Engineers Australia

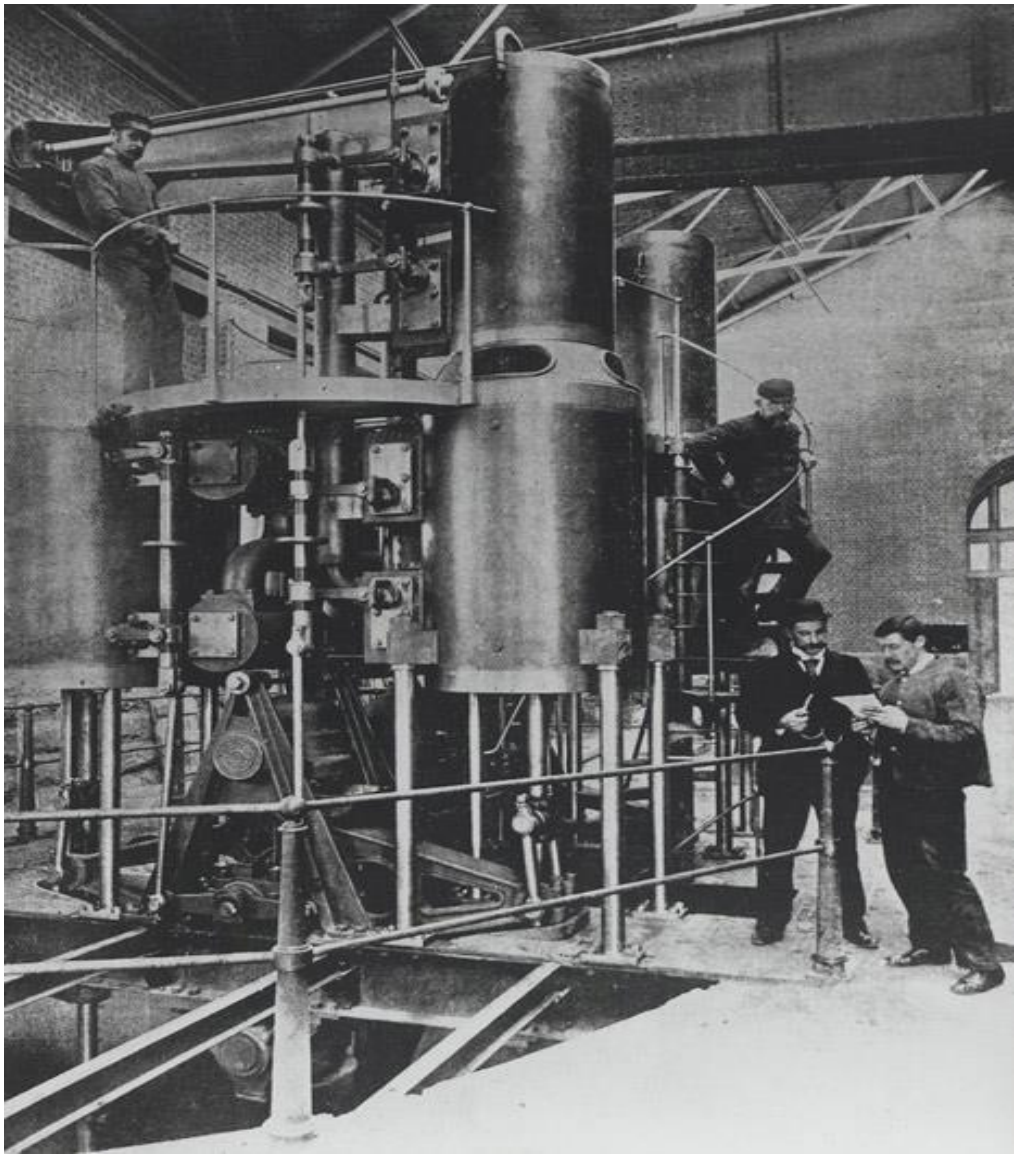
Engineering Heritage Victoria

Nomination

Engineering Heritage Australia Heritage Recognition Program

for

Thompsons of Castlemaine



March 2015

Front Cover Photograph Caption

This image shows the Thompson Engineering Works built Vertical Worthington non-rotative direct-acting triple-expansion Steam Engine circa 1901. Thompson's was a huge engineering works based in Castlemaine and was the first to build such an engine in Australia.

The engine was installed in the Engine Room at the Spotswood sewage pumping station by the Melbourne & Metropolitan Board of Works and overseen by Thompson engineers.

Image: Museum Victoria, Spotswood Pumping Station Exhibition

Contents

1 Introduction

Thompsons of Castlemaine was a very significant manufacturing business during its approximate 100 years of operation under the Thompsons name and, in a limited sense, continues to operate under the name of Flowserve after its takeover. Thompson's Engineering Works has historical significance for the important role it has played in the development of an engineering and manufacturing industry in Australia. It was one of the three main employers in Castlemaine during its heyday, employing up to 800 workers during World War II [1] and produced some of Australia's greatest engineering accomplishments. The company became one of the major manufacturing industries in Victoria and throughout Australasia, designing and manufacturing machinery, sluicing and dredging equipment, pumping plants, railway points and crossings, steam locomotives, revolutionary stationary steam engines and various turbines among many other things.

The recognition of the Thompsons of Castlemaine is aided by a collection of over 50,000 engineering drawings and several pieces of Thompsons designed and manufactured machinery held by the Maldon Vintage Machinery Museum. The large and prominently situated Thompson's complex has been built and extended over a period of more than 120 years. The site is currently divided between several occupants, with Flowserve holding the majority of the original property. The towering 1919 chimney stack, a prominent landmark in Castlemaine, as well as the two storey tuck-pointed brick office building provides the opportunity for a link between Thompson Castlemaine and the relics associated with it.

The grounds outside of the original site provides an opportunity, subject to approval by the owner, Flowserve, for the erection of an interpretation panel relating to the Thompsons of Castlemaine. A suitable location for an EHV interpretation panel is also possibly the Maldon Vintage Machinery Museum.

[1] The Commonwealth Engineer, 1945.

2 Heritage Award Nomination Letter

The Administrator
Engineering Heritage Australia
Engineers Australia
Engineering House
11 National Circuit
BARTON ACT 2600

Name of work: Thompsons of Castlemaine

The above-mentioned work is nominated to be awarded an Engineering Heritage National Marker: A National Comparison of relevant engineering companies is included at Attachment 8 to support this claim.

Location, including address and map grid reference if a fixed work: 5 Parker Street, Castlemaine, Victoria 3450.

Grid reference: $37^0$3'21" S $144^0$12'58" E

Owner (name & address): Maldon Vintage Machinery Museum

The owner has been advised of this nomination and a letter of agreement is attached.

Access to site: By permission from Flowserve.

Nominating Body: Engineering Heritage Victoria

OWEN PEAKE

Chair, Engineering Heritage Victoria

Date: 15 March 2015

3 Heritage Assessment

3.1 Item Name: Thompsons of Castlemaine

3.2 Other/Former Names:
Thompsons & Co.- Foundry and Engineers
Thompson & Co. (Castlemaine) Pty. Ltd.
Thompsons Engineering and Pipe Co. Ltd.
Thompsons (Castlemaine) Limited
Thompsons, Kelly & Lewis Pty. Ltd.

3.3 Location: Castlemaine, Victoria

3.4 Address: 5 Parker Street

3.5 Suburb/Nearest Town: Castlemaine

3.6 State: Victoria

3.7 Local Govt. Area: Mount Alexander Shire Council

3.8 Owner: Flowserve Pump Division

3.9 Current Use: Pump assembly, testing and servicing

3.10 Former Use: Engineering manufacturing facility & foundry

3.11 Designer: Thompsons of Castlemaine

3.12 Maker/Builder: Thompsons of Castlemaine

3.13 Year Started: 1875

3.14 Year Completed: Most manufacturing facilities still in use for their original purpose

3.15 Physical Description:

The Company was one of the largest engineering works in Australia, employing up to 800 workers at one time. Its main output was initially machinery for the mining and pumping industry but after receiving a contract for the manufacture of locomotives in 1913 there was an emphasis on this work alongside of the production of machinery, sluicing and dredging equipment for the mining industry, pumping plants and equipment, railway points and crossings, revolutionary stationary steam engines and various turbines among many other things.

Thompson's site as of December 2014
Image: Google Maps (-37.055558, 144.216333)

3.16 Physical Condition:

The original site appears to be fully intact although it is now subdivided and occupied by several tenants. The buildings appear to be in good order although very little of the original equipment remains.

As well as the original manufacturing site many relics produced by Thompson's remain.

3.17 Historical Notes:

In 1875 Brothers, David and James Thompson, migrants from Northern Ireland, commence an Engineering business on the corner of Kennedy and Parker Streets, Castlemaine, the premises at which they had earlier erected a flour mill. J Burnell, 1956 states that previous to this the Thompson's had been involved in the erection of Quartz Crushing Batteries, Engines, Pumps and Winding Equipment and had even been awarded at the Paris Exposition in 1867 for the flour produced at their mill. The pair began by initially manufacture mining equipment for gold excavation for the nearby Castlemaine gold fields.

1882. One of the earliest contracts obtained by Thompsons was for the supply of Points and Crossings for the Victorian Railways for the formation of the Inglewood railway for the sum of £50,000 (Bendigo Advertiser, 1882). Such equipment was still being supplied to the Railways up until the closure of Thompson, Kelly & Lewis and continues at the same premises today by Vossloh Cogifer Australia.

1887. The Engineering Works rapidly extended and had grown to employ 120 men.

1888. This year David Thompson died and was succeeded by James Thompson and David Thompson junior.

1895. Thompson's first large undertaking was the pumping plant for sewerage works at Spotswood. At a time when Victoria was gripped by a major economic recession Thompson's was thriving. The contract included the manufacture and supply some 500 tons of machinery including four 300 horsepower steam pumping engines, six marine-type internally-fired multi-tubular boilers, surface condensers, Green's economisers, feedwater pumps and a host of other auxiliary equipment such as overhead travelling cranes for each engine house, steam-operated penstock valves, receivers and 128 metres of riveted steel delivery pipes [2].

The pumping station was commissioned in 1896 and "all worked without a single failure" [3]. Steam pumping engine by other manufacturers were installed later followed in 1925 by electrically-driven centrifugal pumps, two of which were supplied again by Thompson's.

Thompson steam engine, North Engine Room, Spotswood Pumping Station, Victoria, circa 1901
Image: Museum Victoria

1900. Thompsons were pioneers in the system of alluvial mining by hydraulic sluicing, with their Gravel Pumps being used in Australia, New Zealand, Nigeria, Holland and the Federated

[2] Museum Victoria, 2015.

[3] J Thompson, 1939.

Malay States. At this time more than fifty of their dredges were working in the Castlemaine district alone. Air Compressors, Steam and Electric Winders were made for all the principal mining fields in Australia. According to the 'Examiner', a Launceston newspaper, one such dredge was used by the Launceston Marine Board to reclaim a large piece of land in the vicinity of Stephenson's Bend.

1908. Manufacture of Water Tube Boilers and Quick Revolution Forced Lubrication Engines was commenced. Many of the QR Engines, coupled to Centrifugal Pumps, were supplied for irrigation purposes along the Murray River.

1913. The manufacture of Dd class Locomotives was commenced. The Company became a Proprietary Limited Company under the title of Thompson & Co (Castlemaine) Pty Ltd.

During the 1914-18 War some 70 Dd class locomotives were built for the Victorian Railways, and a number of marine engines for Commonwealth Standard Cargo Vessels. 40 were built between 1914 and 1917, and, in 1920, components for a further 30 were supplied for assembly in VR workshops in Bendigo, Ballarat and Newport. The first locomotive steamed out of the works on December 12th, 1914:

"A musical whistle by way of warning, and heralded by a cloud of steam as it broke the ribbon. As the pulsating engine, its new garb gleaming in the sun, thrust its way through an avenue of admiring and enthusiastic people, the cheering was maintained" [4]

A 500 ton Forging Press, installed at this time, enabled Thompson's to forge heavy ships shafting.

It was at this time, too, that a notable advance was made in pioneering the manufacture in Australia of Steel Tyres for the Railways and Tramways. The plant for the manufacture of these tyres was designed and built at Castlemaine. Shortly afterwards a 1000 ton forging press was added to the forge equipment enabling forgings to be made to 20 tons weight.

1915. Compound high-speed enclosed engine began being made. These were an early example of Thompson's production of high-speed engines which were built in competition against dominant British makers such as Belliss & Morcom, and W H Allen. See appendix 4 for a detailed description.

In 1916 David Thompson junior was killed in an accident in the works and the management then devolved on Mr EV Dam and Mr Rex Thompson.

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[4] Mt. Alexander Mail local community paper.

1919. The foundry undertook the building of engines for the Commonwealth ships upon abandoning the manufacture of locomotives. The first engine was for the steamer *Drumona,* which was the first ship built in Victoria to leave the yards under its own steam.

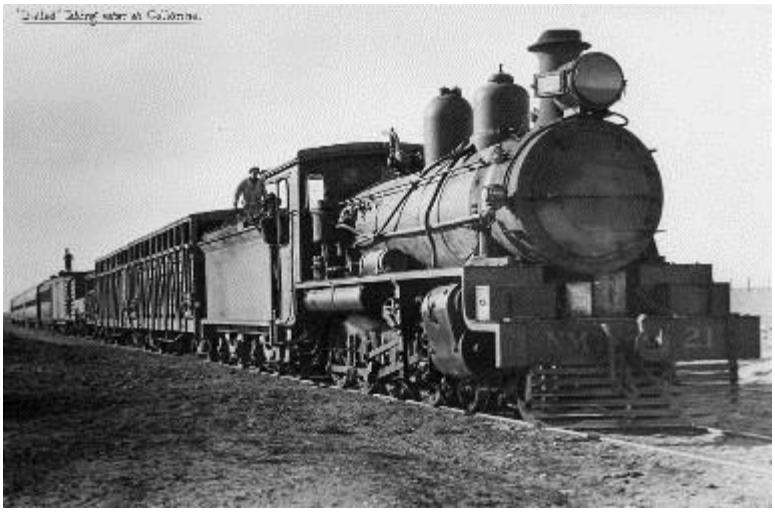
1920. The management realised that the ever widening network of the lines of the State Electricity Commission would soon almost kill the demand for steam engines. In that year, therefore, the Company became licensees to the Metropolitan-Vickers Electrical Co Ltd, Manchester, for the manufacture of Turbines and Condensing Plants. Under this arrangement heavy Power Plant was manufactured at Castlemaine including eleven 25,000 kilowatt turbines with Condensing and Feed Heating Plant. See appendix 4 for a detailed description.

The old established business of Gray Bros, Williamstown, was purchased for the purpose of building Pontoons and other parts of Bucket Dredges, as it was uneconomical to manufacture these at Castlemaine. Soon afterwards the price of tin slumped from £400 to £90 per ton, making it difficult for Bucket Dredge Mining and Sluicing to carry on profitably. It was suggested by certain mining engineers that a solution might be found in a dredge of the Suction Cutter type which would be able to mine rich pockets not accessible to a Bucket Dredge. Three months trial was made with an improvised Harbour Suction Cutter Dredge. The results as reported were extremely good and, using these figures, contracts were obtained for a number of such dredges under guarantee. None of them were able to approach the abovementioned trial results, with a result that they failed to give their guarantees and the Company lost its capital however this displays Thompsons ability to adapt to changing demands.

Tenders were called in December 1923 for 14 NM class locomotives. Twenty overseas and 3 Australian bids were received, with Sir W G Armstrong, Whitworth & Co Ltd of England being the cheapest at £106,381. The next nearest tender was received from Thompson Engineering and Pipe Co Ltd of Castlemaine, Victoria at £136,400. As the overseas tender was not suitable, due to variances from the original specification, Thomson's got the order. The Government also hoped that by awarding a local contract it would foster the establishment and expansion of the local manufacturing industry [5].

The first locos were available for delivery, via Terowie, from May 1925. The Commonwealth was so satisfied with the delivery date and quality that an additional 8 engines were purchased for use on the new line extension being constructed from Oodnadatta to Alice Springs.

[5] Comrail.com, 2015.



Circa 1930 Central Australia Railway. NM 21 taking on water at Callanna
Image: Chris Drymalik

This year also marked a major reconstruction within the Company, the Thompson interest disappearing. The Firm was reconstructed under the title of Thompsons Engineering & Pipe Co Ltd.

1935. A fire in the pattern storage section resulted in the loss of a huge number of wooden patterns. The damage was set to "reach many thousands of pounds" [6]. The wooden pattern storage building was replaced with a concrete building, divided into sections with steel bulkhead doors and equipped with a fire sprinkler system.

1936. The Plant was modified by the addition of new installations and machine tools.

1939. Installation of Hydraulics Laboratory for the testing of Pumps and other associated equipment. This laboratory was also used to carry out investigation and research in hydraulic problems. This enabled the company to obtain reliable and valuable data on all types of flow in pipelines, through valves, nozzles and orifices.

1940. The production during the Second World War included 25 Pounder Guns for the Army, 6 Pounder Tank Attack guns, marine engines and circulating pumps for the Navy, crankshafts for engines on Corvettes, large forgings, propellers and other items vital to the War Effort. So great was the demand that the existing plant had to be added to and extended, the major extensions being the new Forge Annexe and the Non Ferrous Foundry. Thompson's were also commissioned to provide a new rudder-post for a damaged U.S. Navy

[6] The Argus, 1935.

ship from a template made by divers, an engineering feat in itself. See appendix 4 for a more detailed description.

1941. Thompson's build two triple expansion steam reciprocating engines for the HMAS *Castlemaine*, a WWII Corvette. See appendix 4 for a more detailed description.

One of the two triple expansion steam reciprocating engines on the HMAS *Castlemaine*
Image: Maritime Museum of Victoria

1950. To cope with the increasing size of Power Generation Plant, a new shop was erected and equipped with the most modern machine tools. Thompsons tendered for, and won, contracts to supply the spiral casings for hydro-electric power stations in the Snowy Mountains Hydro Electric scheme.

