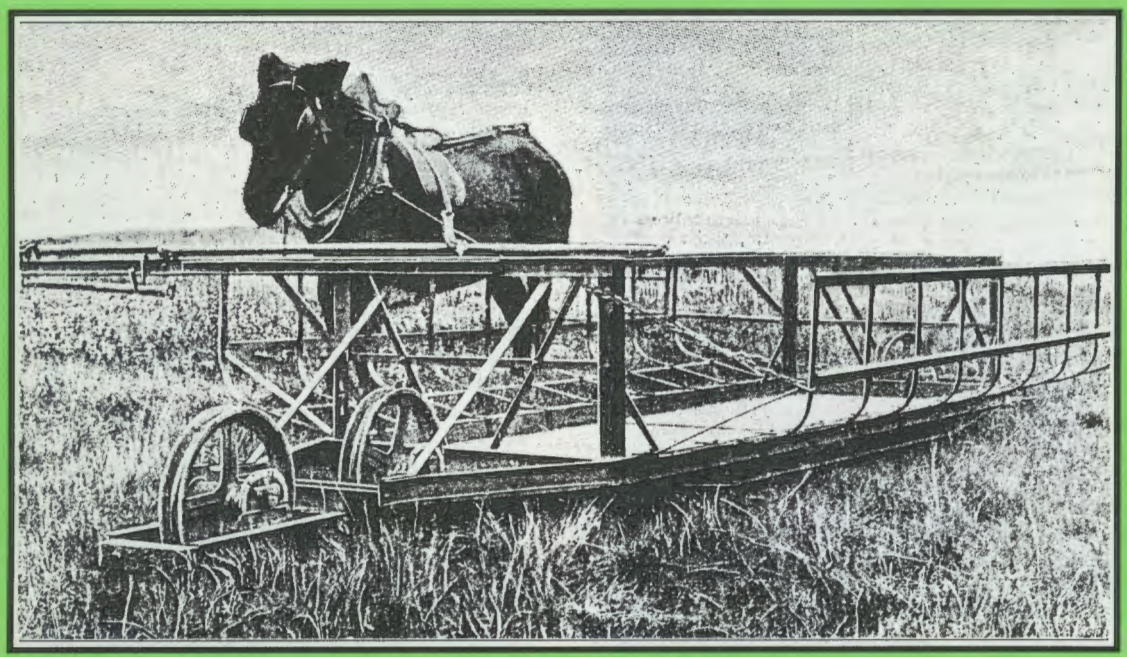
LIGHT RAILWAYS

Number 112 April 1991

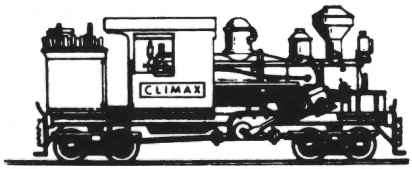
Cheetham Salt Tramways, Part 1
Loxton Farming Company Monorail, SA
Sydney Water Board Monorails
Longworth's Tramway, Kendall, NSW

ISSN 0 727 8101



The Light Railway Research Society of Australia Inc.

Registered by Australia post — publication No. VBQ1339



Light Railway Research Society of Australia Inc.

PO Box 21, Surrey Hills Vic 3127

No. 112
Vol. XXVIII
APRIL 1991

ISSN 0 727 8101

CONTENTS

EDITORIAL

Monorails have been a controversial form of light rail technology over the past 170 years, but one which has seen limited application in Australia. It was therefore a pleasant surprise to receive two articles on monorails, which combine to provide the theme for this issue of *Light Railways.*

Arnold Lockyer describes a fascinating chapter of Australia's transport history in his well researched account of the monorail operated by the Loxton Farming Company. This generated considerable interest at the time as the government was examining light rail applications for the provision of cheap transport to sparsely populated agricultural lands. The monorail, and the subsequent 2 ft gauge tramway, also offers a rare example of the application of light rail technology in agriculture outside the sugar industry. Jim Longworth's account of the concrete transporters used by the Sydney Water Board provides a more recent example of monorail technology.

This issue also presents Part 1 of a series by Norm Houghton on the operations and tramways of the Cheetham Salt Company. This covers the tramways which operated on Victorian salt lakes. It offers a fascinating insight into the evolution of a successful Australian corporate enterprise. Subsequent articles will cover other operations in Victoria and South Australia.

Cover: Illustration of Caillet's monorail from Engineering of 12 February 1897. This four-wheel version is larger than the rolling stock believed to have been used on the Taldra monorail at Loxton. A description of this operation commences on page 13.

THE CHEETHAM CRONICLES

PART 1: VICTORIAN LAKE SALT TRAMWAYS

By Norm Houghton

Cheetham Salt Company

Introduction

The present company Cheetham Salt Limited, based at Geelong, Victoria, has been in business for a century. During this time it has operated numerous tramway systems in three states on its own account or through subsidiaries.

The Company recently deposited a range of archival records in the Geelong Historical Records Centre, and these records form the basis for this series of articles. The records are not fully comprehensive, but are detailed enough to enable an account to be written from Cheetham's viewpoint for the years 1929-1960.

Early Years

Cheetham Salt Limited was originally formed as a salt-producing enterprise at Geelong by Richard Cheetham in 1890. Cheetham began salt-making on the Moolap flats at Stingaree Bay, East Geelong, using capital provided by a local banker, Alexander Cunningham.

Across a portion of Stingaree Bay a coffer dam was built, thus enclosing a certain area. Sluice gates were provided so that the incoming tide would flood the enclosed area. A pump drew water from this area and threw it onto higher levels, which allowed the rest of the system of ponds to be fed by gravitation.

By moving these waters from pond to pond - called condensers - the density rose until gypsum precipitated, thus removing an impurity that would otherwise seriously affect the quality of the salt. The brine was then pumped into several small paddocks called crystallizers. Here the salt precipitated, was shovelled into barrows and wheeled onto the bank and stacked. The crude discoloured salt was then further processed to remove impurities and bagged for marketing.

These early methods of salt production proved to be uneconomical for large-scale production, so the process was changed in 1897 to allow a very close control of the brines, along with improving the bottoms of the crystallizers and using careful harvesting methods. The crude salt was then crushed in a grindery (erected in 1897) and refined to various grades.

As the brands of the Cheetham Company became better-known, trade expanded to the detriment of imported salt. As orders increased, it became necessary from time to time to extend the outer works until these were fully taken up. Growing demand for salt led to the development of a second salt-works at Laverton in 1926.

This building in Little Malop Street, Geelong, served as the head office of the Cheetham Salt Company between 1913 and 1986.

Norm Houghton

Jack Cunningham was the driving force behind the expansion of Cheetham Salt between 1926 and 1934.

Company Expansion

Alexander Cunningham's eldest son, AH Cunningham, had become Cheetham's first Company Secretary in 1894, and then Managing Director in 1900, a post he held until his death in 1921. AH Cunningham's sons all worked for the firm, and it was one of them, A.J. "Jack" Cunningham, the plant engineer and later Managing Director, who steered Cheetham Salt into national involvement in the salt industry during the period 1926-1934. AJ Cunningham had joined Cheetham in 1906 as a young man who had gained electrical engineering qualifications in Melbourne, followed by 18 months practical experience with two Geelong engineering concerns.

The salt trade is one of high volume with low profit-margins, as salt is a very basic ingredient in most manufacturing, industrial and food processes. Demand tends to be inelastic as consumers (particularly industrial ones) only buy for immediate needs, so there is little scope for expanding domestic markets in the short term. The harvest is seasonal (and a year's potential production can be wiped out overnight by unseasonal rains) and was formerly labour intensive. The back-breaking task of shovelling or forking crude salt from the crystallizer floors into surface heaps, bins or hoppers in the shimmering summer glare did not give the industry a good name amongst labourers. As well, salt pans are usually forlorn and desolate places away from habitation, so harvest labour recruitment problems were the norm. It was against this background that Cheetham determined to overcome the problem of what was potentially ruinous competition in a falling market with the onset of the Depression.

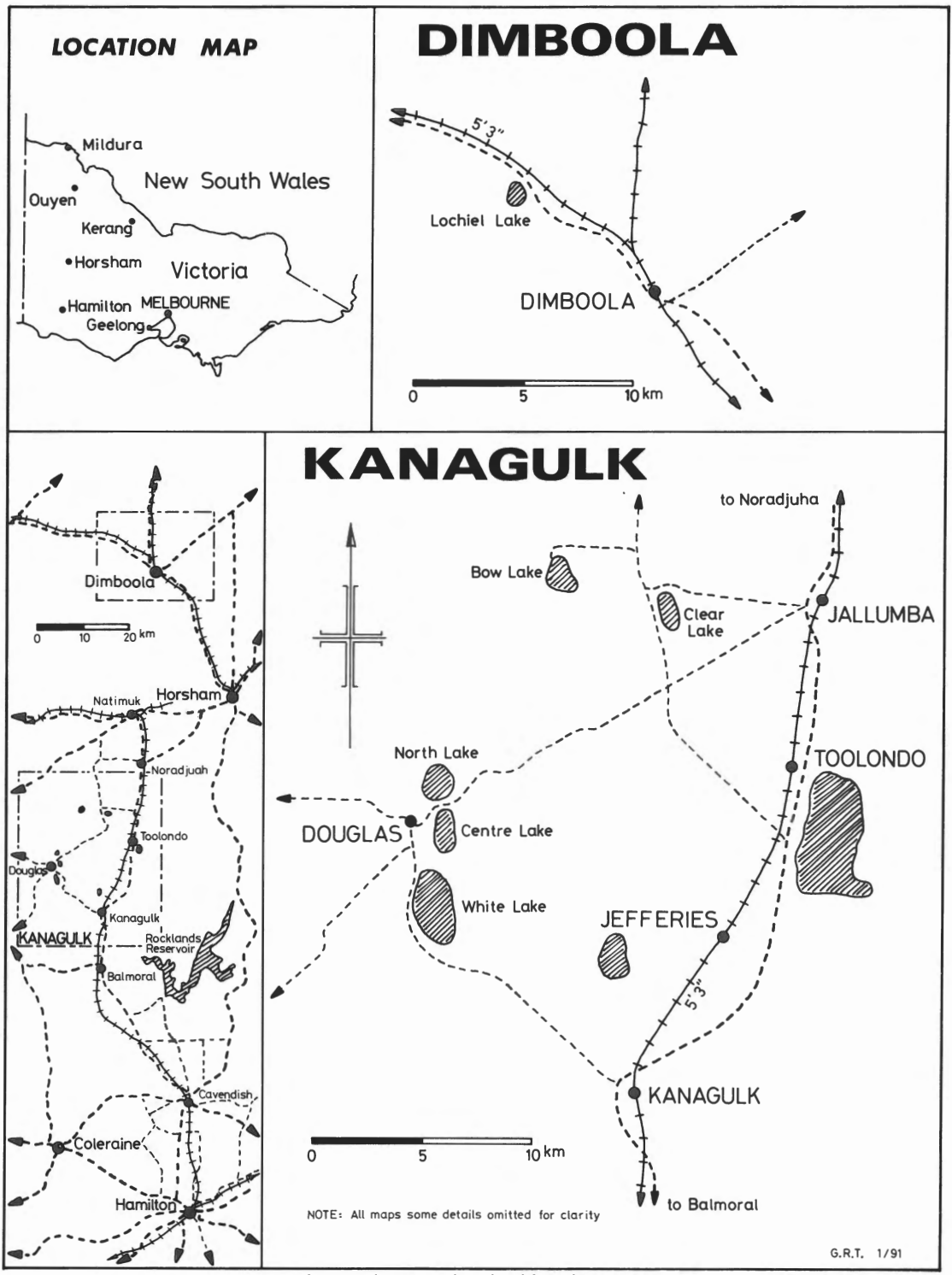
By the mid-1920s, Cheetham was the largest salt-producer in Victoria and was experiencing stiff competition from smaller operators on the numerous salt lakes in the west and north of the state. The Company developed a sophisticated intelligence network on the state of the salt trade and was able to counter some of the competition by contracting with small operators.

Interstate Competition

The main interstate competition for Cheetham was from South Australia and Queensland, both states supplying New South Wales and Pacific export trades. The South Australian trade was characterised by several medium-size operators and numerous small-scale suppliers, and this had an unsettling effect on long-term stability, as price-cutting was prevalent throughout the 1920s.

Cheetham was one of the few salt companies making profits at that time, as well as having the advantage of interior lines of of distribution by being close to major local markets (Melbourne, country Victoria and Tasmania) and closer than South Australia to the Sydney market. South Australia had a very small local demand for salt, and exported most of its production by sea and rail to the Eastern states, and thus had much higher freight costs as a component of market price.

Cheetham was in a strong bargaining position against South Australian companies when it chose to act in 1927 to defend its interests and to, as Jack Cunningham wrote in a report at the time, "bid for the dominance of the salt trade". Cheetham bought into the ailing Australian Salt Company at Lochiel and turned the price-cutting weapon against the other South Australian companies. However, this policy was not completely effective as Cheetham did not control sufficient productive capacity to dominate the market. In 1928, Cheetham changed tactics and began negotiations with the six larger producers. After two years a co-operative



agreement was reached in the interests of market stability.

The agreement resulted in the formation of a new holding company, the Australian Salt Company Limited (ASC), with shareholding from the old Australian Salt Company, The Ocean Salt Coy Ltd, The Ocean Extended Salt Coy Ltd, the Commonwealth Salt Refining Coy Ltd & A Muston, The Castle Salt Co-operative Ltd, and Standard Salt & Alkali Ltd. The new company rationalised assets, divided up the Eastern Australian and New Zealand markets between Cheetham Victoria and the rest, and allocated respective sales shares.

