocks are of a greater length than is advisable, “permissive” blocking has, with certain restrictions, come very