Simply Signalling

Creating the *look* for Garden Railways

Jonathan Tillin

1: Introduction & Branch Line

Do you fancy the idea of having a signal or three on your Garden Railway? I personally think they add character to a railway (I should admit I am a bit obsessed with railway signalling.) With the encouragement of friends in the BGRA I offer a simple Guide to signalling for our railways.

We are not going to talk about the *science* of railway signalling, rather let's concentrate on signalling as an *art form*: something that *looks* right. Exploring the methods used by different railways will help you see that there is no one-size fits all. I will also note that experience proves no rule applies without exception. Freedom to enjoy planting some signals is my aim: it's your railway and your choice. Mix-and-match if you fancy it!

Given the above, why bother to write this at all? Well, even art has rules. Of course, rules can be (and are) challenged but I would suggest that to ignore them completely is to compromise the *look*. So, I will offer some simple rules and technical terms. If I use a term with a specific railway meaning I will initially italicise it. I also believe a picture is worth a lot of words so I have created lots for this Guide. All photos are mine.
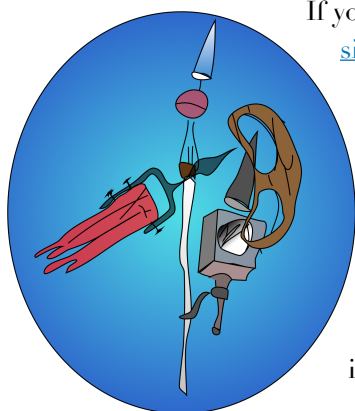
If you really want to go deeper into principles and practise then https://signalbox.org is a great starting point, and I will give a selected reading list at the end.

If you fancy going completely off-piste, Rowland Emett[1] drew improbable cartoon signals as did Heath Robinson. A few of my own curious contraptions will pop up along the way.

Though this is a somewhat personal journey which only scratches the surface of possibilities, what I hope is that you might be inspired by some simple solutions; and that you find signposts to other resources should you be inspired to further explore the mysteries of signalling.

[1] The drawing is after Rowland Emett from the book *Far Twittering*. Faber and Faber (1949)

Way Back When

The *look* is achieved with line-side *signals*: generally found on the left-hand side of the Line. The signal informs the driver if they are authorised to proceed and, if there is a choice, the route selected by the signaller.

There have been many shapes and meanings to signals over the last couple of centuries. One of the earliest would have looked like this:

Stick a board on a post, paint it red (short wavelength, travels farthest) and light a candle or oil lamp at night. Add a handle and you have a *Fixed* (permanent) *Signal*. Turn it *ON* towards the train to say "Stop" and turn it at 90° *OFF*[2] from the train to say "Proceed" (or "All-clear"). The lights would have been red or white.

ON   Stop   OFF

By the early 1840's the military *semaphore* was adapted for railway signalling purposes. The railway semaphore has evolved in shape, colour and purpose over time. Here are the two principal signal *arms* in *lower quadrant* form:

Distant Signal
Fixed at Caution

These signals are OFF

These signals are ON
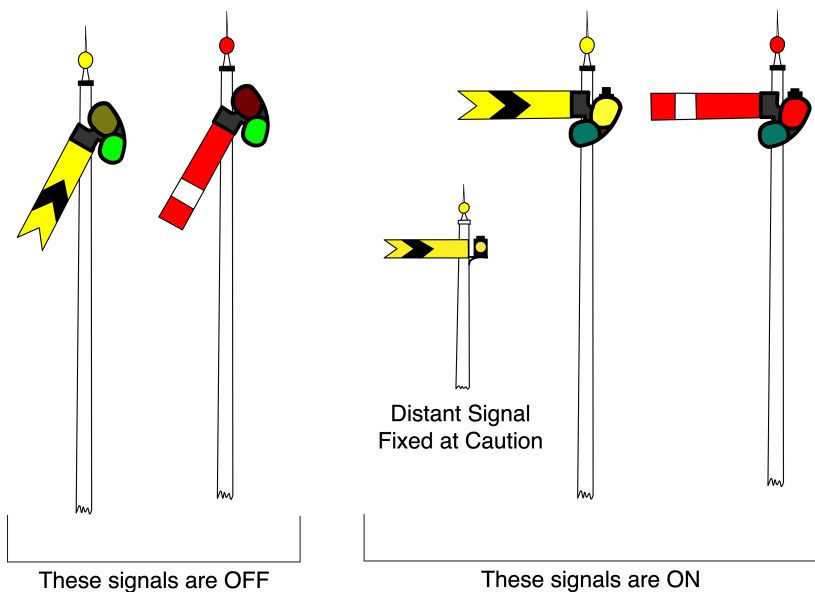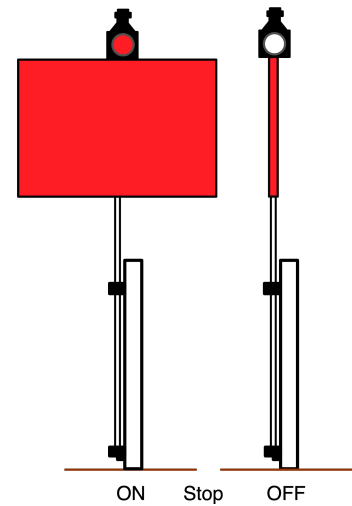
• A *Stop Signal*: front   red with a white band (the band enhances the visibility); back   white with a black band.

A Stop signal is fixed at a point beyond which the front of the engine (or front of the first vehicle) may not pass unless the signal is OFF.

• A *Distant Signal*: front   yellow with a black chevron and *fish-tail* cut-out; back   white with a black chevron.

The Distant signal is fixed at an appropriate braking distance from the first related Stop signal.

A *worked* Distant will not be free to display OFF unless all the relevant Stop signals are also OFF.

The arms are generally between four and five feet in length. The night-time signals are as the colours in the sketch. Paraffin lamps burn with a yellowish flame and the green spectacle glass compensated by being a blueish-green; the red quite a deep ruby colour.

The *Movement Authority* given by a Stop signal OFF will lead to one of the following:

- The next Stop signal;
- *Buffer Stops* (terminal platform);
- *Siding/Yard*;
- Some other defined marker.

Arm Angles

- *ON*   +5°/0°/-5° where 0° is horizontal.
- *OFF*   typically 45°   60°.
- *'WRONG'*   any other angle.

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[2] It doesn't matter whether it's a semaphore Stop or Distant; or a 2, 3, or 4 aspect colour light type, the terms stuck and ON still means a signal showing its most restrictive aspect; and OFF means any other viable aspect.
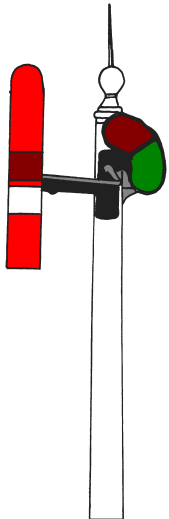
In this Guide some signals are *upper quadrant* (UQ); while others are *lower quadrant*. Upper quadrant signals had their origin in America and did not appear in Britain until the first quarter of the 20th Century. UQ signals are certainly mechanically more advantageous but maybe not so fitted to our *look*.

Then there are the distinctive *Somersault* signals beloved of the Great Northern. These signals were also manufactured by McKenzie and Holland Ltd: this one was spotted in South Island, New Zealand (3ft 6in gauge); the Barry Railway was another user. Originally the Somersault OFF would be 90°.

Distant Memories

You have choices depending upon your preferred era. In the 1830's a precursor to the Distant[3] was a revolving 'arrow' painted red/green (green then understood as the colour for caution). By the 1860's the Distant was a red semaphore retaining the distinctive *fish-tail* cut-out but otherwise looking identical to a Stop signal. The white chevron then gradually replaced the band. It was not until the 1920's that yellow became common and standardised.

Between the 1890s and 1920s it safe to say that red Distant arms had red and green spectacles - the same as the Stop signals. Before that white was a common *all-clear* light.

A yellow light appeared in the 1920s with the introduction of the yellow Distant arm.
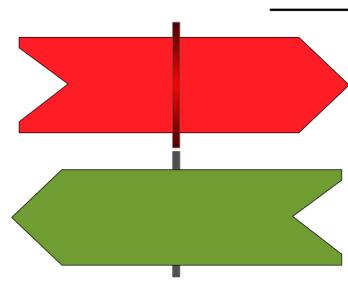
Early Victorian

Later Victorian

Edwardian

Since 1920's

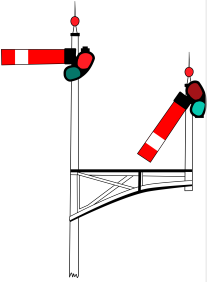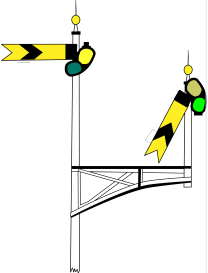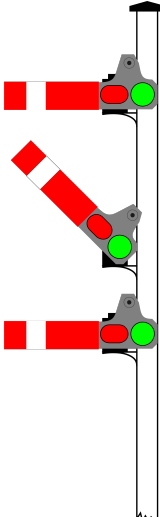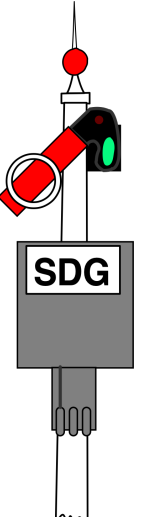[3] This is a massive simplification! The evolution of the Distant is complex and outside the scope of this Guide. Interestingly, the green caution board survived for a century or more by being adapted as a Temporary Speed Restriction advance warning board.

