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 Website: <https://srsv.org.au> Email: info@srsv.org.au

EDITOR: Andrew Waugh, 28 Amelia St McKinnon, VIC, 3204
 Phone (03) 9578 2867 (AH), (03) 9348 5724 (BH), email andrew.waugh@gmail.com
 PRESIDENT: David Langley, P.O. Box 8, Avenel, VIC, 3664, Phone (03) 5796 2337
 SECRETARY and MEMBERSHIP OFFICER: Glenn Cumming,
 Unit 1/4-6 Keogh St, Burwood, VIC 3125. Phone (03) 9808 0649 (AH)
 NSW CONTACT: Bob Taaffe, Unit137, 319 Macquarie St South Hobart 7004, Phone: (03) 6223 1626
 QUEENSLAND CONTACT: Phil Barker
 PO Box 326, Samford, QLD, 4520, email: signal01@bigpond.net.au

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MINUTES OF MEETING HELD FRIDAY 16 SEPTEMBER 2022, AT THE SURREY HILLS NEIGHBOURHOOD CENTRE, 1 BEDFORD AVENUE, SURREY HILLS, VICTORIA.

The SRSV meeting scheduled for Friday 16 September 2022 was held on site at Surrey Hills and was broadcast as an online meeting on the internet using the 'Zoom' application.

Present: – (On site). Glenn Cumming, Graeme Dunn, Michael Foley, Judy Gordon, Andrew Gostling, David Jones, Keith Lambert, David Langley, James Sinclair, Rod Smith and Rob Weiss. (11)

(Online via Zoom). Ken Ashman, Phil Barker, Robert Bremner, Brett Cleak, Graeme Cleak, Michael Formaini, Chris Gordon, Graeme Henderson, Bill Johnston, David Langberg (on a railway platform at Kensington Olympia London UK), Eddie Oliver, Peter Silva, Bob Taaffe and Andrew Wheatland. (14)

Apologies: – Philip Miller, Andrew Pardy, Colin Rutledge and Laurie Savage.

Visitor: – Jim Gordon and Vinoth Rajamani (NZ via Zoom).

The President, Mr. David Langley, took the chair and opened the meeting at 20:06 hours.

Minutes of the July 2022 Meeting: – Accepted as published. James Sinclair / Rob Weiss. Carried.

Business Arising: – Nil.

Correspondence: – Nil.

Reports: – The Tours Officer advised that he had been unable to organise a tour this year.

General Business: –

Keith Lambert provided details about various projects in the Metropolitan District. A summary of the discussion follows: –

- The single line working between Thornbury – Regent using the new elevated Up Line has now finished and the elevated double line is now in use.
- Work will commence later this year for the removal of the level crossing at Keon Parade, Keon Park.
- Frankston Signal Box is now 100 years old. A celebration was organised locally.

Chris Gordon advised that the level crossing removal project at Keon Park will include a stage with one (1) operational elevated line and one (1) operational line at ground level.

(Front cover) Down Automatic K77 at South Melbourne dates from the provision of automatic signals on the St Kilda line in December 1919. At first glance, K77 looks like a standard power lop bracket signal, but a second glance shows that it is anything but. The signalling arrangement drawing (available from the SRS archives) states that the mast is a 'Light Signal on an ordinary Lattice Bracket', but close inspection shows that it is not that either. The post itself is a standard lattice mast used for power signalling with heavy corner angles and flat rivetted lattice work. The breast and doll, however, are standard mechanical lattice mast fittings, including the finial. The light signal itself is a 'Style VR' light unit and is probably the second or third Style VR installed (I believe South Yarra was first). 'Style VR' heads (the name is not official) were designed and manufactured by the VR and were distinguished by the massive hood to ensure that the low powered lights were usually deep in shade. The decking includes a lengthy extension forward of the platform to assist in cleaning the lenses, though servicing the marker light would have required a certain degree of acrobatic exercise. The ladder is on the front of the mast, which is understandable given that the mast is immediately in front of the Dorcas St overbridge. The photo was taken just before the closure of the railway line for conversion into a tramway. Photo: Andrew Waugh

Glenn Cumming noted a recent Weekly Notice item that described the Broadmeadows computer based interlocking being upgraded from Westrace Mark 1 to Westrace Mark 2.

David Langley reported on the signalling upgrade works between Craigieburn – Seymour for the replacement of the double line block working. New signal posts have been delivered to various locations by truck. It was suggested that this work will be completed in March 2023.

Rod Smith reported on recent progress with the level crossing removal project at Surrey Hills and Mont Albert.

Glenn Cumming asked if there had been any progress with the proposed signalling works at Ararat.

Rod Smith reported on recent happenings on the Portland Line.

Phil Barker shared some images of the signal cabin from Beerburrum QLD that has now been relocated to Phil's property. The building is being restored and will house an interlocking frame in the future.

Ken Ashman advised that the control panel from Wellsford NZ has now been added to the collection in his museum.

Graeme Henderson described plans for the Rhaetian Railway in Switzerland attempt to run the world's longest passenger train (25 x 4 car sets) on Saturday 29 October 2022 as part of celebrations of 175 years of Swiss railways.

Graeme Henderson reported on recent news from New South Wales. A summary of the discussion follows: –

- At Wallendbeen, a road over rail bridge was damaged by a truck recently. Trains were forced to stop running for a few hours while the bridge was inspected.
- Rails have been laid in the tunnel for the Chatswood – Sydney Metro. Overhead construction work has not yet commenced.
- An incident in the past week between Goulburn NSW – Yass Junction NSW involving a train operated by SCT was reported.

Ken Ashman reported that in New Zealand, 30 class electric locomotives are being re-activated for operations and sub-stations on the North Island Main Trunk are being upgraded.

Ken Ashman advised that William Robinson was granted a patent in the USA for his 'closed rail circuit' on 20 August 1872. Track circuits have been with us for 150 years.

Syllabus Item: – The planned Syllabus Item was the 32nd annual screening of slides from the collection of the late Stephen McLean, to be presented by Rod Smith. Unfortunately, despite testing in the days leading up to the meeting, the 'new' slide projector did not function on the night and this Syllabus Item has been postponed.

At short notice, Graeme Henderson (on Zoom in New South Wales) broadcast a digital video of the signal boxes at Cootamundra and Junee in New South Wales. The video was originally recorded in May 2007, shortly before Cootamundra and Junee were re-signalled and the signal boxes abolished.

This was followed by a presentation of scanned black and white photographs from the camera of David Langley, taken in the early 1970's. The photographs were taken as David travelled and locations seen included Goulburn NSW in mechanical signalling days, Harden NSW, Young NSW, Sydney Central, Forbes NSW and Mile End SA.

David's presentation concluded with photographs taken on a visit to Queensland and New South Wales with Stephen McLean and William Owens, starting at South Brisbane and then travelling south stopping at all signal boxes on the North Coast Line in New South Wales. Locations seen included Greenbank QLD, Kagaru QLD, Border Loop NSW, Casino NSW, Leeville NSW and beyond.

Despite the early setback, an enjoyable Syllabus Item was presented.

Thank you to Graeme Henderson and David Langley for finding suitable material at very short notice.

Meeting closed at 22:10 hours.

The next meeting will be on Friday 18 November, 2022 at the Surrey Hills Neighbourhood Centre, Bedford Avenue, Surrey Hills, Victoria, commencing at 20:00 hours (8.00pm).

SIGNALLING ALTERATIONS

The following alterations were published in WN 30/22 to WN 38/22, and ETRB A circulars. The alterations have been edited to conserve space. Dates in parenthesis are the dates of publication, which may not be the date of the alterations.

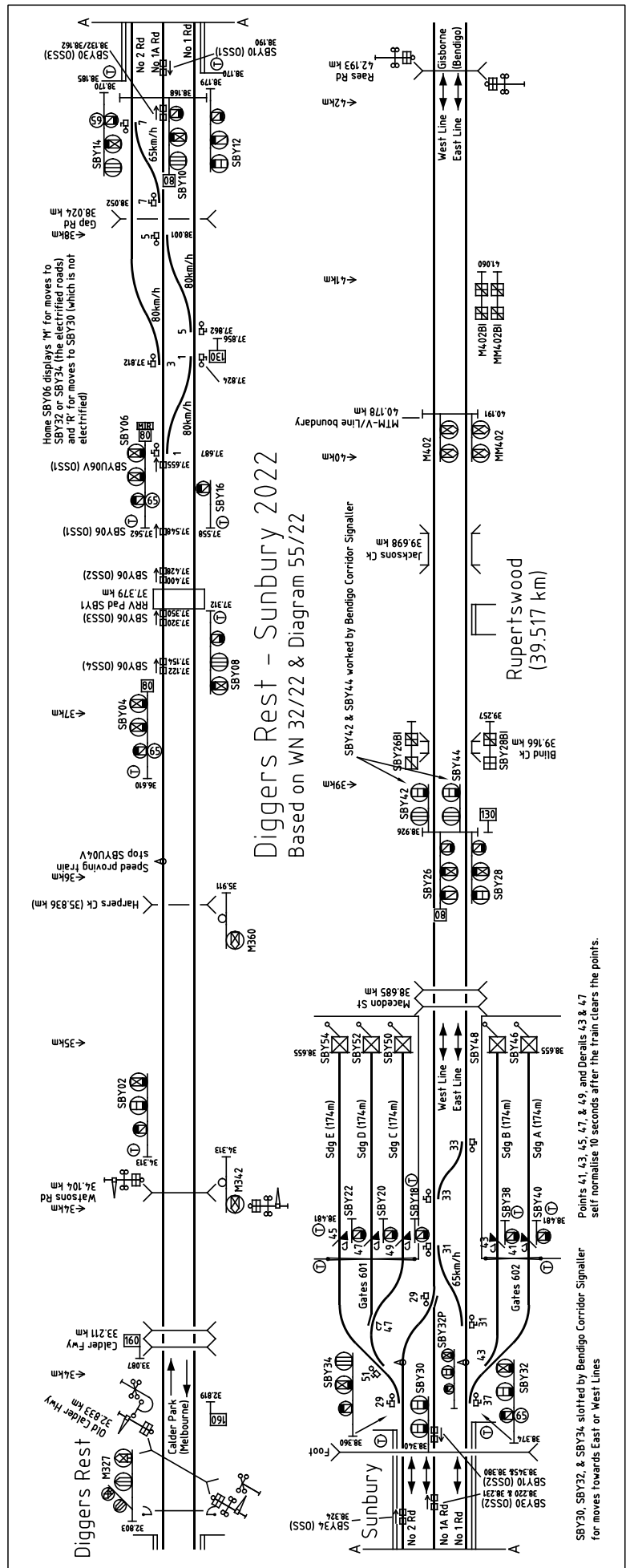
- (02.08.2022) Arcadia** **(SW 153/22 & 175/22, WN 30, 27)**
 The planned commissioning of boom barriers at Main Road (158.138 km) was postponed (& SW 152/22 (sic) was cancelled). The existing flashing lights will be retained and continue to be operated by axle

