



An early photo of Knapsack Viaduct. The end of Top Road on the Lapstone Zig Zag was located at the top of the cleared hill on the left hand side of the bridge. The landscape is vastly different today, the farmland in the foreground has given way to the suburb of Emu Plains and trees now block the view of the bridge from this angle. **ARHSnw Railway Resource Centre 51152**

# Conquering Lapstone Hill

A Fresh Look at the History of the Emu Plains—Blaxland Section of the Main Western Line

Neville Pollard and Graham Harper

**A**t the western extremity of metropolitan Sydney, some 60km from the Central Business District, a plateau variously known as the Eastern Highlands, or more descriptively, ‘The Blue Mountains’ stretches across the landscape. Its eastern edge, known geologically as ‘The Lapstone Monocline’, rises steeply from the coastal plain. Both this escarpment and the deep gorges beyond were a considerable barrier to early European settlers, who did not discover a way across until Blaxland, Lawson and Wentworth’s achievement in 1813. The derivation of the name ‘Lapstone’ is worth relating, as the area was originally a river before tectonic forces caused the uplift of the range. Many water-worn flat stones were found that resembled the ‘lapstone’ of a shoemaker.<sup>1</sup>

## Early Road Crossings

Attempts to construct roads began soon after the historical crossing. Cox’s Road of 1815 followed a survey undertaken by William Evans, and crossed the Nepean River below the present weir on the north side of the rail bridge, turning south-west for about two miles following roughly the course of what we now know as Nepean Street, Emu Plains, to the present Leonay Golf Club. Here the road turned west climbing the steep ridge between Knapsack Creek and Tunnel Gully to join what is now Knapsack Street, Glenbrook.

This road was not really satisfactory; the steepness of the climb coupled with the marshy ground near the river prompted the construction of the ‘Zig Zag’ Road in 1824. This is now known as ‘Old Bathurst Road’ and generally attributed

to William Lawson. Crossing the river by the ferry, just south of today’s Victoria Bridge, the road ran west over the future level crossing at Emu Plains station to climb the escarpment by a series of zig zags, meeting Cox’s Road at the Pilgrim Inn near the site of the present Blaxland station.

In 1832 Sir Thomas Mitchell surveyed Bathurst Road, or Mitchell’s Pass, on the south side of Brookdale Creek from the newly surveyed town of Emu Plains to Zig Zag Road and Pilgrim Inn. To cross a tributary stream Lennox built his famous sandstone horseshoe arch bridge, still used by light traffic. Mitchell’s Pass is now ‘one way’ to traffic descending the range.

The route of the Great Western Highway will be discussed later in the essay.

## Railway Routes

It took three attempts to find a satisfactory rail route up the escarpment. Eminent historian Dr Stuart Sharp comments:

*A significant point about a railway over the Blue Mountains is that it is an important example of an unusual way to provide the railway alignment. The usual practice is to build railways in valleys but, in the case of the Blue Mountains, the history is about the use of mountain ridges to provide the rail corridor.<sup>2</sup>*

When the line opened to Glenbrook in 1867, Whitton had to be content with a zigzag to gain height. Shortage of funds meant that he had to shelve two schemes when it was likely that either would have achieved the desired outcome at the first attempt. To get the line up Lapstone Hill, Whitton proposed using two tunnels, 725 yards and 1,120 yards in length, respectively, on a grade of 1 in 42. The second scheme involved a longer route further north up the Grose River Gorge at a lower altitude but necessitating longer tunnels and the same degree of heavy earthworks<sup>3</sup>.

A number of histories have been written extensively on this section of the Great Western Railway including, more recently, William Bayley's monograph *Lapstone Zig Zag Railway* published 1975, reprinted 2001<sup>4</sup> and Mark Langdon's *Conquering the Blue Mountains*. While both of these publications show evidence of significant painstaking research the safeworking history of the line was not emphasised to any degree. This essay aims to redress this deficiency.

The other treatise, C C Singleton's 'The Ascents of Lapstone Hill', published in the Australian Railway Historical Society *Bulletin* No. 227 of September 1956, has been used as a starting point for the present article.

## The Railway Guide of 1886

'The attention of the traveller by the train leaving Penrith for the mountains must (even previous to his arrival at the tubular [sic] bridge over the Nepean) be agreeably occupied with the scenery before him to the westward, where the otherwise verdant plains, fringed in the distance by the winding edge of the rolling country, the grassy knolls of which are pleasingly dotted here and thither with clumps of trees. Beyond this charming picture the majestic Blue Mountains rise abruptly, like a vast natural fortification, overgrown almost everywhere with sombre foliage, and extending for many miles from the south to the north towards Castlereagh, their base being washed by the Nepean. Along the broken edge of this grand barrier not cerulean here but dark, green, and grey the Railway line may be seen winding upward—past huge rocks and deep declivities, alternating with dense woods, the noble viaduct across Knapsack Gully being hence already distinguishable ... crosses the rich alluvial plain beyond the river ... where grain, fruit and vegetables appear to be the chief products—and at the distance of 2 miles from Penrith, quickly reaches the Emu Plains station where the first ridge of the mountains begins. This station commands a comprehensive view of the first zigzag, by means of which the heights of Lapstone are to be gained and passed. The immediate neighbourhood of the Emu Plains station (having been successfully occupied as an agricultural settlement from the earliest day of the Colony) presents many pictures of gardens, orchards, corn-fields, homesteads and villages-assimilating, in many of its features, to portions of moorland scenery in the west of England.'

Historical Notes on Main Western Line. Volume 1: Granville to Marrangaroo. Compiled by J Forsyth. Pp 47–8.



*Knapsack viaduct . The first Knapsack Block Post was located south (left hand end of the photo). The second site of Knapsack was located about four hundred yards to the right of the bridge. The Down Refuge Siding ended at the top of the gully on the extreme right of the photo. The bridge was widened when taken over as part of the Great Western Highway. N Thorpe collection ARHSnsw Railway Resource Centre 23764a*

Three attempts were made before a satisfactory route could be found over Lapstone Hill—the initial attempt by John Whitton and two later deviations. Each of these will be discussed in some detail.

### **The Lapstone Zig Zag Route (11 July 1867<sup>5</sup>–18 December 1892<sup>6</sup>)**

The earthworks contract for the first 11 miles 3 chains from the western side of Nepean River to Valley Heights, incorporating Lapstone Zig Zag, was let to William Watkins on 13 March 1863 being completed in December 1865<sup>7</sup>.

For a mile beyond Emu Plains the single track followed the present railway alignment; firemen used this level section to build up steam for the tortuous grades ahead. Emu Plains cemetery was passed on the Down side. Near the present Russell Street underbridge the line turned south-west and the 1 in 30 grade commenced in earnest. Any remains of this section have vanished as, over time, the virgin bush succumbed to clearing and residential development. With some degree of accuracy we can surmise that the track followed what we now know as Bunyarra Drive<sup>8</sup>, crossing the present Great Western Highway at its intersection with Walkers Street.<sup>9</sup> In fact the old embankment heading south-west from today's line existed until about 25 years ago, when it was bulldozed. Its curved route can be traced by the similarly curved back fences of the houses which adjoined the old railway land.

The remains of a gatekeeper's cottage, near the Great Western Highway bridge over the newer double-track line, defines the location of the original railway's crossing over Bathurst Road (Mitchell's Pass). Turning south to cling to the side of Lapstone Hill, the line followed the present walking track (previously Great Western Highway) to reach Knapsack Gully 400 yards distant.

Knapsack Gully was spanned by an impressive single-track bridge on a 1 in 30 grade, requiring 6,713 cubic yards of masonry in construction. It has five 50-foot and two 20-foot arches set in Portland cement. The structure is 388-foot long and 126-foot in height from foundations to rail level<sup>10</sup>. It is considered to be one of Whitton's finest bridge structures.

### **Lapstone Zig Zag**

The following section describes train working up Lapstone Zig Zag between February 1890, when interlocking was introduced, and December 1892, when the first deviation was brought into use.

Beyond Knapsack Gully the Down Distant signal, on a 19ft-high post heralded the approach to the Zig Zag and Lapstone Bottom Points (417 feet above sea level or 327 feet above the plains below<sup>11</sup>). Provided that the Home signal, 414 yards further on, was clear, the train passed the junction to Middle Road and Signal Box A. An original pointman's hut, which pre-dated interlocking, was also located in the vicinity. It had the appearance of being nothing more than an oversize country outhouse. The train then steamed into Bottom Wing, 532 feet in length,<sup>12</sup> with its easier gradient of 1 in 100.



*An I Class and a T Class, plus J485 in Loco at Penrith 13 February 1909. Penrith at this time was still supplying bank engines for the steep climb through the notorious single line tunnel. Note the Penrith West Box Down Distant signal on the back of the Station Box Up Home signal—a fairly common practice of the day.*

**J L N Southern collection ARHSnsw Railway Resource Centre 18359**

A Stop signal, 107 yards from the junction points, was located near the terminus end. Worked from Frame A, it was placed at stop to inform the driver when the last vehicle of the train had cleared the points to Middle Road.<sup>13</sup>

Because the dead end was in a cutting and on an eight-chain curve it was not possible for drivers to see the Starting signals for Bathurst or Sydney at Bottom Points so repeating signals were provided on the same post as the Stop signal. When the Starting signal for Bathurst was cleared the train reversed onto the 28½-chain Middle Road with its eight-and ten-chain curves and 1 in 33 grades that Singleton suggested may have been an early attempt at grade compensation.<sup>14</sup>

At a point 157 yards along Middle Road, the Distant signal for Signal Box B at Top Points was passed. The Up Home for descending trains, worked from Signal Box A, was also located on the same post. The B Signal Box, Down Home, was a further 370 yards beyond on a 24ft-high post that also contained the Up Distant signal for Frame A.

Providing signals were clear, Down trains reversed through Top Points (469 feet above sea level), known as Lucasville after 1890, onto the Top Wing, with standing room of 536 feet.<sup>15</sup>

When the Down Starting signal was cleared, the train retraced its steps through the Middle Road junction points and commenced a 1 in 30 climb along Top Road, passing the Down Advance Starting signal. Singleton comments that this signal may have been provided for Down trains travelling up the zig zag in two sections amalgamating at Top Points. Singleton indicated that there was no formal evidence that this working ever occurred.<sup>16</sup> Weekly Notice 8 of 1892, quoted below, makes mention of 'double' trains and Langdon quotes *The Nepean Times* of 19 October 1889 to indicate that such working did indeed occur.<sup>17</sup>

The method of working would have been as follows: (see diagram p392)

1. The goods train from Emu Plains, assisted by a bank engine stopped short of Bottom Points.
2. The train engine took half the load into Bottom Wing, propelled it up Middle Road into Top Wing and hauled it onto Top Road as far as the Advance Starting signal.

3. The bank engine propelled the rear half of the train into Bottom Wing and hauled it up Middle Road engine first and into Top Wing where it propelled onto the first half of the train.
4. Once coupled up the goods proceeded to Glenbrook as normal.

Weekly Notice No. 2 of 1892 gave the following instructions for train working on Lapstone Zig Zag:

*When two engines and one Bogie or Radial Brake Van is on the Up Goods Train the number of Trucks to be taken from Katoomba to Emu Plains must not exceed 19 D Trucks or their equivalent in length of other class of vehicles. When only one 4-wheeled Goods Brake Van is provided, and two engines are on the train, then the load may be increased to 20 D trucks or their equivalent in length of other class of vehicle. When one engine, a Bogie Brake Van and a 4-wheeled Goods Brake Van; or two ordinary Goods Brake Vans are on a train, the load may be increased to 21 D trucks or their equivalent in length in other class of vehicles. Timber based D trucks are to be the basis of lengths of loads.*

*Loads of Down Goods (Double) Trains, Penrith to Katoomba, must in no case exceed 42-Empty timber framed D Trucks ... and when Baldwin engines are employed for such trains the loads must be reduced by one D Truck for each such engine so employed. It must also be reduced in same proportion when Bogie or Radial Brake Vans are used on these trains.<sup>18</sup>*

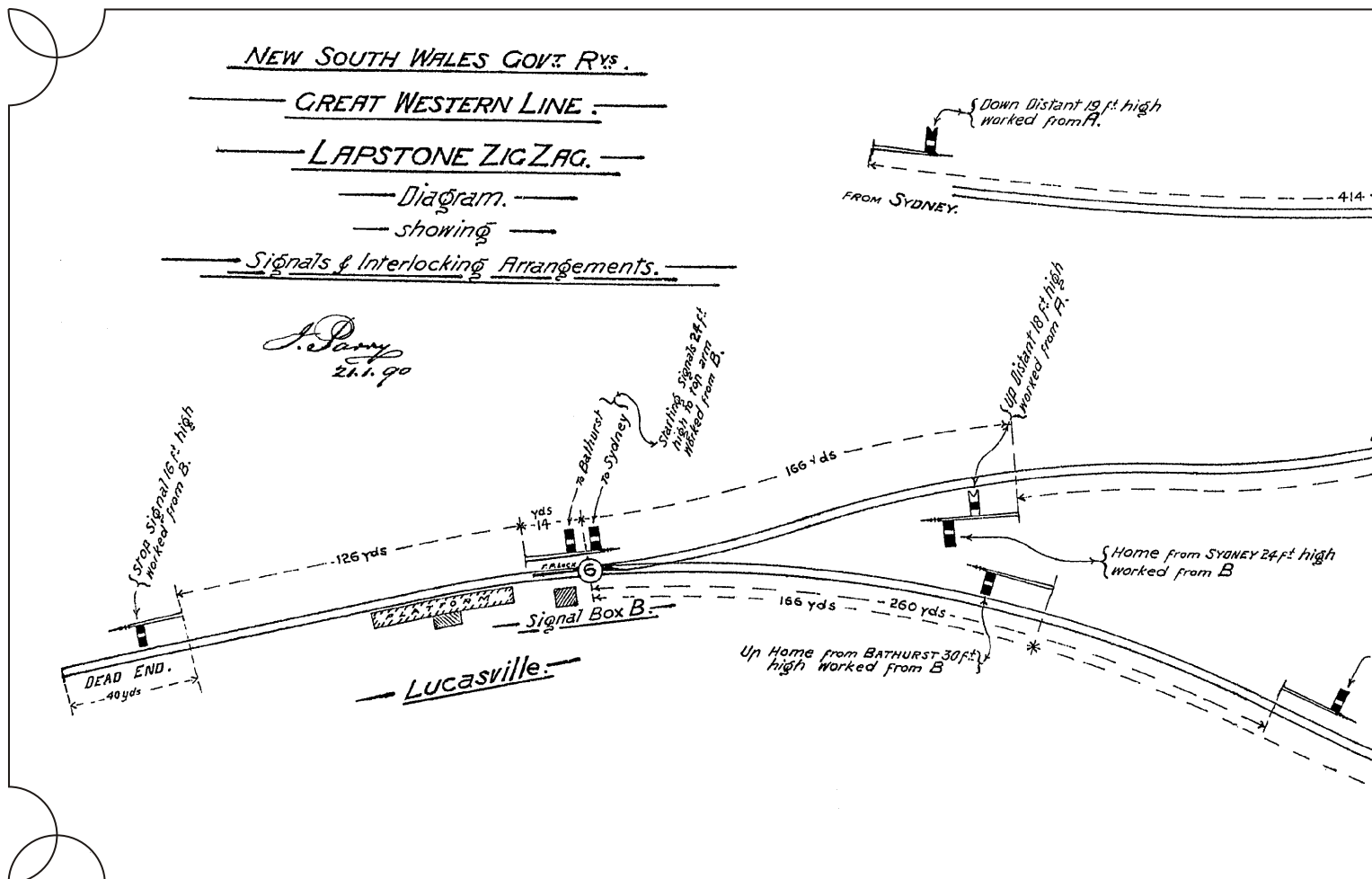
It is obvious from this instruction that the braking provided by the engines and brake vans

was all that was available to control the train.

