

Chilean steam locomotive list

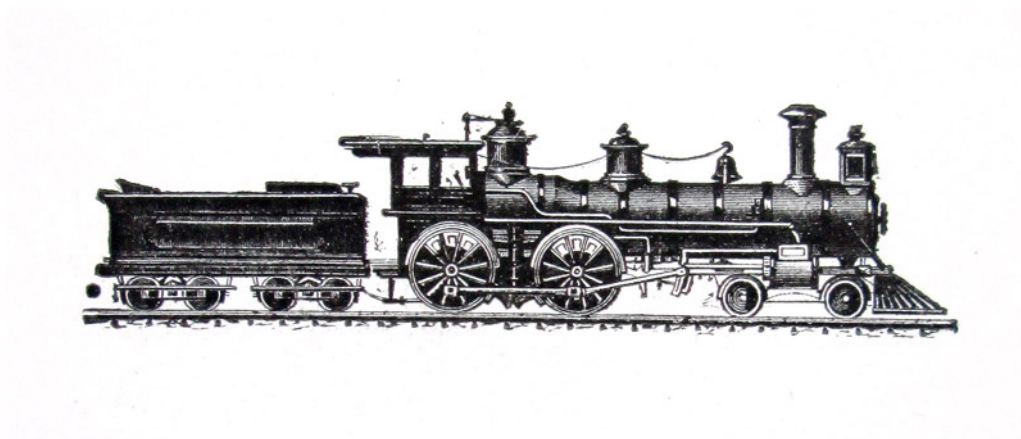
Part 2

Standard, 4' 6", 4' 2" and 3' 6" gauge locos

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v2.63 December 2025

This file can be found, along with the other four parts in the Chilean series and files for a number of other South American countries, at <http://www.railwaysofthefarsouth.co.uk/05x03chileansteamlocos.html>



These lists, though benefitting from modern technology in both research and presentation, build upon those produced by many other investigators, from Wilfred Beckerlegge and Paul Dewhurst in the 1920s to John Kirchner and Allen Copeland eighty or ninety years later. As such, their content will, I hope, be helpful for researchers and authors in the future. Feel free to use this material, though an acknowledgement would be appreciated.

General introduction

These lists grew from the publication of the book *Railways at the End of the World* (The Araucaria Press, Casterton, Cumbria, UK ISBN 978-0-9928622-0-6), back in 2014. During the research undertaken when gathering information for that volume, it had sometimes been frustrating when locomotives in southern Chile could not be easily identified. Once the book had been published there was more time available, and it gradually became obvious that a list of the engines of the Chilean state railways (*EFE*) would have to cover the whole country to be of any use, and thus it expanded all the way up to Arica. Then, during the Covid pandemic, the first moves were made to extend these lists to some of the other smaller South American countries.

The foundations were built upon earlier lists created by others such as Allen Copeland, John Kirchner, and Reimar Holzinger. Additional information has been added bit by bit to their work. Photographs too have been inserted, though these have been kept small, partly to reduce the file sizes and partly to minimise the risk that copyright owners will object. The main purpose of the images is in any case to enable locos spotted in other photographs elsewhere to be identified. When high-resolution versions are likely to be available from museums and archives, this has been flagged up, to encourage interested readers to purchase what they need from those who care for historic drawings or photographs.

As news of this work has spread, assistance has come from other researchers, including in particular Chris West, Claus Gaertner and Martin Murray. Grateful thanks is due to their selfless willingness to share information and images. Whilst many of the written sources consulted have been in Spanish, these lists are currently solely available in English. This partly results from my own lack of linguistic confidence, but is also a reflection of the fact that keeping a fast-changing document synchronised in two different tongues is very time-consuming. Nevertheless, quotes from historic documents have usually been left in Spanish and it is to be hoped that in the future a Spanish version of the whole work can be created.

Close examination of these pages is likely to remain strictly a minority interest, whilst even fewer are likely to print out all 5200+ pages! Thus the files have been designed to be read on screen, with hyper-links from the contents page to aid in finding each section. The density of information is likely to discourage browsing on a mobile phone, but hopefully the layout is suitable for display on tablets as well as larger computers.

It will be obvious that this is a work still in progress, with updates being uploaded to the web roughly on a quarterly basis at present. Comments, additional items of information or images, and suggestions to improve the layout, would all be very much appreciated, and the author can be contacted at martincoombs11@gmail.com

This Chilean list

T

Introducción general

Estas listas tienen su origen en la publicación del libro *Railways at the End of the World* (The Araucaria Press, 1 Felview, Casterton, Cumbria, LA6 2SA, Reino Unido. ISBN 978-0-9928622-0-6), en 2014. Durante la investigación realizada para recopilar información para dicho volumen, a veces resultaba frustrante que las locomotoras del sur de Chile no se pudieran identificar fácilmente.

Tras la publicación del libro, se dispuso de más tiempo, y poco a poco se hizo evidente que una lista de las locomotoras de los Ferrocarriles Estatales de Chile (EFE) tendría que abarcar todo el país para ser útil, por lo que se amplió hasta Arica. Posteriormente, durante la pandemia de COVID-19, se dieron los primeros pasos para extender estas listas a algunos de los otros países sudamericanos más pequeños.

Las bases se construyeron sobre listas anteriores creadas por otros autores, como Allen Copeland, John Kirchner y Reimar Holzinger. Poco a poco, se ha ido añadiendo información adicional a su trabajo. También se han insertado fotografías, aunque de tamaño reducido, en parte para reducir el tamaño de los archivos y en parte para minimizar el riesgo de objeción de los titulares de los derechos de autor. El objetivo principal de las imágenes es, en cualquier caso, permitir la identificación de las locomotoras que aparecen en otras fotografías en otros lugares. Se ha informado sobre la disponibilidad de versiones en alta resolución en museos y archivos para animar a los lectores interesados a adquirir lo que necesiten de quienes se interesan por los dibujos o fotografías históricas.

A medida que se ha difundido la noticia de este trabajo, otros investigadores, como Chris West, Claus Gaertner y Martin Murray, han colaborado. Les agradezco enormemente su desinteresada disposición para compartir información e imágenes. Si bien muchas de las fuentes consultadas están en español, estas listas actualmente solo están disponibles en inglés. Esto se debe en parte a mi falta de confianza en el idioma, pero también a que mantener sincronizado un documento en constante evolución en dos idiomas diferentes requiere mucho tiempo. No obstante, las citas de documentos históricos se han mantenido generalmente en español y es de esperar que en el futuro se pueda crear una versión en español de toda la obra. Es probable que el análisis minucioso de estas páginas siga siendo un interés minoritario, y es probable que aún menos impriman las más de 5200 páginas. Por lo tanto, los archivos se han diseñado para su lectura en pantalla, con hipervínculos desde la página de contenido para facilitar la búsqueda de cada sección. La densidad de información probablemente desaconseje la navegación en un teléfono móvil, pero esperamos que el diseño sea adecuado para su visualización tanto en tabletas como en ordenadores de mayor tamaño.

Es evidente que este es un trabajo en curso, con actualizaciones que se suben a la web aproximadamente trimestralmente. Se agradecerán comentarios, información o imágenes adicionales, y sugerencias para mejorar el diseño. Se puede contactar con el autor en martincoombs11@gmail.com

Esta lista chileno

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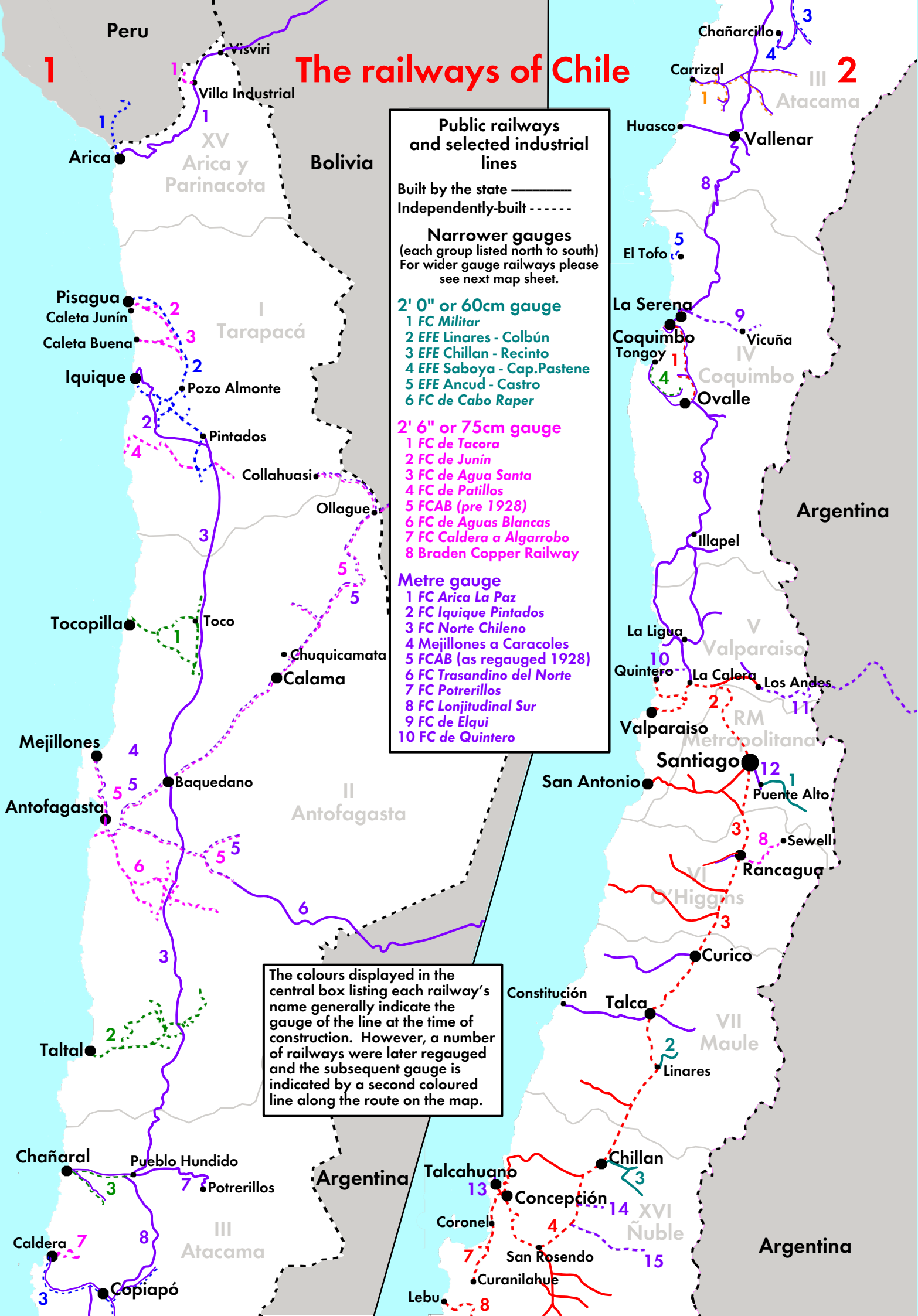
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The railways of Chile



Public railways and selected industrial lines

Built by the state ———
Independently-built - - - - -

Narrower gauges

(each group listed north to south)
For wider gauge railways please see next map sheet.

2' 0" or 60cm gauge

- 1 FC Militar
- 2 EFE Linares - Colbún
- 3 EFE Chillan - Recinto
- 4 EFE Saboya - Cap. Pastene
- 5 EFE Ancud - Castro
- 6 FC de Cabo Raper

2' 6" or 75cm gauge

- 1 FC de Tacora
- 2 FC de Junín
- 3 FC de Agua Santa
- 4 FC de Patillos
- 5 FCAB (pre 1928)
- 6 FC de Aguas Blancas
- 7 FC Caldera a Algarrobo
- 8 Braden Copper Railway

Metre gauge

- 1 FC Arica La Paz
- 2 FC Iquique Pintados
- 3 FC Norte Chileno
- 4 Mejillones a Caracoles
- 5 FCAB (as regauged 1928)
- 6 FC Trasandino del Norte
- 7 FC Potrerillos
- 8 FC Longitudinal Sur
- 9 FC de Elqui
- 10 FC de Quintero

The colours displayed in the central box listing each railway's name generally indicate the gauge of the line at the time of construction. However, a number of railways were later regauged and the subsequent gauge is indicated by a second coloured line along the route on the map.



Other parts of this work

This is one of a number of PDF files covering the steam locomotives of Chile and other South American countries across a wide variety of gauges. The other files can be accessed by clicking on the red hyperlinks listed below.

Part 1	Chilean broad gauge locos
Part 2	Chilean intermediate gauge locos
Part 3	Chilean metre gauge locos
Part 4	Chilean sub-metric gauge locos
Part 5	Chilean locos listed by builders
Part 6	Ecuadorian locomotives
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Part 9	Uruguayan locomotives
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Part 15	Panamanian locomotives
Part 16	Central American countries locomotives
Part 17	Cuban public railway locomotives
Part 18	Cuban industrial railway locomotives
Part 19	Cuban locomotives listed by builders
Part 20	West Indian island locomotives (other than Cuba)

Notes and sources

This document was originally based upon the lists created by Allan Copeland and John Kirchner around 1996, but now has vastly more detail. However, it is very much a work in progress, and additional information – or corrections – will be gratefully received. E-mail me at **martincoombs11@gmail.com**

Sources:

- [1] Allen Copeland and John Kirchner's lists from around 1996.
- [2] Harold Middleton 2015, *The Nitrate Railways Sentinel Steam Railcars* in *Locomotives International* issue 98, Oct/Nov 2015.
- [3] Multi-part article in *Anales del Instituto de Ingenieros de Chile*, 1909 issue 4 to 1910 issue 8.
- [4] *The Fairlie Locomotive*, R. A. S. Abbott, 1970, David & Charles, Newton Abbot, UK.
- [5] Paper in Inst. of Civil Engineers' proceedings 1864.
- [6] *The Railways of Chile*, Wilfred Simms, five volumes, 1999-2000.
- [7] *The Nitrate Railways Company Limited*, Donald Binns, 2008, Trackside Publications.
- [8] File L2601 in SLS library, official NR loco list from 1929.
- [9] *The Anglo-Chilean Nitrate & Railway Co.*, Donald Binns, 1995, Trackside Publications.
- [10] Loco builders' construction lists as appropriate.
- [11] *Un día en la historia de Arica: 13 de agosto 1868*, and *Arica 1868 un tsunami y un terremoto*, Manuel Fernandez-Canque, Universidad Arturo Prat, Iquique
- [12] *FC de Taltal* list from 1930s. SLS library ref. L2603 originally L2063.
- [13] lists supposedly by Wilfred Beckerlegge in SLS library, date of original information unknown.
- [14] Reg Carter lists in SLS library file L8655.
- [15] *Cartas/Informes del Super-intendente del FC de Copiapó 1860-1862*, in *Biblioteca Nacional* in Santiago.
- [16] *The Nitrate Railways and its Locomotives*, *The Locomotive* magazine, 15th Mar., 15th Apr. and 14th May 1932.
- [17] SLS library file L8841 containing lists/notes by Mike Page, Reg Carter & Peter Mitchie.
- [18] *Red Norte*, Ian Thomson, 1997, Locomotives International.
- [19] *EFE memoria anual* 1931.
- [20] Photo on Restoration and Archiving Trust website at <http://gwrarchive.org/index.php>
- [21] *EFE* list of locos 'ingresos' or 'bajos' during 1957, supplied by PMF.
- [22] *A commentary by W. W. Evans on criticisms concerning American v. English locomotives*, E. K. Pease, New York, 1880.
- [23] Correspondence from Pablo Moraga and Jens Schindler.
- [24] *Jeneralidades de Chile i sus Ferrocarriles en 1910*, by José Olayo Lopez C. Santiago, 1910.
- [25] *Los Ferrocarriles de Chile*, 1900, by Juan Velasquez Jimenez, Buenos Aires.
- [26] The 1930 US Dept. of Commerce report. Trade promotion series / Department of Commerce, ... no. 93.
- [27] *The Taltal Railway – A Chilean mineral line*, 2010, Donald Binns and Harold A Middleton, Trackside Publications, Bristol, UK.
- [28] *Re-organizacion de los Ferro-carriles de la Provincia de Coquimbo*, 1894. Agustin Ross et al.
- [29] Yorkshire Engine Co. order books and directors' minute books in the Sheffield Archive office.
- [30] *Tsunami wipes out locomotive fleet*, Ian Thomson, in *Locomotives International* issue 82, 2012
- [31] *The Fairlie Locomotive, part ii Later designs and productions*, the late P. C. Dewhurst and Harold Holcroft, in the proceedings of the Newcomen Society 1962.
- [32] An unexpected source of evidence for loco allocations and duties are the fatal accident reports sent to the Tarapacá Intendencia and retained in files at the Tarapacá Archives at the *Universidad de Arturo Prat* (post 1903) or at the *Archivo Nacional* in Santiago (pre 1903). Only the ones at the *Universidad* have so far been examined, and only up to about 1930.
- [33] *Nuestros Ferrocarriles*, Carlos Huidobro Diaz, Santiago, 1939.

- [34] *Intra-South American trade in used steam locomotives and its raisons d'être*, Ian Thomson Newman, in *Locomotives International* issue 116, 7, 8 or 9?, 2019.
- [35] Report *Red Central Norte 2*, in *Anales del Insituto Injeniero de Chile* in 1919. by Javier Gandarillas M.
- [36] *Letters and translations from Lima 1874-5 – The Compañía Nacional de los Ferrocarriles Salitreros del Peru*. A hand-written document found in a library by Elio Galessio.
- [37] Sir William Howard Russell, *A visit to Chile and the nitrate fields of Tarapaca, etc.*, London, 1890.
- [38] *Estudio sobre los ferrocarriles vecinales o secundarios*, parts 3 and 4, in *Anales del Instituto de Ingenieros de Chile*, 1892.
- [39] *The claim of the Nitrate Railways Company for damages against the Chilian Government*. Printed leaflet from 1895 in Foreign Railways files 1894-5, at the Guildhall Library in the City of London.
- [40] Nitrate Railways Company annual *Reports of the Directors* to shareholders, at the Guildhall Library in the City of London.
- [41] *The Railways of Peru volume 2 The Central and Southern Lines*, R. D. Whetham, 2008, Trackside Publications, Bristol, UK.
- [42] *Los Ferrocarriles del Perú, colleccion de leyes, decretos, contratos y demas documentos relativos á los ferrocarriles del Perú, hecha de orden de D. Enrique Meiggs. Tomo II*, Lima 1877. Available via the Hathi Trust website.
- [43] *Documentos de los Ferro-Carriles de la Provincia de Tarapaca*, 1873, Lima. Available via the Hathi Trust website.
- [44] *Boletin de la Sociedad Nacional de la Minería*, Santiago : La Sociedad, 1883-1918. 34 volúmenes, serie 3, número 132, (Febrero 1908), página 74.
- [45] Chapters in *La industria del cobre en las provincias de Atacama y Coquimbo y los depósitos carboníferos de Lota y Coronel* / Francisco Aracena. Valparaíso : Imprenta del Nuevo Mercurio, 1884. 372 páginas.
- [46] Joe Lloyd's Beyer Peacock progressive numbers loco list at www.beyerpeacock.co.uk
- [47] Sudan Government Railways loco list, in file L7230 of the Stephenson Locomotive Society library.
- [48] *Jeología. Estudio sobre el carbon fósil que se explota en Chile, por don Enrique Concha i Toro, encargado de este trabajo por el señor don Ignacio Domeyko, presidente de la primera seccion de la Esposicion Internacional de Chile en 1875*, published in the *Anales de la Universidad de Chile* 1876.
- [49] *Los ferrocarriles de Chile*, 1916, S. Marin Vicuña, Impr. Cervantes, Santiago. Available online at <http://www.bibliotecanacionaldigital.gob.cl/bnd/632/w3-article-355653.html>
- [50] *El Ferrocarril Salitrero de Taltal*, 2009, Heriberto Echeverría Oyanedel, in *Taltalia No.2* pp142-157, Revista del Museo Augusto Capdeville Rojas de Taltal.
- [51] *Facts and Opinions regarding the economical construction and working of Railways of Narrow Gauge with Steep gradients and Sharp Curves...*, T. W. Armstrong, 1870, PWD of Central Provinces. <https://babel.hathitrust.org/cgi/pt?id=nyp.33433007752011&view=1up&seq=7> Pages 149-184 (digital file pages) by E. Woods and W. Lloyd are on Chile, particularly the Tongoy, Carrizal, Copiapo Extension and *FCSV* railways being mentioned.
- [52] Robert Fairlie's letter in *Engineering*, (see Appendix 3).
- [53] *Transactions of the Institution of Civil Engineers?* in 1877?
- [54] <https://trenesdelperu.blogspot.com/2014/11/informe-sobre-la-destruccion-de-fc-ilo.html>
- [55] Letter in Back Track page of *Locomotives International* issue no. 6, October 1990.
- [56] *Hay que devolver a Carrizal el tren que le llevaba el cobre de los montes vecinos*, an article published possibly in *En Viaje* or *Zigzag* at an unknown date, and over the pseudonym 'Archivero'.
- [57] *Graces' Guide* article on the distinguished early railway and locomotive engineer Edward Woods. https://www.gracesguide.co.uk/Edward_Woods
- [58] *Informe de las Operaciones del Año 1881 y Memoria de los 30 Años 1852-1881*, p. 17-18, p. 23-25, *Compañía de Ferro Carril de Copiapó* (1882). In the *Museo Regional de Atacama* in Copiapó, and also available in the Guildhall Library, London. Quote found at <https://www.geovirtual2.cl/Museovirtual/FFCC/tur190PabellonChan01.htm>
- [59] *British Steam Locomotive builders*, James W. Lowe, 1975 & 1989, TEE publishing then Guild Publishing.
- [60] Case heard before the Railway Commissioners in 1876, 8 Vic. c20, sec. 115, pages 293-297, available in the Na-

tional Archives at Kew. Info. kindly provided by Chris West.

[61] *Early days on the Copiapó Railway*, Ian Thomson, 1999 in *Locomotives International* issue 47. Sr. Thomson gives a list of earlier sources but does not link specific statements to any particular one of those.

[62] *Panama Star & Herald*, July 10th 1882. Microfilm available in the British Library, St. Pancras, London.

[63] *Informe de las operaciones del año 1881 y Memoria de los 20 años 1852-1881*. Valparaiso 1882. Found in The Guildhall Library, London, within the volumes containing Foreign Railways company annual reports for 1881-5.

[64] *Tarapacá en el Mundo* website <https://tarapacaenelmundo.com/patrimonio/ciclo-salitrero/ferrocarriles/ferrocarriles/>

[65] *Zoilo Flores Aponte y el ferrocarril de Mejillones a Caracoles*, thesis by Marta Uriosto de Aguirre, 1979, available at <https://repositorioslatinoamericanos.uchile.cl/handle/2250/4049178>

[66] *Depredando Bolivia: El caso del Ferrocarril de Mejillones a Caracoles*, Carlos Donoso Rojas, 2021, Universidad de Tarapacá. https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0719-26812021000300231

[67] *Anuario administrativo de Bolivia*, La Paz, each year. <https://catalog.hathitrust.org/Record/012445399>

[68] *Le désert d'Atacama et Caracoles*, M. Ing. A. Bresson, Paris, 1875, in *Le Tour du monde : nouveau journal des voyages / publié sous la direction de M. Édouard Charton*. <https://api.nakala.fr/data/10.34847/n-k1.68d5a282/415c13934c2dc0b1d703b8944d2ea33b68012a09>

[69] A summary of loco-related info from the Copiapó Railway Company's annual reports, kindly provided by don Felipe Radrigan in 2023.

[70] *Die Alpen-Locomotive der Zukunft*, A. Brunner, 1876, in *Technische Mittheilungen* 3, Druck und Verlag von Orell Füssli & Co., Zurich. https://www.google.co.uk/books/edition/Technische_Mitteilungen/0v8zAQAAMAAJ?hl=en&gbpv=1

Abbreviations used:

BLW	Baldwin Locomotive Works	cyls.	cylinder bore x stroke
d/w	driving wheel diameter	w/n	works number

Dimensions

Imperial unit driving wheel and cylinder dimensions, ie. in inches, have been added if it seems likely that they were originally created in that system.

Rogers builders numbers

Note that no list has ever been found showing builders' numbers for Rogers locomotives constructed between 1856 and 1872. Numbers from 688 to 2152 were allocated by Chas Fisher from a sales and shipment list but are merely guesses. These numbers are commonly quoted but have no historical authority. They are shown in Connelly's Rogers list in brackets and I have done the same here. PS An original Rogers list has now been found in 2025, in the Pennsylvania State Archives, and will be scanned and made public in due course.

Photographs

Photos have been added here solely to aid in the identification of locos seen in other images elsewhere. They have been found from many different sources, and may still be in copyright. For those reasons, and to keep the file sizes down, they are of low resolution, the majority being only 600 pixels across. The names of photographers will be added as time permits. As these documents are likely to have a very limited readership and are not being produced commercially, it is hoped that copyright holders will understand and permit their presence here. If not, please contact the author and they can be removed.

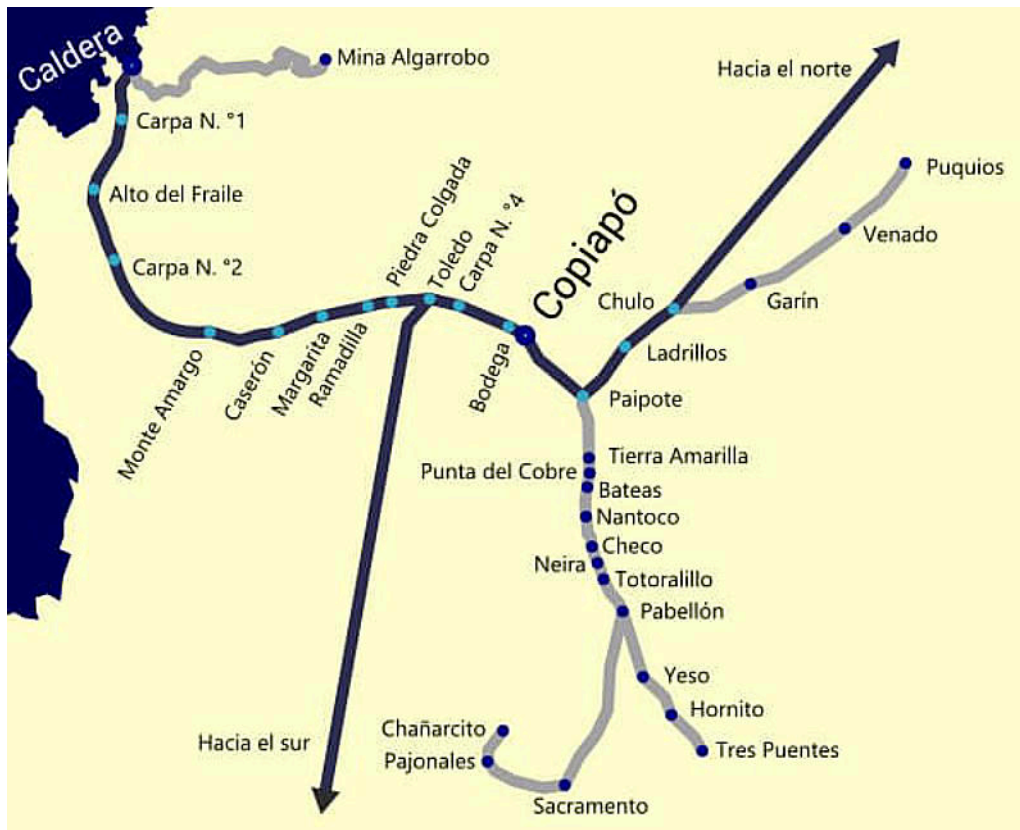
2.1 Standard gauge

2.1.1 *El FC de Copiapó*

1850-1923 on this gauge

Background

Standard gauge. The first railway in Chile. Opened in 1850. 1872 operational notes are from *Informe relativo a los negocios de la Compañía del Ferrocarril de Copiapó 1872* in the *Biblioteca Nacional* in Santiago. Taken over by *EFE* in 1912. Regauged to 1 metre in 1923. Standard gauge locos scrapped 1928-9. Substantial information about the locomotives between 1896 and 1903 in company reports was kindly provided by don Felipe Radrigán.



A map, of unknown origin, showing the stations of the *FC de Copiapó* and the Copiapó Extension Railway to Chañarcillo. The later *FC Longitudinal* is seen heading away north and south.

4-4-0 d/w 60", cyls. 13"x26" built by Norris Bros. in 1850 (1), 1851 (2) and 1852 (3)

Mixed traffic locos. Inclined outside cylinders, and equalised suspension. Notable to modern eyes by having six eccentrics, two of them operating riding cut-offs as was common on early locos when the capabilities of link motion were not well understood [*Railway and Locomotive Engineering* 1901]. Originally wood-burners. Weight of loco in service 18.9 tonnes (No. 3 was 19.3 tonnes). Weight of tender in service 15.9 tonnes. See John Ott's paragraphs about these engines in Appendix 6 at the end of this document.

1st 'COPIAPÓ'

w/n (454)

In service July 4th 1851 [61] and [63]. Though FR's [69] summary of FCC company reports says for 1851 that "On June 21, 1851, the American frigate "Switzerland" de New York arrived in Caldera, with the locomotives and passenger cars for the Copiapo railroad. The next day another American boat arrived, the "Saa Joseph", from Baltimore, with the coal wagons and all the other supplies necessary for the completion of the railroad.

As there were certain difficulties in timely unloading the locomotives and cars, and as they needed certain repairs and a general cleaning because they did not come well conditioned, it was not possible to have them ready for the 4th of July when the line to Monte-Amargo was inaugurated. Due to the exposed circumstances, the first locomotive (number **1**, “**Copiapó**”) was tested, to which three freight cars were coupled, on July 20, 1851.”

1854 via [69]: The “Copiapó” and the “Chañarcillo”, which were our first machines, initially consumed the waters of Caldera, Monte Amargo and Piedra Colgada, which are useless for this purpose. For this reason, the boilers and tubes of these machines suffered greatly. This misfortune is fully repaired in the “Copiapó”, and very soon it will also be in the other. 1855 via [69]: All the equipment is still in good condition, with the exception of one of the old locomotives, which needs the formal repairs already received by two of them (“**Copiapó**” and “**Chañarcillo**”). Out of use in August 1858 [63] or 1862 [15]. Rebuilt for Santiago 1875. 1881 report said “Locomotive No. **1** is in Santiago, where was sent for the Exhibition of 1875, as the first Locomotive that run in the Southern Hemisphere.” Handed over to Chilean government in 1883 as an historic artefact, and then sent to Pan-American exposition in Buffalo, USA. Preserved nowadays at University of the Atacama in Copiapó.

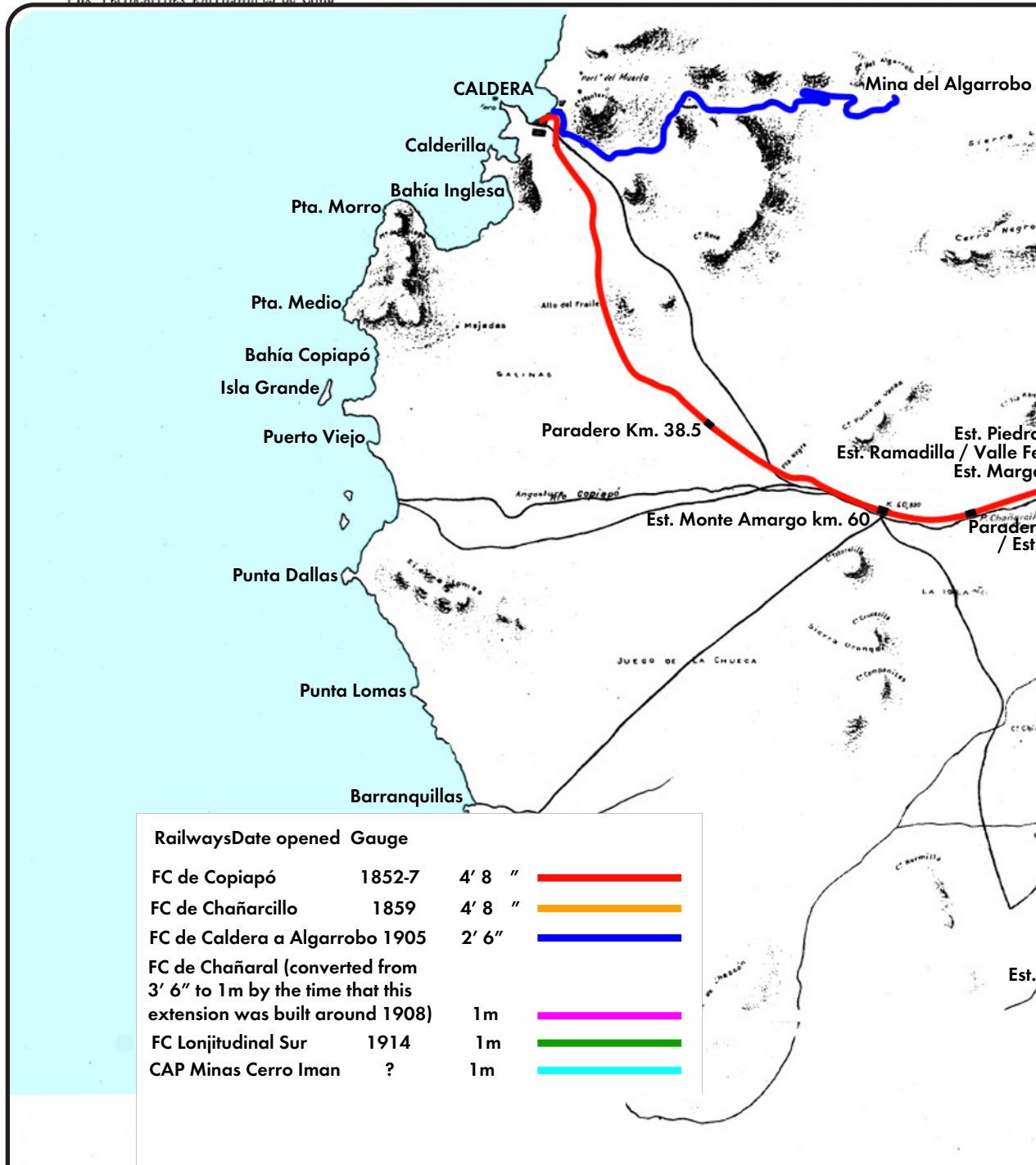
2¹ ‘CHAÑARCILLO’

t







In service Sept. 1851 [61] and [63]. 1854 via [69]: The “Copiapó” and the “Chañarcillo”, which were our first machines, initially consumed the waters of Caldera, Monte Amargo and Piedra Colgada, which are useless for this purpose. For this reason, the boilers and tubes of these machines suffered greatly. This misfortune is fully repaired in the “Copiapó”, and very soon it will also be in the other. 1855 via [69]: All the equipment is still in good condition, with the exception of one of the old locomotives, which needs the formal repairs already received by two of them. (“**Copiapó**” and “**Chañarcillo**”). 1856 via [69]: We can note as another accident of the semester, the rupture of several tubes of the “Chañarcillo” locomotive going up, on June 8, to Pabellón. The cause of the accident was the poor quality of the water that the machine was using, a circumstance that made the driver misread the height at which the water was in the boiler. Out of use in October 1857 [63] or 1862 [15]. 1861 annual report says out of service November 1857. Not mentioned thereafter or in 1909 list [MOBR2228].

3 ‘TRES PUNTAS’

In service Nov 1851 [61] [63]. HT list has names of **3** and **4** reversed, however, [63] in 1881 has name as shown here. 1854 via [69]: The “**Tres Puntas**” and “**Chile**” locomotives are well preserved, because they have never consumed anything but good water. Mediocre condition in 1862 [15], out of service July 1862 [63], or in 1863 according to 1868 annual report. Not mentioned thereafter or in 1909 list [MOBR2228].



Railways Date opened Gauge

FC de Copiapó	1852-7	4' 8 "	
FC de Chañarillo	1859	4' 8 "	
FC de Caldera a Algarrobo	1905	2' 6"	
FC de Chañaral (converted from 3' 6" to 1m by the time that this extension was built around 1908)		1m	
FC Longitudinal Sur	1914	1m	
CAP Minas Cerro Iman	?	1m	

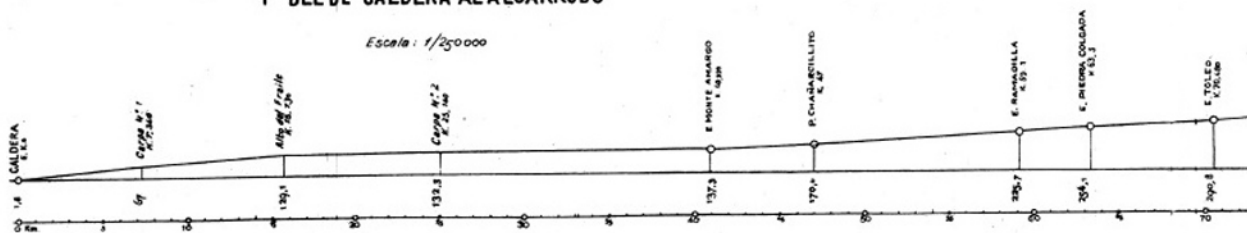
PLANO GENERAL

del

FERROCARRIL de COPIAPÓ

Y DEL DE CALDERA AL ALGARROBO

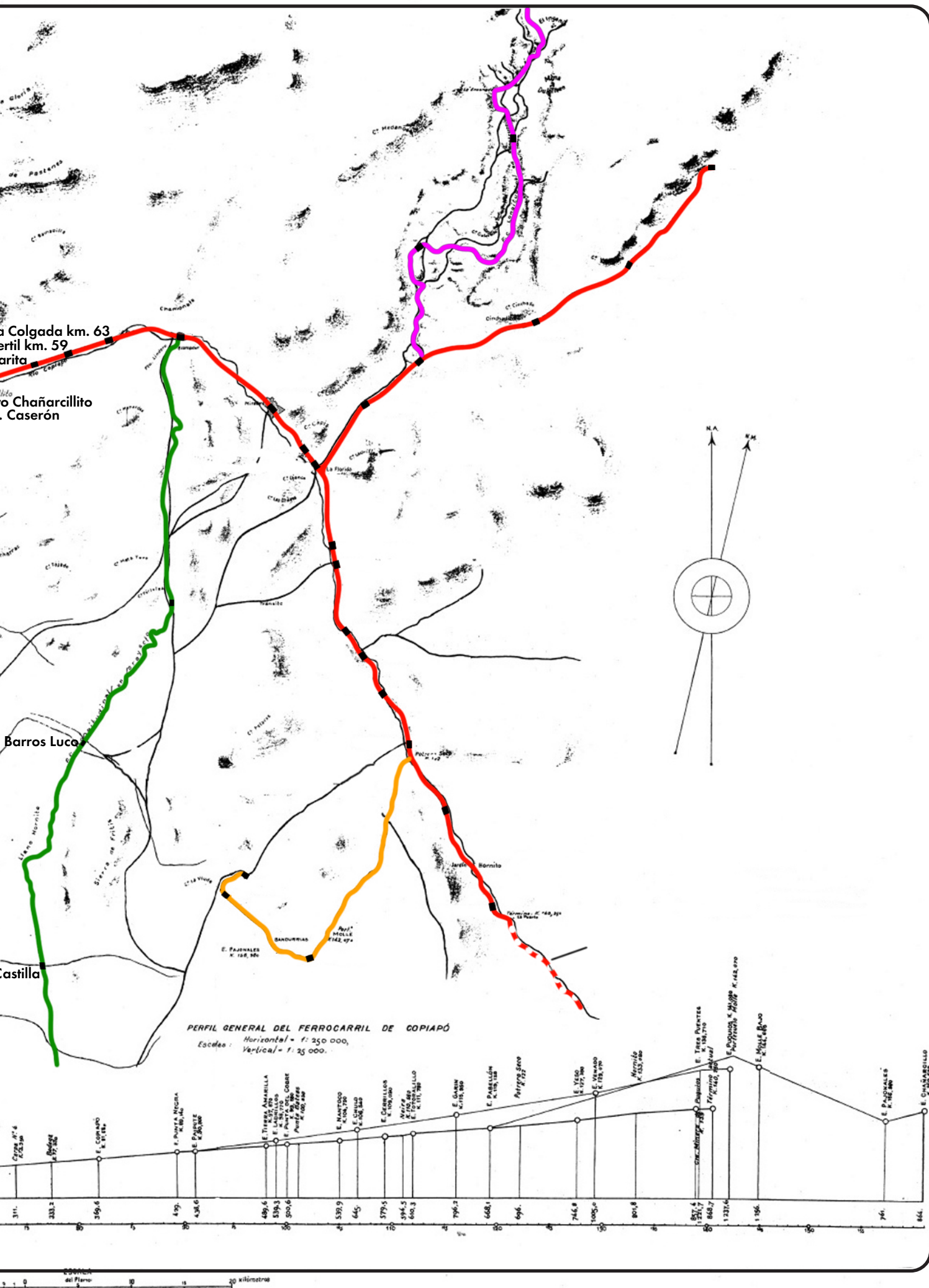
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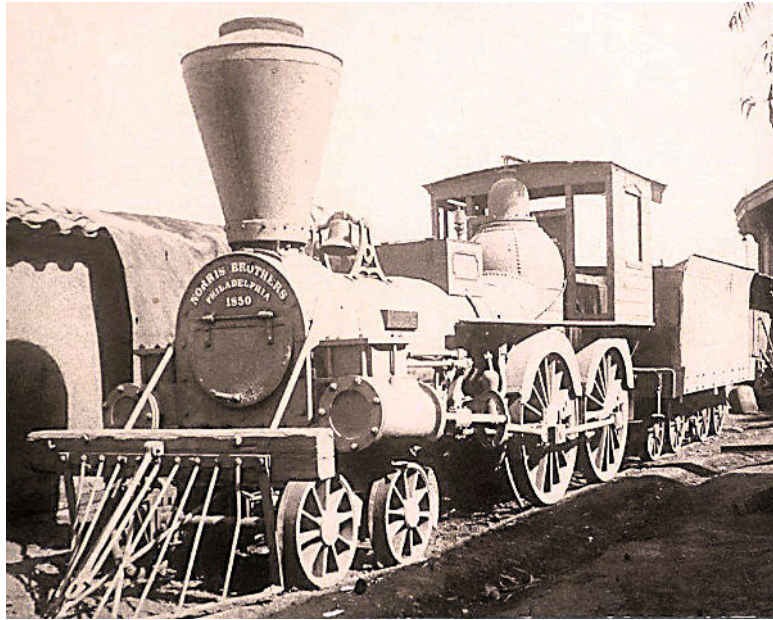


Santiago, Mayo de 1909

Muro Fitos

Est. C





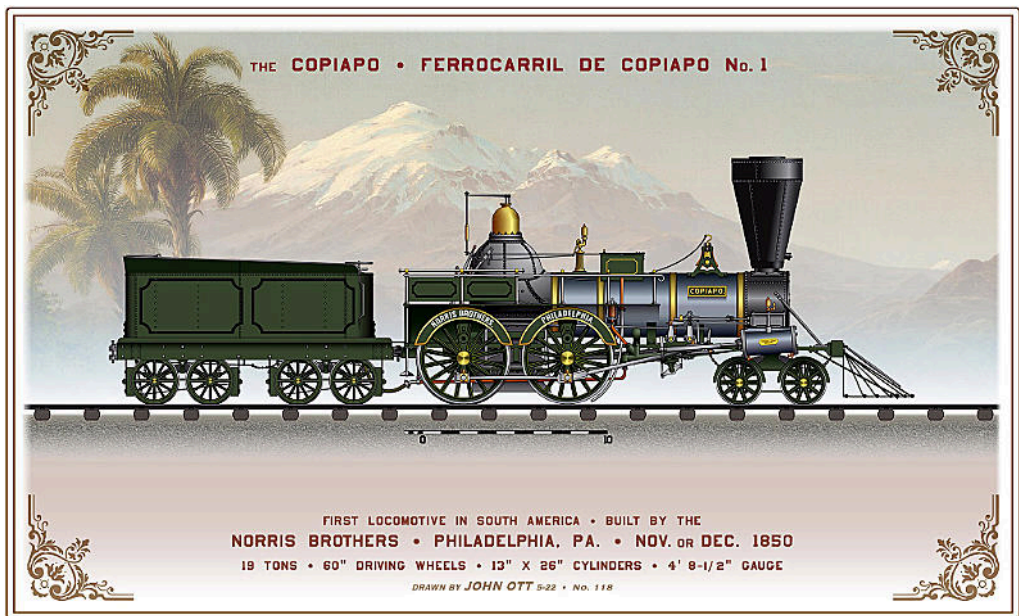
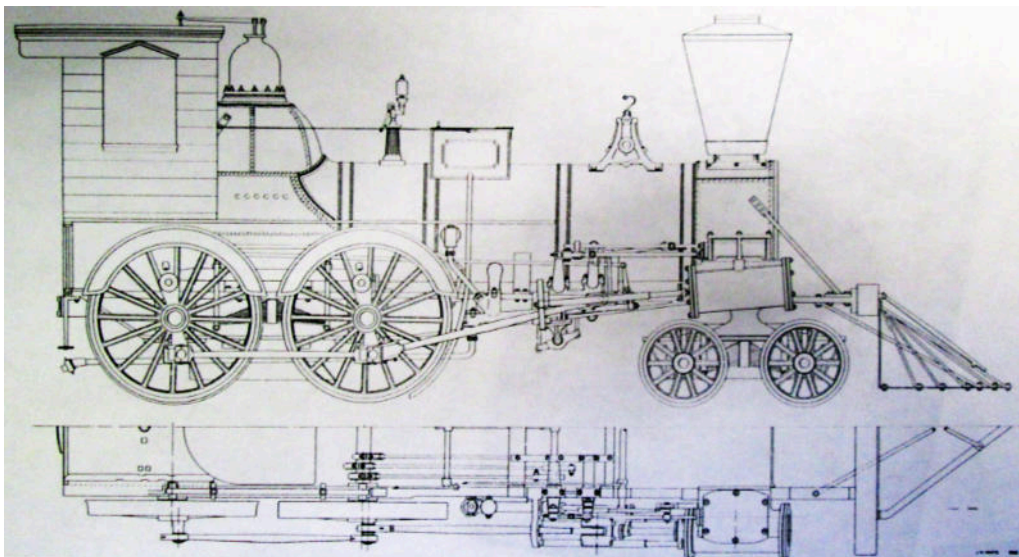
An early photo of no. 1, though probably even then out of use.



FC de Copiapó no. 1, during its visit to an exhibition in the USA in 1901
It seems to have lost its tender around that time.



And as displayed in the grounds of the *Universidad del Atacama* in Copiapó in 2019.



John Ott, who has written on the subject of the Norris Brothers and their locomotives, has also produced a series of tinted drawings. This one is a relatively low-resolution copy but the originals are available on the Facebook group entitled Pre-1895 Railroads and Steam Engines [<https://www.facebook.com/groups/1886828738255343/>].

4-4-0 d/w 54", cyls. 10"x26" built by Norris Bros. in 1851-2

Mixed traffic loco. Inclined outside cylinders, and equalised suspension. Notable to modern eyes by having six eccentrics, two of them operating riding cut-offs as was common on early locos when the capabilities of link motion were not well understood [*Railway and Locomotive Engineering* 1901]. Originally wood-burner. Weight of loco in service 17.4 tonnes. Weight of tender in service 9.7 tonnes.

4 'CHILE'

In service Dec. 1852 [61] and [63]. 1854 via [69]: The "Tres Puntas" and "Chile" locomotives are well preserved, because they have never consumed anything but good water. [61] says this loco was lighter than the previous ones and had a narrower boiler, the article also says that it was destroyed in an accident on 6th May 1859, confirmed by [63] and by 1861 annual report. Not mentioned thereafter or in 1909 list [MOBR2228].

4-4-0 d/w 54", cyls. 14"x26" built by Norris Bros. in 1854

Mixed traffic locos. Inclined outside cylinders, and equalised suspension. Notable to modern eyes by having six eccentrics, two of them operating riding cut-offs as was common on early locos when the capabilities of link motion were not well understood [*Railway and Locomotive Engineering* 1901]. Originally wood-burners. Weight of loco in service 21.8 tonnes. Weight of tender in service 16.2 tonnes. July 1854 via [69]: The ones named “**Coronel Gana**”, “**Allan Campbell**”, and “**W. W. Evans**” are of a higher power than the previous four and have just entered the service. The “**W. Taggart**” locomotive, of equal power to these, has not yet been assembled.

5 ‘CORONEL GANA’ but later took the identity of no. **6** and the name ‘**CANDELARIA GOYENECHE de GALLO**’

In service Aug. 1853 [61] and [63]. Larger boiler and cyls. of 14" diameter. D/w of 54" [61]. Ran until August 1859 [63]. Being fitted with new boiler in 1862 [15], but only returned to service in November 1870, as no. **6**. 1872 in use on Chañarcillo line. 1880 “Locomotives Nos. **6** and **24** require repairs which will be attended to with preference, being the only ones that together with No. **8** are fit for the Chañarcillo line.” 1881 “With the sale of Locomotive No. **23** to the Government at the end of 1879, the locomotive power fit for the Chañarcillo line is considerably reduced, and it has become necessary to order another Locomotive as advised by the chief of this department.” 1883 “No. **6** has had a new cylinder put in place of an old one past repair.” In 1884 motion was overhauled, new tyres fitted, and a new copper firebox fitted [15]. as 1884 report stated “Locomotive No. **6** has also had considerable repairs, the working parts refitted; new steel tyres put on the driving wheels, the boiler has received extensive renewals, new copper firebox and stays, tubes and other boiler accessories have been renewed.” 1891: “Locomotives Nos. **6** and **26** have also received repairs of some importance.” In 1897 : “Locomotive No. **6** is undergoing a complete overhaul, and already has had a new boiler made and other important work effected.” 1898: “The work of the complete renewal of Locomotive No. **6** has progressed, but has not been completed owing to urgent work required on other locomotives that met with accidents.” 1899: “The repairs to Locomotive No. **6**, which was in course of a general refit, were concluded.” Two wheelsets prepared for changing in 1902. Some repairs completed in 1903. 1904: partial repairs. 1906: “undergoing a course of repairs” During 1908 had a complete overhaul, with two new driving wheels, a new copper firebox, and general repair to the machinery.” therefore 1909 in use, having received new cylinders, tyres, lubricator and *rubos* and *llaves*, and d/w given as 54" with cyls. 14x26" [MOBR2228] and valued at \$(Pesos) 15,000. Renumbered **1A** before 1920. No no. **5** mentioned in 1909 list [MOBR2228].

6 ‘ALLAN CAMPBELL’ Possibly renamed ‘**CANDELARIA GOYENECHE de GALLO**’ at some stage but in 1854, and 1862 bore the original name.

In service Sep. 1853 [61]. Larger boiler and cyls. of 14" diameter. D/w of 54" [61]. [61] and [63] say it was also destroyed in the May 1859 accident.

All the first six Norris locos except no. **6** ex **5** were out of use by 1863.

4-4-0 goods locos, d/w 48½" (No. 7), 54" (No. 8), cyls 14"x26", built by Norris Bros. in 1854

Goods locos. [61] and [63] say that this pair both had d/w of 54".

7 ‘WALTON W. EVANS’

Into service May 1854 [61] and [63]. In good condition in 1862 [15].

8 ‘W. TAGGERT’ (name recorded as such in 1858, 1861, 1868, and 1881, but by 1897 was named ‘**AGUSTIN EDWARDS**’).

Abandoned August 1864 [63]. 1868 and 1871 annual reports refer to boiler being worn out, with loco being under repair in the latter year. However, it never again appears as in use. Not mentioned in 1909 list [MOBR2228]. Walton W. Evans was an American engineer deeply involved in the development of railways on the west coast in both Peru and Chile. He was assistant to Allan Campbell in constructing the *FC de Copiapó*, and chief engineer for the building of the *FC Arica Tacna*. This name was later reused for loco no. **31**, built in 1881.

Into service Oct 1854 [61] and [63]. Out of service from March 1863, then rebuilt and back in service March 1872. The 1871 annual report [69] said: All the locomotives are preserved in perfect condition, having refurbished, or better said, rebuilt, locomotives Nos. **8** and **23** that, through their new fireboxes, boilers and tenders, will provide services for many more years. 1872 in use on Chañarcillo line. 1880 “Locomotives Nos. **6** and **24** require repairs which will be attended to with preference, being the only ones that together with No. **8** are fit for the Chañarcillo line.” In use in 1884 [15]. 1862 report by railway's *superintendente* also has the ‘**W. TAGGERT**’ name [15], as does [63] in 1881, but reports from 1896-1903 give the ‘**AGUSTIN EDWARDS**’ name. 1881 “Locomotive No. **8** had both its cylinders broken ; they have been repaired till new ones are made; besides considerable repairs have been made to the fire box and working parts in general.” 1882 “N.º **8** has received a new cylinder (cast in Caldera) in place of one broken and imperfectly repaired the previous year; it has also received a new tender tank.” 1882 “No. **8** has had all the copper stays in the firebox removed.” 1886 “Locomotive No. **8** has had a thorough repair; it has had one of the copper plates in the firebox changed, as well as all the tubes; beside considerable repairs in its machinery and axles.” 1889 “No. **8** is undergoing extensive repairs which are considerably advanced” 1890: “Locomotive no. **8**, which was undergoing repairs at the beginning of the year, has had a thorough repair in its machinery.” 1892: “Locomotive No. **8** has received some considerable repairs, having had one pair of wheels and axle changed, and other repairs done to firebox and wheels.” 1896: “Locomotive No. **8** has had a thorough repair, including an entirely new boiler.” 1908: put out of service on the arrival of new no. **33**.

A photo exists showing this engine attached to a six-wheeled tender of the single leading axle and rear bogie type illustrated with R. and W. Hawthorn 4-6-0TT no. **31**, see below. It seems likely that the tender had been borrowed either from no. **31** or from one of the other Hawthorn locos. In 1896 reported as having received a thorough repair including a new boiler. Considerable repairs in 1901 including new tyres. Two driving wheelsets replaced in 1902, and other repairs to the bottom end. 1904: partial repairs. In 1909 was out of service [MOBR2228] having been replaced by no. **32**. Sr. Agustin Edwards was President of the Copiapo Railway Co. in an 1888 list.



This photo shows Norris Bros. 4-4-0 no. **8** attached to a Hawthorn 2-4 wheel arrangement tender as supplied with loco no. **31**.

A puzzle

O'Connor's Grant list has Grant 330 a 4-4-0 of 1852 as for *FC Copiapo* no. **3**, cyls. 16x22" d/w 60" wgt 62000lbs. However, this is not supported by any other Grant list.

4-4-0 d/w 62", and cyls. 16½x24", built by Kitson & Hewitson in 1858

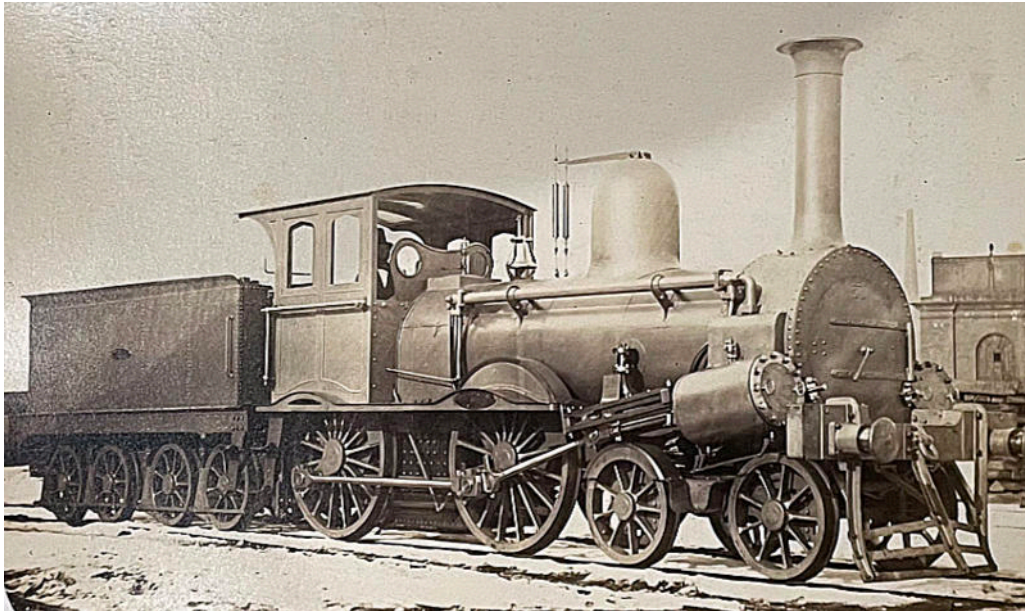
Mixed traffic locos. Outside cylinders. Open cab front with small spectacle plate not reaching to roof. Boiler feed was by a donkey pump at the left side of the smokebox. A company report in mid-1857 via [69] said: Four new locomotives have been ordered from England earlier in the year, which I hope will arrive within six to eight months. They will be of greater power than those currently in service and their use will greatly reduce fuel and water costs. -- The reason why these machines were ordered from England, was the unsatisfactory result of the North American locomotives of this Company, comparing it with that of the English locomotives that they are being used with great success in the railways of Valparaiso, Arica and Callao. Six months later, at the end of 1857 (also via [69]: We have received notice of the four locomotives which were ordered from England; they were contracted with the factory of Kitson, Thompson and Hewitson, in Leeds, for the sum of three thousand and fifty pounds each, with their respective tender; they were being built in the said factory under the immediate inspection of an accredited engineer from the Company, in London, and as of this date they should already be on their way to Caldera. And in mid-1858, via the same source [69]: Two of the locomotives ordered from England have arrived; They are currently being assembled in the Company's workshops, and in a few days, they will be ready for service. Finally, at the end of 1858 [69]: Regarding the rolling stock, the only change it has undergone, since my last report, consists in the arrival of the four new locomotives of which I have previously spoken. These machines, despite having some secondary defects, have perfectly corresponded to the hopes that we had formed of them. Their material and construction are of a much higher class, and the services they provide are very satisfactory. Regarding their strength, I will only say that they have pulled trains of 750 tons, gross weight, over the gradients of this line. The average cost of them, assembled and put on the rails, is 22,100 pounds each.

9 'GUILLERMO WHEELRIGHT' w/n 635 tender w/n 639 Into service July 1858 [61]. In good condition in 1862 having been retubed [15]. 1882 "N.º 9 has also had the tender renewed." In use in 1884 [15]. Strangely, there are no references to repairs to this engine through the 1880s and 1890s though it was clearly in service. 1907: "In December the first of three new locomotives ordered arrived from England, and under (the) No. 32 was put in service on the 25th of that month in place of No. 9, (which was) put out of service and dismantled in order to utilise some parts as spares for the other engines of the same class." 1909 out of service [MOBR2228] having been

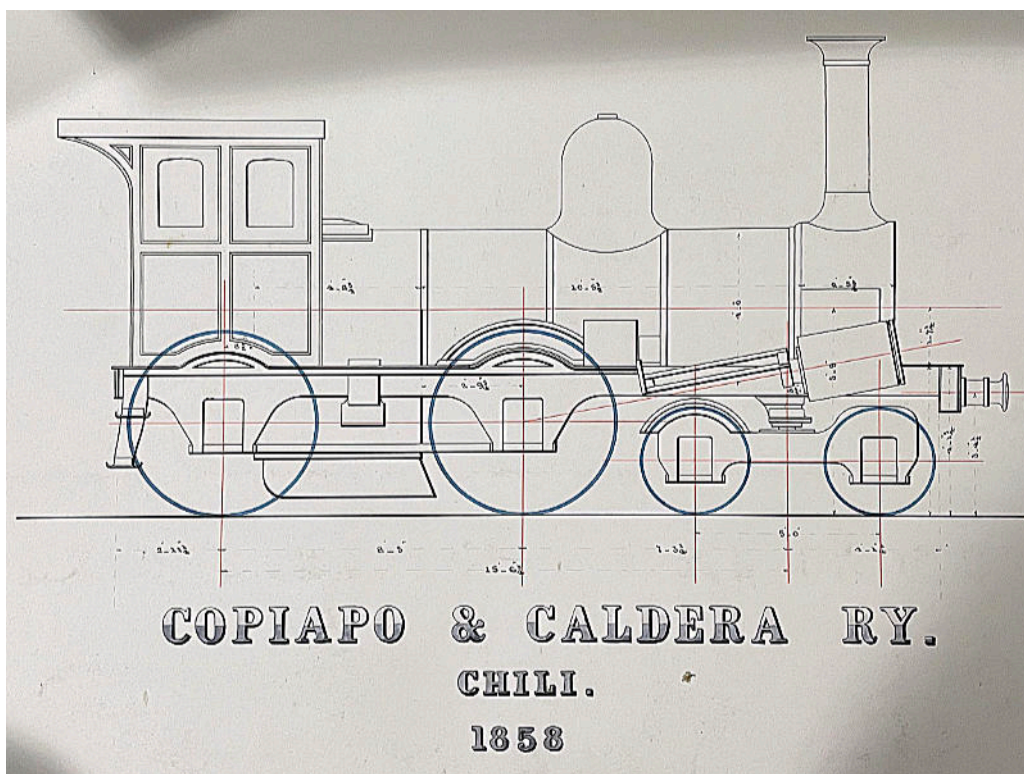
replaced by no. **33**. William (Guillermo) Wheelright was an American engineer deeply involved in the early development of railways in both Peru and Chile.

- 10 'DIEGO CARVALLO'** w/n 636 tender w/n 640 Into service July 1858 [61]. In good condition in 1862 having been retubed [15]. In service 1881. 1886 "No. **10** has been placed under repairs, and the work on its boiler is considerably forward." 1888 "No. 10 is undergoing extensive repairs which are well advanced." 1889 "Locomotive No. **10**, which at the commencement of the year was under repair, has had these completed in its boiler and machinery." 1897 significant repairs carried out. Further repairs in 1898, and considerable repairs to motion during 1899. Wheelsets prepared for changing in 1902. Some repairs completed in 1903. 1907: "now going through a general overhaul." Supposedly under repair in 1908, but 1909 out of service owing to great expense of repairs [MOBR2228] and was lying dismantled at that time.
- 11 'JOSÉ MARIA MONTT'** w/n 637 tender w/n 641 Into service Oct. 1858 [61]. In good condition in 1862 [15]. 1880 "Locomotive No. **11** has been completely renewed and will soon go on the road equal to new." 1881 "Locomotives Nos. **11** and **12** have had repairs of some importance." In use in 1884 [15]. 1885 "No. **11** has received repairs of considerable importance to its machinery and wheels." 1886 "No. **11** has had a thorough overhaul in its machinery and rolling gear, and has had another Hancock Inspirator placed instead of the pumps." 1889 "No. **11** is also under repairs and has an entirely new fire box put in." 1893: "Locomotive No. 11 has had a thorough repair, including a complete new set of boiler tubes, new steel tyres to all the wheels including tender, and a new tank to the tender." 1896 considerable repairs. 1897 significant repairs carried out. Collided with no. **28** at Punta del Cobre on 15th June 1898, significant damage. Complete overhaul of machinery and boiler during 1900. Further repairs to mechanism, boiler and tender in 1902. 1908: put out of service on the arrival of new no. **34**. 1909 out of service [MOBR2228] having been replaced by no. **34**.
- 12 'DOMINGO VEGA'** w/n 638 tender w/n 640 Into service Nov. 1858 [61]. In good condition in 1862 [15]. Under repair 1881 [63], and that year's report said "Locomotives Nos. **11** and **12** have had repairs of some importance." In use in 1884 [15]. During 1894 received complete overhaul including new copper firebox and 'Low Moor iron barrel. 1895: "The thorough repair commenced the previous year on Locomotive No. **12**, has been continued, a set of new brass tubes having been put in the boiler." In 1901 had extensive repairs to both mechanism and boiler, with a new firebox and tubes. Wheelsets prepared for changing in 1902. 1904: partial repairs. Under repair in 1908, but 1909 needed repairs to boiler, cylinders & motion [MOBR2228] and valued at \$(Pesos) 8,000. Brakes solely on tender. Boiler in poor condition, and the cylinders and motion needing work.

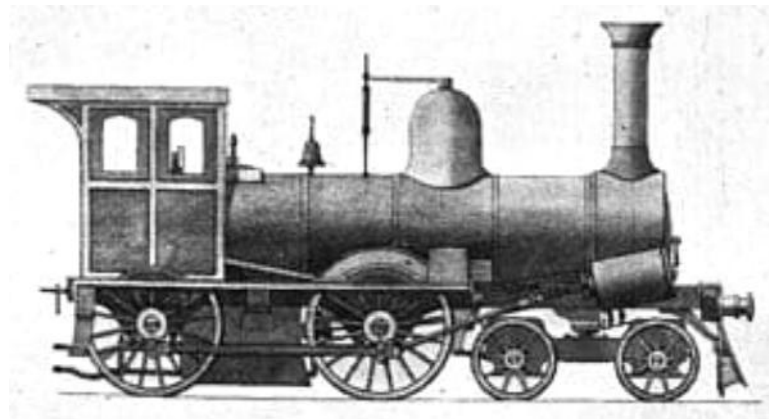
Presumably all the Kitsons were out of use by 1920, as none seemed to have received new running numbers.



These three images, the photo above, side elevation below, and the summary of dimensions below that, all come from the enormous Kitson albums held by the SLS library in Bristol. Thanks are due to Gerry Nickolls, the SLS librarian, for permission to copy these.



Cylinders.		
DIAMETER	STROKE	CENTRES
16½"	24"	6'-1"
Diams. of Wheels.		
LEADING	DRIVING	TRAILING
3'-0"	5'-2"	5'-2"
Tubes.		
NUMBER	DIAMETER	
175	2"	
Heating Surface.		
FIRE BOX	77	
TUBES	991	
TOTAL	1068	
GRATE AREA		
Order Numbers.		
635-38 : 4 OFF.		



Sketch found in P. C. Dewhurst archive at the NRM in York.

The 1859 head-on collision

During 1959 Liberal rebels attempted unsuccessfully to overthrow the government led by Presidente Manuel Montt. In Copiapó the rebels were led by Pedro León Gallo.

From source [69]: "The accident occurred on the night of May 6 to 7, at a time when, after receiving the news of the victory of the government's arms, the leaders of the revolution fled, and the mob, in possession of the province, had become the owner of the Company's properties, which the employees had to abandon. That night the revolutionaries ran a train from Caldera to Copiapó and another from Copiapó to Caldera; Thirty miles from Caldera the two trains met, one running at a speed of thirty-five miles per hour. The crash was terrifying. The number of deaths and injuries that occurred in this accident is not known for certain, but the two locomotives and the cars were smashed into a thou-

sand pieces.

Due to the revolution, the motive power, the most essential, had suffered greatly. Two of the locomotives were entirely torn to pieces by the accident already referred to, and most of the others were so damaged by the crazy management of the revolutionaries that they needed serious repairs to be able to serve for some more time. However, through vigorous work it was possible to put them in a state to be able to meet the demands of the traffic.

At the same time orders were made for a new locomotive to England and another to the United States, and for two complete boilers to be fitted to the existing locomotives.”

The locos involved seem to have been nos. **6 ‘ALLAN CAMPBELL’** that had been proceeding from ??, and **4 ‘CHILE’** running in the opposite direction.

Replacement locomotives

As was mentioned above, two new engines were ordered to replace those destroyed in the collision. The company’s annual reports mention these new machines in the following terms [via source 69]:

Mid 1859: At the same time orders were made for a new locomotive to England and another to the United States, and for two complete boilers to be fitted to the existing locomotives.

End 1859: The two ordered locomotives, one to England and the other to the United States, were being built in accredited factories, and should be concluded in the month of January. The boilers that were ordered for the old locomotives are currently on their way to Caldera and can be expected in a few months.

Mid 1860: Due to various circumstances, the arrival of the new locomotives previously ordered has been delayed; but to date they are on their way to Caldera and I can hope that they will arrive very soon.

End 1860: The two locomotives ordered, one from the United States and the other from England, have arrived, but the latter is not yet assembled. Both machines are of the first order and the best that the art has been able to produce up to now in this field. Its cost in the factory is 3,200 pounds for one and 14,500 US dollars for the other.

Mid 1862: In one of my previous reports, I promised to present to you in a timely manner a comparison of the respective works of the locomotives No. **13** and No. **14**, which, as you will remember, they were commissioned at the same time, the first to England and the second to the United States. Here, then, the figures that show up to last June 30: (table attached) It turns out, then, that the figures in general are in favor of No. **14**; but in order to form a definitive judgment regarding the relative superiority of one of the two locomotives over the other, it will be necessary to have in view data from a longer period of service.

4-4-0 d/w 62", and cyls. 16½x24", built by Kitson & Hewitson in 1861

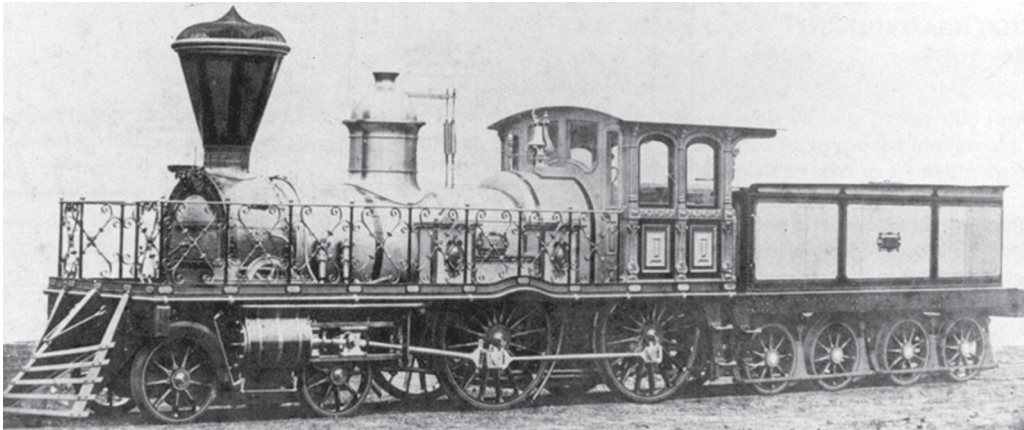
Mixed traffic loco. No. **13** was rather different in appearance from the preceding batch, having horizontal cylinders, a more fully enclosed cab, and a very highly decorated finish including an elaborate handrail around the running plate. Boiler feed may still have been by a donkey pump at the left side of the smokebox.

13 ‘MANUEL CARRIL’ w/n 761 tender w/n 762 Into service Feb. 1861 [61]. Supposedly tested on NER between Leeds and Harrogate before delivery. In good condition in 1862 [15]. Under reconstruction 1881 [63]. 1882 report said “The boiler of N.º 13 has been almost entirely rebuilt, but it is not yet completed; the work upon the engine has yet to be commenced.” 1886 “No. 13 has been placed under repair for a complete refit, which is already considerably advanced; its boiler, machinery and rolling gear, have received considerable alterations and renewals, correcting many of its old defects; in a short time it is expected to be on the road like a new engine.” 1887 “The complete refit of No. **13** has been concluded, and this locomotive is now on the road in service like a new engine.” 1898 significant repairs carried out. 1890: “Nos. **13** and **15**, as well as No. **23**, are undergoing extensive repairs.” 1891: “The extensive repairs that at the beginning of the year

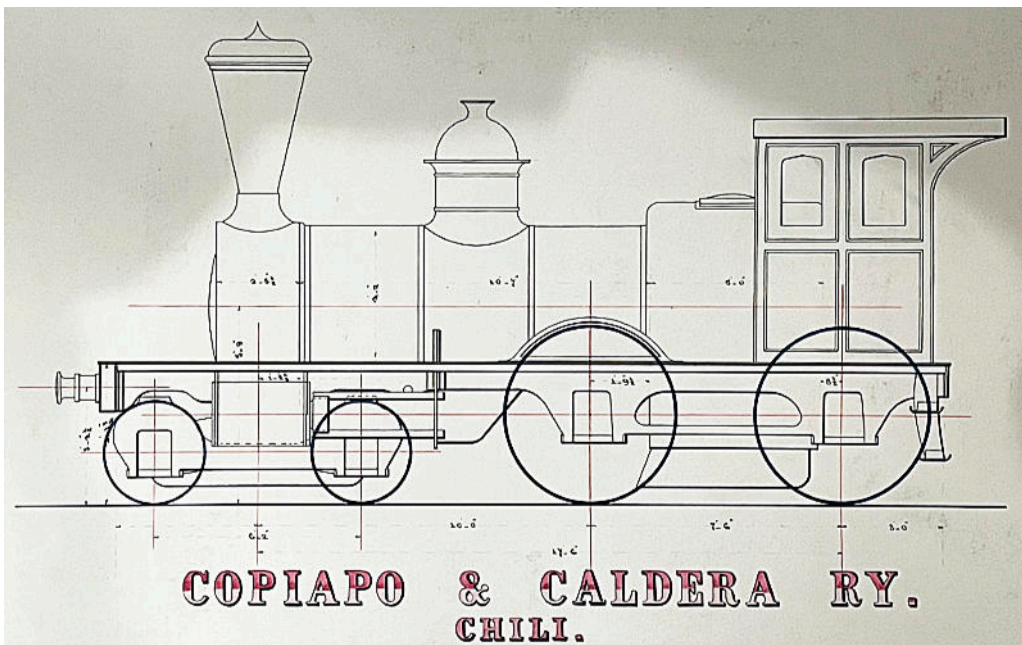
were being effected on locomotives Nos. **13**, **15** and **23**, were completed in the course of same and the locomotives are in service.”

1895: “Locomotives No. **13** and **24**, have also received some repairs of relative importance.” 1898: “Locomotives Nos. **10**, **13**, **14**, **23** and **25** have received repairs of more or less importance” 1906: “undergoing a course of repairs” 1907: “now going through a general overhaul.” 1909 major repairs under way [MOBR2228], with new copper firebox, axleboxes, brasses and connecting rods, and with cylinders rebored and repairs to the motion. Tender noted as having six wheels at that point. Valued at \$(Pesos)14,000.

Presumably all the Kitsons were out of use by 1920, as none seemed to have received new running numbers.



FC de Copiapó no. **13**, built by Kitson in 1860. Note horizontal cylinders, highly decorated railings around running board, and different chimney, dome, cab and tender.



Again these two images, the side elevation above, and the summary of dimensions below, come from the enormous Kitson albums held by the SLS library in Bristol. Thanks are due to Gerry Nickolls, the SLS librarian, for permission to copy these.

Cylinders.		
DIAMETER	STROKE	CENTRES
16½"	24"	6'-2½"

Diams. of Wheels.		
LEADING	DRIVING	TRAILING
3'-0"	5'-2"	5'-2"

Tubes.	
NUMBER	DIAMETER
198	2"

Heating Surface.	
FIRE BOX	90
TUBES	1128
TOTAL	1218 sq'

GRATE AREA

Order Numbers.
761.

4-4-0 d/w 62½", cyls. 16.25"x24", built by Rogers in 1860

Ordered Oct. 1859, shipped Jan. 1860. Rogers order number J-357 1. Rogers data sheets in PCD archive state that special features included: ball valve pump, donkey pump.

14 'JOSÉ SANTOS CIFUENTES' w/n (912 in CF list) Into service Nov. 1860 [61]. In good condition in 1862 [15]. Railway was comparing the running costs of nos. **13** and **14**, but with inconclusive results. In use in 1881 [63] and 1884 [15]. 1882 report said "Locomotive N.º **14** has had its boiler reconstructed anew throughout and the locomotive parts entirely refitted, the cylinders, which for many years had given trouble, through fractures that have difficulty been patched with brass, have had these fractures mended by fusing-on new parts of iron". 1883 "The repairs to Locomotive No. **14** began last year, have been concluded." 1889 "No. **14** has received repairs of some importance," 1891: "Locomotives Nos. **14**, **24** and **27** are in the course of undergoing considerable repairs" 1892: "No. **14** which had a cylinder broken has had it repaired and other repairs effected." During 1894 was in midst of a complete overhaul. 1895: "The thorough repair of No. **14**, begun in the previous year has been completed." 1898: "Locomotives Nos. **10**, **13**, **14**, **23** and **25** have received repairs of more or less importance," 1900 thorough overhaul and new driving wheel tyres and new pony truck wheels. Wheelsets prepared for changing in 1902. 1905: "received complete repairs, including new boiler, firebox and tubes, turning of wheel tyres and a general overhaul of its machinery; it went into service again on 11th October." 1909 under repair but boiler in good

condition as was replaced fairly recently [MOBR2228] and valued at \$(Pesos)15,000. NB Claus Gaertner suggests that this loco was Rogers 904. Weber, Taber & Moshein, Lehmuth and Connelly's Rogers lists all clearly show it as [912], but it may be that there is an alternative listing. The running no. in 1920 was **2A**.

0-4-0ST d/w 42", cyls. 11"x20", built by Rogers in 1866

Rogers order number J-508 1, ordered August 1866. Rogers data sheets in PCD archive list no special features. The mid-1864 company report stated as follows [69]: A small locomotive has also been ordered to verify the movement of the cars in the station, docks, barracks and branches of Caldera, which until now has been done with oxen.

15 'VICENTE SUBERCASEAUX' w/n (1264 in CF list) Into service Feb. 1866 [61]. In use in as Caldera shunter 1881 [63] and 1884 [15]. 1882 report said "Locomotive No. **15** has had an entirely new boiler and its machinery has been completely refitted; the saddle tank it formerly had, is being changed for side tanks." 1890: "Nos. **13** and **15**, as well as No. **23**, are undergoing extensive repairs." 1891 "The extensive repairs that at the beginning of the year were being effected on locomotives Nos. **13**, **15** and **23**, were completed in the course of same and the locomotives are in service." 1893: "No. **15**, had also repairs of some importance and a broken axle changed." 1896 considerable repairs. Considerable repairs in 1901 including new tyres. 1902 saw the tyre-changing completed and other substantial repairs. Some repairs completed in 1903. and that this engine was mostly employed shunting at Caldera. 1904: partial repairs. 1907: "new complete boiler (has) been ordered" In 1908 was receiving a new boiler. 1909 ready for service [MOBR2228], with its new boiler now fitted, new pistons and with cylinders rebored and tyres turned, and valued at \$(Pesos) 14,000. One page describes it as a 2-2-0 but another mentions four wheels coupled and a bogie at either end. Its number in 1920 was **5A**.

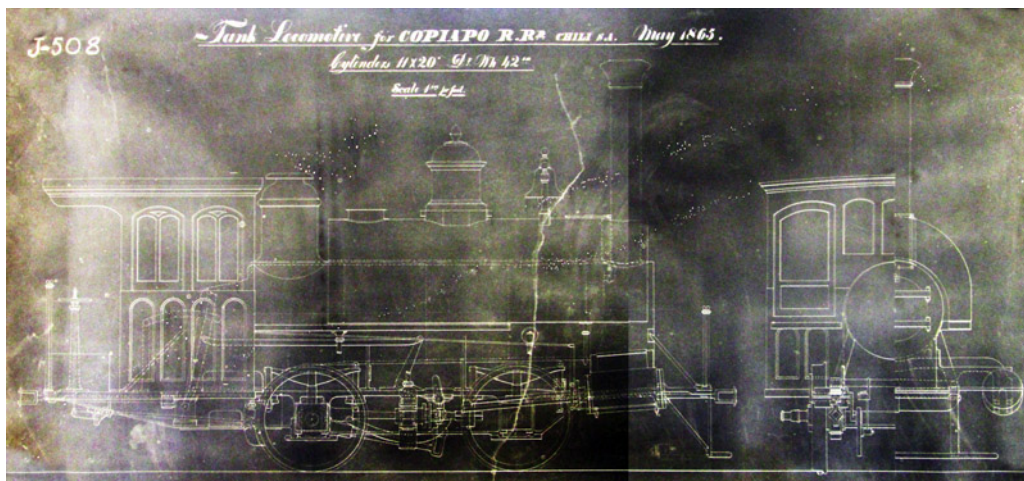
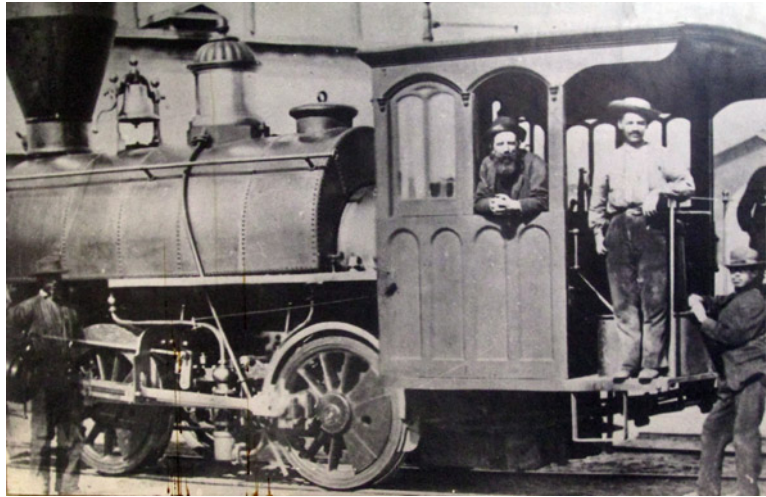


Image from a photostat of a Rogers blueprint in the P. C. Dewhurst collection at the NRM.



Unlabelled photo found in Iquique museum, and appearing to be identical to the drawing above with the exception of the spark-arresting chimney.

4-4-0 d/w 60", cyls. 13"x20", built by Rogers in 1866

Rogers order number J-507 1-3, ordered August 1866. Rogers data sheets in P. C. Dewhurst archive state that special features included: a donkey pump. There seems to have been some delay in the ordering or delivery of these three engines, for the company's reports have recorded the following as far back as mid-1864 [69]: "Although the locomotives are generally in a good state of preservation, three new machines have, however, been ordered. The three ordered locomotives are light and designed to pull passenger trains." In mid-1865 [69], the following was said: "The arrival of the new locomotives ordered to the United States, of which I spoke in one of my previous reports, has taken longer than we had calculated; but according to the latest news they were ready to be shipped and must have left New York at the end of June." RH list has these sold to Peru (*FC L-A*) in 1870, and [34] says sold to *FC Lima a Huacho* in 1868, as not suited to the *FC de Copiapó* owing to wheels being too large for freight haulage. However, they were recorded in service in 1870 at Copiapó (in the 1870 annual report) but no later than that. The annual report at the end of 1870 in fact says [69]: Four locomotives, Nos. **16, 17, 18** and **21**, and two passenger cars, which were not apparent for the traffic on this line, were sold to the Lima-Huacho railway, and their value has been recorded as pending account to invest in the locomotives and cars that must replace those sold. The cylinders on these three engines are also notably small. However, there is no trace of them in the *FC Lima á Huacho* loco list, so that is another puzzle requiring investigation. [61] says these entered service in March, April and May 1866, but that cannot be the case if they were only ordered in August of that year.

16	w/n (1256 in CF list)	Into service March 1866. Sold to <i>FC Lima y Huacho</i> in June 1870 [63].
17	w/n (1260 in CF list)	Into service April 1866. Sold to <i>FC Lima y Huacho</i> in June 1870 [63].
18	w/n (1261 in CF list)	Into service May 1866. Sold to <i>FC Pisco á Ica</i> in October 1870 [63].

2-6-0 d/w 48", cyls. 17"x22", built by Rogers in 1866

Rogers order number J-551 2. The mid-1865 to mid-1866 annual report said the following [69]: Two locomotives for freight trains have been ordered from the United States, and then at the end of 1867: Rolling stock has received an increase of 2 freight train locomotives. Rogers data sheets in PCD archive state that special features included: firebrick [?], surface blow-off cock, crankpins case-hardened. [61] says both into service in May 1867. The company annual report for 1868, as summarised by FR [69] said: The three locomotives that were received from the Chañarcillo Company were separated from traffic after a few days, both because their poor condition did not offer safety on a road that has a gradient of five percent and because their fuel consumption was excessive. We began to use the locomotives No. **19** and **20**, of American construction, which used to handle traffic between Caldera and Copiapó, and we have cer-

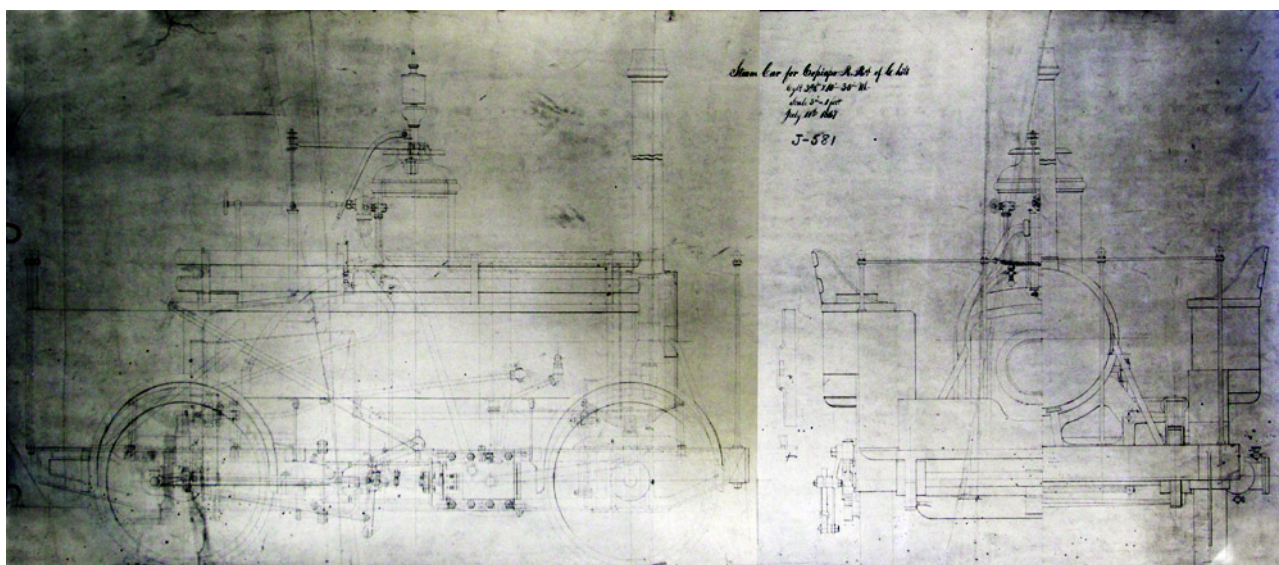
tainly obtained the happiest results. These locomotives handle the gradients of five percent pulling a net weight of 45 tons of cargo (not including the weight of the cars) against 23 tons that the others were not always able to pull. The 1871 report confirmed this [69]: Locomotives Nos. **19**, **20**, **22** and **2?** did the heavy service of the Chañarcillo line and for this reason their fuel consumption appears so high in the corresponding table. However, later in 1871 they were sold on to the *FC del Sur* in Peru, as the 1871 annual report commented [69]: Locomotives Nos. **19** and **20** were sold to “*Ferro-Carril de Arequipa*”, their value appearing in a pending account to invest in the purchase of two others that must take their place.

- | | | |
|-----------|-----------------------|--|
| 19 | w/n (1393 in CF list) | Into service 1867. Withdrawn April 1871 and sold to Arequipá [63], presumably for the <i>FCMaA</i> or the <i>FCAyP</i> . |
| 20 | w/n (1396 in CF list) | Into service 1867. Withdrawn April 1871 and sold to Arequipá [63], presumably for the <i>FCMaA</i> or the <i>FCAyP</i> . |

2-2-0T d/w 30", cyls. 3½"x10", built by Rogers in 1867

Article in *The Engineer*, Dec 31 1869, p434, says this was the first of these small inspection cars built by Rogers. Rogers order number J-581 1. Rogers data sheets in PCD archive state that special features included: boiler radial stayed, side connecting rods [with] brass bushings. “This engine has been run fifty miles in an hour and a quarter with 270 lb. of soft coal. This seems a very high speed for so small a wheel, but we do not doubt the story, as it came to us from Mr. E. P. Gould, who was superintendent of machinery of the Copiapo Railway at the time. The company were so well pleased with its performance that the Rogers Works have since built them another one, with cylinders 4½ x 12, and 4 28in. wheels.” [61] says into service in Jan 1868. The annual report for the end of 1867 said as follows [69]: The following rolling stock has been received: a small Locomotive for the use of the Engineer and for the conduction of mail; wears number **21**. Strangely, this machine is not mentioned as in use in any of the company’s annual reports. It didn’t last long at Copiapó, for the annual report at the end of 1870 said [69]: Four locomotives, Nos. **16**, **17**, **18** and **21**, and two passenger cars, which were not apparent for the traffic on this line, were sold to the Lima-Huacho railway, and their value has been recorded as pending account to invest in the locomotives and cars that must replace those sold.

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| 21 | w/n (1475 in CF list) | Steam inspection car. RH list has this sold to Peru (<i>FC L-A</i> in 1870, and [34] says sold to <i>FC Lima a Huacho</i> in 1868, as not suited to the <i>FC de Copiapó</i> . This suggests that, despite the good review copied above, it did not have the power and hill-climbing ability that was needed, hence the purchase of no. 25 with larger cylinders and smaller wheels. Not listed in 1909 [MOBR2228]. Not listed in 1920. |
|-----------|-----------------------|---|



These side and end elevations come from a Rogers blueprint photostat in the Dewhurst collection in the NRM at York. This has been inverted in tone for display here.

4-6-0 dr. wheels 48", cyls. 16"x24", built by R. & W. Hawthorn in 1860 and 1863, ex FC de Chañarillo

Three taken over with the railway by the *FC de Copiapó* in 1868? whilst the fourth one had been wrecked in an accident in 1868 (see below), though [18] confirms that it remained in existence and was taken into the Caldera workshops for rebuilding in 1899.

The company annual report att the end of 1868 said [69]: The three locomotives that were received from the Chañarillo Company were separated from traffic after a few days, both because its poor condition did not offer safety on a road that has a gradient of five percent and because its fuel consumption was excessive. We began to use the locomotives No. **19** and **20**, of American construction, which used to handle traffic between Caldera and Copiapó, and we have certainly obtained the happiest results. These locomotives handle the gradients of five percent pulling a net weight of 45 tons of cargo (not including the weight of the cars) against 23 tons that the others were not always able to pull.

Locomotives received from the Chañarillo Company:

1 locomotive in good condition.

2 locomotives that need new fireboxes

And then at the end of 1869 the report said [69]: Locomotive No. **22** has received an extensive repair and in its test trip it was able to pull a weight 50% greater on the "Chañarcillo Line" than when it belonged to the selling Company. The same reform will be made to Locomotives No. **23** and **24** with the addition of new fireboxes.

22¹ 'PABELLÓN'	w/n 1093	Whilst this engine had been taken into the working fleet in 1868 on the purchase of the CER, and seems to have been the one of them most rapidly overhauled and put into service, [63] from 1881 says that this loco had then been sold to Iquique in 1871. Earlier that year it had been working again on the Chañarillo line as confirmed by the 1871 annual report [69]: Locomotives Nos. 19 , 20 , 22 and 2? did the heavy service of the Chañarillo line and for this reason their fuel consumption appears so high in the corresponding table.
22² unnamed	w/n 1324?	Original date into service given as 1868 in report [MOBR2228] from 1909. Out of use for 30 years after a collision on the CER before that railway's takeover by the Copiapó Railway, but in 1881 "From the time of the purchase of the Chañarillo line, there was the wreck of a Locomotive destroyed in an accident, (of the No. 24 class) lying by. Many of its small pieces were used as duplicates for the other engines of its class. Taken lately to Caldera, the boiler has been found to be in a very good state, and with a comparatively small repair that is being made to it, it will serve later on to change that of No. 24 ." And then in 1899: "With the frames and other parts of a locomotive that belonged to the Chañarillo line, and which was destroyed in an accident which happened before that line was purchased by this Company in 1868, a locomotive is being rebuilt of the No. 23 and 24 class, which will carry No. 22 . With a comparatively small expense the Company will soon acquire a new and powerful locomotive." Returned to service in October 1903 after a complete overhaul, and then took the vacant number 22 . In 1899 its frames and other parts (quoted again as having been destroyed in an accident before the Chañarillo line was taken over) were being rebuilt to create a new no. 22² . This work still underway in 1900, and also in 1901. By the end of 1902 it was reported as considerably advanced,

23 'BLAS OSSA VARAS'

w/n 1094

and eventually entered service in October 1903. During 1908 it was under repair but was stated to need a replacement boiler. In 1909 it needed boiler repairs [MOBR2228] (though the annual report to shareholders that it had now received its new boiler,) and was valued at \$(Pesos) 16,000. At that time it had an eight-wheeled tender. By 1920 this loco carried running no. **6A**. In 1929 a replacement boiler was purchased from Hawthorn Leslie for this loco, along with one for no. **31/15A**.

This had been '**CHAÑARCILLO**' but was renamed on takeover by the Copiapo company to avoid confusion with loco no. **2**, albeit that engine had already been withdrawn. The 1871 annual report [69] said: All the locomotives are preserved in perfect condition, having refurbished, or better said, rebuilt, locomotives Nos. **8** and **23** that, through their new fireboxes, boilers and tenders, will provide services for many more years. It was sold in 1879 to the government for use over the Pisagua section of the Nitrate Railways during the War of the Pacific, ("With the sale of Locomotive No. **23** to the Government at the end of 1879, the locomotive power fit for the Chañarcillo line is considerably reduced, and it has become necessary to order another Locomotive as advised by the chief of this department.") but then returned to the Copiapó Railway in 1882 [*Liverpool Mercury* report of AGM, 20 October 1880, and 16], annual report for 1882 said "Locomotive N.º **23** that was sold to the Government in 1879, was returned from Pisagua, and re-purchased by this Company for the sum of \$ 8,000. It requires costly and extensive repairs, that will be undertaken as soon as possible." It was under repair in 1884, parts being awaited from England, and some boiler plates were replaced [15], as the 1884 report stated "The work on Locomotive No. **23** is not yet completed, but the greater part of the necessary work has been done; the boiler has been partly rebuilt and nearly all the copper stay bolts and other interior fittings have been put in now. The eccentric crank pins ordered from England for this Locomotive have not yet arrived." 1885 "No. **23** the repairs to which were begun the previous year, has been completely repaired and is now on the road, to all purposes like a new engine." 1890: "Nos. **13** and **15**, as well as No. **23**, are undergoing extensive repairs.' 1891: "The extensive repairs that at the beginning of the year were being effected on locomotives Nos. **13**, **15** and **23**, were completed in the course of same and the locomotives are in service." 1895: "Locomotive No. **23** has received a thorough repair; its boiler has been almost made anew, having had a complete new firebox and a set of brass tubes renewed; it also had important repairs in the working parts." 1898: "Locomotives Nos. **10**, **13**, **14**, **23** and **25** have received repairs of more or less importance" Significant repairs to motion during 1899 and new tyres fitted to driving wheels. Some repairs completed in 1903. 1904: important general repairs. 1905: "undergoing general repairs not yet completed." 1906: "received a thorough overhaul; new cylinders were put in, and various other parts of its machinery

renewed; one copper sheet in the firebox and 170 tubes were changed, and sundry other repairs were effected to the boiler; a new water tank placed on the tender; and general overhaul of the wheel gear.” In 1909 it had been recently overhauled but had defects in a tubeplate [MOBR2228]. However it was valued at \$(Pesos)17,000. By 1919 it had gained side tanks. By 1920 it carried the running no. **7A**.