counters. On/off tracking of road/rail vehicles will not be permitted at Main Rd due to the adjacent crossings.

The whistle board road names for this level crossing will be altered from Arcadia Rd to Main Rd.

- (02.08.2022) Cheltenham – Chelsea** (SW 664/22, WN 30)
Diagram 17/22 (Cheltenham – Chelsea) replaced 81/21 as in service.
- 02.08.2022 Somerton** (TON 366/22, WN 30)
On Tuesday, 2.8., No 4 Road and a portion of No 3 Road were booked back into use.
Access to the restored track is only available at the Up end. The points in No 3 Road leading to No 4 Road (21.819 km & 22.697 km) are clipped to lie towards No 4 Road, and No 3 Road remains out of use between these points. Baulks are provided in No 3 Road at 23.137 km. No 3 Road remains out of use between 23.137 km and 23.273 km (the points leading to Austrack Siding), and the points in No 3 Road leading to the Austrack Siding remain clipped for the siding.
The standard gauge Bright Steel siding remains out of use and the points in No 4 Road (22.666km) leading to the siding are clipped for No 4 Road. Baulks are also provided in the Bright Steel Siding to prevent standard gauge movements into the VicTrack corridor (over the broad gauge Somerton siding).
TON 282/20, TON 479/20, & TON 79/21 were cancelled.
- 03.08.2022 South Dynon Loco** (SW 177/22, WN 30)
On Wednesday, 3.8., the following alterations took place:
- Nos 1, 1A, & 2 Roads in the Melbourne Operations Terminal were slewed and connected to a new dual gauge lead that extends to a set of dual gauge turnout (previously provided) in the Up Engine Track on the lead to the broad gauge turntable.
 - A passive level crossing was provided over the new dual gauge lead for the road to the Broad Gauge Turntable and Diesel Maintenance Building.
 - The turnout in the Up Engine Track are secured to lie for the broad gauge turntable.
 - Baulks are provided in the new dual gauge lead on the Up side of the new level crossing. This provides a 30 metre head shunt for Nos 1, 1A, & 2 Roads in the Melbourne Operations Terminal
- Diagram 66/22 (Moonee Ponds Creek) replaced 22/22.
- 08.08.2022 Pakenham** (SW 812/22, WN 31)
On Monday, 8.8., the sidings were largely abolished. The following alterations took place:
- Nos 4 & 5 Roads were abolished.
 - The Up end of No 3 Road was abolished leaving a dead end siding at the Down end 75 metres in length. This forms a shunting neck to provide access to Siding A. Baulks and a buffer light (PKM799) were provided at the Up end of the No 3 Road.
 - The overhead wiring over Nos 3, 4, & 5 Roads was removed (Siding A is not wired).
 - The controls for the train stop and TPWS(TSS) at Home PKM731 and PKM733 were altered so that they remain up/energised when a route is set into No 3 Road to prevent Metro and V/Line trains from entering the dead end remnants of No 3 Rd.
 - Home PKM711 was abolished.
 - Home PKM715 was removed from the signal bridge and a new ground mast was provided on the right hand side of No 2 Road adjacent to the signal bridge.
 - Crossover 611 was abolished. Circuit alterations were carried out to ensure the normal detection on the points is retained.
 - Home PKM728 was unaltered in both configuration and operation.
- The interlocking was not altered, and the Signaller, Dandenong, must apply and maintain blocking facilities on Crossover PKM611 normal and Tracks PKM617 and PKM711. When setting routes from PKM731 or PKM733 into No 3 Road (shunt neck) a trainstop and TSS failure alarm will occur due to the temporary circuit modifications. The low speed push button must be selected to allow the signal to display a Low Speed aspect into the shunt neck.
Diagram 29/22 (Pakenham – Pakenham East) replaced 69/21.
- 10.08.2022 North Geelong** (TON 379/22, WN 32)
On Wednesday, 10.8., No 1 Road in North Geelong Yard was booked back into service. All points leading to No 1 Road have been restored to use. TON 347/22 is cancelled.
- 12.08.2022 Tandarra** (TON 386/22, WN 33)
On Friday, 12.8., the Up end points have been booked back into service. TON 20/21 is cancelled.

- 15.08.2022 Ferntree Gully (SW 677/22, WN 31)**
 Between Friday, 12.8, and Monday, 15.8., the point machine on Points A and associated relays will be replaced. The boom mechanisms at Hilltop Rd will be replaced and the flashing lights converted to LEDs.
- (16.08.2022) Murchison East – Toolamba (SW 186/22, WN 32)**
 Diagram 32/22 (Murchison East – Toolamba) replaced 60/22 (sic) due to the provision of PCR upgrades.
- 18.08.2022 Gheringhap (TON 389/22, WN 33)**
 On Thursday, 18.8., the Gypsum Siding (83.205 km to 83.490 km) was booked out of service due to poor sleeper and rail condition.
- 18.08.2022 Donald (SW 185/22, WN 32)**
 On Thursday, 18.8., No 2 Road was provided. The points to No 2 Road are in No 3 Road at 337.395 km and 337.754 km and are operated by WSA levers. The standing room in both Nos 2 & No 3 Roads is 300 metres.
 Diagram 64/22 (Sutherland – Watchem) replaced 38/22.
- (23.08.2022) Albion – Broadmeadows (SW 694/22, WN 33)**
 Diagram 27/22 (Albion – Broadmeadows) replaced 23/22 as in service.
- (23.08.2022) Flemington Bridge – Coburg (SW 695/22, WN 33)**
 Diagram 43/33 (Flemington Bridge – Coburg) replaced 61/20 as in service.
- 24.08.2022 Sunbury (SW 674/22, WN 32)**
 On Wednesday, 24.8., the final track layout at the Up end was brought into service.
- The run-off siding at the Up end was extended over the Gap Rd bridge and connected to the Down line. The friction buffer and buffer light SBY16 were abolished.
 - Crossover 5 was abolished.
 - Crossover 3 was renumbered Crossover 1.
 - A new facing Crossover 3 was provided between the Down and Up lines at the Up end.
 - Points 47U were renumbered 51, and 47D to 47.



- Automatics M343 & M361 were abolished. Dwarf SBY08 was abolished.
- Platform No 2 (the Down platform) was extended by 14 metres at the Up end and is now 174 metres long.
- Homes SBY02, SBY04, SBY08, and Dwarf SBY16 were provided.
- Up Homes SBY12 & SBY14 were relocated from the signal bridge to ground masts; SBY12 is 15 metres in the Up direction from its former position, and SBY14 is 24 metres.
- The signal bridge with Home SBY10 was relocated 26 metres in the Up direction.
- All new and modified Home signals are equipped with TWPS(TSS). All new and modified Home signals, except Home SBY10, were provided with a signal post telephone.
- The overhead terminating board at the Up end of No 1 Track was relocated to 38.064 km. Overhead wiring extends from the main lines at the Up end to Nos 1 & 2 Roads (but not over No 1A Rd), and thence into the sidings at the Down end. The main lines and associated crossovers at the Down end are not wired.
- RRV Pad SBY1 was provided at 37.385 km.
- The station limits on the Down/West line will be between Home SBY02 and Home SBY26. On the Up/East line they will be from Automatic M360 to Home SBY28

Diagram 55/22 (Diggers Rest – Clarkefield) replaced 31/22.