Top Road continued on a 1 in 33 gradient through reasonably deep cuttings. Here the keen observer can note drill holes where explosives were packed to blast away the rock. It crossed Cox's Road of 1815, which at that time was no longer in use and possibly barely noticeable, in the vicinity. Breakfast Point platform on the Down was opened on 8 March 1875<sup>19</sup> and closed 27 October 1890; Singleton comments that it owed its existence to an early attempt at land subdivision;<sup>20</sup> Forsyth argues that Sir Alfred Stephens requested the place be opened for special excursion trains and that tables be erected and trees cut down. The waiting shed cost £58 and platform £4. He



A fletcher's wagon on the Lapstone zig zag. ARHSnsw Railway Resource Centre 18359



locates the place as being on a left-hand curve about 1.36km past Top Points. A couple of concrete beams on the edge of the track bed probably mark the site of the platform.

### Subsequent Changes to Lapstone Zig Zag

**Provision of Lucasville platform:** This quaint little platform and timber waiting shed<sup>21</sup> facing Top Wing was opened on 15 April 1878 for Mr John Lucas MP who lived nearby. It was closed on 18 December 1892 with the opening of the first deviation.<sup>22</sup> The concrete platform facing and steps cut into the surrounding rock remain.

Lucasville Platform standing on the eastern face of the Blue Mountains, where the line turns off to the west—is merely of a solitary spot at which the train stops when signalled for; but [sic] between it and Emu Plains Station beneath there is a shifting series of panoramic views of all the lowland country in the County of Cumberland, such as far extent and beauty can hardly be surpassed. As you leave Emu Plains Station and begin gradually to ascent [sic] the steep incline—away to the south towards Mulgoa, Greendale and Luddenham—your eyes can first feast themselves for a moment on the gorge of the Nepean. Then a few yards further on the train rises more slowly towards the first zig zag ... First it goes 200 or 300 yards in one direction, rising slowly every yard, then, by cooperation of the skilful engineer and the watchful pointsman, the train is quickly “reversed” and launched back upon another ascending grade ...

*The Railway Guide of 1886*<sup>23</sup>

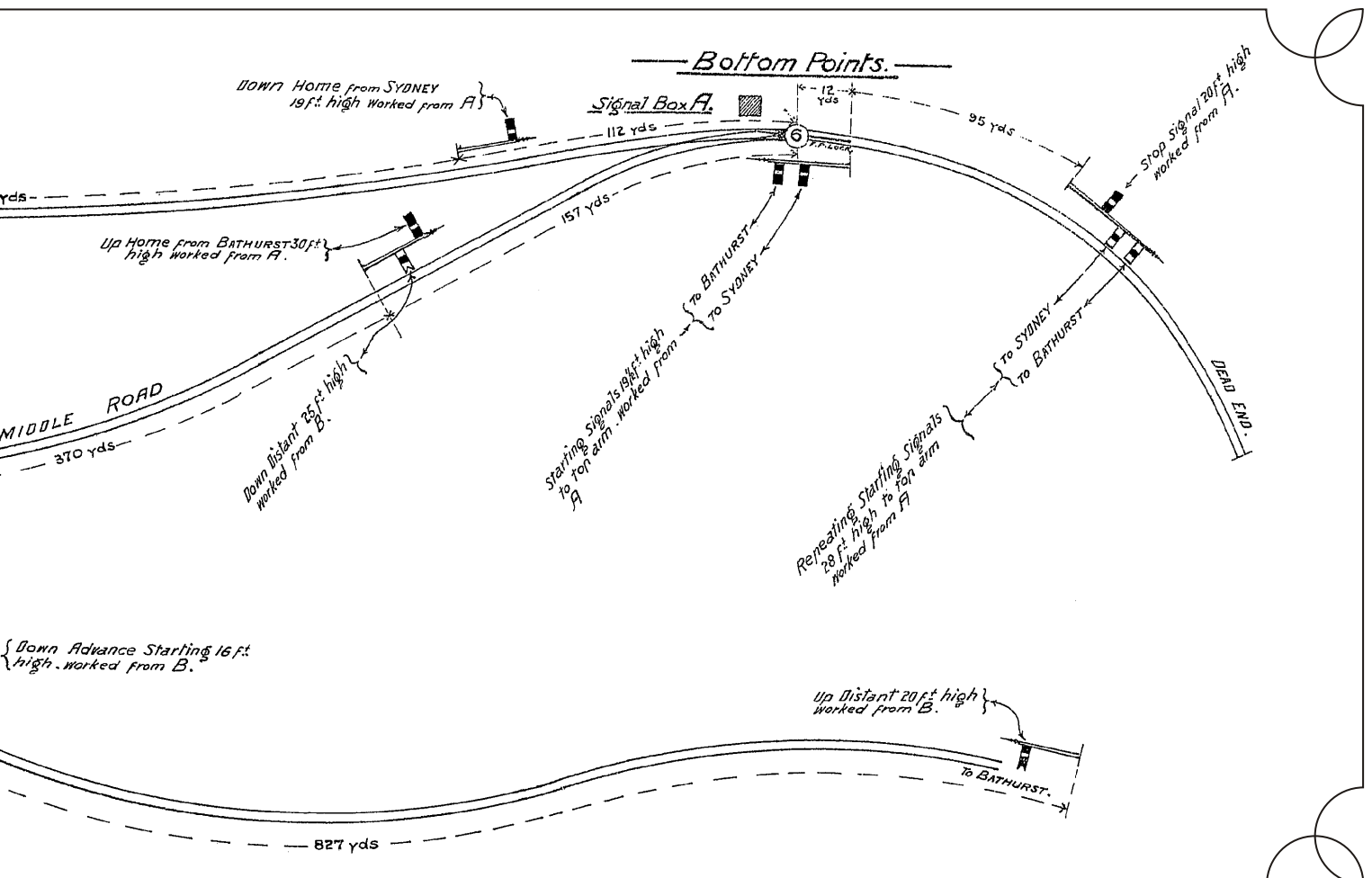
The *Sydney Morning Herald* did not paint Lucas in a very favourable light, describing him as a person who displayed, “frequent and offensive drunkenness as well as vulgarity and violence of speech.”<sup>24</sup>

Lucas was no friend of John Whitton either, accusing him of collusion with John Fowler over contracts for railway equipment from Britain.<sup>25</sup>

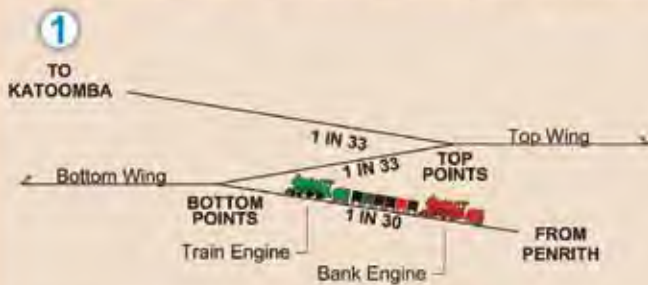
**Realigning Top Wing:** On 22 March 1886 No. 32 Passenger ex-Bathurst comprising of six cars plus brakevan, hauled by No. 156 of the 79 Class, failed to stop and hit the buffers at the end of the Top Wing. To avoid a similar occurrence the adverse arrival grade on both Top and Bottom Wings was increased to 1 in 33 along with the extension of Bottom Wing by 323ft<sup>26</sup>. Top Wing was realigned and both track formations are still evident, the lower being the one where the accident occurred.

**Safeworking:** On the evening of 30 January 1878 an Up Goods train hauled by 17 Class No. 52 came into violent collision with No. 103, a brand new 93 Class, on a Down Goods opposite the Emu Plains cemetery. The accident was caused by the guard of the Up train not following safeworking rules for an unscheduled train.<sup>27</sup>

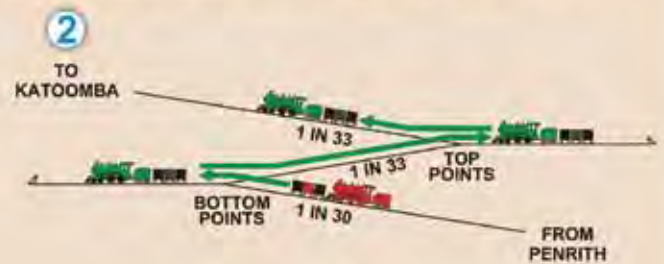
As a result, Ordinary Train Staff and Ticket safeworking was speedily introduced on most single lines; the sections pertinent to this article, Emu Plains–Bottom Points; Bottom Points–Glenbrook; Glenbrook–Springwood, gaining OTS working within a matter of a week or two after the accident. Note that Top Points was not a staff station. Electric Train Staff safeworking was introduced on the Emu Plains–Glenbrook sections on 12 April 1892<sup>28</sup> and between Glenbrook and Springwood on 25 April of the same year.<sup>29</sup>



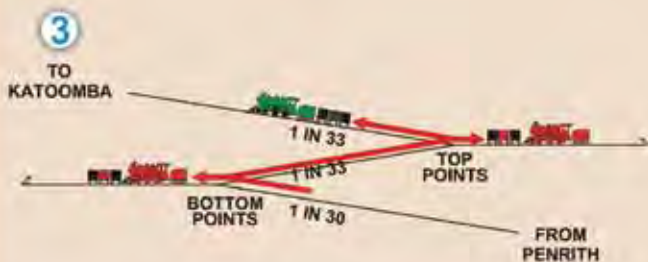
## METHOD OF ASCENDING LAPSTONE ZIG ZAG WHEN EMPLOYING BANK ENGINE



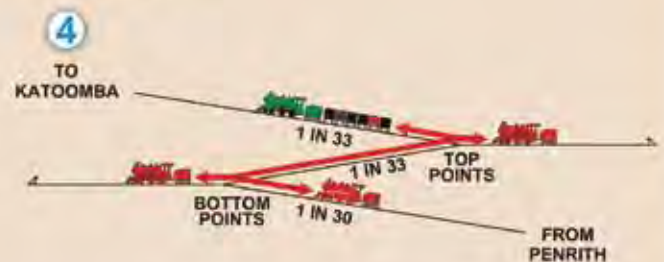
Goods train from Emu Plains assisted by a bank engine arrives clear of Bottom Points.



The train engine takes half the load into the Bottom Wing, propels it up the Middle Road into the Top Wing and then hauls the train onto the Top Road as far as the Advanced Starting Signal



The bank engine propelled the rear half of the train into Bottom Wing. The train was then hauled up Middle Road engine first into Top Wing and then propelled onto the first half of the train.



Once the two portions were coupled up the goods train then proceeded to Glenbrook as normal. The Bank engine then returned to Bottom points, reversed and proceeded to Penrith.

**Interlocking:** When opened, signals were not provided and points were worked from ground levers by a single pointsman responsible for working both Top and Bottom Points. Interlocking, as described above, was introduced on 6 February 1890<sup>30</sup>.

### Glenbrook during the Zig Zag Era 1867–1892<sup>31</sup>

At the end of Top Road the line turned west through an eight-chain right-hand curve to pass through the top of the spur (617 foot) by a 30-foot cutting (opposite the present RAAF base, which can still be observed on the southern side of the Great Western Highway), continuing around a wide 'S' bend, generally following the course of the present highway as far as Blaxland. A falling grade of 1 in 66 brought the line to Glenbrook Station (598 foot). This at that time was located near the present service station and traffic lights at the intersection of the Great Western Highway and Hare Street, about half a mile north of the present station.

The place was opened on 11 July 1867 as 'Watertank'. Locomotive watering facilities, the only infrastructure initially provided, were located on the Up side. Water gravitated from what is now known as Glenbrook Lagoon<sup>32</sup> through a 900 yards long pipeline to a well from where it was pumped by a steam driven Tangye pump into the 10,000-gallon lineside tank.<sup>33</sup>

Singleton notes that in 1870 a crossing loop was added and the name changed to 'Wascoe's Siding'. Historian John Forsyth, however, gives 1874 as the date of this name change.<sup>34</sup> There was bound to be some confusion with this name, however, for Wasco's<sup>35</sup> (note slightly different spelling) two miles further west was also the early name for Blaxland.

In 1874, a narrow timber platform with small station building was added on the Down side; the water tank was opposite at the Bourke end. This was typical of most platforms on the mountains except Mt Victoria, Bowenfels and Wallerawang. Sharp indicates that they were built with a substructure of recycled rails and decks of timber planks sometimes formed by old sleepers.<sup>36</sup> On 3 September 1878 the name changed to Brookdale, finally becoming Glenbrook on 21 April 1879. Forsyth comments:

*The name Brookdale was suggested by Sir Alfred Stephens as being pleasant and suggestive of water and high ground. Glenbrook Creek was listed in the 1866 Gazetteer but it is not known why the name Brookdale was changed to Glenbrook as there are no other towns of the former name in Australia, and, therefore, no real reason to warrant the change.<sup>37</sup>*

By 1882 a second and longer loop had been added, connecting to the main line at the Bourke end and to the original loop at the other, the latter being retained for bank engines returning from Katoomba. Semaphore and Distance signals were also added. A dead-end goods siding joined the long crossing loop at the Bourke end.

### Glenbrook to Blaxland

Beyond Glenbrook the line continued along a plateau on grades of 1 in 33 and 1 in 66 following the course of the present Great Western Highway. Turning northward it continued for about two miles to the Pilgrim Inn and Wasco's Platform (768ft). The name changed to Blaxland on 21 April 1879, named after Gregory Blaxland, one of the members of the first expedition party over the Blue Mountains in 1813. Wasco's and The Pilgrim Inn was a strategic location being the meeting place of Cox's, Mitchell's Pass and Old Bathurst (Zig Zag) Roads.

## A Timetable Example

The following is an example of a goods and passenger (Mail) train timetable over Lapstone Zig Zag in February 1892.<sup>38</sup>

Stations	No. 63 Goods		No. 61 Mail		Comments
	Arr pm	Dep pm	Arr pm	Dep pm	
Penrith	.....	6.30	.....	9.10	No. 61 crosses Nos. 48 & 32
Emu Plains	.....	.....	.....	9.15a	
Glenbrook	7.05	7.27	.....	9.33	No. 63 crosses Nos. 57 & 30
Springwood	.....	7.50	.....	9.55	No. 63 crosses Nos. 32 & 48 No. 61 crosses No. 32a

Given the severe grades and the need to negotiate the zig zag, the time of 23 minutes for the Mail from Penrith to Glenbrook must be considered very commendable.

## The First Deviation (38m 12ch–39m 45ch) 1892–1913

By 1892 the Western Line had reached Bourke and Cobar with the line to Forbes expected to be opened the following year. Most of the raw materials and produce generated between the Lithgow area, at the western edge of the Blue Mountains, and these far-flung locations, had to descend Lapstone Hill to reach Sydney.

