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SOCIETY CONTACT INFORMATION

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MINUTES OF MEETING HELD FRIDAY 17 JULY 2020.

The SRSV meeting scheduled for Friday 15 May 2020 was cancelled because of the restrictions imposed on public gatherings announced by the Victorian Government in response to the COVID-19 (Coronavirus) pandemic.

The SRSV meeting scheduled for Friday 17 July 2020 was held as an online meeting on the internet using the 'ZOOM' application. Again, this was due to the restrictions imposed on public gatherings announced by the Victorian Government in response to the COVID-19 (Coronavirus) pandemic.

Present: – Ken Ashman, Noel Bamford, Phil Barker, Brett Cleak, Graeme Cleak, Glenn Cumming, John Dennis, Michael Formaini, Darren French, Peter Gerandt, Chris Gordon, Judy Gordon, Bill Johnston, Chris King, Keith Lambert, David Langberg, Neil Lewis, Andrew McLean, Eddie Oliver, Roo Richards, Laurie Savage, Peter Silva, James Sinclair, David Stosser, Bob Taaffe, Andrew Waugh and Andrew Wheatland. (27)

Apologies: – David Langley.

The Vice-President Mr. Bill Johnston, took the chair & opened the meeting at 20:05 hours (8.05 pm).

Minutes of the March 2020 Meeting: – Accepted as published. Michael Formaini / Judy Gordon. Carried.

Business Arising: – Nil.

Correspondence: – The Annual return for 2019 was lodged with Consumer affairs Victoria.

Letters to Surrey Hills Neighbourhood Centre cancelling our bookings for the meetings in May 2020 and July 2020.

The invoice for the "Signalling Record" for 2019 was received from the SRSUK and payment was sent.

Letter to Brett Leslie of Stawell welcoming him to membership of the SRSV. Michael Formaini / Peter Silva. Carried.

Reports: – Tours. It is still intended to have a Signal Box tour in September 2020. However, the current restrictions on public gatherings make this unlikely and it is possible that permission for the tour might be refused.

General Business: – David Stosser referred to a recent government announcement about works between Bendigo – Echuca.

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

- The current occupation between Moorabbin – Mordialloc will be completed tomorrow and train services will resume on Monday morning.
- Cheltenham Railway Station will reopen on Monday 17 August 2020. The new signalling and interlocking at Cheltenham is now worked by remote control from Caulfield.

(Front cover). The new Home CTM710 at Cheltenham with the route set up for a move through Platform 2 over Points 610 and 622 reverse. The indication displayed is Reduce to Medium Speed/65, even though the turnout is reverse. This is because Points 610 are 1:21 turnouts and can be traversed reversed at line speed (80 km/h), hence drivers can travel at normal speed at this signal irrespective of whether the points are normal or reverse. However, Points 622 back to the Up line beyond the platform is a 65 km/h (1:15) turnout, so this signal instructs the driver to brake for the 65 km/h turnout beyond the next Home. The use of three drives on the Unistar point mechanism fitted to Points 610 is to be noted. The two back drives ensure that the point blades have the correct alignment, and are particularly necessary with the stiffer point blades on modern tangential points. Photo Chris Gordon

- Absolute Occupation between Anstey – Upfield between Monday 27 July 2020 – Monday 2 November 2020 for level crossing removal works. New points and signals controlled from Metrol have been provided at Anstey to allow trains to terminate in the Up platform.
- Absolute Occupation between Dandenong – Cranbourne between Tuesday 8 September 2020 – Monday 14 September 2020 for duplication and level crossing removal works.
- Absolute Occupation between Laverton – Werribee between Thursday 6 August 2020 – Friday 14 August 2020 for level crossing removal works.
- Absolute Occupation at the Down end of Werribee between Thursday 6 August 2020 – Monday 7 December 2020 for level crossing removal works.
- Absolute Occupation between Ringwood – Lilydale between Friday 25 September 2020 – Monday 28 September 2020 for level crossing removal works. This will then be followed by a further 10-day occupation in December 2020.
- Absolute Occupation between Mordialloc – Frankston between Tuesday 1 September 2020 – Monday 7 September 2020 for level crossing removal works.
- Absolute Occupation between Newmarket – Craigieburn commencing Friday 4 December 2020 for the start of level crossing removal works at Glenroy Road, Glenroy.

Darren French used the 'Zoom screen share' to display an old article describing a runaway at Newport Workshops involving locomotive W255.

Ken Ashman provided details about current projects on the North Island in New Zealand. A summary of the discussion follows: –

- A new passenger service is to be introduced between Auckland – Hamilton later in 2020.
- Signalling works to allow bi-directional working on the main lines at Te Rapa are being planned.
- The North Auckland Line is to be resleepered with concrete sleepers and tunnel floors are to be lowered.
- Track and signal alterations for upgrades to rail freight terminals at Hamilton.

Chris Gordon provided report from Cheltenham where he had finished the commissioning of the new interlocking and advised that the Absolute Occupation was about to be handed back.

Andrew Wheatland and Roo Richards provided details about level crossing projects on the Puffing Billy railway. A summary of the discussion follows: –

- The level crossing at Beaconsfield – Emerald Road, Emerald was upgraded from flashing lights to boom barriers between 4-8 May 2020. The HXP-1 level crossing predictor was upgraded to HXP-3 and approach tracks were extended on both sides of the crossing to give more consistent warning times (130% of minimum). A new double width stainless steel cabinet, with concrete plinth and bollards was provided in the North West (Down side, Up end) quadrant and access / parking space provided (former cabinet in North East quadrant). Two (2) boom barriers were provided and Stratco powder coated fencing was installed.
- The level crossing at Pakenham Road, Cockatoo was upgraded from flashing lights to boom barriers between 4-8 May 2020. Relay operation was retained and additional controls and indications provided. A new double width stainless steel cabinet was provided in the same quadrant as the previous cabinet. The former cabinet was removed several weeks before commissioning on account of a total occupation due to the COVID-19 shutdown and to allow unimpeded access for new conduits and slab works. This is the first three (3) boom crossing on Puffing Billy. Northbound approach – standard boom at right angles to traffic flow. Southbound approach – two (2) short booms parallel to rail line on account of overhead power lines, close proximity of West bound McBride Street intersection with Pakenham Road, the desire to keep right turn out of west bound McBride Street available (across the face of the booms) and the desire to keep left turn from south bound Pakenham Road into east bound McBride Street available. The 'Zoom screen share' used to illustrate the unique arrangement at this crossing.
- At Lakeside approx. 500 metres of conduit has been installed for the signalling upgrade (outer home signal to outer home signal).
- Design work is underway for the upgrade of the level crossing at School Road, Menzies Creek from flashing lights to boom barriers. This crossing will have four (4) boom barriers for full closure of the crossing on account of the side road intersection being inside the stop line.

Syllabus Item: – The Vice-President introduced Member Keith Lambert to present the Syllabus Item.

Keith presented a selection of 18 digital images from Victoria in the form of a "Where is it" type quiz.

The images came from a variety of sources and featured a variety of locations, both country and metropolitan, and from different eras.

Opportunity was provided to view the images and determine the location of each image.

Andrew Waugh top scored with David Langberg also scoring very well.

At the completion of the Syllabus Item, the Vice-President thanked Keith for the entertainment.

Normally at this stage the meeting would close but the meeting Chairman invited further discussion and the meeting continued.

General Business (continued): – David Stosser referred to the two (2) position signals on the signal bridge at Frankston and asked where else two (2) position dwarf signals had been mounted on a signal bridge.

David Stosser used the 'Zoom screen share' to display an extract from a Flinders Street "A" Box pull diagram where lever 69 was noted as a pilot lever and asked what lever 69 was used for before it became a pilot lever. While some of us were discussing the possibilities, others were referring to information that they had close to hand. David Langberg found a comment on a locking sketch advising that lever 69 was previously a point lever. Andrew Waugh was then able to use the 'Zoom screen share' to share a diagram of Flinders Street showing where number 69 points were.

Chris Gordon described some of the new signals at Cheltenham that are bolted to the wall of the cutting / trench / tunnel.

Roo Richards used the 'Zoom screen share' to display images of a train describer indicator system that was trialled in the 1920's.

