SIGNALLING RECORD SOCIETY (VICTORIA)

SOMERSAULT

September 1982. Vol 5, No 5.

Published by S.R.S.V. Publications and Archives Committee
Editor: David Langley, Crichton Street, Avenel, 3664.
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Dead Line for November 1982 issue is 10 October 1982.
NEXT MEETING: Friday 17 September 1982.
VENUE: A.R.H.S. Library Room, Windsor Railway Station.
NEXT TOUR: Thursday 23 September 1982 to Albury & Wodonga.

Minutes of General Meeting of 16 July 1982

HELD AT: A.R.H.S. Library Room, Windsor Railway Station. Meeting commenced at 2010 hours.

PRESENT: J.McLean (Leader), G.Inglis (Minutes Secretary), D.Langley (Editor & Archivist), M.Bau, W.Brook, J.Brough, R.Jeffries, A.Jungwirth, J.McCallum, B.McCurry, S.McLean, P.Miller, J.Sinnatt, P.Stoneham, R.Weiss and one other.

A welcome was extended to Kevin Martin, Rod Kent, Ross Cropley and Greg Price. Greg, Rod and Ross later produced folding paper and were then welcomed as our newest members!

MINUTES OF PREVIOUS MEETING: were adopted as read. (S.McLean/Stoneham)

BUSINESS ARISING: 1. $20 donation has been paid to A.R.H.S. via Jim Brough. Thanks Jim.

2. Show Day Tour - arrangements proceeding well. Travel per 0754 down broad gauge psgr. to Wodonga. Visit Wodonga, Bandiana, Coal Sidings, Albury South & Station Box. Return per 8652 Intercapital Daylight departing Albury 1648 or ? Ticket arrangements - buy an economy return to Albury and when booking on the 0754 (8305) tell the booking clerk that you are with the Signalling Record Society. Twenty seats are being held until 16 September. Don't forget to book on the Daylight also. The fare for the Bona will be $4 payable on the day. Further details from Jack McLean on (03) 890-6764.

3. Account of $143.76 paid covering printing of UK Newsletter Nov '81, Jan '82, Mar '82 and May '82.

CORRESPONDENCE: 1. From Bob Taaffe advising of change of address.

2. From Lloyd Tilley of Flinders St "E" Box with membership application.

GENERAL BUSINESS: 1. Somersault: Correction to item on Broadford in Vol 4, No 2, the signalling diagram should read No 11/81 not 1/81. Also the September issue was reprinted double sided to match the other issues.

3. Wodonga Coal Sidings - the Editor asked for some details on the Coal Sidings before interlocking. Much discussion ensued - some heated - but the relevant details were not forthcoming. Perhaps we are not just old enough.

4. Vale Flinders Street "C" Box. Phillip Miller outlined some of the aspects of the demise of "C" Box. But "C" Box lives! After the panel was transferred to the West end of "B" Box it was found too noisy and confusing so a new internal wall was built and the West end is now known as "C" Box. After the panel was removed from the original building, the she l was demolished. The windows - having been sold previously - were removed safely but not the slates which also had been sold. Demolition progressed over four days and apparently the toilet didn't give in without a struggle.

5. Metrol - takeover of the other signal boxes at Flinders Street is proposed for 31 October 1982. Further details of new arrangements under Metrol were outlined including anticipated timetable accelerations once teething troubles are overcome.

(continued on Page 51)

SIGNALLING ALTERATIONS

16/6/1982 KANIVA. New signalling diagram No 27/81 was issued and diagram No 21/66 cancelled. Signals controlled by levers Nos 8 & 9 will now be controlled by levers Nos 7 & 8 respectively. A new up Home (Light) signal Post 4B is provided on the down side of Farmers Street level crossing for movements along No 1 road. Push buttons were provided to release the lever locks on levers Nos 10, 11 and 12 in the event of the proposed flashing light approach track being occupied.

18/6/1982 FLINDERS STREET. New signalling diagram No 13/82 was issued and diagram No 11/82 cancelled. The mechanical interlocking frame at "C" Box was abolished and the controls transferred to a relay interlocking control panel. The following signals were abolished Nos 71, 74, 78 and 289. Points No 218, 236 and 240 were converted to electro-pneumatic operation. A new down home signal No 324 applicable to "F" and towards the Ladder Tracks was provided. The following points, signals and control levers are worked from the control panel:
Signals - 289, 324, 335, 336, 340, 346, 347, 576 & 715.
Points - 056, 213, 233, 234, 235, 236, 238, 240, 247, 266, 288, 289 & 610.
Control levers - 214 (to Burnley Through line), 215 (across ladder track), 216 (for signal 146 from No 1 road), 216 (for signal 156 from No 1A road), 238 (for signal 156 from No 1A road), 314 (for No 2 road), 334 (for No 3 road), 334 (for No 4 road) & 574 (for No 5 road).

24/6/1982 BALLAN. Flashing light signals were brought into use at Daylesford Road level crossing (80.985Km). The operation of the lights is automatic for up and down trains.

25/6/1982 BENDIGO "D" BOX-SANDHURST-EAGLEHAWK. The intermediate electric staff instrument located at Sandhurst was disconnected and the Special Master Key at North Bendigo "D" Box removed.

30/6/1982 NORTH BALLARAT-LINTON JUNCTION. The ground frame annett locked points and rodded catch points at Whites Sidings were brought into operation. The down home signal on Post 13 was removed.

30/6/1982 LASCELLES. Was closed as an electric staff station, the new staff section becoming Woomelang-Speed. The fixed signals and No 2 road were removed. The up and down end plunger locked points were converted to annett locked points and staff/annett key exchangers provided to switch the flashing lights to manual operation during shunting operations.

30/6/1982 LUBECK. New signalling diagram No 26/81 issued and diagram No 1/77 cancelled. Flashing lights at Horsham Road level crossing were brought into operation. The lights are controlled through track circuits for up and down trains on either Nos 1 or 2 roads.

30/6/1982 SOUTH GEELONG. Flashing lights signals at Marshalltown Road level crossing (79.436Km) were brought into use. Operation of the lights is automatic for up and down trains.

1/7/1982 DIGGERS REST. The annett locked crossover between the goods siding and the up main line was abolished. The annett key was removed from the interlocking frame.

