Signalling Record Society (Victoria) - SOMERSAULT.
September 1987 - Vol 10, No 5.

EDITOR: David Langley, P.O. Box 8, Avenel, 3664.
Phone: (057) 96-2337.

VICTORIAN GROUP LEADER: Jack McLean, 60 Kenmare St.
Box Hill North, 3129. Phone: (03) 890-6764.
VICTORIAN GROUP TREASURER AND SUBSCRIPTION MANAGER:
Robert Weiss, 40 Shady Grove, Nunawading, 3131.
Phone: (03) 874-1521.

NSW GROUP LEADER: Neil Curryer, 20 Elton Close,
Adamstown Heights, 2289. Phone: (049) 43-7404.
NSW GROUP SECRETARY: Bob Taaffe, 11 Deribong Place,
Thornleigh. 2120. Phone: (02) 481-9994.

Articles may be reprinted without prior permission but acknowledgement is required. Opinions expressed in articles appearing in SOMERSAULT or supplements are not necessarily those of the S.R.S.V.

Deadline for September 1987 issue is 16 August 1987.
NEXT MEETING: Friday, 18 September 1987.
VENUE: A.R.H.S. Library Room, Windsor Rly Station.

MINUTES OF JULY 1987 MEETING

HELD AT: A.R.H.S. Library Room, Windsor Railway Station.

MEETING COMMENCED: at 2015 hours.

PRESENT: Jack McLean, Stephen McLean, Wilfrid Brook, Jon Churchward, Warren Doubleday, Roger Jeffries, Ian Mathews, Bruce McCurry, Peter Pay, Colin Rutledge, John Sinnatt, Roderick Smith and Brad Wooding.

VISITORS: Brian Frary and Richard Flinders.

MINUTES OF PREVIOUS MEETING: were adopted as read (Rutledge/Wooding)

BUSINESS ARISING: None.

CORRESPONDENCE: Nil

GENERAL BUSINESS:
1. Reports included the beginning of three track running between Caulfield and Moorabbin on 5 July 1987.
2. Work has commenced on the ATC project between Melton and Warrenheip.
3. John Sinnatt asked what decisions had been made on the installation of Radio Electronic Block on the Mildura line. Part of the syllabus item was directed to this question.
4. Attention was directed to an error in the answer to the question in 'SOMERSAULT' about passing permissive signals at the Stop position. "On CTC, the driver does not to have to get the Train Controller's permission to pass such signals at Stop".

5. Colin Rutledge handed over a cheque for $100 which had been given to him by Andrew Waugh for services rendered in Andrew's project on the conservation of interesting railway signalling and operating equipment and buildings.

SYLLABUS ITEM: Member Bob Whitehead spoke at length on the proposed arrangements for the rationalisation of track and crossing facilities on the Geelong to Mildura line. Some of us old hands will be sorry to see some of the old places go; for instance, who ever would have prophesised that between North Ballarat and Maryborough, the crossing stations would be Sulky Loop and Tourello Loop. (Don't forget Talbot remains-Ed). The whole pattern of the country railway has changed in the last few years. Gone are the roadside goods trains, and the stopping all stations passenger trains with them. The lines under consideration are gearing for fast long distance passenger trains and on the goods side, mainly the movement of bulk grain.
In question time, Bob gave an outline of the possible train working arrangements which could include Radio Electronic Block.

MEETING CLOSED: at 2220 hours.

--oOo--

SIGNALLING ALTERATIONS

* 24.5.1987 EPPING. A turnout was placed at 2..310 km and is spiked for main line running.

* 24.5.1987 MORDIALLOC. The Down Home (co-acting) signal Post MOR712 was moved two metres in the up direction. Illuminated letter "A" lights were provided and switching facilities brought into use. (A 2292/87)

* 28.5.1987 HAMILTON. The annett locked connections to the Car Siding and the Dock Siding, together with the annett locked crossover, were removed. Up Home signal Post 5 was abolished. Amend diagram No 42'86. (A 391/86)

* 31.5.1987 KEON PARK. A turnout at 17.775 km was provided and spiked reverse. The track was slued to its final alignment.

* 1.6.1987 CURYO. Hayes derails were provided at both ends of the the siding. (A 423/33)

* 10.6.1987 GARFIELD. The siding and switch lock were abolished. Amend diagram No 26'85 accordingly. (A 419/87)

* 16.6.1987 CARWARP. The Up Home signal "D" was relocated 182 metres further out in the down direction. (A 449/87)

17.6.1987 CURYO was closed as an electric staff station, the new section becoming Birchip-Woomelang. The fixed signals and plunger locking will be retained for the present. No 3 road and the signal quadrants at the main line points were abolished. Curyo may be opened as an Intermediate Block Post. (A 445/87)

19.6.1987 CHILTERN was closed as an electric staff station, the new section becoming Springhurst-Barnawatha. All signals were abolished and the points were spiked so that all trains will run via the platform road. A Notice Board lettered "30 KILOMETRES PER HOUR TO CROSSING" was provided at the up end of the platform. (A 451/87)

19.6.1987 ROSEDALE was closed as an electric staff station and the new section is Traralgon-Sale. The plunger locking and home signals will remain in use for the present time and signal "E" was converted from push buttons to 5P key operation. The crews of all down trains must operate 5P key switch. Rosedale may be opened as an Intermediate Block Post as required. (A 477/87)

20.6.1987 CAULFIELD. Engineer's Diagram Nos 29'87 (Caulfield) and 27'87 (Glenhuntly-Mordialloc) became effective and diagrams 25'87 (Caulfield) and 23'87 (Glenhuntly-Mordialloc) are cancelled. The Up "F" line will not be commissioned at this time, only the signal arrangements associated with the new line. The alterations are as follows:-

1. The Up and Down Frankston lines between Caulfield and the down side of Neerim Road were resignalled. Signals F377, F364, F355 and dwarfs 53 and 49 were abolished. Signals 53, F353, F365, F373 and dwarf signals 64, 75 and 76.
2. Signal 61 at Caulfield was converted to a light signal and moved 30 metres in the down direction.
3. FM380 was converted to enable it to show a Reduce to Medium indication as required.
4. Access to the up end only of No 1 Stabling Siding and the Up Caulfield Through siding was commissioned and two derails with wheel crowders were provided.
5. A new signalling diagram was provided in Caulfield signal box replacing the existing diagram originally installed in 1933.
6. Express/Stopping push buttons for signals 30, 31, 28, 53, 34 and U34 for moves to the down Frankston line were provided.
7. Boom barriers at Neerim Road, and pedestrian gates on the upside of Neerim Road, were also commissioned.

NOTE:- The single compound at the down end of No 52 points and the up end of No 57 points were spiked to give access from the FM line to Nos 3, 3A and 4 roads only. (A 2343/87)

23.6.1987 TOTTENHAM. Post 9G was abolished. (A 454/87)

23.6.1987 SUTHERLAND. The Down Home signal "A" was relocated 540 metres further out in the up direction. (A 453/87)

24.6.1987 WALLAN. The Up Starting signal Post 3 was converted from a mechanical signal to a light signal. Amend diagram 18'82. (A 489/87)

25.6.1987 SEYMOUR "A" BOX. Up Home signal No 47 was converted from a three position signal to a two position signal by the removal of the "B" light. Amend diagram 4'78. (A 490/87)

WN24/1987 TRAIN RADIO INSTRUCTION MANUAL. A new instruction manual has been issued. Train numbers are no longer used to identify callers using the radios, engine numbers will be used inlieu. A list showing how Victorian engine numbers are converted for use by the radios. In the case of trains hauled by more than one engine, the number of the leading engine is used. (A 468/87)

27.6.1987 GLENHUNTLY-MORDIALLOC. Engineer's Diagram No 31'87 became effective and diagram No 27'87 was cancelled. The Down signals on the centre line will not be commissioned until a later date. The principle alterations are:-
1. Home signals Nos MRN 702, MRN 704, MRN 709 (also co-acting signal) and MRN 711, remotely controlled from Caulfield, were brought into service.
2. Automatic signals Nos MRN 609, F 512, F 486, F 434, F 420, F 398, F366 were brought into service.
3. Home signals No 2 (Glenhuntly), and 74 and 77 (Caulfield) were brought into service.
4. Nos 52, 57 and 72 points, also 81 Dwarf signal (permanently at Stop) were brought into service.
NOTE:- As from 0600 on Sunday 28.6.1987, the new up line from Moorabbin to Caulfield was brought into service for all up trains. All down trains will continue tp use the Down line between Caulfield and Moorabbin. The points at Moorabbin are spiked accordingly.
(A 2358/87)

29.6.1987 SHEPPARTON. The ISDN exchange was brought into service.

30.6.1987 SUNSHINE LOOP. All signals posts were renumbered. [The new signal numbering means that the former number denoting the location is replaced by a three letter abbreviation denoting the location. This three letter abbreviation is used by the Train Controller when selecting various locations. The location identity for Sunshine, which was 2, is now altered to SUN.] (A 516/87.)