Andrew Waugh mentioned the HathiTrust digital library at www.hathitrust.org This website is home to very large collection of digital books and other content. Andrew has recently been reading copies of the Railway Age Gazette from this website.

Ken Ashman recommended Jon Roma's website which contains a lot of signalling material. www.jonroma.net

Bob Taaffe asked when was the first railway relay introduced. Ken (Relay) Ashman advised that Robinson's track circuit of 1872 included a relay. Andrew Waugh noted the Winter's block instruments included an iron clad relay when they were introduced in Victoria in 1883.

Neil Lewis used the 'Zoom screen share' to show images of the construction of the new signal box at Lakeside on the Puffing Billy Railway.

Meeting closed at 21:45 hours.

The next meeting will be on Friday 18 September, 2020, commencing at 20:00 hours (8.00pm).

SIGNALLING ALTERATIONS

The following alterations were published in WN 22/20 to WN 29/20, 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.

08.06.2020 **Kananook** **(SW 346/20, WN 22)**

Between Sunday, 7.6., and Monday 8.6., the following alterations took place:

- Up Home KAN737 was relocated 17 metres in the Down direction.
- Homes KSY715 and KSY720 can now show Medium Speed Warning, and the Low Speed aspect was reinstated.
- The Railview data was modified to give train number propagation between the Railview and the Caulfield TCMS. Mordialloc signal box will not receive TD numbers by this method, and the Train Number Transmitter will remain operational.

Amend Diagram 21/20 (Bonbeach – Frankston).

(09.06.2020) **Bonbeach – Frankston** **(SW 374/20, WN 23)**

Diagram 51/20 (Bonbeach – Frankston) replaced 21/20 as in service.

10.06.2020 **North Geelong C** **(TON 206/20, WN 24)**

On Wednesday, 10.6., the broad gauge Engine Road on the Down side of Thompson Road has been booked out of use due to poor track condition.

11.06.2020 **Woomelang** **(TON 207/20, WN 24)**

On Thursday, 11.6., No 3 Road was booked back into service.

(12.06.2020) **Cheltenham** **(LXRA)**

Park and Charman Roads were reopened to road traffic over the new bridges. Park Road was scheduled to reopen for road traffic on Monday, 8.6., and Charman Road on Thursday, 11.6.

12.06.2020 **North Geelong Yard** **(TON 205/20, WN 24)**

On Wednesday, 12.6., the lead between Dwarf GLG88 and 52 hand points was booked back into service. Access to this lead from Roads 23 & 26 and the extensions of Roads 23 to 26 & Sidings E on the Down side of the ladder remain booked out of service.

13.06.2020 **Reservoir** **(SW 358/20, WN 23)**

On Saturday, 13.6., signal post telephones were commissioned. The axle counter sensor for RES196T track was relocated.

15.06.2020 **North Geelong Yard** **(TON 209/20, WN 24)**

On Monday, 15.6., No 18 Road was booked back into service. Access to No 18 Road is via the lead extending to Dwarf GLG88 via 'A' Sidings. The Up end of No 23 Road remains booked out of service and the points are secured to lie towards No 18 Road.

15.06.2020 **Kananook** **(SW 382/20, WN 24)**

On Monday, 15.6., the software data was updated to provide SPAD alarms for signals F1158 and KAN626.

16.06.2020 **Warracknabeal** **(TON 213/20, WN 25)**

On Tuesday, 16.6., the Grain Elevator Siding (348.549 km to 349.052 km) was booked out of service due to track condition. The points at 348.549 km on the Down side of the platform have been secured normal.

22.06.2020 **Southern Cross – Richmond (Burnley Loop)** **(SW 394/20, WN 25)**

Between Friday, 19.6., and Monday, 22.6., the following U2L signals will be converted from incandescent lights to LED lights: 300, 201, 203, 389, 389P, 209, 213, 217, 391, 225, 229, 235, 237, 393, 393P, 245, 251, 257, & 259.

22.06.2020 **Warracknabeal** **(TON 218/20, WN 25)**

On Monday, 22.6., No 2 Road (348.319 km to 349.079 km) was booked out of service due to track condition. The Up and Down end points have been secured normal.

22.06.2020 **Kananook** **(SW 398/20, WN 25)**

On Monday, 22.6., the RailView data will be updated to provide the following functions:

- Provision of SPAD alarms for signals F1158 & KAN626
- Provision of alarms to indicate a fault with the cross boundary supervisor axle counter track at the interfaces to conventional track circuits.
- Alteration to the Down train number berth stack at Bonbeach. The next stacked train description number will drop down to the track berth when the next train occupies the first indicated track on the RailView.

(23.06.2020) **Train Order Territory** **(SW 94/20, WN 25)**

Operating Procedure 131 (Train Order Territory) was reissued. Down trains that terminate at Dunolly, or Up trains that originate there, are not required to be issued with a corridor Master Key. SW 102/19 was cancelled.

(23.06.2020) **Geelong** **(SW 95/20, WN 25)**

Diagram 36/20 (Geelong) replaced 8/11 to reflect the altered locations of Posts GLG142 & GLG144, and the altered Down end connections to the Carriage Wash Road (SW 163/15).

(23.06.2020) **Warrnambool** **(TON 211/20, WN 25)**

The Up end of No 3 Road, No 4 Road, and the Turntable Road have been booked back into service. TON 225/14, 226/14, & 178/16 are cancelled.

24.06.2020 **Kilmore East** **(SW 98/20 & 100/20, WN 26)**

From Wednesday, 24.6., the following instructions govern operation of the emergency release for lever 23 (the grade crossing Pilot lever).

When communication is lost between the ARTC control centre and the field interlocking that prevents the release of the Pilot lever, the Signaller Kilmore East will request permission from the ARTC Train Controller to use the emergency key release mounted on the signal box diagram. This key release requires all standard gauge signals reading over the grade crossing to be at stop and free of approach locking, and the communications link for the ARTC interlocking to have failed. Once permission is granted, the Signaller can operate the key switch. A 10 minute timer will then commence to run. When this timer has expired it will be possible to reverse Lever 23 using the pushbutton on the block shelf. This is a one-time release; when Lever 23 has been restored to normal it will be necessary to request permission to operate the release a second time to reverse Lever 23 again.

Operating Procedure 102 (Kilmore East) was reissued, and SW 123/08 was cancelled.

(30.06.2020) **Ballarat** **(SW 102/20, WN 26)**

As part of the Ballarat Station Bus Interchange Project, No 5 Road (Ballarat Dock) has been abolished. Dwarf 36 has been abolished. A baulk was provided clear of the Independent Track.

Vehicles are not permitted to be left unattended in the Independent Track.

Diagram 48/20 (Ballarat) replaced 38/20 and 98/12. Apart from this alteration, the new diagram shows the removal of the Fish and Chip Siding (SW 63/17), the reconfiguration of the Ballarat Car Sidings to 160 metres & the renumbering of the roads, and the removal of the Ballarat Goods Yard (SW 72/20).

(30.06.2020) Ararat (SW 103/20, WN 26)

Operating Procedure 82 (Ararat) was reissued. SW 36/19 was cancelled.

(30.06.2020) Wallan (SW 100/20, WN 26)

Operating Procedure 101 (Wallan) was issued.

(30.06.2020) Seymour (SW 100/20, WN 26)

Operating Procedure 103 (Seymour) replaced Operating Procedures 101 (SW 146/08), 102 (SW 123/08), and 103 (161/09).

(30.06.2020) Lyndhurst (SW 435/20, WN 26)

The Up and Down end Points (678 & 679) have been removed (previously booked out in TON 522/20). Temporary circuit alterations were made.

Diagram 43/20 (Lyndbrook Loop to Cranbourne) replaced 35/19.

01.07.2020 Colac (SW 101/20, WN 26)

On Wednesday, 1.7., and Thursday, 2.7., the points leading to the turntable were abolished and will be removed. These points had been secured out of use in SW 70/08. Amend Diagram 54/19 (Birregurra – Colac).

02.07.2020 Boorcan (SW 106/20, WN 26)

On Thursday, 2.7., boom barriers were provided at the passive crossing at Oswells Rd (209.033 km). Operation is by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment was provided. An axle counter reset switch was provided.

