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THE OFFICIAL ORGAN.

At a Meeting of the Canadian Freight Association, held at Montreal, July 7, 1898, it was unanimously resolved:

"That THE RAILWAY & SHIPPING WORLD, the only publication in Canada exclusively devoted to the interests of Transportation, will be recognized as the Organ of this Association."

MODERN SIGNALLING AND INTERLOCKING.

By P. F. Hodgson, Signal Engineer, G.T.R.

In taking up the subject of signalling, I will try to point out the most important phases in the growth & development of this science. Some idea of the perfection to which signalling has been brought may be gathered from the following figures. Out of the 957,000,000 passengers carried during one year, over the 20,000 miles of railway in the United Kingdom, only 1 person in 53,000,000 was killed, & 1 in 1,930,935 injured.

In looking back over the history of signalling during the last 60 years, some of the earlier methods of working trains appear as very crude & primitive. The earliest signal of which we have record took the form of a rushlight placed during the night in the station window whenever it was necessary to stop a train. This was followed in 1834 by a system of signals & a corps of signallers. In the day-time the signalman—usually a policeman—acted as a human semaphore, & by means of extension of the arms, or by the waving of flags of different colors, telegraphed: allright, go on, caution, danger, or stop, to an advancing train. This same style of signalling is still in use for shunting operations. For night, warning hand lamps with bullseyes of different colors were used for signalling allright or danger, as the white or red glass was turned towards the coming train. In the absence of a red light, any light waved violently was regarded as a signal of danger. As late as 1841 the only station signals used on the Liverpool & Manchester line were flags which ran up & down a mast by means of a rope through a pulley.

The first mechanical semaphore was introduced by Sir Charles Gregory in the same year, & consisted of a vertical post with a movable board or arm pivoted near the top, capable of being moved to a right angle by means of a lever fixed at the bottom of the post. A lamp was also provided somewhere about the same position on the post as the arm, the light being made to revolve so as to exhibit different colors to an approaching engineer. At first 2 handles were supplied to these posts, one to move the arm up & down, & the other to make the lamp revolve. This arrangement was subsequently modified, & one handle only was used for working the arm & simultaneously revolving the lamp. This was done by means of bevel wheels connected with the rod between the lever & the arm. This semaphore worked to 3 positions, indicating to engineers allright, caution, & danger. In process of time the caution signal was dispensed with in England, although it is still retained in this country; & the allright signal, instead of hanging vertically, was indicated by the arm being placed at an angle of 45 or 60 %, the latter being preferable, as it ensured a more decided signal, being displayed under all circumstances, notwithstanding variations in length of connections.

On some railways the semaphore arms are pivoted in the centre of their length on special brackets attached to the post; the allright signal in this case consists in the arm being turned to a vertical position, but unlike the old semaphore arm it is not concealed by the post, but appears to the approaching engineman to be held out from the post at a distance of about 3 ft. Instead of the old arrangement of lamp turning round, we now have in the new semaphore a fixed lamp, in front of which spectacles work up & down, so that when the semaphore arm is horizontal, viz., danger, a red glass is in front of the lense, & when the arm is lowered to 60% the allright position, a green glass takes the place of the red.

A great deal has been said in the United States about the use of a white light for allright, & it would take too long to go into all the arguments pro & con. My experience is, that a distinct light is necessary, such as green, owing to the fact that there are so many white lights about a railway which are liable to be mistaken for semaphore lights, should the proper semaphore lamp be out. Again, should the red glass of the semaphore be broken a white light would be exhibited, whereas green is not liable to be mistaken for anything other than what it is.

A very good lamp was invented by Mr. Saxby in 1858, in which the interior revolved, leaving the exterior stationary. This is used exclusively by the London, Brighton & South-coast Ry. to this day.

The most recent type of mechanical semaphore is that now used by the G.T.R., & adopted by it as its standard. The arm is weighted both by the means of the spectacle which carries the colored glass, & by a balance lever attached to the post, thus ensuring the arm flying to danger under all circumstances should breakage occur in any part of the connection working the same, also preventing possibility of the arm being lowered by an accumulation of snow upon its face.