Cheetham had a controlling interest in the new Company, and this meant that it ended up running the operations of the member-companies, with Jack Cunningham as the Managing Director. Cunningham's engineering expertise was unrivalled in the salt trade, and he gathered around him a competent band of managers, engineers and administrators. In this fashion, Geelong exercised tight control, via regular reports, correspondence, telegrams and occasional inspection tours, on the salt works at Lochiel, Port Augusta, Price, Kangaroo Island, Edithburgh, Lake Hart and Lake Macdonnell.

Queensland competition was represented in the Bowen Salt Works (formed 1926), which was able to match prices for South Australian salt along the East Coast. Cheetham was unable to gain outright control of the Bowen Company and, after attempting a merger between Bowen and the Australian Salt Company, settled on the ASC having drawing and selling rights to the bulk of Bowen's production. This was achieved in 1934. Over time, Cheetham gradually purchased equity in the company and gained a controlling share. While Cheetham took a strong interest in the operation of the Bowen Company, it did not achieve direct control until the late 1960s.

The following series of articles will chronicle Cheetham's involvement in the tramway operations of the companies it controlled, beginning in Victoria with the Salt Lake trade after 1926.

VICTORIAN LAKE TRAMWAYS

Background

In the period from 1920 to 1945, Cheetham took a strong interest in salt-harvesting at every Victorian salt-lake to keep an eye on competitors and to seek opportunities for its own trade. The operations at Kanagulk, Dimboola, Douglas, Hattah, Linga and Mystic Park involved tramways.

Tramways were used at the salt lakes for two purposes: to draw in the salt from the lake bed to the lake bank - where it was stacked for drying and ultimate bagging - and to cart the bagged salt to the nearest railway station. Light, portable sectionalised tramway systems and side-tipping trucks pushed by manual labour were particularly effective on lakes having soft bottoms, as heavy equipment tended to break the bottom and soil the salt. Lakes with hard bottoms could be worked with animal- or motor-powered scrapers and graders in conjunction with portable tramways.

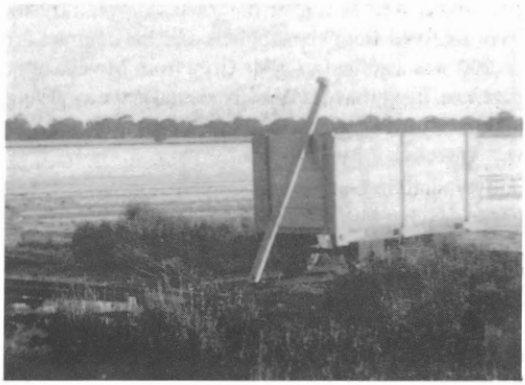
The files reveal some unbelievably crude salt-gathering techniques being practised at the time, such as direct shovelling into sleds, or even plain wooden boxes, which were then hauled with ropes attached to a motor truck on the bank. Dispatch tramways were not common, and the example at Linga seems to have been the only one in Victoria.

Bow Lake

This small lake is situated 11 kilometres due west of the former Jallumba railway station on the now-closed Horsham to Hamilton railway. The lake was used for salt-gathering, at least from 1933-34 by lessees Messrs A Cutchie and W Emmerson. Their operation employed six men to harvest the salt on sledges and transport the bagged product to Jallumba railway station.

Cheetham Salt took over the lease in late in 1935 and retained Cutchie and Emmerson on contract to perform the salt harvest. The Company was quite dissatisfied

Lifting salt on Bow Lake, 1936



Truck and rails on the bank of Bow Lake, 1936.

with the harvesting methods then employed, and suggested to contractors install a light rail and hand-truck system on the lake.

Cheetham's representative contacted the Chief Engineer of the State Rivers & Water Supply Commission at Horsham in February 1936, and was able to purchase 160 metres of double-track rails (light gauge) and two 2 ft gauge (610 mm) bogies. The file entry notes that the rail is "fairly old, but will do the job." Pine sleepers were obtained from a property near the lake. The pine logs were cut into 3 ft (914 mm) lengths and split in the centre to give a half-round cross-section.

The rails were in 12-foot (3657 mm) lengths, to which three sleepers were attached and dogged down. One length of track was sprung into a 75 degree curve to allow the harvesting areas on either side of the base-line to be worked in herring-bone fashion.

One hand-truck was built on the bogies by a Horsham joiner. The truck was mounted on red-gum bearers, to which was fixed a softwood box with one removable side. It had a capacity of one ton.

The tramline was laid into the lake from the bank in February 1936. The total cost of the purchase, transport and laying of the tramway system was £20.1.10. Cutchie and Emmerson contracted to lift a minimum quantity of 200 tons per season. One provision in the contract was that, on completion of the harvest, all tramline and the truck were to be stacked on the lake bank above the water level.

In operation, it was found that the lake bed was too soft and this caused the track to buckle. The contractor cut the salt box down to half size, but this made no difference, so longer sleepers were substituted in parts and fisplates used on the joints. These measures solved the problem.

The file indicates that salt was harvested in 1936 and 1937, but output fell below to projected tonnage, after which the venture seems to have been terminated.

Dimboola

Mr Jack Haines worked Lochiel Lake, seven kms north-west of Dimboola, from the 1920s until his death in 1944. His wife and son, John Jnr, carried on until around 1950. This lake was 80 hectares in size and produced around 3000 tons of salt per year.

A Cheetham report of 1923 details that Haines was using superior harvesting methods in the form of a "sectional narrow-gauge tramway." By 1932, Haines had four sets of tramway and several side-tipping trolleys. The lines were run out into the lake for about 75 metres, and over these three or four men pushed the loaded trucks to the bank, where the salt was stacked for draining and subsequent bagging.

Douglas

The White Lake at Douglas, 13 kms northwest of the former Kanagulk railway station on the former Horsham to Hamilton railway, was worked by J McIntyre from c1921 to 1946. McIntyre had observed Haines' tramway at Dimboola and, in 1923, purchased a set of rails "from the local blacksmith" made to Haines' design. The file has nothing further to add on this operation.

Hattah

Three small lakes, 5 kms east of the Hattah railway station were worked by a crown lessee named McLeod around 1920. The soft nature of the lake bottoms dictated that a tramway be used. A 1935 Cheetham report mentions that McLeod used a tramway with trucks running on rails laid on 6 in x 1 in (152 x 25 mm) sleepers.

Linga

Four salt lakes 16 kms north of the Linga railway station on the Ouyen to Pinaroo line, known as the Pink Lakes, were extensively exploited for salt-harvesting after 1912. The lakes were known in the salt trade as "A", "B", "C" and "Reserve" (Lakes Becking, Crosby, Kenyan and Hardy), and comprised workable salt areas

of 84, 110 and 60 hectares capable of producing an average yearly output of 2000, 5000 and 2000 tons respectively.

Soon after the railway reached Linga in 1912, a Melbourne-based enterprise, Bailie & Devereaux, established a salt-harvesting operation at the Pink Lakes on lakes Becking and Crosby. Parts of lakes Crosby and Kenyan were leased to other operators. Most of the salt was marketed in Melbourne, but Bailie & Devereaux were unable to raise production to satisfactory levels because of transport problems between the lakes and the Linga railway station. Horse and bullock wagons were used to cart the salt over very poor tracks.

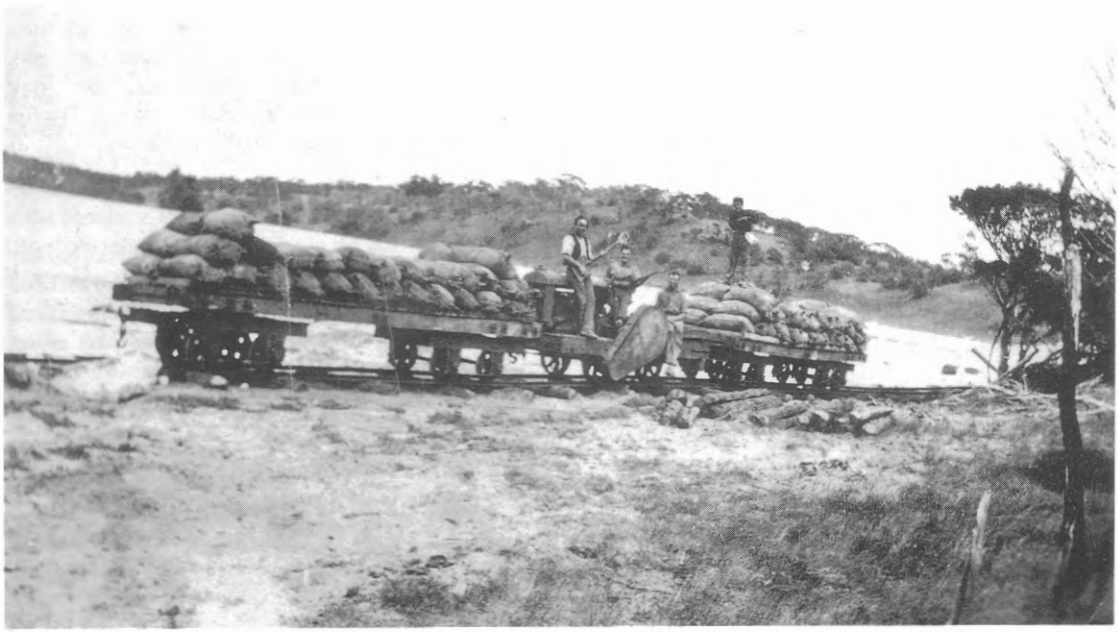
In 1922, Sailor Salt Limited was formed in Melbourne to purchase and upgrade Bailie & Devereaux's operations. It was proposed to raise £37,000, and of this sum, spend £11,500 on laying a steel-rail tramline between Linga railway siding and the lakes (terminating at the north east corner of Lake Becking), as well as £3000 on machinery and buildings. The company's prospectus stated the aim to harvest 10,000 tons of salt per year and capture Victoria-wide markets.

In mid-1923, the company purchased the steel rails and called tenders for the supply of 22,000 redgum sleepers as well as timber for the buildings. Tenders were received from six suppliers and the contract for 26,000 was awarded to a Mr Grey from Molesworth, near Yea. It may have been coincidental in the awarding of this contract that the Managing Director of Sailor Salt was Frederick Purcell of Yea.

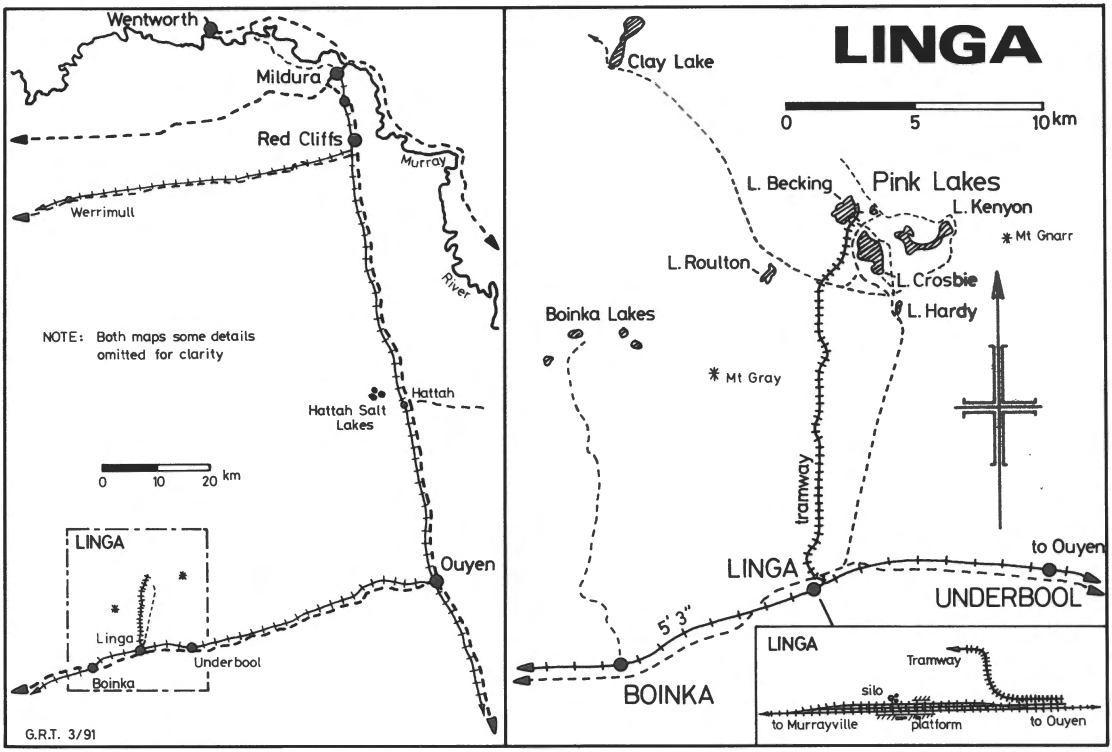
Laying of the rails commenced as soon as sleepers began arriving from Molesworth, but to the company's embarrassment, it was found by mid-October 1923 that the number of sleepers paid for were far in excess of actual deliveries made. The company had been swindled and was compelled to meet the deficiency by purchasing sleepers from the Victorian Railways in order to complete the tramway.

The Sailor Salt operations at Linga were planned and executed on a lavish scale. At the lake site, the company erected a salt-crushing plant as well as supervisor's house and several galvanised-iron buildings for two messrooms, store, cook-house, meat-house, lighting plant, tractor shed, locomotive shed and a bag shed. The electric-lighting plant was provided so that harvesting could go on around-the-clock.

Salt-harvesting had commenced long before the plant and equipment was installed, and a stockpile of



The Fordson tractor and wagons loaded with bags of salt on the Sailor Salt Company tramway.



