

Tyseley (Warwick Road) Signal Box



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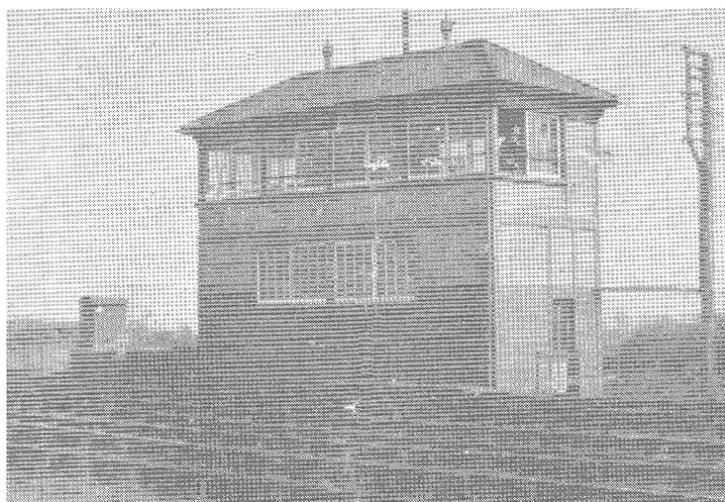
The Signal Box now called Tyseley (Warwick Road) is a Great Western Railway standard type 28B design. The prefix '2' was used to indicate that the signal box is of timber construction and the type '8' was a gable roof design introduced in about 1900 and used for many years. The Signal Box incorporated the iconic 3 up, 2 down window pane arrangement, which was designed to give the operator a clear view. The suffix 'B' indicates that the signal box had horizontal timber boarding and that there were no finals on the ends of the gable roof.

This Signal Box was previously located at Holesmouth Junction on the Avonmouth & Severn Tunnel Railway. It was dismantled and moved to Tyseley in February 1988, after being closed by British Railways on 22nd January 1988.

History of Holesmouth Junction and its Signal Boxes

In 1902 when the Port of Bristol Authority started construction on their new Royal Edward Dock, the proposed eastern arm of the new dock cut across the route of the Avonmouth & Severn Tunnel Railway. This existing railway therefore needed to be diverted between Gloucester Road Crossing and Holesmouth and a new one and half miles long double track railway line was planned between these two locations. The contractors built a small (13' x 10') eleven lever timber cabin at Holesmouth to control a new junction to their sidings and this cabin was opened on 26th August 1902. Although the junction at Holesmouth had originally only provided access to the contractor's sidings, it became the point of connection to the new diversion line. Therefore when this new diversion line was opened on 22nd November 1903, the cabin was retained to control access to the remaining single track section of the Avonmouth & Severn Tunnel Railway.

The cabin closed on 14th July 1908, but with completion of the Royal Edward Dock (officially opened on 29th April 1910), a new signal box named 'Holesmouth Junction Signal Box' was opened on Tuesday 10th May 1910. The cast iron nameplates for this signal box had been ordered on 21st March 1910 (Order No. 263). The opening of the signal box also coincided with the opening of the Avonmouth & Filton Railway, which provided a direct route from the Great Western Railway's system to the docks. The new railway line was initially single track with a speed limit of 40mph. Over the last 500 yards the new line ran parallel with the Avonmouth & Severn Tunnel Railway and at Holesmouth Junction facing crossovers were provided between these two railways. There was also a single track facing connection to the exchange sidings, which were being developed adjacent to the new Royal Edward Dock.



Holesmouth Junction Signal Box was a type 27C design of timber construction with a hipped tiled roof. On the roof ridge were two ventilators. The Signal Box was twenty-nine feet long by eleven feet wide with an internal staircase leading to an operating floor eleven feet above rail level. Like the later signal box, the operating floor windows had the iconic three up, two down window panes. The signal box housed a Great Western vertical tappet, three bar locking frame with forty-six levers at four inch centres. The signal box was equipped with a stove for heating the box in cold weather. This was located towards the back of the operating floor with a stove pipe chimney above.