Amend Diagram 52/17 (Camperdown – Terang).

03.07.2020 Moriac (SW 108/20, WN 26)

On Friday, 3.7., boom barriers were provided at the flashing lights at Hunts Rd (93.929 km). Operation is by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment was provided. An axle counter reset switch was provided.

Amend Diagram 24/17 (Moriac – Winchelsea).

03.07.2020 Buckley (SW 109/20, WN 26)

On Friday, 3.7., boom barriers were provided at the passive crossing at Waltons Rd (102.256 km). Operation is by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment was provided. An axle counter reset switch was provided.

Amend Diagram 24/17 (Moriac – Winchelsea).

04.07.2020 Terang (SW 112/20, WN 27)

On Saturday, 4.7., boom barriers were provided at the passive crossing at Coyles Ln (226.537 km). Operation is by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment was provided. An axle counter reset switch is NOT provided and on or off tracking of road rail vehicles is not permitted at this crossing.

Amend Diagram 6/20 (Panmure to Sherwood Park)

06.07.2020 Buckley (SW 110/20, WN 26)

On Monday, 6.7., boom barriers were provided at the flashing lights at Buckley South Rd (103.859 km). Operation is by axle counters. Healthy state indicators, yellow whistle boards, and remote monitoring equipment was provided. An axle counter reset switch was provided.

Amend Diagram 24/17 (Moriac – Winchelsea).

06.07.2020 West Footscray (SW 421/20 & 104/20, WN 26)

Between Saturday, 27.6., and Monday, 6.7., the new No 1 Platform was commissioned. The Up line was slewed through this platform and the out of service track serving the old No 1 Platform was baulked at both ends. Automatics M286 and M306 were relocated 35 and 30 metres (respectively) in the Up direction and laterally to the slewed track. The TCMS train control system was updated.

n addition, track panels for future turnouts were installed at the following locations: Down side of Albert St; Up side of Geelong Road; Down side of Geelong Road between the Up line and the Down line and the future turnback; and the Down side of the platforms at West Footscray between the Up line and future turnback, and from the turnback to the Down line.

Diagrams 33/20 (Footscray – Spotswood) & 35/20 (West Footscray – Tottenham) replaced 27/19 & 25/19 respectively.

06.07.2020 **Calder Park Sidings**
(SW 422/20 & 105/20, WN 25)
Between Saturday, 27.6., and Monday, 6.7., the track layout was altered to provide leads to a future holding road, third bank of stabling sidings, and a light repair centre and presentation road. The turnouts in operational roads will be installed as straight railed track panels. There are no changes to the existing signalling.

Diagram 49/20 (Watergardens – Clarkefield) replaced 13/19.

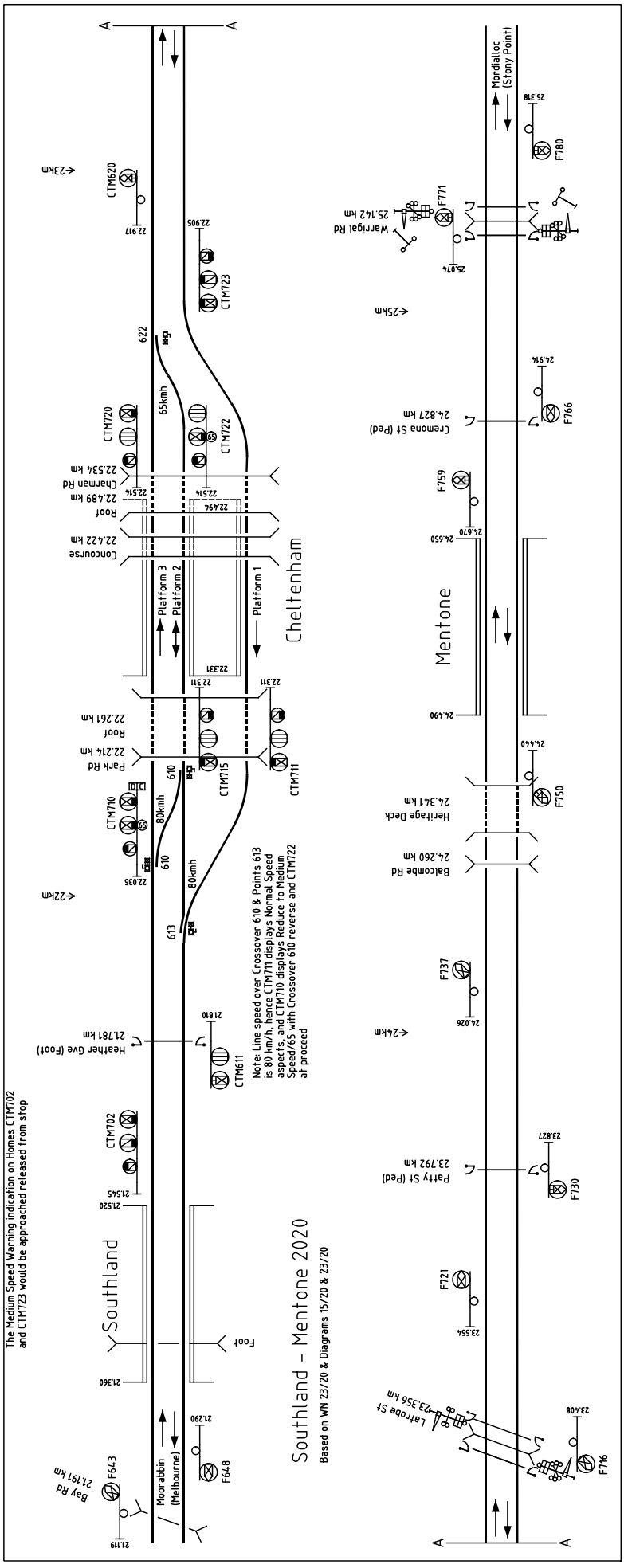
(07.07.2020) **Moriac – Sherwood Park**
(SW 113/20, WN 27)
Diagrams 30/19 (Moriac – Winchelsea), 34/19 (Camperdown – Terang) & 14/20 (Panmure – Sherwood Park) replaced 24/17, 52/17 & 6/20 respectively as in service. The alterations concern the provision of level crossing upgrades at Hunts Rd, Waltons Rd, Buckley South Rd, Oswells Rd, and Coyles Ln.

15.07.2020 **Dandenong**
(SW 475/20, WN 29)
Commencing Wednesday, 15.7., testing of the TCMS control system will be conducted at Dandenong signal box. The TCMS will be operated in 'shadow mode'.

18.07.2020 **Southland – Parkdale**
(SW 359/20, SW 380/20 & SWP 6/20, WN 23 & 24)
On Saturday, 18.7., the grade separations at Cheltenham and Mentone will be brought into service and the track between Moorabbin and Mordialloc reopened. (The signalling was booked back in on 17.7. and the first trains ran on that day.) Cheltenham and Mentone stations will not reopen, and all trains will run express through these stations.

Cheltenham

- The line has been lowered in a cutting and Park Road and Charman



Road cross over the line at 22.214 km and 22.534 km respectively

- The new station has three platforms 163 metres in length.
- Homes CTM702, CTM710, CTM711, CTM715, CTM720, CTM722, CTM723 were provided. Uncontrolled Home CTM611 was provided. Automatic CTM620 was provided.
- Crossover 610 and Points 613 & 622 were provided. Crossover 610 and Points 613 use 1:21 turnouts, while Points 622 is a 1:15 turnout. All points are equipped with Unistar in-bearer point machines.
- The station limits on the Down line are from CTM702 to CTM620, and on the Up line from CTM723 to CTM611.
- Note that SW 359/20 incorrectly referred to the route indicator on CTM710 as a 'feather' type.

Cheltenham – Mentone

- The Patty St pedestrian crib crossing was provided with automatic pedestrian gates with electromagnetic latches on the emergency gate.
- Automatics F716, F721, F730, F737, F750, F759, F766, F771, were provided

Mentone

- The line has been lowered in a cutting and Balcombe Rd crosses over the line 24.260 km
- The new station has two platforms 160 metres in length.
- A 42 metre wide pedestrian walkway over the lines has been provided at the site of the old station (24.320 km – 24.362 km).

