HISTORY OF THE NSW RAILWAYS DURING THE WAR PERIOD 1939 - 1945

SIGNAL & TELEGRAPH BRANCH

*This paper was produced about the end of 1945 or early 1946 by the Signal and Telegraph Engineer or his Assistant and is interesting as an historical review of what signaling works were undertaken for the War effort. The following has been provided verbatim, despite some strange grammar and punctuation, to provide the right flavor of the author’s thoughts.*

*Some in the community and Government were aware of the possibility of a forthcoming War as early as about 1934. Leading industrialists such as Essington Lewis of BHP and WS Robinson from the Collins Group of Companies were lobbying Government and other industrial leaders to do something positive to prepare the country’s capacity to manufacture defence equipment. Such moves were resisted by influential people in the UK who had the ear of local Governments.*

*Preparations for an impending War even are noted in some Railway Weekly Notices in the months prior the Declaration of War.*

*Details of the works details below are mostly shown on the data DVD “Track and Signal Diagrams” available from the ARHS NSW bookshop.*

1 INTRODUCTION

The responsibility of the Signal and Telegraph Branch during the war was satisfactorily to carry on the existing signalling system and to provide additional facilities to enable the large volume of war time traffic to be handled safely and expeditiously. At the outbreak of the war, the New South Wales Railways had a well-equipped and efficient signalling system, capable of meeting the peace time requirements. The Signalling Workshops at Chullora were fully equipped to manufacture a large percentage of the whole of the apparatus - both mechanical and electrical - used on the signalling work, and had a highly trained staff.

The organisation of the Branch was such that in all sections of the signalling and communication systems there was a highly trained technical staff, accustomed to the requirements of the work they had to design, install and maintain. The outdoor staff had been built up over a long period of years and were capable of meeting all ordinary requirements.

On the declaration of war, a definite policy, in accordance with the direction of the Commissioner for Railways, was followed in respect of the Signal and Telegraph Branch employees desirous of enlisting for active service and performing war work outside the Department. The necessity in this regard of giving assistance, where possible, made it necessary for a number of highly trained Officers and men to be released, with the resultant effect that throughout the war period the staff not released for war service were called on to make special efforts, and they responded magnificently.

Quite early in the war the problem of obtaining supplies of vital equipment not obtainable in Australia was considered in detail, and a programme was prepared covering the immediate and the anticipated requirements, as a result of which throughout the whole of the war years the signalling works proceeded without interruption, and it is to the credit of the manufacturers abroad and to the contractors within Australia, also the Workshops’ staffs that so much equipment was made available. This enabled the heavy programme of signalling works authorised over the war years to be undertaken and completed to schedule. The experience was that no works were delayed by reasons of labour or material shortages.

The manpower position, especially in the case of non-skilled labour, became very acute at various stages, due largely to the fact that there was no restriction placed on non-skilled labour in the matter of enlistment, in consequence of which Officers and men were called upon to work excessive hours and to sacrifice a great deal of their pleasure time. This continued throughout the years of war, and I desire to place on record the outstanding services the whole of the staff rendered in this regard.

Time, very often, was short and the need was urgent, so that it is understandable that under such circumstances it was frequently necessary to adopt modifications in design and methods of working. The whole hearted co-operation of the operating staff was always forthcoming in adapting themselves to the altered conditions and any success which attended the work of this Branch was due, in no small measure, to this co-operative effort. The outside staff carried on without a single major mishap, in spite of the unprecedented demands made upon them and, for this, they are to be congratulated.

The following notes, to some extent are a recital of works carried out, convey some idea of the extent of the construction programme and the demands made upon the men and materials.

2 TRANSPORT OF DIVERTED SEA-BORNE TRAFFIC

GENERAL

The anticipated diversion of sea-borne traffic (ore, coal, etc) between the Eastern and Western States, constituted one of the major problems that confronted the Railway Department early in the War Period. Facilities were urgently required for the transport of ore in large quantities from Port Pirie to Newcastle and Port Kembla, and of steel and coal from Newcastle to Adelaide.

The capabilities of the cross country lines to be used for routing this traffic fell short of requirements and the terminal arrangements at Broken Hill and Tocumwal were inadequate for the additional transhipping.

For the purposes of this description it is proposed to treat as a whole, the work associated with this increased traffic. The sections involved are: Broken Hill - Parkes - Narromine - Dubbo - Werris Creek - Newcastle, and Tocumwal - Narrandera - Griffith - Stockinbingal - Parkes, and thence to Newcastle as above.

The first consideration, and the one in which the Signal and Telegraph Branch was involved to a very large extent, was the provision of crossing loops to provide additional traffic facilities.

As the loops conformed to certain standards, it is proposed, first of all, to describe some typical installations and subsequently, when dealing with specific cases, to make reference to the particular type.

The classification adopted is as follows:

1. **Emergency Loop** - This is a simplified type of loop shown in Diagram.

A 3 lever interlocking machine, located in a central position near the staff hut, serves to control the Home Signals at either end of the loop, and a Key for releasing the Loop points.

Landmark signals are employed as a warning of approach to such a Loop, the triangles are fitted with glass reflectors to avoid the fitting of oil lamps.

The station is closed by pulling over the Key Lever and removing the Key. The Key is retained by the District Signal Branch Officer, and cross boards are fitted to the signals. When open, the Key is secured in the lever by clip and S.L. padlock.

Although many Loops of this type were completed, few were brought into use, as the emergency conditions, for which they were provided, did not eventuate.

Nevertheless, complete arrangements were made, in all cases, for the cancellation of the existing electric or ordinary train staff working, and the division of the through section into two ordinary train staff sections, should the occasion arise.

1. **Modified Emergency Loop with Goods Siding Connection** - An example of this type of loop is shown in Diagram.

On Ordinary Train Staff Sections, signal protection should be afforded trains travelling on a ticket whilst they are shunting intermediate sidings.

A number of existing intermediate sidings on Ordinary Train Staff sections were located at sites selected for the provision of Crossing Loops. In order to meet the above requirements, and also permit closing the Loop when necessary, a modified form of emergency loop was developed.

When the Station is closed, opposing Home signals are cleared and secured by means of a “Closing” or “Guard’s” Lever. The guard of a train requiring to shunt the siding, when the station is closed, uses a Receptacle Key to restore the “Guard’s” Lever and Home signals to normal, thereby releasing the Key Lever for the siding connection. An additional lever, known as an “Opening” Lever is employed to impose the interlocking between Home signals when the station is opened. This lever is secured in the reverse position by an opening Key held by a responsible District Officer.

(C) **Centrally Controlled Loop (Key Locked Points)** - In principle, this loop is similar to the Emergency Loop, Type A – see Diagram.

A fully equipped signal box is provided and, when closed, the interlocking machine and staff instruments are worked in accordance with standard regulations.

(D) **Centrally Operated Loop (Fully Signalled)** - This is a standard loop, an example of which is shown in Diagram.

(E) **Automatic Loop** - The arrangements in this type of loop were specifically designed to avoid staffing and to expedite train movements. An example is shown in Diagram.

The power worked Home signals are located a train’s length out from the central staff hut to ensure that the rear of a train has passed inside the Home signal before the electric train staff is restored to the instrument.

The signals are normally at “Stop” and “approach cleared” by the train. Special circuiting against simultaneous operation or either signal clearing with an opposing train inside the Landmark.

Loop points are also released electrically and interlocked with the staff for the section.

In the case of through trains not requiring to enter the Loop or make a crossing the train is brought to a stand at the staff hut, the staff instruments operated by the fireman under automatic working, and then it proceeds on its way - an operation performed with a minimum loss of time.

A central 20 volt primary battery is used for the control and operation of signals, and five track circuits are required between the two Landmarks. A short approach track circuit, 400 feet, approximately, in length, in the rear of each Home signal serves for approach clearing purposes.

A special signal pole line between Home signals carries the signal control wires.

(F) **Converted Automatic Loop** - The converted loop corresponds to the Automatic Loop, Type “E”, and was evolved from the original Standard Unattended Loop.

The Up and Down Line Working of the latter type was changed to Main Line and Loop, existing machines at each end being retained, in most cases, for working the Loop connections.

The new arrangements avoided the double stop for each train which had proved a great disadvantage with the old type of loop, and at the same time allowed greater flexibility for traffic working.

**3** BROKEN HILL - PARKES

The maximum capacity of this line, on the Declaration of War, was 3 Up and 3 Down Through Goods trains per day. Allowing for servicing the section with at least two pick-up trains per week and one water train per day, this represented a clearance capacity of 12,000 tons per week ex Broken Hill.

An Inter-Branch Committee, after careful survey of the position, and, in the knowledge that 16,000 tons were to be handled from Broken Hill, decided that traffic facilities were required for 7 Up and 6 Down Through Goods trains and one water train per day.

To achieve this object, the provision of additional crossing loops was undertaken in January 1941, and by June of that year the following loops were completed:

Koroo Gibbial

Yarrabandai Conoble

Derriwong Oricar

Yeenan Jamma

Gunebang Diwarra

Boonia Box Tank

Mirrabee Tiuna

With the exception of Yarrabandai, Derriwong, Gunebang and Box Tank, all were of the emergency type as described in “A” of the Typical Loops.

