SOMERSAULT

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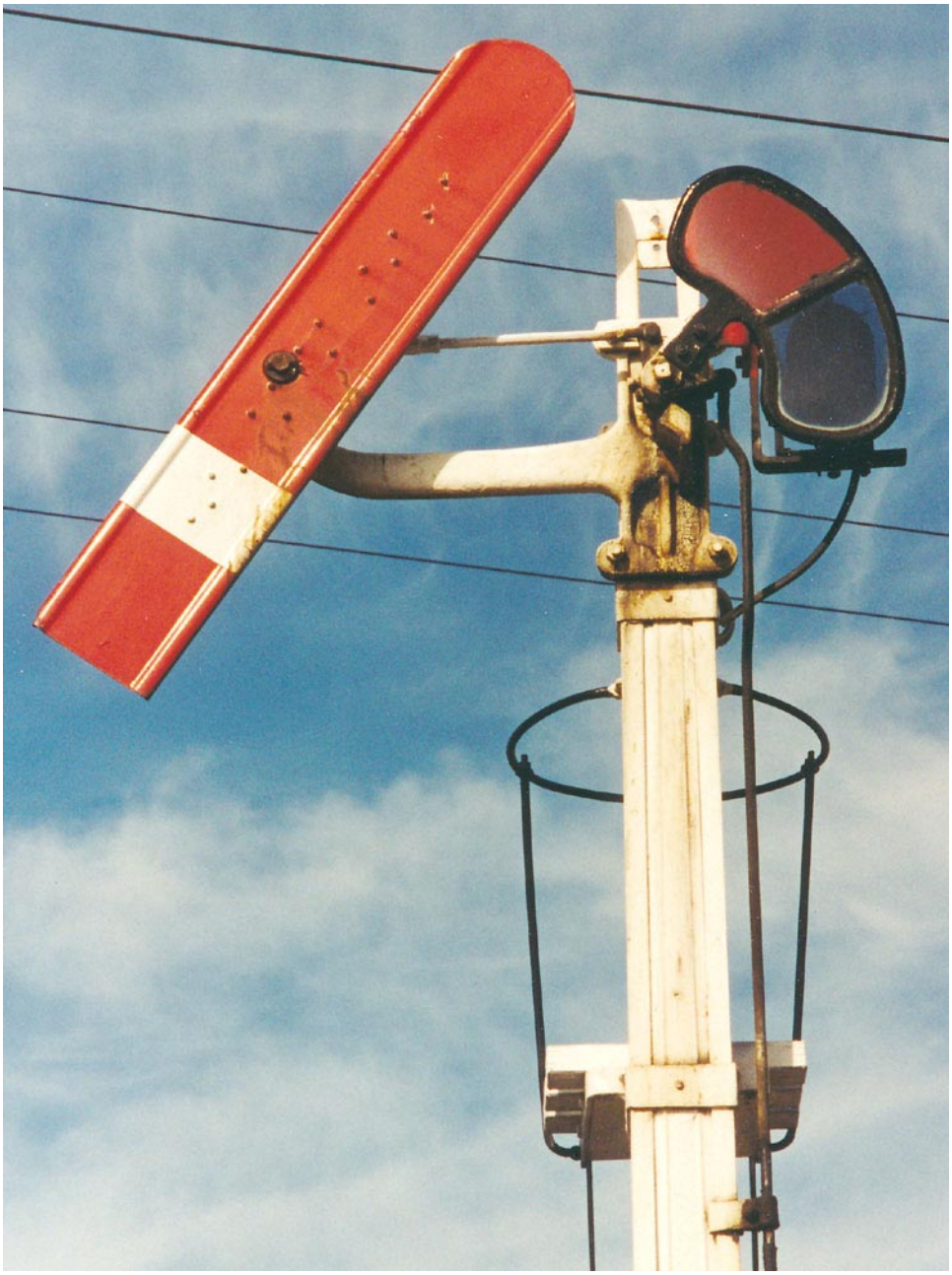

One of the defining images of signalling in Victoria is the somersault semaphore, illustrated here by the Down starting at Donnybrook. Sadly, the resignalling schemes of the last 20 years has meant that there are very few somersault arms left in service in Victoria outside the preservation movement. In this issue we will examine the detailed design of the McKenzie and Holland style of somersault used in Victoria.

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Minutes of Meeting held Friday 21 September, 2012, at the Surrey Hills Neighbourhood Centre, 1 Bedford Avenue, Surrey Hills

Present: - Noel Bamford, Wilfrid Brook, Brett Cleak, Glenn Cumming, Graeme Dunn, Steven Dunne, Vance Findlay, Michael Formaini, Ray Gomerski, Chris Gordon, Bill Johnston, David Jones, Keith Lambert, David Langley, Steve Malpass, Andrew McLean, Colin Rutledge, Brian Sherry, Rod Smith, David Stosser, Bob Taaffe, Damien Thomas, Andrew Waugh and Andrew Wheatland.

Apologies: - Graeme Cleak, Judy Gordon, Chris King, Tom Murray, Greg O'Flynn, Stuart Turnbull and Bob Whitehead.

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

Minutes of the July 2012 Meeting: - Accepted as read. Bill Johnston / Andrew Wheatland. Carried.

Business Arising: - Nil.

Correspondence: - Letter and membership pack sent to Tom Mullens of Montrose.

Letter to Bill Uren at Metro Trains seeking permission for the Signal Box tour on Saturday 22 September 2012.

Letter to National Railway Museum SA re the signalling collection from the former West Torrens Signalling Museum.

Letter from National Railway Museum SA acknowledging letter from SRSV.

Vance Findlay / Steve Malpass. Carried.

Reports: - Glenn Cumming reported on final plans for the signal box tour on the Werribee and Sydenham Lines tomorrow.

General Business: - Glenn Cumming advised that member Alan Cohn of Hampton had passed away.

Rod Smith asked which semaphore signals are to be replaced.

Colin Rutledge advised that all semaphores would be replaced by the end of 2013.

Colin Rutledge provided details about various works in the Country Districts. A summary of the discussion follows: -

* All semaphore signals will be replaced by the end of 2013.
* A crossing loop has been proposed to be located three kilometres on the Up side of Murchison East.
* The new crossing loop at Warncourt will be commissioned in the next financial year. This crossing loop will be located between Birregurra and the Princes Highway level crossing at Warncourt, approximately three kilometres on the down side of Birregurra.
* Proposals for new works at Grovedale were outlined.

Colin Rutledge reported that No.8333 Down Shepparton passenger train had hit a car earlier tonight.

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

* The Sydenham - Sunbury electrification will be commissioned in the third week of November 2012 to coincide with the new working timetable.
* The new crossover at Albion will be commissioned on the last weekend of October 2012.
* The tramway square at Riversdale will be replaced over the Melbourne Cup weekend.
* The new connections at Newport South will be commissioned in late November 2012.
* The computer based interlocking at Greensborough will be commissioned in the second week of November 2012.
* Kensington - Flemington Racecourse will be re-signalled in April 2013 including remote control from Metrol.

Chris Gordon advised that remote control of Greensborough - Hurstbridge from Epping will be commissioned in 2013.

Brett Cleak advised that the Gheringhap - Wingeel CTC will be commissioned in November 2012.

Keith Lambert advised that No.3 Road at Sunshine will be booked out of use after the SRSV tour tomorrow.

Rod Smith asked about the ICE radio system being introduced on ARTC territory. Discussion ensued.

Brett Cleak noted that the ICE radio system is intended to replace separate terminals for VHF radio, UHF radio, SAW, DICE and ICAPS (point control on the Trans Australia Railway).

David Langley noted that Donald Loop has been restored to service after the derailment in December 2011.

This led to a discussion on the pros and cons of timber versus concrete sleepers.

Vance Findlay discussed the ongoing track problems on the ARTC Line in North East Victoria.

Keith Lambert and Colin Rutledge noted that the SG signalling at Maryborough is being removed because it is not in the scope of works for the Maryborough re-signalling.

Syllabus Item: - The President introduced Member Bob Taaffe from Hobart TAS to present the Syllabus Item.

Bob presented a selection of approximately 100 digital images from his collection.

The presentation concentrated on images of signalling from the Irish Republic and Northern Ireland, with special emphasis on electric staff equipment.

A wide range of signalling equipment was viewed along with some interesting variations on electric staff working.

The presentation was thoroughly enjoyed by those present.

At the completion of the Syllabus Item, Bob was thanked for the entertainment & this was followed by acclamation from those present.

Meeting closed at 22:07 hours.

The next meeting will be on Friday 16 November, 2012 at the Surrey Hills Neighbourhood Centre, Bedford Avenue, Surrey Hill, commencing at 20:00 hours (8.00pm).

Signalling Alterations

The following alterations were published in WN 34/12 to WN 41/12 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 alteration.

28.08.2012 **South Kensington** (SW 322/12, WN 39)

On Friday (sic), 28.8., the following booked out signalling equipment (SW 274/12) was removed: Home SKN793, Points 678U, Points 693, and Track Circuits 693T, 778T, 778AT, & 776T. Points 667 & 678D were secured normal. Tracks 693T, 776T, and 778T will show as 'down' on the Signaller's VDU.

28.08.2012 **Gredgwin** (TON 189/12, WN 35)

On Tuesday, 28.8., the siding was booked out of service due to sleeper condition.

28.08.2012 **Wychitella** (TON 190/12, WN 35)

On Tuesday, 28.8., the siding was booked out of service due to sleeper condition.

28.08.2012 **Rochester** (SW 150/12, WN 33)

On Tuesday, 28.8., boom barriers were provided at the passive level crossing at Lucas Rd (230.910 km) on the Down side of Rochester. The level crossing is operated by a predictor and remote monitoring is provided. Healthy state indicators are provided. Trains travelling at more than 50 km/h at the predictor board may accelerate before the level crossing. Diagram 30/12 (Rochester - Elmore) replaced 96/11.

29.08.2012 **Maryborough** (SW 153/12 & 156/12, WN 34)

From Wednesday, 29.8., until Friday, 31.8., the following alterations took place.

The plunger lock on Points 5 (Up end) and rodded derail were removed. Derail and crowder 5D will be provided on the lead to the yard tracks on the Up side of Inkerman St. Points 5 and Derail 5D are worked by a dual control point machine. The points on the Down side of Inkerman St leading from No 2 Road to No 3 Road (and the yard) have been fitted with a point machine and numbered Points 9. Two red Stop Boards lettered 'Stop Obtain permission from Signaller Maryborough' were provided to control movments over Points 9. Stop Board A controls movements from No 2 Road, and Stop Board B is controls movements from No 3 to9 Tracks. Triangular clearance boards were provided at the fouling points in Nos 2 Road, No 3 Road, and the lead from Nos 4 & 5 Roads. These display the word 'Stop' for Up trains, and the track number for Down trains.

Points 13 (leading to the Train Stabling Siding and Fuel Point Siding) were equipped with a dual control point machine, and the WSa lever abolished.

Point machines for Points 5U, 9, & 13 and Derail 5U will only be operated in the hand operating mode, however the position of the points will be detected and indicated on the panel.