24 ‘JOAQUIN SEGUNDO TOCORNÁL’ w/n 1190 PM’s list says this was a 2-6-0, whilst another source (recorded in a P. C. Dewhurst list) says it was a 2-4-0 built by Hawthorn in 1863. 1880 “Locomotives Nos. **6** and **24** require repairs which will be attended to with preference, being the only ones that together with No. **8** are fit for the Chañarcillo line.” Under repair at end of 1881 [63], and that year’s report said “Locomotive No. **24** has had a complete repair; part of the fire box and all the tubes new; the shell of the boiler renewed ; in a few days it will be out of the works in perfect state.” In use in 1884 [15]. 1885 “No. **24** is undergoing a thorough repair; the greater part of the work has already been effected, so that it will shortly be on the road again; in both this and N. **23** the pumps have been advantageously exchanged for Hancock’ Inspirators.” 1886 “No. **24**, the repairs to which were begun last year, has been completed and is now on the road.” 1888 “Locomotive N." **24** has received a thorough repair in its boiler and machinery.” 1889 “No. **14** has received repairs of some importance, as well as Nos. **24** and **25**.” 1891: “Locomotives Nos. **14**, **24** and **27** are in the course of undergoing considerable repairs” 1892: “No. **24** has had extensive repairs to its boiler, having had a new copper firebox with all new brass tubes put in and several sheets changed in the barrel.” 1893: “No. **24**, had completed the repairs begun the previous year.” 1895: “Locomotives No. **13** and **24**, have also received some repairs of relative importance.” Undergoing complete overhaul in 1899 including one new cylinder. In 1900 a complete bottom end over-haul, also one new cylinder, new driving wheel tyres and all new boiler tubes. 1905: “repairs of some importance in its machinery, new copper tube sheet put in boiler along with 175 new brass tubes.” 1909 recently overhauled [MOBR2228], and confirmed as similar to **22**² and **23**. At that time it was receiving boiler repairs including a new tubeplate and retubing, reboring of the cylinders, and repairs to the motion, and was valued at \$(Pesos)19,000. Running number by 1920 was **8A**. [18] says this was last standard gauge loco to be overhauled, in 1923. Don Joaquin Tocornal had been a Chilean conservative politician and minister. He died in 1865.

2-2-0T d/w 28", cyls. 4.5"x12", built by Rogers in 1869

Rogers order number J-655 1, shipped Oct. 1869. Rogers data sheets in PCD archive state that special features included: 2 pumps, wood brake shoes. Comparison with no. **21**, sold out of service as unsuitable to the line, shows that this later machine had slightly smaller wheels and substantially larger cylinders. The annual report at the end of 1870 recorded roughly as follows [69]: A small locomotive was received, bearing the No. **25** and costing \$4,676 00.

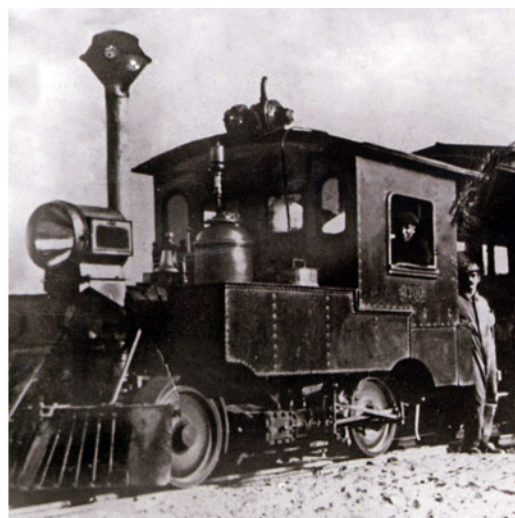
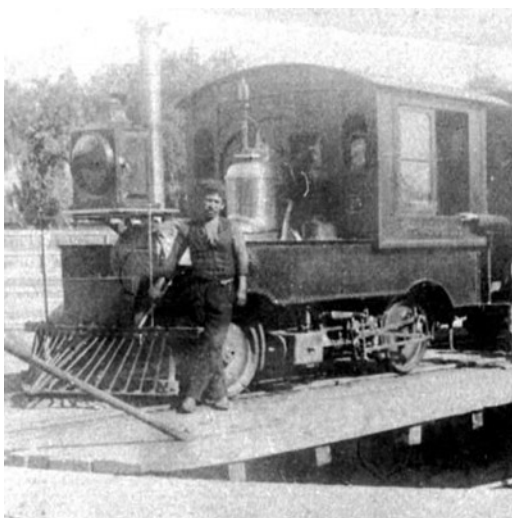
25 ‘TOMÁS G. GALLO’ w/n (1666 in CF list) The 1871 annual report (as interpreted by FR [69]) said: One of

these locomotives (**19** and **20**) and the four sold in 1870 have been replaced by number **25** that has been in service for a year, numbers **26, 27** and **28** (for passenger trains), which will be on the rails in a few days and number **29** (for cargo), which is on its way. Described in 1881 [63] as in service for express trains. In use in 1884 [15]. 1889 “No. **14** has received repairs of some importance, as well as Nos. **24** and **25**.” 1890: “The small express Locomotive, No. **25**, has been completely re-built, having received a new boiler, new wheels and axles, as well as the greater part of its machinery renewed.” 1897: “Locomotives Nos. **25** and **28** have received complete overhauls and repairs. ” 1898: “Locomotives Nos. **10, 13, 14, 23** and **25** have received repairs of more or less importance” In 1902 it received a complete overhaul of both mechanism and boiler including new brass tubes. Some repairs completed in 1903. 1906: “undergoing a course of repairs” 1907: “complete overhaul, having had new cylinders and new copper firebox put in;” 1909 in regular use [MOBR2228], with comment that it had been re-boilered and re-cylindered at some point. It was valued at \$(Pesos)5,000. It pulled ‘*un carro pequeño*’.

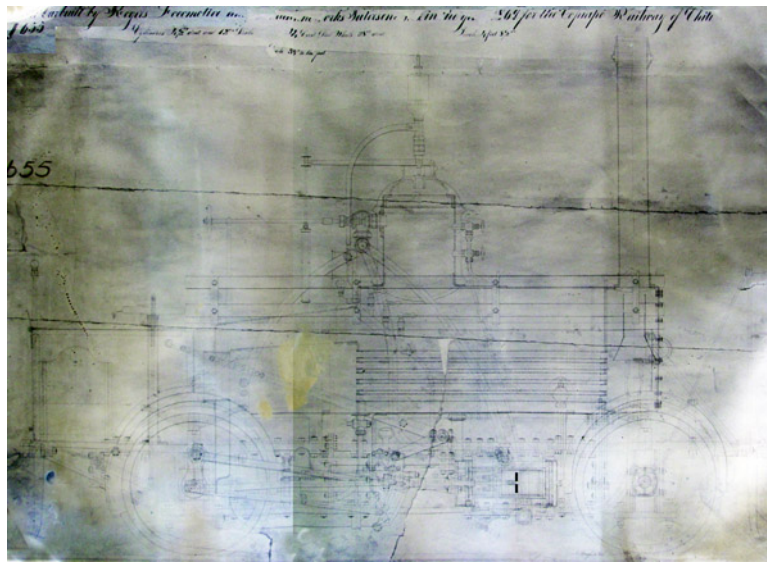
For a couple of years after the supposed removal of the name ‘**TOMÁS R. GALLO**’ in 1894, lists tended to show this engine as un-named, but then the original name starts to re-appear, eg. in annual reports.

Supposedly it carried five different numbers, **25**, then ?, then ?, then *EFE 9A*. (by 1920), and finally *EFE 3200*. However, this not borne out by *FC de Copiapó* records which suggest that renumberings of the railway’s locos were very rare indeed.

Sold to Braden Copper Co. 1931, for scrap? [11]. Photos suggest it received slightly larger tanks in later life. The 1930 US report lists this loco in the metre gauge fleet, seeming to confirm that it was indeed regauged. Sr. Tomás Gallo was a replacement director of the Copiapo Railway Co. in an 1888 list.



The later image on the right shows larger tanks, and altered cabsides as well as a turbo-generator on the cab roof and a small spark arrestor.



The drawing is from a photostat copy of a Rogers blueprint, found in the Dewhurst collection at the NRM in York. Whilst this inverted-toned reproduction is very poor, larger versions have sufficient detail to enable close study.

4-2-0T d/w 38", cyls. 8"x12", built by Rogers in 1871

Rogers order number J-769 1-3, shipped April 1871, but only into service in March and April 1872 [63].

Rogers data sheets in PCD archive state that special features included: 2 pumps, 1 injector, feedwater heater. The 1871 annual report (as interpreted by FR [69]) said: One of these locomotives (**19** and **20**) and the four sold in 1870 have been replaced by number **25** that has been in service for a year, numbers **26**, **27** and **28** (for passenger trains), which will be on the rails in a few days and number **29** (for cargo), which is on its way.

26 'GREGORIO OSSA CERDA' w/n (1907 in CF list) 1872 in use on passenger trains. Out of service from August 1879 and under repair at end of 1881. 1882 "N.º **26** underwent a thorough repair throughout similar to what had been done before to its sister-engines N." **27** and **28**, and is now on the road running the passenger trains with the same economy of fuel as the others" In use in 1884 [15]. 1885 "Locomotive No. **26** in passenger traffic has received a thorough repair, so the three locomotives of this class are in good state. " 1889 "The passenger locomotives Nos. **26**, **27** and **28** have all had repairs of some importance effected." 1890: "Of the passenger locomotives, No. **26** has had repairs of some importance" 1891: "Locomotives Nos. **6** and **26** have also received repairs of some importance." 1892: "No. **26** has had an entirely new boiler put in and extensive repairs have been made to its machinery." 1895: "The passenger Locomotives No. **26**, **27** and **28**, have also received some important repairs and have had one of their pumps changed for a Hancock inspirator." 1898: "Nos. **26** and **27** received general repairs." Complete overhaul in 1903 including two new cylinders. 1905: "new firebox and tubes put in boiler and a general overhaul of its machinery." 1909 out of service following a collision [MOBR2228] and valued at \$(Pesos)5,000. By the end of that year it had been repaired in its motion, wheels and tanks. By 1920 was no. **10A**.

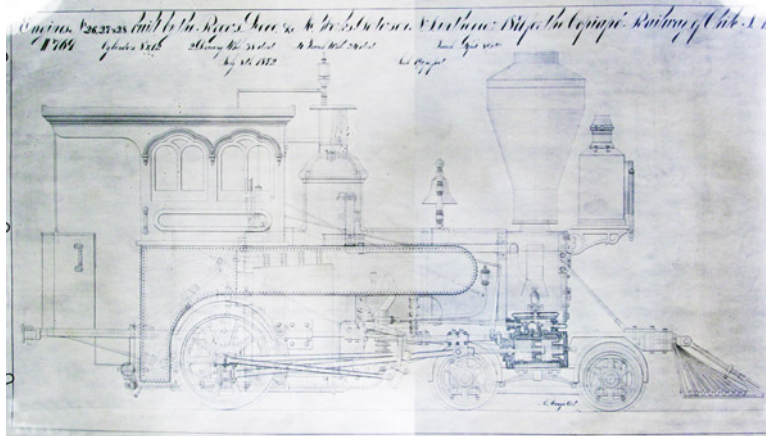
27 'MATIAS COUSIÑO' w/n (1908 in CF list) 1872, 1881, and 1884 in use on passenger trains. Had received heavy boiler work in 1884 [15], as 1884 report stated "Locomotives Nos. **27** and **28**, which are sister engines and employed in the service

of the passenger train, have received considerable repairs; the working parts have been repaired, parts of the boilers and fireboxes and tubes renewed.” 1888 “Nos. **27** and **28** have received repairs of some importance.” 1889 “The passenger locomotives Nos. **26**, **27** and **28** have all had repairs of some importance effected.” 1891: Locomotives Nos. **14**, **24** and **27** are in the course of undergoing considerable repairs, the last requiring a new boiler which is already constructed.” 1892: “No. **27** has had the new boiler that was built the previous year put in; some of its wheel tires have been changed, and other important repairs effected.” 1893: “Through the accident on 3rd April, No. **27** required some general repairs and three new axles [overturned at Bodega when on passenger train through set of points having been changed].” 1895: “The passenger Locomotives No. **26**, **27** and **28**, have also received some important repairs and have had one of their pumps changed for a Hancock inspirator.” “General repairs carried out in 1898. In 1901 received thorough overhaul. 1904: complete overhaul, new firebox and change of tubes, as also new wheels and axles on the truck.” 1905: “tyres of all wheels re-turned and... sundry repairs.” 1908 under repair and receiving new boiler and tyres. 1909 recently overhauled [MOBR2228], having received boiler repairs, re-tubing, driving wheels tyres turned and motion repairs, and replacement bogie wheels and axles, and valued at \$ (Pesos)8,500. Photographed in use in 1913 at Monte Amarga by Prof. Isaiah Bowman. By 1920 was **11A**.

28 ‘JOSÉ FRANCISCO GANA’ w/n (1910 in CF list) 1872, 1881 and 1884 in use on passenger trains.

Had received heavy boiler work in 1884 [15], as 1884 report stated “Locomotives Nos. **27** and **28**, which are sister engines and employed in the service of the passenger train, have received considerable repairs; the working parts have been repaired, parts of the boilers and fireboxes and tubes renewed.” 1888 “Nos. **27** and **28** have received repairs of some importance.” 1889 “The passenger locomotives Nos. **26**, **27** and **28** have all had repairs of some importance effected.” 1890: “a new boiler has been made for No. **28**, which will be put in at the first opportunity.” 1891: “Locomotive no. **28**, for which a new boiler was already constructed, has received a thorough refit.” 1893: “No. **28**, also needed some repairs after the accident on 27th February (see above), but they were of little importance.” 1895: “The passenger Locomotives No. **26**, **27** and **28**, have also received some important repairs and have had one of their pumps changed for a Hancock inspirator.” 1897: “Locomotives Nos. **25** and **28** have received complete overhauls and repairs.” 1898: “Locomotives Nos. **11** and **28** suffered a collision at Punta del Cobre on 15th June, receiving damages that necessitated repairs of importance, particularly the latter, which being the lighter engine, experienced greater damages.” Two new cylinders fitted in 1899 and a general bottom end overhaul. In 1901 received thorough overhaul. Some repairs completed in 1903. 1904: “On 18 September when the passenger train from Caldera to Pabellon was at Kiulometer 22, a frac-

ture in the firebox of Locomotive No. 28 scalded the driver and the fireman. The latter Francisco Gutierrez was killed by thee train going over him when he jumped from the engine, the driver Valentin Elias Lopez died two days after. The cause is attributed to excessive pressure of steam.” 1905: “undergoing general repairs not yet completed.” 1906: “undergoing a course of repairs” 1907: “complete overhaul,” In 1909 it needed repairs to boiler and motion [MOBR2228] and was therefore only valued at \$(Pesos) 7,000. By 1920 it was numbered **12A**.



Taken from a photostat copy of a Rogers GA side elevation blueprint in the P. C. Dewhurst archive at the NRM in York.



No. **26** is seen here in a Rogers builders' photo before delivery.

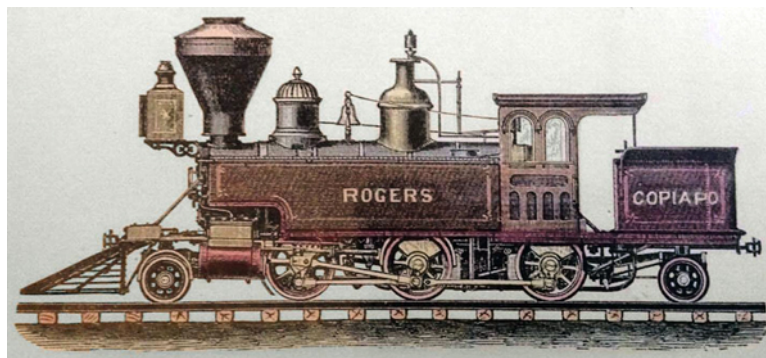


Photo by Dr. Isaiah Bowman 1913, in AGS collection at <http://uwm.edu/libraries/agsl/photos/> showing no. **27** at Monte Amarga. Note that the spark-arresting chimney shown in the drawing and photo above has been replaced by a straight stack. The rear bunker is now taller and seemingly more angular than the original, it possibly now being an oil tank.

2-6-2T later 2-6-0 d/w 40¼", cyls. 15"x20", built by Rogers in 1871

Rogers order number J-793 1, shipped Nov 1871. Rogers data sheets in PCD archive state that special features included: 2 pumps, 1 injector. This engine started life as a 2-6-2T but was reconstructed as a 2-6-0, possibly still with its tanks. The 1871 annual report (as interpreted by FR [69]) said: One of these locomotives (**19** and **20**) and the four sold in 1870 have been replaced by number **25** that has been in service for a year, numbers **26**, **27** and **28** (for passenger trains), which will be on the rails in a few days and number **29** (for cargo), which is on its way.

29 'JOSÉ JOAQUIN VALLEJO' w/n (1980 in CF list) 1872 in use on Chanarcillo line. Out of service from April 1877 at least until end of 1881 awaiting reconstruction. 1881 report said "It will be remarked that Locomotive No. **29** has done very little work. Its model is so defective, that it will require to be almost entirely reconstructed to be of any service. It was intended for the Chañarcillo line." 1888 "The remodelling of No. **29**, which is to be converted from a "Tank-Engine" with ten wheels, into an eight-wheel locomotive with a tender, has been commenced, and considerable progress made in its boiler, rolling-gear and machinery." 1889 "Considerable progress has been made in the rebuilding of No. **29**." PM's list says this was a 2-6-0TT, supported by [MOBR2228] which mentions a four-wheeled tender of 19 tonnes. 1890: "The re-building of No. **29** has been completed, and it is now transformed into an eight-wheel engine with tender." 1893: "No. **29**, also suffered some slight damage at the latter accident (ie. that on 27th February 1893); but subsequently it has had to be taken off the road for a general overhaul." Had extensive repairs in 1894, with two driving wheels replaced and others having new tyres, also extensive boiler repairs and retubing, and a complete over-haul of the motion. During 1900 received a general overhaul of machinery and boiler. 1905: "complete repairs, including new boiler..., general overhaul of its machinery, tyres changed on one pair of driving wheels and the rest turned anew; it went into service again on 5th November." In 1909 it had been laid aside for 12 years (sic) after the rupture of a cylinder but was in course of rebuild with new boiler [MOBR2228], and new cylinder and brasses. The tender had apparently been rebuilt previously. Value in 1909 was \$(Pesos) 16,000. One Rogers' list says running no. was **28**, but list sent in response to P. C. Dewhurst's enquiry says **29**, as did 1909 inventory. By 1920 it was numbered **13A**.



A Rogers artist's impression, produced for publicity and catalog purposes.



This mysterious engine was photographed at Pledra Colgada station at some unknown date. It appears to be a six-coupled Rogers engine, but has side tanks as well as a tender. The 1871-built Rogers 2-6-2T listed above as no.

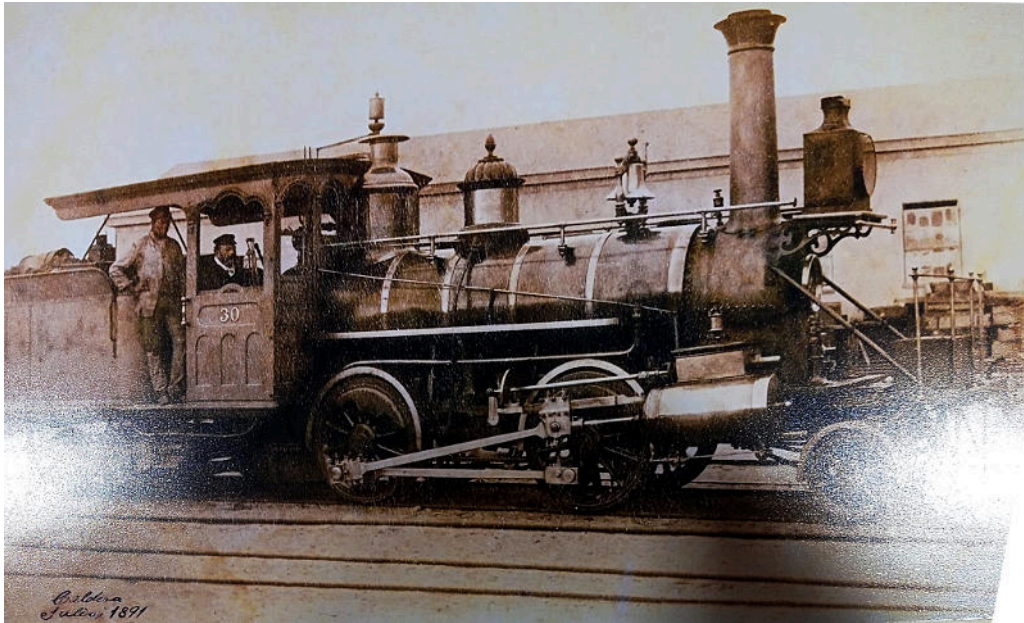
29 'J. J. VALLEJO' was later given a tender in place of its bunker and trailing truck, but the side tank shown is rather smaller than that engine was built with.

2-4-4T d/w 42", cyls. 11"x20", built by Rogers in 1872-3

Rogers order number J-854 1, June 1872. Rogers data sheets in PCD archive list no special features. 1909 quoted as d/w 43", and cyls. 11x20" [MOBR2228].

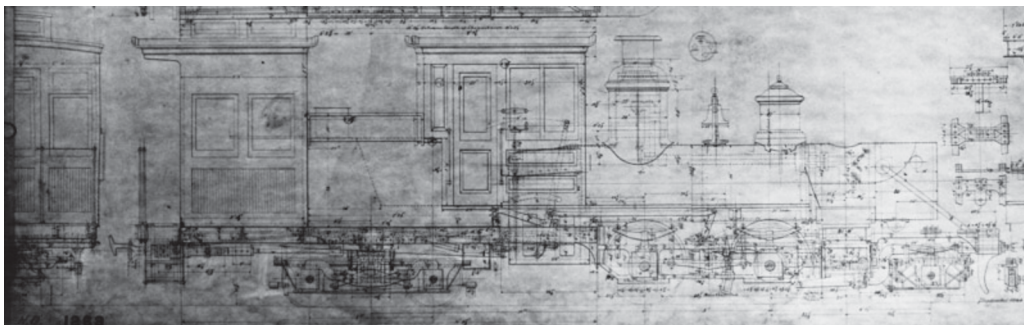
30 'ALLAN CAMPBELL' w/n 2193

PM's list and [17] say this was a 2-4-2T but Rogers list sent in response to P. C. Dewhurst's enquiry confirms it as 2-4-4T. In use as Caldera shunter in 1881 [63] and 1884 [15] and indeed for many years. 1881 report said "Locomotive No. **30** has had a complete overhaul of its boiler and machinery, and is now in perfect state." 1885 "No. **30** has also had considerable repairs effected in its boiler and machinery." 1889 "No. **30** is also under repair and has had an entirely new boiler put in." 1893: "No. **30**, and No. **31**, have also had repairs of some importance." 1896: "Locomotives Nos. **11**, **15**, **30** and **31** have also received considerable repairs of more or less importance." 1897: "Nos. **10**, **11** and **30** have also had important repairs carried out." 1902 saw several wheels replaced and also several boiler and firebox plates. 1904: important general repairs. 1905: "undergoing general repairs not yet completed." 1906: "a complete overhaul; some wheels were changed, and all had new tyres put on, new copper firebox put in, and the boiler almost made new." 1909 in use [MOBR2228]. It is possible that by then it had lost its rear cabin and maybe even the bunker and rear bogie, as there is no mention of a rear bogie. However, one page says "*de 4 ruedas acopladas i 1/2 bogie con 1/2 tender en el marco*". It is clear from the loco distance tables in the company annual reports that this engine was mostly employed shunting at Caldera. Its value in 1909 was \$(Pesos) 14,000. By 1920 it was numbered **14A**. Sr. Allan Campbell was an American engineer working in Chile. He surveyed the route of the Tongoy railway, and was the chief engineer for the construction of the *FC de Copiapó*.



A recently discovered photo of no. **30**, supposedly taken at Caldera in 1891.

There are two main differences from the Rogers blueprint displayed below. The first is that the cab is now open at the rear and with a much longer overhang to the roof, and the second is that the inspection compartment behind the bunker and tank seems to have disappeared. This latter change is not really a surprise if the engine was being used mainly as a shunter/switcher rather than as an officers' inspection saloon.



This inverted-tone copy of a photostat of a Rogers blueprint in the Dewhurst collection at the NRM shows that there was a clerestory-roofed inspection saloon at the rear end. Note that the chimney has been omitted from the drawing, and also that no cow-catcher/pilot is shown at either end.

The fleet in 1881

A recent discovery has thrown much more light on the fate of a number of early withdrawals and sales. The table below has been compressed from a much wider one that was published in *Informe de las operaciones del año 1881 y Memoria de los 20 años 1852-1881*. Intermediate columns detailing major dimensions of each loco have been omitted to enable the more important columns for our purposes to remain legible. The full table is available in an appendix.

NUMERO Y NÚMERO	FABRICANTES	Fecha en que entró al servicio	Fecha hasta que ha funcionado	Kilómetros corridos	OBSERVACIONES
Serie de series	Builders	Since when in service	Last date	Kilometres run	Remarks
1 Copiapó.....	Norris, Filadelfia.....	Julio 4, 1851....	Agosto, 1858....	118,643	Fuera del servicio desde Agosto de 1858.—Reconstruida para la Exposicion en Santiago en 1875.
2 Chañarcillo.....	Id.....	Setiembre, »....	Octubre, 1857....	86,143	Out of service since August 1858.—Rebuilt for Santiago Exhibition 1875.
3 Tres Puntas.....	Id.....	Noviembre, »....	Julio, 1862.....	122,247	Abandonada desde Octubre de 1857.—Abandoned since October 1857.
4 Chile.....	Id.....	Diciembre, 1859....	Mayo, 1859.....	49,034	Id. do. do. July 1862.
5 Coronel Gana *.....	Id.....	Agosto, 1853....	Agosto, ».....	96,139	Destruída en el accidente del 6 de Mayo de 1859.—Destroyed by accident 6th of May 1859.
6 Alfoa Campbell.....	Id.....	Setiembre, »....	Diciembre, 1881....	106,213	Funcionó hasta Agosto de 1859.—Reconstruida bajo el núm. 6, volvió al servicio en Noviembre de 1870.
7 W. W. Evans.....	Id.....	Mayo, 1851....	Mayo, 1859....	95,605	In service until August 1859.—Rebuilt under number 6 and brought again into service November 1870.
8 W. Taggart.....	Id.....	Octubre, »....	Agosto, 1864....	108,630	Destruída en el accidente del 6 de Mayo de 1859.—Destroyed by accident 6th of May 1859.
9.....	Id.....	».....	Marzo, 1863....	106,077	Abandonada desde Agosto de 1864.—Abandoned since August 1864.
10.....	Kitson, Thomson & Hewison, Leeds.....	Julio, 1858....	Diciembre, 1881....	77,900	Funcionó hasta Marzo de 1863.—Reconstruida bajo el número 8, volvió al servicio en Marzo de 1872.
11.....	Id.....	».....	».....	282,080	In service until March 1863.—Rebuilt under number 8 and brought again into service March 1872.
12.....	Id.....	».....	».....	245,022	En servicio.—In service.
13.....	Id.....	».....	».....	231,067	Id. do.
14.....	Id.....	».....	».....	298,387	Id. do.
15.....	Kitson & Hewison, Leeds	Febrero, 1864....	Abril, ».....	270,776	Reparándose.—Under repairs.
16.....	Rogers, Paterson, Nueva Jersey.....	Noviembre, 1860....	Setiembre, 1879....	271,647	En reconstrucción.—Under reconstruction.
17.....	Id.....	Febrero, 1866....	Diciembre, 1881....	271,647	En servicio.—In service.
18.....	Id.....	».....	».....	85,502	En servicio remolcando carros en Caldera.—Shunting engine at Caldera.
19.....	Id.....	».....	».....	78,686	Vendida al Ferro-carril de Huacho en Junio de 1870.—Sold for the Huacho Railway. June 1870.
20.....	Id.....	».....	».....	83,370	Id. id. id. id. de 1870.—Do. do. do. do. 1870.
21.....	Id.....	».....	».....	38,832	Id. id. de Pisco en Octubre de 1870.—Do. Pisco do. October 1870.
22.....	Id.....	».....	».....	45,746	Id. id. de Arequipa en Mayo de 1871.—Do. Arequipa do. May 1871.
23.....	Id.....	».....	».....	».....	Id. id. de id. en id. de 1871.—Do. do. do. do. 1871.
24.....	Id.....	».....	».....	».....	Id. id. de Huacho en Octubre de 1870.—Do. Huacho do. October 1870.
25.....	R. & W. Hawthorn, Newcastle sobre el Tyne.....	Noviembre, »....	Agosto, 1871....	12,650	Id. id. de Iquique en Setiembre de 1871.—Do. Iquique do. September 1871.
26.....	Id.....	».....	Agosto, 1879....	57,024	Id. al Gobierno Chileno en Noviembre de 1879.—Do. to Chilean Government. November 1879.
27.....	Id.....	».....	Junio, 1881....	93,703	Reparándose.—Under repairs.
28.....	Rogers, Paterson, Nueva Jersey.....	Julio, 1870....	Diciembre, »....	».....	En servicio para trenes expresos.—In service for express trains.
29.....	Id.....	».....	».....	».....	Reparándose.—Under repairs.
30.....	Id.....	».....	».....	».....	En servicio.—In service.
31.....	Id.....	».....	».....	».....	Id. do.
32.....	Id.....	».....	».....	».....	Por reconstruirse.—To be reconstructed.
33.....	Id.....	».....	».....	».....	En servicio remolcando carros en Caldera.—Shunting engine at Caldera.

* Reconstruida en los Talleres de Caldera bajo el número 6.
† Entraron en la compra del Ferro-carril de Chañarcillo.

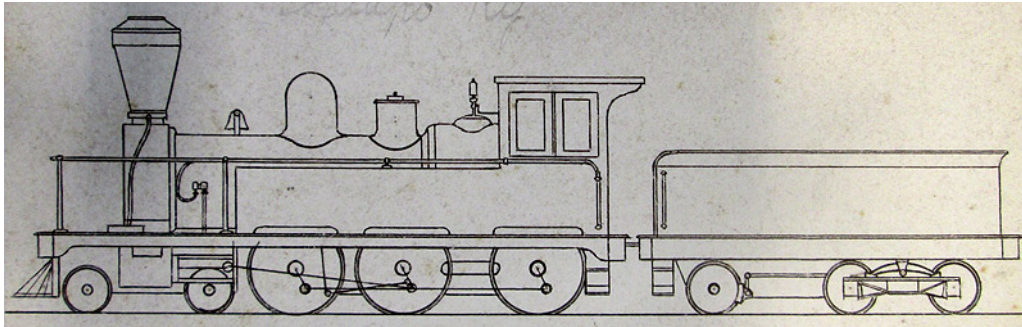
4-6-0TT d/w 1219mm 48", cyls. 406x610mm 16x24". Built by R. & W. Hawthorn in 1881/2 or 1883

Some similarities to the earlier Hawthorn 4-6-0s for the *FC de Chañarcillo* (see above), but with side tanks, Joy valve gear and a crosshead-driven feed pump.

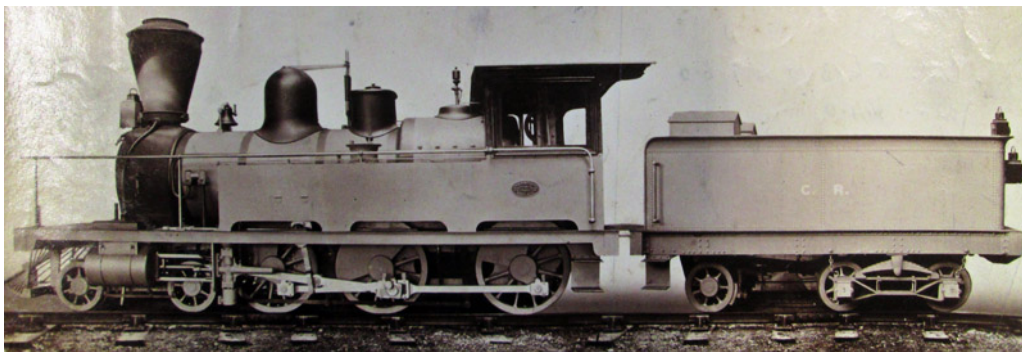
31 'WALTON W. EVANS' w/n 1896

PM list says it was a 4-4-0TT, and another source suggests it was an 0-6-4T. Supposedly an enlarged version of the *FC de Chañarcillo* 4-6-0s. 1882 report said "A new Engine N.º 31 made by Messrs. R. & W. Hawthorne of Newcastle, has been received from England, and is now being set up at the Caldera Work-shops." 1883 "The new Locomotive No. 31 received from England in 1882 has given very satisfactory results; and when traffic is been active, has been employed with advantage and economy in running heavy trains from Caldera to Copiapó." In use in 1884 [15]. 1888 "No. 31 suffered some damages through a derailment in March which were soon made good; but later on some repairs had to be undertaken in its boiler and working parts." 1890: "No. 31 has also had repairs of some importance." 1893: "No. 30, and No. 31, have also had repairs of some importance." 1894 extensive refurbishment of machinery and boiler. 1896 considerable repairs. Thorough overhaul in progress during 1899. In 1900 received a thorough overhaul including boiler and firebox work with new brass tubes, and bottom end still to be done. In 1902 it received a complete overhaul of both mechanism and boiler including new brass tubes. 1904: important general repairs. 1905: "some repairs done to its boiler." 1907: "new complete boiler (has) been ordered" 1909 good condition after an overhaul [MOBR2228] involving complete repairs to boiler and motion as

well as re-tubing and new brasses. Confirmed as a six-coupled loco with a four-wheeled bogie. Built date given then as 1874. In 1907 a replacement boiler was built by Hawthorn Leslie for this engine. Valued in 1909 at \$(Pesos)20,000, but needing a new boiler. By 1920 was numbered **15A**. In 1929 a replacement boiler was purchased from Hawthorn Leslie for this loco, along with one for no. **22**.



A sketch found in the P. C. Dewhurst archive at the NRM in York.



A slightly distorted builders' photo of no. **31**, also from the P. C. Dewhurst archive. This image had been put together from separate photos of loco and tender, so the perspective is mildly confusing.

Locomotive names 1894

The *Informe de las operaciones del año 1895*, circulated in Spanish and English to shareholders before the 1895 AGM, included the following statement:

In conformity with a resolution passed by the Board on 5 October 1894, as follows:

“As a tribute to the memory of the founders of the Copiapó Railway, and with the object that in the future the people of Copiapó may have before them the names of those to whom the existence of this Railway is due, it is resolved, that the Locomotives be given the names of the founders of the Company and other persons who took a prominent part in its formation and in the construction of the line; as follows:

Candelaria Goyenechea de Gallo,
Agustin Edwards,
Guillermo Wheelright,
Diego Carvallo,
José María Montt,
Domingo Vega,
Manuel Carril,
José Santos Cifuentes,
Vicente Subercaseaux,
Blas Ossa Varas,

José 2o. Tocornal,
Gregorio Ossa Cerda,
Matias Cousiño,
 who were the founders of the Company;
José Francisco Gana,
 Intendent of the Province and one of the promoters of the enterprise;
José Joaquin Vallejo,
 first secretary of the Board;
Allan Campbell,
 Engineer who surveyed the line from Caldera to Copiapó;
Walton W. Evans,
 Engineer who constructed the line;"

all the locomotives, with the exception of the small one No. **25**, have had the corresponding name plates attached, in accordance with said resolution.

It should be noted that the above list shows the names in fleet running number order. In practice, most of the locos had carried those names for many years, and only two may have been directly affected by the resolution. No. **8** lost its original name '**W. TAGGERT**' to gain '**AGUSTIN EDWARDS**', whilst no. **25** would seem to have lost '**TOMAS R. GALLO**' and not to have received any replacement.

The fleet in 1900

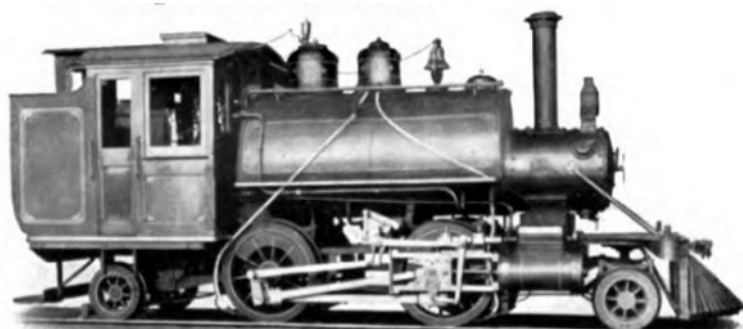
A 1900 list showed twelve large locos for goods and mixed trains, two medium-sized locos, three small locos for passenger trains, and one small for express use [25]. This gives a total of eighteen.

2-4-2ST d/w 43", cyls. 10"x20", built by Baldwin in 1904

Confirmed in BLW spec sheets and shown there as standard gauge. BLW class 8-14¼C nos. 22-23. Spec is in vol. 26 p233. Erecting card drawing 471-51 is in the DeGolyer Library collection. NB Claus Gaertner suggests these may have been BLW 23532-3, though Connelly's Baldwin list has the numbers as shown here. The 1904 report to shareholders stated: "In the past year two new locomotives have been received from the Baldwin Works, Philadelphia, they have cylinders 10"x20", four driving wheels 3' 7" diameter and two 2-wheel trucks. The size is suitable for passenger trains and for switching at stations. One of them is doing service as switching engine at Copiapo station, and the other is doing service in the passenger train. The cost of these locomotives is not yet settled, and will in due course be debited to 'New Works Fund.'"

1²	w/n 23533	1909 in reasonable condition [MOBR2222] and valued at \$(Pesos)12,000. By 1920 numbered 19A
2²	w/n 23534	1909 in reasonable condition [MOBR2222] and valued at \$(Pesos)12,000. By 1920 numbered 20A

A 1909 report [MOBR2228] suggests that these locos could do with side tanks as their present water capacity is insufficient.



Floods in 1905

One locomotive, eleven freight cars, and a small passenger coach were shut up on the line between Linderos and Piedra Colgada from November, when one of the supports of the bridge at the latter place gave way.

4-4-0s d/w 49", cyls. 15"x22", built by R. & W. Hawthorn Leslie in 1907

Ordered for Copiapo Railway Co. on 9th January 1907. 1800 gallon tenders numbered 1031-1033. Copper fireboxes mentioned in 1909 report [MOBR2228]. The 1906 report to shareholders commented: "The bad quality of the water which had to be used in the locomotives during the period of the flood, and which still continues in part, occasioned considerable damage to the boilers and fireboxes of locomotives, the repairing of which will be expensive, and will take some time to carry out. For this reason, and taking into consideration that the larger number of the locomotives have many years of service, three new locomotives have been ordered, the approximate cost of which will be about \$100,000.00 gold." First loco put into service in December 1907, and others during 1908.

32 'GUILLERMO WHEELRIGHT' w/n 2708 Entered service during December 1907. 1909 in very good condition [MOBR2228]. By 1920 numbered **16A**

33 'JOSÉ MARÍA MONTT' w/n 2709 Entered service during Jan. 1908. 1909 in very good condition [MOBR2228]. By 1920 numbered **17A**

34 'AGUSTIN EDWARDS' w/n 2710 Entered service during Jan. 1908. 1909 in very good condition [MOBR2228]. By 1920 numbered **18A**
In 1909 the combined value of the three was estimated as \$(Pesos)105,000.

The three names affixed to these engines were those that had been on engines nos. **9**, **11** and **8**, withdrawn on the arrival of these new machines.



Photo from *The Locomotive* magazine, by courtesy of Pablo Moraga.

The fleet in 1909-1911

The government annual publications *Estadística de los Ferrocarriles Particulares en Explotación* state that the railway had twenty-one locos in operation, four for passenger trains, thirteen for goods and four for shunting.

Source [13] confirms this but may have been using the government publications as the source. As twenty locos were still in sufficiently good order to be given new numbers on the government takeover a year or two later, it looks as though only one engine succumbed around that period.

In 1909 the railway used 4,679 tonnes of British and Australian coal.

Merryweather steam inspection car

A photo in Harold Middleton's collection shows a Merryweather steam inspection trolley, possibly on this railway. It looks very similar to the Merryweather cars on the *Trasandino* but has coupling rods making it an 0-4-0T rather than an 0-2-2T. Alternatively the photo may have been taken on the *FC de Chañaral*, which see below in section 2.4.1.

The EFE takeover

The railway was taken over by the EFE in 1912. [35] in 1919 reports that there existed nineteen locomotives on the 1.45m gauge around 1915-17, of which four were *de maniobras*.

The 1919 EFE list includes all A numbers from **1A** to **20A** except for **3A** and **4A**. Presumably these two must have been allocated with all the others after the 1912 take-over, or in 1916, but then the locos withdrawn before 1919.

However, all the other 'A' numbers were allocated in order of their previous fleet numbers and it is therefore a puzzle that **2A** and **5A** were previously nos. **14** and **15**, with obviously no locos in between that might have become **3A** and **4A**.

The 'A' suffix may well have been an abbreviation for '*ancha*' or broad, ie. broader than the rest of the new *Red Central Norte*.

1A	4-4-0 Norris Bros. 1854, ex no. 6² ' CANDELARIA GOYENECHE de GALLO ', ex no. 5 'CORONEL GANA'
2A	4-4-0 Rogers 1860, ex no. 14 ' JOSÉ SANTOS CIFUENTES '
3A	? (As all other renumberings listed here follow the original <i>FC de Copiapó</i> number order it is
4A	? (strange that there should be two vacant numbers between <i>FCC</i> locos 14 and 15 .)
5A	0-4-0ST Rogers 1866, ex no. 15 ' VICENTE SUBERCASEAUX '
6A	4-6-0 R. & W. Hawthorn 1864?, ex no. 22² rebuilt 1903 from the wreck of the fourth CER loco.
7A	4-6-0 R. & W. Hawthorn 1863, ex no. 23 ' BLAS OSSA VARAS '
8A	4-6-0 R. & W. Hawthorn 1863, ex no. 24 ' JOAQUIN SEGUNDO TOCORNÁL '
9A	2-2-0T Rogers 1869, ex no. 25 ' TOMÁS G. GALLO ', later regauged to become 3200 .
10A	4-2-0T Rogers 1871, ex no. 26 ' GREGORIO OSSA CERDA '
11A	4-2-0T Rogers 1871, ex no. 27 ' MATIAS COUSIÑO '
12A	4-2-0T Rogers 1871, ex no. 28 ' JOSÉ FRANCISCO GANA '
13A	2-6-0 ex 2-6-2T Rogers 1871, ex no. 29 ' JOSÉ JOAQUIN VALLEJO '
14A	2-4-4T Rogers 1872, ex no. 30 ' ALLAN CAMPBELL '
15A	4-6-0TT R. & W. Hawthorn 1881-3, ex no. 31 ' WALTON W. EVANS '.
16A	4-4-0 Hawthorn Leslie 1907, ex no. 32 .
17A	4-4-0 Hawthorn Leslie 1907, ex no. 33 .
18A	4-4-0 Hawthorn Leslie 1907, ex no. 34 .
19A	2-4-2ST Baldwin 1904, ex no. 1² .
20A	2-4-2ST Baldwin 1904, ex no. 2² .

Scrapping of standard gauge locos

Eleven locos were sold to *Casanegra y Cía* by decree of December 1928, and the sole remaining loco was sold to Braden Copper in April 1931, leaving no standard gauge locos owned by *EFE* [34]. Both purchases were presumably for scrap. However the 1929 *EFE memoria anual* still stated that twelve locos of gauge 1.43m were *dotacion detenidas* in December of that year. This error was corrected in a later edition of the *memoria anual*.

Baldwin drawings

The collection of Baldwin drawings at the DeGolyer Library, Southern Methodist University, includes side elevation (SE) or cross section (CS) drawings for one design built for the Copiapó railway.

<i>Tipo</i>	Index#	DWG#	Tracing#	Road name	Road#	Date	Baldwin class	Number	Wheel	Dwg typ	Size
	471-51	4679	-	Copipo	1-2	1904	08-00 14¼C	22-23	2-4-2	SE/CS	3

The list of drawings in which these details were found is at <https://www.smu.edu/~media/Site/Libraries/degolyer/pdf-s/BLW-EDWG-RoadName.pdf> whilst arrangements to purchase copies can be found at <https://www.smu.edu/libraries/degolyer/Research/Permissions>.

This diagram highlights in green the years when each individual loco was recorded as having been in use by the mileage table in the company's annual report. Uniquely the report for 1881 contained solely a fleet list rather than a mileage table so the data for that year is shown in a paler green. 'ur' means 'under repair' that year.

Year	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	
1	1850																																																1
2	1851																																																2
3	1852																																																3
4	1852																																																4
5	1854																																																6 ² 1A
6	1854																																																6 ¹
7	1854																																																7
8	1854																																																8
9	1858																																																9
10	1858																																																10
11	1858																																																11
12	1858																																																12
13	1861																																																ur
14	1860																																																ur
15	1866																																																14 2A
16	1866																																																15 5A
17	1866																																																16
18	1866																																																17
19	1866																																																18
20	1866																																																19
21	1867																																																20
22	1868																																																21
23	1903																																																22 ¹
24	1868																																																22 ² 6A
25	1869																																																23 7A
26	1871																																																24 8A
27	1871																																																25 9A
28	1871																																																26 10A
29	1871																																																27 11A
30	1872-3																																																28 12A
31	1881-3																																																29 13A
1 ²	1904																																																30 14A
2 ²	1904																																																31 15A
32	1907																																																1 ² 19A
33	1907																																																2 ² 20A
34	1907																																																32 16A
																																																	33 17A
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Sources: tables in Copiapó Railway Company annual reports, the majority kindly provided by Sr. Felipe Radrigan and a few others found in the Guildhall Library of the City of London.

2.1.2 The Copiapó Extension Railway – *El FC de Chañarcillo or the Pabellón and Chañarcillo Rly. Co.*

Background

Chañarcillo was an extremely lucrative mining area, in the hills south of Copiapó. This railway was opened in 1858 as a branch of the *FC de Copiapó*, though under independent ownership. It was supposedly built as a horse-drawn line, though to judge from reports of the construction occasional trips by locomotive were made even at that time [*Usk Observer*; *North Devon Gazette* etc. November 1858]. It was built for mule haulage by Edward Woods [57] and then rebuilt by him for locomotives in 1860-1, with a first trial trip being made by “a common American engine of about 22 tons” [*London Daily News* report of the company’s AGM, 9 March 1861], and in 1868 was purchased by the *FC de Copiapó* for 138,000 pesos. In 1910 the whole system was taken over by the state and regauged to 1m. There was severe flood damage and the line was then lifted in 1927. By that time access to the mines was possible from the new *FC Longitudinal* 15 km further to the west. The 1907 *Estadística minera* reports that the maximum gradient on the route to Chañarcillo was 5.2%, as opposed to 1.3% on the mainline from Caldera to Copiapó and 2.4% on the line to Puquios. Woods [51] explains that the line comprised three grades: 14½ miles uphill from Pabellón with an average gradient of 1 in 33 and a maximum of 1 in 26; then downhill from Molle to Pajonales at 1 in 24 average and 1 in 20 maximum; and finally uphill again at 1 in 34 average and 1 in 25 maximum. During the early years when the railway was independent, it had a small *maestranza* at Pabellón.

4-6-0 d/w 48", cyls. 16"x24", built by R. & W. Hawthorn in years listed below

These were designed and ordered by Edward Woods [57] for the Copiapó Extension Rly. They were fitted with outside Allan straight link motion, and were the first 4-6-0s to be built in Britain. Their maximum axle loading was 7½ tons owing to the light rail that had been provided for the original mule-drawn wagons. The total loco weight was supposedly 32 tons. The fuel used originally was half coal and half coke. The locos had side play on the rear driving axle, for ease of traversing sharp curves. The tender for at least the fourth engine was mounted on bogies, contained 2400 gallons of water, and was numbered 715.

‘PABELLÓN’	w/n 1093	Built in 1860. R. & W. Hawthorn list says 4-6-0.
‘CHAÑARCILLO’	w/n 1094	Built in 1860. R. & W. Hawthorn list says 4-6-0.
‘?’	w/n 1190	Built in 1863. R. & W. Hawthorn list says 2-4-0 with d/w 54". “Shipped August 22 nd 1863” according to R&WH order book 2. “The third locomotive has been shipped per the <i>Jessie Jamieson</i> , and is expected to arrive out by the end of next month.” [<i>London Daily News</i> report of company AGM, November 1863].
‘?’	w/n 1324	Built in 1864. This might well have been the engine seriously damaged in a collision during 1868 shortly before the railway was bought by the main Copiapó railway. It then lay derelict for thirty years until rebuilt between 1899 and 1903 to become CR no. 22 ² .

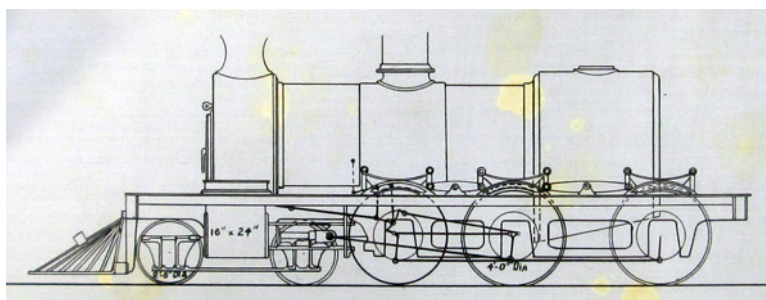
Three of these became Copiapó Railway nos. 22¹, 23, 24, with the names 22¹ **‘PABELLÓN’**, 23 **‘BLAS OSSA VARAS’**, and 24 **‘JOAQUÍN SEGUNDO TOCORNAL’**. Name changes have been said to have been made because the original names were the same as *FC de Copiapó* locos. The duplication of **‘CHAÑARCILLO’** is obvious though the *FCdC*’s engine of that name had been withdrawn well before the arrival of the Chañarcillo machines, and some other must have duplicated another *FCC* name. At a guess, the other name will also have been a place-name, and thus Copiapó is a good candidate for the missing one as it had clearly been used as a loco name by the *FCC*. No. 22¹ **‘PABELLÓN’**, however, did not last long on the *FC de Copiapó*, being sold to Iquique in 1871, presumably to the *FC de Iquique* later the Nitrate Railways.

The fourth loco, possibly w/n 1324 though 1093 is no other possible candidate, had been withdrawn after an accident in 1868, though the wreck was later recovered and rebuilt by 1903, to gain the vacant number 22² though not a name (See section 2.1.1).

The company AGM in October 1864 mentioned that progress being made in coal burning, as opposed to the original coal-coke mix, and that (one?) loco was now prepared for that fuel.

One later version of the above design was constructed, albeit for the *FC de Copiapó* rather than for the Chañarcillo Railway.

?	w/n 1896	Built in 1881. Delivered Sept. 11 th 1882. Tender on 'Bissell trucks' and numbered 894. R. & W. Hawthorn list says 0-6-4 but this is contradicted by the order book which is clearly annotated 4-6-0. It became Copiapó Railway no. 31 'WALTON W. EVANS' which won't have pleased that fierce promoter of American locos.
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From a group of Hawthorn sketch diagrams found in the Dewhurst archive at the NRM.



Loco '**PABELLON**' at Chañarcillo station before its sale to Iquique in 1871.

The small fly-wheel alongside the firebox will have been part of a boiler feed pump. Other interesting features, of these the very first British-built 4-6-0s, include the outside Allan valve gear, the sloping slide valves above horizontal cylinders, the American-style bracing bars from smokebox to buffer beam and the two part smokebox door. The round tub on the running board is presumably a sandbox.



This photo, probably taken at the same time as the one above, does at

least show the smokebox doors and the full length of the tender.

Operations on the branch after 1868

On the takeover in 1868, the Hawthorn 4-6-0s were withdrawn for repair and traffic on this branch was handled by Rogers 2-6-0s nos. **19** and **20**. However, from early 1871 onward nos. **22** and **24** returned to the task. []

[24] says that in 1910 the railway had 2 large locos for goods and pass. trains, 2 medium sized locos, 3 small locos for passenger trains and 1 small for expresses. However, these could by then have been almost any from the *FC de Copiapó*'s fleet.

2.1.3 *El FC de Arica á Tacna* – The Arica & Tacna Railway Co. Often known nowadays as the *FC Tacna á Arica*.

1855 to date

NB This is a duplicate of section 13.5.4 in the Peruvian standard gauge file in this series.

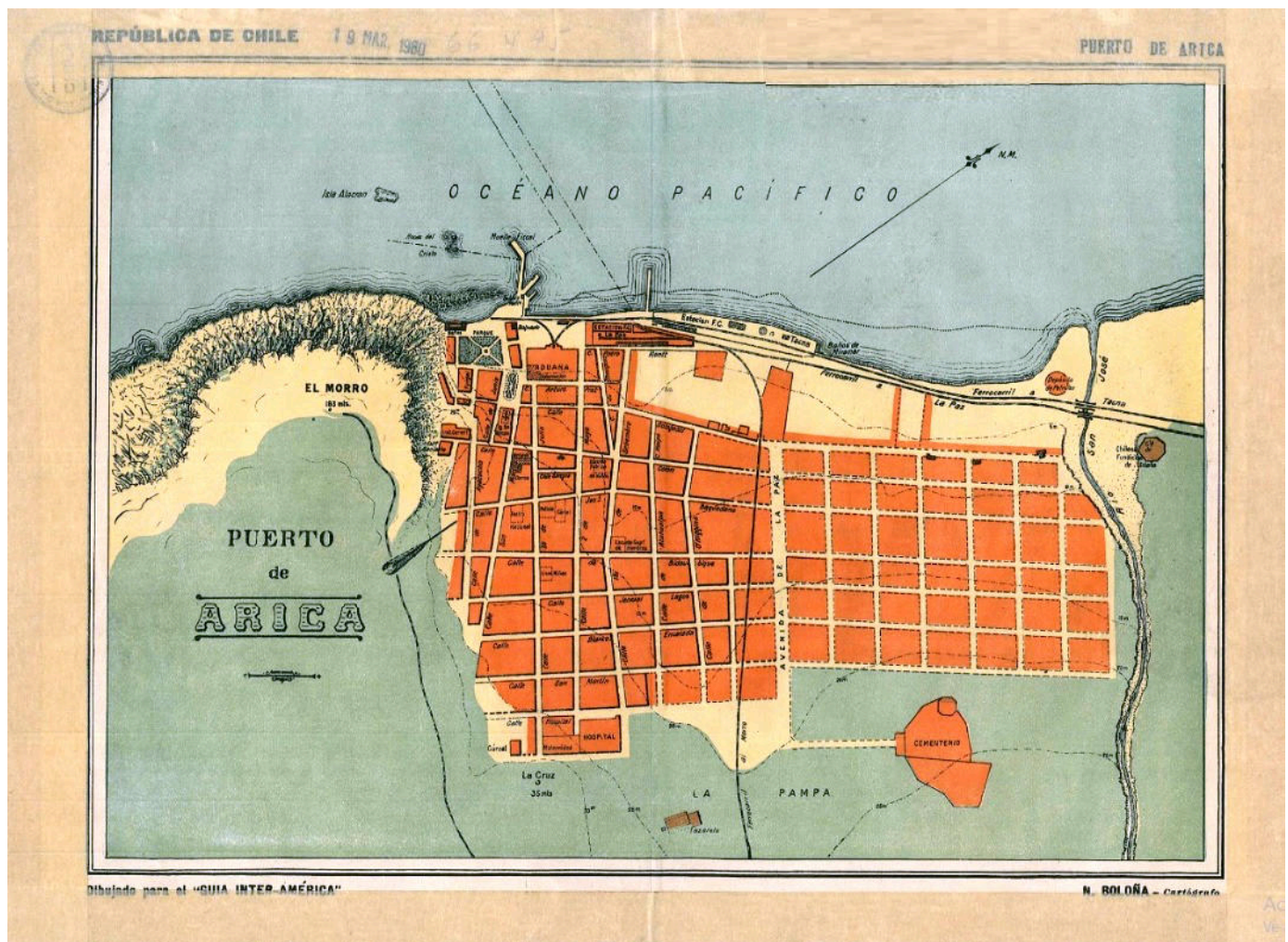
Background

Standard gauge. Built 1855 by Joseph Hegan. 62 km. long. [30] quoting Hawthorn order books at the NRM states that the 1869 and 1870 locos were ordered via John Hegan & Co. of Liverpool. Hegan seems to have been the Peruvian government's principal contractor for the line. Ownership was then transferred in 1856 to the London-based Arica & Tacna Railway Company, with Hegan remaining a director of that company until his death in 1876. Almost the entire sequence of Directors' reports to Shareholders from 1857 to 1939 have been scoured for references to the locomotives, as have the subsequent newspaper reports of each AGM. The relevant paragraphs are set out in Appendix 4 at the tail end of this file.

Whilst the railway purchased in 1911 two Kerr Stuart tank locos for passenger railmotor use, thereafter they began to use petrol railcars converted from road vehicles. By the late 1920s the management clearly would like to have got rid of steam altogether, but there was no money available and from then on the financial situation only went from bad to worse.

The railway was taken over by the Peruvian government in 1942, and is now administered by the Tacna provincial government.

The original workshops were at Arica and almost on the beach, with devastating consequences during the 1868 tsunami, but were removed to Tacna for safety after the 1877 tsunami and remain there today, reflecting the railway's ownership by Peru.

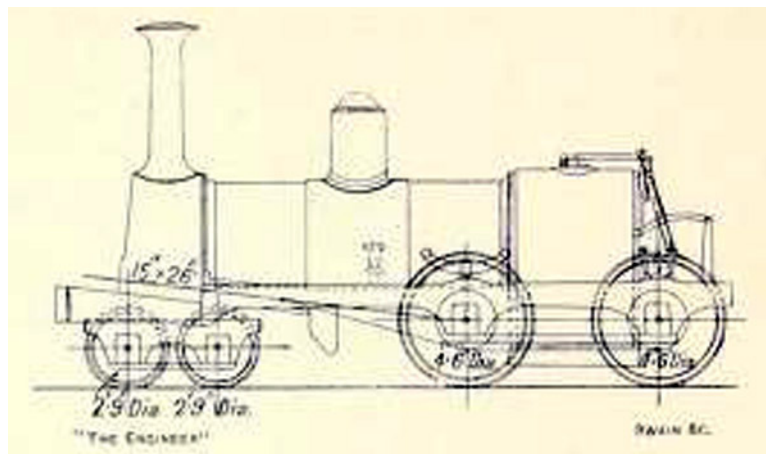


This map of Arica from the 1920s shows the Arica & Tacna Railway running along the seashore and with a turning triangle where the current Plaza Vicuña McKenna stands. Parallel to the Tacna railway but a few yards further inland is the metre gauge FCALP, with its branch to the top of the Morro diverging eastward just a few metres north of the station and then reappearing high on the hillside as it climbs west to the summit.

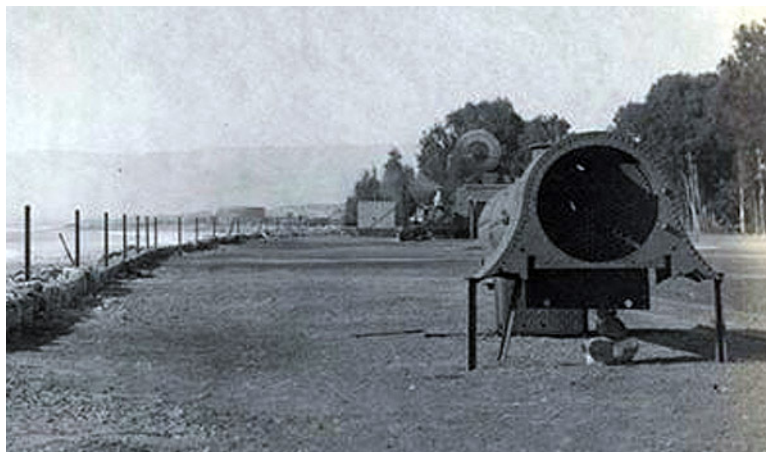
4-4-0 d/w 54", cyls. 15"x26", built by R. & W. Hawthorn in 1853-4?

Inside cylinders. Very short bogie wheelbase (3' 0") a long way ahead of the coupled wheels. Ordered September 1853 [30] by 'Hegan Esq.'. There may only have been four of these, but other sources suggest that there were five. However, R&WH order book 2 in the NRM in York lists only four, ordered by Hegan for 'general traffic' and delivered on various dates from March 10th to May 29th. The following two engines, no. 873 and 874, are shown as having been ordered by a Mr. J? Burge for a Swedish railway. The contracted dates had been between February 15th to August 1st, so whilst the first two locos were a couple of weeks late the remainder were two to three months early. The tenders were to hold 2600 gallons of water and 2 tons of coke and were numbered 498-501.

1 '?'	w/n 869	Probably destroyed by the tsunami of 13th August 1868.
2 '?'	w/n 870	Probably destroyed by the tsunami of 13th August 1868.
3 '?'	w/n 871	Probably destroyed by the tsunami of 13th August 1868.
4 '?'	w/n 872	Possibly the only one of the batch to survive past 1868.



A sketch of one of the original Hawthorn 4-4-0s for the FCAT. Note the very short bogie wheelbase. This sketch was published in E. L. Ahrons' *The British Steam Railway Locomotive from 1825 to 1925*, but seems to have come originally from an article in *The Engineer* which has not yet been found.



This boiler and smokebox preserved on the seafront at Arica in the 1930s may well have been the sole surviving remnant of one of the original FCAT 4-4-0s which had been destroyed in 1868. It is difficult to think of any reason why a later boiler should

have been preserved in this way. However, the shape of the smokebox implies that these engines had outside cylinders much like the later ones and not inside cylinders as had previously been surmised.

The earthquake and tsunami of 13th August 1868

This caused devastation in Peru and Chile, and indeed was felt all around the Pacific. The question of the destruction of early locos in the tsunami of 13th August 1868 is covered in some detail in [30]. ITN points out that when the tsunami struck, (at about 5.15pm local time), the majority of the locos would have been in the *maestranza* in Arica rather than safe in Tacna away from the ocean. Arica was more or less flattened by the disaster.

1 “*La noticia se esparció por todo Tacna, atribulando a tantos que tenían parientes en Arica. Ambas ciudades siempre estuvieron entrelazadas.*

Una tribulación diversa sienten los señores tacneños propietarios de negocios en el puerto, la mayoría extranjeros. Antes de que rompiera el nuevo día ya habían organizado un viaje especial del ferrocarril para saber que suerte habían corrido sus mercancías. El tren que salió en la madrugada no logró pasar el Alto Hospicio: Las líneas estaban destruidas...

Lo que había sido la ciudad no era entonces más que un cúmulo grisáceo de ruinas, restos de mercaderías, una gran cantidad de peces muertos, las columnas y gruesos trozos de muros de la aduana, una locomotora y coches retorcidos del ferrocarril a Tacna, los postes telegráficos destrozados, jabas y cajas de licores y cerveza, todo junto a cuerpos macabramente desfigurados por el roce con la arena provocado por el violento vaivén de las olas.”[11]

“La gran ola de las seis y cuarto de la tarde, con mayor fuerza y altura que las anteriores, terminó de diseminar barcos, coches y locomotoras del ferrocarril;”[11]

2 “*Antes del terremoto, Arica poseía una de las mejores y más modernas maestranzas entre Callao y Valparaíso. Muchas de las máquinas eran pesadas y apropiadamente fijas a fundamentos de cemento. Había también varias locomotoras, coches y muchas piezas fundidas de gran peso. Todo eso desapareció sin dejar vestigio alguno. Es imposible que puedan haber sido barridos hacia el mar, pero, con seguridad, tampoco fueron encontrados en tierra.*” Before the earthquake, Arica had one of the best and most modern workshops between Callao and Valparaíso. Many of the machines were heavy and properly attached to concrete foundations. There were also several locomotives, cars, and many heavy castings. All that disappeared without leaving any trace. It is impossible that they could have been swept out to sea, but certainly they were not found ashore either. [Luther Guiteau Billings of the US Navy (later Rear Admiral Billings), whose account of the disaster has been disputed but at least gives a flavour of the events. NB The quotes are from a Spanish translation of the original English]

3 “There is not a vestige left of the railway works. The three locomotives are in the sea and destroyed ; they were washed some 500 yards from the station. The cars &c., were seen by the crew of a vessel many leagues out at sea.” [Reported in *Cheltenham Examiner* and other UK papers, 21st October 1868].

4 “*Al punto de alcanzar la playa encontré un cúmulo de escombros de tres a cinco metros de altura, compuesto primordialmente de fragmentos de naves naufragadas, trozos de casas de madera, puertas, marcos de ventanas, muebles aplastados -entre los que distinguí una cuna y, cerca de ella, una locomotora estropeada y los restos retorcidos de un coche de carga y otros de pasajeros-, también un cañón de 68 libras (probablemente del Fredonia, buque-almacén naufragado de Estados Unidos) y muchas columnas de hierro pertenecientes al gran edificio de la Aduana.*” At the point of reaching the beach I found a pile of rubble three to five meters high, composed primarily of fragments of shipwrecked ships, pieces of wooden houses, doors, window frames, crushed furniture - among which I distinguished a crib and, nearby, a broken locomotive and the gnarled remains of a freight car and other passenger cars - also a 68-pound cannon (probably from the wrecked, shipwrecked warehouse ship of the United States) and many iron columns belonging to the large building of Customs. [*Arica 1868 – un tsunami y un terremoto*, Manuel Fernandez Canque. DIBAM, Santiago 2007].

“The water raised to the same height as before, and in rushing back it brought not only the debris of a ruined city with it, but even a locomotive and tender and a train of four cars were seen carried away by the fearful force of the waves.” [*San Francisco Chronicle* 31 October 1868 p1].



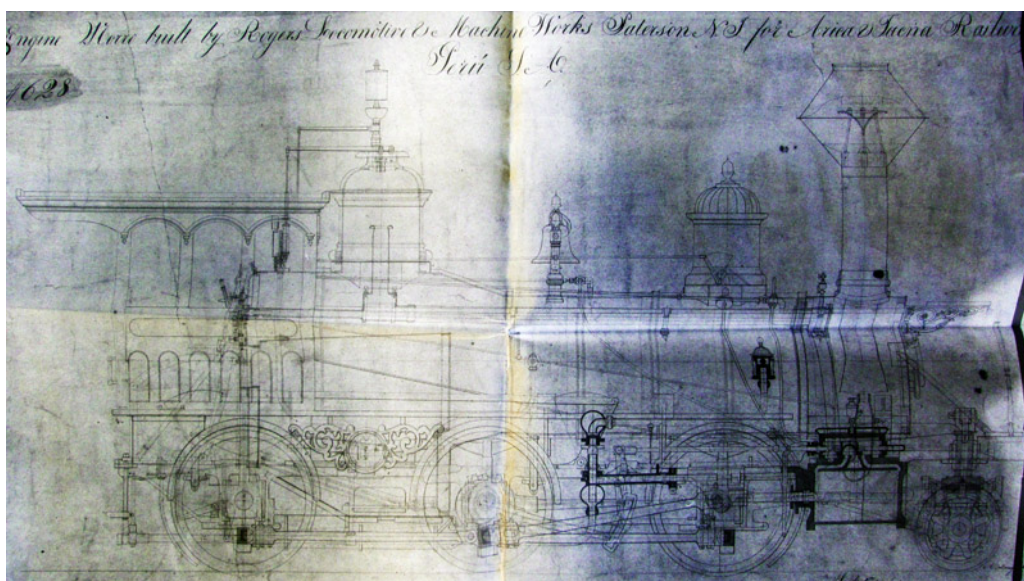
1 Arica FCAT station with the aduana building to the left, and 2 the same scene after the tsunami of 1868.

2-6-0 d/w 49", cyls. 18"x24", built by Rogers in 1868

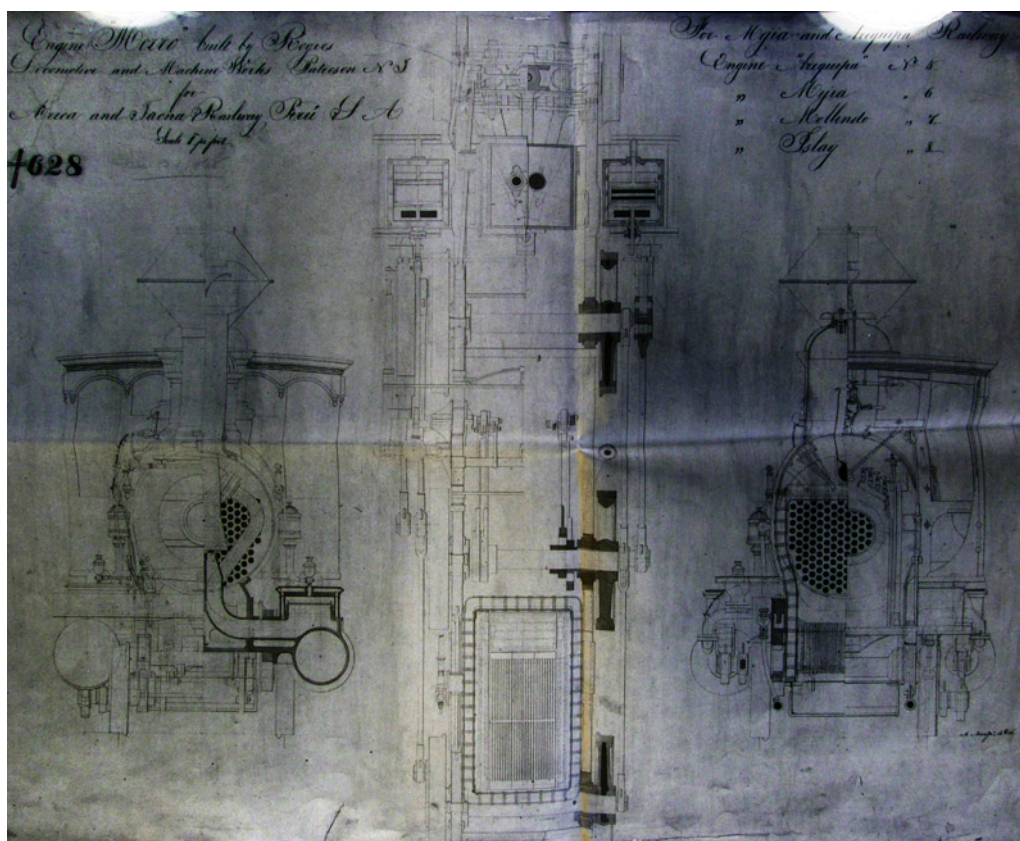
These were ordered initially for the *FC Mejia y Arequipa* in Peru but were diverted to the *FCAT* according to Connelly's Rogers list. Rogers' order no. 628. Possibly this was a loan following the 1868 tsunami, or perhaps a rush order to fill a desperate shortage of motive power. The Rogers summary sheets provided by ALCo to P. C. Dewhurst in the 1920s suggest that just one loco, '**MORRO**', came to the *FCAT* and that four more (actually Rogers nos. 1591-2 and 1597-8) remained on the *FCMA* as their nos. **5-8**, but Connelly's Rogers list clearly shows a total of six engines with the first two of them being completed for the *FCAT*. The company's 1869 report to shareholders stated that these engines only arrived in Arica in June 1869, "after an unusually long voyage".

? ' MORRO ' (names may have been w/n (1569 in CF list)	Name certainly is appropriate for the <i>FCAT</i> rather than for <i>FCMA</i> .
? ' TACORA ' other way round) w/n (1570 in CF list)	Name certainly is appropriate for the <i>FCAT</i> rather than for <i>FCMA</i> .

ITN [30] suggests that these locos moved on to the *FC Mejia y Arequipa* (later the *FC del Sur* of Peru) once the *FCAT* had obtained replacements for the locos destroyed in 1868. However, this has not yet been confirmed in the *FCMA* / *FC del Sur* lists. Alternatively they may have moved on to Iquique where the nascent nitrate railways were experiencing a severe loco shortage. See the next section for the evidence supporting this surmise.



It is clear from these tonally-inverted blueprint photostats from the P. C. Dewhurst collection at the NRM that Rogers saw this loco as being built specifically for the *FCAT* rather than as the short-term loan of a new engine from the *FCMA*. The sheet below showing end elevations and a plan also lists the four *FCMA* loco names at top right.



4-4-0 d/w 54", cyls. 16"x24", built by R. & W. Hawthorn in 1869? (1-2), and 1871-2 (4-5).

First two ordered 4th May 1869 [30] by John Hegan. Tenders numbered 787 and 788 and to hold 2500 gallons. Last two ordered 20th January 1871 by John Hegan Co. for Arica & Tacna Rly., ex works on 9th December 1872 [30].

Tenders were numbered 815 and 816.

1 ‘?’	w/n 1465	Spare boiler ordered for this loco from HL in December 1923. Scrapped by 1968 [18].
2 ‘?’	w/n 1466	Scrapped by 1968 [18].
4 ‘?’	w/n 1545	Spare boilers for no. 4 ordered from HL in 1905 and 1911 but could presumably have been used for any of these engines. Scrapped by 1968 [18]? [16] says this is the loco now numbered 3 and plinthed in the main square in Tacna.
5 ‘?’	w/n 1546	Scrapped by 1968 [18].

Whilst this numbering fits with original loco no. **3** having been the sole survivor of the 1868 *maremoto*, the last two may have been renumbered **3** and **4** at some point, see [30] for more discussion on this topic. A letter from Hawthorn Leslie to P. C. Dewhurst in June 1929 certainly states that these engines were numbered **3** and **4** by the railway. However, a photo below certainly shows the number **5** on the front buffer-beam.

The directors’ report in June 1874 (see Appendix 4) refers to three new locomotives by then being in service. Whilst the two engines built in 1872 might well have been reported as new, the reference to **three** is a little puzzling.

Distinguishing between these Hawthorn 4-4-0s

The original 1853 batch might have had inside cylinders, though that needs confirmation, and certainly had very short-wheelbase bogies. However, no photos of these engines have been seen.

Photos of the later locos show individuals bearing numbers **3**, **4** and **5**, but there are differences between the various surviving images. Some of these may reflect minor swappings of parts, but others suggest that there were differences between the two batches as built.

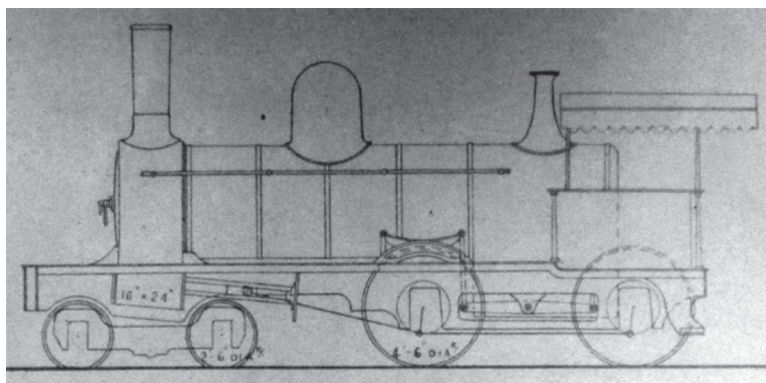
1 Most images show cow-catchers/pilots with vertical bars, whereas that seen on no. **5** is of the Argentine style with horizontal bars.

2 The early picture of loco no. **3** has a tall safety valve bonnet and a one piece chimney without a ring at the top of the base, it also has no short smokebox-side handrail.

3 The photo of no. **5** has the cab spectacle plate further forward, at the front edge of the roof rather than set back inside.

4 All of the above differences are minor, and could have changed from year to year. More significant is that most photos show four bar crosshead guides whilst no. **5** in the final photo is fitted with single bar guides.

5 No. **5** also has a slightly different design of running board edge angle, with a smooth curve behind the front buffer beam rather than a sharp right angle.



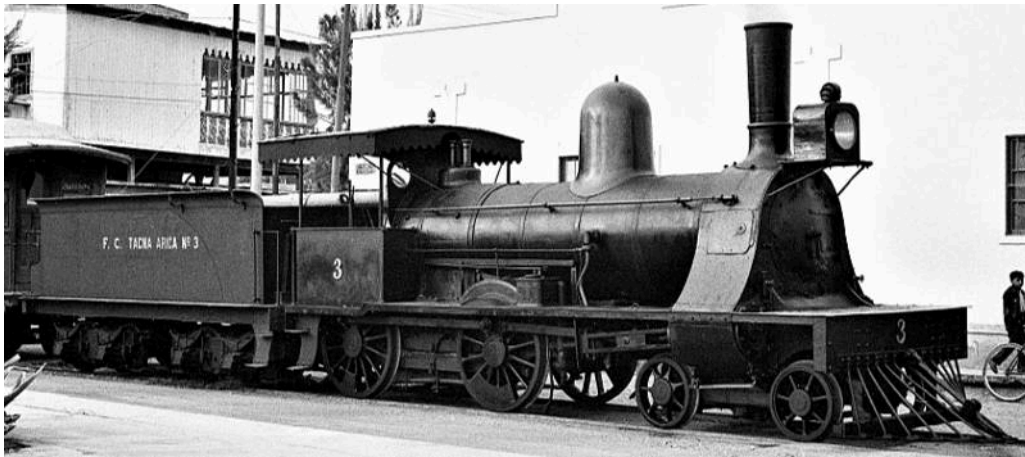
A sketch as found in the P. C. Dewhurst archive at the NRM in York.



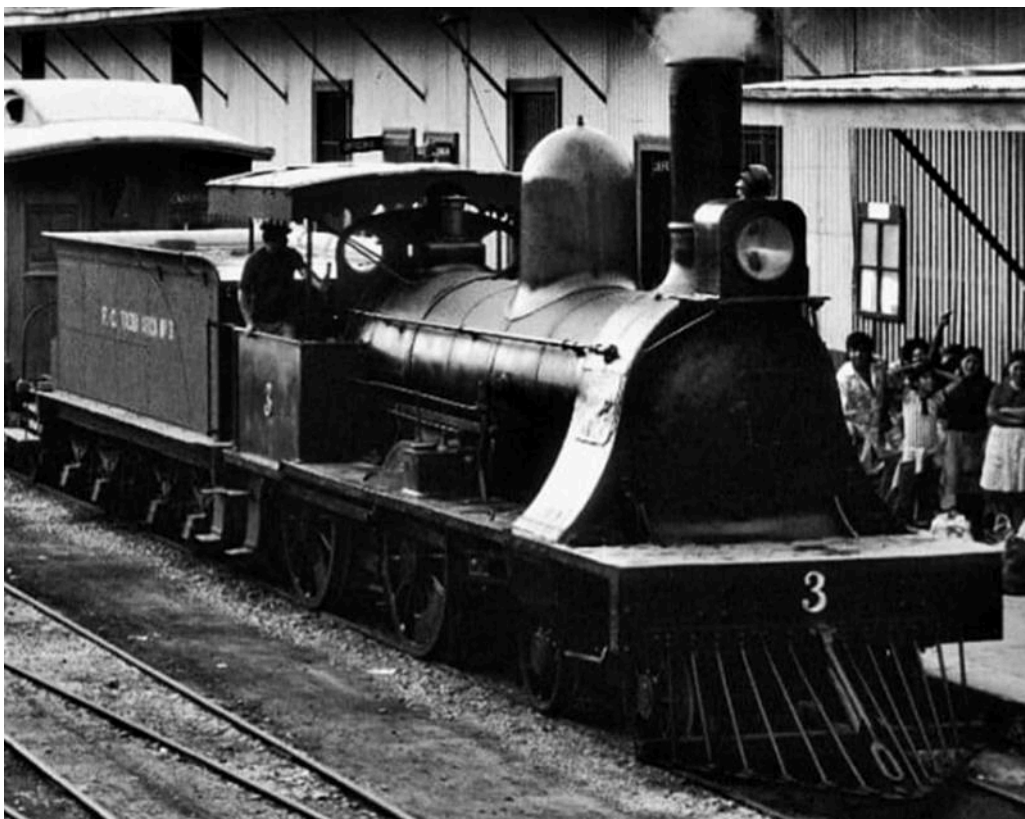
Hawthorn no. **3** seen in a still taken from a video. Note the taller chimney without a ring at the top of the base, also the tall brass safety valve case. Another shot of no.

3, taken in 1929, has the dome painted rather than polished and the tall safety valve cover removed. By then the cabside brass number, also seen below, had been added.

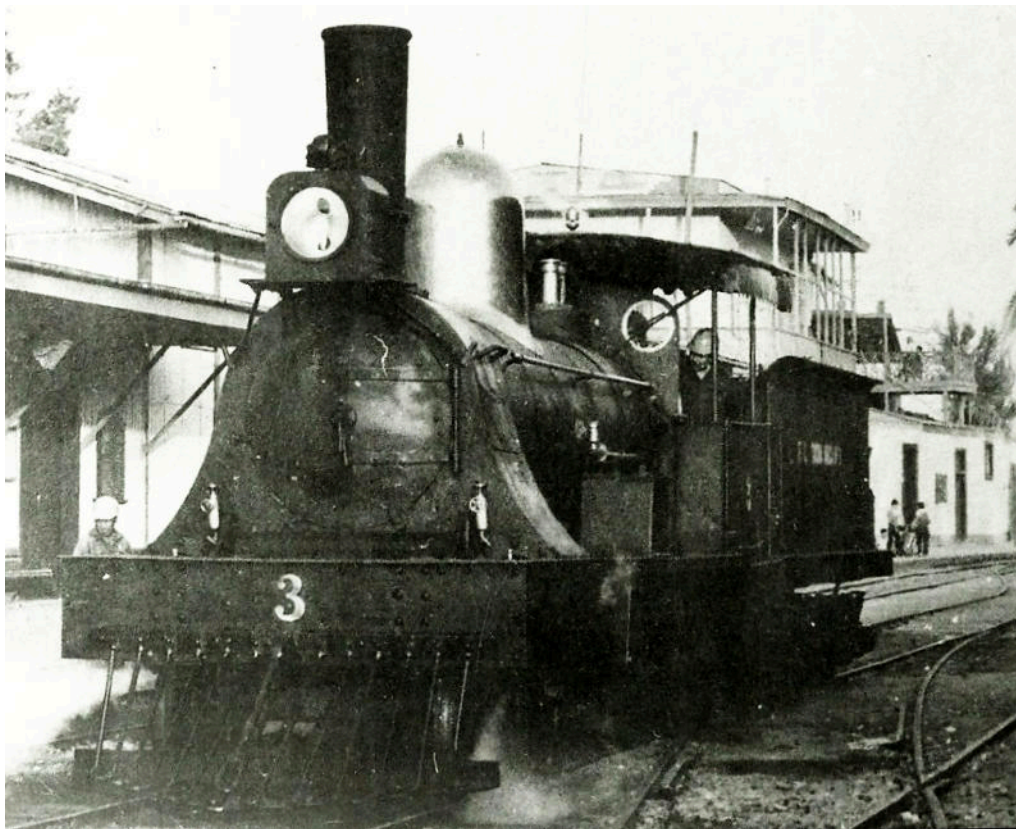
At that date no. **3** also retained splashers for the rear pair of bogie wheels.



No. **3** as seen by Harald Navé in the 1970s. This was presumably taken within the Tacna station compound but it is not clear whether the engine was still steamable at that date or was already a museum-piece.



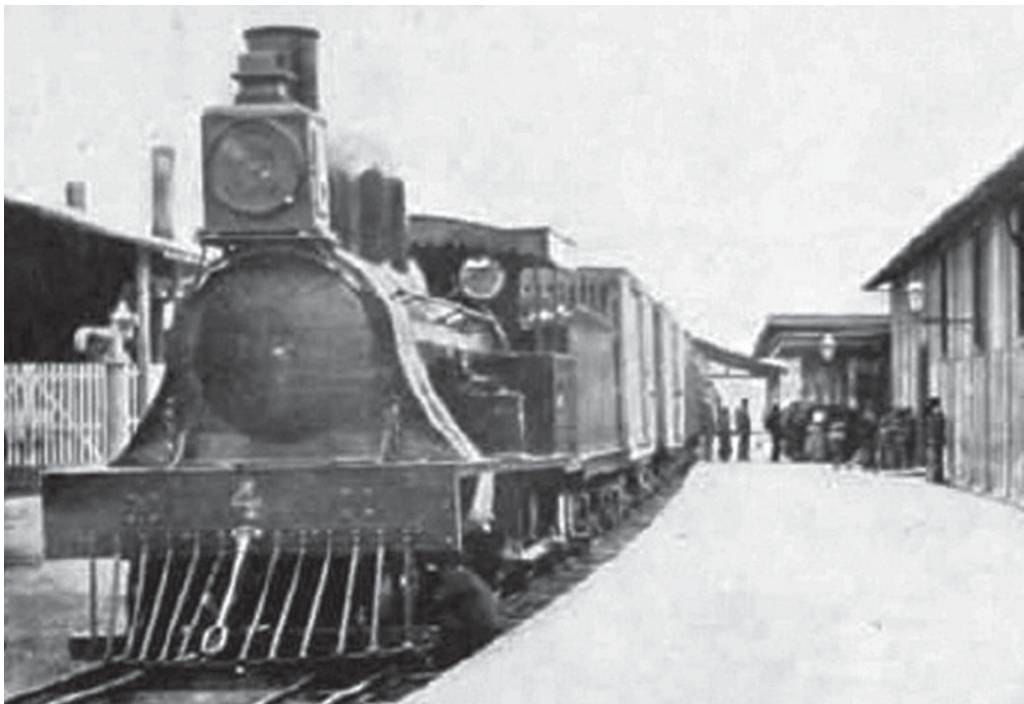
No. **3**, probably on the same occasion in the 1970s as in the previous view, and this time seeming to be in steam.



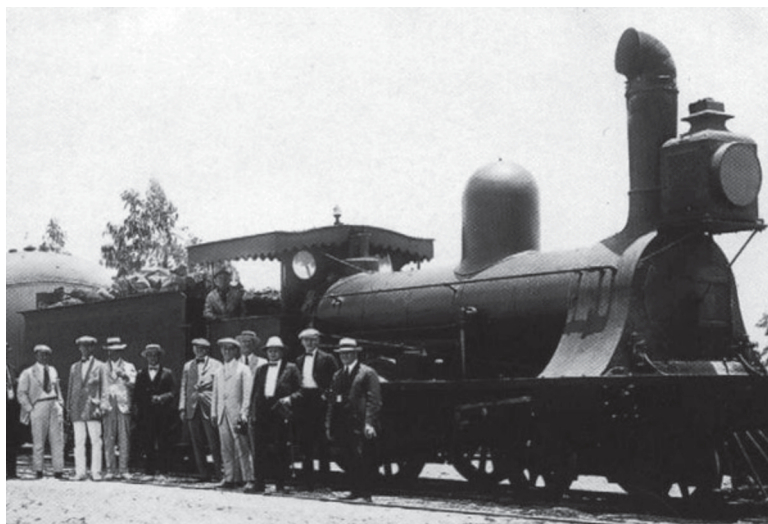
No. 3, again at Tacna but this time facing the other way.



The surviving loco as plinthed in Talca in 2019 and bearing the number **3**. It is rumoured that this was the locomotive that took Colonel Francisco Francisco Bolognesi to Arica in 1880. He commanded the Peruvian forces in the Battle of Arica, and lost his life there.

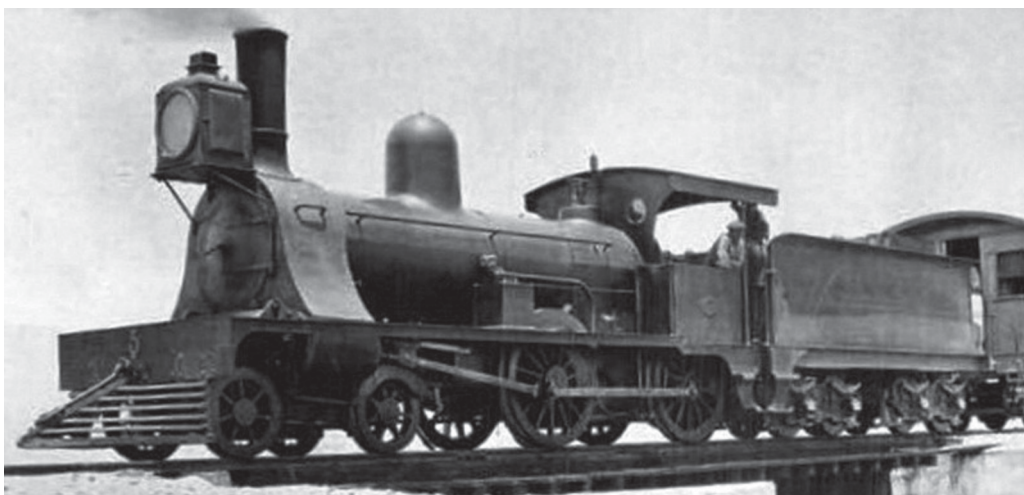


No. 4, with a Chilean-style reverse curve to the cab roof.



An image of another of these locos, no. 1, this time carrying a chimney-top cowl, and also with the reverse curve to the cab roof.

The loco certainly has four bar crosshead guides.



Hawthorn no. 5, on a train. This loco carries the Argentine style cow-catcher, and has a curve at the front of the running board

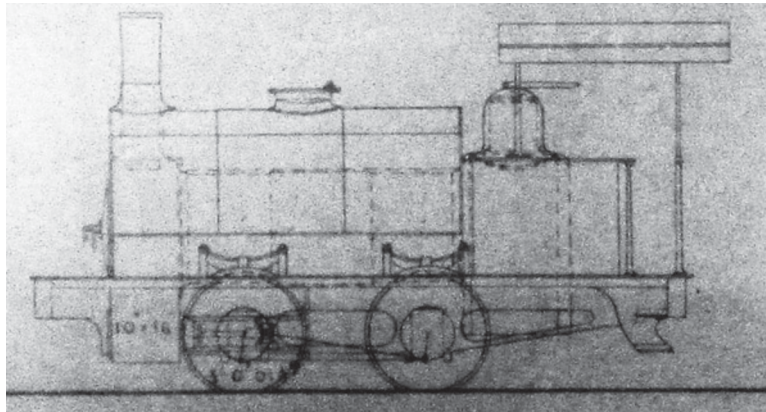
angle, a more forward-mounted spectacle plate, splashers for the rear pair of bogie wheels, and single bar crosshead guides. Also note that the spectacle plate sides curve up and outward from a point below the base of the spectacle glasses; this is not the case in the other photos shown here.

0-4-0ST d/w 36", cyls. 10"x16", built by R. & W. Hawthorn in 1869.

Ordered by John Hegan & Co. for Arica & Tacna Rly. Cylinders were confirmed 10x16", not 10x18", as evidenced by the Hawthorn order book and data from the Nitrate Railways. There were relatively few Hawthorn locos with these dimensions, and this fact aided the identification of this engine as later becoming Nitrate Railways no. **56** and then no. **1**.

3 w/n 1480 It is difficult to work out how this loco became no. **3**.

It seems likely that this engine was then sold to the Nitrate Railways early in 1889, though there had been discussion about its purchase as early as 1874. It became their no. **56** but almost immediately was renumbered to **1** and was then rebuilt with an inspection saloon, as an 0-4-2T and later an 0-4-4T. There is no positive record of it on the *FCAT* in later years and only a statement that it had disappeared by 1968 in source [18].



Sketch found in P. C. Dewhurst archive at the NRM.

Proposed line to Bolivian border

A report of 8 June 1870 suggested that the then proposed Trasandino line to the Bolivian frontier would require sixteen 35 ton six-coupled locos with d/w 46" and cyls. 18x24". [[http://hdl.handle.net/2027/uc1.\\$b46998](http://hdl.handle.net/2027/uc1.$b46998) Second part p335]. Talca was to have a loco shed for twelve engines and a 16m turntable. Huaylillas station would require a loco shed for four engines and another 16m turntable, as would the station at the border. Each of these locations was also to have a coal dump and a loco repair shed. The track gauge was to be 3' 6" minimum [Ibid, p445], though very probably would have ended up built to standard gauge.

Another catastrophe

"At Arica the people were preparing temporary fortifications to repel the threatened assault of the rebel ram "Huascar" the moment when the roar of an earthquake was heard. The shocks were very numerous and caused immense damage. The sea was suddenly perceived to recede from the beach, and a wave from ten to fifteen feet high rolled upon the shore, carrying all before it. Eight times was repeated this assault [sic] of the ocean, and four miles of the embankment of the railway melted away like sand. Locomotives, cars and rails were hustled about like so many play things, and left in a tangled mass of rubbish. ..." [Tavistock Gazette and other UK papers, 13th July 1877.

The fleet in 1880

Harold Middleton has commented (private communication July 2020) that "after the battle of "Campo de la Alianza"

30 km north of Tacna during the Pacific War on May 26, 1880; the Chilean forces occupied Tacna, and the military reports indicated the *FCAT* had five locomotives.” The paragraphs above should give a total of six: being one original 4-4-0, four replacement 4-4-0s, and one 0-4-0ST.

Loco names

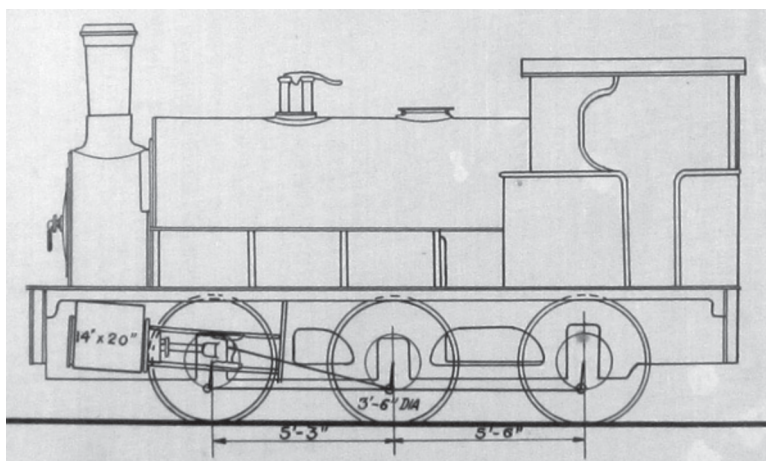
If the Rogers moguls were given appropriate names in Arica – ‘**MORRO**’ and ‘**TACORA**’ – then it seems very likely that the other engines would also have been named. No clues have yet been found as to what these might have been, however.

0-6-0ST d/w 42", cyls. 14x20", built by Black Hawthorn in 1882-3.

