

The LONDON MIDLAND and SCOTTISH RAILWAY



FOUNDED 1963

THE LMS
SOCIETY



The DISTANT SIGNAL

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LMS Society Monologue No 9

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Rapier on Railway Signals. 1874.

Instructions as to the Sighting of Signals. LMS 1936.

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Reg. Instone.

Westinghouse B & S Co.

Trevor Moseley

Chapter 1 - Historical

It seems that railways went through some twenty years of their history before any attempt was made to work signals at a distance from the point they were located, as up to that time each signal was operated from the base of its own post. Such an arrangement required two men at junctions to constantly cross the lines to operate signals. It appears that one young points-man, Robert Skelton, employed at Hawick Junction, Portobello in Scotland came up with the idea in 1846 to counterweight the wire for working signals from a distance and brought it to the notice of the railway. Hence the name 'distant' signal. Experience quickly proved the greater safety and economy of his method that made it possible to concentrate point and signal movements from one central spot instead of working all of them as individual units that soon became general. In 1849 Skelton was awarded a silver medal by the Royal Scottish Society of Arts to commemorate his invention. This was found to be so convenient that a 'distance' signal was erected at St. Margaret's, near Edinburgh 250 yards in advance of the point of danger and following this the distant signal became general. The Great Northern Railway was, on its construction in 1852, completely equipped with distant signals of the semaphore type. It seems that the first signal worked from a cabin was at the summit of Cowlairs incline in Glasgow. This was a vane signal and lamp erected on the clock tower of the cable engine house up from Queen Street terminus, and operated by the cable engineman. This is mindful of an accident in August 1850 at Cowlairs when three long trains were following each other with a five-minute time interval. The second of the three trains was recorded as having 35 coaches and 3 cattle trucks. The first two trains stopped, but the third train ran into the back of them resulting in five fatalities and many injured. The problem here was poor braking systems and where stop signals did exist the need for Distant or "Braking" Signals to warn the position of Home Signal was paramount. We therefore appear to owe Scotland the credit for both the distant signal and the first signal cabin.

The Caution Signal was introduced with the Time Interval System and indicated that the time Interval was not complete, say in a 15 minute interval only 7 to 10 minutes had elapsed requiring the train speed to be adjusted accordingly – in this respect this was a crude form of distant Signal.

The 'Distance' signal was also known as the 'Auxiliary' Signal and the reference to it in the book 'Stokers and Pokers' of 1849 is of interest and quoted in full. "At any of the principal stations Auxiliary Signals were worked by wire and placed 500 yards in advance of the Station Signal Post. They are intended to warn Enginemen and Guards in thick weather (when the main signal cannot be well seen at the usual distance) of the **Red** being turned on at the station, and for this purpose a **Green** signal is shown at the Auxiliary Post. Except when the **Red** signal is shown at the station, no signal whatever is shown by the Auxiliary Signal; but they may always depend on the **Red** Signal being on at the station whenever the green is seen at the Auxiliary.

What the Midland Railway did in the story of the distant signal is of interest, as in order to tell a driver when approaching a distant signal on a curve as to whether the signal he saw was for his line or for that in the opposite direction. This was particularly necessary on the Matlock line. The solution was found by making one half of the disc higher than the other, and if the driver saw the higher side was on the left he knew it applied to him.

Distant signals were initially used in two ways.

1. Where the distant signal was lowered first and acted only as an intermediate signal, the driver being expected to be prepared to stop at the home or station signal as was the practice on the Metropolitan Railway, but not at junctions.
2. Where the distant signal is only lowered (or raised) to the 'off' or clear position after the home or stop signal has been cleared to the 'off' or proceed position. In addition, when applicable, all the stop signals must also be 'off' leading to the next 'block section'. It is therefore a requirement that the distant signal is interlocked with the following stop signal to ensure that it cannot be lowered without the stop signal(s) being lowered first.