General

- The signalling will be controlled from Caulfield signal box. A new Smartlock 400 ViXL interlocking was provided to control the section of line between the Down side of Highett and Warrigal Rd on the Down side of Mentone.
- All signals are of the LED type and are provided with TPWS(TSS)
- Axle counters are the primary method of rail vehicle detection. Axle counter resets provided are: supervisory reset (automatic); point supervisor reset (automatic); next train reset (manual – requires SMT attendance); occupation key reset (manual – requires SMT attendance); and full counting head control. See General Operating Procedures 14 & 17.

Diagrams 15/20 (Glenhuntly – Southland) and 23/20 (Cheltenham – Chelsea) replaced 7/17 & 19/20 respectively.

Caulfield Group Operating Procedure 1 was reissued under a new title 'Caulfield – Moorabbin – Cheltenham, Control of Rail Traffic Movements'.

20.07.2020 **Mentone** **(LXRA)**

On Monday, 20.7., the station was reopened for passenger traffic.

(21.07.2020) **Book of Rules (Section 15)** **(SW 118/20, WN 29)**

Effective forthwith, the instructions on SW1133/99 (Section 15) will no longer apply on the V/Line Network.

(21.07.2020) **Warrenheip Loop** **(SW 119/20, WN 29)**

Effective forthwith, Warrenheip Loop was booked out of service due to V crossing damage. All trains will work by the Down Loop. Warrenheip Loop is now classified as an Intermediate Train Order Station and will be available for follow on movements.

End£

THE ORIGINS OF THE AUTOMATIC BLOCK SYSTEM

(Continued from Vol 45 No 4)

Further improvements

Trade press reports were clear that the Hall system was improved after its initial installations. The exact sequence of improvements is unclear, but an extensive description of the system in 1879[1] shows that improvements were made in both the signal and the circuits.

Figure 11 shows the actual Hall signal in 1879. The left-hand drawing is of the back of the post and shows the door that provided access to the mechanism. A single circular glass window was provided on both sides of the case which allowed light shine through the case to give the signal. At night a lamp was mounted on the back of the signal to replace the sunlight (the lamp is shown on the right-hand drawing, but is omitted on the left-hand one). Although the drawing is remarkably detailed, it is not clear how access was gained to the lamp or mechanism as no permanent ladder is shown and the bracing would have made is difficult to prop a ladder against the mast. The insulators at the top of the mast are the aerial electrical connections – weatherproof electrical cabling was primitive in 1879.

The 1879 Hall signal mechanism is shown in Figure 12 on the next page. This is the mechanism for the automatic signal at the entrance to the block. Unfortunately, no similar drawing for a safety signal mechanism was provided, but it was noted that this mechanism was similar in operation to the automatic signal, but arranged differently as the signal disc was lifted clear of the opening when operated.

The basic mechanism of the signal – a set of electro magnets operating a light counterweighted disk arm via a lever and chain is unchanged from Hall's 1869 patent. The signal remains mechanically latched, as introduced in his 1871 patent. However, the mechanical latch is now directly applied to the electro-magnet armature (where it was applied in the 1873 patent on the safety signal). The operating and unlatching magnets are consequently mounted together at the base of the mechanism. The shock absorber in the operating rod, again from the 1873 patent, has been retained, but additional shock absorbing springs are fitted at the top of the mechanism.

The major design change in this signal was in the design of the electrical contacts. The contactor mechanism was now mounted in the middle of the signal and was directly worked by the shaft 'X' on which the signal arm was mounted. Substantial sliding contacts (1-2 & 3-4) are provided to detect the signal in the latched and unlatched position, and two lighter momentary contacts (5-6 & 7-8) are provided that make briefly as the signal arm moves from the latched to the unlatched position and vice versa.

The circuits for this signal are shown in Figure 13 which show how the additional contacts are used. The major

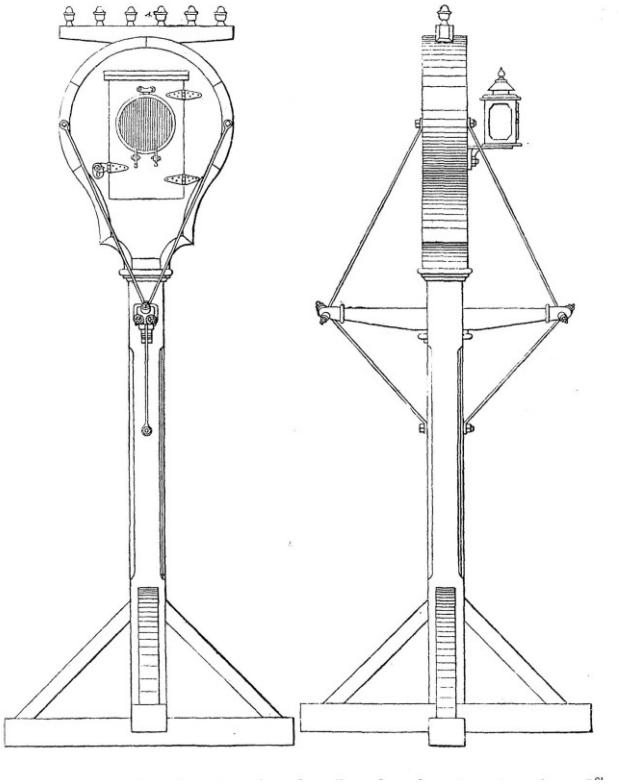


Figure 11. The appearance of the Hall signal in 1879. (from the Railroad Gazette, 31 October 1879 p578)

change in the circuits over 1873 was the daisy chaining of the latching and unlatching magnets in the automatic and safety signal. Passage of a train over the 'on' treadle directly operated the latching magnet of the automatic signal. Movement of the disc arm of this signal made a momentary contact that operated the latching magnet of the safety signal. Passage of the train over the off treadle operated the unlatching magnet of the safety signal. Movement of the disc arm of the safety signal to the unlatched position made a momentary contact that operated the unlatching magnet of the automatic signal. The second change from the 1873 circuit was that each latching and unlatching circuit detected the signal arm in the opposite position – for example the circuit for the latching magnet of the automatic signal proved the automatic signal arm off. The latching magnet to place the signal at danger behind a train would consequently only be energised if the signal was at clear. Once at danger, further depressions of the 'On' treadle would not re-energise the latching magnet. Detecting the position of the disc arm not only saved battery power, but it would have reduced substantially the number of mechanical shocks as the mechanism was operated.

[1] The Hall Automatic Electric Railroad Signals, Thomas F. Krajewski, Railroad Gazette 24.10.1879 p563, 31.10.1879 p577-9, & 7.11.1879 p589-90