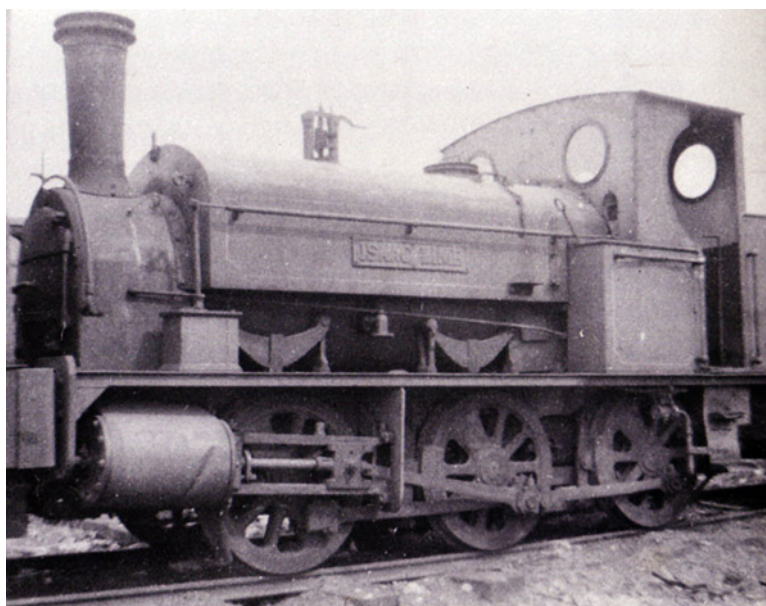
P. C. Dewhurst suggests that this was a duplicate of builders’ numbers 416, 503 and 517 built for use in Norfolk in 1877-81; confirmed by reply from R. & W. Hawthorn Leslie in June 1929.

?

w/n 705



Sketch found in P. C. Dewhurst archive at the NRM. Original source unknown.



‘**ISAAC LIMB**’ was a very similar though slightly earlier Black Hawthorn 0-6-0ST of 1874, that worked in the UK. The only obvious difference from the *FCAT* loco is that the bunker is outside the cab back-sheet rather than contained within it. The cab may also be slightly taller.

2-6-0 d/w 52", cyls. 16x24", built by Hawthorn Leslie in 1885.

Ordered for Arica & Tacna Rly. Was this really a 2-6-0? The R&WH order book has “8 wheels 4 – 4' 6"” in the

Wheels column, which suggests that it was another 4-4-0. Delivered 20th (or 25th) July 1885. Tender was numbered 931 and carried 2300 (or 2500?) gallons. It looks as though this loco was to be numbered **5** but the writing is very faint.

6

w/n 2021

The fleet in 1909-1911

“Mixed train locos were four-coupled (2.40m wheelbase), with four-wheeled bogie, dr. wheels 1.38m, (approx. 54") 0.75m bogie wheels, cylinders 0.40m x 0.605m (approx. 16x24"), total weight 29.25 T, adhesive weight 18.660T. Tenders on two bogies, 10,000 litres plus 2 T coal, and total weight 26.500T.” Six locos in total but not specified whether all of this type. Newest loco built 1865 [3] which was clearly incorrect.

The government publication *Estadística de los Ferrocarriles Particulares en Explotación* states that the railway had six locos in operation, all being tender engines, and weighing on average 55.75 tonnes each. In 1909 600 tonnes of Australian coal were used.

0-4-0TT railmotors d/w ?, cyls. 10"x16", built by Kerr Stuart in 1911

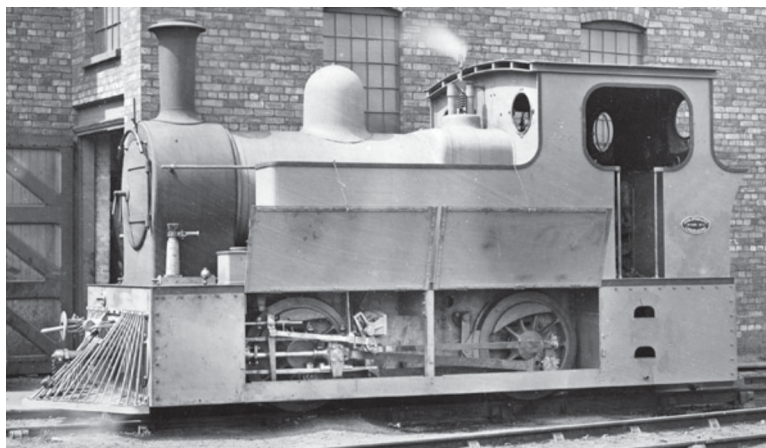
These were not articulated single units, but rather 0-4-0Ts with side skirts against the desert dust, each designed to be close-coupled to a passenger coach which also contained a supplementary loco water tank. The KS order book mentions pipe connections from the locos to the coaches with a pump to lift the water, and that the locos should have cow-catchers at both ends to obviate turning at the end of a journey. It seems that a semi-permanent bar coupling had been envisaged initially, but this was changed to a normal link and pin coupler to facilitate use with other coaches. The coach bodies were to be built by Birmingham RC&W Co. onto underframes and bogies constructed by KS. One loco at least was later in use as an 0-4-0T shunter. The order book notes: “Please note that the engine underframing &c is to be shipped in grey paint & that paint & varnish for finishing in chocolate color is to be sent.” There were also a vast number of varied notes recording conversations with the agents, with Liveseys, and with the Birmingham RCW Co. who were to build the coach bodies.

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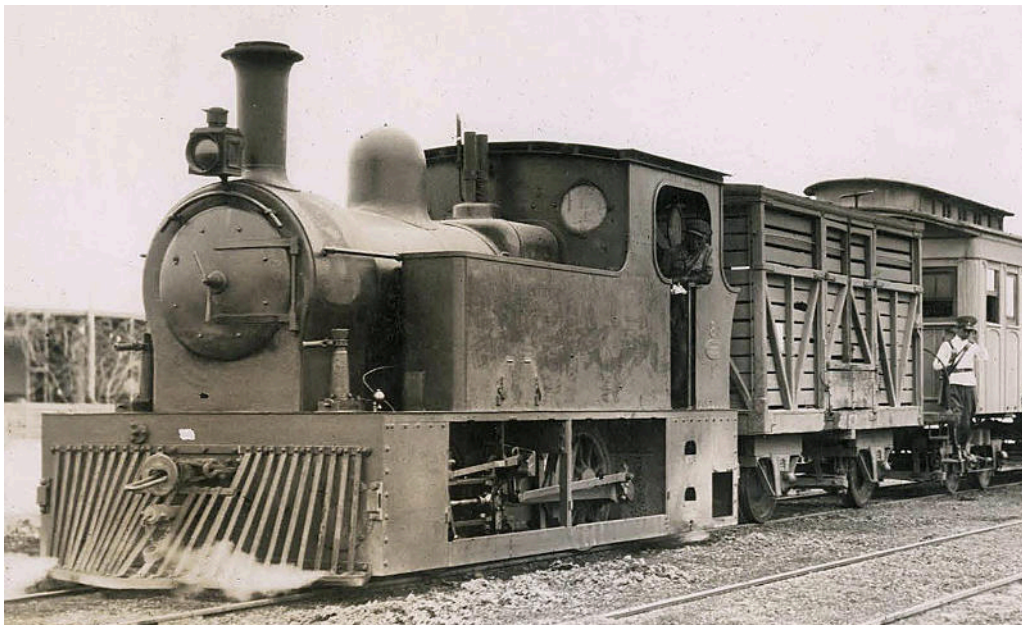
w/n 1204

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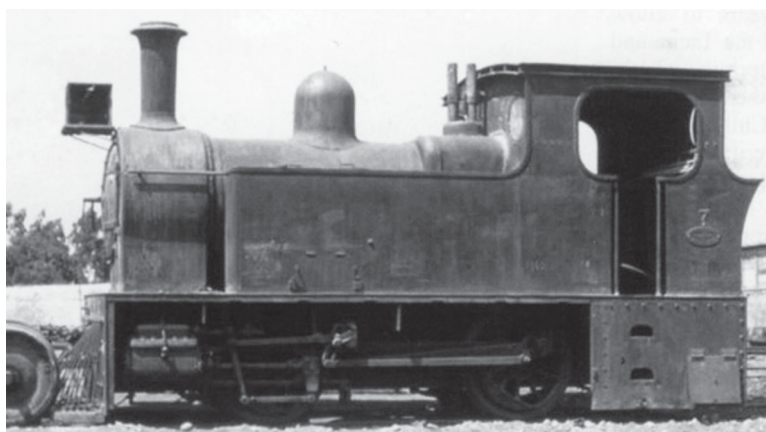
w/n 1205



KS builder's photo, from Hunslet archive at Statfold Barn Farm.



No. 8 is seen here in 1929, with the side skirt doors removed but not yet having lost the remainder of the skirting. Photo kindly supplied by Sr. Pablo Moraga.



Later in its life no. 7 seems to have become a humble shunter. Apart from the loss of most of its skirting it seems little changed. Photo found in the late Bob Whetham's *Railways of Peru* volume 2.

as an asset of extremely industrial value.

The steam autocars or motor-coaches sent out have proved a great success. They started running in the month of January last, and neither at the time of their erection, nor subsequently, has any criticism been passed upon them—a fact which reflects great credit on the makers, Messrs. Kerr, Stuart and Co. All accounts that reach us tend to show that the improved and accelerated service between Tacna and Arica is greatly appreciated.

As stated two years ago, this accelerated service of trains proves

A paragraph from *The Railway Times'* report of the company's AGM in 1912 (issue of June 29th 1912 p649).

The fleet in 1927 and up to the 1942 takeover

The US report dated 1930, recording the state of affairs at the end of 1927, stated that the railway then had “seven locos weighing 60 tons each. These locomotives are of the 4-wheel type having cylinders 16 by 24 inches.” Again this information seems to be over-simplified. The seven locos could be made up of the sole survivor of the first batch of 4-4-0s, the four later 4-4-0s, the single Hawthorn 2-6-0 and the Black Hawthorn 0-6-0T. The Kerr Stuarts may not have been considered as separate locomotives, rather being thought of as steam railmotors. This suggests that none of the-

later second-hand engines listed below had as yet been acquired. An examination of the directors' reports to the shareholders for the following years suggests that the impoverished railway of the 1930s was extremely unlikely to have purchased even secondhand extra engines, although the records of the Locomotive Manufacturers' Association at the NRM in York show that one boiler was supplied to the railway by Hawthorn Leslie in 1936.

Later post-1942 arrivals

The additional locos listed below probably all arrived after the takeover by the Peruvian government in 1942, and possibly not until the 1950s or '60s.

2-8-0 d/w 58", cyls. 16.5"x26", built by ALCo-Schenectady in 1914

Built for the Southern Railway of Peru, and then sold to the *FCAT*. Still present on *FC del Sur* when 1926 US report was compiled.

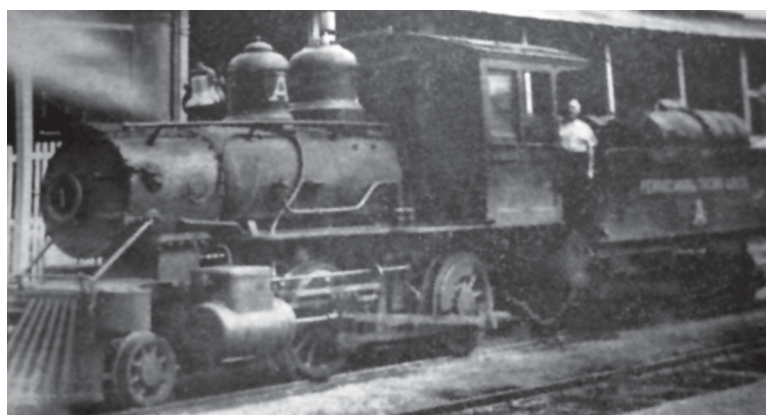
93 w/n 54536? ex *FCS* no. **93**. Loco survives in the railway's museum.



2-4-0 d/w 44", cyls. 13"x20", built by Baldwin in 1908

Built for *FC Ilo a Moquegua*, no. **3 'PACOCCHA'**. Transferred to *FCAT* as no. **1**. Still present on *FCIM* when 1926 US report was compiled. BLW class 06-20C no. 7. Spec. is in vol. 32 p 250.

1 w/n 32845 Loco survives in the railway's museum.



The same loco, bearing a no. **1** plate on the smokebox but carrying a large letter **A** on dome and tender side. Note also that the tender is rather taller than that shown above, reaching to the bottom of the cab windows. As preserved at Tacna museum nowadays, it has regained its original low height tender.

2-6-0 d/w 46", cyls. 16"x24", built by Baldwin in 1908

Built for *FC Ilo a Moquegua*, no. 2 'MOQUEGUA'. Transferred to *FCAT* as no. 2, though BLW list says it became *FCAT* no. 24. that may be a mistake for 2A, which Allen Copeland suggests was its new number on the *FCAT*. Still present on *FCIM* when 1926 US report was compiled. BLW class 08-26D no. 185. Spec. is in vol. 32 p 303.

2 or maybe 2A w/n 32983 Loco survives in the railway's museum.



2-6-0 d/w 54", cyls. 16"x24", built by ALCo-Rogers in 1908

Built for the *FC Ilo a Moquegua* in Peru as their no. 1 'ILO', and later sold to the *FCAT*. When the 1926 US report was compiled the *FCIM* did have a 2-6-0 with those cylinder dimensions but it was shown as no. 4 in the railway's fleet and no. 1 was shown as a 4-6-0.

9 w/n 44954 Loco survives in the railway's museum.



Ex-steam Sentinel railcars

The diesel railmotor currently used to provide a twice daily passenger service along the line, 'Autowagon 261', was built by Sentinel as a steam railmotor for the Central Railway of Peru in 1936. It and several of its sisters were converted to Saurer diesel power in 1938 and then later brought to Tacna. They too should be listed here, for their origins if not their current motive power units. Information below from 'EddieB' on RMWeb quoting James Hefner's *Surviving World Steam* project. It is to be assumed that none of them arrived until after the Peruvian government takeover in 1942. Ian Thomson in *LI* issue no. 66 says that *FCC* no. 7 departed from there in the mid-1960s but did not reach Tacna until 1976, probably spending the intervening decade on the *FCS*.

Bogie railcars built by Sentinel in 1934 (first three) and 1936 (last two) for the FC Central del Peru.

All converted to diesel by Wickham in 1938.

2 on <i>FCC</i> , became 0251 on <i>FCAT</i>	w/n 8983	Arrived on <i>FCAT</i> in 1967 according to <i>ENAFER</i> stocklists consulted by Bob Whetham.
4 on <i>FCC</i> , became 0252 on <i>FCAT</i>	w/n 8985	Arrived on <i>FCAT</i> in 1967 according to <i>ENAFER</i> stocklists consulted by Bob Whetham.
5 on <i>FCC</i> , became 0260 on <i>FCAT</i>	w/n 8986	
6 on <i>FCC</i> , became 0257 on <i>FCAT</i>	w/n 9098	Originally a single-ended passenger car operated with an un-powered trailer car. Operational relatively recently.
7 on <i>FCC</i> , became 0261 on <i>FCAT</i>	w/n 9099	Originally a single-ended goods/parcels car. Rebuilt with a

modern (Volvo?) engine, bonded windows, and air-conditioning, and is still in service in 2025.



Several ex-steam Sentinel railcars at Tacna depot in April 2019. The rear corner of **261** is at extreme left, **257**(?) is propped on blocks in the centre, and two others are within the shed in the background.



An image of 'autowagon **261**' running along the beach in Arica before its makeover. Photographer unknown.



Railcar **261** in its present guise. Whilst the windows, paintwork and roof-mounted AC units suggest radical changes, it seems likely that the bogies, frame and basic body

structure date right back to the vehicle's construction in 1936.

Another ex-Sentinel railcar being re-constructed

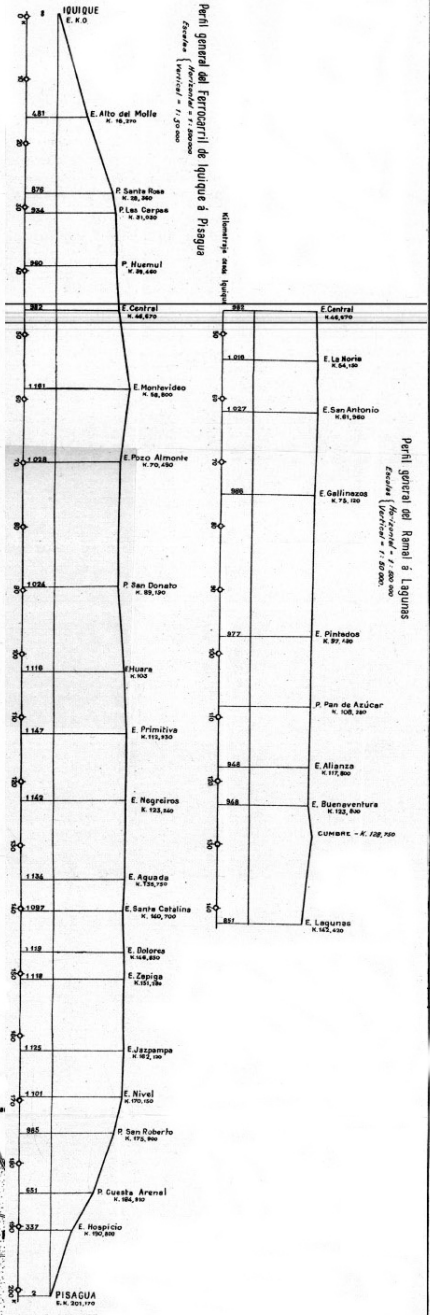
In late 2024 photos have emerged on Facebook showing that a second railcar, no. **0257** ex *FC Central* no. **6**, is nearing the end of its very protracted rebuild.



Paradero Cuesta Arenal
Paradero San Roberto
Estación Nivel
Estación Hospicio
PISAGUA

Legenda

Ferrocarriles
líneas aéreas
Caminos
Distribución





2.1.4 The Nitrate Railways dynasty of companies

1868-1970s?



The *FC Salitreros* initials as seen on an original carriage-side transfer in the collection of Gerald Hartley.

Background

Three linked standard gauge railways were built by the Montero brothers in the Peruvian province of Tarapacá to carry nitrate to the coast. They were constructed between 1868 and 1872, step by step as concessions were granted, and were of the gauge most common in that country. In 1874 they were transferred to the new Peruvian-registered *Compañía Nacional de los Ferrocarriles Salitreros del Perú* to meet the requirements of investors. Five years later the Tarapacá region was caught up in the War of the Pacific, with the result that it was invaded and then absorbed by Chile, though Mr. Rowland the manager remained in post during the change-over. The railways' state at the time was summarised in a telegram published in *Lloyds' List* on 17th March 1880 as "Iquique Railway good order. Pisagua Railway tolerable."

In 1882 a new British-registered Nitrate Railways Company later backed by 'Colonel' John Thomas North took over responsibility for the railways and their operation. In 1955 the whole much-reduced outfit was taken over by the Chilean state.



Loco numbers

This is another railway system with a reputation for having had a highly confusing locomotive numbering system that changed several times. This impression has been reinforced by previous researchers not having identified their sources or indeed the thought processes that led to their conclusions. I would like to suggest a contrary hypothesis, that the railway's logic in numbering its locos was straight-forward, with a few minor and easily explicable alterations along the way. This is most easily demonstrated by setting out the list of engines in their order of accession, as below, and by listing the probable sequence of decision-making. It should be emphasised that this is based on the loco numbers reported by Copeland & Kirchner, and by Binns, despite their evidence not being available. If that evidence falls, then so does this suggested reasoning.

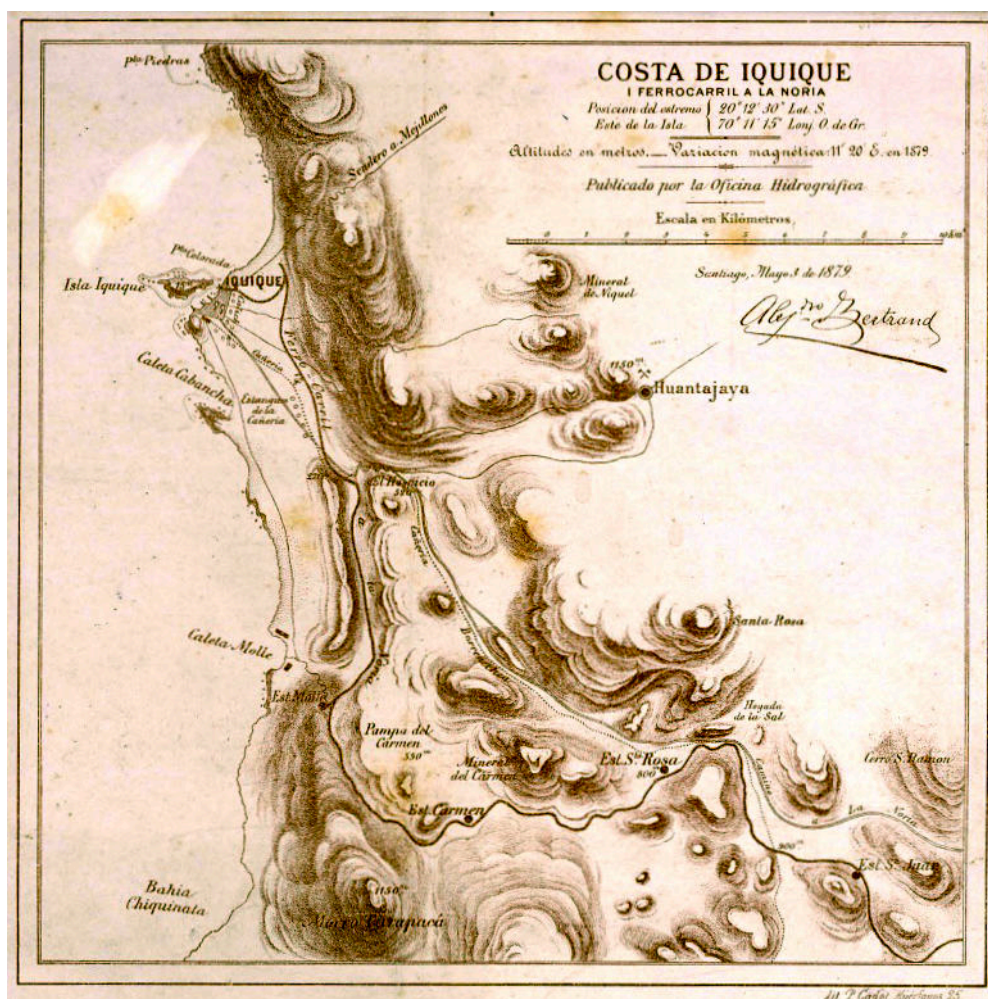
- 1 Engines originally named only, and possibly separately on each of the three railways.
- 2 A common numbering system introduced rather earlier than [7] suggests, certainly by 1875. Single engines, including one or two not yet identified, gained numbers **1-7**, and Double Fairlies were numbered from **8** upwards.
- 3 Further Sharp Stewart 0-6-0Ts were ordered around 1874, so for consistency nos. **4** and **5** were renumbered **24** and **25**, with their new sisters following on from **26** to **31**. The *FCSP*'s only later purchases (the Yorkshire-built Double Fairlies) continued the numbers up to **37**.
- 4 The new 'English company' Nitrate Railways after 1882 added extra locos as new numbers up to **58**. In 1889 it was decided that the small 0-4-0STs should take the smallest single digit numbers from **1** to **8** (Fairlie no. **8** being out of use by then) and to make way for this the Danforth 4-6-4T (**7**) and the Rogers 2-6-0s (**1** and **2**) went to **57** and **59-60**. However, it belatedly made sense to management for the next new engines, more Fowler 2-6-2Ts, to follow straight on from the earlier machines of that type as **56-61**. The final stage of that reshuffle was therefore to shunt the Danforth and the two moguls on in 1891 from **57**, **59** and **60**, to **62**, **65** and **66**. It rather looks as though whoever was in charge of the loco fleet around this period had a fixation with keeping similar locos together in the sequence, and about not leaving any gaps in the number series – perhaps the person concerned tended towards OCD behaviour!
- 5 In 1926 most unusually a gap was left when the new Garratts were numbered from **120** upward rather than from 115. However, by that date a more studied attitude to numbering systems was becoming prevalent in many railway companies and the *EFE* had also turned in 1919 to the practice of beginning each new class of loco at an easily identifiable number, eg. **701**, **801**, etc.

Identification of each of the double Fairlies owned by the Nitrate Railways is difficult. It seems likely that the early Avonside locos had straight-topped boilers, whereas those built from 1873-4 onward had 'wagon-top boilers' with raised fireboxes. Orders placed with the Yorkshire Engine Company for replacement boilers and other parts have been listed below as they often specified which class of engine the items were to be fitted to. In most cases the dates given are those when the order was placed rather than when the completed items were dispatched. The class numbers vary occasionally, and one can't help wondering whether, in some cases, a reference to say 'class 13' actually means loco **13**.

El FC de Iquique á La Noria aka the Iquique Railway

An earlier proposal by Orihuela & Pickering would have been broad gauge. Company formed in London in 1866. Opened officially in July 1871, but clearly carrying some traffic by late 1870. Approval by government 18 July 1868 in [[http://hdl.handle.net/2027/uc1.\\$b46998](http://hdl.handle.net/2027/uc1.$b46998) First half p404], Three locos were present during construction works on 27 October 1870 [Letter to prefect of province from Don Juan Ibarra [http://hdl.handle.net/2027/uc1.\\$b46998](http://hdl.handle.net/2027/uc1.$b46998) Second half p471] and in [<https://babel.hathitrust.org/cgi/pt?id=uc1.b4506422;view=1up;seq=32>] p22. There are many Tarapacá railway documents in [<http://hdl.handle.net/2027/uc1.b2822516>]. A concession was later granted for this railway to be extended to the Bolivian border under the management of a La Noria-Bolivia Railway Co., the gauge to be

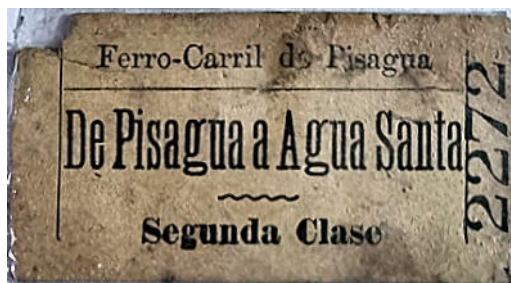
as the contractors should choose, but this was never built.



El Ferrocarril de Pisagua

aka the Pisagua to Sal de Obispo railway

Pisagua to Zapiga. Opened officially in August(?) 1872 or possibly as early as 1869 in part. Authorisation in [[http://hdl.handle.net/2027/uc1.\\$b46998](http://hdl.handle.net/2027/uc1.$b46998)] Letter of 18 May 1869 on p492 of first half. Documents translated by the British Foreign Office at the time and now in the National Archives, Kew, London, show that this railway was originally to have been built to the gauge of 3' 6" before the decision was made to use the same gauge as the Iquique Railway. There were three reversing stations on the initial climb from Pisagua.



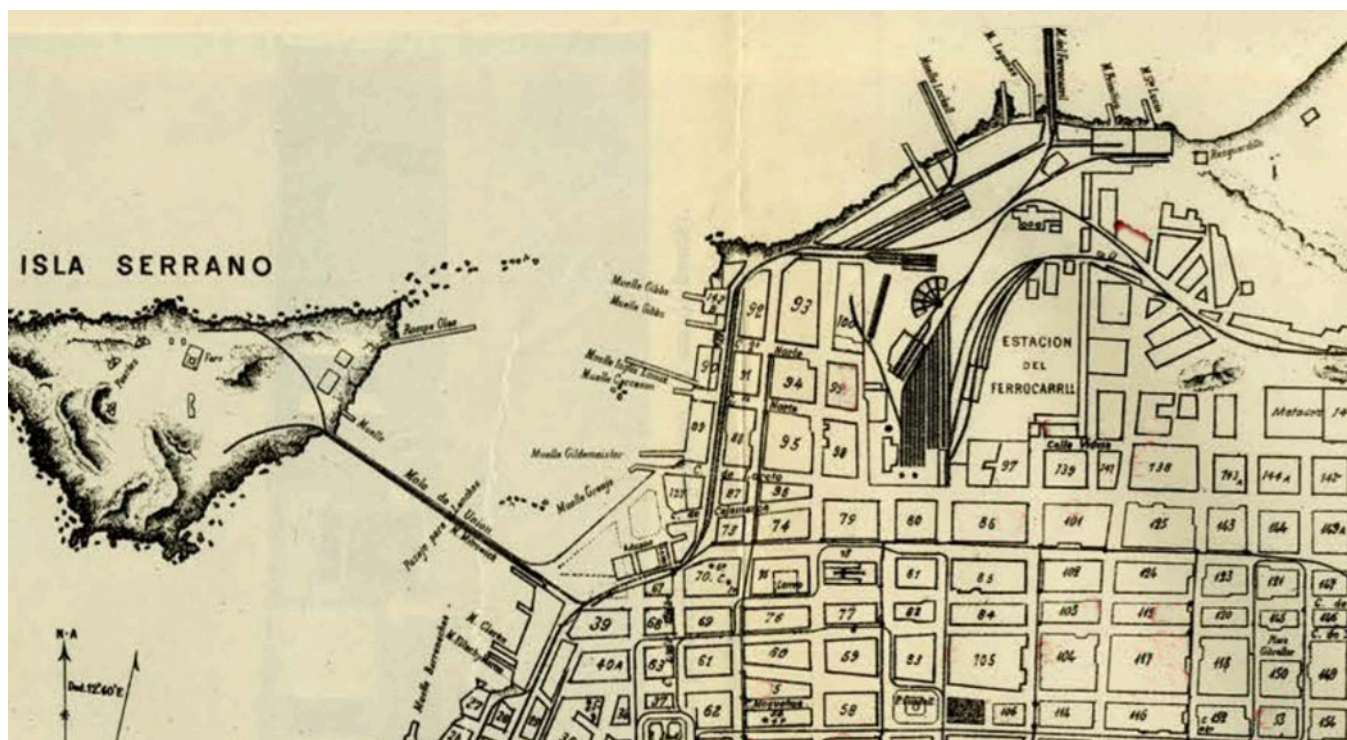
El FC Unión de Tarapacá

aka the Tarapacá Junction Railway

Link between Iquique and Pisagua railways, from La Noria to Negreiros. 66 km. Probably opened by 1871.

Locos may well have been shared between the railways, as convenient, since all three were owned by the same shareholders.

Plan of railway facilities in Iquique in 1903



At that time all the railway facilities were close to the station. The El Colorado site further east was a later development. The muelles (jetties) shown on the plan were named for or belonged to, from east to west: Santa Lucia Nitrate Agencies, Primitiva Nitrate/Lockett Bros., the Nitrate Railways Co., the Lagunas Syndicate, W. & J. Lockett, Antony Gibbs & Sons x 2, Inglis Lomax, Corcoran(?), Gildemeister ex-Rosario, ?, Granja, Mitrovich Hermanos, ?, Clarke(?), Folsch y Martin, and Barranechea. NB The track layout as shown here does not include any link from the station yard to the *muelle del ferrocarril*, or indeed from the mainline to the jetties. That seems extremely unlikely and is almost certainly an error.

Early single engines

Whilst the nitrate railways eventually owned more than twenty Double Fairlies, their first few locos were conventional. Not all of these have been identified but we do know that when a loco numbering system was introduced early in 1875 that seven single engines were given the numbers 1 to 7, before the Double Fairlies which were numbered from 8 upward.

The columns in each loco reference below give the probable names and numbers at various dates.

Original names	Mid 1870s	Interim nos.	1890 onward
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An unsuccessful 'Egyptian' 0-6-0

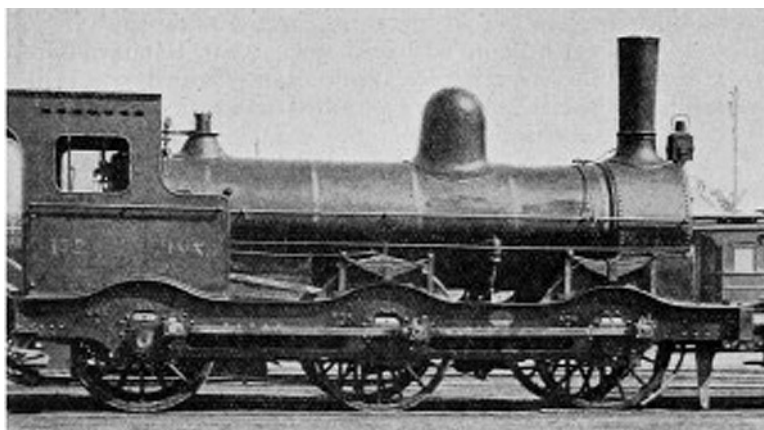
0-6-0 d/w 61¼", cyls. 17x24", built by Robert Stephenson & Co. in December 1869.

See the note re the Rogers 2-6-0s below for the first hint as to the identity of this machine and possibly one other by RS. Checking in original RS & Co. documents at the NRM in York then showed up repeated references to no. 1787 being for the Iquique Railway, Peru, but no mention of a second engine. The dimensions given above are listed in a 'Description book' as being for locos 1765 to 1797, which were built for the Egyptian Government Railway. Another RS list states that all the rest of this batch went to Egypt but that 1787 was 'lost', and this was repeated in an article in *The Locomotive* in 1904. Given that Egypt's large number of similar-looking 0-6-0 goods engines are supposed to have originated from the Pasha of Egypt having taken a fancy to a Midland Railway Kirtley engine seen at the 1862

Great London Exposition in South Kensington, it is indeed an unexpected end result that one of them should have found itself in Tarapacá. Six pages are devoted to the details of these engines in an RS specification book at the NRM.

? 3, 5 or 6? ? ? w/n 1787 "Delivered" 26th December 1869. Tender loco 1800 gallons. Running number is unknown, but those listed are the only unclaimed digits in the range 1-7.

If this was indeed unsatisfactory as Walton W. Evans [a not-unbiased American engineer and salesman] states, this was likely to have been at least partly because of its large driving wheels. These, at 61¼", were by a considerable margin larger than those of any other NR locos. The rigid wheelbase was consequently also long, being in total 16' 3" [RS 'Description book 12', item ROB/2/4/13 in the NRM archives] whereas the double Fairlies had bogies with a rigid wheelbase of no more than 8'6". Consequently the engine was possibly withdrawn relatively early, though it might have been more useful up on the pampa than it would have been on the coastal climbs.



This photo shows an Egyptian Government Railways Robert Stephenson-built 0-6-0 of the same batch as no. 1787. A six-wheeled tender was attached.

No.	Description	When Delivered	When for
1936	50 Tender	Dec. 20 1869	Just south of India River
1937	51 "	" "	" "
1941	52 "	" "	" "
1942	53 "	" "	" "
1943	54 "	" "	" "
1787	55 "	" "	" "
1788	56 "	" "	" "
1789	57 "	" "	" "
1930	58 Tender	changed in Day Book on this date	" "
1931	59 "	" "	" "

The entry in Robert Stephenson & Co.'s delivery book confirming that 1787 went to Peru rather than to Egypt.

0-6-0T d/w 48" cyls. 16x24", built by Sharp Stewart in 1869-70

According to B. Rumary's SS list this was ordered via Fry, Miers & Co. for an unidentified customer. [7] says d/w 49½". SS order no. E568. Fry, Miers & Co. were founded in 1866 as agents largely working in Brazil, but they may also have tried to break into other South American markets. Francis Charles Miers, one of the founders, had in fact been born near Valparaíso so Chile may well have been an obvious additional market worth exploring.

? 4? 24 w/n 2002

In November 1906 the YEC Co supplied one boiler for Sharp Stewart loco of class 24, under contract 163. Boiler empty weight 8T 9cwt. A 1923 photo shows this loco working in Iquique yard. 1929 NR official list implies it was in use then [8].



Photo kindly provided by Señor Pablo Moraga. The works plate in front of the cab doorway is definitely in Sharp Stewart's style, but there is also a Nitrate Railways painted ownership plate on the bunker side behind the cab.



No. **24** somewhat later, with a different smokebox and chimney. The smokebox front panel now has a wide flare at the bottom in the same fashion as that on loco no. **25**.

Three locos at work in late 1870

“El 27 de Octubre de 1870, el suprefecto de Tarapacá informó de que este camino tenia ya 15 millas enrielladas y servidas por tres locomotoras que trasportaban salitre; 11½ millas listas para recibir rieles; y que los trabajadores seguían haciendo los terraplenes ; faltaba abrir tierra en 31 millas para el completo de las 35 que tiene la línea.— Esta cuenta desde entónces con 38 wagones para carga, un coche de 1a y dos de 2a ; una maestranza y un condensador de agua salobre.”

On October 27, 1870, the *su-prefect* of Tarapacá reported that this road had already been railed for 15 miles and was served by three locomotives that transported saltpeter; (there were) 11½ miles ready to receive rails; and that the workers continued to make the embankments; it was necessary to begin work on 3½ miles for the completion of the 35 miles that the line has. – The assets since then include 38 wagons for cargo, a 1st class car and two of 2nd class; a *maestranza* and a brackish water condenser. [42]

A second engine from Stephensons, or a Hawthorn 4-6-0 brought up from Copiapó?

As explained above, it remains possible that a second engine of some kind did go out from RS, perhaps sold on after construction. However, so far none has been identified. There is one alternative possibility, and that is that Walton W. Evans had his British builders rather muddled, for an *FC de Copiapó* table from 1881 states that one of the Hawthorn 4-6-0s originally from the *FC de Chañarcillo* (Copiapó Extension Railway) had been sold to Iquique in 1871. This

4-6-0 d/w 48", cyls. 16"x24", built by R. & W. Hawthorn in 1860

?	?	?	w/n 1093
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After the disaster the *FCAT* had ordered a pair of replacement Hawthorn 4-4-0s and then a further two. Whilst the last pair did not arrive in Arica until early in 1873, it is quite possible that once the first two were in service (along with the sole surviving earlier Hawthorn) the Rogers moguls could have been spared. This hypothesis is strengthened by one of the engines at Arica having been named ‘**MORRO**’, not all that far from ‘**MORO**’ as mentioned by Gillson. If these two engines did arrive in Iquique then their details would have been as follows:

1? 'EL MORRO'	w/n (1569-70 in CF list)	Ex 'MORRO' on the <i>FCAT</i> .
2? 'CARMEN'	w/n (1569-70 in CF list)	Ex 'TACORA' on the <i>FCAT</i> .

A very similar Rogers 2-6-0 of the *FC Mejía y Arequipa*, though carrying a Radley and Hunter spark arrestor. The pair which went to the *FC Arica y Tacna* were built with traditional diamond chimney tops but might well have lost them if run on coal rather than wood fuel. This photo is from the late Christopher Walker's collection and also appears in *Railways of Peru Vol. 2*, by Bob Whetham.

The fleet in 1872

A vituperative letter from a Gregg Gillson, Rogers' fitter erecting locos on the Patillos Railway [??, see Appendix 6 in the Sub-metric gauge locomotives file in this series], states that, when John Cleminson (father of James, the patentee of 6-wheeled carriages) came out to Iquique as the Locomotive Superintendent in 1872, there had been "two Rogers, three English and two Fairlie engines on the road". Plausibly these could have been the two Rogers mentioned above, the two Stephenson and/or Hawthorn locos and the Sharp Stewart tank, and Fairlies '**TARAPACÁ**' and '**HERCULES**'.

Whilst not giving explicit information about the locomotives, the obituary of James Smith Okell, who was working for the railway in Iquique in 1872, is instructive: "...which he abandoned in 1872 to go to Iquique for Messrs. Montero Brothers. The inefficient management of the Iquique railway, and the numerous severe accidents upon the line resulting from it, had, shortly after Mr. Okell's arrival in Iquique, excited much popular indignation : and it was determined that an example should be made of some one or other of the responsible officials, if another accident occurred. Unfortunately for Mr. Okell, a catastrophe, attended with more fatal results than usual, took place early in 1873, and he – although in no way connected with the accident – was selected as the victim to receive the consequence of the popular feeling. He was imprisoned for several weeks, until, by the strong action taken by the British Consul at Lima, supplemented by the appearance of a man-of-war in Iquique harbour, Mr. Okell was set free and placed on parole on the ship." [] This suggests that there might have been casualties amongst the locomotives during that period.

4-6-4T d/w 40", cyls. 17"x22", built by Danforth Cooke in 1871, for the Iquique Railway

This engine has been said to have been Danforth no. 489 built in 1866-8, with there also having been a Danforth Cooke 4-4-0 or 2-6-0 which was Danforth no. 762. However, given that a number 722 can clearly be seen on the builders' plate just above the crosshead slide-bars, the conclusion must be that there was only a single engine from this builder and that it was this 4-6-4T. In other words there probably was no 4-4-0 or 2-6-0. Also, the no. 762, supplied to the Uquique (sic) & La Noria railway according to Connelly's Cooke list, was erected in November 1871 and not 1868 as often quoted. This means that it will have arrived in Iquique around February-March 1872 and would have been assembled and tested in steam in perhaps May-June. This fits very well with the letter by John Cleminson, the loco superintendent, written early that October, saying that he had been conducting comparative tests with this loco during the previous couple of months. The letter was quoted by Robert Fairlie in a letter to *Engineering* the following March [].

The loco's import to Peru is commonly attributed to Walton W. Evans, but following its lack of success he was very keen to distance himself from the project; see source [22]. The design seems to have been unique, and the suspicion must be that it was worked up from a 4-6-0 design especially to be comparable with the Fairlies in the sense of carrying all fuel and water within the locomotive. One additional puzzle is why it should have been fitted with a Radley & Hunter spark-arresting stack, for the Atacama desert is the driest in the world and nowhere is there less chance of setting fire to the scenery, no matter what the fuel used.

The engine supposedly used W. S. Hudson's patented feed-water heater or alternatively was even designed by him. Hudson was a Stephenson-trained machinist who became Master Mechanic for Rogers but also took out various patents. He also designed double-ended tank locos, and interestingly his predecessor and boss as Master Mechanic for Rogers was John Cooke who then moved across town to become a director of Danforth Cooke the builders of this engine. We may speculate therefore as to the design lineage of this machine. The unusual tanks running the full length of the locomotive are in fact each in two parts, with a division and linking pipe just in front of the middle driving wheels. Fillers are visible on either side at the very front and in the centre at the rear.

‘YQUIQUE’

7

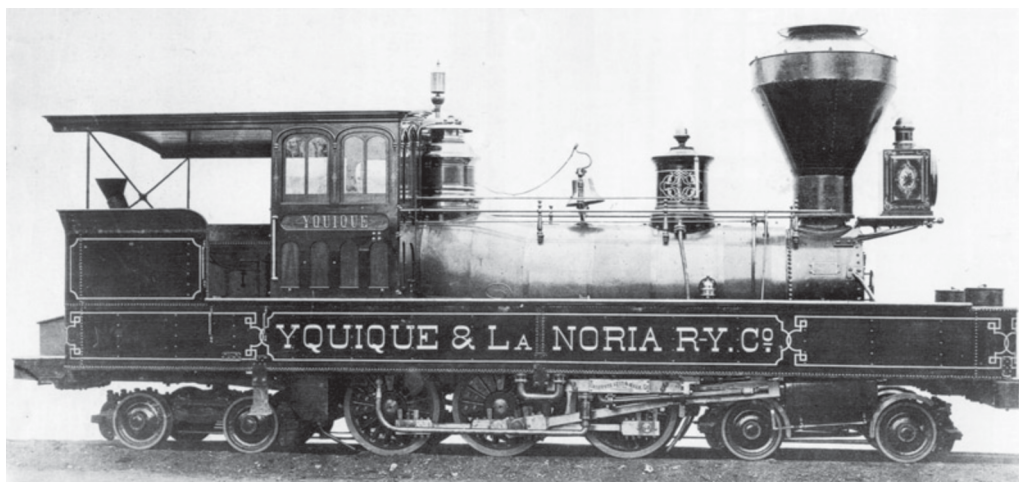
57

62

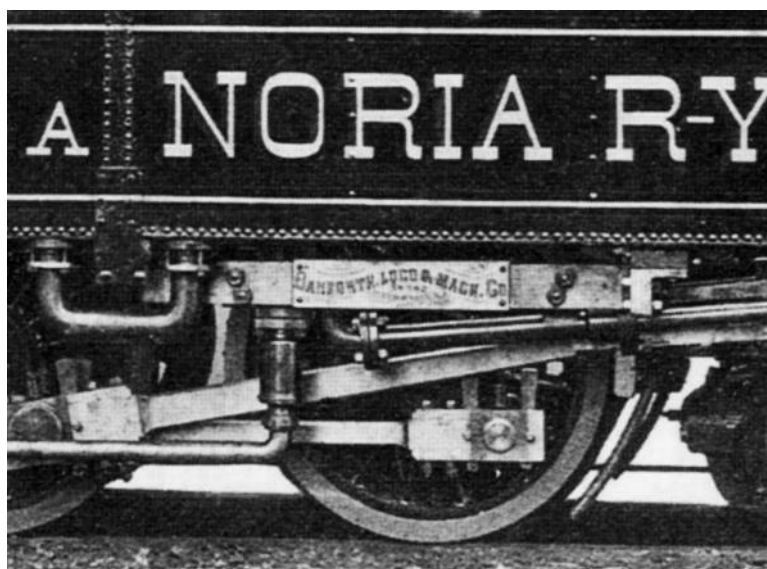
w/n 489?

Re-named ‘DESENGAÑO’ (disappointment or disillusionment) by Don Manuel Montero, but this may have been tongue-in-cheek and not displayed on the loco. Possibly Danforth 469?

Still listed in early 1909 according to one source [3] but [16] says scrapped in 1908 and certainly was not listed in 1929 NRC list [8].



The 4-6-4T by the Danforth Loco & Machinery Company. Close examination of the image reveals that the full length tanks were in fact divided in two at the halfway point, with fillers front and rear, and that a crosshead driven feed pump (or maybe two) was provided. Earlier Danforth Cooke tank locos had also had long and low tanks, though not to this extent. They may have been intended to retain easy access to the firebox stays, or in this case to spread the extra weight across all seven axles. Other aspects of the design follow Danforth Cooke’s standard practice, though the necessity for an R&H spark-arresting stack out in the Atacama desert might be disputed by many.



An enlargement showing the works-plate over the leading driving wheels. As well as the lettering ‘DANFORTH LOCO & MACH. Co.’ there is ‘No. 7?2’ and possibly something else beneath. The equalising pipe between the front and rear water tanks is visible on the left.

Debate about the Danforth 4-6-4T

The Annals of the Chilean *Instituto de Ingenieros* around 1909 contained a long series of articles covering each of the independent railways in the country. In many case these contained loco lists. For the Nitrate railways the list in-

cludes: Running no. **62**, number in service 1, number of driving axles 3, number of carrying axles 4, weight on each driving axle 7260kg, weight on each carrying axle 3630kg, total weight of loco in service 36,300kg. The weights are clearly rounded numbers, as they are all multiples of 3630kg, which equates to 4 short tons.

On a railway with gradients as steep as 1 in 25, the need is for adhesive weight and tractive effort rather than power output. The Fairlies had (100%) adhesive weight of between 64 and 74 tons, and four cylinders of 15 to 17" diameter by 22" stroke with driving wheels of around 45". The Danforth had adhesive weight of only around 22 long tons and two cylinders of 17 x 22/24" (depending on source) and d/w of 40".

Conclusion: The Danforth could have hauled less than two-thirds of the Fairlie loads up the hills out of Iquique or Pisagua. Anyone who says otherwise is deluded.

So why were Fairlie and Cleminson trying to make such a fuss about the loco's seeming failure? Presumably because they and Evans had so much riding on the winner of their very public argument.

But why did Evans try to distance himself from any involvement in the locomotive after the comments of Fairlie and Cleminson rather than just pointing out the disparity in loco size and capabilities? Possibly because he had indeed tried to sell the Danforth as a competitor to the Fairlies and therefore could not easily laugh it off.

The other question is why would the Iquique railway have wanted such a light machine, especially when Danforth Cooke could easily have built a heavier loco and clearly must have done so for other railways? Well, the Montero brothers had obviously been rather gullible initially, hence the Stephenson 0-6-0 which was utterly useless for their needs, and may well have accepted a seeming bargain offer by the persuasive Mr. Evans. Maybe it was offered with a short delivery time. Who knows?

Others have wondered why, if the loco was such a failure as Fairlie and Cleminson stated, it should have lasted until 1909. However, mechanically, under those strange tanks, it was probably a bog-standard US-built ten-wheeler of its era, and therefore might well have worked very well within its haulage capacity, eg. up on the branches of the flat nitrate pampa rather than on the steep climbs from the coast.

Moguls from a little further north?

The volume "Letters & Translations from Lima – 1874" [36], selections from which are in Appendix 3, includes: August 22, 1874: "*Two locomotives for sale at Ilo belonging to the Government which we wish to purchase if suitable...*" and then September 13, 1874: "*We are not yet in possession of the report with regard to the 2 locomotives of Ilo belonging to the state, and which we are thinking to purchasing...*"

The *FC Ilo a Moquegua*, not much further north, possessed a pair of Rogers 2-6-0s, nos. 1870 and 1875, and three more by Danforth Cooke, nos. 772-774. All were built in 1871, but traffic on the *FCIM* was disappointing and it is very possible that locos could have soon been dispensed with to raise funds. These could have been from either or both classes, and in fact the latter is quite likely. In source [36] the two locos whose purchase was being considered are explicitly named as '**ILO**' and '**PACOCCHA**', but whilst the Rogers pair were '**ILO**' and '**MOQUEGUA**', we do not know the names of the Danforth Cooke engines with any certainty and thus '**PACOCCHA**' was very possibly one of them (and '**TACNA**' another). Bob Whetham comments that despite the *FCIM* starting out with ten locos, it later seemed to have had only eight, which tends to support this hypothesis. However, note that there is no confirmation that this sale actually went through. More recently, in 2021, a list of derelict locos remaining at Ilo in 1896 has come to hand. This suggests that '**ILO**' and '**PACOCCHA**', or at least their boilers, were there at that point but that two other engines were missing, a Baldwin mogul named '**OTORA**' and one of the other Danforth moguls. [the *Anales de las Obras Públicas del Perú* for 1896]

2-6-0 d/w 49", cyls. 17x22", built by Baldwin in 1871-2

? ex-'**OTORA**' w/n 2691

2-6-0 d/w ?, cyls. 17x22", built by Danforth Cooke in 1871

? '?' w/n 772-4?

Neither loco was listed in the 1929 NRC official list [7].

How many conventional locos were there?

If the two possible purchases from the *FCIM* are included, that gives us a total of eight 'single' locos in the fleet around 1875.

2x Rogers 2-6-0s from the *FCAT*

2x Stephenson / Hawthorn engines, one being the Egyptian design 0-6-0. and the other the 4-6-0 from Copiapó

1x Sharp Stewart 0-6-0T

1x Danforth Cooke 4-6-4T

2x Baldwin/Danforth Cooke 2-6-0s from the *FCIM*

However, when running numbers were introduced that year there were only seven allocated to single engines, the numbers **1** to **7**. Three possibilities spring to mind to solve the problem:

1 Possibly one of the *FCIM* locos was not purchased, maybe owing to its poor condition.

2 One of the two Stephenson / Hawthorn engines, supposedly very ineffective, might have been withdrawn before the numbers were allocated.

3 There had been an accident, leading to the writing off of one engine. There is no firm evidence for this, but it was the usual reason for the loss of a loco, as occurred on the nearby Tocopilla nitrate railway during its earliest years, and there certainly were accidents at Iquique / Pisagua as mentioned above.

As far as the actual allocation of numbers is concerned, there have been a few suggestions:

1¹ 'CARMEN' (or Rogers 2-6-0, later became NRC no. **59¹**, and still later no. **65**.)

2¹ 'EI MORRO' vice versa) Rogers 2-6-0, later became NRC no. **60¹**, and still later no. **66**.)

3¹ '?'

4¹ '?' Sharp Stewart 0-6-0T no. 2002, later became NRC no. **24**.)

5¹ '?'

6¹ '?'

7¹ 'YQUIQUE' Danforth Cooke 4-6-4T, later became NRC no. **57¹**, and still later no. **62**.)

Double Fairlies

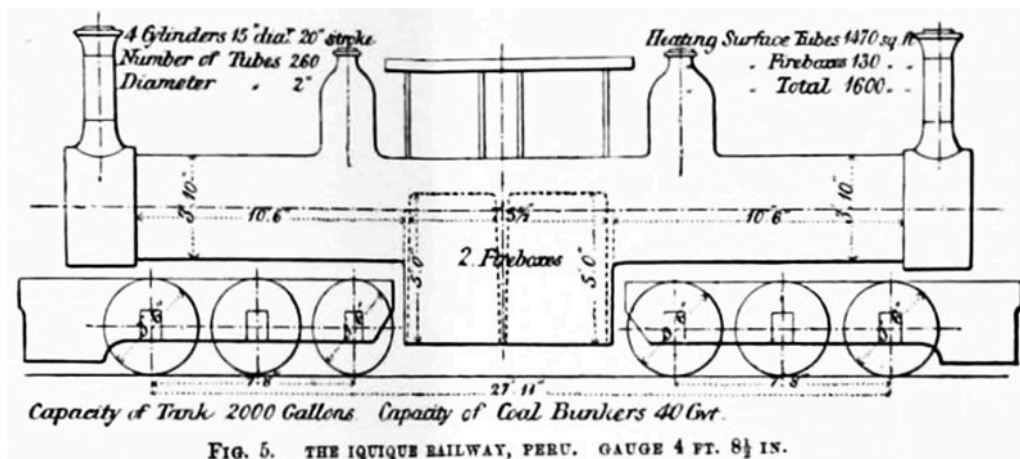
The NRC eventually had as many as twenty-three Double Fairlies, and kept many of them in service until the beginning of the 1930s when the terminal decline of the nitrate industry had begun. That in itself seems to be sufficient rebuttal to Walton W. Evans' diatribes against Fairlie locomotives. However, as Chris West has pointed out, the London offices of the Iquique and Pisagua Railways in 1874 were in Palace Chambers, Victoria St., Westminster, other tenants in the same building being Robert Francis Fairlie and the Fairlie Engine & Rolling Stock Company. That may well have had some influence on the railways' initial decision to try a Fairlie or two.

0-6-6-0T Double Fairlie d/w 42", cyls. 15"x20", built by Fairlie E&SC Co. in 1870

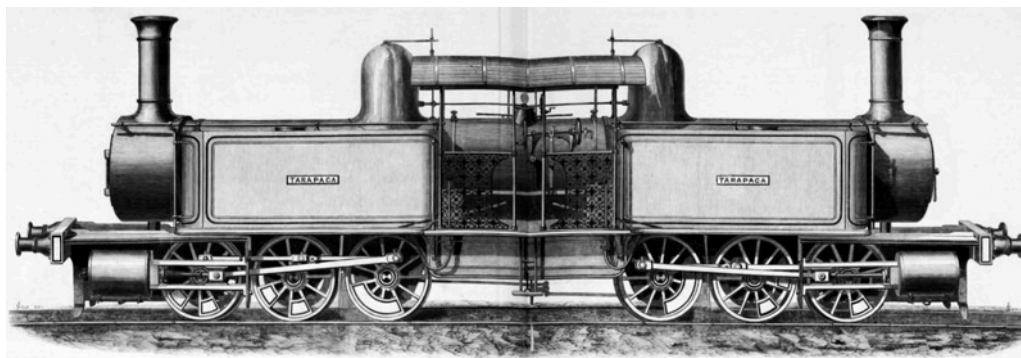
Built for the Iquique Railway. Straight-topped boiler.

'TARAPACÁ' **8** **8** w/n 5

Probably out-of-service by 1889 when the numbering of small tank locos in the single figure range will have re-used the number **8**. Given that boilers, wheels axles, cylinders and other major parts were frequently replaced during a loco's life, the problem leading to this engine's withdrawal must have been an order of magnitude bigger. A serious accident seems to be the most likely scenario, possibly leading to substantial power bogie damage.



A sketch from *Engineering*, 21st August 1874.



Note the side buffers.

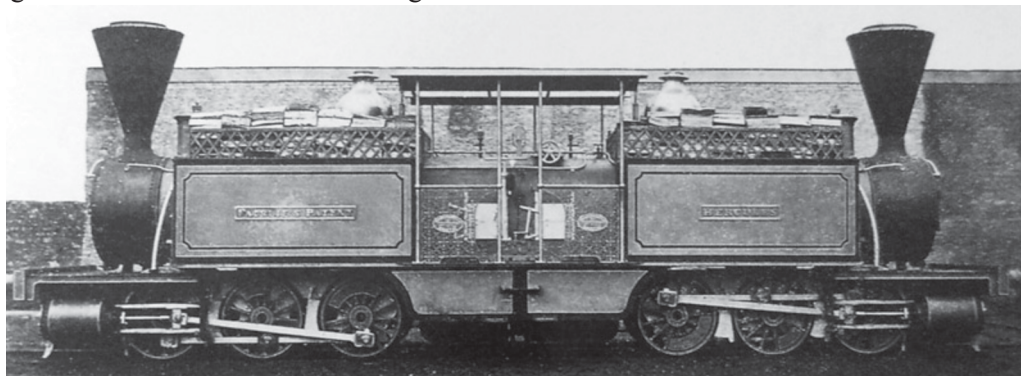
0-6-6-0T Double Fairlie d/w 42", cyls. 15"x22", built by Avonside in 1871, for the Iquique Railway

NR list from 1929 says d/w 43½" and cyls. 15x22" [11]. Straight-topped boiler. Avonside order F.

'HERCULES'	9	9	w/n 853/854	In service and damaged during civil war in 1891, see details in Appendix 5. Rebuilt Iquique 1909. 1929 NR official list implies it was in use then [8]. Article in <i>The Locomotive</i> in March 1932 says still in service at that date.
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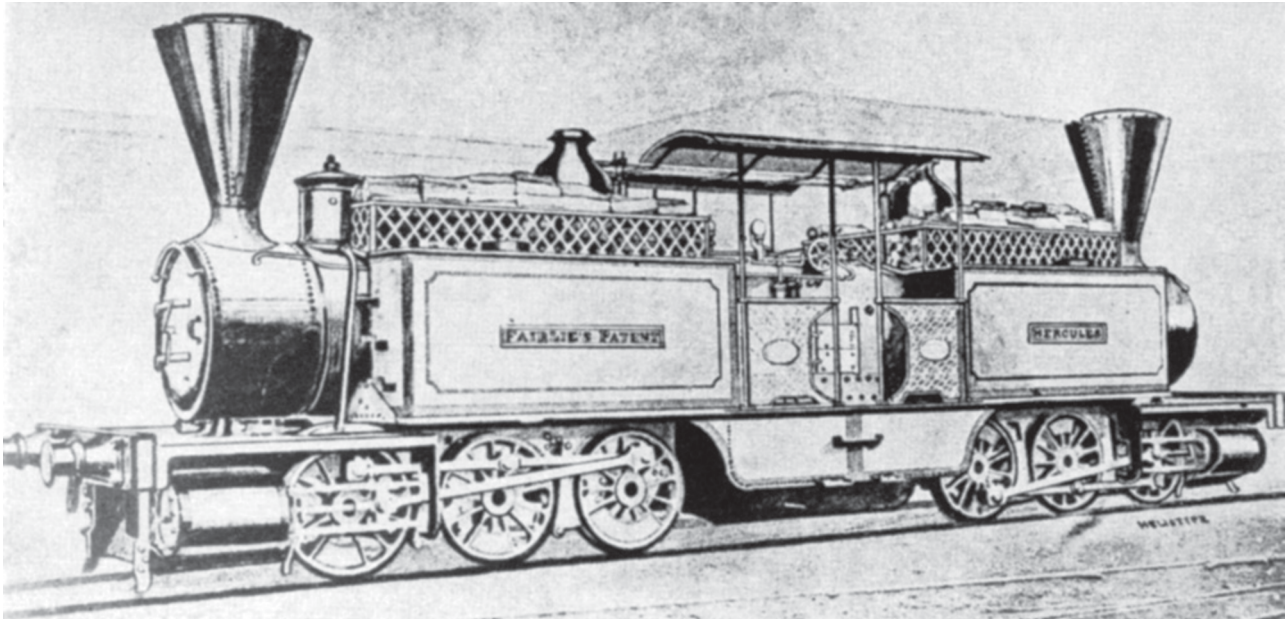
In May 1918 the YEC Co supplied four back radial stays for loco no. 9 class, under order 5121.

In May 1918 the YEC Co supplied twenty-four engine bearing springs for no. 9 class, under order 5126. This suggests that the class might have contained at least two engines.



This previously-unknown image of the Fairlie **'HERCULES'** appeared on an internet site with no source given, although it now seems likely that it is in the possession of the IMechE. It is an Avonside builders' photo. When compared with the engraving below it is clear that the cabsides were of wrought-ironwork rather than solid panels. It does

appear that high level buffer beams and side buffers were fitted as the engraving suggests, though the outer ends of the buffers have been cropped from this image. This may have been a temporary arrangement, for the loco was demonstrated on the Midland Railway around Bristol before shipment to the west coast.



Abbott suggests that this engraving shows the Fairlie '**HERCULES**' built by Avonside in 1871. Note the inside (Allan straight link) valve gear, the side buffers (possibly only fitted for use under test in the UK before shipment), the full length fuel racks, and the early type divided cab roof.

Couplings

A puzzle at this point is that the engravings of '**TARAPACÁ**' and '**HERCULES**', and the photo of the latter, show them with European-style side buffers. Did perhaps the Iquique Railway if not the originally separate Pisagua line use such coupling and buffing arrangements in the early years? Or were the buffers a temporary fitment for demonstration in England before shipment to Peru? For most of its early life the Nitrate Railways system used link and pin couplers, replaced in the 1920s by knuckle couplers.

Loco names and numbers

If the first numbering scheme was introduced in the 1870s, then previously there must have been names. So far we have the names '**TARAPACÁ**', '**HERCULES**' and '**IQUIQUE**' for the first three Fairlies, '**YQUIQUE**' for the Danforth 4-6-4T, '**CARMEN**' and '**MORO**' for the pair of Rogers moguls, and '**La ARGENTINA**' for some unknown engine. Thus there must have been another three names or so for single engines, for when the numbers were introduced those Fairlies became nos. **8**, **9** and **10**. We can also date the change to early 1875 or thereabouts, for if the Fairlies were numbered from **8** upward then there must have been seven single engines and thus the originals may have been joined by the two 2-6-0s from Ilo that arrived in maybe late 1874. The correspondence set out in Appendix 2 clearly refers to locos **18**, **19** and **22** in a letter of May 1875.

Given that it is quite possible that up to twenty engines were in service by the time that numbers were introduced, all of those locos will have previously had names.

Class 12?

0-6-6-0T Double Fairlies d/w 42", cyls. 15"x22", built by Avonside in 1871-2

Built for the Pisagua Railway. [8] gives d/w as 43½". Certainly no. **10** seems to have had a straight-topped boiler.

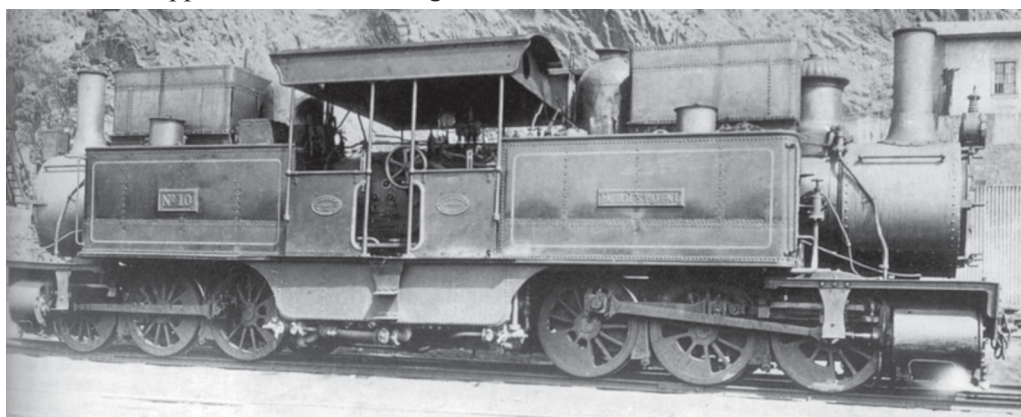
No. **10** was part of Avonside order F. whilst **11** and **12** were part of order FP.

'IQUIQUE'	10?	10?	w/n 851/852	Not recorded in service during civil war 1891. Rebuilt Iquique 1912. 1929 NR official list implied it was in use then [8]. Still in service in 1932 [4].
?	11?	11?	w/n 903/904	Not recorded in service during civil war 1891. 1929 NR official list implies it was in use then [8]. Still in service in 1932 [4] but [16] disagrees.
?	12?	12?	w/n 905/906	In service and damaged during civil war in 1891, see details in Appendix 5. 1929 NR official list implies it was in use then [8].

In October 1912 the YEC Co supplied six steel loco axles for Fairlie engines class 12, under order 22358.

In April 1913 the YEC Co supplied six steel loco axles for Fairlie engines class 12, under order 873.

In October 1913 the YEC Co supplied six axles for engines class 12, under order 1175.



Fairlie no. **10**, in its later years, with oil tanks, but retaining inside valve gear and valve chests. Notably, Laird type crossheads and guides are carried, rather than the usual 'alligator' type.

Ten locos at the beginning of 1873

Sr. Juan Ibarra, writing from Iquique in January 1873, says "*Existen diez locomotoras, y se sabe que estan al llegar cuatro sistema Farly.*" or "There are ten locomotives, and it is known that four Fairlie system (engines) are arriving." [43] This probably refers to the Iquique and Pisagua lines together. In fact we have so far identified eleven locos above, possibly with one already withdrawn, and the next batch of locos ordered new for the railway are indeed four Fairlies.

Fairlie confusion

A number of researchers have tied themselves in knots whilst trying to ascertain the individual identities of the couple of dozen Fairlie locos supplied to the Nitrate Railways. Much of the puzzlement results from a 1929 official NR fleet list seeming to suggest that the batch of Avonside locos listed immediately below, ie AE nos. 886-893, comprised eight engines rather than the four that would be the case if Avonside had stuck to its normal practice of giving each double Fairlie two works numbers rather than one. However, this is only implied by numbers faintly pencilled in on the inked list by some unknown hand. If there were just the four of these, as suggested below, then most other problems disappear.

Additional help is given here by including all the YEC Co spares orders for the NR, which list the loco class in each case and probably in some instances the actual loco number though that is not certain.

Class 14?

0-6-6-0 Double Fairlies d/w 43½", cyls. 15x22", built by Avonside in 1871-2

Straight-topped boiler almost certainly. Avonside order FP. If d/w were indeed 43½" then tyres on these later engines must have been thicker.

?	13?	13?	w/n 886-7	In service and damaged during civil war in 1891, see details in Appendix 5. 1929 NR official list implies it was in use then [8].
?	14?	14?	w/n 888-9	In service and damaged during civil war in 1891, see details in Appendix 5. Scrapped December 1918 [8].
?	15?	15?	w/n 890-1	In service but not damaged during civil war in 1891, see details in Appendix 5. Rebuilt Iquique 1909 [8]. In Sept 1915 a report has this loco working a train from <i>oficina Felisa</i> [32]. In Mar 1918 a report suggests this loco was working along the mainline south of Huara [32]. The 1929 NR official list implies it was in use then [8]. Still in service 1932 [4] and [16] confirms.
?	16?	16?	w/n 892-3	Not recorded in service during civil war 1891. Recorded in Dec 1920 working up double-headed with no. 88 from Iquique to Las Carpas [32]. 1929 NR official list implies it was in use then [8].

In 1897 the YECó supplied three Fairlie boilers for engine class 14, under contract 97. Boiler empty weight 12T 19cwt.

In June 1898 the YECó supplied two cylinders for class 14, under order 13886.

In April 1903 the YECó supplied two cylinders for class 14, under order 16723.

In November 1905 the YECó supplied two double engine boilers for class 14, under contract 152. Boiler empty weight 13T 6cwt.

In early 1906 the YECó supplied one pair loco wheels for Fairlie locos of class 4 (perhaps 14 was meant?), under order 18570.

In November 1906 the YECó supplied one double engine firebox and wrapper for Fairlies of class 14, under order 18834, also smokebox tubeplates.

In June 1907 the YECó supplied one double engine firebox and wrapper for Fairlie class 14, under order 19119.

In June 1907 the YECó supplied two smokebox tubeplates for Fairlie engines class 14, under order 19122.

In December 1908 the YECó supplied one LH and one RH cylinder for Fairlie engine class 14, under order 19733.

In May 1910 the YECó supplied two bogie frames for Fairlies class 13 complete with cylinders, under order 20582, also many other bogie parts including full set of wheels presumably for same loco. Single bogie weight 14T 19cwt.

In September 1910 the YECó supplied one RH cylinder for Fairlie engine class 14, under order 20866.

In April 1913 the YECó supplied four pairs wheels and axles (leaders and drivers) seemingly for engines class 14, under order 815.

In March 1914 the YECó supplied four crossheads for Fairlie Engines class 13, under order 1427.

In July 1916 the YECó supplied one LH cylinder for engine class no. 14, under order 3210.

In July 1916 the YECó supplied four crossheads for engine class no. 16, under order 3213.

In July 1916 the YECó supplied one pair driving wheels and one pair leading wheels for engine class no. 13, under order 3219. Without axles or crankpins.

In March 1918 the YECó supplied two cylinders for engines class 14, under order 11925.

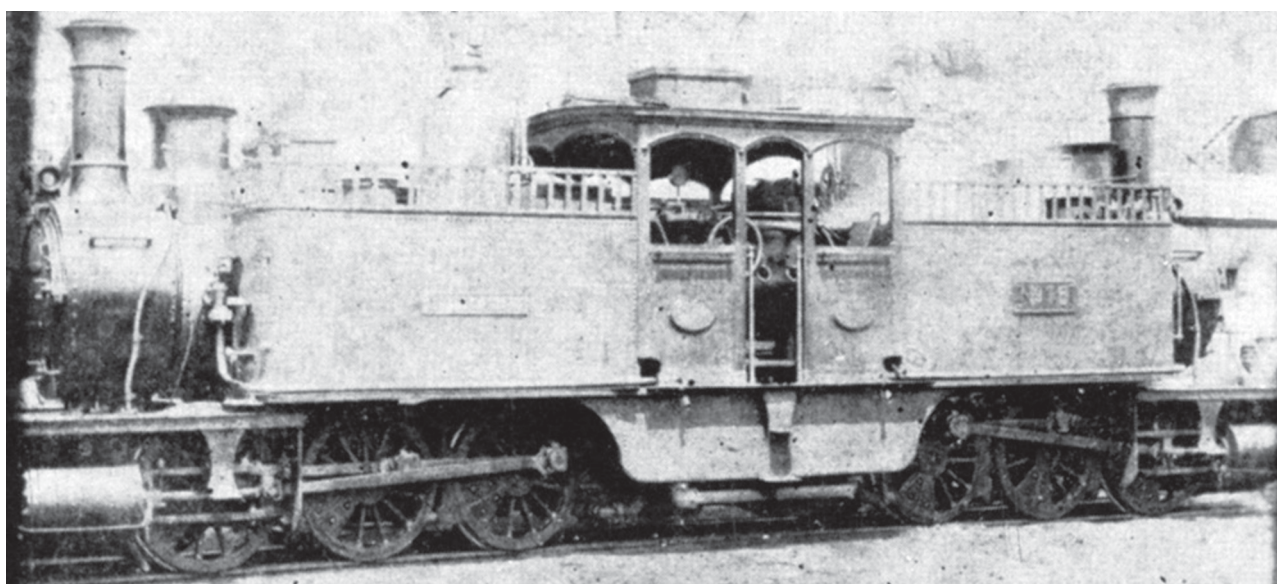
In May 1918 the YECó supplied four crossheads for loco no. 13 class, under order 5115.

In May 1918 the YECó supplied four cast steel bogie centres for loco no. 13 class, under order 5120, also one RH cylinder for no. 14 class under order 5134.

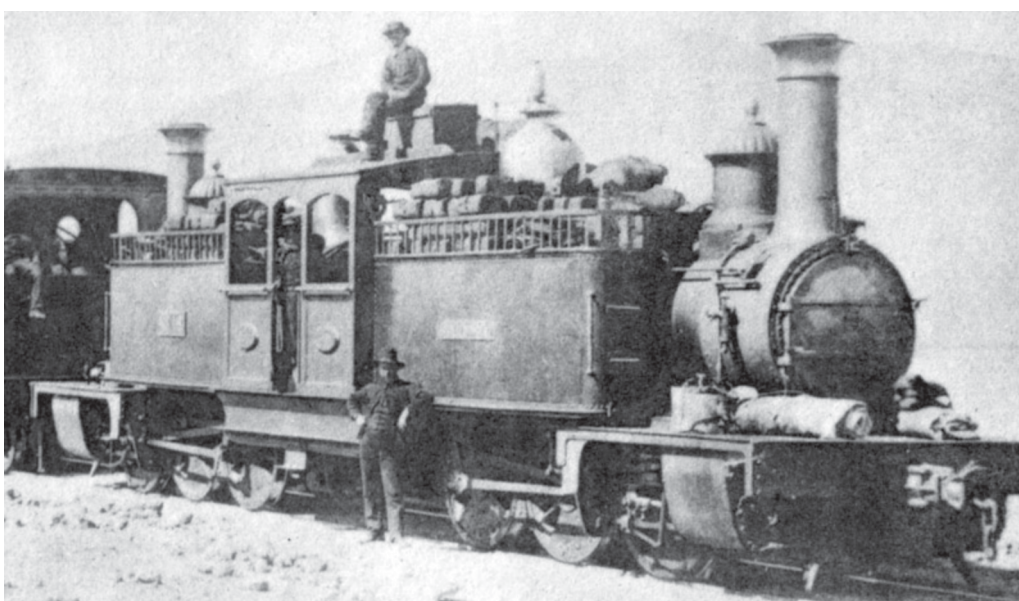
In May 1918 the YECó supplied two leading wheels and two driving wheels (centres only, no tyres or axles) for locos. class 13, under order 5136.



Two double Fairlies with numbers beginning with 1, though in neither case can the second digit be made out. Both seem to have straight-topped boilers, but the upper picture shows low cab sides which suggests that the engine is an earlier one than that in the second image which has a full wooden cab. The second one has full length fuel racks.

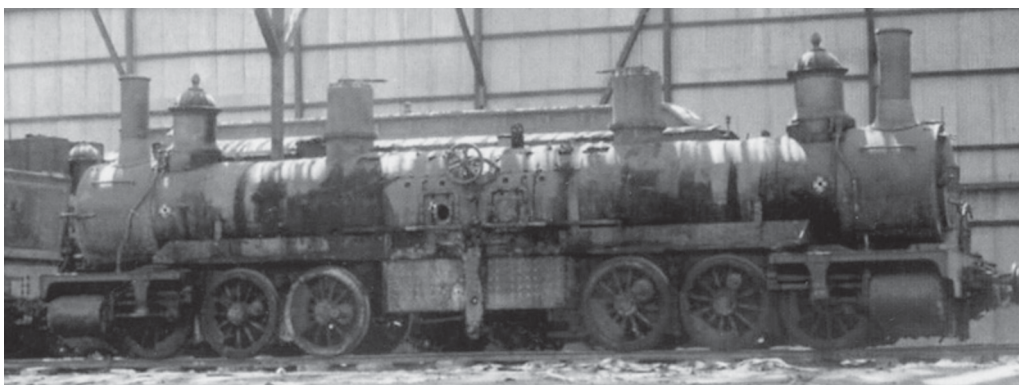


This is a straight-topped boiler Avonside loco with 13 spoke wheels. The number appears to be in the teens, and must be **16** or below. Note the original pattern cylinders curving in at the top, indicating that the steam chests were between the frames and actuated by inside Allan straight link motion.



A very similar double Fairlie to the one seen immediately above, but the cylinder

outer profile is different, for the loco has outside Walschaerts valve gear and cylinders with steam chests above, which means that this picture was taken after that major change had been made. In addition the cab roof above the windows has lost its overhang, the footplate steps are located under the outer ends of the tanks, and the well tank is apparently shallower and with a pipe running across it. The nearer smokebox door appears to be hinged to the left, a feature also visible on the engraving of '**HERCULES**' a few pages earlier. The photo supposedly dates from 1888.



The photo above was taken by Brian Fawcett at the railway's works in Iquique during 1939. The derelict double Fairlie is one of the earlier ones (nos. **8** to **16**) with a straight-top boiler, and interestingly retains its early bogies with inside Allan straight link motion. Note though that Laird type crosshead guides are fitted, as opposed to the normal 'alligator' crossheads with widely spaced guides. Of the other photos here, only the one of loco no. **10** shows Laird type guides. The wheels each have 12 spokes, and balance weights which, whilst of varying sizes, each cover three inter-spoke spaces. YECO Fairlies had 12 spoke wheels with weights covering either 4 or 2 spaces (depending whether on the driving or driven axles). The earliest Avonside engines had varying arrangements but a clear photo of no. **9** shows 13 spoke wheels originally with weights covering four or two spaces (though later with varying thicknesses of weight covering 2 inter-spoke spaces), whilst their later straight top boiler locos certainly had 12 spoke wheels albeit with weights not yet clearly examined. It is therefore suggested that this engine may be one of the Avonside engines numbered between **11** and **16**. It will also be noted that there are the later longer smokeboxes with stove-pipe chimneys.

Class 18?

0-6-6-0 Double Fairlies d/w 42"?, cyls. 15½x20", built by Avonside in 1872

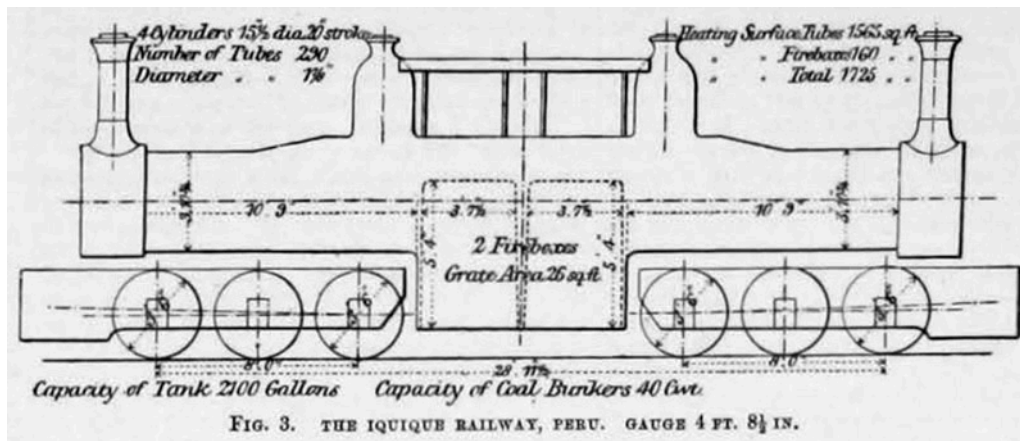
Cylinder stroke lengths for the following six locos are in doubt. [4] says they were rebuilt later with new cyls. and outside Walschaert's valve gear. Fitted with wagon-top boilers. Letters say that the second and third of these locos were shipped from the UK in June 1874, arriving on the west coast that October. Avonside order PU.

?	17	17	w/n 944-5	Not recorded in service during civil war 1891. Scrapped December 1918 [8].
?	18	18	w/n 946-7	In service and damaged during civil war in 1891, see details in Appendix 5. Rebuilt Iquique 1910 [8]. A report in April 1914 has this loco working a train from La Noría through Estacion Central [32], another from that month confirms that the engine was allocated to Iquique running shed at that time [32]. In March 1917 the engine was reported on the Felisa branch, near San Antonio?, [32]. 1929 NR

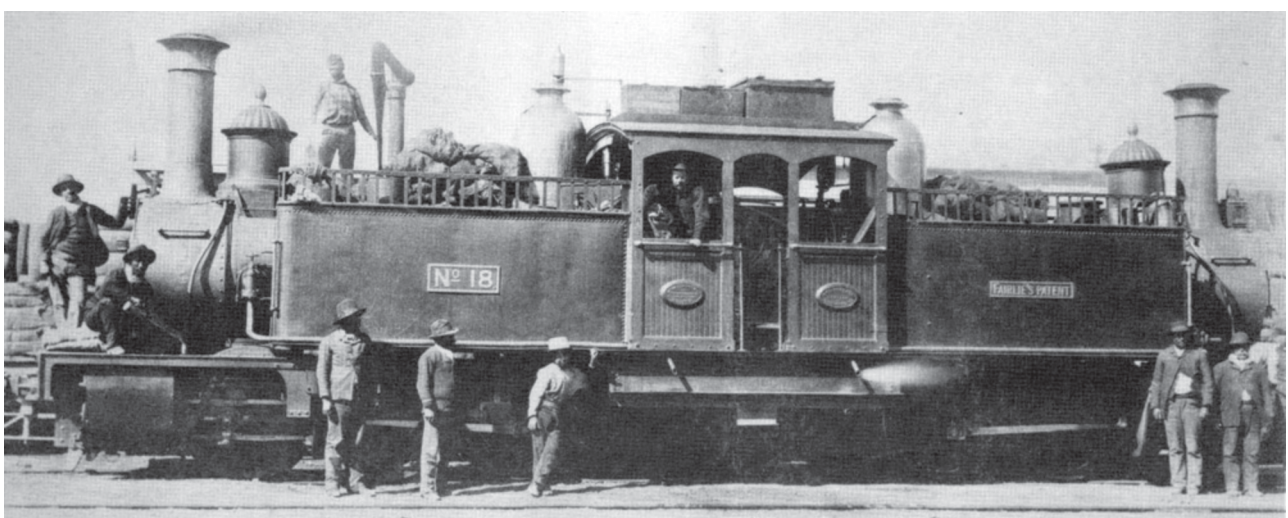
official list implies it was in use then [8]. Article in *The Locomotive* in March 1932 says still in service then.

Not recorded in service during civil war 1891. Rebuilt Iquique 1911 [8]. 1929 NR official list implies it was in use then [8]. Article in *The Locomotive* in March 1932 says still in service then.

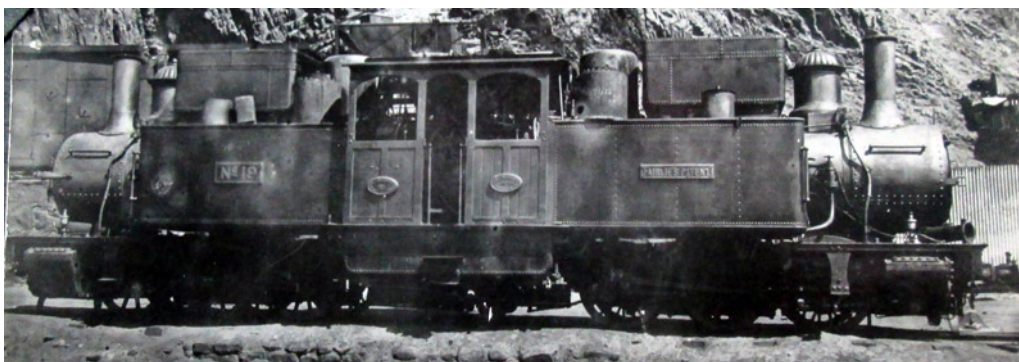
In Feb. 1890 the YEC Co supplied a double boiler for class 18, under order 83A. Boiler empty weight 14T 16cwt.
 In July 1897 the YEC Co supplied a pair of wheels on an axle for class 19, under order 13209.
 In Dec. 1900 the YEC Co supplied a double boiler for class 17, under contract 117. Boiler empty weight 15T 17cwt.
 In December 1908 the YEC Co supplied one pair leading wheels and axle for Fairlie engine class 17, under order 19734.
 In early 1910 the YEC Co supplied two pairs cylinders for Fairlie locos class 18, under order 20204.
 In May 1910 the YEC Co supplied two sets bogie centre bearing plates for Fairlies class 18/19, under order 20579.
 In May 1910 the YEC Co supplied one loco boiler for Fairlies class 18/23, under contract 178. Boiler empty weight 14T 0cwt.
 In September 1911 the YEC Co supplied two cylinders and covers for Fairlie engines class 18, under order 21581, also two cast steel centre bogie bearing plates for engines class 18 under order 21585.
 In July 1916 the YEC Co supplied one LH cylinder for engines class no. 18, under order 3211.



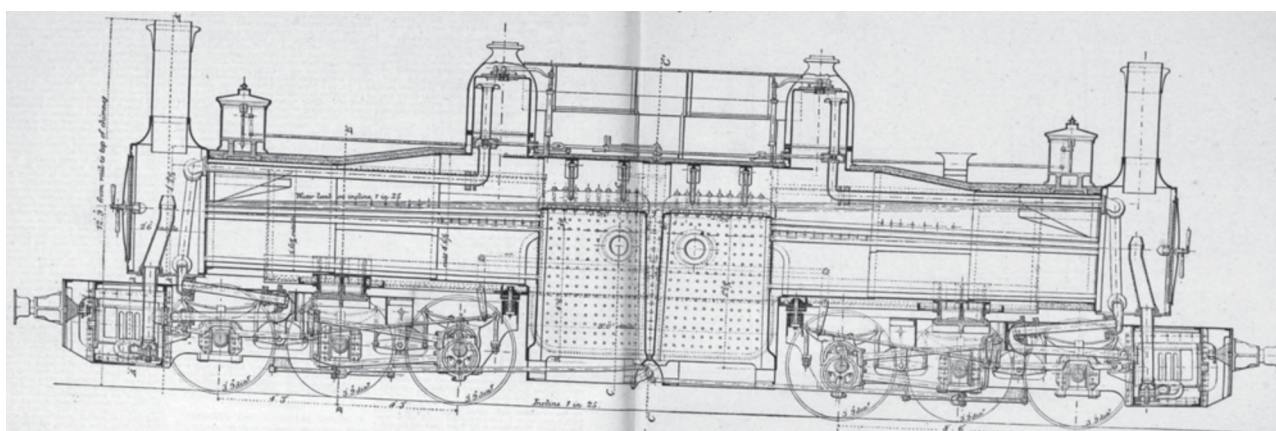
Another sketch from *Engineering*, 21st August 1874.



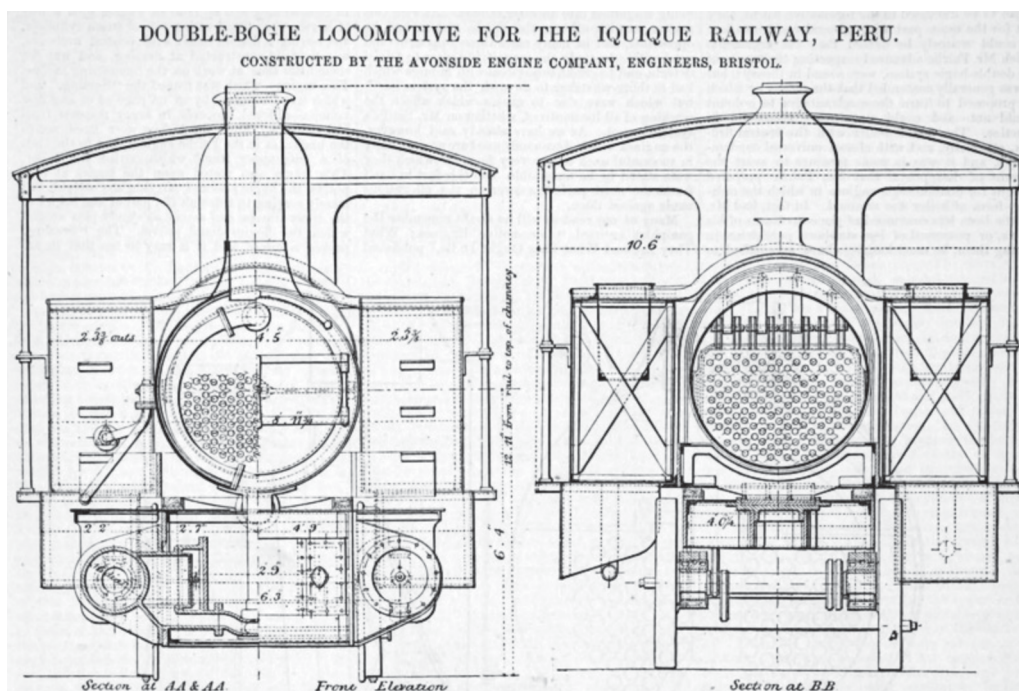
A photo supposedly from 1885 with number **18** still having capped chimneys, proper dome covers and full length fuel racks, but nevertheless with the later pattern outside valve chests and Walschaerts gear. Note also the toolboxes on the cab roof. There is a pipe running along in front of the relatively shallow well tank and drains above it presumably from the injectors.



No. **19** late in its life, with oil tanks, but still with link & pin couplers. The smokeboxes seem to be slightly longer than in other photos, and the original capped chimneys have been replaced by stove-pipes. The well tank, as in the previous photo, is less than half the height of the tanks, rather than more than half as in earlier images. The bogies now have outside valve chests and Walschaerts valve gear. Note also the steps immediately behind the cylinders, rather than back under the tanks as in the previous image.



These side elevation and cross-section drawings of Avonside wagontop boiler Fairlies for the Iquique Railway were published in *Engineering* on 14th November 1873. The drawings supposedly applied to locos **20-22**, but if they were built new with outside Walschaerts valve gear (see below) then then these must have been an earlier batch. Abbott [4] used this drawing to illustrate an Avonside loco for Mexico, but the text surrounding the cross-sections below clearly show that *Engineering* originally captioned them as showing locos for Iquique. The upper drawing shows the loco on a 1 in 25 gradient (4%) and despite the low resolution of this image it may be possible to see that the tubes slope down-wards from the fireboxes to the smokeboxes, to minimise the risk of the upper tubes being exposed above the surface of the water when on a steep gradient.



Class 20

0-6-6-0 Double Fairlies d/w 45", cyls. 16x22 (maybe 20)", built by Avonside in 1873

Ordered via Bailey Hawkins & Co. who also acted for other Chilean customers in the purchase of locomotives. W. Bailey Hawkins was also a Nitrate Railways director. The weight of most of these 1870s Fairlies was given as 61.680T [8]. [4] says they were rebuilt later with new cylinders and outside Walschaert's valve gear, but it now seems that this last batch were actually delivered new with Walschaert's gear. [8] says d/w of no. 22 were 47". Whilst it is certainly possible that these three locos were numbered by Avonside as below, an alternative suggestion is that when the previous order for three locos was doubled, Avonside decided to give each loco a single number rather than a pair. If that was the case then these engines would have been AE nos. 947-949. These three engines had arrived at Iquique by late May 1875. Avonside order RU2 for Bailey Hawkins & Co.

20	20	w/n 1024-5	Not recorded in service during civil war 1891. 1929 NR official list implies it was in use then [8].
21	21	w/n 1026-7	In service but not damaged during civil war in 1891, see details in Appendix 5. 1929 NR official list implies it was in use then [8].
22	22	w/n 1028-9	Not recorded in service during civil war 1891. Scrapped December 1918 [8].

In Feb. 1890 the YEC Co supplied a double boiler for class 20, under order 83B. Boiler empty weight 14T 6cwt.

In December 1908 the YEC Co supplied one LH cylinder for Fairlie engine class 22, under order 19732.

In December 1908 the YEC Co supplied one pair leading wheels and axle for Fairlie engine class 22, under order 19735.

In May 1910 the YEC Co supplied two copper fireboxes for Fairlies class 21, under order 20581.

In September 1910 the YEC Co supplied one RH cylinder for Fairlie engine class 22, under order 20866.

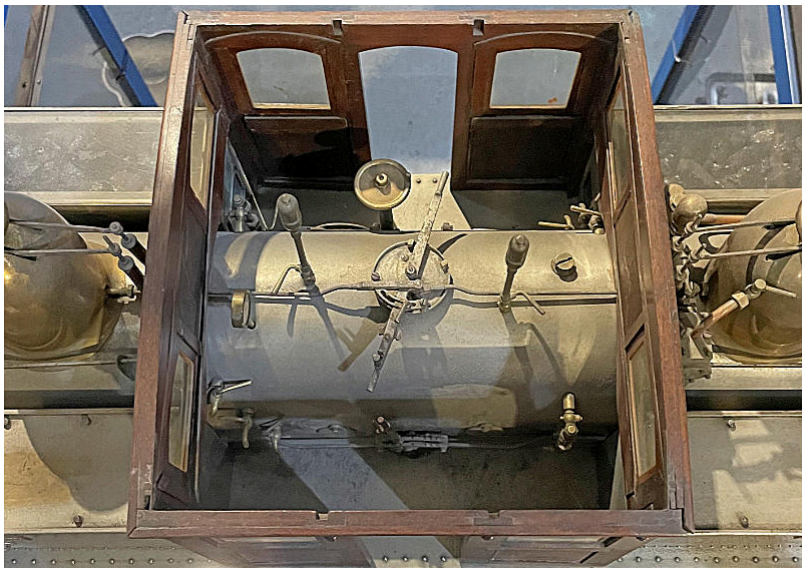
In September 1911 the YEC Co supplied one pair loco leading wheels for Fairlie Engines class 22, under order 21586.

No survivors – apart from a model!

It looks as though Robt Fairlie commissioned the building of a model that would demonstrate how double Fairlie locomotives traversed curves. This does survive at the National Railway Museum in York, England. It is within the public area in the North Shed store, though mounted fairly high up so is not easy to examine closely. It appears to be a good replica of one of the final batch of locos built by Avonside for the Nitrate Railways, though with side buffers rather than a centre-buffer-coupler.



These three photos of the Avonside Fairlie model at the NRM were very kindly supplied by the museum.



Note the single regulator actuating lever accessible by both driver and fireman.



One missing loco?

Robert Fairlie, in the article in *Technische Mittheilungen* in 1876, refers to a single 0-6-6-0T delivered to the *FC Unión de Tarapacá* weighing 64 tons [4]. No trace of this has been found, though it is possible that one of the locos above was intended specifically for operation on that section of line between Negreiros and Pozo Almonte, or perhaps was paid for via that company though actually intended for general use throughout the network.



An unidentified Fairlie brings a freight into a wayside station, giving us an end-on view and showing the left-hung smokebox door common on the NRC.

La compañía Nacional de los Ferrocarriles Salitreros del Perú **The National Nitrate Railways Company of Peru (NNRCP)**

This company was formed at the behest of investors approached by the Montero brothers, who were possibly being leaned on very heavily by the banks. Whilst the company name includes the word Peru, it is clear that the board of directors was based in London, under the Managing Directorship of Mr. A. de Gessler, and merely with a management committee in Lima. It took over management of the above three standard gauge lines on the 25th June 1874, and existed from then until 1882. Its locomotives will have included those mentioned above, but it is clear that the railways were seriously struggling at the time; the Iquique line for example could only turn out a single working loco some days.