1951. To provide accommodation for employees, the Company proceeded with a housing scheme and built many new homes this year.

1954. The demand by Oil Companies and Paper Mills for Heat Exchangers and Pressure Vessels brought with it the necessity for radiographic inspection. During this year an X-ray Plant was installed, suitable for a penetration of 2" metal thickness.

1957. The new Machine Shop for Railway points and crossing was built, with all facilities for assembling the sections and loading direct on to the rail trucks for despatch. This was a contract that Thompson's had held since 1882, at this point 75 years.

1959. New Transformer Station built for the transformers necessary for testing of modern Pumping Units.

1961. The Williamstown Engineering Co, specialising in Steel Fabrication Work, was purchased.

1962. New Hydraulic Test Laboratory erected to facilitate testing of the large pumps now being built. The Steel Foundry and Engineering Business of Davies & Baird Pty Ltd of Brunswick and Coburg, was purchased this year. Further advances in the thickness of Pressure Vessels necessitated the installation of a larger X-ray machine. A new unit was

installed, having a penetration of 4” metal thickness. The old Plant at Williamstown, purchased in 1920 closed down this year.

1963. The Condenser Shop, where all large steel fabrication work was done, was extended to allow the manufacture of large and more varied work.

1964. Old machines replaced by new and additional equipment installed. Thompsons made great progress in the 1960's and 1970's with this mechanical control of low flow situations. At the time of the centenary of Thompsons in 1975 the employees could point with pride to such installations as circulating water pumps for the Liddell Power Station and for Gladstone Power Station and eight other large installations.

1967. Installation of new equipment including vertical plate bending machine to bend 3 inch thick plate cold.

1968. Borg Warner Corporation acquired all the unissued shares of Thompsons Castlemaine Limited. Therefore Thompsons became part of the Byron Jackson Pump Division of the Borg Warner Corporation of Chicago.

Plaque on the external wall of Flowserve located on Park Street. This plaque lists the titles Thompson & Co held over the years until it was placed in 1975.
Image: Owen Peake

Completion of installation of 16 feet diameter table vertical Boring Machine - to take work 32 feet diameter, 30 tons weight, 10 feet high. Conversion of old test bay for use as experimental laboratory and model testing. Technical research on blade design, all types of pumps.

In 1971, the effect of the mineral boom in northwest WA created a demand for heavy section points and crossings, to carry the ore to shipping ports in that State. Thompsons established a new facility at Kewdale, a few kilometres out of Perth, to carry out the production of these items.

1973. The forging shop was closed and a warehouse created. Rearrangement of machines, purchase of new machines, new procedures, etc, all made life interesting.

The Fabrication Department closed in February 1979 after many years of battling with problems such as State preferences, design requirements, and competition, after the final shipments of Yallourn 'W' Condensing and Feed Heating Plant. Power station construction had slowed to the point where there were too many manufacturers and too few contracts to be won. This concluded an era in that field of engineering that spanned 60 years.

1981. Byron Jackson quit the management of Thompsons, which now came under the control of Borg-Warner, Australia. Under the ownership of Borg Warner there was steady investment in machinery and equipment. Borg Warner's principal Australian business was in the manufacture of automotive transmissions, with Ford Motor Company as a major customer.

During 1982-84, the Iron Foundry was upgraded by the introduction of production line facilities for small castings, pollution control equipment on the coke-fired cupolas, a new metal yard and furnace charging equipment. New overhead cranes were also installed. The former Fabrication Shop became a Heavy Machine Shop, housing all the larger machinery in the plant, including the 16-foot boring machine designed "in house".

In 1982, Thompsons heard that Portec Australia was for sale. This company manufactured bonded joints and railway track components. Thompsons bought the business and transferred the equipment to Castlemaine. The Rail Shop was extended in 1985 to accommodate the longer and heavier rail lengths then being supplied.

In 1987, the merger between Thompson and Kelly & Lewis was effected – the business proportion being 60:40. The new company was called Thompson Kelly & Lewis, Ltd. Late in April BTR - Nylex acquired Borg Warner Australia and thus became the parent company of Thompsons Kelly & Lewis Pty Ltd.

1993. Received an award for engineering excellence, presented by the Institution of Engineers, Australia - Victoria Division. The Highly Commended 1993 Award was won for the development, manufacture, testing and installation of eight large replacement sewage pumps for Melbourne Water's Brooklyn pumping station.

1998. Thompsons, Kelly & Lewis obtained a multi-million dollar order for pumps to be supplied to the Laminaria Floating Production and Storage vessel to be operated by Woodside Ltd.

On Saturday 31 January 2000, a fire broke out in the foundry. It was not detected until about 5.00pm when it broke through the roof. The fire had destroyed parts of the foundry, a disused store and parts of the machine shop. The blazing roof of the machine shop fell onto an Okuma MC80H machining centre.

In December 2001 Thompsons, Kelly & Lewis received the final settlement of the fire damage insurance claim. The all-up total of the damage and business interruption was $2,040,000. While replacement of the damaged machinery was fairly straightforward the

rebuilding works met with all sorts of delays, caused partly by the Olympic Games building 'boom' and the artificial pre GST conditions in the building trades. Much business was lost due to the fire.

In 2005 Flowserve acquire 75% share in Thompsons, Kelly & Lewis and took over the business. Flowserve continue to operate their Pump Division out of the Castlemaine premises today, assembling and servicing pumps.

Flowserve's machine shop, December 2014
Image: Owen Peake

Much of the success of Thompson's is attributable to the technical knowledge of their designing, engineers, the works Superintendent, planning engineer and foremen, and to the knowledge and skill of the employees who have identified themselves with the Works, in some cases for three generations. The manufactures of Thompson's were well known as work of the highest quality, and of excellent design [7].

They provided the necessary broad engineering knowledge to undertake new developments themselves with modern machine tools and equipment, much of which was designed and built in house.

All of the engineering firms in the region had closed by 1950. They grew up on mining and failed to strike out into new lines when it became clear that the demand had declined for mining plant, particularly of the types they had manufactured. From this relatively brief history of Thompson's of Castlemaine it is observed that they produced many impressive

[7] Victorian Institute of Engineers, 1919.

pieces. “Why has this foundry, situated in such a small town, been so successful? Is a question often asked. I take the reasons as these:—The engineering department of the business is performed most efficiently; the pattern-makers are ingenious; the work-men and foremen are good; the different establishments have an economical equipment of the best machines, and an authority is exercised by the proprietors in having all contracts—it does not matter whether the work is large or small—completed with care and excellence, and therefore the foundry has attained the highest reputation” (The Bendigo Advisor).

Heritage Listings

Name: Heritage Victoria
Title: THOMPSONS KELLY & LEWIS ENGINEERING WORKS
Number: H1732
Date: 14/10/2000

4 Assessment of Significance

4.1 Historical significance:

The Thompson Foundry was one of the largest engineering works in Australia during the period following the Gold Rush and during a time when Australia aspired to develop manufacturing industries to support the nation.

4.2 Historic Individuals or Association:

James Thompson
David Thompson Snr
David Thompson Jnr
Rex Thompson
John Burnell

Refer to biographical notes at Appendix 3.

4.3 Creative or Technical Achievement:

The machinery designed and manufactured by the company covered a very wide range of products, many of which had never been produced in Australia before. The Thompsons designed and produced a broad range of products to a tremendously high standard.

Thompson's produced many revolutionary products and large undertakings. These included various steam engine designs (including the first Vertical Worthington non-rotative direct-acting triple-expansion engine designed and produced in Australia, Compound High-speed Vertical Steam engines, high power engines for navy vessels, large boilers with Fox's revolutionary corrugated flues, locomotives and steam turbines for electricity generation amongst thousands of other projects.

The 22 NM class locomotives produced by Thompson's provided the main source of motive power for Commonwealth Railways for over 30 years. As well as this Thompson's produced 70 Dd class locomotives for use on Victorian railways and points and crossing for over 100 years. Two NM class locomotives as well as several Dd class locomotives and many relics of the Thompsons, including the Spotswood pumping station (Museum Victoria), remain by which we can judge the quality of the production.

4.4 Research Potential:

The Maldon Vintage Machinery Museum holds 50,000 engineering drawings as well as several pieces of machinery design and produced by the Thompsons of Castlemaine. Furthermore to this there are several DD class locomotives still remaining and a fully operation NM class locomotive still exists amongst many over relics including stamping batteries, steam engines, steam and water turbines, pumps.

Whilst the establishment is described in glowing terms as being of a superior nature little detail is evident due to the subsequent sale of Thompson, Lewis & Kelly and change in the nature of work conducted at the premises. Further research in this area would be helpful. However plans of the Thompson Foundry are known to exist. Analysis of drawings would be of considerable research interest.

4.5 Social:

Thompsons Foundry, along with the bacon factory and woollen mill, has long been a pillar of the Castlemaine community throughout its operation and a factor in the ongoing prosperity of the community following the Gold Rush. It was a large employer over a long period and therefore was a major stakeholder in the development of the Castlemaine community.

The Thompson Foundry band that was formed in the late 19th century also continues to meet and play today.

4.6 Rarity:

There were many manufacturing establishments elsewhere throughout Australia producing machinery during the second half of the 19th century. Thompsons of Castlemaine can therefore be described as representing the better class of machinery manufacturing establishments. Thompsons were better equipped and more able to undertake such works that any other engineering company in Australia over a very long period.

Claims of the superiority of the Thompson Foundry over others appear to hold true when observing the nature and quality of work produced by the company.

4.7 Representativeness:

The Thompsons of Castlemaine were typical of manufacturing factories elsewhere in Victoria and elsewhere in Australia although it was larger than most. In this era there was a strong emphasis on self-sufficiency in manufacturing in Australia and the multitude of manufacturers were evidence of this. The Thompsons of Castlemaine represented this pride in manufacturing excellence in the country.

4.8 Integrity/Intactness:

The vast majority of the original engineering works and foundry still remain with the external brick work of the main office even being heritage listed and protected by Heritage Australia. The premises is now occupied by several tenants including Flowserve. The internals of the buildings have been altered in various ways and the majority of the original engineering equipment is no longer present. As well as the original site still being intact many relics remain scattered throughout Australia, a large collection of which are held by the Maldon Vintage Machinery Museum.

Considering this it is therefore appropriate to recognise the Castlemaine site so that the important story can be told with context.

5 Statement of Significance:

The Thompson Foundry was one of the largest engineering works in Australia during the period following the Gold Rush and during a time when Australia aspired to develop manufacturing industries to support the nation. The presence of this large industry in Castlemaine assisted in consolidating the growth of the city following the Gold Rush. Thompson's of Castlemaine established a reputation as a significantly accomplished manufacturing business.

During its early years it specialised in the production of equipment for the mining and pumping industry, pioneering hydraulic gold sluicing systems, but after receiving a contract for the manufacture of locomotives in 1913 there was an emphasis on this work alongside of the production of machinery, sluicing and dredging equipment for the mining industry, pumping plants and equipment, railway points and crossings. Later the focused turned to engines, pumps and turbines.

The Thompsons of Castlemaine manufactured high quality product and established a reputation far beyond most Australian engineering works. The company manufactured everything from locomotives to the main towers for Melbourne's West Gate Bridge (Quick, 2006). It was one of the principal manufacturers of railway locomotives for the Victorian and Commonwealth Railways during a key period of railway development in Australia.

Thompsons Foundry's ultimate success is in fact noted for its ability to diversify through working with the mining companies, railways, pumping industries, WWII munitions supply, the Australian Navy and power plants. The foundries ability to move with the market enabled it to continue to employ the locals of Castlemaine, to support the economy and develop Castlemaine into the town it is now.

The foundry site remains mostly intact, however most of the machinery and original fit out is no longer present.

6 Area of Significance:

National. Refer to Appendix 8 for a justification of this claim.

7 Interpretation Plan

7.1 General Approach

The strategy for interpretation of the Engineering Heritage Works is laid out in the latest version of EHA's "Guide to the Engineering Heritage Recognition Program" [8]. The interpretation will be by marking the works with an appropriate level of heritage marker; a public ceremony or ceremonies to unveil that marker and an interpretation panel which summarises the heritage and significant features of the works for the public.

This plan provides a summary of the proposals for design, content, location and manufacture of the proposed interpretation.

The ceremony is currently planned to be held on **Saturday 8 August 2015 at 10:30 am.** This ceremony will be held at the Maldon Vintage Machinery Museum and will feature the Drawing Office Exhibit being worked on by the Thompsons Foundry Drawing Office Interest Group. The ceremony will be held indoors in the machinery shed adjacent to the Drawing Office extension.

It is proposed to hold a further ceremony at Flowserve in Castlemaine in 2015 (preferably during a period of better weather than mid-Winter). It is hoped to mount an interpretation panel adjacent to Parker Street but on the Flowserve property near the main entrance gate however this is still subject to detailed negotiation with Flowserve.

Interpretation panel type will be a mini-panel for the Maldon ceremony (400 mm wide x 800 mm high). This will be wall mounted in the Drawing Office exhibit in due course.

For the Flowserve ceremony a standard 1200 mm wide x 600 mm high interpretation panel mounted on a steel stand is proposed.

[8] The 2012 version. www.engineersaustralia,org.au search for Engineering Heritage Australia and Heritage Recognition Program.

7.2 General Attributes of the Interpretation Panels:

1) A title “Thompson’s of Castlemaine”
2) Logos of Engineers Australia, Flowserve and Maldon Vintage Machinery Museum as appropriate. Others to be incorporated if other stakeholders become involved.
3) A representation of the EHA marker plate.
4) The date and other details of the marking ceremony.
5) Text should be 24 point Arial Bold
6) Maximum text should be 100 words for mini-panel and 500 words for standard panel.
7) Historic and recent photographs with captions as appropriate.

7.3 The Interpretation Panel:

1) Size to be nominally 400 mm wide by 800 mm high for mini-panel and 1200 mm wide x 600 mm high for standard panel.
2) The panels to be constructed of vitreous enamel-on-steel or vinyl-on-aluminium with flanges as per drawing at Appendix 9.
3) Mini-panel to be wall mounted and standard panel to be mounted on steel fabricated frames as per Appendix 9.

7.4 Possible Interpretation themes for Standard Interpretation Panel

- The History of Thompson’s of Castlemaine
- The Thompson family
- The remaining products of Thompson’s of Castlemaine
- The “Age of Manufacture” in Australia

7.5 Preliminary Text Blocks for Interpretation Panels

To be added after consultation with Richard Venus.

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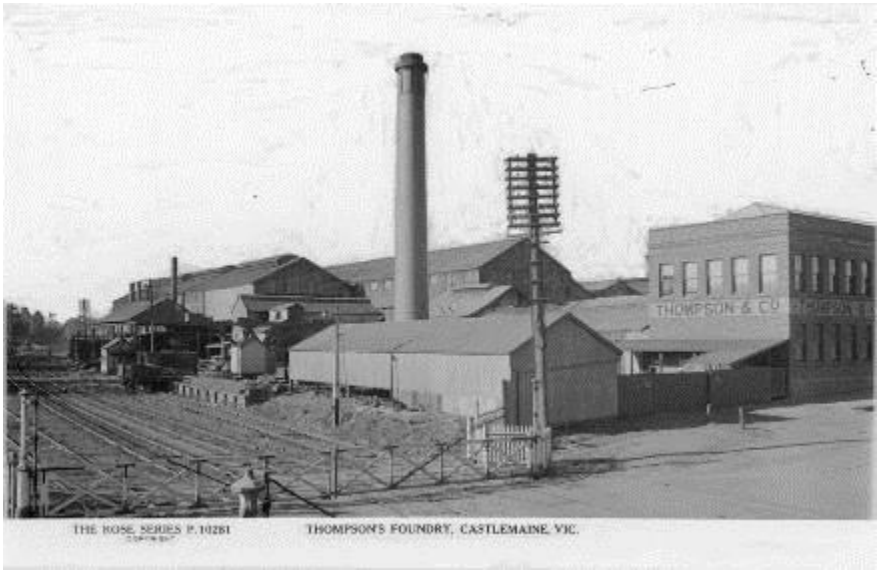
Phone: 0425 817 796

Appendix 1: Images with captions



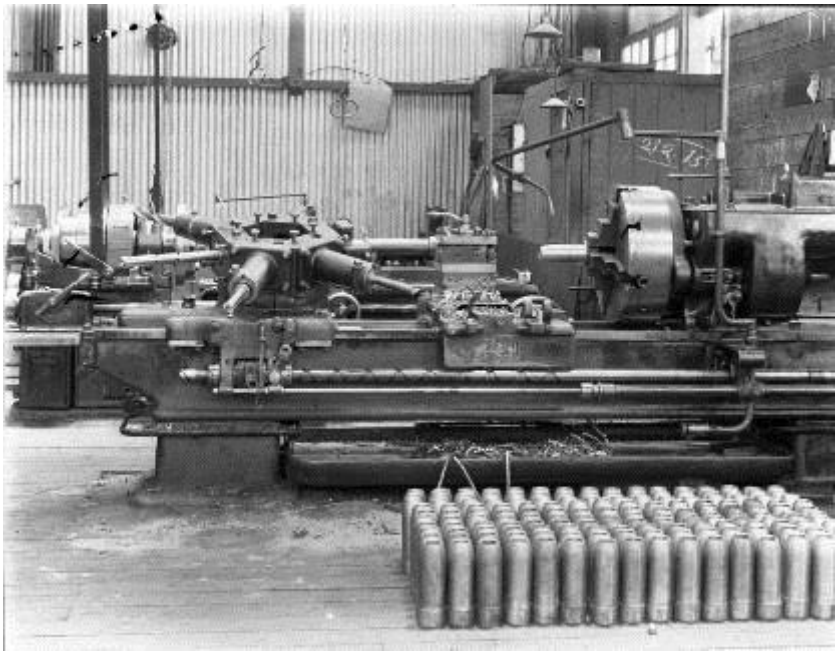
Thompson & Co engineering works, Castlemaine, 1920, glass plate negative photograph printed as a postcard sold in the Castlemaine township between 1920 and 1954.
Rose Stereograph Co, Rose postcard collection of negatives.
The image depicts the original foundry site as it was in 1920. The newly constructed (1919) towering chimney stack is seen as well as the two storey tuck-pointed brick building.
Note that the site at current still looks much the same.
Image: State Library Victoria