Way to Go

Here are some British practice *Directing Signals*. British practice is based upon *Route Signalling*[4] and informs the footplate crew which way the route is set for a train approaching a divergence or *turnout*:

BRACKET	STACKED	INDICATOR
Approaching a junction with slower-speed divergence to the right. When trains run at speed (say greater than 30mph) a *Splitting Distant* will be beneficial.	The arms read the left-most route from the top. (Straight-on if all divergences are to the right.)	A *Route-indicator* (which can display a variety of destinations) is mounted below or alongside an arm.
A *Splitting Distant* gives advance warning of the route at the junction signal.	This form is considered appropriate only for low speed approaches.	The ring on the arm indicates a *Goods* or subordinate line.

Beginning at the time of the First World War the excessive earlier use of splitting Distants was dramatically culled to save on maintenance costs. Henceforth, many junctions had but a single-arm Distant which cleared only for the principal route. High-speed routes did retain their splitting Distants, such as on this lovely representative gantry in the National Railway Museum, York[5].
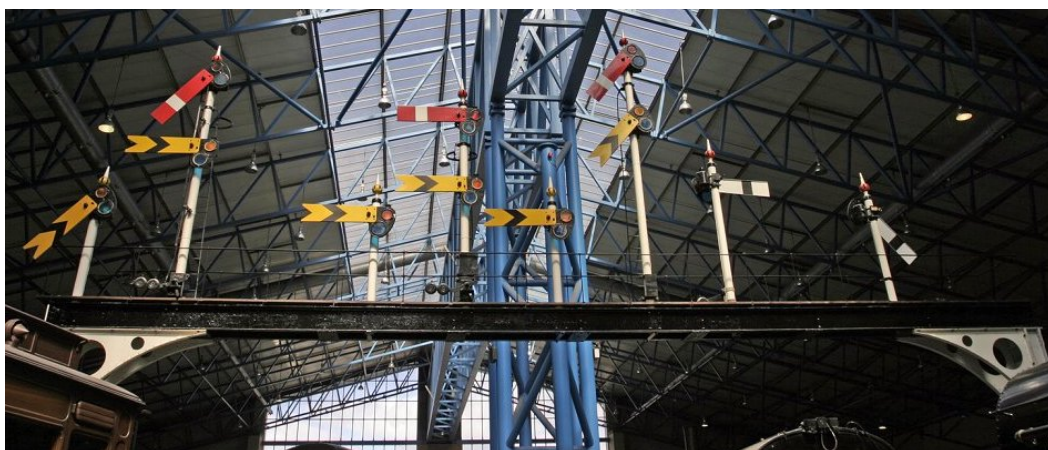
This picture also illustrates the aesthetic, the *look*, by the arm spacing and angles.

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[4] Worldwide, the other standard form of signalling is *Speed signalling*.

[5] The gantry represents the signals placed at Northolt Junction. https://collection.sciencemuseumgroup.org.uk/objects/co209223/tubular-steel-type-signal-assembly

Term Time

There are a few general things it might be helpful to bear in mind:

- Line direction is denoted as Up and Down:
  - On the national system Up is generally in the sense of towards London.
  - On the quarry Lines Up was towards the higher altitude (the quarry), Down towards the sea.
- Routes diverge at a *Facing Point*; they converge at a *Trailing Point*.
- *Signal Boxes* typically manage the passage of trains through *Block Sections*.
- *Ground Frames* are satellites (or extensions) to signal boxes. They will be used where some points are too far away from the signal box to be operated by direct mechanical action. Ground frames can be as grand as Butterley or just one or two levers set out in the open.
- Where passenger trains pass over a facing point it is fitted with a *Facing Point Lock* (FPL) or some acceptable local alternative[6]: the FPL stops the switches deforming and opening as the wheels pass. The FPL can be found either in the centre of the track or to one side.
- Trap points 'trap' vehicles in sidings and goods lines to stop them running away. Catch points 'catch' breakaway wagons on steep rising gradients. The GWR, being contrary, referred to both types as catch points.
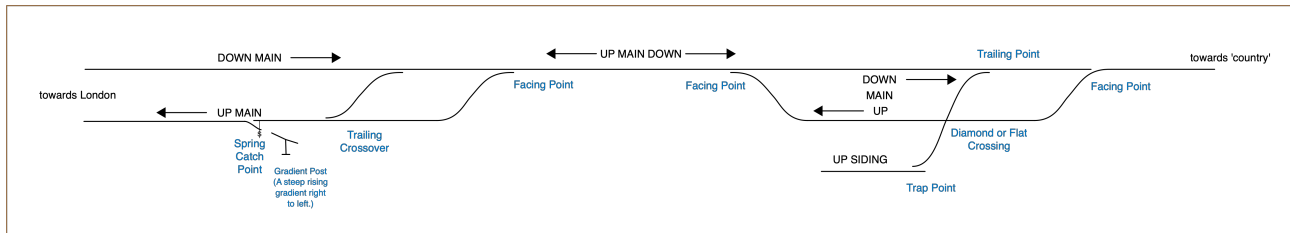

Space and Time

Running Lines are divided into segments or *Blocks*. Each block is a reserved space for one train at a time. The layouts in this Guide all assume a single line so here is a brief introduction to *Single Line Block* (though as on our little railways we tend to *drive-on-sight* it's really only for passing interest).

For our sort of railways a *Train Staff* is suitable and it can be as simple as a chunky bit of wood; engraved on the staff is the name of the signal box at each end of the single line. Staffs are distinctively shaped and coloured; adjacent single line sections will have a different shape/colour. If you fancied hanging a staff from your loco, why not. Red with a round cross-section or blue with a square one would work; or turn a bit of scrap hex bar, paint it as you desire, and fit a handle.

A driver must not enter a single line block section unless in possession of the correct staff.
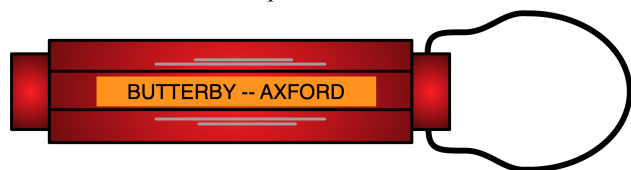
Space separation has been the bedrock of safe signalling systems for some two centuries, however for it to work there had to be an effective communication system which could confirm the availability of each block. On a single line the staff is the simplest answer to that purpose: there being only one staff, if the driver is in possession of it the block must be clear of other trains.

Time separation, or *Time-Interval* working was initially used on both double-track railways and even for following trains on single lines. It was not a success but took some decades to be eradicated. The effective communications which evolved with the developing telegraphic system eventually brought about its demise.

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[6] The Isle of Man had different ideas! We will look at this later.

The Bucolic Branch

In this meander down the byways of signalling we first look at signalling the layout on a simple branch line.

Two diagrams are provided. One shows a passing loop and station; the other adds a level crossing.

I have used Great Western Railway (GWR) house-style because:

a) I'm biased (having lived and worked on the Western much of my life); and

b) H. Raynar Wilson 'late of the Lancashire and Yorkshire and the Midland Railways' wrote in his famous book *Mechanical Railway Signalling* (2nd Ed. 1909):
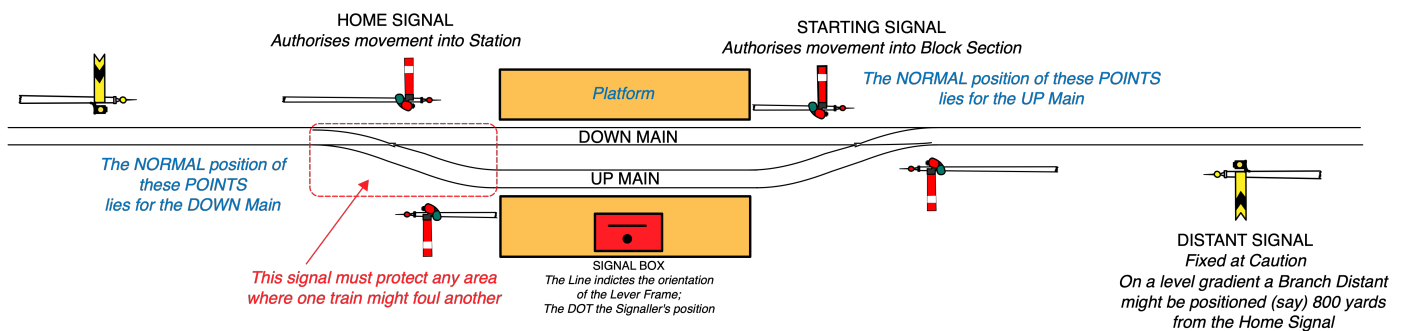
"One of the, if not the most perfectly signalled railways in Great Britain is the Great Western…" Quite.

An example Single Line Passing Station

Notes:

- Stop signals are often sub-divided into *Home* and *Starting*.
- Although the facing points can apparently offer a choice of routes in practice there is only one destination for each train: hence there is only one arm on each Home signal.

Of the types of signalling we are considering this is the easiest to describe. It's the standard for our four-footed friends but was also used, often with modifications, on narrow gauge railways as well.