However, correspondence from 1874-5 in [36] shows that the takeover was not without friction on the ground. In fact so bitter were the clashes that the Montero Brothers actively suggested to the government of Peru that should a proposed nationalisation of the nitrate producers go ahead then the Railway Company also should be taken over, posing as the continuing owners of the railways in correspondence with the government, under the pretence that the takeover had merely been a limited term mortgage on the assets.

Letters between Lima and Iquique

Through the courtesy of Harold Middleton in Iquique I have been able to see a copy of a hand-written book of letters from 1874-5, found in Lima by Sr. Elio Galessio [36]. Here are a few of the most pertinent comments, with notes added after each one. A full commentary on all the sentences referring to locomotives is in Appendix 2, section 2.5.2 of this file.

• “...we have the pleasure of informing you that 16 of June (1874) the steam ship “Pampero”, was to sail ... two Fairlie locomotives N°2 y N°3,...” The numbers given probably refer merely to the second and third locos in the batch that was expected. This supported by a later quote below which refers to three more, ie. the 4th, 5th and 6th of the group

of six Avonside Fairlies.

- July 21, 1874: “*Tomorrow, the locomotive “La Argentina”, which has been under repair for some time past*”. There are no clues as to which engine this was.
- August 22, 1874: “*Two locomotives for sale at Ilo belonging to the Government which we wish to purchase if suitable...*” It seems likely that these were two of the eight 2-6-0s which the FCIM possessed at that time.
- September 13, 1874: “*We are not yet in possession of the report with regard to the 2 locomotives of Ilo belonging to the state, and which we are thinking to purchasing...*”
- September 13, 1874: “*with regard the 17 engines in Iquique and Pisagua... we are anxious awaiting the arrival of the Pampero steamer with the 2 fairlies... you made the arrangements to forward by steamer the 3 others you mention were ready for shipment.*” Clearly the seventeen locos mentioned did not include the two Moguls which would still have been at Ilo. They would have included Fairlies **8-17**, but also seven single locos. These will have been the Danforth 4-6-4T, the Robert Stephenson 0-6-0, Sharp Stewart 0-6-0T no 2002, and the Cooke 2-6-0, but three more unidentified locos would be needed to reach a total of seventeen. That conflicts with the earlier situation in January 1873, when only one loco remained to be identified.
- September 24, 1874: “*an order for two boilers from New York*”. This is puzzling, unless they were stationary boilers of some kind. Whilst there are two US-built locos listed above – the ‘Danforth’ and the Cooke 2-6-0 – they were respectively seven and three years old at that time. Boilers did wear out very quickly when using the very imperfect desert water, but a three year life seems unlikely even in those circumstances.
- October 27, 1874: “*the steamer Pampero arrived.*”
- May 20, 1875: “*The locomotive N° 22 have been handed, the steamer included tubes for the locomotives 18, 19 and 22... The roster at the second semester of 1875 was 22 locomotives.*” This is consistent with the earlier total of seventeen, given that five more Fairlies had now arrived.
- October 27, 1875: “*... At Iquique we received the following telegram from London; four locomotives plus other matters boarding. We are afraid that 4 locomotives are of the little ones who worked in pairs, with equal power to one big that in the today’s circumstances are not enough.*” These will probably be the first four of the batch of six class 26 0-6-0Ts, constructed by Sharp Stewart with operation in pairs back-to-back in mind.

The thoughts of the Peruvian *cuerpo de ingenieros*

These were recorded in 1874 as [11. 1874 p286-7].:

“Examinado el trazo se ve que desde el kilometro 16 hasta el 20 en la Pampa del Carmen, la linea se halla accidentada inutilmente con grave perjuicio, tauto para la seguridad como para la buena explotacion de la linea, y de consiguiente para la Empresa, pues tiene en varias partes curvas en diferente sentido sin tangente alguna. Como el lugar es una pampa, no es la topografía del terreno la que obliga a la adoption de ese trazo.

La Junta incluye a US., una lista de todos los sitios de la linea, donde hay curvas reversas sin tangente, y cierto numero de ellas con tangente muy pequeña. Un trazo como el quo se ha adoptado, ademas de deteriorar el material rodante de una manera desastrosa, lo que no puede ser economico para una Empresa, es susceptible de accidentes por descarrilamiento, principalmente de bajada, con fuertes pendientes que naturalmente obligan a los trenes a bajar con mayor velocidad.

...

En Chancay sucedio un dia que la carga de azucar de un carro, al pasar por una de esas curvas reversas, la carga que siempre ofrece resistencia debido a su inercia, se fue al mar. El agua de la locomotora tiene, debido a la misma fuerza de inercia, que golpear los tubos de las calderas. Si hoy que el material rodante se halla nuevo, puede resistir esos cambios bruscos, llegara, un dia en que no pueda, y aconteceran accidentes graves, siendo de advertir que el choque es proporcional al cuadrado de la velocidad.

...

La Empresa se convencera, de lo perjudicial que le son todas esas curvas sin tangentes y aquellas de radio tan pequeño, considerando solo un instante : 1?— El resultado que ha tenido su material rodante, que de 16 locomotoras, solo dos o tres se hallan en estado de servicio. 2.— El numero tan crecido de accidentes con perdida de vidas y 3.—

Lo incapacitado que se ha encontrado para trasportar toda la carga que se le presentaba..

A smaller double Fairlie – originally built for Switzerland

0-6-6-0 Double Fairlie d/w 45" cyls. 15x22", built by Yorkshire Engine in 1874, contract E29

NB d/w not 55" as some sources say, and confirmed by examination of YECOA drawings. Drawing also clearly shows cylinder stroke as 22" rather than 20" as quoted elsewhere, though the order book entry says the diameter was to be 16". This loco had originally been ordered by G. B. Crawley & Co., railway engineers, for a railway in Switzerland. Neither it nor two even smaller Fairlies ordered from the YECOA at the same time reached the Swiss, this one going to Peru and the others to Sweden [29]. Correspondence in Appendix 2 suggests that this engine may have entered service in June 1875.

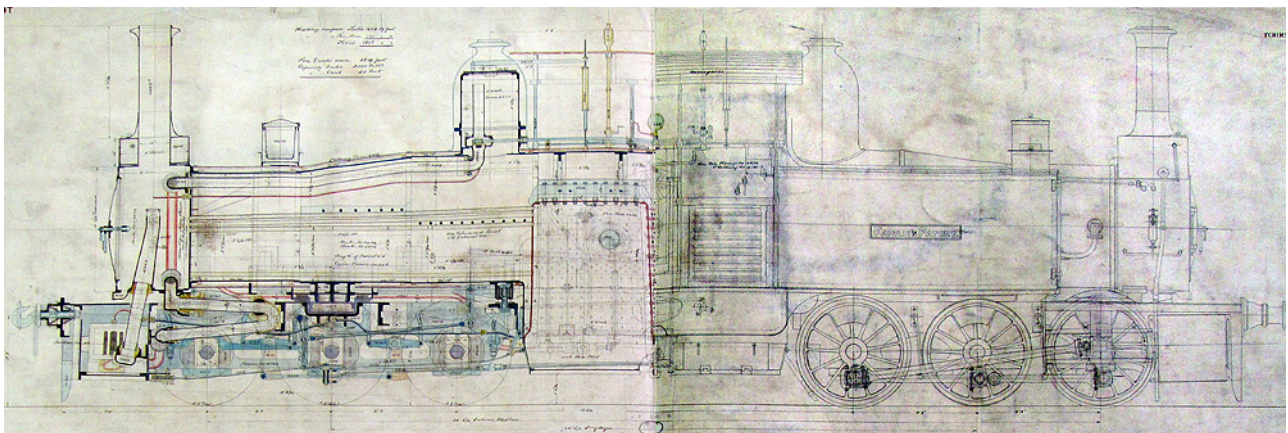
A comprehensive table of part weights is available for this loco in the YECOA weights book covering orders E1 to E58, in the Sheffield City Archives. This gives an empty weight for the loco of 51½ tons. This was the only YECOA double Fairlie supplied to the NR with inside Allan straight link valve gear, all later locos having outside Walschaerts motion.

23	23	w/n 175	Not recorded in service during civil war 1891. 1929 NR official list suggests it was in use then [8] but shows it as by Avonside.
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In Dec. 1900 the YECOA supplied a double boiler for class 23, under contract 117. Boiler empty weight 15T 17cwt.

In Dec. 1900 the YECOA supplied a pair of wheels on an axle for loco **23**, under contract 16722.

In May 1910 the YECOA supplied one loco boiler for Fairlies class 18/23, under contract 178. Boiler empty weight 14T 0cwt.



YECOA GA drawing for their contract E29, which was originally for a Swiss railway, but which was eventually delivered to Tarapacá and became NR no. **23**. Note the intended side buffers which may never have been fitted, the horizontal louvres on the cabsides, and the balance weights covering just two-interspoke-spaces even on the driving wheel pairs.

A paragraph in German from *Technische Mittheilungen* in 1876

A report in the Zurich-based journal of this name [70] gave an enthusiastic plug for Fairlie locomotives during 1876. The following paragraph was on the subject of the Iquique double engines, and is followed here by an English translation:

“VII. Iquique-Bahn, Peru. Spurweite 1,435 Meter. Maximalsteigung 45%0. Minimal-Curvenradius 60 Meter.
Die Bahn hat von der Hafenstadt Iquique am stillen Ocean bis La Noria eine Länge von 56 Kilometer und zwar über continuirlich starke Steigungen von successive 40, 45 und 35%0. Zur Speisung der Locomotiven kann in dieser Localität nur destillirtes Meerwasser verwendet werden, dessen Beschaffungskosten pro Cubikmeter 44 - 55 Fr., auf die Maschine geliefert, betragen. Aus diesem Grunde musste der Gesellschaft daran gelegen sein, Maschinen zu verwenden, welche im Verhältniss zur Leistung einen geringen Consum aufweisen. Die Fairlie-Maschinen der Iquique-Bahn sind nach denselben Principal-Verhältnissen ausgeführt, wie diejenigen der mexicanischen Bahn; als

Brennmaterial werden indessen ausschliesslich Chili-Kohlen verwendet, während auf der Strecke von Vera Cruz nach Mexico theils Kohlen, theils Brennholz verbraucht werden. Ausser der Fairlie Doppel-Maschine, von welcher Type im Jahre 1872 10 Stück nachbestellt worden sind, wurde eine amerikanische Tendermaschine angeschafft, welche, bei 3 gekuppelten Achsen in der Mitte, mit 2 symmetrischen vierrädrigen Laufgestellen disponirt ist und welche dasselbe Gewicht hat, wie die Fairlie-Maschine. Nach den Beobachtungen des Maschinenmeisters, Mr. J. Cleminson in Iquique, bewältigt die Fairlie-Locomotive, unter normalen Verhältnissen, auf der Bergfahrt 120 Tonnen. die amerikanische Maschine 60 Tonnen brutto. Die Doppel-Maschine consumirt nach denselben Beobachtungen pro Tonnen-Kilometer 0,33 Kilogramm Kohlen und 4,66 Liter Wasser, die amerikanische Maschine dagegen 0,48 Kilogramm Kohlen und 6,24 Liter Wasser pro Tonnen-Kilometer)."

VII. Iquique Railway, Peru. Track gauge 1,435 metres. Maximum gradient 4.5%. Minimum curve radius 60 metres.

The railway is 56 kilometers long, running from the port city of Iquique on the Pacific Ocean to La Noria, with continuously steep gradients of 4.0, 4.5, and 3.5% successively. In this area, only distilled seawater can be used to power the locomotives, the cost of which is 44-55 francs per cubic metre, delivered to the engine. For this reason, the company was keen to use engines with low consumption relative to their power. The Fairlie engines of the Iquique Railway are constructed according to the same basic principles as those of the Mexican Railway; however, they use exclusively Chilean coal as fuel, whereas on the line from Vera Cruz to Mexico, partly coal and partly firewood are used. In addition to the Fairlie double engines, ten of which were reordered in 1872, an American tank engine was purchased. It features three coupled axles in the middle, two symmetrical four-wheeled bogies, and weighs the same as the Fairlie engine. According to the observations of the engine master, Mr. J. Cleminson in Iquique, the Fairlie locomotive, under normal conditions, can pull 120 tons on the uphill journey, while the American engine can pull 60 tons gross. The double engine, according to the same observations, consumes 0.33 kilograms of coal and 4.66 litres of water per ton-kilometre, while the American engine consumes 0.48 kilograms of coal and 6.24 litres of water per ton-kilometre.

Two puzzling tank locos

0-6-0ST and 0-6-0T d/w 54" cyls. 15x20", built by Sharp Stewart in 1875

One of these two was almost certainly SS number 2485 (part of order E668) which had originally been ordered for the Oxelosund-Flen-Vaestmanland Railway in Sweden but was left undelivered owing perhaps to a shortage of funds, and was then sold on to Iquique.

The other loco has sometimes been identified as SS 2473 built for stock. However, SS order E683, numbers 2471-3, were 0-4-0Ts and all are accounted for amongst British industrial users. An NBL index of SS order numbers on the other hand has order E705, loco number 2607, as an 0-6-0ST built for the Iquique railway, though Brian Rumary's SS list has it also down for the Oxelosund-Flen-Vastmanland line. Since number 2607 follows directly on from a batch of small 0-6-0Ts for Iquique, it seems highly likely that it was indeed ordered for Peru.

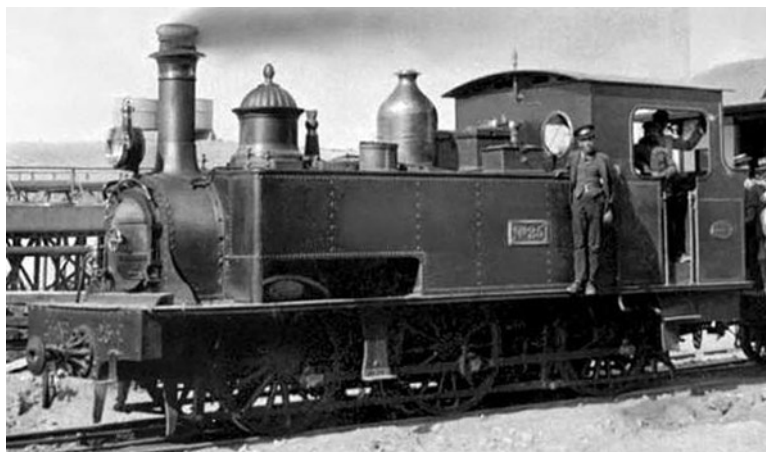
One of these engines had side tanks. This one became NR no. **25**, possibly after a very short period numbered **5**. The other had a saddle tank just as others for Sweden had done. No number is known for that engine, but it clearly was running for some years as photos show it in Pisagua yard in 1889 and 1890. The question therefore is which was which? SS 2485 is sometimes identified as NR no. **25**, though it would seem more likely that 2607 had the side tanks, as it is beyond doubt that the 0-6-0Ts for the Oxelosund line were saddle tanks.

An alternative suggestion is that just one loco arrived from Sharp Stewart, as a saddle tank, and was then rebuilt later with side tanks. This solves the problem of the missing NR loco but is unsatisfactory in other ways. We end up with a homeless SS loco, and photos of the saddle tank and the possible rebuild are difficult to reconcile even supposing that the engine had been reboilered in the meantime. Incidentally Wilfred Beckerlegge's early attempt at creating an NR loco list, probably around the 1920s, and relying on a source that lists locos present in the 1890s, shows no. **25** as a saddle tank.

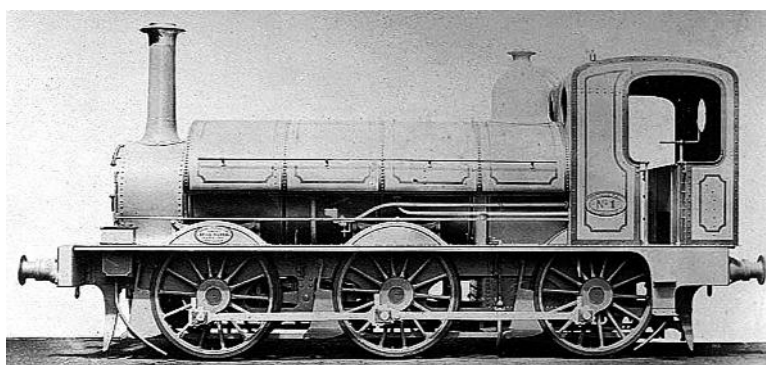
These locos had driving wheels larger than any other NR engines except the Robert Stephenson 0-6-0 described earlier. However their rigid wheelbases, whilst long, were probably of the order of 14' 9" (approx. 4.5m), or at least 18"

less than that of the 0-6-0, and thus they would have had slightly less difficulty on curves. As tank locos they would probably have found use in yards or on *oficina* branches up on the pampa where an ability to climb grades would not be critical, and the photo below showing the saddle tank in Pisagua yard supports this. NB A drawing showing order E668, FG/79/E 2721, exists at the NRM, aka ALS6/PP01/k 2721; this is a GA drawing dated 10 Jan 1874, a low-resolution image of which is shown below. Weight 32.670T [8].

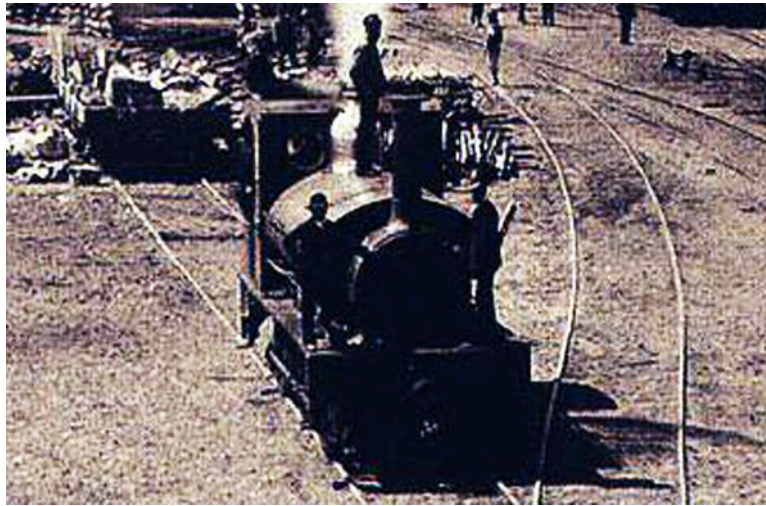
?	?	w/n 2485	A loco no. 24 was in service but not damaged during civil war in 1891, see details in Appendix 5. Saddle tank.
25	25	w/n 2607	In service but not damaged during civil war in 1891, see details in Appendix 5. Side tank. Still in service in 1909 [8]. 1929 NR official list implies it was in use then [8].



No. **25**. Note the SS works plate on front splasher, and another plate on the bunker similar to that on SS no. 2002; this latter plate will be an NR ownership plate.



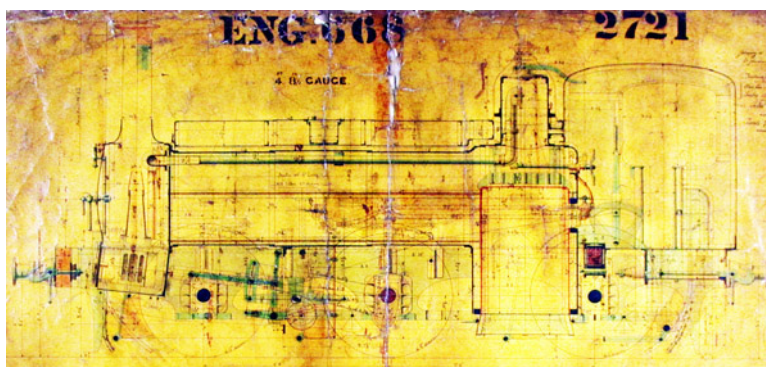
Sharp Stewart no. 2428 of 1874, the first of several 0-6-0STs for the Oxelosund-Flen-Vastmanland railway in Sweden.



The photo above, an extract from a well-known image showing five double Fairlies at Pisagua in 1889, shows a saddle tank loco in the yard there. It would appear to be a Sharp Stewart product by the shape of its tank and dome. This was SS 2485. A second photo showing this engine shunting the patio at Pisagua suggests that this may have been its regular duty in the years 1889-1890.



The above photo shows one of the Oxelösund - Västmanland Sharp Stewarts as now preserved. The loco seen at Pisagua was of this type. Photo by courtesy of Edward Barnes.



Sharp Stewart elevation drawing 2721, held at the NRM in York, their reference ALS6/PP01/k. Whilst this image is too small to be of much use, it flags up that the drawing is available at the NRM.

Class 26 designed for working in pairs

0-6-0T d/w 42" cyls. 16 1/4 x 20", built by Sharp Stewart in 1875-6

Weight 32.670T [8]. [8] says d/w 43". These were similar in basic design to SS 0-6-0Ts nos. 2350-2361 and 2368-

2373, supplied to the Cornwall Minerals Railway in 1873, but had longer tanks and a full cab roof. The cab of both variants is strange to British eyes, for the access is from the rear rather than the sides. This pattern, however, will be rather more familiar to Americans. In the case of the Cornish engines, the intention was that a pair of these locos could be worked back to back by a single crew, and whilst the NR engines had a more substantial cab the same idea was clearly in mind, as proven by the October 27th 1875 letter quoted above. Although no photos have been found showing these locos in pairs, the drawings for a later batch show a full width fall-plate to link the two cabs. This type of cab was carried through to later SS 2-6-0Ts and Fowler 0-6-0Ts and reached its culmination in the 0-8-0T paired locos of class 77 built by Tubize in 1910. Incidentally back in the UK, the Great Western Railway, who took over the CMR in 1876, built five more of these locos but with saddle tanks, conventional cabs and standard GWR detailing. One, number **1363**, survives in the collection at Didcot Railway Centre. The design was then developed into the 1366 class which had pannier tanks; **1369** survives, also at Didcot.

It should also be noted that these were not the first 'back-to-back' locos in use on the west coast. The *FC de Coquimbo* had purchased four 2-6-2Ts by Avonside in 1871 that were designed for operating in pairs. However, in 1877 they were separated into single units. They can be found in section 1.5.1 of the broad gauge file, *FC de Coquimbo* locos numbered **10** to **13**.

26	26	w/n 2562	SS order no. E708. Similar to 1873 locos for Cornwall Minerals and Harbours. In service but not damaged during civil war in 1891, see details in Appendix 5. A report in May 1914 has this loco working at Lagunas [32]. In service 1931 [16]. Withdrawn 1957 [38].
27	27	w/n 2563	SS order no. E708. Similar to 1873 locos for Cornwall Minerals and Harbours. In service and damaged during civil war in 1891, see details in Appendix 5. Out of service 1931 [16].
28	28	w/n 2603	SS order no. E712. In service and damaged during civil war in 1891, see details in Appendix 5. A report in Jan 1919 has this loco working between Huara and Negreiros [32]. Out of service 1931 [16].
29	29	w/n 2604	SS order no. E712. In service but not damaged during civil war in 1891, see details in Appendix 5. In service 1931 [16].
30	30	w/n 2605	SS order no. E712. In service and damaged during civil war in 1891, see details in Appendix 5. A report in April 1918 has this loco working between Negreiros and Huara [32]. A report in July 1920 has this loco shunting in Iquique [32]. In service 1931 [16].
31	31	w/n 2606	SS order no. E712. Not recorded in service during civil war 1891. A report in April 1918 has this loco hauling an oil tank wagon from Huara to <i>oficina La Patria</i> [32]. Out of service 1931 [16].

In February 1901 the YEC Co supplied six fireboxes and wrappers to the same drawing as in the entry immediately below, implying that that they were probably for classes 26, 40 & 70, under order 15590.

In April 1903 the YEC Co won a contract to supply two fireboxes and wrappers for classes 26, 40 and 70, implying that they all perhaps used the same firebox design, under order 16721.

In November 1906 the YEC Co supplied two fireboxes and wrappers for Sharp Stewart locos of class 26, under order 18835, also smokebox tubeplates.

In early 1910 the YEC Co supplied one firebox and wrapper for Sharp Stewart loco class 26, also one smokebox tube-plate for same, under order 20202.

In May 1910 the YEC Co supplied four crossheads for Sharp Stewart locos of class 26, under order 20575, also four axles for same under order 20576.

All still in service in 1909 [8].

In mid 1912 the YEC Co supplied one single firebox and wrapper, probably for class 26, under order 21976.

In October 1912 the YEC Co supplied eight steel loco axles for Sharp Stewart engines class 26, under order 22356.

In October 1912 the YEC Co supplied two single loco fireboxes for Sharp Stewart engines class 26, under order 22360.

In October 1912 the YEC Co supplied two pairs wheels and axles for Sharp Stewart engines class 26, under order 22362.

In April 1913 the YEC Co supplied two loco fireboxes and wrappers for class 26, under order 813.

In October 1913 the YEC Co supplied two loco fireboxes and wrappers for engines class 26, under order 1173, also two cylinders for class 26 under order 1176.

In March 1914 the YEC Co supplied two cylinders for SS engines class 26, under order 1430, also four angle rings for boilers for same under order 1431.

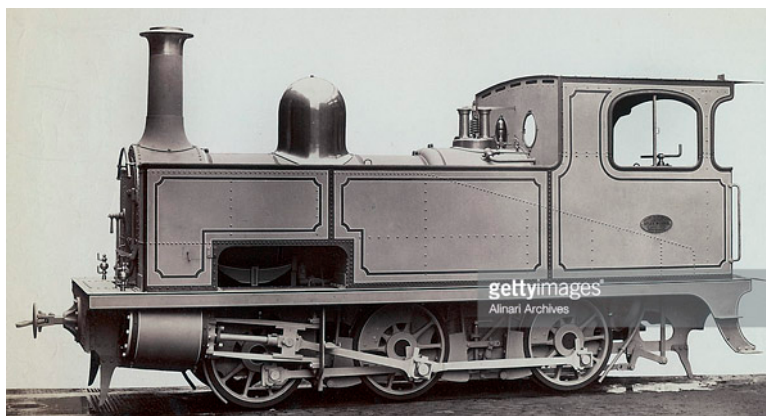
In May 1918 the YEC Co supplied four crossheads for the loco no. 26 class, under order 5114, also one LH cylinder for same under order 5131.

In May 1918 the YEC Co supplied twenty-four engine bearing springs for no. 30 class, under order 5125.

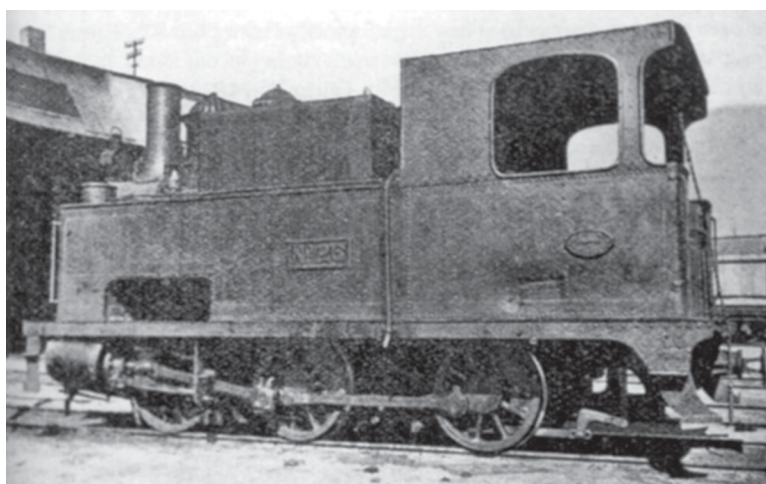
In March 1920 the YEC Co supplied four crossheads for class 26, under order 6819, also four cylinders for same, under order 6833.

In January 1926 the YEC Co supplied ten valve buckles for engines class 26/31/38/41, under order 10889.

1929 NRC official list implies all were in use then [11].



A Sharp Stewart image showing a class 26 loco, and below a much later photo of no. **26** published in *The Locomotive* magazine in April 1932. This shows the engine with oil fuel tank but still carrying a link and pin coupler. It seems to have lost its capped chimney. The cab has been rebuilt with upper panels from a class 38 engine.



Classes 32 and 35

0-6-6-0 Double Fairlies d/w 45" cyls. 17x22", built by Yorkshire Engine in 1874 contract E41, some of which were rebuilt on new power bogies during 1882

A batch of ten 0-6-6-0Ts were ordered on 25th February 1873, probably originally by the Fairlie Engine Company of Westminster. A letter from don Manuel Montero in Iquique dated October 1872 states that an order will be placed for ‘ten engines on the Fairlie system’, which were almost certainly these machines. There has been much speculation over the years about these locos, only six of which seem eventually to have reached Tarapacá, one as an 0-6-6-0T approximately as first built and five rebuilt as 2-6-6-2Ts. **See Appendix 1 at the end of this file for more detail.**

Weight quoted in 1909 as 74.400T [8]. Thicker tyres may have been fitted as the d/w diameter is later quoted as 46½". D/w shown as 46" for no. **32**, and 46½" for the remainder, in source [8] the NR official list from 1929. An article in *The Locomotive* in March 1932 says **32** was built by Avonside, but that was probably a mistake. If these locos were indeed converted back later from 2-6-6-2T to 0-6-6-0T, the decision if not the actual work was clearly made before two further locos to the same design were ordered as 0-6-6-0Ts in 1890.

32	32	w/n 219?	The 1920s diagram sheet for these locos carries the wording “ <i>puesto en servicio 1880</i> ” which may well mean that this first loco arrived then though the others were only shipped in 1882. In service but not damaged during civil war in 1891, see details in Appendix 5. Rebuilt Iquique 1909 [8]. A report in Oct 1919 had this loco working between La Noría and Alto San Antonio [32]. 1929 NRC official list implies it was in use then [8].
	33	w/n 220?	In service but not damaged during civil war in 1891, see details in Appendix 5. Scrapped December 1918 [8].
	34	w/n 221?	In service at Iquique and damaged by shot and shell from the fleet during civil war in 1891, see details in Appendix 5.
	35	w/n 222?	In service at Iquique and damaged by shot and shell from the fleet during civil war in 1891, see details in Appendix 5.
	36	w/n 223?	In service but not damaged during civil war in 1891, see details in Appendix 5.
	37	w/n 224?	In service but not damaged during civil war in 1891, see details in Appendix 5. A report in July 1918 had this loco working a train of oil tanks and empty wagons into Oficina Iris [32].

The following parts orders do not really help us to ascertain how many engines were in these classes, though several orders were clearly for parts for at least two locos.

3rd February 1883, one set of 16 wheels were ordered (probably in anticipation of future needs rather than after any specific incident) from the YEC Co for these Fairlies, via Bailey Hawkins agents, definitely implying that the locos involved were 2-6-6-2Ts, also two sets of tyres, and a wide variety of various other spares.

In June 1888 the YEC Co supplied two copper fireboxes for class 32 Fairlies, under order 7099.

In December 1888 the YEC Co supplied two Fairlie boilers with raised fireboxes for engines class 35, under contract 78A, duplicates of boilers for contract E41 ie. these locos when new, boiler empty weight 15T 8cwt. Also three Fairlie boilers straight-backed (contract 78B) similar to those built under contract 65B for unspecified engines, boiler empty weight 17T 17cwt.

In December 1889 the YECo supplied four copper fireboxes for class 32 Fairlies, under order 8106.

In January 1892 the YECo supplied twelve engine bearing springs and two bogie frame plates for No. 32 class, under order 9410.

In 1901 the YECo supplied a double boiler for class 32, under contract 121. Boiler empty weight 17T 15cwt.

In June 1904 the YECo supplied one double firebox and wrapper for class 32, under order 17430.

In June 1904 the YECo supplied two fireboxes and wrappers and two smokebox tubeplates for class 32(?), under order 17432.

In October 1905 the YECo supplied two double engine boilers for class 32, under contract 148. Boiler empty weight 17T 16cwt.

In early 1906 the YECo supplied four charcoal iron dome casings for Fairlie engines class 35, under order 18569.

In early 1906 the YECo supplied two cylinders (one RH and one LH) for Fairlie engines of class 35, under order 18571.

In November 1906 the YECo supplied two cylinders (one RH and one LH) for Fairlie engines of class 35, under order 18838.

In November 1906 the YECo supplied one double Fairlie boiler for locos of class 32, under contract 162. Boiler empty weight 19T 0cwt.

In May 1910 the YECo supplied six axles for Fairlie locos of class 35, under order 20576, also four crossheads for Fairlie engine class 36, under order 20577, also one cylinder for class 35, under order 20578.

In September 1910 the YECo supplied a set of four side rods for Fairlie engine class 35, under order 20868, also four centre bearing plates for same under order 20869.

In September 1911 the YECo supplied one set of side rods for Fairlie Engines class 33, under order 21582.

In May 1918 the YECo supplied twenty-four engine bearing springs for no. 32 class, under order 5127.

In September 1911 the YECo supplied two pairs of cylinders and covers for Fairlie Engines class 35, under order 21580.

In September 1911 the YECo supplied one set of side rods for Fairlie Engines class 33, under order 21582, also four steel driving crankpins for class 35, under order 21583.

In October 1912 the YECo supplied twelve steel loco axles for Fairlie engines class 35, under order 22355.

In October 1912 the YECo supplied two complete sets bogie bearing plates for Fairlie engines class 35, under order 22359.

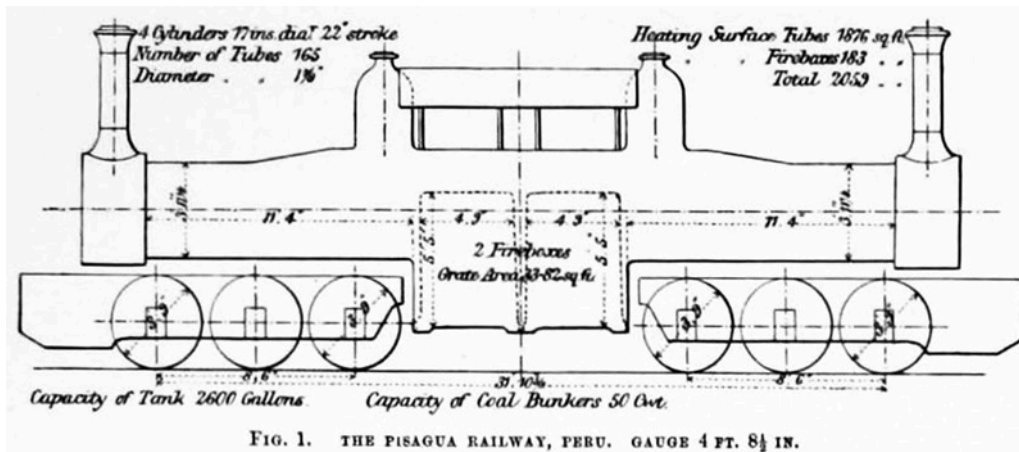
In May 1918 the YECo supplied four crankpins for loco no. 36 class, under order 5117, also one RH cylinder for 35 class under order 5133.

In March 1920 the YECo supplied four crank arms for class 36, under order 6820.

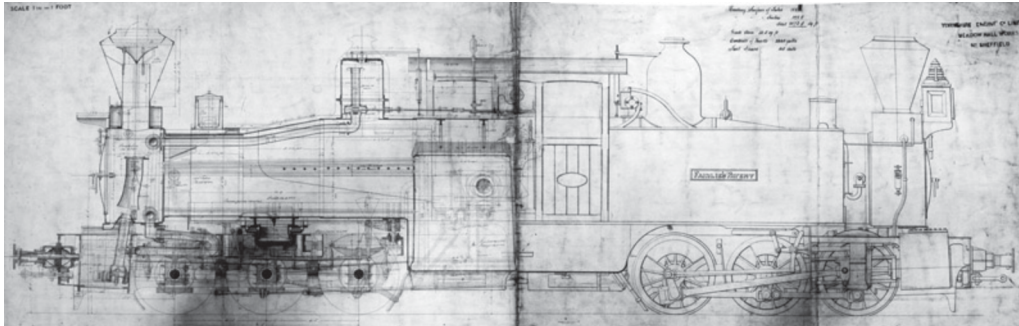
1929 NR official list implies that all except **33** were in use then [8]. Article in *The Locomotive* in March 1932 says all withdrawn by that year.

The boiler and firebox orders placed between 1901 and 1906 suggest that by that stage at least six locos were classified as class 32. These may of course have included the almost identical later locos **63-4** and **73** as well as those originally built under contract E41. A first look through the above list of spare parts orders suggested that there might well have been two separate classes of locos, beginning at nos. **32** and **35**. However, there are no orders for class 35 between 1888 and 1906. Since it is inconceivable that locos **35**, **36** and **37** did not need any replacement parts during eighteen years of operation, it must be that class 32 often included those engines. The remaining problem, however, is why the Nitrate Railways should have referred on a number of occasions to several engines as class 32, and on several more as class 35, rather than as a single class.

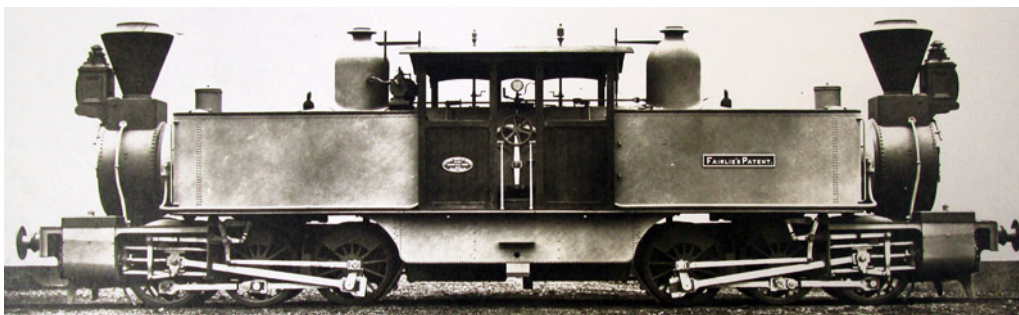
By 1909 they had been converted back to 0-6-6-0s (possibly the rails were now heavier) and were all still in service in that year [3].



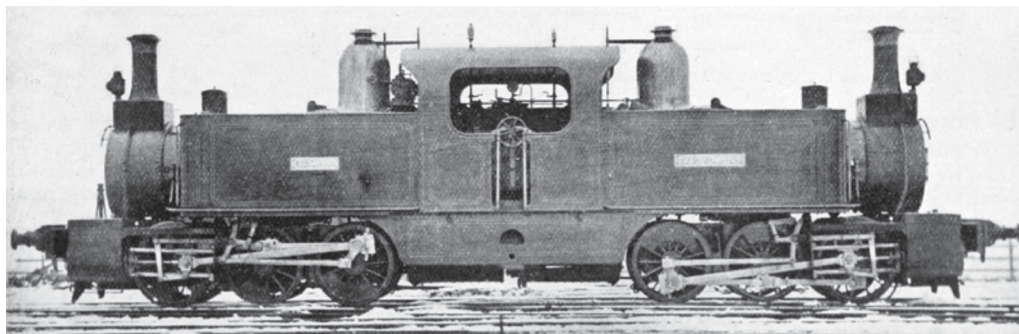
The original design, as envisaged in *Engineering*, 21st August 1874.



A YECOA GA side elevation of these Fairlies, constructed under contract E41.

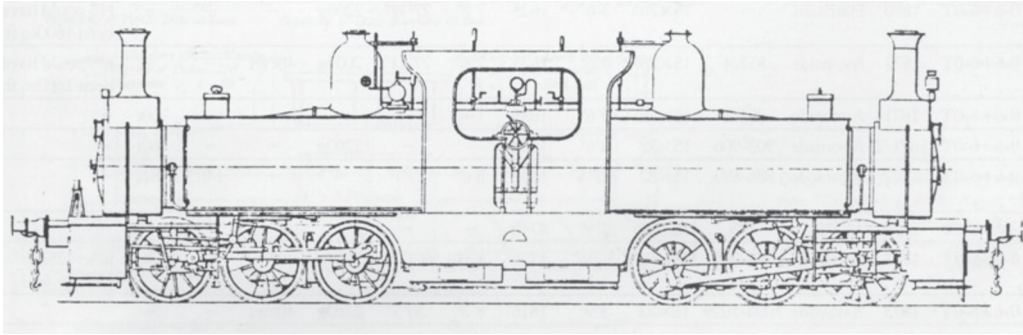


A Yorkshire Engine Co. builders' photo of one of the four from this order that were fitted with side buffers and sent to the Poti-Tiflis Railway in Transcaucasia. Little else appears to have changed from the original design for Tarapacá. It is written in the YECOA photos list that this engine was YECOA no. 225.

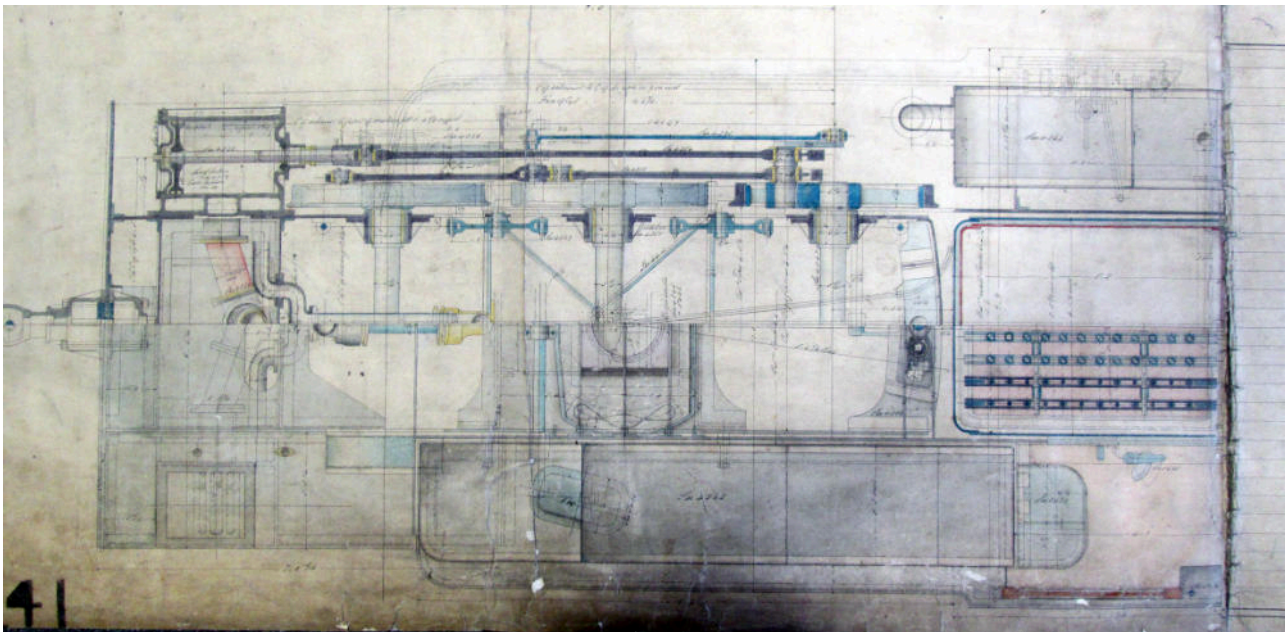


NR no. 32 as operating on the E&WJR in Warwickshire before its move to Chile. It still carries the chimney base sandboxes, though with plain chimneys rather than the spark-arresting type. The left hand tank plate bears the initials 'E & W J R', whilst the right hand plate is the usual 'FAIRLIE PATENT'. Note that, in order to fit within a UK loading gauge the wider running plate alongside the cab has

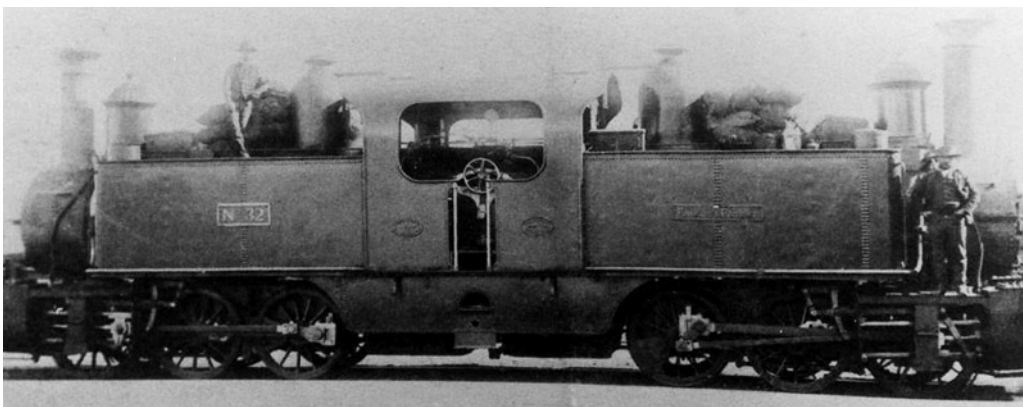
been trimmed back 3" to its width alongside the tanks [60], a new steel cab fitted to minimise the loss of space within, and the footstep has been inset within the well tank rather than protruding from it. This image was published in *The Locomotive* magazine in November 1911.



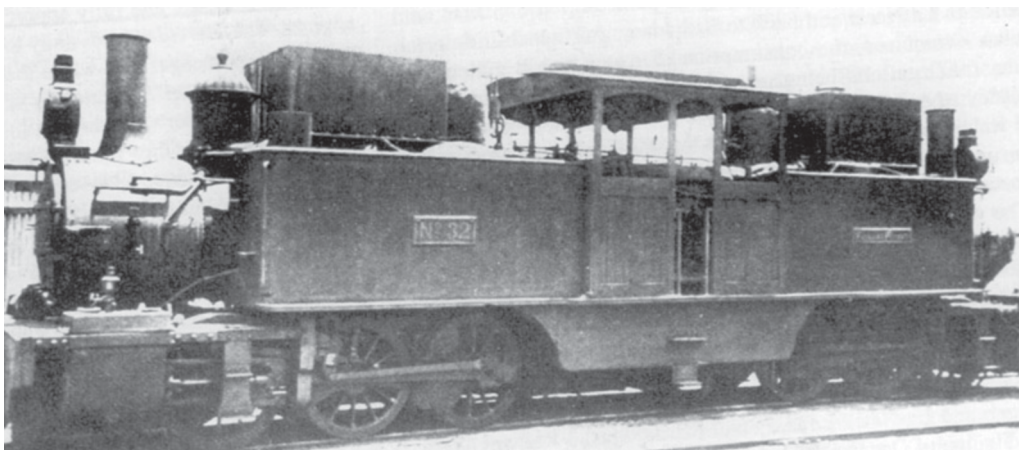
A sketch probably created from the photo above, found by Donald Binns for his *LI* article, showing the loco that eventually became NR no. **32** as altered for use on the E&WJR around 1876-8.



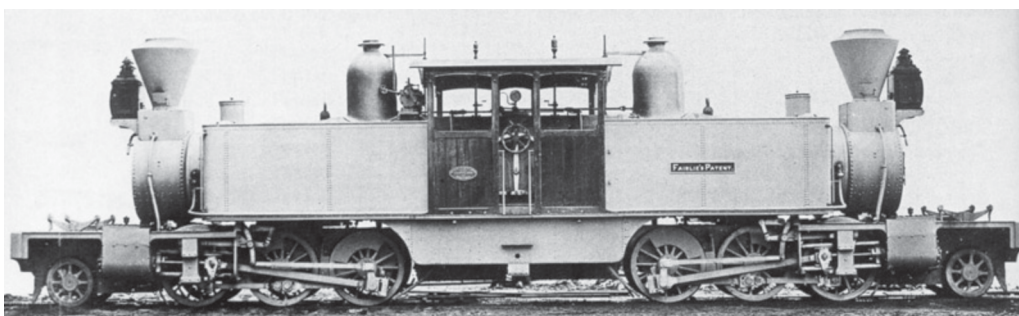
A YECO half plan of the contract 41 locos. The bottom half shows the loco at running board level, with a buffer beam on the left and the cab centre-line to the right. Note the 9' 0" wide tanks and the 6" running plates outboard of them (overall width 10' 0") and then the extra 3" on each side along the length of the wooden cab-sides (shown in brown). It was this 3" that was shaved off for use on the E&WJR, necessitating the fitting of a replacement steel cab.



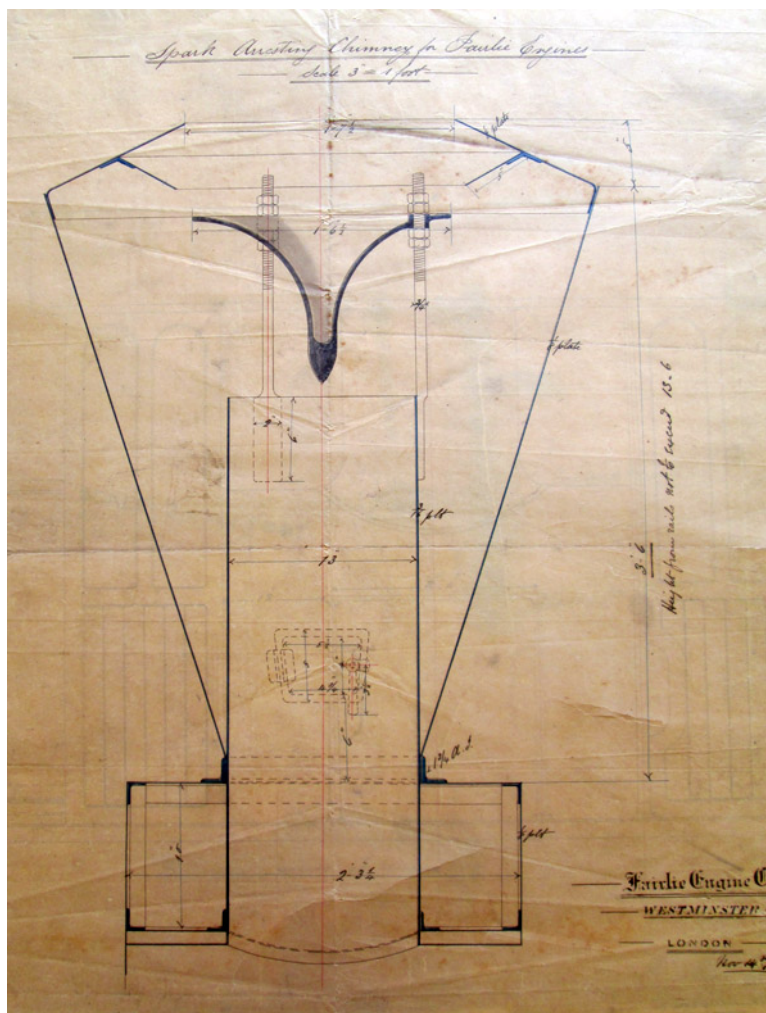
No. **32** more-or-less as it must have first arrived, still with the metal cab fitted for its sojourn on the East & West Junction Railway in Warwickshire. It seems likely, however, that the Rogers style of sand-domes will have been added out in Tarapacá, rather than being supplied by the YECo. The chimneys are also different, being taller and without the sandboxes at their base, whilst footsteps have been added to each bogie. The only puzzle is that the main driving wheelsets have balance weights covering only two inter-spoke spaces rather than covering four as was normal for these YECo Fairlies, and as was the case when it was in Warwickshire. However, the driving wheels still appear to have thirteen spokes, so it may be that it was solely the weights that had been altered.



No. **32** in later life, with a standard wooden cab, and oil tanks on the boiler top. The smokeboxes are slightly longer than the originals, and the chimneys a little further away from the sand-domes. The steps inboard of the cylinders would appear to be the same as in the photo above. The steps beneath the cab would appear to have reverted to the style on the other locos, but then the tanks may well be replacement ones rather than the originals. The wheels now seem to have twelve spokes.



One of those rebuilt with carrying wheels in radial axleboxes, and with steps just behind the cylinders. This is supposed to have been YECo no. 227. The strange square bases to the chimneys on these Yorkshire Fairlies were sandboxes, kept dry by the exhaust gas temperature. The feed pipes are visible down the sides of the smokeboxes. The small drums visible behind the chimneys were centred-mounted tank fillers, with flattish water pipes leading from them to the tanks on either side.



A YECO drawing showing the spark-arresting chimney and square chimney-base sandboxes fitted to both batches of double Fairlies built to the contract E41 drawings.

A temporary acquisition during the War of the Pacific

4-6-0 dr. wheels 1220mm 48", cyls. 406x609mm 16"x24", built by Hawthorn in 1862

Ex *FC de Chañarcillo*. Purchased by the Chilean Government in 1879 from the Copiapó Railway for use over the Pisagua section [*Liverpool Mercury* report of AGM, 20 October 1880], but then returned to Copiapó in 1882 [16]. It has been suggested that the transfer of this engine was merely a stop-gap measure during the War of the Pacific.

(23 'CHAÑARCILLO') w/n 1094 No hint of how this was numbered during its stay on the Nitrate Railways has yet been discovered.

Nitrate Railways Ltd.

This London-based company was formed in 1882 to take-over the ownership and operation of the *Ferrocarriles Salitreros del Perú*. Note that by then the War of the Pacific had taken place and Tarapacá was under Chilean control. Also known as the *FFCC del Salitrero*. From 1887 the company came under the control of the notorious 'Colonel' John Thomas North, 'the Nitrate King', who in 1889 became its Chairman. The Nitrate Railways originally had a monopoly on the shipment of nitrates from Tarapacá province to the coast, a monopoly that was hugely criticised for its exorbitant tariffs and which was eventually broken by the construction of the Agua Santa and Junín railways. The railway's concession passed to the government in 1936 but the network continued to be operated by the NRC company, which paid an annual fee to the government. In 1940 the *FC Iquique a Pintados* took over the whole network. The remaining assets were transferred to the *CSTA* in 19??, and the company was wound up in 1959.



The Nitrate Railways of Chile initials as seen on an original carriage-side transfer in the collection of Gerald Hartley.

The apocryphal Colonel North Construction Company?

A construction company supposedly owned by North, the Colonel North Construction Co., features in Dewhurst's notes and in Copeland & Kirchners' loco lists, in that they suggest that it purchased, leased, or borrowed locos from the main railway company, as well as providing locos as replacements for those removed from the main stock. The company itself may also have purchased replacements. It has been suggested that Colonel North having been an employee of Fowler's in his younger days, he maintained a bias towards their products when ordering new locos. Binns states that the construction company met its demise around the time of the civil war but as usual gives no sources for this belief. No reference to such a construction company has been found anywhere else, not even in William Edmonson's 180 page biography of *The Nitrate King*, published by Palgrave Macmillan in 2011. That tome mentions a large number of nitrate and other companies in which North had interests, but there is no mention whatever of a construction company. In the circumstances its existence must be doubted.

Copeland and Kirchner further suggested that it was the predecessor of the North & South American Construction Company, but this is probably a misapprehension, possibly by Dewhurst originally, based on the word 'North' being in both names. The infamous N&SACCo was wholly an American enterprise and there is no evidence that J. T. North ever had anything to do with it. See appendix 1 in the Chilean broad gauge locos file (sub-section 1.8.1) for more information on this short-lived enterprise.

Class 38 designed for working in pairs

2-6-0T d/w 42", cyls. 16¼"x20", ordered from Sharp Stewart in 1883 order E850, but built under sub-contract by Yorkshire as their nos. 368-371

Weight 33.570T [8]. The Sharp Stewart list also includes their 3110-3113 as 2-6-0s d/w 43" cyls 16½x20", built for the Iquique Railway in 1883 as their **38-41**. Source [8] gives d/w as 43". These locos also had the open-backed cab to facilitate them being worked in pairs. That this was intended is shown by the YECo drawings including a full width fall plate between the two cabs. They seem to have been slightly lengthened versions of class 26, the d/w diameter and the cylinder sizes being almost a match. In fact they may have been identical in their mechanical essentials, the pony truck merely having been added for stability and smooth running, and the tanks being extended forward to add appropriate weight to the front end.

38	w/n 3166	In service and damaged during civil war in 1891, see details in Appendix 5. A report in Sept 1917 suggests that this loco was working in the Lagunas area at the time [32].
39	w/n 3167	In service and damaged during civil war in 1891, see details in Appendix 5. In Oct 1917 this loco was recorded working a passenger train down the branch south west of San Antonio towards <i>oficina Gloria</i> [32].

- | | | |
|----|----------|---|
| 40 | w/n 3168 | In service and damaged during civil war in 1891, see details in Appendix 5. A report in March 1914 has this loco on a passenger train at Mile 76 near Estacion Buenaventura [32]. Another from the same month confirms that the loco was working out of Lagunas running shed. A later report in Mar 1919 has this loco working between Pozo Almonte and Huara [32]. |
| 41 | w/n 3169 | Not recorded in service during civil war 1891. A report in May 1914 has this loco double-heading with no. 46 down through Estacion Central [32]. Withdrawn 1957 [38], though list says this was 'Fowler' 41. |

In February 1901 the YEC Co supplied six fireboxes and wrappers to the same drawing as in the entry immediately below, implying that that they were probably for classes 26, 40 & 70, under order 15590.

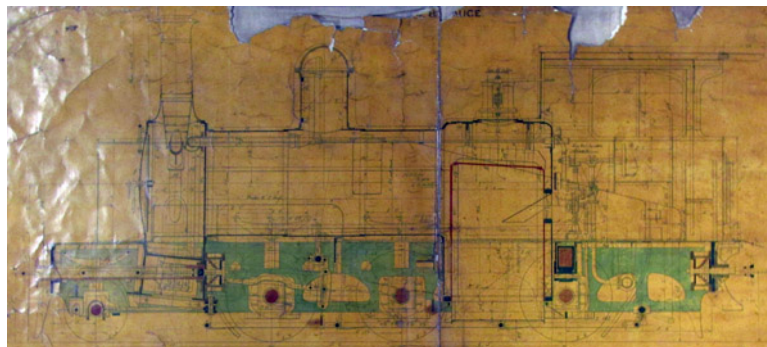
In April 1903 the YEC Co won a contract to supply two fireboxes and wrappers for classes 26, 40 and 70, implying that two of them perhaps used the same firebox design, under order 16721.

In October 1912 the YEC Co supplied two pairs leading wheels and axles for Sharp Stewart engines class 39, under order 22362.

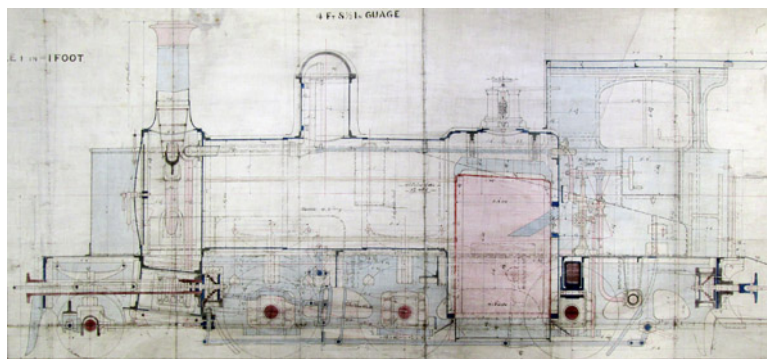
In November 1923 the YEC Co supplied one boiler for engines class 38-41, under contract C247. Boiler empty weight 7T 13cwt.

In January 1926 the YEC Co supplied ten valve buckles for engines class 26/31/38/41, under order 10889.

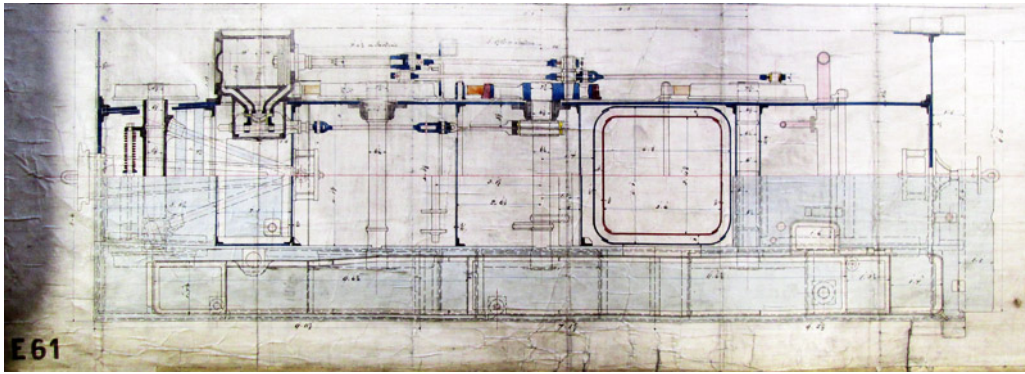
All four still in service in 1909 [8]. 1929 NR official list implies all were in use then [8].



Sharp Stewart elevation drawing 1408, held at the NRM in York, their reference ALS6/PP01/N.



YEC Co GA drawing in Sheffield City Archives. Despite the low resolution of the images shown here, the fall-plate to link to a second loco can just be made out far right. Another unusual feature is that the front drawbar runs through to an arrangement of springs behind the cylinders.

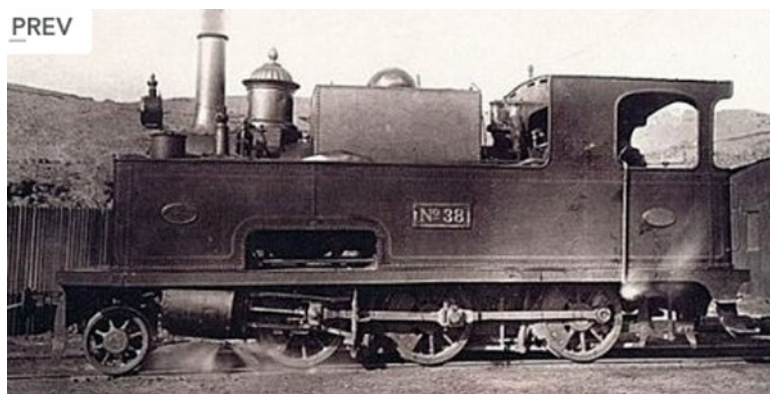


The YEC Co plan for these locos shows a number of interesting features.

The pony truck is effectively a cannon box turning about a pivot point behind the valve chests which doubles up as the fixed point for the front coupling. The side tank and bunker fabrication runs all the way back to the rear buffer beam, creating a narrow, almost square, cab space about 5' 0" wide. At the rear of that space was a 2' 9" wide waist-height barrier to protect the crew from falling backward, and with narrow gaps either side to give access to the other loco when working back-to-back.



Image from the *Album de Tarapacá* of 1900, showing a central waist-high plate to prevent the crew from falling from the back of the footplate.



Later view with oil tank, and dome further back implying that loco had been reboilered. Certainly the chimney has lost its original cap.



A pair of Sharp Stewart designed 'back-to-back' locos in Zapiga loco shed in 1929. On the right is 2-6-0T no. **38**, whilst the rear view of the engine on the left clearly shows the waist height screen that protected the crew from falls.

Class 42

4-6-0T d/w 48", cyls. 18"x24", built by Fowler in 1884 (42-45) and 1885 (46-49)

Weighed 40.830T [8]. Joy valve gear. There is a photo in existence showing a loco of this design and with almost all details identical to these NR engines, but with the number **13** on an NR style plate. This image appeared in a Lever Murphy catalogue. Whilst the explanation has not yet surfaced, this may have been a loco built by LM to the Fowler design for a nitrate *oficina*. See photo in the section devoted to unidentified standard gauge locos, below.

42	w/n 4901	Despatched from works 28-11-1884. In service and damaged during civil war in 1891, see details in Appendix 5.
43	w/n 4902	Despatched from works 28-11-1884. Not recorded in service during civil war 1891. A report in June 1919 has this loco working in the oficina Keryma area [32].
44	w/n 4903	Despatched from works 16-12-1884. Not recorded in service during civil war 1891. A report in April 1914 has this loco working north through Huara and Dolores [32], and another that month also has the loco working through Huara [32]. Another report in Aug 1914 describes this as ' <i>la máquina no. 44 de Zapiga</i> ', possibly implying that it was allocated to that running shed [32], whilst one in April of that year confirms this.
45	w/n 4904	Despatched from works 24-12-1884. In service but not damaged during civil war in 1891, see details in Appendix 5. In a report from April 1917 this loco was recorded at Pozo Almonte [32]. A report from April 1921 also has this loco at Pozo Almonte [32].
46	w/n 4950	Despatched from works 30-1-1885. Not recorded in service during civil war 1891. Four reports in Feb 1914 have this loco on trains working into <i>oficina Sara</i> [32], and two of them suggest that the engine was in fact allocated to Pozo Almonte running shed. A report in May 1914 has this loco double-heading with no. 41 down through Estacion

		Central [32].
47	w/n 4951	Despatched from works 2-2-1885. In service and damaged during civil war in 1891, see details in Appendix 5. A report in Jan 1914 has this loco on a train between Santa Catalina and Negreiros [32]. In two reports from Jan 1917 it was working in the <i>oficina La Palma</i> (later <i>oficina Humberstone</i>) area and to Pozo Almonte [32].
48	w/n 4952	Despatched from works 28-2-1885. In service and damaged during civil war in 1891, see details in Appendix 5
49	w/n 4953	Despatched from works 21-3-1885. Not recorded in service during civil war 1891.

The YEC Co parts orders listed below repeatedly mention class 48, and occasionally class 45. Why not always class 42? Where there any significant differences between them?

In October 1905 the YEC Co supplied two boilers for class 45 (or class 48), under contract 149. Boiler empty weight 9T 7cwt.

In early 1906 the YEC Co supplied two fireboxes for Fowler locos of class 48, similar to class 49, under order 18567.

In November 1906 the YEC Co supplied one firebox and wrapper for John Fowler locos of class 48, under order 18836, also smokebox tubeplate.

In June 1907 the YEC Co supplied one firebox and wrapper for John Fowler locos class 48, under order 19120.

In June 1907 the YEC Co supplied one smokebox tubeplate for John Fowler engines class 48, under order 19122.

In early 1910 the YEC Co supplied one firebox and wrapper for John Fowler loco class 48, also one smokebox tubeplate for same, under order 20203.

In May 1910 the YEC Co supplied two copper fireboxes for John Fowler locos class 42/49, under order 20580.

In May 1918 the YEC Co supplied six buffers for no. 42 class, under order 5129.

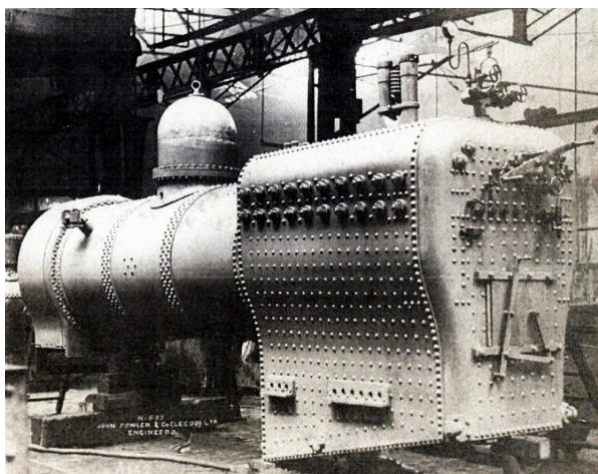
All eight still in service in 1909 [8]. 1929 NR official list implies all were in use then [8].



No. 46 as built. Fowler builder's pic available at the Museum of English Rural Life, Reading, England.



No. **49** later in its life. There is a slightly longer smokebox with a stovepipe chimney; the big rectangular sandboxes have gone; the footsteps fore and aft now have only two steps instead of three; additional handrails line the front of the running plate; the front spectacle plate has bigger openings or may even have been removed; and oil tanks are now mounted above the boiler. In addition the works plates are now affixed to the front of the tanks rather than to the bunker.



A Belpaire boiler for one of the Fowler 2-6-2T Nitrate Railways locos seemingly completed in the Fowler works.

Class 50

2-6-2T d/w 48", cyls. 18"x24", built by Fowler in 1888

Source [8] says built in 1886, but see dates below. Order may have been placed in 1886. Order no. 603. Joy valve gear.

50	w/n 5556	Despatched from works 4-7-1888. In service and damaged during civil war in 1891, see details in Appendix 5.
51	w/n 5557	Despatched from works 31-7-1888. In service and damaged during civil war in 1891, see details in Appendix 5. A report in Jan 1914 has this loco double-heading with no. 64 on a train from Iquique working up through Rinconada [32]. A report in July 1914 has this engine working up through Mile 43 on its way to Pozo Almonte [32]. A report in Oct 1917 has this loco working down through Rinconada to Iquique [32]. Another report in Nov 1918 has this

		loco working into and out of <i>oficina San Lorenzo</i> [32].
52	w/n 5558	Despatched from works 31-8-1888. Not recorded in service during civil war 1891.
53	w/n 5559	Despatched from works 29-9-1888. In service and damaged during civil war in 1891, see details in Appendix 5. A report in Sept 1917 has this loco recorded from <i>oficina Bellavista</i> to Estacion Buenaventura, and the wording is such that the engine may well have been allocated to the running shed at Lagunas [32]. A report in November 1918 has this loco working in and out of Oficina Brac [32].
54?	w/n 5560	Despatched from works 21-11-1888. Copeland and Kirchner speculate that they were loaned to the Col. North Constr. Co. before 1889, but more probably they will have been amongst the four engines lost at sea.
55?	w/n 5561	Despatched from works 30-11-1888. Copeland and Kirchner speculate that they were loaned to the Col. North Constr. Co. before 1889, but more probably they will have been amongst the four engines lost at sea.

Around 1896 the YEC Co supplied 2 fireboxes and wrappers for class 50 locos, under order 12710.

In November 1906 the YEC Co supplied one firebox and wrapper for John Fowler locos of class 50, under order 18837, also smokebox tubeplate.

In June 1907 the YEC Co supplied two fireboxes and wrappers for John Fowler locos class 50, under order 19121.

In June 1907 the YEC Co supplied one smokebox tubeplate for John Fowler engines class 50, under order 19122.

In March 1914 the YEC Co supplied two angle rings for boilers for engines class 50, under order 1432.

In March 1914 the YEC Co supplied six crossheads for engines 50/61, under order 1439. [Might these have been for engines 56/61?].

In July 1916 the YEC Co supplied six hornblocks and wedges for engine class no. 50, under order 3215, also six driving crankpins under order 3218.

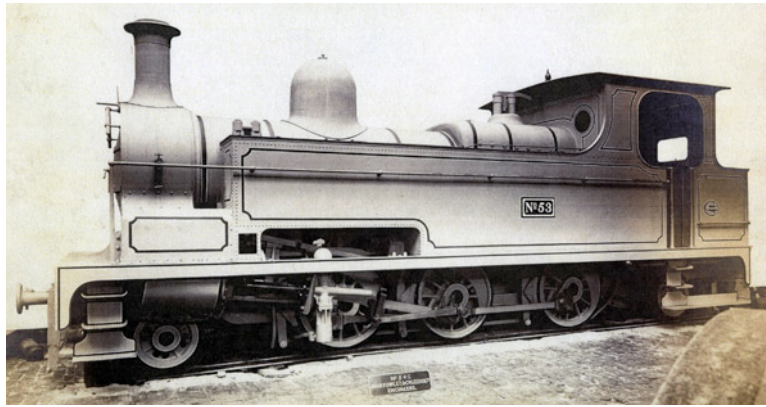
In July 1916 the YEC Co supplied two angle iron boiler rings for engine class no. 50, under order 3220, plus two smokebox tubeplates under order 3221, also two wrought iron dome seatings under order 3222.

In May 1918 the YEC Co supplied three axles for loco no. 50 class, under order 5118, also six hornblocks & wedges for same, under order 5122.

In May 1918 the YEC Co supplied six buffers for no. 50 class, under order 5128, also one set of side rods for same, under order 5130.

In March 1920 the YEC Co supplied six axles for 50 class, under order 6821.

All remaining four locos still in service in 1909 [8]. 1929 NRC official list implies all remaining four were in use then [11].



No. 53 as built. Fowler builder's pic available at the Museum of English Rural Life, Reading. These locos, along with the preceding 4-6-0Ts, seem to have had Joy valve gear.

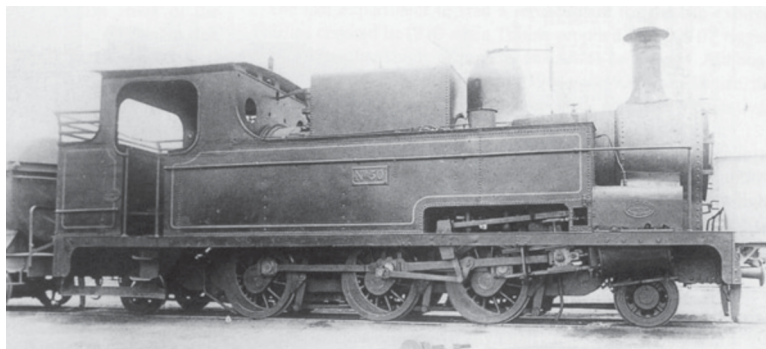


Photo showing loco in later life, with a rather longer smokebox as well as the boiler top oil fuel tank, from Christopher Walker's collection via Donald Binns' *Nitrate Railways* book. The safety valves are also different, and are now mounted on the dome. The bunker is very slightly taller than originally designed, and has coal rails.

Numbers of locomotives at the end of the 1880s

the 1887 company accounts mention purchase of two new engines. The 1888 accounts include the cost of three new engines. 45 locos were in the fleet at the end of 1888. The 1888 Report of the Directors mentions that six new locos had been ordered, and that three had been added to stock making a total of 48. However, W. H. Russell [37 page 159] confirms that at the beginning of 1889 there were forty-five locos.

Successive annual Reports of the Directors [40] then state categorically that seven more locos entered the fleet during 1889, making a total of 55; six more during 1890 making a total of 61 (though three were still in course of erection at the 31st December); and five more during 1891 resulting in a total of 66.

A speculative table of events, dates and numberings around this period is set out at the end of this Nitrate Railways section.

Class 56 / class 3

0-4-0ST d/w 39½", cyls. 12"x18", built by Fowler in 1888 and 1889

Ordered for ? Weight 20.860T [8]. Article in *The Locomotive* in March 1932 says built 1876, as does the relevant NRC diagram sheet from the 1920s. It looks as though the first two were numbered **56?** and **57** before a decision was made to put all the smallest engines in the range **1-8**. So, after two had been lost at sea, all the later ones may have arrived to be numbered straight into the range **3-8**.

56?

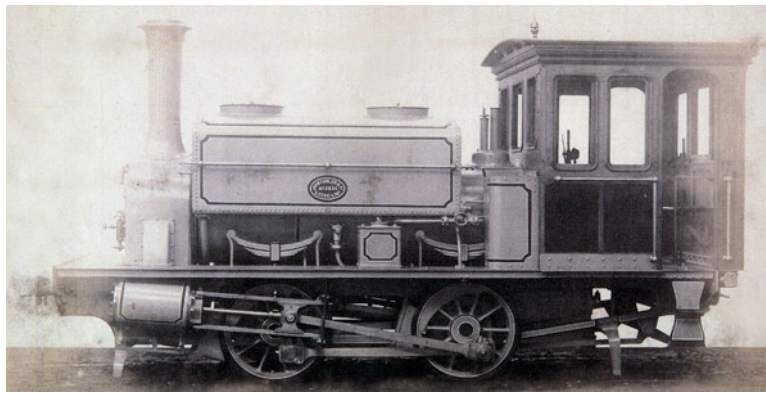
w/n 5563?

Copeland & Kirchner suggest this was loaned to 'Colonel North's Construction Company' before 1889, and that it may have ended up with the *DOP*.

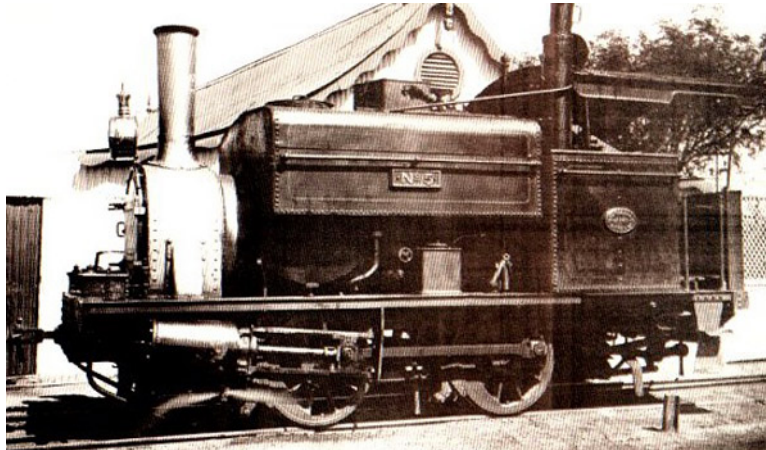
			The no. 61 was set aside for this loco in anticipation of its return. However, the Fowler list says 5563 went to Brazil. Not shown in official 1929 list.
57	3	w/n 5564	Despatched from works 27-8-1888. Copeland & Kirchner suggest loaned to 'Col. North Constr. Co.' on arrival. May have ended up with <i>DOP</i> , or may have been returned. No. 62 set aside for this loco in anticipation of its return. If this engine was no. 3 in 1891 it was in service and damaged during the civil war in, see details in Appendix 5.
—		w/n 5829	This batch of four ordered via W. & J. Lockett. Fowler order no. 6/31-3. Despatched 30-11-1888. Lost at sea. See notes below.
—		w/n 5830	Despatched 14-12-1888. Lost at sea. See notes below.
	4	w/n 5831	Despatched 31-12-1888. See notes below. Not recorded in service during civil war 1891.
	5	w/n 5832	Despatched 31-12-1888. See notes below. In service but not damaged during civil war in 1891, see details in Appendix 5.
	6	w/n 6041	Fowler order no. 6/206:8. Despatched 16-8-1889. Probably replacement for loco lost at sea. Ordered via W. & J. Lockett. In service and damaged during civil war in 1891, see details in Appendix 5. In July 1917 this loco was reported on a passenger train from Huara to Pozo Almonte [32].
	7	w/n 6042	Fowler order no. 6/206:8. Despatched 16-8-1889. Probably replacement for loco lost at sea. Ordered via W. & J. Lockett. In service and damaged during civil war in 1891, see details in Appendix 5.
	8	w/n 6043	Fowler order no. 6/243:5. Despatched 21-10-1889. Possibly replacement for loco loaned to 'Col. North Constr. Co.' Ordered via W. & J. Lockett. In service and damaged during civil war in 1891, see details in Appendix 5. Still in service in 1958. Was preserved for some years in Iquique, and is now under cover at the conservation site of <i>oficina Humberstone</i> .

In May 1918 the YEC_o supplied 5½ gross of bolts for the rods of locos nos. **1-11**, under order 5135. Similar order placed March 1920, under order 6834. Why would this order have mentioned locos **1-11**, when **9-11** were Avonside Fairlies rather than small tank engines like the others?

Four still in service in 1909 [8]. 1929 NRC official list implies six were in use at that date [8]. Article in *The Locomotive* in March 1932 said that five were still in service.



Fowler 5830 which was lost at sea. It is not clear whether all of these engines were built with the wooden cab shown here. Fowler builder's pic available at the Museum of English Rural Life, Reading.



One of these saddle tanks, no. 8, later in its career. This loco survives at Oficina Humberstone.

The loss of four new locos on the SS *Guayaquil*.

The 1889 Directors' Report says five new locos had been sent out, as well as four unfortunately lost at sea with the "SS *Guayaquil*" which would be replaced as soon as possible. The SS *Gulf of Guayaquil* of the Greenock Steamship Co. "foundered off Fishguard [Wales] on her maiden voyage after sailing from Liverpool for Valparaiso, on 24th [NB the enquiry report says 25th] December 1888" [www.wrecksite.eu]. Two of those lost were clearly 0-4-0STs, and the others would seem to have been 2-6-2Ts. Those four engines all left the factory in late November or early December 1888 and were very likely to have been loaded on the same ship. The report of the enquiry into the sinking, published in Liverpool on 20th April 1889, confirms that the ship was carrying two larger and two smaller locomotive boilers (and presumably other parts in crates though they were not specifically mentioned), and deduces that the ship must have been in collision with an unknown other vessel off the Tuskar light on the south east coast of Ireland, [Report is in The National Archives, Kew].

2-6-2T d/w 48", cyls. 18"x24", built by Fowler in 1889

Replacements for original no. 54-55 probably lost at sea. Ordered via W. & J.Lockett.

54	w/n 6039	Despatched 31-10-1889. In service but not damaged during civil war in 1891, see details in Appendix 5. A report in August 1916 has this loco working a train down from La Noría through Estacion Central [32]. A report in April 1918 has this loco working between San Antonio and Santa Lucia [32].
55	w/n 6040	Despatched 31-10-1889. In service but not

damaged during civil war in 1891, see details in Appendix 5.

Both still in service in 1909 [8]. 1929 NRC official list implies both were in use then [7].

Fairlie Boilers

“Nitrate Railway Company – Order for a Sheffield firm. The Yorkshire Engine Company, Limited, have been successful in obtaining a large order for Fairlie locomotive boilers, representing in value several thousand pounds, to replace others supplied by them about 14 years ago. These are for the Nitrate Railways Company.” [*Sheffield and Rotherham Independent* 17th January 1889]

Boilers for “18” American tank locos”

In April 1889 John Fowler supplied two boilers (5827-8) to the Nitrate Railway, Chile, for “18” American tank locos”. It is not known what they might have been, though the Cooke 2-6-0s are supposed to have had 17" cylinders so it is possible that those are the locos referred to. It is alternatively possible that ‘American’ refers merely to any 2-6-2T or Prairie tank.

Class 56 / class 2

0-4-0ST d/w 37", cyls. 10x16", built by R. & W. Hawthorn in 1868-9

Probably purchased second-hand – at a guess in 1889. It now seems likely that this loco was originally the *FC Arica Tacna*’s number 3, R. & W. Hawthorn no. 1480 of 1869. The basic dimensions agree, as do various design characteristics, and minor differences can be explained away as resulting from a reboiling at some stage. Source [36], see Appendix 2, suggests that the NNRC may have considered the purchase of this loco as early as 1874, but the fact that it was numbered 56 on its arrival makes it unlikely that it arrived until the NR loco numbering had reached that point, around 1889.

56 1 w/n 1480

In service and damaged during civil war in 1891, see details in Appendix 5. Later converted to 0-4-2ST and then by 1907 to 0-4-4ST inspection saloon. Weight 18.240T in 1909 [8]. Reported in Sept 1920 working down from Rinconada to Iquique [32]. 1929 NR official list implies it was in use then [8], also confirmed by article in *The Locomotive* March 1932.



(The Danforth 4-6-4T was renumbered 57 at this point, but soon moved to no. 62)

Class 58 / class 1

0-4-0ST Ogee saddle tank d/w 40", cyls. 14x20", built by Yorkshire Engine in 1889

Weight 21.780T [8]. Contract E76. A comprehensive table of part weights is available for this loco in YEC weights book C60 to C131, in the Sheffield City Archives. This gives an empty weight for the loco of 17tons.

58 2 w/n 427

In service but not damaged during civil war in 1891,

see details in Appendix 5. A report in June 1918 has this loco working a nitrate train between Rinconada and Mile 1 in Iquique [32]. A report in July 1920 has this loco working to *oficina* *Pontevedra* [32], which was 10km from Estación Alto de San Antonio.

In November 1889 the YECó supplied alterations to the buffing and drawgear of this loco, via W. & J. Lockett, under order 8055.

The 1929 NRC official list implies it was in use then [8], also confirmed by article in *The Locomotive* March 1932.

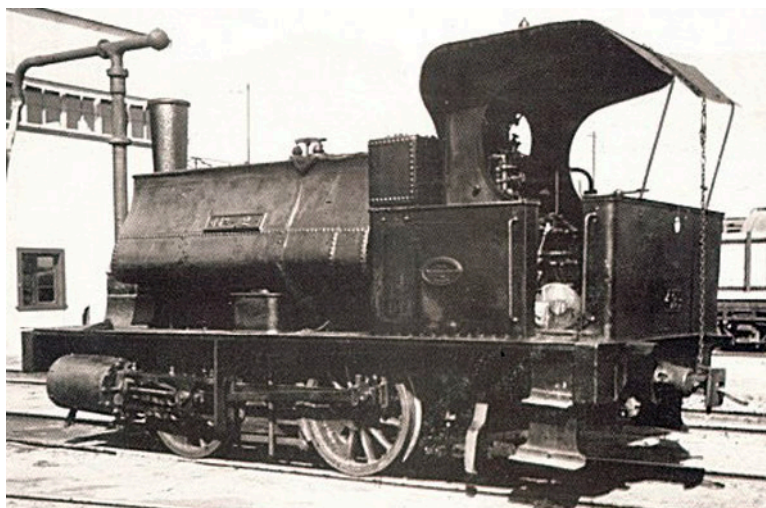


Photo published in *The Locomotive* during April 1932.

Renumbering of certain locos

It seems to have been at this point, in early-to-mid 1889, that the Rogers 2-6-0s nos. **1** and **2** were renumbered **59** and **60** to clear most of that single digit series for all of the small 4-coupled tank locos. The Danforth 4-6-4T also moved from **7** to **57** (a slightly puzzling choice of number), but soon after moved again to **62**. In early 1891 the Rogers 2-6-0s were again redesignated **65-66**, to make space for additional Fowler 2-6-2Ts and for a pair of Fairlies. See a table showing the possible sequence of events in 1888 to 1891 at the end of this section.

Class 56

2-6-2T d/w 48"?, cyls. 18"x24", built by Fowler in 1890 (56-59) and 1891 (60-61)

[8] says numbers **50-61** weighed 50.820T, Fowler order no. 8/52:6. Notably, a number of these Fowler tank locos seem to have carried smokebox doors hinged to the left and which were fastened by rim latches rather than the usual British-style central dart. Whether this was an original fitting or a later modification is as yet uncertain.

56	w/n 6295	Despatched 31-7-1890. Not recorded in service during civil war 1891.
57	w/n 6296	Despatched 21-8-1890. In service but not damaged during civil war in 1891, see details in Appendix 5.
58	w/n 6297	Despatched 21-10-1890. In service and damaged during civil war in 1891, see details in Appendix 5.
59	w/n 6298	Despatched 30-10-1890. In service but not damaged during civil war in 1891, see details in Appendix 5.
60	w/n 6299	Despatched 30-5-1891. A report in July 1921 has this loco working out of Iquique [32].
61	w/n 6300	Despatched 30-5-1891

In March 1914 the YECó supplied six crossheads for engines 50/61, under order 1439. [Might these have been for engines 56/61?].

All still in service in 1909 [8]. 1929 NRC official list implies all were in use then [8].

(62 was the Danforth 4-6-4T built in 1866 and listed above.)

Class 63

0-6-6-0 Double Fairlies d/w 45", cyls. 17"x22", built by Yorkshire in 1890

[8] says numbers **63-4** were '*locomotoras dobles*' weighing 74.400T. Ordered December 1889 via W. & J. Lockett, under contract E82. "Two Fairlie engines E41 class, with alterations to drawing office instructions". A comprehensive table of part weights is available for these locos in YECó weights book C60 to C131, in the Sheffield City Archives.

This gives an empty weight for the loco of 59tons 19cwt. Boiler empty weight 15T 18cwt.

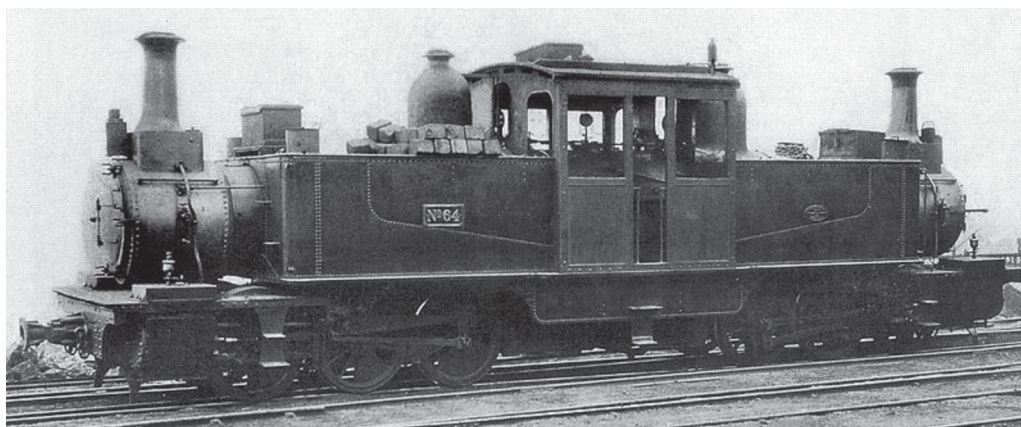
63	w/n 442	A report in Oct 1919 has this loco working between La Noría and Alto San Antonio [32]. In Dec 1925 it was working down the hill from El Molle to Iquique in a report [32].
64	w/n 443	A report in Jan 1914 has this loco double-heading with no. 51 on a train from Iquique working up through Rinconada [32]. A report in Oct 1917 has this loco working out of Iquique [32]. A report in Jan 1920 has this loco in service, but with its location not specified [32].

Both were in service in 1909 [8].

In September 1910 the YECó supplied four radial back transverse stays for Fairlie engines class 63, under order 20870.

In May 1918 the YECó supplied four crossheads for the loco no. 64 class, under order 5113.

1929 NRC official list implies both were in use then [8]. Article in *The Locomotive* in March 1932 says both withdrawn recently.



Double Fairlie no. **64**. Photo from Pablo Moraga's book *Tiempo de Trenes*. This is the fireman's side of the loco, as evidenced by the rivet lines revealing the shape of the bunkers. Note the straight tops to the cabside windows, the steel sheet cab ends, the builder's plate on tank rather than cab, and seemingly the left-hand hinges on both smokebox doors.



This is one of the later YECO Fairlies, seen on the arrival of a loaded train in Iquique during 1899. The loco is probably either no. **63** or **64**, having lost its spark-arresting chimneys but not yet having oil tanks above the boiler. Note the left swinging smokebox door at this end of the loco.

Class 65

(After the 1889-91 renumberings **65** and **66** were the pair of Rogers 2-6-0s built around 1871 and listed above.)

The Civil War of 1891

“During the first three months of 1891, the two Chilean political parties then contending for power were engaged in active warfare all over the Nitrate Districts, and were alternately in possession of different sections of the Nitrate Railways, causing wholesale destruction of the Company’s rolling stock, buildings and line, It is a matter of public notoriety that the Railway was employed for many weeks night and day in carrying troops, that the permanent way and telegraph were frequently destroyed, that the Company’s locomotives were used as engines of warfare, and driven under full steam at one another in various engagements, that the rolling stock was converted into and used as ironclad trains, that many vehicles were totally destroyed in battle, that the Company’s Stations and Camps were pillaged, and that the Pisagua Station, and part of the Iquique Railway Buildings were riddled with shot and shell during the bombardments of the 16th and 19th of February, 1891.” [39]

Even allowing for a certain amount of hyperbole from a company which was still arguing its case against the successful party, now in government, it sounds as though the locomotive fleet must have suffered a certain amount of damage, some of it possibly spectacular. Harold Middleton comments roughly as follows: *“the war started when the revolutionary (Congress) navy besieged Iquique in January 1891. There was a second landing at Pisagua, a fight at Dolores, a battle in Huara, the battle of Hospicio, the Iquique custom duties office battle and the final battle in Pozo Almonte. Note that all the combats were along the NRC lines. All the troops’ movements were by train.*

Specifically, in the Huara combat, two locomotives were launched against the enemies’ train. According to the history, those locomotives were intended to collide with the Congress forces, who had run away on a train. I remember a note that indicated the locomotives turned over on a curve after they had been launched but had not yet reached the enemy train, but I was unable to find the note. The Congress forces made an armoured train in the Iquique workshops, armed with machine guns, which was used as a scout train along the Central to Pozo Almonte stretch, detecting the Balmacedist forces in Pozo Almonte. Later, it fought in that battle giving fire support.”

“Machine guns on an ironclad railroad engine” a headline in *The World*, New York, May 15 1891.

The Baltimore Sun, reporting on 9th June 1891 about the battle of Huara, said *“On February 15 the forces met and fought a battle at San Francisco, where the government troops were defeated. Robles retreated to Santa Rosa, where he was met by reinforcements, and when the retreating forces were reorganized the whole pushed back to Pozo Almonte, forty-five miles from Iquique, the object being to prevent the opposition from recruiting its ranks while passing through the line of the principal nitrate works. At Pozo Almonte two railroad engines were secured. A car with a gun*

mounted upon it was coupled ahead of the first engine. The second engine carried the reconnoitering party, consisting of Colonel Soto, Lieutenant Arancibia and an employee of the railroad company. On arriving at Huara, twenty miles towards Pisagua, it was learned that the advance guard of the enemy was at Negreiros, about twenty miles distant, and that they seemed to be making preparations to march on Huara. The reconnoitering party went on to the Huara nitrate mines and fired three shots with the piece mounted on the car. The enemy retired at once, after which the situation was looked over and the party returned to their camp at Pozo Almonte."

"After some minutes a squad of cavalry was brought up and charged the enemy coming up the railroad. A locomotive was procured and started under steam against the approaching train-load of soldiers. A few minutes later a heavier locomotive was dispatched in the same manner. This completely demoralized the enemy's reinforcements, and the troops already engaged retreated in disorder, leaving Colonel Robles in possession of the field."

The *Cheshire Observer* of March 28th 1891 had a long report entitled *A Cestrian in the Chilian Rebellion*, from Mr. W. Brooke Comber, the manager of the *oficina Paccha*. Extracts relevant to the NR locomotives include: "Two days after that there was fighting in the Hospicio. In the afternoon we rode out in that direction, but there was nothing to be seen. I got in for a railway collision. We rode as far as "San Roberto," and, as there was an engine there with Dr. Hawes Wablgran and one or two others, going to Cuesta Arenal, I left my horse and got on the engine. All telegraph and telephone lines being cut, we did not know if anything might be coming up the line, so went down very carefully, when, just in the worst place, going through a cutting with a very sharp curve somebody called out there was an engine coming up close on us. I just looked round, and there she was about fifteen yards off. I just had time to make a dive off that engine before they struck. Fortunately we were going down very slowly, and the other was not coming up fast, otherwise it might have been a bad accident, as on both engines there were a lot of men. One man broke his leg rather badly. I knocked all the skin off one hand, and got several bruises, but nothing bad. Several others bad bruises. Hawes kept on the engine. He got knocked up against the boiler and bruised a bit."

More recently a most detailed record of the damage caused to Nitrate Railways locos and rolling stock has been discovered amongst Foreign Office papers at Britain's National Archives in Kew, London. This is appended in full as Appendix 5.

Class 67 designed for working in pairs

0-6-0T d/w 42", cyls. 16¼"x20", built by Fowler in 1894

[13] says numbers 67-70 weighed 32.670T. Clearly these were built to the Sharp Stewart design originally supplied as class 26. All four entered service during 1894 [40].

67	w/n 6897	Despatched 24-4-1894. A report from Dec 1920 records this loco shunting at the time in Huara station [32].
68	w/n 6898	Despatched 30-4-1894. A report in June 1930 has this loco working in the Alianza and Buenaventura area [32].
69	w/n 6899	Despatched 30-6-1894. A report from August 1917 has this loco working at Dolores station [32]. Still in service in 1958.
70	w/n 6900	Despatched 30-6-1894. At Iquique operational until 1974 but dumped in 1976 [7] and 1978 [9].