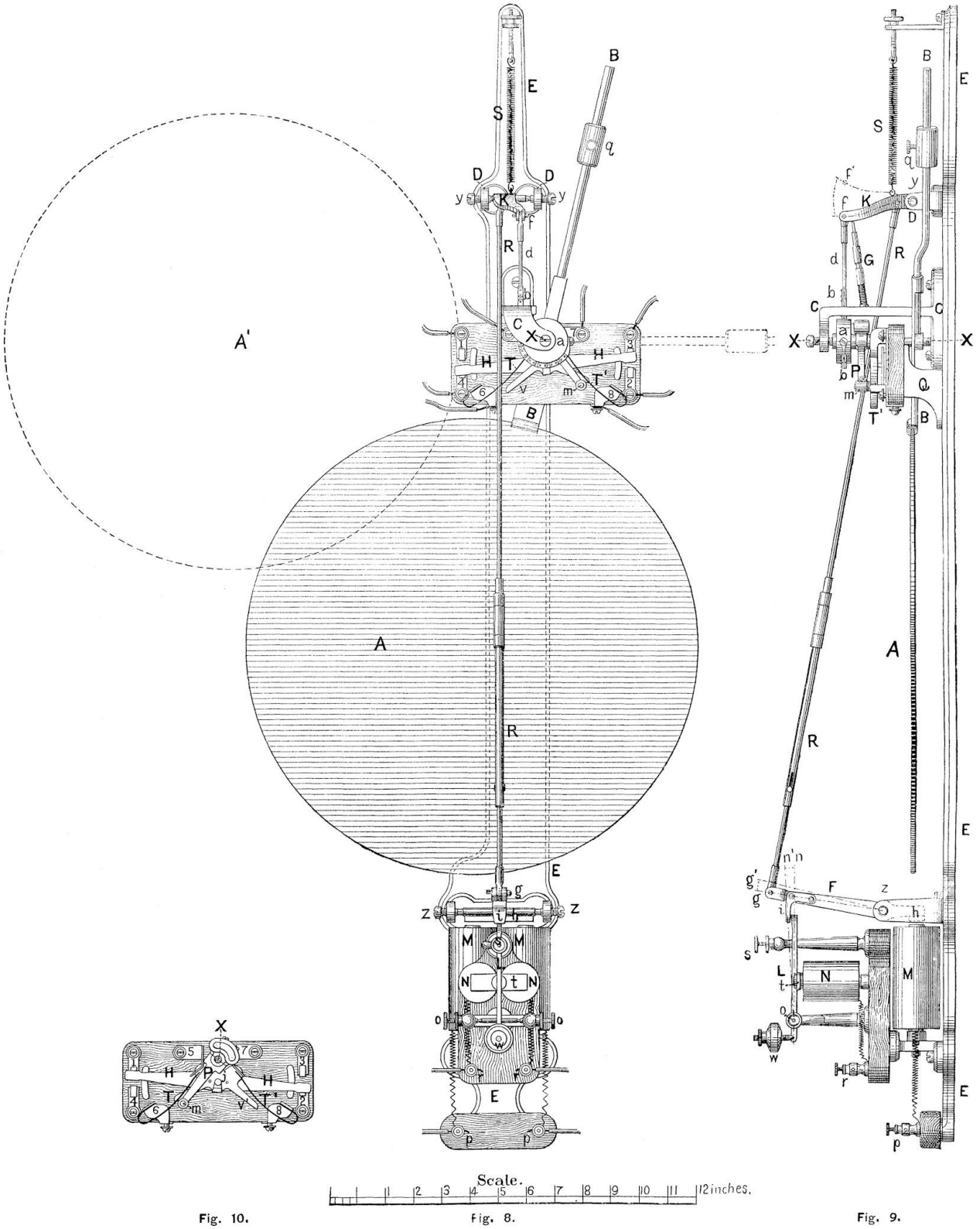


Figure 12. The 1879 Hall Signal automatic signal mechanism. The small diagram on the bottom left is an enlarged version of the contacts which was the key feature of this signal. (from the Railroad Gazette, 31.10.1879 p579)

It was noted in the 1879 description of this circuit that, with power transmission from a central battery, if different trains happened to operate multiple treadles at once, sometimes the signals wouldn't latch or unlatch. However, a train would operate a treadle multiple times and one of these operations would operate the signal.

It would appear, however, that there was a weakness in the circuits. The latch magnet for the safety signal and the unlatch magnet of the automatic signal were operated by momentary contacts on the matching automatic and safety signal. These momentary contacts would only close once for the passage of each train – if the controlled magnet failed to operate for that train it would remain unoperated. In this case, the safety signal would remain 'on' when the automatic signal went on – falsely indicating to the engineer that the system had not gone to danger behind his

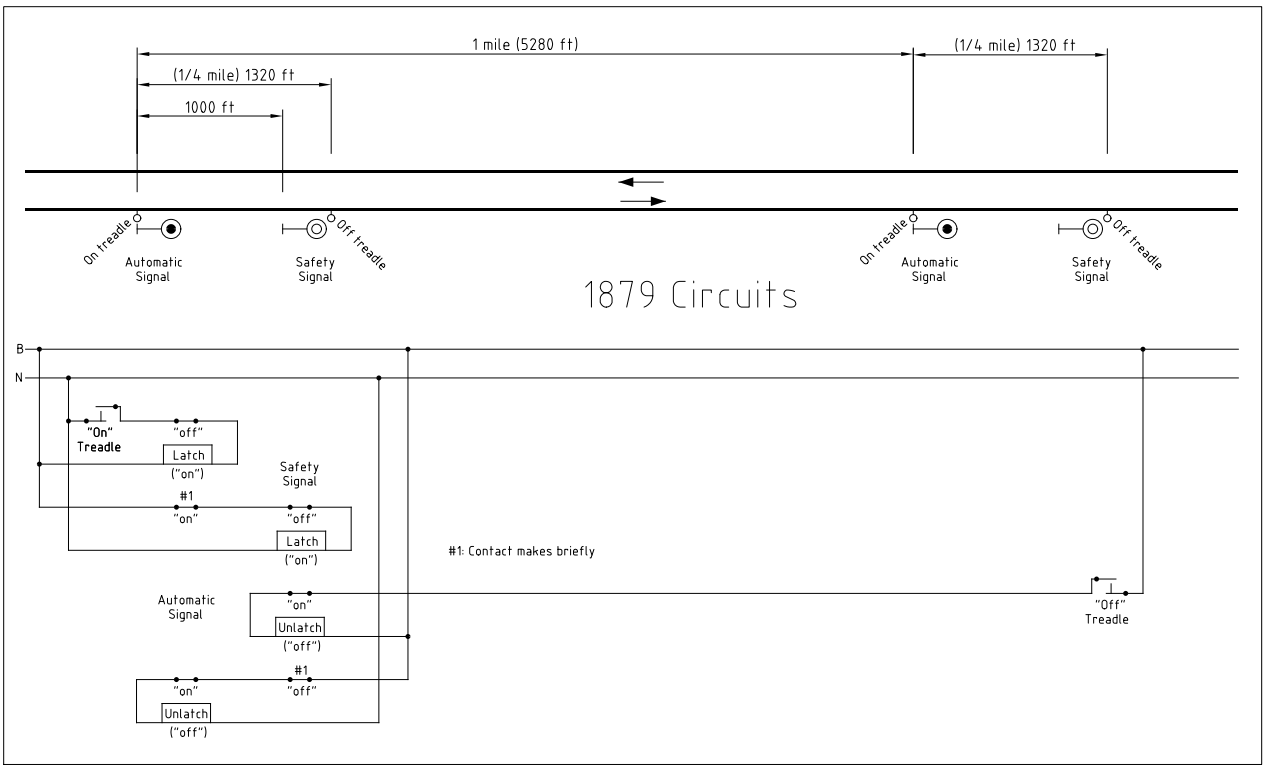


Figure 13. The 1879 circuits for one block. Note that the arrangement of the signals is unchanged.

train, or the automatic signal would fail to clear when the block was cleared. In both cases the failure was on the side of safety, so perhaps this was ignored.

Hall's technology applied to stations

In addition to its application to automatic block signalling, Hall's technology could be installed to protect trains within station limits. Figure 14 shows how a two track station with a level crossing, crossovers, and sidings was protected in this way.

Main line trains were protected by signals on each line on the approach to the station. These signals were automatically placed to danger as the arriving train passed the signal, and automatically cleared as the train departed. These signals would protect trains at the most dangerous point on the line – when they were standing at stations. The home signals could also be placed at danger and cleared by locked switches mounted on the outside of the depot, and this could be used to manually protect shunting trains or cars, or passengers crossing between tracks.

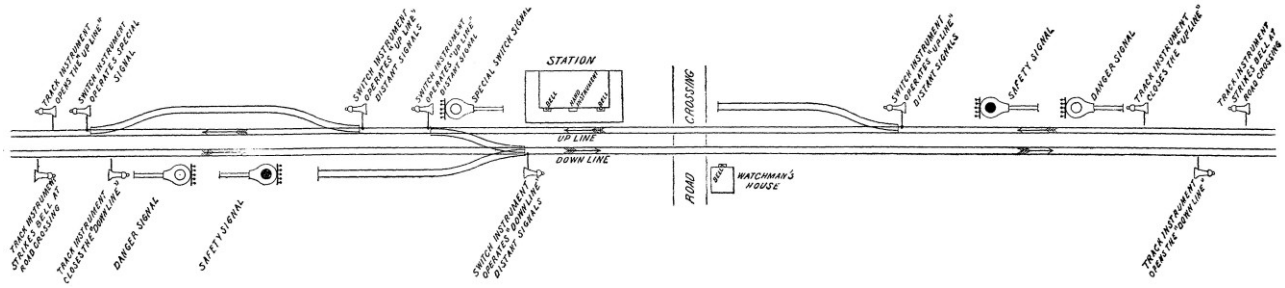
Figure 14. A diagram representing a 'typical' roadside station on a double track line showing how Hall's technology could be used to protect trains. Notice the use of 'Up' and 'Down' on this 1879 US diagram. (from the Railroad Gazette, 24.10.79 p563).