Distant signals are therefore required to be sited sufficiently in advance of the stop signal to enable a driver to bring his train to a stand at the stop signal, should the distant signal be at caution or 'on', this is known as the braking distance. This distance can vary considerably, and in the early days was generally between 400 and 1000 yards, but as train speeds became faster the distance increased accordingly. In all cases both then and now, this distance is dependent on the speed of the line and whether there is a rising or falling gradient. There are cases of distant signals mechanically worked up to a mile from the controlling signal box, this being considered to be the range of what a signaller could be reasonably expected to pull a mechanical signal. In excess of this distance, signals were either motor worked or in later days replaced by a two-aspect colour light signal. Nowadays the distance recommended has been reduced to 1000 yards. Prior to this it was not uncommon for signals to be operated by these means that were less than one mile from the box due to the curvature of the line or the need for the signal wire to cross under tracks resulting in mechanical losses and hardship in operating them. One solution on relatively long straight wire runs, was to employ the use of a Gain stroke lever (plate 1) mid-way between the signal and the controlling box. This helped to compensate for some of these losses and a help weight was required to keep the wire taut.



Plate 1. A gain stroke lever near Barnt Green on the line to Redditch and Ashchurch.

A. L. Moss.

There are situations where relatively short distances occur between signal boxes and to maintain braking distance it was often necessary to have the distant signal for one box mounted under the starting signal of the previous box in the rear. A slotting arrangement was employed (see figures 1, 2 & 3) by means of which a balance lever arrangement on the stop signal post was so designed to stop the distant signal moving to the "off" position until the appropriate levers have been pulled in both boxes (figure 2). Conversely the distant signal will revert to "on" whichever signaller replaces his lever back to normal in the lever frame.

A further use of the distant signal was to reduce the speed of a train at junctions or crossovers that need to be traversed at less than the normal line speed for that section of line. It was the practice to use splitting distant signals (ie a bracket signal (see plate 2) at diverging junctions but this led to accidents as speed was not always reduced for the diverging route, accordingly the signal for the junction was either 'fixed' at caution or removed altogether with the remaining signal kept in the 'on' position for the diverging line.

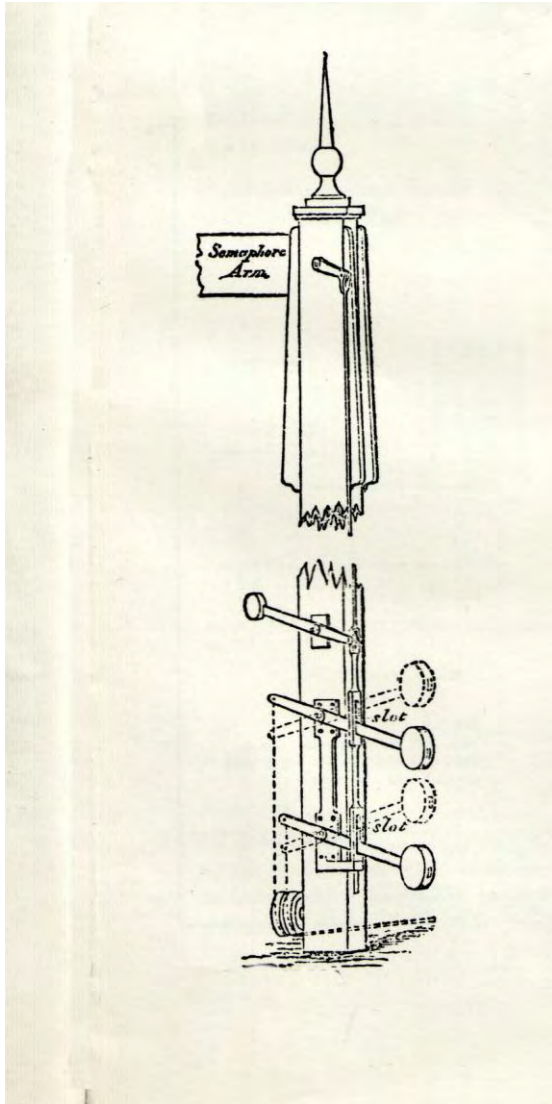


Figure 1.

This diagram shows the origin of the word 'slot'. The two levers and weights were worked, one by each signalman, and, only when both weights were raised to the upper position could the arm drop to the 'off' position.