- 24.08.2022 Craigieburn (SW 674/22, WN 32)**
On Wednesday, 24.8., the Westrace MkI interlocking was replaced with a Westrace MkII interlocking.
- 26.08.2022 Nagambie (TON 404/22, WN 34)**
On Friday, 26.8., the siding (126.232 km to 126.279 km) was booked out due to works associated with the Goulburn St upgrade and track condition in the siding. TON 433/09 is cancelled.
- 27.08.2022 Centrol (TON 399/22, WN 34)**
On Saturday, 27.8., Centrol was relocated to the Disaster Recovery Centre to allow a UGL hardware refresh and desk installations in Rooms 8 and 10.
- 27.08.2022 Wendouree (SW 188/22, WN 33)**
Between Wednesday, 24.8., and Saturday, 27.8., Traffic Light Co-ordination was provided at Gillies St (123.113 km).
- 27.08.2022 Mooroopna (SW 190/22, WN 34)**
On Saturday, 27.8., boom barriers were provided at the passive crossing at Pyke Rd (173.477 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
Amend Diagram 32/22 (Murchison East – Toolamba)
- 28.08.2022 Toolamba (SW 191/22, WN 34)**
On Sunday, 27.8., boom barriers were provided at the passive crossing at Pogue Rd (168.299 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
Amend Diagram 32/22 (Murchison East – Toolamba)
- (30.08.2022) Murchison East – Toolamba (SW 194/22, WN 34)**
Diagram 88/22 (Murchison East – Toolamba) replaced 32/22 due to provision of boom barriers at Main Rd, Pyke Rd, and Pogue Rd.
- 30.08.2022 Flemington Racecourse Line (SW 708/22, WN 34)**
Diagram 65/22 (Flemington Racecourse Line) replaced 99/13 as in service.
- 30.08.2022 Riversdale – Alamein (SW 707/22, WN 34)**
Diagram 65/22 (Riversdale – Alamein) replaced 99/13 as in service.
- 05.09.2022 Northcote – Croxton (SW 717/22, WN 35)**
On Monday, 5.9., rectification works corrected design deficiencies affecting the Up express control and holding times for the Beavers Rd & Arthurton Rd level crossings, and the Croxton pedestrian crossing. The temporary circuit alterations to inhibit the Up express signalling sequence between Croxton and Northcote were removed.
SW 486/22 was cancelled.

05.09.2022 Thornbury – Preston
 (SW 696/22 & SWP 5/22, WN 34)
 On Monday, 5.9., the new elevated Down line was provided between 11.103 km and 12.882 km. The existing bi-directional viaduct between 11.107 km and 12.917 km was converted to the Up line. Bell (11.640 km) and Preston (12.497 km) were opened for passenger traffic. Bell has two side platforms 160 metres in length, and Preston is an island platform 163 metres in length.

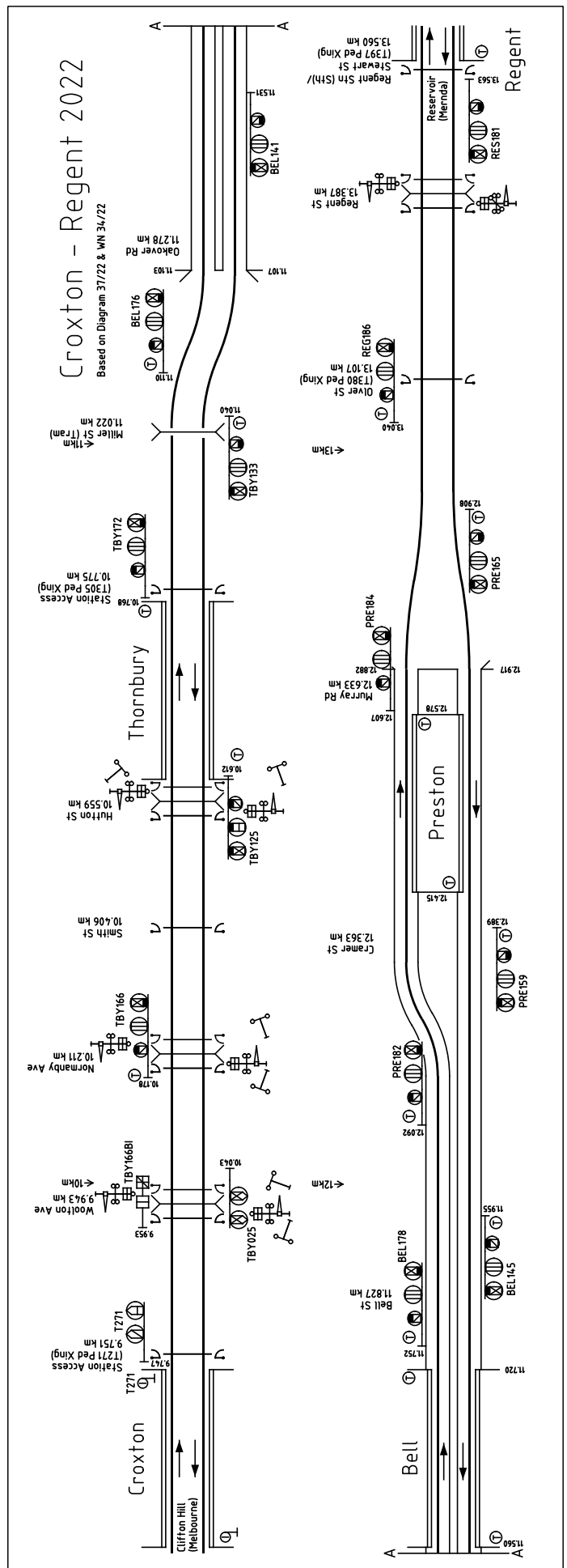
The line is worked under the rules of Automatic Block Signalling.

- Points TBY072 at Thornbury and PRE084 at Preston were abolished.
- The speed proving trainstop for TBY172 was abolished.
- Down Home PRE184 was relocated to the new Down viaduct at 12.607 km.
- Homes TBY133, BEL176, BEL178, PRE159, PRE165, & PRE182 were provided.
- All Homes are provided with signal post telephones.
- The pedestrian crossing at the Down end of Thornbury was reopened for pedestrians. SPAD mitigation is provided at this crossing. If no route is set from Home TBY127 when a Down train enters the platform, the pedestrian crossing will close. Provided no route is set from TBY127, the crossing will reopen after a timeout (assuming no Up train is approaching).
- The aspects of Automatic T271 & Home RES181 were altered.
- Train detection on the Down line between 10.400 km (222 metres on the Down side of Home TBY166) and 13.103 km (73 metres on the Down side of Home REG186) and on the Up line between 10.422 km (189 metres on the Up side of Home TBY125) and 13.122 km (441 metres on the Up side of Home RES181) is by axle counters.

Diagram 37/22 (Northcote – Reservoir) replaced 5/22. Clifton Hill Group Operating Procedure 1 (Thornbury – Mernda) was reissued.

(06.09.2022) Albury (SW 198/22, WN 35)
 Diagram 70/21 (Albury) replaced 34/12 following works at Albury.

06.09.2022 South Dynon (TON 421/22, WN 36)
 On Tuesday, 6.9., No 9 Road at the Train Maintenance Facility was booked out of use as the track condition was not known following the transfer of the lease.



- 06.09.2022 Warrnambool (TON 416/22, WN 36)**
On Tuesday, 6.9., the turntable and access road (266.982 km to 267.000 km) were booked back into service. The points leading to the turntable were restored to use.
- 08.09.2022 South Geelong (TON 422/22, WN 36)**
On Thursday, 8.9., the Down end of the Queenscliff Siding between 75.100 km and 75.224 km was booked out due to track condition. Baulks were provided at 75.100 km.
A 6 car Vlocity will fit between the Down side of Swanston St and 75.100 km
- 09.09.2022 Nagambie (SW 201/22, WN 36)**
On Friday, 9.9., boom barriers were provided at the passive crossing at Coes Rd (128.984 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
Amend Diagram 62/22 (Mangalore - Nagambie).
- 10.09.2022 Wahring (SW 203/22, WN 34)**
On Saturday, 10.9., the boom barriers at Grimwade Rd (130.377 km) were converted to axle counter operation. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
Amend Diagram 62/22 (Mangalore - Nagambie).
- 10.09.2022 Toolamba (SW 199/22 & 200/22, WN 36)**
On Saturday, 10.9., boom barriers, pedestrian gates, and pedestrian gate latches were provided at the flashing lights at Wren St (166.254 km), and boom barriers were provided at the passive crossing at Cummins Rd (166.881 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided. The existing 5P key switches for the manual control of the crossing at Wren St were retained.
Reset key switches for the crossing track are not provided for either crossing and road/rail vehicles cannot on/off track at these crossings.
Amend Diagram 88/22 (Murchison East – Toolamba).
- 11.09.2022 Nagambie (SW 202/22, WN 36)**
On Sunday, 11.9., the boom barriers at Racecourse Rd (127.542 km) were converted to axle counter operation. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
Amend Diagram 62/22 (Mangalore - Nagambie).
- 11.09.2022 Wahring (SW 205/22, WN 36)**
On Sunday, 11.9., boom barriers were provided at the passive crossing at McDonalds Rd (132.249 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is not provided and road/rail vehicles cannot on/off track at this crossing.
Amend Diagram 62/22 (Mangalore - Nagambie).
- 12.09.2022 Nagambie (SW 204/22, WN 36)**
On Monday, 12.9., boom barriers were provided at the flashing lights at Goulburn St (125.837 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
Amend Diagram 62/22 (Mangalore - Nagambie).
- 12.09.2022 Wahring (SW 206/22, WN 36)**
On Monday, 12.9., boom barriers were provided at the passive crossing at Bunganail Rd (133.276 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is not provided and road/rail vehicles cannot on/off track at this crossing.

Amend Diagram 62/22 (Mangalore - Nagambie).