Amend Diagram 118/11 (Maryborough). Operating Procedures 80 (Maryborough) - SW 85/12 - and 81 (Maryborough Locomotive Depot Sidings) - SW 113/10 - were reissued.

29.08.2012 **Chillingollah** (TON 197/12, WN 35)

On Wednesday, 29.8., the siding was booked out of service due to sleeper condition.

31.08.2012 **Tocumwal** (TON 196/12, WN 35)

Commencing Friday, 31.8., the Tocumwal Bridge (250.942 km) will be redecked. A derail has been provided in the up leg of the siding, 20 metres on the Down side of Browne St (250.942 km) and will be secured on when the line is booked out of use. TON 194/12 is cancelled.

(04.09.2012) **Donald** (SW 158/12, WN 35)

Following a derailment earlier in the year, Donald Loop is not available to cross trains. All trains will operate via No 1A Road (the Up Loop). Points C at the Up end of the loop have been straight railed and the trailable point machine removed. Points H at the Down end of the loop have been secured for No 1A Road. Access to the Donald Sub Terminal is not available. Down Repeating Signal DON1 will not detect Points C & K, but will continue to detect Points B. Up Repeating Signal DON2 will continue to detect Points B, F & H. The level crossing at Campbell St will operate normally for Down trains via No 1A Road.

Donald remains an Intermediate Train Order Station for follow on moves. When a Train Order is issued to Donald it only applies to the CP Boards at each end of the former loop in the direction of travel.

SW 2/12 is cancelled.

04.09.2012 **5P/V5PSW Key Replacement** (SW 297/12, WN 35)

Commencing Tuesday, 4.9., mainline points currently secured with 5P and V5PSW locks on the following high speed lines will be progressively changed to a new Protec2 5P lock. The lines are: Dandenong - Pakenham & Cranbourne, Newport - Werribee (both direct and via Altona), St Albans - Sunbury, and Broadmeadows - Craigieburn.

06.09.2012 **Warrnambool - West Vic Siding** (TON 199/12, WN 36)

On Thursday, 6.9., the West Vic siding was booked back into service. The baulks at 267.650 km on the Down side of Wellington Rd were removed. TON 114/12 is cancelled.

(11.09.2012) **Caulfield Loop (Spencer St - Richmond)** (SW 300/12, WN 36)

Diagram 95/12 (Spencer St - Richmond; Caulfield Loop) replaced 15/06 as in service.

(11.09.2012) **Flinders St - Richmond** (SW 300/12, WN 36)

Diagram 97/12 (Flinders St - Richmond) replaced 99/06 as in service.

(11.09.2012) **Jolimont - Epping** (SW 300/12, WN 36)

Diagrams 111/12 (Jolimont - Merri & Westgarth), 107/12 (Northcote - Reservoir) & 113/12 (Ruthven - Epping) replaced 1/09, 49/10, & 47/12 (respectively) as in service.

(11.09.2012) **Auburn - East Camberwell** (SW 300/12, WN 36)

Diagram 103/12 (Auburn - East Camberwell) replaced 107/06 as in service.

(11.09.2012) **Heathmont - Belgrave** (SW 300/12, WN 36)

Diagram 101/12 (Heathmont - Belgrave) replaced 31/10 as in service.

(11.09.2012) **Burnley - Darling** (SW 300/12, WN 36)

Diagram 99/12 (Heyington - Darling & Burnley Stabling Sidings) replaced 115/06 as in service.

(11.09.2012) **Sandown Park - Yarraman** (SW 300/12, WN 36)

Diagram 105/12 (Sandown Park - Yarraman) replaced 9/12 as in service.

11.09.2012 **Showgrounds** (SW 303/12, WN 36)

On Tuesday, 11.9., the Up end of the Loop Line was removed, and the Loop Line was renamed Siding A. Baulks are provided in Siding A 170 metres on the Up side of Post 64. Diagram 117/12 (Flemington Racecourse Line) replaced 35/11.

11.09.2012 **Litchfield** (TON 205/12, WN 37)

On Tuesday, 11.9., the siding was booked out of use. The main line points have been secured normal.

13.09.2012 **St Arnaud** (TON 209/12, WN 37)

On Thursday, 13.9., Nos 2 & 3 Roads and the Turntable Road were booked out of use due to poor track condition. Plunger locked points B and C were secured normal.

14.09.2012 **Murchison East** (TON 211/12, WN 37)

On Friday, 14.9., Nos 3 & 4 Roads were booked out of use due to poor track condition. The points in No 2 Road were secured normal.

15.09.2012 **Donald** (SW 160/12, WN 36)

On Saturday, 15.9., Donald Loop was restored to service and SW 158/12 was cancelled.

The Up end Points C were relocated 105 metres in the Down direction and the trailable point machine and banner were reinstated. The crossing loop now has a standing room of 734 metres. Points K leading to the Donald Sub Terminal, ST21 Master Key lock, non-trailable point machine, and the associated rodded derail and crowder, were relocated 105 metres in the Down direction. The temporary circuit alterations for Down Repeating DON1 were removed.

Amend Diagram 98/09 (Donald Loop - Morton Plains).

17.09.2012 **Donald** (TON 215/12, WN 38)

On Monday, 17.9., the Donald Freezing Works Siding was booked out of use due to poor track condition. Points K in Donald Loop were secured normal.

(18.09.2012) **Tocumwal** (TON 212/12, WN 37)

The redecking of the Tocumwal Bridge has been completed. The Derail block installed on the siding on the Down side of Browne St will be locked off the rail. TON 196/12 is cancelled.

23.09.2012 **Sunshine** (SW 308/12, WN 37)

On Sunday, 23.9., No 3 Road was taken out use. Baulks were provided opposite Homes SUN755 & SUN757. Points 655 will be secured normal, and Points 658 reverse. The control of Home SUN767 was altered to display a Low Speed aspect for moves towards Home SUN757.

In conjunction with the abolition of Siding B, Points 634 were secured normal, and Dwarf SUN734 will be fixed at Stop.

Amend Diagram 47/10 (Sunshine).

(25.09.2012) **Sunshine** (SW 313/12, WN 38)

Diagram 81/12 (Sunshine) replaced 49/12 (sic) in conjunction with the alterations in SW308/12.

(25.09.2012) **Westall** (SW 317/12, WN 38)

Commencing forthwith, the Signaller, Dandenong, must select 'Stopping' for all Up trains through Westall.

27.09.2012 **Ballarat** (SW 161/12, WN 38)

On Thursday, 27.9., automatic pedestrian gates were provided on the Up side of Lydiard St (155.508 km via North Geelong). The pedestrian gates will commence to operate when the signaller operates the control lever to close the Lydiard St gates, and will cease operating when the control lever is restored.

The crib crossing on the Down side of Lydiard St was taken out of use to allow the construction of a new pedestrian crossing.

Amend Diagram 20/12 (Ballarat).

28.09.2012 **South Kensington** (SW 322/12, WN 39)

On Friday, 28.9., circuit alterations were carried out to allow removal of booked out signalling (SW 274/12). Signal SKN793 was removed. Point machines 693 and 678U were removed. Track circuits 693T, 776T, 778T, and 778AT were removed. Points 667 and 678D were secured normal.

07.10.2012 **Melbourne Yard** (SW 330/12, 163/12 & 335/12, WN 40)

On Sunday, 7.10., the following alterations took place at Melbourne Yard and Melbourne Yard Train Wash.

Melbourne Yard Siding No 9 was reduced in length to 169 metres, and Siding 10 was reduced to 170 metres.

At the Train Wash, Points 189, 191, and 209 were renewed. The Thompson point machines on Points 189 & 191 were replaced by M23A dual control point machines and secured reverse. The CCW lever on Points 209 (at the Up end of the Wash plant) was replaced by an M23A dual control point machine that will be operated in hand mode. Dwarf MYD160 was relocated 80cm to the left.

Points 251 at the Down end of the former Arrival Yard were removed.

Diagram 115/12 (West Tower) replaced 60/12.

07.10.2012 **Croydon** (SW 310/12, WN 39)

On Sunday, 7.10., the pedestrian boom barriers at the Up end of the platform (30.961 km) were replaced by automatic pedestrian gates. Diagram 121/12 (Ringwood East - Croydon) replaced 45/07.

08.10.2012 **Southern Cross** (SW 309/12, WN 39)

Between Saturday, 6.10., and Monday, 8.10., the Down Main Goods Line will be slewed between 0.400 km and 0.600 km. Crossover 413 will be secured normal. Automatic 815 (Down Through Suburban Line) was replaced by a new LED mast located on the right hand side of the line 20 metres in the Up direction. Automatics 680 (Spencer St Platform 12) and 720 (Platform 13) were converted to LED. Diagram 123/12 (Southern Cross - MTM Passenger Lines) replaced 45/12.

10.10.2012 **Lilydale** (SW 337/12, WN 40)

On Wednesday, 10.10., the automatic pedestrian boom barriers at the pedestrian crossing over No 1 Track at the Up end of the platform (39.000 km) were replaced by automatic pedestrian gates. Amend Diagram 73/07 (Mooroolbark - Lilydale).

12.10.2012 **Lilydale** (SW 338/12, WN 40)

On Friday, 12.10., the automatic pedestrian boom barriers on the Up side of Maroondah Highway (38.917 km) were replaced by automatic pedestrian gates. Amend Diagram 73/07 (Mooroolbark - Lilydale).

14.10.2012 **Sunbury** (SW 340/12, WN 40)

On Sunday, 14.10., the train stabling compound security gates 601 and 602 will be commissioned and interlocked with the signalling.

15.10.2012 **Sunshine** (SW 164/12 & 170/12, WN 40 & 41)

Between Friday, 12.10., and Monday, 15.10., the signal gantry on the Up side of Anderson St (carrying Down Departure Homes SUN743 and SUN753) was relocated 33 metres in the Up direction. Amend Diagram 81/12 (Sunshine). This diagram was subsequently replaced by 127/12 (Sunshine).

(16.10.2012) **Mooroolbark - Lilydale** (SW 343/12, WN 41)

Diagram 129/12 (Mooroolbark - Lilydale) replaced 73/07 due to the provision of pedestrian gates.

17.10.2012 **Ballarat** (SW 165/12, WN 41)

On Wednesday, 17.10., automatic pedestrian gates were provided on the Down side of Lydiard St (155.508 km via North Geelong). The pedestrian gates will commence to operate when the signaller operates the control lever to close the Lydiard St gates, and will cease operating when the control lever is restored. Amend Diagram 20/12 (Ballarat).

20.10.2012 **Lara - Corio (Elders IXL Siding)** (SW 167/12, WN 41)

On Saturday, 20.10., field circuits were altered for the removal of the West Line points to the former Elders IXL Siding (abolished SW 54/11). The Signalling VDUs at Geelong and Central were updated.

21.10.2012 **Franklin St** (SW 347/12, WN 41)

Between Saturday, 20.10., and Sunday, 21.10., Automatic 806 (Up Through Line) was converted to LED.