30.6.1987 KORONG VALE-CHARLTON-WYCHEPROOF. The electric staff system for the above sections was abolished and replaced by the staff and ticket system. (A 511/87)

WN26/1987 REDCLIFFS-IRYMPLE. The staff used by No 286 may also be used for No 287 without being placed through the instrument at Redcliffs.
(A 524/87)

WN26/1987 BALLARAT "D" (LINTON JUNCTION) SIGNAL BOX. A scotch block has been provided on the former Skipton line 207 metres on the down side of the Ring Road level crossing. (A 528/87)

1.7.1987 KILMORE EAST. The proceed aspect shown on dwarf signal No 12 was altered from yellow to green in accordance with Regulation 51.
(A 533/87)

2.7.1987 WARRAGUL-TRARALGON. The de-commissioning of the Overhead wiring between Warragul and Traralgon was commenced by the provision of air gaps and the removal of drop feeders on the down side of Warragul. (A 2413/87)

6.7.1987 SOUTH DYNON LOCOMOTIVE DEPOT. The Overhead wiring in the depot area, locomotive stabling tracks, fuelling point tracks and approach tracks was decommissioned.

6.7.1987 ROSEDALE. The points at both ends of No 2 road were spiked to lie for No 3 road. (A 547/87)

6.7.1987 LONG ISLAND LINE. The Train Staff for the line will be abolished and the line will be worked as a siding. The Intermediate Electric Staff arrangements will remain for the time being. (A 2373/87)

7.7.1987 ALBION LOOP. The controlled signals were renumbered as follows:- 3/6 - ABJ/6 and 3/8 - ABJ/8.

7.7.1987 McINTYRE LOOP. The controlled signals were renumbered as follows:- 4/2 - MCT/2, 4/4 - MCT/4, 4/U4 - MCT/U4, 4/V4 - MCT/V4, 4/6 - MCT/6, 4/U6 - MCT/U6, 4/V6 - MCT/V6, 4/8 - MCT/8 and 4/12 - MCT/12.

8.7.1987 COLDSTREAM. Staff locks were provided at both ends of the siding. (A 2388/87)

9.7.1987 GRAHAM. The fence at the up end of the platform was relocated 20 metres in the down direction. (A 2398/87)

14.7.1987 JACANA LOOP. The controlled signals were renumbered as follows:- 7/2 - JCA/2 and 7/4 - JAC/4.

14.7.1987 TULLAMARINE LOOP. The controlled signals were renumbered as follows:- 6/2 - TME/2, 6/4 - TME/4, 6/U4- TME/U4, 6/6 - TME/6, 6/U6 - TME/U6 and 6/8 - TME/8.

15.7.1987 COPE COPE. No 3 road and the up end extension of No 3 road were abolished. (A 587/87)

15.7.1987 LITCHFIELD was closed as a switching electric staff station and the existing long section - Donald to Watchem - becomes the permanent staff section. The fixed signals and plunger locking will remain at this stage. Litchfield may be opened as an Intermediate Block Post. (A 586/87)

15.7.1987 SUNSHINE LOOP. The controlled signals were renumbered as follows:- 2/2 - SNE/2, 2/4 - SNE/4, 2/U4 - SNE/U4, 2/6 - SNE/6, 2/U6 - SNE/U6 and 2/8 - SNE/8. (A 607/87)

16.7.1987 ARARAT. The staff locked Shell Oil Company's siding was abolished. (A 577/87)

16.7.1987 GRAHAM. Points 803 and 805 were booked out of service and spiked for normal traffic.

16.7.1987 WATCHEM. The up end plunger locked points were moved 598 metres in the up direction. The down home signal was relocated 376 metres further out and its signal quadrant was relocated from the platform to 168 metres in the up direction. (A 571/87)

18.7.1987 EPPING. The existing main line will be baulked at 22.566km.

20.7.1987 WALLAN LOOP. The controlled signals were renumbered as follows:- 15/2 - WLN/2, 15/4 - WLN/4, 15/U4 - WLN/U4, 15/6 - WLN/6, 15/U6 - WLN/U6 and 15/8 - WLN/8. (A 601/87)

20.7.1987 KILMORE EAST GRADE CROSSING. The controlled signals were renumbered as follows:- 16/6 - KME/6 and 16/10 - KME/10. (A 601/87)

(In addition to these, the three remaining signals at Donnybrook were also renumbered on this day although no "A" circular had been issued.)

21.7.1987 BROADFORD LOOP. The controlled signals were renumbered as follows:- 17/2 - BRF/2, 17/4 - BRF/4, 17/U4 - BRF/U4, 17/6 - BRF/6, 17/U6 - BRF/U6 and 17/8 - BRF/8. (A 603/87)

21.7.1987 TALLAROOK LOOP. The controlled signals were renumbered as follows:- 20/2 - TLK/2, 20/4 - TLK/4, 20/U4 - TLK/U4, 20/6 - TLK/6, 20/U6 - TLK/U6, 20/8 - TLK/8 and 20/10 - TLK/10. (A 603/87)

21.7.1987 SEYMOUR GRADE CROSSING. The controlled signal was renumbered as follows:- 21/2 - SGC/2. (A 603/87)

21.7.1987 BROADMEADOWS. The controlled signals were renumbered as follows:- 8/2 - BME/2 and 8/4 - BME/4.

21.7.1987 SOMERTON LOOP. The controlled signals were renumbered as follows:- 9/2 - SOM/2, 9/4 - SOM/4, 9/U4 - SOM/U4, 9/V4 - SOM/V4, 9/6 - SOM/6, 9/U6 - SOM/U6, 9/V6 - SOM/V6 and 9/8 - SOM/8.

21.7.1987 ALBION TO BROADMEADOWS. Enginer's diagram No 14'86 became effective and diagram No 10'79 is cancelled. The new diagram shows the new signal numbers following the alteration from numbered to lettered location codes. (A 596/87)

21.7.1987 SPENCER STREET TO SOMERTON LOOP. Engineer's diagram No 6'86 became effective and diagram No 26'83 is cancelled. The new diagram shows the new signal numbers following the alteration from numbered to lettered location codes. (A 597/87)

21.7.1987 PORTLAND. The switch stand point indicator on the trailable points at the down end of the Port Sidings was abolished. (O 11/87)

22.7.1987 SEYMOUR LOOP. The controlled signals were renumbered as follows:- 22/2 - SEY/2, 22/4 - SEY/4, 22/U4 - SEY/U4, 22/6 - SEY/6, 22/U6 - SEY/U6 and 22/8 - SEY/8. (A 604/87)

22.7.1987 MANGALORE GRADE CROSSING. The controlled signals were renumbered as follows:-
23/2 - MGE/2 and 23/4 - MGE/4. (A 604/87)

22.7.1987 LONGWOOD LOOP. The controlled signals were renumbered as follows:- 25/2 - LWD/2, 25/4 - LWD/4, 25/U4 - LWD/U4, 25/6 - LWD/6, 25/U6 - LWD/U6 and 25/8 - LWD/8. (A 604/87)

22.7.1987 NORTH BENDIGO JUNCTION-ELMORE-ROCHESTER-ECHUCA. The Electric Staff system was abolished and replaced by the Train Staff and Ticket system with the same sections. The Divided Staff for Epsom Racecourse in the North Bendigo Junction-Elmore section was removed and The Up and Down signals at Epsom Racecourse were abolished. (A 617/87)

23.7.1987 EMU. The down end plunger locked points were relocated 219 metres in the down direction. The up home signal will be relocated 113 metres in the down direction on the right hand side of the line. (O 3/87)

23.7.1987 GEELONG "B" SIGNAL BOX. The following alterations were brought into use:-
1. Points No 30U were abolished.
2. Points No 30D were spiked normal.
3. Lock Bar No 36 was converted to a Pilot lever.
4. The disc signal on post 23 and the right hand disc signal on post 26 were disconnected from their respective operating levers (Nos 29 and 37) and secured at Stop.
5. Levers No 29, 30 and 37 were sleeved normal. (O 26/87)

23.7.1987 VIOLET TOWN LOOP. The controlled signals were renumbered as follows:-
27/2 - VTN/2, 27/4 - VTN/4, 27/U4 - VTN/U4, 27/6 - VTN/6, 27/U6 - VTN/U6 and 27/8 - VTN/8. (A 605/87)