The 1892 Annual Report under the heading, 'Traffic over the Blue Mountains' commented:

*As many as 196 wagons of livestock, in addition to the ordinary goods and passenger traffic, have been moved in one day from the Western Line to Sydney.*<sup>41</sup>

In another section of the Report a comparison was made between the Western Line and the Alpine Railways of Europe:

*The Western Line, for instance, is more difficult to work than any of the Alpine Railways, the ruling grade, radius of curves and frequent loss of elevation, which has to be regained, being all against the Railways of this Colony.*<sup>42</sup>

The impetus to construct a deviation came from Chief Commissioner Eddy whose mission was to run the railways at a profit; to do this he needed stronger and heavier locomotives and longer trains to better utilise the capacity of single lines and improve the efficiency of the labour force.<sup>43</sup> He stated in the Annual Report of 1891:

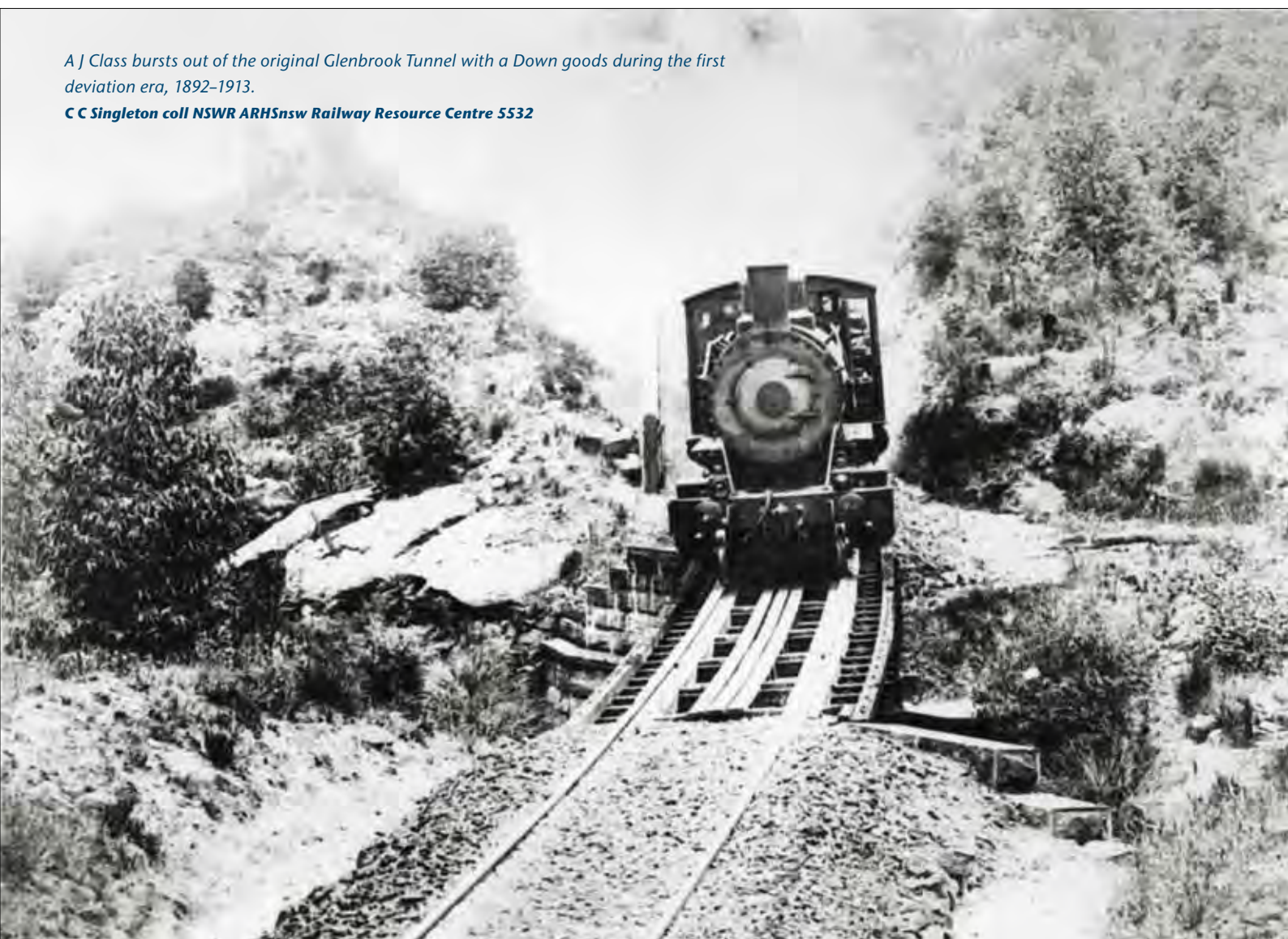
*The policy we are commencing of employing more powerful engines and increasing the carrying power of wagons ... will materially assist the question but a steady policy of annually cutting out some of the worst grades on the trunk lines will speedily bring back material results.*<sup>44</sup>

The Lapstone Zig Zag with its Top Wing of only 536 feet (the length of a suburban platform) and no possibility of extension was clearly one of his first priorities for attention.

Following a survey the contract for the construction of the 1 mile 33-chain deviation and tunnel was let to George Proudfoot (who died before completing the contract<sup>45</sup>) for £37,000 in April 1891.<sup>46</sup> It opened on 18 December 1892.

*A J Class bursts out of the original Glenbrook Tunnel with a Down goods during the first deviation era, 1892–1913.*

**CC Singleton coll NSW ARHSnsw Railway Resource Centre 5532**



## Description of the Route

The deviation left the existing line 14 chains on the Sydney side of Bottom Points, at 38m 12ch from Sydney in the vicinity of today's track leading off Governors Drive into Tunnel Gully.<sup>47</sup> Passing on the top side of the old Bottom Wing<sup>48</sup> the line curved west entering a deep cutting on a grade of 1 in 33 which can be glimpsed on the southern side of the Great Western Highway whilst climbing Lapstone Hill.

Turning north-west the line entered a single-line tunnel, 31.5 chains in length,<sup>49</sup> reviled by enginemen because of its lack of ventilation (to save money no ventilation shaft was provided as it was thought natural air currents would be sufficient), 15-chain reverse curve, 1 in 33 grade and incessant water dripping from the roof onto the track which did nothing to aid adhesion. From the north-west portal the line crossed a small tributary of Knapsack Gully, by a timber bridge, before reaching Glenbrook where the old alignment was resumed.

Historian Cyril Singleton comments on the location of Lapstone Ballast Siding opened on 3 March 1891, which supplied materials for tunnel construction (unfortunately his description is not completely clear):

*It left the original line, after turning the end of the range from the top road of the zig zag, immediately on the Sydney side of the long cutting through the ridge and terminated above the tunnel portal. Twenty years later the siding was located on the same location and extended to Glenbrook Creek Gorge as a materials line for the construction of the second deviation.<sup>50</sup>*

## Changes to the First Deviation

**Knapsack Signal Box:** Knapsack Signal Box, located at 38m 03ch, about 100 metres south of Knapsack Gully Bridge,<sup>51</sup> is believed to have opened on 27 March 1902<sup>52</sup>; the Local Appendix of 1892 does not record its existence but it was known to exist in 1903. Knapsack was a switch-out electric staff station which cut in when traffic required. Equipment used is not known as such working was not common NSW

railway practice.<sup>53</sup> Its purpose as a follow-on staff station was to facilitate the movement of following trains in quick succession in busy periods. No crossing facilities were provided.

The Local Appendix of 1906 gives us three other interesting pieces of information relating the working of Knapsack:

As Up trains approached Knapsack on a falling grade of 1 in 30 Drivers had to make sure that they could stop their train at the Up Home signal if required.

Down trains were not to be stopped at the Down Home signal unless absolutely necessary due to the steep rising grade. To minimise this possibility a staff could not be withdrawn to permit a Goods train to enter the Emu Plains-Knapsack section until five minutes after the previous Goods train had left Knapsack for Glenbrook.

When Knapsack was closed Home signals were left in the 'Clear' position and left unlit at night.

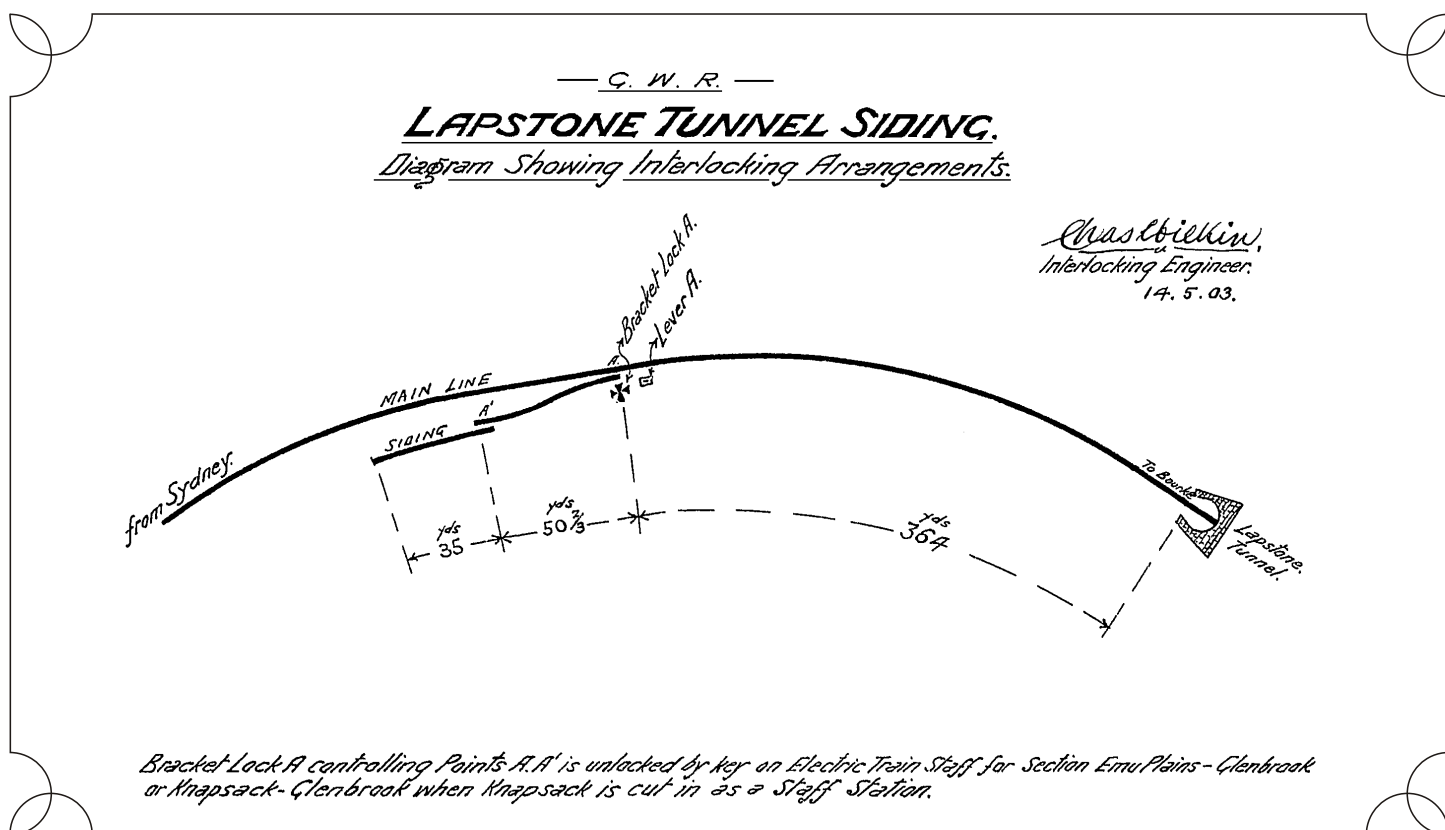
Knapsack Signal Box was removed on 31 August 1909<sup>54</sup> shortly before the opening of Knapsack Crossing Loop.

**Lapstone Safety Siding:** Engine-drivers, from time to time, had problems negotiating the grade up to, and through, the tunnel. A few months after opening, guards were told:

*It will be necessary in future for the Guard of the rear brake van of each Goods Train on the Down journey, which is assisted by a push up engine to allow sand to flow onto the rails when passing through the Lapstone Tunnel.<sup>55</sup>*

This rule was to make sure that the push up engine would maintain maximum grip on the slippery rails. Brakevans were supplied with sanding facilities at the time to assist braking of non-air trains. It was important that the sand pipe was thoroughly clean before sand boxes were filled up.<sup>56</sup>

Over the following years there were instructions about engine loads between Emu Plains and Katoomba. In April 1895 goods trains were limited to a maximum length of 45 four-wheel wagons with bogie vehicles counting as two;<sup>57</sup> whenever the Down Mail exceeded seven standard carriages a pilot had to be provided.<sup>58</sup>





In January 1897 new load tables were issued for five locomotive classes including the new P6 (32 Class) which was limited to 16 goods wagons through the section.<sup>59</sup>

To attempt to alleviate difficulties, Lapstone Safety Siding<sup>60</sup> (38m 47ch) was opened on 10 August 1903. This was a dead-end siding 35 yards in length on the Up side of the line. The points were secured by Lever and Bracket Lock A unlocked by key on the electric staff. Because of the interesting features of this siding, being the only one of its type in NSW, instructions have been reproduced in full:

*The siding has been provided as an additional safeguard in the event of the engine of a Down train from the state of the weather or other cause being unable to pass through Lapstone Tunnel without dividing its load; therefore any such train taking advantage of this siding must work strictly in accordance with the following instructions.*

*The siding must only be used in connection with a Down train after the rear vehicle has passed clear of the points leading into the siding; but under no circumstances must any Down train be divided until these points have been set for the siding and the points must be left at that position during the time any vehicle or vehicles are left on the main line detached from an engine.*

*When a Down passenger train is required to divide its load and the train is brought to a stand in the Tunnel, the Driver must immediately set back sufficiently to admit the whole of the train being outside the Tunnel. He must send the staff by the Fireman to the Guard. The latter will at once go back and set the facing points for the siding, after which he will return to the train, divide the load, and arrange to send the first portion to Glenbrook, handing the Driver instructions in the form prescribed below, authorising him to proceed to Glenbrook without the staff and to return therefore for the remainder of the train.*

*Whenever the siding is used in connection with a Down Goods train, the Driver must send his Fireman back to the Guard with the staff to obtain authority from the Guard on the prescribed form, authorising him to take a portion of his train to Glenbrook and to return for the balance. When the Guard receives the staff from the Fireman, he will make similar arrangements to those laid down for a Passenger train. The Goods train must be divided so that the rear vehicle of the first portion will be fitted with the Westinghouse Brake complete.*

*The Guard of the Passenger or Goods Train, as the case may be, must remain with the rear portion of his Train and take the necessary precautions after setting the points for the siding to secure it before dividing the load.*

*On arrival of the first portion of the train at Glenbrook, the Driver will show the Officer in charge the authority he holds from the Guard of the train and the Officer in charge will then be responsible for safely placing and securing the front part of the train in the siding.*

*When the Driver returns and reaches the rear portion of the train he must send his Fireman back to the Guard with the authority which he previously received. The Guard after collecting the authority and satisfying himself that the engine has been coupled to the train, and the train is complete and again ready to depart must secure the facing points in the normal position for the main line and obtain the staff and hand it to the Driver.*



A T Class on an Up freight at the western end of first single line tunnel at Glenbrook, 23 December 1911  
O B Bolton, ARHSnsw Railway Resource Centre 23767

*On every occasion that the siding is used, a full report of the circumstances be promptly forwarded to the Superintendent of the Lines.*

NEW SOUTH WALES RAILWAYS

Safety Siding Lapstone

\_\_\_\_\_ 190

To the Driver No ..... Train

*The electric staff for the section ..... Glenbrook is in the bracket lock at the safety siding; therefore you are hereby authorised to proceed to Glenbrook without it, in order to take the front portion of your train to that station and to return for the balance and the staff.*

*This authority must be shown to the Officer in charge at Glenbrook when you arrive there with the first portion of your train.*

..... Guard

*A copy of these regulations must be pasted on the lid of the box and renewed from time to time as required.*

The siding closed on 10 January 1910 with the removal of main line points.<sup>61</sup> Why was the siding abandoned? Trains at the time were still experiencing difficulty. The *Nepean Times* on 12 September 1912 reported:

*In one instance ... passengers had to spend nearly an hour admiring the beauties of the interior of Glenbrook Tunnel. Whilst traversing the tunnel the train stopped and not until divided in two sections could progress be made. The stoppage is said to be due to the lack of sufficient head of steam.<sup>62</sup>*

It seems strange that a train short of steam was unable to propel back down the grade to get clear of the tunnel.

The answer seems to lie in the use of sprags mentioned for the first time in respect of this location<sup>63</sup>; perhaps it was felt that the use of sprags would be sufficient to hold a train without the need for the extra security of the Safety Siding. For non-banked Goods Trains that needed to divide their load, the Guard had to apply hand brakes to all wagons on the back portion and place and tighten sprags to the wheels of the last six wagons.

It was also permissible to divide a passenger train; the rear portion had to be hand braked; ‘...and placing at least four sprags in the wheels of the vehicles at the rear of train.’<sup>64</sup> Incidentally the use of sprags continued on the NSW system until early 1967 when Weekly Notice No. 6 of that year announced the deletion of ‘sprags’ from p. 259 of the then-current General Appendix Part 1. By this time most wagons were equipped with full steel wheels making it impossible to employ sprags.

Parliamentary Standing Committee on Public Works. Report Relating to the Proposed Duplication Between Emu Plains and Blaxland, page 10.

Charles Austen Hodgson, Superintendent of Lines.