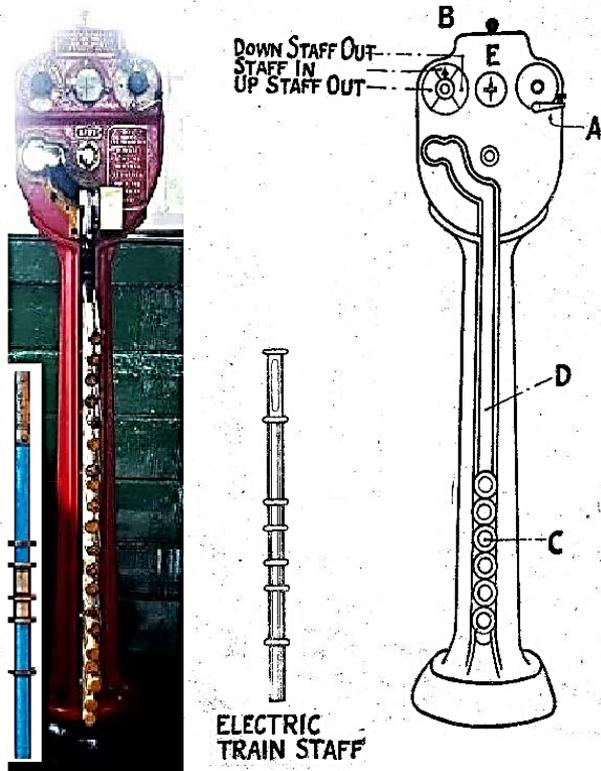
In the July 1910 Service Time Table (STT) no fixed operational hours are given for Holesmouth Junction Signal Box, but it is identified as being 'closed after every day's train service was completed'. There were special instructions for trains entering the exchange sidings for the Royal Edward Dock and the two single lines were operated by methods that prevented more than one train on each section of the track at the same time. This involved the permitted train Driver being given a Tablet (or Staff) from a special instrument in the Signal Box. This authorised them to access the relevant line and the instrument would not release another Tablet (or Staff) for that line until the released one was

given up by the Driver at the other end of the section. There were two single lines originating from Holesmouth Junction at this time:

- 1) Holesmouth Junction to Filton West Junction - worked by Train Tablet
- 2) Holesmouth Junction to Piling Low Level - worked by Electric Train Staff (see description below)

**ELECTRIC TRAIN TOKEN BLOCK REGULATIONS
ELECTRIC TRAIN STAFF.**

The diagram shown below represents the Electric Staff Instrument when it is in its normal position, that is, when there is no train in the Section :-



DESCRIPTION OF ELECTRIC TRAIN STAFF APPARATUS.

The Electric Train Staff apparatus consists essentially of :-

- A Key (A). For transmitting bell signals to the distant token station or for sending a current to release a Staff.
- A pointer (B). For indicating to the distant station when a Staff has been withdrawn, and for indicating to each Signalman the state of the block section at any time. A switch operated by this pointer also works the keyless disc at an intermediate level crossing where such a disc is provided.
- A number of Staffs (C).
- A magazine for receiving Staffs (D).
- An indicator (E). For indicating all outgoing and incoming signals sent on the plunger from either end of the section.

Each instrument is provided with a separate bell. To work a single line between stations "A" and "B" on this system requires an instrument at "A" and another at "B," and the single line between the two stations is called a "Token Section." The two instruments for the section are furnished with a number of Staffs. Only one of these Staffs can be out of the instruments at any time, except when taken out by the Telegraph Lineman as shown in Electric Token Block Regulations 23, 25 and 35. A Staff can be replaced in either instrument at any time without any communication being made with the opposite end of the section. The Staffs for each section controlled from any one token station differ essentially, as do also the Staff instruments, so that a signalman or other person in charge of the instruments who has more than one set of Staffs to deal with cannot by mistake place a staff in the wrong instrument.

Outline of Working.