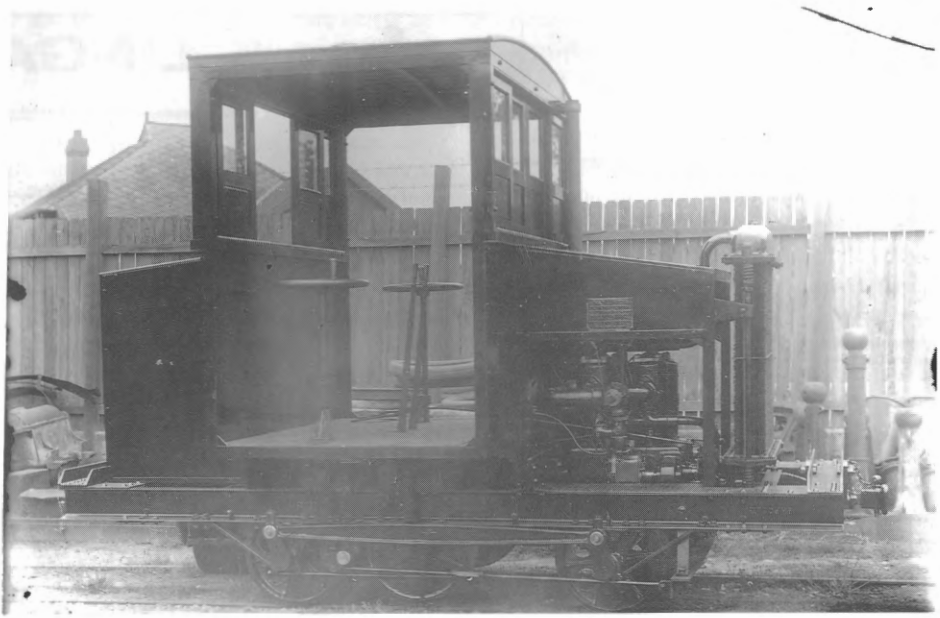
10,000 tons in several stacks was gathered on the lake banks by 1922-23. The salt was lifted by using a grader and a plough as well as scoops. It was then shovelled either into horse-drawn drays or into 20 side-tipping trucks running on 2600 metres of 14 lb (7 kg/m) light portable tramway laid on the lake bed. Two *Fordson* road tractors were also employed on this part of the operation.

The large crushing plant processed various grades of salt and the final product was shovelled into bags, via Watson Patent bag holders, and dispatched to the Linga railway station. The tramway to the station was 16 km in length and mostly ran along a road reserve, although at either end it transvered some leased Crown lands. The line was laid to a gauge of 2 ft 6 in (762 mm), using 22 lb (11 kg/m) rails on hardwood sleepers, across the mallee landscape. Shallow embankments and cuttings were required at the lakes area to maintain the grade and two deep cuttings were excavated through sand ridges on the main access road.

Rolling stock comprised 14 flat-top trucks and two internal combustion rail tractors. One tractor was a *Fordson,* the other a *Purcell.* The latter had a two-cylinder engine developing 20 hp, with a one-speed gearbox, forward and reverse. The driver of the Purcell, Mr Dawson, claimed the locomotive would pull more than twice the load of the Fordson, but it was out of order by 1926.

The deception over the sleeper contract and the problems in completing the tramway led to liquidity problems and this, along with the suicide of the managing director (who was blamed for the deception), led to a weakening of resolve by the directors and the company was put into receivership. Cheetham had a long-ingrained antipathy to small-time, fly-by-night salt producers who, the Company alleged, unsettled the market by offering bargain-price salt on a one-off seasonal basis. They were concerned that such operators might gain control of the Pink Lake leases, now very strategically placed with its access tramway, from the wreckage of the Sailor Salt Company.

One of Sailor Salt's main customers was the Mount Lyell Company's fertilizer works in the Melbourne suburb of Yarraville, so this company had an interest in



Photograph from the Purcell Engineering collection of a locomotive with patent grip drive. Was this the locomotive supplied to the Sailor Salt Company in 1923?

Photo: courtesy Paul Simpson

the future if its supplies from Linga. Cheetham was aware of this and confidentially approached Mt Lyell with the view to conclude a mutually-satisfactory arrangement over the leases. Cheetham proposed that the two companies purchase the assets of Sailor Salt on a share basis, that Mt Lyell be the nominal operator of the leases and draw its salt supplies from Linga (some 2000 tons annually), and the Cheetham name not be publicly mentioned. Cheetham was not interested in drawing salt from Linga, and only wished to exclude competition and prevent the lessee of Lake Kenyan and part of Lake Crosby from using the tramway. The joint agreement was ratified by both companies in September 1926, and a Mt Lyell offer of £6000 for Sailor Salt was accepted by the receivers. The price included a seven year lease on portion of the lakes. Mt Lyell formally took over the operation on 24 December 1926.

Cheetham did not participate in the day-to-day running of the operation and generally accepted the reports of Mt Lyell and its successors, Commonwealth Fertilizers & Chemicals Ltd and Imperial Chemical Industries (ICI), on conditions prevailing at Linga. The access tramline gave continual trouble through being subjected to sand drifts, particularly in the two cuttings.

In the period 24 December 1926 to 31 October 1928, some 3530 tons of salt was carried over the tramline. From 1 January 1929, the tram was put out of service and the contractors, Messrs Dawson and Begg, switched to motor trucks for cartage to Linga station. The road from the lakes to the station was passable in all weather and was kept in order by the contractors, who claimed they could deliver 50 tons per day over the road.

As the tramway was now redundant, Commonwealth Fertilizers lifted major sections of the tramway in 1930. By mid-November, they had stacked 50 tons of 14 lb and 22 lb rails at Linga, along with five tipping trucks, in anticipation of sales through machinery agents Cameron & Sutherland. While Cheetham had suggested sale of the tramway plant to realise a return on superseded assets, it objected to the speed of the operation and the valuations placed by Commonwealth Fertilizers. In response, dismantling operations were suspended at the end of 1930 pending on-site inspection by Cheetham, but its representatives failed to put in an appearance. In April 1931, Commonwealth Fertilizers indicated it would resume track-lifting before sand drifts permanently buried the line.

By this time some portions of the tramline were covered with sand to a depth of six metres and were not worth the cost of lifting. Several side-tipping trucks remained at the lake, along with some tramline and the tractors. Commonwealth Fertilizers were of the opinion that it was not worth carting any of this equipment into Linga because of the high transport charges that would be incurred to move it to Melbourne or other places for sale.

Cheetham had greater experience in acquiring second-hand plant than Commonwealth Fertilizers and ordered a trial shipment of rails for repair works at Geelong. On 17 June 1931, ten tons of rails were sent from Linga in a successful and cost-effective operation. Cheetham followed up with purchases of 16 tons rail truck loads on 22 and 27 August 1931, and in 1933. Each truck contained 240 lengths of 22 lb rail.

The balance of the rail - about 80 tons - was sold to Cameron & Sutherland, machinery brokers of Melbourne. A small parcel of rusted rails was sold locally for fence posts.

The rolling stock was assessed to scrap (due to the high transport costs) and most of the skips were sold on this basis. The wooden-framed mainline trucks were broken up on site in 1931 to retrieve the bogies, which Cheetham retained. Sundry wheel sets and axles were finally salvaged by Cheetham in 1936.

The fate of the Fordson tractors is not so clear cut. Engineers from both companies looked at assembling enough parts from the three tractors early in 1931 to make one good one, but the costs of buying several component parts made the proposition uneconomic. Sound parts from all the tractors were to be retrieved and offered for sale to Fordson dealers and this appears to have occurred after June 1931. It is presumed the Fordson tractor was sold as scrap at around this time, as the accounts for the joint-venture do not show a specific mention of the locomotive tractor and the most likely user of such a unit, Cheetham Geelong, did not acquire it.

Commonwealth Fertilizers had a low opinion of the tractors and advised Cheetham, in response to a question, that the two Fordson tractors were already "useless" when it took over the operation in 1926. They had been cannibalised to keep the other Fordson, ie. the rail tractor, in operation. The Purcell was described as "of no value and was never used". This information was not quite correct as the Purcell did operate for a short period. However, Commonwealth Fertilizers seems to have been correct in its surmise that much of the equipment purchsed by Sailor Salt was either unsuitable or inadequate for the task at hand.

Remains of tramway formation across a washaway, Lake Becking, July 1990. Author's photo

In 1934, Cheetham took over supervision of the contractors and the lease at Pink Lakes and became actively involved in the operation. A list of company plant at the lake, drawn up in June, showed there to be a petrol engine, set of salt rollers and trommel, a salt crusher, several tramway trucks and the Purcell tractor. The contractors had their own plant and equipment. Cheetham also contracted with suppliers from the nearby lakes at Boinka at this time, but no tramways were employed there.

The tramway plant remained untouched at the site, rusting away, until 1938, when Cheetham took an interest in the Purcell tractor as a possible replacement for the failed steam locomotives on its Kangaroo Island tramway. An engineering inspection in May showed the tractor to have many parts missing (magneto, carburetor,

Salt truck on display at Lake Becking, July 1990. Author's photo

oil plug well and some oil pipe), and the opinion was that it not be sent to Kangaroo Island. The gear box was regarded as the most salvageable part and a recommendation was made that the tractor be taken to Geelong, regauged to 2 ft (610 mm) and be attached to a reduction gear to a mobile conveyor belt on the Moolap salt pans.

This did not eventuate, but two years later the fate of the items was settled when the ICI lease expired. Cheetham, as operating agent for ICI, had obtained a more secure lease at Lake Boga and abandoned Linga. Dawson & Begg advertised the sale of Cheetham and ICI equipment (28 tramway bogies and the Purcell tractor) and most of their plant in August 1940. One offer of £20 was received from N Collins of Mildura for the bogies and tractor. For accounting purposes, Cheetham wrote-off the plant in August 1940, and gave ICI £10 as its share, but the file does not indicate whether the plant was sold or whether the alternative action suggested by Cheetham - namely that the plant be consigned to Geelong for scrapping if the sale fell through - was carried out.

Mystic Park

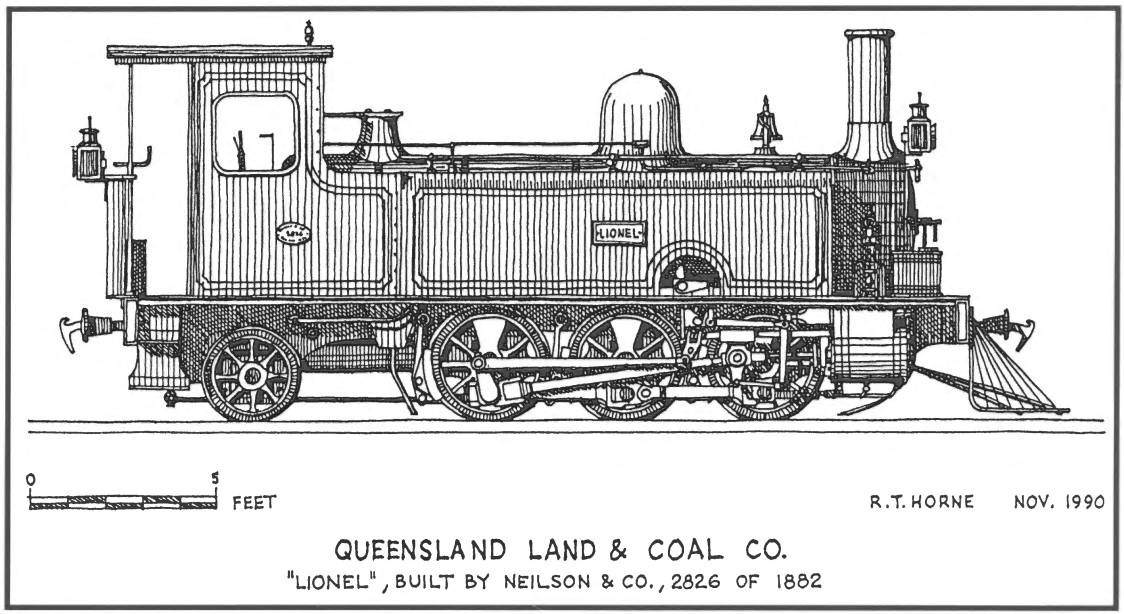
WR Scriven & Bros of Mystic Park, midway between Kerang and Swan Hill, worked Lake William to the north of Kerang for salt for several years prior to the first Cheetham report on this lake compiled in 1923. The lake was on Scriven's property, was 72 hectares in extent, and usually produced 2500 tons of salt per annum.

No tramways were employed until February 1933, when a small system was installed comprising a length of line and three tipping-trucks. The tramway remained in use until 1954. Cheetham contracted with Scriven from 1938 to 1954.

Sources

1. Cheetham Salt Ltd, Victorian Lakes Reports 1923-1946, Series 948, Items 1-15, held at Geelong Historical Records Centre.
2. Cheetham Salt Ltd, Managing Director's correspondence 1926-1956, Series 950, Items 1-20, held at Geelong Historical Records Centre.
3. Cheetham Salt Ltd, General correspondence 1953-1966, Series 949, Items 1-10, held at Geelong Historical Records Centre.
4. Australian Salt Company Ltd, Formation files 1928-1929, Series 922, Items 1-2, held at Geelong Historical Records Centre.
5. Bowen Salt Ltd, Marketing Agreement files 1925-1961, Series 939, Items 1-17, held at Geelong Historical Records Centre.
6. Parliamentary Standing Committee on Railway Report on Mallee Railway Extension, *Victorian Parliamentary Papers,* 1907, Vol. 1, p. 813.
7. *Yea Chronicle* 23/7/1923; 23/8/1923; 20/9/1923; 9/10/1924; 23/10/1924.