These latter loops conformed to the modified emergency type of Loop, Type “B”.

Conoble consisted, originally of a Loop Goods Siding operated by key on the Electric Train Staff. To meet the emergency conditions it was converted to a crossing loop, 1715 feet in the clear, of the emergency type “A”, and since October 1941, has functioned as a permanent crossing station, thereby dividing the long 41 mile section Trida - Ivanhoe.

Apart from Conoble, the only loops brought into use were Box Tank and Tiuna which were opened for the heavy water lift traffic between Menindee and Broken Hill during the drought of 1944-1945.

Extensions to existing Loops were carried out at Bogan Gate, Condobolin, Euabalong West, Ivanhoe and Menindee. These works involved the provision of new signals and/or refixing existing ones together with the relocation of ground frames and point connections.

Additional crossing facilities were provided, also, at Roto, an existing staff station.

Five gangs, in all, were employed, each consisting of a Signal Ganger and four other grades, and the whole of the work was completed within four months, which is no small achievement considering the distance to Sydney and the limited transport available on the 422 mile section.

Careful planning was necessary to enable the signal work to coincide with Permanent Way alterations. This applied, not only to local arrangements, but also to the ordering and despatch of material from Sydney and the subsequent distribution on the ground.

Some special features in the construction of the Loops were:

1 Recovered tramway trolley wire poles were used as signal posts

2 The staff huts were built at Parkes Depot where they were wired and fitted with telephones and Ordinary Staff Boxes prior to despatch. The timber was purchased locally

3 Ground pattern machines were used for the central frames at Emergency Loops.

**3.1 Telephone Facilities**

For some years prior to commencement of hostilities the telephone train control system was in operation between Orange and Condobolin.

Early in 1940, however, it was recognised that extensions would be required and a pair of copper wires was erected between Condobolin and Broken Hill. The Control System was extended to Ivanhoe and all intermediate stations were connected, including the new Crossing Loops. Beyond Ivanhoe no ringing facilities were provided on the new circuit, but Orange Control could speak to any station after contacting Ivanhoe and requesting the Station Officer to ring the station required on the Omnibus Circuit.

**3.2 Broken Hill**

The signalling, in connection with the Exchange Sidings, was brought into use in February 1942. Down and Up signals were provided to protect movements between the Station Yard and the Sidings and a Shunter’s Lever was provided to control the Down Home signal whilst shunting moves are being made in the Exchange Sidings.

In May 1944, a siding was brought into use for the Zinc Corporation. This siding, which is 1m 25c in length, crossed the Silverton Tramway and South Road, necessitating the provision of both railway and flashing light highway signals controlled from a new Signal-box.

**3.3 Parkes**

The removal of the locomotive depot at Parkes to a new site, approximately 1/4 mile west of the station, made available additional space for traffic sidings in Parkes Yard which entailed alterations to layout and signalling.

Furthermore, in order to handle, satisfactorily, the movements of engines between the Yard and the new depot, as well as trains over the Parkes - Goobang Junction section, together with the passage of road vehicles over the Newell Highway Level Crossing, it became necessary to erect a new signal box.

Provision had to be made for signalling the new layout of the Yard, track block working between Parkes and Goobang Junction, power operation of the points leading into the locomotive depot and boom gates for the protection of the Level Crossing.

In view of the electrical controls associated with the above requirements, it was decided to install an electro-mechanical machine consisting of 24 miniature electrical and 56 mechanical levers.

Extensive track circuiting was involved. Save for a short length of track from the Sydney end of the platform to a point immediately west of the Signal Box at the level crossing, the Main Line is track circuited from the power worked Down Home signal at East Street to Goobang West, a distance of 2 1/4 miles. Electric Releasing Switches were provided for the connections at the Sydney end of the Yard to accelerate shunting movements.

Mechanically operated booms were installed and, as at Parramatta Road Crossing, Clyde and at Tarcutta Road, they have provided very successful.

A new signalling pole line was erected between the Signal-box and Goobang West carrying, in addition to signal controls, the power lines for normal and emergency operation of the motor worked points and Signal-box equipment.

Extensive additions and alterations were made to the existing poles at the Sydney end.

Work was commenced in August 1943, and the complete installation was brought into use in July 1944.

4 TOCUMWAL - NARRANDERA

The Main Southern Line, having reached saturation point on the single line section from Cootamundra to Albury, it was realised, at the outbreak of war, that heavy interstate traffic would be handled on the Tocumwal - Narrandera section, and plans were made accordingly. In consequence, certain additional facilities had been provided before the major question of the diversion of sea-bourns traffic was considered late in 1940.

Three new crossing loops were completed in July 1940, viz. Mairjimmy, North Yathong and Corobimilla. All were modified emergency Type “B” Loops and, in each case, extensions, involving the re-location of the signals and ground frames, were carried out the following year, so great was the increase in traffic.

At Finley, Berrigan, Jerilderie and Bundure, facilities were provided for the crossing of passenger trains and fuel length goods trains where, before, only goods trains, of limited length, were permitted to cross. Berrigan and Jerilderie were non-interlocked and during the course of the new work the loop points were interlocked and worked from a ground frame, Key released from the main frame. The pullover type of levers at Jerilderie were replaced by a 6 lever machine. The extensions and re-arrangements at each of these stations necessitated the provision of new signals and refining existing ones.

The provision of a Transhipping Yard and Exchange Siding at Tocumwal, following the completion of a new platform on the Sydney side, and the removal of the Locomotive Depot to a new site, were works which extended over a long period, and involved a certain amount of signal alteration, including a new machine on the Victorian platform.

To permit of moves to and from the new Sidings, however, Electric Train Staff working was required on the section approaching Tocumwal. A new crossing loop was provided at Langunyah, and this station became the dividing point between Ordinary and Electric Train Staff sections. Two Intermediate instruments were provided on the new section for working the Sidings.

The signalling alterations at Langunyah are of the emergency loop Type “A” with an open frame. The Closing lever locks the Home signals in either position.

Additional siding accommodation was provided at Narrandera, together with additional signals, to facilitate movements to and from the Hay and Tocumwal Lines.

This work involved the re-numbering of a large subsidiary ground frame in the Yard and the provision of an electrical release for the new crossovers between the two lines.

**4.1 Telephone Facilities**

The only communication between Narrandera and Tocumwal prior to 1940 was by means of a Morse Line on Postal poles.

A Pole Line carrying one pair of wires was erected between the two stations in 1940, and a local telephone circuit connecting will all stations, which also functioned as a Train Control circuit, with Junee the Controlling Station, was brought into use.

The increase in traffic was such that in 1943 it became necessary to separate these circuits and an additional pair of wires was erected for Train Control. A trunk line was obtained between Narrandera and Tocumwal by superimposing between the two pairs.

The services provided were as follows:

1 Control Line Tocumwal to Narrandera, linked with Narrandera to Junee Control

2 Trunk Line Tocumwal to Narrandera, linked with Narrandera to to Junee Trunk line

3 Omnibus telephone service Tocumwal all stations to Narrandera, connected to Junee with one of the existing services.

During the course of the erection of the pole line, in 1940, difficulty was experienced in obtaining tallow wood crossarms, and a special cast iron crossarm was designed to carry two wires. This type of arm was used, also, for the additional circuit in 1943 and, in all, some 5400 were used, together with 448 miles of copper wire.

5 NARRANDERA - GRIFFITH - STOCKINBINGAL - PARKES

Work was proceeding on this section simultaneously with that on the Broken Hill - Parkes section and between July and September 1941, four new automatic crossing loops, Type “E”, were completed and brought into use. These were Canal Loop, Murrami and Wumbulgal, between Narrandera and Griffith, and Pucawan, between Griffith and Temora.

The opening of the automatic crossing loops at Canal Loop and Pucawan necessitated the replacement of the existing Ordinary Train Staff Working by Electric Train Staff Working, and accordingly, the Ordinary Train Staff section Narrandera - Yanco was replaced by the Electric Train Staff sections Narrandera - Canal Loop and Canal Loop - Yanco.

Similarly the Ordinary Train Staff section Ariah Park - Temora was replaced by the Electric Train Staff sections Ariah Park - Pucawan and Pucawan - Temora.

This involved the provision of eight additional Electric Staff instruments and the erection of two additional G.I. line wires over each section, a total distance of 34 miles.

New crossing loops were provided, also at Binya, Tigan and Mirrool, whilst Springdale, which had been out of use for a long time, was altered and extended and brought into use as a crossing station of the modified emergency Type “B”. The loops at Binya and Mirrool were emergency Type “A”, and Tigan was originally opened as such, but, subsequently, altered to the modified emergency type with a six lever machine.

These loops were opened when necessary and Binya, which was opened in 1942, is still in use.

At Ariah Park, a new Up Refuge Loop between the Main Line and the Engine Triangle necessitated new connections for the latter and moving the Up Home and Landmark signals.

Direct access from the Narrandera to Temora line at Griffith and from the Temora to Parkes line at Stockinbingal was provided by triangle at Griffith and Stockinbingal.