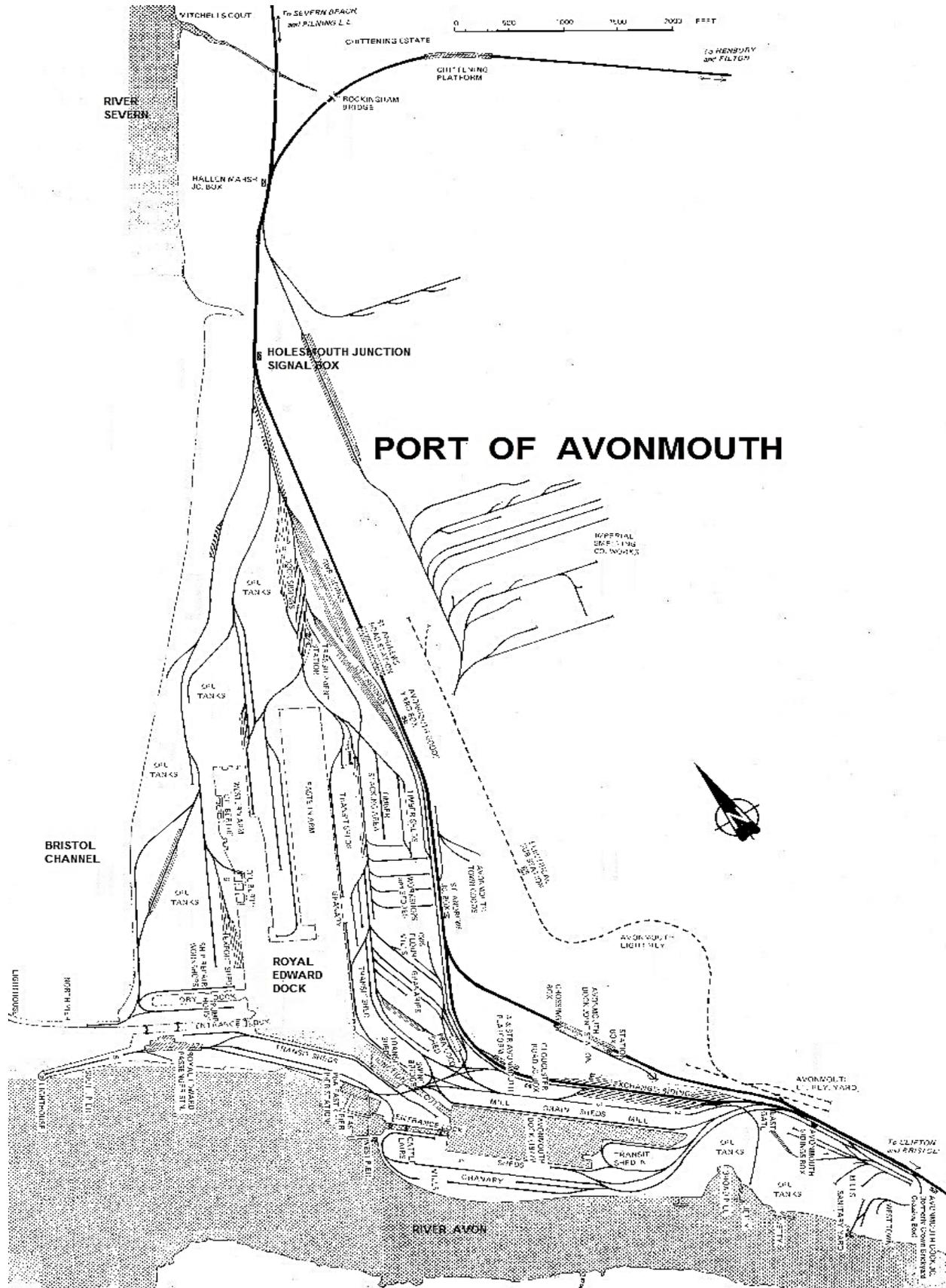
- "A" and "B" represent two token stations.
 - "A" sends "Call Attention."
 - "B" returns "Call Attention."
 - "A" sends "Is Line Clear?"
 - "B" returns "Line Clear" and when pressing the Key down for the last time keeps it down and watches the needle until it regains the upright position, when he releases the Key.
 - "A" takes out Staff, which will cause the Bell in his Instrument to ring once, which must NOT be understood as a Signal coming from "B."
 - "A" turns left-hand Indicator to "Up Staff out," or "Down Staff out," as the case may be, pressing it hard down for a moment or two when doing so, until the Needle regains the upright position.
 - "B" turns left-hand Indicator to "Up Staff out," or "Down Staff out," as the case may be.
 - "A" sends "Train entering Section."
 - "B" returns "Train entering Section."
 - "B" on arrival of Train places Staff in Instrument, and sends "Train out of Section," and turns left-hand Indicator to "Staff in."
 - "A" returns "Train out of Section," and turns left-hand Indicator to "Staff in."
- When taking out a Staff from the Instrument, or replacing one in the Instrument, it is important that it should not be done roughly. When taking a Staff out it is necessary that it should be kept horizontal, and this may best be ensured by placing the thumbs upon the projections in front, and at the back of the instrument. The Staff will be much more readily released if, when the thumbs are placed on the projections, the Staff is turned half-way round away from the Signalman. Under no circumstances may any unauthorised person be allowed to touch the Instruments.

Changes at Holesmouth Junction due to the Henbury Project (1917)