Tramway formation coming down to Lake Becking, July 1990. Author's photo



THE LOXTON FARMING COMPANY MONORAIL AND LIGHT RAILWAY, TALDRA SOUTH AUSTRALIA

By Arnold Lockyer

Introduction

Recent publicity, both good and bad, regarding monorails in Sydney and Brisbane bring to mind an earlier application of monorail technology by the Loxton Farming Company Limited at Taldra, on the River Murray near Loxton in South Australia. Unfortunately, there are few contemporary records still in existence and no known photographs showing the line or its rolling stock.

Since the demise of the monorail, there have been references in a few publications. In some of these articles, the authors have made statements which are not borne out by contemporary records, mainly because of the limited information readily available. This article records the history of the monorail and its successor, a two foot gauge light railway. It is hoped that it fills the obvious void in this fascinating chapter in the application of light rail technology in Australian farming.

Loxton Farming Company

The Loxton Farming Company Limited was formed by a group of city (ie, Adelaide) men, who were rather fond of referring to themselves as "King William Street cockies"[1]. According to MR Casson in her book *Loxton District and Town:*

> On 29 April, 1909, the Loxton Farming Company was incorporated; and a month later on 27 May, the Loxton Hotel Company was duly registered the original members of both companies being Messrs George Gliddon T.C. Walker, G. Williams and L O'Leary. The Hotel Company took over the leasehold of the hotel appointing Mr. Whitcomb as Manager, while the Farming Company took over the Taldra property held by Mr. Whitcomb[2].

This nexus between the Farming Company and the hotel could have proved quite beneficial to the shareholders, because those who worked at the farm had to collect their wages at the hotel[3]. It is not hard to imagine how much an itinerant worker, such as a scrub cutter, would have left in his pocket after collecting his wages at the hotel and having a night in town!

The local paper, *The Renmark Pioneer,* which changed its name to *The Murray Pioneer* from 11 July 1913, covered the whole of the upper Murray region

from Morgan to the Victorian border and much of the Murray mallee area. The file copies of this paper, as far as the author has been able to ascertain, make up the only contemporary record of the activities of the Farming Company.

In 1909 the Loxton Farming Company had 300 acres under crop at their 14,000 acre holding near Bugle Hut and they planned 1600 acres the following season[4]. During the following six years the Renmark paper made several references to the company, which was usually referred to as "an enterprising company"[5]. The reports give no suggestion that the company did not prosper, although the great plan to bring the whole of the holding into production did not seem to eventuate. In 1913 there was still less than 2000 acres under crop[6].

In early 1916, the Farming Company was reported to have "consumated" the transfer of its property to Mr WH Bruce of Adelaide[7], although it may have been owned by a Mr Vincent Zed in the interim [8]. One report claims the company "went broke"[9]. Under Bruce's ownership, the property was known as *Taldra Park*. It has since been subdivided into smaller farms[10].

Railways at Taldra

There were two railways built and operated at *Taldra* station. The first was a monorail built to the design of Monsieur Caillet [see box], which was followed by a two foot gauge light railway. Both used horses for motive power.

Unfortunately, much of what has been written in the past about these lines, particularly the monorail, appears to be incorrect. Accordingly, the following sections record what is known to be fact. Issues which are open to doubt are discussed in latter sections.

Early Proposals

In early 1910, Mr TC Walker, Managing Director of the Loxton Farming Company, told *The Renmark Pioneer* that a two foot gauge tramway with mallee sleepers three feet apart was to be laid "down the middle of the paddock and extended over a couple of heavy sand hills toward the river. With bogie trucks, he anticipated a horse would be able to haul eight 8 or 9 tons along the line[11]. This tramway was never built.

In October 1910, a correspondent from *The Renmark Pioneer*, who was in Loxton to cover a visit of the State Governor, had, to quote his report:

> The good fortune to fall in with a jolly party of excursionists who had come up the river in the *SS Ruby*, under the guidance of Mr TC Walker, managing director of the Gem Navigation Company, the Loxton Hotel and the Loxton Farming Company[12]

The party travelled by river boat from Loxton, thence from Kaesler's Landing to the farm by buggies. It is interesting to note that Messrs Alfd Day, M'Guire and Schmidt, all of the South Australian Railways, were in the party. Following an inspection of the property "full justice was done to the bountiful dinner". Responding to a toast, Mr Walker spoke of the difficulties of local transport and announced that the Farming Company had soundings taken at Pike Creek, a backwater of the Murray River, which came within four miles of their farm. These indicated that the creek was navigable to this point so long as the river was open to Renmark. "They had therefore made arrangements to lay their own line of rail to this - a mono-rail - with which they expected to do as much with one horse as they could now do with ten." He also went on to add that they would be glad to have neighbouring farmers make use of the line when it was completed. As far as can be ascertained, this was the first time the monorail was mentioned.

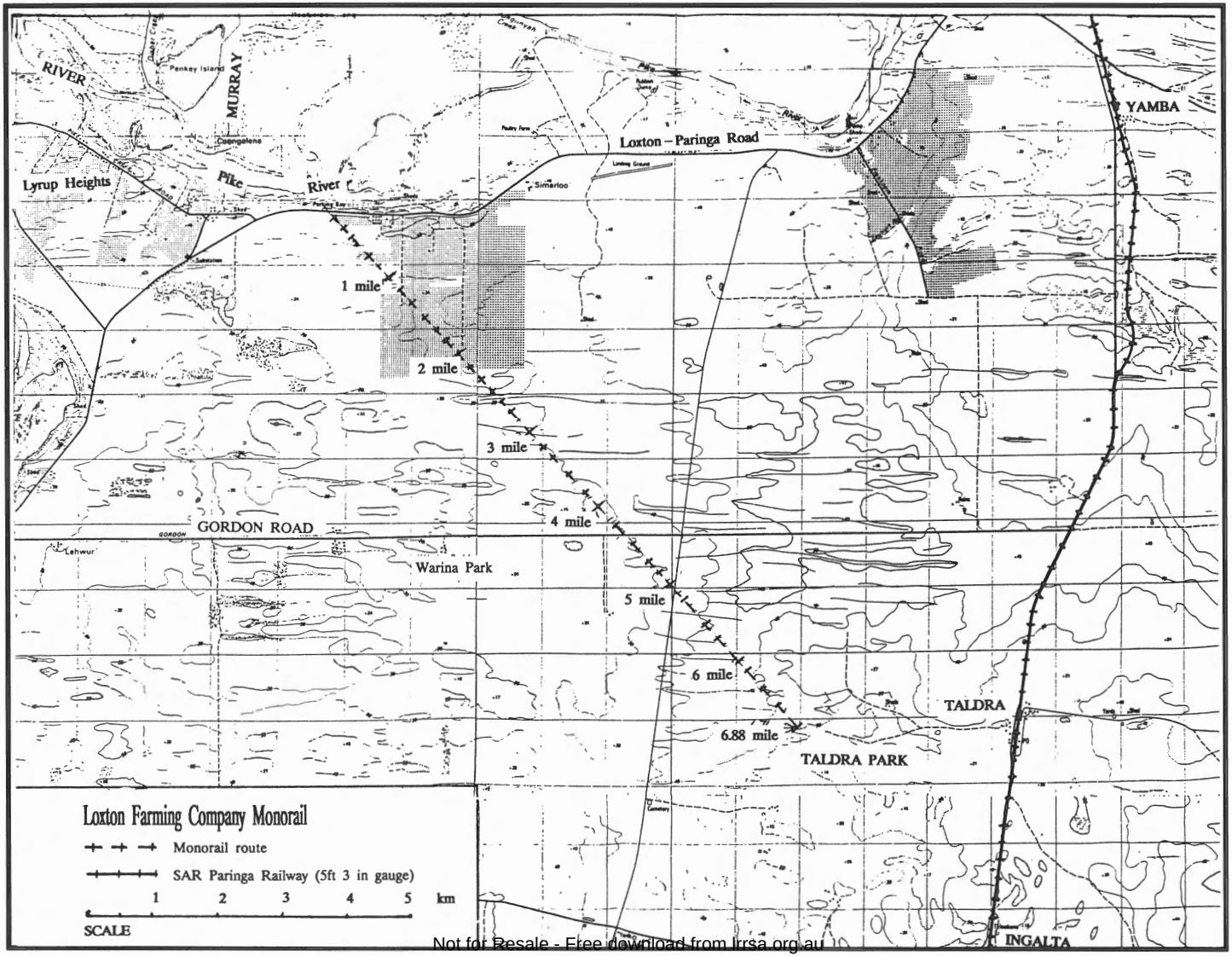
Monorail Construction

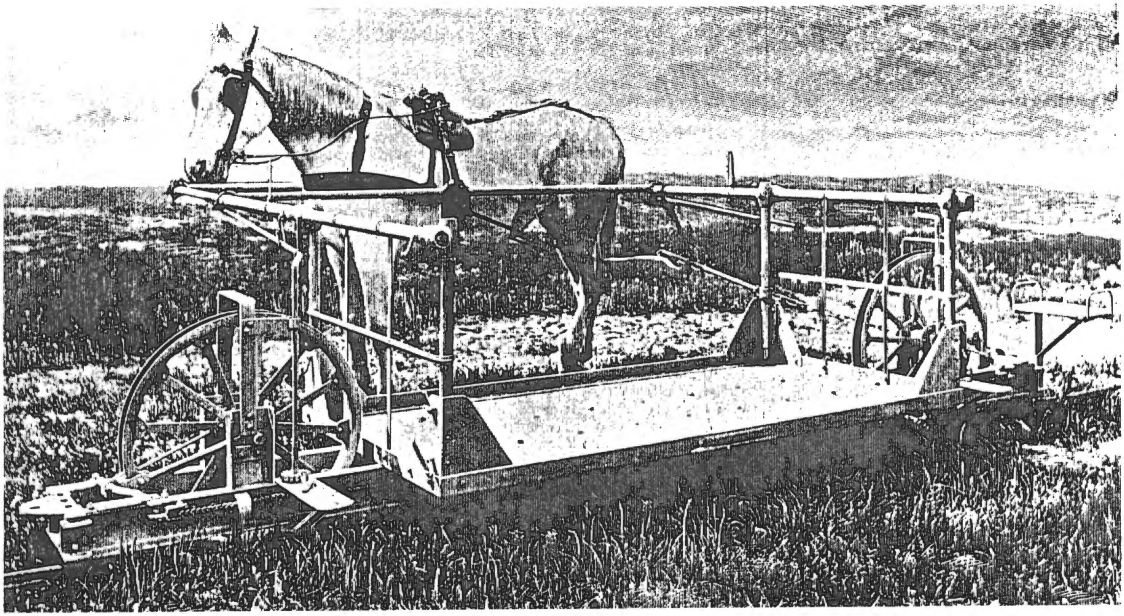
The line was reported to be under construction on 6 January 1911, with Mr Syme of the Adelaide office (presumably the Farming Company) directing the work[13]. Later that month, approximately three miles of track had been laid to within a mile or so of the Farming Company's holding and the foreman, an American Mr CJ Conley, said that he expected to have the track "ready for the conveyance of wheat by the end of the month"[14]. There were 22 men working on the task.

During construction, the rails and other materials were left at the landing and, because the proposed flying fox from the landing to the terminus had not been built, hauled on rails to the monorail terminus at the top of the cliff. They were then carried on the monorail over the completed section of the advancing railhead.

When interviewed in June after completion of the line, Mr Conley gave its length as 6 7/8 miles (11 km), with a proposed additional half mile (0.8 km) to be constructed to the farm house[15]. The line was reported to run from Pike's Creek to the farm homestead in October 1911[16], so it is reasonable to assume that this extra half mile was laid.

The line is believed to have run in a straight line from the landing on Pike Creek to the farm centre[17]. This is supported by an old plan held in the State Lands Department in Adelaide. This shows a narrow easement, running in a straight line from the river landing, apparently providing a right - of - way across sections not held by the company. Mr Conley also supported this in his statement that he had no surveyor and "had to climb trees and tie rags on them to get sights through the scrub[18].





1897 illustration of a two-wheel Caillet monorail. The Loxton Farming Company application at Taldra is believed to have used a similar design. *Courtesy Engineering magazine*

Operation

With regard to rolling stock, in January 1911, one truck was in service and another had arrived, whilst it was planned to have four in operation for wheat carting[19]. The heaviest grade was one in fifteen and a loaded truck carried 25 bags of wheat pulled by three horses, a heavy one in the shafts and two light ones in the lead. With this arrangement, four round trips could be made in less than 24 hours[20].

An anonymous correspondent to *The Bulletin* (whose letter was also published in *The Renmark* Pioneer) claimed to have seen the monorail in operation[21]. Trucks were said to weigh about 10 cwts (500 kg), cost about £15 and ran on 15 Ib to the yard rail. There is also the suggestion that the trucks weighed about 15 cwts (750 kg)[22].

The Light Railway

In August 1913, the South Australian Railways line to Paringa was being laid across the Loxton Farming Company's property. No doubt the company realised that the new line would mean the end of the carriage of their wheat by river boats. They decided to build a two foot gauge railway from the storage shed in the middle of the farm to the new railway.

The company set up a small sawmill to cut pine sleepers for the line and, by August 1913, many were "already in position". For rails, it was stated that "the metal from the seven mile mono-rail to Pike Creek ... will more than serve the new line"[23]

In March 1914, the light railway was in operation "from their homestead on the hill some two miles west to the Taldra Siding", with the car running along the permanent way with ease. During the wheat carting season of just ended, the normal rate of haulage on this tramway was six trips during a working day of eight hours, increased during a rush to eight trips. Two horses pulled 3 tons easily, trotting some of the distance[24].