At junctions it is often necessary to have several semaphore arms on the one post, either fixed one above the other, or side by side. Thus we often have one post with several arms on each side of it, but these are distinguished by the direction in which they point. The American rule is that all arms controlling the approaching trains shall point to the right, while on the G.T.R., & in England it is exactly the opposite, the arms pointing to the left. This is owing to the fact that in the U.S., on double track, they run on the right hand track, while here we run on the left.

In cases where semaphore arms are fixed one above the other, the top arm as a rule governs the main line, the lower arms the sidings. A great improvement on this arrangement of placing one arm above the other, & one which will, I think, come more into use as it is better known, is to have the arms side by side, & to fix the mainline arm higher than the others. To do this several short posts are fixed on a cross-tree, supported by one main stem, & each of the short posts carries a semaphore arm & lamp. This is what is called a bracket signal. Engineers can readily understand in which direction they are about to be turned. For instance, supposing an engineer is approaching a junction & the track upon which he is travelling diverges into 3 tracks, on either of which he might be switched, a bracket signal with 3 arms would be placed at the point of junction, each of the 3 posts on the bracket signal would carry 1 semaphore arm. If, therefore, the left hand arm is lowered the engineer will know that he is being switched to the left hand track. If the middle arm is lowered he would know he is switched to the middle track, & so on.

Semaphores in Canada are divided into 3 classes, distant, home & station. The distant signal arm is notched, or fish-tailed, & is fixed 1,200 ft. from the home signal, & is used to denote the position of the home signal at the junction or crossing. In yards which are interlocked it is very important that the switch targets or pot signals should be as low as possible to avoid the possibility of their being mistaken for the allright signals. This is more particularly necessary at night, when the lights are apt to be confused one with another. In many cases the pot signal is attached to and works with the switch, so as to move whenever the switch is moved, but the best arrangement is for them to be worked by separate levers & interlocked with the other signals in the yard, so that the switches can be moved without disturbing the signal, which can afterwards be worked as required.

A very important point in signalling is to ensure getting the best possible location for the signal, taking great care that there shall be no dark background or anything to intercept the view of the approaching engineer. For this reason signals should be made various heights to suit the location, for it must be remembered that these signals are the means by which instructions are given to the engineer to regulate his progress through a crowded yard or junction. It is, therefore, of the utmost importance that these signals be unmistakable, & that they shall always indicate such instructions as ought to be observed & obeyed, so as to ensure the safety of the trains. For some time it was contended that it was quite unnecessary to inform the engineman in which direction the signalman was about to send him, but this has long been recognized as a mistaken notion, & it is now a generally conceded fact that it is necessary for a driver to clearly understand the direction in which he is about to be turned, as in the event of the signalman making an error through mistaking him for another train, & turning him into a wrong direction, he will have an opportunity of discovering it & pulling up his train in time.

In the early days semaphore arms were usually worked by means of levers fixed at the bottoms of the posts, but as distant signals came more generally into use they were worked by means of pullover levers or drums fixed in some convenient position near the stations, these levers being connected to the signals by means of wires. The next progressive movement in signalling was rendered necessary by the increased traffic & complication of tracks, to facilitate the working of which the switch & signal levers were brought together at one central point, so that they might be handier to the operator & save him running about from switch to switch. Although being more convenient for working, this was found to be very unsafe, owing to the signalman being able to pull over the wrong lever. It was to obviate this danger that Mr. Saxby in 1856 devised and patented his first system of interlocking points & signals. Since this date various modes of interlocking levers have been invented. The fundamental principle established by Mr. Saxby remains the same, viz., that it shall be impossible for a signalman to give any conflicting signals either accidentally or otherwise, or to work signals contradictory to the position of the switches. The switch & signal levers being concentrated & brought together in a signal cabin, were readily worked by the signalman, & by means of a mechanical connection between the switch & signal levers made it impossible to move them in a contradictory manner.