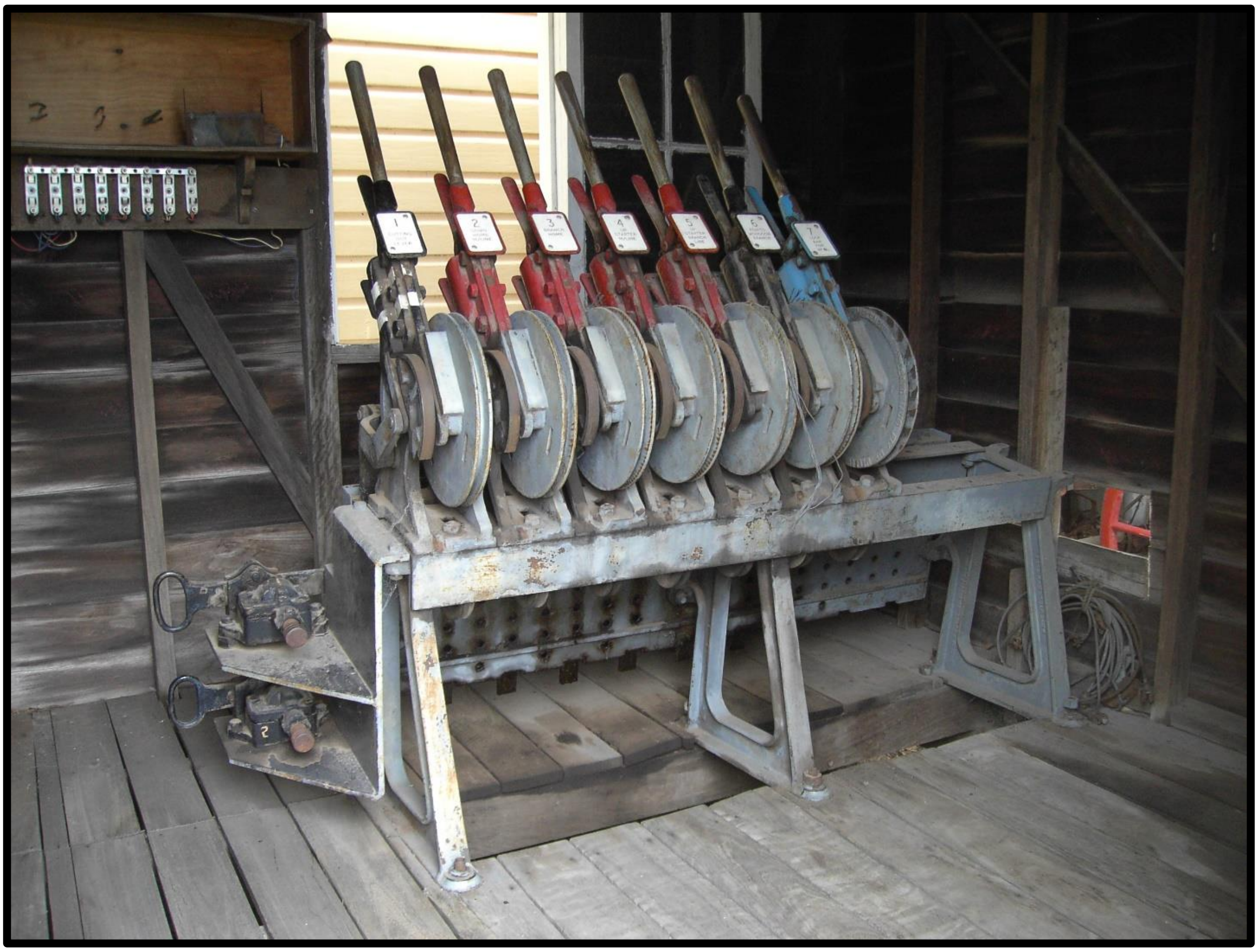
PROCEED ORDER

The Journal of the Signalling Interest Group Queensland

No.16 **October/December 2022**



The former Miles signal cabin and double-wire lever frame at Miles Historical Village. The lever frame utilities tappet interlocking, the subject of our feature article this issue. This lever frames utilises single tappets however larger signal cabins, and some ground frames use duplex tappet interlocking. The principles are the same for single and duplex tappet interlocking; the basis for duplex (or double) tappet interlocking is to prevent a lever being pulled halfway to incidentally release a lever it should not release in that position.