WN28/1982 DETENTION AT AUTOMATIC SIGNALS - REGULATION 74. Commencing forthwith when a locomotive hauled train or railmotor equipped with a speed recorder is detained at Automatic Signals other than in the Suburban Electrified area (Dandenong-Pakenham excepted), the Driver before proceeding in accordance with Regulation 74, must endorse the speed chart accordingly:

example - ES 6852
Reg. 74
Signature

In addition the Locomotive Assistant must also endorse the Log Book. Where radio communication is provided the Driver must advise the Guard who must, in all cases, endorse his running statement accordingly. Where radio contact is possible, the Driver must also advise the Train Controller who must inform the Driver of any information likely to affect the aspect of the fixed signal and carefully log the details. The attention of all running staff is drawn to Regulation 239, P128-129 GA, relative to the protection

of trains and running lines which must be strictly complied with. Any failure to do so could have serious repercussions. (Did too-Ed)

4/7/1982 FLINDERS STREET "C" BOX. The relay interlocking control panel was transferred to Flinders Street "B" Box but the control panel still controls the former "C" Box area and is still known as Flinders Street "C" Box.

6/7/1982 NORTH GEELONG. Drivers call lights were provided for the three telephones located near the hand points at the down end of the yard near "C" Box, and also at the intermediate staff instrument at Thompson Road ("C" Box).

7/7/1982 MOOROOPNA. Flashing light signals were provided at Rumbalara Road level crossing (176.088Km). The points at both ends of Northern Pear Growers Siding and the up end points at Mooroopna were provided with annett locks. Staff/Annett Key exchangers were provided at the points to convert the flashing lights to manual operation during shunting operations. A new signalling diagram No 25/82 (Mooroopna-Tallygaroopna) was issued at this time and shows also that the down end points at Mooroopna are now staff locked, Nos 2, 3 and 4 roads at Mooroopna were abolished together with the intermediate main line connection at the up end, and the home signals were abolished. The Total Oil siding at Shepparton also appears on the diagram.

15/7/1982 CHILTERN. Flashing lights at Racecourse Road (269.261Km) were brought into operation. The operation of the lights is automatic for up and down movements on both Broad and Standard gauge lines.

WN30/1982 FLINDERS STREET "B" BOX. No 965 dwarf signal applies from Nos 1 to 4 goods sidings and No 967 applies from Nos 5 to 9 sidings. Insert reference on diagram 13/82 accordingly.

25/7/1982 HORSHAM-PIMPINIO LOOP-DIMBOOLA. New signalling diagram No 23/82 (Pimpinio to Wail) was issued. Diagram No 1/40 (Pimpinio) was cancelled. Pimpinio was abolished as an interlocked electric staff crossing station, the points were spiked and all signals abolished. The staff locked siding at Pimpinio has not been commissioned at this time. A new crossing loop was provided at Pimpinio Loop on the down side of Pimpinio. The loop points are motor operated and the control panel is situated at the down end of the loop. The electric staff system was removed and replaced by Train Staff and Ticket sections: Horsham-Pimpinio Loop-Dimboola. Pimpinio Loop is a staff station for all trains.

27/7/1982 WEST FOOTSCRAY-SUNSHINE. New signalling diagram No 29/82 was issued and diagram No 5/81 cancelled. The down line at Tottenham has been altered to run via the high level station and the new over bridge. The existing level crossing and station were abolished.

27/7/1982 BATMAN-UFFIELD. New signalling diagram No 24/82 was issued and diagram No 12/78 cancelled. Boom barriers and pedestrian barriers were provided at Bakers Road level crossing. The down starting signal at Batman was converted to a light signal and moved 31 metres in the down direction. A new up automatic signal - C400 - was provided at the up end of Merlynston platform and has been provided with a reflectorised letter "A". Both these signals will clear when a train has stopped in the platform preceding each signal.

WN31/1982 MAFFRA. A staff exchange box has been provided at Maffra.

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SOUTH AUSTRALIAN NEWS by Editor.

Much is happening in SA with the conversion of the Pirie line to s.g. Dual gauge trackage is appearing at many locations in Adelaide and on a recent trip to that state I saw s.g. track laid from Islington to Salisbury. The yards at Dry Creek and Islington were coming on and signals were beginning to sprout along the new line. In order to facilitate the provision of s.g. to Glanville a section of the Outer Harbour line at Port Adelaide has been reduced to single line. The section is governed by home signals at either end and the points are trailable with oil buffer connections. Commencing on 29 May 1982 the electric staff system on the Pirie line was replaced by Train Orders. The new s.g. line will be automatic signals (not necessarily CTC though). The Train Order Xing stations are Two Wells, Mallala, Long Plains, Bowmans, Nantawarra, Bumbunga, Snowtown, Redhill and Nurom. Virginia was closed altogether and the main line regauged. Broad gauge trains operate via the former Passing Siding.

(cont. Page 52)

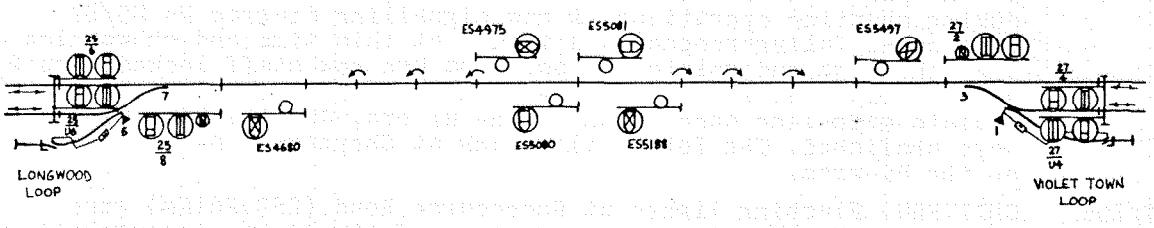
SINGLE LINE AUTOMATIC SIGNALLING
(THE ABSOLUTE PERMISSIVE BLOCK SYSTEM)

by John F. Sinnatt. (continued)

6. Sections under Centralised Traffic Control

6.1 With Two Signalling Line Wires

Automatic signalling was installed in 1962 on most sections of the single-line Standard Gauge line between West Footscray and Wodonga. The work was completed early in 1963 and the points and signals at crossing loops were then brought under control of a CTC apparatus at Spencer Street. The intermediate automatics performed the function of block signals or distants somewhat similarly to those shown in Figure 12 except that the signals corresponding to 3 and 4 were opposite each other. The signalling of a complete section between crossing loops is illustrated in Clear Normal Speed. (Portion of that diagram has been reproduced here. -Ed.)