In February 1901 the YECó supplied six fireboxes and wrappers to the same drawing as in the entry immediately below, implying that they were probably for classes 26, 40 & 70, under order 15590.

In April 1903 the YECó won a contract to supply two fireboxes and wrappers for classes 26, 40 and 70, implying that they perhaps used the same firebox design, under order 16721.

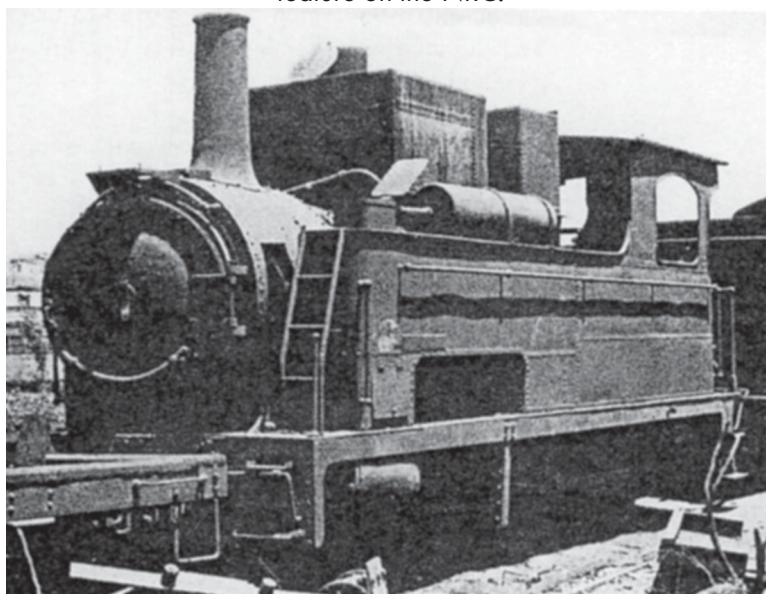
In October 1912 the YECó supplied six steel loco axles for John Fowler engines class 67, under order 22357.

In November 1923 the YECó supplied one boiler for engines class 67-70, under contract C247. Boiler empty weight 7T 14cwt.

In January 1926 the YEC Co supplied four valve buckles for engines class 67-70, under order 10888. All four still in service in 1909 [8]. 1929 NRC official list implies all were in use then [7].



Whilst these Fowler 0-6-0Ts were clearly built to the Sharp Stewart drawings and are more or less identical to class 26, they can be identified by the second works or agency plate right at the front of each tank, over the sand-boxes, and by the handrail running the full length of the tanks and round the front corners. This is no. **70**. Note the left hung smokebox door, a common feature on the NRC.



This photo by Wilf Simms is supposedly of Fowler loco no. **70** at Maestranza El Colorado. The smokebox appears to protrude further forward than that that seen above. Views in [7] also show that a conventional lower cab back, albeit made up solely of rails rather than sheet steel, had been fitted at some point on a slightly extended footplate, in contrast to the original open rear to facilitate working back-to-back.

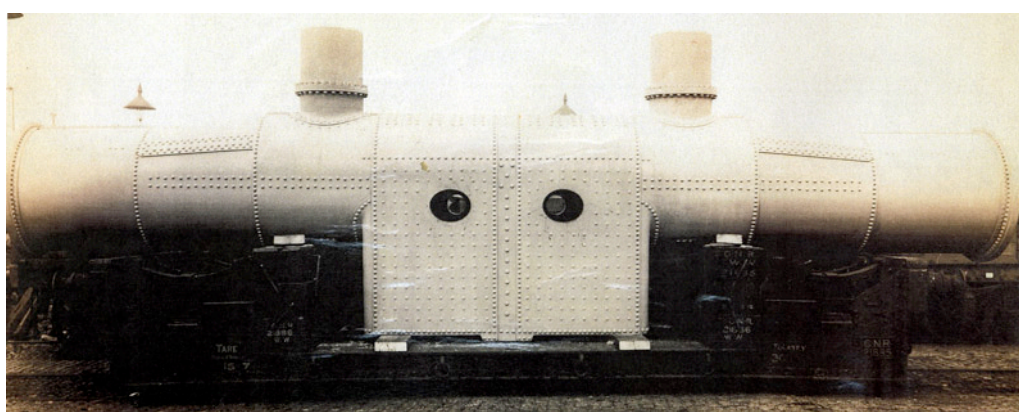


This rear view of. no. 70 by J. Hutzler in 1976, clearly shows the footplate extension and fixed railings that replaced the original narrow protective 'wall' at the back of the cab.

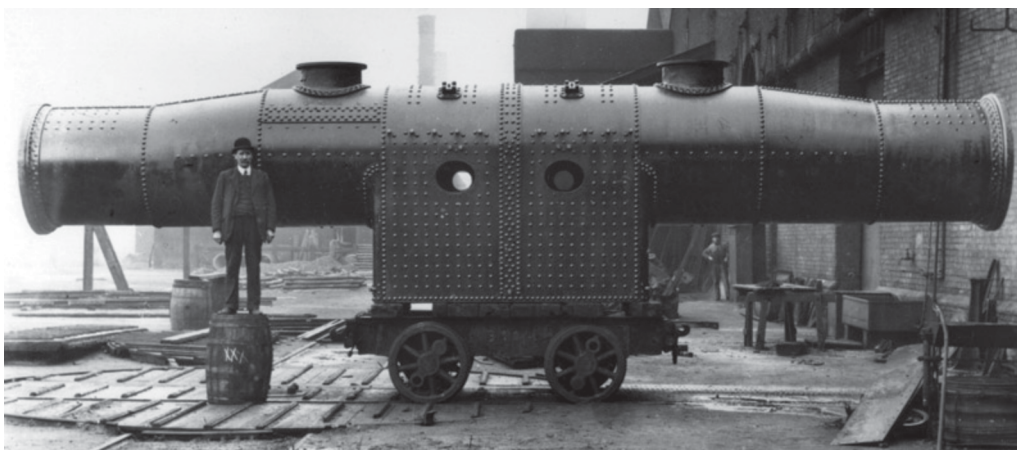
Replacement Fairlie boilers by Fowler and others

Seven replacement double Fairlie boilers were constructed in 1893 and 1894 by Fowler under their works nos. 6901-7. Most if not all were ordered under Fowler order no. 11/224. Despatch dates were between 31-8-1893 and 24-10-1894. Similarly Fowler supplied Fairlie boilers 7838-9, despatched 7-9-1897. We have already recorded at least thirteen replacement Fairlie boilers built by YEC Co, and later there were a few constructed by Haine St. Pierre.

There were probably many others, for until the introduction of proper water treatment in the 1920s boilers out in the desert were unlikely to have lasted more than ten to fifteen years before replacement. That suggests that during the NRC's main period of Fairlie use – say 20+ Fairlie locos over a period of roughly sixty years – sixty to one hundred replacement double boilers might have been required. Only twenty-five have been discovered, nine by Fowler, thirteen by the YEC Co and three by HSP. A thorough look at the spares order books of other manufacturers might well bring rewards.



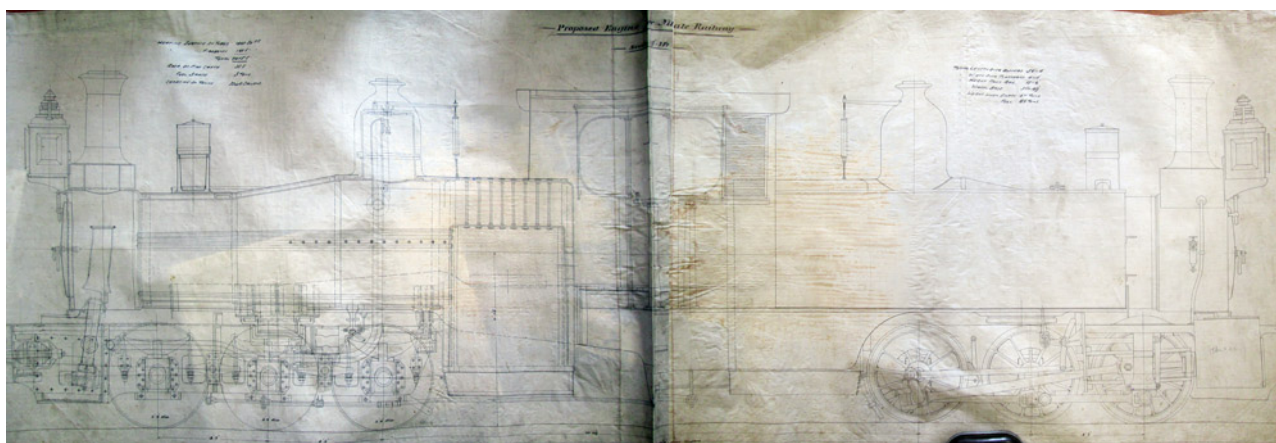
A Fowler-constructed double boiler, in a photo from the MERL archive in Reading. It clearly shows a wagon-top boiler, and that the NR retained the second set of fireholes for the driver, unlike the Festiniog Railway which by the 1880s had decided they were unnecessary.



And an equivalent photo from the Yorkshire Engine Company, interestingly showing the boiler barrel lap joints reversed despite both images showing the fireman's side firebox doors to the fore.

Proposed twin-boiler Fairlies

It seems that the NR invited tenders for the construction of one or more twin-boilered Fairlies at some point. The drawing below, found in the archives in Sheffield, shows such a loco, as sketched out by the YEC_o, though it does not seem to have been built. The drawing shows the cylinders as 17"x22" and the wheels as 45" diameter, and thus it may be assumed that the bogies would have been identical to those on the contract 41 design.



A decade without any new locos

Between 1894 and 1905 no new engines were purchased. In fact not only were there no new locos, but none were withdrawn either. The total listed in the company's annual report to the shareholders remained at 70 throughout that period, albeit with a number between 12 and 22 recorded as under repair or awaiting repairs on the 31st December of the appropriate year.

Class 71

0-4-4-4-0 Three truck Shays d/w 36", cyls. 13½"x15", built by Lima in 1905-6 (71) and 1907 (72)

Class C 80-3. [8] says numbers **71-2** were '*locomotoras de engranajes*' (geared locos) weighing 72.560T, and both in service in 1909. The photos below show that these were saturated engines with the main steam pipe emerging from below the dome, rather than superheated locos whose steam pipe would have run back from a front end regulator in the smokebox. Ian Thomson has suggested that these locos differed, the second being ordered after experience with the first. However, examination of the dimensions given on the Shay Locomotives website [<https://www.shaylocomotives.com/>] does not support that. Virtually all the dimensions given are identical, with the exception of the second loco having a capacity for half a ton more coal (very plausible) and an unladen weight around 10 tons less than its predecessor (much less plausible).

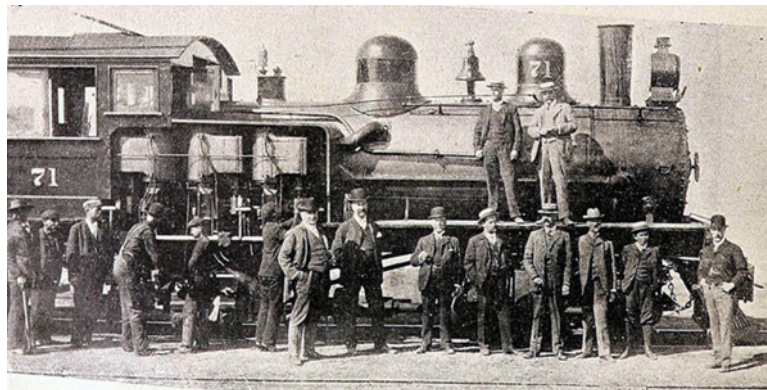
71 w/n 1612

72 w/n 1813

Withdrawn circa 1915? Neither loco appears in 1929 NRC official list [7].



Lima builder's photo, from the Shay website.



Managers inspecting the new loco no. **71**, from *Sucesos* magazine issue 428.

Class 73

0-6-6-0 Double Fairlie, d/w 45" cyls 17x22"

Possibly using some parts originally built by Avonside in 1870 but effectively a new loco erected by the railway around 1904-5, although perhaps not completed until 1908.

[8] says number **73** was a '*locomotora doble*' weighing 74.400T. This is the same weight as a number of other later Double Fairlies on the railway. No. **73** is rumoured by some sources to have been a Fairlie built by the Yorkshire Engine Co. in 1906, but cannot be traced as a new engine in the YECo. list. It is just about possible that it was a much rebuilt No. **8** incorporating a new boiler and bogies from YECo, and this was suggested by earlier researchers. That would probably have meant the re-use of the boiler cradle, almost the sole re-usable structural part if the worn out boiler and the old bogies were discarded.

Certainly in late 1903/early 1904 the YECo had supplied two Fairlie bogies similar "in every respect" to those supplied in 1882, complete with cylinders and motion though wheels were not mentioned, under order 17158. This is a little puzzling, for the locos supplied in 1882 had been the modified 2-6-6-2T type, but other evidence suggests that they had been rebuilt back to 0-6-6-0T status by then.

The story of this engine originating around the surviving boiler cradle of no. **8** seems on closer examination to be unlikely. That loco had been built when Fairlies tended to have their bogie pivots precisely aligned over the middle driver of each bogie, and thus the distance between the pivots was in this case 20' 3" or 6172mm. By the time that the rather larger YECo engines were designed a year or two later the pivots had been moved inboard of the centre axles by about four inches to improve the weight distribution, but nevertheless the pivot spacing was now roughly 23' 0" or 7000mm. Would the railway have wanted to compromise the design of a new engine by fitting new later-style bogies under a cradle roughly 2' 9" shorter than that which had become something of a standard? That seems unlikely. It is doubtful whether even the early fireboxes would have fitted into that space given that the E41 bogies extended two to three inches longer inboard of the pivots, and even if they did the smokebox tubeplates of an early style boiler would have been well inboard of their proper position relative to the cylinders, thus making the routing of the steam and exhaust pipes rather problematic. I suggest that it is much more probable that a new boiler cradle was assembled – not a

difficult task and one that might well have been undertaken at Iquique. It therefore seems more likely that no. **73** was in fact a completely new loco to the YEC Co E41 design, assembled in the railways' own workshops, though possibly incorporating minor parts discarded from other engines over the years. Source [8], the NRC's own 1929 list, gives 1908 as the date of entry into traffic for this engine. As an aside, the only later double Fairlies built seem to have been the final batch from Vulcan Foundry for the *FC Mexicano* in 1911.

73

In July 1917 this loco was recorded on a train of water tanks at Estacion Central, on its way to Dolores [32]. A Feb 1918 report suggests this loco was at that time working out of Iquique [32].

In March 1920 the YEC Co supplied two cylinders (RH & LH) for class 73, under order 6832.

In the 1929 NRC list it is confirmed as having cyls. 17x22" and d/w 45", ie exactly the same as the other E41 design engines such as nos. **32-37** and **63-64**.

Class 74

0-6-6-0T Meyers d/w 45", cyls. 17"x22", built by Yorkshire in 1908

[8] says numbers **74-5** were 'articuladas' weighing 113.400T., and both in service in 1909. They had been ordered under contract 165 in late 1906 or early 1907. The YEC Co order book says 'Hulbund Mechanical Cleaners' to be supplied and fitted. The surviving YEC Co sketch general arrangements entitle these engines as 'proposed Nicholls type articulated locomotives', though they would seem to be very similar to Kitson-Meyers, with the characteristic space between the bogies permitting a full depth firebox. There may well have been some contortions to avoid breaching the Kitson patents, which would still have been in force in 1908. The relatively short life of these locos might reflect a certain dis-satisfaction with them, but might alternatively be merely the result of the terminal downturn in the nitrate industry by the end of the 1920s.

74 w/n 940

"Recently scrapped" according to [16] in 1931.

75 w/n 941

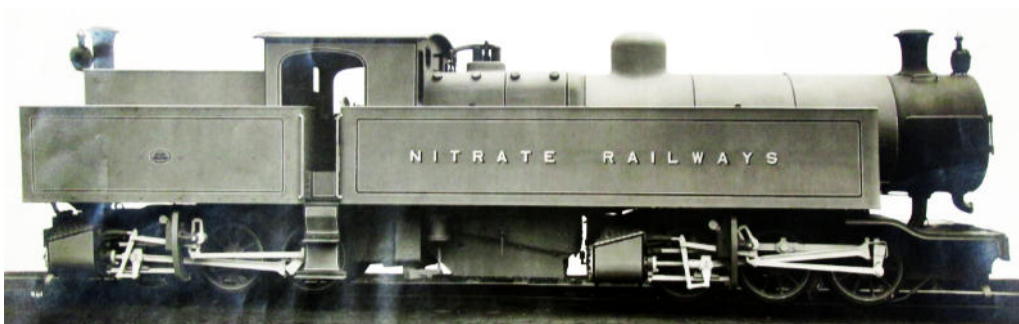
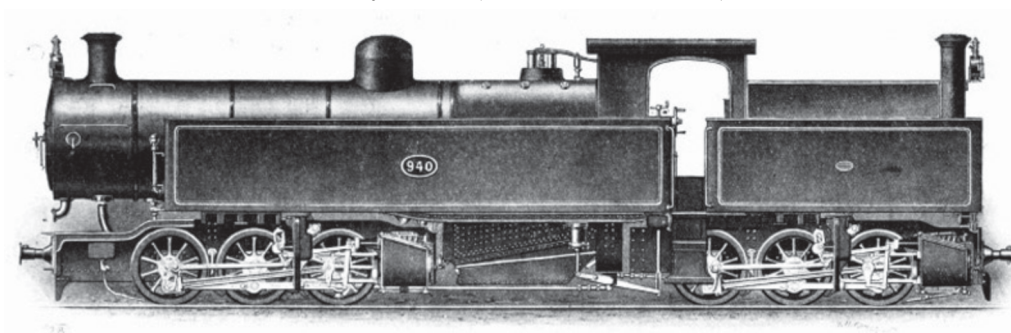
"Recently scrapped" according to [16] in 1931.

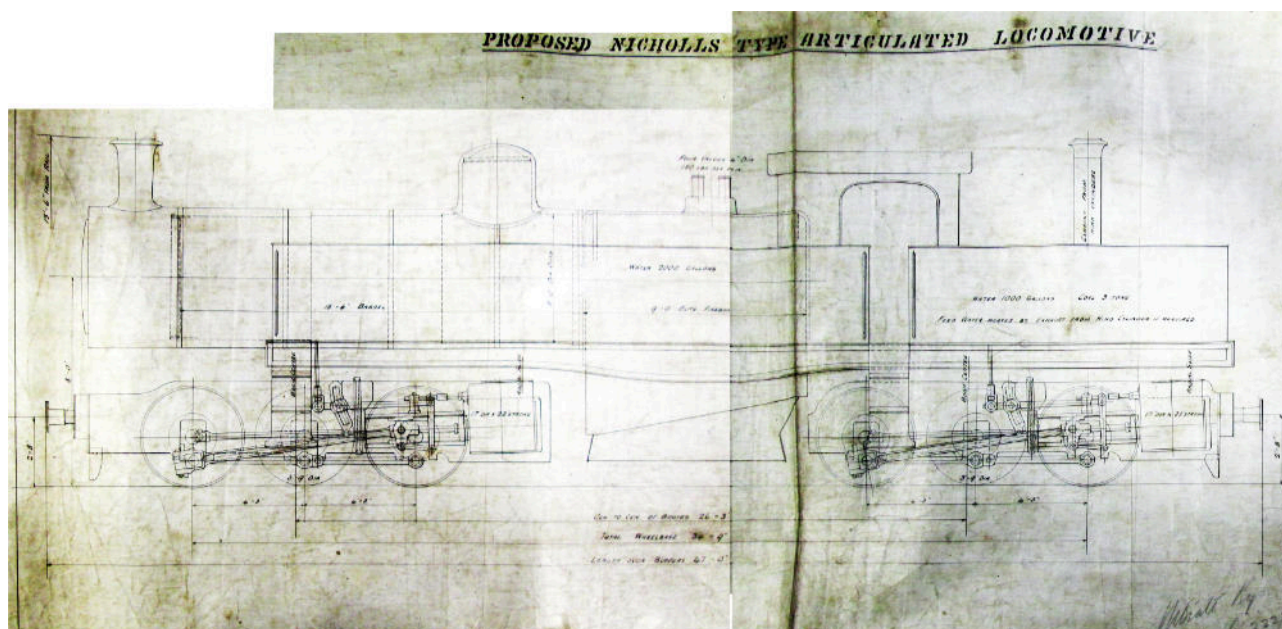
In March 1911 the YEC Co supplied three cylinders for artic. engines class 74, under order 21239.

In March 1914 the YEC Co supplied two complete sets motion brackets for engines class 74/75, under order 1428, also two tubeplates for same under order 1429.

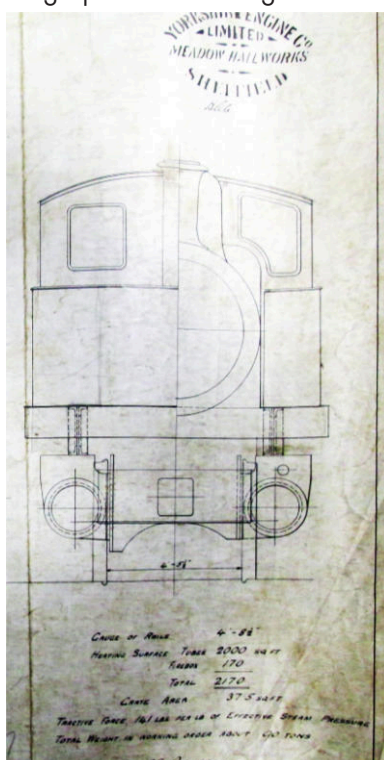
In July 1916 the YEC Co supplied two cylinders (LH & RH) for engine class no. 74-75, under order 3212.

In May 1918 the YEC Co supplied twelve axleboxes for no. 74 class, under order 5123, also twelve engine bearing springs for same under order 5124, also three cylinders (two LH and one RH) for same under order 5132.





A side elevation (above) and end elevation (below) of these NR Meyers, made up from part photographs of a drawing held at Sheffield Record Office.



The fleet around 1909 to 1911

[8] agrees with all preceding info up to loco 75, but shows none of those with higher numbers. If correct, in 1909 the railway had 73 locos in service, numbers 1-75 minus two of the 0-4-0STs numbered between 3 and 8. In fact the annual report to shareholders at the end of that year said that there had been seventy-three locos in the fleet at the end of 1908, but that in the following twelve months there had been four withdrawals, leaving sixty-nine as the total. The government annual publications *Estadística de los Ferrocarriles Particulares en Explotación* agreed with this, stating that the railway had 69 locos in operation in 1909, 74 in 1910, and 73 in 1911. Of the 69, 8 are shown as for passenger trains, 51 for goods, and 10 for shunting.

During 1909 35,160 tonnes of 'briquettes de Cardiff' were used as fuel.

Class 76

0-6-0ST d/w 36" (39"?), cyls. 14"x20" OC, built by Avonside in 1902

Avonside list says type 'Special' ordered by Grace Bros. & Co. This loco does not appear in source [8]'s 1909 list, so was probably purchased second-hand, though the 1920s diagram sheet does say "*puesto en servicio en 1902*". Source [8] shows this loco as '0-6-0STx'. Article in *The Locomotive* in March 1932 says 76 was a YECo. double Fairlie built in 1908 and withdrawn shortly before 1932, but this was probably an error.

76 w/n 1452

A report in Jan 1921 has this loco shunting at Iquique [32]. Spares ordered from AE in Feb 1921 for this loco by the NRC, delivered 11/1921?. It appears that the loco may have been known colloquially as 'Avonside' at that time. 1929 NR official list implies it was in use then [8]. Sold to Iquique port after 1932. Plinthed on the outskirts of Iquique, by the roundabout where the main road starts to climb up the escarpment to Alto Hospicio.

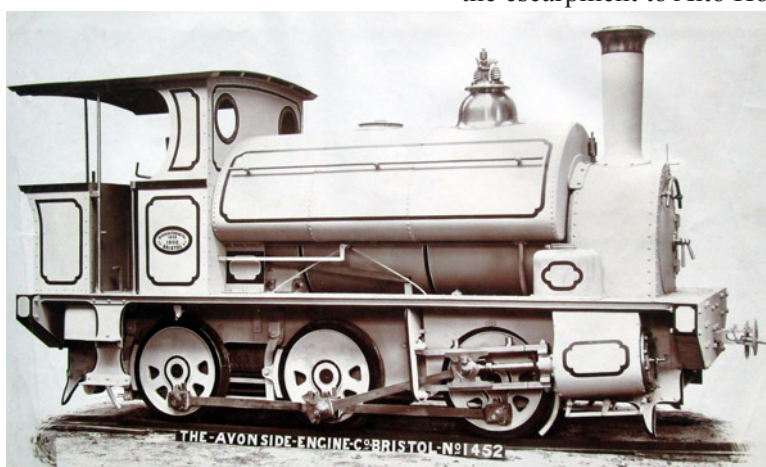
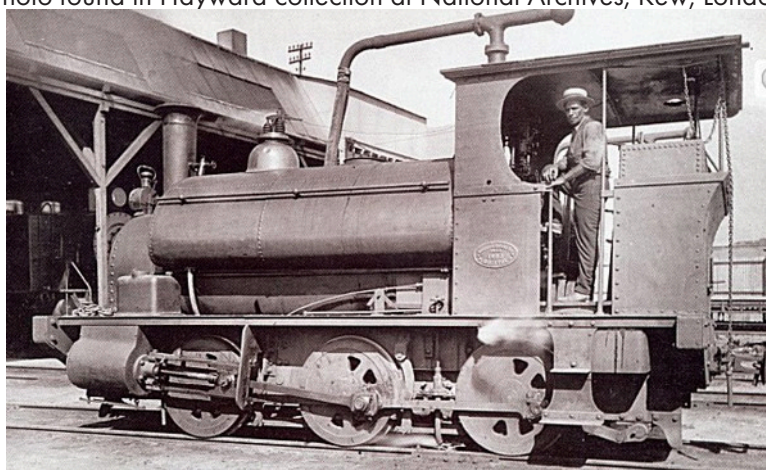


Photo found in Hayward collection at National Archives, Kew, London.



Class 77 designed for working in pairs, and class 81?

0-8-0T d/w 42", cyls. 53x50cm, built by Tubize in 1910 (77-80), 1914 (81-84) and 1920 (85-86)

The first batch locos were arranged, like classes 26, 38 and 67, to be able to work in pairs back-to-back with a single crew. Source [11] shows these locos as '0-8-0Tx'. A substantial number of Nitrate Railways shares had been owned at least since the 1890s by Franco-Belgian interests, represented since a shareholders' revolt in 1896 by Monsieur A. de Wandre as a Director. The choice of Tubize rather than a British company to build this batch of locos may have reflected that influence.

77 w/n 1667

A report in Dec 1918 has this loco working between Rinconada and Iquique [32].

78 w/n 1668

A report in Feb 1926 has this loco working out of

		Iquique [32].
79	w/n 1669	Builders' pic show cabside plate 'B79'
80	w/n 1670	Still in service in 1958.
81	w/n 1801	One of the batch 81-84 was involved in a serious accident in October 1917 at Mile 18 on the descent from Las Carpas to Iquique, when a mixed train was totally derailed with various injuries and the death of the fireman [32]. A report in March 1920 has this loco working out of Iquique [32].
82	w/n 1802	Withdrawn 1957 [38].
83	w/n 1803	A report in May 1917 records this loco working out of Iquique up onto the pampa [32]. A report in July 1920 has this loco bring a train of empty oil tanks down from Rinconada to Iquique [32].
84	w/n 1804	
85	w/n 1805	
86	w/n 1806	

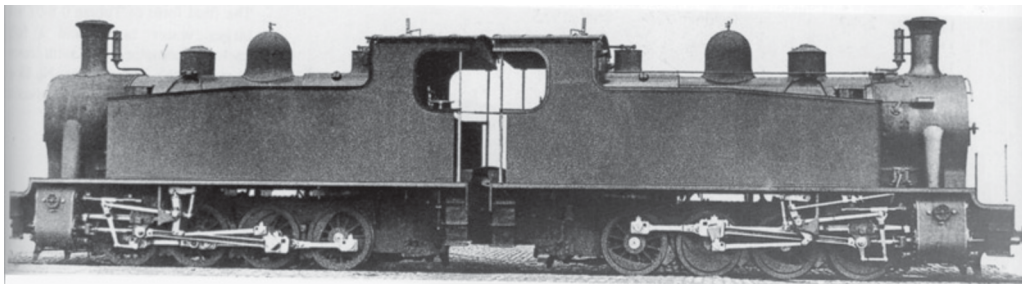
In July 1916 the YECó supplied one crosshead for engine class no. 77, under order 3214, also four steel driving crankpins for same, under order 3217.

In May 1918 the YECó supplied four crossheads for loco no. 77 class, under order 5116.

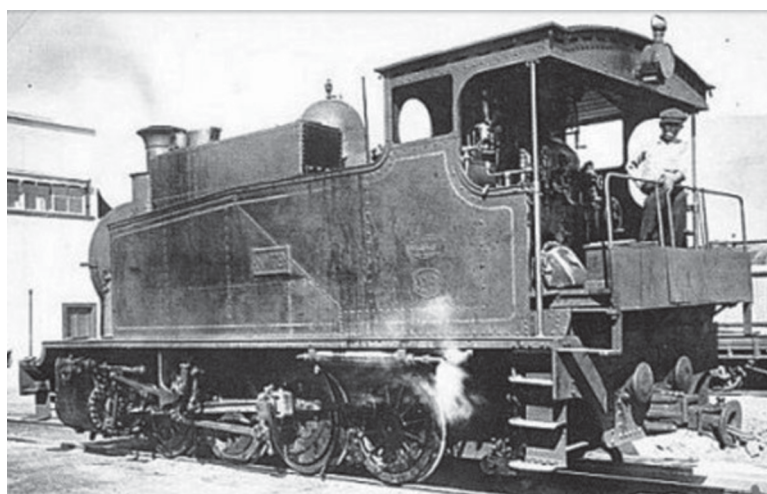
In May 1918 the YECó supplied three axles for loco no. 77 class, under order 5119.

In December 1924 the YECó supplied three flanged tubeplates for engines class 81-86, under order 10080.

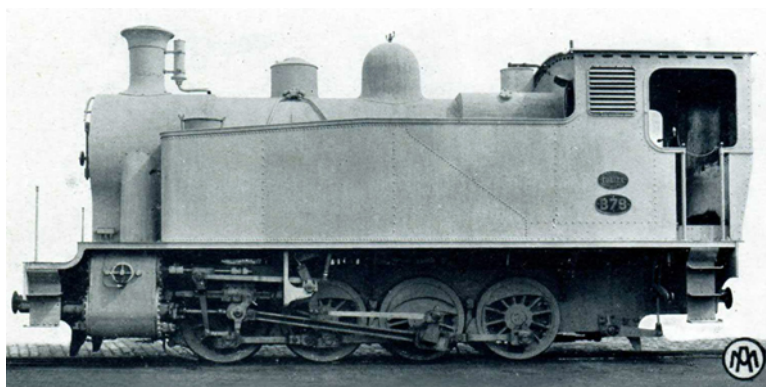
1929 NRC official list implies all were in use then [8].



Tubize builder's pic from Uwe Bergmann collection via Donald Binns' *Nitrate Railways* book.



A view presumably showing one of the first batch loco modified for working singly, and with an oil tank.



One of the later locos, designed from the start for working singly.
Note that the tanks are slightly longer, reaching the rear end of the cylinders rather than terminating a foot or so further back. The overall weight was 64 tonnes rather than the 60 of the original locos.

NBL records suggest that two or more drawings (S1010 and S1011) were produced for 0-6-6-0 Fairlie locos for the Nitrate Railways in 1914, presumably for a tender that never came to fruition, though 1914 would seem very late for the railway to have been considering new Fairlies.

Belgian Fairlie boilers

Haine St. Pierre in Belgium also built three replacement double Fairlie boilers for the NR in 1913, according to Donald Binns, though it is not known which class of loco they were intended for.

Drawings of YECo 'back-to-back 2-8-0T locos

The archives of the British Overseas Railways Historical Trust, held in Greenwich, London, apparently contain several drawings showing proposed 2-8-0T 'back-to-back' locos for the NRC. These have not yet been examined and the date of the proposal is unknown, but it seems possible that this might have been the Yorkshire Engine Company's bid for the contract that was won by Tubize. NB These drawings do not survive within the collection held at Sheffield Record Office.

Class 87

2-8-2T d/w 47", cyls. 20"x22", built by Porter in 1918

Porter list says d/w 42" and cyls. 22"x20". One source says these were renumbered **14**, **7**, **22**, and **33** in December 1918, but [7] says this is incorrect.

87	w/n 6134	Still in service in 1958.
88	w/n 6135	A report in Jan 1920 has this loco working down from Molle to Iquique [32]. Recorded in Dec 1920 working up double-headed with no. 16 from Iquique to Las Carpas [32]. Still in service in 1958.
89	w/n 6136	A report in December 1920 has this loco working up from Iquique to Las Carpas [32]. Still in service in 1951.
90	w/n 6137	Still in service in 1958.

1929 NRC official list implies all were in use then [8].

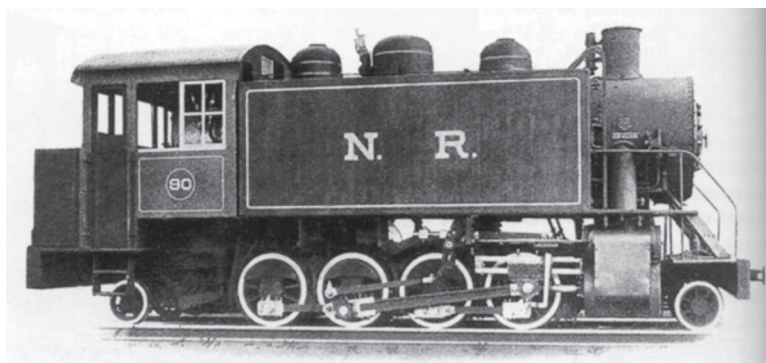


Photo from Uwe Bergmann's collection via Donald Binns' *Nitrate Railways* book.

Note the raised position of the fuel bunker tank in the later picture below.

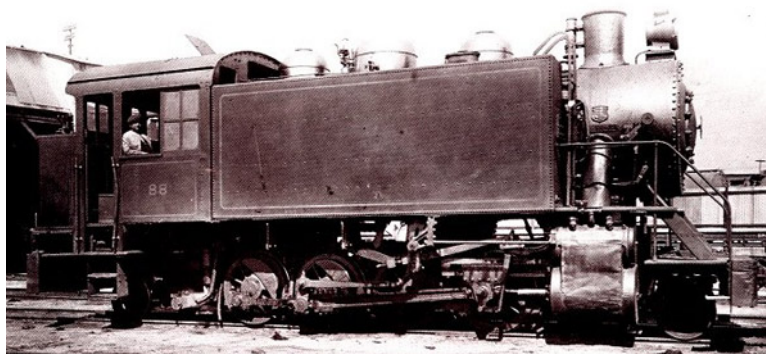


Photo from Christopher Walker's collection via Donald Binns' *Nitrate Railways* book.

'Mikados Chicos' class 91

2-8-2 d/w 44", cyls. 18"x24", built by Baldwin in 1920

BLW class 12 30 ¼ E nos. 49-54. Spec. in BLW volume 66 p386. Mainly for use on the more level pampa sections, according to [16]. Erecting card drawings numbered 168-11X 9999 and 355-11BX 12100 are in the DeGolyer Library collection.

	91	w/n 53206	
	92	w/n 53229	A report in Jan 1930 has this loco at Estacion Brac
[32]. Withdrawn 1957 [38].			
	93	w/n 53246	Baldwin list says this had road no. 88 . Withdrawn 1957 [38].
	94	w/n 53247	Baldwin list says this had road no. 89 . A report from Oct 1926 has this loco working in the area of oficinas San Enrique and Peruana, ie. near Estacion La Noría [32]. A report from Oct 1930 has this loco working an up passenger train though Estacion Montevideo, ie from Central towards Pozo Almonte [32]. Seen in steam at Iquique in 1963 [20]. Still in service in 1971. At Iquique dumped in 1978 [9].
	95	w/n 53248	Baldwin list says this had road no. 90 . Withdrawn 1957 [38].
	96	w/n 53249	Baldwin list says this had road no. 91 . Still in service in 1958.

In November 1923 the YECó supplied four sets of firebox roof slings for engines **91-96**, under order 9291. 1929 NRC official list implies all were in use then [8]. The Avonside order book had an entry for Nitrate Railways Co. Ltd, Baldwin locos class **91-96**' dated Nov. 1933, presumably re spares ordered. As well as **94** and **96** several others were still in use in 1951.



BLW works photo. Hi-res versions available from the RR Museum of Pennsylvania.

A change to knuckle couplers, to oil fuel, and to Westinghouse brakes

The network had used link and pin couplers for many years, but in the early 1920s the decision was made to change over to Henricot MCB knuckle couplers, for the usual reason that larger locos made longer trains a possibility, but only if the couplings could cope with the loads. Similarly, after the First World War, the change was made from using Welsh coal to Mexican and Californian oil. The adoption of Westinghouse air brakes seems to have taken place around the same period, with all new engines from the above-mentioned Mikados so fitted, though it is not yet clear how many of the older locos were retro-equipped. It seems very likely that the driving force behind all of these changes was Thomas Jefferson, who had become the NR's Loco superintendent, then being appointed CME and finally also Operating Superintendent. He eventually moved on to the *FC Central del Peru*. All this after an early career spanning training at Kitsons, followed by appointments with the *FCAB* and the *FCTT*. Further details are in source [16] part 3.

Class 97

4-8-4T d/w 42", cyls. 22"x20", built by Yorkshire in 1924

Order placed 8th November 1922?

97	w/n 1941
98	w/n 1942
99	w/n 1943
100	w/n 1944
101	w/n 1945
102	w/n 1946

In July 1923 an order was placed with the YEC Co for spares for these engines under orders 9034-6.

In October 1924 the YEC Co supplied six sets of Le Chatelier counter-pressure brake equipment for recently delivered locos, presumably these 4-8-4Ts, under order 9957.

In the early months of 1925 various additional spares for these 4-8-4Ts were supplied by the YEC Co, including tube-plates, tubes, superheater tubes, and automatic couplers.

In June 1925 the YEC Co supplied three steel firebox tubeplates for these 4-8-4Ts, under order 10450, also three copper firebox rook plates for same, under order 10484.

In August 1925 additional spares were supplied by the YEC Co for these engines, including one set of additional spring gear, and a trailing bogie compensating beam and carrier, under order 10553, also three steel firebox tubeplates under order 10676.

In January 1926 the YEC Co supplied additional tubes for these 4-8-4Ts under orders 10548 and 10549.

In January 1926 the YEC Co supplied five extra sets of spring gear for the 4-8-4Ts (similar to one set supplied under order 10553), under order 11267.

In October 1926 the YEC Co supplied six bogie control springs and eight bearing springs for the 4-8-4Ts, under order 11305.

1929 NRC official list implies all were in use then [8].



Class 103

2-8-2 d/w 44", cyls. 19"x24", built by Baldwin in 1924 (103-108) and 1925 (109-114)

Class Gde. BLW class 12 32 ¼ E nos. 72-77 and 109-114. Spec. in BLW volume 72 p168 and vol. 78 p324. Fitted with Worthington-Simpson feed-water heaters.

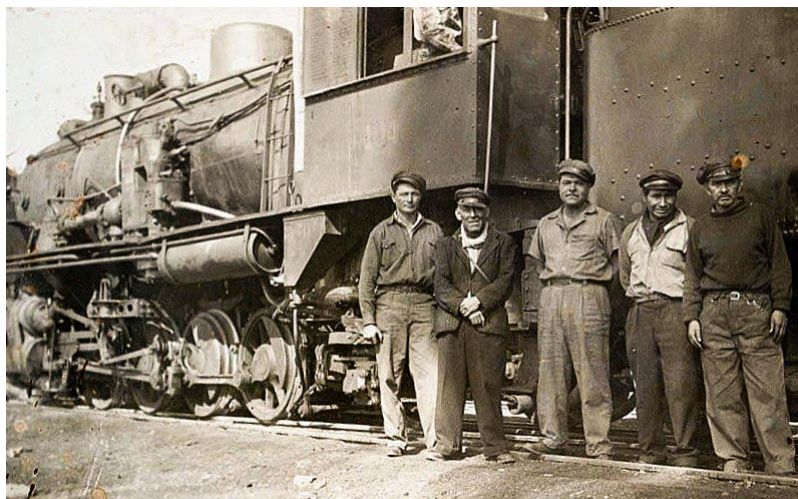
103	w/n 58041	Still in service in 1958.
104	w/n 58042	Still in service in 1958.
105	w/n 58066	Baldwin list says this had road no. 74 when built. This may be the result of confusion with the BLW class numbers. Still in service in 1958.
106	w/n 58067	Baldwin list says this had road no. 75 when built. See comment re no. 105 . Still in service in 1971. At Iquique dumped in roundhouse 1978 [9].
107	w/n 58068	Baldwin list says this had road no. 76 when built. See comment re no. 105 . Still in service in 1958.
108	w/n 58069	Baldwin list says this had road no. 77 when built. See comment re no. 105 . Still in service in 1958. Seen in steam at Iquique in 1963 [20].
109	w/n 58635	Still in service in 1951.
110	w/n 58636	Still in service in 1951.
111	w/n 58637	Still in service in 1958.
112	w/n 58638	At Iquique in operational condition in 1978 [9].
113	w/n 58639	Still in service in 1958.
114	w/n 58640	Seen in steam at Iquique in 1963 [20]. At Iquique in operational condition in 1978 [9].

Around 1928-9 the YEC Co supplied one boiler for engines class 103-114, under contract 269. Boiler empty weight 20T 1cwt.

1929 NRC official list implies all were in use then [8].



Baldwin builder's photo, via Chris Walker's book *Railways of Latin America in Historic Postcards*.



No. 104.

Nos. 115-119 were left blank for some reason. See notes above.

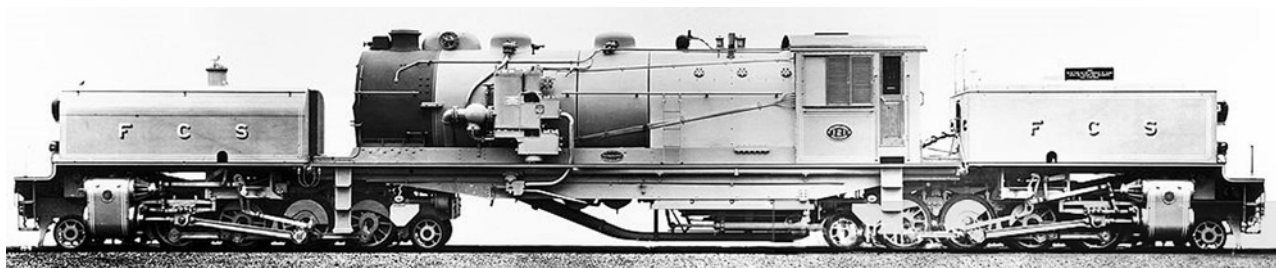
Class 120

2-8-2+2-8-2T Garratt d/w 42", cyls. 22"x20", built by Beyer Peacock in 1926 (120-122) and 1928 (123-125)

A 1924 blueprint shows that a 2-6-2+2-6-2 design was worked up by Beyer Peacock before they settled on a 2-8-2+2-8-2.

120	w/n 6291	
121	w/n 6292	Still nominally in service in 1958, though little used.
122	w/n 6293	Still in service in 1951. Withdrawn 1957 [38].
123	w/n 6481	Still in service in 1951.
124	w/n 6482	Still in service in 1951. Withdrawn 1957 [38].
125	w/n 6483	Still nominally in service in 1958, though little used.

1929 NRC official list implies all were in use then [8].



Beyer, Peacock builder's photo in 'works' grey'.



Garratt no. **121**. Photo by courtesy of the Restoration & Archiving Trust.

Copeland suggests that the *EFE* had two 2-6-0 locomotives of the same dimensions to the Fowler 2-6-2T, though longer in the wheelbase, given as Baldwin 1900 but untraceable, which might be Baldwin Extra Order rebuilds, as their numbers follow the N&S American 2-6-0s (?). Alternatively, he surmises that these might have been the Fowler 2-6-2Ts that went to the Col. North Construction Co., if they had been passed on to the *DOP*? The sources that led to this unlikely conclusion are unknown.

Steam railmotors

4w+4 bogie steam railcars d/w ?, cyls. 6¾"x9", built by Sentinel Cammell in 1925 [2]

It is not clear whether these were numbered in the loco series, perhaps implying that Fairlies 11-13 had been withdrawn by 1925, or in a carriage number series.

11 w/n 5640

12 w/n 5642

13 w/n 5656

All three withdrawn in early 1950s? One survived at El Colorado roundhouse until 1986 or later. Two of the passenger body sections, without their bogies, were used first there as a classroom and clinic, and then were sold for use as office accommodation at a mining site outside Arica (south side of highway 11, about a mile east of the 'Redonda de Lluta' rondabout, 8 miles from Arica). HMN inspected them there in 2013, and found that there was also a boiler end body section on the site, away at the back of the yard. [All info in this paragraph from *LI* issue 98]. They were all still in place in 2019 when seen by MCC.



Two Sentinel bodies in an industrial yard north of Arica, as seen in 2019.

Above are the two passenger saloons as viewed from the road a mile or so east of the Redonda de Lluta roundabout. Below is one of the two power

unit sections, as seen from the river bank south of the yard. Permission to enter the yard would need to be obtained from the owner's office near the Abastible gas depot north of the Redoda de Lluta on the road to Tacna. The staff at the yard were not willing to take responsibility on their own account.



Loco boiler water treatment

At the beginning of the 1930s the NR introduced the 'Permutit / Zerolit' water treatment for boiler water. Finding pure water had always been difficult in the Atacama. An article in *The Locomotive*, 15th February 1932, reported that the change had resulted in a reduction in fuel and water consumption of 30% and a subsequent reduction in the number of locomotives needed of 25% owing to the reduction in boiler shop down time.

The *EFE* takeover

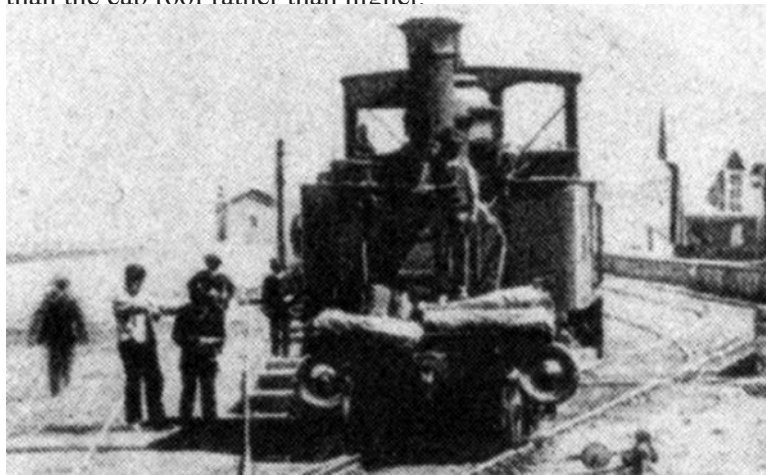
The NRC original concession had explicitly stated that the system would revert to the state in 1936. This occurred as specified, even though Tarapacá was by then under a different state, ie. Chile not Peru. However, the Nitrate Railways Company continued to operate the railway, presumably paying a fee to the Chilean government. Of course by this time the nitrate industry was well into its terminal decline, and in 1940(?) the operation was taken over by the *FC Iquique a Pintados*. The standard gauge seems to have continued in operation though steadily declining, but in 1960 the *FCIP* and the NRC with it were subsumed within a new *FC Iquique a Pueblo Hundido* which also included the *Long. Norte*. From then on the standard gauge was progressively abandoned, with the exception of the climb out of Iquique, where the NRC route was easier to operate than that of the metre gauge so a third rail was added to the former. This former NRC alignment in fact still exists, though nowadays only seeing an annual passage by a light engine to ensure that the route remains viable. Metre gauge track runs to an army base north of Pozo Almonte but there is no track of any kind north of that point. The route down into Pisagua seems to have been lifted some time in the late 1950s or early 1960s.

Unknown tank locos

The following photo extract, taken in 1899, shows some sort of tank loco at Iquique station. No details are known, and it seems unlike any NR loco class yet identified. It appears to have a bell-mouthed dome in front of the cab and a sand-dome further forward though not necessarily of the Rogers fluted pattern. The chimney seems to taper slightly inwards from the top. The tanks would seem to be of equal height to the boiler and to have coal rails along the top. The cab is largely open fore and aft, and there may be a bunker extending a short way to the rear. It is possible that this loco was owned by a nitrate shipper or maybe the port rather than being in the main NR fleet.



Similarly, the next photo, taken at an unknown NR station, shows a so far anonymous outside-cylindered tank loco. Whilst the chimney has possible similarities with that seen above, other aspects of the locos differ. The tanks on the second loco seem to stretch forward close to the smokebox, and the dome, whilst having an opening for safety valves as above, is slightly lower than the cab roof rather than higher.



Nitrate Railways double Fairlie locomotives list

Earlier paragraphs have drawn attention to mysteries in the NR's fleet of Fairlies. This has not been helped by some recent researchers being rather careless in their analysis. The table on an adjacent page sets out the extent of current knowledge.

The growth of the fleet

In order to show how the fleet grew through the first twenty-five years of the railways' existence, and to make it easier to spot gaps that might have been filled by as-yet-unknown locos, a table has been laid out on a following page. This is still in the process of construction and may become clearer in due course.

Baldwin drawings

The collection of Baldwin drawings at the deGolyer Library, Southern Methodist University, includes side elevation (SE) or cross section (CS) drawings for one design built for the Nitrate Railways.

Index#	DWG#	Tracing#	Road name	Road#	Date	Baldwin class	Number	Wheel	Dwg typ	Size
168-11X	9999	-	Nitrate	91-96	1920	12-30 1/4 E	49-54	2-8-2	SE	33 X 73
355-11BX	12100	-	Nitrate	91-96	1920	12-30 1/4 E	49-54	2-8-2	SE	31 X 70

The list of drawings in which these details were found is at <https://www.smu.edu/~media/Site/Libraries/degolyer/pdf-s/BLW-EDWG-RoadName.pdf> whilst arrangements to purchase copies can be found at <https://www.smu.edu/libraries/degolyer/Research/Permissions>

Nitrate Railways double Fairlie locomotives

NR no.	Year built	Builder	Works no.	Wheel arr.	Boiler top	Cyls. d. x s.	d/w diam.	Rigid wh. base gear	Valve gear	Withdrawn date	Notes
8	1870	Fairlie	5	0-6-6-0T	Straight	15x20"	42"	7' 8"	In. Allan		<i>NB: Valve gear: 'In. Allan' means inside Allan straight link motion, whereas 'Out. Wal.' means outside Walschaerts.</i> Ordered for Iquique Rly. 'TARAPACÁ' . Withdrawn and number reused.
9	1871-2	AE	853-4	0-6-6-0T	Straight	15x22"	42"	7' 8"?	In. Allan	After 1929	Avonside order mark F. Ordered for Iquique Rly. 'HERCULES' . Rebuilt 1909. In 1929 had d/w 43.5".
10	1871-2	AE	851-2	0-6-6-0T	Straight	15x22"	42"	7' 8"?	In. Allan?	After 1932	Avonside order mark F. Ordered for Pisagua Rly. 'IQUIQUE' . Rebuilt 1912. Later had d/w 43.5"
11	1871-2	AE	903-4	0-6-6-0T	Straight?	15x22"	42"	8' 0"	In. Allan?	After 1932	Avonside order mark FP. Ordered for Pisagua railway?
12	1871-2	AE	905-6	0-6-6-0T	Straight?	15x22"	42"	8' 0"	In. Allan?	After 1929	Avonside order mark FP. Ordered for Pisagua railway?
13	1871-2	AE	886-7	0-6-6-0T	Straight?	15x22"	43"	8' 0"	In. Allan?	After 1929	Avonside order mark FP. Ordered for Iquique railway?
14	1871-2	AE	888-9	0-6-6-0T	Straight?	15x22"	43"	8' 0"	In. Allan?	1918	Avonside order mark FP. Ordered for Iquique railway?
15	1871-2	AE	890-1	0-6-6-0T	Straight?	15x22"	43"	8' 0"	In. Allan?	After 1929	Avonside order mark FP. Ordered for Iquique rly? Rebuilt 1909
16	1871-2	AE	892-3	0-6-6-0T	Straight?	15x22"	43"	8' 0"	In. Allan?	After 1929	Avonside order mark FP. Ordered for Iquique railway?
17	1873	AE	944-5	0-6-6-0T	wagon-top	15½x20"	42"	8' 0"	In. Allan	1918	Avonside order mark PU.
18	1873	AE	946-7	0-6-6-0T	wagon-top	15½x20"	42"	8' 0"	In. Allan	After 1929	Avonside order mark PU. Rebuilt 1910
19	1873	AE	948-9	0-6-6-0T	wagon-top	15½x20"	42"	8' 0"	In. Allan	After 1929	Avonside order mark PU. Rebuilt 1911. Had outside Walschaerts valve gear in its later years.
20	1873	AE	1024-5	0-6-6-0T	wagon-top	16x22"	42"	8' 0"	In. Allan	After 1929	Avonside order mark RU2, for Bailey Hawkins & Co.
21	1873	AE	1026-7	0-6-6-0T	wagon-top	16x22"	42"	8' 0"	In. Allan	After 1929	Avonside order mark RU2, for Bailey Hawkins & Co.
22	1873	AE	1028-9	0-6-6-0T	wagon-top	16x22"	42"	8' 0"	In. Allan	1918	Avonside order mark RU2, for Bailey Hawkins & Co. In 1929 recorded as d/w 47" and cyls. 16x22"
23	1874	YEC	175	0-6-6-0T	wagon-top	15x22"	45"	8' 6"	In. Allan	After 1929	Order E29, originally for Switzerland.
32	1874	YEC	22x?	0-6-6-0T?	wagon-top	17x22"	45"	8' 6"	Out. Wal.	by 1932	Order E41 arrived with metal cab as used on E&WJR, rebuilt 1909.
33	1874	YEC	22x?	2-6-6-2T	wagon-top	17x22"	45"	8' 6"	Out. Wal.	1918	Order E41 rebuilt, later almost certainly rebuilt back to 0-6-6-0T
34	1874	YEC	22x?	2-6-6-2T	wagon-top	17x22"	45"	8' 6"	Out. Wal.	by 1932	Order E41 rebuilt, later almost certainly rebuilt back to 0-6-6-0T
35	1874/82	YEC	22x?	2-6-6-2T	wagon-top	17x22"	45"	8' 6"	Out. Wal.	by 1932	Order E41 rebuilt, later almost certainly rebuilt back to 0-6-6-0T
36	1874/82	YEC	22x?	2-6-6-2T	wagon-top	17x22"	45"	8' 6"	Out. Wal.	by 1932	Order E41 rebuilt, later almost certainly rebuilt back to 0-6-6-0T
37	1874/82	YEC	22x?	2-6-6-2T	wagon-top	17x22"	45"	8' 6"	Out. Wal.	by 1932	Order E41 rebuilt, later almost certainly rebuilt back to 0-6-6-0T
63	1890	YEC	442	0-6-6-0T	wagon-top	17x22"	45"	8' 6"	Out. Wal.	by 1932	Order E82
64	1890	YEC	443	0-6-6-0T	wagon-top	17x22"	45"	8' 6"	Out. Wal.	by 1932	Order E82
73	1908?	Iquique?		0-6-6-0T	wagon-top?	17x22"	45"	8' 6"	Out. Wal?	After 1929	Almost certainly a brand-new loco to the E41 design.

Nitrate Railways probable order of loco accessions and renumberings 1888-1891

At the beginning of 1888 there were engines **1, 2, 7, 9-49** in service, giving a total fleet of 44 locos.

Events

Dates

Fowler 2-6-2Ts (5556-5557) **50-51** despatched early/late July 1888

Arrived October 1888?

Fowler 2-6-2T (5558) **52** despatched end August 1888

Arrived end November 1888?

Fowler 2-6-2T (5559) **53** despatched end Sept 1888

Arrived December 1888?

End of 1888: Total quoted as 45, possibly allowing for 3 still being erected, or as 48

Hawthorn 0-4-0ST (1480) from *FC Arica Tacna*, numbered **56**

Purchased during early 1889

Fowler 0-4-0ST (5564) **57** despatched end August 1888

Arrived end Nov. 1888 or possibly later?

Fowler 2-6-2Ts (5560-5561) **54-55**, despatched late/end November 1888 (lost at sea on Christmas Day)

Fowler 0-4-0STs (5829-5830) despatched end November 1888 (lost at sea on Christmas Day)

YEC0 0-4-0ST (427) no. **58**, built 1889

Arrived early? 1889?

Cooke 2-6-0s **1-2** renumbered **59-60**, (Fowlers **56-58** possibly already awaited) Renumberings early to mid 1889?

Hawthorn 0-4-0ST no. **56**, renumbered **1**

YEC0 0-4-0ST no. **58**, renumbered **2**

Fowler 0-4-0ST no. **57**, renumbered **3**

Danforth 4-6-4T **7** renumbered **57** (still slightly puzzling)

Fowler 0-4-0STs (5831-5832) **4-5** despatched end of 1888

Arrived Mar 1889?

Danforth 4-6-4T **57** renumbered **62**, (Fowlers up to **61** now awaited)

Renumbering mid to late 1889?

Fowler 0-4-0STs (6041-6042) **6-7** despatched mid August 1889

Arrived mid November 1889?

End of 1889: Total quoted as 55, with 7 locos having been added to fleet during 1889

Fowler 0-4-0ST (6043) **8** despatched late October 1889

Arrived January 1890?

Replacement Fowler 2-6-2Ts (6039-6040) **54-55**, despatched end of Oct 1889 Beginning of 1890

Fowler 2-6-2Ts **56-57**, despatched July-August 1890

Arrival late 1890?

Fowler 2-6-2T **58**, despatched late October 1890

Arrival early 1891?

End of 1890: Total quoted as 61, with 6 locos having been added to fleet during 1890 though with 3 of them still in course of erection

Cooke 2-6-0s renumbered **65-66**, (Fowlers **59-61** and Fairlies **63-64** already awaited) Renumbering early 1891

Fowler 2-6-2T **59**, despatched late October 1890

Arrival beginning of 1891?

Fowler 2-6-2Ts **60-61**, despatched end of May 1891

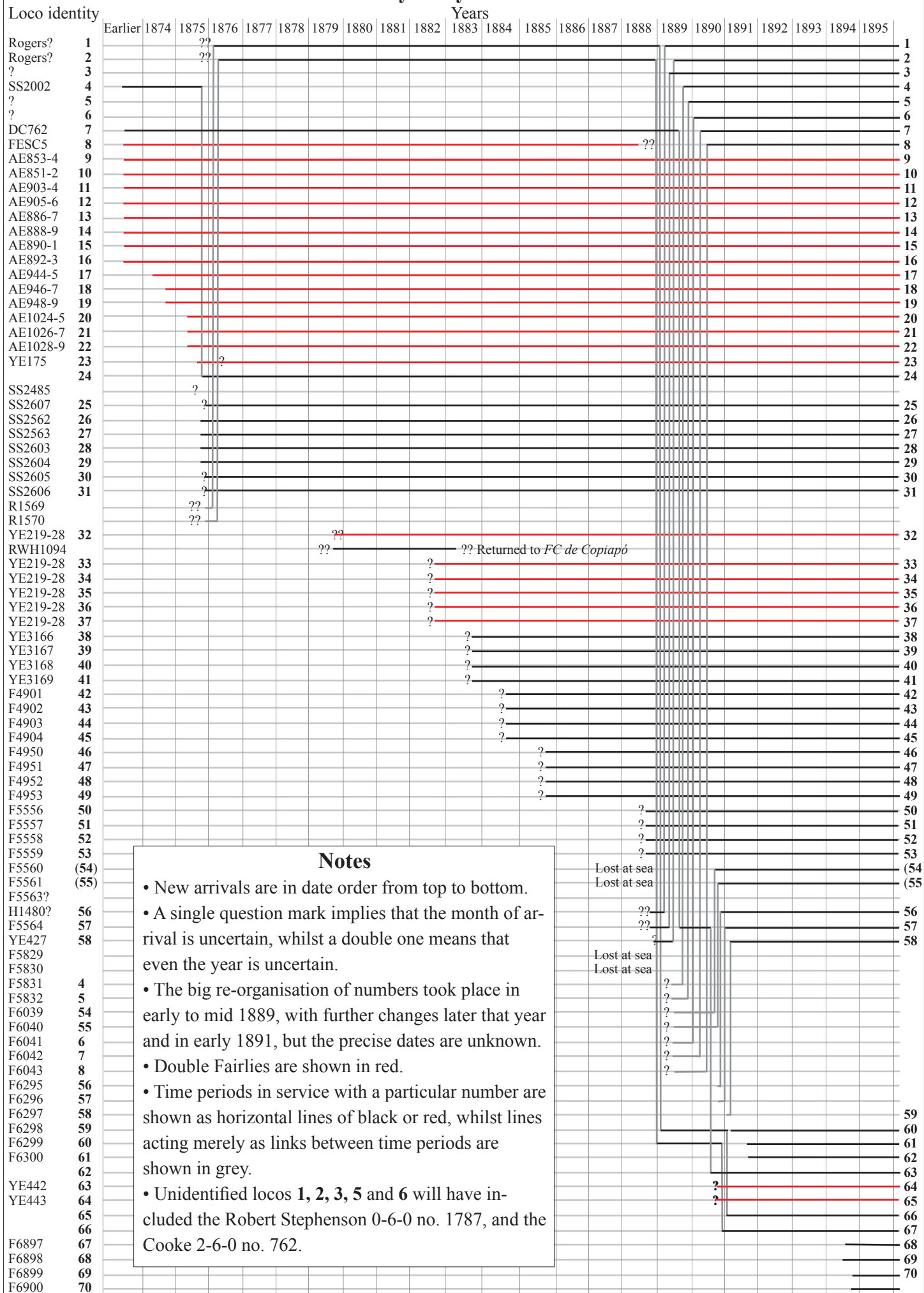
Arrival August 1891?

Fairlies **63-64**, built 1890 by YEC0

Arrival sometime in 1891?

End of 1891: Total quoted as 66, with 5 locos having been added to fleet during 1890

The first twenty-five years of the NR fleet



2.1.5 *El FC Mineral de Chuquicamata* The Chile Exploration Co.

1913-1978

Background

Standard Gauge. Line to smelter opened 1913, remainder opened 1914.

A report in the *Boletín de la inspección de geografía y minas* in 1915, describes how the ore was extracted by steam shovels and then “*Los carros cargados en el banco por las palas son arrastrados de a 5 o 6 por una locomotora de 51 toneladas al patio de union, donde se arman trenes de 18 o 20 carros que son conducidos por locomotoras de 91.5 toneladas, sin el tender, a un puente de acero y madera de pino, y de ahí de descargan por el fondo directamente a los buzones...*” “The cars loaded on the shelf by the shovels are dragged 5 or 6 at a time by a 51-ton locomotive to the union yard, where trains of 18 or 20 cars are assembled, which are driven by 91.5-ton locomotives, without the tender, to a steel and pinewood bridge, and from there they discharge directly into hoppers beneath”

The system was electrified in 1925, but the electrics were mostly replaced by diesels by 1962. The mainline closed after 1978.

2-6-2T d/w 44", cyls. 17"x24", built by Baldwin in 1913

Baldwin class 10-28 ¼D no. 44. Spec is in vol. 44 p211. Delivered via the American Smelting & Refining Co. Oil-burner. Working weight 140,000 lbs.

1	w/n 39773	Supplied with a tender. Spec. sheet notes that pilot on rear of loco must be fitted so that it can remain attached when a tender is coupled on.
---	-----------	---

2-6-2T d/w 46", cyls. 18"x24", built by Baldwin in 1917

BLW class 10-30 ¼D no. 42. Spec is in vol. 54 p377. Oil-burner.

2	w/n 45544	Fitted with additional low level Janney couplers on fireman's side to enable haulage of 2' 6" gauge wagons. Possibly 45549, according to spec card.
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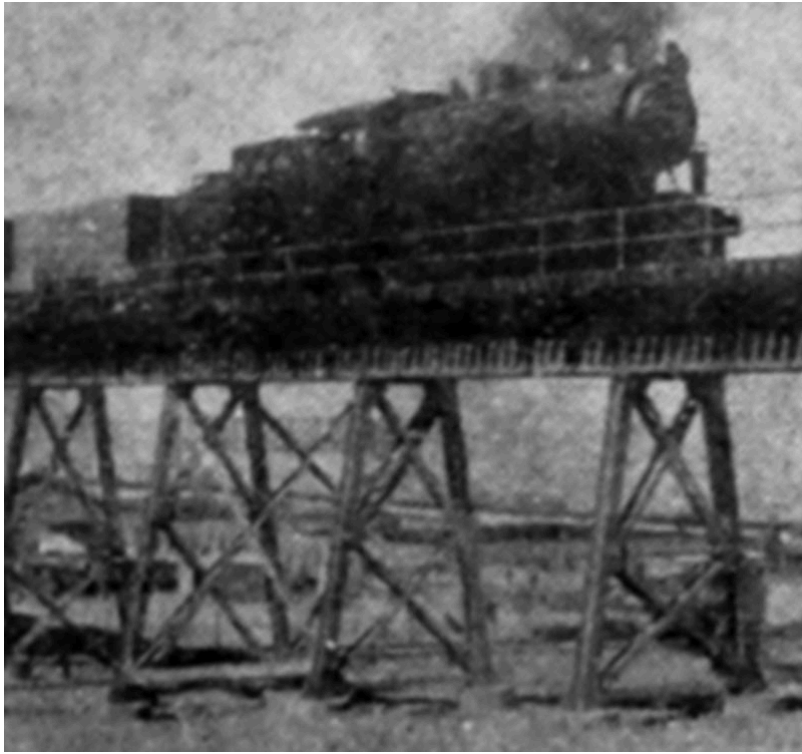


BLW archive pic; hi-res versions available from Railroad Museum of Pennsylvania.

2-8-0 d/w 56", cyls. 22"x30", 101 tons, built by ALCo-Schenectady in 1914

These may well have been the ‘91.5 tonnes’ locos referred to in the quote above as being used for the twenty car trains to the processing plant.

?	w/n 54673
?	w/n 54674



A contemporary magazine image showing a tender engine on the big viaduct which led to the crushers. It has been suggested that this might be one of the ex Panama Canal 2-6-0s listed below, but the boiler is mounted a good deal higher than on those engines so it is probably one of this pair of ALCo 2-8-0s. Picture kindly provided by Sr. Pablo Moraga.

Ex-Panama Canal construction locos

Sometime after 1914 (when construction of the Panama Canal was completed), a number of locomotives that were used on the project were retired and advertised for sale. A number were sold to the A. B. Shaw Co., Chicago, Illinois. Locomotives from two different groups were resold to the Chile Exploration Co.

2-6-0STT d/w 54", cyls. 19"x26", built by ALCo-Schenectady in 1905-6 as 2-6-4Ts

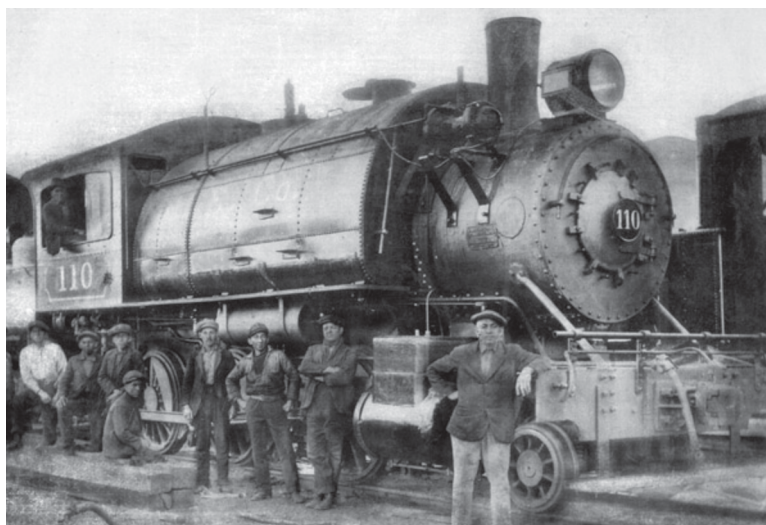
Built for the Panama Canal works but rebuilt as 2-6-0s between 1907 and 1910. On completion of the canal project, the locos were converted to standard gauge and those for Chuquicamata were rebuilt again, this time as 2-6-0 saddle tanks but retaining their tenders. It is believed that these engines retained their original numbers. Twenty locomotives, numbered **103, 104, 106-113, 115-124** were acquired.

103	w/n 38176
104	w/n 38177
106	w/n 38179
107	w/n 38180
108	w/n 38181
109	w/n 38182
110	w/n 38183
111	w/n 38184
112	w/n 38185
113	w/n 38186
115	w/n 38188
116	w/n 38189
117	w/n 38190

118	w/n 38191
119	w/n 38192
120	w/n 38193
121	w/n 38194
122	w/n 38195
123	w/n 38196
124	w/n 38197



The Panama Railroad 100 series engines, as originally configured as 2-6-4Ts.



One of the ex Panama Canal ALCo 2-6-0STTs, seemingly without its tender. These locos can be identified by the curved top to the single full length cab window.



The size of the 'boiler' on this photo suggests that this was in fact a saddle tank loco with a tender. The image accompanied an article in *Pacífico* magazine, August 1919. The number '7' is displayed on the back

of the tender. However, a photo of the locomotive depot showing eighteen of the railway's total of maybe around thirty saddle tanks, makes clear that the majority ran solely as tank engines and without attached tenders.



This large saddle tank, supposedly at Chuquicamata in 1920, is almost certainly also one of the Panama 101 series engines. [photo from *Pacífico* magazine June 1920 p480]. The full photo makes it clear that it was running purely as a tank loco and with no tender, unlike some others on this system.

2-6-0 d/w 54", cyls. 19"x24", built by ALCo-Cooke in 1906

Two locomotives, from the ICC Panama **201** series were also sold to the A.B. Shaw Co. and resold to the Chile Exploration Co. These were built as 2-6-0s by ALCo Cooke in 1906. Further details are not presently known, but Panama **246, 249, 257, 259, 262, 263, 282, 288, 289, and 298** were sold to A.B. Shaw and are not otherwise accounted for. The later lives of **205, 206, 210, 211, 218, 219, 220, and 222** also are unknown. They may also have become saddle tank locos, for the depot photo shows no tender engines.

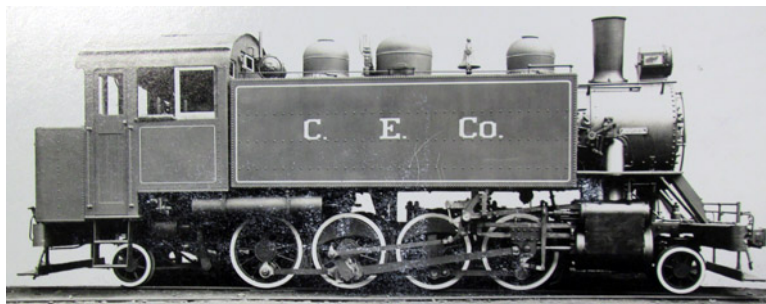
? w/n ?
? w/n ?



The last of the Panama Railroad 200 series locos, as now preserved at Paterson, New Jersey.

2-8-2T d/w 48", cyls. 19"x26", built by Porter in 1920

90	w/n 6500
91	w/n 6501
92	w/n 6502
93	w/n 6503
94	w/n 6504
95	w/n 6505



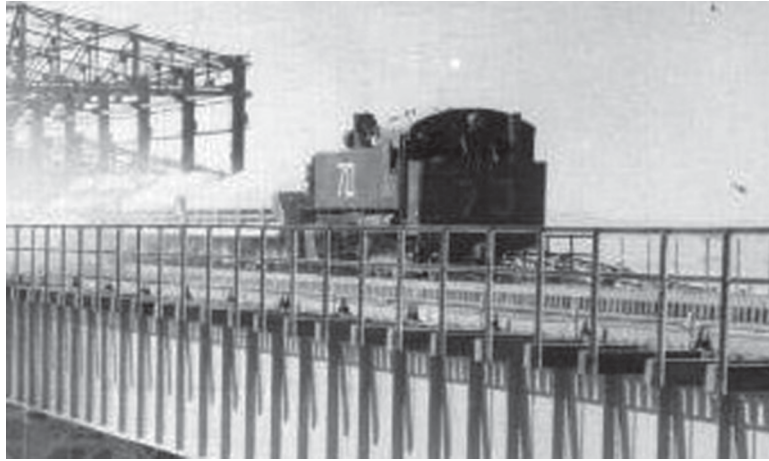
2-8-2T d/w 46", cyls. 19"x26", built by Baldwin in 1925

The first one was BLW class 12-32¼E no. 95. The BLW spec is in vol. 28 p320.

61	w/n 58312
62	w/n 58313
63	w/n 58314
64	w/n 58315
65	w/n 58316
66	w/n 58317
67	w/n 58318
68	w/n 58319
69	w/n 58320
70	w/n 58321
71	w/n 58322
72	w/n 58323



BLW archive pic; hi-res versions available from Railroad Museum of Pennsylvania.



It looks as though the later identification of these locos was by means of huge numbers painted on the tank sides.

0-6-0ST d/w 46", cyls. 17"x24", built by Porter in 1914 (5549-5553), 1915 (5699-5702), and 1917 (5987-5989)

The Porter list suggests 5549-53 might have been numbered 2-6. A photo showing an 0-6-0ST? numbered 22 next to a steam excavator suggests that one of these locos bore that number. Another image showing clearly the number 17 may well have illustrated one of these Porter locos, though it has a full length tank rather than one finishing at the front tube-plate.

2?	w/n 5549
3?	w/n 5550
4?	w/n 5551
5?	w/n 5552
6?	w/n 5553
?	w/n 5699
?	w/n 5700
?	w/n 5701
?	w/n 5702
?	w/n 5987
?	w/n 5988
?	w/n 5989



This may well be one of the above Porter 0-6-0STs, but this is not certain.
The image was from an article in *Pacifico* magazine August 1919.

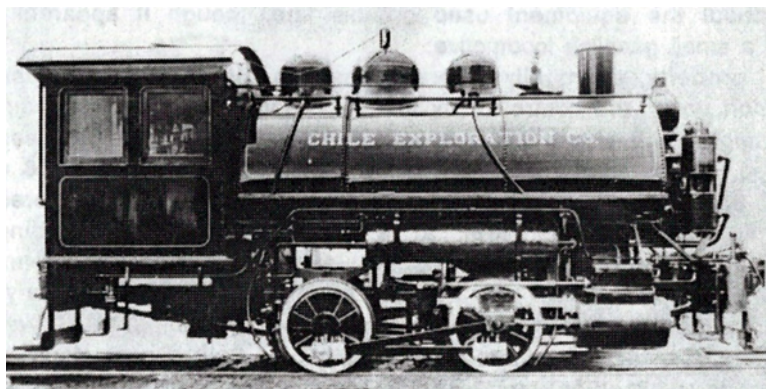


The above loco has a full-length saddle tank rather than one terminating at the front tube-plate. Thus far it has not been identified.

0-4-0ST d/w 33", cyls. 12"x16", 27T tons, built by Vulcan I.W. in 1916

Ordered by Chuquicamata but not delivered. Resold by VIW to U.S. customer. A photo shows one of these locos complete and lettered as for the Chile Exploration Co., so the cancellation must have occurred at a late date.

- w/n 2581 Not delivered.
- w/n 2582 Not delivered. Diverted to Mountain Ico Co., Pocono Summit, Pennsylvania.
- w/n 2590 Not delivered.
- w/n 2591 Not delivered.



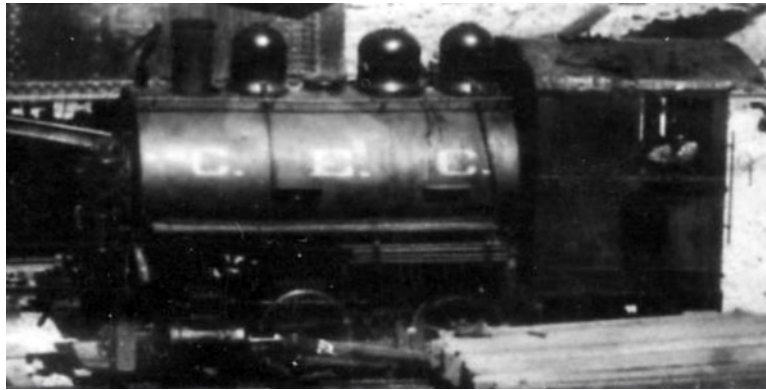
0-4-0ST d/w 30.5", cyls. 11"x16", built by Vulcan I.W. in 1917

? w/n 2700



Note that there are minor detail differences between this photo and the one above. Hi-res image available from the Hagley Museum

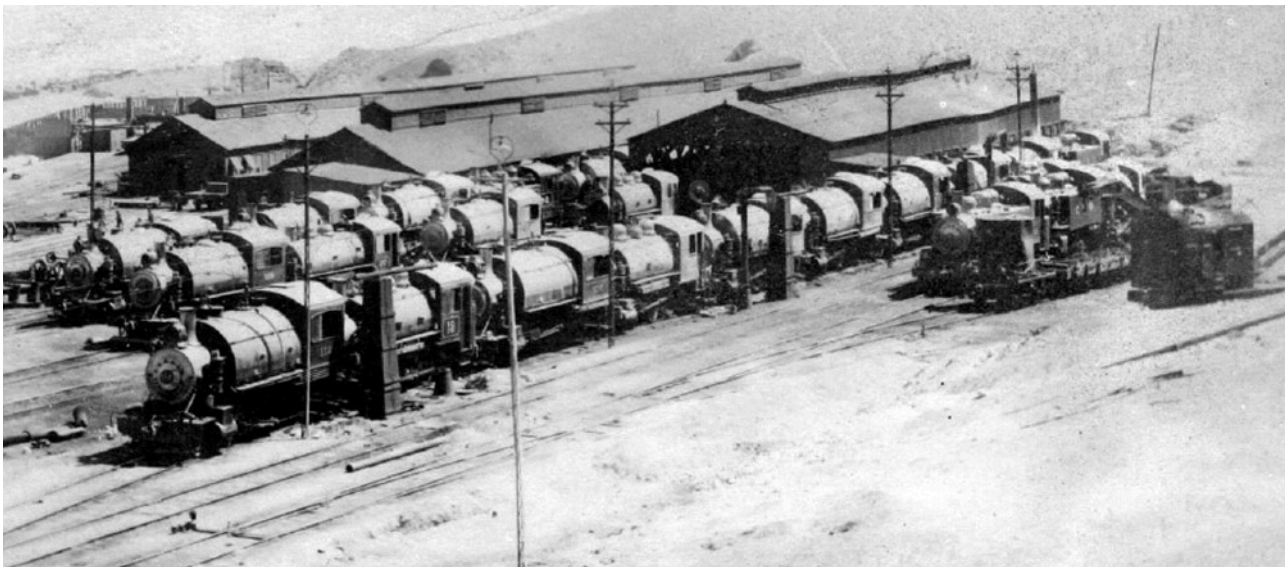
Unknown 0-4-0ST



This 0-4-0 saddle tank is not the same as that shown above. The domes are taller and located differently. The cab does not have side doors, and there are steps on the tanksides just below the C. E. C. lettering.

The 1927 fleet

In 1927, the company operated 57 steam locos of 20 to 55 tons. All were on the standard gauge. 57 delivered locos are listed above.



Loco shed at Chuquicamata, with twenty-two engines in view. Date unknown.

Smelter and refining plant narrow gauge engines

30-inch gauge smelter and refining plant locomotives are listed here for convenience, but these are addressed in full in the sub-metric gauge locos file:

0-4-0CA d/w 5½"/11"x10", built by Porter in 1914. Compound compressed air locos.

? w/n 5586

? w/n 5587

? w/n 5598

0-4-0ST d/w 20", cyls. 6"x10", built by Porter in 1917. 6.5T.

? w/n 5970

? w/n 5971

0-4-0T d/w 22". cyle. 5"x10", built by Vulcan IW in 1917.

? w/n 2703

? w/n 2704

? w/n 2807

0-4-0ST d/w 20", cyls. 6"x10", built by Vulcan IW in 1918.

L376 w/n 2836

L377 w/n 2837

The mine was taken over by the *Compania de Cobre Chuquicamata* (part of *CodelCo*). By 1980, the mine was worked by truck haul. All mainline rail services were later abandoned.

2.1.6 *El FC Electrico de Cruz Grande al Tofo* – The Bethlehem Chile Iron Mines Co.

1914-1973

Background

Standard Gauge. Ran inland from an excavated dock at Cruz Grande near Chungungo to the mine at El Tofo. The straight line distance was little more than 7km, but the actual track length was nearer to 25km. Work commenced 1914(?) and opened 1922 [18], with the mainline down to the port being electrified from the start.

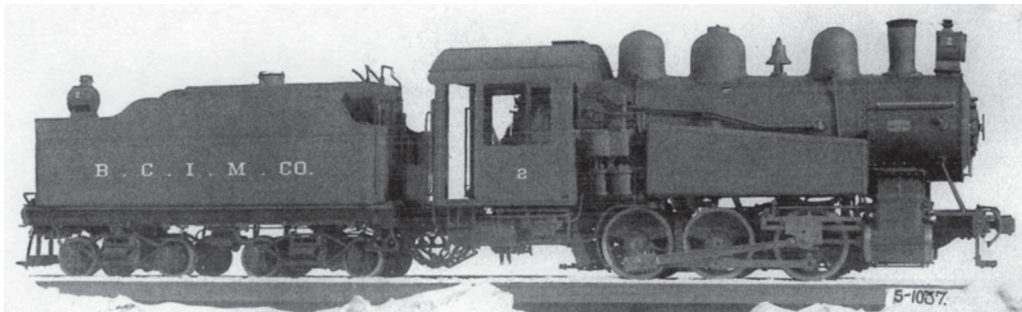
“LÍNEA Está actualmente en construccion una linea que tendrá un desarrollo de 24 kilómetros con una trocha de metros 1,47. Esta linea se compondrá de das secciones, una a vapor i la otra eléctrica. La seccion a vapor circunvalará el mineral i conectará con la seccion eléctrica la que llevará el metal a la Caleta. La explotacion de esta linea, segun cálculos, será de diez mil toneladas diarias i despues, una vez hecha la dársena, subirá a treinta mil toneladas. El costo de esta grande obra se calcula en tres millones de pesos de nueve peniques.” [44, issue of Sept-Oct 1915].

The steam locos below were presumably purchased for the construction and for the operations within the mine mentioned in the paragraph reproduced above. The railway was acquired by *Compania de Acero del Pacifico (CAP)* 1971. Mine closed 1973.

0-6-0T d/w 46", cyls. 19x24", built by ALCo Schenectady in 1914 for the Bethlehem Steel Co.

The ALCo builder's photo shown below shows no. **2** attached to a tender, with which it was clearly delivered. A photo dated June 1945 shows this tender, separated from the loco, standing in a siding at Stockpile no. 4, and presumably in use as a water tanker for some unknown purpose.

- | | |
|---|-----------|
| 1 | w/n 54561 |
| 2 | w/n 54562 |



High resolution copies of this image are available from ALCo Historic

Photos at <http://www.alcohistoricphotos.com/>

21W 2096

AMERICAN LOCOMOTIVE COMPANY,

NEW YORK.

Class 060 T 132 Road Number, 2

BUILT FOR THE BETHLEHEM CHILE IRON MINES CO.

GAUGE OF TRACK	CYLINDERS		DRIVING WHEEL DIAMETER	BOILER		FIRE BOX.		TUBES		
	Diam.	Stroke		Diameter	Pressure	Length	Width	Number	Diameter	Length
4'-8 1/2"	19"	24"	46"	64"	180 lbs.	84 1/8"	39 1/4"	250	2"	11'-0"

WHEEL BASE			WEIGHT IN WORKING ORDER—POUNDS		
Driving	Engine	Engine & Tender	Driving	Engine	Tender
9'-0"	9'-0"	41'-0 1/2"	132000	132000	97500

FUEL	HEATING SURFACES, SQ. FT.			GRATE AREA SQ. FT.	MAXIMUM TRACTIVE POWER	FACTOR OF ADHESION
Kind	Total	Fire Box	Tubes			
Soft Coal	1429	115.6	1544.6	22.9	28800 lbs.	4.58

Tender, Type B-Wheeled,
Capacity, Water, 4500 Gals.
Fuel, 7 Tons.

NEGATIVE No. S-889

Details of BCIM no. **2**, from an ALCo publicity card.

0-4-0ST d/w 40", cyls. 14"x20", built by Porter in 1914

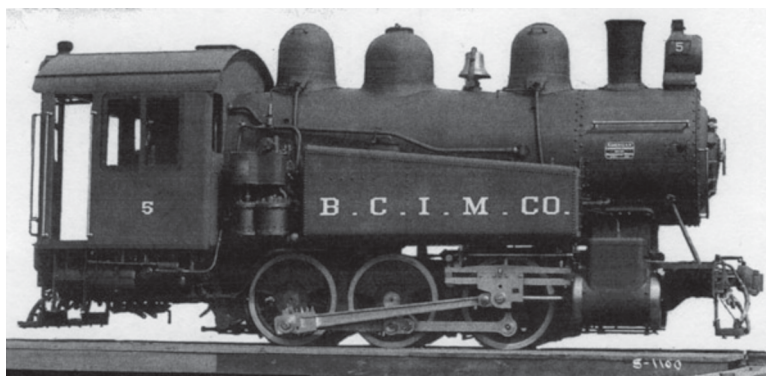
These engines were ordered supposedly for the 'Bethlehem Chile Lime Co.' presumably linked financially to the iron mines but may not have been at same location. 36 tons, standard gauge. Alternatively the company name may have resulted from a mistake, with 'iron' having been misread as 'lime'. If so, then this loco may have been the saddle tank engine seen in one photo.

3? w/n 5469

0-6-0T d/w 46", cyls. 19"x24", built by ALCo Schenectady in 1915

4 w/n 55104

5 w/n 55133



High resolution copies of this image are available from ALCo Historic Photos at <http://www.alcohistoricphotos.com/>

CIW 2097

AMERICAN LOCOMOTIVE COMPANY, NEW YORK.										
Class, 060 T 132						Road Number, 5				
BUILT FOR THE BETHLEHEM-CHILE IRON MINES.										
GAUGE OF TRACK	CYLINDERS.		DRIVING WHEEL DIAMETER	BOILER		FIRE BOX		TUBES		
	Diam.	Stroke		Diameter	Pressure	Length	Width	Number	Diameter	Length
4'-8½"	19"	24"	46"	64"	180 lbs.	84¾"	39¼"	250	2"	11'-0"
WHEEL BASE.					TOTAL WEIGHT IN WORKING ORDER—POUNDS.					
Driving			Engine		Driving			Engine		
9'-0"			9'-0"		132000			132000		
FUEL	HEATING SURFACES, SQUARE FT.					GRATE AREA SQ. FT.	MAXIMUM TRACTION POWER	FACTOR OF ADHESION		
Kind	Tubes		Fire Box	Total						
Soft Coal	1429		115.6	1544.6	22.9	28900 lbs.	4.57			
Capacity, Water 800 U. S. Gals.						Fuel, 1000Lbs.				
NEGATIVE No. S-931										

Details of BCIM no. 5, from an ALCo publicity card.

Although the photos above show nos. 2 and 5 with side tanks, one photo does show a substantial saddle tank at Cruz Grande so it is possible that no. 1 or 4 were built to that configuration.



One of the El Tofo 0-6-0Ts high on the ship loading hopper at Cruz Grande.

0-8-0 d/w ?, cyls. ?, built by ALCo Schenectady in 1920

8

w/n 61573



The lettering on the tender is not a mistake, despite first impressions. ALCo Historic Photos, who supplied the image, state that the BCIM loco had been photographed and then relettered as if for the Cornwall Railroad in Pennsylvania who were purchasing an identical loco (61575) that had been constructed at the same time.

2-8-0 d/w ?, cyls. ?, built by ALCo Schenectady in 1920

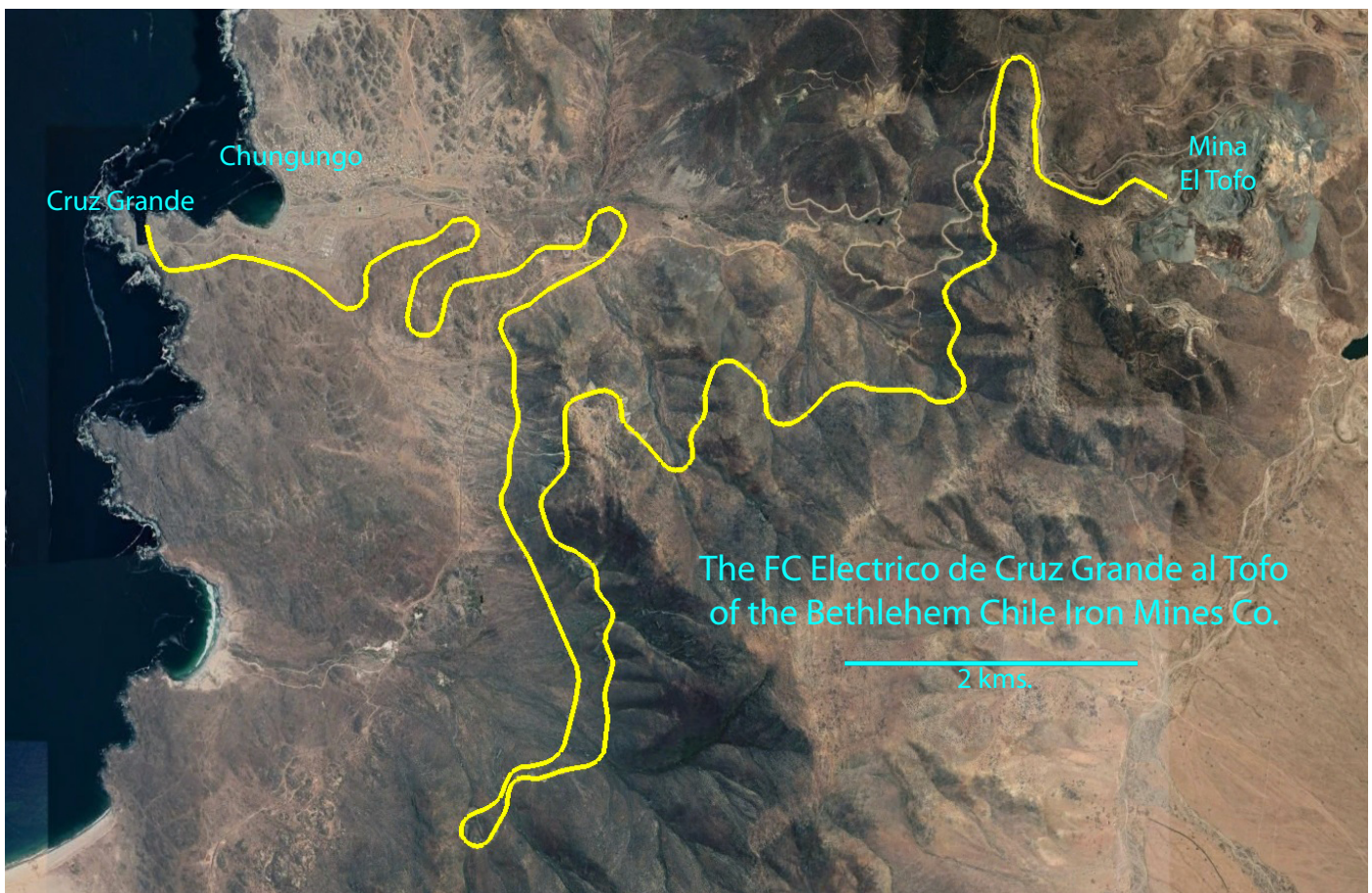
9

w/n 61574

Missing numbers, probably allocated to electrics

Other sources state that the 1916-built GE mainline electric locos here were numbered **6-8**, whilst electric switchers included numbers **10 to 16**. The webpage at <http://resmy.fortunecity.ws/tofo.htm> states that four GE electrics used in the mine were numbered **13-16**.

Diesels numbered **1-4** were purchased in 1952 or thereabouts, so steam locos with those numbers may have been OoS by then.



Earlier exploitation at this location

The El Tofo mine site was previously owned by the French-owned *Hauts Forneaux, Forges et Acieries de Chili*, who built the iron works at Corral near Valdivia.

“La Compania francesa se dedicaba a la explotacion de este yacimiento a ciclo abierto, trabajando en forma de canteras, formando bancos con cortes de diez metros de altura; sobre cada banco o camino se colocaba línea Decauville que arrastraba el mineral, ya arrancado, al lugar en que debía ser embarcado al andarivel que lo lleva a la costa; el arranque en cada corte se hacía por explosion ele taladros hechos a mano con barrenos comunes o bien con brocas para cargas de pólvora.” [87, in issue of Jan-Feb 1915]

It may well be that those early ‘Decauville’ lines used steam haulage, and given that the owners used 750mm gauge at Corral the tracks may have been of that gauge rather than the 60cm normally assumed when the word Decauville is heard.

2.1.7 Minor standard gauge industrial railways

Oficina Paposo

Standard gauge, but note also Paposo railroad further south with 2' and 2' 6" gauge tracks as mentioned in sub-metric gauge locos file.

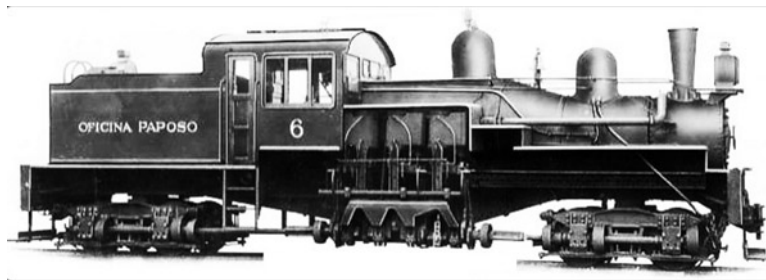
• *Oficina Paposo* (owned by the Nitrate Agencies & Co.) was 2km from station La Noría on the Nitrate Railways; locos were owned in 1926 but not listed in the *Album del Norte*. The *oficina* had been owned in 1889 by Hernan Fölsch and Federico Martin. There was no mention of locos at that time. Up to 1919 was owned by Grace Nitrate Co. Ltd, and then by Gildemeister?

Two truck Shay d/w 36", cyls. 12x12". built by Lima in 1920

Ordered via W. R. Grace & Co, after service as Lima's yard switcher numbered 2 and later 6? 60 tons. Official photo shows owner's name 'OFICINA PAPOSO' on bunker side and '6' on cabside in usual Lima style.