Flowserve works, Castlemaine, 2010, image of the current state of the site.
The original site remains mostly unaltered as can be seen in the image of it in its current state.
Image: Google Maps (-37.055558, 144.216333)

A1.1 Historical Images

Assorted Standard Sluice Valves, 1903
Gold sluicing equipment for the mining industry was Thompson's initial port of call once they had expanded beyond their original flourmill.
Image: Alan Miller

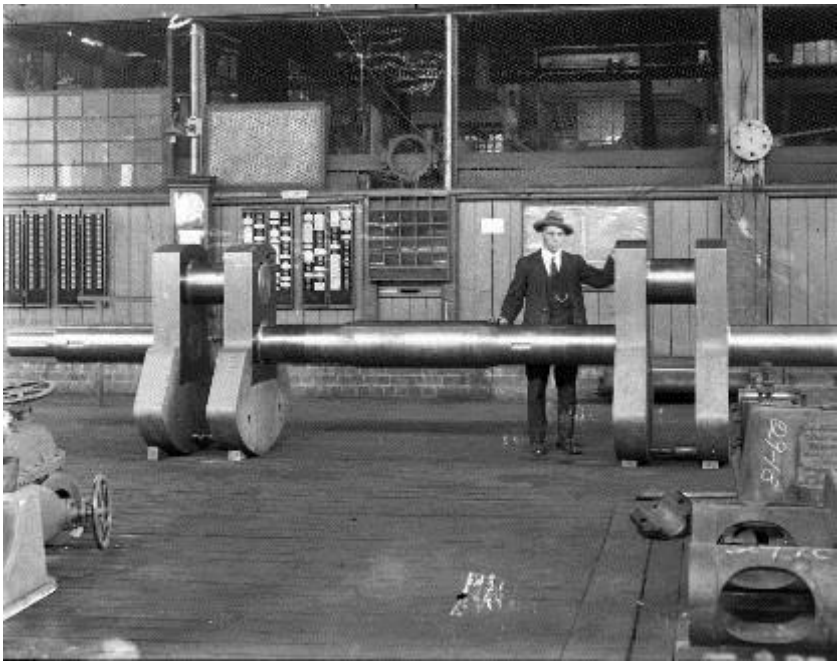
Two roads crossing two roads, 1921
Some of the major works conducted by Thompson & Co was producing railway points and crossovers. This work is still carried out today at the same premises by Vossloh Cogifer Australia.
Image: Alan Miller



Manufacture of 18 lb HE Shells. 1915

Thompson's was involved in producing artillery and munitions for the war effort during the first and Second World Wars. They also produced various high power triple expansion steam engines, engine and driveline components as well as the machinery that was used to produce munitions to name a few of their more significant war time achievements.

Image: Alan Miller



Double Throw crankshaft for 400 HP Gas Engine, 1918

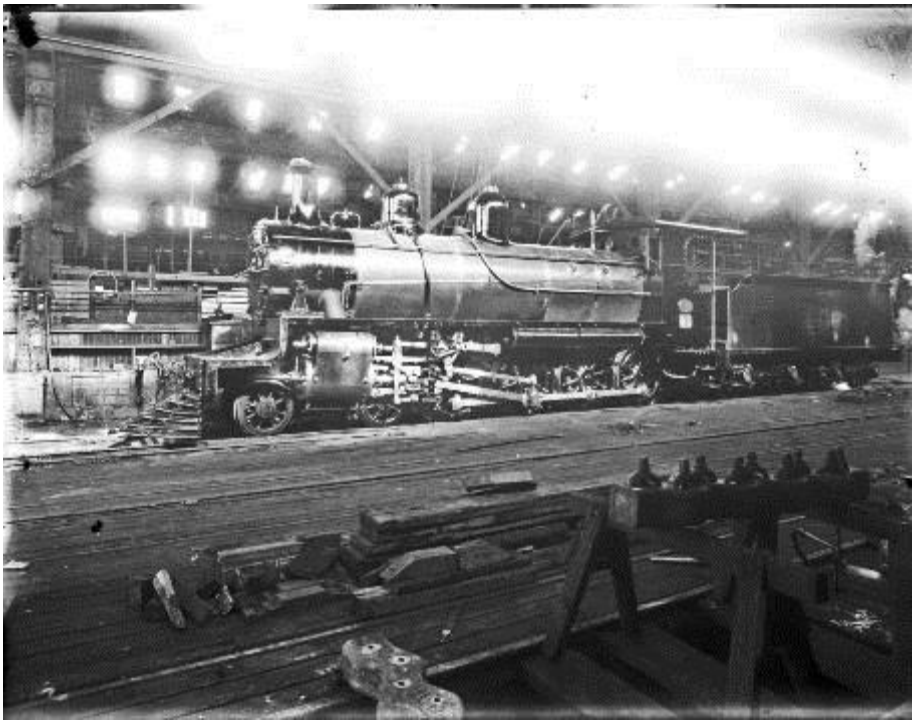
Image shows the capacity for the work that the Thompsons were able to undertake. The crank shaft is fully forged and over 24 feet long.

Image: Allan Miller

'Major' Sent In For Repairs, 1914

Steam locomotive nicknamed 'Major' was sent to Thompsons for repairs after a rear-end collision. The image displays the capacity for the work that was capable of being undertaken by Thompson & Co even in 1914. The locomotive weighed in at approximately 90 ton yet it was quite simple to be maneuvered around the workshop due to how well equipped Thompsons was.

Image: Alan Miller



One of the early built NM class locomotives and tender undergoing the final stages of construction in the Thompson Workshop.

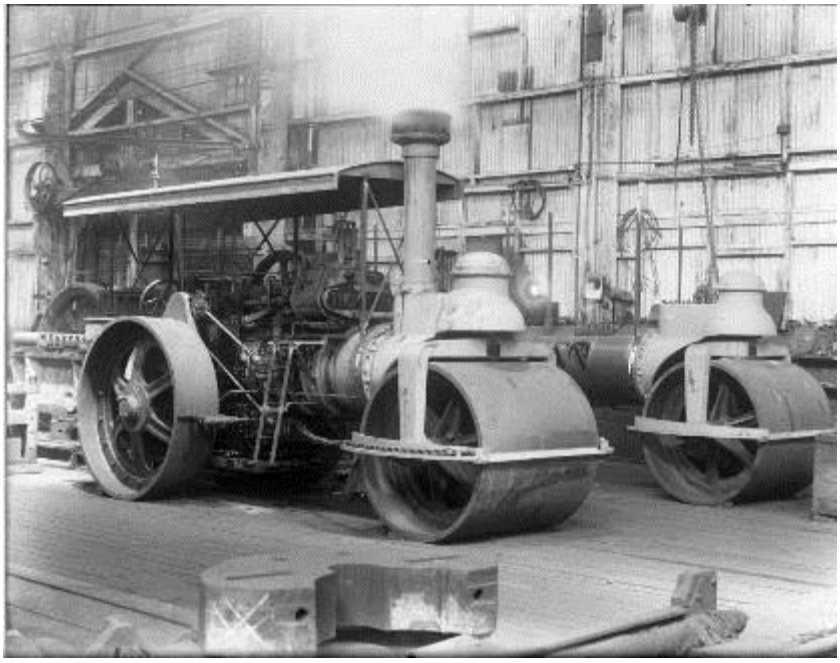
Image: Alan Miller

NM 15 in Port Augusta, 1950

NM 15 was the first NM class locomotive produced by the Thompsons. It first came into service on the 15/06/1925 and is now derelict but still on display in Quorn, South Australia.

Image: Chris Drymalik

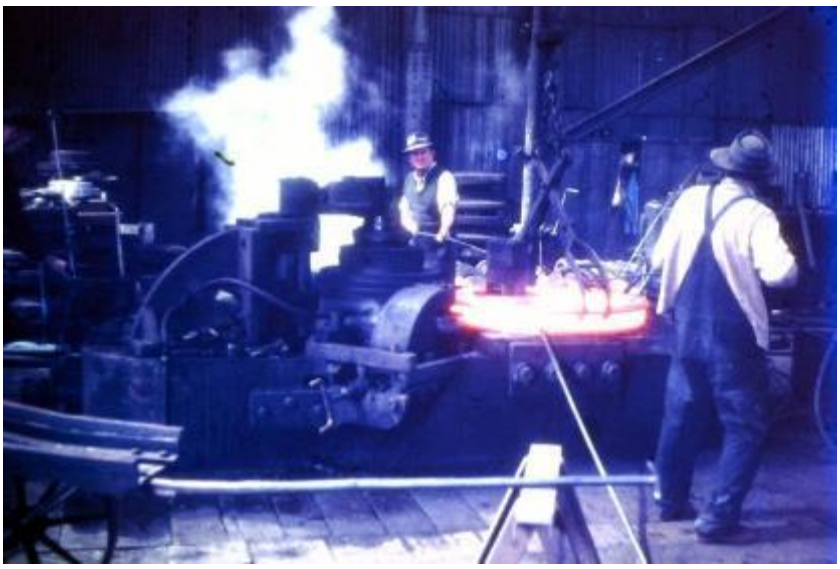
Commonwealth Steam locomotive NM 24 built by Thompson of Castlemaine at the Thompson's seaside picnic, an event held for employees of Thompson and Co
NM 24 entered service on the 30/11/1925 on the Central Australian Railway serving flawlessly through November 1955 and then scrapped in October 1958.
Image: Murray Billett



Two Road Rollers during construction, 1927

After the manufacturing boom that was experienced while Thompson's were producing steam locomotives they were able to continue to prosper as a company to moving on to making other complex machinery. During the Depression the number of employees was reduced to 80. In an effort to hold the remaining staff together, and also to assist the economy of the town, the management decided to design and build ten 12-ton steam road rollers for the CRB, Melbourne Councils, and Melbourne Tramways.

Image: Allan Miller



Steel tyre rolling machine, 1970's

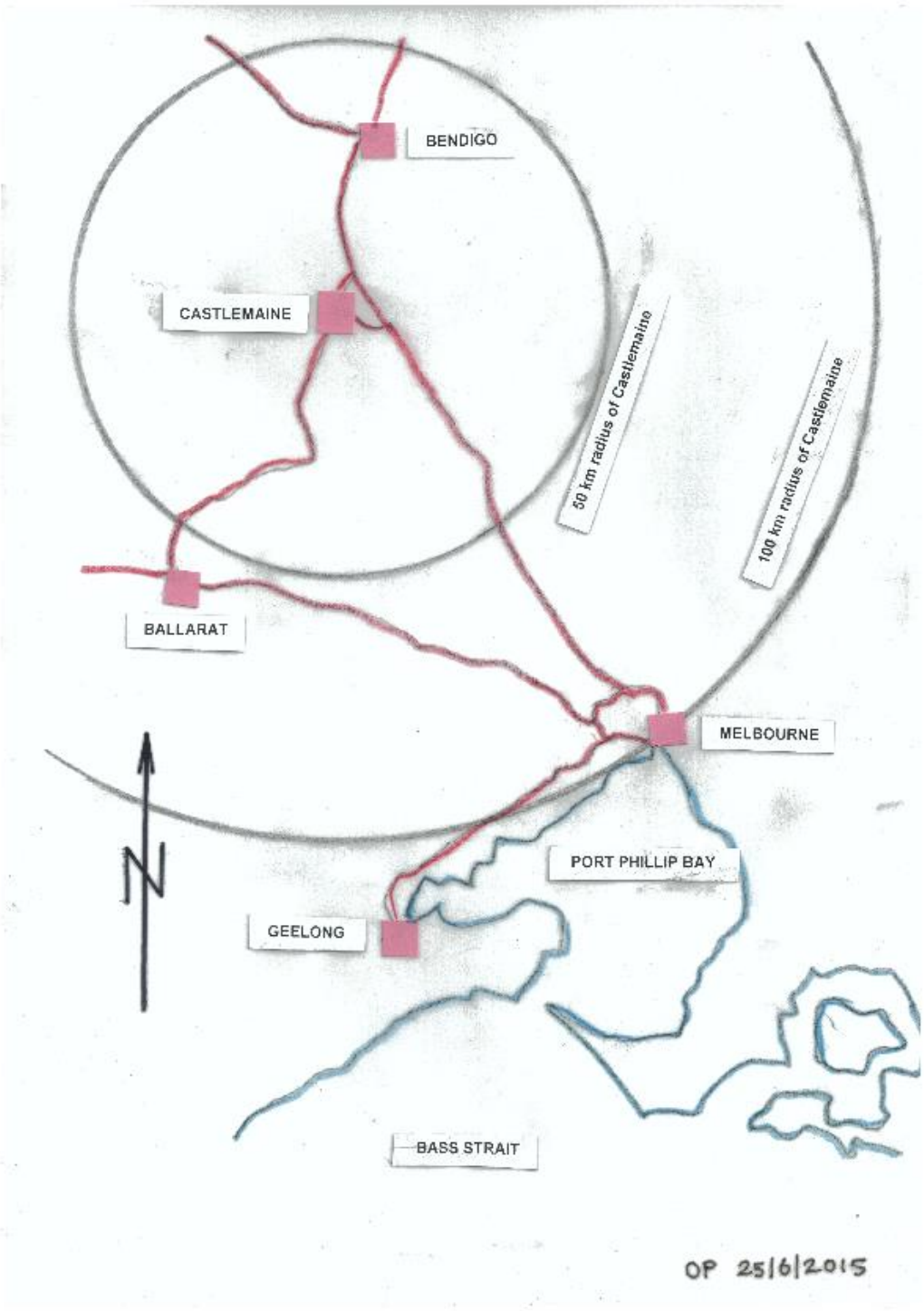
The tyre rolling machine was made in-house by Thompson's and was powered by a Thompson's built steam engine. The machine was potentially built in 1917 when the war cut off Australia's supply to train and tram tyres. It continued to see use into the 70's, showing the workmanship that went into Thompson build machinery.

Image: Miles Pierce

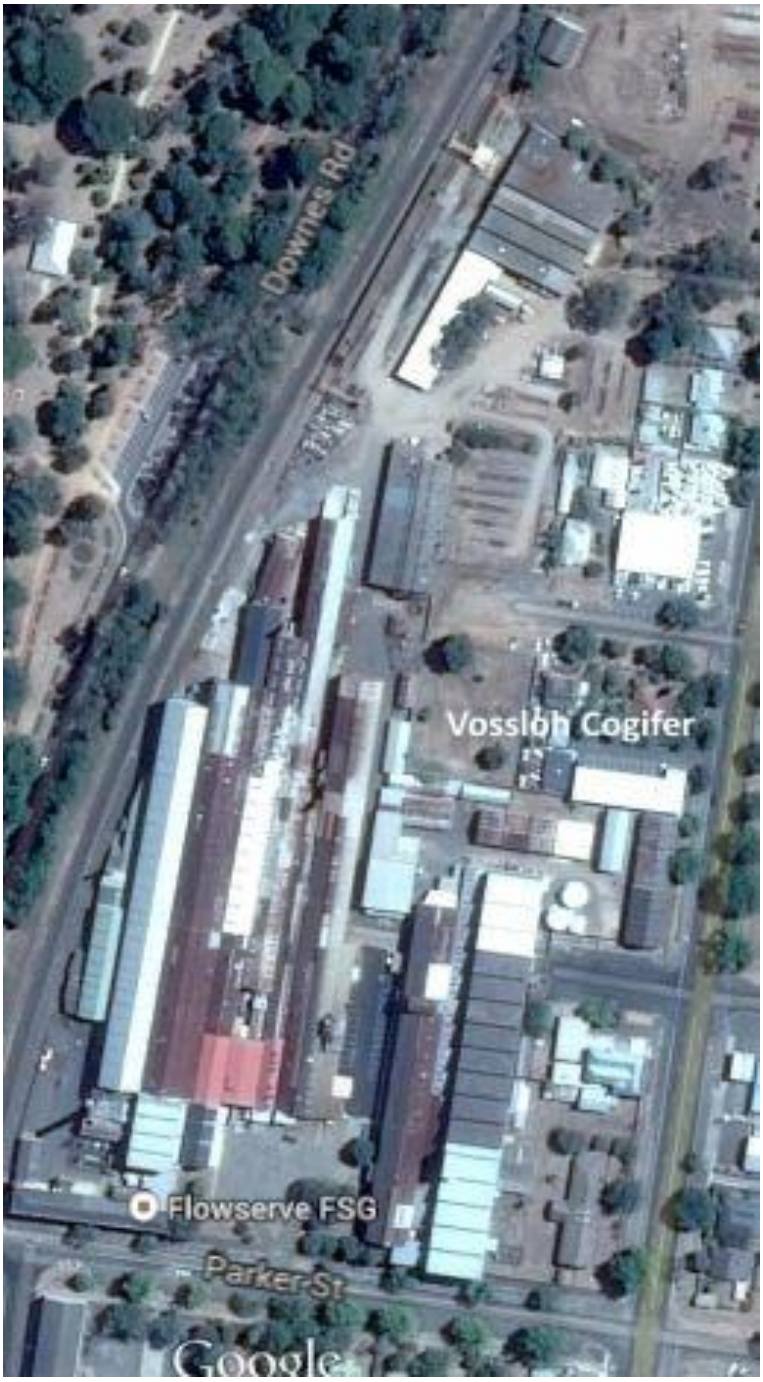
A1.2 Recent Images

The majority of Thompson's original site is now owned and occupied by Flowserve. Pump assembly, maintenance and repair is conducted at the site.
Images show an external view of the original site from the east end of Parker Street and the machine shop where pumps are repaired and serviced.
Images: Owen Peake