Double lines were installed at Griffith and protection was afforded by signals at each end controlled from a central box. Intermediate staff instruments for the respective sections on the Narrandera and Temora lines were provided to accelerate the movements.

At Stockinbingal a single line, only, was installed, for which an Ordinary Train Staff was provided. The connection at the Temora end was unlocked by Key on the Ordinary Train Staff for the section Temora - Stockinbingal and at the Forbes end an intermediate staff instrument served the dual purpose of giving authority to enter the section to Milvale and to unlock the ground frame.

**5.1 Stockinbingal - Parkes**

Between Stockinbingal and Parkes the existing facilities were adequate to meet the demands made upon them and no alterations were made.

**5.2 Telephone Facilities**

Between Temora and Griffith the Train Control Telephone Service was obtained by using the local telephone circuit and this system was capable of handling the business until 1944, when the increasing volume of traffic made it necessary to separate the two circuits. This entailed the erection of an additional pair of copper line wires over a total distance of 94 miles. The work was completed and separate circuits brought into use in May 1945.

**5.3 Parkes - Narromine**

Additional crossing loops were provided at Nanardine, Mickibri, Myaroo and Narromine.

The Loops at the three former stations conformed to Type “A” in all respects but were located within Electric Train Staff sections and for that reason did not require any special opening and closing arrangements for operation of the Goods Siding connections.

Six new staff instruments were required together with an intermediate staff instrument for the Narromine Loop.

Nanardine, Mickibri and Myaroo have been retained as permanent crossing stations.

**5.4 Telephone Facilities**

Prior to 1940 the Train Control Officer at Dubbo used the Omnibus Telephone Circuit between Narromine and Parkes, but traffic grew to such an extent in this year that a pair of copper wires was erected to extend the Train Control System directly to Parkes.

6 DUBBO - WERRIS CREEK

Extensive signalling alterations were necessitated by the provision of Branch Storage Sidings adjacent to Dubbo Triangle. This work involved the replacement of a 16 lever subsidiary machine with a 24 lever machine, with consequent re-numbering of all functions. The chief difficulty to be overcome was to keep all equipment in service whilst the change-over was taking place.

An intermediate staff instrument was provided at the Troy Junction end of the triangle to facilitate this working.

The work on this section is noteworthy in that the first automatic loop, Type “E”, installed on these railways, was completed at Piambra in May 1940. Closely following this work were similar installations at Premer, Toogarlan and Bakana.

In addition, emergency loops, Type “A” were provided at various Goods Sidings throughout the section, viz.:

Boothenba Ulinda

Muronbung Oakey Creek

Kamilaroi Tamarang

Mendooran

All of these loops were in use at various times and Electric Train Staff working was suspended and trains worked over the divided sections by Ordinary Train Staff.

A short distance from Werris Creek, at Gap, the Inverell and Dubbo lines converge and advantage of this was taken to install a crossover between the two lines. This permitted trains to proceed directly from Binnaway to Sydney without reversal in Werris Creek Yard.

Two intermediate staff instruments were provided adjacent to the crossing and, to operate the connection, both staffs were used in a Duplex Lock on the facing point lock lever.

The lengthening of the crossing loop and the provision of additional siding accommodation at Binnaway entailed considerable signalling work including a new 16 lever machine which replaced a 12 lever.

The improved traffic working, which resulted from the provision the automatic type of loop, led, subsequently, to the conversion of all the old standard unattended loops, on this section, to the new automatic type.

This work was carried out over a period extending from January 1944 to June 1945, and therefore does not come within the category of work performed for the diversion of sea-borne traffic.

The loops concerned were as follows:

Barbigal Weetaliba

Caratel Yannergee

Neilrex Caroona

**6.1 Telephone Facilities**

The Telephone Train control already in service between Dubbo and Binnaway was extended to Werris Creek, thereby linking the Western and Northern Controls.

A pair of wires was erected for this purpose between Binnaway and Werris Creek and another pair of wires between Dubbo and Binnaway enabled the extension of the Werris Creek - Binnaway Telephone Circuit to Dubbo.

7 WERRIS CREEK - NEWCASTLE

The final section to be dealt with on the cross-country route from Broken Hill and Tocumwal to Newcastle is the Main Line portion from Werris Creek to Newcastle.

Two centrally operated loops, Type D, were provided, viz. Braefield and Liddell. A motor operated distant signal was provided at Liddell another feature of which was the high concrete foundation required for the Signal box, located in a cutting.

Existing loops at Kankool, Ardglen, Pangela, Togar and Koolbury were converted from Up and Down Main working to Main and Loop working, centrally operated. The conversions necessitated extensions to the interlocking machines and the provision of 27 new signals in all.

8 SUMMARY

The foregoing covers, briefly, the signalling work involved in making provision for anticipated cross-country traffic.

With the exception of Broken Hill, Tocumwal and Parkes, most of the work was completed within twelve months during 1940-1.

The following summary gives some idea of the volume of work executed:

**New Crossing Loops**

Type “A” 23

Type “B” 8

Type “D” 2

Type “E” 8

Converted to Type “D” 5

Special (Griffith and Narromine) 2

Total 48

Electric Train Staff instruments provided 32

Intermediate ETS instruments provided 9

**MAIN NORTHERN LINE**

9 HORNSBY - NEWCASTLE

The unprecedented traffic on this section throughout the War was handled satisfactorily without many additions or alterations to existing signalling facilities.

In 1940 a section of automatic signalling was installed between Wyong and Wyee to give increased train movements and in 1944 extensive additions were made at Hawkesbury River in conjunction with the provision of a Down Refuge Loop.

The miniature lever machine controlling movements over the gauntlet track on Hawkesbury River Bridge was replaced by a larger machine of similar type to control all power operated signals in addition to those on the Bridge.

Traffic congestion became so acute in July 1945, owing to a 5 mph speed restriction over the full length of the Bridge that motor operated catchpoints were installed on the Up Road at the Northern end. Special circuiting was provided to reduce the number of line wires and at the same time to accelerate the train working.

10 NEWCASTLE - WERRIS CREEK

This section has been dealt with previously in regard to additions and alterations carried out to provide for the diversion of sea-borne traffic.

Other developments, however, called for special consideration from time to time, and in two instances a large amount of work was entailed.

The establishment of a Military Camp at Greta, early in the War, necessitated the termination of trains at that station. Both platforms were extended and all connections north of the platforms had to be relocated while special signalling was provided for terminating Down trains and engine run round and shunting facilities.

The second major installation carried out was in association with a new munitions factory at Rutherford which came into production early in 1942.

The Racecourse Branch line was re-opened and extensions made for handling employees trains at the factory terminus. Electric Train Staff working was introduced and improved connections were made at Rutherford Junction on the Main Line.

Another installation undertaken on behalf of the Commonwealth Government was a new siding at Myambat between Denman and Merriwa. An intermediate staff instrument and ground frame were provided. The long 35 mile section, Denman - Merriwa, was divided at Sandy Hollow to permit the despatch of a train to Myambat before the previous train had arrived at Merriwa.

**10.1 Telephone Facilities**

The most important addition to the telephone services on this section was a single channel carrier system from Sydney to Werris Creek which, together with a similar service between Armidale and Glen Innes, and a trunk channel between Werris Creek and Armidale, permitted through communication between Sydney and Armidale.

In the Newcastle Coal Road Area a complete Train Control System was installed enabling speeder handling of Coal traffic. The system was linked to the existing Newcastle Control, and complete co-operation was thereby obtained between coal road traffic and main line operations.

11 WEERIS CRREK - WALLANGARRA

The methods employed on the Tocumwal - Narrandera section for facilitating the opening and closing arrangements at crossing loops, which were an innovation at the time that section was dealt with, were adopted, later, on the Main Northern line between Werris Creek and Wallangarra.

The modified emergency type of loop was used, with the difference, that no provision was necessary for Guards to shunt the sidings when the stations were closed. Loops of this type were installed at the following stations:

Nemingha Kelly’s Plains

Limbri Dundee

Warrungen Gresley

Wollun Loop Bluff River Loop

Pundar

At Bluff River Loop fabricated steel signal posts were used for the first time.

On the section Woolbrook - Walcha Road, tablet instruments were replaced by Electric Train Staff instruments to provide for automatic working.

In addition to alterations at West Tamworth, Armidale, Bolivia and Tenterfield, additional listings were installed at Wallangarra on both the NSW and Queensland sides.

Two of these sidings were laid in off the third rail section leading to the meatworks. In the Queensland turnout it would found necessary to close the frog of the ‘K’ crossing for the direction concerned, where the Queenland rail cut the NSW rail.

This was successfully carried by the Department, and the single lever which operated the turnout points and the catchpoints was also made to close the correct frog for the direction of traffic for which the points were set.

**NORTH COAST LINE**

12 WEST MAITLAND - SOUTH BRISBANE

Prior to the war, very heavy traffic passed over the 493 miles of single line between West Maitland and South Brisbane, and quite early it was realised that, unless considerable additional facilities were provided in the way of crossing stations and extra storage and shunting sidings, it would be impossible adequately to handle the war time traffic. With this end in view, an extensive programme of new works was prepared and these involved very heavy calls on the Signal and Telegraph Branch to provided additional signalling facilities.