Significant changes occurred at Holesmouth Junction as a result of the First World War, when work was started on the construction of what was to be the second largest munitions factory in the UK (The Henbury Project). To provide more capacity for the anticipated rail traffic to this factory, an estimated £192,000 was to be spent on improving the railway infrastructure, including the doubling of the Avonmouth & Filton Railway using second-hand materials. This work was completed by 11th February 1917 allowing the single line tablet instrument in Holesmouth Junction Signal Box to be replaced with standard block instruments. The facing crossovers at Holesmouth Junction were also dispensed with on Sunday 13th May 1917. Reflecting the increased importance of the railway lines at Holesmouth Junction remote detonator placing equipment was added to both main lines, operated from the Signal Box by lever 5 (up line) and lever 33 (down line). The connection to the Bristol Port Authority's Sidings adjacent to the Royal Edward Dock became a double track arrangement with a facing point on the Down line (locked in place by lever 27). The additional point-work and signalling required the frame in Holesmouth Junction Signal Box to be extended with a new lever (lever 0) being added to the left hand end of the frame. In June 1917 however, the Henbury munitions factory project was cancelled by the Government. The US had entered the war on 6th April 1917 and it was decided that the munitions required should be imported. The Ministry of Munitions constructed other works close to Holesmouth including; a picric acid (a nitrite explosive) factory and an extensive zinc smelting works (this produced sulphuric acid as a by-product, which was the main ingredient of mustard gas). These works were initially operated by the government owned National Smelting Company Ltd, but by 1929 had been purchased by the Imperial Smelting Corporation.

Holesmouth Junction Signal Box controlled the northern exit point from the Port of Avonmouth, which had now become the main route into and out of the port. In 1919, the Signal Box was open continuously from 6:10am on Monday to 5:50pm on Sunday. Both regular and special freight trains used the junction and this later group included the 'run as required' Special Banana Trains from the Transit 'N' Shed in the Old Dock to London and the Midlands. These used steam heated wagons to ripen the banana's enroute and were run at express passenger train speeds to

stop the fruit perishing. The Port of Avonmouth also became a major port for the importation of fuel. Anglo American Oil Company (a subsidiary of Standard Oil, later ESSO) had private sidings there in 1904. By 1911, the timber pond, where imported timber had been stored, was converted for the use by Anglo Mexican Petroleum Products (acquired by Shell Transport & Trading Co. in 1919) with 27 fuel holding tanks constructed on the north-west quay. The Royal Edward Dock was subsequently extended, with the construction of the dock's Western Arm built over the timber pond. This was completed in 1923 as an oil dock with six dedicated berths for unloading tankers. More fuel holding tanks were constructed adjacent to the new dock and by 1939, the rail siding accommodation in the docks could hold 350 railway tank wagons.



Two photographs from December 1983 show how Holesmouth Junction Signal Box had started to deteriorate. It was closed by British Railways on Friday 22nd January 1988 with the remaining signals and switches transferred to remote control from the neighbouring St Andrews Junction Signal Box. The original slate tile roof and ridge ventilators had gone, replaced with bitumastic felt over wooden boards. The stove pipe chimney is just visible. Crossing the railway track behind the signal box is one of the oil pipelines from the dock.



Holesmouth Signal Box dismantled (1988)

In 1988, the Birmingham Railway Museum at Tyseley recognised that it needed a ground frame to control the switches (points) and signals on their proposed demonstration line. This line was being built into the new Warwick Road terminus platforms. After looking at a number of potential buildings, it was decided to purchase the redundant Holesmouth Junction Signal Box from British Railways. At the time Holesmouth Junction Signal Box had twenty-seven working levers in the frame and some of the locking arrangements had been removed. British Railways also wanted to retain the two detonator levers and all the instruments, but most of signalling equipment leading to the outside cranks was available, plus the Signal Box cast iron nameplate. RM Douglas Construction Ltd carried out the dismantlement of the Signal Box over the week ending 28th February 1988. Some of the missing locking components were obtained from the neighbouring Hallem Marsh Signal Box, which was being decommissioned at the same time. This was also the source of several signals and some external signalling equipment. Loaded on a lorry for transit to Birmingham, it was estimated that the signal box, frame and recovered material weighed three tons.

British Railways had required everything to be removed to ground level, so the opportunity was taken to record the foundation details while on site. This was found to be constructed of nine parallel 10 foot, 11 inch long rectangular section joists (RSJs) 6 inch by 5 inch, at 5 foot 2 inch centre spacings, supported by a 2 foot wide concrete beam on the ground at the front (rail side) and a timber grillage at the rear.

The four photographs below show the Signal Box and members of the RM Douglas gang during the dismantlement.