HOME SIGNAL
Authorises movement into Station

STARTING SIGNAL
Authorises movement into Block Section

The NORMAL position of these POINTS lies for the UP Main

Platform

DOWN MAIN

The NORMAL position of these POINTS lies for the DOWN Main

UP MAIN

SIGNAL BOX
The Line indictes the orientation of the Lever Frame;
The DOT the Signaller's position

This signal must protect any area where one train might foul another

DISTANT SIGNAL
Fixed at Caution
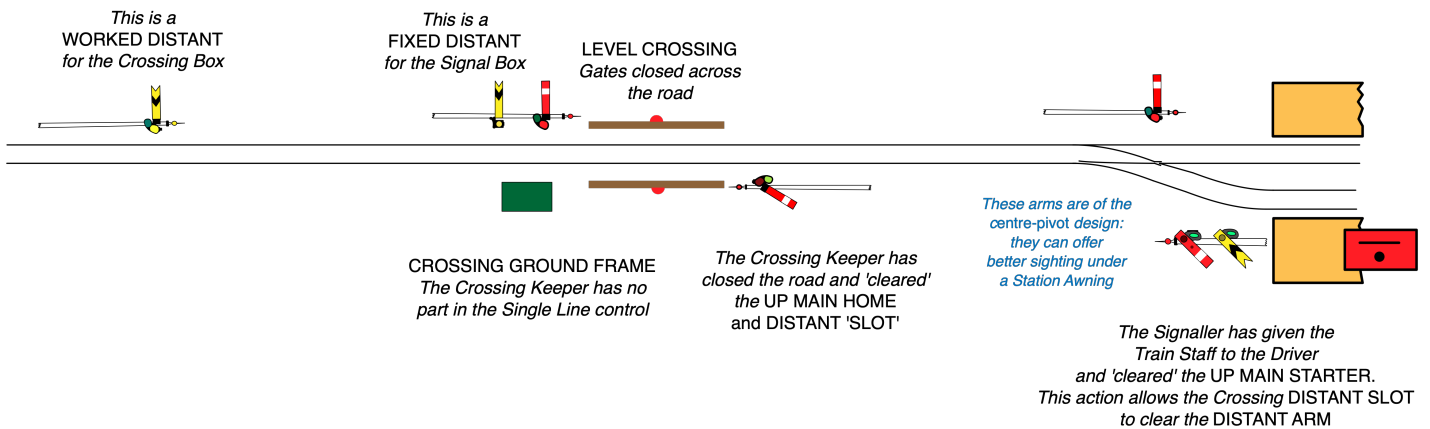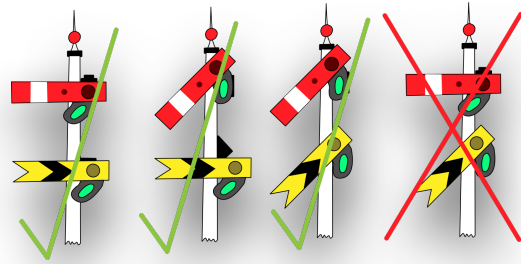On a level gradient a Branch Distant might be positioned (say) 800 yards from the Home Signal

An example Single Line Level Crossing

This layout is also designed to show some variations of the mechanical Distant signal

- A single-arm **worked** Distant. ON: 'Caution, prepare to stop at Home signal'; OFF: 'Line clear, all related Stop signals are OFF'.

- A Distant **fixed at caution**. Given that the maximum speed for manual staff exchange is 10 mph many passing stations had their Distants fixed at caution.

- A **lower-arm** Distant. When *worked* (as under the station Starting signal) a mechanical or electrical contrivance (known, esoterically, as a *Slot*) ensures the Distant arm can only be OFF if the Stop arm is also OFF.

This is a
WORKED DISTANT
for the Crossing Box

This is a
FIXED DISTANT
for the Signal Box

LEVEL CROSSING
Gates closed across the road

CROSSING GROUND FRAME
The Crossing Keeper has no part in the Single Line control

*The Crossing Keeper has closed the road and 'cleared'
the* UP MAIN HOME
and DISTANT 'SLOT'

*These arms are of the centre-pivot design:
they can offer
better sighting under
a Station Awning*

*The Signaller has given the
Train Staff to the Driver
and 'cleared' the* UP MAIN STARTER.
This action allows the Crossing DISTANT SLOT
to clear the DISTANT ARM

BELOW: Idridghay Level Crossing on the Ecclesbourne Valley Railway: a simple solution. Hand-worked gates and a yellow flag. A retro-reflective STOP board is fixed on each approach.

STOP
Await
Instructions

Steam Ferry Crossing

A study in three pictures from the Paignton and Dartmouth Steam Railway at Steam Ferry Crossing. This crossing has been modernised since these pictures were taken, however I include it to show a very economical (and common) use of simple signalling on Branch Lines.

The mechanically-worked Up Distant. GWR style tubular post, enamelled metal arm and cast-iron spectacle plate. The ON spectacle glass is smaller than the OFF one as it has less leeway in its correct display angle.

The signal is on the right-hand side of the line to aid sighting.

The Crossing Ground Frame and gates. There are no Home signals at the level crossing   the red gate targets were often considered sufficient in past days.

The near gate has been renewed at some time but no target has been added.

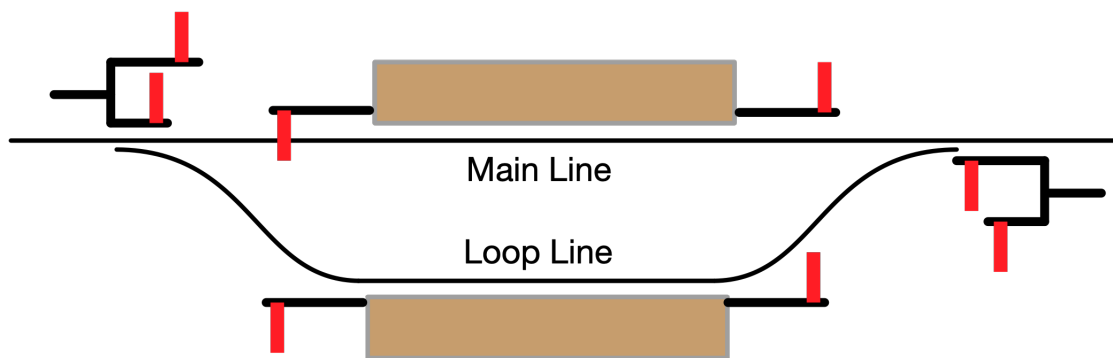(The bracketed post in the distance is for a new colour-light signal.)

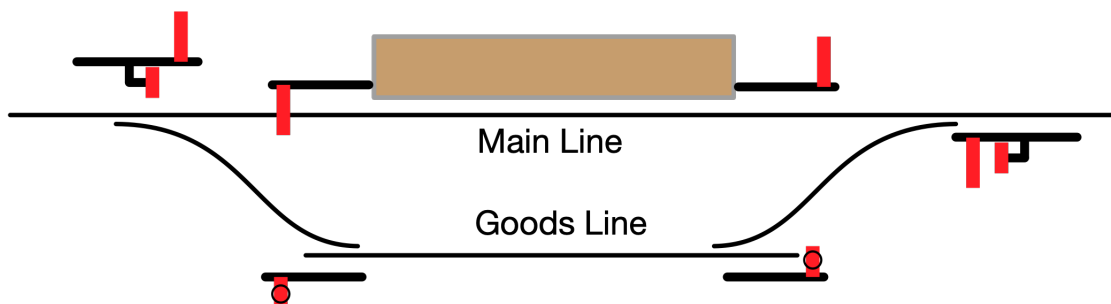The mechanically-worked Down Distant..

It is on the inside of the curve to offer better sighting (especially as GWR locos are driven from the right-hand side of the footplate).
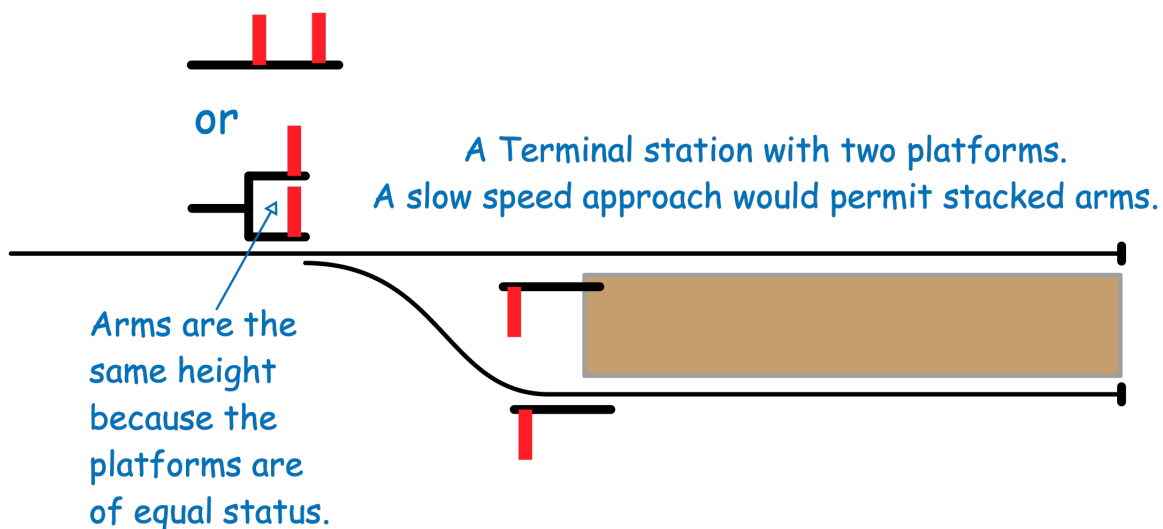
More ideas

(The Home signal arms for the Goods Line are described in Chapter 4)

Main Line

Loop Line

Here, most trains run straight through.
The Loop Line is used less frequently.