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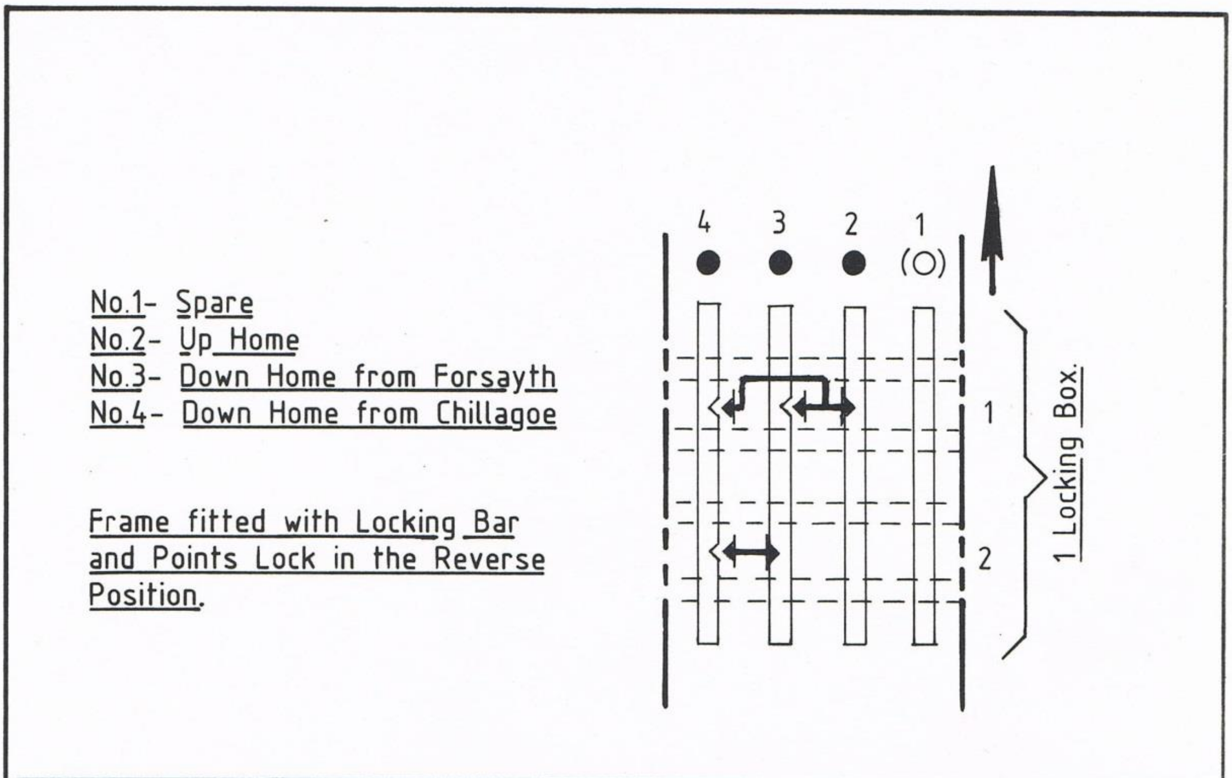
Tappet Interlocking

While many readers are familiar with the levers in signal cabins, most will have only a basic concept that the levers are somehow interlocked below the floor level to prevent the signalman making any errors. A number of different types of interlocking have existed with one of the easiest types to understand, and also a very common type, is tappet interlocking.

Various examples exist from the smallest two-lever ground frames to the largest 80-lever signal cabins. There are several examples of smaller interlockings and two examples are presented below. These small examples provide a good place to start understanding the basics of mechanical interlocking, and specifically the tappet interlocking system, which was invented by James Deakin of Stevens & Sons in 1870.

The diagram below shows part of the interlocking diagram for Almaden, when a four-lever ground frame existed on the platform to control the three signals at the station. The four-lever ground frame still exists, as do the semaphore signals, however the signals are no longer connected to the ground frame.



Lever	Locks	Releases	Released By
1	Spare		
2	3 · 4		
3	2 · 4		
4	2 · 3		

Above: Part of the interlocking diagram for Almaden station in Far North Queensland. A simple four-lever ground frame operating three signals approaching the station yard. (Source: QR/KRML Collection)

The bottom part of the diagram shows a table which describes the interlocking in a tabularized format. The first column is the lever number. The second column shows which levers are locked when the lever in column 1 is pulled from Normal to Reverse. Therefore, the action of pulling lever No.2 locks levers No.3 and No.4 in the Normal position. The next column shows what levers are released by pulling the lever in column 1, in this case none, but if the action of pulling lever No.2 released another lever the lever number would be shown here. The last column shows what the lever in column 1 is released by, again in this case none, but this will be explained further in the second example.