Appendix 2: Map

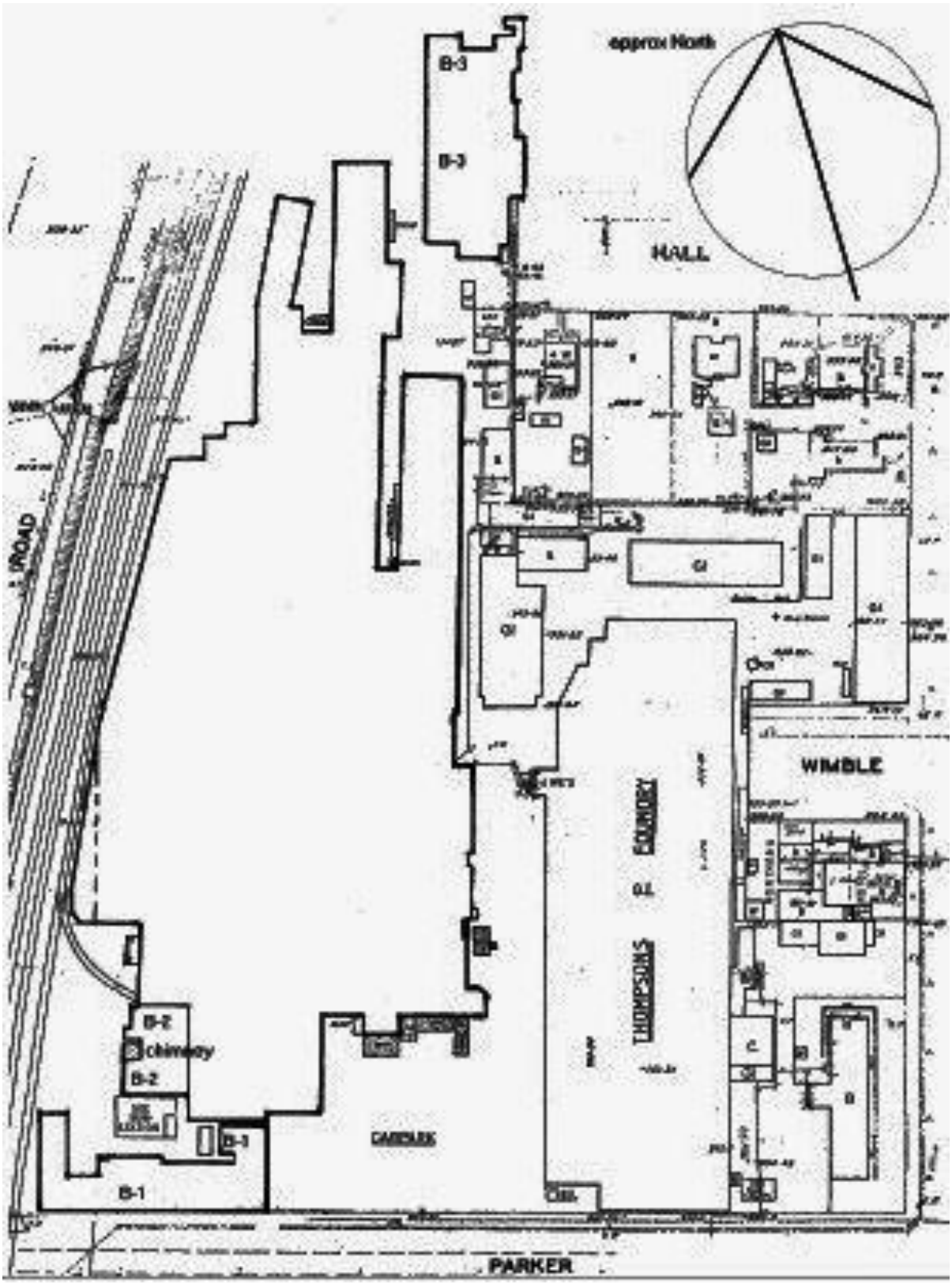


Location Map of Castlemaine. Note that Castlemaine was well located near the centre of Victoria and within about 100 km of many of the major towns and cities including Melbourne. It was also well located with respect to the Goldfields which were concentrated around Ballarat and Bendigo as well as the country in between including around Castlemaine itself.



The site of Thompson's Castlemaine.
The works are located in the block bounded by Parker Street, Barker Street and Downes Road, Castlemaine Victoria. Flowserve now occupies the frontage on Parker Street and the buildings running down the Downes Road while Vossloh Cogifer occupy the frontage on Barker Street and the buildings at the rear of the property.

Image: Google Earth



Early floorplan of the Thompson site showing how relatively unchanged the external of the site still is.

Image: Allan Miller

Appendix 3: Historic Individuals or Associations

David Thompson Snr. & James Thompson [9]

The brothers David and James Thompson migrated from Northern Ireland to Victoria in 1852-53 and formed a partnership, and first erected a Quartz Crushing Plant on old Quartz Hill in the Castlemaine district. For the next ten years they continued mining operations, being principally engaged on the erection of Engines, Batteries, Pumps and Winding Gears for various mines in Central Victoria. The following extract is taken directly from a Brief History of Thompsons, Castlemaine:

"In 1864 they erected a Flour Mill at the corner of Kennedy and Parker Streets, part of which is incorporated in the present offices of the Company. They obtained a number of prizes for their flour, notably an award gained at the Paris Exhibition of 1867. This award now hangs in the writer's office and is particularly interesting in that it bears the impress of Napoleon the Ill who was then on the throne of France, three years before his defeat at Sedan.

In 1875, the Thompson Bros. Began taking engineering work at the same premises. Milling was carried on for a further two years but was then abandoned, the plant being sold to a firm in New South Wales.

The Engineering Works rapidly extended and in 1887 had grown to employ 120 men. One of the earliest contracts obtained was for the supply of Points and Crossings for the Victorian Railways, and it is of interest to note that the contract for this equipment has been retained for the last 65 years.

David Thompson died in 1888 and the business was then carried on by James Thompson and David Thompson the younger, and Robert Thompson. James retired later that year leaving the business to David Thompson jnr".

[9] No images of David & James Thompson have been located at the time of writing.

David Thompson Jnr. [10]

David Thompson Jnr. was the most influential member of Thompson's Engineering works, developing the company beyond a simple mining machinery manufacturing business. He took over the works after the death of his farther David and retirement of his uncle James in 1891. At the death of David Thompson the chairman of the Victorian Institute of Engineers quoted that "Mr. David was of great repute, and a man who had left his mark on Australian engineering. He had been most favourably known throughout Australia, and there was probably no mining field of importance on which none of his engines were to be seen". The following is an extract taken directly from the Australian Dictionary of Biographies:

"Educated locally, David Thompson junior (1865-1916) served his apprenticeship in the family's engineering works. He assisted his father and uncles in the management of the business, but also spent much of his time supervising installation of the firm's machinery throughout Victoria. On 23 June 1896 he married Elizabeth Florence Whitehead at St Thomas's Anglican Church, Moonee Ponds, Melbourne. Between 1889 and 1908 the firm diversified into the production of heavy-duty pumping plants for the Metropolitan Board of Works and the State Rivers and Water Supply Commission; it also began production of hydraulic-sluicing and dredging equipment. By 1910 there were fifty Thompson-made sluicing and dredging plants in the Castlemaine district alone. Effectively head of the company since 1908, David became general manager when John died in 1910. Under David's direction the firm expanded into the manufacture of high-speed force-lubricated steam-engines, water-tube boilers and steam superheaters. Awarded a contract to supply twenty DD class locomotives for the Victorian Railways, Thompson & Co. (Castlemaine) Pty Ltd was floated in April 1913 with a paid-up capital of £88,333. Thompson inspected production at engineering and locomotive works in England and Germany; after his return the firm spent £63,000 extending and re-equipping the Castlemaine workshops. By 1919 sixty locomotives had been built for the Victorian Railways and another twenty-two were later made for the Commonwealth.

A member of the Chamber of Manufacturers, the Victorian Institute of Engineers and the American Society of Mechanical Engineers, Thompson served for many years on the Engineering Wages Board which met in Melbourne. He was an outspoken critic of excessive railway freight charges and an advocate of protective import tariffs; in 1914 he had appeared before the Inter-State Commission. Thompson took a warm interest in the welfare of his employees: he encouraged apprentices to attend classes at the local technical school,

[10] No images of David & James Thompson have been located at the time of writing.

supported employees' sporting clubs, organized an annual picnic for the firm's workers, and was a playing member and president of the Thompson Foundry Band from its inception in 1886.

On 4 February 1916 Thompson died at his Castlemaine home from injuries received in an accident at the foundry. He was buried with Presbyterian forms in the local cemetery. His wife survived him. They had no children. David Thompson had developed the business into one of the largest and best equipped non-government engineering works in Australia with a maximum workforce of over 600. The family connexion ended in 1925 when the company was restructured as Thompsons Engineering & Pipe Co Ltd In 1974 it became a subsidiary of Borg-Warner (Australia) Ltd".

After the death of David Thompson Jnr. Bessie Thompson, widow of David Thompson, bequeathed to the University of Melbourne the sum of £500 for the purpose of founding a scholarship in the 'science of Civil Engineering at the University, to be known as the 'David Thompson Scholarship'. It was Bessie's desire that the scholarship be used to provide assistance to a student pursuing a Civil Engineering course, as Civil Engineering was at the time a way of describing General Engineering, as distinct from Military Engineering. In her will, the Bessie also expressed a desire that the University give preference to students who are sons of residents at Castlemaine when selecting scholarship recipients.

John Gurner Burnell

John Burnell played a major part in building the company into Australia's leading manufacturer of high-efficiency pumps and supervised the manufacture of artillery and tank guns, marine engines, circulating pumps and other heavy forging and foundry work during WWII. After the war he guided the firm through a further period of expansion in which major contracts were obtained to supply condensing and feedwater plant for new, electric power stations across eastern Australia. The following is an extract taken directly from the Australian Dictionary of Biographies:

"John Gurner Burnell (1885-1967), engineer, was born on 21 January 1885 at Paddington, Sydney. Educated at The King's School, Parramatta, and the University of Sydney (B.E., 1907), he completed one year of an arts course in 1903 before transferring to mechanical engineering. During his course Burnell gained practical experience at the New South Wales railway workshops and at the Pyrmont plant of the Colonial Sugar Refining Co.

After graduating with first-class honours, in 1908 he was appointed to the new State Rivers and Water Supply Commission of Victoria under Elwood Mead and by 1911 was chief mechanical engineer. Burnell travelled extensively throughout northern Victoria, supervising the installation and testing of steam-driven pumping plants which provided water for irrigation, stock and domestic use. He came into close contact with the engineering firm, Thompson & Co. (Castlemaine) Pty Ltd, one of the commission's major contractors.

Commissioned in the Australian Imperial Force on 29 September 1915, Burnell was posted to the 5th Field Company, Engineers. His appointment terminated in Australia on 13 February 1920 and he resumed his job in Melbourne.

In 1922 Burnell resigned from the commission to become assistant-manager with Thompson & Co. When the company was reconstructed as Thompsons Engineering & Pipe Co. Ltd in 1925, he was appointed to the board as technical director and promoted to general manager. Responsible for the day-to-day running of the firm's Castlemaine works, he played a major part in building the company into Australia's leading manufacturer of high-efficiency pumps. In 1928 he oversaw the introduction of a standard range of general service pumps

and in 1932-33 designed special, centrifugal pumps for treating juices containing cane fibres in Queensland sugar-mills. Having investigated the theory and design of large, axial flow-pumps, in 1939 he persuaded the board to install a hydraulic laboratory with the capacity to measure flows of up to 30,000 gallons (136,383 litres) per minute and to handle pumping loads of 15,000 horsepower. By 1940 pumping equipment had become Thompsons major product, representing 40 per cent of the Castlemaine works output.

During World War II Burnell supervised the manufacture of artillery and tank guns, marine engines, circulating pumps and other heavy forging and foundry work. After the war he guided the firm through a further period of expansion in which major contracts were obtained to supply condensing and feedwater plant for new, electric power stations across eastern Australia. The Castlemaine works were extensively re-equipped with modern machine-tools and a fabrication shop was built which almost doubled the workshop space.

Throughout his years with Thompsons, Burnell was approached by those outside the firm who valued his expertise. In 1928 he had commenced work on the Australian pump test code, on which he published a paper in the Journal of the Institution of Engineers in October 1929. This work subsequently became the basis of an equivalent British standard. He was also engaged to report on pumping and water supply to the irrigation settlements of Mildura, Merbein and Red Cliffs for the Federal Development and Migration Commission. Even major competitors came to him to seek advice on pump-design problems.

Burnell firmly believed in the importance of basic research to engineering design and manufacturing. While at Castlemaine, he conducted many experimental investigations into practical problems and patented design improvements for feedwater heater and de-aerators (1934) and steam desuperheaters (1939). His published research also revealed an involvement in the design of power station feedwater and condensing plant. Other fields in which he was concerned included steam-air ejectors, water jet pumps, water-hammer and cavitation. In 1938 Burnell visited engineering works in England, Sweden, Germany, France and the United States of America where he negotiated Australian manufacturing licenses with several companies. He made a second business trip abroad in 1956.

Actively interested in the welfare of Thompsons' employees, Burnell maintained the firm's almost unblemished industrial record and the policy of paying above-award wages to its best employees. During the Depression he retained its most highly-skilled tradesmen and draftsmen by initiating projects such as the manufacture of steamrollers, even though there was little prospect of the work being profitable".

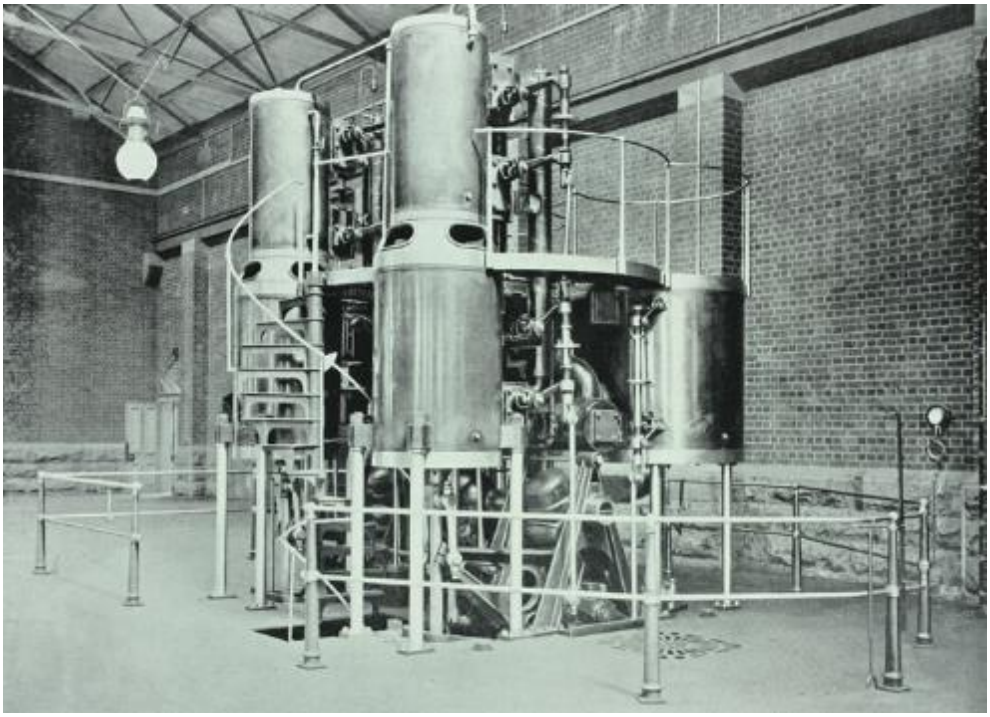
Appendix 4: List of Significant Engineering Achievements

4.1 Spotswood Sewerage Pumping Station

Built by the Melbourne & Metropolitan Board of Works between 1893 and 1897, the Spotswood Pumping Station was a key part of Melbourne's first centralised sewerage system.

Thompson's were contracted to manufacture and supply some 500 tons of machinery including four 300 horsepower steam pumping engines, six marine-type internally-fired multitubular boilers, surface condensers, Green's economisers, feedwater pumps and a host of other auxiliary equipment such as overhead travelling cranes for each engine house, steam-operated penstock valves, receivers and 420 feet (128 metres) of riveted steel delivery pipes.

Worthington non-rotative direct-acting triple-expansion engine

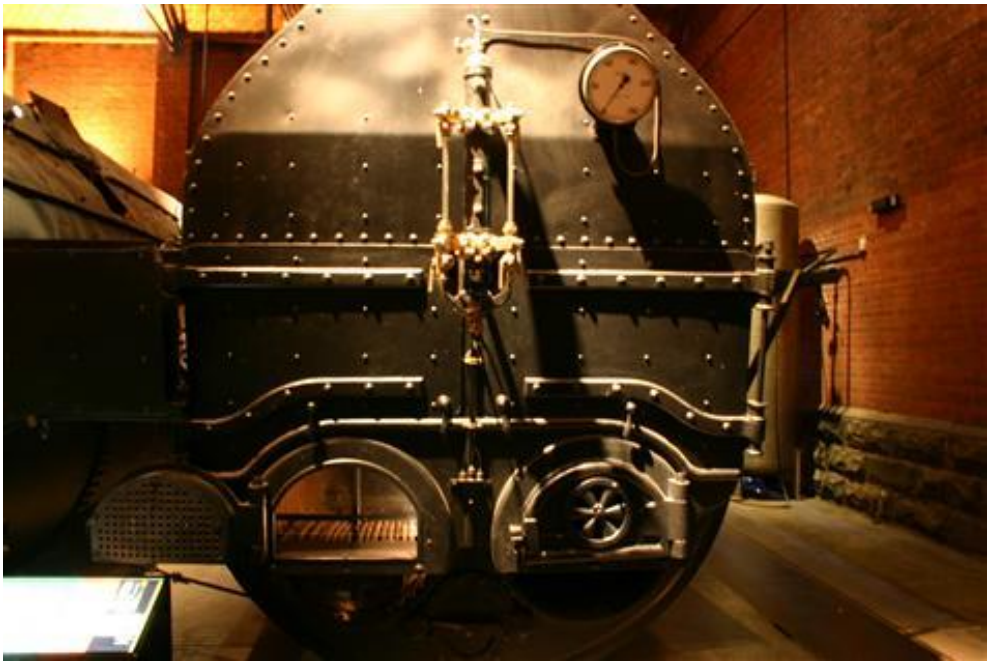


Thompson steam engine, North Engine Room, Spotswood Pumping Station, Victoria, circa 1901.
Image: Museum Victoria

According to Museum Victoria the four engines manufactured in about 1895 were produced for Spotswood and of an unusual design described as a Worthington non-rotative direct-acting triple-expansion type. They had no flywheels or crankshaft and six steam cylinders of three different sizes. Two rocking 'compensating' beams provided coupling between each pair of piston rods and drove the opposing side valve gear. The Worthington engine design had originated in America and was widely used for high-duty pumping plants in both Britain and the United States by the 1890s. In Australia, the Spotswood engines were the earliest

example of a vertical Worthington design, although a number of horizontal Worthington engines had previously been installed for water supply and sewage pumps.