23.7.1987 BENALLA LOOP. The controlled signals were renumbered as follows:- 28/2 - BNL/2, 28/4 - BNL/4, 28/U4 - BNL/U4, 28/6 - BNL/6, 28/U6 - BNL/U6 and 28/8 - BNL/8. (A 605/87)

23.7.1987 WARRAGUL-TRARALGON. The de-commissioning of the Overhead wiring was completed on this date. (O 71/87)

WN29/1987 WARRAGUL. At Warragul a bitumen pathway has been constructed across the tracks to enable containers of parcels to be transferred between the Station and the Freight Gate by means of a forklift. When it is necessary for the pathway to be used, the Officer-in-Charge must inform the Stationmaster of the movement. The Stationmaster must proceed to the signal box and supervise the operation from there. The signalman must sleev all signal levers NORMAL which control the affected area and must not permit any train to enter No 1 road, all shunting operations must cease also. "A" signal box must be "switched out". (A 611/87)

WN29/1987 CIRCULARS. Commencing forthwith all Circulars issued by the Safeworking Department (V/Line and The Met) will be prefixed by the

letter "O" signifying Operations. This replaces the "A" circulars which will no longer be issued from this Department. V/Line circulars will commence with No 1 and The Met. circulars with No 2000. (O 1/87)

WN29/1987 ST ARNAUD. Approval has been granted by the local council for trains to stand across the Howitt or Millett Street level crossings for up to 40 minutes per day. It must be distinctly understood that both crossings must not be occupied by trains at the same train. Special signs are erected on each side of these level crossings. The signas indicate that should Howitt or Millett Street be blocked, the next level crossing is at the other end of the yard. (A 602/87)

WN29/87 BEYOND SOMERTON LOOP TO SEYMOUR LOOP. Engineer's Diagram No 20'86 became effective and Diagram No 16'72 is cancelled. The diagram has been issued in connection with the renumbering of the standard gauge signals. (A 606/87)

WN29/1987 MANGALORE TO WINTON. Engineer's Diagram No 52'86 became effective and Diagram No 9'70 is cancelled. The diagram has been issued in connection with the renumbering of the standard gauge signals. (A 606/87)

WN29/1987 CRAIGIEBURN, DONNYBROOK and WALLAN. Engineer's Diagram No 12'86 became effective and Diagram No 18'82 is cancelled. The diagram has been issued in connection with the renumbering of standard gauge signals. (A 606/87)

WN29/1987 KILMORE EAST. Engineer's Diagram No 40'86 became effective and Diagram No 15'76 is cancelled. The diagram has been issued in connection with the renumbering of standard gauge signals.(A 606/87)

WN29/1987 BROADFORD. Engineer's Diagram No 18'86 became effective and Diagram No 11'81 is cancelled. The diagram has been issued in connection with the renumbering of standard gauge signals. (A 606/87)

WN29/1987 SEYMOUR. Engineer's Diagram No 8'87 (Seymour) became effective and Diagram No 4'78 (Dysart-Seymour) is cancelled. The diagram has been issued in connection with the renumbering of standard gauge signals and also shows the arrangements at Seymour following the abolition of Dysart and Tallarook signal boxes. (A 606/87)

WN29/1987 MANGALORE. Engineer's Diagram No 50'86 became effective and Diagram No 10'78 is cancelled. The diagram has been issued in connection with the renumbering of standard gauge signals and also shows the reduction in facilities in the yard following the 'booking out' of various roads and connections over the past few years. (A 606/87)

✱ 26.7.1987 OAKLEIGH. Post 16 was relocated eight metres in the up direction. (O 2009/87)

✱ 26.7.1987 HAZELWOOD SIDING. The Overhead wiring has been removed. (O 70/87)

--oOo--

INTERLOCKING ON THE V.R. - ROCKER LOCKING FRAMES

McKENZIE and HOLLAND'S CAM AND SOLDIER INTERLOCKING FRAMES
(Nos.5, 5a, 6, & 6a pattern frames)

by Colin Rutledge.

DEVELOPMENT

The partnership of McKenzie, Clunes and Holland was formed in 1861. The company of McKenzie and Holland secured their first patent in the names of the three partners on 30 July 1866. The patent applied to an interlocking frame in which the locking was worked indirectly via a cam. Motion induced into the cam by the operation of a lever caused a square shaft to rotate. A linkage from the square shaft drove the releasing or locking devices as required. The basic arrangement can be seen in Figure 1. To the best of our knowledge this frame is the No.1 pattern and the forerunner of all McK & H frames up until the change to tappet locking.

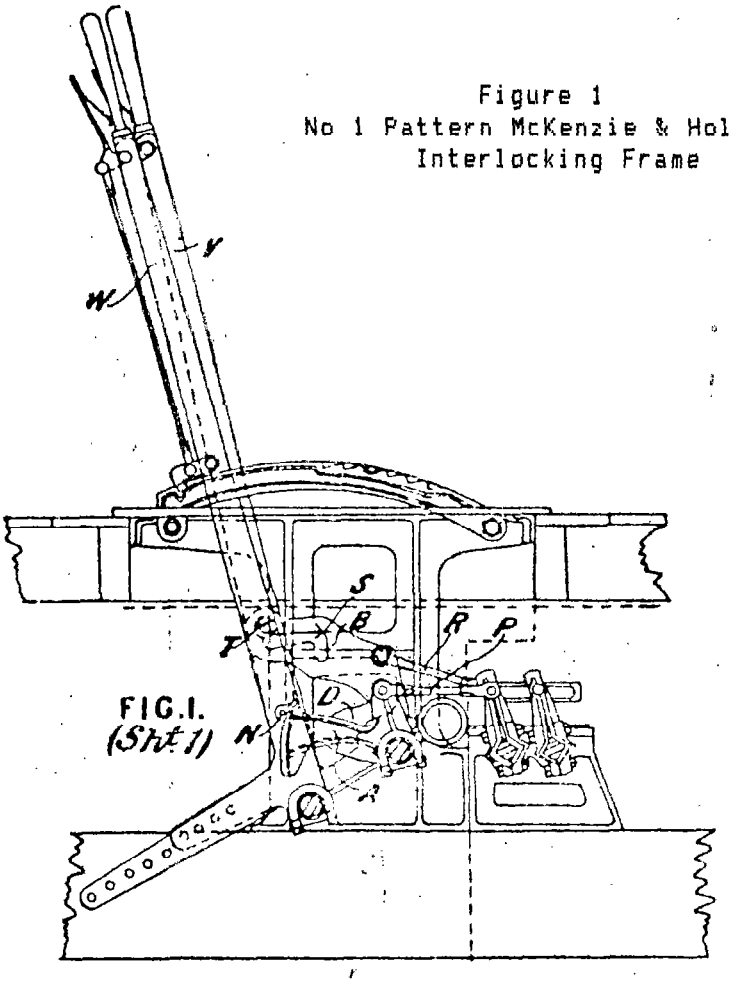


Figure 1
No 1 Pattern McKenzie & Holland
Interlocking Frame

There are a number of distinctive features of the No.1 pattern frame apart from the cam and shaft configuration. A pawl is used to hold a lever normal or reverse, but in later patterns a spring loaded catch is provided. The drawing shows the frame fitted with floor plates having six reverse notches; the most I have ever seen. As far as mounting is concerned, it appears that 12"x4" timbers are laid at right angles to the frame with long bolts holding the whole installation rigid.

On 7 June 1873 T. Clunes, W. Holland & S.T. Dutton secured patent No. 2034 for an "apparatus of the kind described in Specification No. 1963 A.D. 1866". Figure 2 shows the apparatus patented which is of the type commonly refered to as "cam and rocker" or more simply just "rocker". McKenzie and Holland called this frame their No.5 pattern apparatus. No. 5a, 6, & 6a apparatus are all derived from the 1873 patent by incorporating various alterations.

All four machines are 5" pitch and have the levers standing vertical when normal. They are identical above the floor with the exception of the catch arrangement. Below the floor there is no difference between No.5 & 5a pattern, and very minor differences between No. 6 & 6a pattern. The variation between No. 5a & 6 is greater and prevents some interchanging of parts.