As early as 1941 the lack of crossing facilities was felt on the long sections between Border Loop and South Brisbane, and the 31 1/2 mile section, Glenapp - Kagaru was divided in November of that year, when an automatic type crossing loop was provided at Tamrookum. This was the first crossing loop to be constructed by the NSW Railways over the Queensland border, and a special feature of the work was the pole line construction within the limits of the loop. Short 15 feet poles, constructed from old rails, were interposed between existing wooden poles to give the reduced spans necessary to carry the insulated signalling wires.

Two more crossing loops of the automatic type were later provided, in 1942, over the Queensland border at Bromelton and Greenbank.

Although these loops were of the automatic type, provision was made for staffing them when necessary, to avoid delays to through trains, and it was necessary to provide special accommodation to house the staff, a 12’ x 10’ cabin being provided for the purpose.

The opening of Bromelton brought the intermediate staff station, Round Mountain Quarry Sidings, between two automatic crossing loops, Tamrookum and Bromelton, necessitating a special circuit arrangement to enable the train crew to withdraw a staff from the intermediate instrument, an operation which normally requires an Officer at the controlling station. This was accomplished successfully, and Round Mountain is the only place where this method is in operation.

In 1941, a standard gauge siding was provided at Beaudesert Road to serve the Rocklea Munition Works. This siding crossed the Queensland main line and was controlled by staffs for the NSW section, Clapham - Kagaru, and the Queensland section Rocklea - Cooper’s Plains. To achieve Queensland control, auxiliary staff instruments were provided at Rocklea and Beaudesert Road Signal boxes, whilst an Intermediate staff instrument for the NSW section was provided at Beaudesert Road.

This method of working did not adequately meet the increasing demands, notwithstanding the opening of Greenbank as an automatic crossing loop, and in November 1943, Beaudesert Road was opened as a Follow-on Staff station, and the Intermediate instrument withdrawn.

Meanwhile, the provision of additional crossing loops and traffic facilities on other sections was becoming urgent and in May 1942, the first of a series of simplified loops was opened at Kilbride between Paterson and Wallarobba, followed at short intervals by similar loops at Bundook, Kerewong, Gauld’s, Braunstone, Mt Neville and Loadstone.

These loops were similar to the modified emergency type, referred to elsewhere, the only difference being the provision of Distant signals instead of Landmarks, which necessitated an 8 lever machine in each case. “Opening” and “Closing” levers were provided to permit of the Down and Up signals being left in the clear position, in the event of it being necessary to close the station temporarily. At these loops, the Staff Huts, Interlocking machine and the Staff Exchanging Platforms, were erected adjacent to one another to form a complete unit.

The opening at Kilbride involved the closing of Martins Creek as a follow-on staff station and the provision of an Intermediate staff instrument for working the Quarry Sidings.

When, in June 1943, the position became critical due to greatly increased military traffic, the position was reviewed and, as a result, a number of additional Crossing Loops were provided and the modified emergency loops referred to above were altered to permit of faster working.

All these loops, with the exception of Gauld’s together with the original installations at Coff’s Harbour, Kyogle, The Risk and Border Loop, were converted to the centrally operated type, involving, in each case, increasing the size of the interlocking machine to at least 20 levers.

In addition, new centrally operated crossing loops were provided at Nooroo, Yumbunga, Killawarra, Dalhousie Creek, Landrigans, Nana Glen and Kungala. Closing facilities were not provided at these loops, but “U” indicators, operated by a Guard’s lever were provided on the Main Line Starting signals to enable Guards to operate the frame whilst the station was unattended.

At Kagaru and Glenapp, the Down and Up Main Line working through the crossing loop was abolished in favour of Main and Loop line working and these stations were converted to fully signalled centrally operated loops with “U” indicators on the Starting signals. The Queensland interlocking machine in each box was replaced by a larger machine of NSW type.

Whilst the provision of additional crossing loops gave relief, in as much as traffic was moving more freely, the position in some of the older established yards was becoming acute, and it was decided to increase the accommodation at many of these stations. It was realised, however, that some immediate relief was imperative, and that this could best be provided by easing the restrictions on shunting movements by increasing the distance between the Home signals and Loop points. This work was commenced on 29/6/1943 and by 20/7/1943 fourteen stations had been completed, involving the refixing of 12 Bracket signals, 11 single signals and the provision of 3 new signals.

Meanwhile, the work of enlarging the Yards and improving the signalling facilities was proceeding.

Outer Home signals, with special “Shunting Limit” boards, were provided at Stroud Road, Wingham, Gloucester, South Grafton, Grafton and South Brisbane. The Outer Home signals at South Grafton and South Brisbane were of the Upper Quadrant, power worked type, whilst Upper Quadrant, motor worked Distant signals were provided at Stroud Road, Wingham and South Grafton.

At South Grafton additional Loco sidings were brought into use, whilst at Grafton, the Crossing Loop was extended and additional Down and Up siding accommodation was provided. This involved the complete re-signalling of the Yard and the erection of a new Signal box to accommodate a 52 lever machine. A feature of this work was that as the Sidings and Loop alterations were completed, they were brought into use, the connections being operated, temporarily, by ground frames, controlled by keys from the old Signal box.

At Glenreagh, Casino and Clapham, extensive alterations and additions to the Yards involved considerable signalling alterations.

Telarah was converted from a Follow-on station to an Electric Train Staff and Crossing station. Although the Crossing Loop was laid in on the Sydney side of the platform, it was necessary, for the convenience of shunting the Down Sidings, to retain the Signal box on the platform and this involved the operation of the points at the Sydney end by electric motor and the provision of an Intermediate Staff instrument for the working of Up trains. An interesting feature of the work at Telarah was the use for the first time on the NSW Railways of dual control points motors, fitted with ‘Hand Throw’ levers, for operation by the traffic staff in the event of electrical failures. This type of motor was also used at Gloucester.

At Gloucester the points at the Grafton end of the Loop were converted to motor operation and brought under the control of the Signal box.

The provision of additional siding accommodation at Taree and the necessity for providing for future extensions, involved the replacement of the existing Loco and Station Signal boxes, by two new Signal boxes, Taree South (68 levers) and Taree North (32 levers).

Mechanically operated Boom Gates were installed at Macquarie Street level crossing, adjacent to Taree North Box.

The provision of additional platform accommodation at Dungog involved considerable signalling alterations and the existing Signal box was displaced by a new Signal box (36 levers) erected in the new station buildings. A hand operated boom gate, the first of its kind, was provided at the Yard Crossing on the station side of the Back Platform Road.

Whilst the foregoing remarks give a general description of the major works carried out during the War Period, on the section West Maitland - South Brisbane, consideration must also be given to the minor works, carried out concurrently. These included such works as:

1 Signalling for Transit Sidings at various stations

2 A new station and Signal box at Nambucca

3 Provision of Commonwealth Siding at South Grafton

4 Track circuits and electric locks for the security of facing points in some cases where the Home signals were moved out from the points to give greater facility for shunting

5 Provision of indicators and repeaters where the signals were moved to sites which were not under direct observation of the Signalman.

These works, while not involving much in themselves, were, nevertheless a persistent drain on manpower and materials available for the major works, and it needed careful planning and organisation by the administrative staff to enable them to be completed efficiently and expeditiously without undue interference with the major programme.

Whilst statistics do not give a true picture of the work performed, it may be of interest to review a few of the major installations on the North Coast section, over the period of less than five years:

New Crossing Loops

Type “C” 7

Type “D” 7

Type “E’ 3

Converted to Type “D” 13

Total 30

Electric Train Staff instruments 38

Intermediate Train Staff instruments 5

Home signals refined to provide additional

shunting facilities 14 stations

Signal boxes 5 (212 levers)

**12.1 Telephone Facilities**

The volume of traffic handled on the North Coal Line necessitated the extension of the Train Control System from Casino to South Brisbane. As a result of this extension the Control was divided at South Brisbane. Newcastle controlled as far as Taree, as previously.

Telephone services were improvised by connecting a Sydney - Newcastle trunk direct to the Newcastle - South Grafton trunk, thus eliminating switching at Newcastle.

A single channel carrier installed between South Grafton and South Brisbane.

Additional metallic circuits were provided as well on various sections of the line to ease the congestion which resulted from the abnormal traffic.

**SOUTH COAST**

13 SUTHERLAND TO WOLLONGONG AND BRANCHES

The increased traffic, due to the establishment of heavy industries at Port Kembla, was anticipated during the first year of the War and additional automatic signals were installed on the Loftus - Waterfall Section. Three position signals replaced the two position signals with distants behind, and the sections were split up to reduce sectional clearing times. This work involved the provision of five new signals and the conversion of four 2 position to 3 position signals. The installation was completed in December 1940.

At the same time, an additional telephone line was erected between Loftus Junction and Thirroul, 2 - 200lb copper wires being provided for the full distance.

Three position automatic signals were provided, also, between Otford and Coal Cliff, some six months later, to replace the existing two position system.