On the Standard Gauge Line the circuits for the signals in both directions between loops are combined into one two-wire reversible circuit (the CTC control circuit is separate). With this arrangement the automatic signals clear behind a train and remain off until the direction of traffic is to be reversed by the Train Controller calling the opposing Departure signal. The signals already off then go back to Stop and are proved at Stop; the automatics for the opposite direction then clear and finally the Departure signal clears.

A system controlled from Sunshine and similar in principle was installed between Sunshine and Rockbank (there are two two-way lines Sunshine-Deer Park West Junction) in 1976. On this line, however, the intermediate block signals are spaced closer together and do not require separate distants. A number of signals can also display four aspects necessitating provision of additional line wires.

Track circuit and power supply arrangements on the two lines are also different. The Standard Gauge has a.c. track circuits as far as Somerton and two volt d.c. coded track circuits beyond except for steady energy d.c. track circuits at crossing loops. The different codes do not control the signal aspects but coding is used to give an approach indication at the loops. The signals (searchlights) are also a.c. powered as far as Somerton and d.c. beyond. The direct current is obtained from batteries floated across rectifiers. Alternating current for supplying the rectifiers is taken from the SEC at various locations and extended to the signal locations by aerial conductors erected on the Railway pole route after being stepped up from 240v to 440 a.c. (It will be remembered from section 4 that power for the 1925 Tallarook-Goulburn Junction-Seymour installation was supplied in a very similar manner.)

The Sunshine-Rockbank line has audio-frequency jointless track circuits except for standard a.c. track circuits at points. The signals are d.c. searchlights but batteries are provided only for the CTC field stations not the signals. The SEC supply locations are interconnected through railway cables and by suitable switching, anyone of the locations can supply the whole system. Both coded and jointless track circuits are described in an article in "Somersault", July 1978 issue.

In explaining how the system works technically it will again be assumed that two pairs of intermediate automatics without overlaps are provided, each capable of displaying Stop, Warning and Proceed, and that the track circuits are not coded. Figure 14(d) shows how the controls for signals 3 and 6 in (a) can be combined into one reversible circuit. The controls for 3G in (b) are the same as those for the simple APB searchlight in Figure 13(g) except that the contacts are drawn in a different order. The corresponding controls for signal 6. assumed to be at Stop. are shown in (c). Figs (b) and (c) can be combined not both be off at the same time, and G and PCR contacts are added at the ext-

As illustrated, the direction of traffic is set for Down trains; signals 3 and 5 are both off, signal 1 is capable of being cleared whilst signals 4, 6 and 8 are all at Stop. When a Down train passes signal 3, relay

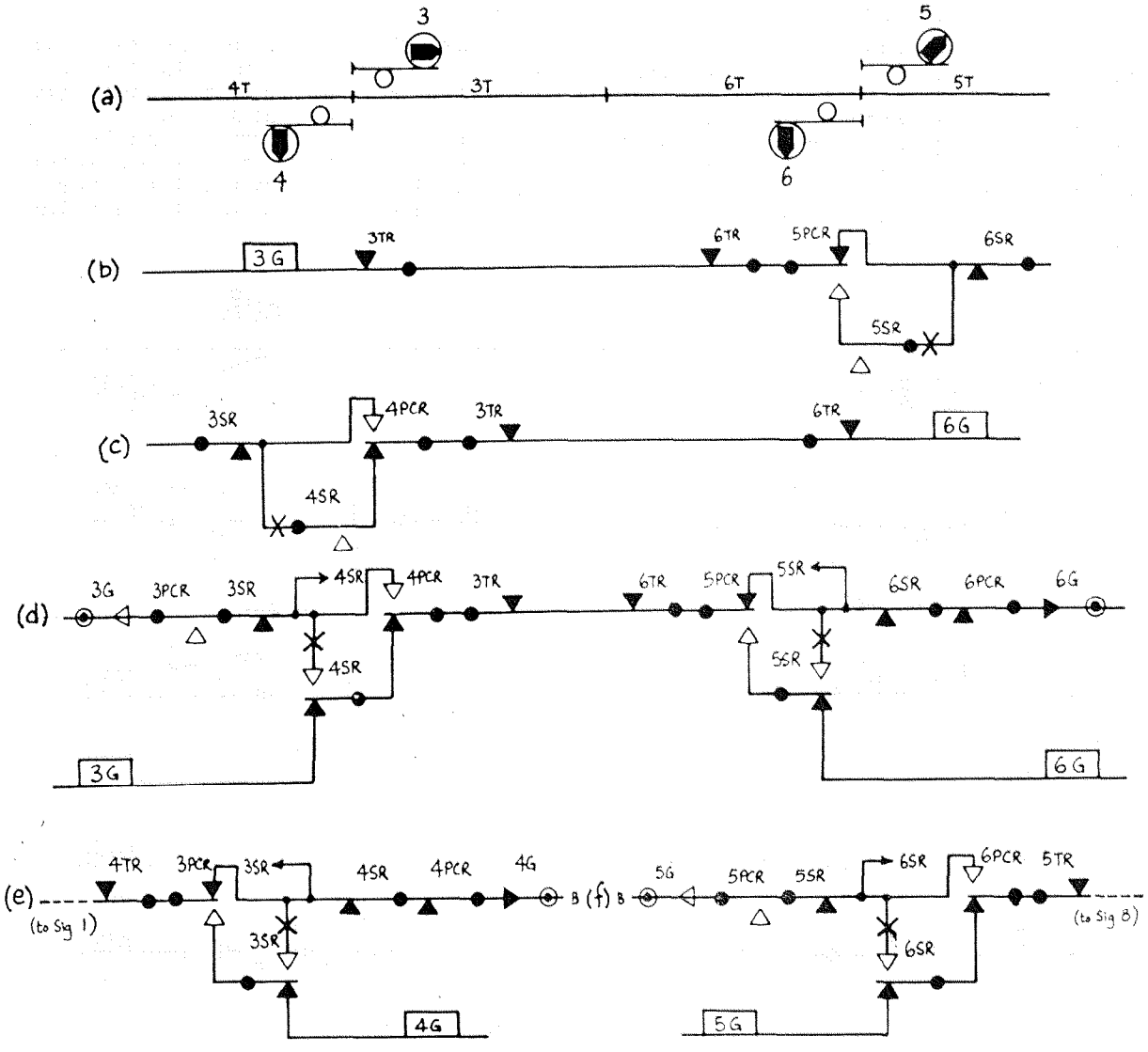


Figure 14 (a) – (f)

(not shown)

$3SR_A$ picks up before 3PCR drops and 4G in (e) is held at Stop; when 4TR picks up Departure signal 1 can be cleared again if required. Even if it is not, signal 3 goes to Warning automatically when the van passes signal 5, which also goes to Warning,,and signal 3 to Proceed, when the train arrives at the next station, signals 4 and 6 remaining at Stop the whole time. The sequence outlined occurs whether or not a second train is approaching, and the behaviour of the signals is thus quite different from those versions of APB already described where the intermediate signals in both directions are normally at Clear or Stop.