21.10.2012 **North Melbourne** (SW 344/12, WN 41)

Between Saturday, 20.10., and Sunday, 21.10., portion of the Coburg Good ladder across the Broadmeadows Suburban, Up and Down Through Suburban, and Down Main Suburban lines were removed. Points 684 & 685 and Crossovers 677 & 686 were removed. Post NME777 was removed. Diagram 91/12 (North Melbourne & Macaulay) replaced 87/12.

22.10.2012 **Spencer St** (SW 348/12, WN 41)

Between Saturday, 20.10., and Monday, 22.10., components of the future Points 650 were installed at 0.016 km in the Down Main Goods Lines. Homes 703 (Platform 13) and 704 (Platform exit CU) were converted to LED. Automatic 808 (Up Through Suburban Line) was converted to LED.

(23.10.2012) **Status of Locations** (SW 169/12, WN 41)

Operating Procedure 131 (Train Order Territory Location Status and Requirements for Master Keys) was reissued. SW 124/12 is cancelled.

Master Keys are not required between North Bendigo and Swan Hill unless shunting at an intermediate siding (Raywood, Tandara, Prairie, Mitiamo, or Lake Boga). Master Keys are not required between Swan Hill and Piangil. Master Keys are not required between North Bendigo and Echuca unless shunting at an intermediate siding (Elmore or Rochester).

A proceed and return train orders may be issued between Batesford and Ballarat East.

(23.10.2012) **Hernes Oak - Morwell** (SW 171/12, WN 41)

Effective immediately, the absolute occupation between Moe - Hernes Oak - Bairnsdale is cancelled. SW 155/12 is cancelled.

The design of the somersault signal in Victoria allowed the arm to rotate to just beyond vertical. However, the maximum angle intended for a home signal was intended to be around 78 degrees. Beyond this angle, the spectacle and blinder would lift beyond the signal lamp, as can be seen here. This is the Down Home at Diamond Creek on a cool morning in February 1986. The wire run between the plunger lock and the home was probably adjusted to give a good 'off' the previous day, when it was hot. The cool morning contracted the wire, raising the arm beyond the correct angle. This semaphore is fitted with a McKenzie and Holland blinder, however, an electrical repeater is also provided.

The Somersault signal in Victoria

Andrew Waugh

The use of the somersault semaphore signal was a distinctive feature of signalling on the Victorian Railways, although today there are probably less than 50 still in service. This article will discuss what is known about the design of the somersault signal.

The GNR and the somersault

The somersault signal was developed between 1876 and 1878 on the Great Northern Railway in the UK (the details in this section are taken from 'An illustrated history of Great Northern Railway Signalling, Michael A. Vanns, OPC, 2000). In early 1876, the GNR suffered two accidents, Abbotts Ripton and Corby, that were (partially) caused by severe weather that resulted in snow preventing the semaphore arms from going to danger. On 22 September 1877 provisional patent (No 3569) was granted to Edward French, a GNR signal fitter of Hitchin. In the statement of claim, French described his invention as

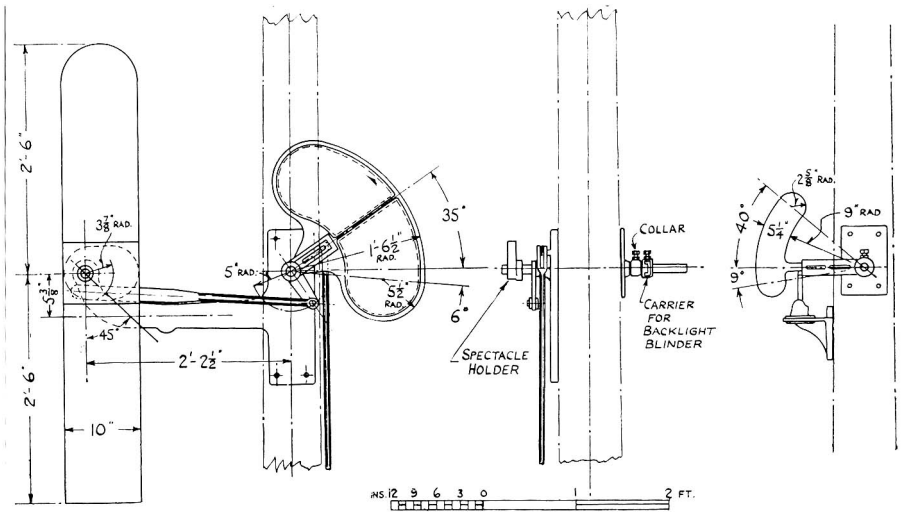
> "to construct semaphore signal arms, that when in the extended, or "danger" position, the accumulation of snow or action of the wind thereon shall not have any tendency to move the signal from the "danger" into the "all right" position; and furthermore, that when moved out of the "danger" position, the signal arm shall tend to return to it. For these purposes I place the pivots on which the signal arm turns in the middle of its length, and I make the parts on each side of the side of the pivots so that the one part shall counter balance the other part, both as regards weight and superficial area. Thus as each part presents the same area for the snow to accumulate, or the wind to act upon, these will have no tendency to move the signal arm out of whatever position it may be placed in. Furthermore, I place the pivots of the arm vertically above the centre of gravity thereof when in the horizontal position, so that the arm will always tend to retain that position, and to return to it when inclinded in either direction."

These features exist today in the somersault signal used in Victoria, although few Victorian arms were ever subject to snow. A drawing of a somersault signal was published in 'The Engineer' of 22 February 1878 which was notable for the arm rotating clockwise. Vanns states that the somersault signal was used for all new works and renewels on the GNR from at least 1878 onwards.

O.S. Nock in his series "Railway Signals, Standard Semaphore Types used in Pre-grouping Days" published in The Model Engineer of 13 February 1943, discusses the Great Northern Railway 'centre-balanced' semaphore arm (or as he puts it 'somersault arms, as they have been popularly called'):

> The arm bracket is a casting, having a boss to provide a journal for the spindle on which the spectacle casting rotates, and the outer end carries a stud for the arm itself to pivot upon. A bell-crank on the main spindle, adjacent to the boss, connects the operating-rod from the base of the signal post to the horizontal-rod working the arm. The semaphore is reinforced at the centre by a plate 10 in x 8 in x 3/8 in., to which is attached a so-called fan plate. [...] The spectacle casting is carried on a separate crank, with a slotted attachement, to permit of adjustment; a similar arrangement will be seen in the rear elevation for carrying the backlight blinder. The main spindle is of circular section throughout and the various cranks are secured to it by set-screws. The spectacle moves through an angle of 70 degrees, and the 90 degrees movement of the arm is obtained though the operating-rod acting at a proportionately lesser leverage at the point of attachment to the semaphore.

This description broadly describes the somersault used in Victoria, however, the detailed design is considerably different to that used today in Victoria. (or, for that matter, in Western Australia or New Zealand). In Nock's drawing, below, it can be seen that the bell crank on the spindle was arranged in such a way that the horizontal rod pulled the arm to clear it. The obvious disadvantage of this arrangement is that the horizontal rod had to be connected to the arm below and to the left of the arm pivot. If the tipping rod became disconnected from the bell crank, the weight of the rod, hanging from the arm, would tend to rotate the arm to clear. To prevent this, the GNR cast a short spur projecting forward from the arm bracket to catch the horizontal rod if it became disonnected.



(Left) The GNR version of the somersault signal. The version used in Victoria has significant differences (compare the diagram on the following page). The arrangement of the crank and horizontal rod differs significantly, as does the spectacle design. Notice also that the arm pivot is midway along the arm, whereas in Victoria the inner end was longer than the outer. (from O.S. Nock, 'Railway Signals, Standard Semaphore Types used in Pre-grouping Days, The Model Engineer, 13 February 1941 p125)

List of semaphore parts from 1901 McKenzie & Holland contract

173	Semaphore Gear, including Lamp, Item No 174; C.I. lamp bracket, Item No 175; C.I. arm bracket, Item No 176; C.I. arm plate, Item No 177; two W.I. arm straps, Item No 178; W.I. connecting rod, Item No 179; W.I. spindle, Item 180; C.I. collar, Item 181; C.I. bush, Item 182; C.I. spec clutch, Item No 183; C.I. spec, Item No 184; C.I. blinder, Item No 185; and W.I. crank, Item No 186; fitted complete	per set £5.0.0
174	Lamp for Semaphore - Item No 173, fitted with one 6-in lense, and one 1-in lense; complete with glazed interior, well and burner,	each £1-15-0
175	C.I. Lamp Bracket for Semaphore - Item No 173, with holes for 1/2-in coach screws,	each £0-3-4
176	C.I. Arm Bracket for Semaphore - Item No 173, for long, medium, and short arms, as may be ordered; with holes for 5/8-in bolts, bored for spindle and arm stud, and fitted with 1 1/4-in arm stud, turned, drilled, and screwed, and provided with nut, washer, and split pins,	each £1-4-9
177	C.I. Arm Plate for Semaphore - Item No 173, bored and faced for 1 1/4-in arm stud; bored for and fitted with W.I. 11/16th-in connecting rod stud, turned, shouldered, drilled, and provided with a split pin; with W.I. washer plate drilled and fitted with 1/2-in bolts and nuts for arm,	each £0-10-0
178	W.I. arm straps for Semaphore - Item 173, with slotted holes for wood screws,	per doz £0-4-5
179	W.I. 3/4-in Connecting Rod for Semaphores - Item No 173, long, medium or short arms, as may be ordered; with eye joint drilled for stud, and with 3/4-in joint drilled for and fitted with W.I. 3/8-in pin, turned, drilled, and provided with split pin,	each £0-4-0
180	W.I. Spindle for Semaphore - Item No 173, with square end fitted for crank and clutch; turned and fitted for bush,	each £0-3-4
181	C.I. Collar for Semaphore - Item No 173, bored for spindle, drilled, taped and provided with 3/8-in set screw,	each £0-1-1
182	C.I. Bush for Semaphore - Item No 173, bored for spindle, with holes for 1/2-in coach screws and oiling,	each £0-1-2
183	C.I. Spec Clutch for Semaphore - Item No 173, fitted for spindle and spec, drilled, tapped and provided with 5/8-in set screw, and 1/2-in bolts and nuts,	each £0-2-2
184	C.I. Spec for Semaphore - Item No 173, fitted for clutch, drilled for and provided with split pins, and holes for 1/2-in bolts,	each £0-3-6
185	C.I. Blinder for Sempahore - Item No 173, bored for spindle, drilled, tapped, and provided with 5/8-in set screw,	each £0-2-11
186	W.I. 4 3/4-in x 4 1/4-in Crank for Semaphore - Item No 173, fitted for spindle, drilled, tapped, and provided with 5/8-in set screw, and with each arm drilled for 5/8-in pin, and set for right hand or left hand as may be ordered, each	£0-5-0