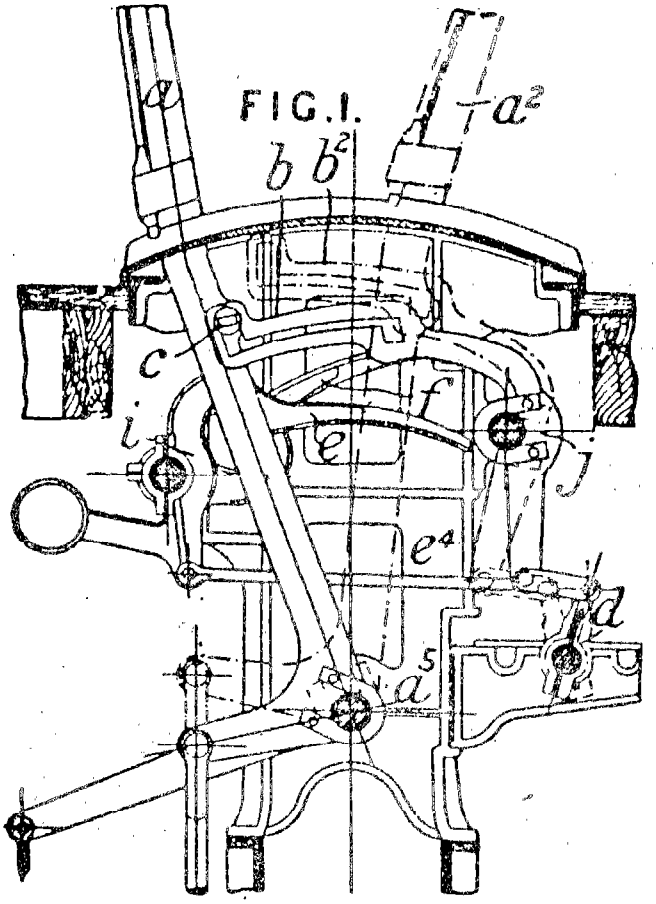


Figure 2
No 5 Pattern Interlocking Frame

CONSTRUCTION DETAILS

In all frames the only component not made of either wrought or cast iron is the circular lever number badge which is brass.

Elevated frames are mounted on two parallel bearers (Normally 12" x 4" oregon beams) which run the length of the signal box. These oregon bearers are known as machine timbers and are supported on uprights of suitable 12"x6" timber spaced at approximately 10 foot centres. The top edge of the machine timbers are 2'11 1/4" below floor level and located centrally in the hole in the floor which is 2'4" wide and as long as necessary.

The apparatus is held onto the machine timbers by 5/8" bolts passing through the feet portions of the machine frames and right through the machine timbers. There are no other mounting or securing points for the apparatus. This gives rise to the fairly common site of signal box floors drooping in the centre. It is also sometimes said that the frame is actually holding up the box. In old boxes this can indeed be the case as the 12"x6" machine timber supports have their own foundations and the floor bearers are usually tied to the supports. The frame being rigid on the machine timbers also tends to prevent the operating floor from moving to and fro.

Ground level machines are erected on blocks of timber which run at right angles to the apparatus. These blocks are about 36" long, 12" high and 4" wide, and are in turn secured to longitudal timbers anchored in the ground.

The No. 5 & 6 range of apparatus can consist of any number of levers and or spaces as desired. The apparatus is built upon cast iron frames usually

referred to as "A" frames. These frames carry the three shafts that run the length of the apparatus and come in three different types. Adjacent to and on the left of lever one is the left hand end frame, one side being flat and the other having projections for the erection of the apparatus. The right hand end frame is a mirror copy of the left. Intermediate frames are provided as required and are of a different style to end frames. Flexing of the lever pivoting shaft is the principle factor determining the placing of intermediate frames. It is unwise to have a point lever with its heavy load more than 4 levers away from a frame. The arrangement of lever functions, therefore, influences a frame layout. At the same time, frame spacing is generally spaced equally or nearly so throughout an apparatus, the maximum spacing of "A" frames should not exceed ten levers. Many machines are erected with intermediate frames instead of right-hand ends to facilitate extentions at some future time.

There is an important difference between "A" frames for No.5/5a and 6/6a pattern apparatus. The mounting face for rocker shaft brackets on a No.6/6a apparatus is arranged so that the two possible shaft brackets are directly in vertical line. This allows identical shaft brackets to be used for top and bottom locking. The earlier No.5/5a "A" frames have an offset in the mounting face. Therefore top and bottom shaft brackets are different in order to maintain vertical alignment of the soldier shafts.

The three shafts which pass through each "A" frame, and upon which major components pivot, are all the same diameter of 2 1/4" but are not interchangable. The lever shaft is located in the lower centre of the apparatus and is turned down to 2" dia. every 5" for the fitting of levers. The lock shaft is found near floor level to the front of the "A" frames. This shaft is also turned down to 2" dia. but it has two turnings every 5". Lock shafts are situated so that a lever is exactly between consecutive pairs of turnings. Cam shafts are opposite lock shafts on the other side of "A" frames. They are turned in a similar manner to lock shafts and are also set in an apparatus in a like manner.

On the back edge of each "A" frame holes are provided to bolt on bottom or top shaft brackets. Shaft brackets are available in sizes ranging from 3 shaft to 12 shaft capacity. Two part shaft brackets are used if a greater number of shafts than 12 are required. By using 2 part brackets it is possible to have 22 shafts bottom and or top.

Like "A" frames shaft brackets come in left and right ends, and intermediate form. Ends are bored to a diameter of 1 1/4" and intermediate brackets are bored to 1 5/8" dia. to take the soldier shafts. When long shaft brackets make an apparatus back heavy, stanchions are fitted to the extremities of the brackets. Stanchions rest on timber blocks of suitable size in the basement of the signalbox. A tie rod is fitted across the outer ends of long shaft brackets to prevent side flexing.

As previously mentioned there are different "A" frames for No. 5/5a and 6/6a pattern apparatus so different shaft brackets are used. A No. 5/5a pattern "A" frame has the upper shaft bracket mounting approximately 1 1/4" proud compared to the bottom mounting. In order to maintain vertical soldier shaft alignment the top brackets are 1 1/4" shorter. This requires that there be no shaft provided above the No.1 position of the bottom bracket in the top bracket. Top and bottom brackets are not interchangeable. In the case of No.6/6a machines the mounting faces are in line. Therefore top and bottom brackets are identical, and are also the same as the bottom bracket for a No. 5/5a pattern apparatus. Although there is now a shaft position above No.1 bottom shaft it cannot be used. Because mounting arrangements for top shafts on No. 5/5a machines meant that the No.1 shaft position was unusable, the design of the cam was permitted