6

w/n 3072



Lima builder's photo, from the Shay website.

The Port of Iquique

The original standard gauge system. Info from sources [6] and [7]. Loco no. 4 was a new GE diesel in 1966, so there were probably only ever three steam locos.

0-4-0ST? d/w ? cyls. ?, built by ?

No details known but probably ex Nitrate Railways Fowlers nos. 3-8.

1

2

0-6-0ST d/w 34" cyls. 14x20", built by Avonside in 1902, and later owned by the Nitrate Railways

3

w/n 1452 Ex Nitrate Railways no. 76. Purchased by port after 1932. Now on display near a roundabout on the main road up to Alto Hospicio.



‘The Colonel North Construction Co.’

Background

John Thomas North, native of Leeds, honorary colonel and nitrate ‘king’, supposedly also promoted a civil engineering company in Chile under the above name, though this is mentioned by no sources other than Dewhurst, Copeland/Kirchner and Binns. The original source was possibly Dewhurst, though he was usually very careful to make it clear when he had speculated about information. Copeland & Kirchner suggest that the following Nitrate Railways locos were used by this company, but the source of this information is unknown. I am by no means convinced that this company existed, suspecting that it was merely the result of confusion with the short-lived North & South American Construction Co. (see appendix at end of part 1) and therefore suggest that you take the following notes inspired by Copeland’s list with a pinch of scepticism:

0-4-0ST d/w ?, cyls. 12"x18", built by Fowler in 1888 and 1889

Ordered for ? but became Nitrate Railways locos. Weight 20.860T [8].

56?		w/n 5563?	The IRS Fowler list shows this as ordered via Chapman Antony & Co. for Bahia, but std. gauge loco for Brazil seems unlikely. Loaned to Col. North Constr. Co. before 1889 according to Allen Copeland’s list. May have ended up with the <i>DOP</i> . No. 61 set aside for this loco in anticipation of its return.
57	3	w/n 5564	The IRS Fowler list shows this as ordered by the Nitrate Railways. Loaned to Col. North Constr. Co. before 1889? May have ended up with the <i>DOP</i> , or may have been returned. NR no. 62 set aside for this loco in anticipation of its return. It seems to have returned, but gained the number 3 in the NR fleet.

Nos. **54-57** were possibly loaned to Colonel North Construction Co. prior to 1889 in exchange for other locos. This is speculation by Copeland and Kirchner, and their attempt to reconcile Fowler deliveries with an article in *The Locomotive* and an earlier manuscript list of E. L. Ahrons.”

and the *Dirección de Obras Públicas*

Standard gauge. Whilst it is clearly possible that the *DOP* may have inherited locos from Colonel North's construction company if it existed, what is less clear is why the construction company or the *DOP* would have needed standard gauge locos in the first place. No new standard gauge railways were opened in Chile between the Nitrate Railways' network in the 1870s and the Cruz Grande al Tofo and Chuquicamata lines at the time of the First World War. However, the supposed construction company was presumably involved in building Nitrate Railways branches to various *oficinas*, and possibly in North's Tarapacá Waterworks Company and its activities.

La Cía. Carbonífera y Industria de Lota

Background

The predecessors of this coal company, developed by the Cousiño family in the Lota and Coronel area, had 4' 6" gauge (1.37metres) rail systems serving their mines at Lota and Puchoco. These are dealt with later in this document. However, the company history published in 1952 reported that the internal rail system at Lota was of 1.44m gauge, ie. standard gauge. This seems unlikely, but has been mentioned here in order to cover the possibility that they had altered the gauge for some reason.

La Cía. Salitrero Pedro Perfetti

No detail yet known. Standard gauge.

Summary of operations:

- **Aguada**, south west of station Dolores on the NR. This may have been *Aguada de Branes* north of station Zapiga on the NR out of Pisagua.

In 1889 owned by Pedro Perfetti, no mention of locos at that time.

Owned by *Juan Flores & Pedro Perfetti*, then by the *Compañía Salitrera Aguada*, later to become the *Cía. Comercial y Salitrera la Aguada*.

- **Flor de Chile** Departamento de Taltal.

Operating 1906.

In 1909 owned by *Pedro Perfetti*

In 1926 owned by *Cía. Salitrero Pedro Perfetti*, No details given or locos listed. '*Paralizado 1926*'.

- **Tres Marias**, in Tarapacá, on NR at Km. 55 north of Est. Huará.

Owned in 1889 by Pedro Perfetti. No mention of locos at that time.

Owned at one stage by *Cía. de Salitres y FC de Agua Santa*.

- **Tricolor ex Oficina Sara**, Departamento de Taltal

Operating 1906.

Owned in 1909 by the *Tricolor Nitrate Co.*

'*Paralizado 1914*'.

In 1926 owned by *Cía. Salitrero Pedro Perfetti* or *Tricolor Nitrate Co.*, No details given or locos listed.

The loco name below suggests that Perfetti may well have owned one of the *oficinas* named Victoria.

0-4-0T d/w 33", cyls. 10x14", built by Baldwin in 1904

Class 4-14 C number 145. This was probably purchased for use at an *oficina* in Tarapacá, where the standard gauge was in use by the NR, and perhaps at an *oficina* named Victoria of which there was one south of Pozo Almonte and another south east of Pisagua. However, both of those were owned by the *Cía. de Salitres y FC de Junín* rather than the Perfetti company. Alternatively '**VICTORIA**' may have been an *oficina* manager's wife or daughter.

'VICTORIA'

w/n 23826

2.1.8 Unidentified standard gauge locos

Avonside

0-6-0ST d/w 34" cyls. 14x20", built by Avonside in 1902, for an unknown customer via Grace Bros. agents.

? w/n 1452 Between 1908 and 1910 it was purchased by the Nitrate Railways and became their no. 76.

BMAG

4-6-2 d/w ? cyls. ?, built by Berliner Maschinen AG in 1936 for the 'Joyabahn'. Although in the *BMAG* list as for Chile, this was probably for a constituent of the Southern Railway of Peru, which served the town of La Joya south-west of Arequipa. However, Bob Whetham's *Railways of Peru Volume 2 – the Central and Southern Lines* makes no mention of any *BMAG* engines.

11 w/n 10548

Henschel

0-4-0T d/w ?, cyls. ?, built by Henschel in 1913. Delivered via Gebr. Vorwerk & Co. to Iquique.

? w/n 11943

? w/n 11944

SMiG

4-6-0T d/w 48", cyls. 18"x24", similar to those built by Fowler for the Nitrate Railways in 1884-5. The image below was published in an album by the *Sociedad Maestranza i Galvanizaciones* (successor of Lever Murphy of Caleta Abarca) in 1921. It is not known whether it was actually built by that manufacturer. The photo shows a loco apparently identical to Fowlers **42-49** of the NR, but carrying the number **13** and an additional elliptical plate of some kind in front of the cab. The only difference is the lack of the large sandboxes on either side of the smokebox that had been fitted to the NR engines.

It seems likely that it was also for the standard gauge, for if adapted to broad gauge it would almost certainly have had side buffers as were standard on the *EFE* at that time. Fowler did not build any 4-6-0T locos other than those for the Nitrate Railways, whilst those eight were all in service in 1909 and 1929, thus precluding the possibility that one had been sold out of service and overhauled at Caleta Abarca for a new user before 1921.

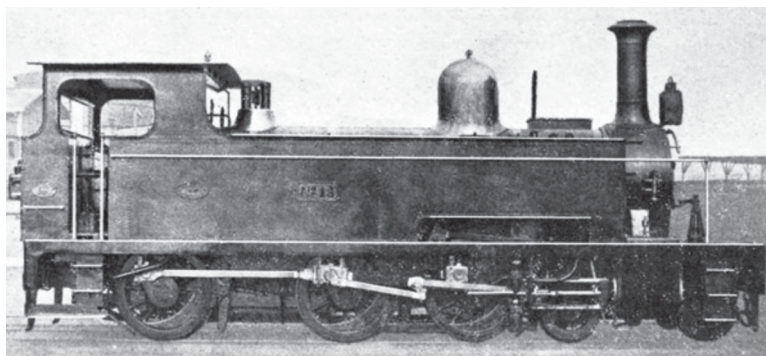
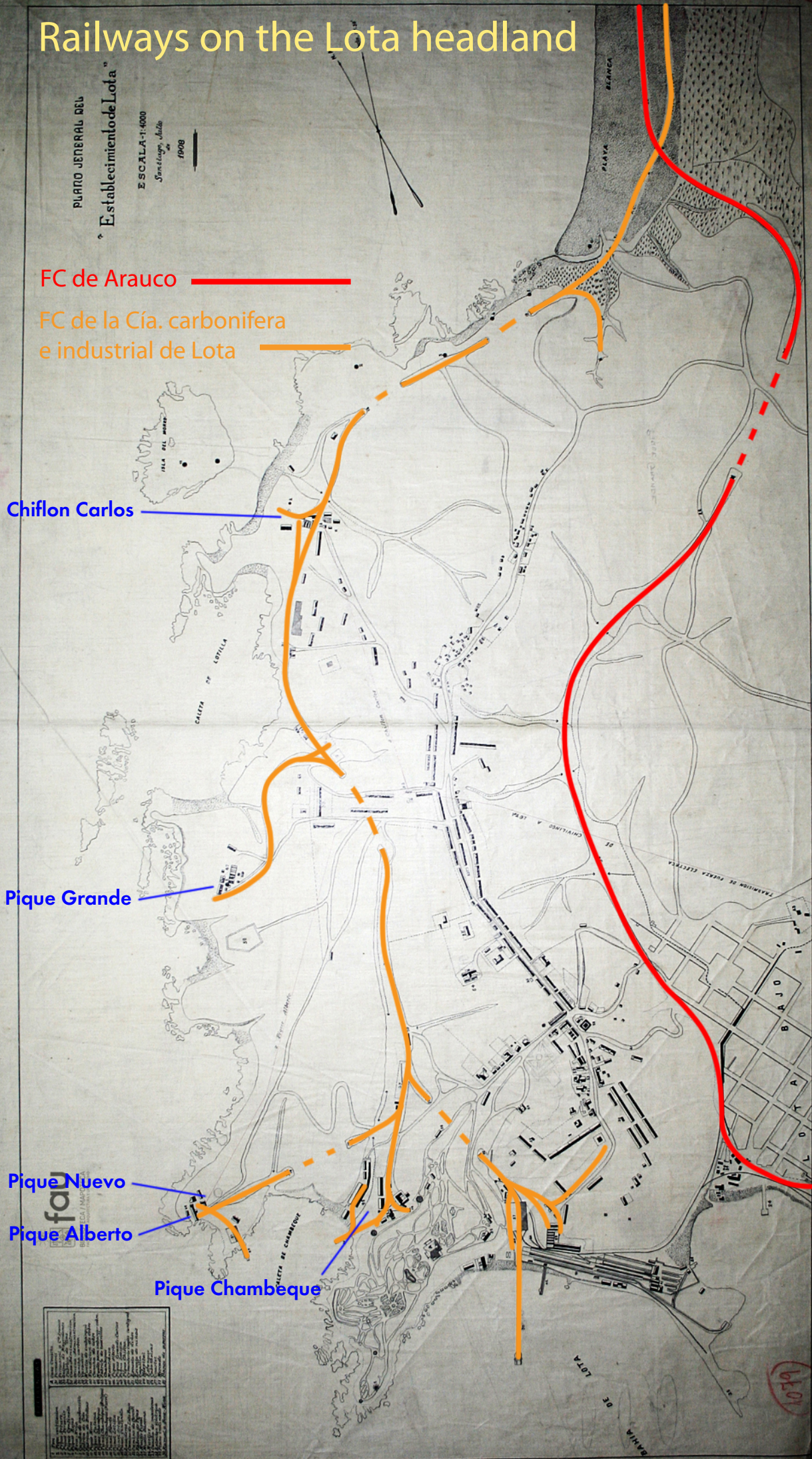
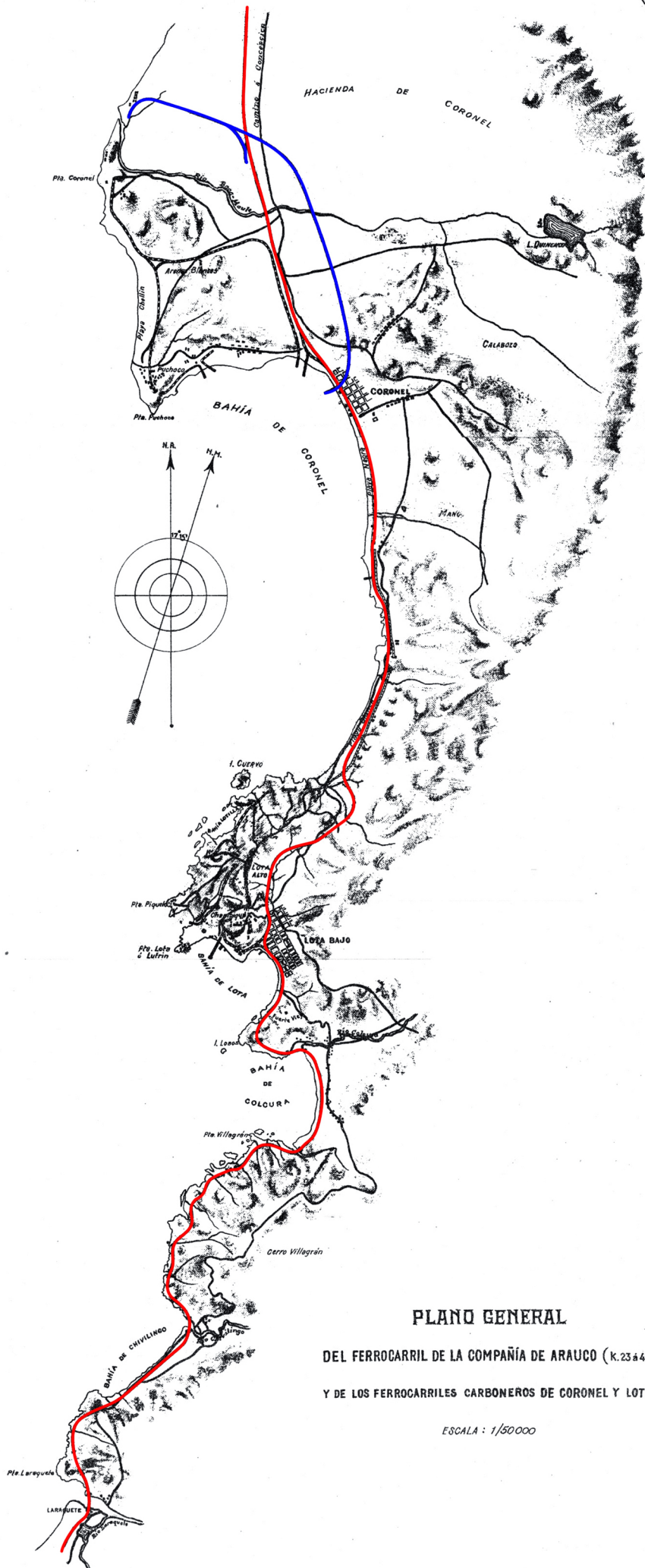


Photo provided by Sr. Andrés Thompson.

Railways on the Lota headland





2.2 4' 6" gauge railways in the Arauco coalfield

2.2.1 Lota coal mines

El FC de la Compañía Explotadora de Lota y Coronel and its successors including the *Cía. Carbonífera y Industria de Lota* 1856-1997?

The context

Chile's principal coalfield lies mainly south of Concepción, though there were mines at Penco, Lirquen and Talcahuano slightly to the north. Whilst there were a few mines east of the Rio Bio-Bio, the majority were along the shore of the Bahía de Arauco and on further south to Curanilahue, and again on the coast around Lebu. Transport out was by sea, or by the broad gauge *FC Arauco* which ran north from Curanilahue to Concepción.

Whilst the longer distance coal railways have been dealt with in the broad gauge file, lesser lines ran on other gauges, including the unusual 4' 6". To assist in understanding the layout and ownership of the mines using this gauge, it is worth explaining the layout of the workings around Coronel and Lota, facing the Bahía de Arauco. The maps on the previous pages are there for this purpose, and there is further detail in the Broad Gauge Locomotives file.



A medal produced in 1942 to commemorate the life of Matias Cousiño, creator of the Lota coal mining dynasty of that name, and of ninety years since mining there began.

Background

This was an enterprise of the Cousiño family, trading in the 1860s as *Cousiño i Garland* and then as *Cousiño e Hijo*. The *Explotadora* company named above existed from 1870 to 1904, and was then reconstituted with more capital in 1905 as the *Cía. de Lota y Coronel*. In 1921 it became part of the *Cía. Minera e Industrial de Chile*; and from 1933 was under the *Cía. Carbonífera e Industrial de Lota* (see below).

The gauge was 1.36m or close to 4' 6". The railway began in 1856 and was loco worked from 1870, was 5km long, and was to have been extended by 4 km in 1904 to the Playa Negra mine but this was not completed owing to unsatisfactory developments underground. The Playa Negra line ran north parallel to the Arauco mainline and just inland from it. It certainly reached as far as Playa Blanca, halfway to Coronel, where there was a rail-connected jetty out from the *pique Centinela*, but may never have been extended the final few hundred metres to Playa Negra (which seems to have been on Rojas land until the Lota company purchased it).

The main route ran around the Lota headland with several tunnels. From the south end of the system a 1km branch linked to the Arauco railway at Lota station. In 1910 the system was reported as having seven Manning Wardle 0-6-

OTs, which does not quite match the list below. The locos listed were all for this unusual gauge and it is assumed that they all worked on tracks connected to the above company even if not actually owned by it.

The railway from Coronel to Buen Retiro, separate from this system but also owned by the CELC, was seemingly built to the broad gauge of 5' 6" but seems to have been originally intended to be of 4' 6" gauge [MOBR172].

Contemporary descriptions

Ferrocarril de Lota.- Como tipo de un ferrocarril enteramente industrial, al servicio de un establecimiento, podemos citar el de Lota, cuya línea mide 2,950 metros entre sus diferentes ramificaciones y cuya exportación de carbón varía entre 70 y 110,000 toneladas al año, y cuyos hornos benefician entre 550,000 á 560,000 quintales métricos de minerales de una ley media de 17½% produciendo 9,476, 224 kilogramos de cobre el año 1876. La trocha de la vía es de 1.m37. El peso de los rieles es 18k.35 por metro corrido, usándose en la explotación locomotoras de dos tipos: las locomotoras de dos estanques que pesan 10,000 kilogramos cada una, y las de dos estanques con cilindros interiores que pesan 5,500 kilogramos cada una. Los carros vacíos pesan 2,000 kilogramos cada uno y tienen capacidad para cargar 3,000 kilogramos de carbón. El radio mínimo de las curvas del trazado es de 50 metros. El establecimiento tiene una magnífica maestranza. [33]

“Lota Railway.- As a type of an entirely industrial railway, at the service of an establishment, we can cite that of Lota, whose line measures 2,950 meters between its different ramifications and whose export of coal varies between 70 and 110,000 tons per year, and whose furnaces benefit between 550,000 to 560,000 metric quintals of minerals at an average of 17½% purity, producing 9,476, 224 kilograms of copper in 1876. The gauge of the track is 1.m37. The weight of the rails is 18k.35 per meter run, using locomotives in operation of two types: the locomotives with two tanks that weigh 10,000 kilograms each, and those of two tanks with inside cylinders weighing 5,500 kilograms each. The empty cars weigh 2,000 kilograms each and have capacity to load 3,000 kilograms of coal. The minimum radius of the curves is 50 meters. The establishment has a magnificent set of workshops.”

“El ferrocarril recorre el establecimiento de norte a sur, desde el pique Centinela hasta la Fundicion de cobre, en una extension de cerca de tres quilómetros (2,850 metros), pasando por los piques Arturo, Cárlos, Lotilla, Chambeque y Alberto; por las fábricas de ladrillos ordinarios y refractarios; por la de botellas y cristalería; por la Maestranza y carpintería a vapor hasta llegar al gran muelle de fierro que sirve para el embarque del carbon.

En todo el trayecto pasa por tres túneles, que llevan las siguientes denoniinaciones y los tres perfectamen te bien con-struidos, cómodos y seguros.

Túnel Chambeque, pasa por debajo de una parte del Parque y por la poblacion de Lota Alto con una extension de. 22?.7 mts.

Túnel Lotilla, con una extension de-. 226.11.

Túnel Arturo. 138.11.

Mas de medio kilómetro en túneles 589 mts.

El ancho de la via es de 1.37 m.

Cuenta con el siguiente material rodante:

Locomotiva **Don Luis**, de 8 toneladas de peso aproximativamente, con cilindro de 0.250mts. de diametro.

Locomotiva **Chambeque**, de 10 toneladas de peso aproximativamente, con cilindro de 0.268mts. de diámetro, y 121 carros de carga y material de madera, con capacidad para 2,800 kilogramos cada uno.

Estas máquinas hacen de quince a veinte viajes en el dia, desda los diversos piques hasta el muelle de embarque.” [45]

“El ferrocarril de los establecimientos de Lota tiene una trocha de 1,37 m., pasa por cuatro túneles, dos de los cuales miden mas de 200 metros de largo. Está servido con cinco locomotoras de la marca Manning Wardle. Estas son de tres ejes acoplados, sin bogie, con peso adherente de 10 a 12 toneladas. Su poder de arrastre ea aproximadamente de 80 toneladas. Existen 140 carros carboneros en servicio, con capacidad aproximada de cinco i media toneladas de peso.” [Source 44 Feb 1908]

To British eyes, not the least interesting feature of the Lota company’s activities was the wide-spread use of ‘black

wagons' – chaldron wagons to use their more formal Northumbrian name; ie inside bearing wooden-framed coal wagons.

Archive material

Laterly the Chilean coal industry was managed by *ENACAR*, the *Empresa Nacional del Carbón*. When the last mines closed in 1997 *ENACAR* seems to have been wound up. The archives of the organisation, including those from its privately-owned predecessors, have been stored by *CORFO* in Lota, on Calle Carlos Cousiño and at Chambeque. However, their importance has now been recognised and a more suitable location is being sought. The following article gives a little more information: https://www.archivonacional.gob.cl/616/w3-article-94185.html?_noredirect=1 When this material becomes available to researchers visiting Lota it might well repay a visit.

0-4-0ST, d/w 36", cyls. 10"x16", built by Manning Wardle in 1870, for "Lota Coal Mines"

Side buffers and restricted height and width. Note that the MW notes reproduced below say that the buffer spacing was to be the same as on MW 115 for Puchoco, the first indication of a link between the two systems other than the track gauge.

'DON LUIS'

w/n 303

Named presumably for Don Luis Cousiño, the chairman of the company.



Remarks

303 Gauge 4'-6". The alterations from the Ordinary class 34.
 10" cyl are as follows. Gauge 4'-6". Special canopy over driver
 5040 with glasses back & front. Buffers to be the same centres as
 those on engine N^o. 115. A lamp iron to be fixed on front
 buffer beam & a head lamp of the ordinary kind. The engine to
 be made to pass through a tunnel 9'-6" high & 8'-6" wide. Name
 Don Luis on a brass plate 2½" letters. The following were made
 to new drawings. Reversing handle & brackets. Expansion
 brackets. Reversing lever, shaft & brackets. Axles. Buffer beams. Frames
 canopy. Coke boxes. Footplating, & Footstep see drawing Order N^o.
 5040. The wheels 3 feet. Axles boxes, Hornblocks, Couplings & connecting
 rods, Crank pins, Eccentrics. Feed pump, Crosshead & all the motion are
 the same as Ordinary class 34. Buffers with wrought iron cases & heads
 same as present class 34 supplied Jan 1st 1892. A pair of cylinders with
 covers complete (round stud holes) Block pistons same as 24000. Valve
 spindles old size, gunmetal slide valves, supplied under Order N^o.
 60162. See N^o. 6 duplicate book page 164. Dec 18th 1906. Tyres 2' 4 7/8
 inside dia. supplied under Order N^o. 63933. March 8 - 1909.
 A new B. & F. Boiler complete. (copper fire box having 3 3/4" flanges) Fitted
 with lever safety valve. Hopkinsons small size water gauge & all mountings
 complete. Supplied under Order N^o. 66010. For tracings sent into the
 works see N^o. 7 duplicate book page 26. September 30th 1910.

NAME DON LUIS

Manning Wardle notes re this engine. A duplicate set of notes also listed
 a full set of wheels, axles tyres and crankpins supplied in 1914.

0-4-0ST d/w 36" cyls 10½x17" oc, built by Black Hawthorn in 1874

Sent via Henry Simon of Manchester for export.

‘CHAMBEQUE’	w/n 322	Chambeque is an area on the headland on which Lota grew up. The construction of a Manning Wardle loco named ‘CHAMBEQUE II’ in 1920 (see below) suggests that this one was out of service by then.
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0-4-0ST d/w 24", cyls. varied, built by Black Hawthorn in 1883, 1885 & 1890

‘HORMIGA’	w/n 767	Hormiga = Ant. Cyls. 6x10". Delivered via Henry Kendall & Sons via W. Bailey Hawkins & Co. of London. This loco probably looked like the later ‘MOSCA’ as shown below.
‘ABEJA’	w/n 837	Abeja = Bee. Cyls. 7x11". Delivered via W. Bailey Hawkins & Co. for export.
‘MOSCA’	w/n 1015	Mosca = Fly. The Black Hawthorn list gives the name as ‘MOSTA’ but ‘MOSCA’ is much more likely, and seems to be confirmed by the photo below. Cyls. 6 1/8x10". Delivered for the Lota Co. Colonel.

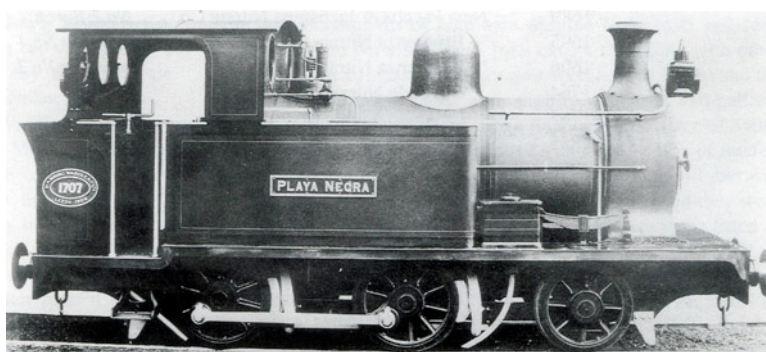


From DIBAM archive at the Biblioteca Nacional, Santiago. The closely-set side buffers were for use with the 'black wagons' as seen behind the loco in this view.

2-4-0T, d/w 33", cyls. 11"x17", built by Manning Wardle in 1898, 1906, 1914, and 1919

Mostly sent via Neal Miller. 9' 0" max height.

'BENJAMIN SQUELLA'	w/n 1375	Don Benjamin Squella was administrator and then general manager of the Lota company from 1877 to 1892.
'PLAYA NEGRA'	w/n 1707	Playa Negra is halfway between Lota and Coronel. It was the site of a mine eventually owned by this company, but one that disappointed in its development and was therefore never linked to this rail system.
'LOTILLA'	w/n 1851	Lotilla is the name of the bay between the Chiflon Carlos and the Pique Grande on the map on a previous page.
'PLAYA BLANCA'	w/n 1932	Sent via J. B. Marsh. Cartazzi boxes for leading wheels to give ½" side-play. Playa Blanca is to the south of Playa Negra. There were also mines here.

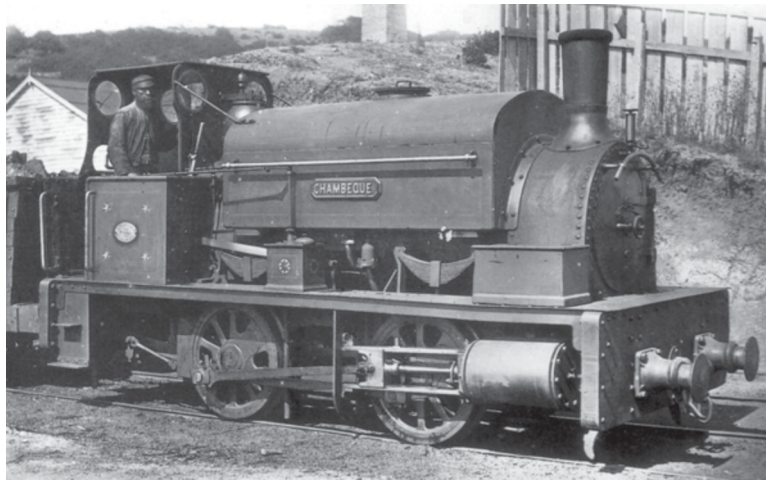


Manning Wardle builder's photo, via Fred Harman's books.

0-4-0ST, d/w 30", cyls. 7"x12", built by Manning Wardle in 1920

Sent via J. B. Marsh.

'CHAMBEQUE II'	w/n 1987
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4-6-0 d/w ?, cyls. ? built by Lever Murphy possibly between 1894 and 1903

Sr. Andrés Thompson's Wikipedia page on Lever Murphy lists a locomotive built for this company but gives no further details, nor indeed any confirmation of the gauge. Whilst there was an 'orphaned' 4-6-0T built by Lever Murphy, it seems unlikely that a 4-6-0T would have been built for the 4' 6" gauge, though it is possible that a broad gauge loco was built to haul Lota coal along the Arauco Railway, in the same way that the *Cía Ríos de Curanilahue* seems to have done later. It is possible that this loco was the 4-6-0T illustrated earlier and looking very similar to the Fowler 4-6-0T engines of the Nitrate Railways.

Unidentified locos

The photo below, showing a six-wheeled tank loco hauling black wagons, and another in the background probably of the same design, was taken on the *Cía. de Explotadora de Lota y Coronel* system in 1940. The engines are so far unidentified but the near one is clearly an 0-6-0T and presumably was British-built.





This image was supposedly taken in Lota in 1959, shows a saddle tank loco with a tank commencing at the front tube plate rather than the front of the smokebox. Its identity is unknown.



Gauge confusion during the later years

The company history, published in 1952 [*Cien Años del Carbón de Lota*] states: “*Todas las minas e instalaciones de superficie estan unidas por une red ferroviaria de doble trocha, con un longitud total de vias de 28.834 metros, y es de tres rieles. Empalma con el Ferrocarril de Concepcion a Curanilahue en la estacion de Playa Blanca. Tiene una trocha de 1.44m. para el equipo interno de carros, y otra de 1.675 m. para el equipo ferroviario de la red general. El ferrocarril interno cuenta con el siguiente equipo: 21 locomotoras,...*” It is not clear whether the gauge mentioned was a mistake and the system retained the earlier 4' 6" gauge (1.37m.), or whether it was really standard gauge as mentioned in the quote. Presumably by 1952 some of the 21 locos may have been diesel, or even electric, and possibly of narrower gauges within the mines. Alternatively, this total may have included all the engines working on the ex *FC de Arauco*, since this was now under the same ownership. Certainly the company did use at least one broad gauge loco transferred from its erstwhile *FC de Buen Retiro i Coronel* a few miles further north. See section 1.4.6 in the broad gauge file.

0-4-0ST d/w 37", cyls. 12x20", built by Robert Stephenson & Hawthorn in 1948

Both ordered for the Cía. Carbonífera e Industrial de Lota on 23rd April 1947. These locos were built for the *Cía. Carbonífera y Industria de Lota*, and may have been for 4' 6" gauge though the RSH list and order book somewhat unusually specify no gauge. The RSH ‘List of Engines’ book preserved at the NRM does show 7415 as being standard gauge, though only by a ditto sign in a long list of such symbols; whilst for 7473 no gauge is specified. The sole photo

seems to show one of the locos working over mixed gauge three rail track whilst it hauls broad gauge wagons with the aid of an additional offset coupling above the low level side buffers and hook for the 4' 6" gauge. The low level buffers imply that this engine worked with chaldron wagons, which strengthens the evidence that they were indeed built for the 4' 6" gauge. A very poor film clip showing one of these engines pulling a rake of chaldrons suggests that the high level broad gauge couplers may have been a later modification.

? w/n 7415

? w/n 7473



Pablo Moraga collection



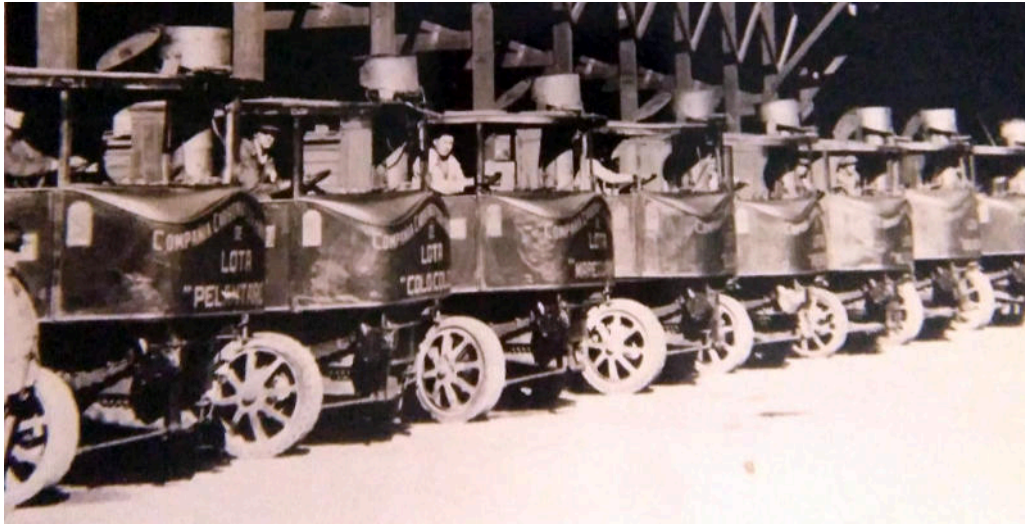
This still from a video shows one of this pair of RSH locos hauling chauldrons, which would seem to confirm that these engines were indeed on the 4' 6" gauge.

Mixed gauge shunting in the later years

As explained above, when the Lota company gained control of the *FC de Arauco* and broad gauge wagons began to run into the mine yards over mixed gauge tracks, wagons were shunted by 4' 6" gauge locos fitted with offset broad gauge couplers. However, it now begins to look as though in later years the opposite was done, with broad gauge locos also having offset side buffers at a low level for the 4' 6" gauge chaldron wagons. There is thus also a section (1.4.6) for this operator in the broad gauge file.

Sentinel steam wagons

The *Cia. Carbonifera y Industrial de Lota* owned not only railway locomotives but also a fleet of Sentinel steam lorries.



As well as the company name painted across the front of each steam waggon, there appears to be an individual name at the foot of each panel.



This second posed image was dated 1927. This was spotted on a wall in the museum in Lota Alto.



One of the earlier Sentinels is seen bearing the name '**LAUTARO**' and the company title '*Compañía Minera e Industrial de Chile*'. This photo was published in *La Opinion* of Lota on 14th December 1924.

2.2.2 “The Puchoco Coal Company”

La Compañía Carbónifera de Puchoco

The coal companies in Puchoco

It can be tricky to distinguish the various coal mining companies around Coronel. Reports from the early 1870s list the following:

1 *Las Minas de Puchoco*, de Guillermo Délano – these were at the south-westerly extremity of the Puchoco peninsula. It was this business which operated under the title *La Compañía Carbónifera de Puchoco*. The Schwäger family had originally had a controlling interest in this company but pulled out in 1866 after F. W. Schwäger II had a serious accident when falling from a tramcar in Valparaíso. The operation was recorded [] as having a tunnel of 150m, and one steam loco in 1871 and two in 1874 [48] – presumably the Manning Wardles listed below. The tunnel gave access to a jetty on the east side of the hill in Puchoco. The mines flooded in 1881 but eventually were combined with Schwäger’s later holdings and re-opened in the 1890s.

2 *La Compañía de Puchoco* – in Huerta to the east towards Coronel town, and run by don José Rojas, initially with Schwäger funding. The Rojas holdings were eventually recorded by more than one commentator as having a 2' 6" gauge railway.

3 *El Establecimiento de Puchoco* – this was the later Schwäger family company and that furthest to the north. When Federico Schwager returned to the industry in 1870 he eventually purchased the mines of Huerta (ie. Sr. Rojas’ mines, above) and Boca Maule, giving rise to a long-standing lawsuit with Sr. Délano. There was eventually a substantial 3' 0" gauge system here, the *FC de Boca Maule i Puchoco*, which ran to a jetty close to Coronel town.

4 *La Compañía de Playa Negra* – This was to the south of the town and may originally have been owned by Sr. Rojas. It was eventually taken over by the Cousiños of Lota but never fulfilled its apparent potential owing to geological problems. As a result a planned extension northward of the Lota 4' 6" gauge coal system was never completed.

Background

4' 6" gauge. This was the early Puchoco Délano business working mines at the southern extremity of the Puchoco peninsula. These were inundated by the sea in 1881, at which point the locos might well have been sold to the only other 4' 6" gauge railway in the area, that at Lota.

“As at Lota, the works were designed and carried out by English engineers, and the place seems like a transplanted corner of the county of Durham... The various pits are connected with the loading wharves by railways, and all day long locomotives are seen dragging train loads of coals or bricks to the loading stages in the harbour, where ships are waiting for freights.” [*Chile: sketches of Chili and the Chilians during the war 1879-1880*, Robert Nelson Boyd, 1881, W. H. Allen & Son, London]

Later, in 1893, the Délano and Schwager businesses were combined and exploitation in this area was renewed. However, from then on it seems that rail transport utilised a branch of the 3' 0" gauge *FC de Coronel a Boca Maule i Puchoco* network, probably because the jetty was longer and more sheltered than that belonging to the Délano estate.

0-4-0ST d/w 30", cyls. 8"x14", built by Manning Wardle in 1864, for the Puchoco Coal Co.

MW class D but with non-standard wheels. Built for restricted height. Side buffers.

? w/n 115

0-4-0ST, d/w 30", cyls. 8"x14", built by Manning Wardle in 1871, for the Puchoco Coal Co.

“The same as engine 115.”

? w/n 383

115 D 4-6 This engine is an alteration of class D. not only in the gauge, but everything was kept specially low. Wheels 2-6 dia. 4' 6"; Axle Boxes, Axle journals, Coupling, & Connecting rods, same as our present class D. The Motion was the same as No 13. The Feed pumps, were the same as No 13. The following were new, Frames, Footplate, Boiler & Slide bar brackets, Tank, Cylinder, Buffer beams, Coke boxes, Rail guards, Brake gear, all specially arranged to suit height. See drawings.

383
8" cyl
6270

Gauge 4'-6". Alteration of class D. Same as No 115

2.3 4' 2" gauge

2.3.1 *El FC de Carrizal i el FC de Cerro Blanco*

1860-1880

El FC de Carrizal i Cerro Blanco

1880-1922 and possibly later

Background

Gauge 4' 2". The *FC de Carrizal* opened in 1860, originally with iron-plated wooden rails, steam locos were permitted from 1863. This was originally two separate railways: the *FC de Carrizal* from the port of Carrizal Bajo via Canto del Agua (18 miles) up to Carrizal Alto and Portezuelo (an extra 4½ miles), and the *FC de Cerro Blanco* which from some time in the early 1860s extended onward from a junction at Canto del Agua to Yerba Buena. Later the two were merged, in 1880. Carrizal Bajo to Yerba Buena was 99 km, the branch from Canto del Agua to Portezuelo an extra 11.5 km., the branch from Chorrillos to Coquimbana 28 km, the branch from Km 50.700 to Mina Astillas 2.4 km, and the branch from Milla Doce to Merceditas 44.7 km. See the map on the following double page spread. Carrizal Alto had been reached in 1864, and Yerba Buena in 1868. The branch to Carrizal Alto continued beyond the town, terminating in the Mondaca and Portezuelo mines after a couple of zigzags at a gradient of 3.75% to get the trains up the hillside. The mainline up from the coast to Canto del Agua was at a grade of 1 in 88, and using 44 lb. rails.

The branch south from Milla Doce south to Merceditas, and that to the Mina Astillas, were constructed in the 1880s. Interestingly, the names of the locations Milla Doce and Milla Quince confirm that the *FC de Cerro Blanco* distances were indeed measured from Estación Canto del Agua, and that they were measured in miles rather than kilometres.

“At Canto del Agua station were two smelting plants, fed by the railway’s branches that linked the line with the mines scattered around. The golden years lasted until 1889, when the drop of the international price and the exhaustion of the richest veins forced to reduce the operation to two weekly trains in 1900. At the end of the Great War, the smelters were forced to cease work owing to the drop in the market.” [HMN]

The railway was closed in 1922 after an earthquake and *maremoto* on November 11th 1922, which is reported to have destroyed the railway's workshops as well as many of the locomotives [26], and the concessions were declared null and void in 1928 [18] so the railway became state property. There was sporadic use of the lines east of Punta de Días in the 1930s, by a don Luis Phillips. Similarly, the line west of Punta de Días, down to Carrizal Bajo and up the branch to Carrizal Alto was worked from 1933 by Sr. Silva Prado and then by the Soc. Aurífera Cerro Negro. This was by means of an ‘autocarril’ of some kind.

“During the thirties, and under the sponsorship of the Chilean state, the Mining Ministry decide to build a smelting plant in Chile that would operate as a buying agency for the smaller mines. The place chosen for to construct the plant was Paipote, close to Copiapó. A contract with Allis Chalmers was signed in 1940, but the second world war postponed everything.

As a temporary measure, in December 1942, under the Chilean state smaller mines office, a new smelting plant was erected in Carrizal Bajo. The idea was to feed this smelting plant with ore from the different small mines scattered in the area and to use the old railway for transporting the ore to the plant.” Eventually the rail routes were regauged to 1m in 1941-3 by the *Caja de Credito Minero* and taken over by the state railways in 1943 [18]. “A concrete workshop was erected in Carrizal, which still exists. As motive power a two axle Davenport diesel rod locomotive was acquired. She had a Caterpillar six cylinder engine rated at 98 hp. The Carrizal smelting plant started in May 1943, and worked until 1946, when the end of the war reduced the demand.

Following the war, the Paipote project was reassumed, and the work started in 1948. The first copper bar was produced on 28 December 1951. For to move the slag wagons between the furnace and the dumper, the Davenport was used for many years.” [HMN]

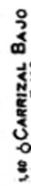
The system was closed entirely in 1961. The Coquimbana branch had apparently been lifted prior to 1920.

CERRO BLANCO

ESCALA = 1:250 000.



Escalas { Horizontal = 1: 250 000
Vertical = 1: 25 000.



Superintendent's report to Directors of the Carrizal Railway for the first half of 1862

Sr. Felipe Radrigan has forwarded the following extracts from this report: "Notwithstanding the apparent cheapness and good effect of the draught by mules I am of the opinion that steam power is not only more efficient but much cheaper.

In February I opened communication with locomotive builders in England and the United States stating to them the build of the road and asking from them propositions for light locomotives from 3 to 5 tons weight; I have received twelve different propositions ranging from 420 to 680 £ and from 2,800 to 4,000 \$ for each Engine and tender, either of them being capable of drawing 20 cars weighing 4,500 lb. each up a grade of 50 feet to the mile at a rate varying from 8 to 12 miles per hour, those from the United States all having tenders whilst those from England were such as are called «saddle engines», having the coal bunkers and water deposit on same frame and in some cases over the boiler.

I have selected in case you decide that I shall apply steam, those from the United States as being better adapted for this country the drafts or tracings I shall have slightly modified for this traffic."

Delivery dates

It is clear that the first locos to arrive must have been the Hughes 0-4-0STs, followed by the first four Manning Wardles and later the James Cross tender engines. The Manning Wardles are definitely recorded as having been ordered for the *FC de Carrizal* but there are no surviving lists for James Cross or Henry Hughes and recent compilations merely state that these locos were for Carrizal y Cerro Blanco. The fleet has therefore been listed according to the post 1880 running numbers from **1** to **11** or **12**. More recently it has become clear that the James Cross engines will have been ordered for the *FC de Cerro Blanco*.

0-4-0ST? d/w ? cyls. ?, built by Henry Hughes and Co. in 1863

"Two shunting locos four-coupled". Source [13] and the builder's list both say built by Hughes of Loughborough. These may have been the railway's numbers **10-11** [14]. It is not clear when Hughes began to build locos but he was certainly advertising that capability by 1863. Source [33] says weighed 10 tonnes. Secondary sources have sometimes stated that these locos were ordered for the **FC de**

"Las locomotoras compradas en Inglaterra, no estaban hechas para ellos. Esto no era para desalentar a hombres de esfuerzos como aquellos que a todo le encontraban arreglo. He aquí como explica el activo gerente la solución que en 1864 encontraron los empeñosos carrilanos.

Las locomotoras recibidas de Inglaterra, no obstante no pesar cada uno, con su complemento de agua y carbón, más de siete toneladas, se hallaron demasiado pesadas para la línea antigua, colocadas como vinieron sobre cuatro ruedas, dificultad que se venció agregando a cada una dos juegos más de ruedas, uno adelante otro atrás de las cuatro ruedas unidas, siendo estas últimas las que obran en la fuerza del vapor sobre los rieles, y las cuatro nuevas puramente para ayudar al sostén de la máquina. Al llegar a Canto del Agua, donde principia el mayor ascenso para llegar al mineral, se levantan esas cuatro ruedas sostenedoras, para imponer más peso sobre las cuatro ruedas originales, y de consiguiente, dan más fuerza para la tracción."[56]

"The locomotives bought in England were not designed for this railway. This did not discourage men of initiative like those who found a solution. Here is how the then current (?) manager explains the solution found in 1864 by the determined railwaymen.

'The locomotives received from England, despite each one weighing, with its complement of water and coal no more than seven tonnes, were found too heavy for the old line. Placed as they arrived, on four wheels, (this was) a difficulty that was overcome by adding two more sets of wheels to each one, one in front and one behind the four coupled wheels, the latter being the ones that transmit the force of the steam to the rails, and the four new ones purely to help to support the machine. Upon reaching Canto del Agua, where the greatest ascent to reach the mineral begins, those four supporting wheels are raised, to impose more weight on the four original wheels which consequently give more force for traction.'"

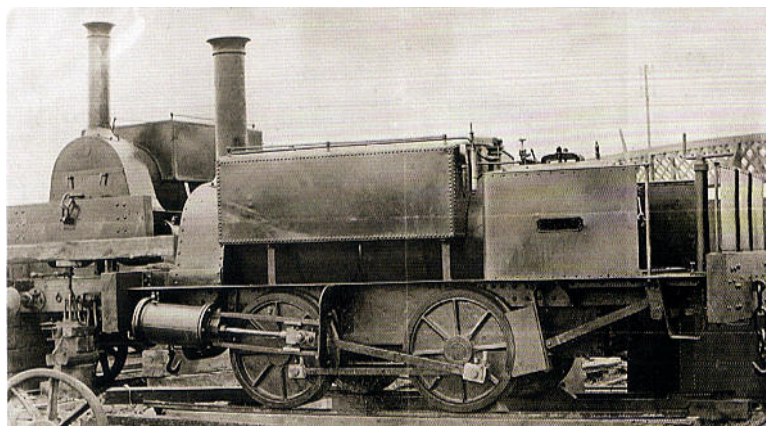
11 'VALLENAR'

w/n ?

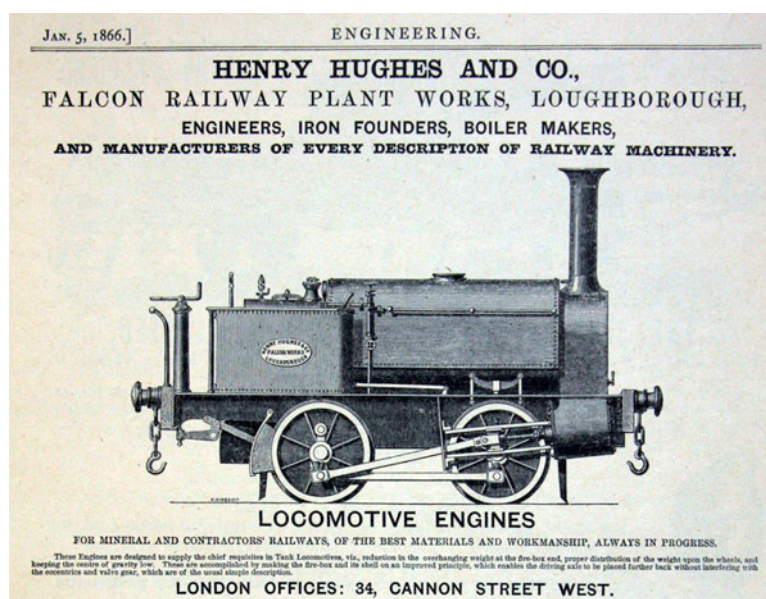
12 'FREIRINA'

w/n ?

Source [33] says 'La FREIRINA' was in 1939 lying totally dismantled at Carrizal Bajo. The name 'FICIRINA' is quoted in a number of enthusiast lists, but the much more probable name of 'FREIRINA' appears in Huidobro Diaz [33]. Freirina is a nearby town in the Huasco valley south of Carrizal, and the administrative centre for this area.



This photo shows typical Hughes 0-4-0ST locos of the 1860s or early 1870s. That on the left with a flat-topped tank seems to be mounted on a standard gauge wagon, presumably for shipment from the Falcon Works. It seems probable that FC de Carrizal locos **11** and **12** would have looked similar. In fact the photo might even show one of them as they would appear to be of narrow gauge but not too narrow.



This is a Hughes advert, as published in *Engineering* in 1866, from the Grace's Guide website.



A Hughes worksplate, from a loco supplied to Sweden in 1871.

From a photo by Edward Barnes.

Superintendent's report to Directors of the Carrizal Railway for the year 1864

Further extracts forwarded by Sr. Radrigan: "... From this it follows that traffic has already reached a point that assures shareholders a good dividend, even on a considerably increased capital, with the help of which it is attempted to replace the animal motive power (already insufficient for the new demands of traffic). with that of steam by means of locomotives...

... The new line was brought to the mine fields, and the rails on the main line from Carrizal Bajo to the station in Canto del Agua were renewed; All of it will be able to accept steam locomotives...

Rolling Stock

The locomotives received from England, although each one, with its complement of water and coal, did not weigh more than seven tons, were found too heavy for the old line, placed as they came on four wheels; difficulty that was overcome by adding two more sets of wheels to each one, one in front and one behind the four joined wheels, the latter being the ones that act with the force of the steam on the rails, and the four new ones purely to help support the wheels. machine.

Upon reaching the Canto del Agua, where the greatest ascent begins to reach the Mineral, those four supporting wheels are raised, to impose more weight on the four original wheels, and consequently give more force for traction."

RESUMEN DEL INVENTARIO DEL EQUIPO.

Enero 31 de 1865.

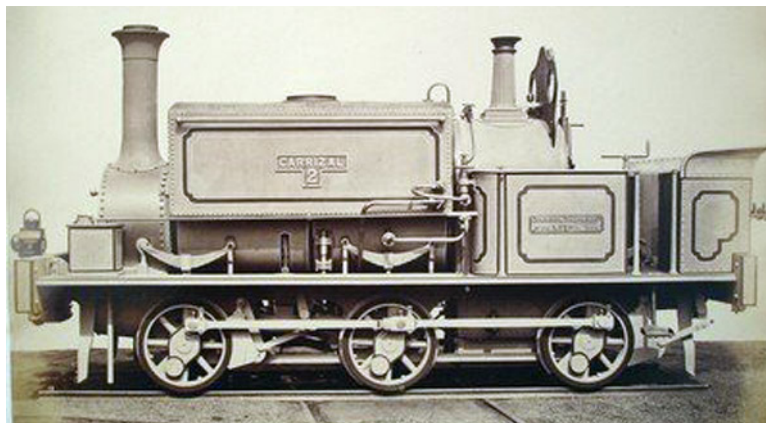
2 Locomotivas su valor.....	\$10,000 00	
1 Coche nuevo de 1. ^a clase.....	1,400 00	
2 id. viejos de 1. ^a id.....	800 00	
2 Volandas.....	400 00	
11 Carros para diversos usos a \$160 cada uno..	1,760 00	
75 id. de carga principalmente nuevos a razón de \$225 cada uno.....	16,875 00	
6 Carros Estanques para agua, \$400 cada uno	2,400 00	
1 Carro pequeño	160 00	
1 id. en construccion.....	80 00	
Animales por la existencia que hai.....	4,000 00	
Arneses " " "	600 00	
		\$38,475 00

0-6-0ST d/w 30", cyls. 12"x17", built by Manning Wardle in 1865 (1-4) and 1867-8 (5-6)

All six were ordered for the Carrizal Railway Co. Modified K class locos. Fitted with Caillet's translation slides on front and rear axles [Harman] and [51]. "The engines will take a gross load of 125 tons, representing 79 tons of cargo, up the first 18 miles, at an average speed of 9 miles per hour, and thy will take a gross load of 52 tons, representing 32 tons of cargo up the 4½ miles extension, at about 5 miles per hour. [51 p64]

1 'ADELANTE'	w/n 158	Delivered with 30" wheels but later fitted with 36" replacements.
2 'CARRIZAL'	w/n 161	Delivered with 30" wheels but later fitted with 36" replacements.
3 'HUASCO'	w/n 160	Delivered with 30" wheels but later fitted with 36" replacements.
4 'GUNDIAN'	w/n 159	Delivered with 30" wheels but later fitted with 36" replacements.
5 'MONDACA'	w/n 233	Delivered new with 36" wheels.
6 'CHAÑARCILO'	w/n 234	Delivered new with 36" wheels. In 1939 it was lying derelict at Carrizal Bajo [33]. The name ' CHAÑARCILO ' may be from the Chañarcitos smelter which was located close to Canto del Agua station.

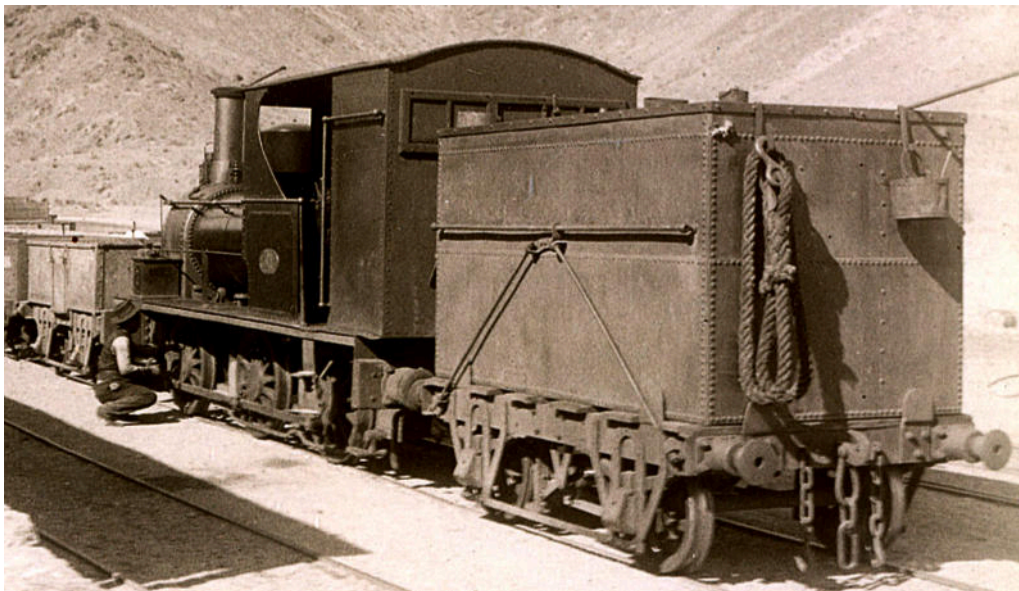
HT's list has the names of **2** and **4** reversed, and no. **6** as '**CHAUFREITO**'. However, builders' photos of '**CARRIZAL**' and '**CHAÑARCILO**' show the names and running numbers as above, as do the Manning Wardle notes reproduced below.



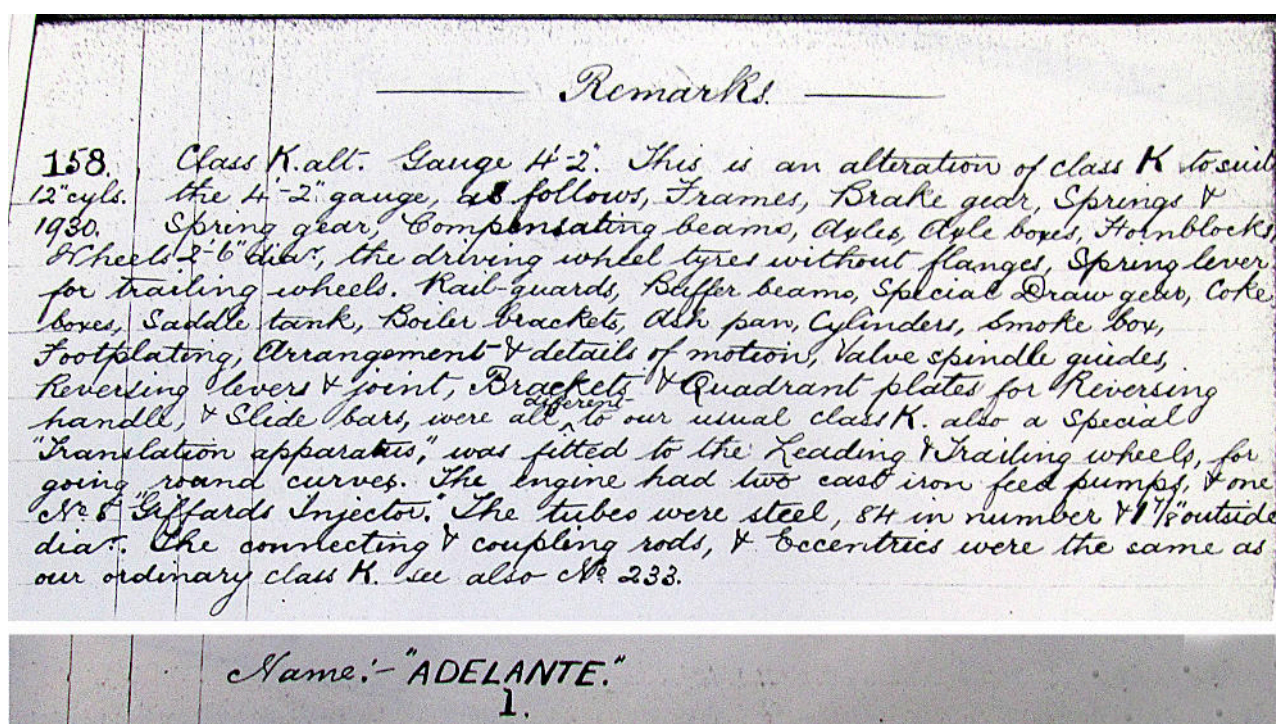
2 'CARRIZAL', photo from Pablo Moraga's collection



6 'CHAÑARCILO', photo from Pablo Moraga's collection



This image of an unidentified 0-6-0 on the FC de Carrizal was provided by Sr. Pablo Moraga. It is not yet clear whether the engine was originally a tender engine or maybe a tank loco which had later been equipped with the improvised tender seen here. It might be one of the Manning Wardles listed above, or possibly one of the James Cross engines listed below.



These notes from the Manning Wardle archives give details of the first loco supplied to this railway. The pages for the succeeding three engines merely say that they were identical to no. 1.

Remarks	
233 12 cyl 3180	Glas K alt. Gauge 4'-2". Same as 158. With the following alterations. Wheels 3'-0" dia. Steam dome on fire box shell. Canopy over driver. Brass pipes for watering brake blocks. Extra washing out plugs etc. see drawings Order N ^o 1930 & 3180. Note a number of duplicate parts were sent out afterwards under Order N ^o 12435. Also the engines have since been supplied with Giffard's injectors N ^o 6 size with pipes & attachments complete see drawing Order N ^o 4569. See also N ^o 158

234 12 cyl 3180	NAME MONDACA. 5 Glas K alt. Gauge 4'-2". Same as 233.
-----------------------	--

	NAME CHANARCILO 6
--	-------------------

Similarly, these are the notes describing nos. 5 and 6.

A missing engine?

The photos above show that the Manning Wardles built for the Carrizal Railway were numbered 1 to 6 from the start. It seems certain that the locos which follow, built by James Cross were ordered on the other hand by the Cerro Blanco railway. Whether they were numbered originally is unknown, for neither builders' loco lists are complete. At a guess, when the two railways were combined in 1880 a single numbering scheme was created, with the Cerro Blanco engines merely following on from the Manning Wardles, and then the pair of Hughes locos. However, there is a gap in the numbers as now recorded, with no number 7. It is possible though, that the later numbers are each one place higher than they should be, for one source records the highest two numbers as 10 and 11, rather than 11 and 12.

Three tender locos, d/w ? cyls. ?, supposedly by James Cross and Co. of St. Helens in 1866

Source [13] says built by James Cross & Co. but there is little info available about the locos built by that firm. These may have become the railway's numbers 7-9 [14]; P. C. Dewhurst clearly thought this was the case, and Lowe [59] also gives those numbers. Cross only built about sixty locomotives in total before they ceased trading in 1869.

Chris West has drawn my attention to a James Livesey ledger page discovered by Frank Jux, which includes a pencilled entry "Paddison's Engines ordered end of 1865 @ £1,195 each." George Paddison (Obituary: Minutes of the Proceedings of the Institution of Civil Engineers 1871.31:222-224.) had been chief assistant engineer on the *FC Santiago a Valparaiso*, then holding posts on the *FC Coquimbo* works and the Asuncion and Villa Rica Railway in Paraguay. After surveying work between Tacna and Bolivia he was appointed Chief Engineer of the *FC de Cerro Blanco*, completing the 70 mile construction in 1968. It therefore looks as though these Cross locos were indeed ordered for the Cerro Blanco railway by Paddison and via James Livesey who was acting as agent for James Cross. "

8 '?' w/n 19

9 '?' w/n 20

In 1939 was lying dismantled at Estación Milla Quince [33], "con tender".

10 '?' w/n 21

Report of the directors of the Carrizal Railway for the second half of the year 1867

"The heavy locomotive expenses are caused in part by an extraordinary train that I ran in some of the busiest months; It was also necessary to put one of the locomotives a new firebox and make major repairs, and one of the small locomotives had a complete overhaul and its water tank was enlarged."

Report of the directors of the Carrizal Railway for the second half of the year 1869

“The Workshops and Equipment machines are in perfect condition, with the exception of two locomotives that need new boilers, which must arrive soon from England, and once provided with them the machines will be as good as new, to meet this expense I would recommend that an amount of \$5,000 be reserved.”

Report of the directors of the Carrizal railway for the second half of the year 1870

“The locomotives are now in perfect condition, with the exception of one that needs its new boiler installed.”

Superintendents’ reports during the 1870s

Second half of 1874: “With the exception of locomotive no. 2, which needs a new boiler and which I have ready to place in it, all the rest of the equipment is in excellent condition.”

Second half of 1875: “In the current semester there will be a need to place a good number of steel rails on the line, worth approximately \$2,000, as well as the new boiler that came from England will also need to be placed on one of the locomotives, if not during said semester, very early in the next one.”

Superintendents’ reports during the 1880s

The majority of Superintendents’ reports published in the *Memorias del Directorio* or Directors’ reports to shareholders through the 1880s say that the rolling stock etc. is in good order. However, there are occasional extra details, though few specify loco names or numbers.

First half of 1881: “...since the arrival of the ‘Caroline Morris’, I have begun the renewal of the locomotives and cars with the stores brought out in that ship. One locomotive is now entirely refitted with new boiler and other repairs.”

First half of 1882: “...the mechanics having been engaged for some time in renewals of rolling stock, fitting on a new boiler and wheels on locomotives...”

July 1882: “Circumstances have compelled me to anticipate the refitting of one of the engines with a new boiler, which with cylinders cost \$ 3,350;”

February 1883: “On the arrival of the stores ordered from England, extensive renewals will have to be proceeded with, fitting a new boiler on one of the engines, in renewing both engine and car wheels, and...”

July 1883: I shall be obliged to fit on one set of new engine wheels and several pairs of car wheels”

January 1884: “...a quantity of stores, including a locomotive boiler and a further supply of wheels, will shortly be required,”

July 1884: “I shall require to charge to this account a locomotive boiler and a further lot of wheels as soon as they arrive from England,” and “...\$1,971.71 for a locomotive feed water purifier which I put up at our other watering place Algarrobal; it is similar to the one erected at Canto del Agua in 1883; they both do excellent service.”

January 1885 (from the Spanish version): “*Se ha cargado a esta cuenta la suma de \$ 1,448 97 para una renovación especial de cilindros, llantas etc. en una de las locomotoras y composturas en los fondos de algunos de los carros. Como a?rá preciso rehacer casi, la locomotora No. 1, durante el Semestre en curso poniendole caldero, cilindro y ruedas nuevas etc....*”

August 1885: “FUND FOR REPAIRS. – This account has been charged with \$ 7,151.89 for new car wheels and the almost entire rebuilding of No. 1 Engine with new cylinders, boiler, tanks and wheels.”

January 1886: *Como en poco tiempo mas habrá necesidad de comprar en Inglaterra dos calderos para locomotoras o hacerlas construir en el pais,...*

August 1891: The renewal of the locomotives with the two new boilers brought out from England towards the end of last year having already been commenced... and There has been charged to this account \$3532.07 for two new saddle Locomotive water tanks made during the half year for the Engines getting new boilers, as I have not yet charged the new boilers I would suggest that nine thousand dollars be set aside for this Fund.

August 1892: There has been charged to this Fund during the half year \$16104.18 for one new locomotive boiler and some car wheels.

January 1893: There has been charged to this account \$4013.20 for new car wheels and axles and some locomotive tubes; as I shall be obliged to charge a new locomotive boiler and some other things as soon as they arrive from England, I recommend that a sum of ten thousand dollars be again set aside for this fund.

July 1893: I have charged to this account \$9018.00 for one new locomotive boiler and some car wheels and axles. As I shall be obliged to charge to this account another new Locomotive boiler and set of Engine wheels during the current half year, I recommend that a sum of ten thousand dollars be again set aside for this fund.

January 1894: I have charged to this account \$11,296.30 for one new locomotive boiler and one set of new engine wheels and some car wheels and axles.

August 1894: I have charged to this account \$14814.97 for one new locomotive boiler and some new car wheels and axles. As I shall be obliged to make further renewals principally of cars and water tanks I again recommend that fifteen thousand dollars be set aside for this fund.

January 1899: I have charged to this fund \$8303.52 for a new set of engine wheels and eight sets of car wheels put into service in December. As during the current half year I shall be obliged to charge a larger sum to this 'Fund' for one new Locomotive Boiler, one set of engine wheels, some car wheels and some materials for new cars, all of which articles are here in store, but will be taken for the service during the current half year, I therefore recommend that ten thousand dollars be set aside for this fund.

0-6-2T d/w ?, cyls. ?, built by Porter in 1907

Widely rumoured to have worked at Carrizal but not yet confirmed.

5 w/n 3856? Connelly's Porter list suggests that 3856 went to Sloss Sheffield Steel & Iron Co. in Birmingham Alabama. Preserved in Coquimbo, as regauged to 1m.



The fleet in 1909

Yunge's *Estadística Minera 1908 y 1909* says the railway had 11 locos. Total of eleven locos in 1909-1911 according to the government's *Estadística de los Ferrocarriles Particulares en Explotación*: the most modern being from 1867 according to [13]. Santiago Marin V. in 1916 gives the same figure.

During 1909 the railway used 1,600 tonnes of Australian coal.

2.4 3' 6" gauge

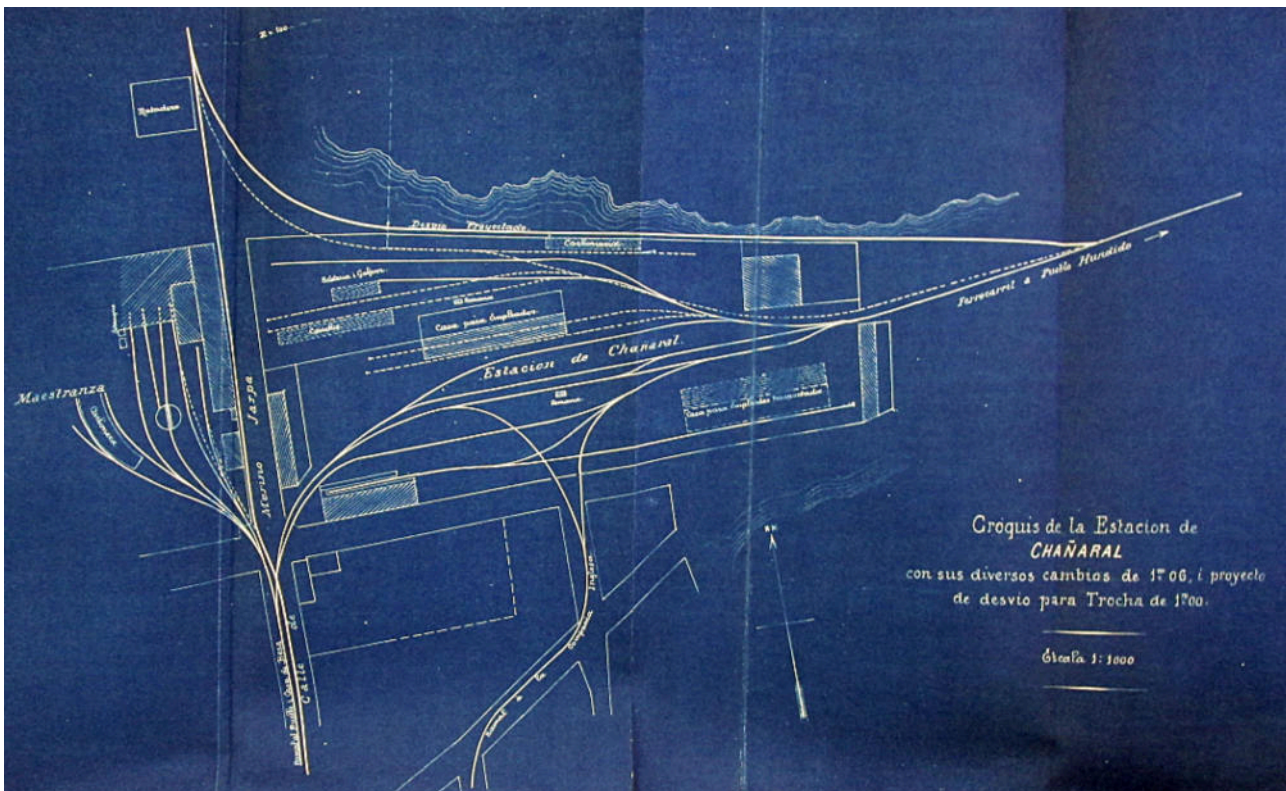
2.4.1 *El FC de Chañaral*

1871-1904 on this gauge

Background

3' 6" gauge. Construction began before 1871, when the first length was opened during August, to link the mines of Las Animas and El Salado with the port. The track was 65km long including the branch to Las Animas. The railway ran independently until sold to the government in 1888. An extension east to Pueblo Hundido (now known as Diego de Almagro) was opened in 1897. From near that terminus a line southward to Inca de Oro was completed in 1904, becoming part of the *FC Longitudinal*. The earlier sections were converted to metre gauge between 1901 and 1904. From 1919 when the *FCAB* took over the running of the *FCNC*, the *FCC* was apparently also leased to them. There were also short branches to the mines Fronton, Progreso, Manto Verde and Carmen, whilst the Las Animas branch was eventually extended to Los Pozos.

In Chanaral itself the later metre gauge railway station and yard is further south and further uphill than the original facilities, as is much of the town. During the 20th century it gradually became apparent that the original site was an invitation to disaster, the río Salado being subject to occasional catastrophic flooding, not to mention the risk of tsunamis overwhelming anything near the beach. Attempts to identify earlier railway features seem destined to failure therefore, as that low-lying area along the northern end of Calle Merino Jarpa has more than once been wiped out utterly. There were seven locomotives according to S. Marin Vicuña [49]. The following locos are in the Dübs list as having been built for the 'Chararal Railway' via Lockhart Tozer & Co. but were for this line.

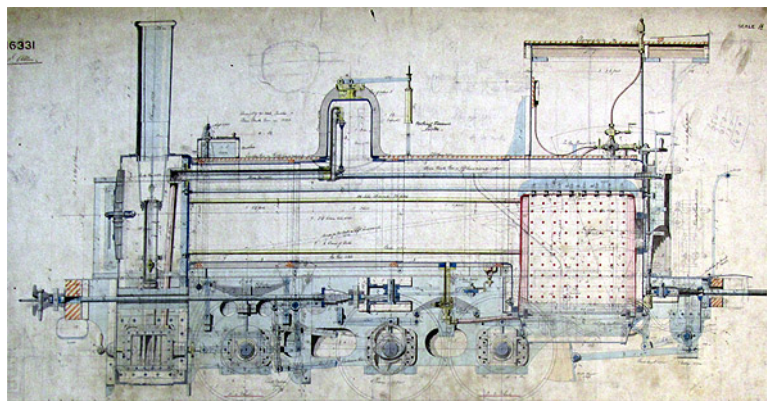


The original station and yards at Chañaral. 3' 6" gauge tracks are shown as continuous white lines, whilst the proposed new metre gauge lines are shown dotted. This whole complex was later replaced by a new station and yard on slightly higher ground to the south-east.

0-6-0T d/w 36", cyls. 12"x17", built by Dübs in 1870

Dübs order no. 399.

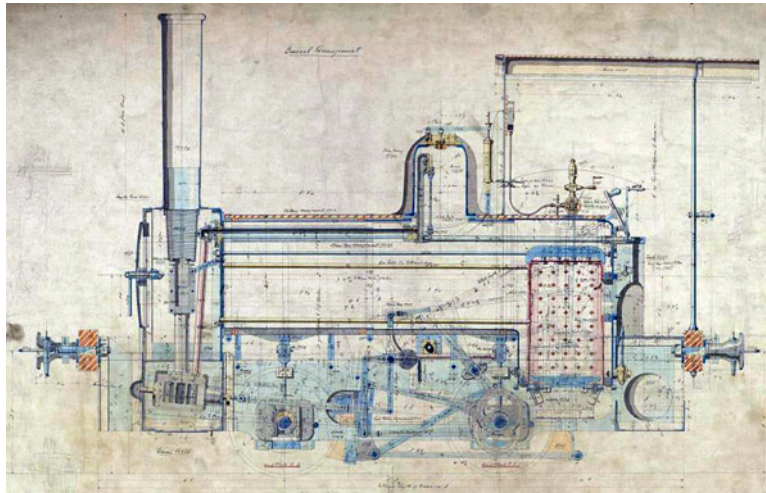
- | | | |
|---|---------|---|
| 1 | w/n 399 | 1888 report suggests inoperable, boiler and tubes worn out, valves, pistons and cylinders all worn. However, second report at same time suggests this is the only loco that could really be made useful and that the boiler only needs a little work. Other report in <i>DOP memoria</i> implies loco in an awful state. 1892 <i>memoria</i> implies back in service temporarily but at only 100psi owing to state of boiler. 1897 in use on suburban passenger trains. |
| 2 | w/n 400 | 1888 report says out of use and needing total reconstruction. 1892 <i>memoria</i> implies back in service temporarily but at only 100psi owing to state of boiler. 1897 in use on suburban passenger trains, but requires constant maintenance owing to age and bad state of boiler. |
| 3 | w/n 401 | 1888 in bad condition needing fundamental repair and a new boiler. Boiler apparently only 3/32" thick at one point and with 3" solid sludge in bottom! 1892 <i>memoria</i> implies back in service temporarily but at only 100psi owing to state of boiler. Overhauled again, 1896. |
| 4 | w/n 402 | 1888 dismantled but can be re-assembled and with a new firebox plate could run services for a few months. <i>DOP memoria</i> supports this. 1892 <i>memoria</i> states that loco only exists as a bare hulk. |



The drawing appears to show a fall plate at the back of the cab, suggesting that these locos were designed to run with a tender. The original drawing is in the care of the NRM in York.

0-4-0T d/w 30", cyls. 9"x18", built by Dübs in 1870

- | | | |
|---|---------|--|
| 5 | w/n 403 | 1888 in use on the town service and on the jetty. But clearly not in a good state. 1889 <i>DOP memoria</i> lists various defects. 1892 <i>memoria</i> states that loco only exists as a bare hulk. |
|---|---------|--|



FC de Chañaral no. 5, in a Dübs GA drawing provided by Sr. Jair Larenas.



Photo from Señor Pablo Moraga's collection. Labelled as being at Chañaral and probably of this engine, despite there being differences from the drawing above. The chimney and dome are different, and the lower cabsides suggest that the tanks had been replaced. Boilers did not last long in the desert and a replacement might well have been slightly different.

Locomotive names

Anecdotal evidence suggests that in 1899 there was a derelict loco named ‘**LAS ANIMAS**’... “*Reconstruccien de una maquina cual desde hace 10 anos estaba afuera del servicio y solamente tenía ruedas, cilindros y su estructura basica: La locomotora "Las Animas"*” [Francisco Javier Aranda Valdivia in a Facebook post]. It is possible of course that this was the Dübs 0-4-0T shown derelict in the photo above. If one engine had been named, then clearly others may also have been.

Reports from the Directors during the 1873-1875 period

Sr. Felipe Radrigan has very kindly forwarded extracts from the six-monthly reports to shareholders which mention the locomotives. Note that these will have been translated from Spanish.

Second semester 1872

A locomotive, in which suitable reforms have been introduced, hauls, as has already been proven with the modifications, almost double the number of the old ones, also admitting 50 percent of the latter's load of minerals. Such brilliant conclusions cannot help but significantly influence the aspirations to soon complete the transformation of the rest of the rolling stock.

First semester 1873

Two locomotive boilers have already been repaired, the one for the street engine being repaired today, all of which have been found in quite bad condition, purely due to the use of distilled water, which is not the most apparent for locomotives. Notwithstanding what has been said, there is still more to be done to achieve the perfect condition of the equipment, as it should be in a company like this, especially when it is relatively small for the heavy traffic that is done.

Second semester 1873

No info about rolling stock

First semester 1874

For this purpose, I would like to recommend the most immediate order to England for iron plates for the lining or cover of the engine boilers (boiler shell), having to change those of two locomotives: a large one and a small one that is used for traffic in the port.

The fire boxes and their tubes, which is what costs the most, are in good condition; therefore, they will continue to serve.

Second semester 1874

As soon as the boilers ordered from England arrive, the locomotives' boilers will be replaced, as they are quite deteriorated due to the use of distilled water.

During the current semester, the two locomotives will be in perfect condition, and with the installation of small wheels on one of them, like the ones No. 4 has today, will be a powerful and economical machine for the heavy traffic of the line.

First semester 1875

Within a few days, locomotive No. 1 with its new boiler, which under current circumstances should serve five years with little replacement, and in four more months No. 5 will be in service with its new boiler. With another boiler, the Company's locomotives will be able to work for about six years without requiring more than attending to their ordinary conservation.

Reports from the government takeover period

The following paragraphs formed part of the first report by the administrator supervising the newly nationalised *FC de Chañaral* in 1888:

Locomotoras

Las que posee son de poco poder para este ferrocarril; Se necesitan locomotoras de mas poder i nuevas, pues todas las existentes estan gastadas completamente.

La No. 1, que es la mejor, no salo de la línea sin que algo lo suceda, su caldero está malo, sus tubos tambien, sus excentricas válvulas, pistones, cilindros ect. todos gastadas i no aguanta arriba de 150 tubos de vapor.

La No. 2 está inutil i no admite reparacion alguna, i habia necesidad de reconstr??? completamente para que pueda servir.

La No. 3 está en mal estado i necesita una reparacion radical i caldero nuevo, pues en su estado actual no aguanta 80 libros de vapor.

La No. 4 que está desarmada, se dar a principio, en estas dias, a armada, i cuo que cambiando una plancha del fogon, ?udiá ?uestar regulares servicios ?oi algunos meses.

? ?das estas son las destinadas al servicio de la línea, i queda un:

La No. 5, es la que hace el servicio urbano i del muelle.

Aljibes

El ferrocarril cuenta con 8 aljibes que es necesario reconstruidos? completamente, pues estan en mal estado i no permiten se haga el servicio de? agua estan destinados sin su reparados radicalmente, uno de ellas está inser?vible i es necesario construirlo lo ?.

A slightly later report, probably from March 1889, gives a little more detail:

Material Rodante



The above reports repeatedly refer to *aljibes*. This usually means a tank or well, and is often used to refer to tank wagons, but in this case the reference to “*Tres Estanques tender aljibes, se han refaccionado i puesto en servicio; los demas estan inútiles.*” in the second report quoted above would seem to suggest that loco tenders were being referred to. This reinforces the comment above that the 0-6-0T loco drawing appear to show a fall plate at the rear of the cab. The existence of a total of eight tenders, for only four mainline locos, implies that they were not permanently coupled and may even have been used in pairs on long trips. Alternatively they may have been used to supply water to outlying stations as well as for the locomotives.

A steam inspection car

The only known reference to this vehicle is in the penultimate paragraph of the second report above, where it is referred to as a *volanda a vapor*, a *volanda* in the north of Chile meaning a handcar or *zorra*. (“*En el norte le llaman volanda a los carritos de empuje.*”) It is possible that this was the Merryweather-built vehicle hitherto assumed to have been on the *FC de Copiapó*.

4-6-0 d/w 40", cyls. 14x18", built by Sharp Stewart in 1890

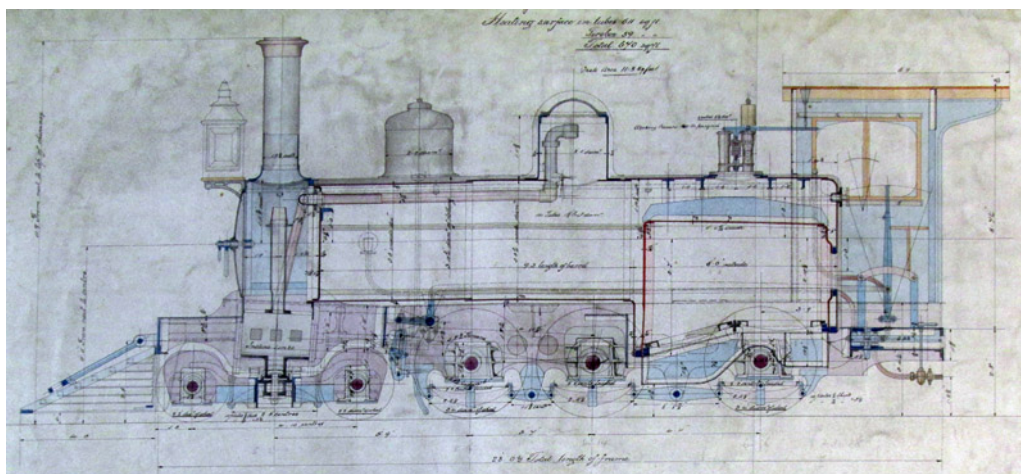
Constructed to the same design as order E927 for the Mogyana railway in Brazil. Ordered as part of the big *EFE* forty-five loco contract through Antony Gibbs & Sons. They were referred to in a letter from Antony Gibbs & Co. to the *EFE* as *tipo ‘Lagerfasz’* which may refer to similar machines built earlier for a customer of that name [MOBR158]. Seemingly ordered through J. Birch & Co. according to SS notes. Photo shows one of the Mogyana locos. The long wheelbase made it difficult to use these locos on the mineral branches in the Las Anímas area. The two 4-6-0s mentioned above cost £3500 in total. At the same time 30,000 Pesos were set aside to repair four locos.

- | | | |
|---|----------|---|
| 6 | w/n 3581 | Was waiting on a new boiler in 1897. |
| 7 | w/n 3582 | 1897 in service on extension works but unreliable owing to current state. |

Given that these last two engines had been purchased by the state when the creation of a metre gauge longitudinal railway was already being thought of, and that they had been derived from a metre gauge design, it would have been sensible if the minor regauging from 3' 6" to 1 metre had been allowed for, so that they therefore could have joined the *Red Norte* metre gauge fleet in 1904. However, no evidence has yet been seen that this was done.



Sharp Stewart builder's pic of one of earlier Mogyana locos.



Sharp Stewart elevation drawing 3944, held at the NRM in York, their reference ALS6/PP01/R.

The fleet in 1893

In 1893 there were apparently four locos in service [*DOP memoria* 1893-4 p 145].

And in 1907

The 1907 *Estadística minera* reported that “*El material rodante es deficiente i la atencion del Estado para este ferrocarril es mui escasa; el servicio es, pues, malo.*” []

2.4.2 El FC de Tongoy

1865-1910 on this gauge

Background

3' 6" gauge. A concession was granted to don José Tomás Urmeneta in 1865 for a railway from the port of Tongoy/Tongoi to Ovalle, though note that this was several years after construction had begun, by Sr. Urmeneta and a Carlos Greene. The line opened in 1867 for 48 km to Cerrillos, where a 17 km branch with a maximum grade of 1 in 19 headed east to the very rich mines at Tamaya. There were at least sixty copper mines around Tamaya, until flooding of the workings between 1888 and 1891 put paid to most of them. A branch to Trapiche was constructed around 1897. The railway was purchased by the government in 1901 and extended on metre gauge from Cerrillos to Puntilla junction near Ovalle (and south-east to San Marcos) meeting the Coquimbo railway. The remainder was regauged to 1m. in 1910. The Cerrillos to Tongoy port section closed in 1935; the remainder between Tamaya and Ovalle closed in 1959.

Unidentified original locos

The 1853 report setting out proposals for the line suggested that four locos would be needed [<https://hdl.handle.net/2027/hvd.hndlq3>]. The report by the railway's engineer in 1860 says there were three locos in use during construction, each with eight wheels. [in *Biblioteca Nacional*].

Source [15] of 1862 then says:

3 x 6-coupled & ten wheels (4-6-0T or 2-6-2T?), cyls 13" x 19", dr. wheels 3' 6", adhesive 15T, total 21T, BP 120 psi, tank engines, for mixed traffic.

1 x 4-coupled & 8 wheels (4-4-0T or 2-4-2T?), cyls 10" x 18", dr. wheels 3' 0", BP 120psi, for mixed traffic.

1 x 0-4-0T, cyls 7¼" x 12", dr. wheels 28½", BP 120psi, for traffic to Tamaya.

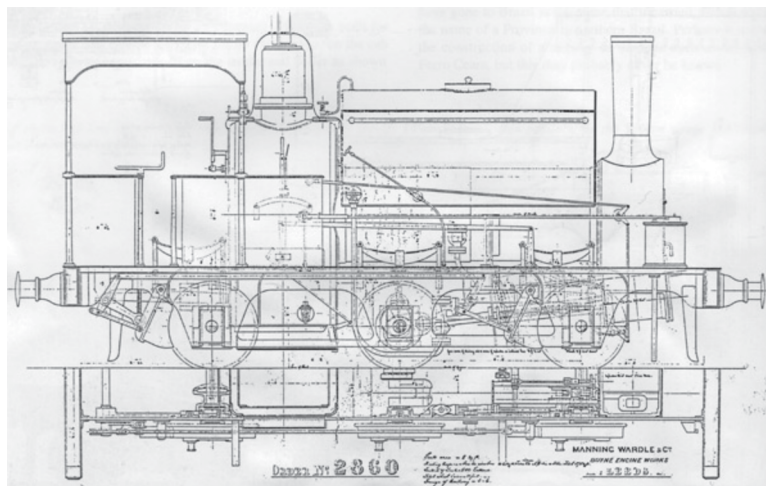
also 3 x locos requiring new boilers, cylinders and wheels and three others unusable.

This seems rather a large number for such a small scale railway. Possibly some engines have been mentioned twice.

0-6-0STd/w 30", cyls. 12"x17", class K altered. built by Manning Wardle in 1866

[11 and MW list] Larger wheels of 37½" possibly supplied later, though 30" wheels still recorded in 1873 [MINT670].

‘MINERO’	w/n 215	Reported in good condition in 1902 following a comprehensive overhaul [MOBR1480]. Present in a 1907 list [MOBR1910].
‘OVALLE’	w/n 216	Reported in good condition in 1902 following a comprehensive overhaul [MOBR1480]. Present in a 1907 list [MOBR1910].
‘HÉRCULES’	w/n 217	Retubed 1902 [MOBR1480]. Present in a 1907 list [MOBR1910].



Manning Wardle GA drawing via Fred Harman's books. He comments that the provision of cab roofs was unusual for early K class locos.

Remarks	
215 12" cyl 2860	Class K. Gauge 3'-6". This is our class K engine adapted to a 3'-6" gauge & required very extensive alterations. See drawings Order N ^o 2860. The wheels were originally 2'-6" dia but have since been increased to that of our class K. Duplicate parts have been supplied under Order N ^o 12269, 13113, & 10846. For which drawings. Boiler with expansion angle irons rivetted to fire box shell smoke box of steel, also wrought iron wheels with crucible steel tyres supplied under Order N ^o 26141 Sept 26 th 1884. Also crank pins & coupling rods altered in the centres supplied same as class K 23100. The crank pins are $\frac{3}{8}$ " shorter on the wheel boss than class K & for wheels see new drawing, see also new drawing of fire box shell with roof & longitudinal stays altered (26141)

NAME MINERO

Remarks	
6 cyls 30	Class K alt. Gauge 3'-6". Same as 215. Wheels of cast steel with crucible steel tyres 2'-6" dia supplied under Order N ^o 35843. Oct 1894. Also new boiler smoke box with circular door fire boxes with large corners cast iron eccentric straps etc supplied under Order N ^o 35843. Oct 1894. New copper fire box supplied under Order N ^o 60646. April 16 th 1904.

NAME OVALLE

Remarks	
214 12" cyl 2860	Class K alt. Gauge 3'-6". Same as 215. This engine had new boiler complete, cast steel wheels etc supplied Order N ^o 35837. Oct 1894

NAME HERCULES

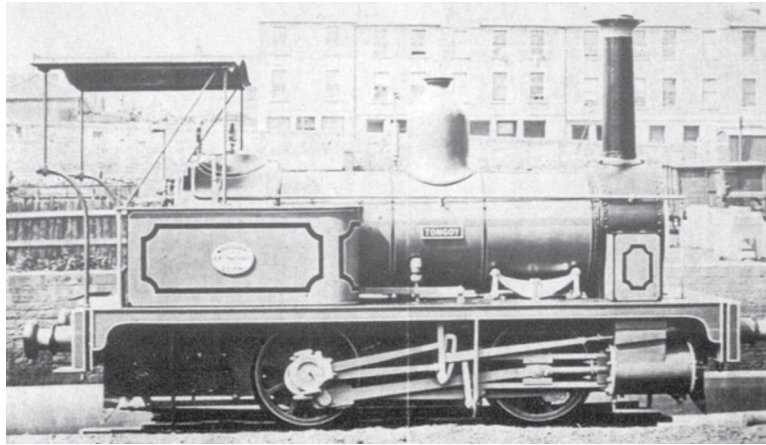
Notes made by Manning Wardle to record details of these three engines.

0-4-0T d/w 36" cyls. 10x18", built by Hawthorn of Leith in 1866

Davison patent well tank type locos. Samuel Dobson Davison was the managing partner in Leith for the Hawthorns. He died in 1883, after which loco building here seems to have ceased.

? 'TONGOY'	w/n 364	Presumably this engine must definitely have been de-named or out-of-service by 1888 when a new 'TONGOY' was purchased.
?	w/n 365) A Directors' report in 1882 (see below) refers to a loco
?	w/n 366) 'URMENETA', which may have been one of these.

Reputedly all out of use for some years by 1881 [Note in LI issue 23, but source not given.]



Loco '**TONGOY**', built by Hawthorn of Leith. Photo from Señor Pablo Moraga's collection.

0-4-2T d/w 30" cyls. 6x12", built by Black Hawthorn in 1867

3' 6" gauge, for export via W. & J. Lockett, might have come here as 1867 was when the railway was officially opened. W. & J. Lockett were certainly active in Chile and Peru.

? w/n 45
? w/n 46

References to locomotives in Directors' reports during the 1860s

First semester report 1867

Sr. Felipe Radrigan has very kindly forwarded quotes from this and other company reports: "There are five locomotives assembled and in excellent condition for work, and the other two that have been used only by the contractor, are being repaired, to leave them in good condition for service, at his expense.

It has not been possible to take on this work before, due to the shortage of mechanics, and because it was necessary to carry it out separately from the company's other works."

Second semester report 1867

"The locomotives, I am pleased to tell you, are also in good condition; Those that the contractor had in use during the construction of the line have been completely repaired; The only more than regular deterioration that we noticed is in the flanges of the front wheels due to the frequency and suddenness of the curves on the slope; The main defects that are noted are that the fire-boxes get hot and a lot of coal is consumed, but I hope to partially remedy both before long."

Impressing the Peruvians

Incidentally, in 1869 the Peruvian government specification for the proposed railway between Viña and Cajamarca referred to the Tongoy railway, to its gauge and to its 12 tonne locos, explicitly requiring that that railway be built to the same standards [*Los Ferrocarriles de Peru*, 1871, tomo II, p76].

2-6-0T d/w 30", cyls. 13"x18", built by Rogers in 1870

One of these may well have been constructed as a saddle tank. Rogers order number J683-706. These loco names were taken from two of the many rich copper mines at Tamaya served by the railway. A report by the loco superintendent written in 1873 makes clear that prior to the arrival of these two locos all of the engines on this railway had been of British origin [].