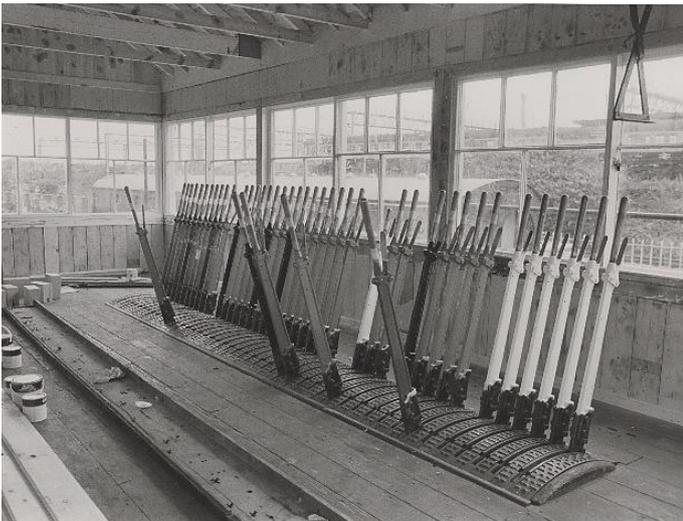




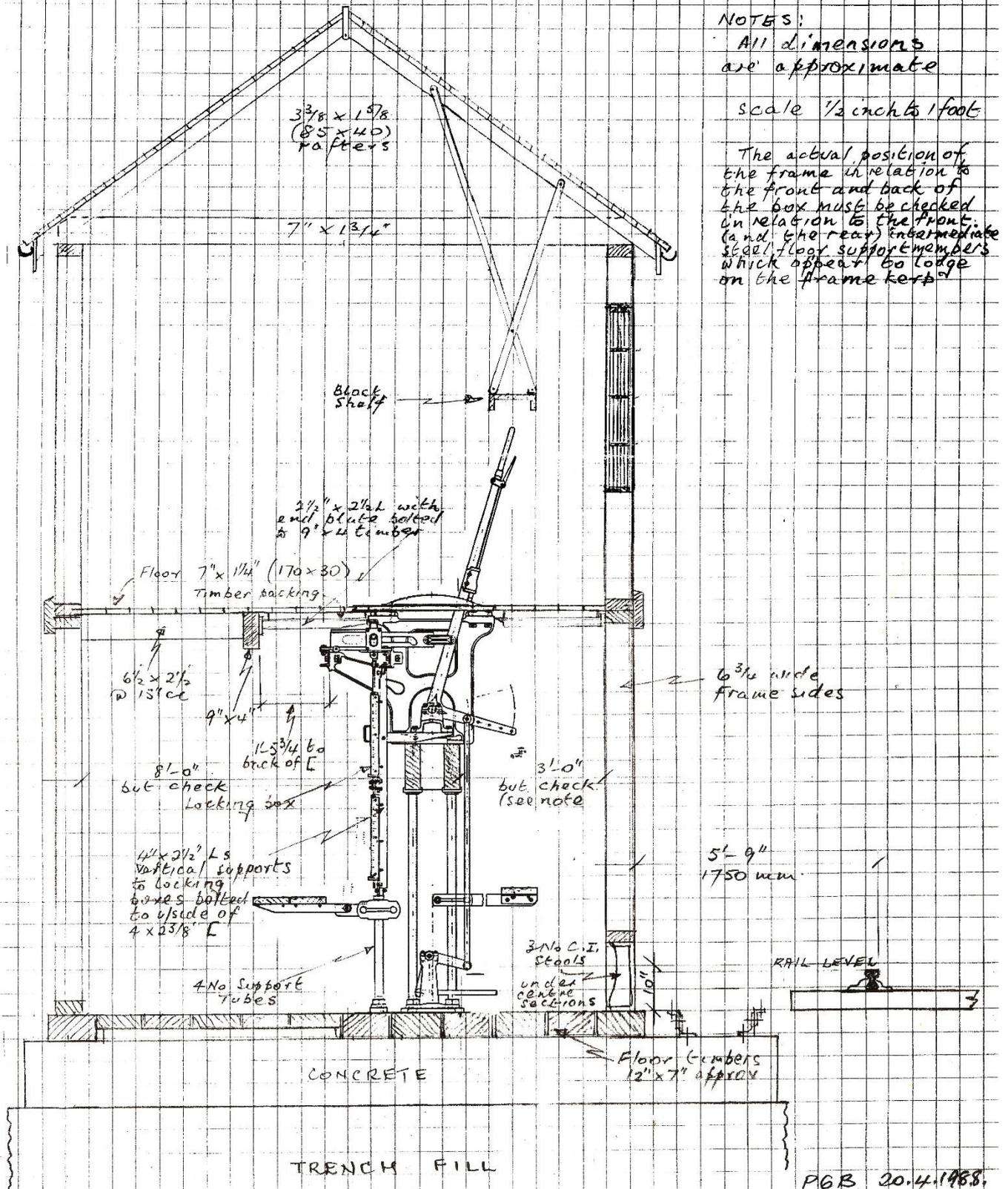
Holesmouth Junction Signal Box re-erected at Tyseley

At Tyseley the Signal Box was re-erected on a new concrete slab foundation, instead of the original timber bearers and RSJ's. Unfortunately one of the main longitudinal iron castings of the lever frame had broken while it was being dismantled. The frame was therefore taken to Metalock (Birmingham) Ltd of Halesowen, where three fractures in the cast iron were repaired and plated over to give extra strength. This was an intricate job because it was essential that the correct dimensions were maintained to ensure smooth operation of the levers.