- (13.09.2022) Mangalore – Mooroopna** (SW 216/22, WN 36)
Diagrams 70/22 (Mangalore – Nagambie) and 104/22 (Murchison East – Toolamba) replaced 62/22 & 88/22 due to the level crossing upgrades. Note that the Waugh Rd (169.865 km) upgrade did not take place at this time.
- 13.09.2022 Wahring** (SW 207/22, WN 36)
On Tuesday, 13.9., the boom barriers at Wahring-Euroa Rd (136.148 km) were converted to axle counter operation. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
- 14.09.2022 Wahring** (SW 209/22, WN 36)
On Wednesday, 14.9., boom barriers were provided at the passive crossing at Old Dargalong School Rd (142.125 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
- 14.09.2022 Arcadia** (SW 152/22 & 208/22, WN 27)
On Wednesday, 14.9., boom barriers were provided at the flashing lights at Main Rd (158.138 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is not provided and road/rail vehicles cannot on/off track at this crossing.
- 16.09.2022 Nagambie** (SW 211/22, WN 36)
On Friday, 16.9., boom barriers were provided at the passive crossing at Cemetery Ln (124.206 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
- 16.09.2022 Wahring** (SW 210/22, WN 36)
On Friday, 16.9., boom barriers were provided at the passive crossing at Charles Cochran Ln (140.686 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
- 17.09.2022 Toolamba** (TON 438/22, WN 37)
On Saturday, 17.9., the junction points to the Toolamba – Echuca line (166.284 km) were booked out of use as the signal design does not allow operation of the points. The Echuca line is currently booked out (SW 139/21).
- 17.09.2022 Mooroopna** (SW 212/22, WN 36)
On Saturday, 17.9., boom barriers were provided at the passive crossing at Ferguson Rd (171.682 km). Operation will be by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment were provided.
A reset key switch for the crossing track is provided and road/rail vehicles can on/off track at this crossing in accordance with Operating Procedure 133 (Modified Location).
- 19.09.2022 Broadmeadows** (SW 715/22 & 723/22, WN 36)
Between Wednesday, 14.9., and Monday, 19.9., the Westrace MkI interlocking at Broadmeadows was replaced by a Westrace MkII interlocking. The new interlocking controls the existing signalling between Broadmeadows and Somerton. The interlocking data was updated.
Magnetic gate latches were provided on the by-pass gates at the Broadmeadows station access pedestrian crossing.
The interlocking data was updated on Thursday, 15.9.
- 19.09.2022 Broadmeadows – Craigieburn** (SW 715/22 & 723/22, WN 36)
Between Wednesday, 14.9., and Monday, 19.9., TPWS was provided on the Home signals between Broadmeadows and Craigieburn. The following signals were equipped: BMS510, BMS512, BMS513, BMS514, BMS523, BMS527, SOM584, SOM586, SOM587, CGB507, CGB518, CGB519, CGB521, & CGB523.
The interlocking data was updated on Thursday, 15.9.

- 19.09.2022 Craigieburn – Wallan** (SW 715/22 & 723/22, WN 36)
 Between Wednesday, 14.9., and Monday, 19.9., the WestCad train control system at Craigieburn was modified to remove ‘Section Occupied Indication’ and ‘Block Section Clear Acknowledgement’ window. A block must be applied to the Down Starting CGB507 unless the Train Controller has confirmed that the previous Down train has cleared the block section and granted permission for a Down train to enter the block section.
 Two axle counter overlay track circuits were provided between Craigieburn and Wallan. Axle counter overlay No 7 (E295T) will extend on the Down line between 29.612 km (Down Starting CGB507) and 47.237 km (Wallan-Whittlesea Rd at Wallan). Axle counter overlay No 8 (E472T) will extend on the Up line between 27.086 km (408 metres on the Up side of Home CGB510) and 47.237 km (Wallan-Whittlesea Rd). Both overlays will indicate as un-occupied in the interlocking and will have no effect on the existing signalling system.
- 19.09.2022 Bunyip & Longwarry** (SW 214/22, WN 36)
 Between Monday, 19.9., and Friday, 14.10., Bunyip and Longwarry will be closed for passengers. All trains will run express through these stations.
- 21.09.2022 North Geelong Yard** (TON 447/22, WN 38)
 On Wednesday, 21.9., Points 53 (70.147 km) were booked out of service due to timbers in poor condition. Crossover 87 has been clipped normal to prevent rail movements approaching Points 53.
- (27.09.2022) Footscray – Spotswood** (SW 734/22, WN 38)
 Diagram 51/22 (Footscray – Spotswood) replaced 95/20 as in service.
- (27.09.2022) West Footscray – Tottenham** (SW 733/22, WN 38)
 Diagram 53/22 (West Footscray – Tottenham) replaced 97/20 as in service.
- 03.10.2022 Jolimont, Dennis, Darebin, Ivanhoe** (SW 732/22 & 736/22, WN 38)
 Between Friday, 30.10., and Monday, 3.10., new PLC field stations will be installed at these stations. These will be run in parallel with the existing JZA field station until the JZA replacement project is complete.
- 03.10.2022 Ivanhoe** (SW 732/22, WN 38)
 Between Friday, 30.10., and Monday, 3.10., the boom barrier mechanisms at Marshall St will be replaced.
- 03.10.2022 Brighton Beach** (SW 735/22, WN 38)
 On Monday, 3.10., automatic pedestrian gates (with electromagnetic escape gate latches) were provided at Dendy St.
 Amend Diagram 55/20 (Prahan – Sandringham).
- 09.10.2022 Colac** (SW 223/22, WN 38)
 Between Friday, 30.9., and Sunday, 9.10., the Master Key lock, small point lever, and rodded connections were abolished. Dual control point machines were provided on the main line points (153.099 km) and the catch points (153.153 km). The main line points will be secured out of use.
 Amend Diagram 50/22 (Birregurra – Colac).
- 09.10.2022 Camperdown** (SW 223/22, WN 38)
 Between Friday, 30.9., and Sunday, 9.10., the small point lever on the points in No 2 Road leading to No 3 Road, hand locking bars, and rodded connections were abolished. Dual control point machines were fitted to the points leading to No 3 Road and the derail/crowders in No 3 Road at each end.
 The dual control point machines will only be available for hand operation. They will be operated under the usual instructions for such an arrangement. The dual control point machines on the derail/crowders will be secured normal by an E pattern Annett Lock fixed to the selector lever of the point machine. An F pattern Annett Lock with key was provided in a sleeper mounted locked box adjacent to the derail/crowder; the Annett key can be removed when the derail is off the rail. The dual control point machines on the points to No 3 Road are secured normal by an F pattern Annett Lock fixed to the selector lever of the point machine. The Signaller, Camperdown, was provided with an E pattern Annett key which must be kept locked away when not in use.
 Amend Diagram 74/20 (Camperdown - Terang).

End£

BALLARAT B SIGNAL BOX

Continued from Somersault Vol 5 No 5

Working Ballarat B

The main task of the Signaller at Ballarat B was the passing of trains between the four tracks through the train shed and North Ballarat (Ballarat C), including working the interlocked gates.

However, part of the task at Ballarat B was shunting between the station roads. In February 1933 the B&S Inspector noted that a point clip had been provided in the signal box and it was to be used on the "points not secured by a lockbar" (i.e. Points 20) when it was necessary to transfer a passenger train from one platform to the other. This was, of course, far cheaper than providing a facing point lock on the points. In November 1933 instructions were issued for the attaching of the sleeping cars to the Mildura train. To save hauling the heavy sleeping cars up the Ingliston bank, the cars were attached at Ballarat on the Down and detached there on the Up. The front portion of the train – with any passengers who wished to remain in the cars and not patronise the refreshment rooms – would be shunted forward towards Post 31 (the Signaller was specially enjoined that the line had to be clear to Post 31) and then back onto the sleeping cars standing in No 3 Road. The point clip provided in February seems to have been forgotten and the Signaller was required to sleeve the levers working points without lockbars. Although the instructions do not mention it, the train would have had to be shunted back to No 1 Road to pick up the passengers who had been partaking of their evening meal and the rest of the train. In May 1937 engines A2 996 and D1 524 collided on the Down line when shunting from one line to another. It would appear that one locomotive had been signalled to the Down line to shunt to another line, and then a second locomotive, requiring to do the same, was signalled on top of it. The Signaller was subsequently instructed that, when it was necessary for two shunting movements to be made towards Post 31 at the same time, he was to instruct the driver of the first movement to pull down sufficiently far to allow room for the second movement.

Another problem was trains blocking the level crossings. In June 1934, for example, the District Superintendent formally instructed the Signallers at Ballarat B "that consistent with prompt despatch and the

safe and proper working of trains, the working of trams and other public road traffic over the level crossing must be conducted with the least possible delay." No doubt that memo helped the Signallers enormously in working the gates.