Reversal of direction is initiated by the Train Controller pressing the button on his panel for Up Departure signal 8. A relay operates from the CTC field apparatus and although signal 8 remains at Stop at this stage, power is cut off to the right hand end (not shown) of (f). Mechanism 5G is thus de-energised so that signal 5 goes to Stop and 5PCR drops. In (d) this causes signal 3 to be affected similarly and in (e) power is cut off to the reversible circuit so that 1GR (not shown) drops and holds signal 1 at Stop. Another relay there then operates and power is applied to the left hand end of (e) provided that signal 1 is at Stop and not approach locked. As 3PCR has previously dropped 4G is now energised so that signal 4 clears and 4PCR picks up. Signal 6 then similarly clears provided that signal 3 is at Stop, and the Up Departure signal finally clears providing that signal 5 is at Stop. hus, before signal 8 clears all opposing signals must be at Stop.

It should be mentioned that if a signal had no partner (e.g. ES4680 on diagram of SG signals), the reversible circuits would still be terminated at the location and a relay (AxGR) provided in place of the missing signal (the relay opposite ES4680 is designated A6GR); contacts on this relay are used in place of the PCR contacts. A stick relay is not required making the connections to the reversible circuit much simpler.

The circuits at the stations at both ends of the section are shown in Figure 14 (g) and (h). Departure signals 1 and 8 are equipped with GR relays and when the Down direction is set, 1GR is operated but 8GR is not. These signals are equipped with stick relays (not shown) of the usual APB type. The relays for changing the direction of the reversible circuits are designated 1/2FR (traffic Relay) and 7/8FR; the capacitors make these relays slow to release. Where the direction is set for a departing train, the FR is down and the various controlling contacts keep it down until the direction is altered; the relay at the arriving end is p.

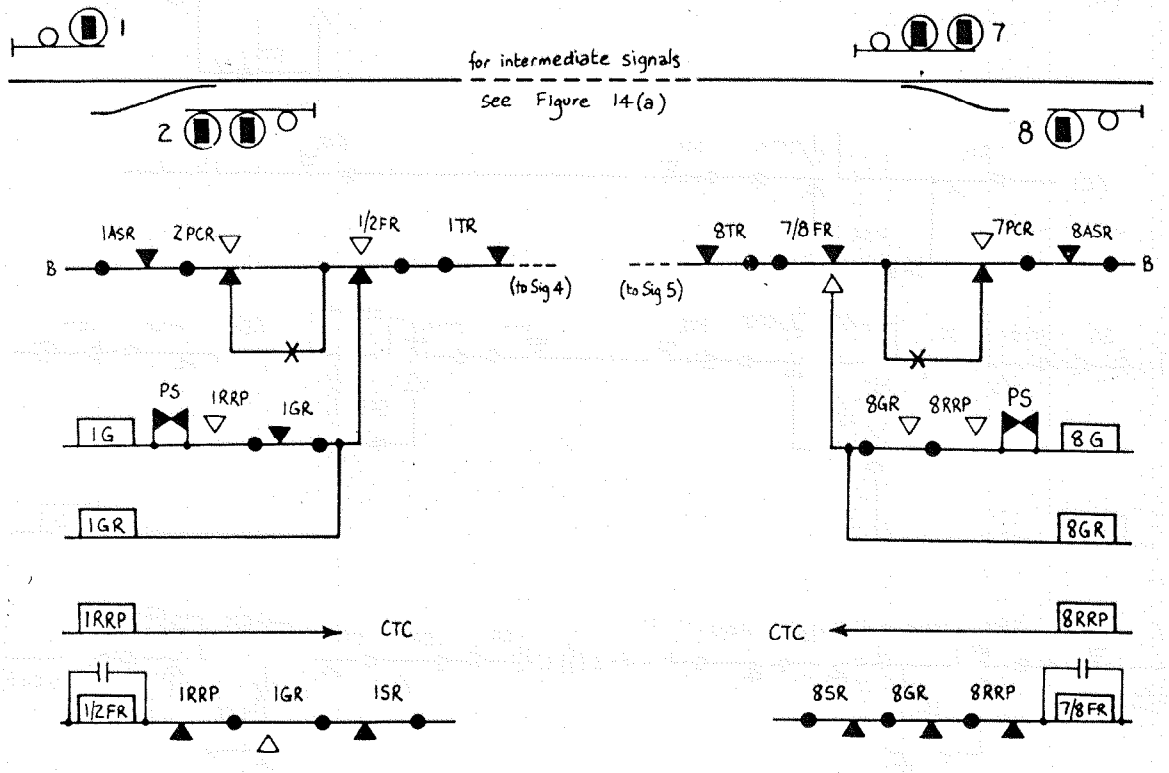


Figure 14 (g) & (h)

If the controller now wishes to send an Up train, relay 8RRP operates from the CTC apparatus and drops 7/8FR. This causes signals 5 and 3 to go back to Stop (as previously explained) and 1GR drops, holding signal 1 at Stop. Relay 1/2FR then picks up and applies power to the reversible circuit provided that 1ASR (Approach Stick Relay) is operated, so that signals 4 and 6 clear, and 8GR picks up; Departure signal 8 then finally clears.

The outward action when signal 8 is called by the Train Controller while the section is unoccupied is that signal 5 goes back to Stop, then 3 goes back, then 1 is held at Stop, then 4 clears, then 6 clears, and finally 8 goes to Proceed. An objection has been raised to this process in that if, for example, signal 4 is faulty and does not clear, then signals 6 and 8 will also remain at Stop and a failure of the Departure signal will be registered. With the usual VR system where the automatics clear forward from the Departure signal rather than back towards it, a failure of one of the signals does not affect any of the others. The latter system is also much quicker than the others if the signals are equipped with train stops.