To Victoria

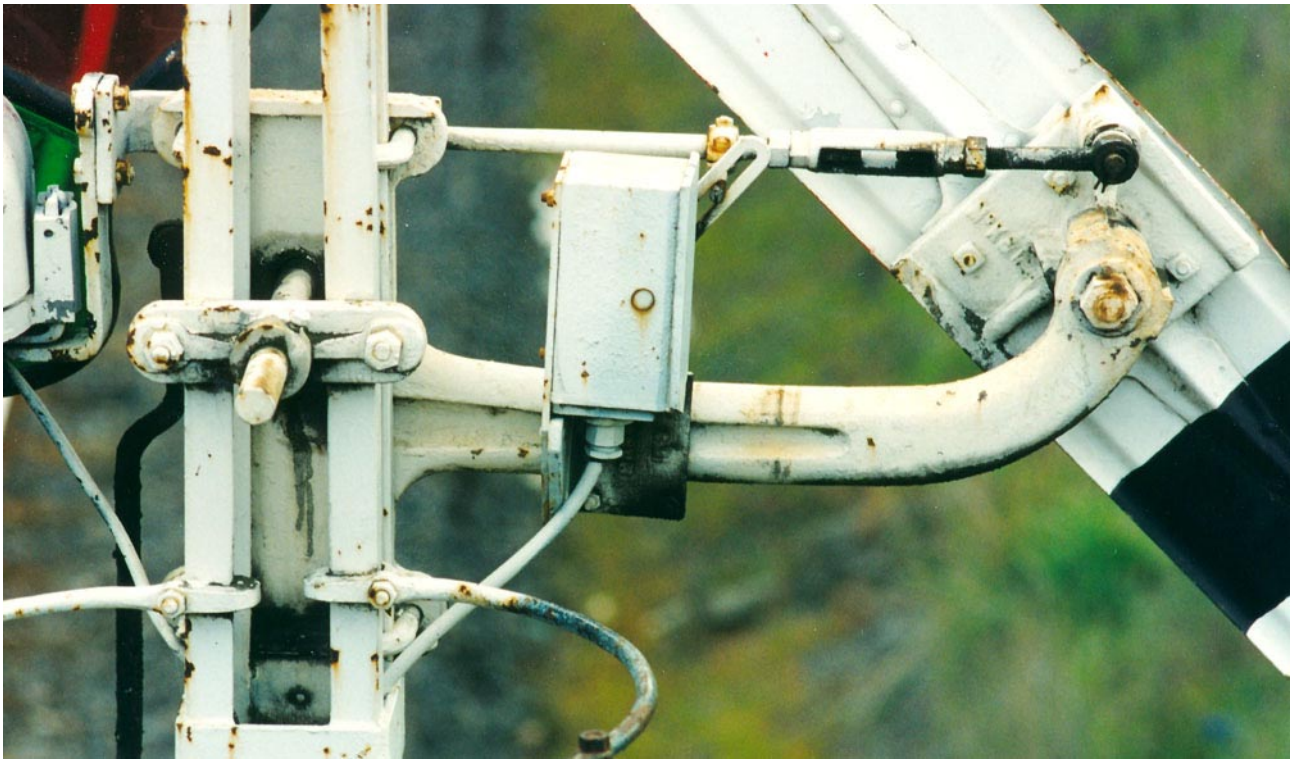
The path from the GNR to Victoria is, unfortunately, not clear. It would appear that McKenzie and Holland took up the somersault signal and redesigned the mechanism. Nock, in a later part of his series on railway signals (22 May 1941), discusses the various coal railways in southern Wales which he states were almost entirely equipped by McKenzie and Holland and which all used somersault arms. He goes on to say, however, that the design of the somersault signal differed between the railways. That used by the Taff Vale Railway corresponded very closely to that used by the GNR, but the Rhymney and the Brecon & Merthyr Railways used 'McK&H's own type of spectacle,' by which he apparently means that they were designed for a movement of 79 degrees, whereas the Taff Vale (i.e. GNR) was designed for (an arm movement of?) 90 degrees. In a subsequent part discussing the Northern Counties Committee (Northern Ireland) (3 July 1941) he states that the NCC used "McKenzie and Holland's type of somersault fittings ."

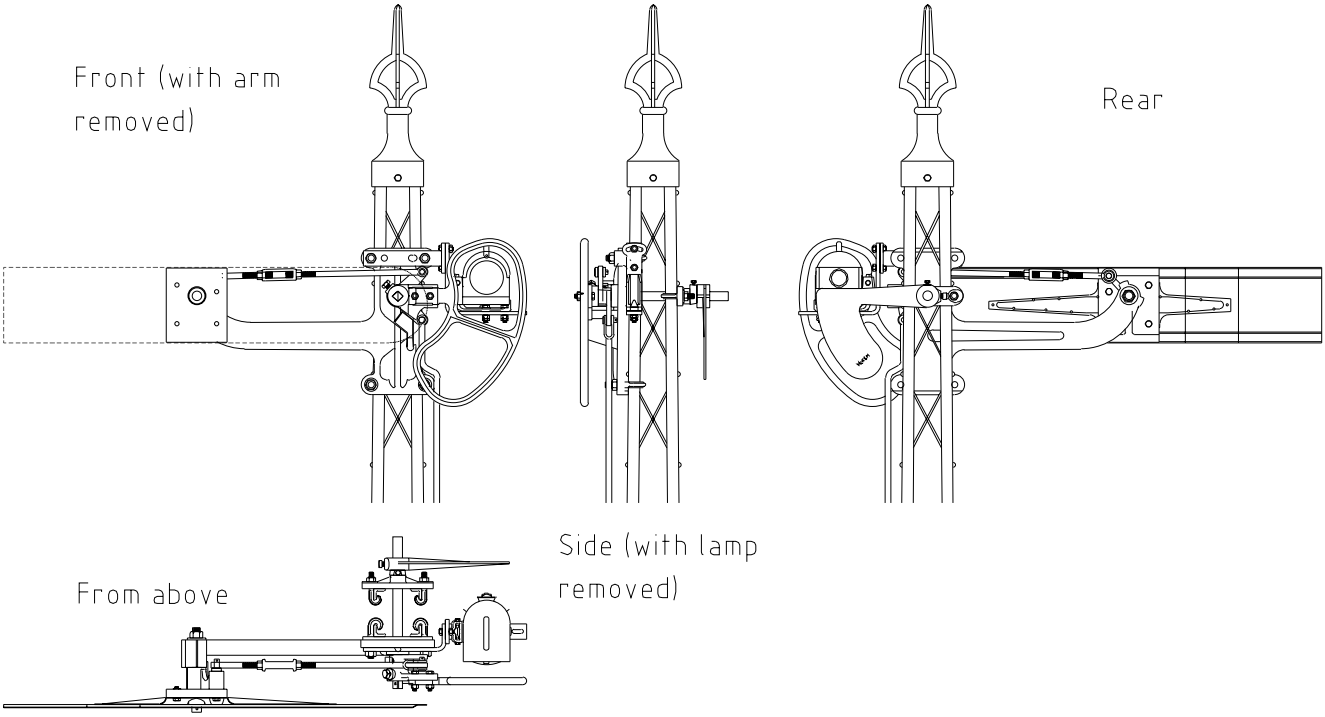
McKenzie and Holland signed two contracts in August 1882 with the Victorian Railways, one for semaphore fittings and one for interlocking equipment. It would appear that this material was supplied from the UK. In September 1883, the Victorian Railways lithographed a plan titled 'Set of Semaphore Fittings - Complete'. This plan shows a non-somersault arm (a reproduction of part of this plan can be found in Somersault. Vol 14 No 2 p74ff). Contracts were let for supply of semaphore fittings in May 1884, September 1884, and July 1885. The fittings supplied under this last contract were definitely to this plan, and it is likely that the earlier two contracts were also to this plan. A new plan titled 'Set of Semaphore Fittings - Complete' was lithographed in August 1886 and was used for a further contract to supply semaphore fittings in October 1886. This 1886 plan was of a somersault signal, but it was to the GNR design in which the horizontal rod pulled the arm off. No further small contracts were let for semaphore fittings. Instead, McKenzie and Holland were granted a contract in August 1887 in which they supplied fittings on a rates basis. It is possible that this rates contract marks the introduction of the modern somersault arrangement. An early photograph of Somerton (interlocked in October 1889) clearly shows the horizontal rod well above the arm bracket, and indicates that the modern arrangement was in use by late 1889.

On 4 March 1898 a contract was gazetted to McKenzie and Holland for the manufacture, supply, and delivery of interlocking point, signal, and gate fittings for the period ending 31 December 1900. A similar contract was gazetted on 9 August 1901 for the year to 30 June 1902. The specifications annexed to these contracts provided descriptions of the signalling components supplied to the Victorian Railway. The 1901 list provides more detail than the 1898 list, and the semaphore arm parts are listed in the table above.

In New Zealand, the somersault signal was made standard after the arrival of Wynne in 1900 - the first standard plans for somersault signals are dated 20 August 1900 (S91) with fittings (S92) and timberwork (S93) presumably much the same date. Henry Wynne had originally been a McKenzie & Holland (UK) apprentice. Drawings dated 1939 and reproduced in 'Semaphore to CTC' show somersault signals that are almost identical to Victorian practice. However, the book noted that minor dimensional changes

The front and rear views of a somersault arm mounted on a batten post. This uses the Type A arm bracket, and it can be seen how the extensions to the body of the bracket are just the right size to allow the hook bolts to extend and clamp to the vertical angles of the post. The rear view shows how the back bearing is also clamped to the vertical using hook bolts. This is a home signal, and the separate spectacle plate bolted to the clutch plate can be seen. On the arm, the copper rivet heads can be seen securing the arm plate itself to the stiffener (which can be seen in the rear view). The horizontal rod can be seen connecting to the arm plate onto which the arm is mounted. The rectangular box clamped to the arm bracket is a circuit controller repeating the position of the arm to the signalbox. Note that no back blinder is provided. These photos are of the Up Home at Sunbury.





Somersault Home semaphore arm
Scale 1mm = 1"

prevented interchange of the parts manufactured by McKenzie and Holland in Worcester (UK) and Melbourne (table 4.2 references spectacles and arm castings 'English pattern' and 'Melbourne pattern). (Semaphore to CTC, Richard W Heine, NZRLS, 2000)

On 12 November 1926 the Victorian S&T issued a drawing B614 for a somersault signal mounted on a pipe mast. On the same day they issued detail drawings B615 to B617 showing the components of a somersault signal. B614 was subsequently cancelled, but the detail drawings remain in force today with minor alterations. This should not be thought to indicate that the design of the parts shown on the detail drawings dates from 1926. The drawings (except B617) state that the parts were 'drawn from sample'; that is, the details were measured (reverse engineered) from existing components. As far as is known, the parts supplied to these drawings are interchangable with older parts, indicating that there was no major changes to the design in 1926.

The Somersault in detail

The following discussion on the design of the Somersault is based on the 1926 drawings. A drawing of a complete arm mounted on a lattice mast is reproduced above.

Arm brackets & back bearings

The arm bracket is a large iron casting mounted on the front of the mast that supports most of the parts of the semaphore. The arm brackets used for home and distant signals are shown on drawing B615, and that used for a calling-on arm on drawing B682.