14 WOLLONGONG - PORT KEMBLA

The largest project associated with Port Kembla, however, was the duplication of the line between Coniston and Port Kembla North. In addition to the new signal boxes at Coniston and Allan’s Creek *(Ed – actually opened in 1937*), automatic signalling was installed on the new double line.

The interlocking machine provided at Coniston was the first of the new electro-mechanical type.

Track block working was provided between Wollongong and Coniston which necessitated certain alterations at Wollongong, including a power operated Down Starting signal.

Electric power at 240 volts was taken from the Shire Council’s Main at various points along the line and adequate provision made for emergency operation in the event of a local power failure.

As the supply of low voltage signal motors was short at the time, advantage was taken of a number of 100 volt direct circuit motors, which were in stock of little value. Special rectifiers were obtained and these motors were operated directly from the Mains without the provision of a battery. The economy in both battery material and low voltage motors, which were needed for country work, was considerable. Batteries were also dispensed with on the track circuits, the direct current relays being operated by alternating current through a rectifier. This was the first occasion in which direct current motors and track relays had been operated in this way.

One other device, used for the first time, was a commercial product known as a “Westrak” Unit. Use of this piece of apparatus enables the feed and relay of a track circuit to be located together and under certain circumstances, economy in the use of control wiring is effected.

15 UNANDERRA

The opening of the Port Kembla duplication in July 1941, was followed four months later by the opening of the new junction and signalling arrangements at Unanderra.

The methods of interlocking adopted at Coniston were followed at Unanderra, but on a much larger scale. The new layout provided every facility for running and shunting moves in anticipation of the heavy traffic on the Branch line to and from Moss Vale.

Daylight Colour Light Signals and electric dwarf signals were installed and the Yard was completely track locked. The installation comprised a 32 lever mechanical machine and 28 electric levers controlling 41 signals and 9 mechanical points and associated facing point locks.

The problem of supplying current to the large number of direct current track circuits in the Yard was overcome by the provision of two secondary batteries, one at either end of the Yard, and each consisting of 2 - A8 Edison cells. The cells were placed on floating charge with a dry plate rectifier.

In view of the nature of the traffic dealt with in the Yard it was decided to dispense with “overlaps” in the running signal control circuits, thereby simplifying the track locking and effected economies in relays and wiring.

Special emergency power supply arrangements were provided so that in the event of a local shut down of the power, the track locking continued to function to permit the movement of points.

**MAIN SOUTHERN LINE**

The record of work performed on the Main Southern Line during the War is, for all practical purposes, a record of the relief afforded the long single line section, as it existed at the commencement of hostilities, between Cootamundra and Albury.

Admittedly alterations and additions were carried out elsewhere, but, in the main, the signalling system, as it existed in 1939, was able to cope with the tremendous traffic between Sydney and Cootamundra throughout the War Period.

16 JUNEE - ALBURY

Seven months after the outbreak, Table Top was converted from a Follow-on Staff Station to a fully signalled crossing loop, centrally operated. This was followed, six months later, by the conversion of Yerong Creek to a centrally operated loop.

The Wagga Wagga - Uranquinty section next received attention, and in March 1941, it was divided at Kapooka, and finally, in December 1943, Kinloss was opened as a centrally operated loop, thereby dividing the section Table Top - Albury.

The provision of these additional crossing facilities indicates, clearly, the pressure imposed on this line, the longest remaining section being 12 miles in length, between Culcairn and Gerogery.

From time to time a large amount of work was carried out at Albury. New interlocking machines were installed in both Station and South Signal boxes. Altered and additional Yard arrangements were provided for in Station Box in 1940 and controls for a Victorian Shunting Neck were provided in South Box in July 1942.

Additional siding accommodation on both Up and Down sides of the Main Line necessitated considerable additions to Station box interlocking during 1944-5. A relay unit machine was installed to save mechanical extensions and releasing switch controls were provided for the remote Siding connections. A power worked Outer Home signal with a Distant signal behind, also power worked, and an Intermediate Electric Train Staff instrument at the inlet to the Down Sidings were also provided.

Other works carried out were the extension to the platform at Wagga Wagga and alterations to the connections at the Albury end, and the provision of a Signal box and mechanically operated boom gates at Tarcutta Road Level Crossing, Wagga. Protection of the Level Crossing was necessitated by the heavy road traffic consisting, largely, of military vehicles.

The gates were fully interlocked and special arrangements were made for the Signalman to receive ample warning of the approach of both Up and Down trains. This installation of mechanical booms was the first of its kind outside the Metropolitan Area, similar gates were subsequently provided at Parkes.

17 COOTAMUNDRA - JUNEE

The largest single undertaking during the War, so far as this Branch was concerned, was the duplication of the Cootamundra - Junee Section, together with major alterations to Cootamundra and the Junee Yards. The latter work was not completed although a great deal of preparatory work was done.

The automatic signalling on the through section followed standard practice. Three position signalling was adopted, the controls being on open line wires with a special red lead weather proof covering. 200 miles of this class of line wire were required together with 250 miles of bare copper wire. A special feature was the erection of all battery and relay huts at Cootamundra Depot. They were of timber and fibro construction and fitted with the necessary shelves and terminal boards. Relays were installed and wiring completed prior to loading on trucks for despatch direct to their locations in the field. Portable ramps were used unloading and setting on prepared foundations.

The complete installation, as it now exists, was brought into use in three stages, between March and October 1942, viz: Cootamundra - Tanyinna, Bethungra - Illabo and Illabo - Junee North, in that order. Between Tanyinna and Bethungra the single line was retained pending the completion of the difficult construction work on Bethungra Bank. Relay unit machines were added to the old machines at Cootamundra South and June North to avoid expensive additions to Signal boxes which would be dispensed with when the new Yards were completed.

Siding connections with automatic releasing arrangements were provided at Strattons Siding and at a Commonwealth Oil Storage Siding on the Down side near Cootamundra, also at Frampton and Marinna Goods Sidings whilst at Illabo an interlocking was installed, complete with closing arrangements.

Major items of equipment, apart from line wire material were:

Upper Quadrant signals 36

Direct Current Track Relays 93

Relays 196

Primary Battery Cells 1570

(Summary is exclusive of requirements for Cootamundra and Junee Yards)

18 COOTAMUNDRA

The duplication of the Cootamundra - Junee Section was undertaken to increase the track capacity and accelerate traffic movements and in order to achieve these objectives, it became essential to provide additional station, traffic and locomotive facilities at both Cootamundra and Junee.

The double line terminated on the Sydney side of Cootamundra at North Junction, and, with the opening of the duplication to Junee, commenced again at the southern end of the Yard. The first requirement, therefore, was to complete the duplication through the Yard and secondly to provide additional traffic marshalling sidings with adequate facilities for the expeditious handling of locomotives.

A new main line was laid in, extended from North Junction to Cootamundra South. The old island platform was extended and relocated and served on one side by the Down Main Line and on the other by a Down Refuge Loop. The up platform was extended to 800 ft to accommodate, satisfactorily, long mail and express passenger trains.

Connections were provided at both the North and South ends to the Down Sidings which had to be moved over on account of the encroachment of the Down Refuge Loop, and the shunting neck was extended and alterations and additions made to the sorting sidings at the North end.

It follows that these additions entailed considerable alterations to the track layout and in order to meet, fully, the traffic demands in the marshalling and despatch of 1,000 ton loads intensive signalling became a matter of prime importance.

Automatic signalling had been in use for many years on the Wallendbeen - Cootamundra North Junction section, and, with similar working on the southern side, the correct procedure was to continue power signalling on the new double line through the Yard. The Main Lines, therefore, together with the Down Refuge Loop and No 1 Platform Road were fully track circuited and power signals provided for through main line movements. Both-way working, with full protection for opposing running moves, was provided on both the Down Main Line and No 1 Platform Road.

Under the old arrangements three signal boxes were required, viz. North Junction, Station Yard and South. With the introduction of power worked signals the opportunity presented itself of dispensing with North Junction Signal box and operating the connections by power, controlled by the new North Signal box at Temora Road crossing. As the Junction box was staffed continuously this effected a considerable saving.

Another advantage, accruing from automatic signalling, was the introduction of single line track block working between Cootamundra West and North Signal boxes via the South Fork. Due to the preponderance of engine moves from West to North, after reversal, balancing of Tablets under the old token system was a frequent necessity.

The yard itself is bounded north and south by two main roads, Temora Road on the north and Gundagai Road on the south, both roads carrying a fair amount of traffic. It became necessary, therefore, to provide full level crossing protection and to this end, the boxes were located adjacent to the respective highways. Power operated boom gates were installed together with wicket gates for pedestrian traffic.

These locations proved eminently suitable from a signalling point of view and all points came within range for mechanical operation with the exception of those at North Junction and the connections into the North Dock at No 1 Platform.

A difficultly, however, which was always present in the working between two boxes, relatively close together, is the large amount of overlapping signal controls - each box requiring to control signals departing from one interlocking and approaching the other.