It is interesting to note that 6 7/8 miles (11 km) on the monorail (ie, the terminus) is approximately 2 miles (3 km) west of Taldra siding. According to one old resident, Bert Auricht, who remembers seeing the light railway, the 2 ft gauge line ran to "Bruce's homestead" from Taldra railway station. Bert says that Bruce used the railway to transport prospective buyers to sales held on the property, as well as taking horses and bullocks purchased in Adelaide from the siding to the homestead. Horses in tandem were used to pull the truck[25]. If this information is correct, the rolling stock much have been quite substantial, and much larger than the rebuilt truck in the Loxton Pioneer Museum. It is not known when the line ceased operation.

Government and Monorails

Passing to the dubious information which has been disseminated about the monorail, I will first deal with

THE CAILLET MONORAIL SYSTEM

In the English magazine *Engineering* of 5 February 1897, there appeared an article headed 'A Single - Rail Railway' which continued and concluded in the following issue of 12 February. It described a new monorail system devised by a Frenchman, Mr Caillet. The article expounded on the work of Mr Decauville, whom the writer virtually credited as being the father of conventional tworail light railways, then stated:

> *other inventors less practical than Mr Decauville have from time to time sought by the introduction of useless and cumbrous complications to simplify his already elementary system, and by the use of one rail only. This has been affected by the addition of accessories, far more costly than a double track, forming a so- called single - rail railway, which, elevated of necessity above the ground, served as a means of transit for its small load, its cars hung pannierwise on each side of the track, and steadied by what amounted practically to two other rails attached one on each side of the triangular trestle to which the bearing rail was secured.*

After pointing out the need for a rail system in places where even the cost of the cheapest Decauville line could not be justified, the writer continued:

> *Such a demand appears to have been met in a most ingenious fashion by a French engineer, Mr Caillet (et), who has devised a real mono- rail system, either portable or permanent, and which, though it is not applicable to steam or other power traction, does nevertheless, in the simplest manner, possess the conditions demanded for limited traffic in sparsely populated districts, and especially for colonial agriculturalists. The permanent way of this system consists of a single flatfooted rail of very light section, to which are attached at short intervals flat soleplates or sleepers, in each side of which holes are formed for the passage of a pin that can be driven into the ground to hold them in place.*

Illustrations of rolling stock for the railway included such diverse units as flat trucks, a side tipping hopper truck, a passenger car and a man - propelled ambulance car. Two and four - wheeled trucks were shown being hauled by horses. Trucks were described as:

> *For the most part, they are supported on four wheels, the tyres of which are grooved to fit the contour of the rail; these wheels, which run in bearings on the underframe of the vehicle, may either extend beyond it at each end or be placed beneath the body of the carriage. It is needless to say the wheels are all in the same plane. Obviously such a vehicle, especially when loaded, could not be maintained in equilibrium, and it is in overcoming this difficulty that the ingenuity of Mr. Caillet (et) is conspicuous. Projecting from one side of the vehicle as will be seen from the illustrations are two rods, or a light frame, the former being required when only manual labour is employed, the latter when horse power is used for propelling the vehicle... [T]he load can be so evenly distributed as to call for but a small effort to overcome the tendency to fall in either direction, so that practically the only work that has to be done is that due to overcoming tractive resistances, which are insignificant on the rail as compared with those on a road or the uneven surface of a cultivated field.*

In the second part of the article, the dimensions of animal-powered trucks are given as "necessary to have a total width of nearly 10 ft", presumably to keep the centre of gravity low and reduce the tendency to topple over. They were mounted on wheels of "from 20 in. to 30 in. in diameter" and "able to carry 1 or 2 tons."

the claim that the South Australian Government was directly involved, particularly the suggestion that the Loxton monorail was directly paid for by the Government[26].

There is no doubt that the Government of the day was interested in the Loxton monorail. It was searching desperately for some cheap means of providing transport to country areas. The monorail system was promoted in 1911 as costing only £200 to £250 per mile to lay, as suitable for relocation at £8 to £10 per mile, and to enable carting to be done in a tenth the time and at a tenth the cost of normal horse transport[27]. It was claimed to cost only a fifth the cost of a decent road.

A month before the Loxton Farming Company announced their intention to build the Pike Creek line, the question of possible use of monorails of "Caillet type" as feeders to the Pinaroo railway was raised in Parliament. Mr Vaughan, Commissioner of Crown Lands, also expressed the opinion that such a monorail would be "especially suited" for use in the River country[28].

In response to a Parliamentary question, the Premier stated, on 28 September 1910, that the Government had not yet decided to give the monorail a trial[29]. However, on 4 October the Treasurer said that inquiries were being made and a truck was being prepared for experiments at the SAR Islington workshops[30]. Two days later, the Premier reported that the Railways Commissioner was getting a truck ready at Islington and that four miles of track was to be laid at Pinaroo[31].

Members of Parliament were invited by the Premier to inspect the Islington - built truck at the Exhibition Siding behind Parliament House on 1 December 1910. He said the truck was not dependent on the horse for stability[32]. It is understood that the truck ran on a central rail with a large wide - tyred wheel on each side to give it stability. After the inspection, the Treasurer said that the truck was, in his opinion, "unsatisfactory"[33].

In September 1911, *The Renmark Pioneer* carried a report that a non - competitive exhibit at the Adelaide Show was a Caillet monorail. However, this was not so, as it turned out to be a very similar monorail exhibited by GT Lane and Company at Adelaide, as sole agents for the Monorail Portable Railway Company Limited of London and Antwerp[34]. This public display led to a reawakening of monorail questions in Parliament. The Treasurer told Parliament that the Government had purchased the one displayed at the Show[35]. A month later it was announced that the Government was going to lay down a monorail from Roseworthy railway station to Roseworthy Agricultural College[36].

In February 1912, a change of Government resulted in the construction of conventional railway lines to serve rural areas, including the line to Paringa. The monorail at Roseworthy never came into existence.

It is also important to note that, in announcing the Loxton Farming Company's intention to build the line, Mr Walker said that "they had therefore made arrangements to lay *their own line of rail..*"[37] [author's emphasis]. Considering all the foregoing, it is very hard to accept statements that the line at Taldra was built by the SAR for the Farming Company and that it was paid for by the Government.

A Caillet Monorail?

It has been claimed that the monorail was a genuine Caillet monorail made by Caillet Brothers in England. That the Government was aware of the Caillet system is evident as it was named as such in reports of Parliamentary proceedings[38], and would be reasonable to assume that photographs of it were available, possibly from the English *Engineering* magazine of 1897[39].

However, the assertion that the Loxton monorail was built by Caillet Bros.[40] does not appear to be borne out. According to a report in *The Renmark Pioneer*, "the company had their trucks made in South Australia with only a photograph to guide the maker"[41]. In addition, Mr Conley admitted in an interview that the monorail truck wheels originally supplied were of cast iron, which proved to be unsatisfactory and had to be replaced with wheels of cast steel[42]. Such a mistake would not have been made by a manufacturer with the experience that Caillet Bros would have had.

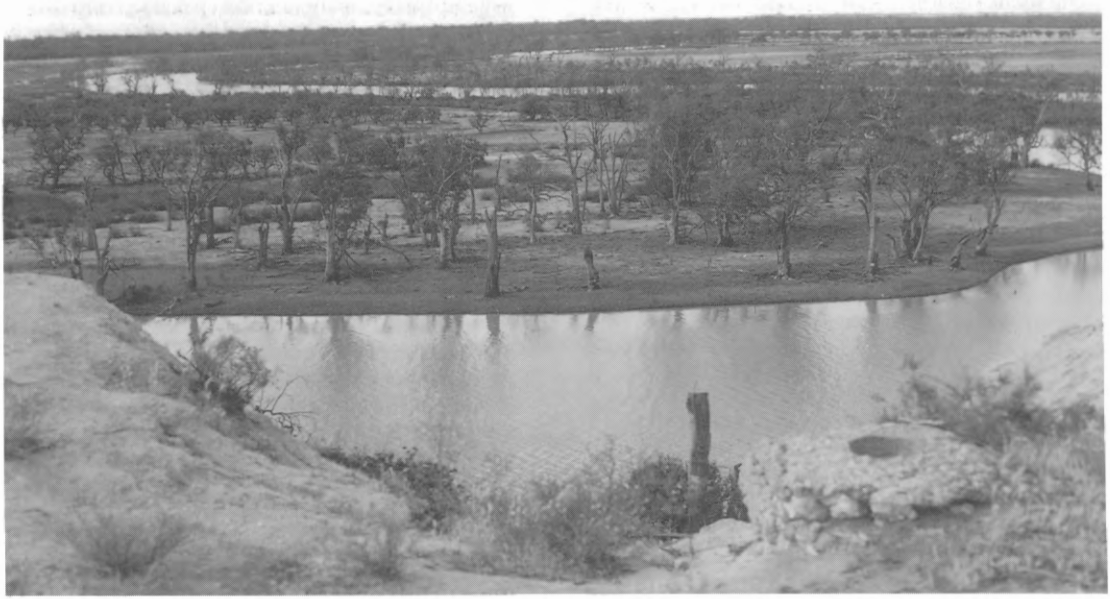
With the lack of photographic and detailed eyewitness evidence, it is not possible with absolute certainty to say that the Loxton trucks were identical with those designed by Mr Caillet, but the following description published in 1911 indicates that they were very similar:

> The light rails are laid along the centre of short roughcut sleepers and the wheels which run along the line are double- flanged. The floor of the truck is not more than a foot above the ground, and iron rests depending from the side, take the weight of the truck when not in motion and prevent it from inclining much out of the horizontal. Iron uprights at each corner hold in position stout iron bars across the ends. These bars are extended out over one side of the truck sufficiently to allow room for a horse to walk between the shafts which run fore and aft, from bar to bar. The gearing of the horse keeps the truck upright [43].

Success or Failure?

It has also been claimed that the monorail was a poor performer and, on the whole, a failure[44].

When the line was in operation it was claimed to be a success, both in the local press and in Parliament[45]. After completion in seven days, 2800 bags of wheat were



Monorail terminus site at Lyrup Heights in October 1988. This view from the top of the cliff looks down to the landing place on Pike River. The concrete block and post would have been part of the flying fox used for carrying goods from the landing to the monorail and vice versa. *AD Lockyer*

moved from the farm to the landing[46]. After completion of the flying fox from the top of the cliff to the landing, the monorail was used to backload superphosphate fertilizer, water and other supplies to the farm[47].

In spite of many favourable reports in the local paper, the line had its critics. Some people did not like it[48], possibly because they saw it as a poor substitute for 'proper' roads and railways. Others considered the claims made by monorail supporters were not sustainable[49]. Some of this criticism came about because the critic did not have the necessary information available. For example, the fact that the Farming Company used three horses to pull each truck and that they had more than one truck.

Writing in *The Murray Pioneer* when the monorail was being pulled up to build the Taldra light railway, *The Rambler* said that it had "served the company so well since its inception"[50]. Whilst perhaps not the ideal solution to the cheap transport problem, from the evidence it appears to have done the job it was meant to do. Like the river traffic that it served, its demise was brought about by the arrival of *the iron horse*. The death knell really sounded when the government, which encouraged any innovation which might save them the cost of providing roads and extending the South Australian Railways system, lost the election held about February 1912 and was replaced by a government which found the money for railway extensions.

Monorail Heritage

In preparing this article, I was fortunate in having made available to me by Mr FA Hentschke of Loxton, notes that he had made and copies of letters he had received some years ago. Mr Hentschke became interested in the monorail when he found that very few Loxton residents knew of its existence, and he took up the challenge to find out all that he could about it.

Mr Hentschke found that the property on which the monorail terminus was located had passed to a Mr Rothe. He contacted Wally Rothe, son of the owner, and with Reg Thiele who was also interested in the monorail, the three went to the cliff at the site of the original terminus. They made a "perilous descent" to the water, where they found a broken double-flanged wheel, about two feet in diameter. Mr Hentschke believed this to have come from a monorail truck and possibly confirmed a story of a truck getting away on the monorail, crashing over the edge of the cliff, breaking the horse's back and damaging both truck wheels. Later Wally Rothe found a second double-flanged wheel at the same site.

Messrs Hentschke and Thiele rowed a boat up the creek and recovered the wheels. They were found to be two feet in diameter, within the range of wheel sizes quoted in the Caillet article[51], namely 20 to 30 inches.

Mr Hentschke then built, from the information available to him, a truck for display at the Loxton Historical Village Museum. Unfortunately he was not aware of the illustrations in the *Engineering* magazines of February 1897.

As built, the replica truck varies from the Caillet design, having the wheels mounted under the tray of the truck. The top of the tray was over two feet above the rail. The Caillet truck had the wheels mounted at each end of the tray and extended beyond it, keeping the top of the tray down to about a foot above the rail.

Also in the Loxton museum is a two foot gauge truck reconstructed by Mr Hentschke from the remains of a derelict truck located at Obst's farm near Taldra, and said to come from the 2 ft gauge line from the Farming Company's property to Taldra siding. This truck does not appear to be large enough to carry personnel, horses and bullocks.

Epilogue

As would be expected, very little remains today of the monorail or the light railway which operated in the 1910 - 15 period.

In January 1984, Mr Kingsley B Mack, on behalf of the Riverland Field Naturalists, made a submission to the Department of Lands at Berri for a permanent cairn or marker to be erected at the terminus site at Pike Creek with an appropriately inscribed plaque giving data on the monorail. It was considered that cartage of wheat by monorail was unique and worthy of such recognition. The Department did not agree. Mr Mack pointed out that:

> ... The only really tangible remains that can be viewed to day are the Terminus, which is on high land east of Lyrup Heights, and about 500 metres east of the Loxton- Paringa- Lyrup Heights road junction. The Terminus appears to be on Section 41, Hundred of Paringa ... and may be discovered by heading north from the Highways monument motif and a metal sign on a fence, 100 metres or so to and aged, half dead Pepper Tree ***(Shinus molle)*** on the escarpment edge. The Chute is plainly visible down the slope commencing from a concrete anchor block.