The arm bracket consists of a rectangular portion that is secured to the mast and supports the spindle, and a bracket that extends to the left of the mast to support the stud on which the arm rotates. With a home/distant arm casting, the spindle and the arm stud are situated at the same level and 26 5/8" apart. On a calling-on arm bracket, the spindle and stud are 16 1/2" apart, and the stud is 1" higher than the spindle.

An important secondary purpose of the arm bracket is to provide stops to prevent the arm and spectacle from moving too far. The spectacle stop positively locates the arm and spectacle at stop. It takes the form of a large projection located below the spindle. When the signal is at danger, one arm of the spectacle crank rests on this projection. The projection is well braced to take the shock of the spectacle and arm returning to danger.

The arm stops are located on the boss of the arm bracket and engage with projections on the blade carrier. One stop prevents movement of the arm beyond 4 degrees below horizontal, and the second prevents movement beyond one degree beyond the vertical position. Neither stop is very substantial, and it would appear that the stops are primarily intended to prevent excessive movement of the arm if the horizontal tipping rod becomes disconnected. The horizontal stop prevents the arm from rotating below horizontal position to vertical, while the vertical stop prevents the arm from moving beyond the vertical position. When adjusting a somersault signal, it would appear that the spectacle is allowed to rest on its stop, and then the length of the tipping rod is adjusted so that the arm is horizontal. At this point the arm should be clear of the horizontal arm stop. (In some preserved signals, the arms droop below horizontal, and this is probably the result of misadjusting the tipping rod so that both the arm and spectacle stops are engaged when at danger.)

Because of the placement of the vertical stop, the arm of a somersault signal can theoretically move to the vertical position when at clear. In practice, it is not intended to move this far - with the arm vertical, the spectacle plate would have partially moved beyond the light, and the back blinder would have uncovered the back light. The actual intended angle when at clear will be discussed when the spectacle plate is considered.

There are four types of arm bracket for home and

distant arms, referred to as Type A (1B615), B (2B615), C (3B615), and D (4B615). Type A arm brackets are used for the topmost arms on lattice and batten masts. Type B brackets are used for arms on wooden masts. Type C brackets are used for the second and lower arms on lattice and batten masts. Type D brackets are used for pipe masts. Similarly, there are two types of calling-on arm brackets: Type A (1B682) and B (2B682). Type A brackets are used on wooden masts, and Type B on lattice and batten masts. Calling-on arms are never located at the top of masts, and there is no known example of a calling-on arm mounted on a pipe mast.

You would think that a calling-on arm bracket would be identical to a home/distant arm bracket, except with a shorter bracket, but you would be wrong. Almost all the dimensions of a calling-on arm bracket differ from those of a home signal, but only very slightly.

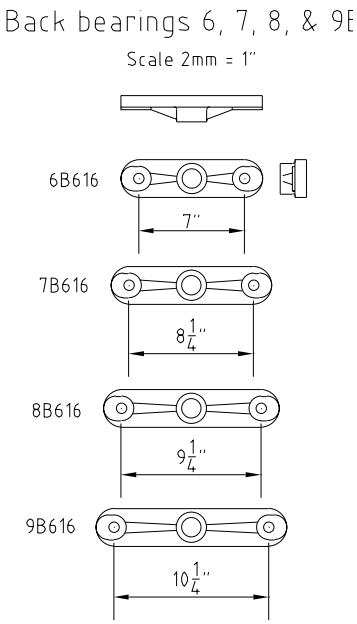
The 1901 McK&H schedule indicates that three arm brackets were available - for short, medium, and long arms. It is not known how these relate to the modern arm lengths.

Back bearings support the rear of the spindle. Very different back bearings are used on wooden masts, steel lattice or battern masts, and tubular steel masts, and these will be described below.

Arm brackets and back bearings on lattice and batten masts

Both lattice and batten masts are constructed from four vertical steel angles. Drilling holes in these angles would seriously weaken the mast, and consequently the arm bracket and back bearing are clamped to the angles using cast steel hook bolts. On lattice masts (and probably batten masts), the arm bracket is positively located on the mast by a 1 1/4" x 5/16" steel strap rivetted to the mast at the required height. The upper rib of the arm bracket rests on this strap and prevents the arm assembly sliding down the mast.

The topmost home/distant signal arm on a lattice or batten mast uses the Type A arm bracket. The distinguishing characteristic of the Type A is that the holes used to hold the arm bracket to the mast are outside the body of the arm bracket. The holes are 7 1/8" apart, and this allows the hook bolts to sit outside the vertical steel angles of the lattice or batten masts at the top of the mast. The Type A also has 1/2" x 1/2" ribs across the back of the arm casting at the top and bottom. These ribs ensure a small air gap between the back of the arm bracket and the mast, preventing moisture from being trapped between the bracket and the mast and causing the mast to rust. As already mentioned, the top rib also sits on a flat rivetted to the mast to prevent the semaphore from sliding down the mast.



Second and lower home/distant arms use the Type C arm bracket. Lattice and batten masts taper, but the mounting holes on Type A arm brackets are fixed at 7 1/8" apart. This distance is too small to allow the Type A arm brackets to be secured to the vertical angles lower down the mast. Instead, the Type B arm brackets are altered by removing the ribs at the back of the casting and rivetting the bracket to two steel strips 2 1/2" wide, 5/8" thick, and of a length to suit the width of the mast at the point the arm is mounted. Holes are drilled through these plates at appropriate points to take the hook bolts. Photos suggests that Type A arm brackets could also used as the basis for Type C arm brackets.

The taper on a lattice or batten mast also requires several different back bearings. The back bearing comes in four varieties, which only vary in the width of the casting (hence the location of the nominal hole for the hook bolts). 6B616 is for use for arms between the top of the mast and 3 feet below the top arm. For arms in this location the mounting holes are nominally 7" apart (the holes were actually drilled to suit the mast). For arms between 5' and 8' below the top arm (the normal arm spacing was 6'), 8B616 is used with the holes nominally 8 1/2" apart. For arms between 9' and 12' below the top arm, 9B616 is used with holes nominally 9 1/2" apart, and for arms 13' to 16' below the top arm, 10B616 is used with holes nominally 10 1/4" apart.

Arm brackets and back bearings on wooden masts

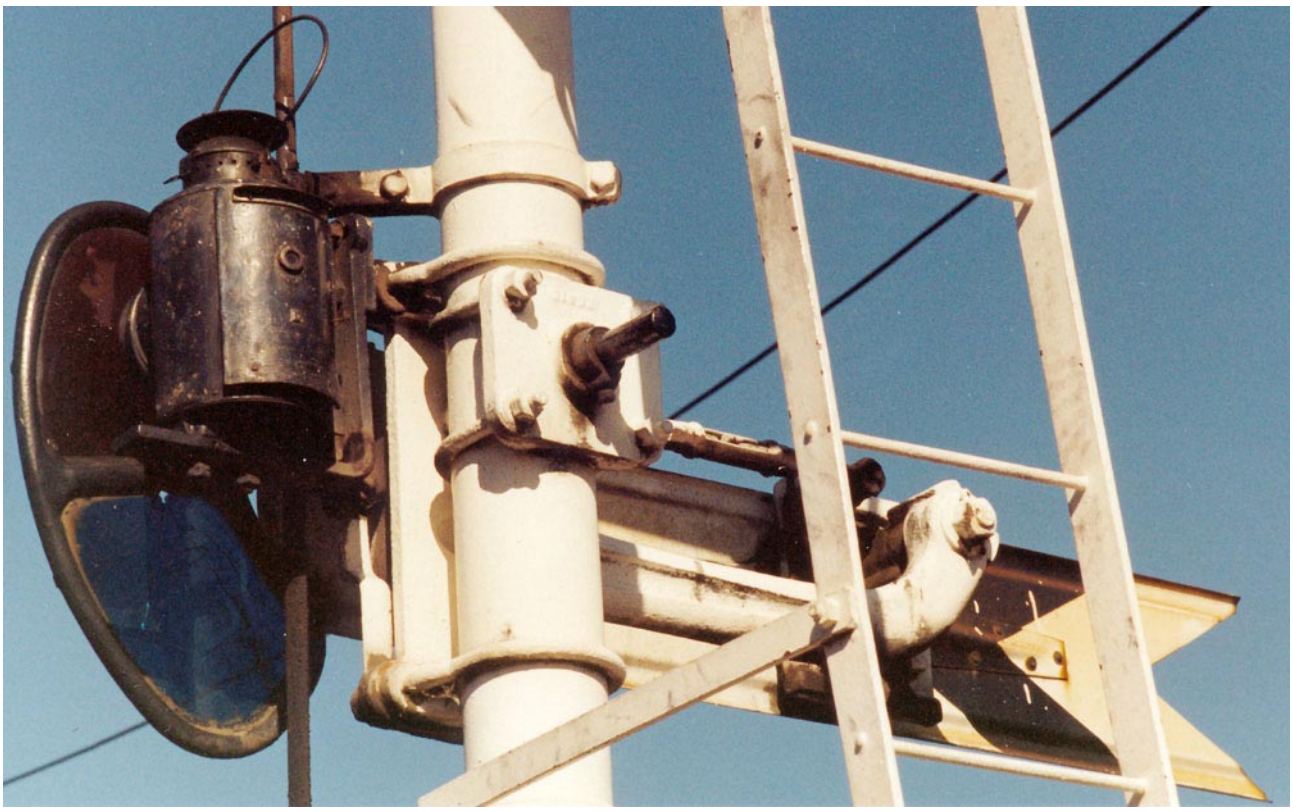
Arm brackets and back bearings are fixed to wooden masts by bolts and coach screws. A flat seat is cut into the front of the mast for the arm bracket and five holes drilled right through the mast - one hole for the spindle on the centre line of the mast, and four holes for the bolts that secure the arm bracket to the mast. On the back of the mast, a similar (though smaller) seat is cut for the back bearing, and four holes drilled for the screws holding it to the mast.

Type B arm brackets are used for wooden masts (and as the basis for Type C arm brackets). A Type B arm bracket is identical to the Type A arm brackets except that the fixing holes are within the body of the arm bracket and are only 3 1/2" apart. The arm bracket is secured to the mast using 3/4" bolts with the bolt heads at the rear of the mast. Like the Type A, the Type B had a 1/2" x 1/2" rib at the top and bottom of the back of the arm casting to minimise the contact area between the arm bracket and the surface of the wooden mast and prevent rotting of the mast.

The back bearing for a wooden mast (5B616) is a simple cast iron bearing screwed to the back of a wooden mast using four 1/2" coach screws.

Arm brackets and back bearings on pipe masts

The arm bracket is secured to a pipe mast by means of two U-bolts that pass around the back of the mast. The earlier type of back bearing is similarly secured to the mast by means of two U-bolts that pass around the front of the mast underneath the arm bracket. In addition, I believe that the back bearing has a shaft that projects forward through a hole in the mast and through the arm



This photo of the Moreland Down distant at Anstey shows how the Type D arm bracket was secured to a pipe mast using two U bolt. It also shows the original type of back bearing, also secured by means of U bolts. No blinder is provided as this distant is fixed and the spindle is fixed in place by a collar.

bracket to prevent it sliding down the mast. The later type of back bearing is a simple steel tube that passes through the mast and the arm bracket and is held in place by two washers.