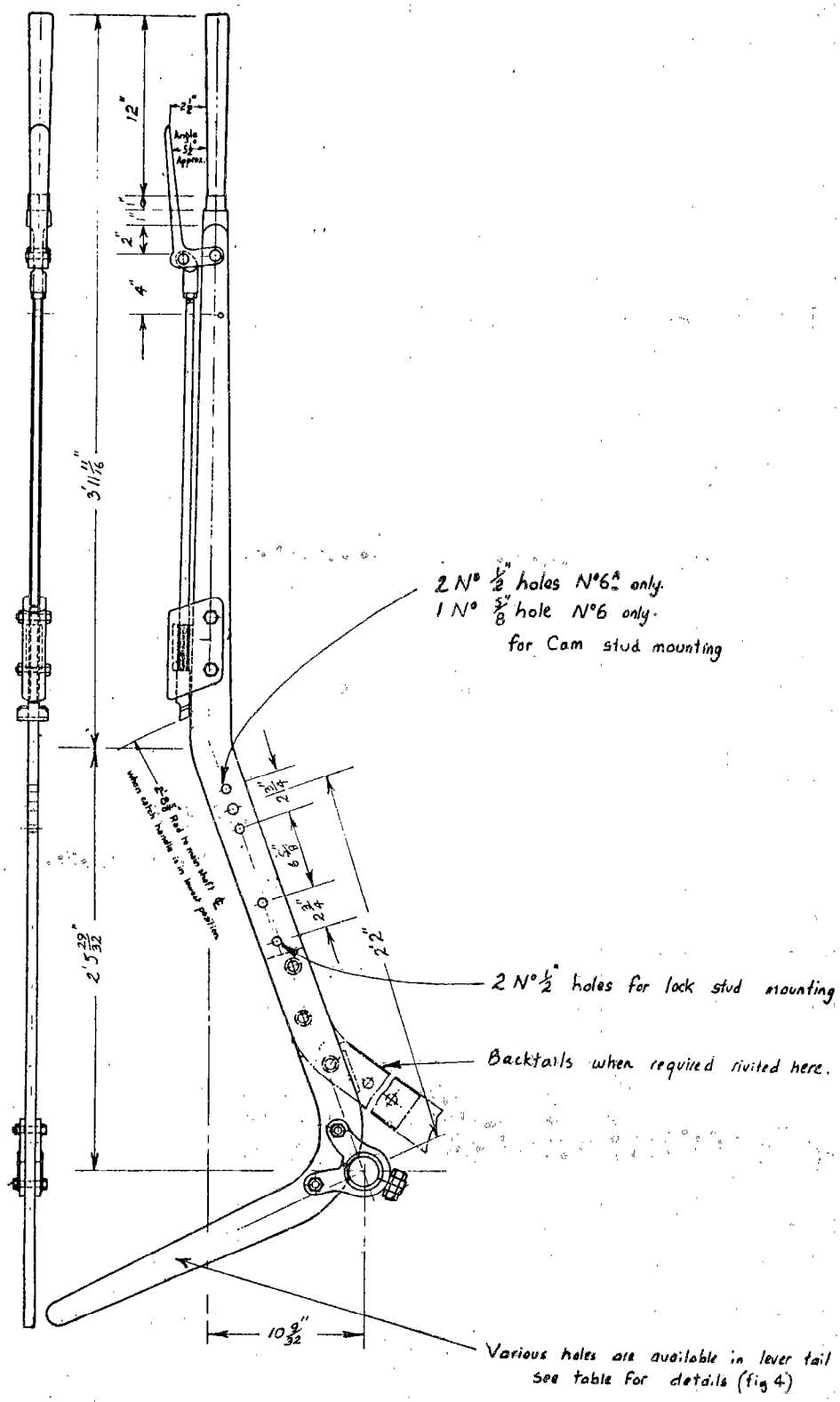


Figure 3.
Detail drawing of a Bent Lever.

to use that space. Cams used on No.6/6a machines are very similar in outline to the No. 5/5a cam and so on the latter pattern apparatus, the cams foul the position of the No.1 top shaft.

Across the tops of the "A" frames run two angle iron girders known as floor plate bearers. These bearers are drilled at 5" centres for attaching the floor plates.

Shafts and floor plate bearers are made in the longest practical length. In a large apparatus they are around 40 levers long. Except for soldier shafts, joins are made by halving the shaft or bearer over an "A" frame. Soldier shafts requiring rigid joins are jointed in a special coupling between shaft brackets.

Cast iron floor plates are universal and on some No.6 pattern machines are marked No.5 & 6 pattern. The side of a floor plate against a point or facing point lock lever has only one reverse catch notch. A signal lever has three reverse notches to allow for wire expansion or contraction, the first notch is level with that of a point lever.

The floor plates on the outer ends of an apparatus are known as end floor plates. End floor plates are made in left and right hand formats. Right hand ends are available in two types, one of which is a mirror image of the left hand plate. The second is a special plate used on an apparatus which has provision for an extension. Normal left and right hand end plates are branded "McKenzie and Holland". With the exception of the left hand side of the catch boxes on the levers this is the only place on an apparatus where the manufacturers name appears. The special right hand end plate is un-branded and does not have a vertical face. The lack of a vertical face allows any identification on the top of the last "A" frame to be seen at the right hand end of the apparatus.

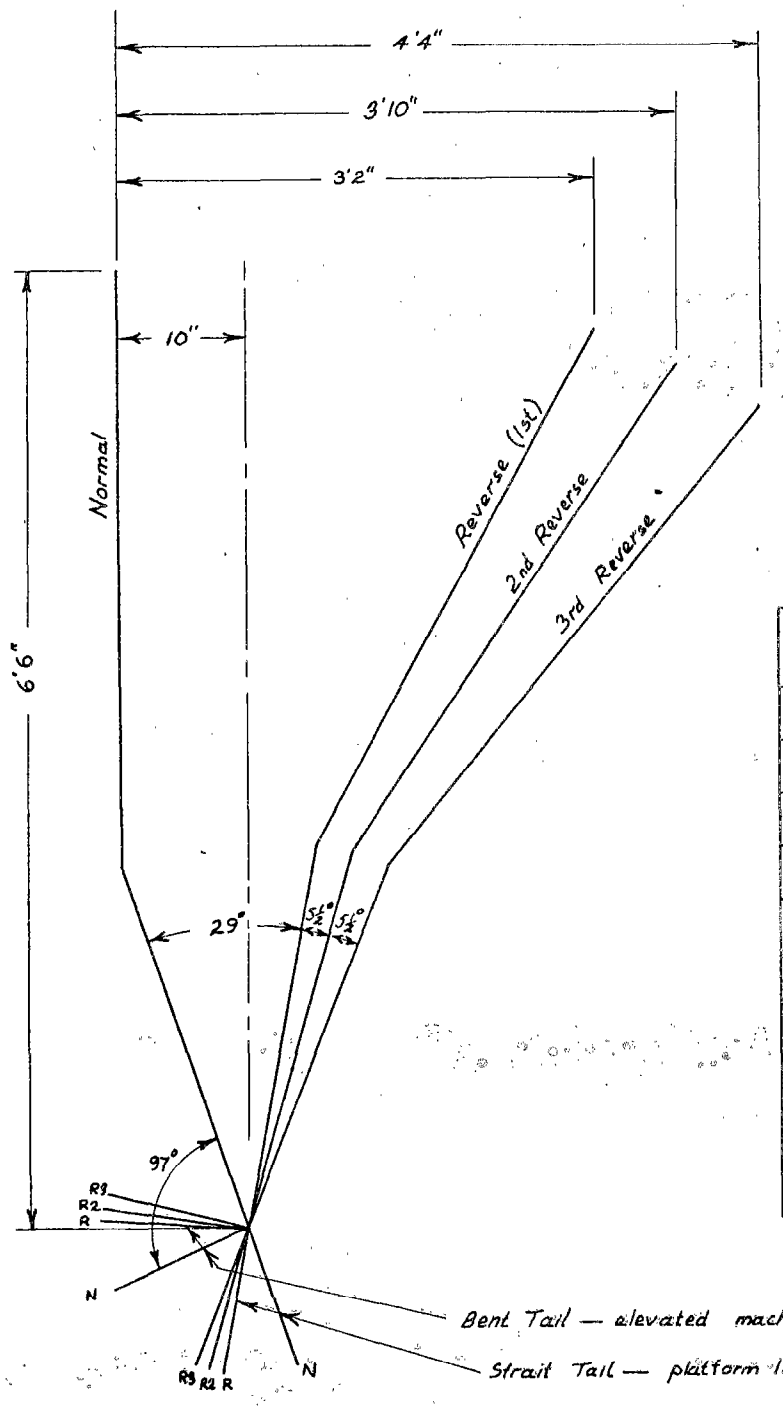
Levers in the four patterns of apparatus, are all slightly different, but they are, however, interchangeable within the two seperate basic patterns. All levers have the same basic dimensions and it is possible to redrill a No. 5/5a pattern lever to make it 100% interchangable.

The differance between a No. 5 and 5a lever is wholly in the catch assembly. A No.5 catch rod is forged in one piece and operates through a wrought iron folded construction catch box. The No.5a pattern catch rod is an improvement on the No.5. The length is adjustable to allow for wear and the catch box is made of cast iron. The No.5a type of catch rod is used without modification on No. 6 & 6a levers.

Levers are secured to their shafts by lever clips which are made of cast iron. There is a slight differance in clips on No.5/5a apparatus compared to No.6/6a. Clips are individually fitted and so are not interchangeable.

A No.5/5a lever that requires a back tail for the fitting of a counter weight has the tail as an integral part of the lever whereas in later patterns, the tail is a seperate piece bolted on. The final unique feature of the No.5/5a lever is the location of the hole provided for securing the cam stud. The centre of the stud is approximately in line with the back edge of the lever. To accommodate the stud the lever has a rearward projection of sufficient size for the single mounting hole.

Levers for No. 6 pattern apparatus as mentioned previously have the No. 5a catch assembly. The hole for mounting of the cam studs has been moved to the centre line of the lever for this pattern. No. 6a pattern levers again have No. 5a catch assembly except that the catch handle has been modified. Previous patterns have a catch handle where the connection to the catch rod is exposed at the rear. An enclosed connection between the catch handle and the catch rod is a distinguishing feature of a No.6a pattern apparatus. Below the floor, the



No 5 & 5A similar but bent lever angle is 90

LEVER TAIL HOLES & TRAVEL

Hole Size	Distance from lever pivot.	Travel Reverse	Travel 3rd Reverse
7/8"	10"	5"	6 7/8"
7/8"	12"	6"	8 1/8"
	14"	7"	9 5/8"
	16"	8"	10 7/8"
5/8"	18"	9"	12 1/4"
5/8"	20"	10"	13 5/8"
5/8"	22"	11"	15"
5/8"	24"	12"	16 3/8"
5/8"	26"	13"	17 3/4"
5/8"	28"	14"	19 1/8"

Dimensions are approximate only.