235. Are the difficulties under which you are working increasing? Yes; they grow with the volume of traffic.
236. Do you expect them to be worse this year than last year? No.
237. I understand you have done something to relieve the congestion? Yes; we are putting in a crossing loop at Knapsack.
238. Will that relieve the pressure? It will help.
239. Will it be sufficient? I do not think so.
240. You look upon this work as being necessary if the congestion is to be relieved? That is so.
241. What other difficulties have you? We have very serious detention of trains in transit.
242. Stock trains? Stock and goods trains.
243. I understand that the seriousness of the congestion is more in relation to stock trains than goods trains? Yes, but it is all serious because the delays cost money
244. But is not the delay more serious in connection with the stock trains? Yes.
245. That is because of the deterioration and cruelty to the stock? Yes.
247. So that the Western Line is the worst from that point of view? It is now. The Northern Line used to be bad in that way but it has been partly remedied.
248. But the Western Line is considered to be from a traffic point of view a difficult one? Yes.

**Knapsack (Second Location):** Knapsack (37m 52ch) was opened on 1 November 1909<sup>65</sup> 11 chains north of the first Knapsack Signal Box and a few chains south of the Bathurst Road (Mitchell’s Pass) level crossing<sup>66</sup>. The Up Refuge Siding crossed Bathurst Road by a raised trestle bridge; the foundations can be located by the presence of heaps of rock on the side of Mitchell’s Pass near the Knapsack Bridge car park.

The steepness of the grade precluded the construction of a conventional crossing loop; instead an ingenious arrangement of two connected dead-end Refuge Sidings graded to give a departing Down train a starting advantage were provided. The Down Refuge was 1,056 feet in the clear whilst the Up Refuge was 1,065 feet. This was amended in Weekly Notice 5 of 1910 to 1,066 foot for the Up Refuge.

The method of working was as follows:

#### Crossing Two Goods Trains

No. 16 facing points (see accompanying diagram) had to be set for the Up Refuge Siding before an Up train was permitted to leave Glenbrook. This was a safety consideration that would cause a runaway Up train to run into the siding and if not stopped, to derail rather than collide with an approaching Down train. The Up train had to remain at the Up Home signal until the Down train had entered the Down Refuge or a staff had been obtained to proceed. Once the Down train was safely refuged, 16 points were reset for the main line and the Up train could then proceed to Emu Plains. The Down train then propelled across the main line into the Up Refuge. On receipt of the appropriate token the train charged onto the main line via 16 points making the most of the lighter grade of the siding to gain momentum.

#### When a Down Goods Train was too Long to be Accommodated in the Down Refuge Siding

The Up Goods Train, after stopping at the Up Home, as above, moved into the Up Refuge to allow the Down Goods to pass on the main line. The Up Goods then reversed into the Down Refuge to resume the trip to Emu Plains.

#### Placing Trains in Both Refuge Sidings to Allow a Third Train to Pass

This was obviously not permitted, however, it was permissible for a Goods train and Light Engine to be put away to allow a passing movement; the Light Engine was permitted to move back onto the main line without proceeding to the opposite Refuge Siding to exit, as this could presumably be done within the protection of the home signal.

#### If ‘Train Arrival’ at Glenbrook had not been Received for a Preceding Down Train

The following Down train must not be stopped at the Down Home signal but could be admitted into the Down Refuge until permission was given to proceed. This instruction was modified in 1911 allowing trains to stop at the Down Home if they were assisted in the rear by a bank engine.<sup>67</sup>

#### Crossing Two Passenger Trains

This movement was not permitted.

#### Other Rules Regarding the Operation of this Crossing Loop

While ever a Down Goods was travelling in the section Knapsack–Glenbrook No. 16 points had to be set for the Refuge Siding. This was to protect the main line in the event of a breakaway.

During dark and in foggy weather a red light had to be displayed on the buffer stops of the Refuge Sidings.

In 1910 instructions were issued that once a train had arrived in the Up Refuge, hand brakes had to be released to enable the train to set back to the Down Refuge. For the journey on to Emu Plains hand brakes had to be applied to six wagons at the front (by the Fireman) and six at the rear (by the Guard). For a loaded train brake pipe pressure could be increased to 70lb.<sup>68</sup>

The speed of Up trains not requiring to cross could not exceed five miles per hour while changing staffs<sup>69</sup>. We could assume that Down trains would be struggling to better that speed!

Knapsack closed on 16 March 1913<sup>70</sup> one week after the opening of the second deviation (discussed below). The remains of the now-overgrown Down refuge can still be seen by walking into the bush towards the present main line immediately north of Knapsack Bridge. A small concrete reinforcing wall and pipe can also be found, by the careful observer, by walking along the side of the old refuge.



## Visiting Lapstone Zig Zag

The land covered by the old zig zag became a Nature Reserve in 1929<sup>39</sup> and people are, therefore, welcome to stroll over the old formation. The M4 Motorway should be exited at Russell Street, Emu Plains and signs followed to Knapsack car park near the Whitton Memorial and old gatekeeper's cottage. The 400-metre walk to Knapsack Bridge is by sealed pathway. Since the location of Bottom Points has been removed by highway construction, (remains of the first single-track deviation and most of Bottom Wing can be seen on the southern side of the highway a hundred metres or so along Governors Drive<sup>40</sup>), visitors should take the steps at the southern end of Knapsack Bridge which lead to Top Wing and Lucasville platform. A walk may be taken down Middle Road, or along Top Road to Knapsack Street, Glenbrook and The Great Western Highway.

## Visiting the Site of the First Deviation

There are two ways to visit the cutting and the tunnel; from the lower end by walking into Tunnel Gully Reserve from Governors Drive<sup>83</sup>; from the upper end by turning left off the Highway into Mount Street<sup>84</sup> and left into Lucasville Road. Walk down the hill and into the bush taking an easterly course. Care must be taken as this route will lead to the top of tunnel portal. From this point a track leads down into the cutting. Note at this spot the diversion of Tunnel Gully away from the cutting.

The North-West Portal can be observed by turning left at Barnet Street<sup>85</sup> and then immediately right. This leads to a mushroom farm<sup>86</sup> located inside the tunnel. During the Second World War it was used by the RAAF to store 500 pound bombs and chemical weapons. It was at this time that the concrete floor was laid.<sup>87</sup>



The double track deviation left the original single line just east of Russell St Emu Plains. This was the location of Nepean Jn. The image is taken on the site of the original track. RailCorp's feeder line follows the location of the old track at this point.



The old gatekeeper's cottage marks the location where Bathurst Road (now Mitchell's Pass) crossed the original single line. The present line is located behind the cottage with the bridge over the former highway to the left. On the right is the John Whitton memorial.



A scramble through the bush at the northern end of Knapsack bridge will reveal the end of Knapsack Down Refuge Siding. The buffer stops were located a few metres further on at the top of Knapsack Gully.



A train proceeding up would pass along Middle Road to Top Points, shown here. Middle Road is seen on the left and Top Road, proceeding to Glenbrook, is on the right.



A few metres from Top Points Lucasville platform was located along Top Wing.



The scene at the end of Top Wing. The reader will note two formations. The lower was abandoned after the runaway of 22 March 1886 in favour of the top formation that was regraded to 1 in 33 against arriving trains.



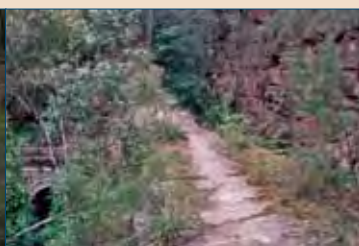
The cutting along Top Road between the junction with Middle Road and Knapsack St Glenbrook. Note the vertical bore holes where explosives were added.



The entrance to Top Road at Knapsack St Glenbrook. Four wooden sleepers are still in situ near the gate.



The scene along the single track 1892 deviation. Lapstone Safety Siding was a short distance further on.



The eastern portal of the infamous single line tunnel is on the left with diverted Tunnel Gully on the right. The tunnel is bricked up at this end.



The north western portal of the 1892 tunnel. The tunnel was used to store chemical weapons during World War Two with mushroom production in more recent times. Evidence suggests that mushroom cultivation may now have ceased.



The site of the first Glenbrook station near the intersection of the Great Western Highway and Hare St Glenbrook. The date, 1927, refers to the opening of the Great Western Highway on the old railway formation.





**Page 399 and left:** The arched, sandstone Bottom Road viaduct of the former Lapstone Zig Zag, as it appeared on Tuesday 13 January 2009. The nearby lower viaduct remains part of the current day Main Western Line between Emu Plains and Lapstone. The older bridge is now accessed only by a public walking track—although it was, for around sixty years, part of the Great Western Highway, before that road was deviated during the early 1990s.

**Both photos by Brian Walters**

**Below:** The John Whitton monument on 13 August 2008. The plaque records “John Whitton—Built railways Penrith to Bathurst, Sydney to Albury, Sydney to Queensland”. A separate plaque on the side of the obelisk also reads “In memory of men who worked with Whitton”. This memorial, and the adjacent Gate Keeper’s Cottage ruins (see photo, below left), is located where Bathurst Road (Mitchell’s Pass) crossed the single line. The second site of Knapsack was located a hundred yards or so to the south of the Whitton monument. The present line passes behind the ruins and crosses Mitchell’s Pass by a bridge.

**Both photos by Brian Walters**



A crossing loop of similar configuration was provided at Dombarton on the steeply graded Unanderra–Moss Vale line on 12 May 1943<sup>71</sup> but has since been closed. This was the only other example of this configuration. The rules for operation of this loop were similar to those for Knapsack, although there was grade separation with the propelling moves between up and down refuges passing *under* the main line rather than crossing it on the level. This grade separation allowed the shunting movements to take place without fouling the main line, or restricting approach of trains in either direction.

### Glenbrook During the First Deviation 1892–1913

After the closing of the original line, a portion was retained as a Refuge Siding at the Down end of the station. According to Singleton<sup>72</sup> the small crossing loop had been abolished by 1900 (see section on Glenbrook during the zig zag era) and the second loop extended at the Bourke end necessitating the relocation of the goods siding.

A number of changes took place two years later with interlocking of the yard including duplication westwards, provision of an island platform catering for Up and Down working, and a new Up Refuge Loop. A loop goods siding was now located on the Down side with the old dead-end siding abolished. The Up Refuge had been extended at the Bourke end by 1910.

The station constructed at this time was described by Sharp as a 'duplication building'.<sup>73</sup>

There has been considerable discussion during the preparation of the article as to whether the line was ever duplicated from Blaxland to the original (Old) Glenbrook; Langdon, for example, disagrees,<sup>74</sup> but the weight of evidence is, overwhelming.

Firstly Singleton, with employment as a railway engineer, shows evidence of duplication in diagrams on p. 125 and map on p. 130;<sup>75</sup> he shows the date of opening after September 1902.

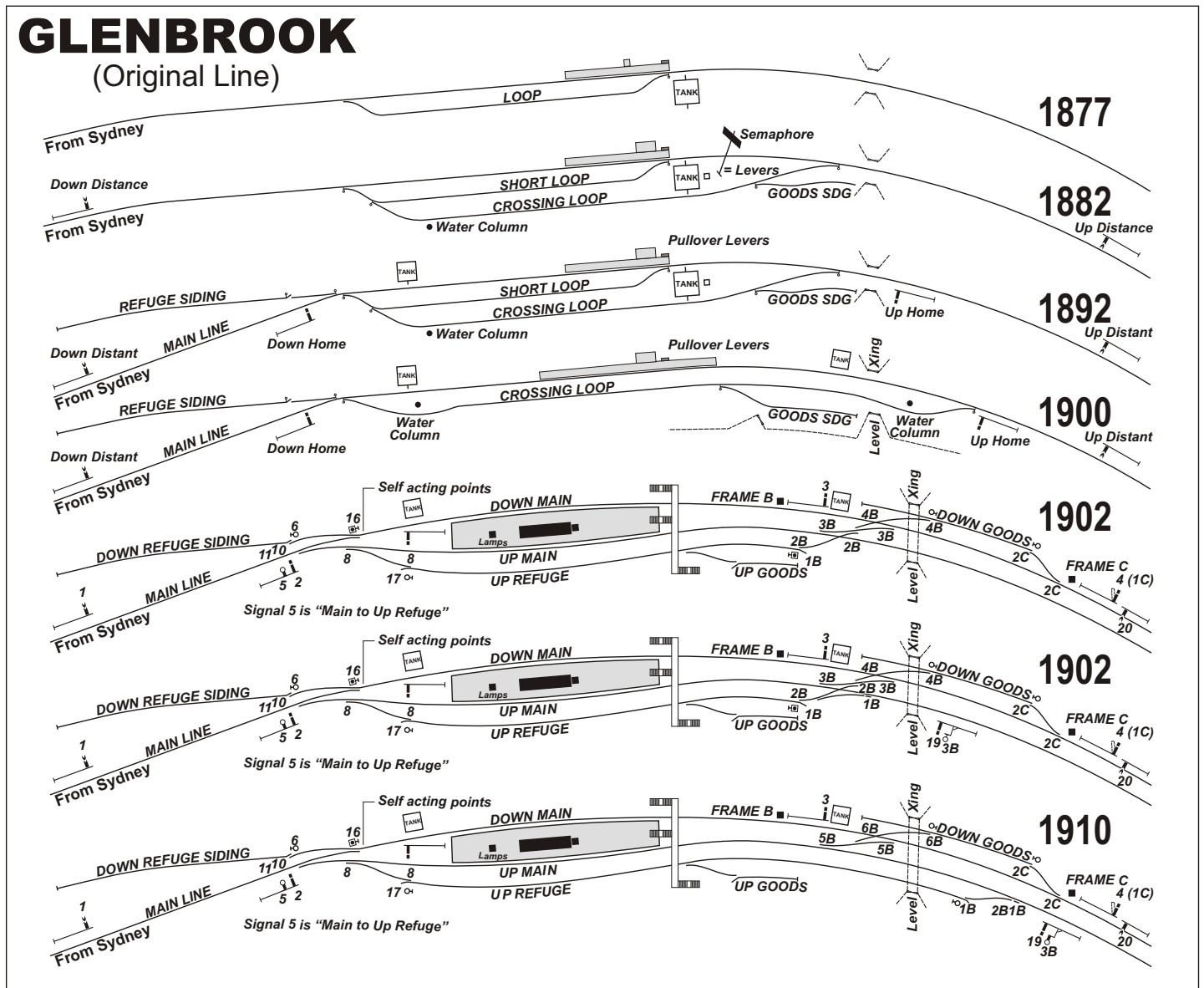
Secondly, and perhaps more convincing, the 1902 Annual Report comments on improvements made during the reporting period:

*The duplication of the western line over the Blue Mountains, between Glenbrook and Mount Victoria, and the improvement of station accommodation is approaching completion ...*<sup>76</sup>

And again:

*The work of duplicating the western line, between Glenbrook and Mount Victoria, has been energetically carried forward, the double line between Glenbrook and Mount Victoria having been completed and handed over to traffic, and rapid progress with the remaining sections New station buildings have been erected at Glenbrook ...*<sup>77</sup>

*The 1906 Local Appendix West notes the Preece's One Wire Block sections as being Glenbrook to Karabar or Springwood (when Karabar was switched out). Preece's Block was only used on double lines in NSW.*



Further, a number of Weekly Notice entries at the end of 1901 indicate ballast train working between Lawson and Glenbrook<sup>78</sup> while the sketch map accompanying the 1909 Report on the duplication of the Emu Plains–Blaxland section shows double track between Blaxland–Glenbrook.<sup>79</sup>

Finally, Forsyth mentions on p. 51 that the line was duplicated from Glenbrook to Springwood on 26 January 1902.<sup>80</sup> He also makes reference to duplication on p. 52 of the same notes. The conclusion we must draw is that the line was duplicated from Mount Victoria to the first Glenbrook.

### An example of timetabling over the first deviation

The following describes the timetable used for the first deviation in March 1893.<sup>81</sup>

Station	31 Express	53a Goods	61 Through Mail	Comments
	am	pm	pm	
Penrith	11.10–11.15	3.45–4.10	9.00–9.06	No. 61 cross No. 30
Emu Plains	11.19	4.17–4.25	9.10a	No. 53a cross No. 34
Glenbrook	11.36	4.50–5.00	9.25	No. 53a cross No. 24 No. 61 cross No. 32
Blaxland	11.43a	.....	.....	
Springwood	12.00–12.01	5.25–5.30	.....	No. 53a cross No. 24a

An interesting comparison can be made with No. 61 Mail taking only 23 minutes to travel between Penrith and Glenbrook over the Zig Zag and No. 31 Express requiring 19 minutes over the first deviation, a saving of only four minutes.