The treadles putting the home signals to danger also operate bells to warn the station staff and passengers of the arrival of a train. It was noted that separate bells, with different tones, were provided for each direction of travel.

The signals also detect the position of each set of points. If the points were reversed the protecting signal was automatically placed to danger and remained there (irrespective of the operation of the treadles or hand switches) until the points were restored for the main line. Where the points were spread out over a long distance, additional home signals could be provided, as is shown in the diagram just to the left of the station building. This allowed an approaching train to enter the station, even though the remote points were reversed.

A bell is provided in the level crossing watchman's house. This was set ringing by treadles about a mile in each direction. This allowed the watchman to 'close' the crossing to road traffic.

(Continued on page 89)



CALLING ON SIGNALS

Chris Wurr

The diminutive and humble Calling On signal appears to date from the earliest days of the year 1900 on the Victorian Railways. Calling On signals at many busy locations became a necessity following the introduction of track circuits. They were mostly provided to permit trains or locomotives to pass Home signals held at the Stop position by the track circuits in advance being occupied by vehicles or trains. This was mostly for shunting purposes or for locomotives to attach to their trains.

Previously, similar situations were overcome by the Signalman displaying a green hand signal from the signal box to indicate to the Driver that the road was occupied and that he had the Signalman's authority to pass the Home signal at Stop to enter the occupied road. However, as interlocked locations became more extensive and complex, often the signal in question was located too far away from the signal box for the Signalman to visually communicate with the engine crew.

The re-building of Flinders Street station into one of the busiest railway stations in the world, as we know it today, was the trigger for the VR to install track circuits and consequently Calling On signals. Together with brand new station buildings, the whole of Flinders Street station trackage was re-modelled into the complex seen today. The extent of new point and trackwork which necessitated full interlocking of signals and points, can be seen by the creation of Flinders Street B and C boxes and the enlargement of A, D and E Boxes as they became known. This all occurred in the early 1900s. In this era, all trains were still locomotive-hauled – the beginning of electric suburban trains was another nineteen years away.

With the entire suburban rail network of burgeoning Melbourne being concentrated on Flinders Street station, but locomotives for all the steam-hauled trains being supplied from Locomotive Depots situated at Princes Bridge, Port Melbourne and North Melbourne, the area was a nightmarish *ordered chaos*. Whilst many trains "ran through", there were always trains terminating or originating from one or other of the 14 platforms, with their locomotives cutting off or dropping on, and running to and from their respective loco depots. To cater for the complete safety of all these movements, track circuiting was installed over most of the trackage in the station precincts, as much of the jurisdiction of the various signal boxes was unable to be visually seen by the Signalmen who controlled the moves. The Driver of say, a fresh locomotive, requiring to drop onto the east end of an Oakleigh train sitting in Platform 6, under the Swanston Street Bridge, would be unable to see the controlling Signalman's green hand signal to pass the Home signal held at Stop by the Oakleigh train sitting in the platform. Calling On signals solved this problem.

And so, Flinders Street Station became the first location on the VR to acquire Calling On signals.

A Calling On signal was a square-ended arm of 2′ 6″ length, as against other two-position arms of 4′ 8″ length. It was of the same 10″ width and was mounted below a Home signal on the same signal post in two-position signalling areas. It was painted or enamelled red with a 5″ wide vertical white band, set 6¾″ from the left-hand end.

The blades would have almost certainly originally been of painted wood, however the official drawing B381, first dated 27th January 1921 shows an enamelled steel blade, and this may have been the commencement of the change from wooden to steel arms.

The spectacle carried a black painted sheet of metal at the Stop position which obscured the lamp light and a green glass at the Proceed position. This Proceed position colour was later changed, more of which anon. Not mentioned in the description contained in Regulation 48 (b) of the Books of Rules & Regulations from the 1919 issue onwards, and similarly not found in any of my research, is that the blank sheet metal "blind" in the spectacle at the Stop position, carried a small (maybe ½″ diameter hole) in the centre of the plate. This was to enable the Signalman to observe if the signal lamp was alight where the Calling On faced the signal box. Where the rear of the signal faced the box, this aperture was filled by the use of a bolt and washer, and the lamp's backlight sufficed.

The signal applied ONLY to the same road as that to which the Home above it applied and indicated to the Driver that the road ahead may or may not be occupied by vehicles. The Driver then had to proceed with caution.

Calling On signals were mainly worked from their own separate levers in interlocking frames, however the Home and Calling-On on the former Post 74, Flinders St C Box (controlled by A Box) was worked by one lever, the operation of the Home or the Calling On being decided by the use of reversers, depending on whether the track circuit was occupied or not.

Some of the Home and Calling On signals on the four posts of the signal bridge spanning A, B and C at the Lydiard St level crossing at Ballarat and worked from Ballarat B Box also worked in a similar fashion. This was a rather complex array of signals comprising Homes and Calling-Ons on both sides (Up and Down signals) of three of the four posts. The Down Home and Calling-On on Post 29 were both worked by lever 33, on Post 27 both were worked by lever 28 and on Post 26, they were both worked using lever 30. The other Homes and Calling Ons on the signal bridge were worked with separate levers for each signal. Reducing the number of levers overcame the need to extend the interlocking frame in this instance, which in turn would have required a completely new elevated signal box to guard the busy level crossing with its interlocked gates and tramway crossing, as well as all the rail movements at this busy end of the Ballarat station area.

Sunshine also had a Home and Calling On signal (Post 35, Lever 50) which was controlled by just one lever, Seymour A Box had two Callers on Post 7 worked from the same levers as the Homes above (Levers 3 and 5), likewise the Home and Calling On on one doll of Post 23 at Wangaratta was worked by lever 71, whilst the Home and Calling On on the other doll were worked by separate levers. There are bound to be other such set-ups not known to this writer.

The Appendix section at the rear of Lambert & Jungwirth's publication *Weekly Notice Extracts* provides the first notification of the impending introduction of the Calling On signal. In Weekly Notice 34 under the date of 19th February 1900, the official announcement reproduced to the right was included. There was no diagram, however, of a Calling-on signal.

In the very same issue of Weekly Notice 34 which was issued on 18th February 1900, it was notified that at Flinders Street B Box, two additional Calling On arms were provided on Post 48 and two on Post 49. "Additional" here presumably meaning, in addition to the Home arms above, to which they applied. This WN entry marks the appearance of the very first Calling On. It is notable that these instruction for these arms exempted light engines from clause B – engines coming onto trains were not required come nearly to a stand at the Home before the Calling-On was cleared.

REGULATION FOR CALLING-ON SIGNALS	(A) Where short Arms are fixed upon the Home Signal Posts as Calling-on signals, they are placed below the Home Signal. When the Home Signal is at Danger, and the Calling-on Arm is lowered, the Engine-driver must draw forward past the post of the Signal on which the Calling-on Arm is fixed, as far as the line is clear. If, after lowering the Calling-on Arm, the signalman wishes to communicate with the Enginedriver, and the Signal Box is ahead of the Calling-on Arm, he must show a Hand Danger Signal from the Box to stop him. The lowering of the Calling-on Arm is not an authority for a Starting Signal to be passed at Danger. (B) Unless instructions are issued to the contrary, the Calling-on Arm must not be lowered until the train has been brought to a stand at the Home Signal.