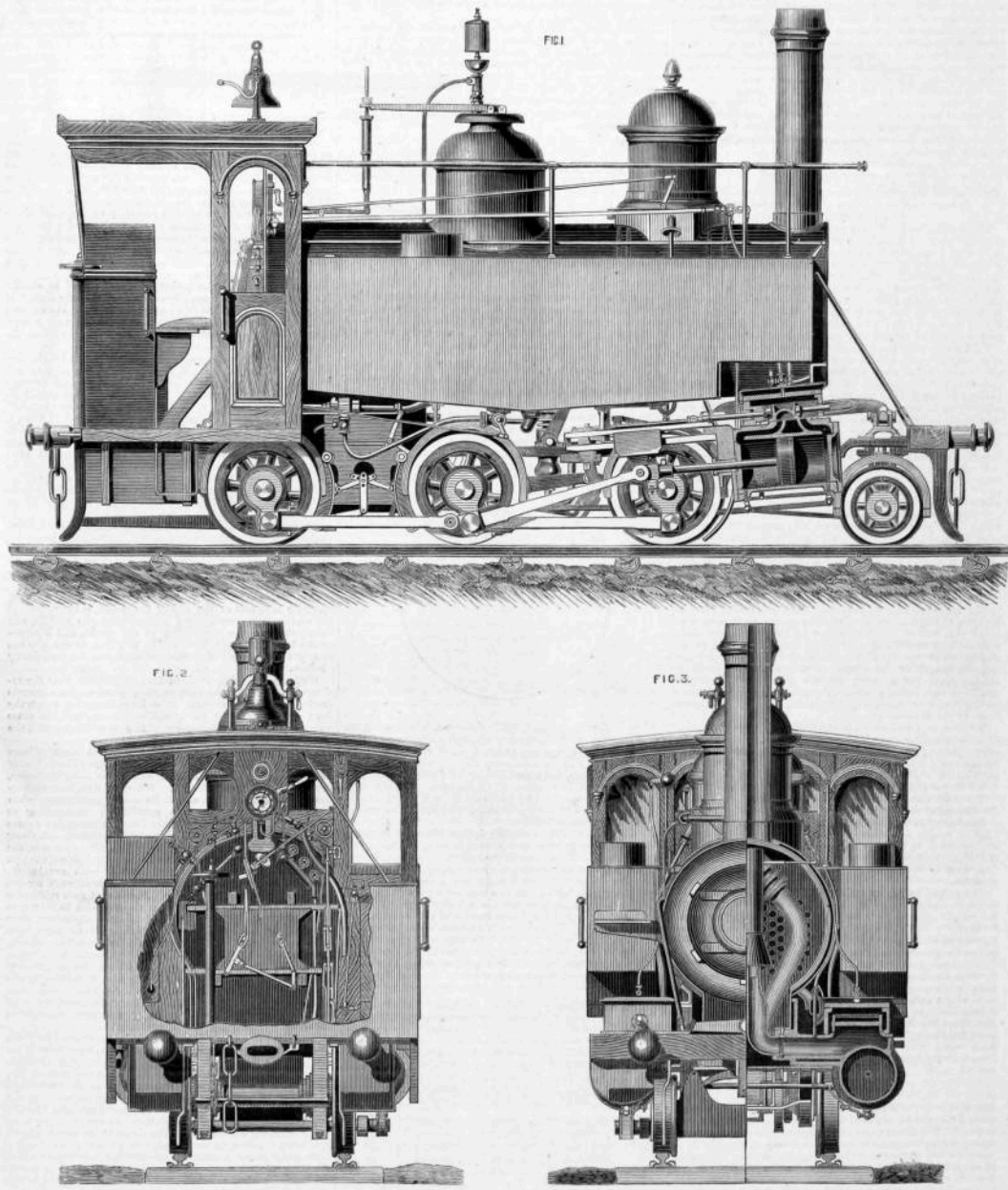
In the issue of *Engineering* published on March 24th 1871, p201-2, there appeared the following engravings of these engines accompanied by a short article: "We illustrate, above, a tank locomotive constructed at the Rogers Locomotive Works, Paterson, New Jersey, U.S., for the Tongoy Railway of Chili, a line of 3 ft. 6 in. gauge having sharp curves and steep gradients. The engine has outside cylinders 13 in. in diameter with 18 in. stroke, these cylinders being slightly inclined and having the valve chests on the top as shown. As the engine will have to travel down long in-clines

arrangements have been made for admitting steam into the exhaust passages so as to prevent dust from being drawn into the cylinders from the smoke-box. The engine is carried on eight wheels, three pairs being coupled as shown, while the front pair are connected to a swinging truck constructed on a plan designed by Mr. Willian S. Hudson, the superintendent of the Rogers Locomotive Works. Referring to the front elevation it will be seen that the leading axle-boxes are connected by two plates shaped so as to form horns between which the ends of a transverse bearing spring are situated, and to which these ends are secured by swing links. The spring-box is provided with a centre pin upon which the whole can swivel, the thrust of the spring being transmitted to a transverse beam which is connected at its ends to a pair of equalising beams coupled at their other ends to the springs of the front pair of coupled wheels. To take up the fore and aft strains the plates by which the leading axle-boxes are connected are attached to a pair of radius bars which turn on a centre situated just in front of the axle of the leading pair of coupled wheels. By this arrangement there is obtained a modified form of Bissell truck with swing links substituted for the ordinary inclines and with equalising beams for distributing the shocks due to travelling over an uneven road. The central pairs of coupled wheels are without flanges so that altogether the engine is capable of traversing curves with great freedom. The water is carried in side tanks as shown, and the boiler is fed by one injector and one pump worked off the left-hand crosshead. The remaining features will be understood from the engravings without special description, and we need merely add in conclusion, therefore, that we are indebted to the *Technologist* for the particulars of the engine we have described.

8 ‘CAMPANIL’ w/n (1717 in CF list)

9 ‘PIZARRO’ w/n (1770 in CF list)

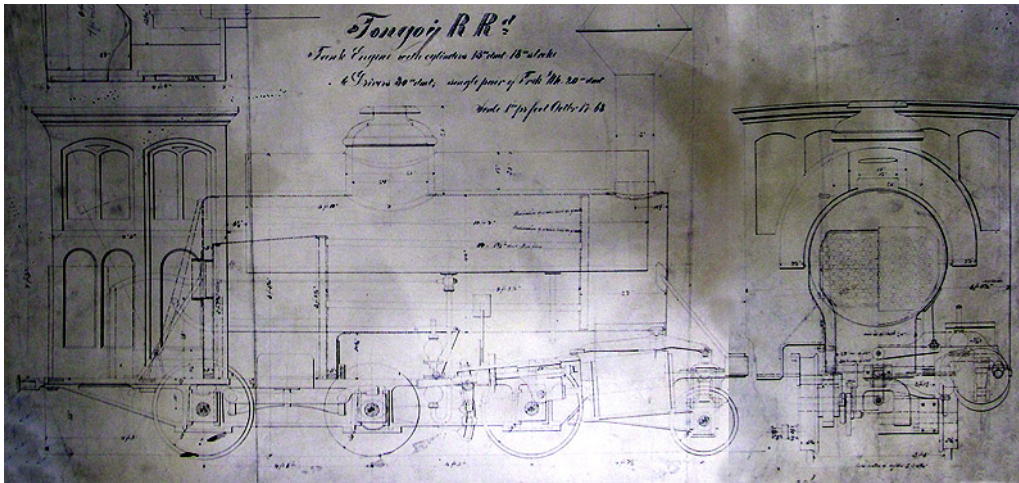
TANK LOCOMOTIVE FOR THE TONGOY RAILWAY OF CHILI (3 FT. 6 IN. GAUGE).
CONSTRUCTED AT THE ROGERS LOCOMOTIVE WORKS, PATERSON, NEW JERSEY, U.S.A.



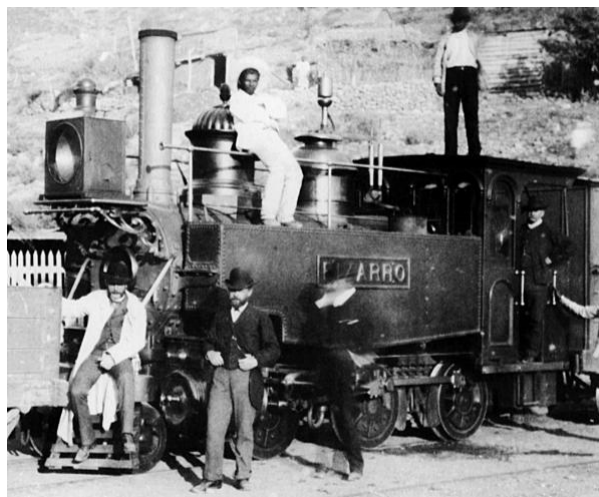
Engravings of the Rogers 2-6-0Ts from *Engineering*, 24th March 1871 p201.



Rogers builder's pic.



Whilst this image was reversed from a photostat copy of a Rogers blueprint as supplied to P. C. Dewhurst, it might possibly represent an early proposal rather than a loco as actually built. The blueprint is dated October 1868, but there do not seem to have been any locos with these dimensions built until no. **8 'CAMPANIL'** (clearly with side tanks) in 1870. As no. **9** was built almost simultaneously, it is unlikely to have been different from no. **8**.



No. **9** in service, probably up on the slopes of the Cerro de Tamaya to judge from the shadows.

References to locomotives in Directors' reports during the 1870s

First semester report 1872

"New tyres have been ordered for the machines used on the Tamaya branch, and twenty-five tons of rails."

Second semester report 1872

"The equipment and track are in rather fair condition.

With the rails ordered there will be enough for the year's renovations.

With the strong service of more than five years, the time is approaching when it will be necessary to renew the fireboxes of three of the locomotives."

"I wish to repeat here what I have had the honor of telling you verbally on several occasions about the convenience of selling the three small locomotives we have and replacing them with two stronger ones.

With more powerful machines it will be possible to reduce the number of trains and achieve very important savings.

Later there will be heavy traffic between Sauce and Tongoy, and then trains leaving Tongoy must pass to Sauce instead of stopping at Cerrillos. For this service the locomotives are not suitable, because between Cerrillos and Sauce there are gradients of four percent. The locomotives I am referring to were built for the route between Cerrillos and Tongoy, where the highest gradient is two percent."

Second semester report 1873

“The road, equipment and telegraph are in good condition. This time it will only be necessary to renovate two locomotives that require important spare parts, and buy 30 to 35 tons of rails.

In my opinion it would be advisable to sell two of the small locomotives that we own and replace them with a large one. In this we would save employees, fuel and maintenance costs.”

First semester report 1875

“The equipment is in fair condition, but in this semester some of the boilers will have to be refurbished and for this purpose I will need two more mechanics. There are enough materials.”

Second semester report 1876

“... This semester a new boiler will be needed for one of the machines...”

First semester report 1877

“This semester another 50 tons of steel rails will be needed, a new boiler for one of the English engines and some bronze tubes for the locomotive boilers.”

A Fowler 0-4-0ST for 3'6" gauge was exported via Duncan Fox & Co. in 1878, Fowler 3589 with cyls. 9x14". This was more than likely to have been for Chile, where there were only a couple of railways of that gauge open at that time.

2-6-0T d/w 33" cyls. 14x18", built by Sharp Stewart in 1886, 1887 and 1888

[11] suggests these were replacements for the Rogers 2-6-0Ts above. They were SS order nos. E885, E893 and E913.

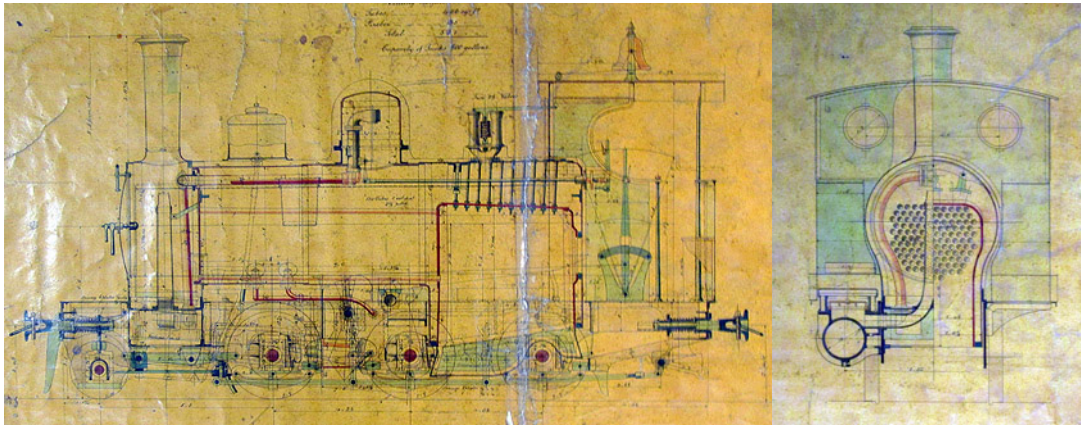
? ‘CAMPANIL’	w/n 3359	Variety of top and bottom end maintenance tasks undertaken in 1902: <i>Se hicieron y colocaron todas los tubos con sus respectivos anillos, se remacharon los tubos en la plancha correspondiente, se cambiaron los tirantes de cobre por otros de fierro en la caja del caldero, se reparacion las paralelas, se hicieron y colocacion las zapatas de la cabeza del piston y se ajustaren las bielas, las cuñas de las cajas de las ruedas y los brazos aceptadas de estas ultimas.</i> [MOBR1480]. Present in a 1907 list [MOBR1910].
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? ‘PIZARRO’	w/n 3378	Photo is in volume NBL 20 in Mitchell Library. One third of tubes replaced 1902 [MOBR1480]. Present in a 1907 list [MOBR1910].
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? ‘TONGOY’	w/n 3420	Present in a 1907 list [MOBR1910].
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Sharp Stewart builder's pic.



Sharp Stewart elevation drawing 4528, held at the NRM in York, their reference ALS6/PP01/O.

2-2-0 d/w ?, cyls. 3½x6", built in the maestranza at Tongoy in 1884

"Máquina chica, para inspección y servicio de la línea, construida en la maestranza de este FC en 1890 – pesa 3 toneladas y con cilindros de 3½ x 6." [MOBR1910]

This was probably the 'carro a vapor' reported in 1902: *"A ésta maquinita, destinada especialmente a la inspeccion de la via, se le arreglaron las bielas, i la caja de distribucion, i se ajustaron sus descansos. Actualmente se termina la construccion de ruedas nuevas, a fin de que, con un gasto insignificante, continúe prestando importantes servicios"* [MOBR1480]. A photo shows this to have been a strange four-wheeled (though rodless) locomotive with inside cylinders and well tanks at front and rear. The wheels were built-up rather than cast, and a minute four-wheeled van with similar wheels seems to have been attached for the track inspector to travel in. A document from around 1905 says *"Por alquiler del carro a vapor y carrito anexo, se cobrará a vagon de (\$0,50) cincuenta centavos por kilómetro recorrido, con derecho a cuatro personas, pagando, como minimum, veinte kilómetros."* [MOBR1809]

'RELAMPAGO'

w/n ?

Present in a 1907 list [MOBR1910].



This photo was found by a Baguley Drewry representative and sent home as a curiosity.

The civil war

"This has been caused by the bridges and engines being rendered unserviceable by the military authorities in March last, since when all traffic has been suspended." [Belfast News-Letter, 17 October 1891, p8.]

References to locomotives in Directors' reports during the 1880s

First semester report 1882

"Besides executing the usual repairs of locomotives, to maintain them in working order for the daily traffic, the mechanics in the workshop have been engaged, putting a new fire-box and a new pair of cylinders on the engine "Hércules" and overhauling it completely, and preparing a new boiler for the "Pizarro." The locomotive "Urmeneta" has received 16 and the "Pizarro" 14 new tubes, and in the Donkey engine, placed at the end of the mole 36 iron tubes have been renewed, besides repairing it thoroughly."

Second semester report 1882

"During the present it will be necessary to install a new firebox to the 'Ovalle' machine with its corresponding tubes,

use approximately 33 tons of steel rails to renew the bars that are already very worn out, and also change a couple of cylinders to the **'Hercules'** machine, the total value of which will be about \$4,650."

"The exceptional character of Tongoy Railway (perhaps the only example in the world which for a distance of 10 miles forms a continuation of curves of 187 to 250 feet radius, combined with gradients of 3% to 5.10 %, entails as a consequence, heavier expenses in renewals of machinery & rolling stock than in any other line of equal length. The workmen are constantly occupied in maintaining the locomotives and cars in working order, making such renewals as may be required. Notwithstanding the reduced number of the staff in each department, the renewal of the engine **'Hercules'** has been finished, the **'Ovalle'** has been dismantled, and a boiler with its fire box and tubes is ready to be fitted on the **'Pizarro'** and soon as may be necessary. Twelve freight cars have been provided with new bottoms, and six almost entirely renewed, using for their reconstruction, only part of the previous iron framing. By a rare coincidence, two breakages, which were speedily repaired, occurred in the axles of the driving-wheels of the engines **'Pizarro'** and **'Minero'** during the half year, but fortunately without any injury to life, as the accidents happened in the up journey from Cerrillos to Tamaya."

First semester report 1884

"All the repairs necessary to maintain in good order the 5 engines at present in service and the pumps, tanks, piping, etc., have been made; whilst the American engines, which, after 14 years constant service in gradients of 4 and 5%, between Cerrillos and Tamaya had suffered considerable deterioration, have been completely overhauled: In order to economize in the labour employed in pushing the hand cars used in the inspection of the line by the engineer and line-keeper, I have decided to replace it by a small steam car, which is actually in course of construction. Profiting by the mechanics' spare time and by old wheels and stores its cost will not exceed \$ 200."

First semester report 1885

"As the two locomotives **Campanil** and **Pizarro** have been exclusively employed since the year 1871 in the service between Cerrillos & Tamaya, the other three of Manning, Wardle & Co. being only used for light or special trains between Tongoy & Cerrillos, they are now very much worn-out, and will require within a very short time new boilers, fire-boxes, and cylinders. The small steam-car built in the Workshop was finished in March last, and renders valuable service in the inspection and repair of the line."

Second semester report 1885

*"Locomotoras. – En vista del estado ruinoso en que se encuentran hace tiempo las dos máquinas **Campanil** y **Pizarro**, se resolvió adquirir una nueva locomotora, que se espera en el segundo semestre del año en curso.*

Although the net profit of the past half year appears somewhat under that of the preceding six months, this is entirely due to the order which the Directors have thought it necessary to forward to England for a new locomotive to replace the **"Campanil"** which is in a very dilapidated state after 15 years' constant service in the heavy gradients of Tamaya. The cost of the new locomotive will be \$ 20000 approximately, and although it will not arrive until the ensuing half year the Board considers it but prudent to lay aside \$ 5000 each six months to provide for its payment."

"Locomotives. In view of the dilapidated condition of the engines **'Campanil'** and **'Pizarro'**, it was decided to order a new locomotive which is expected in the second half of this year."

First semester report 1886

"...the future cost of the new locomotive, which there is reason to believe already on the road, and which will, fortunately cost less in England, than the sum originally estimated."

Second semester report 1886

"At the close of 1886, the new locomotive **'Campanil'** which appears to be of good sound material, and well adapted for its work, arrived at Tongoy and began running in January last on the steep gradient of Tamaya hill. But, in view of rapid deterioration of the other engines, belonging to the Company, the Directors have considered it advisable to order another locomotive similar in all respects to the **'Campanil'** and expect it will arrive in Chile in a short time; later on, a third new engine may be required."

"Rolling stock & Locomotives. In consequence of the continued use of the rolling stock and locomotives during 20 years, the Company now finds itself in the necessity of undertaking their gradual renewal.

The two most powerful engines, '**Campanil**' and '**Pizarro**' which carried on the service, under difficult conditions, on a road with a five per cent grade and curves of 187 feet radius, on the Tamaya hill, are completely useless, and of the others, which run between Tongoy & Cerrillos, only two are in a fit state to do work and they will be worn out in nine or twelve months. The Company has therefore been compelled to purchase for the traffic on Tamaya hill, two new locomotives, one of which has already arrived in Tongoy and been working since the beginning of the year with the best results: the second, with the usual spare pieces of machinery, is expected during current half year or at the beginning of the following.

First semester report 1887

"At the end of the half year under review, the second new locomotive ordered from England reached Tongoy, and already renders valuable services. Its construction is in all respects similar to the first one received, and has given the same satisfaction.

Notwithstanding the foregoing, however, the rapid deterioration of the other engines will oblige the board to order, very soon, another engine from abroad; whilst instructions have already been given to order the stores necessary for a renewal of one of the English locomotives which still remains in a state for further service.

The new "**Campanil**" recently built in England, which has been running since the month of January last, has given every satisfaction, and it is to be hoped the new "**Pizarro**" of similar construction will yield an equal result. On the "**Hercules**" a new tube-plate has been fitted and is at present undergoing a general repair, so I expect in three months it will be ready for active service.

The other engines "**Pizarro**" (the old one) "**Ovalle**" and "**Minero**" are pretty well worn out.

The locomotives have run during the six months a distance of 13,656 kilometres..."

Second semester report 1887

"As almost all the traffic has been done by the new locomotives **Campanil** and **Pizarro** and as during the six months 19811 58/100 metrical quintals more than in the same period of 1886, have been carried, the great advantage and economy of these powerful engines are apparent.

The locomotives have remained under steam 1448 hours and have run a distance of 13366 kilometres on a consumption of 15.67 kilograms of coal per kilometre.

The **Hercules** has received a thorough overhaul and is now, as well as the two engines recently purchased, in very good condition."

First semester report 1888

"...although during the half year 24,381.22 metrical quintals more were carried than during the first half of 1887. This economy has arisen from the almost exclusive use of our new Locomotives. During the present half year we hope to have running the new engine '**Tongoy**', of same construction as the '**Pizarro**' and '**Campanil**', as also the '**Minero**' for which we have ready a new boiler and other necessities.

The Locomotives have been under steam 1366 1/2 hours and run a distance of 13,036 kilometres on a consumption of 15.47 kilograms per kilometre."

Second semester report 1888

"The new engine "**Tongoy**" similar in all respects to the **Pizarro** and **Campanil** began running during the half year and has given equally satisfactory results."

"Although the Locomotives have drawn 13,966 24/100 metrical quintals less during past half year, the expenses, as is seen above, have been almost exactly the same as those of the 2nd half of 1887, this result being entirely due to the higher prices paid for the last cargoes of coal received."

"The Locomotives have been under steam 2024 hours and have run a distance of 16,017 kilometres on a consumption of 12 44/100 kilograms of coal per kilometre."

First semester report 1889

"The renewal of the engine '**Minero**' with a new boiler, fire box and cylinders was completed during the half year. The locomotives have been under steam 1136 1/4 hours and have run a distance of 12552 kilometres on a consumption of 11 59/100 kilograms of coal per kilometre."

Second semester report 1889

Nothing of relevance.

Later history

By 1895 only four locos were usable, two of 21 tonnes, 1 of 18 and 1 of 16 tonnes.

The locos may all have been scrapped after the regauging which was completed around 1910.

Locos for the mines at Cerro de Tamaya?

See also the sub-metric gauge locos file for a pair of Manning Wardle 2-4-0Ts supplied to the unusual gauge of 3' 0½", probably for the copper mines at Tamaya.

2.4.3 El FC de Mejillones á Caracoles

1873-1877



Background

Gauge 3' 6", rather than 1 metre as originally surmised. Developed from earlier schemes to link the Bolivian coastline up to the cities on the altiplano. Proposed in particular to access the silver mines of Caracoles, and nitrate and guano deposits along the way. This government-promoted line was the loser in a railway construction battle between an impoverished and financially-mistrusted Bolivian government on the one hand, and the affluent Chilean-backed investors and trading houses of Antofagasta on the other. The latter were promoting the building of what later became the FCAB, to which this scheme from Mejillones port was a clear threat. Both Mejillones and Antofagasta belonged to Bolivia at the time, as did the ports of Cobija and Tocopilla.

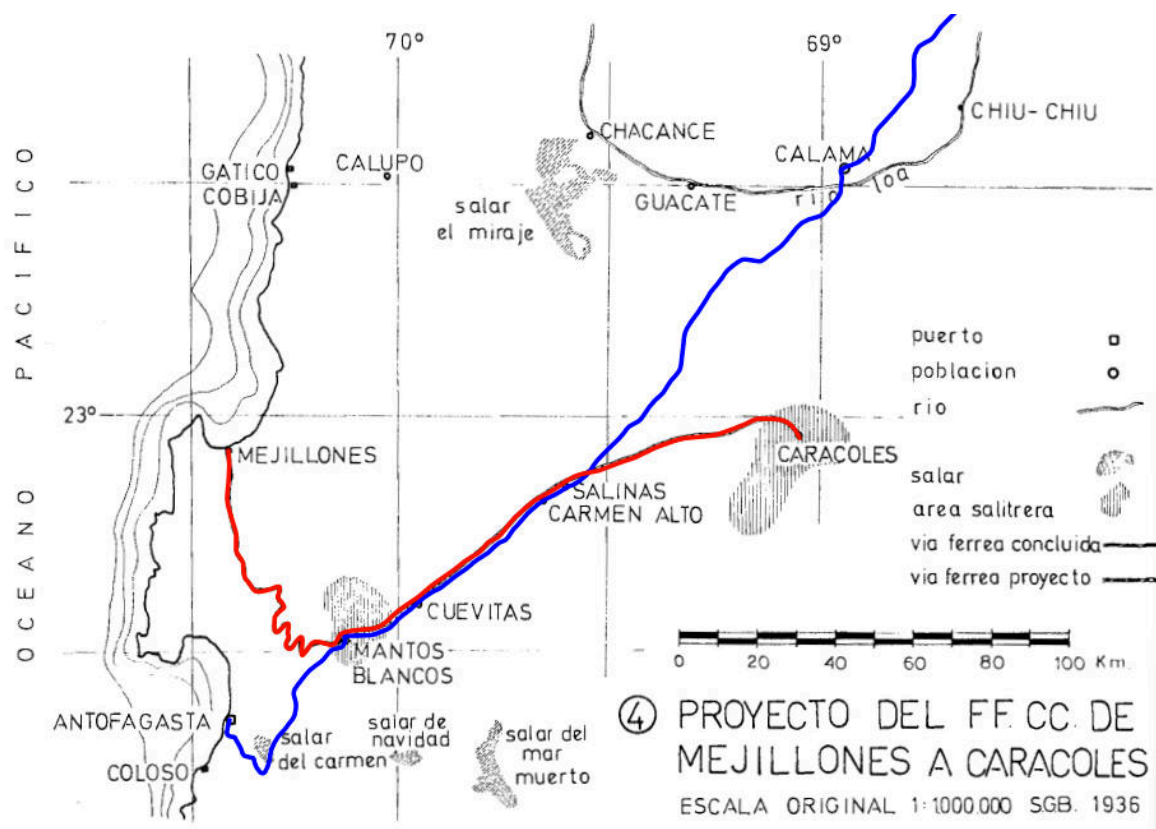
The *Daily Alta California*, on 12th October 1872, stated "A Railroad was naturally the first thing thought of in the effort to provide facilities for working. The Republic of Bolivia has finally taken the matter in hand and kept the enterprise out of the hands of monopolists. The road will be constructed by Messrs. Watson & Meiggs, prominent bankers of Valparaiso, the latter being a son of Henry Meiggs, the great South American railroad king. The former is now in this city and will leave today for the East on the overland train.

The route of the road will commence at Mejillones, almost due west from the mining district; thence will pass about thirty miles over a sand plain, and thence, ascending by a gradient of about one hundred feet to the mile, through a long quebrada, the bottom of which is caliche, hard and firm, to the Caracoles mines. It will be about one hundred and twenty-fives miles in length. Very little cutting or blasting will be necessary in accomplishing the work.

The gauge will be three feet six inches. The contract requires the use of the Fairley (sic) engines, which can only be obtained in Leeds, and American passenger and freight cars. Owing to the high price of freight at present, the ties will all be brought from Chile instead of California. The syress will be used for this purpose. Estimates have been made

by the Kimball Car Manufacturing Company, in this city, for the construction of the cars. Mr. Watson has visited the works of the Company, and is well pleased with what he has seen. If the cost price compares favorably with those of the east, California will receive the preference.”

Had the railway been completed, it would have been owned and operated by the Bolivian Government.



The red line shows the intended route of the FC de Mejillones á Caracoles, and the blue the route of the FCAB main-line. The section of the FCMC between Mejillones and Mantos Blancos was also later duplicated by the FCAB, partly by their Antofagasta to Mejillones route, and partly by the Estación Pampa to Estación Prat (near Mantos Blancos) short-cut, the latter now re-opened to provide a route for sulphuric acid trains that avoids them passing through the city of Antofagasta.

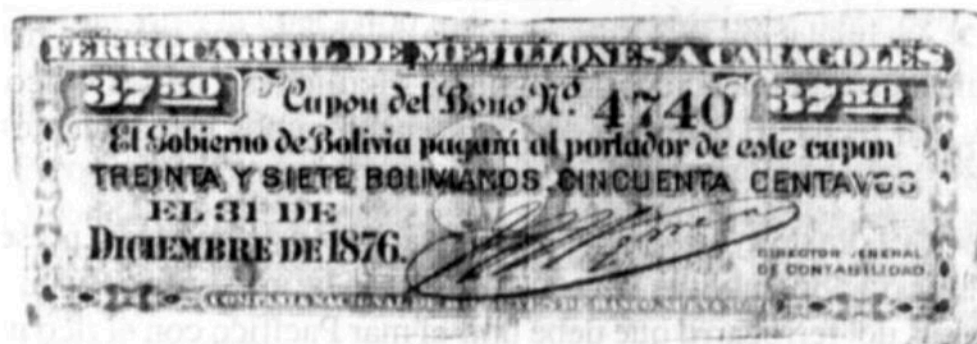
The (very) full financial and political story is told (largely from the Bolivian side) in Marta Uriosto de Aguirre’s 1979 thesis entitled *Zoilo Flores Aponte y el ferrocarril de Mejillones a Caracoles* [65], but here is a short summary:

An 1872 contractual proposal by Srs. Watson and Meiggs (John Meiggs fronting the scheme for his brother Henry) was accepted by the Bolivian government, with three years being allowed for the construction. Source [42 chapter 14] states that work began in January 1873, but became paralysed some months later owing to disagreements between the government and the contractors.

The concession was transferred to Sr. E. (ie. Henry or Enrique) Meiggs in 1875 but progress was still slow and in July 1877 the government rescinded the contract. Several miles had been railed by then and earthworks extended beyond Cuevitas. The route headed south-east from Mejillones, to the FCAB’s *estacion* Prat (ex *estacion* Mantos Blancos), then parallel to the FCAB as far as Cuevitas and Salinas, finally diverging through Punta Negra to reach Caracoles. Harold Middleton has also studied this scheme in detail. He has written up his findings at [<https://trenesdelperu.blogspot.com/2014/09/>].



(ANVERSO)



(REVERSO)

Locomotives

Until recently virtually no information had come to light, apart from that a loco nameplate was found sometime after the tsunami, supposedly of the first engine of the railway. It read ‘**La BOLIVIANA**’ and was donated to the Antofagasta Primary Education Museum, but its current location is unknown.

However, delving into Spanish language research papers and documents in early 2023 revealed the following snippets of information:

Source [65]: Apparently the section of line to Carmen Alto was inaugurated by the arrival of the first two locomotives in December 1872 , and Uriosto writing of August 1873 says “ *Tienen dos locomotoras poderosas, más de cien mil durmientes, y se espera de un día para otro el arribo de once mil toneladas de rieles.* ” [source 65 chapter 9 first paragraph]

An annex or appendix to source [65], setting out the contract conditions agreed in 1872: “The company will equip the line with at least the following equipment: eight locomotives of the "Fairlie" system, ten carriages of the 1st class; twelve 2nd class cars; sixty open American wagons, with skeleton sides, each capable of carrying six tons, six enclosed wagons for baggage and valuable metals; five pushcarts; eight wagons for horses, mules and cattle of all kinds.”

Mejillones was to have “A building to accommodate five locomotives with their pits, tanks and relevant apparatus;” and “A turntable fifteen metres in diameter;” and “In Caracoles they will build a station equal to the one in Mejillones.”

Source [66] quotes Charles Watson of the railway building consortium writing in 1875: “*Para entonces, se denunció que las dos primeras locomotoras Fairlie importadas desde Inglaterra, tenían una potencia inadecuada para gradiente casi continua de 4/%, un detalle técnico no menor agravado por el uso de rieles inapropiados para máquinas de primera fuerza*” [66]

Source [67, vol. 1873 p57] from 1874 sets out changes in the contract which have the effect of relaxing the requirements for the loco fleet. In practice the variety of locos listed probably reflected the situation on the ground at that time, in other words it is effectively a fleet list: “*RESOLUCION DE 3 DE ABRIL. Ferrocarril de Mejillones. Modificaciones al contrato de 10 de Julio*

Ministerio de Hacienda e Industria.—La Paz, Abril 8 de 1873.

Vista la precedente esposicion del Ingeniero del Estado y del Ingeniero en Jefe de la empresa del ferrocarril de Mejill-

ones a Caracóles, y teniendo en consideracion: 1o. Que aunque por la especificacion 12a. del art. 1o. de la contrata de 10 de Julio de 1872, se determina que la empresa debe dotar a la línea del ferrocarril arriba espresado de ocho locomotoras del sistema Fairlie, esta condicion es modificable, segun el último inciso de dicho artículo, en que se ha estipulado que las locomotoras serán de la mayo fuerza que se conoce en esta clase de construcciones; y 2o. que los Ingenieros informantes no creen conveniente que las ocho locomotoras sean de un mismo sistema, y sí de otros sistemas que actualmente están ofreciendo brillantes resultados;

El Gobierno acepta la modificacion que proponen los mencionado. Ingenieros en cuanto a la calidad de las locomotoras; de manera que en lugar de las ocho del sistema Fairlie, deberá la empresa dotar a la línea

De dos del sistema Fairlie:

De tres de la fábrica Dubbs y Ca. Glasgow Exorcis:

De dos de la fábrica Rogers Locomotive, Works—Paterson, New Jersey—Estados Unidos:

Y una de la fábrica "Gran Locomotive", Works—Paterson, New—Jersey—Estados Unidos.

Remítase al Prefecto del Departamento de Cobija para que mande notificar esta providencia a los jerentes de la empresa del ferrocarril de Mejillónes, para que su aceptacion se tenga como modificacion pactada en el contrato.

Regístrese y publíquelo. ”

FRIAS. —Pedro García.

A previously unknown user of Fairlie locomotives

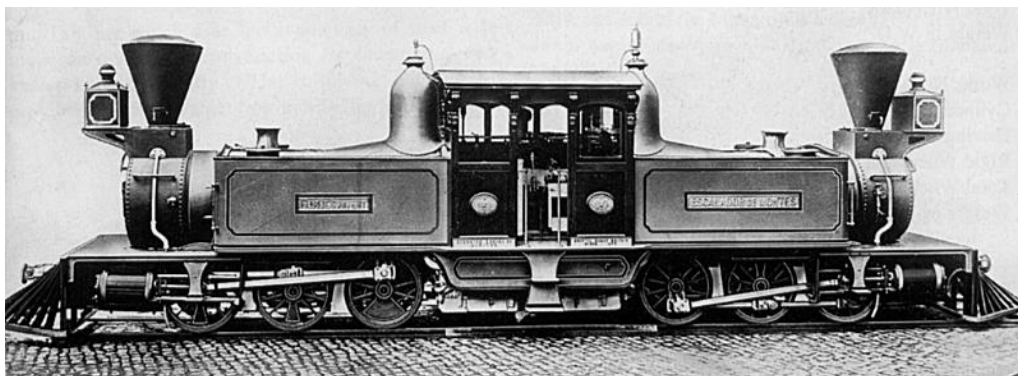
The references to Fairlies above came as a tremendous surprise. Reseachers such as P. C. Dewhurst, Rowland Abbott and Donald Binns, during the past sixty or more years have attempted to pin down the locations where each Fairlie locomotive worked, none with complete success. The paragraphs below speculate as to what the Fairlies and other locomotives were, but so far none have been identified with any certainty.

0-6-6-0T Double Fairlies d/w 36(or 39?)", cyls. 13¼x18", built by Avonside in 1872

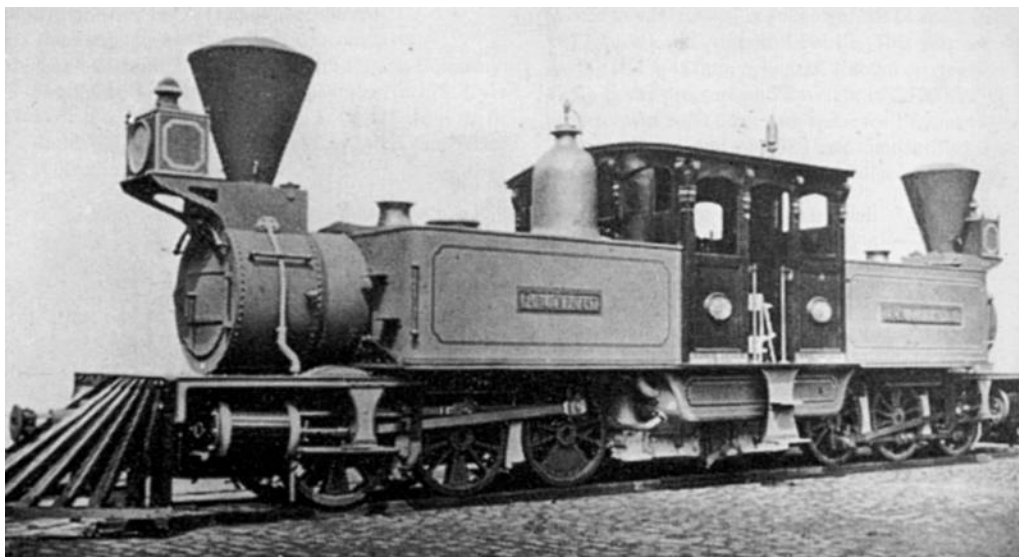
Ordered by Fairlie Engine Co. This was a batch of three machines, numbered in the usual Avonside Fairlie manner with two works numbers for each engine. The Avonside numbers were 958-9, 960-1 and 962-3. If two arrived here then where did the third engine go? One of them was photographed before leaving Avonside's works carrying spark-arresting stacks and the name 'ESCALADOR de MONTES'.

‘?’ w/n ?

‘?’ w/n ?



These two builders' photos seem to show the first of the three Avonside machines nos. 958-9, 960-1, and 962-3, bearing the name 'ESCALADOR de MONTES'.



?-?-? d/w ?, cyls. ?, built by Dübs in ?

Ordered by ? It is difficult to know what these might have been, The only Dübs engines for this part of the world in the early 1870s were 0-6-0Ts 399-403 for the Chañaral Railway in 1870, and 0-4-0s 687-689 for Peru via the London Banking Association in 1874. Notably, the geographical list of NBL and predecessors' orders archived at the Mitchell Library in Glasgow contains no references at all to Bolivia. It is of course possible that these engines were second-hand from elsewhere, or that they had been in mind but not actually ordered.

? w/n ?

? w/n ?

? w/n ?

?-?-? d/w ?, cyls. ?, built by Rogers in ?

Ordered by ?

? w/n ?

? w/n ?

2-6-0? d/w ?, cyls. ?, built by Grant in ?

Ordered by ? The various Grant lists are very incomplete. However, Grant did build a number of 3' 6" gauge locos for Costa Rica in 1873-4. It is quite possible that an engine for Mejillones piggy-backed on those orders, or indeed that a machine supposedly for Costa Rica actually went elsewhere since fewer have been identified there than were supposedly built. The Best and Dubits list of Grant locos allocated nos. 1003-4, 1043, 1046-1051, 1053-1054 and 1061-1065 to engines for Costa Rica, with the first three and also 1053-4 being for 'Punta Arena RR', ie. they were delivered via Puntarenas on Costa Rica's Pacific coast. Weber has all bar the first three as 2-6-0s. The O'Connor Grant list suggests that 1003-4 and 1053-1054 might have been 4-coupled.

? w/n ?

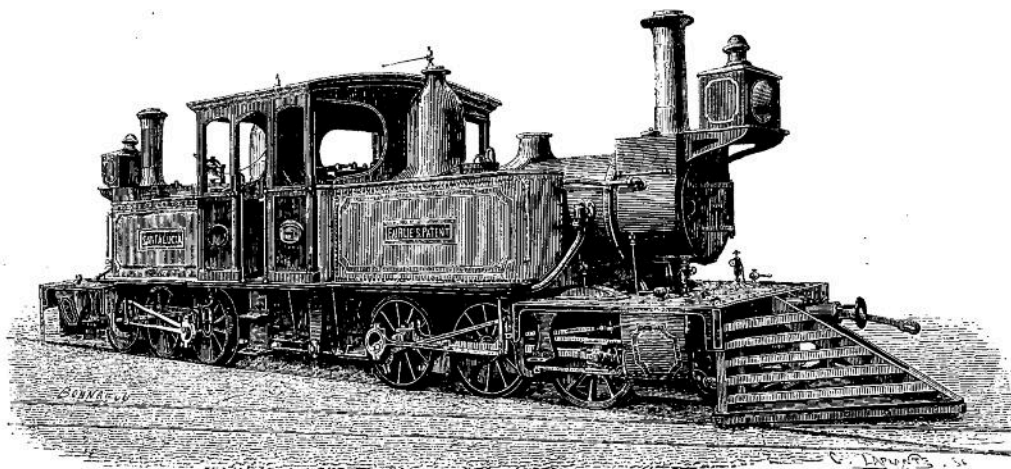
A French tourist's words from 1875

"Ce sont ces quatre mille mules qu'il s'agissait de remplacer par quelques locomotives : aucun obstacle insurmontable — mes études me l'avaient démontré — ne pouvait les empêcher de franchir le désert. Mais si les explorations préparatoires que j'avais faites dans les solitudes de l'Atacama n'avaient pas été sans rencontrer des difficultés, l'exécution du chemin de fer lui-même rencontra bien plus d'empêchements moins à croire à la réalisation prochains du chemin de fer qui donnera la vie à tout le littoral bolivien, et permettra de travailler dans des conditions incomparablement plus favorables à l'exploitation des merveilleux gisements de Caracolès. Aucune des objections qui ont été faites à l'établissement de cette voie ferrée n'a de valeur sérieuse. Voici, par exemple, ce qu'écrivait un professeur de l'université de Santiago : « Les nombreuses quebradas, de cent cinquante à deux cents mètres de

largeur, qui coupent le chemin, rendraient nécessaires des ponts et des viaducs immenses et nombreux; si l'on voulait les éviter pour en faire le tour à l'ouest, alors on ne rencontrerait plus d'eau pour alimenter les machines. Quant au télégraphe électrique, le bois étant chose très-rare et très-précieuse, les poteaux seraient constamment volés par les chercheurs de mines et par les chercheurs de guanacos..., etc. » — Ce professeur de Santiago semble ignorer tout à fait les progrès accomplis par l'art de l'ingénieur : les quebradas ne sont pas un obstacle, quand on emploie le matériel roulant américain, qui passe par des courbes du plus petit rayon; c'est la locomotive de l'Anglais R. Fairlie qu'il faut adopter, et cette locomotive permet de remorquer de lourds convois sur des rampes de trois à quatre pour cent. (Les rampes de nos chemins de fer français ne dépassent guère un à un et demi pour cent.) Cette machine peu connue, et que par ce motif nous avons cru utile de reproduire (voy. p. 352), est double ; construite sur deux trucs mobiles, et pourvue de douze roues, elle peut franchir les plus petites courbes et conserve une adhérence telle qu'elle traîne les plus lourdes charges sur un plan très-incliné. Les services du mécanicien et du chauffeur se font latéralement ; d'un côté le chauffeur a ses deux foyers; de l'autre, le mécanicien a les organes du mouvement; tous deux sont abrités par une élégante cabine en bois verni qui met aussi les parties délicates du mécanisme à l'abri du sable. Les soutes à charbon et les caisses à eau sont d'une capacité calculée pour contenir la portion nécessaire à l'aller; derrière la machine est placé un wagon-citerne contenant l'eau et le charbon nécessaires pour le retour. Quant au télégraphe, le professeur chilien ignorait, paraît-il, l'emploi des poteaux en tôle de fer galvanisée, qui ne peuvent tenter les voleurs. D'ailleurs, partout où les chemins de fer et les télégraphes s'établissent, ils deviennent bien vite, de la part des populations, l'objet d'un respect justifié par les services qu'ils rendent.” [68]

The second half of the quote above contains M. Bresson's comments on the Fairlie locos in use on the railway.

Translated, they read: “This professor from Santiago seems completely unaware of the progress accomplished by the art of engineering: the quebradas are no obstacle when one uses American rolling stock, which passes through curves of the smallest radius; it is the locomotive of the Englishman R. Fairlie that must be adopted, and this locomotive makes it possible to tow heavy convoys on gradients of three to four percent. (The ramps of our French railways hardly exceed one to one and a half percent.) This little-known machine, and which for this reason we thought it useful to reproduce (see p. 352), is double; built on two moving bogies, and provided with twelve wheels, it can cross the smallest curves and retains such grip that it drags the heaviest loads on a very inclined plane. The services of the fireman and the driver are done laterally; on one side the fireman has his two fire-doors; on the other, the driver has the organs of movement; both are sheltered by an elegant cabin in varnished wood which also protects the delicate parts of the mechanism from the sand. The coal bunkers and the water boxes are of a capacity calculated to contain the portion necessary for the outward journey; behind the machine is placed a tank car containing the water and the coal necessary for the return.”



La locomotive du désert. — Dessin de Bonnafoux, d'après une photographie.

The engraving which accompanied M. Bresson's article in 1875. As was acknowledged in the caption, this was drawn from a photo, actually of one of the pair of standard gauge Avonside Fairlies which ended up on the FC

Norte de Montevideo in Uruguay. In fact they were slightly smaller than their 3' 6" gauge sisters at Mejillones but they looked very similar. Minor differences in appearance included the outside link motion seen here, the River Plate style horizontal-barred cow-catcher, ditto, and the chimneys selected for the different fuels that were anticipated when they were built.

The end of the story

In April 1877 the concession was re-awarded to Francisco Bascuñan Álvarez. He worked the existing length for a while, but gave up as he could not make it pay. A 1905 list in [] suggests that the abandoned “metre gauge” railway between Cerro Gordo and Mejillones del Sur had been 22.5km. long.

Then a *maremoto*, on the night of 9th May 1877 (confirmed by checking Antofagasta municipal records, though that conflicts with other dates given above), destroyed locos and stock, and that seems to have been the end of this scheme. “Mejillones was visited by a tidal wave 65ft. in height ; two-thirds of that town are completely obliterated, guano shoots, wharves, launches, boats, water distilleries, railway stations, locomotives, cars, and furniture being all swallowed up by the sea. Six persons were drowned.” [*Manchester Courier* and other UK papers 25th June 1877]

This was the same earthquake and tsunami that ended the life of the Patillos railway further north.

“Jorge Cruz Larenas, en su libro “Fundación de Antofagasta” nos entrega la visión más completa. Explica que el terremoto “causó grandes estragos, pero no tanto por la fuerza del temblor, pues las casas eran de madera, sino por las tres salidas de mar. La segunda salida de mar ocurrió como 15 minutos después de la primera y su ola se calculó en unos 22 metros de altura. Arrasó con malecones, muelles, escalas de piedra y las dos primeras manzanas de la población frente a la playa. Los perjuicios más graves fueron causados en la estación que desapareció con casa, habitantes, locomotoras y maestranza”.” [https://www.diariomejillones.cl/reportaje/13_03_16.htm]

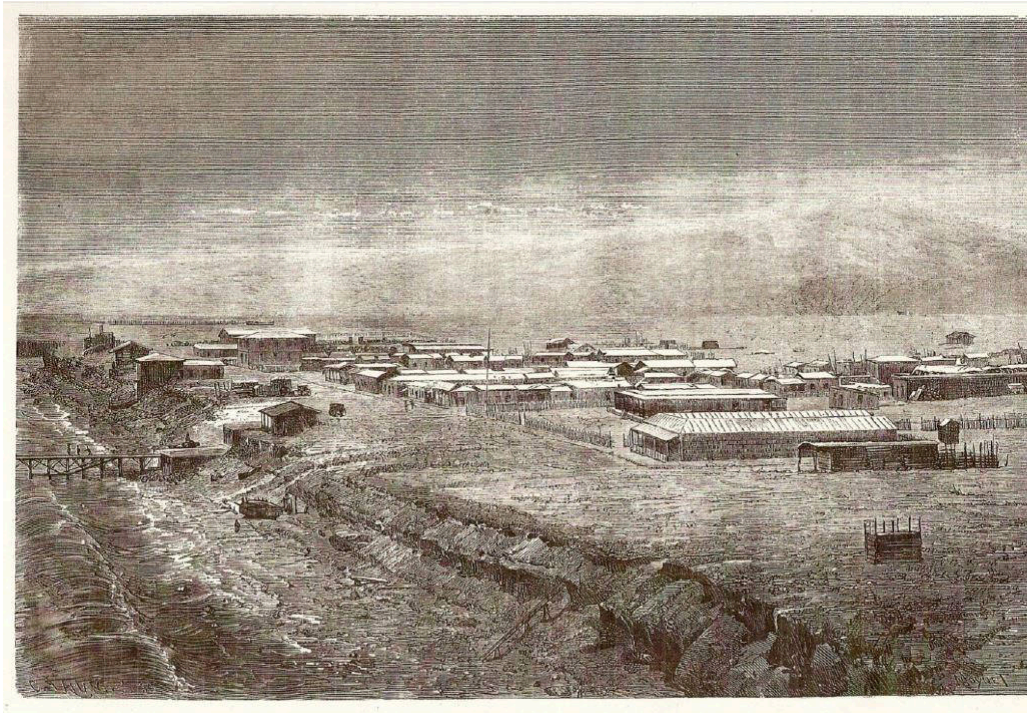
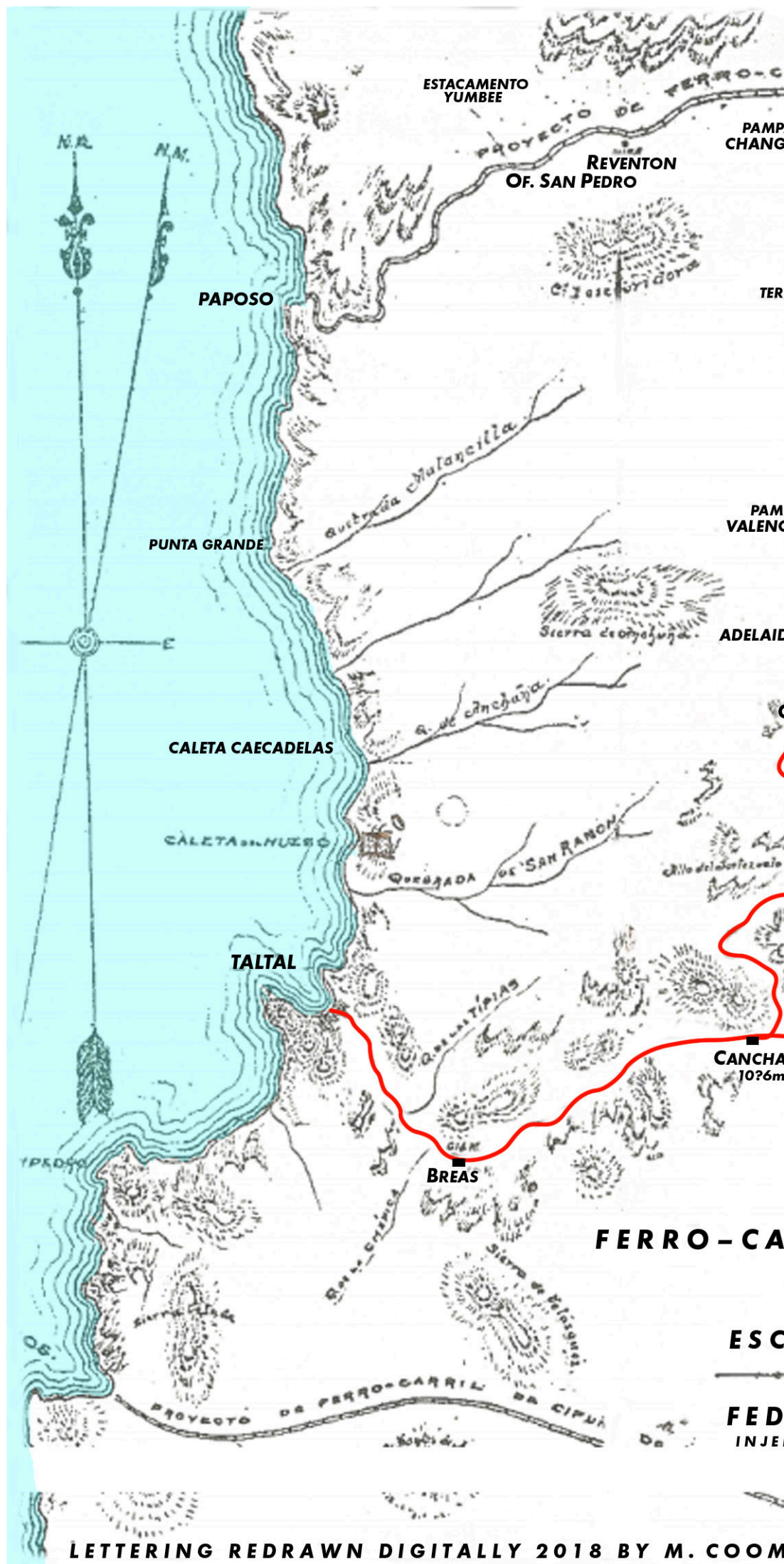


Fig. 6. Vista general de Mejillones. Dibujo de J. Moynet, según una fotografía.

Some of the rails and sleepers were later used to build an urban tramway in Antofagasta. Incidentally, it rather looks as though the modern road south out of Mejillones for 18 km. until it reaches the main north-south highway, is built on the old trackbed of this railway. From that junction southward, the earthworks of the line can be traced very clearly using Google Earth, for about 20km. until a point halfway along the Pampa to Prat section. After that I have not succeeded in finding them. That total length of traceable trackbed – ie. 38 km. – equates closely to

Map published originally in the *Guia administrativa, industrial i comercial de la provincia de Tarapacá y Antofagasta*, 1909, by Domingo Silva. This digital version with lettering and railway routes redrawn, by Martin Coombs, 2018.



2.4.4 *El FC de Taltal*

1882-1977



The FC de Taltal's initials as seen on an original carriage-side transfer in the collection of Gerald Hartley.

Background

3' 6" gauge. Line opened for traffic 28 Oct 1882. In 1905 the company were asking for permission to construct a 15km branch northward from oficina Chile to oficina Moreno, with a view eventually to continuing all the way to Paposos though this would involve difficult engineering. Locos largely moved over to oil-burning 1908-13. Closed 1976-7. See map on following double page spread.

0-6-0T d/w 36", cyls. 13"x20", built by Nasmyth Wilson in 1881

The specification for these engines set out by Livesey & Co. is available online at <https://archives.imeche.org/archive/railways/livesey-and-henderson/james-livesey-and-company-specifications-1-100/2077656> original section 21 digital page 62. The original builder's photo shows a short smokebox and stove-pipe chimney, whilst the safety valve springs are exposed above a shallow plate-work fairing. However, another photo, of no. **2**, probably taken after the re-boiling in the 1890s, shows a longer smokebox extending almost to the front buffer-beam and with a capped chimney. The safety valves are now encased within a large brass cover, possibly over a raised firebox. In addition a bell has been fitted in front of the dome, and the cab step backplate now seems to widen out at the bottom, rather than tapering steadily downwards as before. A final difference is that whilst the first picture showed chopper couplings, the later one illustrates the loco fitted with link-and-pin couplers. The photo accompanying the 1943 *Railway Magazine* article, mentioned below, shows the long smokebox, full safety valve cover, bell, and link-and-pin coupler, but with a stove-pipe chimney.

1

w/n 208

Report in mid 1886: Running and in fair condition, soon requires wheels changing, new slide valves and spindles.
Report in mid 1887: Running and in good order.
Report in mid 1888: Running and in good order.
Report in mid 1889: Undergoing general repairs.
Report in late 1890: Working satisfactorily. New boiler fitted in 1895-6 according to Directors' Report. "*Thoroughly overhauled and renewed...*" in 1897-8, according to Directors' Report.
Report in mid 1902: "thoroughly repaired both as regards engine and boiler".

2	w/n 209	<p>Report in mid 1886: Running, but requires a thorough repair, new ties, valves and spindles.</p> <p>Report in mid 1887: Undergoing a thorough repair, it is not yet known if she requires a new boiler or not.</p> <p>Report in mid 1888: Waiting for new boiler and cylinder.</p> <p>Report in mid 1889: Running and in good order.</p> <p>Report in late 1890: Working satisfactorily. New boiler fitted in 1895-6 according to Directors' Report.</p> <p><i>"Thoroughly overhauled and renewed..."</i> in 1897-8, according to Directors' Report. Photo confirms that it received replacement boiler.</p>
3	w/n 210	<p>Report in mid 1886: Running and in good working order.</p> <p>Report in mid 1887: Running and in good order.</p> <p>Report in mid 1888: Running and in good order.</p> <p>Report in mid 1889: Running and in good order.</p> <p>Report in late 1890: Working satisfactorily.</p> <p>This was probably the loco withdrawn very early, pre 1895 (see note below).</p> <p>Report in mid 1909: "reconstructed, using new parts made in the workshops, and was ready for service on 30th June 1909"</p> <p>Report in mid 1909: "fitted with a new firebox"</p>
4	w/n 211	<p>Report in mid 1909: "fitted with a new smokebox tube-plate"</p> <p>Report in mid 1886: Running and in good working order.</p> <p>Report in mid 1887: Running and in good order.</p> <p>Report in mid 1888: Undergoing general repairs.</p> <p>Report in mid 1889: Still running, but will soon have to undergo thorough repairs, and will require a new boiler.</p> <p>Report in late 1890: Working satisfactorily.</p> <p>This loco certainly lasted long enough to get a replacement boiler and probably into the second half of the 20th century if the clothes worn by crew members in a photo are a good guide..</p>
5	w/n 212	<p>Report in mid 1886: Undergoing a thorough repair, awaiting duplicate parts from England.</p> <p>Report in mid 1887: Running and in good order, equal to new.</p> <p>Report in mid 1888: Running and in good order.</p> <p>Report in mid 1889: Undergoing general repairs.</p> <p>Report in late 1890: Working satisfactorily.</p> <p><i>"Thoroughly overhauled and renewed..."</i> in 1897-8, according to Directors' Report, and new copper firebox fitted same year.</p> <p>Report in mid 1902: "thoroughly repaired both as regards engine and boiler".</p> <p>Report in mid 1907: fitted with a replacement boiler incorporating a new firebox.</p>
6	w/n 213	<p>Report in mid 1886: Running and in good working order.</p> <p>Report in mid 1887: Running, requires general repair.</p> <p>Report in mid 1888: Running and in good order.</p> <p>Report in mid 1889: Running and in good order.</p> <p>Report in late 1890: Working satisfactorily.</p>

“Thoroughly overhauled and renewed...” in 1896-7, according to Directors' Report. A photo shows this engine with the later style replacement boiler.

Report in mid 1905: “fitted with a new boiler”.

Report in mid 1886: Running and in good working order.

Report in mid 1887: Running and in good order.

Report in mid 1888: Running and in good order.

Report in mid 1889: Running and in good order.

Report in late 1890: Undergoing general repairs.

“Thoroughly overhauled and renewed...” in 1896-7, according to Directors' Report.

Report in mid 1902: new boiler (but not firebox?) fitted.

Still in existence in shed in 1977 [27].

Report in mid 1886: Running and in good working order.

Report in mid 1887: Running and in good order.

Report in mid 1888: Running and in good order.

Report in mid 1889: Running and in good order.

Report in late 1890: Undergoing general repairs.

Report in mid 1908: “supplied with new boiler”

References to nos. **1** to **8** in boiler orders (see below) suggest that this loco remained in service until at least the 1940s. However, the Livesey & Sons Ltd. commissioning register in the archives of the IMechE in London (catalogue ref. LIV/2/2/2) refers to a Taltal Company letter of Feb. 26th 1918 which had stated that Pilot Loco no. **8** had been sold. My guess would be to an oficina.

In July 1907 the NBLCo despatched a set of drawings for the boilers for *FC de Taltal* locos **1-8**, with there being a note about “Order of 22nd Jan 1907” which implies that one or more boilers was built.

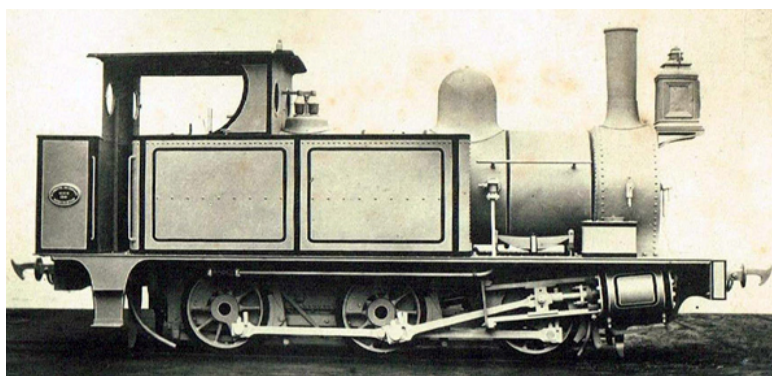
In April 1910 the YEC Co supplied one copper firebox for locos **1-8**, under order 20491.

In September 1916 the YEC Co supplied one copper firebox for locos **1-8**, under order 3456.

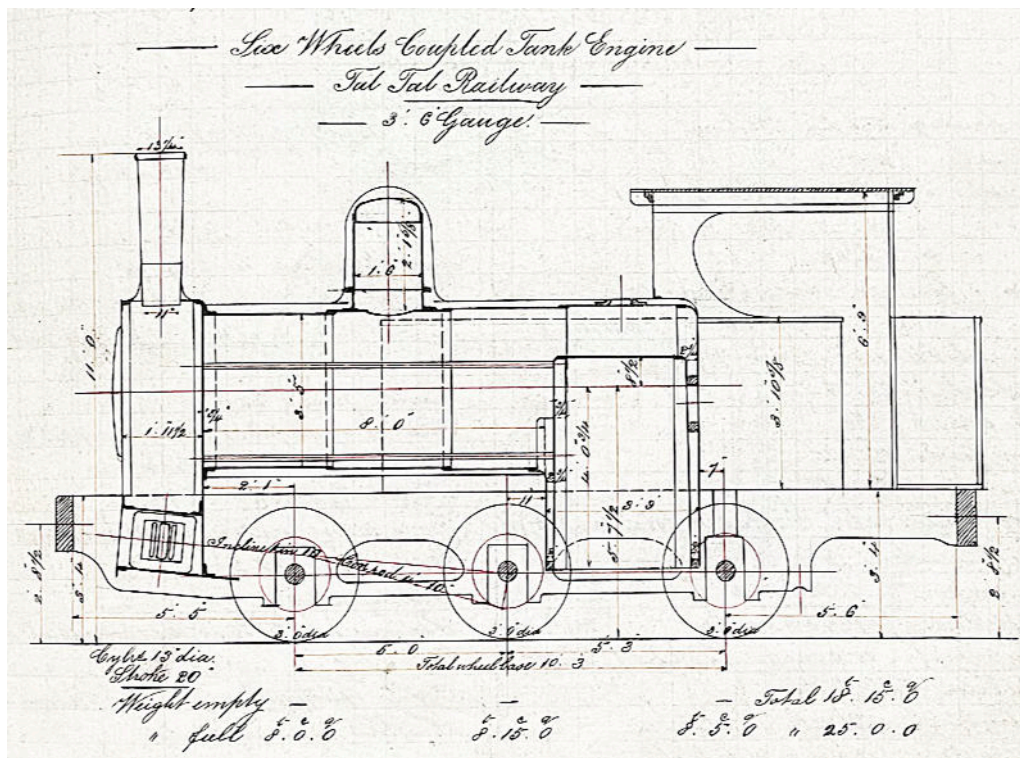
In May 1926 the YEC Co supplied one LH cylinder with all covers for engines **1-8**, under order 11168.

[26] mentions 7 small six-coupled locos in the fleet in the late 1920s. Mr. C. T. Thompson, General Manager, was quoted in the *Railway Magazine* of 1943 (Jan. & Feb. edition p49) as having written to the *Railway Gazette* saying that seven of these locos were still in active service at that point.

At least one was still in existence when the railway closed.

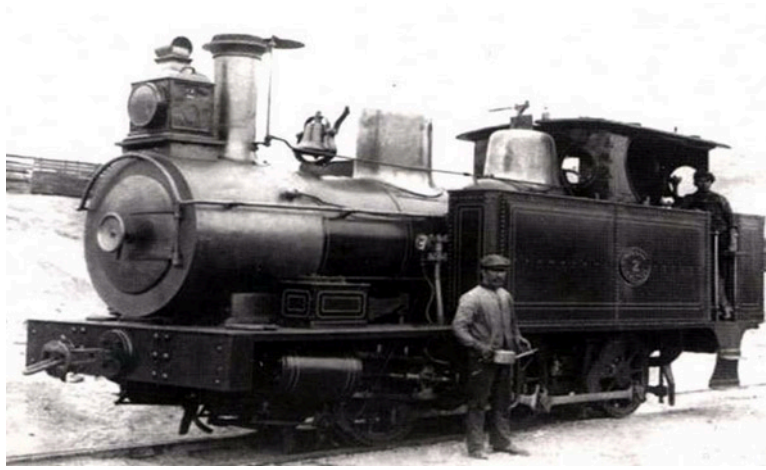


In original condition, with short smokebox and small safety valve mounting.

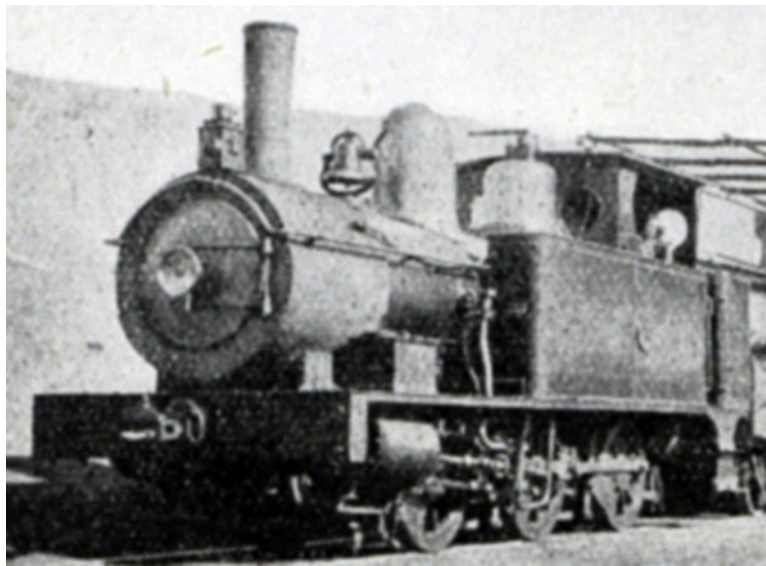


A weights diagram of these engines in a Nasmyth Wilson diagram book in the library of the Stephenson Locomotive Society, and below the accompanying list of dimensions.

<p> Axle bearings 5 1/4" dia. 6 1/2" long (leading & driving) " " 5 1/4" " 7" (trailing) Conn. rod " 2 1/2" " 2 1/2" (front) " " " 3" " 3 1/2" (hind) " " " 14" 10" long Coupl. " bearings 2 1/2" dia. 2 1/2" long (lead & trail) " " " 3 1/2" " 3 1/2" (driving) Piston rod 2 1/4" dia. Piston 2 1/2" deep Crosshead slides 12" long Slide bars 13 1/4" x 3 1/2" Steam port 1 1/8" x 10" Exhaust " 2 1/4" x 10" Lap of slide valve 1/16" Throw of Eccentrics 1 1/2" Stephenson's link motion Area of Steam pipe 3' 3" sq. ins. " exhaust " 15' 7 1/2" sq. ins. Nozzle 3 1/4" dia. 13 3/4" above tubes. Safety Valves two 2 1/2" valves. Pressure of Steam 150 lbs per sq. in. </p>	<p> <u>Heating Surface.</u> Tubes ----- 514 5 1/2 ft Fire box ----- 55 " (with 3" off bottom) Total 569 " Grate area 7' 8" sq. ft Capacity of Water tanks 700 gallons " " Fuel " 60 cub. ft. </p> <p> 136 tubes 1 3/4" dia. 12 3/4" B.W.G. thick Boiler plates 7/16" thick Fire box shell plates 7/16" thick Copper plates 1/2" thick Frames 1/8" thick Tyres 5" x 2 1/2" Wheels 10 arms. Springs 1 pl. 3/8" thick 17 pl. 1/8" thick 3" broad. " 2" 6" centres Transverse spring 1 pl. 1/2" thick 12 pl. 1/8" thick 3" broad 2 1/2" wide Tractive force at rails </p>
---	---



No. 2 as later reboilered, with longer smokebox, capped chimney, taller dome, large safety valve bonnet, bell, and steps widening at bottom.



A very similar rebuilt loco, but this time with a stovepipe chimney, as illustrated in *The Railway Magazine* in 1943. Another photo shows loco no. 6 in this configuration though with an older-style large oil headlight.

A serious accident during the construction period

A number of UK and US newspapers, picking up news forwarded from *The Panama Star and Herald* of 10th July 1882, had reported that a serious railway accident at Taltal had killed ten people on 15th June 1882, and destroyed property worth \$US15,000. "The line reaches the port on a three per cent. grade, and it is customary to keep full steam to assist the brakes by backing. This precaution was forgotten or overlooked and the train dashed into the port, swept through the station and finally brought up in fragments on the beach." [*Herald & Review*, Decatur, Illinois, 18 July 1882, p1] It could be speculated that such an accident might have seriously damaged or even wrecked a locomotive. It took place during the construction period, the hand-over to the owning company not taking place until 20th October of that year.

The full *Panama Star & Herald* article has now been examined [62]. It reads as follows:

"Serious Railway Accident at Taltal.

Saturday night the 15th June witnessed a most frightful Railway accident, unfortunately accompanied with fatal results, on the Taltal Railroad. This line, which is fifty-two miles long, is owned by an English company and connects the nitrate district of the interior with the port of Taltal ; it was just being completed, in fact the last rail had been laid that day, and it was to be formally handed over by the contractor Dr. G. K. Stevenson, on the 30th. As yet however, it is not properly opened for passenger traffic, but people are allowed to travel on the loaded freight cars. On this day the normal daily train, consisting of an engine and four cars, loaded with nitrate and ten passengers, left Agua Verde, a

station near the end of the line, at 5.30 p.m., and passed Breas, a station about twelve miles from Taltal without anything particular occurring. From this point to the port there is a downward grade of about 3 per cent, the weight of the train being sufficient to bring it down, but steam is always kept up as a precautionary measure to reverse, in case of the train obtaining too great a velocity ; and the supposition in the present case is that the driver neglected this precaution trusting too much to his brakes.

The home stretch which leads right into the Railway yard is perfectly straight, and is two miles long with a downward grade of 3½ per cent. The train arrived rather late, 11.30pm, and the yard gateman reports her as having thundered in at a tremendous pace, (it is supposed it could not be less than seventy miles an hour). On reaching the level end of the yard, within about one hundred and fifty yards of high water mark, the track runs on a five feet embankment round a moderate curve and from this point, the commencement of the curve, the engine jumped about seventy yards without touching anything – in its flight it must have become disconnected from the cars, have pitched on its head on some rocks, and then have turned a complete somersault, landing in its usual position about one hundred yards from the point it left the rails. The cars and nitrate were thrown mainly to the left, two of them being a complete wreck. The driver, Peter Anderson of Dundee, John Davis, Fireman, and Henry Shannon, Conductor, and ten passengers, including three women, were killed – in fact the majority of the bodies were unrecognisable and that of the driver was completely scattered in small fragments, the two brakesmen were the only ones who escaped, one of whom was badly hurt but is expected to recover, and the other, who was in the last car, was apparently uninjured. He however, can give no particulars of the accident, beyond the train having got away, and all he remembers is recovering consciousness amongst some nitrate in which he fell. The loss in property is probably about £2,060.” [It seems likely that there was some confusion about the amount of property destroyed, for the derisory amount mentioned here is at odds with the \$US15,000 quoted earlier.]

An 1883 proposal?

Livesey & Sons’ first drawing register notebook, now archived at the IMechE in London as their file LIV/1/2/3, contains a reference dated 2nd January 1883 to drawing no. 1169B entitled Taltal Ry. ten-wheel locomotive. Unfortunately a large proportion of the drawings held at Livesey’s London offices were destroyed during wartime air raids, so it is unlikely that we will ever discover what these engines were to have been.

A first attempt to purchase larger locos

2-6-0ST d/w 37", cyls. 14½x22", built by Beyer Peacock in 1885

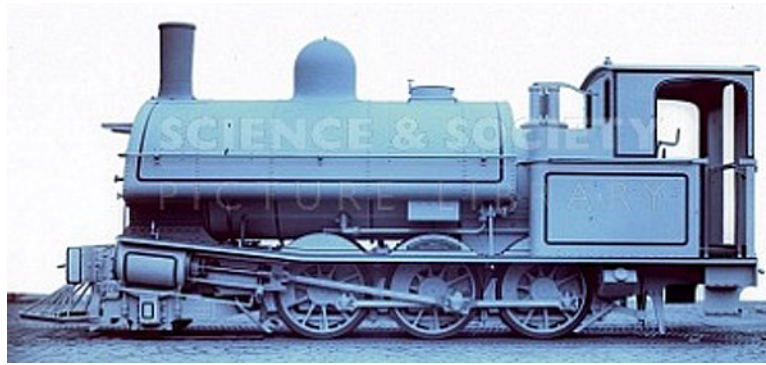
This was BP’s order no. 6366, for the *FC de Taltal*. On completion these engines were offered for sale. This event is explained by Harold Middleton thus: “When the railway was constructed, the nitrate industry of Taltal was booming owing to the War of the Pacific which had paralysed the Tarapacá nitrate producers. But in 1882, the Chilean Government, having just gained possession of Tarapacá province, raised the export nitrate tax, affecting the industry and its production. According to the Chilean authorities, this tax was to finance the war. This tax constrained the whole industry, affecting much more the southern regions such as Taltal because Tarapacá was the cheapest nitrate producer.”

The locos were purchased by the British Government and sent to Egypt for use in the Sudan. Another source, however, says that they went via the Cape Government Railways which did indeed supply a number of locos to the Sudan. On arrival, possibly as late as 1896, they were initially numbered **9** and **10**, probably because they had been built bearing those numbers in readiness for use on the *FCT*. Later they reputedly became Sudan Government Railways nos. **10** and **11**, ‘ASSOUAN’ and ‘KOROSKO’, and eventually **8** and **9** after 1899 [Info from Helmut Dahlhaus via Alon Siton]. In 1905 they were rebuilt as 2-6-0 tender locos at the Wadi Halfa workshops, and they were eventually scrapped in 1911 [47].

Certainly they never reached Chile. It is interesting that these were saddle tank engines rather than the side tank pattern always used for later Taltal locos.

(9) w/n 2399

(10) w/n 2400



A BP works photo of one of this pair, by courtesy of the Manchester Museum of Science and Industry online collection at <https://www.scienceandsociety.co.uk/index.asp>

Similar locos, though with a shorter saddle tank, were supplied to the 3' 0" gauge Ballymena & Larne Railway in Ireland.



An advertisement from *The Railway News* issue of January 31st 1885, offering for sale the two Beyer Peacock tank locos that had recently been completed.

By courtesy of Chris West.

2-6-0T d/w 39", cyls. 14½"x20", built by Dübs in 1887

Photo on page 50 of volume NBL037 in Mitchell Library. Slightly shorter tanks than later locos, motion covers, doors in tank sides. Order no. 2319.

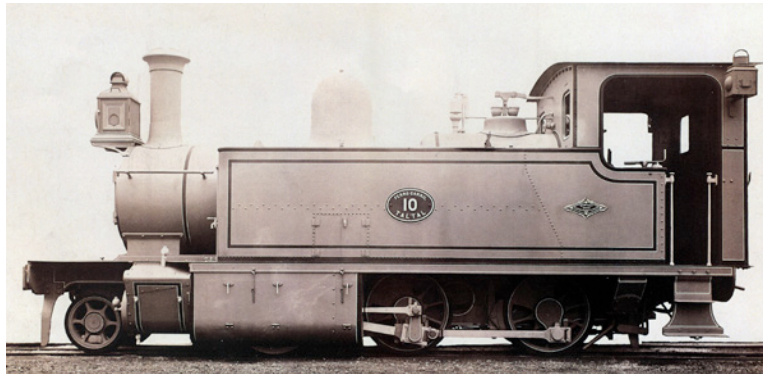
9	w/n 2319	<p>Report in mid 1888: New engine, doing good work.</p> <p>Report in mid 1889: Running and in good order.</p> <p>Report in late 1890: Working satisfactorily.</p> <p><i>"Thoroughly overhauled and renewed..."</i> in 1896-7, according to Directors' Report.</p> <p>Report in mid 1903: "thoroughly repaired both as regards engine and boiler".</p> <p>Report in mid 1904: fitted with a brand-new boiler.</p> <p>Report in mid 1907: fitted with a replacement firebox tube plate.</p>
10	w/n 2320	<p>Report in mid 1888: New engine, doing good work.</p> <p>Report in mid 1889: Running and in good order.</p> <p>Report in late 1890: Working satisfactorily.</p> <p>New boiler fitted in 1895-6 according to Directors' Report.</p> <p>New firebox fitted in 1896-7 according to Directors' Report.</p> <p>(???)</p> <p>Report in mid 1901: new boiler and firebox fitted.</p>

Report in mid 1906: "supplied with boiler fitted with new fire-box."

Report in mid 1907: fitted with a replacement firebox tube plate.

Report in mid 1909: "fitted with a new firebox tube-plate"

Report in mid 1909: "fitted with a new smokebox tube-plate"



2-6-2T d/w 39", cyls. 14½"x20", built by Vulcan Foundry in 1889

A sketch drawing in the NBL archive suggests that one of this company's predecessors, probably Dübs, also tendered for this contract (their sketch diagram S137). Locos were later modified to burn oil and with a roof-mounted tank. Incidentally Beyer Peacock drawing records archived at SIM in Manchester showing that a very similar design dated May 1st 1889 (cyls. outside 14½"x20", 6-coupled (3' 3" d/w), 2-wheel lead & trailing bogies (2' 3"), side and hind tanks, was sketched out a scale of ½" to 1 foot, but taken no further presumably as a result of VF having won the contract.

11	w/n 1258	<p>"Thoroughly overhauled and renewed..." in 1897-8, according Directors' Report, and new copper firebox fitted same year.</p> <p>Report in mid 1906: "supplied with boiler fitted with new fire box."</p> <p>Report in mid 1906: "fitted with new solid horn blocks, and with new saddle castings in order to strengthen the frames at the corners of the horn slots"</p> <p>Report in mid 1908: "supplied with new tube plate/s"</p> <p>Report in mid 1910: "fitted with a new firebox"</p>
12	w/n 1259	<p>"Thoroughly overhauled and renewed..." in 1897-8, according to Directors' Report. Photo in [27] shows loco running as a 2-6-0T.</p> <p>Report in mid 1903: "thoroughly repaired both as regards engine and boiler", and 'boiler fitted with a new firebox, and its outside shell was thoroughly repaired and made equal to new.</p> <p>Report in mid 1907: fitted with a replacement boiler incorporating a new firebox.</p> <p>Report in mid 1907: "fitted with new solid horn blocks, and with new saddle castings in order to strengthen the frames at the corners of the horn slots, also new cab front plate"</p> <p>Report in mid 1909: "fitted with a new firebox tube-plate"</p> <p>In works in 1977 [27].</p>
13	w/n 1260	<p>Report in mid 1901: new boiler and firebox fitted.</p> <p>Report in mid 1903: "thoroughly repaired both as regards engine and boiler".</p>

14	w/n 1261	<p>Report in mid 1905: fitted with a new firebox and many new boiler plates.</p> <p>Report in mid 1907: fitted with a replacement firebox tube plate.</p> <p>Report in mid 1907: “fitted with new solid horn blocks, and with new saddle castings in order to strengthen the frames at the corners of the horn slots, also new cab front plate”</p> <p>Report in mid 1909: “fitted with a new firebox tube-plate”</p> <p>New copper firebox fitted in 1895-6 according to Directors' Report. “<i>Thoroughly overhauled and renewed...</i>” in 1897-8, according to Directors' Report, and new copper tube-plates fitted same year.</p> <p>Report in mid 1901: new boiler and firebox fitted.</p> <p>Report in mid 1903: “thoroughly repaired both as regards engine and boiler”.</p> <p>Report in mid 1906: “fitted with new fire-box tube plate.”</p> <p>Report in mid 1906: “fitted with new solid horn blocks, and with new saddle castings in order to strengthen the frames at the corners of the horn slots”</p> <p>Report in mid 1908: “supplied with new boiler”</p>
15	w/n 1262	<p>Report in mid 1910: “fitted with a new firebox tube-plate”</p> <p>“<i>Thoroughly overhauled and renewed...</i>” in 1896-7, according to Directors' Report.</p> <p>Report in mid 1902: “thoroughly repaired both as regards engine and boiler”.</p> <p>Report in mid 1906: “supplied with perfectly new boiler.”</p> <p>Report in mid 1906: “fitted with new solid horn blocks, and with new saddle castings in order to strengthen the frames at the corners of the horn slots”</p> <p>Report in mid 1907: fitted with a replacement firebox tube plate.</p>
16	w/n 1263	<p>Report in mid 1909: “fitted with a new firebox”</p> <p>“<i>Thoroughly overhauled and renewed...</i>” in 1897-8, according to Directors' Report, and new copper tube-plates fitted same year.</p> <p>Report in mid 1902: “thoroughly repaired both as regards engine and boiler”.</p> <p>Report in mid 1904: fitted with a brand-new boiler.</p> <p>Report in mid 1906: “fitted with new fire-box tube plate.”</p> <p>Report in mid 1906: “fitted with new solid horn blocks, and with new saddle castings in order to strengthen the frames at the corners of the horn slots”</p> <p>Report in mid 1908: “supplied with new tube plate/s”</p> <p>Report in mid 1909: “fitted with a new firebox”</p>

In March 1922 the YEC0 supplied three sets of girder roof bars for the fireboxes of locos **11-16**, under order 8073, also twelve round firehole rings for locos **9-16**, under order 8075.

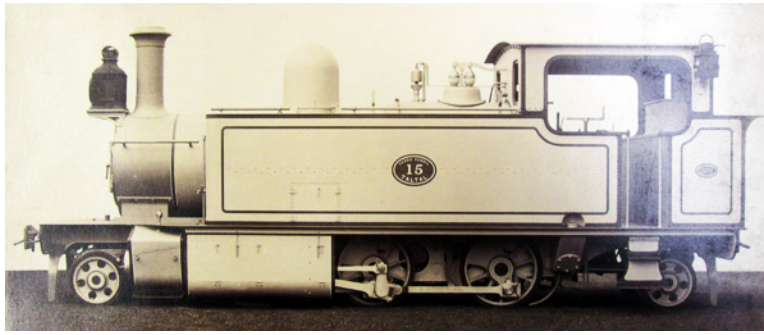


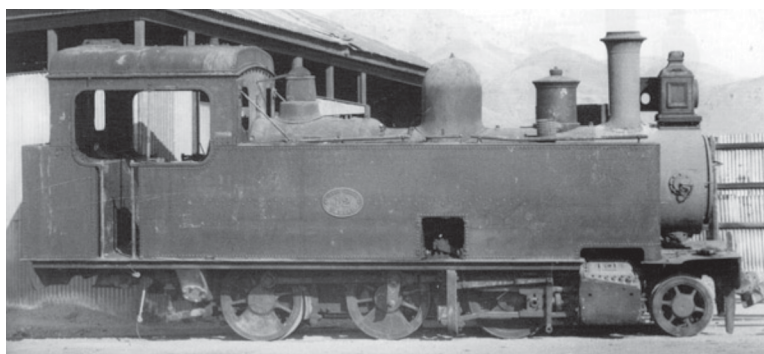
Photo from Vulcan Foundry album at Merseyside Maritime Museum.



One of the 2-6-2Ts out on the pampa, still with its motion covers but now having extended side tanks and a longer smokebox. Note that these engines can be distinguished from the later locos built with long tanks by the trailing truck and rear bunker.



A poor quality photo, but showing one of the 2-6-2Ts after the fitting of a roof-mounted fuel tank and again with an extended smokebox.



2-6-2T no. **12**, converted to a 2-6-0T, with oil tank built in to cab roof, longer tanks and added sand dome. Also with extended smokebox.

[14] suggests there was a second number **12**, which was a 2-6-0T built by Kitson. This might be an error resulting from seeing the original no. **12** in the state illustrated in the photo above.

Report of the directors, mid-1891

Sr. Felipe Radrigan has passed on the following quote from that report: “Engines have been maintained in good working order. Nos. **1, 2, 4, 5, 8, 9, 10, 11, 12, 14, 15** and **16** are in good trim. Nos. **6** and **7** have undergone a thorough repair, whilst Nos. **3** and **13** are waiting their turn in the repair-shed.”

An 1892 report [38]

Las locomotoras más pesadas son de 20 toneladas sobre seis ruedas motoras y de 26 toneladas de peso con sus provisiones de agua, carbón, etc., y 40 toneladas incluyendo el peso del tender; los cilindros son de 0.m50 x 0.35 y el diámetro de las ruedas es de 0.m915 y el timbre de la caldera es de 9 atmósferas. Estas locomotoras remolcan de subida en gradientes de:

4.216%... 69,786 kilogramos ó 11 carros vacíos.

4%... 73,092 kilogramos ó 12 carros vacíos.

3.757%... 77,206 kilogramos ó 14 carros vacíos.

3%... 93,623 kilogramos ó 20 carros vacíos.

Hay también locomotoras-tender de 20 toneladas útiles de peso con su carga de agua y carbón, con cilindros de 0.35 x 0.46 y seis ruedas acopladas de 0.90 de diámetro, teniendo la caldera 9 atmósferas de timbre. Estas locomotoras arrastran, de subida, con velocidad de 17 kilómetros por hora en gradientes de:

4.216%... 56,532 kilogramos ó sea 13 carros vacíos.

4.000%... 59,210 kilogramos ó sea 14 carros vacíos.

3.757%... 62,543 kilogramos ó sea 15 carros vacíos.

3.000%... 75,843 kilogramos ó sea 20 carros vacíos.

“The heaviest locomotives are of 20 tons on six driving wheels and of 26 tons with their water, coal, etc., and 40 tons including the weight of the tender; the cylinders are 0.m50 x 0.35 and the diameter of the wheels is 0.m915 and the bell of the boiler is 9 atmospheres. These locomotives pull uphill on gradients of:

4,216%. 69,786 kilograms or 11 empty cars.

4% 73,092 or 12 empty cars.

3.757% . . 77,206 or 14 empty cars.

3%· 93,623 or 20 empty cars.

There are also tank locomotives of 20 useful tons of weight with its load of water and coal, with 0m.35 x 0.46 cylinders and six coupled wheels of 0m.90 diameter, with the boiler working at 9 atmospheres' pressure. These locomotives drag uphill, with a speed of 17 kilometers per hour in gradients of:

4,216% 56,532 kilograms or 13 empty cars.

4,000% 59,210 kilograms or 14 empty cars.

3,757% 62,543 kilograms or 15 empty cars.

3,000% 75,843 kilograms or 20 empty cars.”

The reference to the weight of the tender for the largest locos is puzzling, whilst the wheel diameter given also does not match the 39" wheels of the largest locos listed above.

2-6-0T d/w 39", cyls. 14½"x20", built by Vulcan Foundry in 1893

17

w/n 1397

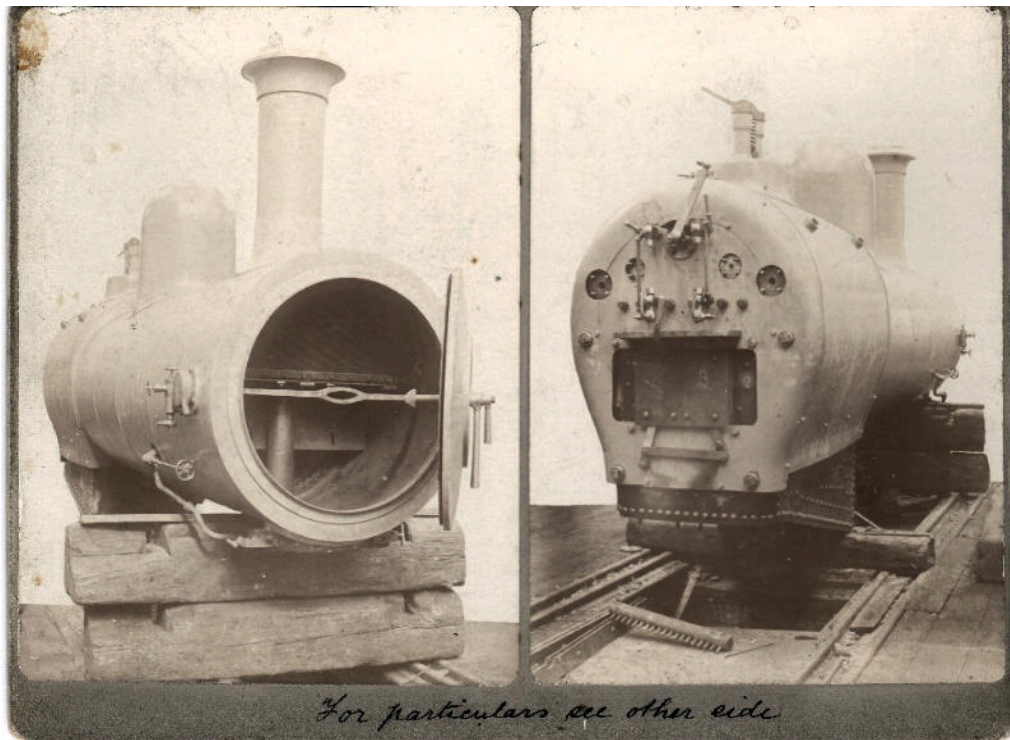
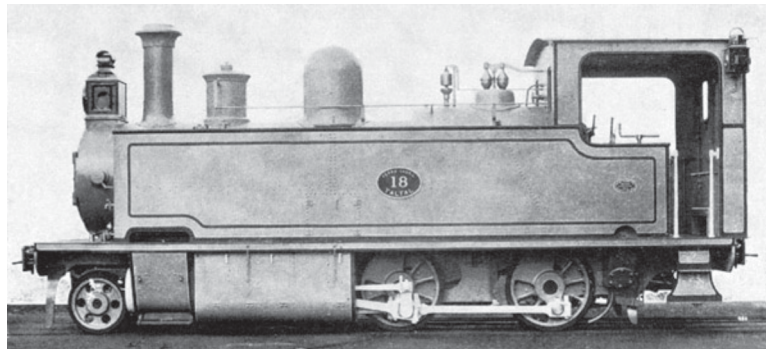
New firebox fitted in 1896-7 according to Directors' Report.

“Thoroughly overhauled and renewed...” in 1897-8, according to Directors' Report.

Report in mid 1902: new boiler (but not firebox?) fitted.

Report in mid 1904: fitted with a new firebox and many new boiler plates.

Report in mid 1906: "fitted with new fire-box tube plate."
 Report in mid 1908: "supplied with new firebox"
 Report in mid 1909: "fitted with a new firebox"
"Thoroughly overhauled and renewed..." in 1896-7, according to Directors' Report. *"Thoroughly overhauled and renewed..."* in 1897-8, according to Directors' Report, and new copper tube-plates fitted same year.
 Report in mid 1902: new boiler (but not firebox?) fitted.
 Report in mid 1906: "supplied with boiler fitted with new fire box."
 Report in mid 1908: "supplied with new tube plate/s"
 Report in mid 1909: "fitted with a new firebox"
 Report in mid 1909: "fitted with a new smokebox tube-plate"



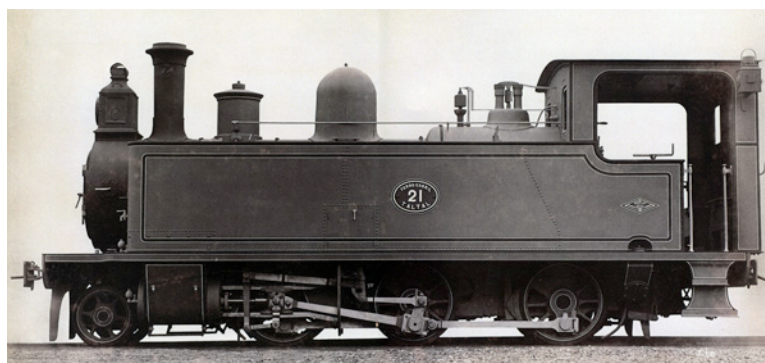
One of the boilers for VF 1397 and 1398, presumably in the course of lagging and fitting out before being mounted on the frames.

2-6-0T d/w 39", cyls. 14½"x20", built by Dübs in 1894

Longer tanks (reaching to front tube plate), no motion covers, and sand dome. Order no. 3160.

"Thoroughly overhauled and renewed..." in 1896-7, according to Directors' Report.
 Report in mid 1904: fitted with a new firebox and many new

- boiler plates.
- Report in mid 1906: “supplied with boiler fitted with new firebox.”
- Report in mid 1908: “supplied with new firebox”
- Report in mid 1910: “fitted with a new firebox”
- 20 w/n 3161 “*Thoroughly overhauled and renewed...*” in 1896-7, according to Directors' Report. “*Thoroughly overhauled and renewed...*” in 1897-8, according to Directors' Report, and new copper tube-plates fitted same year.
- Report in mid 1902: new boiler and firebox fitted.
- Report in mid 1907: fitted with a replacement boiler incorporating a new firebox.
- Report in mid 1909: “fitted with a new firebox tube-plate”
- 21 w/n 3162 “*Thoroughly overhauled and renewed...*” in 1896-7, according to Directors' Report.
- Report in mid 1901: new boiler and firebox fitted.
- Report in mid 1903: “thoroughly repaired both as regards engine and boiler”.
- Report in mid 1906: “supplied with boiler fitted with new firebox.”
- Report in mid 1908: “supplied with new tube plate/s”
- Report in mid 1910: “fitted with a new firebox”
- 22 w/n 3163 “*Thoroughly overhauled and renewed...*” in 1897-8, according to Directors' Report.
- Report in mid 1902: new boiler and firebox fitted.
- Report in mid 1903: “thoroughly repaired and ready for work on 8th July”.
- Report in mid 1905: fitted with a new firebox and many new boiler plates.
- Report in mid 1907: fitted with a replacement firebox tube plate.
- Report in mid 1908: “supplied with new firebox”





A loaded train heads down to Taltal port behind what is probably a Dübs or NBL 2-6-0T, to judge from the lack of any cut-outs in the tanks over the cylinders. Note the added tool-boxes (or maybe extra sand-boxes) above the tanks, and also the brakemen standing on the wagon ends.

Directors' report in June 1894 talks of “*four new locos now running and the **four** additional ones on order*”.

0-6-4T d/w 39", cyls. 16"x20", built by Dübs in 1895

Order no. 3182. Notably, the builder's photo shows a headlamp and a cow-catcher or pilot fitted at the bunker end but not at the smokebox end, implying that these locos may have been intended to work cab first.

23	w/n 3182	Report in mid 1907: fitted with a replacement boiler incorporating a new firebox.
24	w/n 3183	<p>“<i>Thoroughly overhauled and renewed...</i>” in 1896-7, according to Directors' Report. That seems strange for a loco only 1-2 years old.</p> <p>Report in mid 1905: “fitted with a new boiler”.</p> <p>Report in mid 1906: “undergoing thorough repairs at time of writing.”</p> <p>Report in mid 1908: “supplied with new tube plate/s”</p>

In April 1912 the YEC Co supplied one copper firebox for locos **23-24**, under order 22003., also two steel smokebox tubeplates and two half throatplates probably for same engines under order 22006, 22007.

In January 1913 the YEC Co supplied one copper fireboxes for engines **23-24**, under order 676.

In November 1913 the YEC Co supplied one copper firebox for engines **23-24**, under order 6??.