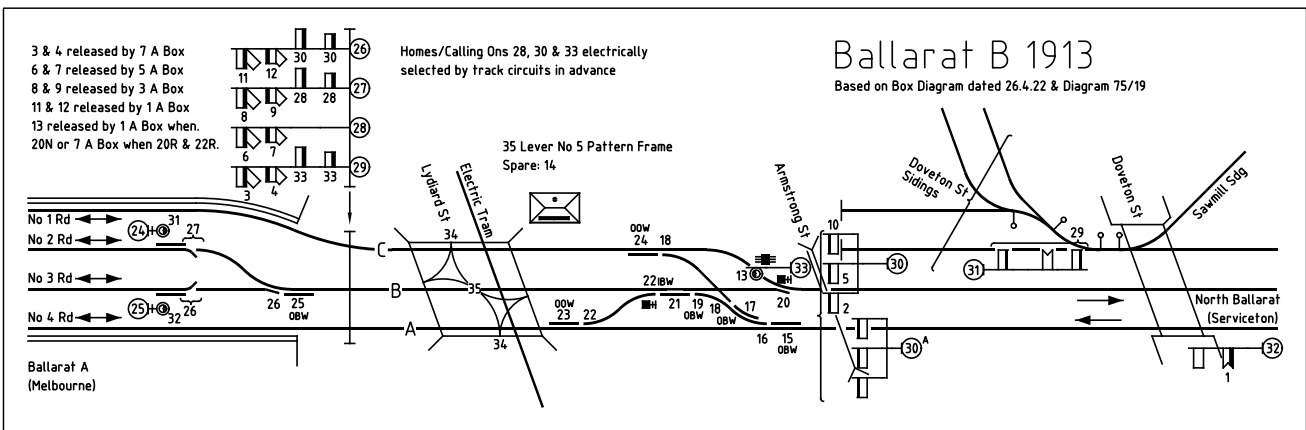
In July 1951 it was the working of Up double headed goods trains from North Ballarat that was causing grief. If such a train was accepted by Ballarat B, but held at Post 30 until the Ballarat yard staff could deal with it, Doveton St would be blocked for a lengthy period. The Signallers at Ballarat B were instructed to confer with the SM's office and the Yard Foreman if offered a double headed train. If the train could not be immediately accepted into Ballarat yard, it could not be accepted by Ballarat B and had to be held at North Ballarat's Up Starting signal until it could be given a clear run into the yard. It is not clear how the signallers at Ballarat B knew the offered train was double headed.

Longer trains with dieselisation also caused problems. Commencing 1 February 1954, the Down Adelaide Express was instructed to stop in No 1 Road with the front of the leading vehicle at the Down end of the platform to ensure that the van was on the platform at the other end. In this position the locos obstructed Lydiard St, and a shunter was instructed to meet the train and cut off the locos which then ran forward towards the Down Starting Signal. The shunter was to remain with the locos. The Signaller was to note the arrival time of the train, and was to close the gates and signal the locos back onto the train using Disc 13 five minutes before it was due to depart (note that there was clearly a fixed time at the platform, even if the train was late, no doubt to allow passengers time to patronise the refreshment rooms). Of course, once recoupled to the train the locos would be in advance of Post 26 and the Signaller had to "verbally inform the Driver that all is right for the train to depart upon receipt of prescribed signals from the platform".

Very minor changes

During the middle years of the 20th century only very minor changes were made at Ballarat B.

It was noted that the lever locks on lever 10 & 30 were removed on 18 March 1937. The function of these lever



locks was not stated, perhaps they worked in conjunction with a track circuit on 'C' track.

On 8 November 1937 the locking on lever 1 was altered so that the Up Distant could only be worked for moves to Nos 1 or 4 Roads. Previously it appears that it could be also cleared for movements to all four roads - this was the original practice for distant signals in Victoria. It is interesting to think about why the ability to clear the distant for two routes was retained at Ballarat B, at most other Victorian locations the locking on the distant was altered so that it could only be cleared for one route. The likely answer is that the main platform was No 1 Road, and this was certainly used for the Adelaide Express. I would love to know if the distant continued to be cleared for trains into No 1 Road until the end or was it left at caution?

Bell communication was provided to the gatekeeper at Doveton St at the beginning of May 1942. Exactly how the gatekeeper there was informed about approaching trains before this was not exactly clear, particularly given the sharp curve in a cutting for trains approaching from Ballarat.

On 18 August 1944, Home/Calling-on 28, 30 & 33 were altered to electrically detect 18U normal. No doubt there was a story behind this. On 15 December 1954 the signal fitter no doubt had an enjoyable day clambering over the signal bridge replacing the green calling-on spectacles with yellow spectacles.

The hand gates at Doveton St (74 miles 12 chains) were replaced by boom barriers on 14 July 1959. A lever lock was provided on lever 29 to hold the starting signal at danger until the booms had been proved down. Dwarfs Posts 34, 35, and 36 were provided to control shunting movements on the sidings over Doveton St. These dwarfs were controlled locally from pushbuttons on each post and not by the signaller at Ballarat B. Amusingly, at the same time, the interlocking was altered so that signals 13 and 29 could not be cleared at the same time. The box diagram at this time suggests a range of subtle alterations had occurred. Mechanical detection had been provided on Catches 26 & 27 and Points 18D, 20 & 22D, and the lockbar on Points 26 had been replaced by a selectable lockbar.

The sixties saw a gradual renewal of the pointwork. The first set renewed was Points 18U on 9 February 1960. The associated lockbar, 24, was renewed at the same time. When points were subsequently renewed the associated lockbar was abolished and the track circuit used to hold

the points via a lever lock on the lever working the facing point lock. This occurred to Lockbars 17 & 21 on 9 February 1960 when Points 16 and single compound 18/19 were renewed. Lockbar 23 was similarly abolished on 31 May 1964, and the selectable Lockbar 25 on 5 February 1967. It is interesting that the very short lockbars on Catches 26 and 27 were not abolished until 1990 when the catch points were removed.

The signal box apparatus foundations were renewed with steel and concrete foundations on 28 February 1971.

The Ballarat Tramways sadly passed into history in late 1971. The Sebastopol and North Ballarat lines were the last to close for traffic with the last trams running on 19 September 1971. The tramway crossing itself was abolished around 30 March 1972 when the insulated joints in the railway lines were relocated.

The Shell Siding off the Doveton St sidings was closed in 1972. Dwarf Post 35 was abolished on 8 June 1972, and the siding was removed at the beginning of May 1973.

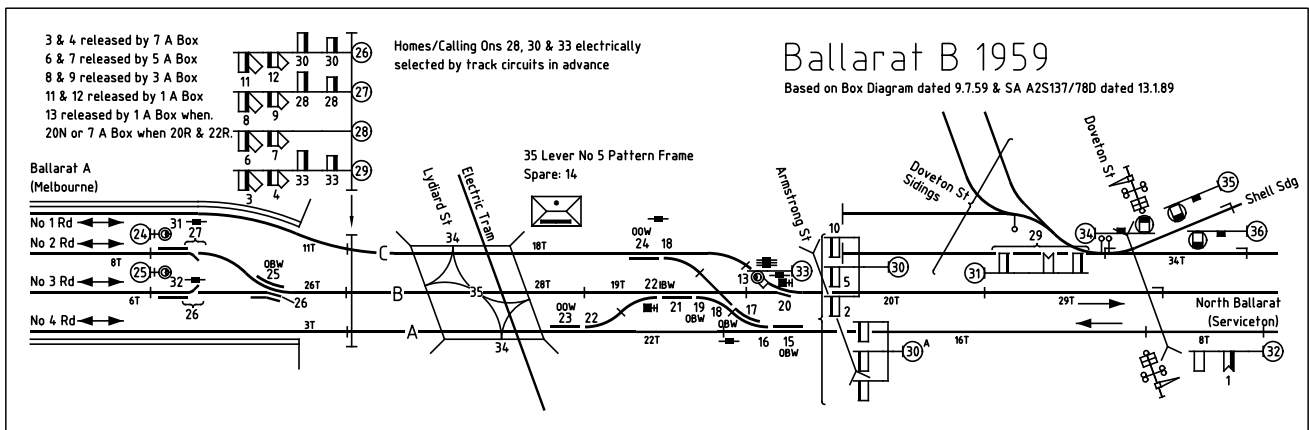
Rotating flashing lights were provided at the Lydiard St gates on 12 December 1978.

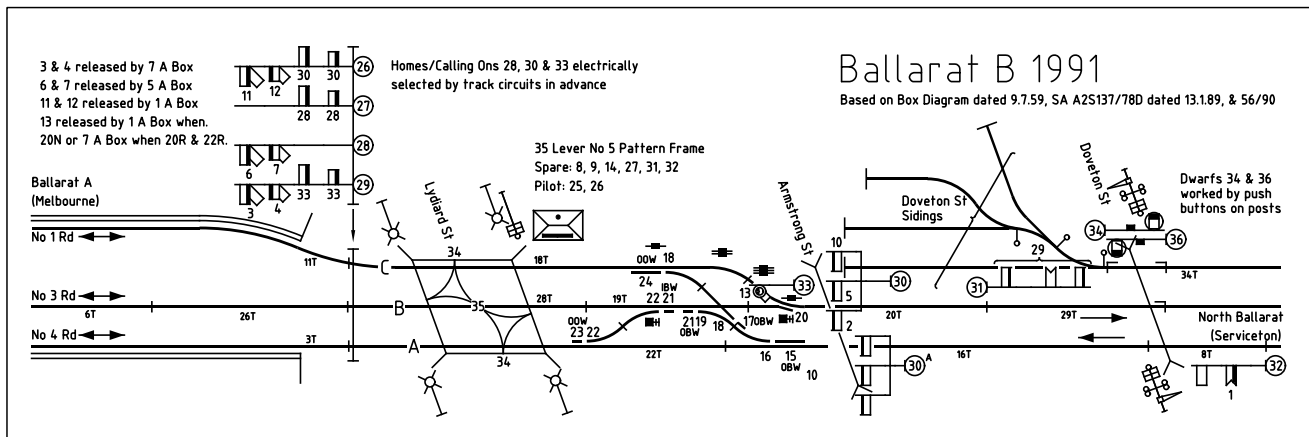
A post telephone was provided at Post 30 on 1 September 1982 (but I suspect it was probably provided at the foot of the co-acting signal, Post 30A). Posts 30 and 30A were electrically lit on 24 May 1984.