The earliest signal litho diagram of Flinders Street, which this writer could find, is 14/10, available from Mark Bau's *Victorian Railways* website. Between the introduction of Calling Ons in 1900 and the issue of diagram 14/10 (actually signed off by Engineer of Signals, Francis MacNamara Calcutt on 27-3-**1911**), big changes had occurred at Flinders Street. 14/10 shows Post 48 to be the left-hand doll on signal bridge No.6 which spanned 11, 12 and 13 West Roads (between the Brighton & Essendon Platform 9 and the Port Melbourne Platform 10 at their western extremities. 48 consisted of two Home arms in directing signals fashion, the top arm applying in a westerly direction out of the Port Melbourne platform via M to the Down St Kilda line and the bottom arm, via L to the Down Port Melbourne line.

Post 15 at Glenorchy. This post was provided in conjunction with the extended crossing loop. The calling-on arms were provided because it was too far from the box to reliably hand signal shunting trains. The provision of calling-on arms was common in Victoria on these extended crossing loops. All photos Chris Wurr.

The wooden armed calling-on signal at Port Augusta on the Commonwealth Railways. Although named a 'Calling-on', it applied to several routes and was probably closer to a low speed signal. Note the lighter coloured putty around the yellow spectacle – possibly a relic from the change in colour from green to yellow.

Not a Calling On signal in sight on *that* post.

Likewise, Post 49 was a three disc setback from the St Kilda line --- again, no Calling-On. Clearly there had been much re-numbering of signals in the intervening years. However, Calling-On signals had certainly proliferated by the issue of 14/10. I counted no less than 46 posts at Flinders Street which sported them.

Harking back to the transcription of the wording of the regulation contained in WN 34/00 above, it is interesting that the notification gives no details of the appearance of the signal, nor the night time aspect colours ---- apart from the disclosure that it is a short arm! If WN 21/01 issued on 18th November 1901 is contemplated, then it seems most likely that Calling On signals displayed a red light at Stop, and a green at Proceed during hours of darkness, from initial introduction until this point in time. The entry in WN 21/01 entry declares that forthwith, Calling On signals will display one light in lieu of two. Was this amendment to Regulation 53 (as it was numbered at the time) a result of the proliferation of Calling-On around the Flinders Street area since their introduction 22 months previously, having become so numerous that Drivers were facing an ever-growing barrage of red lights, and so (as with purple lights in Disc and later Dwarf signals) something had to be done?

Concurrently (as the VR was fond of saying), Spencer Street station had acquired its first Calling-On. The left-hand doll on three post bracket signal 20 applying through the crossover from 4 Road to 3 Road in the Centre Yard is depicted on litho 123/08 and this was announced in Weekly Notice 23/07 issued on 10th June 1907.

The other Calling-On signal shown on 123/08 was on Post 17 and applied (ambiguously from the point of view of the diagram) from No.1 Road, Centre Yard either ahead to the dead-end extension of No.1, or through the crossover to the dead-end extension of No.2.

The introduction of this Calling-On, slipped under the WN's radar and is not notified anywhere before the issue of the litho.

From this early start, Calling-On signals eventually sprouted up all over the state.

From Serviceton to Warragul -- from Geelong to Wangaratta. A thorough perusal of both the 1949 and 1967 Books of Signals gives a tally of no less than 36 signal boxes which had control of Calling-On signals.

Another application of Calling-On signals which was not in accordance with the original intent of their use, was on the Up & Down Independent Goods Lines between West Footscray and Sunshine. These lines skirt Tottenham Gravitation Yard on its northern and southern boundaries. Goods trains are admitted to these lines at Sunshine, West Footscray and, after the opening of the Tottenham – Brooklyn Loop on 15th February 1965 -- Tottenham B Box. The lines are operated under what is termed *Special Instructions*. This is basically Permissive Working, *i.e.* non-absolute block. Each train is to keep a good lookout for any train or locomotive ahead of them.

Trailing into these lines are turnouts giving access to the various sections of the Tottenham Yard complex. Three turnouts lead off the Down Independent and two off the Up line. Trains are permitted to stop on the Independent lines, cut off loco (and wagons), pull ahead, then set back into the yards to pick up or set off loading. The points of these turnouts are operated by non-interlocked WSa point levers operated by the shunting staff. To provide a modicum of protection to trains shunting off the "main" line and also trains departing out of the yard, semaphore Home signals with Calling On arms below were provided in the rear of the points. The Home arm was fixed in the Stop position and the Calling On was normally kept at the Proceed position, until put normal by means of the ground lever near the points by the shunting staff. These Calling On arms have been replaced by a yellow light at the

Proceed position and extinguished when put to Stop. The use of lights in lieu of arms was permissible under the rules. The use of Calling On signals on these goods-only lines, had a twofold advantage. They protected trains whilst shunting off the main line or departing onto the main line and they also conveyed to Drivers, a reminder that the line ahead may or may not be occupied. In recent years, Tottenham Yard has been all but abandoned for day to day operation. This writer is unaware of what the current situation is now, regarding shunting and the operation of the signals --- indeed, if they even still exist.

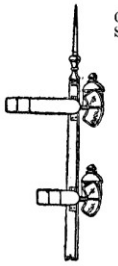
Somerton was another location to feature one of these *less than orthodox* Calling On signals. On 24th November 1976, Post 19 was put into service on the goods only line from Upfield. Due to the gauntleted arrangement of standard and broad gauge lines, this Fixed Home and Calling On signal applied to trains on both gauges.

Here is how Calling On signals were described in the 1919 Book of Rules & Regulations.

(b) The **Calling-on Signal** consists of a short arm fixed under a Home Signal, as illustrated in the margin.

The Calling-on Signal applies to the same Line as the Signal immediately above it.

Calling-on Signals may be displayed by lights only.



When the Calling-on Signal is in the normal position, as illustrated in the above diagram, its light is obscured, but when it is at the Proceed position, a Green Light is visible.

In the event of a Proceed Indication being displayed at the same time by the Home and Calling-on Signals, both Signals must be considered to be at "Stop."

This last sentence may seem to be fairly common sense to we Victorian Railways signalling enthusiasts. However, recently reading a book on the history of North Eastern Railway (U.K.) signalling, this writer was somewhat taken aback to read:

NER practice was that the calling-on arm was always to be cleared before the home signal could be lowered; other railways only allowed the one or the other to be lowered.

To my way of thinking, that somewhat defeats the purpose of having a Calling On signal at all.

By the re-issue of the Book of Rules & Regulations in April 1966, the only changes to the section on Calling On signals was an illustration of the signal at the Proceed position which was not included in the 1919 book, and the change of colour of the Proceed aspect at night, to yellow.

Whilst this article is a broad discourse on Calling On signals of the Victorian Railways, it is worthwhile presenting here, a limited overview of the same or similar signals in use on other railways around Australia, as this has implications for what transpired next, in the story of these signals.

The change of colour for the Proceed aspect at night, came about following the annual Conference of the Railway Commissioners of all states in Hobart in mid-1953. At this conference the consensus was that Australia-wide, the Proceed aspect of Calling On signals at night, should be a yellow light. At this time, the Victorian Railways, Western Australian Government Railways, New South Wales Government Railways, Commonwealth Railways and the Queensland Railways appear to have been the five states using Calling On signals and each one used a green Proceed aspect.

The NSWGR and QR employed a short, red, square-ended arm with a horizontal white stripe by day. Their spectacles both carried a blank in the Stop position and a green light at Proceed. The NSWGR diagram appears to show a full green glass in the spectacle plate, whereas the QR resorted to a 5½" X 2½" slot for the green to peep through. Both railway's Rules specifically called these signals Calling Ons.

The Commonwealth Railways Rule Book describes their signal also as a Calling On, but apart from specifying a green aspect at Proceed and an obscured light at Stop, there is no textual description of the appearance, nor an illustration of the particular signal. Having spent many enjoyable hours hanging around the old Commonwealth Railways, this writer is inclined to believe that the Commonwealth only ever had **one** Calling On signal. This faced westbound trains at the Outer Home Signal at Port Augusta. It appears that this signal was not track circuit controlled. The Rule Book does not specify if the Calling On signal applied to the same road as the Home above, however anecdotal information from a former Australian National (Commonwealth) Port Augusta Driver, revealed that the signal applied to several roads ------ thus, in the strictest terms, it was NOT a true Calling On signal. As with other CR mechanical semaphore signals, their Calling On was a somersault arm identical to that used on the VR – albeit wooden!