Main Line

Goods Line

Here, a Goods Line takes the place of the Loop Line.
The arms are smaller and the exit (Starting) arms have rings.
The Goods Line has Trap Points at both ends.

or

A Terminal station with two platforms.
A slow speed approach would permit stacked arms.

Arms are the
same height
because the
platforms are
of equal status.

On all these suggestions single-arm Distants fixed at caution may be provided

LEFT: The Up Starter at Liskeard.

A nice 4ft centre-pivot slung out from above the awning. The small elevated disc shunting signal to the left gives access for stock onto the Looe Branch. The white diamond signifies that there is an electrical track circuit checking that the platform line is clear (or not) of a train.
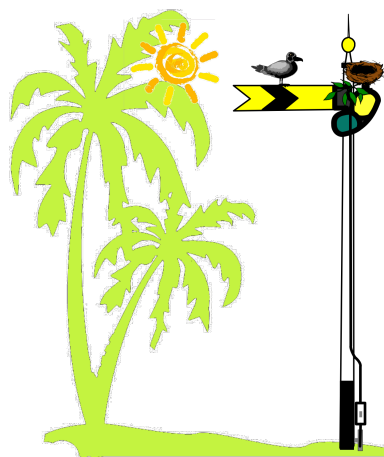
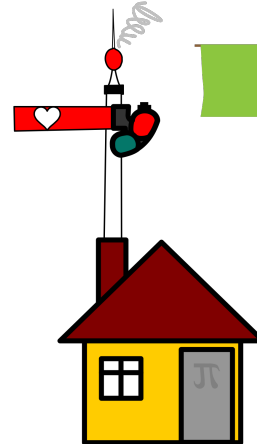LEFT: A view from the GWR Autocoach at Didcot Railway Centre.

A 4ft main arm and 2ft siding arm bracketed to the left. Just ahead of the signal post is the facing point with the FPL cover in place. The track at right-angles is for storage of a motorised trolley.
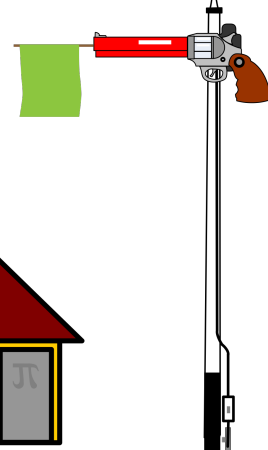
Types of signal…

Distant   Home   Starting

RIGHT: For something non-GW here is a lovely single-arm slotted-post signal by McKenzie and Holland (M&H) at Goathland on the North Yorks Railway. The arm would have disappeared inside the post at one time.

LEFT: A 'sort-of' Station Signal at Broomhill on the Strathspey Railway.

RIGHT: A passing loop at Llangower on the Bala Lake Railway. Notice there is only one Starting signal (in the Loop); the Home signals for both directions on the Main Line are OFF simultaneously; the *finials* on the top of the near bracket posts differ from each other.

All of which proves there is no such thing as standard railway signalling!

# 2: Narrow-Gauge Possibilities

The Festiniog Railway (FR)

"*As is to be expected on such a singular system, the signalling employed was not similar to that used by any other railway company.* " (J. I. C. Boyd: *The Festiniog Railway* p173). Well, it might be more generous to say that the Festiniog never rushed to be in the forefront of signalling evolution.
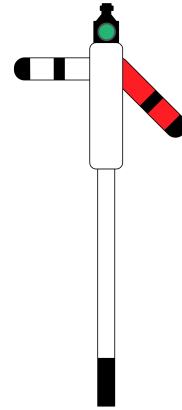
1860's Signalling

A slotted-post *Station Signal* as used on the FR. The three-position usage was employed for the early time-interval method of working.

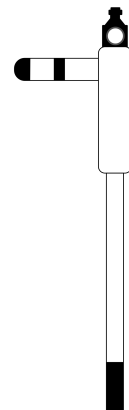There is an excellent write-up in the *16mm Special Edition No. 153*[7], and a discussion at

https://www.festipedia.org.uk/wiki/Double-arm_station_signals
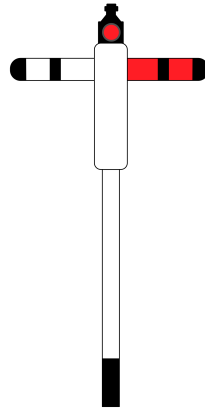
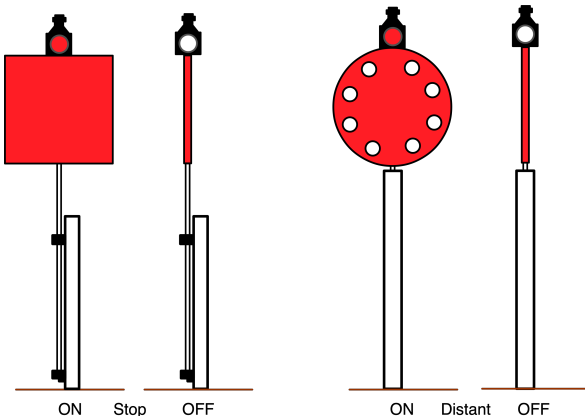|			
1860's	Stop	Proceed Slowly	All-Right
1890's	Stop	All-Right	Discontinued

Notes:

- With a station signal the location did not determine the *stopping position* of the train.
- The FR practices right-hand running.
- By the 1890's the signals had become two-position.
- The black banding is odd though not unique.

Board and Disc signals

ON   Stop   OFF   ON   Distant   OFF

The FR were to use both forms of signal. For example, boards were used to protect the Moelwyn Tunnel. Discs were common but their meaning varied with the context:

https://www.festipedia.org.uk/wiki/Disc_signals

On our railways a disc can be considered a Distant signal. I infer that the disc was only turned OFF if the station signal was at *All Right*, and the *Point Indicator* was set for the right-hand *Siding*[8]. A *capstan* at the station wound the disc through 90° via pulleys and a continuous loop of wire. A small disc on the capstan repeated the intended position of the line-side one.

Board signals might look nice protecting your tunnel: remember to supply a nearby hut for the signal keeper.

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[7] 16mm NGM are reminded that the special editions can be downloaded from the members-only area of the web site.

[8] Early railways referred to passing loops as sidings.

Point Indicators
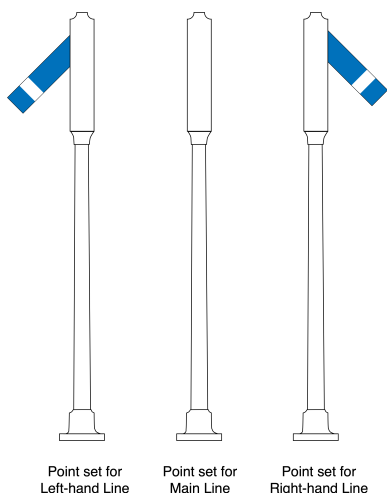
These blue *Indicators* showed the lie of a facing point in, or giving access to, a running line. They were about ten feet high and were worked directly from the point switches. They were manufactured by McKenzie & Holland.

The FR sported some three-position points so those indicators showed three positions. There would have been a lamp on top: Boyd gives the colours as Red   Turnout, and White   Main.

If these interest you, check out the following section of the wonderful *Festpedia*[9] for drawings, a photo, discussion, and dimensions.

https://www.festipedia.org.uk/wiki/Point_indicators

It would be 'going the extra mile' to add these to a FR layout. One would have to be very dedicated!

Point set for
Left-hand Line

Point set for
Main Line

Point set for
Right-hand Line

Post-1877 Semaphore

Supplied by McKenzie and Holland to the FR over a number of years. (The slotted-post was obsolete by the 1870s.) These lovely signals had a renaissance in 2014 with the commissioning of the new signalling at Portmadoc. A model of them is available from Roundhouse Engineering, as are disc signals and capstans. Maybe use these instead of the GWR semaphores on a passing loop as shown in Chapter 1?

The spectacle only held a red glass. When the signal was OFF the white light of the lamp showed. In the 2014 re-signalling at Portmadoc[10] the lamps were cleverly reinvented with LED technology. The spectacle still has only a red glass with a white light, but when OFF the white LED changes to green.

A particular feature of Semaphores is the Finial: these M&H ones were really ornate. The GWR finial used a ball and spike and their practise was to paint the ball the colour of the signal arm (Stop, or Stop over Distant   red; Distant yellow).