The terms Normal and Reverse are quite important to understand and refer to the position of the lever within the lever frame. The Normal position of a lever is with the lever back in the lever frame or away from the person operating the levers. The Reverse position is with the lever pulled fully towards the person operating the levers. It should also be noted that while most levers are normally left in the Normal position, some levers are normally kept in the Reverse position. This terminology will become clearer as more signalling arrangements and diagrams are studied.

The top left section of the diagram states what each lever operates and can indeed show what is written on the number plate of the lever. The note below this list shows that a metal bar is provided, secured with a standard QR points padlock, to keep any signal levers placed in the reverse position secure against unauthorized movement of the levers. The reason for this is that this lever frame was located on the platform, readily available to be tampered with by anybody on the platform.

The top right section of the diagram is the actual drawing of the interlocking showing the arrangements between each and every lever in the frame. This section of the diagram can either be drawn as if the interlocking fitter were standing in front of the lever frame, or behind the lever frame. In this case it is drawn as if standing behind the lever frame which is shown by the levers numbering downwards from No.4 to No.1 when read from left to right. The diagram shows that one locking box is provided for the interlocking and that it has two slots running horizontally for the interlocking, represented by the numbers No.1 and No.2 adjacent the bracket stating “1 Locking Box”. The long rectangles running vertically are the tappets attached directly to each lever. The tappets are flat steel bars with notches cut into their sides, as shown by the diagram, into which the locks engage when required to prevent movement of that lever. When the lever is pulled from Normal to Reverse the tappet will move up the page, as indicated by the big arrow, remembering that this view of the interlocking is from behind the lever frame. The darker arrows and interconnecting lines represent the actual locks which, as can be seen by the movement of the tappet, will change the position of the notches relative to the locks represented by the dark arrows and lines. The locks are free to slide left or right depending on the positions of the notches in the tappets applicable to that lock.

Looking initially at lever No.4, if pulled by the person operating the levers, will cause the tappet to move up the page, as both locks are free from the notches in the side of the tappet. This will cause the Down Home signal from Chillagoe to be cleared to a "proceed" indication. Due to the fact that the notches in the tappet are no longer aligned with the locks, levers Nos. 3 and 2 are locked in the Normal position. Looking at the functions of the signals this makes perfect sense. With lever No.4 pulled and the signal at "proceed" a train from Chillagoe can enter the station yard. With levers Nos.3 and 2 locked in the Normal position the signals from Forsayth and Mareeba are locked at "stop" preventing trains entering the station yard from those directions thus avoiding the possibility of a collision.

Assuming the levers are normal as shown in the diagram, if lever No.3 is pulled the lock between levers No.3 and No.4 will slide horizontally in slot two of the locking box, and the lock will engage in the notch in lever No.4. That means that lever No.3 locks lever No.4 which can be confirmed by looking at the table again. The table also states that lever No.3 locks lever No.2 and by looking again at the tappets it can be seen that when lever No.3 is pulled, and the tappet moves up the page, the notch which was in line with the lock between levers No.2 and No.3 will move away from the notch. With no notch beside the lock it cannot move horizontally therefore lever No.2 is locked in position.