Figure 4.
Angles of Lever Operation.
No 6 & 6A pattern lever.

mounting for the cam stud was varied again for the No. 6a pattern. Cam studs were now secured by two bolts inlieu of the one centre bolt in previous patterns. Details of levers are shown in Fig.3 and the angles through which levers work are explained in Fig.4.

The interlocking itself comprises cams driven by a stud on a lever. The movement induced into the tail of a cam is transfered to a soldier shaft by cam links and soldiers. Additional soldiers on any given shaft drive locks by the means of lock rods. Locks lock levers by acting on lock studs fitted to the side of levers.

Because the position of the cam stud varies with pattern as described previously, there are different cams for No 5/5a and No 6/6a pattern apparatus. All cams are made of wrought iron and look the same. The position of the slot, generally referred to as the race determines what pattern cam it is. Clips, which vary with pattern similar to lever clips, allow the cam to pivot on the cam shaft. A 5/8" dia. pin in the tail of the cam connects to cam links. Cam links transfer the motion at the tail of a cam to the rest of the interlocking. One link is provided on each side of the cam tail. It follows therefore that cam links are made in pairs and as so are not interchangeable due to being hand made. Mild steel 1 1/2"x 5/16" is used for all but the longest links.

The cam links are connected by a 5/8" pin to a soldier. Soldiers are cast iron and are clamped tightly to a shaft by two 5/8" bolts. The dimensions of soldiers have changed very slightly between patterns but are still entirely interchangeable, and it is very difficult to pick the variation. There are a number of different soldiers for differing applications and these will be explained in a following section. Soldiers push or pull 3/4" dia. lock rods which in turn opperate the locks.

Locks are cast iron and pivot on the lock shaft at the front of the apparatus. The journal is halved, the cap portion being held on by two 1/2" studs. The various locks and their applications are described in a following section.

DESCRIPTION OF THE LOCKING

In all types of interlocking apparatus there are two modes of locking. There is the locking of a lever that is normally free and the releasing of a lever that is normally locked.

On a McK&H frame of the No. 5, 5a, 6, 6a patterns there is a seperate mechanism for each type of function. Referring to Fig.5 a simple junction is shown as a single turnout with a signal for each facing move. Points 1 are normal and so it is necessary to secure signal 2 at stop while it is in order to allow signal 3 to be placed to proceed. Should points 1 be placed to reverse, signal 2 can be released while signal 3 needs to be locked. We will call the route past signal 3 with points 1 normal the main line, and the other route the branch line. The interlocking for levers 1, 2 & 3 is shown in Figure 6. The pivot point of the levers is omited for clarity as are the floor plates and all other parts. Lever 1 has a cam fitted which drives a soldier shaft which in turn drives the locks. It is difficult to appreciate the working of the cam, but the near vertical slot at each end of the race is actually inclined to the stud on the lever because the lever and cam pivots are some distance apart. (A detailed drawing of a cam is presented as Figure 7.)

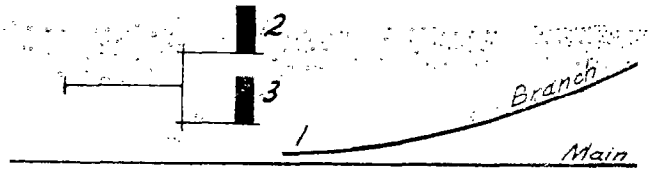


Figure 5

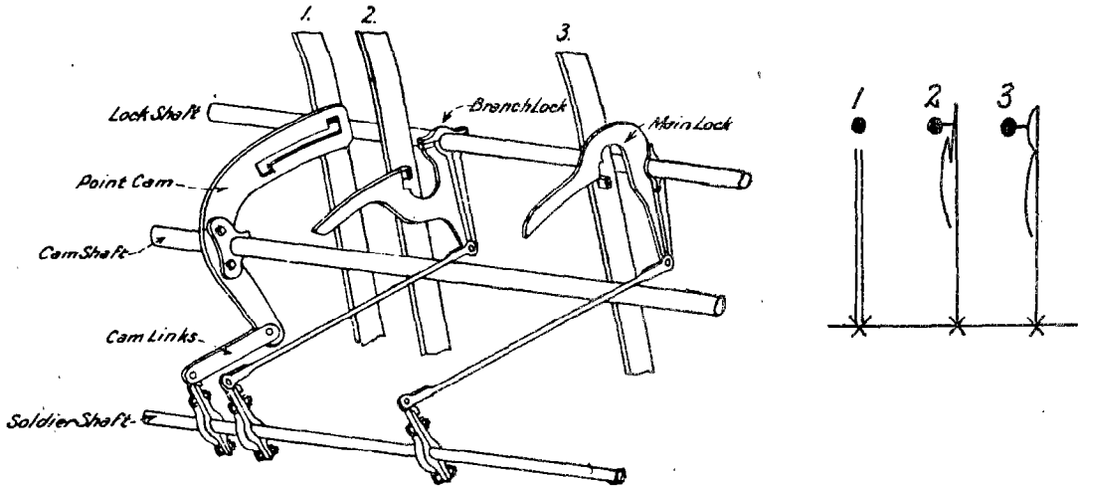
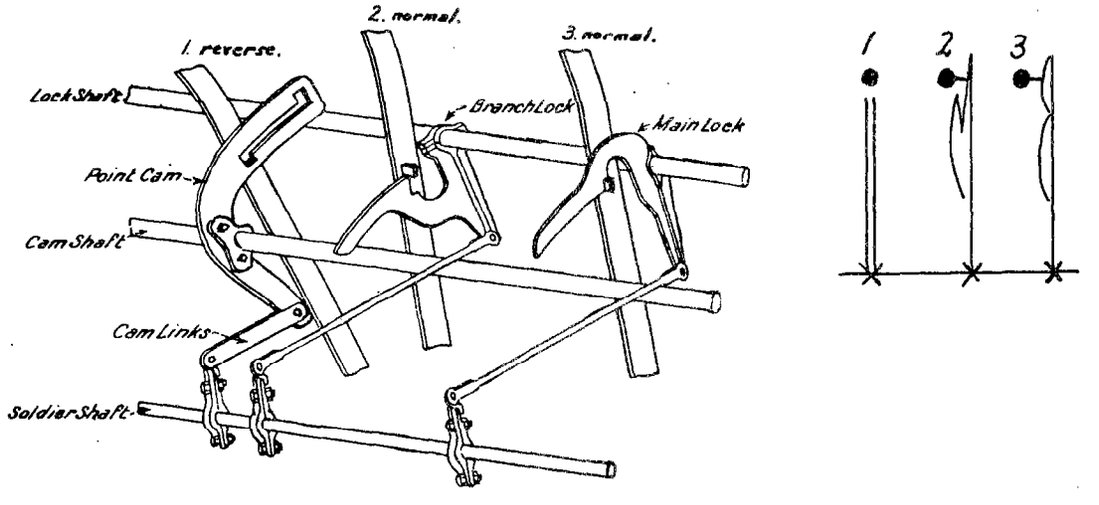


Figure 6a
All levers normal.