A note about the components:

A stranded and galvanised wire rope connected to the operating lever pulls the crank at the bottom of the post; the crank lifts the counter-weight and pushes the 'down-rod' up. This action (as the rod is connected at the spectacle side of the arm spindle) pushes the arm OFF. The weight on the bottom crank counterbalances the weight of the wire run and the spectacle casting is heavier than the arm: together, these features ensure the arm will return to danger.
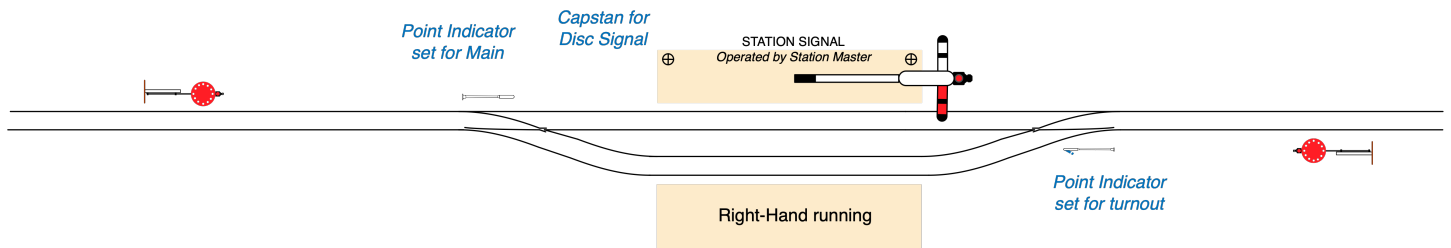
A Festiniog solution to a passing loop and level crossing are given below. Gates were not always fitted with red targets; targets were mandatory only after 1925 and the requirement was not retrospective.
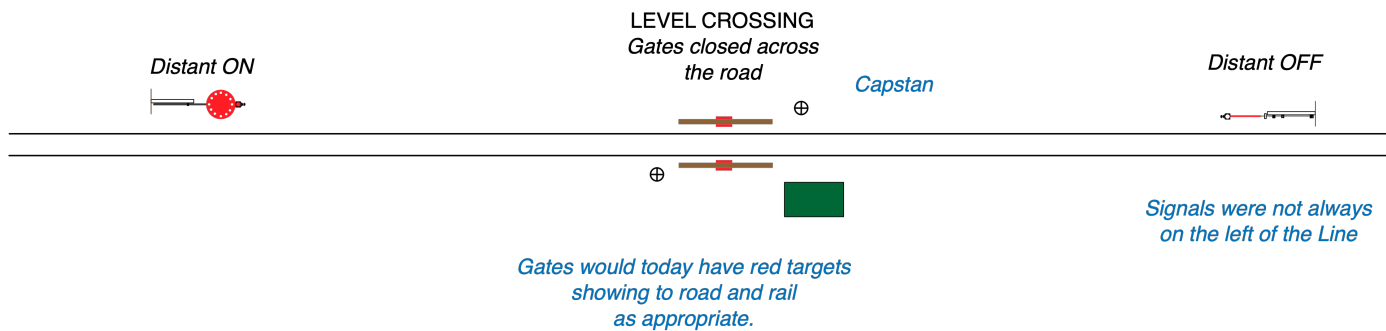
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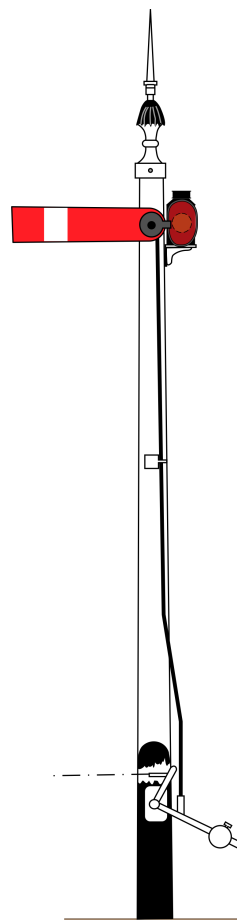
9 The full index is at https://www.festipedia.org.uk/wiki/Signals_contents

10 https://www.festipedia.org.uk/wiki/Harbour_Station_remodelling_and_resignalling_(2007-2014)

A Festiniog style Passing Station

Point Indicator
set for Main

Capstan for
Disc Signal

STATION SIGNAL
Operated by Station Master

Right-Hand running

Point Indicator
set for turnout

A Festiniog style Level Crossing

Distant ON

LEVEL CROSSING
Gates closed across
the road

Capstan

Distant OFF

Gates would today have red targets
showing to road and rail
as appropriate.

Signals were not always
on the left of the Line

The re-signalling at Portmadoc in the process of construction..

This is the re-created 'Trident' signal array on the Cob. The arms all have 'X' on them indicating they are out of use. An LED colour-light signal is showing green: this will be removed when the semaphores are commissioned.
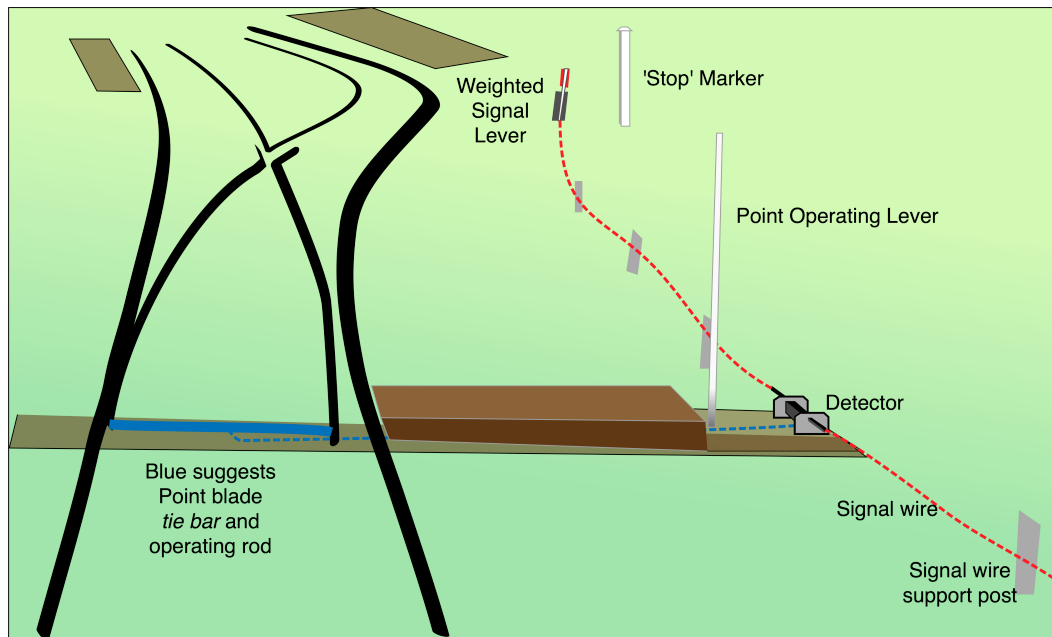
The Isle of Man Railway (IMR)

The IMR (3ft gauge) evolved it's own signalling system. So far as the *look* is concerned, the key differences (as I understand them) are:

- At passing loops the Home signal was worked by a weighted lever or capstan.
- Starting signals were not provided. Instead, a white 'Stop' marker post signified the end of the movement authority from the Home signal.
- Points were worked by a local lever and the Home signal wire passed through a mechanical *detector* which proved the facing point switches were set correctly (left-hand running). The detector provides a basic interlock between the point and the Home signal.
- Distants are not provided at passing loops.

Above is a sketch showing key line-side detail at an IMR passing loop. A photo can be found at Sam's World: The Isle of Man Steam Railway....

The Home signals at passing loops were almost identical to the M&H ones on the Festiniog: they also had a red spectacle for ON and a white light for OFF. A nice photo is available at https://agmtraveller.com/isle-of-man.php

The principal differences being the finial style and the red spectacle which was round rather than a liver shape. It was only a later re-signalling at Douglas that introduced green as the OFF light.

There is a slotted-post signal at Castletown, a photo here

http://www.island-images.co.uk/Rail/2013%20Rail/1303301303.html.

The left-hand sketch is a simplified representation of the Up Peel Line Distant at Douglas. The arm with the 'S'[11] is (unusually) pointing to the right-hand side of the post; it refers to a temporary siding (Boyd[12]). Note the finial different again. Why not design your own? A telegraph insulator next to the finial indicates the Distant was monitored electrically in the signal box.

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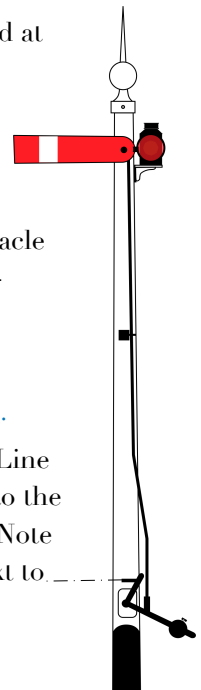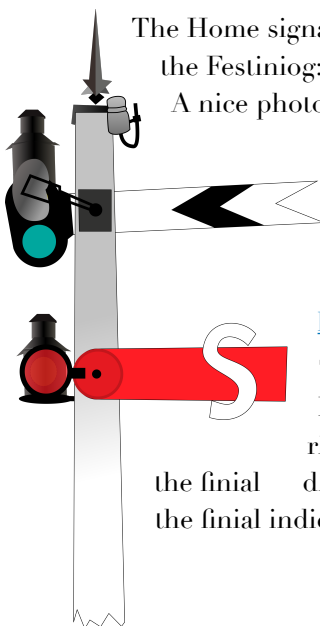
[11] 'S' normally indicates an authority to shunt into the forward block section, but as this arm is beside the Distant the train would already be in the block section.