Information on Calling On signals used on the WAGR is scant and uncertain. What *is* known is that their 1940 issue of the Book of Rules & Regulations describes Calling On signals in similar terms and physical description to the VR counterparts. Anecdotally in late 1960, these signals were described as "rare" on the WAGR --- apparently only in use on the middle road at Perth Central station for arriving trains ex the Midland and Armadale suburban lines. Apparently (and I stand to be corrected here) the night Proceed aspect was (in April 1961) a green light. Calling On signals had been done away with by the issue of the 1962 Rule Book.

The South Australian Railways employed short armed signals on the same post as Home signal arms, and while these may have appeared to be Calling On signals to the casual observer, they are not named, nor described as such in their Rule Book. My 1947 issue of the book notes a red, square-ended arm with vertical white band, with red and yellow night time aspects. There is no mention of whether the signal applies to the same route as the Home above it, merely that the signal at Proceed indicates *Proceed at low speed prepared to Stop* and was used for *shunting or entering occupied block*. As the SAR never used mechanical, two-position disc signals in the same vein as the VR, it is more than likely that the short *Shunt Arm* was used instead, to

direct moves to sidings. Again, this is in two-position signalling territory.

The Tasmanian Government Railways appear to have employed similar signals to the SAR, but apart from seeing a photograph of a post with two Homes and a shorter arm below, this writer has no knowledge of their indications, aspect colours or rules.

So, what bearing does the foregoing have on the "consensus" professed at the 1953 Commissioner's Conference to changing the colour of the Proceed aspect from green to yellow? The stated objective of such a change was simply "uniformity" --- presumably, although unstated, across all government railway systems in Australia. And the result? Of the five state systems using Calling On signals, the Commonwealth changed their single, solitary glass to yellow! The VR was tasked with gaining approval for the change from the Governor in Council (a legal imperative for all Rule changes) and then embarking on the mammoth task of changing ALL of theirs to yellow. After gaining the stamp of approval from the Guv, the Chief Civil Engineer notified the General Superintendent of Transportation on 9th November 1954 that conversion would commence on 17th November 1954 at Spencer Street and the Melbourne Yard and the next day at various suburban locations. This resulted in circular A1659/54, dated 11th November 1954 being issued to notify the impending change. The Weekly Notice may have *jumped the gun* with its notification in No.48 of that year. *Jungwirth & Lambert* shows an entry at Bacchus Marsh of conversion, dated 8th November. Perhaps it was just a practice run! Surprisingly, full conversion of all Calling On signals in the state was swift. *Weekly Notice Extracts* shows that all locations which hosted Calling On, were converted before the end of 1954, the bulk of the work being conducted during the month of November.

Meanwhile, north of the Murray River, the NSWGR and QR did their own thing ---- which was nothing. *Absolutely* **nothing**! My copy of the NSWGR General Appendix, in force from 3rd September 1967 still stoically shows a green Proceed aspect at night. And further north again, in Queensland, the QR must have thought their being so far away from the rest of Australia, they could get away with it and likewise did absolutely **nothing**! An official diagram of all QR signals, dated 3rd June 1968, also conveys that the Proceed aspect is/was green by night!

The signal bridge at the eastern end of Tailem Bend, South Australia, showing two SAR short-armed Shunt Signals – not Calling On arms!

Anecdotally at any rate, it appears that the WAGR also did not alter their Calling On aspect to yellow.

So much for the "uniformity" agreed upon in Hobart in 1953.

Lastly, to put an end to the theory circulating among Victorian railway employees from the early 1950s, the change of aspect colours had absolutely no connection with the shocking head-on collision of the Up and Down Overlands at Serviceton on 7th September 1951. Many employees believed that the reason for the "regrettable incident" was the Driver of the Down Overland mis-reading in the fog, the green light of a Calling On signal.

The fact that the aspect change came within a few short years of this incident, no doubt fuelled the "theory". The facts of the matter are that there were no Calling On signals involved in the collision, and that the Driver **never** made any such claim anyway.

This writer is unsure if there are ANY Calling On signals still in service on the railways of Victoria (apart from *Puff*). Possibly the Independent Goods Lines at Tottenham?

I am indebted to Des Jowett and David Harvey for providing information for this article and to Trevor Penn, David Langley and Andrew Waugh for guidance. Retired WAGR Engineman Bernie Morris from Kalgoorlie provided the anecdotal insight regarding their Calling On signals.

David Whiteford and Chris French in Western Australia kindly supplied information as well.

THE ORIGINS OF THE AUTOMATIC BLOCK SYSTEM

(Continued from page 83)

An appraisal of Hall's contribution

Thomas Hall never claimed to have invented automatic block signalling, but he did take the concept and produce the first operational system. Other people were slightly in advance of Hall in imagining an automatic block system and it would appear that the possibility of an automatic signalling system did not occur to Hall until the Revere accident. However, by this time Hall had spent some years developing electrical signalling technology and he was able to rapidly put together an automatic block signalling system from his kit of technology.

The innovative nature of Hall's technology is shown in an unusual way, the major patent dispute with the Electric Railroad Signal Co (which the Union Switch and Signal Co inherited and pursued[2]). Despite having a portfolio of patents, the Electric company (and the US&S) could only sue the Hall company over an alleged infringement of Pope's patent on a central battery scheme. This marginal patent was the only one Hall was sued over; all his other patents were sufficiently strong that they could not be attacked.

To modern eyes, Hall's system had two critical weaknesses: the use of treadles to detect trains, and that the system was not failsafe. Neither were immediately fatal to the success of the system. Although Hall's system fell from favour from around 1880, when Union's track circuit based system swept the field, this was probably due to Hall's untimely death in 1880, and the relative cheapness of the Union system. In the 1890s Hall's two sons, William and Alvah, reorganised the Hall Signal Company. They rearranged the system, and successfully competed against the Union track circuit system, even though treadle based train detection was still used. While the safety problems with treadles were recognised, the 'wire circuit' system was considered more reliable than a 'rail circuit' system. Treadles quickly fell from favour, however, when Robinson's track circuit patent expired, which suggests the real reason for the continued use of treadles.

The Hall disc signal, improved and made safer in 1890, was remarkably long lived and was still being installed new by a few railroads as late as 1911. By that date, however, almost all railroads preferred the more distinctive semaphore signal, but its widespread use for automatic signalling required the development of an electric semaphore that could be driven by batteries. This did not occur until 1897, and until this time the Hall banjo signals was a very viable signal. The final eclipse of the disc signal was due to the introduction and acceptance of the three aspect semaphore signal from around 1905.

While Hall's technology seems to have been a signalling dead end, this view would be wrong. Several of his ideas are still very much with us today. The Hall disc signal is really a light signal, and light signals ultimately vanquished the electric semaphore and are now the predominant railway signal in use. Hall's treadle system is the distant ancestor of the modern axle counting systems which, today, are a serious rival to the track circuit.

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[2] The Union Electric Signal Co purchased all the patents of Frank Pope, S.C. Hendrickson, and the Electric Railroad Signal Co in March 1880. Pope joined the board of the Union Electric Signal Co in July 1880. In February 1881, George Westinghouse became President of the Union company, and in April 1881 the company was renamed the Union Switch & Signal Company. Pope remained a director of the US&S for many years. It should be noted that, apart from being an electrical engineer, Pope was a patent attorney. It is fairly safe to assume that Pope's Electric Railroad Signal Co was what is now known as a patent troll; a company that makes its money by using the patents it owns to litigate against other companies rather than actually producing goods. Such companies were common in the US in the later part of the 19th century. It is notable that the Union Switch & Signal Co continued the case, appealing all the way to the Supreme Court.

(Above) Two of the new signals at Cheltenham. Home CTM711 controls Up movements from Platform 1 to the Up line. Notice that it displays normal speed indications even though it reads over the curved leg of a turnout. On the right, Home CTM720 controls movements from Platform 3 to the Down line. The provision of ladders, working platforms and elaborate safety screens is noticeable. (Below) The altered 'panel' at Caulfield showing the extension of control to Cheltenham and Mentone at the lower right. All photos Chris Gordon.