*The Great Western Highway took over the old rail formation from about the present RAAF base to Blaxland. This photo is taken just west of the site of the first Glenbrook. The bridge and cutting lasted until the early 1980s when the highway was widened to four lanes and a new roadbridge was constructed.*

**ARHSnsw Railway Resource Centre 51155**

No. 63 Goods took 57 minutes Penrith to Glenbrook over the Zig Zag while No. 53a Goods took 50 minutes via the first deviation.

Care must be taken with these comparisons, however, as length restrictions had been eased after the close of the Zig Zag, which probably meant that trains were now much heavier.

### The railway formation and the Great Western Highway

A plan dated 23 August 1910 shows a ‘Main Western Road’ connecting with the railway formation at the bottom of the old Lapstone zig zag and after crossing over Middle Road proceeding through 180 degrees to connect with Top Road near the present RAAF establishment. It seems that even at this early stage there were plans to construct a road on much of the railway formation when the deviation had been completed. This plan also showed a proposed road over the gully near the present Governors Drive.

The Main Roads Board commenced negotiations with the Department of Railways in August 1925 for the possession of the abandoned right of way between the former Knapsack Crossing Loop and Blaxland. The Department of Railways sold the land to the Roads Board for £184/19/10 and the new highway was completed on 23 October 1926. Knapsack Bridge was widened to 5.118 metres by corbelling out the parapets.

The highway diverted from the railway formation near the site of Bottom Points, slightly south of the 1910 plan previously mentioned, over a grade of 1 in 13.7 to rejoin the track in the vicinity of Glenbrook. As the long single-track cutting was too expensive to widen it was found more expedient to cross the summit on the level opposite

the RAAF Base. West of Glenbrook the roadway followed the rail formation to Blaxland.<sup>82</sup> The 1910 plan shows a ‘spoil dump’ at the bottom of Lapstone Hill. Presumably this came from the first tunnel excavation and was probably used in road construction.

Since 1991 when the M4 Motorway was extended onto Lapstone Hill and the Great Western Highway the section between Mitchell’s Pass and Knapsack Bridge became a sealed walking track and a flood evacuation route out of Emu Plains.





*A scene during the construction of the 1913 deviation. As many as fourteen hundred men worked on the deviation, many arriving after completing the deviation around the Lithgow Zig Zag. B205 (later Z25) Class 2-6-0, 327, is seen here during the Glenbrook Tunnel construction.*

**N Thorpe, ARHSnsw Railway Resource Centre 23766**

### **The Second Deviation (1913) and the Duplication Emu Plains–Blaxland**

Whereas Eddy had been passionate about provision of heavier locomotives and longer trains, it was Chief Commissioner T B Johnson's vision to see duplication of main lines completed as soon as possible.<sup>88</sup> With the Lithgow zig zag deviation complete, the single-track section through the old Glenbrook tunnel, remained the only major bottleneck between Sydney and Lithgow.<sup>89</sup>

The matter of duplication of the Emu Plains–Blaxland section was referred to a Public Works Committee by the Legislative Assembly on 14 December 1908<sup>90</sup> with evidence taken intermittently from 18 January to 9 November 1909. The final report was dated three days later and a working plan was completed by 23 August 1910.<sup>91</sup>

The Committee heard that goods traffic between Eskbank (Lithgow) and Sydney had nearly doubled over the preceding few years. In 1893 both Up and Down traffic amounted to 1,032,714 tons whilst in 1909 the corresponding figure was 2,016,060 tons. Traffic had actually doubled on the Up line where figures for the two years were 584,784 and 1,192,432 tons respectively. Figures for the carriage of stock showed a similar trend with 1,028 sheep vans and 270 cattle wagons in October 1908, with corresponding figures one year later 3,587 vans and 445 wagons respectively.<sup>92</sup>

The single-line bottleneck was under so much pressure that in previous years some traffic had had to be diverted via Harden and Blayney; the construction of the Knapsack Crossing facility was an attempt to provide a short-term solution. There were a number of specific problems:

- The inability to get empty wagons out to the country for loading.
- The cost of working trains over the line. If larger loads could be carried per train, it was estimated that 42,000 train miles could be saved at 2/- per train mile and 23,000 light engine miles at 1/3 per mile making a total of saving £5,648. Further estimates of savings included cost of using assistant engines from Penrith, £2,287; 2,223 hours and detention of trains at 10/- per hour, £1,111/10/- making a grand total of £9,046/10/- or double the interest on the estimated cost of the new line.<sup>93</sup>

### **Description of the route**

The surveyed deviation left the then-existing line at the commencement of the 1 in 30 grade at 36 miles 52 chains near the present overbridge at Russell Street, Emu Plains;<sup>94</sup> from there the line turned north-west and then south, through 180 degrees, to meet Lapstone Hill. Near Mitchell's Pass level crossing the new line crossed the existing single-track line necessitating a temporary deviation and junction.



A Ruston steam navy appears to have been used here for the first time in NSW. This is a 2-8-0 tender type locomotive, one of the Baldwin-built 131/J131/X10/Z28 Class locomotives. It would have been on the Glenbrook Gorge deviation construction branch.

Neil Cram Collection Penrith City Library

Keeping at a lower level, the line crossed Knapsack Gully turning west at Glenbrook Gorge and proceeded along the edge of the northern escarpment for about a mile. After passing through a short 12-chain tunnel through the crest of the ridge the line turned north-west passing through (New) Glenbrook, about half a mile south of the old line, then crossing that line at 41 miles 4 chains curving back to join it at Blaxland 41 miles 53 chains (old line) 44 miles 28 chains (new line). To keep the grade at 1 in 60, the new line was approximately 2 miles 57 chains longer than the old making the total deviation 7 miles 54 chains.

The residents of Glenbrook were not happy with the line being moved from the centre of the village and suggested a northerly deviation across the original line in the vicinity of Old Glenbrook past the lagoon to meet the existing line near Blaxland. This was rejected because of the impossibility of getting a better grade than 1 in 40. Another suggestion was for the new station to be placed further east than planned. Whilst this was feasible the proposal was not accepted because of conflicting evidence presented by the residents.<sup>95</sup>

### Cost

Revised cost was expected to be £135,000, exclusive of land resumption, for a single Down line; however, it was considered prudent to make provision for a future double track by widening cuttings in the vicinity of Glenbrook Gorge at an additional cost of £12,000. If the double line were provided at this time the additional cost would be £43,000.<sup>96</sup>

Considerable evidence was presented about the desirability of constructing the Up line at the same time; advantages were that two stations (and two station masters) would not be required at Glenbrook; tourists visiting Glenbrook Gorge could be better catered for and there would be savings on braking costs of goods trains descending the range of around £600 per annum.<sup>97</sup> Presumably time would be saved by not having to pin down brakes. Disadvantages were increased track maintenance costs for the longer distance necessitating correspondingly higher freight charges and a general feeling that the existing line was capable of satisfactorily handling Up trains.

A later decision, after the completion of the Report, agreed to complete both lines at this time.<sup>98</sup>

The Committee unanimously approved the project with the additional recommendation that the Chief Commissioner be responsible for construction. It was normal for the railways to carry out this type of work as it was connected with existing lines. In addition economies could be achieved by employing £30,000 worth of Departmental machinery then being used on deviation works at Lithgow Zig Zag.

Construction commenced in January 1911 with as many as fourteen hundred navvies working on the Glenbrook Gorge section. A shanty town of three thousand workers and their families sprang up at Bluff.<sup>99</sup> Materials for tunnel construction came from a siding branching off the old main line, then being lowered down the escarpment by funicular railway. The Annual Report for 1911 commented that two steam navvies, the first to be employed in the state, had been obtained with one already at work.<sup>100</sup>

### The Bridge over Knapsack Gully

The new double-line bridge was constructed of brick with eight arches of 45ft spans. Langdon,<sup>101</sup> quoting from *Lithgow Mercury* of 29 March 1912, indicated that the original intention was for a steel bridge but a lengthy strike at the Lithgow steelworks forced a change of plans.

The Down line was opened on Sunday 11 May 1913<sup>102</sup> and the Up on 25 September of the same year.<sup>103</sup>

A comparison of load tables for T and TF (D50 and D53 Class saturated goods locomotives) illustrates the advantages of the new line over the first deviation:

Old Line (Down)	New Deviation (Down)
180 tons approximately <sup>104</sup> 205 tons Valley Heights-Katoomba (a similar grade to the first deviation). <sup>105</sup>	450 tons <sup>106</sup>

### An Example of Timetabling over the Second Deviation

This represents train running from 26 September 1937<sup>107</sup>:

Stations	No. 65 Through Goods	No. 59a Relief Mail	Comments
	pm	pm	
Penrith	9.23–9.44	10.33	No. 65 refuged for No. 49/49a
Emu Plains	9.50		
Glenbrook	10.10	10.51	No. 65 39 minutes at Valley heights. Refuged for 59/59a. Most mail trains had no time given for passing Glenbrook.
Springwood	11.19	11.10–11.15*	* Valley Heights

By 1937 goods trains were taking 26 minutes Penrith to Glenbrook, about half the time taken to traverse the first deviation. Mail trains took 18 minutes, a saving of three minutes over No. 31 Express.



*Old Knapsack Viaduct with new viaduct under construction circa 1911.  
N Thorpe collection, ARHSnsw Railway Resource Centre 23764b*

### **(New) Glenbrook Station (41 miles 54 chains) —Layout on the Second Deviation**

A diagram of the layout dated 14 August 1913 shows a 428-yard-long Down Refuge Loop with a loop Goods Siding accommodating 20 four-wheel wagons on the Up side opposite the station. A trailing crossover was provided at the Katoomba end.

The signal box controlling all points and signals was located at the Sydney end of the station building. Of interest was the fact that an Up Auxiliary Distant was provided as well as a Down Advanced Starting signal. The Up Starting signal employed two arms that both worked simultaneously to make sure that Drivers could sight this signal while approaching the footbridge. This arrangement ended on 1 September 1922 when the main arm was refixed to a lower position on the post and the second arm was removed. Track Circuit Indications and Electric Lever Locks were provided to inform the signalman that a train was occupying the Down Main between No. 10 Refuge Loop points and a point 100 yards on the Sydney side of the Down Home signal<sup>108</sup>. Glenbrook was also a block post employing Tyer's One-wire Three-position block instruments. The following notes on signalling arrangements may be helpful for the safeworking enthusiast.

The Glenbrook track locking would have been standard electric protection of facing points; it would replace the train bar and clearance bars that were depressed whenever a train was on the points, preventing them from being moved. The method of releasing the electric lock was also a standard way: pass over the points then set back—presumably modified for Glenbrook because of the rising grade.

When track locking was provided at boxes like Sydney Station West (opened in 1924), there was usually an electrician rostered full time so he could intervene and release the locking in the event of failure or a wrong route being set. But at places like Glenbrook, there would have been no signal electrician, and if the road was set the wrong way, the simplest way to convince the locking that the train was brought to a stand was for said train to pass the signal then set back. This presumably was not appropriate at Glenbrook, so the necessity to run through to the western end of the refuge instead. As the track was level through the station there was less risk of the train running away when setting back.

Track circuits on New South Wales Government Railways were very much in their infancy in 1913. Installation of one on the facing points at Glenbrook then would have been very unusual—many places had to wait until the 1970s to get them.

The failsafe nature of signalling usually means that when things fail they show danger. Thus the failure of the circuits at Glenbrook points would mean that the indicator in the signal box would show track occupied whether it was or not, hence the need for personal observation. When the loop was extended towards Sydney in the 1950s and motor points installed, working would be even more cumbersome as the re-located points would have been well out of sight of the station. The siting of the Down signals at Glenbrook was such that there were no obstructions to the driver's view of them, so they only had single arms.



*The new Glenbrook Station on the second deviation. This view was taken from the west, and the short goods siding is in the foreground, while the recent earthworks and the positioning of the ballast train in the wrong direction suggest that work may have still been in progress.*

**ARHSnsw Railway Resource Centre 9257**

The Down Starting Signal was really another Home, and was later renamed Down Second Home, while the Down Advanced Starting signal governed the entrance to the Blaxland Junction block section which had become normal practice. The signal naming rules were about to change to allow only one Starter in each direction—the old platform starting signals would have then been called Homes if there was an [Advanced] Starting signal.

The Down Second Home signal was relocated 40 feet closer to the station on 3 March 1920.<sup>109</sup> The reason for this is obscure, but would appear to have something to do with allowing a more generous fouling point with the nearby main lines crossover.

On 26 October 1922,<sup>110</sup> Starting Signal control was provided on the Down Starting Signal. This arrangement had



*3384 hauls a Down passenger train through Glenbrook during 1935.*

**J Buckland, ARHSnsw Railway Resource Centre 12308**

two advantages: the signal was returned automatically to stop as a train passed it, and it was then impossible to clear it again until 'line clear' had been obtained from Blaxland Junction.

The station building design, with slight modifications, was also constructed at, Blaxland, Valley Heights, Faulconbridge, Linden, Woodford, Hazelbrook, Lawson, Leura, Medlow Bath and Bell on the mountains as well as a host of other locations on the NSW system until 1935. Constructed from a design approved in 1901, it represented a change from the Victorian to the Edwardian style of architecture that included: square-headed windows; small window panes on the top window sash for all windows; a moulded string course around the four corners of the external building; moulding under window sills and an application of a soldier course of brickwork above the windows.<sup>111</sup> All stations between Glenbrook and Bell, with the exception of Mt Victoria, were constructed as island platforms with duplication.

On 18 June 1935, automatic signalling was introduced between Glenbrook and Valley Heights involving the replacement of the Down Starting Signal with an upper quadrant signal and track control on the Up Main Home signal; fixed green upper lights were provided on the Up Distant signals.<sup>112</sup> A little over five weeks later on 31 July automatic signalling was introduced between Emu Plains and Glenbrook.<sup>113</sup> Some of the signals are believed to have used equipment from the Molong–Dubbo Line that in 1933 had been converted from single line automatic signalling to electric staff. The change included the substitution of a Down Accepting Signal for the existing Down Distant. The Up Distant were retained, however, as the new Up Accepting signal was over a mile and a half out from the Home signal. This arrangement was rare on the mountains, but did occur on other lines.

On 16 September 1958, in connection with the introduction of electrification, existing signalling between Glenbrook and Valley Heights was converted to single-light indication. Closing levers were provided at Glenbrook to permit the signal box to be switched out as required.<sup>114</sup> An unwired Emergency Facing Crossover was provided on the west side of the footbridge. The Down Refuge Loop had been increased to 1,770 feet by this time and the points at the Sydney end of the loop were motor worked. Signals on the Penrith–Glenbrook section were converted to single-light indication on 17 March 1959, concurrently with the automation of Emu Plains level crossing and the abolition of Emu Plains signal box.<sup>115</sup>

On 28 October 1989 the Refuge Loop at Glenbrook was removed and the goods siding renamed Per Way Siding and altered to be worked from Frame B.<sup>116</sup> The diagram in Weekly Notice 45 of 1989 showed that this siding had been converted to a trailing dead-end configuration.

Parliamentary Standing Committee on Public Works. Report Relating to the Proposed Duplication Between Emu Plains and Blaxland, page 14.

William Thomas Waters, Sydney and Glenbrook.

His evidence argued that people in Glenbrook would be inconvenienced by the station being moved to a new site.

372. I wish to emphasise that Glenbrook must be considered as being more than an ordinary mountain resort. It is a suburb of Penrith, and of many places in the Plains, and people use it for picnicking and other purposes. They make a sort of playground of it. Glenbrook is 41 miles from the sea, and has an elevation about the same as Wahroonga and a train service almost equally as good. We have a large number of permanent residents and I think I am right in saying there are about thirty-three regular season ticket-holders who go to and from the city every day. I mention these matters with the object of showing that Glenbrook is not a little roadside station, but that it is a desirable place to live in and people have built their residences round the existing station with a feeling of security, and that the station would always be convenient to reach Sydney without delay. We claim the existing station is about the centre of the building and residential areas. We have ascertained that there are 36 houses on each side of the station, that is, on the west and eastern sides.