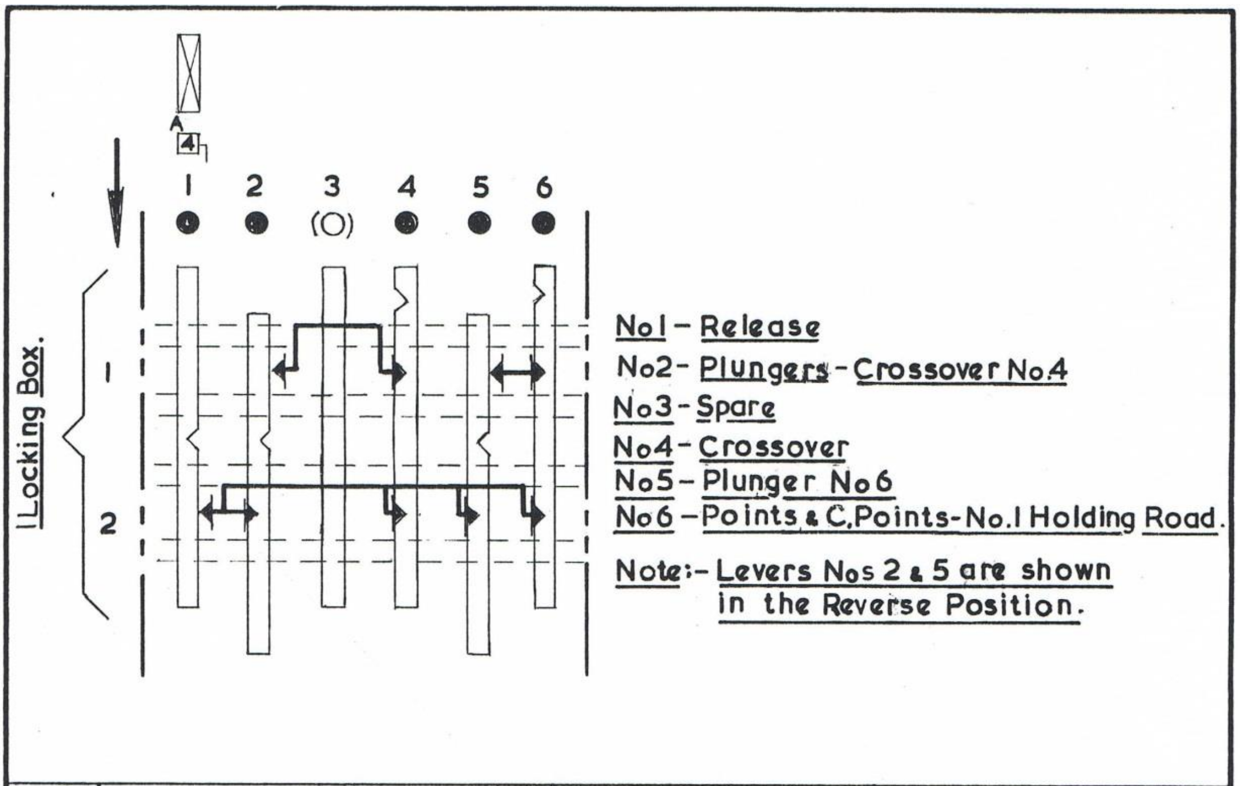
Assuming the levers are again normal as shown in the diagram, pulling lever No.2, sliding the tappet up the page, will push the lock horizontally across into the notch in lever No.3 and via the attached bridle the lock adjacent lever No.4 will engage in the notch cut into the tappet of lever No.4. Bridles are metal bars that attach locks that are not engaging in tappets of adjacent levers. It may be necessary for lever No.1 to lock lever No.16 in a larger lever frame so a bridle bar would physically join the lock adjacent lever No.1 with the lock adjacent lever No.16. The dotted horizontal lines on the locking diagram indicate where the bridle bars are placed. This type of lever frame and locking box can fit two bridle bars above and below each tappet, in the case of levers No.2 and No.4 the bridle bar linking the locks runs above the levers. This is important when designing interlocking to ensure there is space for the bridle bars to link the appropriate locks. In more complex interlockings additional locking boxes provide greater capacity for locks and bridle bars.

The second and slightly more complicated interlocking diagram on the following pages is from Pring and shows a six-lever ground frame which existed in the early 1980's.

Firstly, and importantly, notice that this diagram is drawn facing the levers, and when pulling a lever from Normal to Reverse the tappet will move down the page, again as indicated by the arrow at the top left of the diagram. Also notice that levers No.2 and 5 normally stand in the Reverse position and this is also indicated by the note on the diagram.

The bottom part of the diagram again shows a table of the interlocking showing each lever, what it locks, what it releases, and what it is released by. Lever No.2 locks lever No.4 both ways and this is shown by the letter B/W after the number. Likewise lever No.5 locks lever No.6 both ways. In other words lever No.2 when pulled from Normal to Reverse will lock lever No.4 in the Normal position or Reverse position.

Lever No.1 states it was released by "ER by SM No.2" which isn't perfectly clear without a further explanation of signalling at Pring at this time. Basic colour light signalling was provided and was operated by the Station Master at Pring from a panel in the station building. Electrically released ground frames were provided to access sidings and crossovers. ER stands for Electric Release and SM stands for Station Master. This ground frame was electrically released by the Station Master when he operated switch No.2 on the panel in the station.