Section 41, Hundred of Paringa is where the easement mentioned earlier is shown on the old Lands Department maps, so it would be correct. The chute would be where bags of wheat and possibly other farm produce were slid down to the river landing for loading onto barges or river boats.

In October 1988, the author visited the area and, using Mr Mack's directions, had no difficulty in locating the terminus. There was a sign, apparently erected by the Loxton Museum with the words:

MONORAIL TERMINUS STEAMER LANDING
for more details visit Loxton's historical village.

Monorail truck rebuilt by F Hentschke on display at Loxton Historical Village Museum, October 1988

A D Lockyer

After cutting across the farmer's paddock, doing as little damage to his crop as possible, it was easy to find the concrete foundations of the post, that was probably the flying fox anchor, and the groove, which formed the chute down to the river landing.

Acknowledgements

I wish to record my thanks to the following for their assistance in preparation of this article:

Richard Wood, editor, Engineering magazine, London, England, for permission to use illustrations.

Frank Henschke and Kingsley Mack of the Upper Murray area, South Australia, for access to their personal notes regarding the monorail.

Officers of the South Australian Department of Lands.

Margaret Lock, for sorting out and typing my manuscript. My wife, for her assistance with research at the Mortlock Library, Adelaide.

References

1. *The Renmark Pioneer 14* October 1910.
2. *Loxton: district and town* by MR Casson and WRC Hirst, Hawthorn Press, Melbourne, 1972
3. *Where it forgets to rain: a story of the Murray Mallee* by Marie Fogden. Published by the Family of Murray and Mary Fogden, Nangari, May 1983
4. *The Renmark Pioneer* 25 February 1910.
5. *The Renmark Pioneer* 6 October 1911, *The Murray Pioneer 1* August 1913.
6. *The Murray Pioneer 1* August 1913.
7. *The Murray Pioneer* 18 May 1916.
8. MR Casson and WRC Hirst, *op cit.*
9. FA Henschke, Loxton, unpublished notes.
10. MR Casson and WRC Hirst, *op cit.*
11. *The Renmark Pioneer* 25 February 1910.
12. *The Renmark Pioneer* 14 October 1910.
13. *The Renmark Pioneer* 6 January 1911.
14. *The Renmark Pioneer* 20 January 1911. As the monorail construction had not reached the half way mark at this date, the reference to "end of the month" probably meant February.
15. *The Renmark Pioneer* 16 June 1911.
16. *The Renmark Pioneer* 6 October 1911.
17. KB Mack, unpublished submission on behalf of Riverland Field Naturalists to Department of Lands, Berri, January 1984.
18. The *Renmark Pioneer* 16 June 1911.
19. *The Renmark Pioneer* 20 January 1911.
20. *The Renmark Pioneer* 16 June 1911.

Marker erected on side of Loxton Paringa Road
A D Lockyer

21. *The Bulletin* 16 February 1911; *The Renmark Pioneer* 3 March 1911.
22. KB Mack, *op cit.*
23. *The Murray Pioneer* 1 August 1913.
24. *The Murray Pioneer* s March 1914.
25. Hilde & Bert Auncht, letter dated 10 April 1977 to RH Theile, Loxton.
26. Reece I Jennings. *WA Webb South Australian Railways Commissioner 1922—1930* Nesfield Press, 1973, p.24; Marie Fogden, *op cit;* KB Mack, *op* cit.
27. *SA Hansard 1911 pp.* 1111-1112, 24 October 1911.
28. The Renmark Pioneer 2 September 1910.
29. *SA Hansard 1910 p.* 598, 28 September 1910.
30. *SA Hansard 1910 p.* 641, 4 October 1910.
31. *SA Hansard 1910 p.* 687, 6 October 1910.
32. *SA Hansard 1910. pp.* 1260-1, 1 December 1910.
33. *SA Hansard 1910 p.* 1281, 2 December 1910.
34. *The Renmark Pioneer* 22 September 1911; *Observer* Adelaide, 23 September 1911.

35. *SA Hansard 1911* p.1112, 24 October 1911.
36. *SA Hansard 1911* p.llll, 30 November 1911; *The Renmark Pioneer* 22 September 1911.
37. *The Renmark Pioneer* 14 October 1910.
38. *The Renmark Pioneer* 2 September 1910.
39. *Engineering magazine,* England, 5 and 12 February 1897
40. RI Jennings, *op cit.*
41. *The Renmark Pioneer* 22 September 1911.
42. *The Renmark Pioneer* 16 June 1911.
43. *The Renmark Pioneer* 20 January 1911.
44. RI Jennings, *op cit.*
45. *The Renmark Pioneer* 16 June and 6 October 1911;
SA Hansard 1911. pp. 769 and 1112, 24 October 1911; *The Murray Pioneer* 1 August 1913.
46. *The Renmark Pioneer* 16 June 1911.
47. *The Renmark Pioneer* 6 October 1911.
48. *SA Hansard 1911 p.* 1112, 24 October 1911.
49. FA Hentschke. *op cit;* KB Mack, *op Cit.*
50. *The Murray Pioneer* 1 August 1913.
51. *Engineering* magazine, England, 12 February 1897.

MONORAIL TRANSPORTERS OF THE SYDNEY WATER BOARD

By Jim Longworth[1]

Introduction

Monorails are not a recent invention. In 1821, HR Palmer patented an invention for a single line of boards supported on posts[2]. Horses pulled cars straddeling the boards, between warehouses and wharves at a London navy yard.

Classification of monorail types can be based on whether the rolling stock is suspended from or supported on its running rail[3]. Supported monorails can be further classified by whether lateral stability is provided by outrigger wheels running on the ground, gyroscopic motion or a guide rail placed above the car; or guide rails placed below the car attached to the supporting structure. The monorail described herein is of the last type.

Monorails have often been controversial (eg, Sydney's *Harborlink*) or of dubious economic success (eg, the Listowel & Ballybunnion Railway in Ireland). However, they have played a valuable role in the construction industry, transporting concrete onsite between mixers or batching plants and points of placement. The Sydney Water Board[4] used them extensively between 1954 and 1978. Similar equipment was used on a construction site at Geelong in Victoria in the 1950s[5]. Another application of this type at Mexborough in England differed in that it was equipped with a seat for the driver and was installed on site permanently[6].

Water Board Applications

The first application of monorail equipment by the Sydney Water Board was in 1954. In April an order was placed with Motor Tractors Pty Limited for the provision of monorail equipment for placing concrete in the floor of Allawah Reservoir in the St George area of Sydney's southern suburbs. Without attendants, the monorail provided "a shuttle service between loading and unloading points, so eliminating wheeling in barrows, etc" [7]. The equipment operated in dual sets, one powered skip towing a trailer skip.

The Allawah monorail generated some interest within the Water Board's organisation. A special meeting of the Board embraced a visit to the site:

Of particular interest were the arrangements for transporting concrete, from the mixing plant to the points of placement by monorail trucks in dual sets, a method which Members commented, presented substantial advantages on jobs of that nature[8].

A full page photographic spead of the equipment in use was carried in the *Annual Report for 1954-1955.*

By August 1963, monorail equipment was required for construction of Richmond and Seven Hills reservoirs in Syndey's north-western suburbs. The Board's existing stocks of power wagons were all in use, so two extra wagons were ordered from Cooke Harrison Pty Limited[9].

Board equipment remained in full use and, by November 1963, more was required for construction of St Mary's Treatment Works. An order was placed with Cooke Harrison Pty Limited for four power wagons and additional rails[10]. In all, 17 prime movers were operated by the Water Board. A complete listing of Water Board monorail transporters is provided in Appendix A.

Track

Monorail track came in standard lengths of 12 feet, with curves of 12 ft radius [11]. Curved rails were six feet long, ths requiring six to make up a half circle of 24 ft diameter. Rails were normally laid straight, but could be offset up to 1:16 at either side of the line of the preceeding rail. The rail was supported on outrigger stands with adjustable legs.

Points were provided by a special stand. Hinged at one end, the rail swung laterally in a horizontal plane, between two positions at the other end.

Only two men were required to install the system. There were no fishplates, bolts or nuts to fit. A hundred yards of track could be laid over average ground conditions in half and hour to an hour. Initially the first rail and two stands were placed in position. One end of the next rail was connected to the existing rail and positioned on its adjustable stand at the fathest end, whereapon further track sections could be coupled up.

Rolling Stock

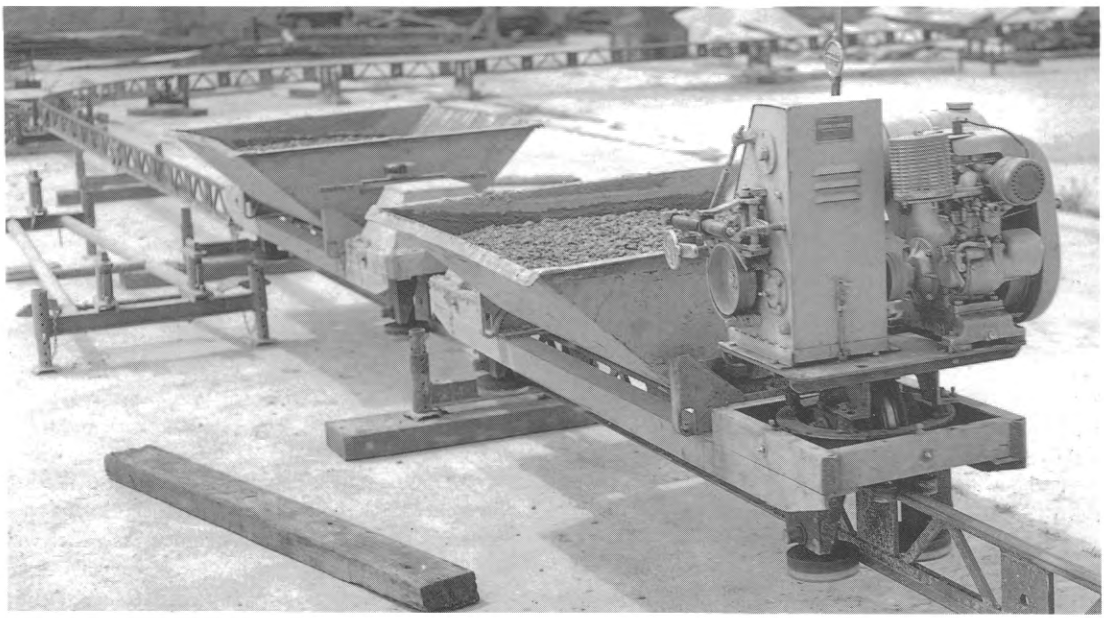
The rolling stock was manufactured by Road Machines (Drayton) Limited, Iver, Buckinghamshire, England [12]. Power wagons were initially equipped with J.A.P or Howard 412 cc air-cooled, four-stroke petrol engined rated at 7 BHP. By 1964, 12 of the transporters had been fitted with Wisconsin Model AENLD engines, each weighing 110 lbs. These were air-cooled petrol engines developing 9.7 BHP at 2600 RPM.

The motor and direct drive gearbox were mounted on a common baseplate which could be fitted to either end of the wagon. Transmission of power was by gearbox incorporating two single-plated clutches operated by duplicated levers giving forward and reverse. Brakes were single shoe friction-type operated either manually or automatically. The power wagon alone could negotiate a 1:12 gradient, or with trailer a 1:18 grade. Maximum speed was 100 yards per minute (6 kph).

Wagon stability was maintained by four idler rollers contacting the vertical rail's horizontal bottom flange. Weight of the wagon was entirely taken on groved running wheels mounted fore and aft in turntables.

Skip capacity was:

Wet concrete	$12^1/_2$ cu ft	(354 litres)
Struck capacity	$14^1/_2$ cu ft	(410 litres)
Heaped capacity	27 cu ft	(764 litres)
Payload	1750 lbs	(795 kg)



Monorail powered transporter and trailer at Allawah Reservoir. A set of points stand next to the trailer wagon.
Water Board Photo

Dimensions were:

Overall length	8 ft $10^1/_2$ in over couplers
Wheel centres	6 ft 8 in
Overall width	4 ft $2^1/_2$ in
Max height	4 ft $5^1/_2$ over engine
Tip distance	2 ft $1^1/_4$ in from track centreline to both sides

The power wagon was unloaded off the delivery truck on its own transporter trolley. This consisted of a length of rail, supported at one end by two pneumatic tyres and the other by two horizontal handles for manual lifting. The trolley was then connected to the end of the monorail track at the handle end, and the wagon moved off onto the track.

Operation

Operation was practically automatic. One of the people operating the concrete mixer or batching plant sent the machine off. It stopped automatically, unloaded and was sent on its return journey by one of the people placing the concrete. Thus, no person was specifically charged with moving the subject loads. Spring loaded stops could be installed in any one of three holes in each length of rail, straight or curved.