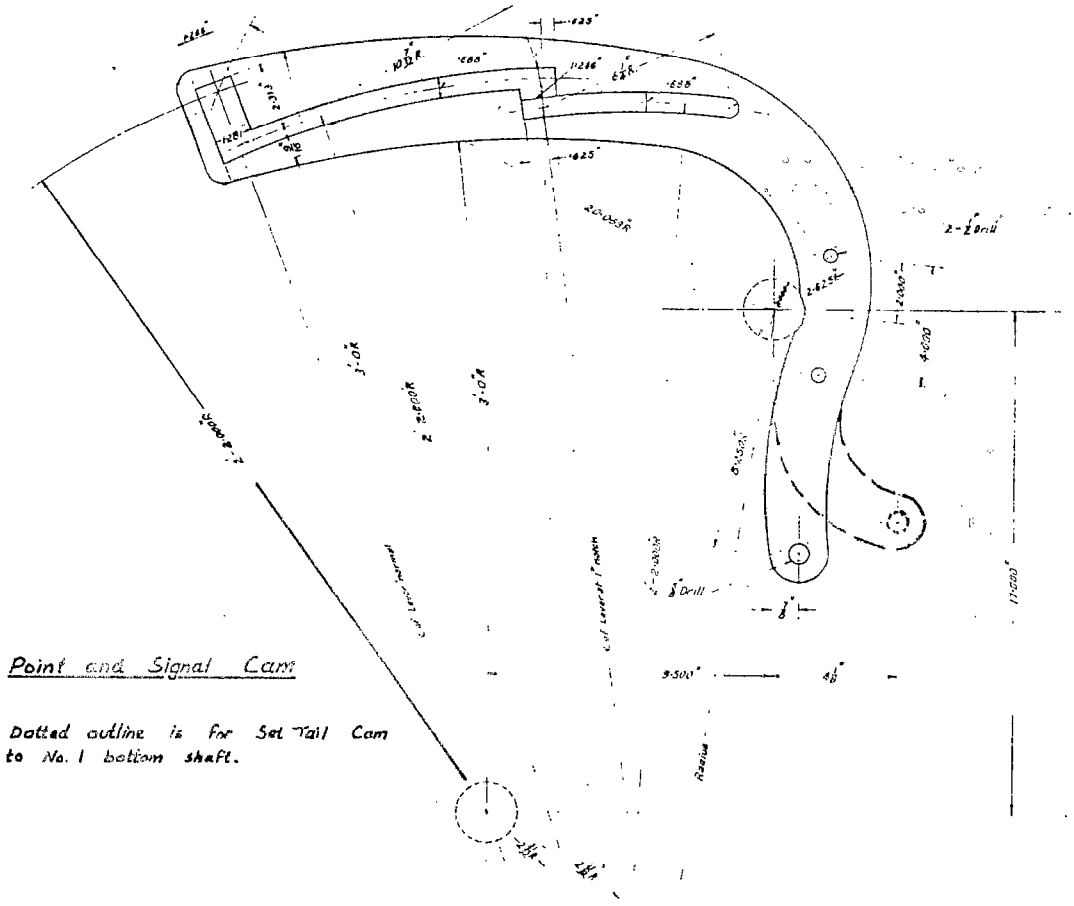


Figure 7.
Drawing of a Point and Signal Cam.

[A] Lock in, and Release from Normal. - The lock on lever 2 is a Branch Lock and is locking 2 lever normal. The lock on lever 3 is a Main Lock and is not locking lever 3. By pulling lever 1 towards reverse the cam stud causes the cam to rise until the stud enters the race. This is referred to as the first lift of the cam and imparts 1 1/8" of movement to the cam tail which rotates the soldier shaft. With the lever in this position (B position, refer Fig.4) any initial locking will be effected. In this case the lock on lever 3 is set so that any movement of the lock rod will cause the locking face of the lock to cover the stud. Lever 3 is therefore locked by the initial movement of lever 1. As lever 1 is moved between B and D positions no movement is imparted to the cam as the race between B and D is concentric with the lever pivot. Lever 1 being

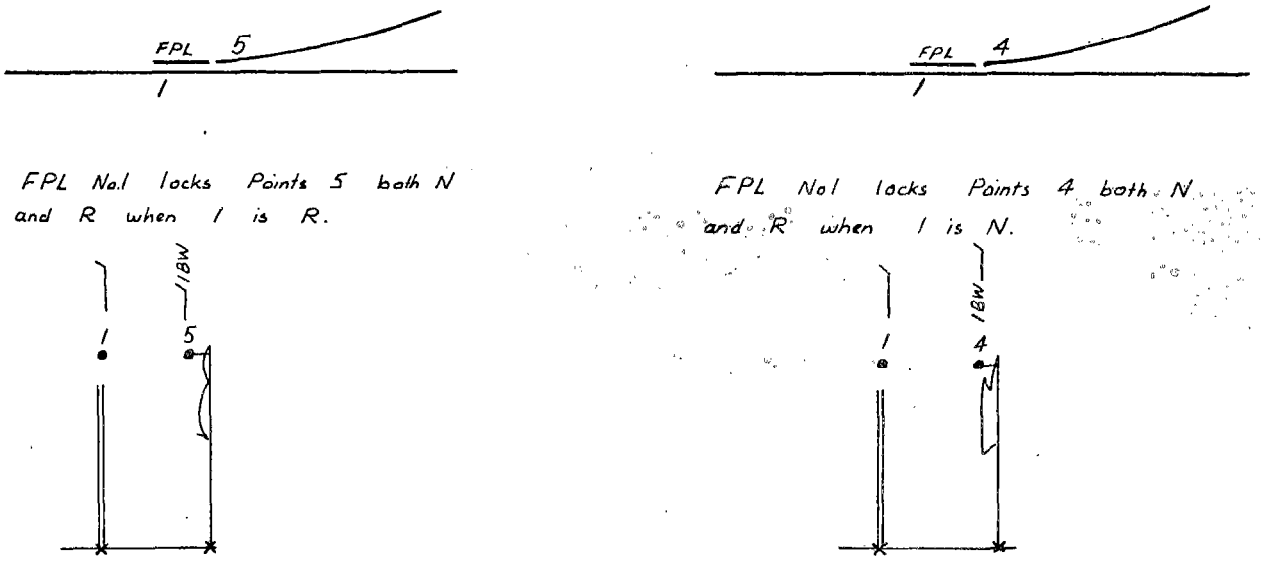


Figure 8

moved from D to reverse gives the final lift to the cam and so the cam tail moves another 1 1/8". On lever 3 the Main Lock drives further down, while on lever 2, the Branch Lock has been set so that only on the completion of the final cam movement does lever 2 become free.

[B] Lock in, and Release from both Normal and Reverse. - The locks used to lock a lever both ways by another lever are a variation of the Main and Branch Locks. These both ways locks are called Main Facing Point Locks and Branch Facing Point Locks.

The name is derived from the most common use of a both ways lock, that being a lock bar lever applying to a point lever. The application of facing point locks is shown in Figure 8. Their working is the same as a main or branch lock excepting the provision of a second lock face for the reverse position. The diagrams shows the Facing Point Locks with weights projecting rearwards, while the Main and Branch Locks are unweighted. Figure 9 shows all locks and their varitions. In the case of the four locks mentioned the reciprocal of the locking is inherent in the design. For example, if lever 1 has a cam driving a Branch lock on lever 2, it is said that lever 2 is released by lever 1. The inverse is true in that lever 1 can be released by lever 2.

At this juncture, having gained a knowledge of the basic principles of "rocker" interlocking we can delve into the fine intricacies of the locking.

[C] Multiple Locks and Releases. - The maximum number of locks that can be fitted to a lever is limited. Four is the most, but this number can only be obtained if capacity on adjacent levers is sacrificed. Between levers there is room for two locks working on either lever or one on each. On any apparatus other than the very smallest there are many situations where a lever will require to be locked by or released by more than one other lever. To have a separate lock for each of the locking or releasing levers is impossible for the

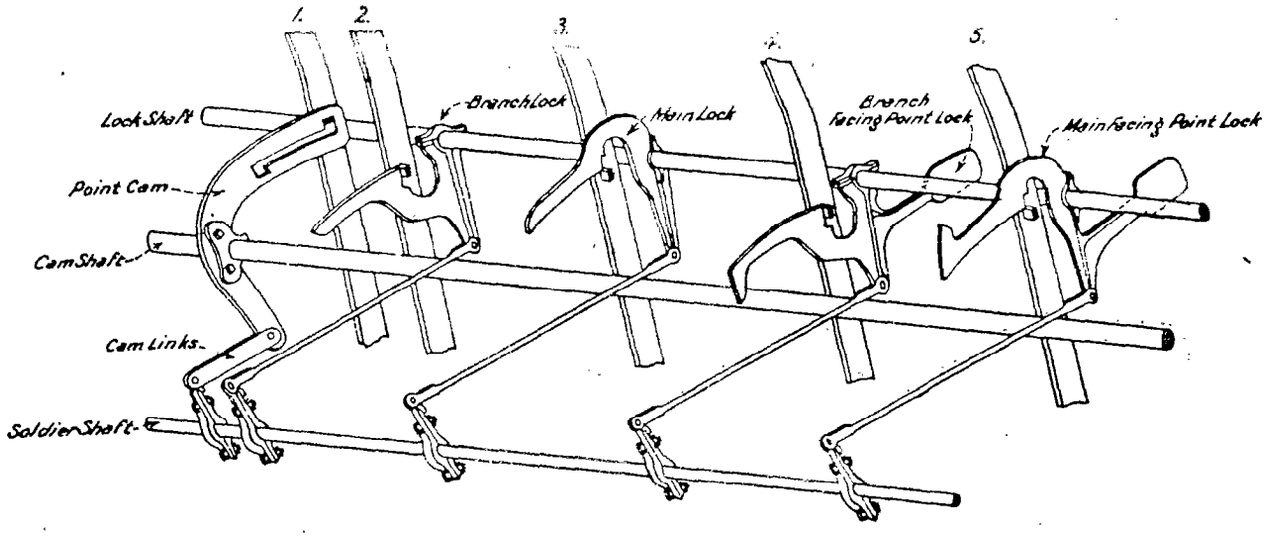
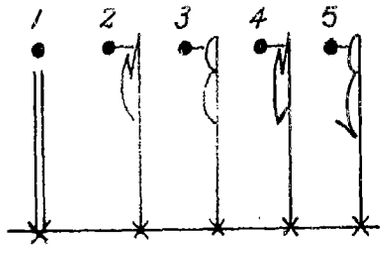
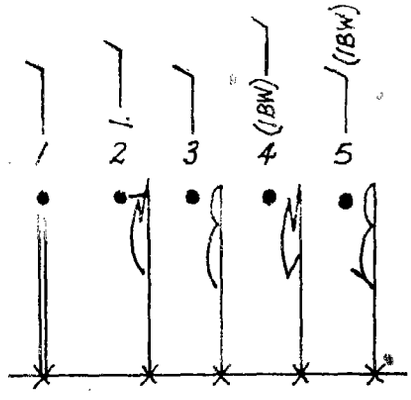