In purely power worked areas this is overcome electrically without much complication, but in the case of mechanical signals, cumbersome dual control equipment is required. In order to avoid the disadvantages and difficulties associated with this equipment electric controls were provided on all mechanical levers operating signals which were controlled by both boxes. This compromise has proved entirely satisfactory and has enhanced the efficiency of the working within incurring the expense of full power operation.

Each signal box was equipped with a mechanical machine, 64 levers in North Box and 56 levers in South Box, and two miniature lever units.

All power worked signals and points were controlled by the miniature levers together with the ‘overlapping’ controls on the mechanical signals.

Power was taken from the town supply at 240 volts at both signal boxes and stepped down to 120 volts through 10 kVA transformers.

All track circuits were the AC - DC type with rectifiers and signal motors operated at 110 volts DC through suitable rectifiers whilst the points motors were standard 110 volt AC mechanisms.

19 MISCELLANEOUS WORKS

Apart from those already described, additional facilities on the Southern Line were only provided at scattered points. Principal among these were:

MOSS VALE Additional Sidings

GOULBURN Alterations to Goulburn North to facilitate moves to and from the Crookwell Branch, which was called upon to carry a large amount of ore traffic.

BREADALBANE Additional automatic signals and releases for a double ended siding between Breadalbane and Cullerin. This installation was carried out for the Australian Iron and Steel Co.

20 TELEPHONE FACILITIES

The telephone services on the Main Southern Line were extended by the provision of a carrier channel between Goulburn and June and additional trunk line facilities between June and Albury, the latter circuit being phantom over existing Circuits.

Metallic circuits, in addition to those existing, were erected between Sydney and Moss Vale and Goulburn and Harden.

**MAIN WESTERN LINE**

21 EMU PLAINS TO ORANGE

A survey of the list of signalling works carried out on this line reveals that, with one exception, the alterations were necessitated by new connections or other structural alterations. In other words the abnormal traffic between Sydney and Lithgow was handled adequately without any additional signal facilities between Emu Plains and Lithgow.

22 BOWENFELS

The one exception, referred to above, in which greater flexibility in traffic working was required was the section Lithgow - Bowenfels.

There were several contributory factors, chief of which, was the passenger service inaugurated between Katoomba and Cooerwul, a new station immediately on the Sydney side of Bowenfels and serving the Lithgow Small Arms Factory.

Workmen’s trains, conveying shift workers, were run from Katoomba three times a day and, as they terminated at Bowenfels, engines had to be run back to Lithgow for reversing and fresh engines brought out to take the return trips, all of which intensified traffic between Lithgow and Bowenfels at certain hours of the day.

A further difficulty associated with the working at Bowenfels was in respect of the shunting of the Goods Siding from the Up Main. The Officer-in-Charge had no indication of approaching trains and further, he had no means of placing the automatic signals on either side to ‘Stop’. This unsatisfactory condition gave rise to a reluctance on the part of the Control Officer to despatch an Up train from Wallerawang whilst a train was about to shunt Bowenfels.

In order to meet traffic requirements extensive alterations were made although they were concentrated in a relatively small area.

A miniature lever unit was provided at Bowenfels with provision for operation by the Station Officer when the station was open or by the Guard of a Goods train requiring to shunt. This lever unit controls Up and Down Signals on either side, and with full track indication, ensures satisfactory working under all conditions.

Additional signals were installed between Lithgow and Bowenfels - one Up and one Down Automatic Signal - thus providing closer headway and facilitating shunting trips ex the Colliery Line.

In Bowenfels Yard additional releasing switches were provided for two Goods Siding connections, and also for the Up Siding to permit of refuging Up trains and immediately west of Bowenfels the provision of a new Down automatic signal permitted earlier clearance of the signal admitting Down trains into Bowenfels platform.

The whole of this work was carried out and completed in 1943.

23 MARRANGAROO

The establishment of a large Commonwealth Stores, in 1942, some miles from the railway line at Marrangaroo, necessitated connections to both the Uo and Down Main Lines, the latter being a facing connection, at the western end of the platform.

Traffic requirements introduced several special features into the signalling arrangements which are unique so far as this system is concerned.

Under normal working conditions the automatic signals clear for the through road and a Down train arriving at Marrangaroo, preparatory to entering the Branch line receives a clear signal at the Down Facing Points. A special cancelling button was provided on the signal post to be operated by the driver and after a pre-determined time the Home signal returns to ‘Stop’ and the guard is then enabled to obtain an electrical release for the points, provided the Up Road is clear. This is the only instance where provision is made for the automatic release of a facing connection.

A second requirement was in respect to despatch of Down trains which necessitated a Wrong Road movement on the Down Main from the Stores Branch Line. To provide adequate protection an additional Down Automatic Signal was necessary and the controls for the special move extended back a distance of 2 1/4 miles.

Two releasing switches, an Upper Quadrant power worked signal at the Facing Points and a six lever machine to operate the connections completed the requirements.

24 MISCELLANEOUS

Loop Sidings were provided between Orange East Fork and Orange and between Cowra and Wattamondara.

The former was located within the single line track block section necessitating special releasing arrangements, whilst the latter involved the provision of an intermediate electric staff instrument.

Sidings for the Commonwealth Stores at Kelso, which were brought into use in 1943, made connection with the Main Line in Kelso Yard and considerable signalling alterations were necessary to provide for traffic movements.

Work of a somewhat similar nature were carried out at Bathurst West for another Stores Siding connection. This latter installation was the initial step in providing additional traffic facilities in Bathurst Yard - a major undertaking which is still in hand.

25 TELEPHONE FACILITIES

A single channel carrier telephone system was installed between Sydney and Orange, thereby providing direct communication between Sydney, Parkes and Narromine.

**METROPOLIAN AREA**

A great deal of work, directly and indirectly associated with the war effort of the Railway Department, was carried out within the immediate Metropolitan Area.

The immense amount of traffic passing through on its way north or south was handled successfully by the signalling system as it existed in 1939, and only in isolated instances was it found necessary to provide additional signalling to meet traffic demands. For the most part, the efforts of the Branch, so far as the Metropolis was concerned, were directed towards the provision of signal and interlocking facilities rendered necessary by new installations.

These varied between minor works such as an additional siding on the Botany Goods Line and major undertakings such as the provision of a power interlocking to control the new yard at St Marys consequent upon the establishment of a Munitions Factory by the Commonwealth Government.

26 INGLEBURN

From an historic point of view, the alterations and additions carried out at Ingleburn in November 1939 are important in that they were the first undertaken as a war measure.

The platforms were lengthened and arrangements made for the termination of Down trains in the Up Platform, all in preparation for the heavy military traffic to the local camp.

27 SYDNEY STATION

Wartime traffic accentuated a difficulty that had been experienced at Sydney Station for some years in the handling of long passenger trains at certain platforms. Conditions, which occurred principally at holiday periods in normal times, became a daily occurrence during the War and some measure of relief became imperative.

Special Starting Signals were installed for Platforms 1, 4, 8 and 10. Track locking circuits were amended accordingly and a special type of dwarf running signal, of new design, was necessary on account of limited clearance preventing the erection of standard signals.

28 PARRAMATTA

Parramatta, on the western section, is the terminus of the electric service and, apart from the electric trains dealt with, there is a very heavy steam traffic - both passenger and goods. A number of steam passenger trains, connecting with the electric trains, terminate at Parramatta. During the war period, the platform accommodation and the track layout were inadequate for the requirements, and additional platforms, tracks and crossover facilities were designed and undertaken.

The problem in respect of the signalling was that some of the new point connections were outside the range of the existing mechanical Signal box, and the track alterations were so extensive that to carry out the signalling as an extension of its original mechanical form would have necessitated more than one signal box.

This was avoided by the provision of a small electric lever unit, immediately above the mechanical interlocking machine, and the installation of electro-pneumatically operated signalling at the Sydney end of the Parramatta interlocking. Small air compressors in duplicate, directly coupled to electric motors, were installed to provide the necessary air pressure. These compressors cut in and out automatically on the lowering or raising of the air pressure. The arrangement has proved entirely satisfactory.

Associated with the station alterations at Parramatta was a complete train indicator system, worked from a central control point, to enable the train departure indications to be displayed simultaneously at four entrance locations, the whole operation being synchronised by the use of Selsyn motors. This installation was completed in August 1942.

A further addition to the Parramatta machine was a small panel controlling the Up Refuge Loop at Westmead. This panel, which came into use in February 1944, incorporated several unique features:

1 The Controlling levers or Keys are mounted directly on the Indicator Diagram Panel.

2 The Track Indicator Lights are normally extinguished and give a red light indication when the track is occupied.

3 The levers are “Route” levers, in so far that both points and signals for a particular route are controlled by the same lever. One lever designated “Loop Enter”, controls the points and signal leading into the loop whilst a second lever, “Loop exit”, controls the exit points and signal. A third lever allows the signalman to set the main line for automatic working when the loop is not required.

These features were provided specially to facilitate the work of the Signalman who is fully occupied in dealing with local traffic at Parramatta.

The Remote Control Circuits are similar in principle to those used at Villawood, the only variation being in respect of the ‘route’ method of signalling.