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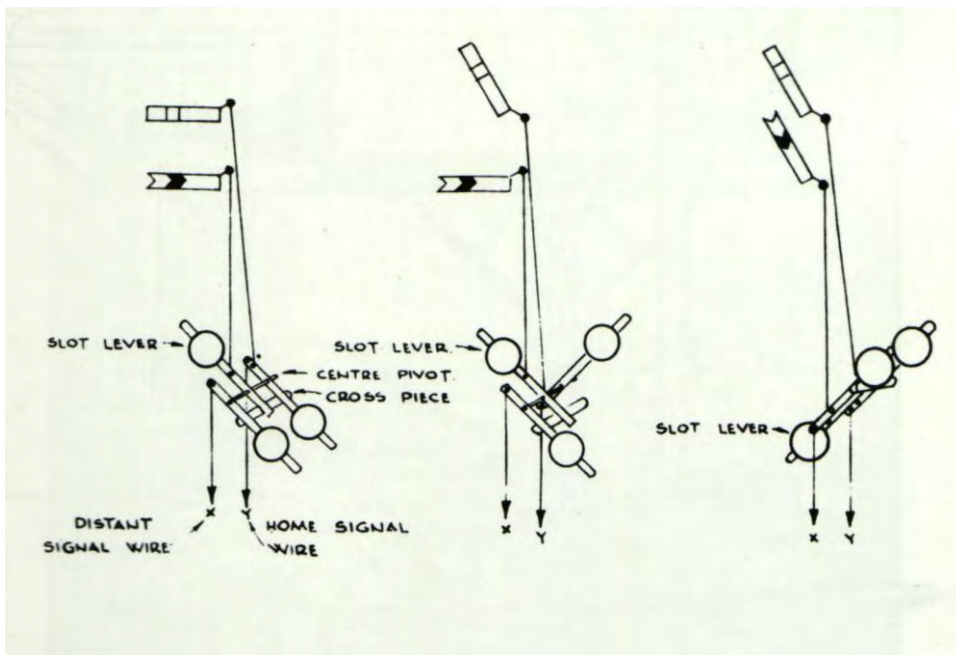


Figure 3.

Figure 2.

The gravity method of slotting a two-arm distant/stop signal. Slotting is the term given to signals, so controlled, that in the case of the home or distant arm being on the same post, the distant arm cannot be pulled 'off' until the stop arm is 'off'.