Multi-tubular Boiler



No. 4 Spotswood Sewerage Pumping Station boiler located in the North Boiler House.
Image: Museum Victoria

According to Museum Victoria the six boilers manufactured in about 1895 were produced for Spotswood and are a double furnace, internally-fired return multi-tubular boiler of dry-back scotch marine design rated at 300 horsepower. It incorporates Samson Fox's corrugated furnace flues which add greater strength, 15 Galloway tubes, two water pockets and overhead steam receiver weighing in at approximately 24.5 ton. Between 1897 and 1947 these boilers supplied steam for the pumping engines at the station. It was used as an air receiver (a storage medium between the compressor and the consumption system when the plant changed to electric pumps) between 1952 and 1982. It was relocated to the north east corner of the Boiler House in 1990 and prepared for static display by Lake Goldsmith Steam and General Engineering.

Overhead Travelling Crane

Double girder overhead travelling crane located in the North Engine Room
Image: Museum Victoria

Thompsons were also responsible for the production of the double girder overhead travelling crane located in the each engine room. This crane was originally manually operated but was later converted with a compressed air driven winch for lifting and retained manual traversing only.

4.2 NM class Locomotives

The NM class locomotive was a class of 4-8-0 locomotives, of the same design as the Queensland Railways C17 class but with larger tenders and vacuum rather than air brakes among many other modifications, built by Thompson's for the Commonwealth Railways. The class operated on 3 ft 6 in (1067 mm) narrow gauge lines in South Australia and the Northern Territory in readiness for the extension of the Oodnadatta railway to Alice Springs.

Pichi Richi Railway restored NM 25, 2003
Image: pichirichirailway.org.au

The locomotives came into service between June 1925 and December 1927 and all were withdrawn between 1954 and 1956 as the NSU diesel locomotives entered service. See Appendix 6 for a detailed history of each locomotive. Throughout their working life the engines remained basically unaltered apart from the provision of back bunker boards and boarding the front of the tenders showing the quality produced by Thompson's.

NM class specifications [11]

Wheel arrangement	**4-8-0**	
Gauge	3 feet 6 inches (1067 mm)	
Weight	80 tons 19 cwt	82.2 t
Length	53 ft 0½ in	16.17 m
Tractive effort	19,200 lb	85.4 kN
Boiler pressure	160 psi	1103 kPa
Driving wheels	3 ft 9 in	1.14 m
Cylinders	17 x 22 in	430 x 560 mm
Valve gear	Walshaerts	
Grate area	18.5 ft²	1.7 m²
Coal capacity	6.5 tons	6.6 t
Water capacity	3,000 gal	13600 L

[11] Courtesy of pichirichirailway.org.au.

4.3 Dd Class Locomotive

The Dd class was a passenger and mixed traffic steam locomotive built by Thompson's, among seven other workshops. Thompsons built 40 of these locomotives for the Victorian Government between 1914 and 1918, second in number only to Victorian Railways Newport Workshop. These locomotives gave excellent service for the next fifty years.

To celebrate the Centenary of the first Dd-class locomotive completed by the Thompson Foundry for the Victorian Railways the Victorian Goldfields Railway held a special event on the December 2014. Steamrail Victoria locomotive D3 639 masqueraded as DD 893 which was the first Dd engine built by Thompsons.

Image: Mathew Davis

Dd 893 was completed by Thompson's Foundry on the 12th December 1914 and entered service with the Victorian Railways on the 23rd December 1914.

A collection of Thompson plates displayed at Castlemaine Station for the Victorian Goldfields Railway, December 2014.

Image: Mathew Davis

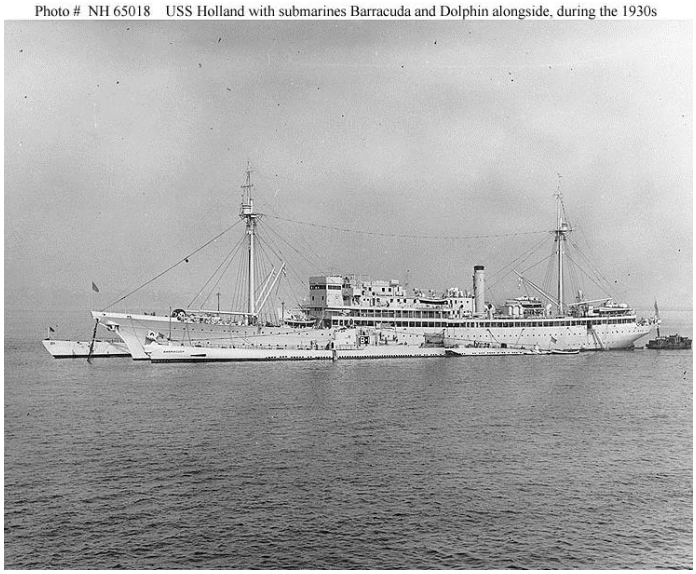
Dd class specifications [12]

Configuration	4-6-0
Gauge	5 ft 3 in (1,600 mm)
Driver diameter	61 in (1.549 m)
Length	57 ft 4 3⁄4 in (17.49 m)
Axle load	13 long tons 0 cwt (29,100 lb or 13.2 t)
Weight on drivers	38 long tons 6 cwt (85,800 lb or 38.9 t)
Locomotive weight	53 long tons 0 cwt (118,700 lb or 53.9 t)
Tender weight	41 long tons 16 cwt (93,600 lb or 42.5 t)
Locomotive and tender combined weight	94 long tons 16 cwt (212,400 lb or 96.3 t)
Fuel type	Coal
Fuel capacity	5 long tons 0 cwt (11,200 lb or 5.1 t)
Water capacity	4,220 imp gal (19,200 l; 5,070 US gal)
Boiler pressure	175 lbf/in2 (1.21 MPa)
Firegrate area	21.2 sq ft (1.97 m2)
Heating surface: – Total	1,375 sq ft (127.7 m2)
Cylinders	Two, outside
Cylinder size	18 in × 26 in (457 mm × 660 mm)

[12] Courtesy of Museum Victoria.

4.4 U.S. Navy Vessel Rudder Repair (USS *Holland*)

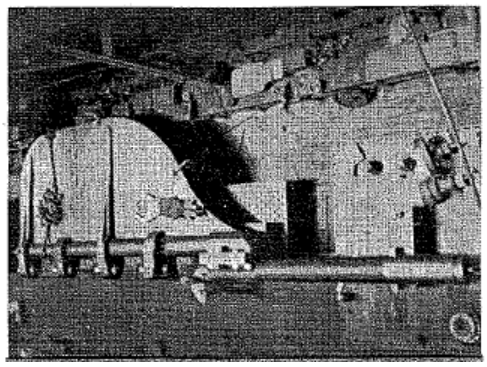
Thompsons of Castlemaine is 117 kilometres inland from the Port of Melbourne yet, due to the revolutionary works that had previously been produced at Thompson's, they were asked during the Second World War by the U.S. Navy to assist in repairing one of their disabled warships [13].



United States Navy Submarine Tender USS *Holland* (AS3) at anchor in the 1930s with two submarines tied up on her starboard side. She served in au8sgtralian waters in 1942. Source: US Navy

The United States Navy Submarine Tender USS *Holland* (AS3) ran into a storm crossing the Great Australian Bight and lost its huge rudder, rudder stock and rudder post. To make the situation more difficult, the vessel could not be docked in Melbourne so Thompsons were requested to assist in overcoming this serious but unique set of circumstances. A set of drawings was obtained from the supply ship which always accompanied the U.S. Navy. As they were unable to dock the ship, divers were used to make a template of the rudder post and foot.

[13] The ship was USS Holland (AS3), built in 1926 of 8230 tonnes displacement, 483 feet 8 inches long powered by two steam turbines driving two shafts. Total power 7000 SHP. Speed 16 knots. She was decommissioned and scrapped in 1952.



This was one of the most difficult jobs ever carried out in the Castlemaine plant's forge. With the aid of a 1,000 ton forging press the job was completed in a remarkably short time. These items of equipment are usually made of cast steel, but a forging was preferred in this case from the point of view of time and soundness. Some difficulty was experienced in machining these parts owing to the possibility of the template having twisted during transport from Melbourne. However, it all assembled and fitted into place perfectly after all final drilling and bolting the assembly to the keel of the ship being carried out under water by means of air drills.

The Company, through its skilled employees, felt a great sense of achievement on completing this job and received a special commendation from the United States Navy for the manner and speed with which the job was carried out.

4.5 Compound High-speed Vertical Steam Engine

The compound high-speed enclosed engine is an early example of their production of high speed engines which were built in competition against dominant British makers such as Belliss & Morcom, and W. H. Allen (Lamb, 2013). The engine is significant as it represents the study and understanding of the evolution of power from steam to internal combustion engines . Previous to this engine Thompson's had only produced low-speed steam engines which weren't suited to all applications. This engine diversified Thompson's range, showing their ability to conform to requirements at the time.

Engine number 496 built by Thompson's & Co.
Image: National Steam Centre Collection

Engine No.496, was built in 1916 for the Victorian Public Works Department (PWD). At the time the PWD were building a land dredge at the State Dockyards at Williamstown for the Bendigo Creek Trust. The engine was the main power source for the dredge which was used to clear Bendigo Creek of years of built up sludge from local mining operations. The provenance of the engine is known for the initial period of its working life on the dredge. It was then acquired by Swinburne Technical College for their Thermodynamics Laboratory in the 1950s.

4.6 Commonwealth Maritime Steam Engines

In 1919 the foundry undertook the building of engines for Commonwealth ships upon abandoning the manufacture of locomotives. During a visit to Thompson's to inspect the finished engines by acting minister for the Navy, the Premier, the chief executive officer of ship construction and the chief mechanical engineer they expressed the opinion that the workmanship and the material were of the highest quality [14] in true Thompson style.

Thompson's initially built six sets of engines, 300-horse power, and are the largest that have been constructed in Australia [15]. The engines were of the triple expansion type, with three

[14] The Argus, 1919.

[15] The Argus, 1919.

cylinders having diameters of 25inch, 41inch, and 68 inch respectively, and a stroke of 45inch. Triple expansion engines are three-cylinder reciprocating engines [16] which circulate spent steam from the first cylinder to power the second and then third. The first engine was for the steamer *Drumona,* which was the first ship built in Victoria to leave the yards under its own steam. The other engines were installed in, amongst other ships, the SS *Dundula,* SS *Eudunda* and SS *Iron Crown* which was sunk off of the coast by a Japanese Submarine.

One of the two triple expansion steam reciprocating engines on the HMAS Castlemaine
Image: Maritime Museum of Victoria

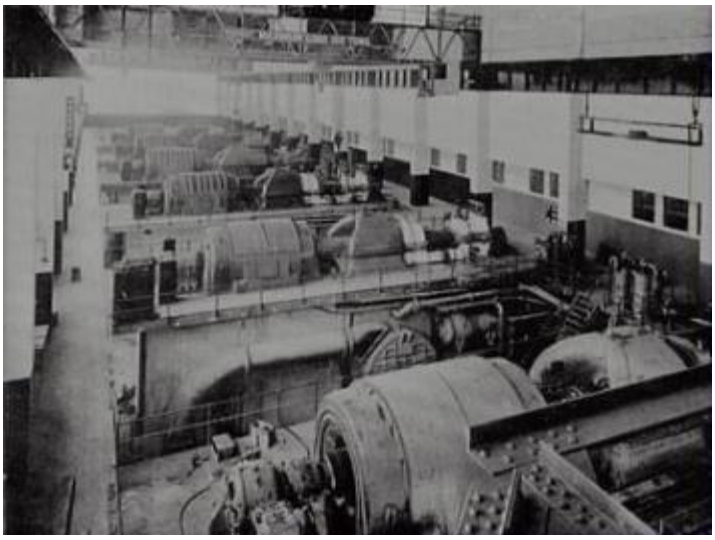
At a later date Thompson's also produced two triple expansion steam engines developing a total of 2000 indicated horse power at 220rpm for the now fully restored HMAS *Castlemaine.* Each engine was connected to a propeller shaft and gave HMAS *Castlemaine* a top speed of 15 knots and an economical cruising speed of 10 knots.

4.7 Steam Turbines

Thompson & Company, Castlemaine, in 1920 commenced the manufacture of steam turbines, condensing and feed heating plants for power stations all over Australia. In 1927, they had under construction six 25,000kW turbines with condensers for Bunnerong power station in New South Wales. They were built to the design of the Metropolitan-Vickers Electrical Company Ltd, England, who supplied the rotating portions of the turbines, Thompsons also supplied the circulating water pumps for the condensers. Thompson's also built 4 of the same turbines for the Yallourn 'B' Station Turbine House (National Trust, 2013). The firm also supplied condensers and water circulating pumps for 125,000kW generating

[16] Some triple expansion steam engines have four cylinders – high pressure, intermediate pressure and two low pressure.

sets at Yallourn. In addition, water turbine casings for the Sugarloaf-Rubicon hydro-electric scheme were built. The manufacture of such items continued until 1979.



Interior view of the Sydney City Council's Bunnerong power station, showing six 30,000 kW turbines, 1931
Image: City of Sydney Archives

Turbine Specifications [17]

Type of turbine	Metropolitan Vickers Impulse turbine with a double-flow low pressure cylinder
Capacity for generation	25,000kW
Generator cooling medium	Air
Speed of turbine	3000rpm
Number of cylinders	2
Stop valve steam temperature	670°F

[17] Courtesy of Engineering Heritage Australia.

Appendix 5: Drawing Office

The Drawing Office played a key role in the design and production cycle at Thompsons with every item ever produced requiring an engineering drawing. Technology and equipment used in the Drawing Office did not change significantly until the Computer Aided Design era. Drawing Office staff had large desks that held the linen or tracing paper for the drawing and used pencil or ink. They also had access to a range of technical publications for reference purposes. The Drawing Office was close to the offices of the departmental heads who worked closely with their design and drawing teams to design solutions to meet their customers' requirements. These were often complex and unique designs, the “one-offs” that Drawing Office staff describe as Thompson’s specialty.

Thompsons Drawing Office
Image: Maldon Vintage Machinery Museum Inc.

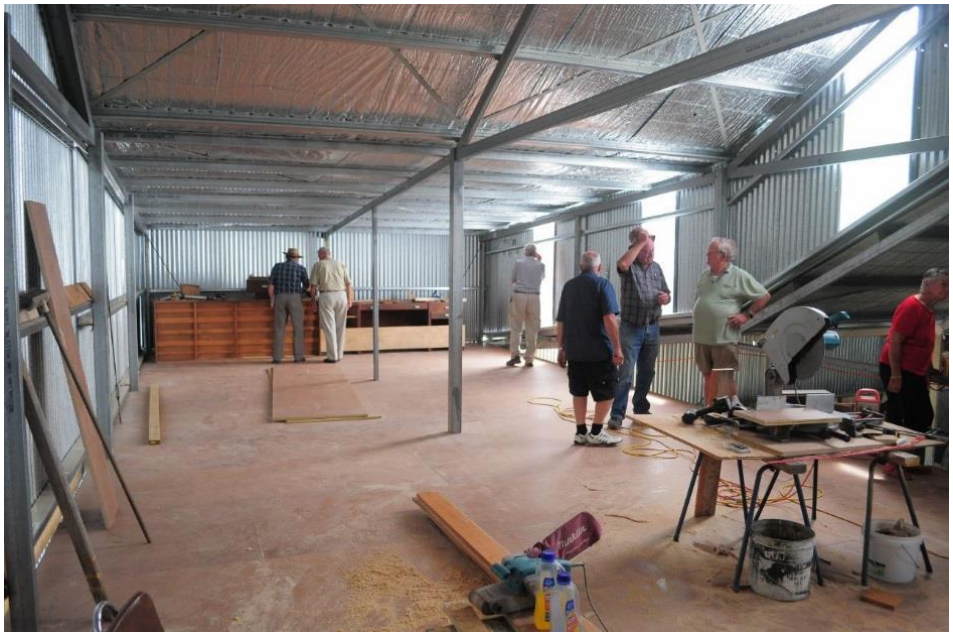
During the mid-twentieth century a typical engineering drawing would proceed as thus:

1. Once the customer's requirements and terms of the contract were finalised, the "order" was assigned to a Drawing Office design engineer or draftsperson. The documentation provided to them included the order number which had been recorded in the order book.
2. The designing engineer or draftsperson would then undertake the calculations required to design the piece being made, record these in their calculation books, and from this data produce a set of drawings using a pencil on tracing paper. They would obtain drawing numbers from the drawing register to record on the drawings.
3. When the drawings were finalised the required number of blueprint copies would be made and sent to the relevant manufacturing workshops.
4. The paper drawings would be copied by "tracers" who worked in the Drawing Office, using ink on linen. The linen version would become the final version and the tracing paper version discarded

5.1 Drawing Office Collection

Each and every drawing produced was filed on site and is representative of the design process utilised by Thompson's. This collection of Thompson's engineering drawings, now preserved by the Maldon Vintage Machinery Museum, is a rare example of a collection of engineering drawings in Australia, comprising of the largest number of individual drawings with a longer time span than other similar collections (1893-1970's). The collection is rare not only for its size but for the breadth of project types undertaken.