[12] *The Isle of Man Railway*

Fishy-tales

Lezayre

Signal worked from post. Spectacles for both directions
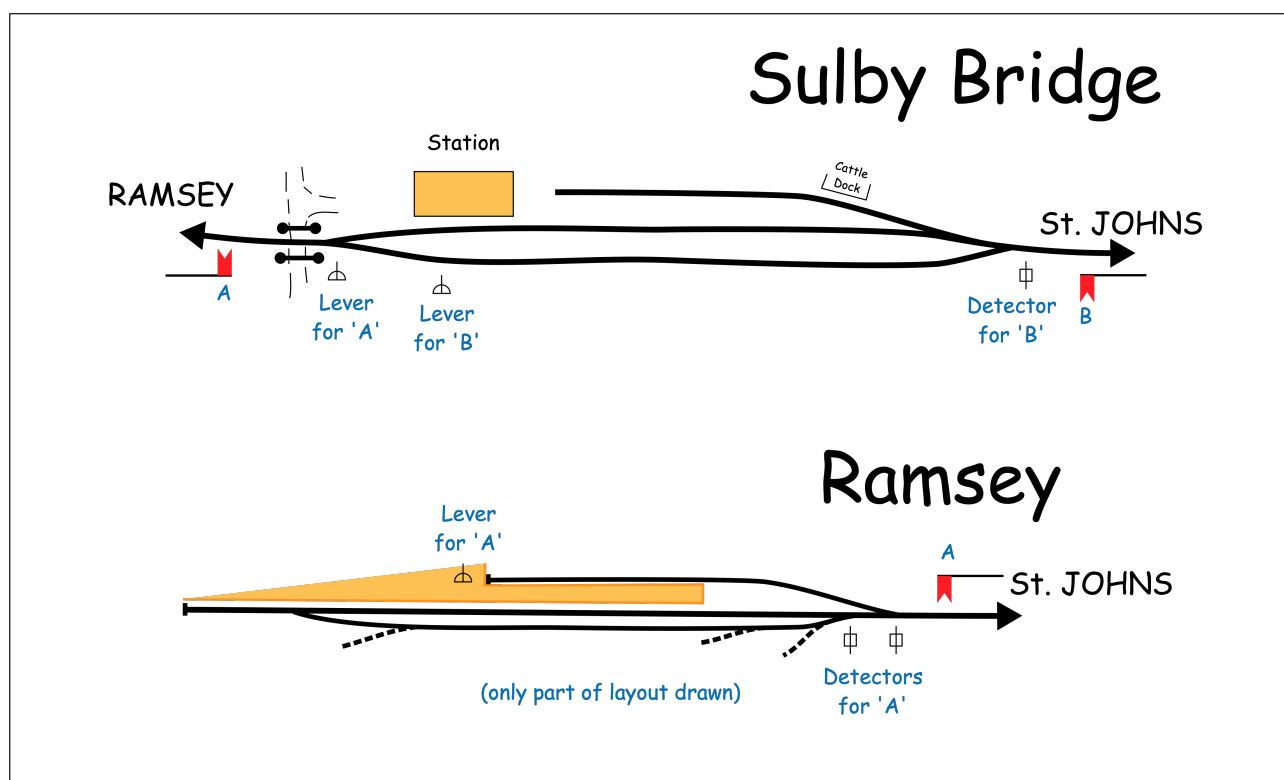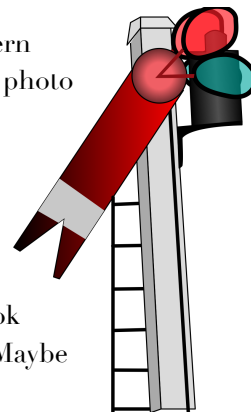
RAMSEY

Station

St. JOHNS

(siding now removed)

Removed after 1951
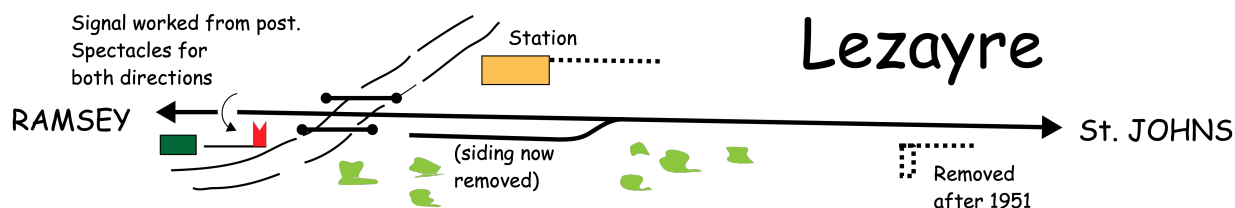
Reproduced above is a sketch from Boyd. It depicts a level crossing on the Manx Northern Railway[13]. A single signal with a fish-tail is protecting the crossing both ways. There is a photo of this at http://www.disused-stations.org.uk/l/lezayre/index.shtml. The note details a duplicate spectacle casting fitted on the opposite side of the arm spindle, and that the signal operation is from the base of the post. Maybe it looked like the sketch here (or maybe there was only a red glass both sides).

To quote Boyd again, "*The signalling of the steam railways and the interpretation of signals differs considerably from that customary on the mainland*" (p 127). This allows the quirky look which you might favour: or just use a normal Stop arm and apply it to both directions. Maybe paint both sides red with a white stripe or white dot.

Sulby Bridge

Station

RAMSEY

Cattle Dock

St. JOHNS

A

Lever for 'A'

Lever for 'B'

Detector for 'B'

B

Ramsey

Lever for 'A'

A

St. JOHNS

(only part of layout drawn)

Detectors for 'A'

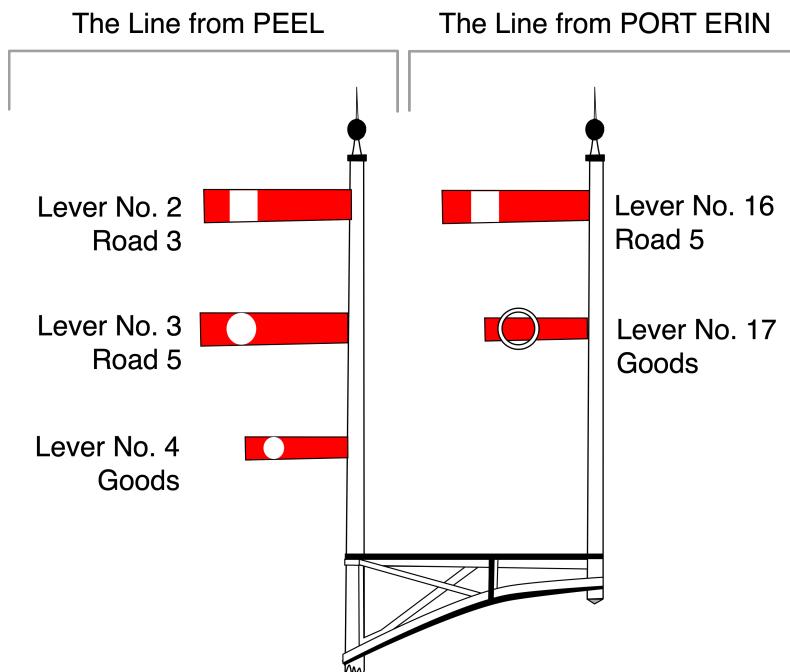Two more examples from the Manx Northern. (The blue annotations are mine, the rest are based upon Boyd.) The use of fish-tailed, red-armed signals here is odd to say the least. Boyd (p130), who describes them as Home signals, concludes that '*the interpretation of a fish-tailed signal was a purely insular one*'. Either way, they are another quirky option!

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[13] subsequently absorbed into the IMR.

Stripes, dots, and Rings

The lower quadrant *Inner Home* signals at Douglas offer an interesting mix of styles. In IMR terms *Road* here directs the train to a platform line. The sketch is extracted from a photo and lever frame information in Boyd. The arms with 'dots' indicate moves from the Peel side of the station to the Port Erin side. (On some early Railways (circa 1860's) red arms with white dots related to the Up line, while white stripes related to the Down line.) Notice how the smaller Goods Line access arms (perhaps 3ft rather than 4ft) also differ from each other.

- I have omitted the spectacle castings and lamps for simplicity.
- The signal posts are of the same height because they apply to two separate single Lines.
- The 'stacking' of signal arms is also of note: we came across this in Chapter 1.

The Line from PEEL   The Line from PORT ERIN

Lever No. 2
Road 3

Lever No. 3
Road 5

Lever No. 4
Goods

Lever No. 16
Road 5

Lever No. 17
Goods

Definitely not narrow gauge! Stacked slotted signals on the GWR broad gauge display line at Didcot. Notice the top arm is longer than the bottom one; notice also the spectacle is red only; the access ladder is to the front. The loco is the re-created 'Fire Fly'.

These signals are two-position types. When OFF the arm falls into the post and the red spectacle moves away from the lamp case.

https://didcotrailwaycentre.org.uk/article.php/20/brunels-broad-gauge-railway

3: Minimal Signalling

Penrhyn

A signal controlled access to the port from the standard-gauge branch. There were no signals here for the narrow-gauge line. A photograph of this signal is found at[14]
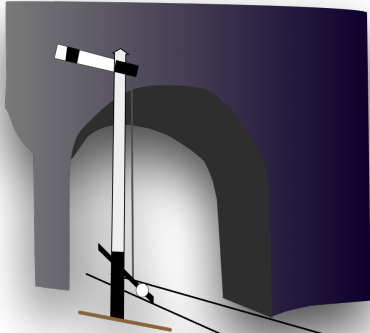
http://www.penmorfa.com/Slate/photos-1960%27s%20page2.htm
 (It's not an upper-quadrant, the spring-loaded back-stop mechanism has worn out, typical of mechanisms that have seen better days.) The signal also appears on the back cover of the 16mm Special *Penrhyn Quarry Railway Modeller's Guide*[15].