The two-wire reversible circuitry described also does not seem suitable for use where the Departure signals are controlled locally by signalmen. In this case there would apparently be nothing to prevent signals 5 and 3 from going back to Stop if an attempt were made to clear signal 8 after a Down train had passed signal 1. This might not be unsafe as signal 8 itself would not clear but it certainly could be inconvenient. With two-wire CTC, a "non-vital" relay interlocking is interposed at the head office end between the control panel and the remote control and supervisory system. This interlocking prevents a Departure signal from being called while an opposing train is in the section or the opposing signal is off.

It was nevertheless the case that the signalling on the Standard Gauge line was operated from temporary local control panels installed in huts at the crossing loops for periods of up to ten months before the CTC system was completed. (The panel at Seymour Loop still exists insitu. - Ed)

6.2 With No Signalling Line Wires

On the Tailem Bend-Wolseley line in South Australia the crossing stations are controlled remotely by CTC apparatus located at Murray Bridge. Owing to the vulnerability of the aerial pole route to damage from storms and vandals, a system was devised which did not necessitate use of line wires between stations (except for the CTC control circuit). This was achieved by the use of reversible coded track circuits. Moreover as commercial power supply was not readily available throughout the region, primary batteries had to be used for feeding the track circuits between stations. To reduce the load on the batteries and prolong their life, the track circuits were to be normally de-energised and code transmitted only when required for a train movement.

A track and signalling diagram is given in an article in "Railway Transportation", March 1973 (now ceased publication), published soon after the installation was completed and which includes also the information given above. The crossing stations are provided with outer Home and Departure signals staggered by about 800 metres. In six of the eleven sections between stations there are no intermediate automatics and a Yellow light on the Departure signal could warn of a Stop indication up to 13 Km further on. The other five sections have an intermediate loop goods siding, and one automatic signal is provided for each direction. These signals are located at the facing points and because the track circuits are normally de-energised, the signals are normally at Stop. The points are secured by electric switch locks but the releasing circuits prevent a whole train from being side-tracked and the points restored to normal. The siding can therefore be in passing. One of these sidings (Banealla) has since been closed.

Figure 15 represents a section with one pair of automatics but without the goods siding (which in practice would exist between them). Tracks 1T, 4T,

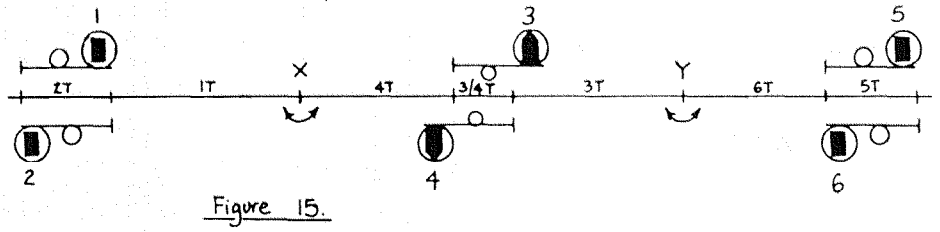


Figure 15.

3T and 6T are reversible coded track circuits to which either a track relay or coded d.c. can be connected at each end; normally the track relay is connected. The other track circuits are fed by steady d.c. Code 120 (impulses per minute) is used to give a Warning indication and code 180 to give Proceed. These codes correspond to frequencies of 2Hz. and 3Hz. respectively, but even in this electronic age the "code transmitter" (generator) still consists of a pendulum oscillated by an electro-magnet. Maximum workable length of coded track circuits is about three kilometres, and the code is repeated from one section to the next as indicated at points X and Y. Newly-generated code is applied at the signal location.

Before he can clear a Departure signal the Train Controller has to set the direction of traffic. He does this by addressing the stations at each end of the section at the same time and then presses a button marked Up or one marked Down. If the Down button is pressed, the code transmitters near signal 5 are activated and coded energy is applied to 6T provided that Up Departure signal 6 is at Stop and 5T is unoccupied. Code 120 is applied if outer Home signal 5 is at Stop but code 180 if it is off. The TR at Y follows the code and a contact repeats it into 3T. The code is received at the other end of 3T and detected; if it is code 120 the signal goes to Yellow or if 180 the signal goes to Green, provided that signal 4 is at Stop and 3/4T unoccupied.

When signal 3 clears and its PCR picks up, provided that 4SR is down, local transmitters are activated and code 180 is applied to 4T; this is repeated at X and received and detected at the other end. Signal 1 will then go to Green if addressed by the Train Controller (a separate action from setting the direction). When a Down train passes signal 3, APB stick relay 3SR picks up in between the time 3/4TR drops and slow-releasing 3PCR drops, and sticks up through the PCR down. When the van passes signal 4, provided this signal is at Stop and its SR down, code 120 is transmitted back and signal 1 can be cleared to Yellow if required for a second train.

When the van of the last down train passes signal 6, code 120 will be sent and signal 3 will go to Yellow, 3SR dropping at the same time. I do not know whether transmission of the code stops now - perhaps after a short delay when the CTC supervisory system indicates that the whole single-line section is clear or whether the Train Controller has to press a button marked "Cancel". (Such a button would be required in any case.) Perhaps some reader knows the answer? And if the Train Controller has to cancel, does he have some incentive such as a flashing light or buzzer? As mentioned earlier, it is part of the design philosophy of the system that code be sent only when required for train movements in order to conserve battery power.