Wire recovered from Parramatta was used, for the most part, between Parramatta and Westmead and considering the number of functions controlled and the indications returned to the Signalman a relatively small amount was required.

The installation, though small, is the most modern in NSW.

29 BLACKTOWN

The provision of a new platform serving the loop line on the Richmond Branch together with power operation of the loop points at the Richmond end necessitated extensive additions to the Blacktown machine.

In common with works of a similar nature an electric lever unit was added and a relay location was erected adjacent to the Signal box.

The space available clear of the interlocking machine was so small that the indicator diagram, to which the miniature lever unit was attached, was mounted on special rollers so that it could be push back clear of the levers for normal operation and drawn forward for maintenance purposes. Flexible connections were used for the wiring to the diagram and the lever unit.

30 SEVEN HILLS AND ROOTY HILL

Works on considerable magnitude were carried out at both Seven Hills and Rooty Hill, all of which formed part of the quadruplication programme.

31 ST MARYS

The largest power interlocking installed during the War was that at St Marys. The Dunheved Branch line into the Munitions Factory, which was built in conjunction with this work, was also equipped with automatic signalling. An all-relay interlocking was installed at St Marys similar to the installation at Sutherland, which came into use in October 1939.

The track layout at St Marys was designed to form part of the western duplication scheme and to that end and the two Down Roads and two Up Roads were provided adjacent to one another. This arrangement permitted the installation of the permanent track and signal facilities - an important consideration when the four roads to Penrith are completed.

A connection to the new Down line through St Mary’s - known at this stage as a “Down Refuge Loop” was take off the Down Main some 25 chains on the Sydney side, whilst the new Up road connection was made a short distance west of the platform and extended for a little over half a mile. Access to and from the Dunheved Branch was provided from all four roads and island platforms served the Up and Down Lines.

These connections together with a Goods Siding on the Down side and power operated boom gates protecting the level crossing necessitated the provision of a 64 lever machine, all electric.

An elevated signal box was erected at the western end of the Up Platform, a position commanding an uninterrupted view of both road and rail traffic. The road traffic passing over the level crossing was particularly heavy and it was realised, early, that every facility would be required by the Signalman to protect the Crossing and at the same time handle the fast main line train traffic. Signal controls extended for a mile on either side of the Signal box on the Main lines and for a similar distance on the Branch line.

Difficulty was experienced in obtaining much vital equipment during construction and for that reason it was impossible to standardise on point and signal mechanisms.

Light signals were used extensively, but in order to ease the position in the Signal Workshops, a number of 110 volt direct current Upper Quadrant Signals were utilised.

These mechanisms were all that remained in stock after the completion of the Wollongong - Port Kembla installation.

A similar position arose in regard to the point mechanisms. A number of 110 volt DC machines were on hand and, being unsuitable for use elsewhere, it was decided to make use of them for this work. Sufficient were available to equip all but three pairs of points on which 110 volt AC machines were used.

A main 110 volt secondary battery was installed for signal and point operation, the same supply being used also for control purposes. This latter provision reduced the requirements of AC relays.

Power supply at 120 volts AC was obtained from the Departmental 66kV line through suitable transformers with an emergency supply from the local Council mains. An Automatic Change-over Switch cut either supply into service should the other fail.

A special feature was a “Code Call Discriminator” designed and manufactured within the Department. This device is so designed that it responds only to the code call of St Marys on the Omnibus Telephone Circuit, thereby saving the annoyance of continual ringing from other stations.

32 ST MARYS - ROPES CREEK

The construction of a Branch line from St Marys to Dunheved and Ropes Creek, serving the Munitions Factory, was undertaken in conjunction with the remodelling of St Marys.

The line was equipped with power signalling and mechanical interlocking were provided at Dunheved and Ropes Creek. The former required a 32 lever machine and the latter 40 levers.

Six colour light signals were installed requiring in all, twelve track circuits. The track circuits were similar to those on the Wollongong - Port Kembla section using an alternating current supply with direct current track relays and rectifiers.

A special signalling pole line was erected between St Marys and Ropes Creek. This line was used, also for power distribution, supply being taken at Dunheved and Ropes Creek.

33 VILLAWOOD

A Munitions Factory covering a large area was erected between Chester Hill and Villawood. Connections from the Up and Down Main lines to the factory area were laid in at both the Chester Hill and Villawood ends and, for traffic purposes, it was necessary that both connections should come under the control of Villawood.

In addition, a connection south of Villawood was provided from the Up Main to a store associated with the factory on the opposite side of the line.

The connections to the factory at the Villawood end and to the Stores Siding at the southern end of the platform came within the range for mechanical operation from the existing signal box at Woodville Road Level Crossing. Those at the Chester Hill end, however, were 3/4 mile away and thus necessitated power operation.

A Miniature electric level unit containing 30 keys was added to the 12 lever mechanical machine and the electric levers used to control all signals and power worked points, the mechanical levers being reserved for points within range and facing point locks. This arrangement avoided an extension to the machine and Signal box.

On account of the distance to the connections near Chester Hill special remote control circuits were designed using telephone type relays and telephone cable, thereby effecting considerable economy in the use of insulated wire.

34 QUAKERS HILL

At the instigation of the Fleet Air Arm of the Royal Navy, signal protection was provided for a Runway on the Schofields Aerodrome which impinged on the Railway Line, approximately midway between Quakers Hill and Schofields.

The single line was track circuited between the two stations and power operated signals installed on either side of the runway.

Control of these signals was exercised by a single miniature lever in Quakers Hill Signal box operating in two positions.

The signalling pole line was dispensed with across the area approaching the runway and insulated wire in troughing substituted.

Telephone communication was provided between Quakers Hill Station and the Aerodrome authorities so that complete co-ordination could be obtained during the passage of trains or the movement of aeroplanes on the runway concerned.

**COMMUNICATIONS**

Reference has been made, elsewhere, to additional telephone facilities provided throughout the lines, but two special sections have yet to be dealt with, viz: Automatic Telephones and Telegraphs.

35 THE AUTOMATIC TELEPHONE SYSTEM

To meet the increased demands of the service generally, many additions were made to the Railway Automatic Exchange network. In the Sydney Area additions included the installation of 100 line automatic exchanges at Homebush and Sydenham and a 200 line exchange at Darling Harbour to facilitate handling of the Goods Train Services.

An additional 100 line unit was installed at Newcastle and alterations were made to the direct automatic telephone circuit between Sydney and Newcastle which gave more reliable service. New branch exchanges were also provided at Port Waratah and Broadmeadow.

At Goulburn, traffic increases necessitated the introduction of speedier and more comprehensive services and a 100 line automatic exchange was installed, an innovation which was warmly welcomed by the hard pressed traffic staff owing to the speedier and more certain working which was brought about.

Departmental automatic telephone services were provided for various Service Departments as follows:

1 Navy, Army and Air Force Transport Officers

2 Movement Control Officers

3 D.A., Q.M.G., Victoria Barracks

4 HQ 2nd Australian Army, Carlingford

5 HQ US Army

6 Allied Works Council

7 Board of Area Management, D.A.P.

8 Commonwealth Land Transport Department.

Close co-operation was maintained with the Postmaster General’s Department and Service authorities in providing the necessary cables and wiring for the various communication services.

The establishment of an Aircraft Annexe and Small Craft Assembly Plant by the Department necessitated the provision of extensive communication facilities which involved modern common battery manual exchanges to handle incoming Postal and Railway automatic lines and local services and, in addition, an inter-office communication system in both plants.

36 TELEGRAPH SERVICES

Coupled with increasing demands on the telephone system were increases in telegraph business and, to meet these, improved methods were introduced to speed up the handling times.

A three channel carrier telegraph system was designed and manufactured within the Department and installed between Sydney and Newcastle to economically provide additional telegraphic facilities. On one of these channels a teletype system was installed to operate between Sydney - Enfield - Broadmeadow and Newcastle Control Offices to enable information respecting train loads to be sent promptly. At the same time a teletype service was provided between the Car Diagram Bureau at Sydney Station and the Newcastle Booking Office to meet the requirements of the Traffic Branch Booking Staff which needed a speedier interchange of information.

Duplex Telegraph equipment was designed and manufactured within the Department and installed between Sydney and Spencer St station, Melbourne, with a repeater station at Albury, and the Simplex Circuit from Sydney to Albury was replaced by Duplex working with an intermediate station at Junee. The success of these installations was so marked that the Victorian and South Australian Railways requested similar Duplex telegraph equipment to be made up by the NSW Railways, and this was purchased and installed between Melbourne and Adelaide during 1943.

**SIGNALLING EQUIPMENT**

Prior to the outbreak of War the position was reviewed in respect of stocks of certain items of vital signalling material and steps were taken, as far as possible, to ensure that ample supplies would be available in the event of hostilities commencing.

The material concerned was equipment manufactured completely, in either England or the United States of America, together with raw material and component parts for manufacturing, in Departmental Workshops, equipment which, up to that time, had not been made locally.