373. I understand that you consider that the new station would prove of great inconvenience to a number of the residents who are now reasonably served by the existing station? Yes.

arrangements at the junction between the single and double line. Each of these locations will be discussed.

### Nepean Temporary Junction

Double line reached 36 miles 52 chains, on 10 December 1910<sup>117</sup> necessitating provision of a temporary junction near the present bridge over Russell St Emu Plains.

Junction points between the double and single lines along with the facing point lock were worked from Signal Box A on the Down side along with Down and Up Home and Distant signals and Up Starting signal. Electric Train Staff instruments for the section Nepean Temporary Junction–Knapsack were also located in the Signal Box.<sup>118</sup>

On 8 June 1911 a siding on the Up side connected to the Up Main by Duplex and Bracket Lock was brought into use in connection with the duplication of the next section.<sup>119</sup> An instruction in early 1912 required the signaller to obtain the key from No. 7 Lever to work the points rather than the guard.<sup>120</sup>

Instructions issued three months later allowed hand brakes of Up trains to be released at Nepean Junction instead of Emu Plains if the train were forced to stop at the Starting signal to await 'Line Clear'.<sup>121</sup>

Nepean Junction closed on 9 March 1913 with the opening of the double line to Lapstone Hill.<sup>122</sup>

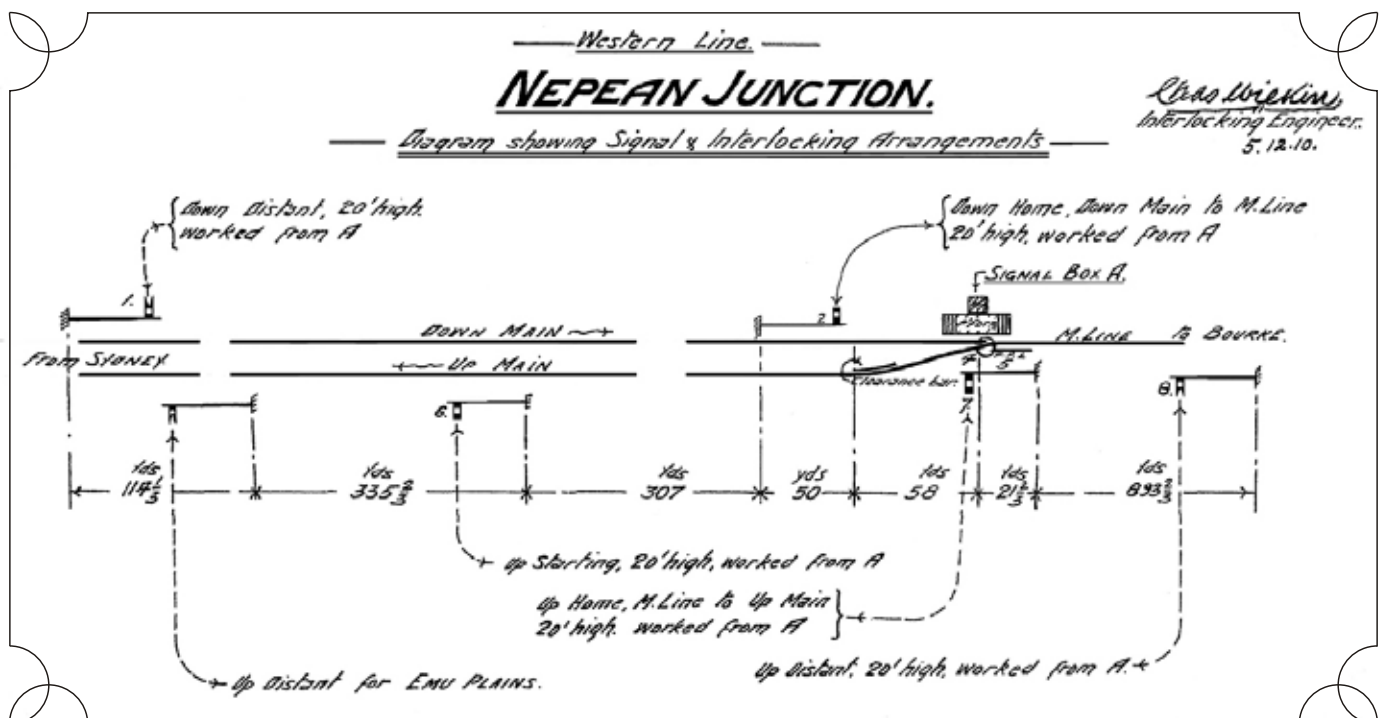
### Lapstone Hill

On 19 December 1912, a temporary siding for the Construction Branch was opened on the Up side at 37 miles, the frame being unlocked by the key on the staff for the section Nepean Junction–Knapsack.<sup>123</sup> The siding was closed on 6 March of the following year.<sup>124</sup>

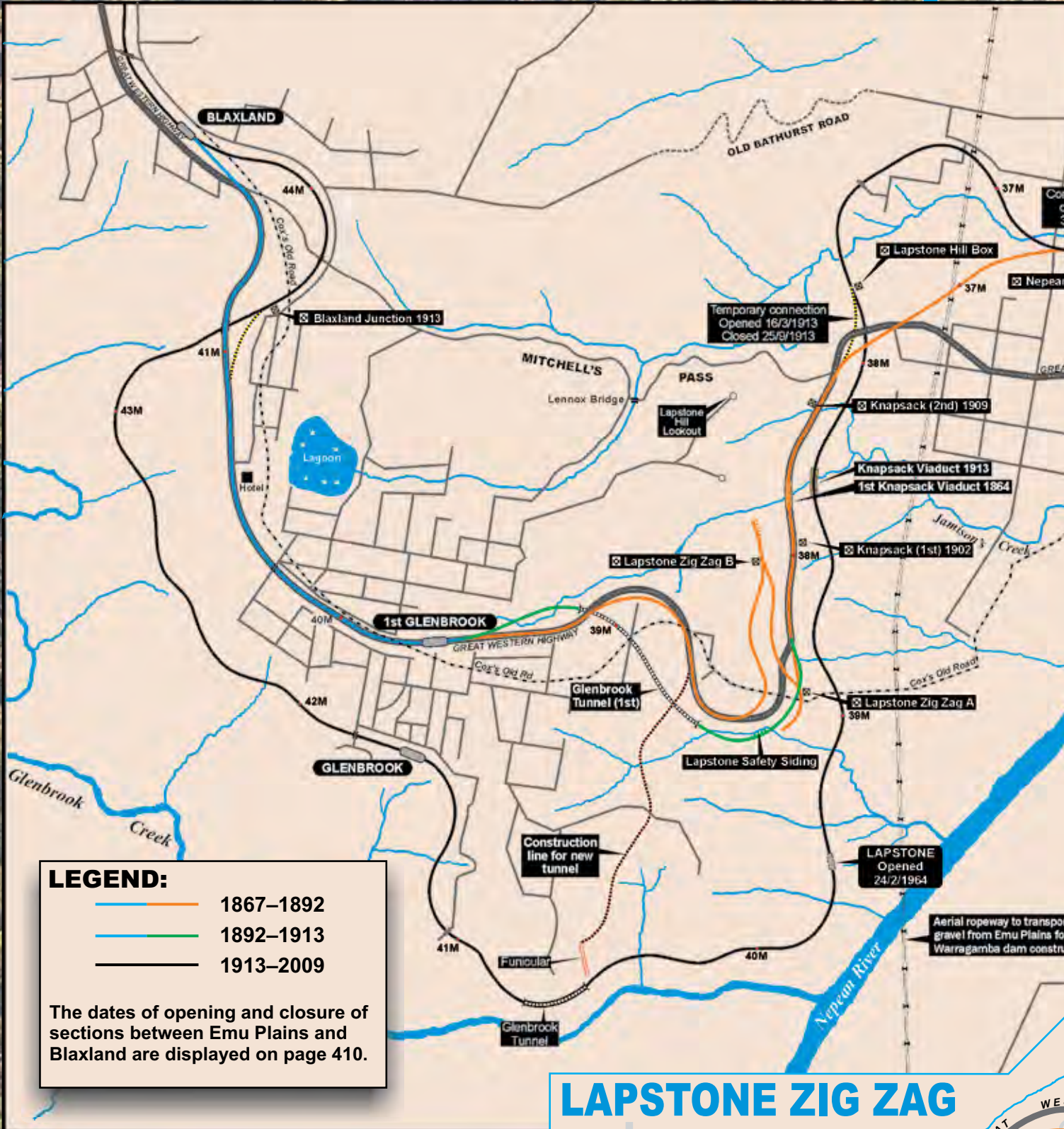
With the extension of double line from Nepean Junction to Lapstone Hill on 9 March 1913 we must assume that the signal box and associated signalling were provided there at the same time. We do know that a short 13-chain deviation<sup>125</sup> off the existing single line between Knapsack Crossing Loop and Lapstone was opened to permit construction of the double line to proceed. This was necessary as there was a difference in height between the single line and the new deviation.

### Duplication on Each Side of the Second Deviation

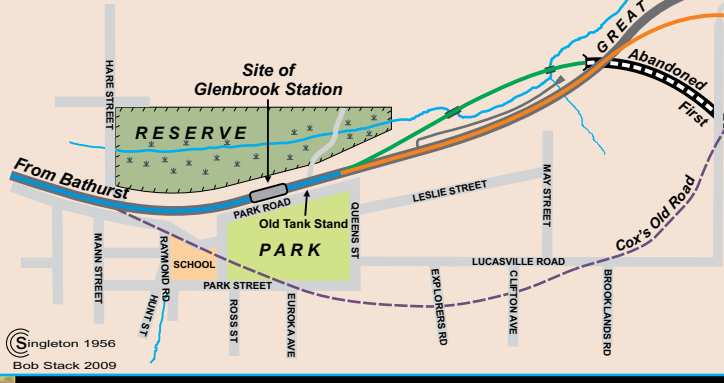
While the second deviation was being constructed, work on duplicating the single line at its margins continued. The double line between Emu Plains and Blaxland was opened in a number of sections resulting in the opening of temporary



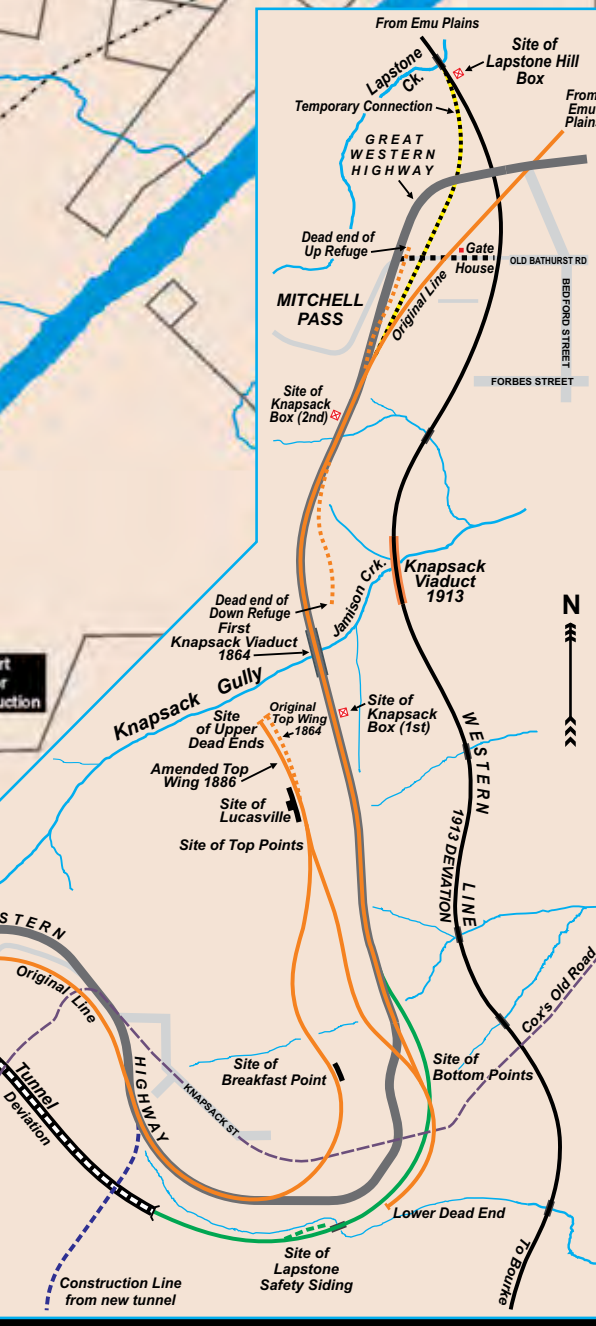
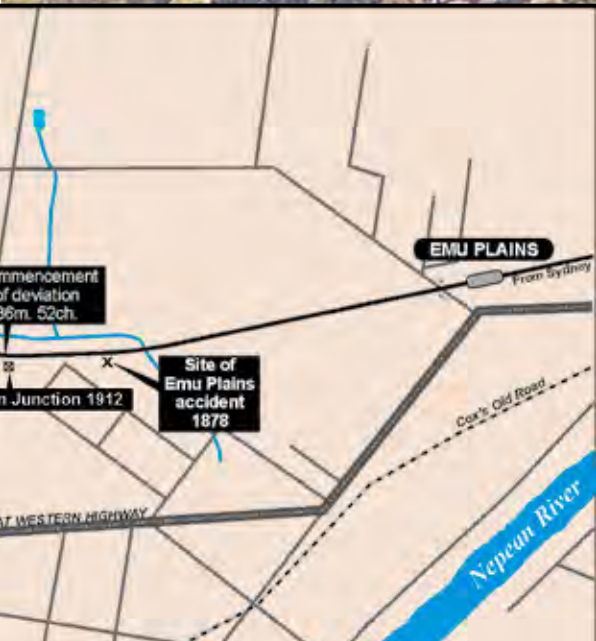
# The Ascent of Lapstone