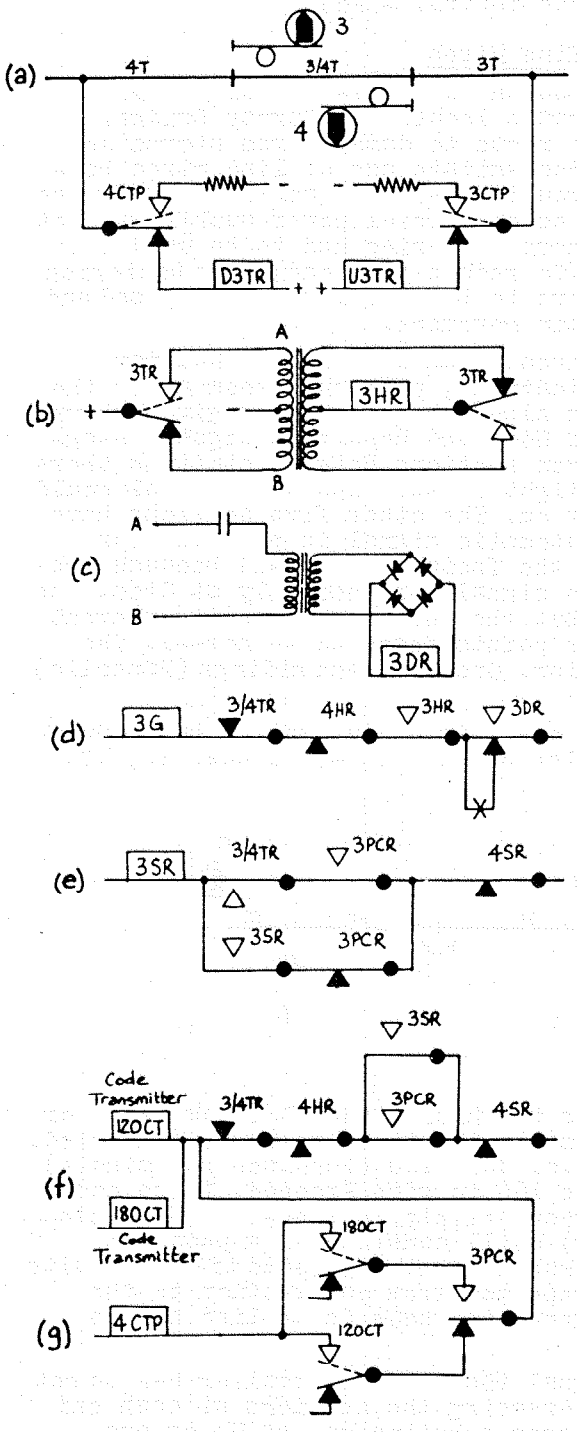


Figure 16

Technical information contained in an IRSE Paper "Normally De-energised Reversible Coded Track Circuits" is used as the basis for the simplified description given here. The diagrams in Fig. 16 for a hypothetical intermediate signal location need little further explanation except perhaps for the de-coding action. In (a) relay U3TR at the Up end follows the code received and one contact applies positive energy alternately to the outer ends of the primary winding of the decoding transformer DT. The necessary arc suppression arrangements are omitted for simplicity.) Another contact connects relay HR alternately to the opposite ends of the secondary winding. The combined effect is that steady d.c. flows through HR and the relay operates and stays up while code 120 or 180 is present. A selective decoding unit 180DU in (c) tuned to resonate at 3Hz. (code 180) is connected to points A and B in (b), thus 3HR (Home Relay) picks up when either code is received but 3DR (Distant Relay) responds only to code 180. These relays control the signal as shown in (d).

The other diagrams have been sufficiently explained already but it is interesting to note that the contacts in (f) and (g) controlling relay 4CTP are similar to those controlling an APB signal with normal circuitry except that 3PCR determines the code sent instead of the polarity. We may also note that although the signals are both normally at Stop, this version of APB has greater affinity with that used on the Standard Gauge line than that on the Geelong line as the automatics clear back towards the Departure signal.

7 Control Lever Systems (Non-APB)

7.1 With Electric Lever Locks

The signalling schemes described so far are all applications of the Absolute Permissive Block system in which a stick relay provided at each intermediate block signal establishes or maintains direction of traffic. However, a quite different single-line automatic signalling system is possible which does not use stick relays. In the Lever Locking and Track Control system described in "Somersault", Nov 1980, direction of traffic is established by the operation of the control lever at the distant end. This direction is maintained by the control lever at the near end being being locked normal and the one at the far end being back locked away from normal while a train is in the section. So automatic signals can safely be provided which normally show Stop, and clear when the control lever is operated to release the Departure signal.

The method described was in fact applied to signal S185 (Clifton Hill "B"-Westgarth) and (after conversion from repeating signal A316 in 1955) to LA316 (Camberwell-Riversdale). The other four automatic signals on old style (pre Centre Line) LL&TC sections - A304, S186, ST334 and LA313 - were controlled by their own levers for interlocking purposes. A point of interest is that although the control lever had to be pulled over to the full reverse position to release the Departure signal, the controls for releasing S185 and LA316 made as soon as the lever was pulled past the lock. This meant that if the signalman decided to put the lever back as far as the lock while a train was in the section (and he couldn't get it any further at that stage) the automatic would still stay off.

The two signals named were very much isolated instances but it would be quite possible for a succession of automatics to be released by the control lever. Each signal would clear again as the train proceeded and then, when the last train in that direction arrived at the distant end and the control lever was restored, all signals would go back to Stop together. The signals for the opposite direction could then be cleared.

The "control lever" system, while simple in concept, requires provision of more line wires than does APB. This occurs because the circuits for maintaining direction, i.e. those for the electric locks on the control levers, extend right through the section and are separate from, and so additional to the signal circuits. With APB the directional stick relays do not require additional line wires. It might be expected therefore that the system described would be more of theoretical than of practical interest, and would be installed only where special circumstances applied.

In fact a modern version of the system, where the intermediate signals are released by a control lever, has been installed on the two-way lines of the Melbourne Underground Rail Loop. The control levers are push buttons mounted in route-setting control panels with the non-vital interlocking effected by electronic circuitry, and magnetic latching relays are used for maintaining the established direction of traffic, but the signals are released substantially as described.

7.2 With Direction-Setting Relays

The new underground sections of the Burnley and Caulfield Loops, opened for public traffic in January 1981, run from junctions with the existing lines immediately north of Spencer Street suburban platforms to junctions between Flinders Street and Richmond. The length of the Burnley Loop is about 3.7 Km. between fouling points at each end; the Caulfield Loop is somewhat longer. Three intermediate stations are provided, at Flagstaff, Museum and Parliament, but at the time of writing (June 1981) only Museum has been opened. Also at this time, the junctions referred to are worked locally by Spencer St No 2 signal-box and Flinders Street E signal-box, but they are to be brought under the Metropolitan Control Centre "Metrol" when this is in full operation.