Figure 9a
All levers normal.





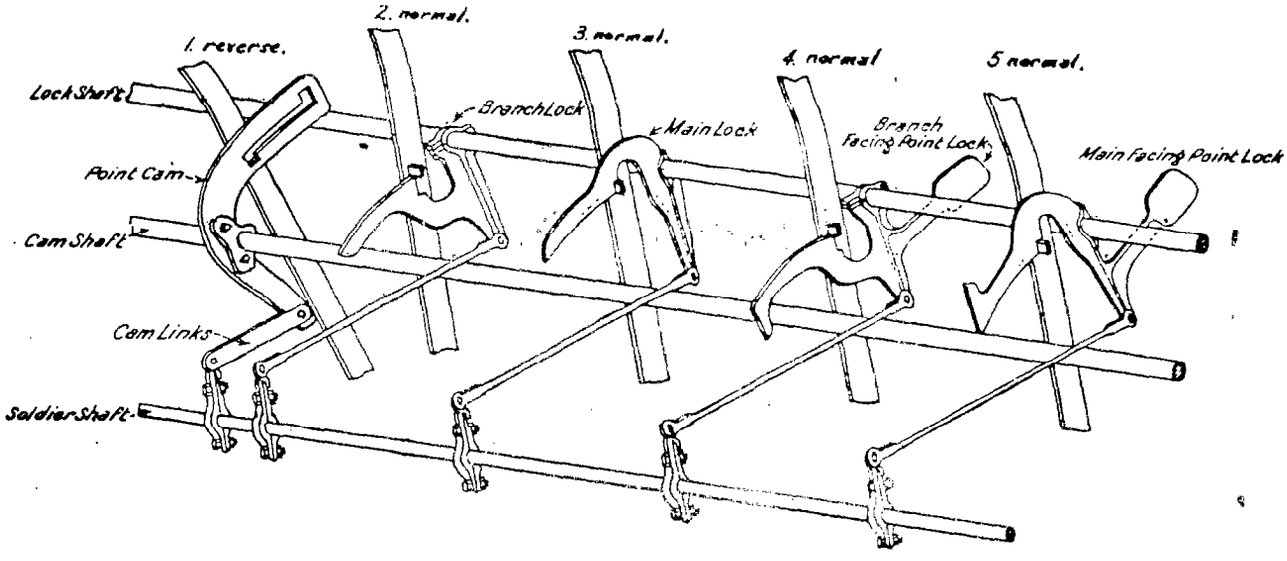


Figure 9b
Lever 1 reversed.

space reasons outlined. If we take the layout in Figure 5 and add two turnouts as shown in Figure 10 the multiple lock/release cam be illustrated. Signal 2 is now released from Normal by points 1 and 5 both being Reverse. Signal 3 is mow locked Normal whenever points 1 or 6 are not Normal. The interlocking is shown in Figure 11.

It can be seen that it is necessary to have a cam on levers 5 and 6. The lock rods are extended back to pick up the appropriate shaft. Instead of a pivoting pin in the end of the lock rod a cage is formed over each shaft that is to

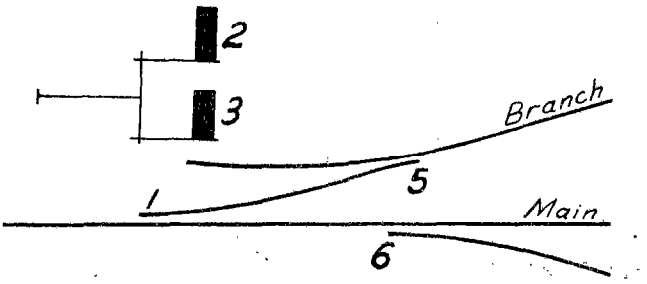


Figure 10

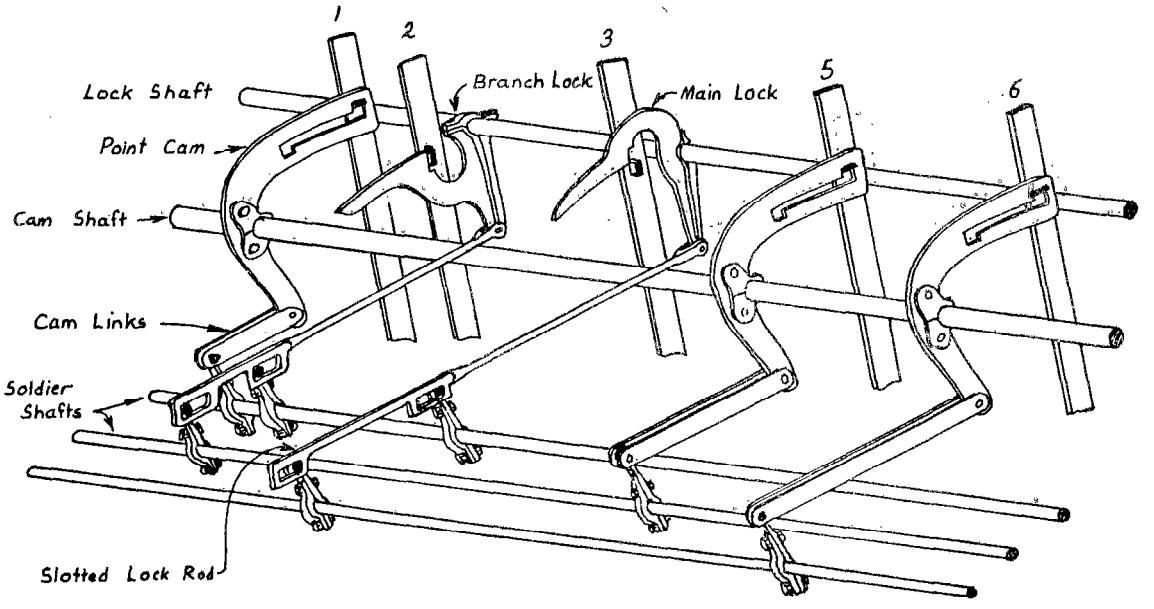
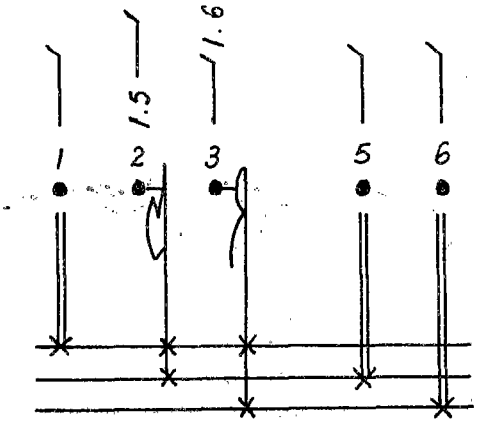


Figure 11.

work the lock. Close examination of Figure 11 will reveal that if the shaft connected to lever 1 is turned, the soldier will move towards the lock. At this stage the lock rod will not move because the soldier on the shaft connected to lever 5 is pushing against the back of its cage. When lever 5 is placed Reverse, the weight of the Branch Lock on lever 2 will cause the lock to fall clear of the stud on that lever. A similar sort of action happens to lever 3, but in this case, the movement of either lever 1 or lever 6 will push the Main Lock down over the stud on this lever. The Main Lock can have a projecting weight to assist holding the lock clear of the lever stud with all levers Normal.



(to be continued)

--oOo--