The principal items concerned were as follows:

Power signal and points mechanisms

Primary batteries for signalling purposes

Signalling relays

Electric motors for train stop and points mechanisms

Insulated signal wire and cable

Lenses and roundels for signal lights

Coloured sheet glass for signal roundels

Electric lamps - Non commercial types and sizes

Insulating materials, eg vulcanised fibre for insulated rail joints

Telephone and general communication equipment

The stocks available were sufficient for 12 months requirements, based on experience of previous years, for both maintenance and new works programmes, and, with a view to meeting the anticipated construction work, arrangements were made to increase the quantities on order to meet any emergency.

As the War progressed, difficulty was experienced in respect of insulated wire, which, up to that time had not been manufactured in Australia, and arrangements were made for supplies to be obtained from Cable Makers Ltd., Liverpool NSW and Olympic Tyre and Rubber Co Melbourne, Victoria. These manufacturers were able to produce, locally, wire which conformed to the exacting specification for signalling requirements.

Difficulty occurred, also, in obtaining supplies of vulcanised fibre sheet for the manufacture of rail insulations and from time to time it was necessary to use substitutes.

Large quantities of channel steel, 1 5/8” x 1 1/4”, used for point rodding connections, were required for the extensive crossing loop programme and for other mechanical installations and at times requirements were barely met.

A satisfactory arrangement was made in 1942 with the Melbourne Iron and Steel Co., for consignments of uncropped and unstraightened channel iron steel to be forwarded directly to Cootamundra Depot where staff were assigned to process the material.

The work involved cropping, straightening and punching, and in all, about 300,000 feet were processed.

The position in respect to all supplies became much more acute with the entry of Japan into the War, but orders placed earlier in the USA were fulfilled in sufficient time to cover requirements. Equipment was obtained subsequently through the Division of Import Procurement and as a result it can be said that at no time was the standard of signal equipment modified to any great extent.

37 DISPERSAL OF MATERIALS FOR SAFETY

Signalling material and equipment are stored normally at Chullora and Sydney, but in view of the vulnerability of both locations it was deemed advisable, after the outbreak of the War, to disperse large quantities in country centres.

Signal depots and any station having suitable storage accommodation were used. Many locations were selected, amongst them being Brewongle, Bathurst, Goulburn, Breadalbane, Yass, Binalong, Harden, Cootamundra and Frampton.

**NATIONAL EMERGENCY SERVICES**

Considerable NES activity was manifested in the Department following the entry of Japan into the War and together with other Branches, steps were taken to provide for any emergencies that might arise as a result of enemy action.

The following arrangements were made in the Metropolitan Area:

1 Emergency Metropolitan Depot and Signal Trouble Office - This was established in the disused Eastern Suburbs tunnel at Redfern Station and was fully equipped to maintain essential telephone services and otherwise serve as an emergency headquarters for Metropolitan Maintenance Staff.

2 Creation Warden’s Posts -

(A) Posts - The 26 Depots and four Field Offices in the Metropolitan Area were established as Wardens’ Posts, thereby inaugurating a scheme of decentralised control so that each squad could work independently should communications fail with the Central Authority.

(B) Wardens - All Chargehands and certain other employees possessing NES Certificates were appointed Wardens. Regular instruction regarding their special duties was given by the Supervising Officers.

(C) Staff under the Control of Wardens - Men were selected and appointed to act in Special Capacities under the direction of the Wardens.

(D) District NES Organisation - Each Warden was supplied with full particulars of the local district NES organisation, which information was also available in the Signal Trouble Office.

(E) Lectures to Wardens and Staff - A series of lectures was delivered by a Senior Officer to all Wardens another staff on various phases of ARP work. These lectures were supplemented by the Fire Appliance Officer of the Chief Mechanical Engineer’s Branch.

3 Issue of NES Equipment

This equipment was issued to all Supervising Officers and Maintenance Staff in the Metropolitan Area including specially selected Repair Gangs which were to be utilised in the case of emergency.

4 Emergency Materials and Ambulance Equipment

Materials for emergency purposes were distributed at various points throughout the Area, together with First Aid Equipment in addition to the Ambulance Boxes already supplied.

5 Air Raid Alarms

A comprehensive alarm system was provided for all Branches of the Railway and Road Transport Departments.

Air raid warning signals were given by means of hooters or bells and the system embraced the whole of the Eveleigh - Macdonaldtown Workshop Area, together with the Randwick Tramway.

*COMMENTS –*

*It has been noted that some works were omitted for some reason. On the line between Unanderra and Moss Vale new crossing loops were provided at Mt Murray and Calwalla, but it is believed that they were never brought into use. Another crossing station was operated at Dombarton, but as it was on a very steep grade, a special zig zag arrangement meant that most trains went into the zig zag sidings to allow crossing and a chance to restart trains on the level.*

*On the North Coast, Bartletts was also opened as a Electric Staff stations. Both it and Gaulds were closed when Landrigans was opened.*

*NSWR TERMINOLOGY*

*This section has been added to explain some of the terms and practices used in NSW that may be unfamiliar to some members.*

*Ordinary Staff or Ordinary Train Staff – the NSWR term for Staff and Ticket.*

*Receptacle Key – special key provided to allow trains to work intermediate sidjngs when travelling on a Staff Ticket. The key also had a receptacle to hold the staff ticket.*

*Long – Short Staff Sections – from about the 1920s it was unusual for NSW staff station to switch out as automatic operators were provided for operation by train staff.*

*Miniature Electric Levers or Electric Lever Unit – was an interlocking machine consisting of Kellogg (or Telephone) Keys. First used in 1937 and not superseded by rotary switches until the late 1950s. Originally the miniatures were used by themselves as relay interlockings. In 1941 they were combined with mechanical levers in some locations.*

*Boom gates were the normal in for level crossing protection operated from signal boxes from about 1913. It had been the practice in NSW for level crossings to be replaced or closed where possible from as early 1892. Interlocked swing gates were used early but were not used for new installations from about 1913 although the double purchase gates wheels were recycled until about the start of World War Two. The new gate control where were then used for mechanically operated gates until the introduction of Type F flashing lights and half booms by the mod 1950s.*

*Boom gates were probably adopted because they were simpler to construct and maintain as well as reduce damage due to accidents. In the Newcastle Area power operated gates were used from the later 1930s using compressed air or hydraulic systems. At some other locations the booms were operated electrically. At country and outer suburban locations hand gates were preferred until labour costs made it too expensive.*

*U Indicators were a means to allow trains to pass Starting signals in the Stop position at single line crossing loops. The U indicator was displayed below the Starting signal arm when the Guard’s lever was reversed and could be passed when the driver was in possession of the staff and the guard waved his piece of green cloth.*

*Electric Staff instruments for the War period were all manufactured in the Workshops.*

*Releasing Switches were the NSW version of a Switchlock were the operation of the releasing handle allow an Annett Key to be removed to unlock a ground frame.*

*The Australian War Memorial holds some documents and manuals of how to move traffic by rails and also proposals for gauge conversion between Port Pirie and Broken Hill by the US Army. This did not proceed as transshipping arrangements at Broken Hill were working and the conversion would take too long and then could not be justified.*

*Amongst the files referred to were:*

*Australian War Memorial – AWM242 Tec 7 “Transport of Coal and Iron Ore” 1940*

*“Railway Manual – War 1942” – Directorate of Railway Transpotation, General Headquarters, Melbourne 1942*

*CAPTIONS FOR PHOTOS*

*Westmead panel – The first route set panel in NSW was installed in Parramatta signal box to remotely control the points at Westmead. When the Up Refuge Loop was extended to Seven Hills and a complimentary Down Relief Line was later opened, the panel was reconfigured so that one Kellogg Key operated the entry points to the Down Relief and the other the exit points from the Up Relief.*

*Allans Creek – this signal box was actually opened prior to the War. It was initially opened to control the connections to the first industrial sidings into Lysaghts Works. Later the line through here was duplicatedand a triangle connection from Unanderra North. After the War a further connection was provided into the Australian Iron & Steel’s (later BHP) Flat Products Division. This style of signal box, timber and steel framed and clad with fibro sheets, was common for elevated structures between the mid 1930s until the early 1950s.*

*Coniston – the relay interlocking panel in the new signal box. In addition, a small mechanical frame was also installed to operate the points and locks in front of the box. The box had been relocated from Woodville Jct after it was replaced by a new signal box beside the Donald Street level crossing. As the signal box was reasonably new it was reused at Coniston where, although a relatively large building, it housed only a small panel and frame.*

*Gaulds – this is one of the short lived emergency loops and consisted of a staff exchange platform, an open frame and a staff hut.*

*Parkes – the interior of the new signal box with a large standard mechanical frame, a combined track circuit and box diagram. On either side of the diagram is the pulling list and the Kellogg Key panels. The bell at the nearest end of the diagram is a block bell to announce trains to the signalman at Goobang Juntion. At the far end of the frame is the NSWR style gate wheels to work the boom gates. To the left hand end is a MES instrument. The Kellogg Key panels were co-numbered with the mechanical levers.*

*Parkes – Gate wheel. This style of gate wheel appeared about the early 1940s and remained in use for new installations until about 1952. This example has a fabricated framework, but at least one example had a cast framework.*

*All photograph were from the former NSWR Signal and Telegraph Branch in the R. Taaffe Collection*