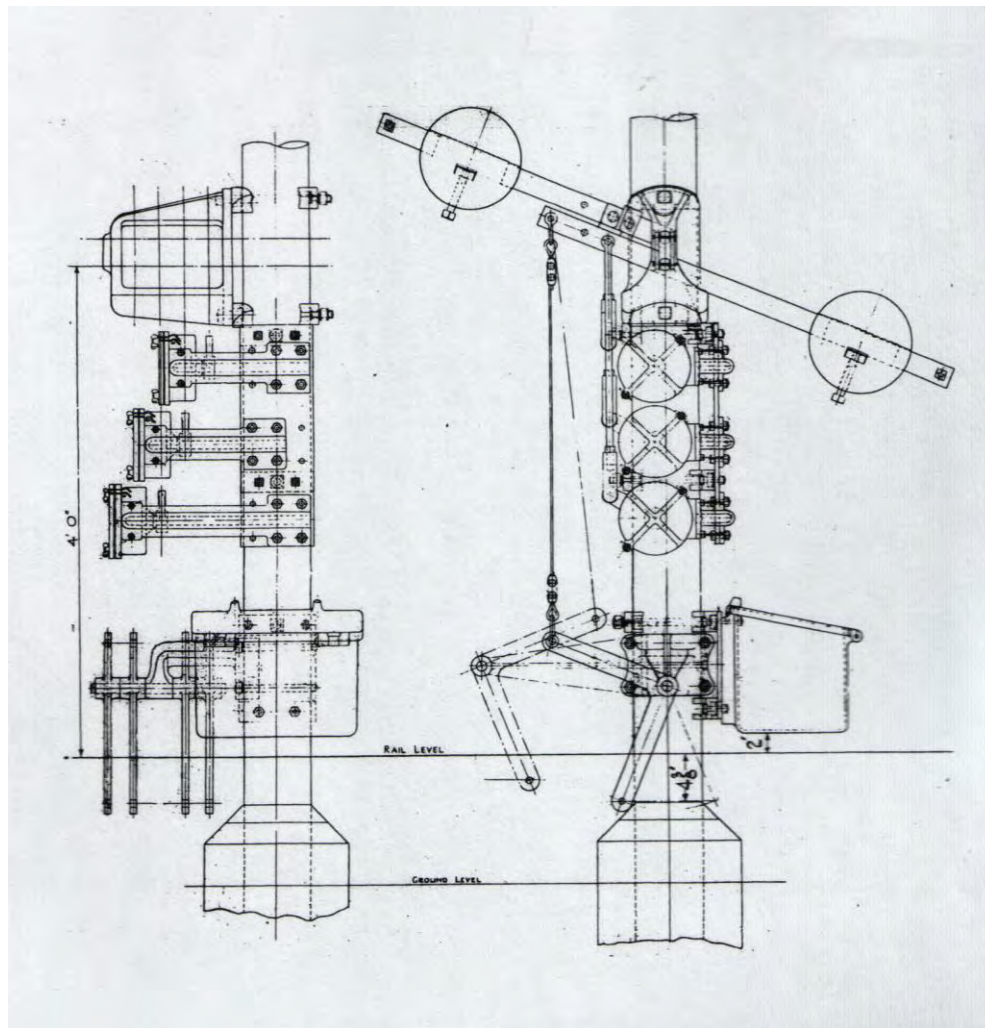


Figure 3.

LMS Drawing MD 3115 dated 2nd July 1935 showing the 'slot' assembly of balance levers etc on a tubular post. Also shown are the contact boxes and cranks at the base of the post and battery box. See also plates 10 and 11 on pages 12 and 13.



Plate 2.

Stenson Junction Home signals looking towards Derby on 15th March 1950. The splitting distant arm is in use. The stop arm is mechanically worked with the distant arms operated by British Railway Signal Company electric motors due to the necessary 'backslotting' required by the various stop signals ahead. A. F. Bound (the S&T Engineer) insisted that motor worked distant signals must be mechanically slotted (at the top of the main stem) to ensure the arm does not stick in the 'Off' position with the top arm 'On'. The primary cells are housed in the cupboard at the base of the post. The signal was part of a scheme by the development section that closed North Stafford Junction. Stenson Crossing Goods Junction and Sunny Hill, although Sunny Hill Box was restored during WW2 for working Sinfin W.D. Ordnance Depot. The scheme was commissioned on 26th

June 1932, although Sunny Hill had been abolished the previous November. A new 40 lever 4½" centre lever frame was installed in Stenson Junction Signal Box at the same time, unusually for this period at the front of the box. The signal may also have been new at this time. The splitting distant signals were not for the box ahead, but for the inner home signals at the same box, about 1200 yards ahead – to Derby or to Chellaston. Similarly the inner home signal bracket had splitting distant signals for the starters – to fast line or slow line. This was rather like an Intermediate Block Section, but could not be worked as such as there was no provision for the Stenson Junction signalman to give "Train out of Section" before the train had passed the box. It is thought that the reason for taking the photograph in 1950 was likely to have been with regard to preparations that were the underway for building the Willington power station, and re-signalling for the new connections thereto. A replacement signal box was brought into use in March 1964.

British Rail DY38716.

Chapter 2 - The Distant Signal problem

A problem with the original distant signal arm was that it was exactly the same as the stop signal arm being painted red and portraying a red light at night. However in August 1872 the London Brighton & South Coast Railway cut a fish tail in the outer end of the arm at Norwood Junction thus distinguishing it from the stop arm, although the red light remained as neither green or white was acceptable – the former being used as the clear indication at junctions and the latter for all other stop signals. It can be seen that whilst the distant signal was distinguishable in day time by the fish tail there was no such differentiation at night as red and green were portrayed for both stop and distant signals. One solution adopted by several railways was to use the Coligny Welch lamp for distant signals that had a sideways 'V' cut out on an extension of the signal lamp on the right hand side that was quite distinguishable from 250 yards (see figure 4).