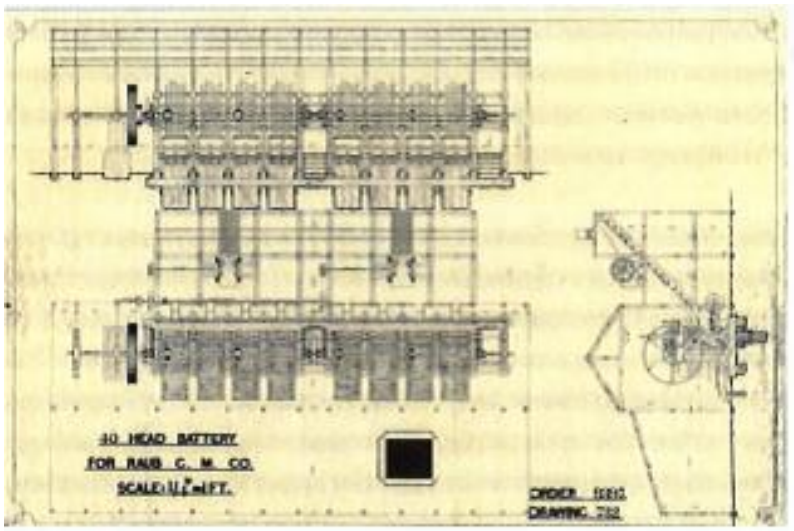
The archive storage container recently installed at the Maldon Vintage Machinery Museum to contain the Thompson Drawing Office Archives.
Image: Owen Peake



The new space built to house a replica of the Thompson Drawing Office at the Maldon Vintage Machinery Museum (December 2014).
Image: Owen Peake

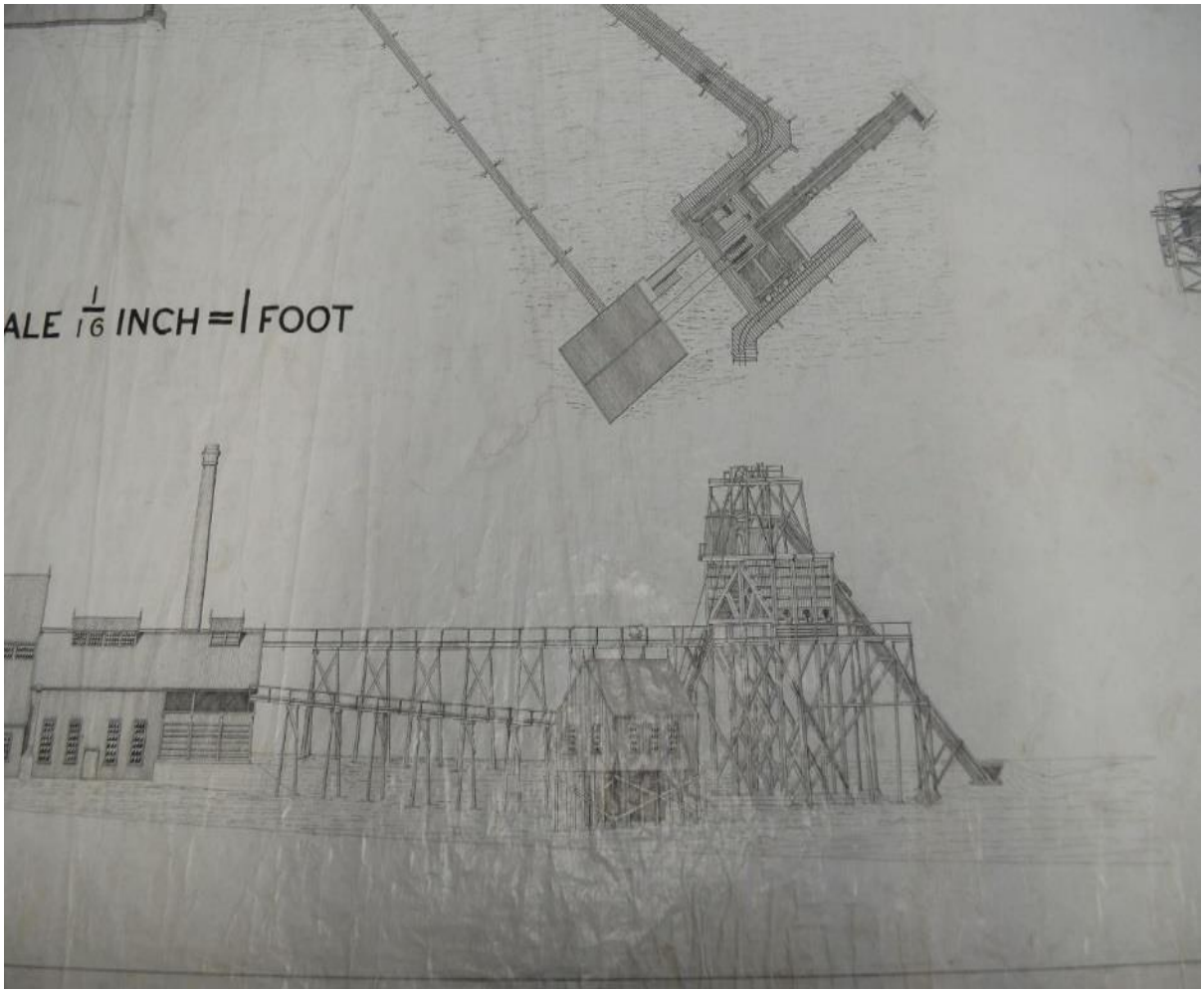
The drawings have outstanding background at the Museum due to the Thompsons Foundry Drawing Office Interest Group. Members of this group being people who created some of the drawings, blueprints and register entries and who because of this direct relationship are able to bring their working and technical knowledge to further enhance the understanding and utilisation of this collection.

The drawings are a mixture of linen-backed tracings and blueprint formats each containing a drawing number and many contain an order number. The sequence of drawings (numbered 23 to 42,771), though interrupted, has a regular distribution within this timeframe and comprises around 42,000 individual drawings of engineering structures, equipment and products designed and/or manufactured by Thompson's.



Example of a Thompsons drawing: #732, 40 Head Battery for Raub Mine, Malaya 1898
Image: Maldon Vintage Machinery Museum Inc.

Due to the powerful visual impact the drawings have strong interpretative capacity and can rapidly convey information about the subject being depicted. This includes; components, date of design, name of the equipment, name of the client and intended location. The drawings also have high interpretative value as a manifestation of a critical stage in the engineering design process; being themselves the result of numerous calculations, and the document then used to create the actual products.



An example of the meticulous line-work found on older Thompson linen drawings. All shading is produced by very fine parallel lines.
Image: Owen Peake

The collection is not only limited to linen tracings and blueprints and also includes:

Drawing Register-
13 volumes in total containing entries for around 60,000 drawings. Each entry includes a drawing number, drawing title, order number, date of registration and size of sheet containing the drawing and its storage location.

Drawing office equipment-
Equipment and furniture used by staff.

Drawing instruments from the Thompson Drawing Office. The Museum collection contains large quantities of such instruments.
Image: Owen Peake

Set of French curves from the Thompson Drawing Office. The Museum collection contains large quantities of such instruments.
Image: Owen Peake

Testing laboratory equipment and records-
Including Programmable calculators and associated hardware, programs written by Thompson's employees for the calculators, test logs and charts.

Photographic records of engineering products and equipment-
Comprising 2,000 Glass Plate negatives from the 1890's through 1930's, Black and White film negatives and some colour photographic prints and colour slides from the 1950's through 1970's.

16mm film-
6 reels in total containing footage of the work undertaken by Thompsons on the Liddell power supply project, Hunter Valley NSW during the late 1960's and early 1970's

Photographic Register-
2 volumes used to register images taken for Thompsons by commercial or staff photographers between the 1890's and 1960's.

Order Books-
53 number volumes in total used to register orders to be designed and manufactured once the contract between Thompsons and the client was in place.

Assortment of other records-
Including correspondence received by Thompsons from the Commonwealth Department of Defence regarding ordinance contracts and equipment during WWII, share certificates, catalogues, certificates awarded from 19th century international and national technology exhibitions, certificate of David Thompson's membership of the Victorian Engineers Society June 1882, company seal, 60 individual etched metal-plates depicting Thompson's buildings, logos and products.

Appendix 6: War Time Production at Thompsons

As soon as Australia decided on an all-in war effort [18] one of the first establishments to be drawn in was Thompsons at Castlemaine. The number of employees rose during the war to 800 at Castlemaine and 200 at the firm's Williamstown works, as compared with pre-war figures of about 550 and 150 respectively. Ordnance production calls for a very large number of forging's principally from alloy steels of the highest quality, needing skill and experience in working, backed by full facilities for mechanical testing of material. Thompson's was one of the only firms in Australia at the time to possess all of these resources in the one location. Due to this the Ministry of Munitions decided to constitute a forge and heat treatment annexe at Castlemaine.

Thompson's were partly responsible for keeping Australia running during the war. They manufactured not only munitions and pieces that saw battle but produced water pumps for irrigation, train and tram tyres, power generation equipment and countless other pieces of machinery that are essential for health, sanitation and wellbeing.

Important Works [19]

Work		Number Produced	Produced For	Description
Low-pressure test chamber		7	RAAF	First fusion welded low-pressure chamber used in Australia for the testing and training of pilots
Morgan-Whyalla water scheme		-	South Australian Government	Water from the Murray River was pumped from Morgan to Whyalla through 223 miles of pipe from 30 in to 21 in diam. The total static head to be overcome is about 1,450 ft.
Train and tram tyres		-	Various Governments	The war cut off Australia's supply to train and tram tyres so

[18] World War II – 1939 – 1945.

[19] Taken from The Commonwealth Engineer, 1945.

			throughout Australia	Thompsons fashioned their own machinery and commenced producing these products.
Rudder post		1	Replacement of rudder and rudder post of US Navy Heavy Cruiser which suffered storm damage in the Great Australian bight.	See Appendix 4
Recuperator		1,150	25 pound guns for Ministry of Munitions	Mechanism which returned the gun barrel to its firing position after recoil.
Barrels, jackets, breech rings and breech blocks		600	25 pound guns for Ministry of Munitions	Main components of the gun were rough machined and supplied to Charles Ruwolt for finishing
Barrels and breech rings		630	6 pound tank-attack guns for Ministry of Munitions	Main components of the gun were supplied rough-machined to General Motors-Holdens Ltd.
Jackets		100	3.7 in. anti-aircraft gun for Ministry of Munitions	Jackets for 25 pound navy guns
Crankshafts, intermediate and tail shafts for 1,000 hp steam engines		34 sets	Mine sweepers for Royal Australian Navy and Royal New Zealand Navy	Mine sweepers were produced in Australia during WWII
Crankshafts, intermediate and tail shafts		10 sets	Corvettes for Royal Australian Navy and Royal	Bathurst class corvettes were a class of general purpose

for 2,700hp engines			New Zealand Navy	vessels produced in Australia during WWII
Gear and thrust shafts		21 sets	9000 and 6000 ton freighters for Australian Shipbuilding Board	A & B class merchant ships produced in Australia during WWII
Turbine rotors		17	9000 and 6000 ton freighters for Australian Shipbuilding Board	A & B class merchant ships produced in Australia during WWII
Propellers		6 x 9’ 58 x 7’	Propellers for the Royal Australian Navy	Manganese bronze propellers 9 ft. 9 in & 7 ft. 6 in. diameter
Crankshafts for 200hp engines		175	Ruston Hornsby engines for Ministry of Munitions	Crude oil engines for landing barges, etc.
Casings and impellers for circulating water pumps		100	Circulating water pumps for RAN and Australian Shipbuilding Board	
Pumps		125 x 9” 39 x 15”	RAN and Australian Shipbuilding Board	9” & 15” Circulating water pumps
Tail shaft liners		44	Royal Australian Navy	Tail shaft liners for freighters
Pumps		35	Country Fire Brigade Board	Pumps for firefighting purposes
Air receivers		600	Crude oil engines for the Royal Australian Navy	24 inch diameter, by 4 ft. 4 in. long, having hemi-spherical ends and

				designed for a working pressure of 350 lb.sq.in.
Turbo alternators		4	Victorian Railways, Brisbane City Electric Light Co, State Electricity Commission, Adelaide Electric Supply	
Triple expansion engines with condensers, shafting and propellers		4 x 2,700 hp 6 x 750 hp 6 x 1000 hp	Royal Australian Navy	Triple expansion engines with accessories and drive line
Salvage pumps		12	US Navy	12 in. pump with vee-belt drive from a Cadillac (as they were driven by a Cadillac engine), the duty being 4,000 gal per min at 40 ft head

Appendix 7: NM class Locomotives Produced by Thompsons [20] [21]

Two NM class locomotives as well as several Dd class locomotives and many relics of the Thompsons remain by which we can judge the quality of the production.

NM 15	
15.6.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.41.
8.1956	Written off.
12.1957	Derelict, Quorn.
NM 16	
22.6.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.42.
5.1954	Written off.
NM 17	
20.7.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.43.
9.1955	Written off.
6.1958	Recorded as Serviceable.
1964	Reported derelict.
NM 18	
1.8.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.44.
6.1958	Serviceable.
1964	Derelict.
NM 19	
7.9.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.45.
1.1955	Written off.
12.1957	Derelict, Quorn.
NM 20	
28.9.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.46.

[20] Courtesy of Chris's Commonwealth Railways Pages.

[21] The NM class locomotives were 3 feet 6 inches (1067 mm) gauge.

12.1957	Serviceable.
NM 21	
12.10.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.47.
6.1958	Serviceable on standby.
NM 22	
31.10.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.48.
10.1956	Withdrawn.
22.10.1958	Scrapped.
NM 23	
16.11.1925.	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.49.
1.1954	Written off.
12.1957	Derelict, Quorn.
NM 24	
30.11.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.50.
11.5.1944	Involved in Puttapa accident.
11.1955	Written off.
22.10.1958	Scrapped.
NM 25	
14.12.1925	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.51.
29.3.1964	Last mainline use.
-	To Homestead park Port Augusta.
1991	To Pichi Richi Railway at Quorn.
NM 26	
4.1.1926	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.52.
6.1958	Serviceable, standby.
NM 27	
21.1.1926	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.53.
9.1955	Written off.
12.1957	Derelict, Quorn.
NM 28	
6.3.1926	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.54.

8.1956	Written off.
22.10.1958	Scrapped.
NM 31	
28.4.1927	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.55.
12.1957	Serviceable.
NM 32	
27.5.1927	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.56.
6.1955	Written off.
12.1957	Derelict, Quorn.
NM 33	
13.6.1927	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.57.
12.1954	Written off.
12.1957	Derelict, Quorn.
NM 34	
2.7.1927	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.58.
8.10.1967	Last run through Pichi Richi Pass.
30.10.1967	To Mile End Railway Museum.
1988	To Port Dock Station Railway Museum.
NM 35	
6.1927	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.59.
1964	Derelict.
NM 36	
7.1927	Entered service Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.60.
6.1956	Written off.
1964	Derelict.
NM 37	
1927	Entered service on the Central Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.61.
10.1954	Written off.
22.10.1958	Scrapped.
NM 38	

12.1927	Entered service on the North Australia Railway. Built by "Thompson and Co", Castlemaine, Victoria, builder No.62. It was too heavy for general traffic work on the North Australia Railway line and had only been sent for use during the construction of the Katherine to Birdum extension.
1929	Following completion of construction the engine was stored awaiting approval for the extension of the North Australia Railway to continue.
1930	Following a decision not to continue with the line extension, the Commissioner wrote to the Queensland Railways asking if they were interested in exchanging "NM 38" for two "B15" class engines, rather than returning the engine to the Central Australia Railway. If appears that despite the Queensland Railways not taking up the offer the engine remained on the North Australia Railway and is thought to have been used a couple of times after being stored when no other locomotives were available.
30.9.1941	Left North Australia Railway for Central Australia Railway.
7.1949	Converted to oil burner.
6.1956	Written off.
1957	Derelict.

Appendix 8 National Comparison [22]

Large Engineering Works in Australia during the period of operation of Thompsons of Castlemaine (1875 to 2005)

This appendix has been prepared to compare Thompsons with other comparable engineering companies in Australia.

In preparing this list the following general characteristics were sought:

- Companies starting up at the end of the Gold rushes (1860s) or a little later.
- Companies with a substantially long life i.e. well into the twentieth century [Changes of name and ownership are not considered important in this context – rather continuation of the core business the company had pursued previously].
- Companies in the heavy engineering manufacturing business with an emphasis on railway equipment.
- Companies which demonstrated flexibility to change product lines and to try new sectors as times changed.

Size is not everything. Some of these companies were larger than Thompsons. On the other hand some of the companies depended on imported technology more than Thompsons did and therefore did not have the same degree of drawing office skills which Thompsons did have.

Almost all these companies formed alliances. They obtained licences from overseas companies either to give them access to intellectual property or to import key components. They formed alliances with other local companies to plug gaps in their manufacturing capabilities and in some cases they purchased these companies in order to reinforce their capabilities.

Generally companies with a single type of product line have been excluded. For instance there were some large companies such as T J Richards in

[22] Appendix prepared by Owen Peake, March 2015.

Adelaide who were involved almost exclusively in the automotive manufacturing industry.

It should be noted that some of the companies listed were eventually taken over by the same group in more recent times. Clearly some groups, such as Downer, went out collecting ‘trophies’ as they expanded their influence.

Companies owned by governments have not been included in this comparison. Such operations as state railway workshops, Commonwealth Aircraft Corporation (CAC), Government Aircraft Factories GAF), Commonwealth Engineering (Comeng) and the ordnance factories all come into this category.