Each of the two loops consists of a single line signalled for two-way running. Broadly speaking, trains travel in the Up direction (Richmond-Museum-Spencer Street-Flinders Street) in the morning and in the Down direction in the afternoon and evening. On the Burnley Loop, 18 Down and 17 Up intermediate signals are provided. It is understood that their spacing allows a headway of about 150 seconds between successive trains running under Normal Speed aspects, reducing to about 90 seconds with the trains subject to delayed clearing of Medium Speed aspects at the approaches to stations, including delayed lowering of speed-proving train stops.

The signals are all normally at Stop, those for the required direction of traffic being released by the operation of a control lever (or button) in the signal-box at the distant end. The intermediate signals then work automatically until the control lever is restored. The platform starting signals, however, are approach-cleared and time-delayed to enforce a station stop of about 20 seconds. These signals may also be held at Stop by Metrol but it is believed that this facility is provided mainly for use in emergencies. Although the signals on the Loops work automatically for the direction set, they are classed as Home signals and a Driver must telephone for permission to pass a signal at Stop.

Audio-frequency jointless track circuits are installed (the principle of these is explained in "Somersault", July 1978) and the transmitters, receivers and track relays, together with the other necessary relays, are housed in relay rooms located at end end of each platform. The relay rooms are named Flagstaff West, Flagstaff East, Museum West, Museum East, Parliament North and Parliament South. As the Caulfield Loop is built above the Burnley Loop, separate relay rooms are provided on each level and the suffixes Upper and Lower may be added where necessary. Although unmanned, a relay room may be referred to as a "box" in the description which follows later of the working of the

system, as "the next box" gives a better idea of separation than "the next room". A control push-button on a panel in a box may also be referred to as a "lever".

The direction setting and signal control relays work at 50v d.c. I have no information on power supply arrangements but believe that at least one back-up supply is available in case of failure of the main supply. Nevertheless the circuits for setting direction of traffic seem to have been designed specially to minimise disruption to service in the event of a complete break in signalling power supply. Directional stick relays as used in the APB system would drop out when power failed and after it was restored a train would have to pass a clear signal to pick up a stick relay and re-establish direction. In the system installed on the Melbourne Underground two magnetic latching relays are provided in each box and one or other picks up according to whether the Up or Down direction is set. Once such a relay picks up, it stays up, even if the power fails, until released by momentary energising of a separate de-latching coil. It thus stores or remembers the direction set.

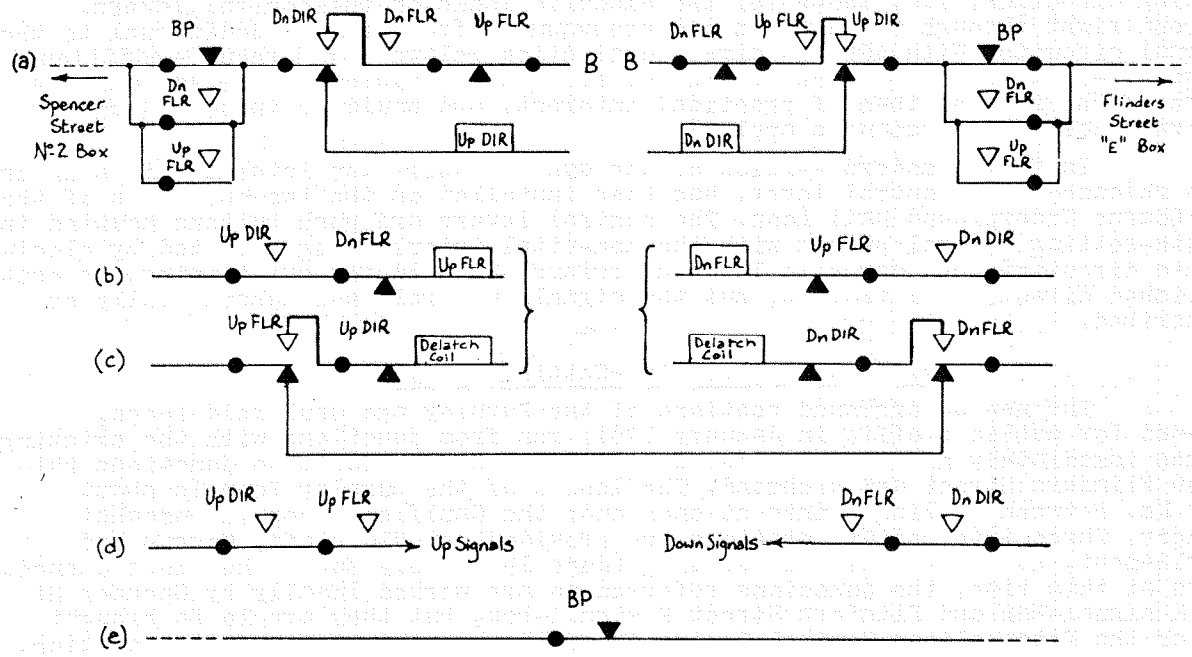


Figure 17.

Assume now that the whole single line section is clear with all signals at Stop, and that Spencer Street is to send Down trains. The signalman at Flinders Street E Box operates his control lever and provided that the Up Departure signal there is at Stop and not approach locked or route locked, a Down magnetic latching relay designated DnFLR picks up. A contact applies power to a reversible circuit to the next box, Parliament South, and an ordinary relay there designated DnDIR (Fig. 17a) then picks up providing that intervening track circuits are clear. These are represented in a group by the contact BP on the right hand side.

Magnetic latching relay DnFLR in (b) now operates, and the DIR & FLR both being up, the Down signals there are released as in (d). (A third contact has been omitted from (b) - this will be referred to later.) Power is also now applied to the next box on the left, and the DnDIR and DnFLR there pick up, the signals also being released at the same time. The cascade continues box by box until Spencer Street is reached, whereupon, when the two relays there have operated, the Down Departure signal is released and can be cleared by operation of its lever. The DIR relays remain up after a train enters the section as make contacts on the FLRs bridge out the BP contacts shown in (a). If signalling power fails while a train is in the section, the DIRs drop out but as the FLRs stay up, the BP contacts remain bridged out. So when power is restored, the DIRs pick up again in turn and the signals clear once more.