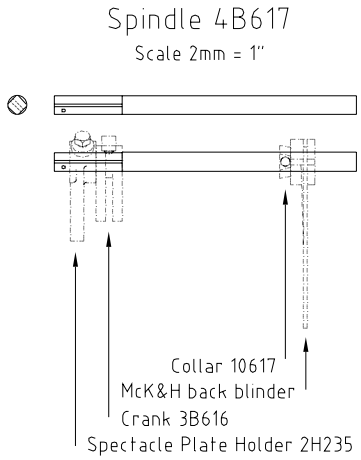
Type D arm brackets are used for pipe masts. They are identical to Type A arm brackets, except the spindle hole is larger (1 15/16″ diameter, instead of 1 9/32″) and the ribs on the back of the bracket are removed. The larger spindle hole is used to accommodate the back bearing tube.

Two different back bearings have been used for pipe masts. The original bearing, for which I don't have a detailed drawing, appears to be very similar to the back bearing of a wooden mast. However the base plate is larger as the mounting holes had to take the U bolts that fitted around the pipe mast. It also probably has a tube that projected forward from the back bearing through a hole in the mast and the arm bracket, completely enclosing the spindle. This tube positively locates the signal on the mast and prevents it from sliding down the mast. The drawing for this bearing was cancelled in June 1942. Given that few pipe mast semaphores would have been installed after this date, most of the pipe mast back bearings in existance were probably of this type.

The second bearing for a pipe mast (7B617) was added to the drawing in June 1942. It consists of a 1 29/32″ pipe 5 1/2″ long with two sleeves welded inside to form the bushes for the spindle. The bearing fits inside a hole drilled in the mast, and the front projects through the Type D spindle hole (1 15/16″ diameter) to prevent the arm sliding down the mast. The bearing is held in place in the mast by means of two cast steel washers with semi-circular faces (to fit against the pipe mast). The front washer is welded to the bearing, while the back washer was loose and held against the mast by means of a 1 1/2″ pipe nut.

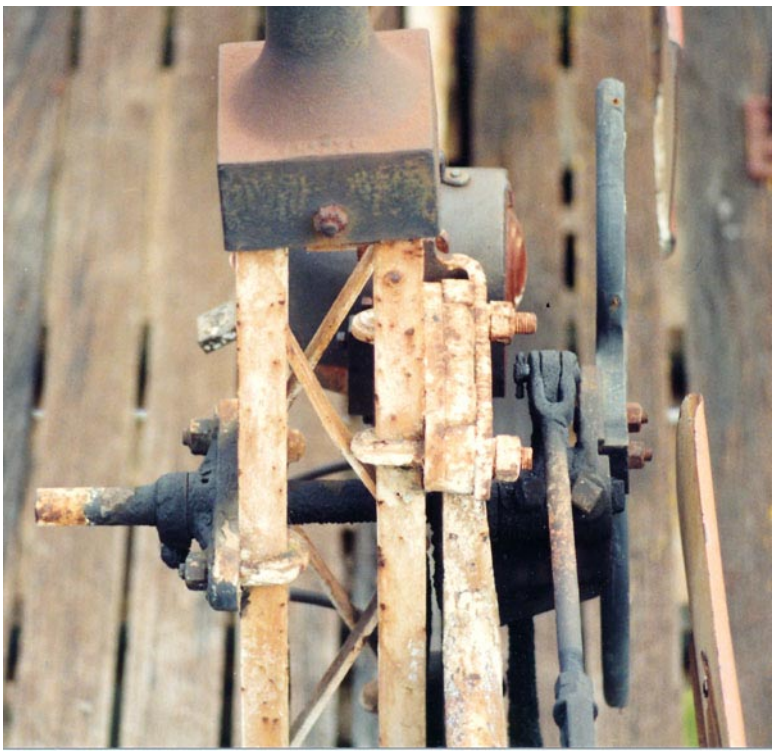
Spindle

The spindle (4B617) is a turned bright steel shaft 20″ long by 1 1/4″ diameter. The front 4 1/2″ is squared to 1″ square, and on this square portion is mounted first the crank, and then the spectacle. The square portion, of course, ensures that the crank, spindle, and spectacle move together. The crank and spectacle are secured to the spindle by means of set screws and prevented from coming off the spindle by a split pin in the end of the spindle. The blinder or collar at the rear of the mast is on a round portion of the spindle and is secured to the spindle by a set screw.

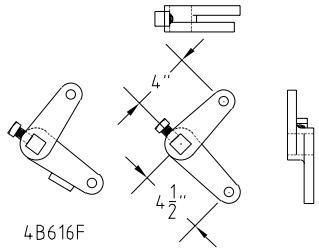


Crank

The cast steel crank to which the down rod is connected is mounted on the spindle between the arm bracket boss and the spectacle. The crank transfers the vertical movement of the down rod into a horizontal movement that operates the semaphore arm, and a rotating movement that operates the spectacle and the blinder (if fitted). It is interesting to note that the two arms of the crank are not



A side view of a lattice mast. The hook bolts holding the arm bracket and the back bearing can be clearly seen. On the front of the spindle is mounted the crank and the spectacle, and a collar is provided at the rear next to the back bearing instead of a back blinder. The arm can be seen at the extreme right, and it can be appreciated just how far forward a somersault arm sits in relation to the mast. This was the Up Home for Ballarat B (Lydiard St) box.



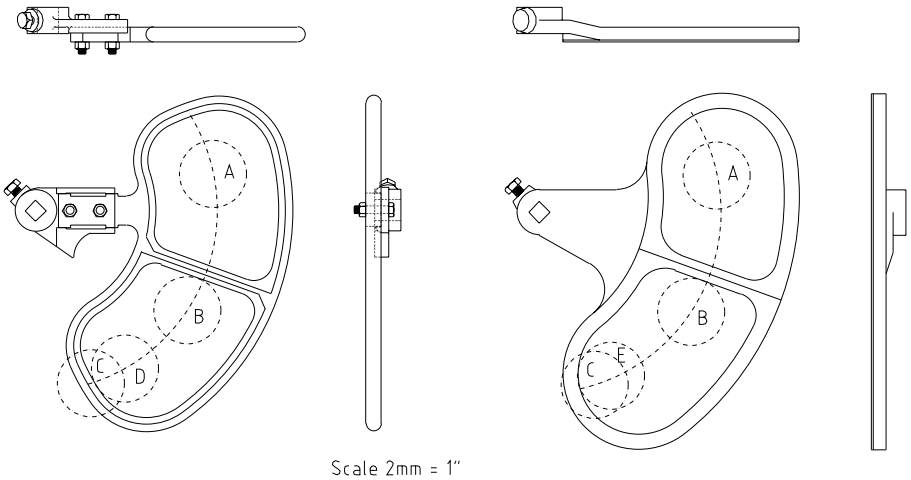
Cranks
4B616 (left) & 3B616 (right)
Scale 2mm = 1"

of equal length - the down rod arm is connected 4 1/2" from the spindle, while the tipping rod is 4" from the spindle. This difference in length means that the travel of the horizontal tipping rod is only roughly 90% that of the down rod. This difference is probably to reduce the effective crank arm on the blade carrier, while still ensuring a reasonable travel of the down rod. Interestingly, the 1901 schedules states that the crank arms were 4 1/2" and 4 3/4".

There are actually two versions of the crank - 3B616 and 4B616 - which are identical except that 4B616 has a small projection underneath the down rod crank arm. This projection sits on the spectacle stop and the effect is to rotate the crank 10 degrees counterclockwise when the signal is at danger. This reduces the down rod movement necessary to give a good clear, but also reduces the maximum 'off' angle. Drawing B615 specified the use of crank 4B616 when a reverser was provided, and 3B616 otherwise. It is possible that this was to deal with reduced travel of the down rod with a reverser. The current semaphore assembly drawing, B939, specifies 4B616 for all somersaults. Photographic evidence suggests, however, that most semaphores actually use 3B616.

Spectacle & glasses

Two types of spectacles are used on Victorian somersaults, and it is not clear why two were necessary. The Type A spectacle (H235) is used for home signals and calling-on signals, while the Type B spectacle (B455) is used for distant signals. The drawings for both types were produced in February 1923.



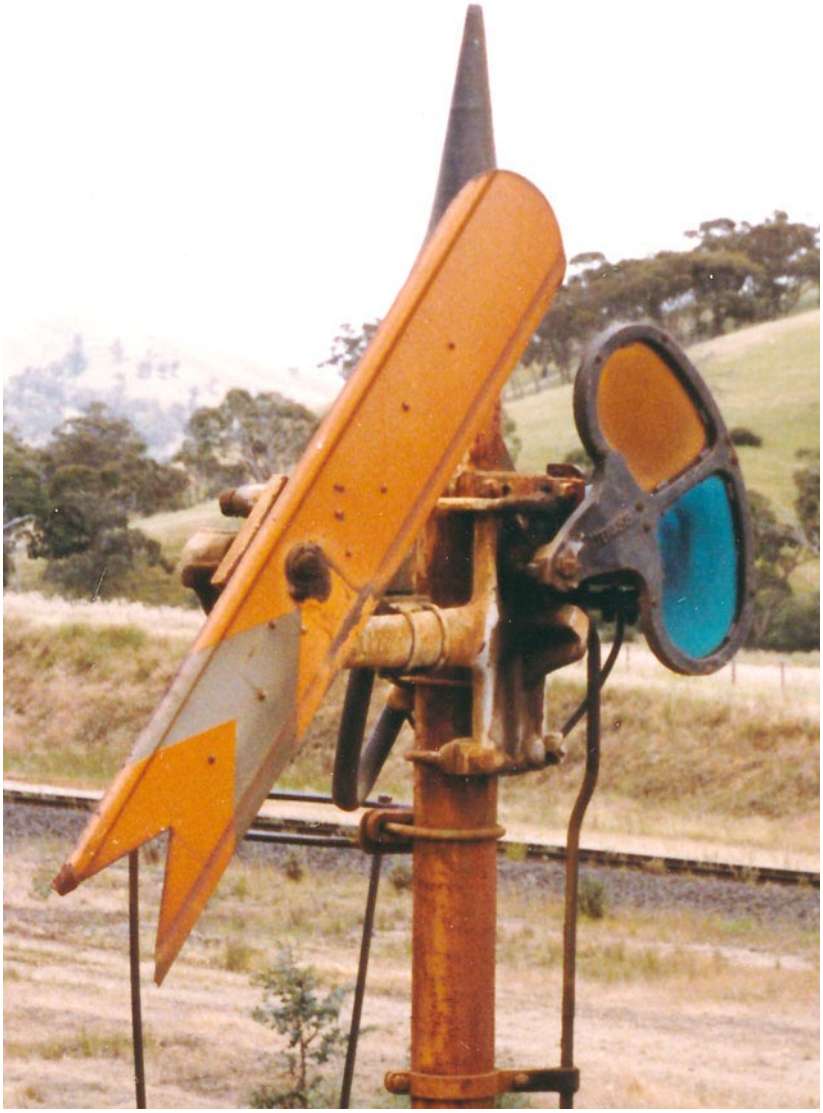
Scale 2mm = 1"