As with the Festiniog station signals the arm is not of a 'standard' colour scheme. This is the front of the signal. The rear of the arm was plain white. It does not appear to have been fitted with a lamp.
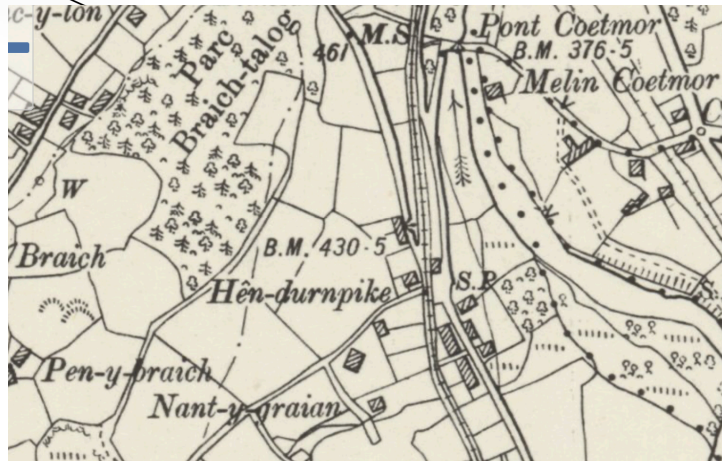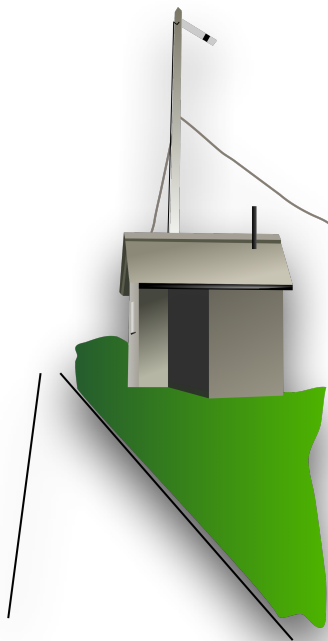
At Hendurnpike (the only level crossing on the narrow-gauge line) a signal, 22ft high and mounted at the rear of the crossing keeper's hut gave indication for both directions. This signal arm is also white but with a black highlight band both sides: photos can be found in the *Modellers Guide*.

The signal is shown on the 1888-1915 OS 6" Mapping[16] (extract above). More recent video and still images show southbound (UP heading for the quarry) trains passing this tall signal OFF having already crossed over both road intersections: so it is clearly used for both directions. The crossing, hut, and single signal would certainly offer scenic interest on a layout.

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[14] I really can't recommend the wonderful *Penmorfa* archive enough.

[15] 16mm members may download from Members' Only pages

[16] Accessed 14/04/2025 at https://maps.nls.uk/geo/explore/side-by-side/#zoom=17.8&lat=53.18761&lon=-4.08170&layers=6&right=11

The Simple Solution

Just provide a figure and a flag! Maybe also some sort of marker indicating the limit of movement authority even if only to ensure passing trains don't foul one another. Use posts as on the IOM or even painted 'kerb-stones' at sleeper level as on railways such as the Talyllyn.

A note about flags:

Two trains approach a passing loop, if the signaller unfurls a green flag which train is it intended for? Certainly we don't want both entering the loops simultaneously, in case one driver misguides their braking. To overcome this dilemma modern flags are coloured on only one side. The rear is black with a thin colour band.

Whether this is too purist or not is for you to decide.

RIGHT: A GWR tubular post Distant fixed at caution and fitted with an oil lamp and bulls-eye lens with a fixed yellow filter inside. (Heathfield Goods Line, near Newton Abbot). Note that the tube is sleeved about a third of the way up to add strength.

The small silver case at the base of the post will hold a battery giving power to the lamp-alight proving circuit[17] feeding back to the signal box.

ABOVE LEFT:

The modern equivalent: retro-reflective Distant board. Notice it is mounted on two posts to resist wind turning forces.

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[17] A bi-metallic strip above the wick would bend and make a contact if the flame was alight.

Bala Lake Railway.

A GWR wooden-post signal at Llanuwchllyn. The top arm is the Starter for the single line and is 3ft (it would have been 4ft in standard gauge days); it is showing signs of wear on the back-stop. The smaller bottom arm is for the Shed Sidings on the left.

A train is entering the station and the Home signal is OFF. Below it is another small arm giving access to the Loop Line.

Llanberis Lake Railway (LLR).

Modern upper-quadrant 3ft low-speed signalling on a tubular post. The lower arm is OFF for the right-hand route. A GWR finial tops it off. There are no visible counterweights   public safety would need them shielded anyway, and possibly unnecessary given a very short wire run and UQ arms.

The FPL is installed outside the track on the right-hand side.

A Ground-frame on the LLR.

Levers are coloured to denote their function:

Yellow   Distant
Red   Stop
Black   Point(s)
Blue   Facing Point Lock
When Distant arms were red the corresponding lever was green not yellow.

4: Further Studies

Subsidiary Sidelines

If stacked arms read from the top, left to right how come the Llanuwchllyn arms reads bottom to left? The answer is the arms are not stacked: the bottom one is offset to the left. By mounting a smaller *subsidiary* arm on a bracket the display can be equated to it's big brother the bracketed junction signal.
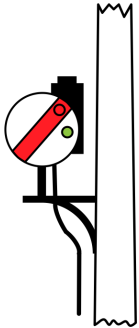
Today, this small arm would be replaced by an *elevated (*or even a *ground) shunting signal*.
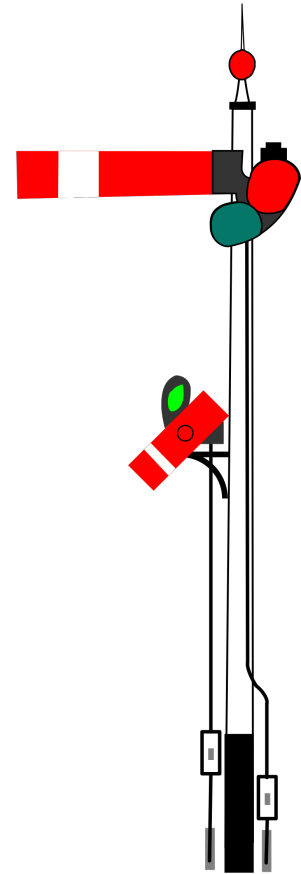
Subsidiary arms are always smaller than running signal ones. They do not need to be read from any distance and are only used for slow-speed moves. If mounted below a main arm, but not offset, then both read to the same destination.
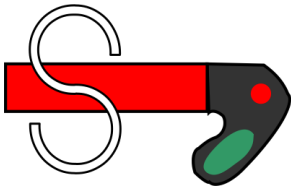
A GWR arm[18] with an S indicates the driver may *shunt-ahead* into the block section for a limited distance for the sole purpose of setting back over points trailing to the normal direction of traffic. The rear is white with no black stripe.

This is the modern version of the subsidiary arm: the illuminated letter is revealed only when the signal is OFF. The rear is white with a black stripe. (There are also *Calling-On* and *Warning* arms but I'm keeping them outside the scope of this Guide.) A subsidiary and main arm must not be OFF at the same time.

S, C or W as required

White light when signal ON
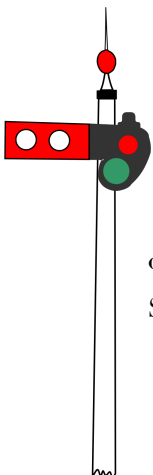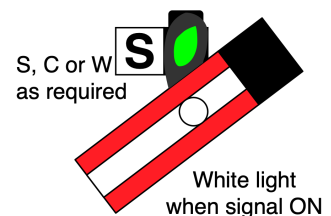
Finally, there is a cornucopia of odd arms dreamt up by different railway concerns: I'll offer just one, the GWR *Backing Signal*. An arm with two holes in it, white to the rear.

Shown on the cover is a 'scissors' subsidiary shunt-ahead arm.

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[18] Already described as 'old patten' in the GWR General Appendix for 1936

Shunt Signals

Shunting signals are for low speed stock and wagon management. They are more likely to be found in complex track layouts or where the train movements are at some distance from the signaller.

In simple branch line locations they might have be dispersed with, reliance being placed on oral instructions and flag movement authorities.

Shunt signals are almost invariably fixed at ground-level. They can take the form of miniature arms, targets, or circular discs with red or yellow bands. If stacked the same rule applies as for other signals: top reads to the left-most route.

RIGHT: A quarter-scale stacked miniature arm shunting signal in the style of the Lancashire and Yorkshire Railway.

LEFT: The (rare) yellow shunt arm at Butterley. Provided the points are *Normal* a move may take place into and out of the *Head Shunt*. If the points are *Reverse* the arm must be OFF before a movement can be made.

These yellow arms have very limited uses and must be clearly visible to the signaller.

It *is* worth noting that some smaller railways use shunting discs as the main signals. That's fine at very low speeds and is certainly a cheaper option than posts and arms. For the *look* the larger arms on posts may suit us better.

LEFT: Signal at Butterley Ground Frame, a Midland Railway pattern lower quadrant signal.

Notice the three lever counterweight mechanism at the base. This is a mechanical 'slot' and ensures the arm will only move to OFF if both the Hammersmith signaller and the Butterley GF operator have reversed their appropriate levers.

ABOVE: Butterley GF, a nice collection for the *look*. It can represent a small signal box with the inevitable *telegraph terminal pole* to the right; oil store and outside loo to the left.

Telegraphs

Would a *pole route* enhance the *look*? Here are a few pointers if you are thinking about it.