The end of mechanical signalling (almost)

In the second half of the '80s the railways instituted a program to rationalise the major country yards. The facilities had changed little for decades and were now completely inappropriate for operations; in particular they were much too large with the demise of car load freight. A major goal of the rationalisation was the closure of mechanical signal boxes and the redundancy of many of the signallers. Ballarat was included in this program and the existing six signal boxes in the area were to be closed, the track greatly simplified, and the rationalised yard worked from a new panel in the Ballarat station office.

Notionally the first stage of the rationalisation of Ballarat took place on 21 September 1990 when Nos 2 and 3 Roads through the train shed were replaced by a single road. The new No 3 Road was realigned through the train shed to allow greater clearances, particularly for freight trains. Catch points 25 & 26 (with their very short lockbars) were abolished. Signals 8 & 9 on the signal bridge were removed, together with the ground discs 31 & 32. Levers





8, 9, 25, 31 & 32 became spare, and 26 & 27 became pilot levers.

The next alteration did not occur for nearly two years. On 14 June 1992 the lead from the Up line to Nos 1 & 3 Roads were abolished (Points 16, 19, & Crossover 18). All Up trains were subsequently routed via No 4 Road. Homes 5 & 10 on Posts 30 and 30A were taken out of use and crossed. Note that all the remaining signals on the signal bridge remained in use as Up shunting moves could continue to be carried out from the Down line via Disc 13.

Ballarat East and Ballarat A signal boxes were abolished around the end of June and a new panel was provided to work the eastern part of Ballarat yard (frustratingly, the exact date is not known). No changes were made at Ballarat B at this time; and push buttons were provided on the panel to release levers 3, 4, and 13 at Ballarat B.

On 24 July 1992 the double track line between Ballarat and Linton Junction was rearranged. The former Up line became a single track main line, with a junction to the Maryborough line at North Ballarat. The former Down line essentially became part of the Redan branch line and served the sidings at Doveton St, North Ballarat, and Whites Siding. A new turnout provided access to this shunting line just on the Down side of Doveton St. A single track extended between Doveton St and Armstrong St where turnouts provided access to all three roads through the train shed. The straight road, incidentally, was the non-platform No 3 Road. Three position light signals and point motors were provided. All signalling between Ballarat East and Linton Junction was now controlled by the panel at Ballarat, except the gates at Lydiard St which remained worked by Ballarat B. All levers in Lydiard St became spare except for Gatestop 34 and Gatewheel 35. There was no interlocking or detection between the gates and the controlling signals. The signaller was consequently cautioned that levers 34 & 35 had to be normal before a move could be signalled across the level crossing.

It was originally intended, of course, to abolish the mechanical gates at Lydiard St and replace them with boom barriers as part of the resignalling. Unfortunately, the precinct was heritage listed and the Ballarat council refused permission to install boom barriers at Lydiard St. Ballarat B consequently entered a sort of half life as a gatebox, working the gates under the direction of the Signaller at Ballarat. The railways declared that it was not possible to work the gates from the panel, and at some

point before 2000, the railways simply secured the Lydiard St gates across the roadway eliminating the need for Ballarat B to be staffed.

After the Adelaide line was closed for gauge conversion in April 1995, the only movements across Lydiard St were locomotives running around Ballarat passengers trains, freight to and from the Maryborough line, and the occasional Redan pilot.

Motorised gates

In late 2000 the gates, including the mechanism, were extensively overhauled. On 26 November 2000 the gates were reconnected to the gatewheel in Ballarat B and restored to service as a prelude for motorisation.

The motorised gates were brought into use on 1 April 2001. Traffic lights were provided at the crossing which were controlled by lever 17 on the panel. The gates themselves were worked by 'open' and 'close' buttons and a 5P keyswitch labelled 'local' and 'remote' was provided. CCTV was provided to check the crossing was clear.

To close the gates to road traffic, the Signaller reversed lever 17 to call the traffic lights. When the traffic lights had cycled to 'Stop' the rotating lights on the gate posts and the warning bell started, the gatestops lifted above the road surface, and the close button on the panel lit up. After checking the CCTV screen to ensure the crossing was clear of cars, the Signaller would press and hold the close button to swing the gates. Gate movement could be stopped at any time by releasing the 'close' button. When the gates were fully closed across the road and the gate stops detected up, the 'Close' indicator on the panel went dark and the required signal could be cleared.

The gates could only be closed across the rail lines when all signals over the crossing were detected normal. To close the gates to rail traffic the Signaller restored Control 17 to normal which lowered the gatestops and illuminated the 'Open' button on the panel. Pressing and holding the 'Open' button swung the gate, and, again releasing the button stopped the gate movement.

Failures of the gate motors, CCTV, or traffic lights could be handled at two levels. With the first level response, the Signaller could operate the keyswitch to the 'local' position which disabled control of the gates from the panel, forced the traffic lights into a flashing yellow mode, and disabled the electric motors. The gates could be operated manually by a signal maintenance technician from a cabinet near the Down end of Ballarat B. A

competent employee was required to direct road traffic. Once closed across the road the gates were secured by a chain until the fault was fixed. If the fault was of longer duration, the gates and gatestop could be reconnected to the frame at Ballarat B. Under these circumstances, the Signaller started a cycle by reversing Control 17 to call the traffic light cycle. When the red traffic light was illuminated, the Signaller could request the gatekeeper to swing the gates. When informed they were closed (and detected closed), the required signal cleared.

Manual operation from the Ballarat B box did not occur often, but it did occur at least once. On the weekend of the 1/2 October 2005 the panel was relocated from the station office to the new RFR control room at Ballarat. As freight trains continued to run, being piloted through Ballarat, the gates were connected up to Ballarat B and worked manually. Manual operation may have been used occasionally on other occasions if the motors failed.

The unit lever panel at Ballarat was replaced by a Phoenix VDU panel on 11 May 2009 in conjunction with the provision of the new station at Wendouree. A small unit lever panel was provided to work the Lydiard St gates.

Automatic pedestrian gates were provided on the Up side of Lydiard St on 27 September 2012. The gates commence to operate when the control lever to call the traffic lights was reversed, and ceased operating when the control lever was restored. At this time the pedestrian crossing on the Down side was taken out of use to allow for construction of a new crossing. Automatic pedestrian gates were provided on the Down side of Lydiard St on 17 October 2012.

The Ballarat signal box was abolished on 27 May 2016 with control being transferred to Centrol. The unit lever panel controlling the Lydiard St gates was abolished. Control of the gates (and the whole line from Deer Park West to Wendouree) was transferred to a VDU based workstation at Centrol.

On 18 December 2017 the automatic pedestrian gates at Lydiard St were equipped with emergency gate control locks.

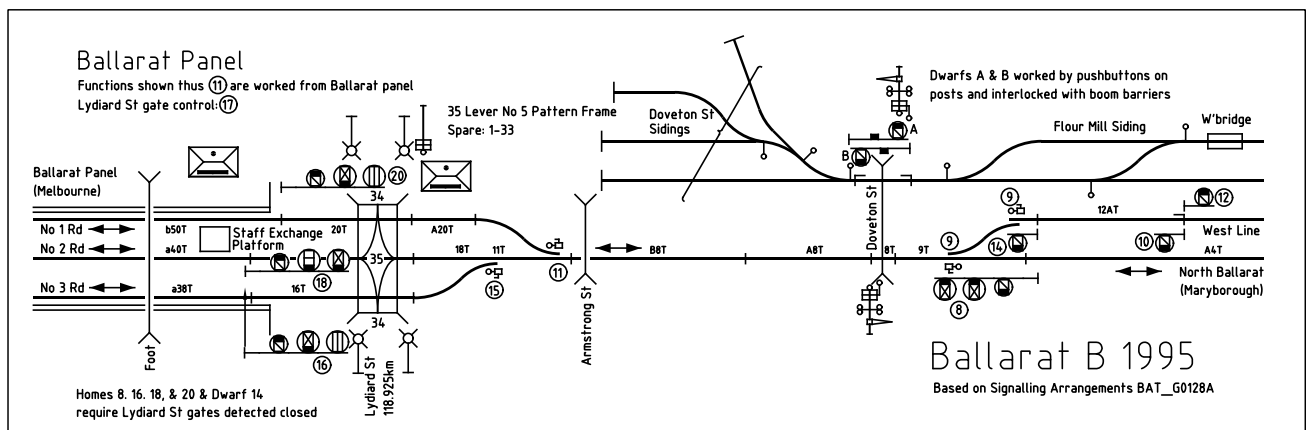
The spectacular end

The end of the interlocked gates came about in a spectacular way on 30 May 2020 when a late night VLocity ran away down Warrenheip bank and demolished the gates.