## LAPSTONE ZIG ZAG

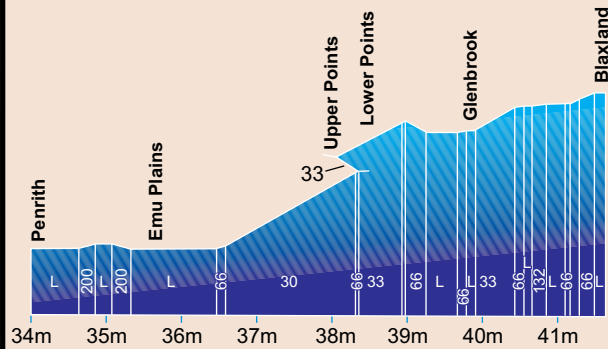


# stone Hill

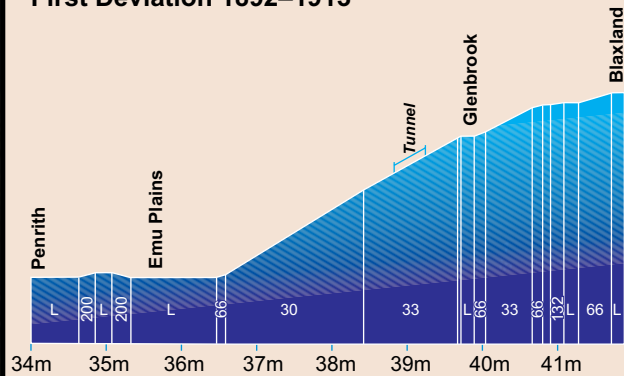


## Grades

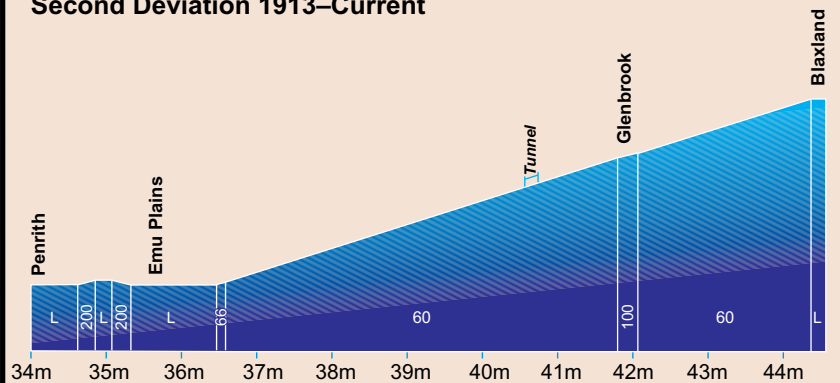
Original Line 1867–1892



First Deviation 1892–1913

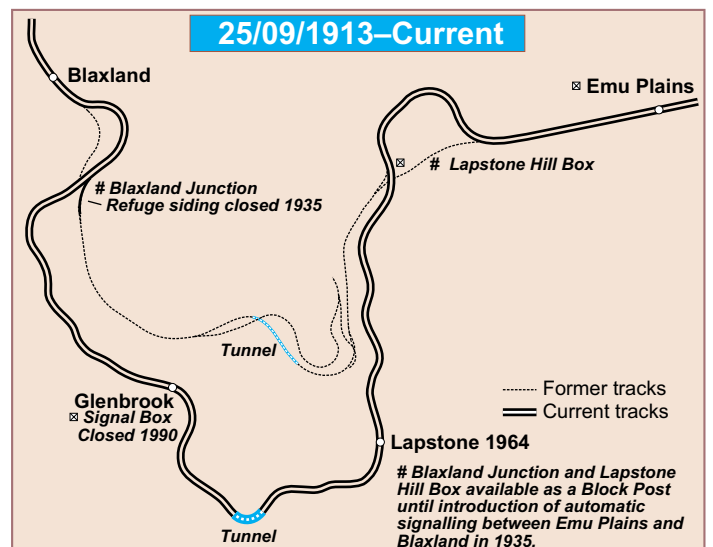
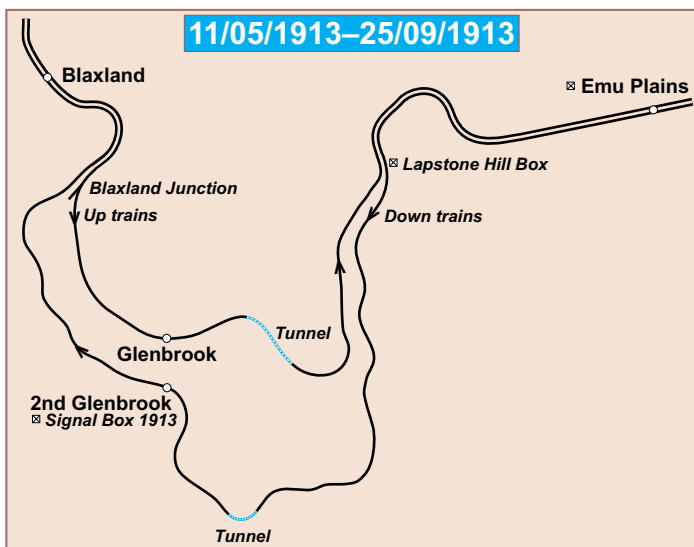
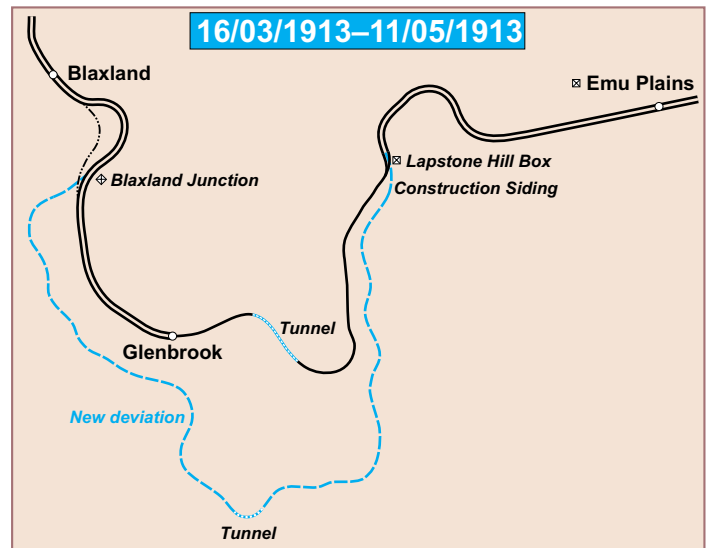
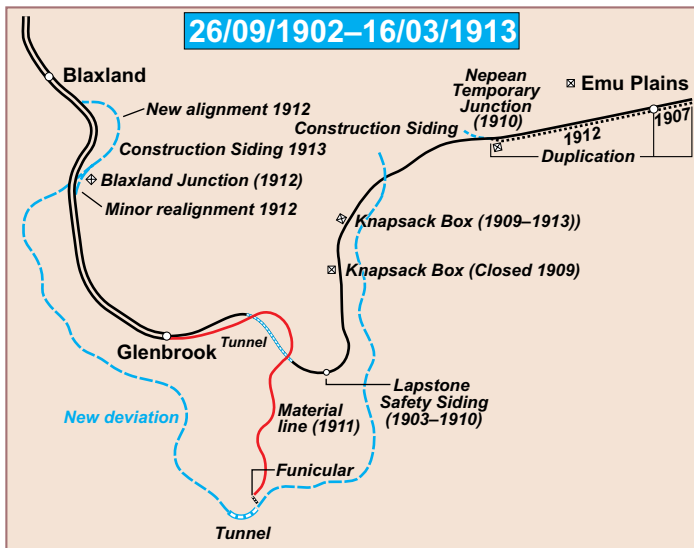
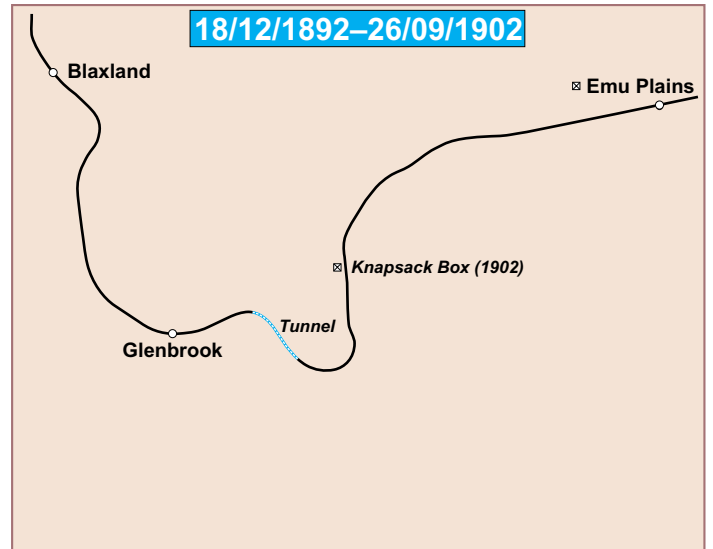
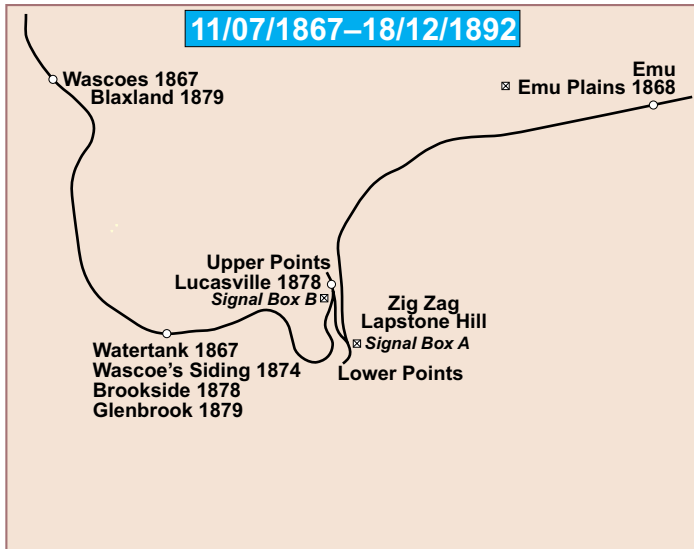


Second Deviation 1913–Current



The diagrams on this page have been revised from the originals drawn by C C Singleton in issue 227, September 1956 ARHS Bulletin.  
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# STAGES FOR THE ASCENT OF LAPSTONE HILL



© Bob Stack ARHS 2009—C C Singleton 1956





*Then new 4-8-2 'Mountain' locomotive 5703 exits Glenbrook Tunnel with an Up Goods on 30 October 1929.*

**CA Cardew, ARHSnsw Railway Resource Centre 08709**

The Down Home signal was moved 75 yards closer to Sydney and a new trailing crossover between the Down and Up lines on the Sydney side of the signal box was brought into use on 28 and 29 April 1913.<sup>126</sup> In addition, a new ballast siding was provided on the Down side; the key to unlock the frame was obtained from the lock on No. 7 Lever in the signal box.

After the opening of the new Up line on 25 September 1913, the old single line (first deviation) was renamed Up Relief line. Trains were not to use this line until the Runaway Siding had been completed at Lapstone Hill; this was an extension of the old line beyond the connection with the Up Main. It is most doubtful if this line saw much further use, as brakes on goods trains would have continued to need pinning down and maintenance of this section could not be justified on economic grounds. Further, because the Up Relief line was a shorter route, trains using it to be overtaken would be delayed because the faster train would be using the longer and therefore slower route.

The crossover between the Up and Down Main remained until 26 March 1934;<sup>127</sup> Lapstone itself continued as a Tyer's One-wire Three-position Block Post until the introduction of automatic signalling between Emu Plains and Glenbrook on 31 July 1935, when the signal box was closed.<sup>128</sup>

A review of the 1913 signal diagram shows that there are two Distant for both the Up Main and Up Relief line, presumably due to falling grades. The only Up Distant signal of the four to be fitted with a fixed green upper light is the Up Outer Distant for the Main. The single Down Distant is also similarly fitted. The signal box is of standard platform level box layout with levers at the rear; the signalman worked with his back to the

line. Standing room between Home and Starting Signals was a mere 220 yards, less than more recent installations.

### **Blaxland Junction**

Blaxland Junction (not to be confused with the present Blaxland) was located in the vicinity of the Great Western Highway bridge over the main line about half way between Glenbrook and Blaxland. This was the junction between the second deviation and the original route previously discussed. Understanding is complicated by the fact that the 1902 double-line section between Blaxland Junction and Blaxland was regraded in 1912 on a new less steep but slightly longer alignment. As some of the details relating to Blaxland Junction are no longer available the authors have tried to piece together an accurate chronology:

1. On 8 September 1912<sup>129</sup> the new Up Main between 40m 46ch (original mileage), about a mile west of [Old] Glenbrook and Blaxland station was brought into use and the old Up Main between those two points closed. The Advanced Starting signal at Blaxland station was dispensed with<sup>130</sup> along with the Goods Siding and Permanent Way Siding. The Permanent Way siding at 40m 52ch (not to be confused with the one at Blaxland) was also removed. This was a dead end siding located on the Up side opened on 22 September 1911<sup>131</sup> to unload materials for the new deviation. Frame A, which worked points, catchpoints and Home and Distant signals, was unlocked by Guard's key kept at Springwood. The siding could only be shunted by Up trains and only during daylight.

2. On 21 October 1912<sup>132</sup> the new Down Main line between 40m 42ch and Blaxland was opened and the old line placed out of use. A new Down Distant for Blaxland station was provided 800 yards from the Down Home signal. The old Down Main at Blaxland station was converted into a temporary permanent way siding to assist with recovery of materials. The existing goods siding at Blaxland was placed out of use (apparently this didn't happen immediately as stated in '1' above).
3. On 15 January 1913 Blaxland Junction was opened due to a junction being added in an existing Block section. The complete signalling and interlocking arrangements were described in Circular No. 5 of 1913.<sup>133</sup> The opening of Blaxland Junction would indicate that points had been laid in preparation for the second deviation
4. On 11 May 1913 Down trains commenced using the new deviation but Up trains continued to use the existing route.
5. On 25 September 1913 Up trains commenced using new deviation. A signalling diagram dated 14 August 1913, for the opening of the new Up Main, shows a trailing crossover between the Up and Down Main at Blaxland Junction with the old Up Main, curving to the east. Signals and points were controlled from Frame A in an elevated signal box alongside the junction points.<sup>134</sup> Of interest was the provision of split Distant on the Up, one for the new Main and the other for the Relief, an indication at that time that the Relief Line was to remain (otherwise a single Distant would have sufficed). The distance between Home and Starting signals was twice that of Lapstone Hill. Levers were also positioned at the back of the signal box to give the signalman unobstructed view of the track. Between 25 September and 22 October the line was theoretically available as an Up Relief but may have been used during this period to recover infrastructure.
6. On 22 October 1913 a 391-yard section of the old Up Relief line was brought into use as an Up Refuge. Catchpoints were provided in the refuge siding worked from No. 12 points Frame A. A signal on the Up side of the line near the catchpoints, worked from Frame A, was brought into use to assist trains reversing back onto the main line. No. 5 signal, Up Main to Relief, controlled trains entering the refuge. The former No. 6 Up Starting signal was disconnected and used as a stop signal and signified the end of the refuge.<sup>135</sup> Weekly Notice 20 of 1920 officially announced that the staff had been withdrawn<sup>136</sup> and the old line removed. It noted that there were no buffer stops as the end of the refuge but drivers were not to pass the Stop Board 1,360 feet from the catchpoints and 150 feet from the 'head' of the old line. A red light was exhibited on the Stop Board during night hours.<sup>137</sup>
7. On 26 October 1922,<sup>138</sup> starting signal control was applied to the Down Starting Signal.
8. On 27 June 1923 the bracket signals Up Main Home and Up Main to Siding (former Up Relief Line) were abolished. A new left hand half bracket signal was provided in lieu; the straight post carried the Up Main and the bracket post carried the Up Main to Siding signal.<sup>139</sup>
9. On 24 May 1926 a portion of the Up Refuge was converted to a permanent way siding and siding for Blue Mountains Shire Council. To provide this the Stop

Board 120ft, from the dead end, was moved out 113 feet nearer the main line. Catchpoints, secured by chain and SL lock, were provided 33 feet from the relocated Stop Board. No more than five trucks could be accommodated at any one time. This work was in connection with the construction of a new overbridge spanning the Up and Down Main Lines at 43 mile 48 chains.<sup>140</sup>

10. On 1 September 1930 the Up Refuge Siding was extended at the Sydney end to 1,601 feet in the clear.<sup>141</sup>
11. On 30 October 1930, following the extension of the siding a month earlier, a repeating wrong line signal was provided 1,000 feet from the original so that the driver could see the indication. Presumably before this additional signal was provided, the driver relied on the guard to indicate to him when to set back.<sup>142</sup> In July 1934<sup>143</sup> D57 Class locomotives were banned from using the Up refuge.
12. The siding was finally dispensed with on 4 March 1935; and the crossover abolished one week later along with redundant signalling.<sup>144</sup> Blaxland Junction finally closed on 4 June 1935 as a Block Post with the introduction of automatic signalling between Glenbrook and Valley Heights.<sup>145</sup>



*In January 1926, 5365 and a wagon ran away from Falconbridge as a result of a broken coupling and the driver falling out of the cab. The train reached an estimated speed of fifty miles per hour through Springwood. It was stopped by being routed into the 'head-in' refuge siding at Blaxland Junction. This Siding Formed Part Of The Original Main Line.*

**Neil Cram Collection Penrith City Library**

**The Blaxland Junction Runaway:** The following is an account of a runaway that occurred on Saturday 2 June 1926 that commenced at Faulconbridge and ended up at Blaxland Junction.