Lever	Locks	Releases	Released By
1		$^{B}_{R}$ 2·5·4·6	E.R by S.M.No.2
2	$4^{B/W}$		
3	Spare		
4			1
5	$6^{B/W}$		
6			1

Above: A slightly larger example from a six-lever ground frame previously located at Pring, near Merinda, on the Collinsville/Newlands Railway. (Source: QR/KRML collection)

Lever No.1 is a Release lever, released electrically by the Station Master, and with this lever normal all levers in the lever frame are locked in either the Normal or Reverse position, expect lever No.3 which is unused. With lever No.1 pulled to the Reverse position the notch in the tappet is now adjacent the lock previously holding lever No.2 (and

Nos.4, 5 and 6 via the bridle bar) in position. But not all of those levers are immediately free to be moved. Lever No.4 is still locked in the Normal position by the other lock which is held in place by lever No.2 being in the Reverse position. Likewise lever No.6 is locked in the Normal position by the other lock which is held in place by lever No.5.

The interlocking here is making sure the levers are operated in the correct sequence, and only when authorized, and released, by the Station Master. Lever No.1 is operated first to take control of the ground frame and release the other levers in the frame. To operate No.4 crossover, lever No.2 must first be put back to Normal which then frees lever No.4. Lever No.4 could then be pulled to the Reverse position to reverse the crossover, then lever No.2 can again be pulled to Reverse to lock the crossover in the Reverse position. The same sequence of operation applies to levers Nos. 5 and 6 for the points and catch points of No.1 Holding Road. No levers are provided to operate signals so hand, radio, or lamp signals would have been used.

Above: The former 80-lever Rockhampton Goods yard signal cabin lever frame now preserved at the Rockhampton Heritage Village. Just below floor level, and on an angle, the trays that hold the interlocking can be seen. The number of interlocking trays depends on the complexity of the interlocking, which in the case of an 80-lever frame can be imagined as quite complex. Three locking trays were provided in this case, each with 4 channels, and each channel capable of holding 5 bridle bars linking different locks together.

The only way lever No.1, the Release lever, can be put back to the Normal position is when levers Nos. 4 and 6 are Normal, and Nos. 2 and 5 are Reverse. This proves that the crossover and points are in the Normal position and securely locked in that position by the appropriate Plunger levers.

These two examples show the basic details of mechanical interlocking using the Tappet system, and by looking at the diagram it is fairly clear how the various pieces move up and down, or side to side, within the interlocking box. This type of interlocking is used at Charters Towers and Ascot signal cabins, and also in all ground frames. The process of designing the interlocking is significantly more complicated, particularly with larger installations, and is beyond the scope of this brief overview.

The other common type of interlocking used by Queensland Railways is the T-Bar system which is still used at Kuranda signal cabin. The interlocking diagram is quite different and a short description of that system will appear in a future issue of *Proceed Order*.

SIGQ - Update

At the close of 2022 it is a good time to provide an update on the activities of SIGQ and what the future holds. The main theme or focus of SIGQ remains unchanged and that is to provide a platform for sharing information about the rich signalling and safeworking history of Queensland Railways.

The publishing of *Proceed Order* at regular intervals continues with a mixture of previously written articles, updated where possible, and new articles. Work towards the publication of special editions of the journal also continues. Of course, all are freely available on the SIGQ website to download and print.