Mr Peter Boosie from RM Douglas carried out the Civil engineering design and supervised much of the Signal Box installation. The photographs below show the signal box in the process of being re-built at Tyseley.



TYSELEY WARWICK ROAD SIGNAL BOX
 formerly
 HOLESMOUTH JUNCTION SIGNAL BOX
 TYPICAL CROSS SECTION



NOTES:

All dimensions are approximate

scale 1/2 inches to 1 foot

The actual position of the frame in relation to the front and back of the box must be checked in relation to the front (and the rear) intermediate steel floor support members which appear to lodge on the frame kerb

PGB 20.4.1983.

Mr Peter Boosie drew the above sketch, showing a cross section of the Tyseley Signal Box. See how the lever frame, with its mechanical locking bar arrangement below, dominates the signal box. Although the frame at Tyseley has forty-six levers installed (note, no additional lever 0), only twenty-nine levers are currently operational.

The design of the Signalling installation was undertaken by Mr John Madeley, who had recently retired from British Railways (Western Region) Signal & Telegraph (S&T) Department. It was arranged for three signalling personnel (T Hodgson, Nigel Bellamey and Ken Evans) to be granted three weeks leave of absence from British Railways to help install the signalling locking in the Tyseley Signal Box. Interlocking is explained in the following extract from the Great Western Railways - Course of Instruction for Safe Working of Railways:

INTERLOCKING.

Locking Frame.—Levers operating signals and points brought together into signal box in a "Locking Frame." Levers coloured as follows :

- Distant Signals Yellow.
- Stop Signals Red.
- Switches Black.
- Facing Point Locks Blue.
- Spare Levers White.
- Detonator Placer Machines White with black bands.

Position of levers in frame corresponds with lay-out of Station or Yard. Underneath number on lever are smaller figures called "leads," which represent the numbers of the levers which must be pulled over before locking on that particular lever can be released. Levers kept in position by spring catch in notch.

Interlocking.—Means that levers obstruct or free the movements of one another in such a manner as to ensure the correct working of points and signals, and prevent the exhibition of conflicting signals.

Each lever is provided with a "tappet" or "tail-piece" which is attached to it, and moves backward and forward with the lever. Running at right angles to this tappet, and close to it, either under or above, are the Lock Bars.

These bars in the smaller frames are provided with studs or wedge-shape pieces, fitted in such a manner as to impede the movement of the tappets when the levers to which the tappets are attached should be locked, but the tappets can release themselves from the studs and push the bar sideways when other studs have been released by the movement of other levers.

Locking Principles.

1. Stop Signals, when reversed, lock points in advance worked from same box.
2. Points, when reversed, lock Stop Signals to rear of them worked from the same box.
3. Stop Signals, when reversed, in advance of points lock such points in either position.
4. Discs for one direction and Starting Signals for contrary direction lock one another.
5. Discs for conflicting movements over the same points lock one another.
6. Points lock other points, which would allow of conflicting movements, to the front or rear in between Stop Signals.

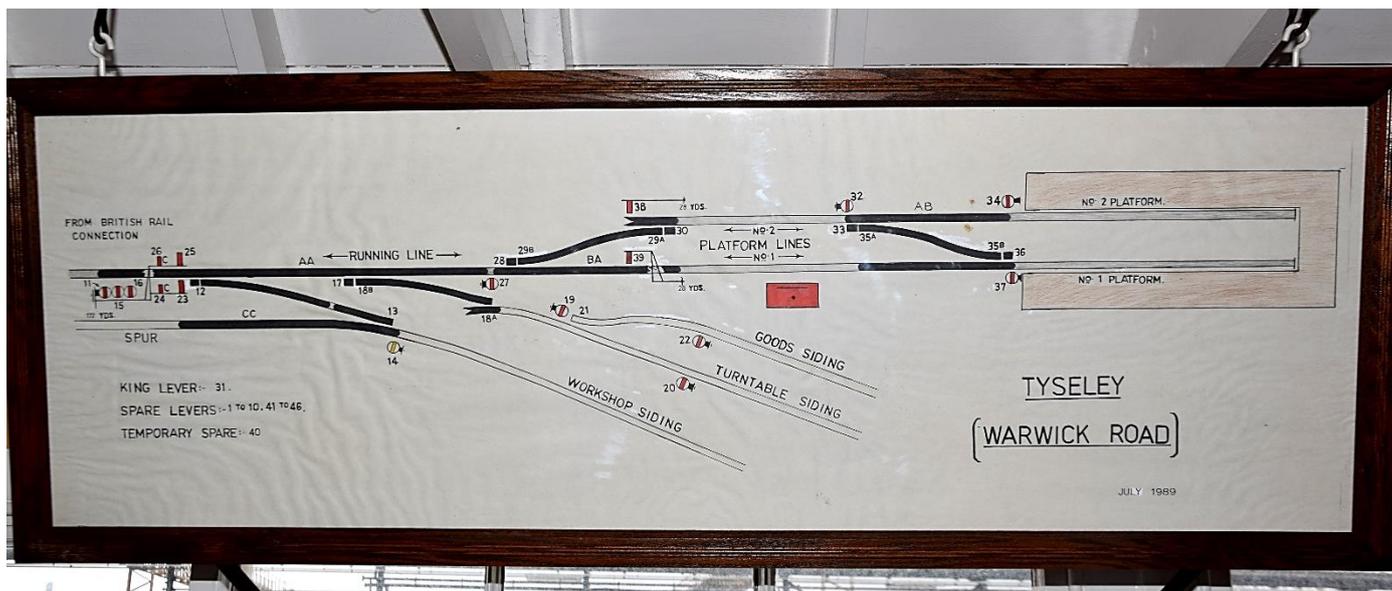
Locking at Single Line Crossing Stations so arranged that Up and Down Home Signals cannot be at "All right" at same time.