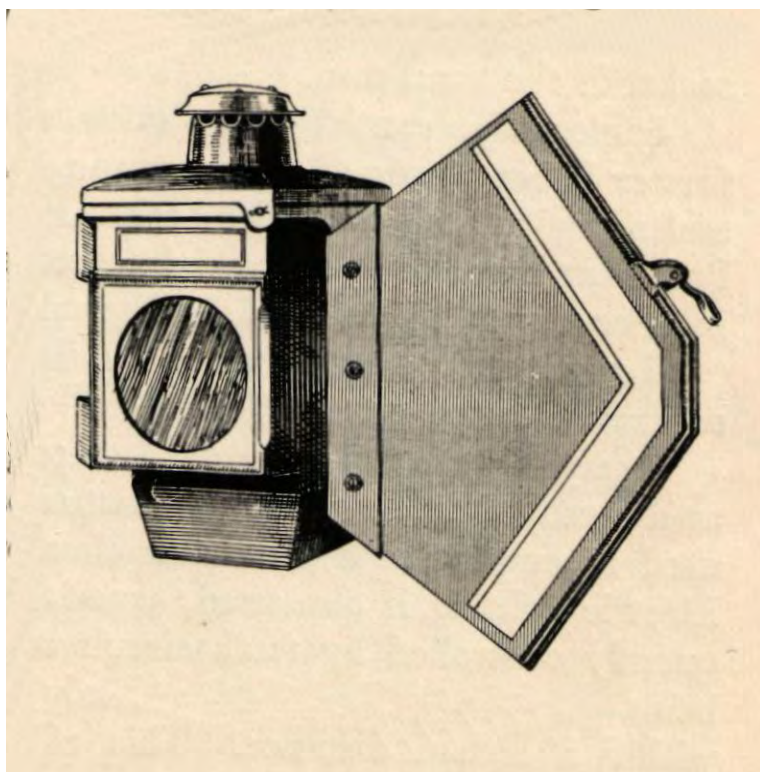


Figure 4.

The Coligny-Welch signal lamp as used on some British railways to differentiate a stop signal arm from a distant signal arm.

Another solution used on Swedish railways and also the Furness Railway from 1914 was to use a flashing light at distant signals. This was also experimented with pre-war on the LMS although not in the context we are dealing with here but rather to obviate the need for fog-men in certain areas where fog descended very quickly, An orange or yellow light was used before the 1923 grouping by the London Electric Railways (underground), also the

Great Western the South Eastern & Chatham and the Great Central Railways as a means of differentiation, probably Paddington (1914 plate 3), Victoria (1915) and Keadby Bridge (1915) respectively. There was also the GWR owned Ealing/Shepherds Bush section that used the American style three-position semaphore signals having a yellow 'caution' aspect but no yellow arm (plate 4).

Plate 3.

The 1914 erected 3 aspect upper quadrant signal at Paddington station, being Paddington Station Departure Box Platform 1 Down Main Starting signal with distant for Westbourne Bridge.

Westinghouse



Plate 4.

The GWR owned Ealing and Shepherds Bush Railway installed automatic three position upper quadrant signalling in 1920 following on from the successful Paddington experiment in 1914. The signal, although still painted red, used yellow for the 'caution' indication, which is that shown in this picture.

Westinghouse.

The Ministry of Transport requirements (1925/8) relative to signals – the solution..

In 1925 The Ministry of Transport issued a requirement to make Distant Signal arms yellow with yellow lights thus rendering superfluous the Coligny Welch lamps used by some railways with the Southern Railway abandoning them in 1928. In 1928 The Ministry of Transport issued further requirements relative to signals that were listed in an LMS publication dated April 1936 (ERO 52039) entitled "*Instructions as to the Sighting of Signals*". This is what it had to say with regard to Distant Signals:-

Up and Down Distant Signals for each block post, to be provided on all running lines which have two position stop signals. One Distant Signal in each direction, with the necessary control from each Signal Box, is sufficient for a number of block posts closely grouped together, unless there are good reasons to the contrary.

At diverging junctions only one Distant Signal should be provided, worked for the junction line over which the highest speed is permissible, unless in exceptional circumstances more are essential.

Where special circumstances, e.g. permanent speed restrictions, justify the adoption of an un-worked signal, it should be secured in the warning position and not coupled up or duplicated for directing purposes.

The interval between a Distant Signal and the first Stop Signal to which it applies must be such that a train in proximity to the former, and moving at the highest speed can be stopped before passing the latter.

All signals, as a rule to be immediately on the left of, or vertically over, the line to which they apply.

Semaphore Distant Signals to be distinguished from Stop Signals during daylight hours by yellow coloured arms, with notches cut out of the ends. They must be placed below, and be controlled by Stop Signals, if they are carried on the same post and applicable to the same direction. A Distant Signal placed under a Stop Signal of a box in the rear must, unless the circumstances are exceptional, be repeated under all Stop Signals in advance of that signal which are worked from that box, with the necessary additional control by such signals.

Front lights of all running signals to be red for Danger, yellow for Caution (including the warning position of Distant Signals), and green for clear, with white used for backlights to be only visible when the signal is at Danger.

Chapter 3 - The LMS response.