Poles were spaced an average of 70 yards apart. Wire (generally bare copper which quickly oxidised and turned green) was slung between lead-less glazed porcelain insulators. On curves it was common practice to site the route on the inside so that any damaged pole fell away from the railway. Similarly, good practice strung the wires on the inside of the insulator: should the binder break the wire dropped onto the wooden arm rather than away from the pole.

A telephone circuit would require two line wires, each station and crossing would have an instrument connected to the same pair of wires (an Omnibus Circuit). An electric train-staff or token system would generally make do with one line wire, the circuit returning via the mass of the Earth (earth return).

The grey poles are 1933 style Hornby; the brown one is not Hornby (possibly continental) but has the look of a pole of the 1870's. The Signal is a 1930's Hornby lattice-post.

Backlights

Just a brief word about backlights as proprietary model signals might provide them. (Unless we are fine-scale modellers we don't really need backlights.)
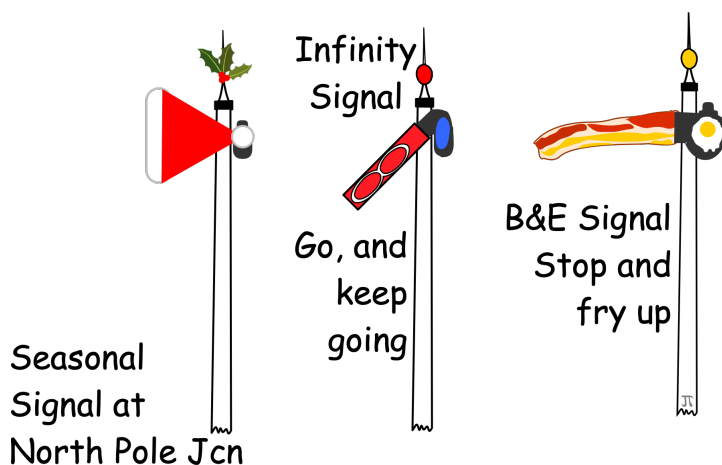
Signallers particularly need to know if the arm has returned ON when the lever is replace to normal in the *lever-frame*. At night if the front can be seen then the aspect will change; if solely the rear, a small white light is visible only when the arm is ON; if the signal is not at all visible some sort of electrical repeater is provided.

This all sounds simple enough but railways were a long-time settling on this solution. The Festiniog M&H semaphores are a good example: they used green, blank and white backlight indications. The Roundhouse kit (if you wanted to add their backlight) explains it, as does Boyd[19].

Painting Specifications

This is a very generalised suggestion based on pre-1925 GWR: railway companies varied greatly in their practices; and indeed different Districts on the GWR had their own fancies. For the colours I have given the most recent specifications.

Wooden signal posts	White with black 4ft to the base.
Ladders	Black (with white 4ft to the base after 1915)
Spectacle housing, lamps, brackets and staging	Black
Rods, weights, wheels and cranks	Black, but weights often white.
Finials	This Guide shows GWR practice.
Arms	As shown in this Guide. Accurate colours (as currently specified) below
Red	BS 4800-2011 shade 04-E-53: Poppy
Yellow (from 1924 in London area, from 1927 elsewhere)	BS 4800-2011 shade 08-E-51: Golden yellow
Black	BS 4800-2011 shade 00-E-53: Black
White	BS 4800-2011 shade 00-E-55: White

Infinity Signal

Go, and keep going

B&E Signal Stop and fry up

Seasonal Signal at North Pole Jcn

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[19] *The Festiniog Railway* page 178

Dimensions

There are so many variations that I offer just one guide to dimensioning and painting wooden arms. Referencing 4ft GWR main (running) arms this detail was given in a Departmental Painting Instruction dated 1907[20].

Arms were originally wood, painted and varnished, but pressed-steel and enamelling took over from the 1920's. Wooden posts were invariably tapered.

A tapered post I have at 350mm in length is 12mm square at the base and 9.5mm square at the top. The Roundhouse M&H post at 222mm is 11.5mm at the base and 5.6mm at the top. If I had to make one from scratch it would probably not taper!
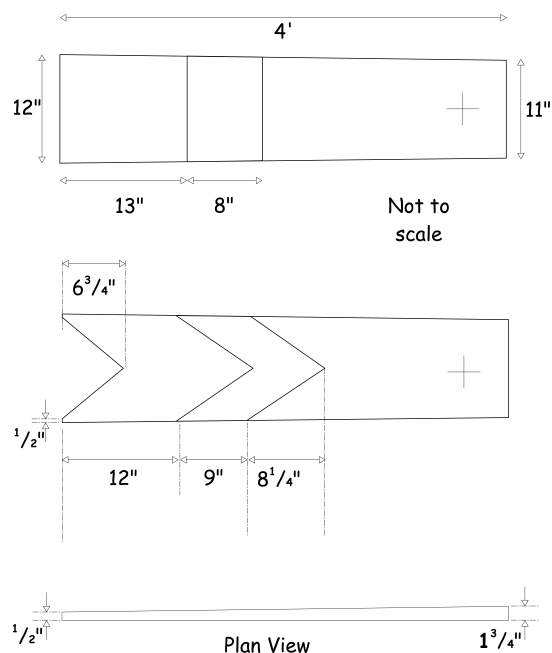
Here is a suggested spacing for 4ft arms on wooden posts (the short posts are named *dolls*).

We have looked only at wooden posts (generally pitch pine) but rolled tubular steel, reinforced concrete, old bullhead rail, and lattice posts were all to be found on Britain's railways.
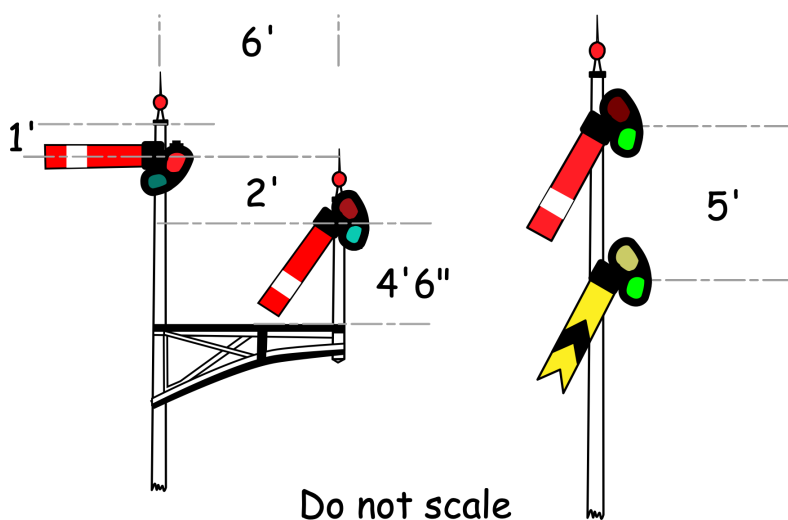
[20] Accessed from Appendix 3 *GWR Signalling Practice* by D. J. Smith

Postscript

There were some significant legal changes over the decades which affected even the Festiniog (as a public carrier). The Regulation of Railways Act of 1889 consigned any last vestiges of time-interval working to the bin of history and made safe signalling systems mandatory (and costly). The Light Railways Act of 1896 eased the burden in specific cases   granted to the Festiniog in January 1923   and the Colonel Stevens era swept away many fixed signals. I guess it depends on how much of a specific *look* you want, need, fancy.

And, at the end of this signalling story, don't forget how nice a *look* is made by the tail-lamp, or a 'last vehicle' board. The train is complete and so is our journey. Have fun!

I've enjoyed researching and writing this Guide and I hope you enjoy reading it. I've constantly had to remind myself that I'm writing neither an historical article nor a technical justification for particular practices. I hope I've included enough information to enable you to site some meaningful signals on your railway (should you choose to). I also trust you will have seen the inventiveness and logic of engineers when it came to controlling trains in small self-enclosed railway systems. Finally I hope you will see that lovely though signals are, they are only a means to an end.

Resource List

I've given the web addresses used in the text and mentioned the books I have quoted but here are some fuller research details of the principal sources if they might be of interest:

Books

Boyd J. I. C. (1965) *The Festiniog Railway Volume I 1800-1889*. 3rd (Revised) Edition. The Oakwood Press.

Boyd J. I. C. (1962) *The Festiniog Railway Volume II 1890-1962*. 2nd (Revised) Edition The Oakwood Press.

(Volume I has pages up to 194; Volume II commences at 201.) I recommend not using the earlier editions: much was learned after the commencement of the preservation movement.

Boyd J.I.C. (1962) *The Isle of Man Railway* The Oakwood Press.

Kitchenside G. & Williams A. (2008). *Two Centuries of Railway Signalling*. 2nd (Revised) Edition. Oxford Publishing Co.

Lee Charles E. (1972) *The Penrhyn Railway*. Welsh Highland Light Railway (1964) Ltd.

Macnab Ian (1945) *A History and Description of the Isle of Man Railway*. Greenlake.

Sinn J. N. (1978) *Great Western Way*. The Historical Model Railway Society.

Smith David J. (2019) *GWR Signalling Practice*. Great Western Study Group in association with The Wider View

Turner Susan (1975) *The Padarn and Penrhyn Railways*. David and Charles.

Vaughan A. (1973) *A Pictorial Record of Great Western Signalling.* (Reprint 1975). Oxford Publishing Co.

DVD

Marsh John Ed. (2012) *Penrhyn Quarry Railway Archive*. CFVS Volume 67.