The entries below are sorted according to alphabetical order of earlier company names to avoid any suggestion of similarity with Thompsons.

AUSTRAL OTIS [23]

Austral Otis was a Melbourne engineering works established in 1887, on the site of former Langlands Foundry in Grant Street South Melbourne. It was one of the largest manufacturers of elevators in Australia, and continued as the Otis Elevator Company.

The company was initially formed in 1878 as Hughes, Pye & Rigby manufacturing mining plant, steam engines, elevators, wool & other hydraulic presses. It was incorporated as a public company in 1887 as The Austral Otis Engineering and Elevator Company Limited and in October 1893 changed its name to The Austral Otis Engineering Co Ltd. The company epitomised the boom era. It was founded with just £600 in capital, but by the end of the 1880s it employed 300 workers, producing pumping engines, mining machinery, hydraulic lifts and huge steam engines for the city's cable trams and first electric power stations.

Austral Otis tendered to the Victorian Government to produce two steam traction engines after starting up in 1880 as a general engineering business, and in the late 1880s it set up a well-equipped works for heavy engineering, which covered about four acres. It had important agencies for machinery

[23] Extracted from Wikipedia, Austral Otis, updated 14 April 2014.

including Worthington Pumps and the Otis Bros & Co elevators. The company undertook many major contracts, for mining and other machinery equipment and it was awarded prizes for its steam engines and hoisting equipment at the Centennial Exhibition in 1888, in Melbourne.

Herbert Robinson Brookes (1867–1963), came to Melbourne to improve the management of Austral Otis. He was highly successful and by 1912 was a director of the firm.

With the development of multi-storeyed iron and steel framed buildings during the skyscraper boom in the 1880s, there was created a demand for fast and reliable passenger lifts such as those of the Otis Elevator Company in the US

and Waygood of Britain. With these came the establishment in 1889 of a reticulated hydraulic power system, one of very few in the world at that time. Austral Otis had a substantial part of this market.

The company also made steam engines for the Melbourne cable tram system, for gold mines and sluicing plant, and the Ballarat Woollen Mills. The Melbourne City Building was originally served internally by an early Otis hydraulic lift while the 1932 Manchester Unity Building has a rare surviving original Otis-Waygood escalator between the ground floor lobby and mezzanine. This was the first building in Victoria to have escalators installed. The building also had high speed Otis lifts serving the higher floors.

About 1896 the Melbourne and Metropolitan Board of Works (MMBW) was building a large sewage pumping station at Spotswood. There was a requirement for large triple expansion steam engines. The MMBW wanted Hathorn Davey engines built in the UK. The government wanted locally built engines and Thompsons of Castlemaine were successful at getting the initial order for four engines. The Thompson engines (based on a Worthington design) were not as efficient as the single Hathorn Davey engine. Austral Otis also built one engine for the No. 6 pumping well in 1901.

When the MMBW required additional pumping engines in 1909, Austral Otis was asked to prepare plans for four new engines. These were based largely on the successful Hathorn Davey design and Austral Otis was able to demonstrate its substantial expertise in steam engineering. The first two new Austral Otis engines were commissioned in June and July 1911, followed by the remaining two in mid-1914. These four engines were every bit as good as the Hathorn Davey engine and had a long and reliable life. These four engines (and the Hathorn Davey engine) have been preserved in the pump house which is now part of Museum Victoria's Scienceworks.

Austral Otis built many other engineering products. However it is best known for its steam engines and its elevators.

The Food Machinery & Chemical Corporation acquired a controlling interest in the business in 1948 and Austral Otis became a subsidiary of the American company. Its name was changed in 1952 to Food Machinery (Australia) Ltd. The Austral Otis name then ceased to exist.

CLYDE ENGINEERING, SYDNEY

Clyde started operation in 1898 when a syndicate purchased the premises of timber merchants Hudson Brothers at Granville. The company won contracts for railway rolling stock, sewerage systems, agricultural machinery and trams. In 1907 the company won a contract for steam locomotives from the NSW Government Railways. By 1923 there were 2200 employees.

During World War Two the emphasis changed to the manufacture of munitions and equipment for the forces.

In 1950 the company won its first contract for diesel locomotives from the Commonwealth Railways. The company had a licence to manufacture Electro-Motive Diesel (EMD) products from United States.

By 1950 Clyde Engineering had become the largest engineering enterprise in NSW.

In the post-war period the company diversified greatly into such areas as industrial electronics, telephone equipment, aluminium fabrication, earth moving machinery, powers station equipment, boilers amongst other products.

Clyde Engineering was taken over by Evans Deakin in 1996 and Evans Deakin became part of the Downer EDI in 2001.

They remain the Australian licensee for EMD and have manufactured or imported large numbers of EMD locomotives for various Australian railway operators. EMD accounts for about a third of world diesel-electric locomotive manufacture.

JAMES MARTIN & Co, GAWLER, SA [24]

James Martin & Co was an Australian engineering company which progressed from making agricultural equipment to making railway locomotives.

James Martin & Co was founded in Gawler, South Australia in around 1848 by James Martin. By the late 1870s it employed over 200 workers on an 8 acre (3 ha) site. The company operated a large foundry, and an extensive range of workshops. James Martin's production included agricultural machinery, steam engines, iron bridges and mining machinery. In the late 1870s the works were the second largest engineering establishment in the colony of South Australia, second only to the Government's railway workshop.

By 1898, the company had built 170 locomotives for several customers.

The company went bankrupt and was handed over to a liquidator in the early 20th century. James Martin's site and machinery were sold by the liquidator in December 1907. The purchaser, Henry Dutton, kept the firm's name but decided not to continue the agricultural side of the business. The Government assisted the new owner with a large order for new locomotives. The agricultural machinery production works was purchased in January 1908 with the intention of resuming operations. In 1915 Perry Engineering purchased the business from Dutton's estate and most of the major contract work then went to Mile End.

PHOENIX FOUNDRY [25]

The Phoenix Foundry was a very significant manufacturing business during its 50 years of operation. It was one of reputedly 40 foundries in Ballarat during the heyday of manufacturing in Victoria in the 1880s. It was a larger business although there were other large foundries in the city including the nearly Union Foundry which is known to have produced a number of very large Cornish

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[24] Wikipedia, James Martin & Co, updated 14 Feb 2015

[25] Extracts taken from the Nomination for Engineering Heritage Recognition, Owen Peake & Mike Caldwell, Engineers Australia web site, August 2013.

pumping engines including a Cornish Bull engine supplied to a New Zealand mine.

The company was founded in 1856 by Richard Carter, Robert Holden, George Threlfell and William Henry Shaw (manager) and commenced operations in 1857. The company concentrated on building products for the mining industry in the period 1857 to 1871 and thereafter concentrated on the construction of railway locomotives.

In 1861 there were 96 hands employed. In 1869 there was a serious fire on the premises. In 1870 the company became a limited liability company. At that time Shaw was the manager.

In 1871 the company won a contract for 10 locomotives from the Victorian Government. “The standard of work was so satisfactory that further contracts were given”.[26] On 4 March 1873 the first locomotive was completed.[27]

In 1881 the company made moves to relocate to a larger site but several applications to the Council were rebuffed.[28] By 1882 they had made the decision to remain on the present site and to rebuild. Furthermore “from 1882 the company stopped taking on other work to concentrate only on locomotive construction”.[29]

New workshops and stores were built at this time:

- Materials and Pattern Store - 2 storey building 80 feet by 22 feet.
- Boiler Makers and Tender Shop - 137 feet by 26 feet.
- Pattern Makers Shop - 137 feet by 26 feet.
- Blacksmiths Shop - 94 feet by 83 feet.

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[26] The Argus, Melbourne Victoria, 21 July 1871, page 6.

[27] William Bramwell Withers, The History of Ballarat from the First Pastoral Settlement to the Present Time, F W Niven & Co, Ballarat, 1887, page 293.

[28] Robert Butrims and David Macartney, The Phoenix Foundry, Australian Railway Historical Society Victorian Division Inc, 2013, page 66.

[29] Robert Butrims and David Macartney, The Phoenix Foundry, Australian Railway Historical Society Victorian Division Inc, 2013, page 66-67.

- Fitting Shop - 332 feet by 38 feet. This shop ran right through the site from Armstrong Street to Doveton Street.[30]

'The completion of the 100th locomotive [by the Phoenix Foundry] was celebrated on the 13th April, 1883, when there were still greater rejoicings. Mr. Service (the Premier), other Ministers, and Parliamentary representatives were present, and the locomotive was decked with flags, and boughs, and flowers. Speeches, cheers, pealing of bells, banquets, a whole city keeping holiday, and the Tubal Cains of the great locomotive workshop of Victoria as the applauded heroes of the day, made up a series of sensations, long to be remembered'.[31]

The Phoenix Foundry became by 1887 'the largest locomotive factory in Victoria, securing against all competition the making of nearly the whole of the colonially manufactured engines. The company delivered the first locomotive to the Government on the 4th March, 1873, the next day's Courier saying:— "At five o'clock to the minute yesterday morning, locomotive No. 88 left the Phoenix Company's works, in Armstrong Street, on the steam lorry specially made for the conveyance of the engines and tenders to the railway station." By the 2nd April the engine had completed its 1000 miles test, and the feat was celebrated by bringing up a special train of Cabinet Ministers and others from Melbourne, by flags all over the city, by pealing of the Alfred Bells, and by a banquet in the city hall'.[32]

Despite the downturn in economic activity during the 1890s it was reported in 1902 that "In the promise of a new century saw 250 men employed in 1902".[33]

In 1904 there was a bitter standoff between the Victorian government and Phoenix Foundry. The Government had apparently decided to give all locomotive work to the Victorian Railways Newport Workshops and conducted a smear campaign against Phoenix foundry to cover its tracks. In October

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[30] Robert Butrims and David Macartney, The Phoenix Foundry, Australian Railway Historical Society Victorian Division Inc, 2013, page 66.

[31] William Bramwell Withers. *The History of Ballarat from the First Pastoral Settlement to the Present Time*. Ballarat: F. W. Niven and Co., 1887, page 293. [University of Ballarat, Mt Helen Library].

[32] William Bramwell Withers. *The History of Ballarat from the First Pastoral Settlement to the Present Time*. Ballarat: F. W. Niven and Co., 1887, pages 292—293. [University of Ballarat, Mt Helen Library].

[33] Bates, Weston, Lucky City: The First Generation at Ballarat 1851-1901, Melbourne University Press, 1978, page 215.

1904 there was a Royal Commission into the matter which accused Phoenix of “profiteering” although no evidence was ever produced.

In 1905 the directors entered voluntary liquidation. The Phoenix Foundry closed in 1906 due to the centralising policy of the Victorian Government.

The Phoenix Foundry manufactured a total of 361 locomotives of which 352 were for the Victorian Railways.[34]

“If the Phoenix directors had had a crystal ball, they would quite likely have gone to some lengths to keep the company going. The changes to railway motive power in the first decade of the twentieth century were so great that they rivalled the impact of dieselisation half a century later, as a result, locomotives were to be produced in great numbers.[35]

Two things happened during the first decade of the twentieth century. Firstly there was further rapid development of the Victorian Railways network. Secondly there was a realisation within the Victorian Railways that they had been following outmoded designs from British sources and that there were better ways to build locomotives which involved much less maintenance effort. British locomotive designers had predominantly followed the locomotive design model of placing cylinders and valve gear inside the frames of the locomotive. This made these high maintenance parts of the locomotives hard to access for maintenance.

American designers moved to cylinders and valve gear outside the frames where the motion work was much more accessible for maintenance. Locomotives bought by Victorian Railways from the USA around the turn of the century provided models for a rethink of locomotive design in Victorian Railways and led to accelerated retirement of older styles of locomotives.

Having driven Phoenix Foundry out of business Victorian Railways were in desperate need of new locomotives. Initially this demand was met by Newport Workshops who reached one locomotive produced per week around 1913 and 1914.[36]

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[34] The source of this quote to be investigated further.

[35] Robert Butrims and David Macartney, The Phoenix Foundry, Australian Railway Historical Society Victorian Division Inc, 2013, page 140.

[36] Robert Butrims and David Macartney, The Phoenix Foundry, Australian Railway Historical Society Victorian Division Inc, 2013, page 143.

Locomotives were purchased from overseas and contracts were let to other contractors including Thompsons of Castlemaine and Walkers of Maryborough, Queensland. [37]

P N RUSSELL & Co, Sydney

Peter Nicol Russell established an engineering business in Sydney in 1855.

P N Russell & Co purchased a large area of land in the Sydney CBD facing Darling Harbour in 1859. P N Russell & Co redeveloped and established a large foundry and engineering works on the site. P N Russell & Co had two other foundries in the city; the Sydney Foundry on George Street and the Sussex Street Engine Works. Both these businesses were moved to the new Darling Harbour site. A number of small buildings around the yard, a large workshop and modelling shed along the northern boundary, and another large workshop on the Barker Street frontage were constructed by the early 1860s. In the early 1860s, the company also purchased land on the other side of Barker Street and the associated wharf owned by J L Travers. In the late 1860s, a large railway carriage factory and boiler house building was built on the site.

The business employed up to 1000 people.

The business closed due to management inability to negotiate to resolve industrial action in 1875.

[37] Robert Butrims and David Macartney, The Phoenix Foundry, Australian Railway Historical Society Victorian Division Inc, 2013, pages 141, 143.

CHARLES RUWOLT PTY LTD (LATER VICKERS RUWOLT PTY LTD) [38]

Charles Ernest Ruwolt (1873-1946), engineer and industrialist, was born on 19 March 1873 at Mieckenhagen, Mecklenburg-Schwerin, Germany, son of Ernst Johann Christian Ruwoldt, farmer, and his wife Maria Catharina. The family migrated in 1878 and took up wheat-farming at Mount Gambier, South Australia. Charles was educated at Yahl Paddock and Mount Gambier Public schools. During his apprenticeship in 1886-90 with James Martin & Co, a machinery manufacturer at Gawler, he attended the State technical school. For the next decade Ruwolt worked with various Victorian foundries and engineering manufacturers, including James Alston & Co., Warrnambool, the Phoenix Foundry, Ballarat, Austral Otis, South Melbourne, and Thompsons, Castlemaine.

In 1902 he opened his own iron foundry listed at Parfitt Road, Wangaratta, making windmills (1903–1911) and carrying out agricultural machinery repairs. In 1908 the company merged with Isaac Stevenson of New Zealand and became a leading manufacturer of gold mining dredges, used throughout Australia and exported to the Malay States, Siam (Thailand), the Philippines, South Africa and New Guinea.

In 1912 he started an engineering and steel foundry business in Richmond, Melbourne. The company moved into mining machinery, spares and industrial products.

By 1938 it was one of the largest engineering companies in Australia, occupying 20 acres (8 ha) and employing 600-700 workers. Its steel foundry was one of the largest and best-equipped in the country and it manufactured the most important machinery in Australia, which Ruwolt, a tall, earnest man of heavy physique, promoted personally.

With the advent of World War Two the firm was deployed to manufacture field artillery and Mr Ruwolt held a senior position in the wartime administrator of home-front resources.

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[38] Richard Thomas Wightman, D. M. Whittaker, Wangaratta (1963); Institute of Engineers, Australia, Journal, 6, No 10, Oct 1934; G. D. Hayes, Charles Ruwolt, a History to 1927 (M.Eng.Sc. thesis, University of Melbourne, 1981).

Many 25-pounder guns and other items were produced at his Richmond works. The works was a 24-hour operation at the height of wartime production.

Ruwolt died on the 4th November 1946 and by 1948 Vickers Limited (UK) had purchased Ruwolt and became Vickers Ruwolt Pty Limited.

Cockatoo Docks & Engineering Co. Pty Limited in Sydney Harbour was also part of this public company, but the assets were held by the Federal Government with Vickers Holding Pty Limited having management rights.

In 1985 it was decided to close the Ruwolt facility and move the heavy fabrication, machine and fitting factories to Karrabin, Brisbane. On the 1 January 1986, ANI took over Comsteel Vickers calling it ANI Ruwolt. The move to Karrabin was completed in June, with the Bradken Division assuming management responsibility of the works.

ANI Ruwolt continued to operate under this name until 1995, at which time it was merged into ANI Engineering as part of a major overhaul of ANI's manufacturing business. The active use of the Ruwolt name ceased at this time. The Karrabin works is today a principle manufacturing facility for the Bradken Group and currently employs 550 people.

WALKERS OF MARYBOROUGH, QUEENSLAND

The company was set up by John Walker and three friends as the Union Foundry in Ballarat, Victoria in 1863. In 1867 a branch was set up in Maryborough, Queensland which soon became the headquarters for the company.

The company was re-organised and re-named as Walkers Limited in 1888. It had a major interest in supplying machinery for sugar mills at that time.

The company was taken over by Evans Deakin in 1980 and by Downer Group in 2001 and continues to operate as part of Downer Rail.