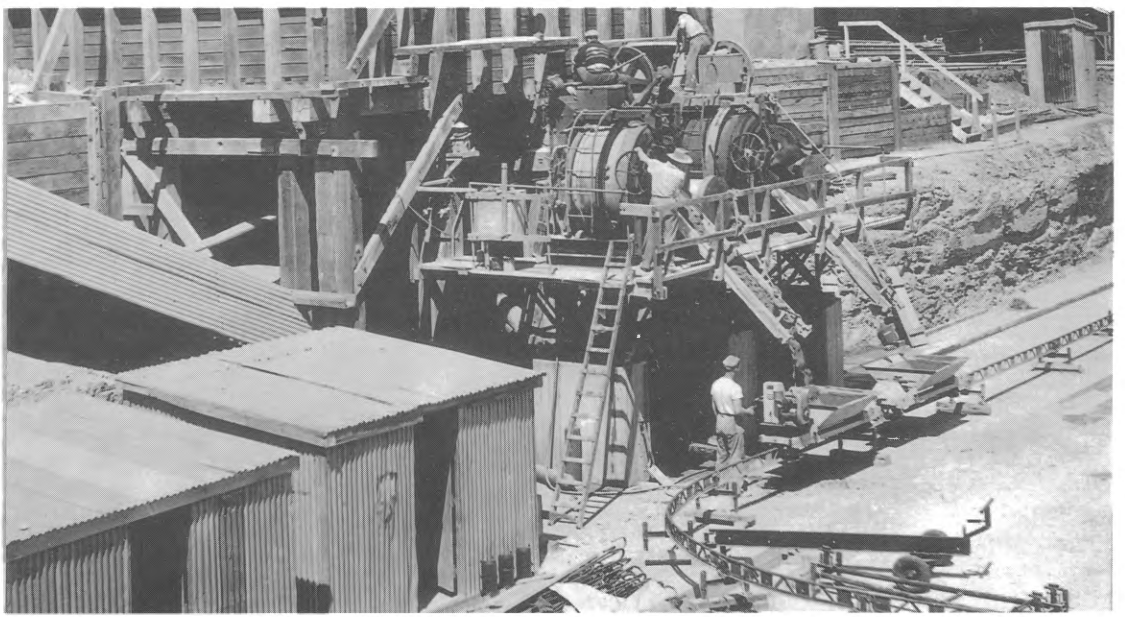
The Water Board monorails reportedly worked quite well as they rattled around the site. Tracks could be quickly and easily rearranged to suit the transport requirements. They were most favourable on sites having difficult access, such as a deep excavation across the delivery line, or where the desired delivery points were scattered widely over a large site.

Reports are that the monorail equipment was expensive to maintain and not well supported by the suppliers in Sydney. Plant records indicate continual and extensive repairs (Appendix A). Use of the monorails, together with the humble builder's barrow, hand cats, etc, was superceded as onsite concrete transporters by large tower cranes, FWD dump trucks and concrete pumps mounted on road vehicles. Equipment was disposed of by auction.

Water Board Modifications

During 1962, alarm gongs were fitted to the wheel guards on transporters. The gong was operated by a swing hammer, activated by a striker welded to the transporter's wheel. This must have made quite a racket combined with noise from the motor powering the machine.

By March 1970, frequent accidents were occurring when kick-starting the monorail prime movers. Operators had to take up awkward positions to reach the



Loading monorail wagons from concrete batching plant at Allawah Reservoir. A manual transporter trolley in in the foreground *Water Board Photo*

Unloading concrete from a monorail wagon, Allawah Reservior

Water Board Photo

kick-starters on equipment which was elevated above the ground. Wear on the mechanisms exacerbated the problem. As a result, the kick-starter crank pins were bent 2 inches out away from the body of the motor, thus enabling ful contact between the operator's foot and the kick lever.

This modification was proving less than successful and, by September 1971, rope-pull recoil motors were fitted to five units for trial. A spring impulse starter was fitted to another unit. No further problems are reported[13].

During February 1975, the possibility of fitting 320 mm high hungry boards to one end of an unpowered transporter wagon was investigated. This was to allow the equipment to be used as a rope hauled monorail alongside pipe trneches at grades of up to 1:2. A rope anchor was to be attached to the chassis for winching up inclines, with a sprag provided in case of rope failure. It is not known whether this modification was put into practice.

Environmental Significance

Soil erosion and subsequent siltation of waterways is a by-product of construction activity. Any practice which reduces the extent of vegetation clearing and soil disturbance will reduce loss of vegetal habitat and the volume of silt removed from a given area. Reducing the extent of earthworks, masonary construction and occupied land have long been seen as advantages of the supported monorail[14].

As with elevated rope-worked inclines[15], monorails elevated the track off the ground surface and supported it on regularly spaced stands. Each stand touches the ground at only two points. Vegetation and ground cover can remain largely undisturbed along the length of the transport line.

Having only two wheels, the monorail has reduced frictional resistance compared with four-wheel onground receptacles[16]. However, their elevated supported trackwork must have seriously obstructed onground movement around the construction sites where it was used.

Acknowledgements

Thanks are extended to the following Water Board Staff for their help in preparing this albeit brief note on an interesting light railway application: M Cavenagh, G Gierek, P Madson and J Orlovich.

References:

1. The author is an Environmental Scientist with the Sydney Water Board's Development Division.
2. Day, JR and Wilson, BG, *Unusual Railways*. Muller, London, 1957.

3. Botzow, HSD, *Monorails*. Simmons-Broadman, New York, 1960.
4. The Board was known as the Metropolitan Water, Sewage and Drainage Board (MWS&DB) over the period described in this article. It became the Water Board in 1989.
5. Houghton, N, "Geelong Miscellany", *Light Railways* No.83, January 1984, p.4.
6. Booth, AJ, "Monorail at Mexborough", *The Narrow Gauge* No.116, Autumn 1987.
7. MWS&DB, Minutes of Meetings, 7 April 1954.
8. MWS&DB, Minutes of Special Meeting, 2 November 1954.
9. MWS&DB, Minutes of Meeting 28 August 1963.
10. MWS&DB, Minutes of Meeting 20 November 1963.
11. The track went through a series of modified designs from Patent No. 159247 of 1954 for "Improvements relating to monorail systems", through 205390 (1957) for "Improvements in and connected with rails sections", 224380 (1959) for "An improved monorail unit" and finally 263655 (1964) for "Improvements in or relating to monorail tracks".
12. The equipment was covered by British Patent Nos. 577832, 583760, 720680, 720681, 724560, 768709, 829898, 839018 and 961767. In Australia, rolling stock was covered by Australian Patent No. 158297 (1954) for "An improved vehicle for transversing a monorail system".
13. Details from Water Board file.
14. Wade, EA, "The patent narrow gauge railways of John Barraclough Fell", *The Narrow Gauge*, No.113, Winter 1986.
15. Longworth, J, "Elevated rope-worked inclines: an environmental future", *Light Railways*, No.110, October 1990.
16. Zimmer, GF, *The mechanical handling and storage of material*. Crosby Lockwood, London, 1916.

APPENDIX "A"

Transporter No. T22/	Date Purchased	Cost (2) ($) (1)	Repairs ($) (1)	Date Discarded	Recovered ($)
1	16.6.54	1866	3226	16.11.71	30
20	16.6.54	2052	3246	14.11.72	40
3	9.12.54	2048	3730	26.11.74	5
4	27.11.57	1981	4422	27.11.73	25
5	27.11.59	2156	2625	18.4.72 (5)	50
6	9.11.59	2180 (3)	4068	26.11.74	5
7	9.11.59	2180 (3)	3506	27.11.73	25
8	9.11.59	2180 (3)	3253	27.11.73	30
9	9.11.59	2180 (3)	2904	16.11.71 (6)	30
10(4)	12.9.63	1590	1146	18.4.72	50
11	12.9.63	1590	1146	18.4.72	50
12	2.9.63	1590	3391	26.7.78	20
13	16.10.63	1511	2233	5.6.73	10
14	27.11.69	1511	3357	26.7.78	30
15	27.11.63	1511	2646	2.5.78	300
16	12.12.63	1511	4405	23.11.76	20
17	22.12.63	1511	627	26.11.74	5

(From "Discarded Plant History Card")

(1) Rounded to nearest $
(2) Purchase price may include track components
(3) Power wagon L.750, Trailer wagon L.368
(4) Plant Transporter No. T22/10 consisted of a power wagon only
(5) To D. Singh Construction Pty Ltd
(6) To Marland

FROM THE ARCHIVES

LONGWORTH'S TRAMWAY, KENDALL

The following is an edited version of an article by CF Dewey, which appeared in *The Staff*, a railway and tramway workers journal, of 20 June 1924. The article describes a a journey on Longworth's timber tramway from the North Coast railway at Kendall. It was submitted to *Light Railways* by David Burke.

Kendall is a nice, quiet township of some size and population. There are a few sawmills, and also a butter factory or two; but most important of all, as far as this article is concerned, it is the terminus of a unique railway of private ownership, which extends to an extensive timber holding termed Cataract, some 10 miles in the westerly direction of Comboyne. It is really this railway which we have come to inspect.

The railway is of standard gauge, and was originally laid with 5-inch x 4-inch brush boxwood rails. These were not quite a success, owing to the heavy weight of the locomotive, so now the line is laid throughout with steel T rails of several varieties, from 40 lb to the yard down.

The route abounds in curves, and as proof of this readers would be interested in a $3^1/_2$ chain piece which occurs right on top of a little hill about mid-way out. A deviation, however, is now in the course of construction, and very shortly this tight corner will be eliminated. The grades too are rather severe, and many stretches of 1 in 25 are met with. In many places the route passes through private property, and in these instances the owners, Messrs. Longworth Ltd. of Laurieton, have had to acquire an 8-feet right-of-way.

Constructed just prior to the commencement of the war, the line is essentially a timber-carrying one, but by courtesy of the owners passengers are occasionally carried if they can find accommodation on the running board or fender of the engine or upon the bolsters of trucks. Supplies for neighbouring settlers are also taken along, and a friendly "toot" on the engine whistle given in advance brings them to the track side in time to take delivery. These transport services are performed entirely without charge.

The line is single for its whole length. There is no staff system, nor are there any fixed signals, for there is only one engine and one train, and not by any stretch of the imagination could any conflicting movement take place.

Upon reaching the depot, which really consists of a wooden shed alongside a loop line, we meet the senior member of the firm. He details to us the wonderful workings of the locomotive, for you will well imagine that the machine which would negotiate such a track as described above to be just a little different to those engines we are accustomed to round about Sydney. It is of the *Climax* geared type, and is of American origin. It has rather small driving wheels, but has immense tractive power for its size.

The drive is transmitted to both axles of the two bogies through a horizontal shaft along the entire length of the engine and just above the axle centres. The shaft is driven through a gear-box by two small cylinders placed one each side of the boiler at an incline of about 60 degrees, and engages with the axles by bevel pinions. The shaft is fitted with flexible universal joints, so that it may readily adjust to any track variations.

The engine's speed is not remarkable, for rarely is 8 mph exceeded; but the load behind the tender is usually 10,000 to 12,000 super feet of log timber, this having a tare weight of 40 to 60 tons. The proprietor says that the train does in one day what an old-style bullock team would do in a week. Wood saplings and cuttings are consumed as fuel.

The "All aboard" is given at 7.15 am, and as there now happens to be four passengers offering, and one of them a lady, a little thinking out has to be done as to where we will all fit. Eventually, however, we all manage to accommodate ourselves on the front of the engine, this being an ideal position for making observations, and with some hissing and grinding a slow start is made. There is no load behind for we are merely taking the empty trucks along.

About a quarter of a mile along we pass through that structure which would correspond to a running shed - a wooden construction built over the line a furnished with an orthodox pit. It is here that the engine is housed overnight.

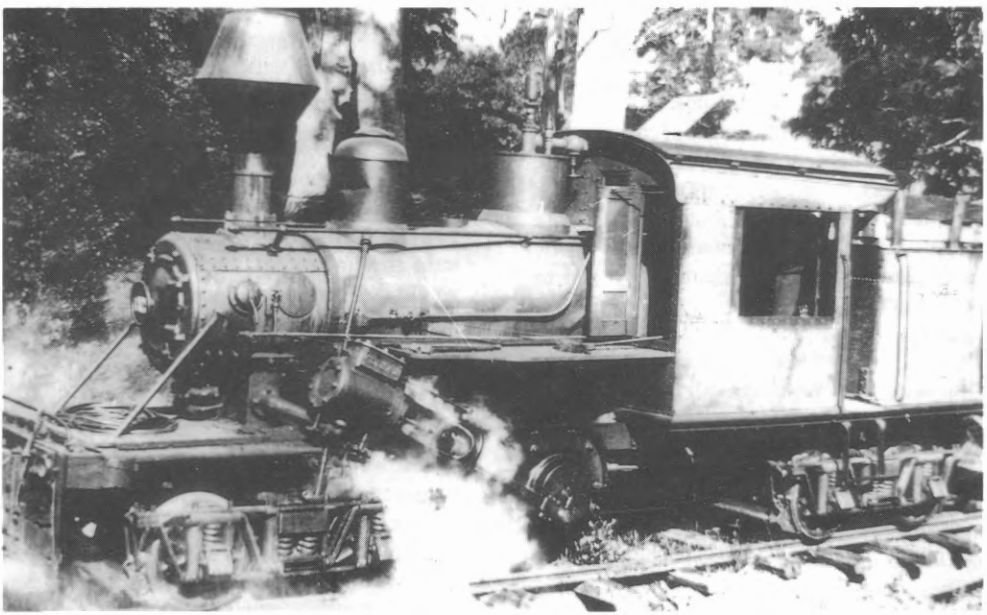
Nearly three miles out we come to the Camden Haven River, where we stop for water. This is drawn from the river through an injector pipe, and it is a slow process, for it took nearly an hour to fill the tanks.

Starting again, we cross the river on a bridge of good rustic timber construction, and proceed slowly through much beautiful, undulating country until about half way, we enter the thick forest. We are now in virgin country, and many real live snakes and goannas wriggle away as they hear the roar of the train on the rails. These surroundings continue for some miles until we pull up at a siding which we are told is Tipperary. Here several bags of sugar are put off, together with a large case of groceries.