A: Position of light when at stop
B: Position of light when arm is at 45 degrees
C: Position of light when arm is at 90 degrees
D: Position of light when arm is at 78 degrees
E: Position of light when arm is at 84 degrees

All light positions with crank 3B616, with crank 4B616 spectacle is rotated 10 degrees counterclockwise

Spectacle Plate 3H235 and
Spectacle Plate Holder 2H235
For Home & Calling-on signals

Spectacle Plate B455
For Distant signals

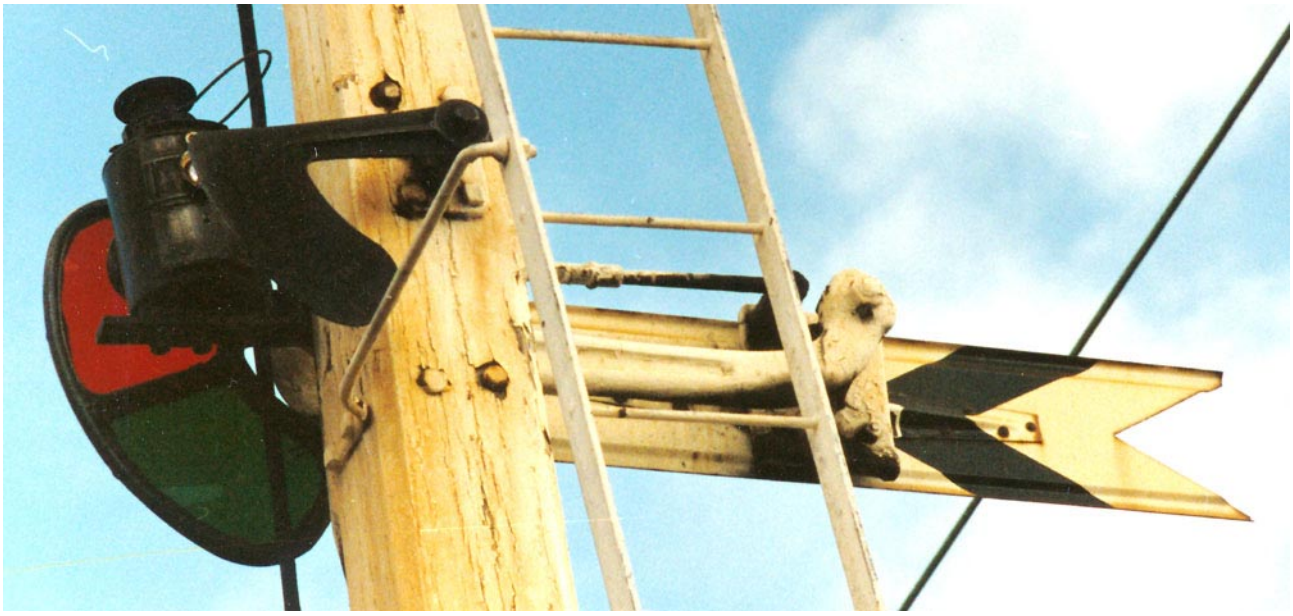


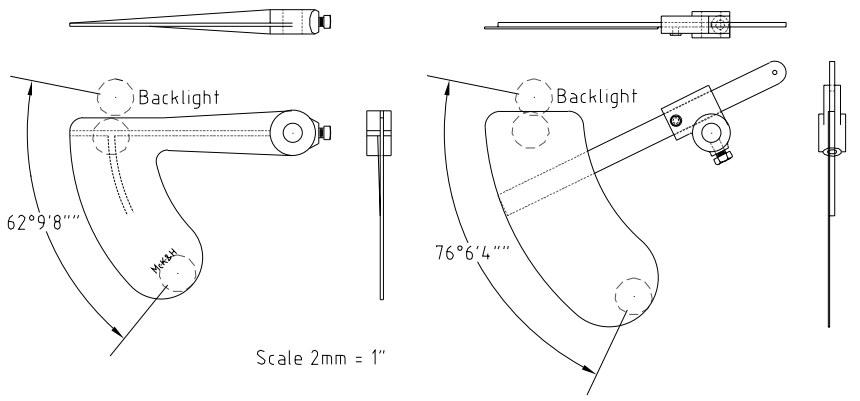
Type A spectacles (shown on H235) are in two parts - a cast iron holder (2H235) which is mounted on the spindle, and the cast iron spectacle itself (1H235) which is bolted to the holder by two 1/2" hex bolts and spring washers. The purpose of splitting the spectacle into two parts is not obvious, as no provision is made for varying the position of the spectacle on the holder. The H235 spectacle itself comes in three varieties depending on the glasses supplied: 1H235 is a plain spectacle with no glass, 3H235 contains red and green glasses (for Home signals), and 5H235 contains a yellow glass with the upper opening blanked off with a piece of sheet steel (for a calling-on arm). The glasses are secured in the spectacle using pins and putty. This was the type of spectacle plate referenced in the 1901 list, but in that list the 'holder' is referred to as a 'spec[tacle] clutch'. Somersault signals could operate safely without spectacles, and this was done occasionally where vandalism was a problem and the signals not normally required at night. The home signals at Flemington Racecourse were so treated up until at least the mid eighties. In this case Type A spectacles were provided and the spectacles were unbolted from the holder. The spectacles would have been stored locally and could easily have been fitted when necessary.

The Type B spectacle (B455) differs substantially from the Type A and is used for distant signals. This appears to be a later design than the Type A spectacles as it is not included in the 1901 McKenzie and Holland contract. In this spectacle, the spectacle plate and the holder are

(Above) The co-acting Down Distant at Kilmore East was a pipe mast. This photo clearly shows the different spectacle plate (B455) used for distant signals as compared with home and calling-on arms.

(Below) A rear view of the Down distant for Brunswick. This is a wooden mast, and the four hexagonal bolt heads securing the arm bracket to the mast can be seen above and below the back bearing. The blinder is the McKenzie and Holland style, and the small cast iron back bearing can be seen bolted to the mast with square headed coach screws.





All light positions with crank 3B616, with crank 4B616 spectacle is rotated 10 degrees clockwise

McK&H Back Blinder Back Blinder 1B617/5B617

combined into one iron casting. The glasses are held in place by two brass bezels (normal bezel - 2B455, and reverse bezel 3B455). Originally, the spectacle was supplied with red and green glasses, but it was altered in October 1927 to add a variant with yellow and green glasses. This type of spectacle can use moulded glasses (shown on N361 drawn in August© 1947).

The spectacles control the minimum and maximum angles at which a semaphore is 'off'. For both types of spectacle, the light is just completely in the 'off' spectacle when the spindle has rotated 45 degrees. (All the angles in this paragraph are with crank 3B616 - for crank 4B616 reduce the angles by 10 degrees for the off positions.) This corresponds to a 48 degree movement of the arm (as the effective crank arm on the blade carrier - 3.75" - is less than that of the crank - 4"). The maximum off position for a Type A spectacle is 72 degrees (78 degree arm movement), and for a Type B is 78 degrees (84 degree arm movement). It is interesting that the calculated maximum arm movement of 78 degrees closely matches the 79 degree angle Nock quotes for the McK&H design used on the Brecon & Merthyr Railways.

Blinder

The purpose of a blinder is to allow the signalman to confirm at night that a semaphore facing away from the signalbox is showing danger. A small white light back light is provided at the back of the semaphore lamp. When the arm is at danger the light is visible to the signalman. When the arm is cleared, the blinder obscures the light. Blinders are only provided when the signal faces away from the locations from which the signal is worked (slotted signals are worked from one location and controlled from another, and a blinder is provided if the signal faces away from any of these locations). Blinders are normally not provided if the signal is fitted with an electric repeater.

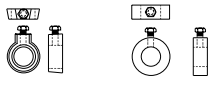
Two designs of blinders are known to have been used in Victoria. The older design originated with McKenzie and Holland (there are examples with 'McK&H' cast into the body) and is listed in the 1901 contract schedule. This design was not included in the detail drawings issued in 1926, however, a large number of semaphores survived into recent times with this type of blinder. It was quite common to find the two types of blinder in use on one semaphore mast, and was even common to find the McK&H style used on batten masts. The length of the McK&H blinder means that when the spindle has rotated 62 degrees the back light will start to reappear. This suggests that the McK&H blinder should be adjusted on the spindle so that the spindle needs to rotate 10 degrees (for home and calling-on arms fitted with Type A spectacles) or 16 degrees (for distant arms fitted with Type B spectacles) before the blinder begins to obscure the back light.

The newer design was in use by 1926, when the component drawings were issued, and has the advantage over the McKenzie and Holland design that it is adjustable to suit lamps mounted further from the mast centreline. The blinder (1B617) consists of a kidney shaped piece of mild steel sheet spot welded to a 1 1/2" x 5/16" bar. This bar is mounted in a cast iron blinder carrier (5B617) which, in turn is mounted on the spindle. Setscrews are used to secure the blinder in the blinder carrier, and the blinder carrier on the spindle. A spit pin is also fitted to the end of the blinder to provide a last line of defence in preventing the blinder from falling out entirely. In addition to being adjustable, the new design has the advantage that the maximum travel is better matched to the spectacles - the maximum travel of the blinder being 79 degrees.

Unlike the movement of the spectacle plate, these 'off' angles are unchanged irrespective of the crank used as the blinder is clamped to a round portion of the spindle and the position of the blinder can consequently be adjusted to suit the crank.

Collars

Blinders are only provided where the semaphore faces away from the signalbox. Where a blinder is not provided, a collar is provided on the spindle to secure it in the bearings. Collars were in use in 1901 (Part 181), but it appears that no collar was included on the standard drawings in 1926. Collar 10B617 was added to the drawing in October 1945 and was a relatively complex cast iron shape. In May 1957 this was replaced by 11B617 which is a simple mild steel ring. Both types of collar are secured onto the spindle by means of a set screw.



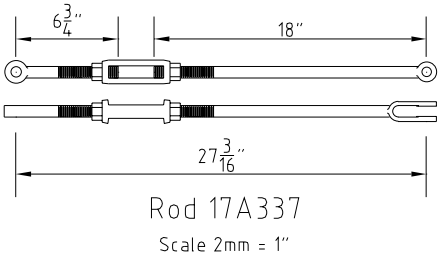
Collars 10/11B617

Scale 2mm = 1"

Tipping Rod

The horizontal rod connecting the arm spindle and the pin on the blade carrier is one of the standard 3/4" rods

(Right) A side view of the mounting of a home signal arm onto an arm bracket. The blade carrier, centre, rotates on a pin mounted in the end of the arm bracket. The carrier is driven by the horizontal tipping rod which drives on a pin in the top of the carrier. The length of the tipping rod can be adjusted by the screw in the tipping rod. The tipping rod is held onto the blade carrier pin by a washer and split pin, which can just be made out in the photo.