Traffic Minute 1791 dated 28th November 1928 was entitled “*Proposed alteration of colour of lights and arms of distant signals, shunting signals, and calling-on arms etc*”. It was a report by the Chief General Superintendent regarding the 1928 requirements, which, in addition to the items listed above, required White lights for Calling-on signals in the normal position and the facing side of the arms of semaphore signals and the face of disc signals to be painted to accord with the colour of the light. It went on to say that as far as the LMS system was concerned the requirements had only partially been complied with in connection with widenings, new works and renewals and he considered the time had now arrived when full effect should be given. The recommendation was for the Executive Committee to approve expenditure of £16,332 to carry out the necessary work spreading the cost over a three-year period with the following lines to be dealt with during 1929.

Former LNW	Between Euston and Carlisle.
Former Midland	St. Pancras and Carlisle
Former L&Y	Manchester and Liverpool and Southport.
Former L&Y	Manchester and Blackpool and Fleetwood.
Former Caledonian	Carlisle and Glasgow
Former G&SW	Carlisle and Glasgow.

Board Minute 2334 dated 30th October 1930 reported the expenditure incurred was £16,332. Board Minute 2569 taken on 30th July 1931 reported that of the 200 distant signals in the Northern Division (Scotland) to be abolished at diverging junctions, authorized by Board Minute 2110 on 24th October 1929, only 108 had been dispensed with. In 1937, the Signal and Telegraph Engineer, reported at the Works Committee Meeting on 27th October that expenditure of £11,295 had been incurred on the modifying distant signals, an over expenditure of £992. It can be seen that compliance with the 1925 requirements was expensive and certainly not done overnight as costs were still being incurred in 1937 no later minute being found.

In addition to the 1925/8 requirements, with the introduction of tubular steel signal posts the LMS saw fit to paint isolated distant signals with alternate 2' 0" long black and white stripes

similar to those on the 'Belisha Beacon' pedestrian road crossings as brought in by the Minister of Transport Leslie Hore-Belisha from 1935 This was covered by an addendum to LMS S&T Engineering Circular No.48 dated September 1939 – see Plates 5 and 6.



Plate 5.

The isolated Ais Gill Up Distant on a tubular post photographed on 8th October 1953 and painted with alternate black and white stripes as stipulated in S&T Engineering Serial No. 48.

British rail D1381.

Plate 6.

Ilkley Up Main Distant in 1946. An over zealous painting squad painted this MR distant signal with black and white stripes against the S&T Engineering Serial 48 instruction that only specified tubular signals should to be so treated.

F. W. Smith.

LMS Engineering Serial No. 38 dated August 1932 referred to unworkable or fixed distant signals specifying that “any unworkable distant signal must be provided with a complete spectacle glazed yellow and green. There must be nothing in its appearance to distinguish it from a “workable” distant signal so far as a driver is concerned”. Plate 7 and 8 clearly shows an unworkable distant signal arms bolted directly to the post with one yellow aspect only.

And so ended a relatively simple problem that took almost 100 years to resolve.





Plate 7.

This MR signal at St. Pancras has an Acfield/Cooke route indicator with both wood and corrugated arms. The distant signal is fixed and clearly be seen as such being simply bolted to the post with only a single spectacle.

British Rail D980.