Volunteers assisted with the Tyseley Signalling project; painting the levers and installing signalling equipment. After the installation was completed several volunteers trained as Signalmen. The photograph below shows Trevor Hollis operating in the Signal Box. In recent years volunteers have also undertaken repairs and painted the windows and woodwork of the Signal Box.



On the completion of the new Platforms, Track and Signalling Installation at the Birmingham Railway Museum, the site was inspected by Major P Olver from the Railway Inspectorate Department of Transport. This occurred on Monday 14th August 1989. He tested the points and interlocking and wrote to the Museum on 18th October 1989 confirming the works had been well carried out, but that some necessary action was required to rectify three areas of concern. These were addressed and Major Olver subsequently wrote to confirm that he was satisfied the new works were satisfactory on Wednesday 6th December 1989.

Inside Tyseley (Warwick Road) Signal Box



The first floor of a Signal box is called the operating floor, from here the signalman has a good view of the track which he controls. In front of the window are the levers (from the original 1910 signal box) that operate the switches (points) and signals. Above the levers hangs the Signal Diagram showing the track layout. Each switch (point) and signal has a number against it and this relates to the number on the lever. The lever's position in the frame corresponds with the track layout and they are numbered sequentially from left to right. Where pairs of switches always operate together (i.e. switches either side of a crossover or switches to sidings with catch points) these can both be operated by a single lever. The signal diagram is annotated with a suffix A or B in these circumstances.

On the lever handles is a label with a series of numbers. These are called the 'Leads' as they are a list of the other levers that must be operated before that particular lever is released by the locking arrangement. Spare levers are painted white and are positioned at either end of the frame.

The trackwork on the Signal Diagram is coloured either Black or White. The black trackwork indicates the presence of Track Circuit detection on this section. The Track Circuit equipment energises an insulated section of rail with a low voltage. When rolling stock or a locomotive is present on this section an electric circuit is completed and the resulting current operates an instrument on the Shelf above the levers. The Track Circuit instrument can act as both; as indicator for the Signalman, and a safety feature by locking other levers to prevent switches (points) or signals being operated. There are four Track Circuits in operation at Tyseley:

Track Circuit Name	Route
AA	Main Running Line
AB	Platform Crossover
BA	Platform Connection
CC	Workshop Siding Connection

Lever colours, Switches (points) and Signals

Switches (points) are operated by the black levers in the Signal Box. These levers mechanically move steel rods that run alongside the trackwork to the switch, where they are connected to the stretcher bar that holds the moving portion of the switch. If the switch is some distance from the Signal Box (or there is insufficient room for the rodding, as was the case at Snow Hill Station in Birmingham), an electric point motor positioned next to the switch can be energised by the lever to operate the switch. Redundant signalling equipment (including two electric point machines) was purchased from British Railways (Shrewsbury Depot), while other equipment including six facing point lock and detectors were purchased direct from Westinghouse Signals.