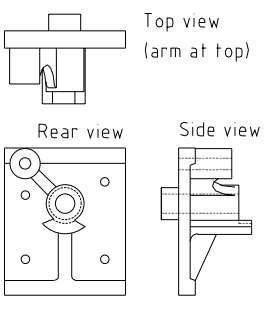
shown on drawing A337. The rod seems to be referred to as the 'tipping rod' or the 'connecting rod'. The signal adjustors course uses the term 'tipping rod', while drawing B619 uses the term 'connecting rod', as does the 1901 McKenzie and Holland schedule (item 179). Tipping rods are a 3/4" rod with an eye at one end (for the pin on the blade carrier), an adjusting screw, and a jaw at the other end (for the crank). The adjusting screw allows the length of the tipping rod to be adjusted to ensure the arm is horizontal when the spectacle plate rests on the stop.

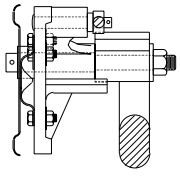
The design has altered slightly over the years. In 1926, rod 7A337 had been used and the adjusting screw was located centrally in the rod. Sometime later the rod became 3H122, and then in April 1930 to 17A337. Currently, the adjusting screw is located closer to the arm pivot than the spindle, and this change was probably to allow for the provision of an arm repeater (which is clamped to the arm bracket and driven from the tipping rod).

Blade Carrier

The blade carrier (1B616) is a complex casting onto which the semaphore blade is mounted (the 1901 list calls this part the 'Arm Plate'). On the centre line of the casting is a hole into which the stud fixed in the arm bracket is fitted; the blade carrier and arm rotating around this stud. The blade carrier and semaphore blade is secured onto the stud by means of a washer and split pin.

Around the hole in the blade carrier are two projections that control the position of the arm at each end of its travel. To one side of the casting, at the top, is the stud onto which the horizontal tipping rod is connected. This stud rotates the blade carrier, and hence the arm, around the stud in the arm bracket. The stud is 3 3/4" from the point of rotation. The arm is held onto the blade carrier by four 1/2" bolts.




Blade carrier with arm mounted on arm bracket

Wooden Semaphore Blades

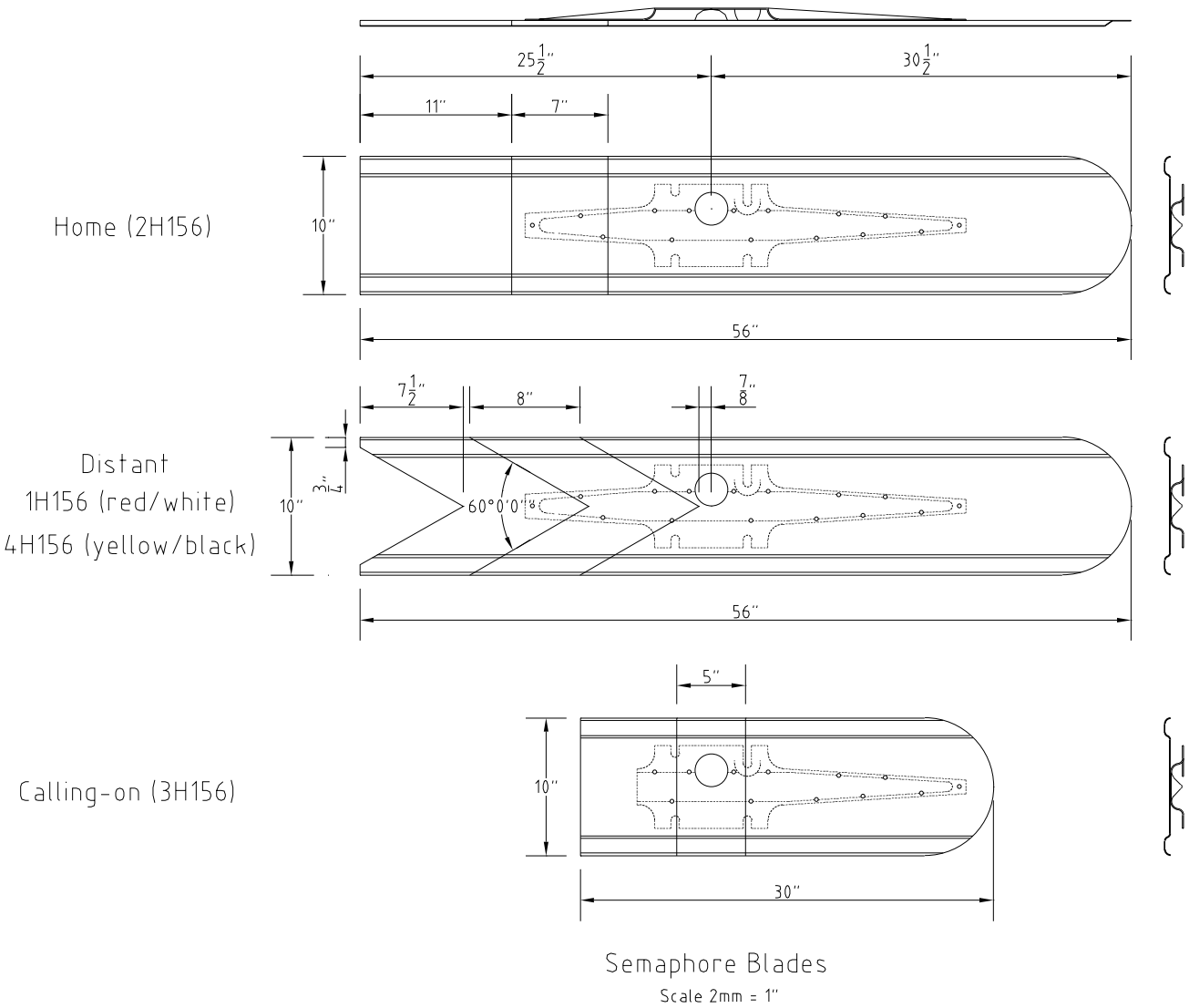
Unfortunately, a drawing of a wooden somersault arm has not survived. It is assumed that it was the same size as the steel arm - 4'8" long and 10" wide. The arm was bolted to the blade carrier by four bolts. A flat steel plate (the Blade Carrier Plate - 2B616) was provided on the front of the arm to distribute the pressure of the bolt heads across the surface of the semaphore. This reduced the possibility that the wind would tear the arm from the blade carrier. It can also be safely assumed that vertical flat steel straps were screwed to the back of the semaphore arm at each end to prevent the arm from splitting, and these are listed in the 1901 list.

Steel Semaphore Blades

The standard enamelled steel semaphore blade (H156) for a home or distant is 4'8" long with a width of 10". The pivot point is 2' 1 1/2" from the outer end of the arm, and 2' 6 1/2" from the inner. Vertically, the pivot point is 1 3/8" above the center line of the arm. This means that the centre of gravity of the arm is below and closer to the mast than the pivot point and the arm will always return to danger. A calling-on arm is 30" long and 10" wide with the pivot point being 9 1/2" from the outer end of the arm and 1' 8 1/2" from the inner.

Steel semaphore blades are constructed from two pressed steel plates - the blade and a stiffening plate. The blade itself is pressed from No 16 SWG sheet steel and has two stiffening channels 3/8" deep and 1" wide at the top and bottom of the blade. The stiffening plate is pressed from No 14 SWG sheet steel and is a complex shape designed to stiffen the blade in the horizontal direction. The stiffening plate also has the bolt holes used to secure the arm to the blade carrier. The two are connected by means of 16 copper rivets (12 in the calling-on arm) in brass eyelets (the metals were chosen to prevent corrosion).

The colouring on the arm is vitreous enamel. The current enamelling instructions (on drawing H1101) are dated



May 1961. The colours used are from BS 381c (1948) Signal Red No 537, (Lab: 44.30, 49.68, 32.29) and Traffic Yellow No 368. (From the 1988 revision of BS281c Traffic Yellow No 368 was renamed Apricot No 568 - Lab: 63.85, 29.81, 59.79). In addition, of course, the arms used black and white.

The fronts of the semaphore arms are enamelled as follows. A home signal arm is all over red with a white band 7" wide, commencing 11" from the end of the arm. A standard distant arm is either yellow with a black chevron, or red with a white chevron. The point of the chevron for the distant signal commences 7/8" from the pivot point, and is 8" wide horizontally. The angle of the chevron is 30 degrees from the horizontal. A calling-on arm is red with a 5" wide white band centred on the pivot point.

The 1910 W&W Branch instructions shows slightly different painting instructions. The bar on a home signal arm was 10" wide, commencing 10" from the end of the arm. The distant arm had a 'reversed K' in which the chevron was superimposed on the 10" wide white bar. It is not known how long the 'reversed K' design was in use, but at least two enamelled examples were in use into recent times.

Generally, the rear of the arms are white with black stripes. The dimensions of the stripes are the same as for the front of the arm. However, the back of some arms (particularly distant arms) were all-over black. This was to aid sighting from the signal-box where a repeater was not provided and the background was poor.

The enamelled steel arm design dates from at least January 1921 when drawing B381 (showing the details of the blade and stiffening) was drawn. The drawing showing the complete semaphore blade (H156) was produced in January 1922.

Painting of the fittings

Generally, all of the fittings of a somersault signal are painted white, except for the arm itself, the spectacle, and the blinder. The spectacle and blinder are painted black. Slight variations existed depending on the whim of the painter. The 1910 W&W Branch instructions state that "all fittings, such as lever plates, rod guides, down rods, brackets, cranks, and blinders must be painted black'.

Conclusion

The somersault semaphore undoubtedly gave a very positive 'clear' signal during daylight. It is also, in my opinion, a very attractive signal. However, it has significantly more parts than a more conventional semaphore with the arm and spectacle rotating around one pivot. This would suggest that a somersault semaphore is more expensive to manufacture than a conventional semaphore. As other states in Australia successfully used conventional semaphores, it is hard to understand the justification for adopting the somersault signal.

(Above) A close up of the bottom arm on Post 25, Clifton Hill, on one of the rare occasions that it was cleared for a train. It is just possible to make out the text 'McKenzie & Holland/Melbourne" cast into the arm bracket, indicating that this was an original McK&H product. The arm bracket itself is a Type C, used for second and lower arms on lattice posts, and close inspection will reveal how the arm bracket has been rivetted onto horizontal strips which, in turn, have been secured to the vertical angles. This signal is fitted with an electric repeater clamped to the arm bracket. (Left) The last calling-on arm to be regularly cleared in Victoria was probably that on Post 21 at Ballarat B. It applied for moves in Platform 1 and was used several times each day to signal the locomotive back onto the passenger cars when running around. The arm is just off - the lens of the lamp can just be seen through the yellow glass. The on 'glass' of a calling-on is a steel plate (no light is given when a calling-on arm is at stop), but a small hole is punched in the plate to show a tiny white light to allow the signaller to confirm that the arm is on at night. The enamelling of the calling-on arm is not quite in accordance with the instructions, but whether this represents an earlier practice or sloppy enamelling is not known.