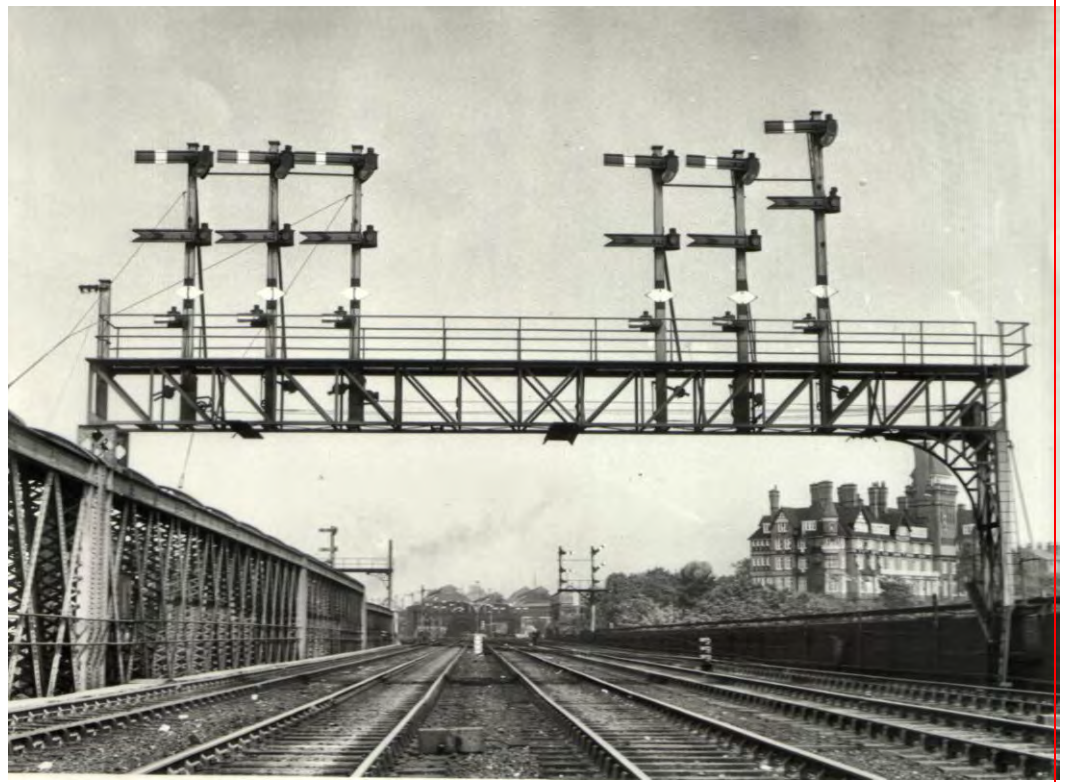


Plate 8.

A LNWR signal gantry at Preston being Preston No.1 Down Fast and Down Slow homes with six fixed distant arms below the stop arms. Again bolted to the dolls with no spectacles leaving the lamp to constantly display a yellow aspect. The gantry is on the bridge over the River Ribble.

British Rail D521.