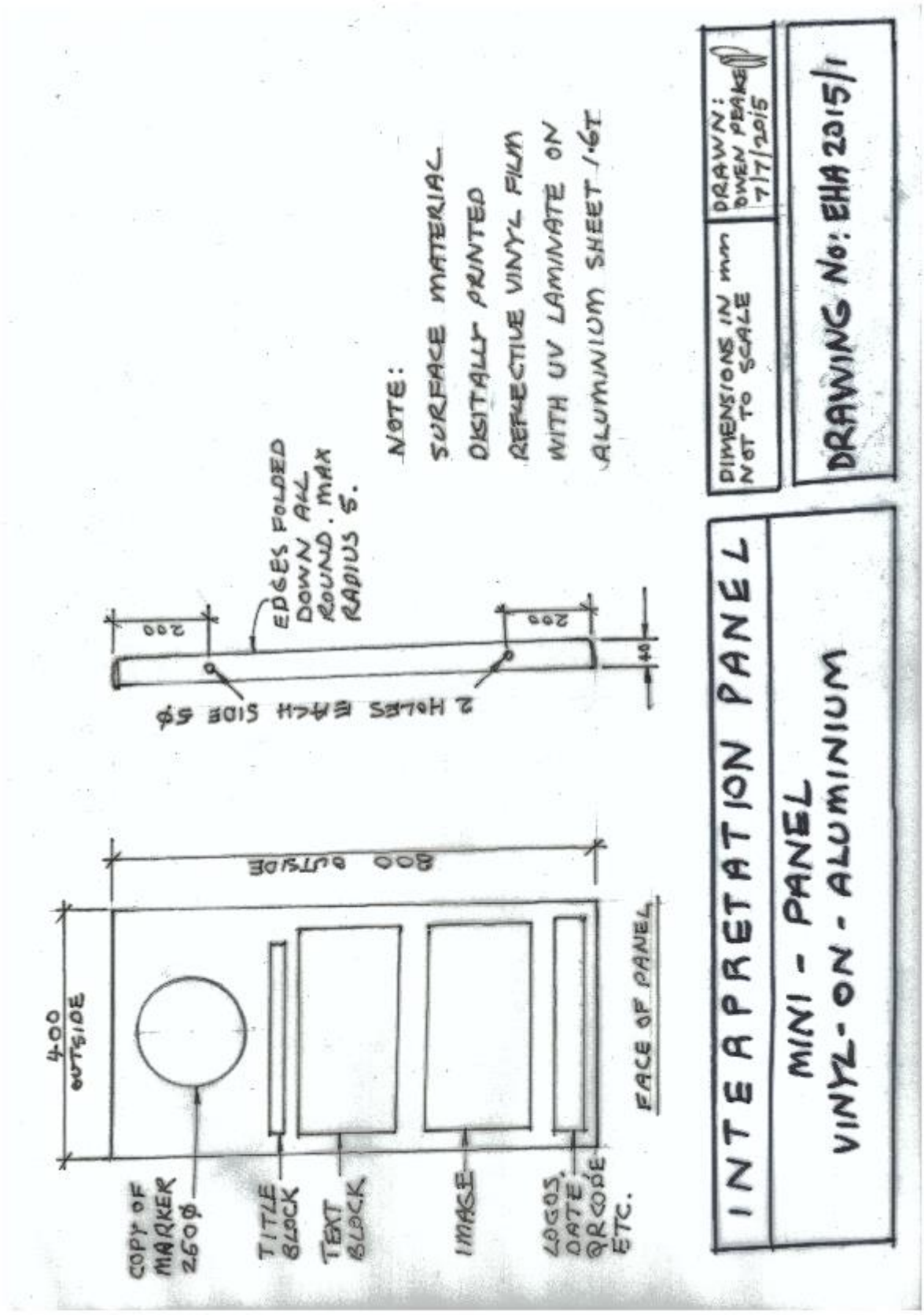
The company built ships for the Royal Australian Navy during World War II including the two River class frigates HMAS *Diamantina* and HMAS *Burdekin.* Diamantina has been preserved at the South Brisbane Queensland Maritime Museum. She is the largest remaining Australian military relic of World War Two. Thirty four ships were built during this period. The company also built the powerful steam engines to drive many of these ships.

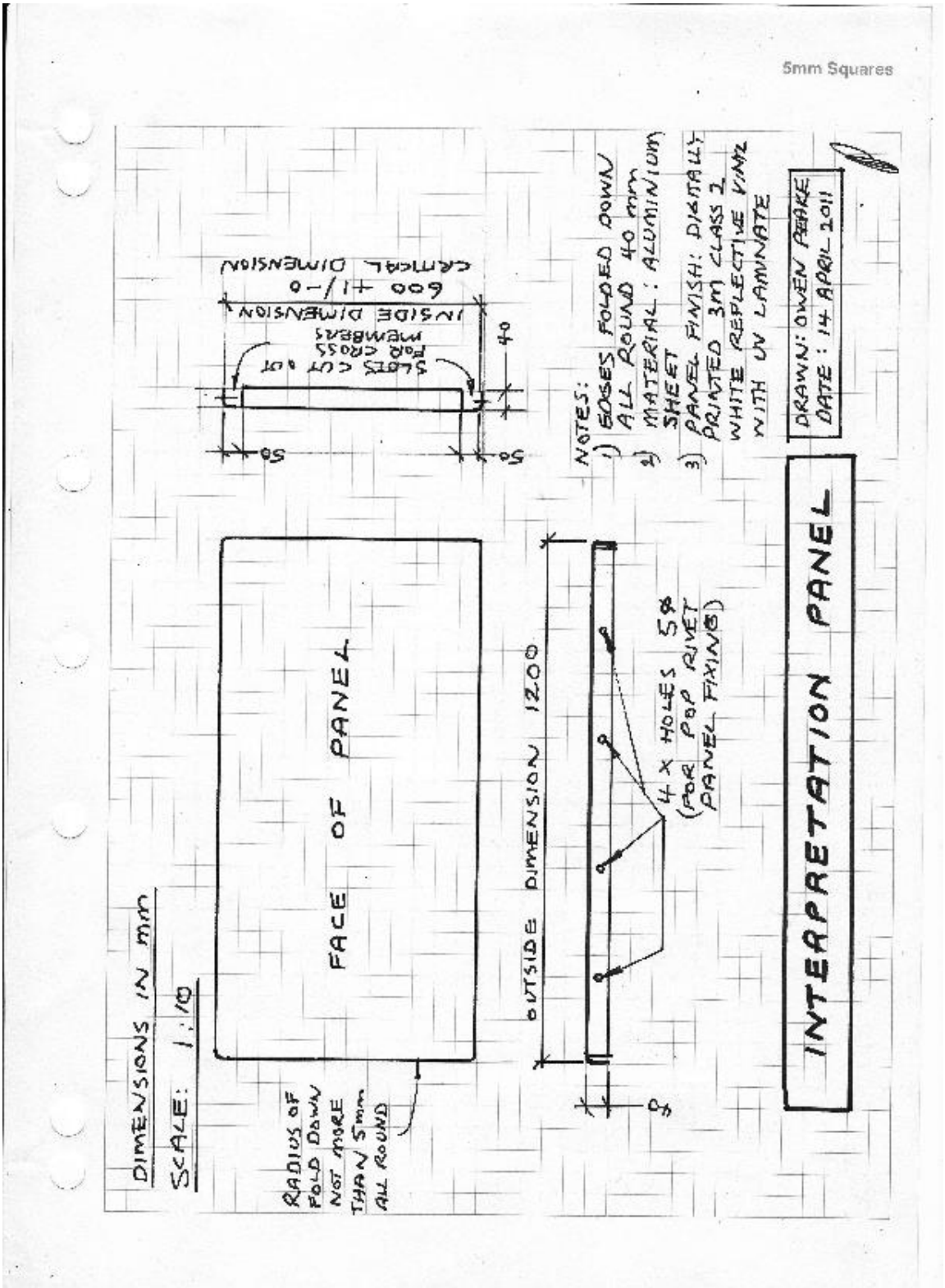
Locomotive manufacture has also been quite large in the past with 556 steam locomotives being built for most of the major state railway operators in Australia and a few diesel-electric locomotives.

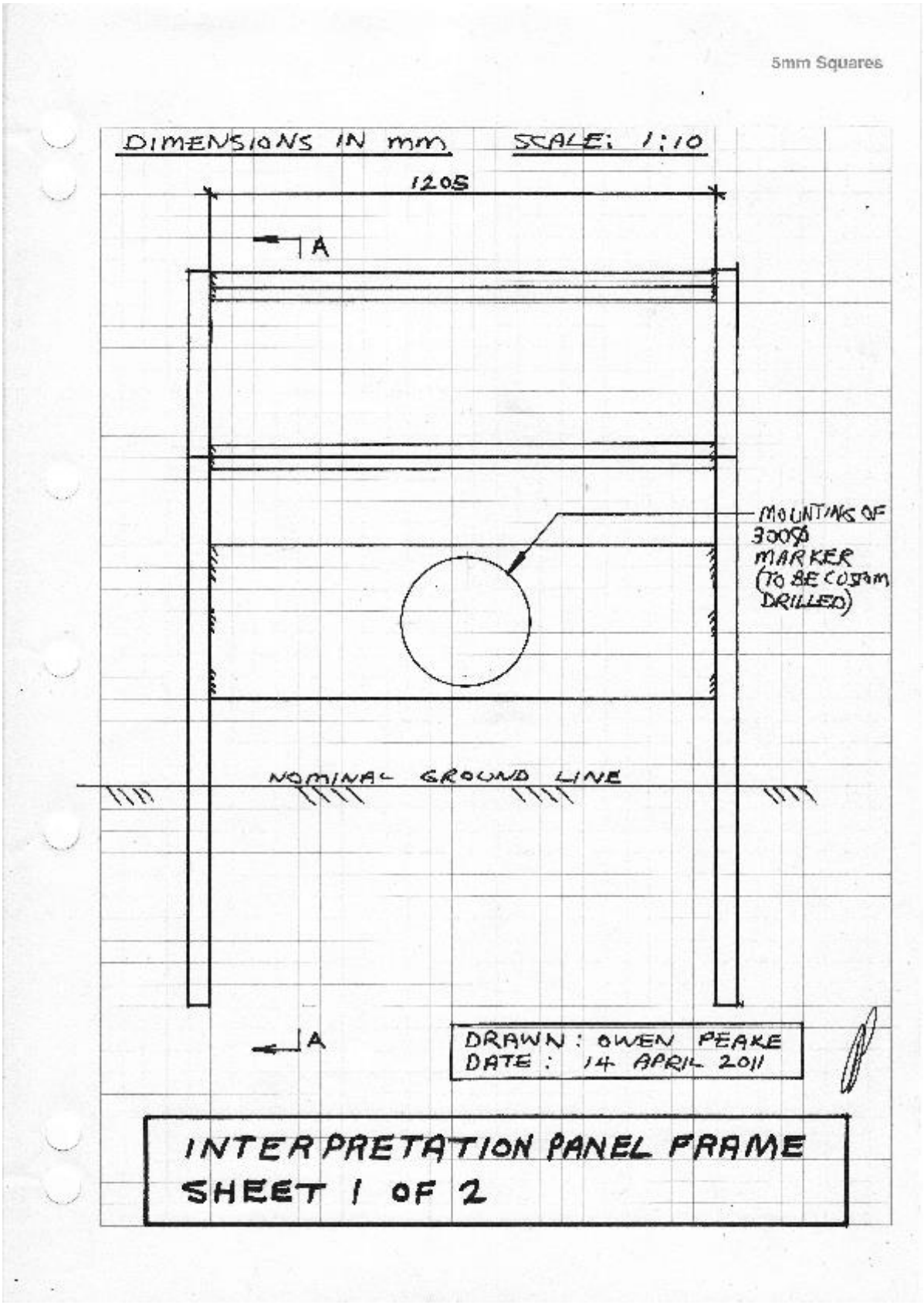
In more recent times they have specialised in electric unit train manufacture. Queensland, uniquely amongst Australian state train operators, has electrified most of its rural train network and Walkers have manufactured 452 unit train carriages for Queensland Rail. Unit train carriages have also been manufactured for Malaysia (90 units) and Western Australia (96 units). Walkers also manufactured 12 tilt train carriages for Queensland Rail.

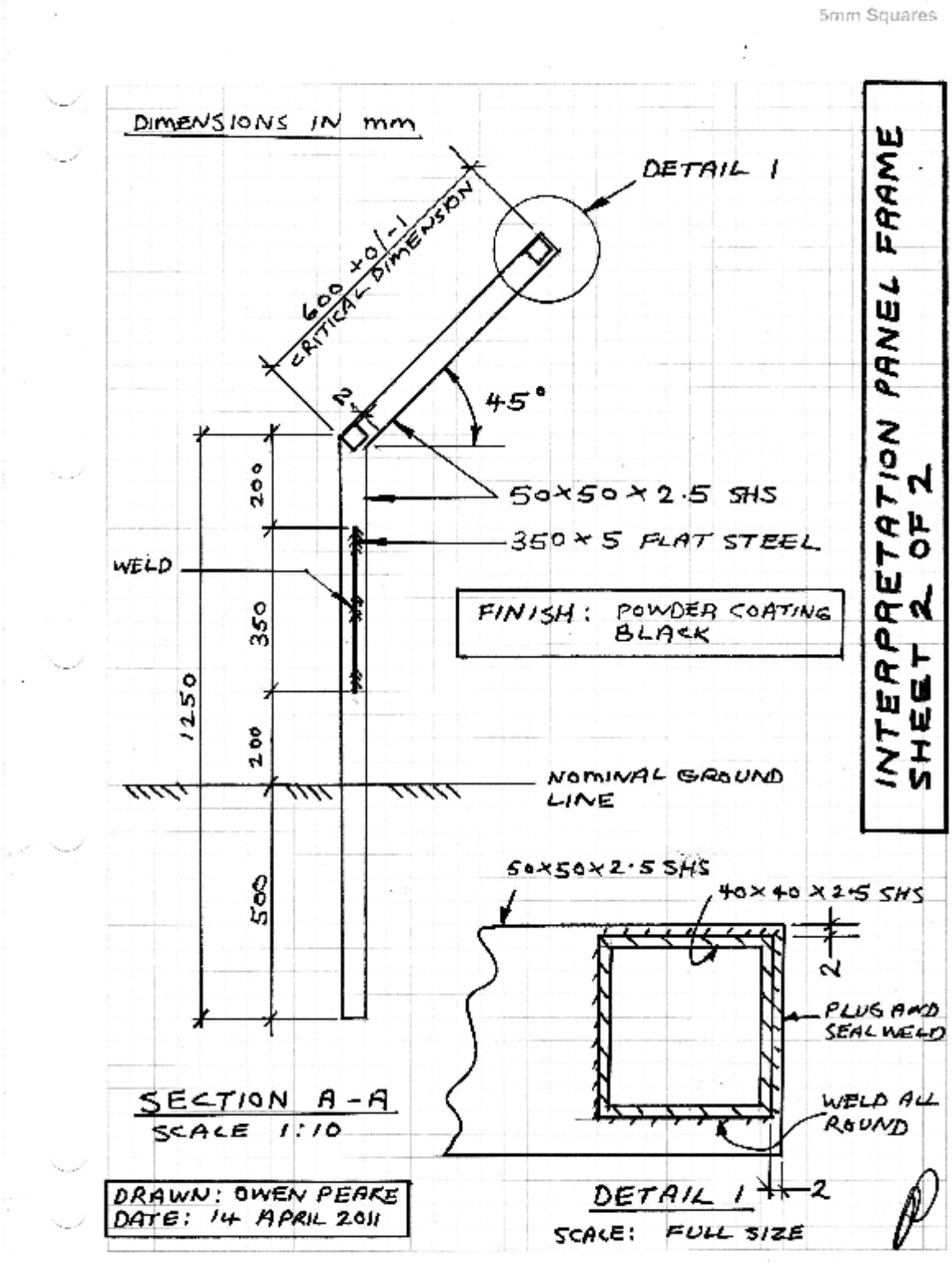
.Walkers mill engines to drive sugar mill crushing plant were made in large numbers. These powerful engines proved to be reliable and long–lived and several are still in service in sugar mills although the industry has largely changed over to steam turbine driven crushers.

Appendix 9: Interpretation Panel & Mounting Frame Drawings




5mm Squares
INTERPRETATION PANEL
DRAWN: OWEN PEARCE
DATE : 14 APRIL 2011
NOTES:
1) EDGES FOLDED DOWN ALL ROUND 40 mm
2) MATERIAL : ALUMINIUM SHEET
3) PANEL FINISH: DIGITALLY PRINTED 3M CLASS 2 WHITE REFLECTIVE VINYL WITH UV LAMINATE
4 X HOLES 5ø (FOR POP RIVET PANEL FIXING)
OUTSIDE DIMENSION 1200
FACE OF PANEL
RADIUS OF FOLD DOWN NOT MORE THAN 5mm ALL ROUND
DIMENSIONS IN mm
SCALE: 1:10
INSIDE DIMENSION 600 +1/-0
CRITICAL DIMENSION
4 SLOTS CUT OUT FOR CROSS MEMBERS
40
50
50


5mm Squares
DIMENSIONS IN mm
SCALE: 1:10
1205
A
MOUNTING OF
300Ø
MARKER
(TO BE CUSTOM
DRILLED)
NOMINAL GROUND LINE
A
DRAWN: OWEN PEAKE
DATE: 14 APRIL 2011
INTERPRETATION PANEL FRAME
SHEET 1 OF 2



CHANGE CONTROL

VERSION 1	30 JANUARY 2015	11544 WORDS	FIRST DRAFT
VERSION 2	2 FEBRUARY 2015	11593 WORDS	TRACK CHANGES BY OP ON VERSION 1
VERSION 3	15 MARCH 2015	12422 WORDS	BRENT'S SECOND DRAFT WITHOUT TRACK CHANGES
VERSION 4	17 MARCH 2015	16051 WORDS	ADDED APPENDIX 8, NATIONAL COMPARISON
VERSION 5	5 APRIL 2015	16162 WORDS	MINOR EDITING OP
VERSION 6	18 APRIL 2015	16284 WORDS	MINOR EDITING OP
VERSION 7	25 JUNE 2015	16284 WORDS	ADDED LOCATION MAP; ADDED GAUGE CLARIFICATION FOR NM CLASS LOCOMOTIVES; IMPROVED RESOLUTION OF P36 (THOMPSONS WORKS PLAN)
VERSION 8	25 JULY 2015	16511 WORDS	UPDATE OF INTERPRETATION PLAN
VERSION 9	28 AUGUST 2015	16529 WORDS	UPDATED APPENDIX 4 CLAUSE 4.4 WRT USS HOLLAND AS THE SHIP WHICH HAD LOST ITS RUDDER.

Items still to be resolved:

1) **Letter of approval from Maldon Vintage Machinery Museum page**
2) **Resolve details of second ceremony at Flowserve page 23**
3) **Panel text blocks for panel at Flowserve page 24**