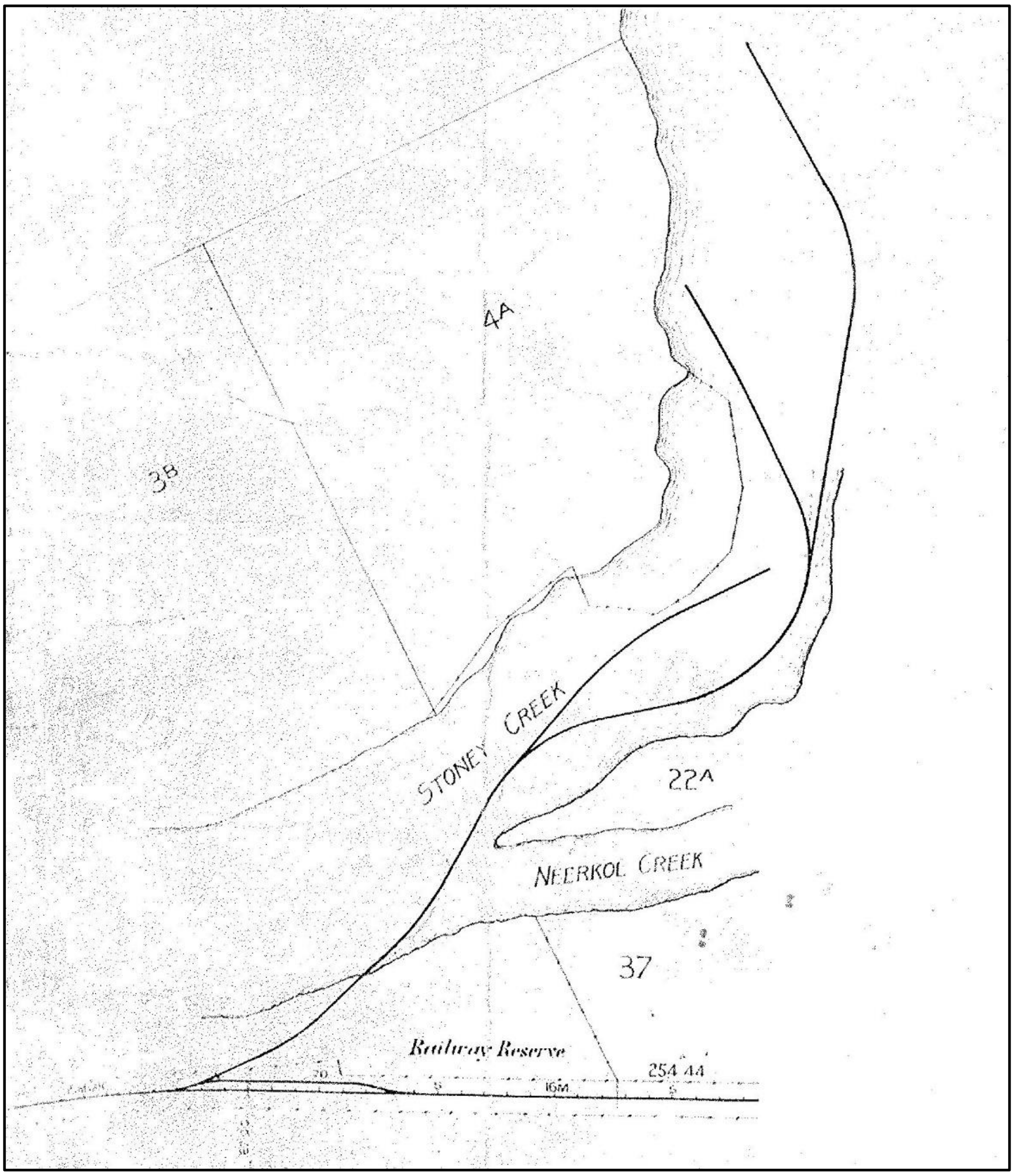
Research Room – Ordinary Staff

In August 2022 a visit to a local historical village known to have at least some railway items ex Queensland yielded an interesting piece of data for the Ordinary Staff research project which has been running for some time now.

An example of a Red Diamond Ordinary Staff, from an unknown location in Queensland, shows clear evidence of being repurposed and perhaps changed to Red Diamond from another colour, but still with a diamond shaped head. This Ordinary Staff will be featured in a future edition of *Proceed Order* with some conclusions drawn from its modification.

Gayside (Central Line) The station yard plan dated 'Revised September 1924' shows the nameboard at Gayside was close to the 15m68ch mark (plan mileage) or 16m63ch from Archer Park. The siding certainly existed from 1916 when the location previously known only as 15 Miles 68 Chains was named Gayside, although it probably existed from 1913 when a loop siding was put in. At that time, it was referred to as Stanwell Ballast Pit Siding. In 1918 a Distinguishing Number (1297) was allocated indicating passenger and/or parcel traffic.

The station yard plan (further revised April 1928) shows a loop siding on the southern side of the main line, with sidings branching off the loop siding into Stoney Creek. No signalling is provided for this Isolated Siding. In 1949 the dead-end sidings and loop siding appear to have been removed and in 1962 the nameboard and pedestrian gate were relocated to 16m3ch (plan mileage). By early 1980 the place was deleted from the timetables.



Above: The details of the sidings at Gayside with a loop siding beside the main line and the sidings into Stoney Creek to load ballast. No signals were provided at this Isolated Siding