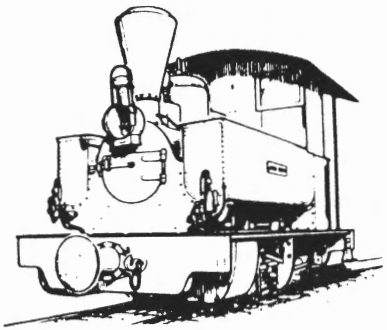
Leaving Tipperary, we pass over much country which has been denuded of its timber, and this obtains until we reach the rail-head at Cataract, the time being 9.40, or 2 hours 25 minutes for the 10 miles. Here the proprietor explains the layout to us, and we see a giant log-hauler, which is in-charge of his son. This machine has a large steel cable attached to it, and hauls the big logs from where the timber-getters are working in the forest. We saw it bring several big pieces of timber in, which were to form our load on the return journey.

This was commenced about 1.30 pm, and the going was much slower on account of the load behind. In many instances, the engine only just managed to negotiate the various "summits", and once we had to "back-pedal" in order to gain more impetus; but, nevertheless, the power of the locomotive was amptly demonstrated.

Pulling into Kendall terminus after a fair run down hill, we note that the time is just after 4 pm. Here we see the big logs discharged upon slips, where they remain overnight to be loaded in the morning onto a stern-wheeler barge, which conveys them some miles down the river to the mills at Laurieton. The trucks are then inspected and oiled up, while the engine goes along to the running shed to be attended to as engines should be, and when this is completed she is shut up for the night, after performing a good day's work, I am sure.



Longworth's Climax Locomotive at Kendall.



LETTERS

BENDIGO STEAM TRAM MOTORS, LR.110

With reference to Ken Milbourne's letter concerning the Bendigo steam tram motors, I offer the following comment.

It is my belief that WW Gunn took delivery of an ex-Bendigo steam tram motor during 1910 or 1911. A reference in the West Gippsland Gazette in October 1911 refers to the rebuilding of the locomotive. It does not give an arrival date, but implicit was that it had been in the immediate past. This is consistent with the opening of Gunn's Shady Creek Mill in 1909. His 2-4-0 Fowler, *PARROT* was found to be incapable of handling the grades on the line under load and for 18 months or so horses were used while Gunn sought a replacement locomotive. References in local newspapers, land files and interview notes with Jack Gunn (son of owner) confirm this.

No mention is made of where or from whom the locomotive was purchased but it is clear that, if the departure date from Bendigo is correct (1903), it was almost almost certainly in use somewhere else prior to coming to Crossover. This fits quite well with Ken's information concerning the departure of such a unit from JS Lee & Sons in Tasmania.

With regard to the Phoenix unit that went to Cave Hill, the *Australasian* of 7 April 1906 refers to steam power being in use. This may refer to the Baldwin unit only, but I believe both were purchased and delivered at the same time. This makes the delivery date prior to April 1906 and certainly before 1910.

Although I cannot quote builders numbers, it seems to me that, on the basis of Ken's information and the above, that it is most probable that Gunn's locomotive came from Tasmania.

Mike McCarthy
The Basin, Vic

NORTH MT LYELL RAILWAY, LR.109

The Sydney Morning Herald, despite its distance from Tasmania, throws a little light on the further movements of the ex-North Mt Lyell locomotives. The 23 March, 1935 issue carries an advertisement for the sale of one of the Avonside 4-6-0s which, on the detail given in *LR.109*, should be No.2 (Avonside 1393/1899). In part, the advertisement reads:

> For sale, Second hand locomotive with tender. Made by Avonside Engine Company Bristol. 3 ft 6 in gauge, approx 50 tons.

The party selling is given as AG Webster & Sons Ltd, Liverpool Street, Hobart. Like many locomotives going through the hands of dealers or agents, it was still for sale some time later as evidenced by a further advertisement by AG Webster & Sons in the SMH on 11 January 1936:

> For sale. Locomotive and tender, 3 ft 6 in gauge, working weight 45 tons. This engine has done very little work and is in first class order and condition.

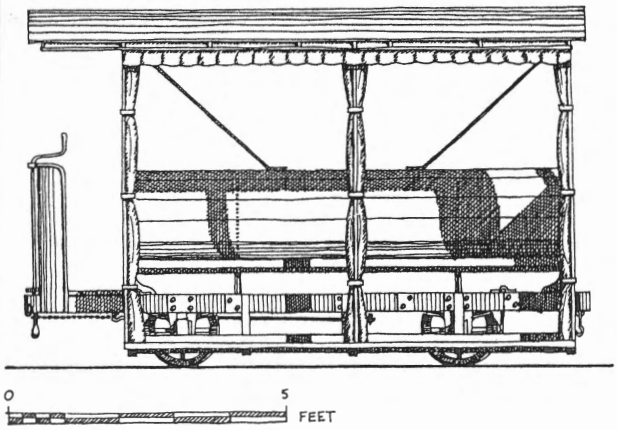
A decade earlier, the SMH of 5 June 1926 had advertised the disposal of another ex-NMLR locomotive in a July auction of the assets of the Huon Timber Company Ltd. Three locomotives were listed;

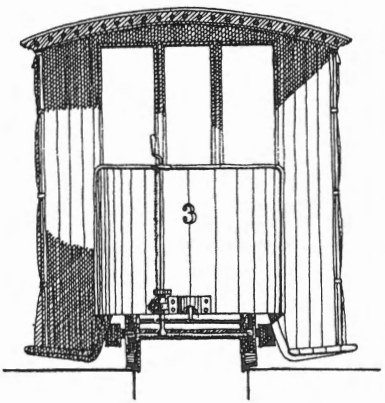
2 Shay locomotives, 150 lb WP
Barclay locomotive, 160 lb WP

The ex-NMLR locomotive was No.4 (Lima 698/1902) while the other two locomotives have been reported elsewhere in Light Railways as the Shay (Lime 2029/1908) and the Barclay, *THE HUON* (Barclay 959/1902).

The auction cannot have been a complete success, for in addition to the three locomotives not being sold and subsequently transferred to other Millers' operations, a further advertisement appeared on 14 May 1927 offering for sale the remaining plant, consisting of 1000 tons of rails, saw milling machinery and timber trucks.

Craig Wilson
Beecroft, NSW





R.T. HORNE JAN 1991

W.A.G.R. COSSACK-ROEBOURNE TRAMWAY
2'0" GAUGE HORSE TRAMCAR BUILT 1886 BY THE METROPOLITAN R.C.& W.CO. LTD.

NORTH WEST COASTAL TRAMWAYS, ROEBOURNE, WA: LR.52 AND 97

In my letter on page 28 of Light Railways 97, I speculated whether the "liliputian vehicles for a 2 ft gauge railway in Western Australia", seen under construction by members of the British Association at the Saltley, Birmingham, works of the Metropolitan Railway Carriage & Wagon Company in 1886 could have been for the Roebourne-Cossack Tramway. I have now discovered that there is a microfilm copy of the drawing of these delightful little cars in the Metro-Cammel collection in the Birmingham Public Library which clearly shows that they were, indeed, the Roebourne cars. The drawing is entitled "Open carriage, Western Australia" and shows that the cars were built in two batches: Order 528A of June 1886 and Order 874A of August 1890.

I have prepared the accompanying drawing from a microfilm print and some detail modifications will be noted in the photographs of the cars in service shown on page 11 of LR.52. Overall, dimensions appear to be 9 ft 8 in long x 6 ft wide x 6 ft 4 in high, with a wheelbase of 5 ft and 1 ft 3 in diameter wheels.

Richard Horne
Croydon, Surrey, UK

BALWYN WILD LIFE SANCTUARY: LR.110

I enclose a copy of an advertisement from the Melbourne *Age* for 20 January 1945 which includes a block for the North Balwyn Wild Life Sanctuary. During my childhood, we used to travel out to Mount Albert on the tram and climb aboard a large, lumbering, horse-drawn dray for the journey through the relatively empty spaces along Union Road, where the precursor of the now famous Healesville Colin Mackenzie Wild Life Sanctuary was located. The dray had long rows of seats facing outwards along the side of the wagon.

While I don't recall a miniature railway (shame!), I have pleasant memories of animals right on the then fringes of Melbourne suburbia.

Roger Secombe
Mitcham, Vic

Wild Life Sanctuary
NORTH BALWIN
OPEN DAILY.
Koalas, Kangaroos, etc.
Drag Meets Mont Albert Tram at terminus,
30-minute intervals, daily after 2 p.m.
FREE DONKEY PONY RIDES

REFERENCES, ANOTHER OPINION, LR. 57.

Alan Watson, in the course of his opinions, mentions that he had yet to see a definition of the term *OGEE*.

I have recently found such a listing in the Classic Dictionary of Architecture compiled in 1848 and published in 1875, with a facsimile edition published in 1986 by John Henry Parker, FSA. The Dictionary states:

> *Ogee (Old Fr.);* a moulding formed by the combination of a round and hollow, part being concave and part convex. In Classical architecture, ogees are extensively used, and are always placed with the convex part upwards... In Gothic architecture also ogees are very abundantly employed, but they are, quite often as not, employed with the hollow part upwards... The term *Ogee* is also applied to a pointed arch, the sides of which are each formed by two contrasting curves.

Paul Simpson
Panania, NSW

BOOTLESS BAY RAILWAY, PAPUA NEW GUINEA, LR.101.

Further information has come my way on the locomotive *POLYGON* used on the Bootless Bay Railway. Whilst checking through photographs held at the Port Dock Railway Station Museum, I found a photo of *POLYGON* working at Port Pirie prior to her dispatch to Papua. "No.2" similar to that shown in the photograph on page 23 of LR.101, is painted on the back of her bunker. This would appear to rule out most of the argument in my letter that the No.2 in the photo indicated that she was the second locomotive on the Bootless Bay line.

Arnold Lockyer
Dover Gardens, SA

CHICHESTER RIVER GRAVITATION SCHEME

Light Railway News No.76 (June 1990) contained extracts from a paper on the Chichester River Gravitation Scheme in New South Wales. These referred to the use of a 2 ft gauge petrol motor on the scheme.

Investigations have revealed this to be a typical 20 HP bow-sided cabless *Simplex* locomotive as shown in the enclosed photograph. John Browning's list of Motor Rail and Tramcar Company locomotives in Australia and Fiji (November 1990), contains only one possible contender for this unit. B/No. 1859 of 1919 ordered by Frank Saunders is the only loco of the period not accounted for. Some further details of the Chichester scheme appeared in the LRRSA NSW Division's Research Bulletin No.7 of January 1990.

Does any reader have further comments on this suggested identification for the locomotive?

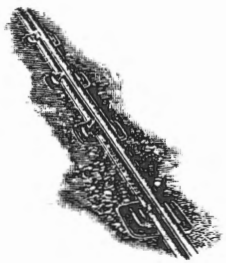
Jim Longworth
Sydney Water Board

Simplex locomotive on 24 gauge tramway at Chichester River scheme - Water Board photo.
Back Cover: undated Robt, Hudson catalogue for monorail equipment *courtesy Jim Longworth*

Hudson Monorailway

FOR VERY LIGHT LOADS AND TEMPORARY WORK

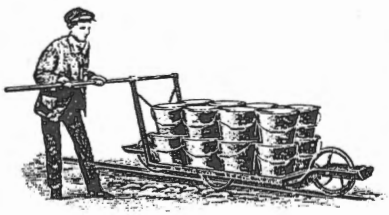
Suitable for prospectors and others where loads are light and intermittent, and the track often needs moving.



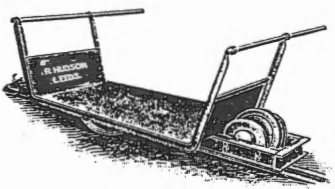
The initial cost of Monorailway is lower than ordinary railway track, making it cheaper to use where the work is of a temporary nature.

MONORAILWAY TRACK
Code 45146 AGGREGATIO

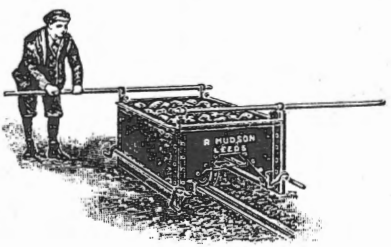
The Monorail is economical when limited traffic of light nature is conveyed over a long distance, especially if the ground is uneven, rough laying of the track, uneven curves, etc., do not affect the efficiency of the trucks, as the wheels and axles are specially constructed to pass over such faults.



PLATFORM TRUCK
To carry pails, etc.
Code 45147 AGGREGATOR



GENERAL PURPOSES TRUCK
Code 45148 AGGREGHI



HOPPER QUARTZ TRUCK
For tipping into bins or chutes.
Code 45149 AGGRESS

As normal load we recommend 400 to 550 lb. for one man, and 1,000 to 1,500 lb. for two men. The trucks are propelled by long poles or tubes which project out at the sides, and by means of these the trucks are quite easily kept in equilibrium.

PRICES OF STANDARD TRACK, etc.

Rail Used	Per Mile of Complete Track			Switches to suit	
	Basis Price	Approx. Weight	*Code Word*	Basis Price each	*Code Word*
10 lb.	£170	11 tons	AGGRIEVED	£2 0 0	AGGRIEVING
14 lb.	£221	15 tons	AGGRONDA	£2 10 0	AGGROUP

Net prices on application

For loads of 900 to 1,200 lb. we recommend 10 lb. rails, and 14 lb. rails for loads of 1,200 to 1,800 lb.

LEEDS LONDON DURBAN
JOHANNESBURG MAURITIUS
LOURENCO MARQUES BEIRA

HUDSON

CALCUTTA KARACHI
CAIRO LOANDA LOBITO
SALISBURY SINGAPORE