VLocitys are equipped with two braking systems; a conventional pneumatic system working on disc brakes on the axles, and a hydrodynamic braking system that absorbs energy in the transmission. They are also equipped with a Wheel Slip/Slide Protection (WSP) system that detects loss of adhesion when accelerating or braking. When the WSP detects wheel slide during braking, the brake pressure in the brake cylinder will be reduced¹ and hydrodynamic braking terminated. Sanding may be automatically applied. Braking is automatically reapplied to the level commanded by the driver once the wheel has stopped sliding. Sand during braking is only applied immediately behind the leading bogie. This was a standard approach on multiple unit trains at this time and was intended to ensure that the two leading axles of the train were always on unsanded rail to assist in shunting track circuits. However, it meant that the rails were sanded a long way in advance of the wheels that would benefit from the sanding. Pre-acceptance tests of the VLocity by Bombardier in 2008 revealed the startling result that the sanding system had no effect on stopping distance, including in the low adhesion tests. However, it appears that the VLocitys could achieve the required low adhesion braking performance depending solely on the WSP system.

Train 8185 was a Down three car VLocity that departed Southern Cross at 2216 for Wendouree. The evening was gusty with very light rain and this affected adhesion during the latter part of the journey. When accelerating from the stop at Ballan, for example, the VLocity WSP system was active for three quarters of the time during the first 5 kilometres as it accelerated to the line speed of 160 km/h.

In anticipation of poor adhesion the driver commenced to brake from the 160 km/h speed limit about a quarter of the way down Warrenheip bank, earlier than he normally would have. Six seconds later the WSP detected wheel slide, and two seconds later sand was automatically applied. Four seconds later the driver released the brake



¹ Neither the preliminary nor final report give much details. It is not clear if the brake pressure is reduced or completely released.

Nor is it clear if this reduction applies only on the sliding axle or on all axles on the bogie, car, or train.

and immediately reapplied it. The train then apparently rapidly reduced speed, with the speedo showing 132 km/h after seven seconds and the driver released the brakes. However, the speedo was giving an incorrect reading as it derived its reading from a sliding wheel. GPS data indicates that the actual train speed was between 150 and 158 km/h when the brakes were released.

With the brakes released the train accelerated, the wheels stopped sliding, and 22 seconds later the speedo was showing the correct speed of 161 km/h. At this point, just after passing the freeway entrance overbridge, the driver reapplied the brakes in position 5 (one less than full service braking). Four seconds later the WSP detected wheel slide and the WSP remained active for the remainder of the approach to Ballarat. Two seconds later sand was again applied, and remained active until just after passing over Humffray St.

Seventeen seconds after the brakes were applied for a second time, with the train past the Water St overbridge and still doing 158 km/h, the driver selected full service braking. After a further 26 seconds, with the train probably off the severe down grade and the speedo showing 98 km/h, the driver reduced the brake application to 30%. Again, the speedo was incorrect and the actual speed was between 134 and 136 km/h. Three or four seconds later, with the speed apparently increasing and Humffray St rapidly approaching, the driver reapplied full service braking.

The train passed over Humffray St, Ballarat East, at between 120 and 125 km/h (three times the speed limit of 40 km/h). The report noted the road users would have had a short warning time. It then passed through Crossover 39 to No 1 Road at between 110 and 119 km/h. The design speed through this 1:8.7 crossover is 40 km/h, and consultants for the ATSB calculated the overturning speed at 117 km/h assuming no crosswind and a loaded train (there was a crosswind, but the train was essentially empty which would have lowered the centre of gravity a bit).

The driver applied the brake in emergency just after passing through Crossover 39. He did not apply the brake in emergency earlier as he was "concerned that there would be a time delay to regain braking control if they were to move back to service braking".

Going through the platform at Ballarat the speed was recorded at 98 km/h – without doubt the fastest any rail vehicle has ever passed through Ballarat.

The road beyond the platform had not been set and the gates were closed across the line. The train passed the signal at the end of the platform at Stop, and entered the crossing two seconds later at a speed of 93 km/h. One second before this the road traffic lights changed from green to flashing yellow². Fortunately, it was late at night with little road traffic around, although the CCTV recorded three pedestrians crossing the tracks about 49 seconds before the train arrived.

The gates and gateposts on the south side of Lydiard St crossing were completely destroyed. Parts of the gates were subsequently found lodged in adjacent buildings.

The runaway train continued through Points 11, another 40 km/h turnout, onto the main line, and passed over Doveton St at 73 km/h. Twenty seconds later, and around 220 metres further on, the train finally came to a stop between Doveton St and Macarthur St.

The ATSB estimated that the VLocity achieved a braking rate of 0.2 m/s² on the final part of the Warrenheip bank with the brake in full service (versus a design rate of 0.95 m/s² on dry rail), and that the wheel/rail co-efficient of adhesion was between 0.02 and 0.03 (versus a nominal 0.25 for dry rail). No contaminants were found on the wheel or the rail, and the very poor adhesion was considered to be the result of light rain.

The final report was critical of the VLocity sanding system and V/Line's processes. On the night in question, the delivery systems of the sandboxes on the leading car were partially blocked by vegetation debris, restricting sand delivery to 0.6 kg/m to the left wheel and 1.4 kg/m to the right, vs a minimum design rate of 1.5 kg/m (when cleaned, the delivery rate was 1.8 kg/m). In addition, the right sandbox was found to be effectively empty when inspected after the incident and so may not have been delivering sand during the runaway. The ATSB also noted that the sand nozzles were located higher and further from the wheels than research has shown to be most effective at depositing sand at the right location on the rails. They also noted that modern practice for locating sanding nozzles was to place them closely in advance of the wheels being sanded to maximise the effectiveness of the sanding. Finally, they were critical that V/Line apparently had made no attempt to improve the effectiveness of sanding to improve braking performance.

Lydiard St was immediately closed to road traffic. This closure was formalised on 6 June 2020. The remains of the Down side gates were removed and barriers provided to close off the road on this side. The Up side gates were secured across the road with the gate stops up. The pedestrian gates, flashing lights, and bell were restored to service.

Eventually, the decision was made to remove the interlocked gates and approval was granted to provide boom barriers. Between 13 and 15 November 2021 boom barriers were provided at Lydiard St and the level crossing was subsequently reopened for road traffic. The coordinated traffic lights were restored to use. The boom barriers were worked manually from the existing controls on the Ballarat VDU at Centrol. The remnants of the interlocked gates were abolished and the gate stops were secured down. The open/shut control buttons and the emergency stop button on the Ballarat VDU at Centrol were abolished.

The WON referring to the provision of boom barriers did not mention Ballarat B, but it has no further use.

² Showing the rapid response of the DC track circuit and relay interlocking.

THE TYPE C DWARF SEMAPHORE



C 8/15, issued in 1915 to cover the new three position signalling, introduced Dwarf signals to Victoria. Initially, these were three position shunting signals in which the daytime aspect was given by a home signal arm painted on a red disc. The signal was cleared by rotating the disc. Dwarf signals were intended to work in three positions (Stop, Caution Low Speed, and Clear Low Speed) mounted on the spindle of a standard GRS Model 2A signal mechanism.

However, by 1916 a cheaper Dwarf semaphore had been developed that was worked by wire or rodding from a mechanical frame. This also worked in the upper quadrant, was also notionally a three position signal, but could only show two aspects (Stop and Caution Low Speed).

This design was superseded around 1918 by the Type B mechanical Dwarf signal. It appears that the major improvement of the Type B was that it could work in both the upper (three position) or lower (two position) quadrants. The 1919 Rulebook included the aspects of the two position Dwarf signal.

Around 1920 the Type C mechanical Dwarf signal was introduced. The Type C could also work as a two position (lower quadrant) or three position (upper quadrant) signal, as shown in these photos. Dwarf 25 at Drouin (left) was a three position version; when cleared the disc rotates clockwise. Dwarf 7, at Epsom Rd signal box on the Flemington Racecourse line (below), was a two position version where the disc rotated counter clockwise to clear the signal. Notice the slightly different position of the painted arm in both signals, which was in accordance with drawing B85 for the spectacle disc, and the use of a yellow lens for the 'off' position for the lower quadrant version (which should be green).



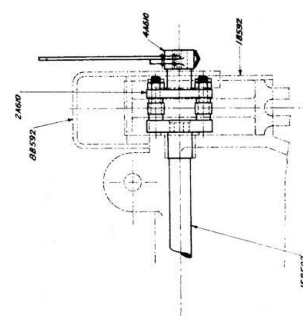


Another view of Dwarf 25 at Drouin (above) showing the operating mechanism. The operating wire connected directly to one arm of an L shaped crank, the other being used for the balance weight. A U shaped vertical connecting rod (3B591) hung from the crank and drove on operating slide (2B591) that had a triangular shaped race (see the assembly drawing on the following page). The disc spindle (4B592) had an operating plate (5B592) with two roller pins at the rear. As the slide was lifted, the race engaged with rollers and rotated the spindle to clear the signal. Curiously, no mention was made on the drawing about the lower quadrant version, but this would have simply required the operating slide to be turned around. One advantage of the Type C Dwarf was that it would be mounted on a standard 5" diameter pipe and could be easily raised up to give an elevated Dwarf signal. The angled box next between the disc and the balance crank on Dwarf 25 (above) was a contact box acting as a signal repeater. Dwarf 7 at Epsom Rd (below) lacked the repeater, and had, instead, a back blinder.