The original cascade started by Flinders Street E operating his control lever takes a finite time to complete - it might even stop part way along if some faulty condition exists - and a safe guard is necessary to prevent an opposing cascade being started in case Spencer Street No 2 should wrongly

operate his control lever during the unguarded period. A direct circuit is therefore provided between Spencer Street No 2 box and Flinders Street E box clear of the intermediate boxes, and as soon as E Box operates his control lever, a relay at No 2 box picks up over this circuit and prevents the Up FLR there from being energised and starting a cascade. If the relay fails to pick up over the direct circuit, the Down Departure signal cannot be cleared. When Metrol takes over, the two opposing control levers will be operated from the same location and can be directly interlocked.

Once the direction has been set, Down trains may be run as required. After the last train has arrived at E box and the control lever has been restored, a relay is connected to a circuit which detects whether the tracks at all the boxes to Spencer Street are clear (Fig. 17e). This is a reversible circuit and a relay would be connected to the other end if the Up direction had originally been set. When the relay at E box operates proving that the whole single-line section is clear, a contact energises the de-latching coil of the DnFLR and this relay releases. Two parallel cascades now start back to Spencer Street. In the first, over circuit (a), the DnDIRs drop one by one and the Down signals at each box go back to Stop. In the second cascade, over circuit (c), the de-latching coils of the DnFLRs are energised and these relays release. When finally both the DnDIR and DnFLR at Spencer Street have dropped, the signalman there can operate his control lever to set the direction for Up trains.

As will be seen from (a), the Up relays before operating prove that the Down relays have dropped. This does not, however, prove in itself that all the Down signals have returned to Stop and that all the Train Stops are set to trip. These conditions must therefore be proved in the signal circuits, but I have information only on the direction setting circuits and so cannot explain exactly how this is done.

One further feature of the direction setting controls remains to be described. So that Metrol can prevent a platform starting signal from clearing, an ordinary stick relay - DnRSR or UpRSR - is provided at each box. Assuming that Figure 17 represents a box which controls a Down platform signal, then when the DnDIR picks up, the DnRSR follows and only then does the DnFLR pick up. The UpFLR proves the DnRSR down. Converse arrangements apply where the box controls an Up platform signal. Thus the missing contacts in (b) are those of an RSR. When Metrol wishes to put a platform starting signal to Stop, a pulse is sent to operate a Cancel relay to unstick the RSR. A pulse is sent over a different lead to pick it up again.

(to be continued)

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Minutes of Generall Meeting (continued)

GENERAL BUSINESS: 6. The U.S. Timetable Collectors Association wrote to the Leader regarding their aims and Jack responded as well as forwarding some material.

7. Distant Signals - Graeme Reynolds of Ballarat is continuing his signalling researches and wants to know when the first Distant signals appeared in Victoria. Opinion put it at around 1878, following the introduction of this new class of signal. Further discussion put the appearence of fish tailed arms at around 1876. Any information regarding this subject, as well as Winter's Block, can be sent to Graeme at 22 Howitt Street, Ballarat. Phone (053) 32-7721.

MEETING CLOSED: at 2117 hours and the members were treated to a slide show entitled "The Western Line - or some of it" and was presented by Alan Jungwirth. It was immediately obvious that the show could have been sub-titled "Nostalgia Unlimited".
After the session members decided that the silly bus operator would be invited back to present another silly bus.

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Safeworking between Blossburg and Skyline (Montana USA)

by Graeme Reynolds.

Between Skyline and Blosburg Electric Staff block working had been in use for a long time by May 1942 when the Northern Pacific Railway applied to the Interstate Commerce Commission to replace that system with an installation of automatic block signals and remotely controlled points and signals at Skyline. In July that year the application was denied because of the complexities of working traffic over that section.

The railway line west of Logan consisted of two diverging tracks which passed over the mountains by separate routes and met about 127 miles westward at Garrison. On the northern arm is the section mentioned in the application. Skyline was about two miles east of Blossburg and the line connecting these places was on a falling gradient of 1 in 50 for east bound traffic. At about six hundred feet from Blossburg was sited the western portal of the 3780 feet long Mullen Tunnel. Four hundred feet past the eastern portal there were catch points in the line to check runaway trains, but as these points were so interlocked they had to be closed before a staff token for the section could be released. Hence their use would have been only for trains which had run through without authority.

Traffic on the line in 1942 was two regular passenger trains and about seven freight trains daily in each direction, however, additional troop or special trains were also operating. The railway company suggested that delays could be reduced and safety enhanced as it was planned to completely track circuit the section and place the control for the installation under one man at Blossburg. It was asserted that this would minimise the risks and mistakes which might be made by three operators needed to work trains over that section.

The application was not only opposed by three railway trade unions but local personnel gave evidence that the installation "would not be as safe or satisfactory". They stated that normally trains exchanged staff tokens at low speedswhich already reduced time delays and that they preferred to use a tangible item to show the right of occupancy of the section. Probably the employees had more than safety matters in mind, as the company stated that its outlay of $21,000 would be offset by the savings in wages of these operators.

The Commission denied the application as there was thought to be less likelihood of error under the existing system than under the proposed one whose effectiveness depended entirely on an observance of and obedience to signals. Hence, it was argued that the proposed changes did not even maintain the safety level of the current system. Whilst this reasoning is based on the sever gradient and the tunnel, it did provide some evaluation of the benefits of electric staff compared to the usual American practices.

This article is based on Signalling on Single-Line Section, Northern Pacific Railway, United States which was published in Monthly Bulletin issued by Railway Research Service (London) January 1943.

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SOUTH AUSTRALIAN NEWS (cont)

In the main the new s.g. crossing loops will be located at the existing stations but the loops are being lengthened. At Mallala the broad gauge station is between two sharp curves and the alignment here is being eased so that the line speed can be raised. Mallala will not be a future crossing loop only a goods siding. Crossing loops in the standard gauge days look like being at Virginia, Two Wells, Long Plains, Bowmans, Nantawarra, Bumbunga? Snowtown, Redhill and one one the new section between Merriton and Crystal Brook. The loop at Bowmans will be on a completely new alignment avoiding the sharp curves through the present station.

NEW SOUTH WALES NEWS

The latest Weekly Notice I have from NSW shows that CTC is now in operation between Telarah and Mt. George. The conversion of loops from mechanical operation to power operation with local panel operation has reached Wauchope. In the next issue of Somersault I hope to publish an article on the North Coast signalling written by Bob Taaffe. This article is on the mechanical days and the development of the various styles of signalling the loops up to the present. An article on the CTC work on the North Coast is in