Railways try to avoid facing points as they can be dangerous if traversed when not correctly aligned, but it is not always possible to avoid facing points at junctions or on single track lines. On railways where passengers are carried,

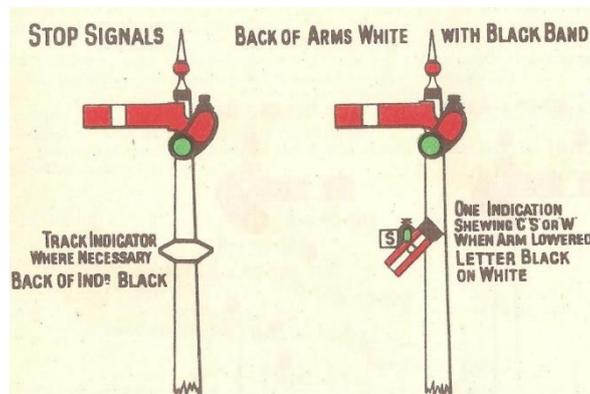
the Ministry of Transport require facing points to be fitted with locks and locking bars with detectors to ensure that the points stay correctly aligned. Where these locking bars are operated by an independently lever, this is painted blue.



There are both semaphore signals and ground disc signals installed at Tyseley. The semaphore signals are normally operated by a wire from the Signal Box to the Signal post where a weight is connected to the Signal Semaphore arm. Screw adjusters provided in the Signal Box can be used to tighten or slacken long signal wires. Arm and lamp repeater instruments are provided on the shelf in the Signal Box for signals that are out of sight.

At Tyseley the lower quadrant design of semaphore signal arm has been installed as that was the type favoured by the Great Western Railway. Normally these semaphore signal arms reside in the horizontal position, but when the lever is pulled in the signal box they are lowered to indicate that the line is clear. There are three main types of semaphore signals:

- 1) Yellow levers operate Distant Signals. The semaphore arm of a Distant Signal has a forked end. The front of the semaphore arm is painted yellow with a black chevron. An illuminated two colour spectacle glass (green / yellow) is attached to and moves with, the semaphore arm. A Distant Signal at caution (horizontal semaphore arm) gives advance warning to locomotive drivers that the next Stop Signal is likely to be in the Danger position. At some locations, such as near level crossings, Fixed Distant Signals were provided as these should always be approached with caution. As Tyseley is a relatively small site there are no Distant Signals.
- 2) Red levers operate Stop Signals, which are sometimes called Home or Starting signals depending on their location. The front of semaphore arms of Stop Signals are painted red with a white band. A Stop Signal at Danger (i.e. horizontal semaphore arm) requires the locomotive to stop his train before the signal.
- 3) Red levers also operate Subsidiary Signals, which can be found on the same signal posts as Stop Signals. These are positioned below the Stop Signal and have a shorter semaphore arm which is painted with red and white strips. There is only a single green light which can be seen when semaphore arm is lowered. Lowering the semaphore arm also reveals a letter C (Calling-on), S (Shunt-ahead) or W (Warning). These subsidiary signals are used by Signalmen to allow drivers to draw forward with caution and pass the associated Stop Signal at Danger. The signal will be at danger because either a train is on the section of line ahead or the switches are set for another route, but it might be necessary to allow a locomotive to draw forward to facilitate shunting or to draw a second train into a station.



Ground disc signals are used instead of semaphore signals to control shunting movements over cross-overs or into and out-off sidings. These movements take place at relatively slow speeds, so a semaphore signal is not necessary, but ground disc signals have the same function as Stop semaphore signals, so in the signal box they are operated by red levers.



On the shelf above the levers are several instruments, including the four Track Circuit indicators, Release Plungers, several Signal Repeaters and an Occupation-Key instrument.

The Signal repeaters are used to indicate the position of those signal arms that are difficult to see from the Signal Box. The position of the signal arm is monitored and replicated in the instrument irrespective of the position of the controlling lever.



Occupation-Key instruments were introduced by the Great Western Railway to work a system called the Economic System of Permanent Way Maintenance on single lines. An Occupation-Key instrument is provided for each specified section of track and this instrument is provided with a single key. Withdrawal of the key inhibits the issue of electric train staffs (or tablets) for that specified section of track. This meant that while in possession of the key, the permanent way staff could be sure that no locomotives would be allowed to use that section of track. When the permanent way staff's work was completed the key would be returned to the instrument, to allow normal working to be resumed. Withdrawal of the key from the Occupation-Key Instrument at Tyseley inhibits the operation of all the levers in the Signal Box.



One final piece of safety apparatus that deserves a mention is the Lever Collar. When a train is detained or an obstruction identified on a section of railway track which is not monitored by Track Circuit apparatus, this is a potential danger. In these circumstances the Signaller must place a Lever Collar on the controlling signal lever as a reminder that there is an obstruction present. This Lever Collar must not be removed until the obstruction is removed.

We hope you have found the information here interesting.

References:

Photographs, Drawings and Correspondence held in the Tyseley Archive

Service Time Table No.4 Bristol (Great Western Railway) various years from 1904 to 1947

Appendix to the Service Time Table No.4 Bristol (Great Western Railway) various years

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