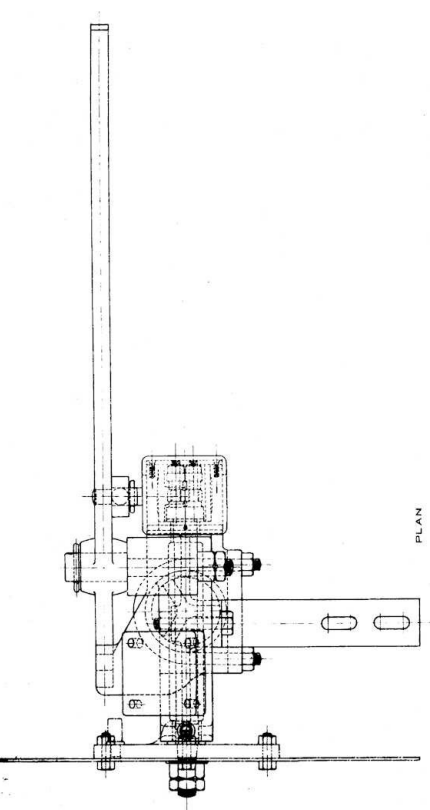


Mechanism complete. Standard as shown. Without Blinder /1137 with Blinder 2417.
 * To be added (minimum 50) - 2417 - 4437

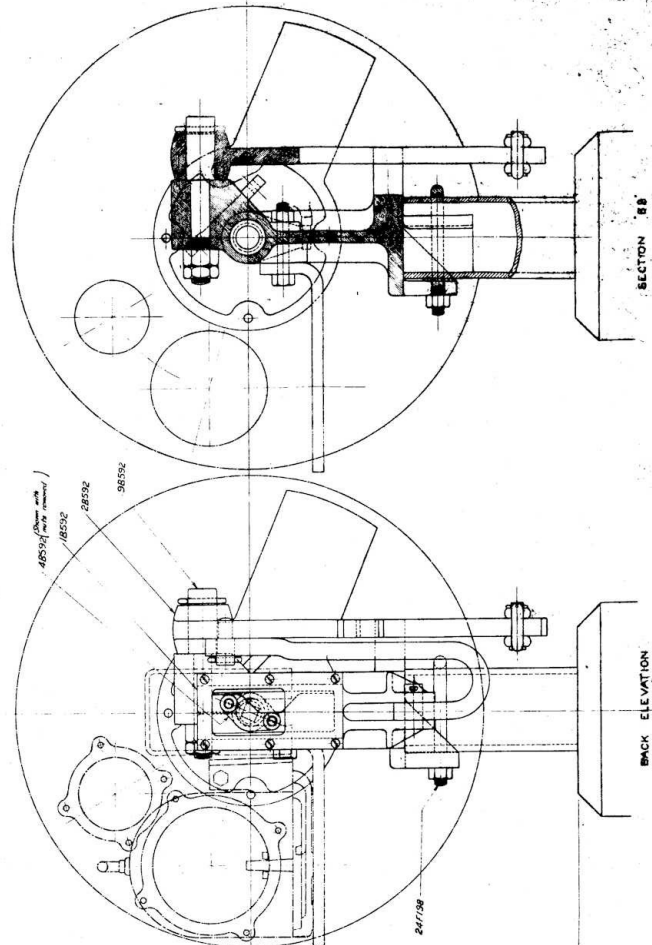
No	Name	Material	QTY	1137	1137-4437
1	Blinder	C.I.	1	L	L
2	Operating Shaft	C.I.	1	L	L
3	Operating Pin	C.I.	1	L	L
4	Operating Roller	C.I.	1	L	L
5	Operating Spring	St.	1	L	L
6	Operating Stop	St.	1	L	L
7	Operating Pin	St.	1	L	L
8	Operating Pin	St.	1	L	L
9	Operating Pin	St.	1	L	L
10	Operating Pin	St.	1	L	L
11	Operating Pin	St.	1	L	L
12	Operating Pin	St.	1	L	L
13	Operating Pin	St.	1	L	L
14	Operating Pin	St.	1	L	L
15	Operating Pin	St.	1	L	L
16	Operating Pin	St.	1	L	L
17	Operating Pin	St.	1	L	L
18	Operating Pin	St.	1	L	L
19	Operating Pin	St.	1	L	L
20	Operating Pin	St.	1	L	L
21	Operating Pin	St.	1	L	L
22	Operating Pin	St.	1	L	L
23	Operating Pin	St.	1	L	L
24	Operating Pin	St.	1	L	L
25	Operating Pin	St.	1	L	L
26	Operating Pin	St.	1	L	L
27	Operating Pin	St.	1	L	L
28	Operating Pin	St.	1	L	L
29	Operating Pin	St.	1	L	L
30	Operating Pin	St.	1	L	L
31	Operating Pin	St.	1	L	L
32	Operating Pin	St.	1	L	L
33	Operating Pin	St.	1	L	L
34	Operating Pin	St.	1	L	L
35	Operating Pin	St.	1	L	L
36	Operating Pin	St.	1	L	L
37	Operating Pin	St.	1	L	L
38	Operating Pin	St.	1	L	L
39	Operating Pin	St.	1	L	L
40	Operating Pin	St.	1	L	L
41	Operating Pin	St.	1	L	L
42	Operating Pin	St.	1	L	L
43	Operating Pin	St.	1	L	L
44	Operating Pin	St.	1	L	L
45	Operating Pin	St.	1	L	L
46	Operating Pin	St.	1	L	L
47	Operating Pin	St.	1	L	L
48	Operating Pin	St.	1	L	L
49	Operating Pin	St.	1	L	L
50	Operating Pin	St.	1	L	L
51	Operating Pin	St.	1	L	L
52	Operating Pin	St.	1	L	L
53	Operating Pin	St.	1	L	L
54	Operating Pin	St.	1	L	L
55	Operating Pin	St.	1	L	L
56	Operating Pin	St.	1	L	L
57	Operating Pin	St.	1	L	L
58	Operating Pin	St.	1	L	L
59	Operating Pin	St.	1	L	L
60	Operating Pin	St.	1	L	L
61	Operating Pin	St.	1	L	L
62	Operating Pin	St.	1	L	L
63	Operating Pin	St.	1	L	L
64	Operating Pin	St.	1	L	L
65	Operating Pin	St.	1	L	L
66	Operating Pin	St.	1	L	L
67	Operating Pin	St.	1	L	L
68	Operating Pin	St.	1	L	L
69	Operating Pin	St.	1	L	L
70	Operating Pin	St.	1	L	L
71	Operating Pin	St.	1	L	L
72	Operating Pin	St.	1	L	L
73	Operating Pin	St.	1	L	L
74	Operating Pin	St.	1	L	L
75	Operating Pin	St.	1	L	L
76	Operating Pin	St.	1	L	L
77	Operating Pin	St.	1	L	L
78	Operating Pin	St.	1	L	L
79	Operating Pin	St.	1	L	L
80	Operating Pin	St.	1	L	L
81	Operating Pin	St.	1	L	L
82	Operating Pin	St.	1	L	L
83	Operating Pin	St.	1	L	L
84	Operating Pin	St.	1	L	L
85	Operating Pin	St.	1	L	L
86	Operating Pin	St.	1	L	L
87	Operating Pin	St.	1	L	L
88	Operating Pin	St.	1	L	L
89	Operating Pin	St.	1	L	L
90	Operating Pin	St.	1	L	L
91	Operating Pin	St.	1	L	L
92	Operating Pin	St.	1	L	L
93	Operating Pin	St.	1	L	L
94	Operating Pin	St.	1	L	L
95	Operating Pin	St.	1	L	L
96	Operating Pin	St.	1	L	L
97	Operating Pin	St.	1	L	L
98	Operating Pin	St.	1	L	L
99	Operating Pin	St.	1	L	L
100	Operating Pin	St.	1	L	L



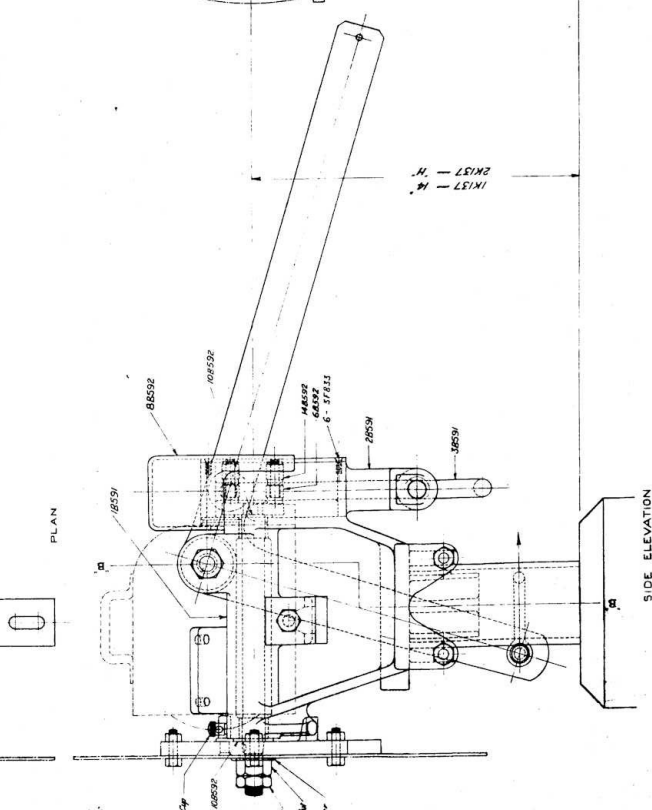
ASSEMBLY
BLINDER IN POSITION



PLAN



SECTION 1137



SIDE ELEVATION

BACK ELEVATION
Cover 48532 symmetrical

SIGNAL