#### ***Runaway on the Railway—Dashes Down the Mountains—Fifty Miles an Hour***

*A railway engine [a photo of the locomotive shows a Standard Goods type, almost certainly 5365] with one truck attached to it, bolted down the Blue Mountains on Saturday afternoon.*

*As a result of a series of incidents both the driver and fireman had alighted from the locomotive.*

*About 2pm a loaded goods train from the west was running into Faulconbridge station, when the couplings between the first and second trucks broke. The engine was brought to a standstill at once, and the air brake on the long line of trucks instantly prevented the "disabled" portion of the train from following on to the engine and truck attached to it.*

*As soon as the engine was pulled up the fireman alighted from the locomotive to ascertain the trouble.*

*Then began a series of misadventures, which resulted in the engine and truck bolting a distance of seven miles before they were sidetracked on the old Glenbrook line.*

*The driver remained on the engine, but while hanging out of the cab of the locomotive he slipped and fell, injuring one of his legs.*

*At the same time the engine and truck, laden with metal, moved off. The driver, owing to his injuries, was unable to regain the locomotive, which gained speed as it proceeded towards Springwood.*

*Springwood station was communicated with, and the officials there no sooner realised that the runaway was on the line than the engine and truck dashed through the station at a speed of about 50 miles an hour. The Springwood signal officers were too late to switch the runaway on to a siding as it had passed the points<sup>146</sup>.*

*Valley Heights Station was telephoned to, and meanwhile the engine and truck were careering down the mountains. The line from Faulconbridge to Valley Heights, a distance of about three miles, descends 400 feet, and the runaway gained speed as it proceeded.*

*The officials at Valley Heights communicated with Blaxland Junction, and it was from that station that the runaway engine and truck were run onto the old line at Glenbrook.*

*The engine and truck rushed through Warrimoo at a terrific speed, and when switched onto the Glenbrook line had descended a total distance of 700 feet in its wild journey of seven miles.*

*At Glenbrook [actually Blaxland Junction] the runaway dashed into a dead end and probably owing to the contour of the line the speed of the engine was considerably reduced, and it was reported yesterday that little damage was done to the locomotive or truck...*

*The train which met with the accident was in charge of Driver Ings and Fireman Matt, both of whom are attached to the Enfield depot<sup>147</sup>.*

## Subsequent Changes

**Removal of Assistant Engine Working:** Up until the opening of the second deviation most goods trains at least were assisted from Penrith to Katoomba. This was no longer necessary after 1913 as the steep Lapstone Hill had been avoided and the line had been regraded as far as Valley Heights. As a result a new roundhouse and locomotive facilities were opened at Valley Heights. This was only the third roundhouse built on the system after Singleton and Port Waratah.<sup>148</sup>

**Removal of Runaway Catchpoints:** Runaway catchpoints were provided at Lapstone Hill, Glenbrook and Blaxland Junction 10 yards outside the Down Distant signal at each location.<sup>149</sup> The purpose of these was to derail any vehicles that broke away and started running back in the wrong direction. Catchpoints at 36 miles 8 chains, 37 miles 75 chains and 41 miles 76 chains were removed in July 1933<sup>150</sup> along with 136 others on the system as a result of the Albury Mail accident at Bowning on the Southern Line on 11 July 1933.<sup>151</sup>

**Automatic Signalling and Single Light Colour Light Signalling:** These have been discussed previously.

**Electrification:**<sup>152</sup> Regular electric operation of some trains to Valley Heights commenced on 23 October 1956, while assisting Down trains to Katoomba was taken over by electric locomotives in February 1957. From 6 March, trains to and from Mount Victoria were electrically hauled while electric operation reached Lithgow and Bowenfels in June the same year.<sup>153</sup>



3526 hauling the Caves Express over the new Knapsack Viaduct on Lapstone Hill.

A Cranston, ARHS<sub>nsw</sub> Railway Resource Centre 23769

**Lapstone Railway Station:** (39 miles 42 chains), about two miles south of the old Lapstone Signal Box, was constructed by Lapstone Estate Pty Ltd for £32,566 and opened on 24 February 1964 to enable subdivision of about twenty acres of land on the western side of the line. An island platform was proposed but this would have cost £78,570.<sup>154</sup> The station itself can best be described as a functional brick building on the Up platform with minimal facilities on the Down.

**Bridge over M4 Motorway:** John Fisher (bridge designer) had two problems to solve with the design of this bridge: firstly, because of grade constraints there was limited height for a road bridge to pass under the railway at this point. Secondly, he wanted a design that would enhance the bridge as the gateway to the Blue Mountains. The design chosen was a bowstring steel arch which opened with the extension of the M4 Motorway in 1991. The design won the Australian Iron and Steel Construction Award for 1992.<sup>155</sup>

**Track Strengthening:** Concrete sleepers and heavier rail was laid over the Mountains during the 1990s to improve the efficiency of coal movements.

## Accidents

Three additional accidents are worthy of mention.

The first was the head-on collision at Emu Plains that proved a watershed in tightening up of train operating rules. Three railwaymen died on the night of 30 January 1878 in this horrific collision caused in part by a guard's decision to proceed into a section in an attempt to get to Emu (Plains) before an opposing movement arrived. The accident was instrumental in hastening the introduction of train staff and ticket working on single lines in NSW. The Rules and system were ready for implementation but final Executive Council was still required and was to have taken place five days later.



On 16 January 1976, 21.30 Sydney–Mount Victoria Interurban train stalled outside Glenbrook tunnel and was hit in the rear by 4622 hauling 20.20 goods, Darling Harbour–Orange at 22.45. Double-deck car DCF8004 is seen here being rolled over the embankment in an effort to clear the Main Western Line.

**Sydney Telegraph Paper, ARHSnsw Railway Resource Centre 16032**

On the evening of 16 January 1976, a goods train hit the rear of a stationary interurban train, which had stopped mid-section due to power difficulties. One passenger was killed and a number injured. There was some question as to the indications displayed by the automatic signal protecting the rear of the train.

On 2 December 1999, a morning interurban train crashed into the car carrier wagon at the rear of the *Indian Pacific* express, which was halted at a failed signal. Seven passengers died and many more were injured, all casualties being on the interurban. The primary cause was established as the Penrith signaller having directed the interurban train to pass a failed signal at danger without indicating the presence of the *Indian Pacific*. However, radio communication was poor and recommendations were made for improved monitoring of 'dark spots' in the network.

## Automatic Train Control Experiments:

The Blue Mountains Line was recently selected for trials of the Automatic Train Protection Systems (ATP). These systems are designed to override a train's brakes if the driver does not slow down when approaching a red signal, or an area with a lower speed limit. This is achieved by a computer analysis of the train's speed and the computer is able to intervene and stop a train before it passes a red light. The system also applies the brakes if something has happened to the driver, or if there has been some other incident. This computer system can override the train controls, slow or stop the train, and thereby improve safety for passengers, rolling stock and crew.

## Conclusion

Today as the traveller sits back in an air-conditioned intercity V Set EMU, XPT or Xplorer, and effortlessly glides up the

eastern escarpment it seems incomprehensible that such difficulties were encountered in surmounting this grade in the early years.

It is no coincidence that a memorial to John Whitton was erected in the vicinity<sup>156</sup> to acknowledge the work of this great man who, with few resources, succeeded in pushing the first line up over the ridge to tap the produce of the rich western slopes and plains. Until the railway had been completed, much of this traffic had been lost to Melbourne and Adelaide via the Darling River. Whitton's railway served to improve the standard of living for all who have come after him.

We should remember that Whitton's liberal use of steep grades on his railways, as a cost saving exercise, was far preferable to the other favoured alternative—horse-drawn trams!

Well done John!

## Acknowledgements

The authors would like to thank Dr Bob Taaffe for his helpful comments in the preparation of this article, Bob Stack and Bruce Freeman for assisting with research and completion of excellent diagrams, and Arthur Ellis for review of first draft text.

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- 12 WN 2/92
- 13 Lapstone Zig Zag: Opening of Interlocking Arrangements 6 February 1890.
- 14 Singleton C C. The Ascents of Lapstone Hill. ARHS Bulletin No. 227, September 1956. p122. WN 2/92
- 16 Singleton. op cit. p124
- 17 Langdon. op cit. p 25
- 18 A timber frame D truck was 15ft in length over body and 18ft over buffers (WN 2/92). A D truck was a four-wheeled open wagon; an early version of the ubiquitous S truck. Engine loads at the time were calculated in length rather than weight.
- 19 Forsyth, J. H. compiled. 2004. 'Historical Notes on Main Western Line from Granville Junction to Bourke.' Vol.1 'Granville Junction to Marrangaroo (1<sup>st</sup> site)...' p51. Singleton quotes 1 September 1880 as opening date. Ibid
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- 22 WNs 51 & 52/92
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- 27 This accident has been written up in a number of places including: Lee. op cit. p139 – 140 and ARHS Bulletins Nos. 187, 188 & 191.
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- 50 Singleton. op cit. p126
- 51 Forsyth, J H compiled. 2004. 'Historical Notes on Main Western Line from Granville Junction to Bourke.' Vol. 1 'Granville Junction to Marrangaroo. op cit. p56
- 52 Forsyth, J H compiled. 2004. 'Historical Notes on Main Western Line from Granville Junction to Bourke.' Vol. 1 'Granville Junction to Marrangaroo. Op cit. p56. As Weekly Notices for 1902 do not appear to have survived it is not possible to verify this date.
- 53 Personal Communication, Dr Bob Taaffe. January 2008.
- 54 WN 36/09
- 55 WN 19/93
- 56 WN 34/93
- 57 WN 16/95
- 58 WN 21/96
- 59 WN 3/97
- 60 A diagram of the siding dated 14 May 1903 gives the name 'Lapstone Tunnel Siding.'
- 61 WN 3/10
- 62 If this was the case the train could have set back outside the tunnel as they could when the siding was in use. It seems as though the journalist was misinformed about the problem.
- 63 A sprag is a thick piece of squared timber about 90cm planed to a point at each end. They were used to secure wagons by inserting them into the spokes of wagon wheels to act as a brake. They are no longer used.
- 64 WN 17/13
- 65 WN 11/10; Circular A81/09
- 66 Gregory's. Map 234 J10
- 67 WN 9/11
- 68 WN 27/10
- 69 WN 32/10
- 70 WN 11/13 See also WN 10/13
- 71 Circular 102-12/1943
- 72 Singleton. op cit. p125
- 73 Sharp, Dr Stuart. op cit. p8. For a discussion of these buildings see the description of the station on the second deviation.
- 74 Langdon op cit. p26
- 75 Singleton. op cit.
- 76 New South Wales Government Railways and Tramways. Report of the Railway Commissioners for the Year Ended 30 June 1902. p5.
- 77 Ibid p18
- 78 WNs 44-48/01 also 4/03
- 79 Legislative Assembly of NSW. Parliamentary Standing Committee on Public Works. Report together with Minutes of Evidence, Appendix and Plan relating to the Proposed Great Western Railway Duplication between Emu Plains and Blaxland. Minutes of Evidence.
- 80 Historical Notes on Main Western Line from Granville Junction to Bourke. Vol 1 Granville Junction to Marrangaroo op cit. p51.
- 81 New South Wales: 'Timetable for Passenger, Goods and Livestock Trains. Western Division.' From 1<sup>st</sup> March 1893. p12–13.
- 82 Forsyth, J H compiled. 2004. 'Historical Notes on Main Western Line from Granville Junction to Bourke.' Vol. 1 'Granville Junction to Marrangaroo. op cit. p57.
- 83 Gregory's ... Map 264 H1
- 84 Gregory's ... Map 234 E15
- 85 There is a No Right Turn into Barnet Street when travelling from Sydney.
- 86 Mushroom farming may now have ceased.
- 87 See Plunkett, Geoff. Chemical Weapons and Railway Tunnels. Australian Railway History. May 2008. Vol. 59 No 847. p161f.
- 88 Gunn John. op cit. p259
- 89 NSW Government Railways and Tramways. Report of the Chief Commissioner for the Year ended 30 June 1910. p5.
- 90 Parliamentary Standing Committee on Public Works. Report Relating to the Proposed Great Western Railway Duplication between Emu Plains and Blaxland. op cit. Minutes of Evidence. P2.
- 91 NSW. Working Plan. Deviation between Emu Plains and Blaxland. 23 August 1910.
- 92 Ibid pv
- 93 Ibid pv,vi
- 94 Gregory's Map 232 C8
- 95 Parliamentary Standing Committee on Public Works. Report relating to the Proposed Great Western Railway Duplication between Emu Plains and Blaxland. op cit. Minutes of Evidence. pvii
- 96 Ibid. pvi.
- 97 Ibid p11
- 98 Ibid. pp4 & 6
- 99 Langdon. op cit. p28
- 100 NSW Government Railways and Tramways. Report of the Chief Commissioner for the Period Ended 30 June 1911. p7.
- 101 Langdon. op cit. pp 27–28
- 102 WN 19/13
- 103 WN 38/13
- 104 Parliamentary Standing Committee on Public Works. Report relating to the Proposed Great Western Railway Duplication between Emu Plains and Blaxland. op cit. p7.
- 105 New South Wales. 'Working Timetable for Passenger and Goods Trains. Western Division. 26 September 1937. p220.
- 106 WN 20/13
- 107 New South Wales. 'Working Timetable for Passenger and Goods Trains. Western Division.' 26<sup>th</sup> September 1937. p64.
- 108 Circular 271/1913
- 109 WN 9/20
- 110 WN 43/22
- 111 Sharp. op cit. p15
- 112 Circular 283-27/1935.
- 113 Circular 360-38/1935
- 114 Circular 254-5/1958 & WN 37/58. An explanation of signal indications are outlined in WN 43/58.
- 115 Department of Railways NSW. Office of the Signal and Telegraph Engineer. Penrith (Excl) to Glenbrook. 17 March 1959.
- 116 WN 44 & 45/89
- 117 Circular A417/1910
- 118 WN 51/12 See the section titled Lapstone Hill
- 119 WN 24/11
- 120 WN 2/12; 4/12
- 121 WN 40/11
- 122 WN 10/13
- 123 WN 51/12
- 124 WN 10/13
- 125 Singleton. op cit. p129
- 126 WN 71/13
- 127 WN 13/34
- 128 Circular 360-38/1935
- 129 WN 37/12. C212/12 relating to this work does not appear to have survived.
- 130 This statement has wider implications. Was Blaxland ever a block station? The authors didn't think it was—but abolition of an Advanced Starter would imply that not only was it, but that it was being abolished.
- 131 WN 38/11
- 132 WN 43/12
- 133 WN 2/13 Circular 212/12 relating to this change is missing.
- 134 An image by O B Bolton is included in Langdon. op cit. p33.
- 135 WN 42/13
- 136 The writer's are unsure of the meaning of this statement.
- 137 As there was no date given the staff may have been withdrawn some time earlier. Sometimes Weekly Notices took some time to catch up with changes.
- 138 WN 43/22
- 139 WN 26/23
- 140 WN 21/26. This WN incorrectly states that this overbridge was at Blaxland instead of Blaxland Junction. 43m 48ch is the location of the present Great Western Highway overbridge.
- 141 WN 38/30
- 142 WN 43/30
- 143 WN 28/34
- 144 WN 11/35 This WN also indicated that the signal box had been dispensed with which seems to be incorrect as Weekly Notice No 12 of 1935 indicated that the Up Home signal had been replaced by a straight post presumably still requiring the need for a signal box.
- 145 WN 22/35; Circular No 283-27/1935. This is when Blaxland Junction was closed.
- 146 It would have been virtually impossible for the runaway to be stopped at Springwood at that time. The signalman would be required to remove an annett key from the signal frame, stride vigorously about 750 feet, insert key into ground frame, reset the points and (because of the curvature of the line) jump clear! If he had succeeded the engine would still have been derailed at the exit catchpoints to the Up Refuge.
- 147 *Sydney Morning Herald*. 4 January 1926. p11. A photo of the locomotive as well as an eye witness account of the speeding train are contained in the following day's edition.
- 148 Sharp, Dr Stuart. op cit p9
- 149 Circular 272/1913
- 150 WN 30/33
- 151 For a discussion on Runaway Catchpoints see: Pollard, Neville. 'Runaway Catchpoints: 'Weighed in the Balance and Found Wanting.' *Australian Railway History*. Vol. 58, No. 839. September 2007.
- 152 For a history of electrification of the Mountains Line see: Miller, Stephen. 'Blue Mountains Electrification—50 Years Later.' *Australian Railway History*. Vol 59, No 843. January 2008.
- 153 Keenan, David and Clark, Howard; *First Stop Central*, 1963, pp46–7
- 154 Forsyth. op cit. p61
- 155 Fraser, Don. 1995. *Bridges Down Under: The History of Railway Underbridges in New South Wales*. Australian Railway Historical Society NSW Division. p167.
- 156 Located near the Knapsack Bridge car park. Gregory's Map 234 J10.