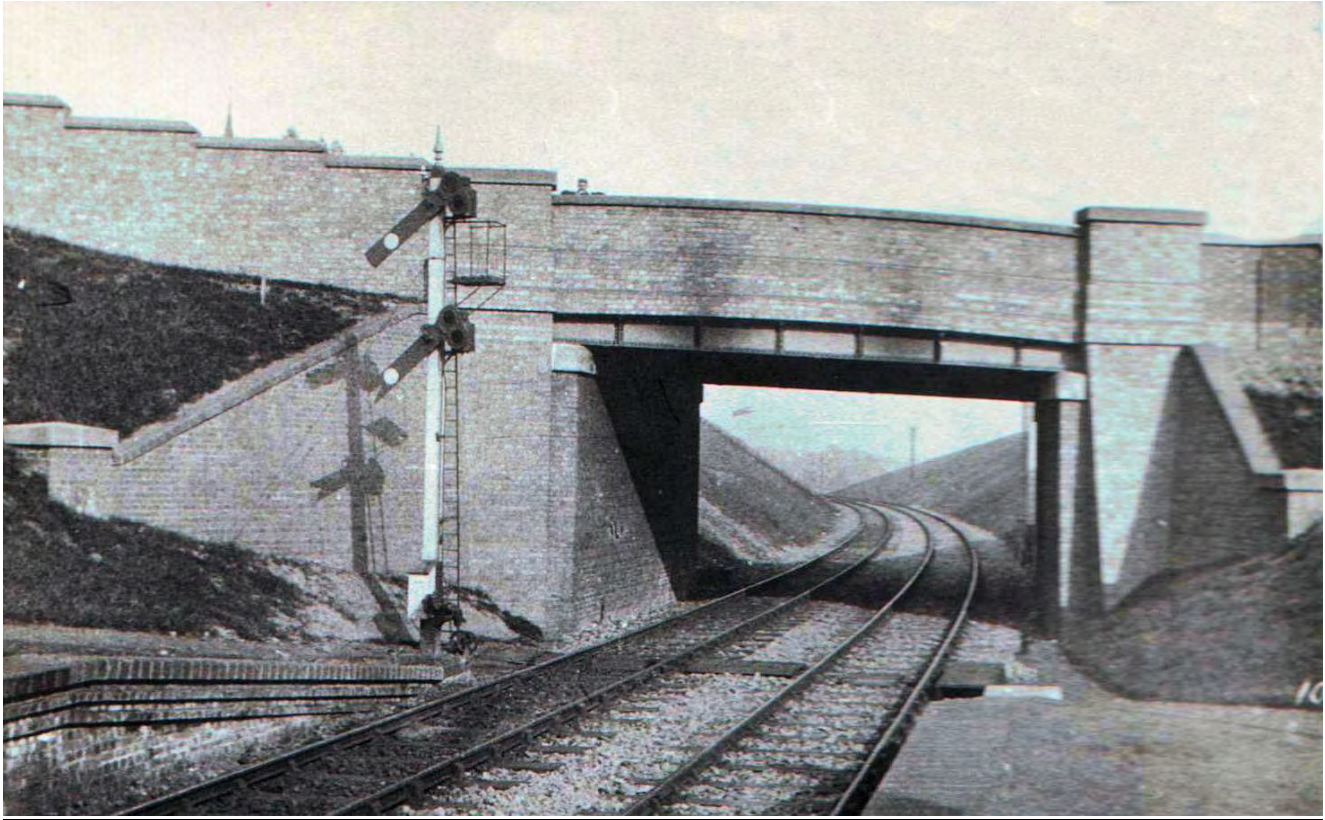


Plate 9. A Midland Railway signal at an unknown location with stop and distant arms painted exactly the same with no differentiation apart from the fish-tail cut from the end of the distant arm. With both arms also portraying the same aspects at night. The MR painted roundels on the arms unlike other railways who used a white stripe. Authors collection.



Plate 10. The LMS Standard slotting arrangement on a tubular post being Bedford St. John's Down Starting signal. This clearly shows the 'T' piece bolted to the upper distant arm balance lever on the left which stops the distant arm dropping 'off' by gravity until both levers in the signal boxes have been reversed..

V. R. Anderson.

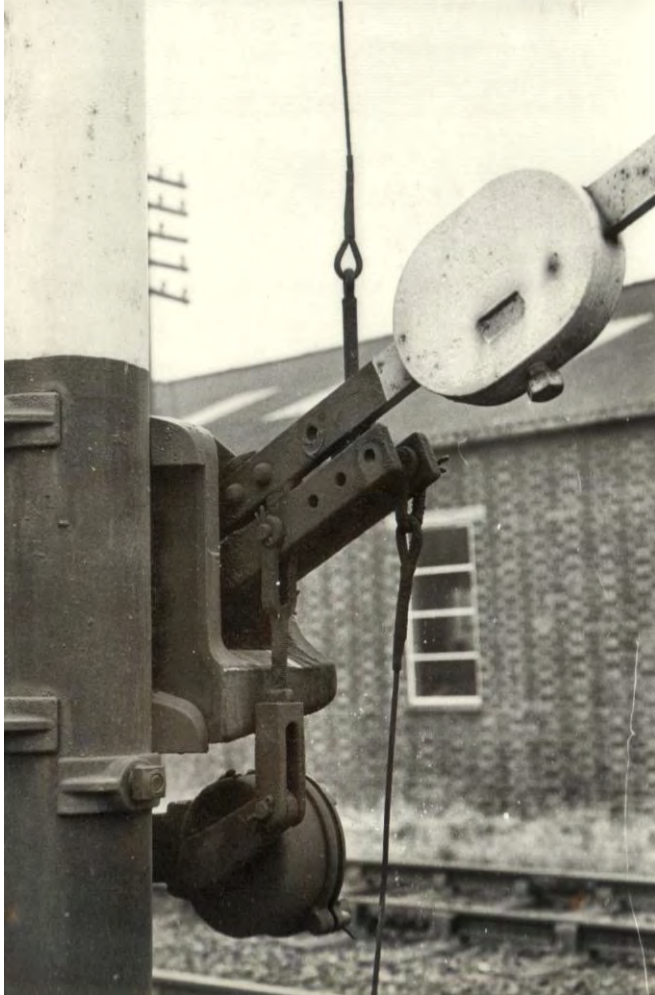


Plate 11.

A Close up of the Bedford St. John's Down Starting Signal slot. For some reason the wire to the distant signal has been removed from the crank and also the lever. Should the distant wire have been connected it can be seen that the distant signal cannot be pulled off due the 'T' piece seen on plate10. Clearly the distant was connected at one time as the distant signal lever is connected to a contact box just below that operated an indicator in the signal box to show that it was 'off'.

V. R. Anderson.

Multiple Aspect Signalling.

Colour light signalling retains the yellow light for 'Caution' – but that's another story.

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