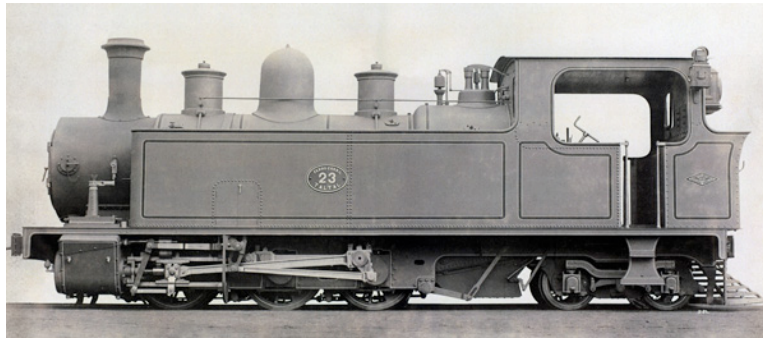
In April 1914 the YEC Co supplied one copper firebox for engines **23-24**, under order 1500. Thus in two years four fireboxes had been supplied for just two locos. That sounds extremely unlikely and it is probable that other engines will have had the same design of boiler.

In September 1916 the YEC Co supplied one driving crank arm and pin for locos **23-24**, under order 3458.

In June 1920 the YEC Co supplied one copper firebox for locos **23-24** under order 7051, also one copper firebox tubeplate and one steel boiler backplate for same class of locos under orders 7052-3, also one steel bottom half throatplate for unspecified locos, under order 7054, also one steel smokebox tubeplate for locos **23-24**, under order 7055.

In November 1922 the YEC Co supplied one steel smokebox tubeplate for locos **23-24**, under order 8448.

In October 1923(?) the YEC Co supplied solid drawn copper exhaust pipes for locos **23-24**, under order 9218.



Dübs publicity photo. High-resolution copies can be purchased from the Mitchell Library.

Annual reports to share-holders

Directors' report in June 1895 says "*Four new engines... have been added... Of the twenty-three locomotives...*"

Directors' reports in June 1897 and 1898 says fleet contains "*7 small 6-wheel coupled... and 16 large 6-wheel coupled*" locos. These suggest that one of the original NW 0-6-0Ts had been withdrawn by 1895.

A rapid growth of traffic from 1903 onward

The mid-1903 report to shareholders: "In 1902 a German Company purchased the Atacama oficina and have since acquired very extensive nitrate grounds in the same locality. They recently determined to erect a large oficina, to be called the "Chile" oficina, about 4½ kilometres north of Atacama, capable of producing upwards of 2,000,000 quintals of nitrate annually, and they urged the Railway Company to make provision for carrying and shipping the same. An agreement has accordingly been entered into with that Company for the extension of the Atacama Branch to their new oficina, and also as to traffic rates and other arrangements. The production of the new oficinas – Ballena and Chile – will in all probability, in a very short time double the traffic of the Railway, and it became necessary to make immediate provision for carrying and handling this largely increased traffic. A considerable addition to the rolling stock was imperative, also an additional pier to facilitate the shipping of the nitrate and the landing of the increased quantities of coal which will be required by the oficinas and by the Railway Company. It was also necessary to provide a large extent of further siding accommodation at Taltal, and to increase the capacity of the workshops.

The branch line to the Chile oficina is in a forward state and the other works are well advanced. Part of the new rolling stock has already been sent out, and orders for the remainder have been placed, and it will follow as rapidly as practicable.

Mr. W. R. Henderson, a Director of the Company, was in Chile during the early part of the year, and rendered very valuable aid in the negotiations with the representative of the German Nitrate Company and in deciding upon the works necessary to be undertaken at Taltal.

It is probable that the traffic of the Railway may be still further increased, as the German Nitrate Company is known to be contemplating the erection of another large oficina. "

2-6-0T d/w 39", cyls. 14½"x20", built by North British Hyde Park Works in 1904

1930s *FCT* list says built at Queens Park Works. NBL order no. L33. Repeat of the 1894 Dübs order E3160.

25 w/n 16209

Report in mid 1904: new, and began work on 19th May.

Report in mid 1906: "fitted with new fire-box tube plate."

Report in mid 1907: fitted with a replacement boiler incorporating a new firebox.

Report in mid 1909: "fitted with a new firebox"

26 w/n 16210

Report in mid 1904: new, and began work on 24th May.

Report in mid 1906: "fitted with new fire-box tube plate."

Report in mid 1907: fitted with a replacement boiler incorporating a new firebox.

Report in mid 1909: "fitted with a new firebox tube-plate"

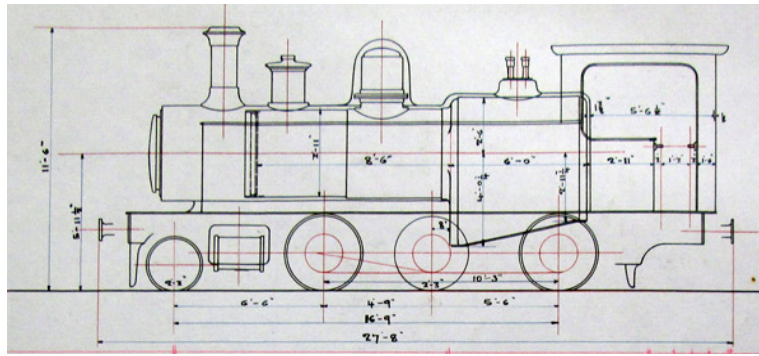


Diagram from NBL weights book.

New loco shed at Taltal

The report to shareholders in mid-1904 recorded the complete of a new locomotive shed for 30 locomotives, 195 ft. x 100 ft.

2-6-0T d/w 39" or possibly 35", cyls. 14½"x20", built by Beyer, Peacock in 1904 (27-29) and 1905 (30-31)

[27] says had smaller wheels than preceding pair of engines, which suggests that d/w 35" may be correct.

27	w/n 4562	Report in mid 1906: "undergoing thorough repairs at time of writing." Report in mid 1907: fitted with a replacement firebox tube plate. Report in mid 1908: "supplied with new boiler" Report in mid 1908: "supplied with new firebox"
28	w/n 4563	Report in mid 1907: fitted with a replacement firebox tube plate. Report in mid 1910: "fitted with a new firebox"
29	w/n 4564	Report in mid 1907: fitted with a replacement firebox tube plate. Report in mid 1908: "supplied with new firebox" Report in mid 1910: "fitted with a new firebox"
30	w/n 4595	Report in mid 1907: fitted with a replacement firebox tube plate. Report in mid 1908: "supplied with new firebox" Report in mid 1910: "fitted with a new firebox tube-plate"
31	w/n 4596	Report in mid 1907: fitted with a replacement firebox tube plate. Report in mid 1909: "fitted with a new firebox tube-plate"

In April 1910 the YEC Co supplied three copper fireboxes for locos **27-31**, under order 20492. This and the various other firebox orders that follow, prompt the same thought that was made above in relation to locos **23-24**, ie. that many of the engines must have had identical boilers.

In April 1911 the YEC Co supplied four copper fireboxes for B-P locos **27-31**, under order 21259.

In April 1912 the YEC Co supplied two copper fireboxes for locos **27-31**, under order 22004, also six copper firebox tubeplates probably for same class of engines, under order 22005.

In August 1912 the YEC Co supplied five copper fireboxes for engines **27-31**, under order 22270.

In January 1913 the YEC Co supplied four copper fireboxes for engines **27-31**, under order 675.

In November 1913 the YEC Co supplied six copper fireboxes for engines **27-31**, under order 1222.

In May 1913 the YEC Co supplied six copper fireboxes for engines **27-31**, under order 913.

In April 1914 the YECo supplied eight copper fireboxes for engines **27-31**, under order 1501.

In November 1918 the YECo supplied two copper fireboxes for engines class **27**, under order 11662, also one steel tubeplate and a smokebox door and two trailing dragboxes possibly all for same class of locos, under orders 5640-2.

In June 1920 the YECo supplied three copper fireboxes for class **27-31** engines, under order 7048, also three copper firebox tubeplates and three steel smokebox tubeplates for unspecified locos, under orders 7049-50.

In December 1920 the YECo supplied items including a smokebox tubeplate for superheating one engine of class **27-31**, under order 7461.

In March 1922 the YECo supplied six firebox foundation rings for locos **27-31**, under order 8074, also six oval fire-hole rings for locos **25-31**, under order 8075,

In October 1923 the YECo supplied three partial copper fireboxes for engines **27-31**, under order 9216, also solid drawn copper exhaust pipes for same under order 9217.

In May 1926 the YECo supplied one three firehole rings and two copper steampipes for engines **27-31**, under orders 11169 and 11170.

In April 1927 the YECo supplied two sets of superheating equipment for loco **9-31**, under order 11718.

[26] mentions 23 large six-coupled locos, thus suggesting that all of the locos from number **9** to number **31** were in use in the late 1920s.

0-6-6-0T Kitson-Meyer d/w 34¾", cyls. 14"x18", built by Kitson in 1904 (50), 1906 (51), 1907 (52-59)

50	w/n 4288	Steam trial at works 15-10-04 [27]. "Six new locomotives have been erected, one of them being a double engine (Meyer's system) which has given very satisfactory results." Report in mid 1907: fitted with a replacement firebox tube plate. Report in mid 1909: "fitted with a new boiler"
51¹	w/n 4432	Steam trial at works 19-12-06 [27]. Report in mid 1910: "fitted with a new firebox" Dismantled remains survived in 1978 [9].
52	w/n 4433	Steam trial at works 9-01-07 [27]. Report in mid 1910: "fitted with a new firebox tube-plate"
53	w/n 4434	Steam trial at works 1-02-07 [27]. Report in mid 1910: "fitted with a new firebox tube-plate"
54	w/n 4504	Steam trial at works 27-09-07 [27].
55	w/n 4505	Steam trial at works 31-10-07 [27].
56	w/n 4506	Steam trial at works 11-10-07 [27].
57¹	w/n 4512	Steam trial at works 16-11-07 [27].
58	w/n 4513	Steam trial at works 21-11-07 [27].
59¹	w/n 4514	Steam trial at works 6-12-07 [27]. Had Worthington feed-water heater from new or very early on [27]. Damaged by boiler explosion 1969. Remains survived 1978 numbered 60 [9]. With extended side tanks.
60^{1?}	w/n 4515?	Only reported by [14]. Brian Rumary's Kitson list says 4515 went to Madras, so it seems unlikely that it came here. Certainly the Livesey & Sons Ltd. commissioning register in the archives of the IMechE in London (catalogue ref. LIV/2/2/2) refers to loco nos. 51-59 as a group, with no mention of a no. 60 . Certainly the mid 1909 report to share-holders reported that there were now ten Meyer locomotives on the

railway, with the implication that this was the total number ordered.

In April 1910 the YECo supplied one copper firebox for locos **51/9** Kitson-Meyer, under order 20493, also one steel firebox to replace copper box for engines **51/9** Kitson Meyers under order 20494, also three copper firebox tubeplates for engines **51/9** Kitson Meyers under order 20495.

In April 1911 the YECo supplied one copper firebox and one firebox tubeplate for engines **51-59** class, under orders 21260 and 21261.

In April 1912 the YECo supplied one copper firebox for locos **51-59**, under order 22001.

In August 1912 the YECo supplied three copper fireboxes for engines **51-59**, under order 22273, also one steel firebox to replace copper, under order 22274.

In January 1913 the YECo supplied one steel firebox tubeplate to replace copper, for engines **51-59**, under order 674.

In January 1913 the YECo supplied one copper fireboxes for engines **51-59**, under order 677.

In September 1916 the YECo supplied one copper firebox for locos **51-59**, under order 3457.

[26] says there were ten 'Meyer double engines' in the fleet in the late 1920s.

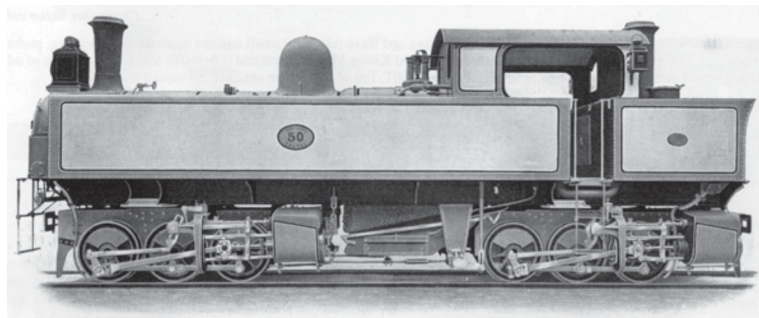
In June 1920 the YECo supplied three copper firebox tubeplates for locos **51-59**, under order 7056, also two steel smokebox tubeplates probably for same class of engines, under order 7057.

In February 1921 the YECo supplied four trailing dragboxes for locos **51-59**, under order 7601.

In March 1922 the YECo supplied 100 engine axlebox lubricating pads, for engines **50-59**, under order 8076.

In November 1922 the YECo supplied twenty-four bogie axlebox lubricating pads for locos **51-59**, under order 8449.

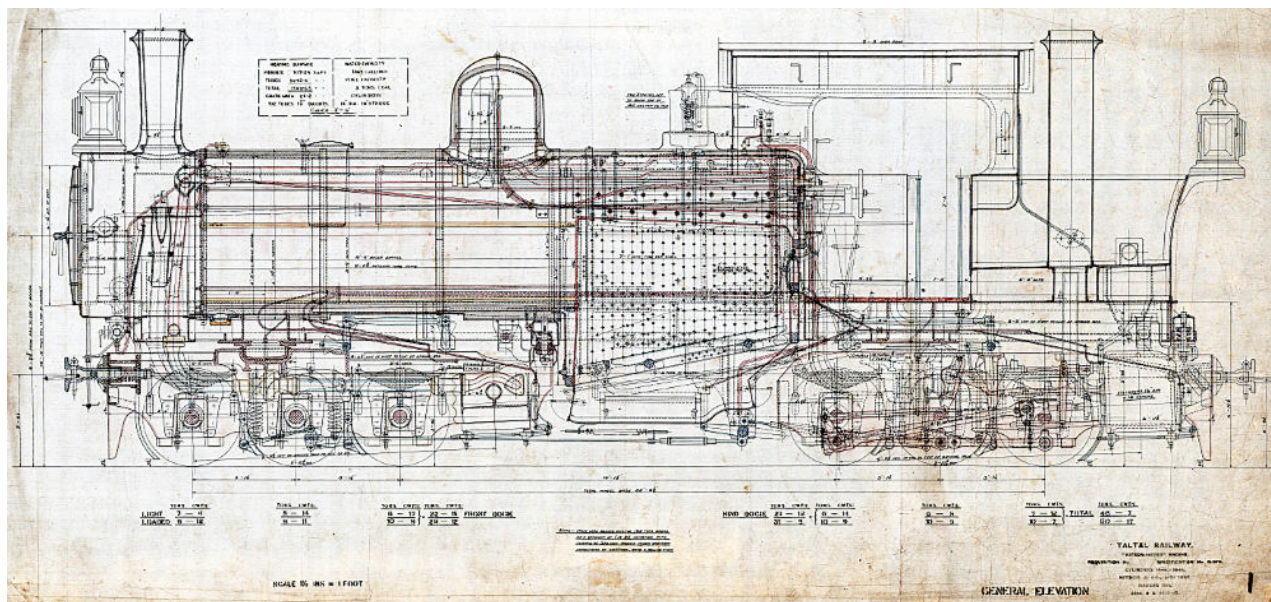
In October 1923(?) the YECo supplied two copper firebox tubeplates for locos **50-59**, under order 9219.



The first *FC de Taltal* Kitson-Meyer, no. 50, as illustrated in Kitson publicity material. Note that *FC de Taltal* Kitson-Meyers were built with enclosed cabs whilst those for the *FCTT* had more open cabs.



Spot the difference! This would seem to be the same photograph as the previous one, but one or the other has been retouched to draw out the detail. It was probably the image above with its darker surrounding paintwork and lighter panels. Note also the great care taken to show the loco at its best, including making sure that the rods were down on both bogies.



Kitson GA side elevation drawing of nos. 4504-6 and 4512-4, as preserved in the Kennedy Henderson collection at the NRM in York. The same roll also contains similar but slightly different drawings for a) nos.4432-4 and b) no. 4288.



Kitson-Meyer no. **59**, with a Worthington feed water heater and therefore a divided tank. The bunker is also higher than on the earlier engines.

Kitson-Meyer variations

Whilst all these early Kitson-Meyers for Taltal, Tocopilla and Girardot had identical cylinder (14x18") and bogie (34 $\frac{3}{4}$ " wheel diameter and 37 $\frac{1}{4}$ " wheel spacings) dimensions, other measurements slowly grew. The overall wheelbase of all the Chilean engines was 25' 6 $\frac{1}{2}$ ", whilst on the Colombian machines it was originally 26' 1" and later 26' 6". Similarly the weight grew from 55 tons 7 cwt for Taltal, 62 tons 13 cwt for Tocopilla, and 60 tons 19 cwt increasing to 64 tons 4 cwt for Colombia. A number of other dimensions are listed in Kitson drawing office volumes held by the Stephenson Locomotive Society librarian (though not listed in the library accessions list).

The fleet in 1909-11

The government publications *Estadística de los Ferrocarriles Particulares en Explotación* state that the railway had 41 locos in operation in each of the years 1909 to 1911. Whilst that corresponds to the total number of locos purchased up to that point, it is difficult to equate to the story that one of the Naismith Wilson 0-6-0Ts had been withdrawn before 1900. The 41 were specified as 33 for goods trains and eight for shunting. The latter group will have comprised those same 0-6-0Ts and perhaps implies that the withdrawn loco had been reinstated by then. Several decades later, all locos were apparently still in stock in 1937, also implying that all eight 0-6-0Ts remained in the fleet. During 1909 the railway used 19,872 tonnes of Australian coal, but from 1913 onward the locos were steadily converted to burn oil, though the process was not completed until 1928 [27]. The company annual report for 1912, re-

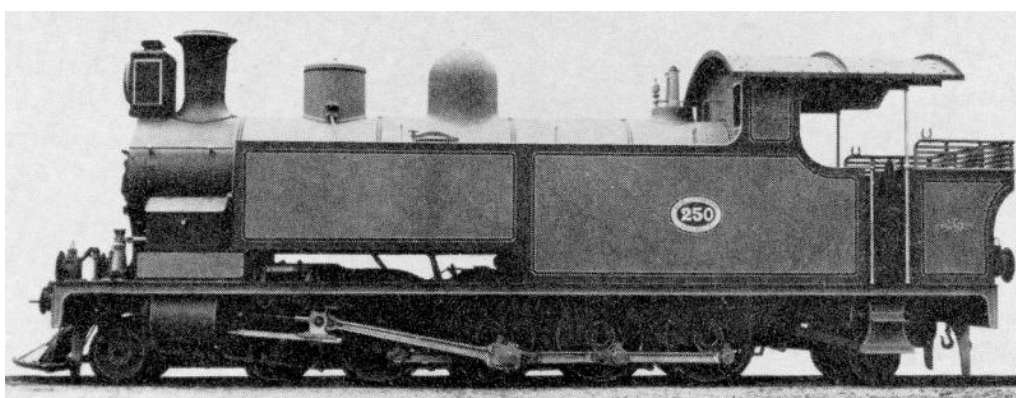
ported in *The Railway Times* of Nov. 2nd 1912, p452, explained that five years of experiments had been conducted with oil before the decision had been made to switch over entirely to that fuel.

A cancelled order

4-8-2T d/w 42"? cyls. 17x22", were to have been built by NBL around 1915, but the order L638 for four locos was cancelled presumably owing to the war.

NBL order shows order placed/confirmed 23rd July 1914 for 'Four (4) Side Tank Locomotives 4-8-2 type, Cyls. ? x22", Gauge 3' 6", fitted with Robinson's Superheaters'. Running numbers confirmed by letter of 4-12-14. Delivery to be 'end of February 1915', but later altered to 'June'. Over-written 'Cancelled' with two semi-illegible dates. Harold Middleton suggests that these would effectively have been Natal Government Railways class 'Dübs B' locomotives (later SAR class G), though with cylinders of 17" diameter rather than 18".

40-43 w/n 21108-21111



The NGR class 'Dübs B', which Harold Middleton suggests would have been the pattern for these four Taltal locos had the order not been cancelled.

Second-hand purchases

In the 1940s, three locos were acquired from the *FCAB*. All of these were built as 2' 6" gauge, converted to metre, then to be regauged to 3' 6" when sold to Taltal.

2-8-4T d/w 37½", cyls. 17"x22", built by Kitson in 1912

29 w/n 4845 ex *FCAB* **29** Still in process of regauging when line closed [16].
In works in 1977 [27].

30 w/n 4846 ex *FCAB* **30** Dumped outside in 1977 [27].



MCC's own photo of no. **30**, at Taltal in 1975, whilst supported on ambulance bogies during re-gauging work.

2-8-0 d/w 37½", cyls. 16½"x20", built by North British Hyde Park Works in 1911



An ex-FCAB North British built 2-8-0 in the yard at Taltal, presumably no. 157 as listed above.



Another view of no. 157 at Taltal. Photo by Trevor Rowe in 1970.

Loco movements up and down the coast

It is well known that after the *FCTT* dieselised much of their operations at the end of the 1950s, they sold a number of Kitson-Meyers and 2-6-2Ts south to Taltal. However, much less appreciated is the fact that a decade earlier the *FC de Taltal*, in dire straits owing to the closure of many *oficinas*, had sold six of its own Kitson-Meyers to the Tocopilla Toco operation. I have no information as to which engines were involved, or whether all of them returned as part of the later transaction.

[CYPHER] A/S FILES
FROM SANTIAGO TO FOREIGN OFFICE
 Sir C. Orde D. 1.50 p.m. 13th July 1945.
No. 185. R.10.50 p.m. 13th July 1945.
 13th July 1945.
 I I I I
 Following from Burns from Higgs.
 Anglo Chilian offer to purchase in the present condition
 six Meyer locomotives at £2500 each payment London. I
 recommend acceptance. Government report on our offer delayed,
 awaiting full inventory from Taltal.
 O.T.P.
 him our written offer of the railway.
 On the 14th. of June we were asked to supply a complete
 inventory of the railway with values and we telegraphed to Mr.
 Thompson for this. The Compiling of this was a lengthy job and
 it was not presented until July 25th.
 Meanwhile we sold six Meyer locomotives and sixteen tank
 wagons and the sum of twenty-two thousand nine hundred pounds
 has already been paid to you.
 At this time we heard of the large sales of Chilean nitrate

In 1959 [9], locos were acquired from the *FCTT*, including five 2-6-2T and six Kitson-Meyers. Wilfred Simms re-

ported the following present at least in part in 1978 [6].

0-6-6-0T Kitson-Meyer d/w 34¾", cyls. 14"x18", built by Kitson

51²	w/n 4654 of 1909.	Ex <i>FCTT</i> no. 24 .
57²	w/n 3604 of 1895	Ex <i>FCTT</i> no. 12 .
59²	w/n 4656 of 1909	Ex <i>FCTT</i> no. 26 . Last operational loco on line. Steamed as late as 1978 to shunt scrap wagons [16]. Preserved in Taltal.
60²	w/n 3532 of 1894	Ex <i>FCTT</i> no. 10 .
61	w/n 4655 of 1909	Ex <i>FCTT</i> no. 25 .



This shows no. **59** during its very last days as the railway was dismantled. Note the increased height of the much re-welded tanks and bunker. Photo found on a Chilean rail enthusiasts' Facebook page. Photographer unknown.

0-6-6-0T Kitson-Meyer 34"?, cyls. 14"x18", built by Kerr Stuart

57³	w/n 816 of 1903	Ex <i>FCTT</i> no. 21 .
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0-6-2T d/w 37", cyls. 13x20", supposedly built by North British in 1907 for Lautaro Nitrate

Wilfred Simms reported this present in 1978 but [9] does not mention this.

41	w/n 18312?	Ex Lautaro Nitrate no. 12 . Dumped in 1977 [27].
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0-4-2T d/w 34¾" or 35¾", cyls. 11"x18", built by Kitson or Avonside for the FCTT

One of their locos **16**, **17**, **27**, or **28**. [27] suggests that one of these four came to Taltal, but gives no evidence for this. However, the number does make sense, and suggests why some of the following batch of ex-*FCTT* 2-6-2Ts were numbered from **43** onward.

42	w/n ?	Possibly ex <i>FCTT</i> no. 16 .
-----------	-------	---

2-6-2T d/w 34¾", cyls. 14"x18", built by Kitson for FCTT

32	w/n 4840 of 1911	Ex <i>FCTT</i> no. 32 .
43	w/n 3613 of 1895	Ex <i>FCTT</i> no. 15 . Dumped 1977 [27].
44	w/n 4340 of 1905	Ex <i>FCTT</i> no. 22 . Dumped 1977 [27].
45	w/n 4857 of 1911	Ex <i>FCTT</i> no. 33 . Dumped 1977 [27].
46	w/n 3601 of 1894	Ex <i>FCTT</i> no. 14 . In use in 1970 in green livery with yellow lining [J. Wiseman photo]. On shed 1977 [27].



MCC's own photo on the quayside at Taltal in 1975.

0-6-2T d/w ? cyls. ?, built by North British in 1904 for Lautaro Nitrate Co. or possibly by Kilmarnock Engineering no. 515 of 1921?

Binns & Middleton's Taltal Railway book suggests this loco was KE no. 515. KE was a short-lived builder housed in the former Dick Kerr works in Kilmarnock. Certainly Strain & Robertson included KE when circulating loco builders with invitations to tender for nitrate *oficina* locos, though by the time that the S&R records finish in 1921 they had not actually won any contracts.

‘Los DONES’

w/n 16027? In a shed in 1977 [27].

Parts of locos surviving into the 1970s

Also parts of Kitson-Meyers **21, 50, 55, 58, 59**, and Kitson 2-6-2T no. **44** in scrapyard. [9] reports that identities during the final years at Taltal were very mixed up, even with two locos bearing the same number.

Loco haulage capacities in each section of route

	Nos. 1-18	Nos. 9-31	Nos. 50-59
Taltal a Central	45T	65T	125T
Central a Refresco	61T	100T	160T
Refresco a Ovalo y Aguada	90T	135T	256T
Ovalo a Chile, Alemania y Lautaro (Según el personal disponible)	45T	65T	125T
Canchas a Portezuelo	90T	160T	256T
Portezuelo a Santa Luisa	61T	100T	100T
Agua Verde a Miraflores y Tricolor	90T	160T	256T
Refresco a Flor de Chile, Esperanza y Ghizela	90T	135T	235T
Refresco a Ballena	61T	100T	200T
Refresco a Britannia	90T	115T	
Catalina a Carolina	90T		
Catalina a Alianza			

These figures are from Echevarría 2009 [source 50], who seems to have found them in the railway's *Reglamento General* for 1931. However, they are not consistent and could do with checking in the original document.

2.4.5 The Anglo-Chilean Nitrate & Railway Co. later the Anglo-Chilean Consolidated Nitrate Corporation – *El FC Tocopilla a Toco*

1888-2015



Background

Gauge 3' 6". Built 1888-1890. A map in the *Biblioteca Nacional* digital collection suggests that at some point it was proposed to extend the line that runs south-east from Estación Central much further, to provide a direct route from the copper mines at Chuquicamata to the sea at Tocopilla. Robert Stirling, son of Patrick Stirling of the GNR in Britain, was the loco superintendent, and seems to have been the initiator of the Kitson-Meyer design [27]. The British-owned Anglo-Chilean Nitrate & Railway Co. was acquired in 1924 by the American-registered Anglo-Chilean Consolidated Nitrate Corporation a.k.a. the *Cía. Salitrera Anglo-Chilena*.

Three shunters? Kitson 0-6-0Ts according to 1930 US report

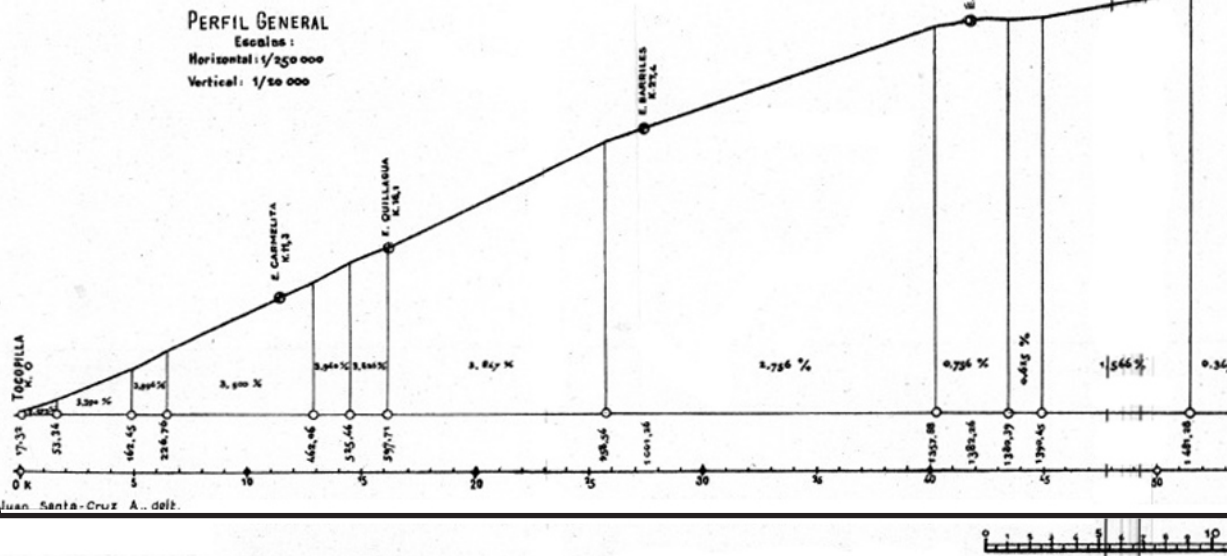
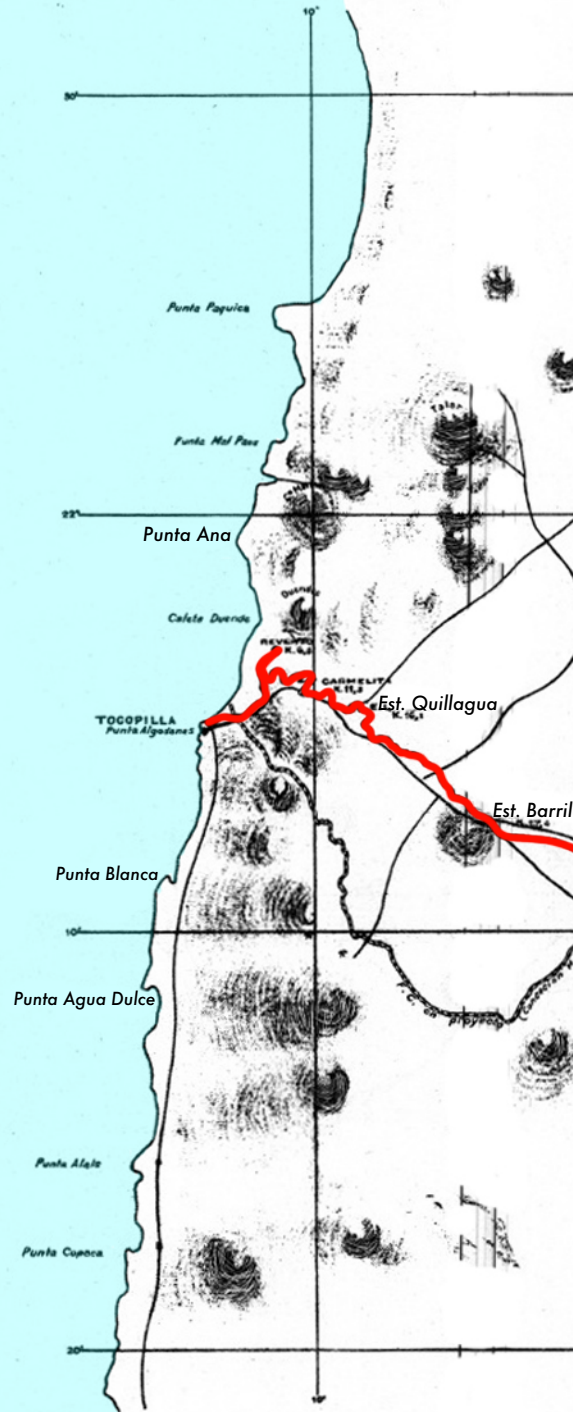
There is no sign of them in the Kitson list, and no identities seeming to be missing from the list of running numbers.

PLANO GENERAL
DEL
FERROCARRIL
DE
TOCOPILLA
AL
TOCO

ESCALA
1
250 000

FC Tocopilla - Toco

FC Longitudinal





ARTURO TITUS S.
Ingeniero Inspector
de Ferrocarriles Particulares.

There are no discrepancies in the 1893 annual report summary of locos, nor in any of the later lists. It looks as though this was a mistake made by Rodney Long or a colleague when making up the lists for source [26].



4-8-4T d/w 38½", cyls. 17"x24", built by Kitson in 1889 (1-3) and 1890 (4)

- 1

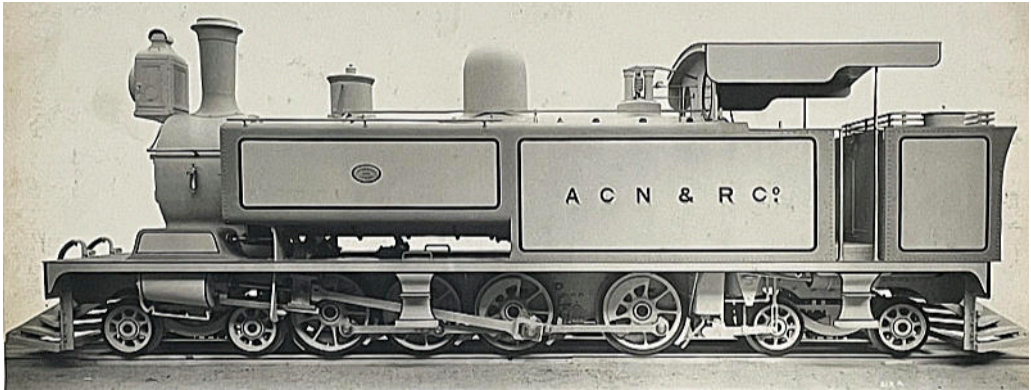
w/n 3185
- 2

w/n 3186
- 3

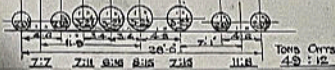

w/n 3187

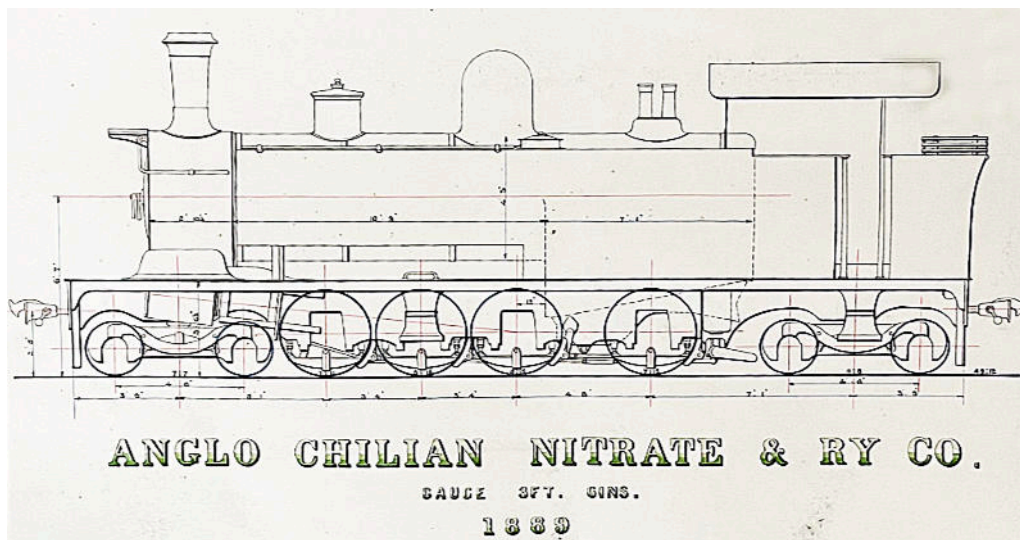
This engine was destroyed in the accident of 29th April 1893.
See below for details from the company’s annual report for 1893.
- 4

w/n 3188



The photo, the table of dimensions below, and the diagram that follows, are from the Kitson albums held at the SLS Library in Bristol.

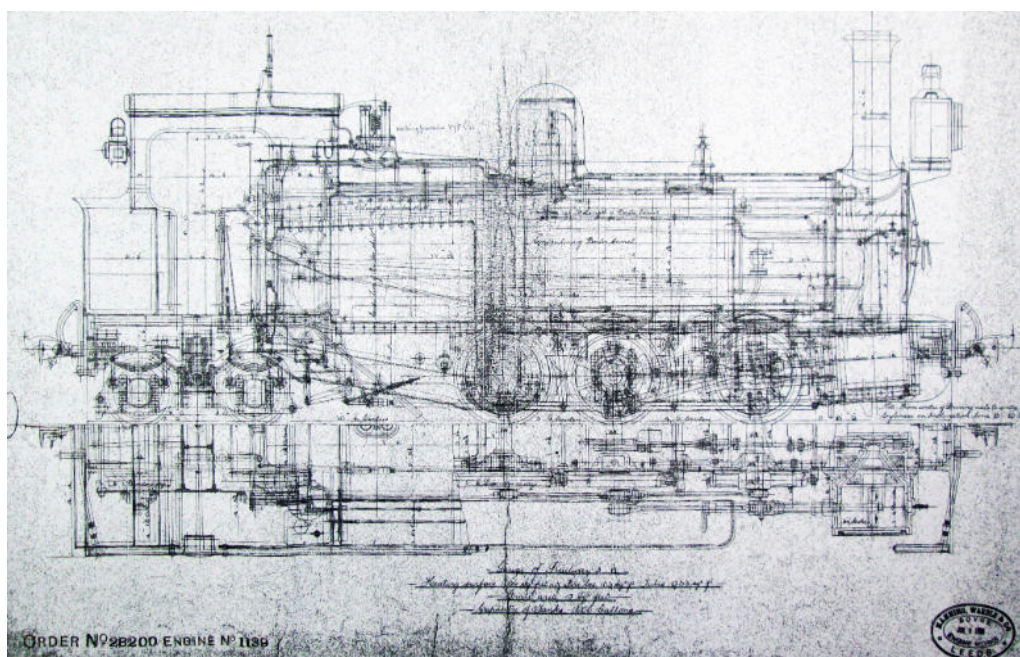
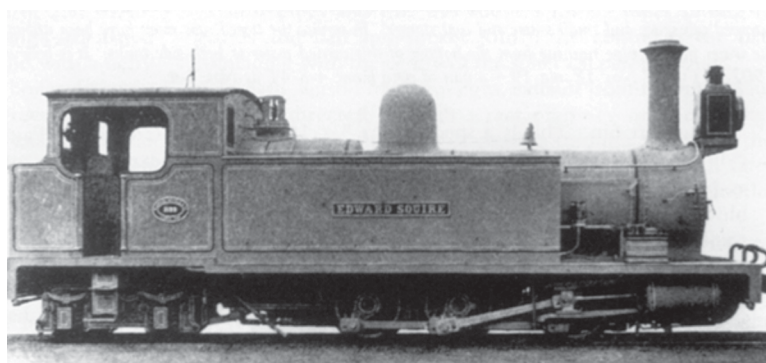
DER No.	BUILT FOR	GAUGE	CYLINDERS		BOILER				TUBES No.	DIA.	HEATING SURFACE		GRATE AREA	WATER CAPACITY	FUEL CAPACITY	BOILER PRESSURE	WHEELS DIAMETERS, WHEEL BASE AND WEIGHTS	DATE			
					BARREL LENGTH	DIA.	F/BOX SHELL LENGTH	BREADTH			TUBES PBOX	TOTAL									
17	ANGLO-CHILEAN NITRATE & RAILWAY CO.	3'-6"	OUTSIDE		17'	21"	10'-9"	4'-3"	7'-1"	2'-11"	174	1 1/4"	881-65	93-15	974-8	16	1670	CUB: FT. 80	160		1890
18	A.C.N. & R. CO.	3'-6"	OUTSIDE		17'	21"	10'-9"	4'-3"	7'-1"	2'-11"	173	1 1/4"	876-53	93-15	969-74	16	2070	CUB: FT. 80	160		1902



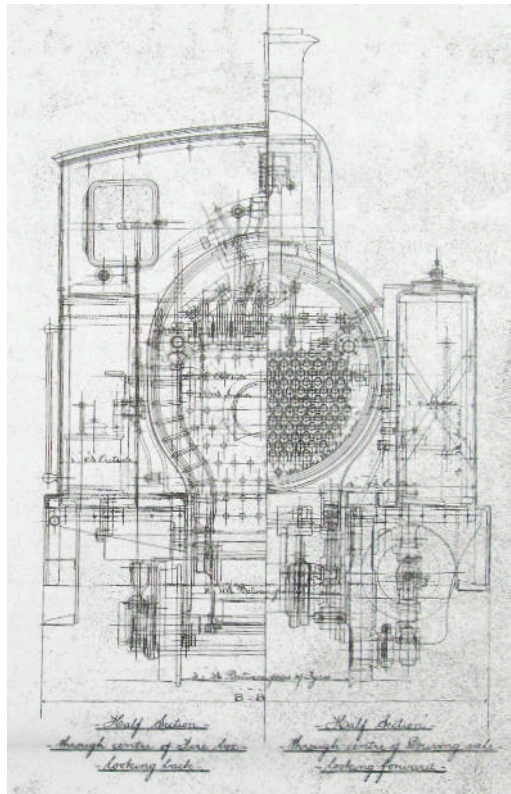
0-6-4T d/w 38", cyls. 16"x24", built by Manning Wardle in 1889

Harman's MW list says fitted with vacuum brakes?! NB If this engine had a name, then what about other early locos in the fleet? Sr. Edward Squire was the engineer in charge during much of the construction of the railway, though with a mixed reputation. Despatched August 1889.

5? 'EDWARD SQUIRE' w/n 1139



Original MW GA drawings for this engine are in the Hunslet archive at
Stafford Barn Farm, Staffordshire, England.



Sent away August 1889			Remarks	
N ^o	Class	Charge		
1139	16" x 24"	Special 3'-6"		
28200			<p>This is a special 16" x 24" outside cylinder Side Tank Engine on six coupled wheels 3'-2" diameter + a fourth wheeled bogie at the trailing end with wheels 2'-4" diameter. This engine is fitted with Vacuum brake. The Leading wheel has $3\frac{1}{4}$" play + the Trailing $\frac{5}{8}$" (each side). Coupled wheels are wrought iron. Bogie wheels cast iron. The Boiler is fitted with a dome, working pressure in Boiler 175 lbs per square inch. Boiler + dome lagged with wood + felt. Steam Safety Valves, Central Buffers (Tunstons make). Bell on the boiler. Bucks Whistle, American. Head Lamp, Crank pins, and Trailing Horn blocks. crucible steel Chimney with brass top. For duplicate work see full list of drawings + tracings Order N^o 28200.</p> <p>This Engine had a spark arrester in Smoke box; made in four parts of $3\frac{1}{4}$" round bar iron, + galvanized iron wires N^o 10 w. g. made by Proctor Bros + supplied under Order N^o 29885 in July 1890.</p> <p>This Engine had a special Valve fitted on the Spigot as recommended by Mr Stirling see Blue Photo print in 28200 drawer, another Valve with couplings to Brake cylinder supplied under Order N^o 29910 in July 1890. see Photo print sent by the Vacuum Brake Co.</p>	
			Name EDWARD SQUIRE" brass plate $3\frac{1}{2}$ " letters.	

These Manning Wardle notes describe various features of this one-off design.

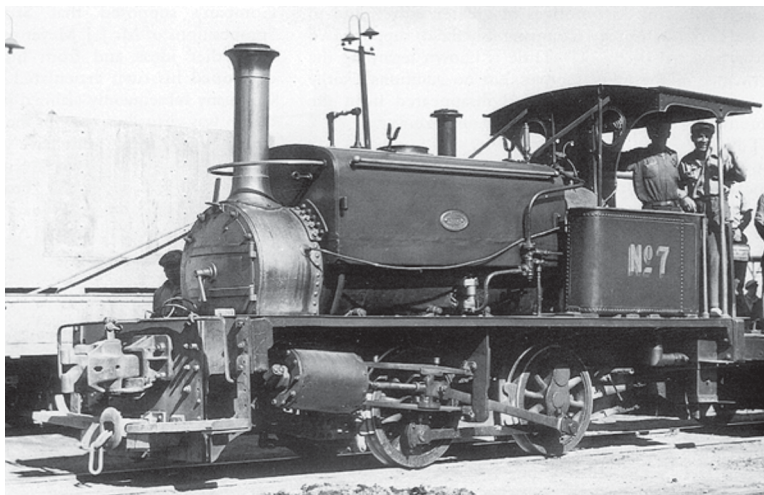
0-4-0ST d/w 33 $\frac{3}{4}$ ", cyls. 10 $\frac{1}{2}$ "x16", built by Manning Wardle in 1888 and 1889

Purchased via Woodgate Innes & Co. The 1930 US report gives dimensions which imply that one of these two locos had been modified, possibly with the addition of carrying wheels, and perhaps with an inspection saloon added as the length had increased from 18' 11" to 30' 7".

6

w/n 1107 Plinthed at north end of Tocopilla town centre in centre of dual carriageway, carrying works plate 1126 [6].

w/n 1126 Also later carried offset (LHS) low-level link-and-pin couplers for use with narrower gauge wagons, as well as main MCB couplers.



No. 7. Note additional off-centre low level coupler.

N ^o Class Gauge	Remarks
107 special 3.6 27300	<p>This is a special 10½" x 16" outside cylinder Saddle Tank Engine for four coupled wheels 2' 9" diam, wheel base 14' 5" = 30.3 sq feet, 27.32 feet in Boz. + 27.1 ft in 64" Sicks out diamr capacity of Tank 350 gallons. This Engine is in many respects like N^o 632. It is fitted with Canopy same as N^o 1075. Cylinder attch of class F with steam + Exhaust pipe branch same as 20020. Piston rings cast iron 10½" diam 3/4" broad + 3/8" thick crank pins Class F. 26280. Engine N^o 1051. Couplings + Connecting rods same as Order N^o 26540. Engine N^o 1074. Tyres same as class F springs Driving 17 plates + Leading 12 plates same as 11700. This Engine is fitted with George Funtons central patent coupler 2' 6" from rail, Cast iron brake blocks. Lamps, + Lubricators fixed on Saddle tank with unions screwed into steam pipes + couplings same as Order N^o 26800. for further particulars + duplicate work see full list of drawings + tracings general book. Order N^o 27300. This Engine is also fitted with a bell on Saddle tank same as Order N^o 26100. for brackets + plates for Draw gear see page 445 Copy book. This engine had vacuum brake for train with Ejector + necessary pipes fitted on Engine under Order N^o 29910. July 1890. This Engine had a spark arrestor in smoke box of 3 1/2" round bar frames + N^o 10 w.g. wrought iron wires. + 1/2" mesh galvanized, this was made by Parster Smith under Order N^o 29885. July 1890. Draw gear same as Order N^o 27860 supplied. Janr 1889, see print + tracing, in drawn for Order N^o 27300.</p>

N ^o Class Gauge	Remarks
1126 10 26 3.6 27860 New Boiler complete 1908	<p>Sent away March 1889.</p> <p>This is a special 10½" x 16" outside cylinder, four coupled Locomotive Saddle Tank engine, same as N^o 1107. except in the following alterations. Slide blocks increased in length (same as Order N^o 27700. Engine N^o 1117) special spark arrestor in smoke box supplied under Order N^o 29885. + Vacuum brake under Order N^o 29910. see dr + tracings July 1890. For Buffing + draw gear see print + tracing in drawn when drawings are kept for this Order N^o 27860. A new Low Moor iron boiler barrel fire box shell + smoke box tube plate. New steel smoke box with door + fittings complete. New copper fire box with 3 1/2" flanges. new set of brass tubes (old arrangement) New expansion brackets Regulator, copper inlet pipe. lever safety valves + cast iron chimney. For further particulars see Order N^o 63545. + for tracings sent into the works see N^o 6 duplicate book page 225. Dec 8. 1908.</p>



No. 6 as seen in March 2019.

Report of the directors 1889

The printed directors' report for the AGM in December 1889 recorded that two large locomotives and two shunting engines were now present at Tocopilla. At that point twenty miles of track had been completed.

0-6-6-0T Double Fairlies d/w 36", cyls. 14"x20", built by Yorkshire Engine Co. in 1891

Ordered February 1890 under contract E84. A comprehensive table of part weights is available for this loco in YECOs weights book C60 to C131, in the Sheffield City Archives. This gives an empty weight for the loco of 43¼tons. Interestingly, YECOs drawings show that these engines were fitted with a steam reverser with oil-filled cateract cylinder along the lines of Hendrie's design for the NGR. This was located above one of the driver's side water tanks and with very long drop rods in the linkage to minimise alteration in the valve settings as the bogies turned on curves.

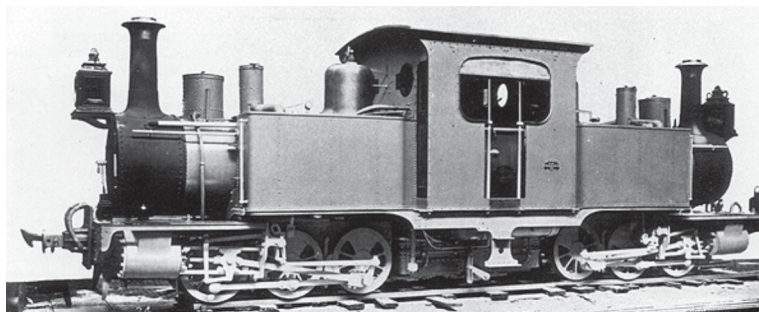
8 w/n 446

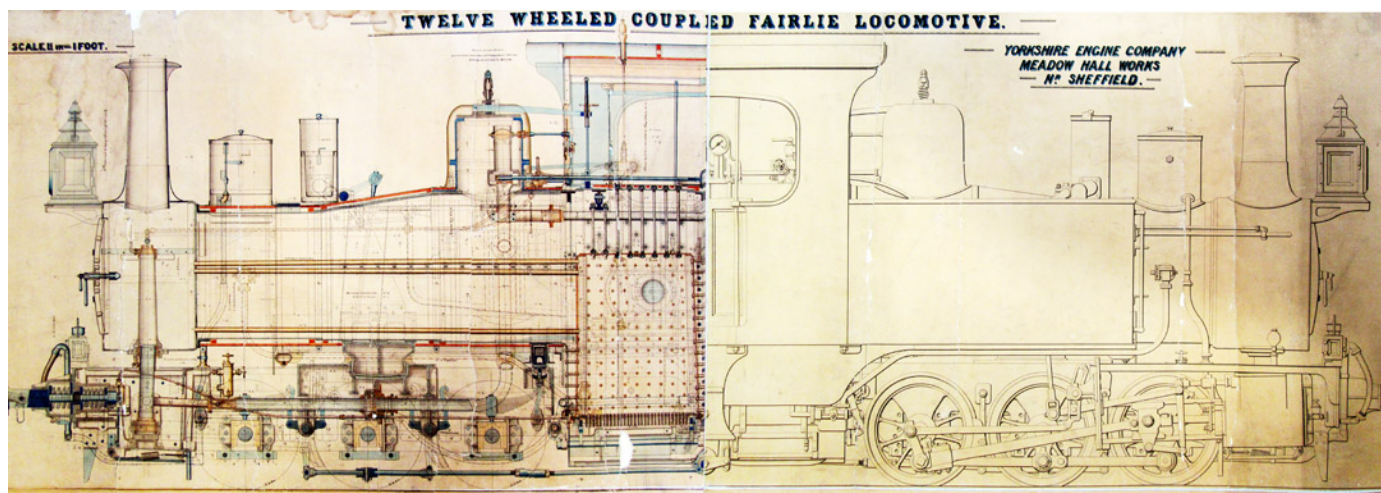
9 w/n 447

In January 1893 the YECOs supplied twelve steel tyres for these locos under order 10205, order 10357 slightly later was for twenty-four more tyres, as was an order 11770 in June 1895.

In November 1893 the YECOs supplied one set of connecting rods, coupling rods, pistons, front cyl. covers, etc., under order 10700.

Withdrawn prior to 1925, and possibly as early as 1902. [4] says both withdrawn around 1929.





The 1893 accident

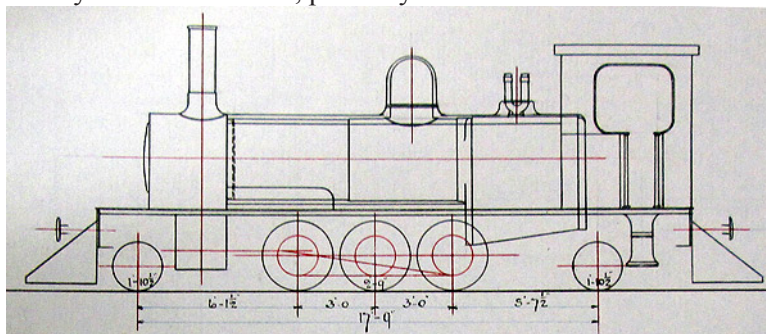
An extract from the railway manager's account, as reproduced in the annual report to shareholders: "On Saturday last (April 29) engine No. **3** with the second train from Toco left the reverse at mile 4, at about 11.20 P.M., with a train of eleven cars loaded with nitrate. About half a mile below the reverse, and having attained a velocity apparently not less than 40 miles an hour, the engine left the rails, tore up line and sleepers for over 100 yards, and was precipitated with its whole train down the side of the hill, which at that place is very steep and over 500 feet high." After detailing his measures in the preparation of a relief train and his arrival on the scene, the manager proceeds :— " We found the bodies of the fireman and of the telegraph clerk from Toco, who was a passenger by the train. The body of driver Tauser was not recovered till daylight next morning, being completely buried under a car of nitrate. The only other person on the train besides the conductor was a brakesman, who turned up next morning badly wounded about the head. These two will recover, so that the deaths are three. The damage and loss in rolling stock and material is very heavy, somewhere about £5,000," A later reference mentions "the value of the locomotive destroyed in the accident..."

The fleet in 1894

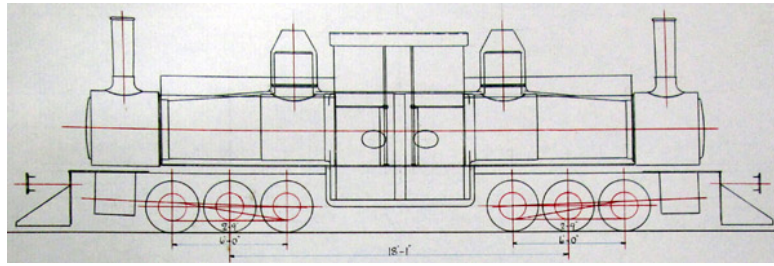
The company's annual report to shareholders in June 1894 states that the loco fleet was comprised of six mainline engines and two shunters, with three mainline locos and two (illegible) shunters approaching completion. One loco and a number of wagons had been destroyed in an accident, on 29th April 1893. The two shunters were clearly Manning Wardles nos. **6** and **7**. The loco which had been destroyed was no. **3**, one of the 4-8-4Ts. The statement re three mainline locos and two (?) shunters approaching completion would seem to have been something of a fiction, unless initial completion at Kitson's works rather than erection at Tocopilla was meant. Certainly that number of new locos had been ordered from Kitson, built and shipped from the UK, but one Kitson-Meyer and one 2-6-2T were lost at sea *en route* and not replaced until 1895.

Proposed designs never actually built

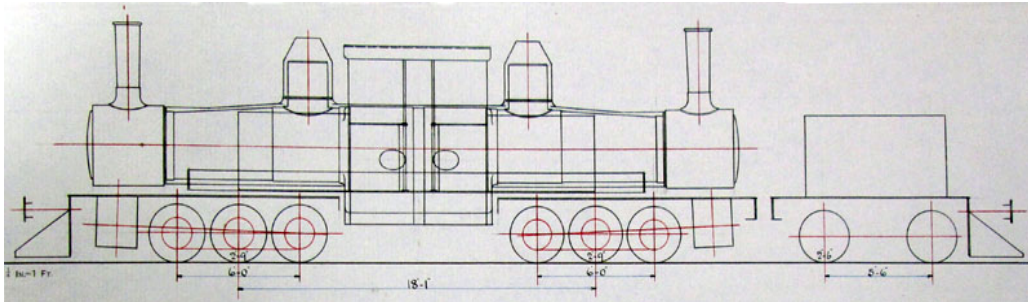
Sketch drawings in the NBL archives suggest that the Neilson company was working up designs for 2-6-2T, 0-6-6-0 double Fairlies (including a compound, and one with attached four-wheeled water tender instead of having loco mounted tanks), and 0-6-6-0 Meyers for the ACNC, probably around the same time as the YE Fairlies were built.



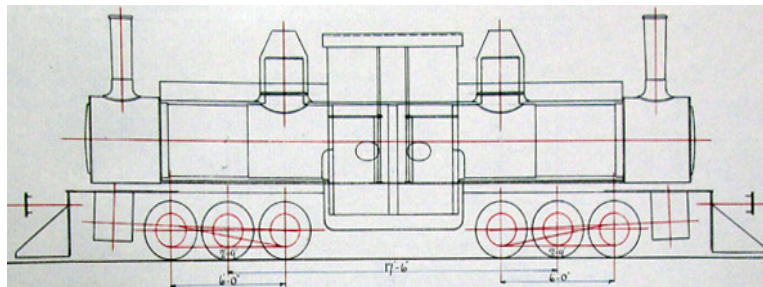
Neilson sketch S173 showing proposed 30 ton 2-6-2T for the ACNC. Cyls. 13x18".



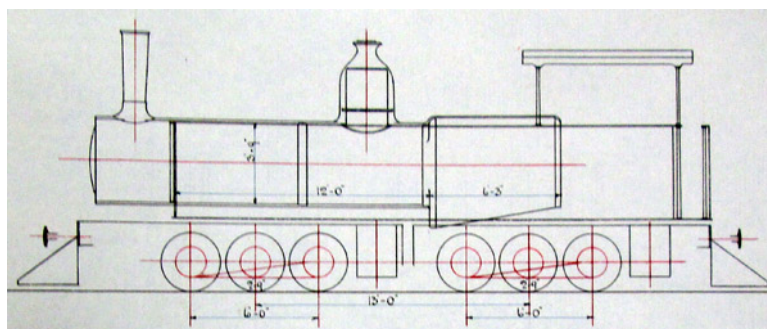
Neilson sketch S174 showing proposed 57 ton compound 0-6-6-0 Double Fairlie for the ACNRC. Cyls. 13 " and 19 " x 18". It would be interesting to see how the flexible steam pipes would have worked on a Fairlie with inside cylinders.



Neilson sketch S175 showing proposed 50 ton simple 0-6-6-0 Double Fairlie with a 15 ton 4-wheeled water tender for the ACNRC. Cyls. 12 x18".

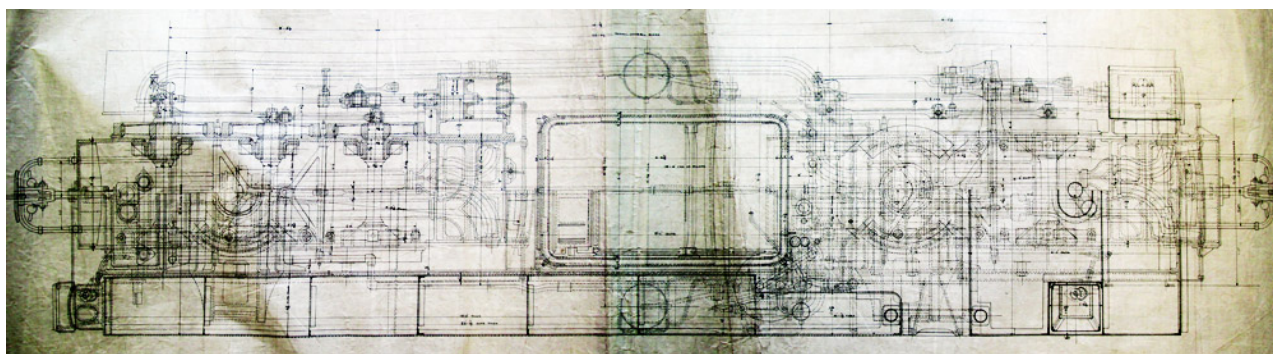


Neilson sketch S180 showing proposed 53 ton simple 0-6-6-0 Double Fairlie for the ACNRC. Cyls. 12 x18".



Neilson sketch S181 showing proposed 50 ton 0-6-6-0T Mayer (sic) for the ACNRC. Cyls. 12 x18".

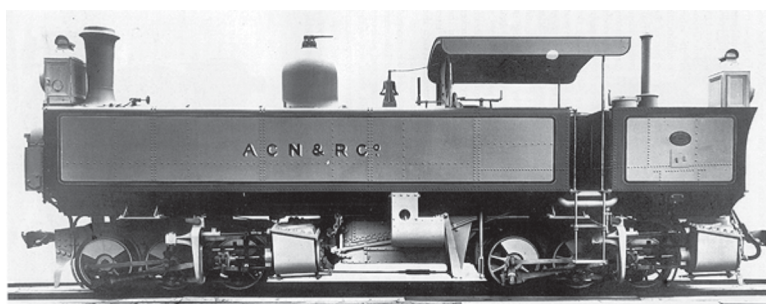
A Yorkshire Engine Company plan view of an 0-6-6-0T Meyer for the ACNRC surviving in the archive at Sheffield Record Office shows that the YEC must also have tendered for the construction of Meyers for the railway. The date of the drawing is unknown but it is very detailed and clearly not merely an outline proposal.



0-6+6-0T Kitson-Meyers d/w 34¾", cyls. 14"x18", built by Kitson in 1894 (10-11?), 1895 (12), and 1909 (23-6)

10	w/n 3532	In service in 1931 [9]. Sold to <i>FC de Taltal</i> in 1959 and became their no. 60 [9]. Ian Thomson [55] reckons that one of the bogies on the surviving K-M loco at Taltal is from this engine, though the majority of that loco is <i>FC de Taltal</i> no. 59 which was originally <i>FCTT</i> no. 26 .
11	w/n 3533	The original no. 11 was lost at sea. It was replaced by an identical machine. Precisely which set of parts carried which plates is uncertain.
11?	w/n 3534	In service in 1931 [9].
12	w/n 3604	In service in 1931 [9]. Sold to <i>FC de Taltal</i> in 1959 and became their no. 57 [9].
23	w/n 4653	
24	w/n 4654	In service in 1931 [9]. Sold to <i>FC de Taltal</i> in 1959 and became their no. 51 [9].
25	w/n 4655	In service in 1931 [9]. Sold to <i>FC de Taltal</i> in 1959 and became their no. 61 [9].
26	w/n 4656	In service in 1931 [9]. Sold to <i>FC de Taltal</i> in 1959 and became their no. 59 [9].

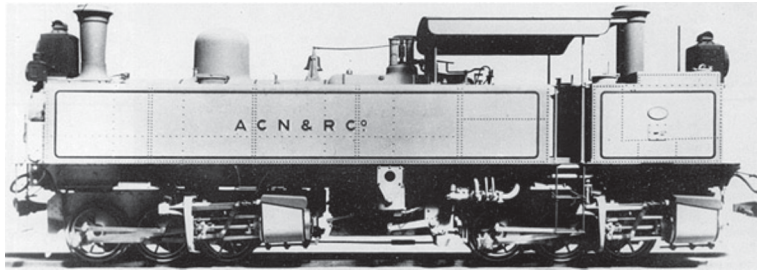
One of these K-M locos derailed and overturned near Tocopilla on 30th November 1910 [*Zigzag* issue 315].



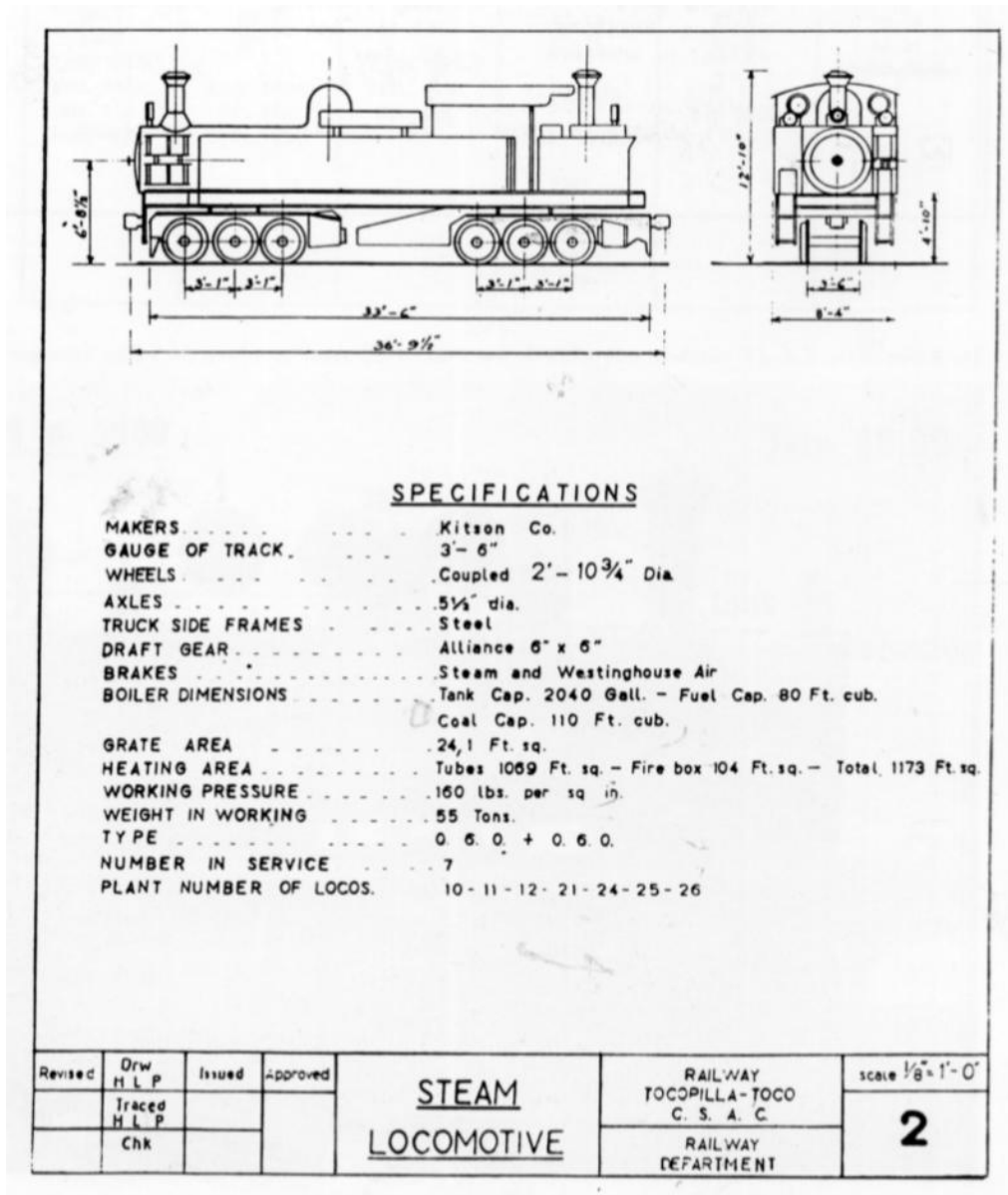
Note narrow rear chimney, and cover over brake actuating cylinder alongside firebox.



Kitson builders' photos, via Donald Binns' *FCTT* book. This one was probably no. **12**. Note the larger rear chimney on this 1895 loco.

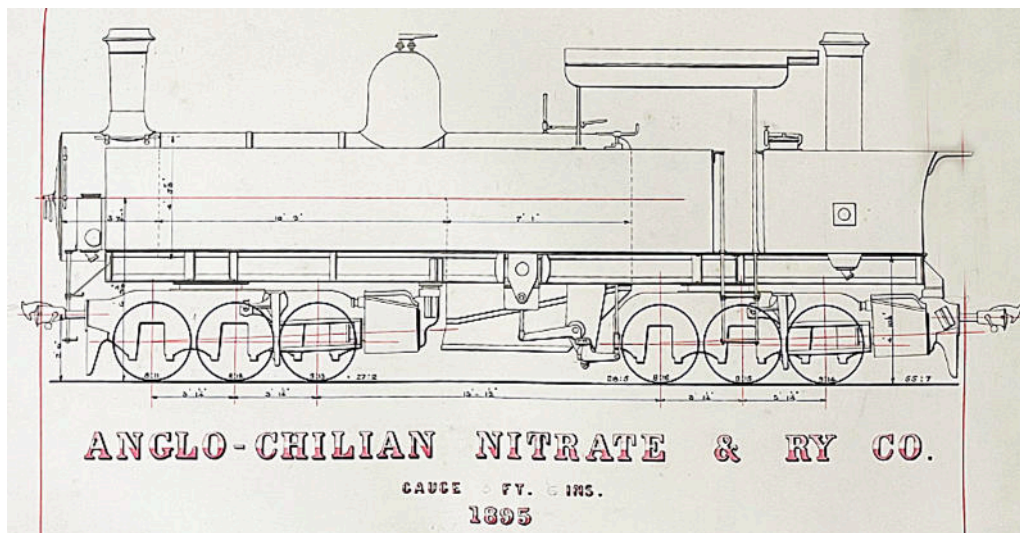


A loco of the 1909 batch, with modified boiler having a more forward mounted dome.

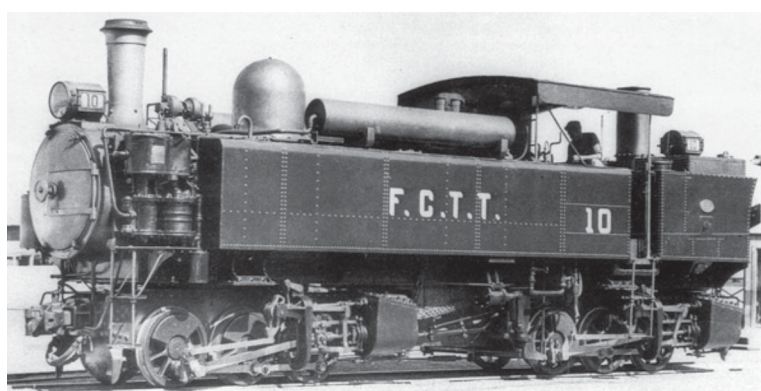


An FCTT diagram sheet, as reproduced in Donald Binns' *Kitson-Meyer Locomotives* book.

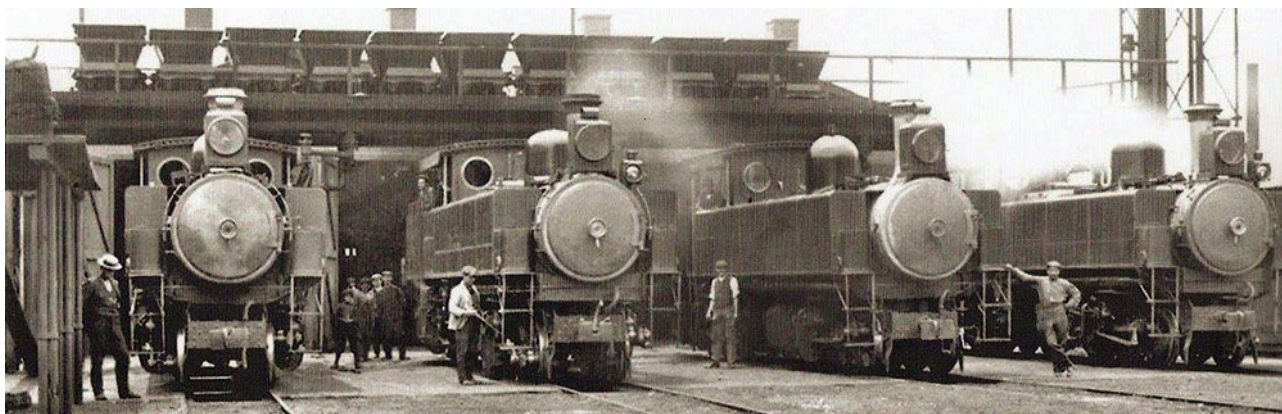
In later years these locos gained air brakes – the pump being fitted in front of shortened tanks. The dome on no. **10** also appears to have moved forward, suggesting that re-boilering had taken place using the 1909 type of boiler.



A diagram of an ACNC Kitson-Meyer, probably no. **12** as the caption gives the date of 1895, from the Kitson albums in the SLS Library.



FCTT Meyer no. 24 on an uphill oil train in 1926.



Four Kitson-Meyers on shed at Tocopilla. Date unknown, but clearly before the fitting of air brakes and knuckle couplers.

ORDER No.	BUILT FOR	GAGE	CYLINDERS DIA. STROKE	BOILER				TUBES NO. DIA.	HEATING SURFACE			GRATE AREA	WATER CAPACITY	FUEL CAPACITY	BOILER PRESSURE	WHEELS DIAMETERS, WHEEL BASE AND WEIGHTS	DATE
				BARREL LENGTH DIA.	FLY BOX SHELL LENGTH	HEADS	TUBES PER BOX		TOTAL								
3604	ANGLO-CHILIAN NITRATE & RAILWAY CO	3'-6"	OUTSIDE 14" 18"	10'-9"	4'-5"	7'-1"	4'-4"	210	12	1064	104	1168	24-1	1900	TONS 3	160	1895
4252 4	JAMAICA GOVERNMENT	4'-8"	OUTSIDE 13" 22"	11'-6"	5'-12"	6'-3"	5'-5"	226	13	1328	130	1458	26	2500	TONS 4	180	1904
4262	CENTRAL AFRICA	3'-6"	OUTSIDE 16" 24"	13'-4"	5'-0"	8'-3"	5'-4"	239	2	1727	136	1863	34	TENDER 3000	ENGINE 7 TONS TENDER 6 1/2 TONS	180	1904
4288 4432-4 4504-6 4512-14	TALTAL	3'-6"	OUTSIDE 14" 18"	10'-9"	4'-6"	7'-1"	4'-5"	198 192 192	13 13 13	1075 1042-4 1042-4	107 107-23 107-23	1182 1143-65 1149-65	25-2	1900 1865	TONS 3	160	1904 1907
4653 6	COLOMBIAN ANGLO-NATIONAL CHILIAN	3'-6"	OUTSIDE 14" 18"	10'-8"	4'-4"	7'-1"	4'-5"	206	12	1042	104	1146	25-5	2040	CUB: FT. 80	160	1909
4671 3	COLOMBIAN NATIONAL	3'-0"	OUTSIDE 14" 18"	10'-8"	4'-4"	7'-1"	4'-5"	206	13	1042	102	1144	25-5	1720	CUB: FT. 100	160	1909
4915-16	COLOMBIAN NATIONAL	3'-0"	OUTSIDE 14" 18"	10'-8"	4'-4"	7'-6"	4'-5"	206	13	1042	105	1148-5	27	1833	TONS 2 1/2	160	1912
5039-40	COLOMBIAN NATIONAL	3'-0"	OUTSIDE 14" 18"	10'-8"	4'-4"	7'-6"	4'-5"	100 14	13 5 1/2	764 1065	870-5	27	1833	2 1/2	160	1914	
5064-5	COLOMBIAN NATIONAL	3'-0"	OUTSIDE 14" 18"	10'-8"	4'-4"	7'-6"	4'-5"	100 14	13 5 1/2	764 1065	870-5	27	1833	2 1/2	160	1914	

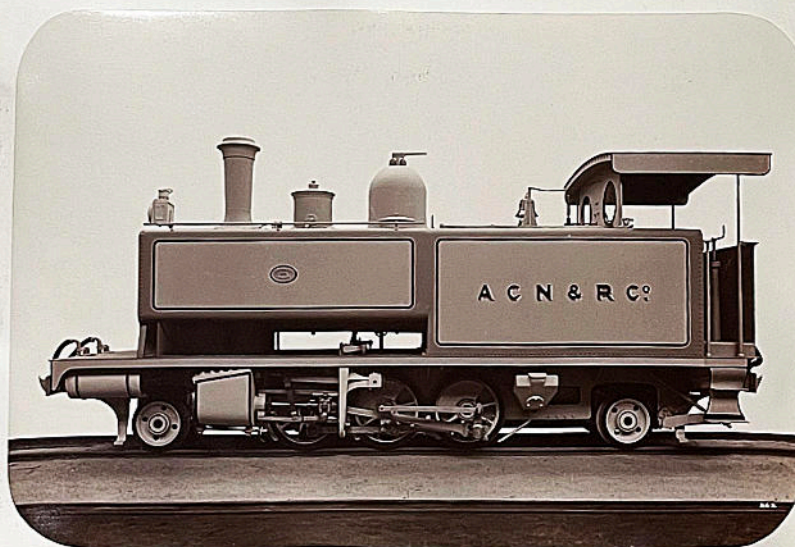
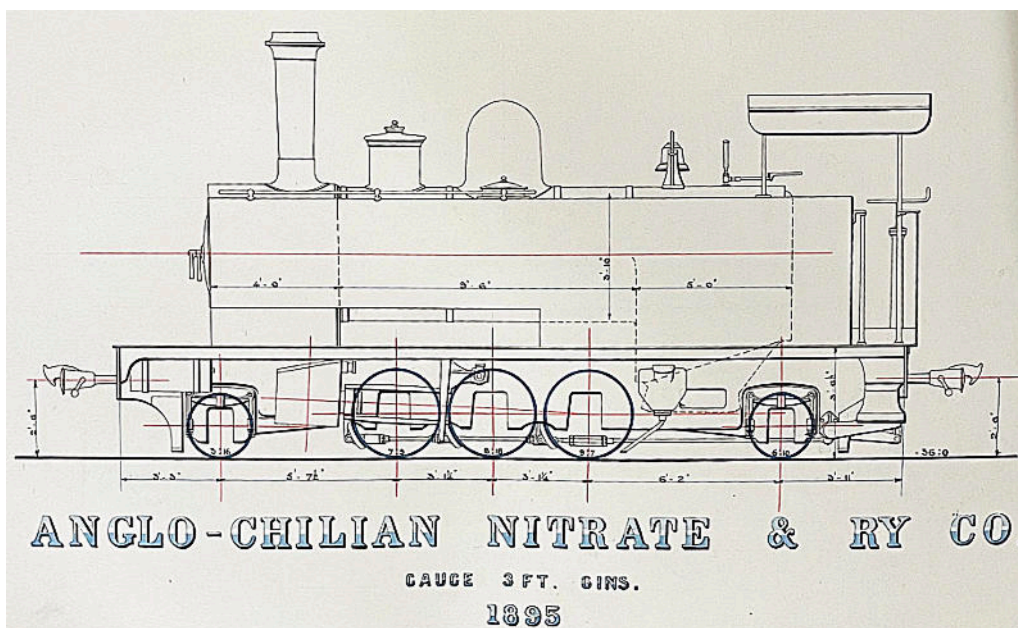
A table of dimensions for a variety of Kitson-Meyer locomotives, from a Kitson album in the care of the SLS library in Bristol.

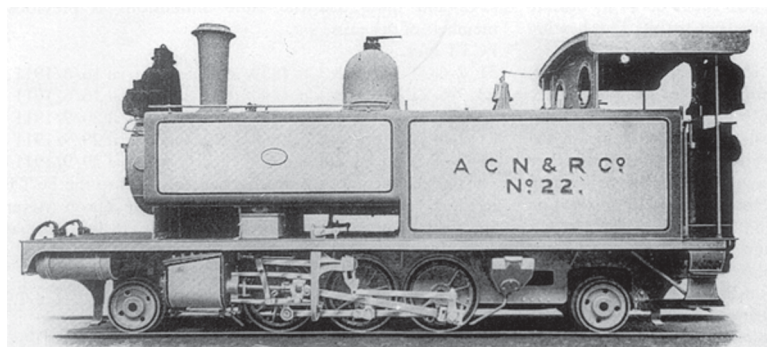
2-6-2T d/w 34 3/4", cyls. 14"x18", built by Kitson in 1894 (13-14?), 1895 (14-15), 1905 (22), 1911 (31-35)

Driving wheels, cylinders and motion apparently identical to those fitted to the Kitson-Meyers.

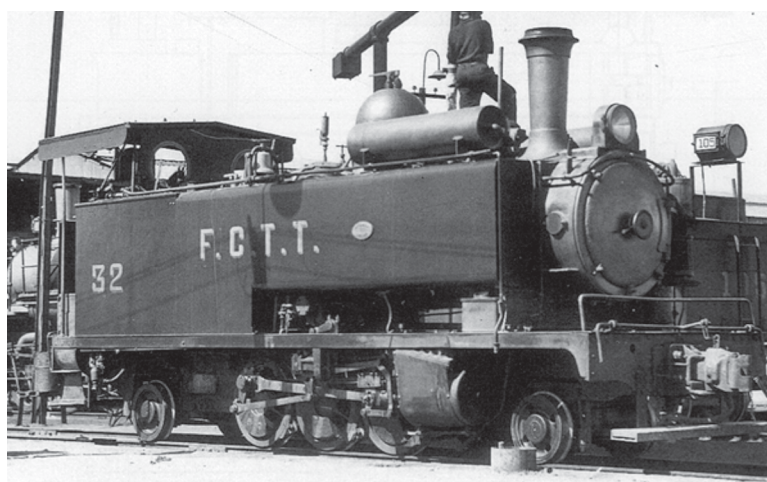
- 13 w/n 3535 Steam trial 13/7/1894 [27].
- 14 w/n 3536 Steam trial 1/8/1894 [27]. Similarly, this first no. 14 was sunk at sea and replaced by another.
- 14 w/n 3601 Steam trial 22/4/1895 [27]. Sold to *FC de Taltal* in 1959 and became their no. 46 [9].
- 15 w/n 3613 Sold to *FC de Taltal* in 1959 and became their no. 43 [9].
- 22 w/n 4340 Sold to *FC de Taltal* in 1959 and became their no. 44 [9].
- 31 w/n 4839
- 32 w/n 4840 Photographed by Brian Fawcett at María Elena in 1939 [20]. Sold to *FC de Taltal* in 1959 and became their no. 32 [9].
- 33 w/n 4857 Sold to *FC de Taltal* in 1959 and became their no. 45 [9].

34 w/n 4858
35 w/n 4859

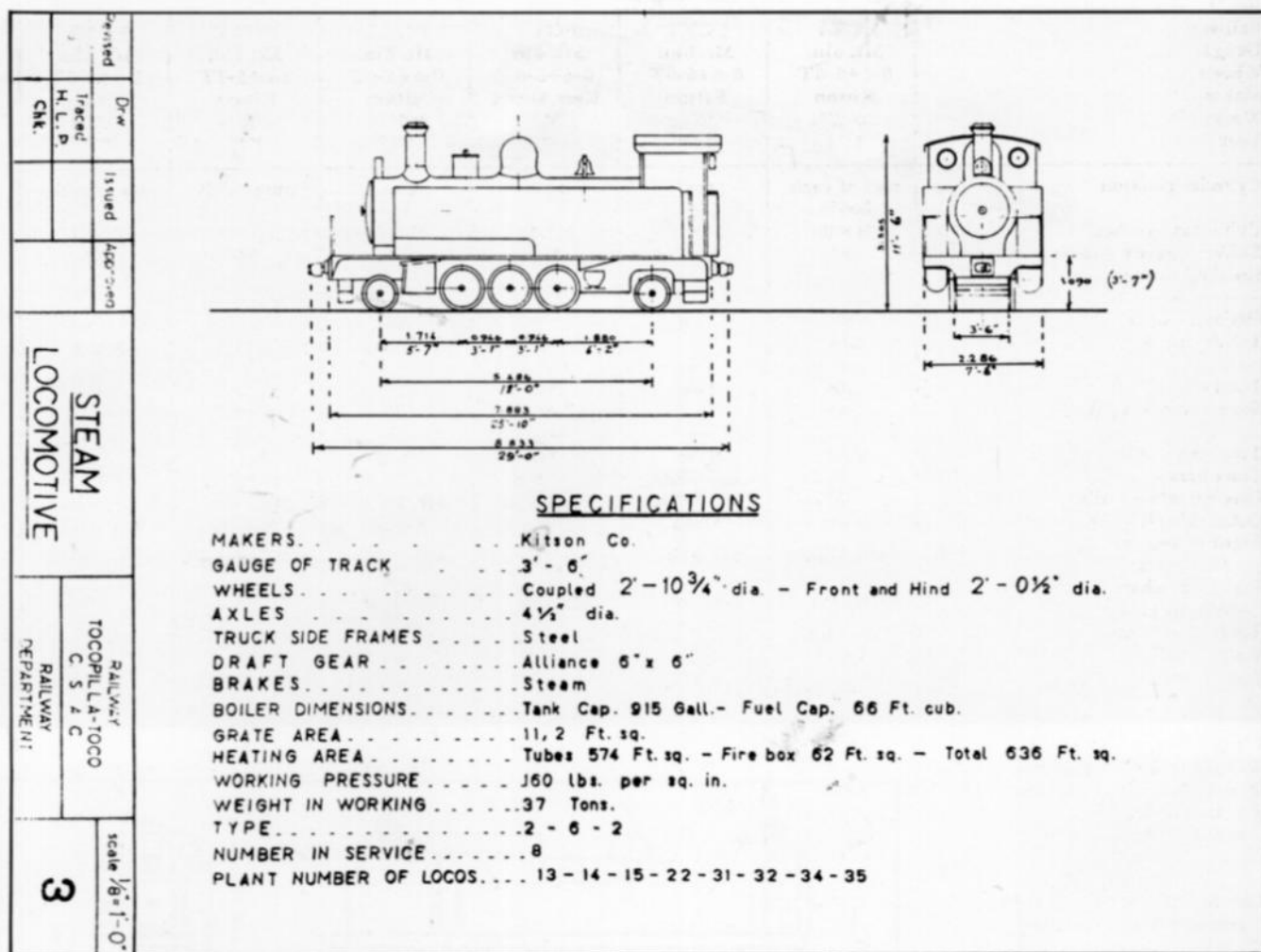




Kitson builders' photos, via Donald Binns' *FCTT* book.



No. **32** sporting added air-pump and reservoir, and with a shunters' step and handrail affixed to the front buffer-beam. The coupling is now a knuckle-coupler rather than the original chopper.



An FCTT diagram sheet, as reproduced in Donald Binns' *Kitson-Meyer Locomotives* book.



Not the clearest image of a Kitson-Meyer and a 2-6-2T at Tocopilla port, but the latter does seem to be displaying front end handrails both forward of the tanks and across the buffer-beam.

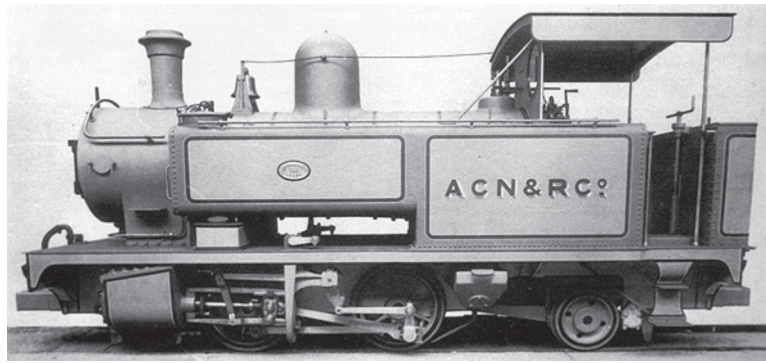
0-4-2T d/w 35 3/4", cyls. 11"x18", built by Kitson in 1900

US report in 1930 gives d/w as 34 3/4"

16 w/n 3977

17 w/n 3978

[27] suggests that an FCTT 0-4-2T was eventually sold to the *FC de Taltal*. It might have been one of these two.



Kitson builders' photo, via Donald Binns' FCTT book.

4-8-4T d/w 38½", cyls. 17"x21", built by Kitson in 1902

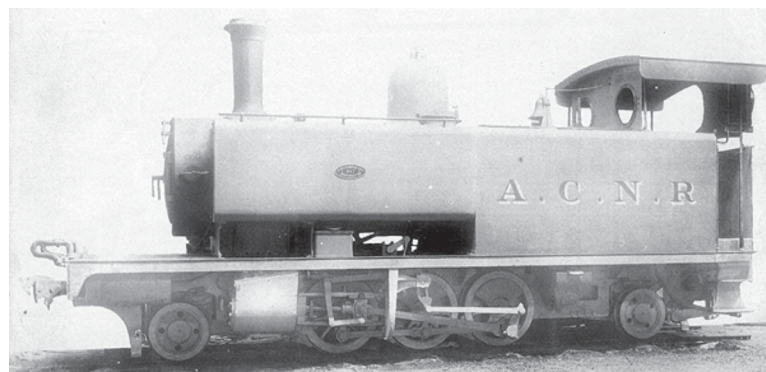
US report in 1930 gives cyls. of all 4-8-4Ts as 15"x21". There were minor differences between this batch and the earlier locos as delivered, though it is not yet clear which of two builder's photos show which batch. Photos show that one set of locos had a boiler top sandpot whilst the other did not; and that the tank fillers were different, as was the boiler feed pipework.

18 w/n 4108

19 w/n 4109

2-6-2T d/w 34¾" cyls. 14x20" (later rebuilt to 14x18"?) built by Kerr Stuart in 1903

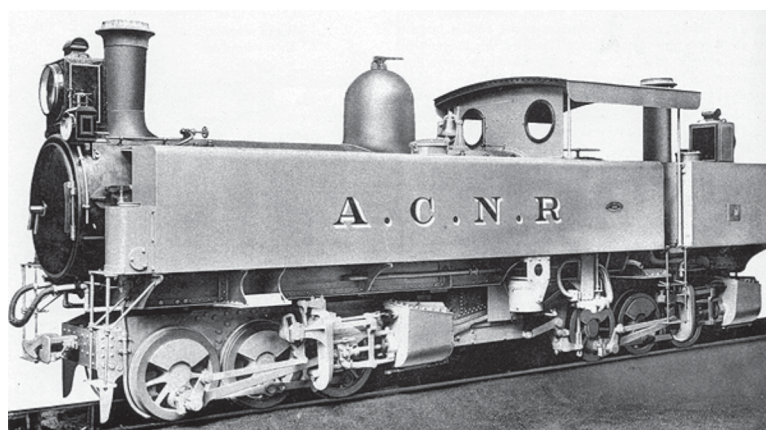
20 w/n 817



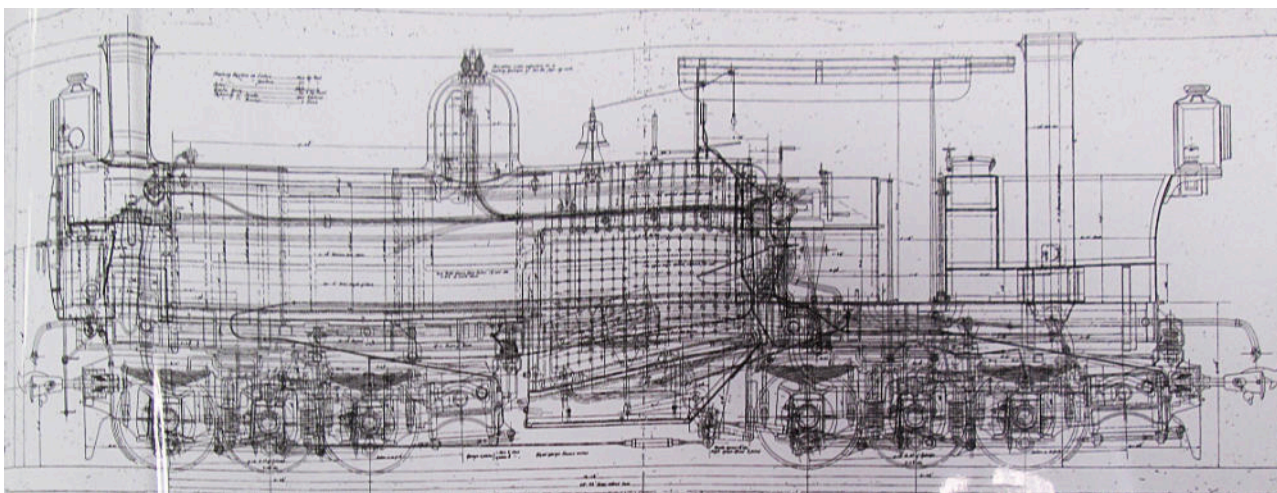
Kerr Stuart builders' photo, via Donald Binns' FCTT book.

0-6-6-0T Kitson-Meyer d/w 34"?, cyls. 14"x18", built by Kerr Stuart in 1903

21 'TOCO-PILLA' w/n 816 In service in 1931 [9]. Sold to *FC de Taltal* in 1959 and became their no. **57** [9].



Kerr Stuart builders' photo, via Donald Binns' FCTT book.



A Kerr Stuart GA drawing found in the Hunslet archive at Statfold Barn Farm in Staffordshire, UK. The Hunslet Engine Company took over the assets and goodwill of a number of defunct British loco builders over the decades. Whilst this design has not been compared closely with the equivalent Kitson drawings, one obvious minor difference is that the boiler safety valves are on the dome rather than over the firebox.

Fleet totals early in the new century

Source [13] lists the following locos:

- 4 x Meyers with double 6-coupled bogies,
- 2 x Fairlies with double 6-coupled bogies,
- 5 x Kitson locos, with 4 coupled axles,
- 1 x Manning Wardle with 3 coupled axles,
- 4 x *remolcadoras* Kitson with 3 coupled axles,
- 1 x *remolcadora* Kerr Stuart with 3 coupled axles,
- 2 x *remolcadoras* Kitson with 2 coupled axles.

In 1907 the *Estadística minera* confirmed the total, reporting that “*El material rodante consta de 19 locomotoras, hoi todas de calderos calentados con petroleo;*” [] However, those totals of nineteen actually date from around 1902, with the number continuing to grow through that decade. The details, such as numbers of coupled axles, listed above cannot be relied upon as they do not correlate with the locos listed below.

A move to oil fuel

During 1908 *The Railway Times* reported that the railway was gradually moving over to the use of oil rather than coal as locomotive fuel.

The fleet in 1909-11

The government publications *Estadística de los Ferrocarriles Particulares en Explotación* state that the railway had 22 locos in operation in 1909, and 25 in 1910 and 1911. These are specified as 15 for goods train use and 7 for shunting, increasing to 16 for goods use and 9 for shunting. The shunting locos will have included the two Manning Wardle 0-4-0STs, the two Kitson 0-4-2Ts, possibly three of the less competent 2-6-2Ts, and latterly the two Avonside 0-4-2Ts listed immediately below.

During 1909 the railway used 5,028 tonnes of Australian coal, and 2,952 tonnes of crude oil.

0-4-2T d/w 34¾, cyls. 11"x18", built by Avonside in 1910

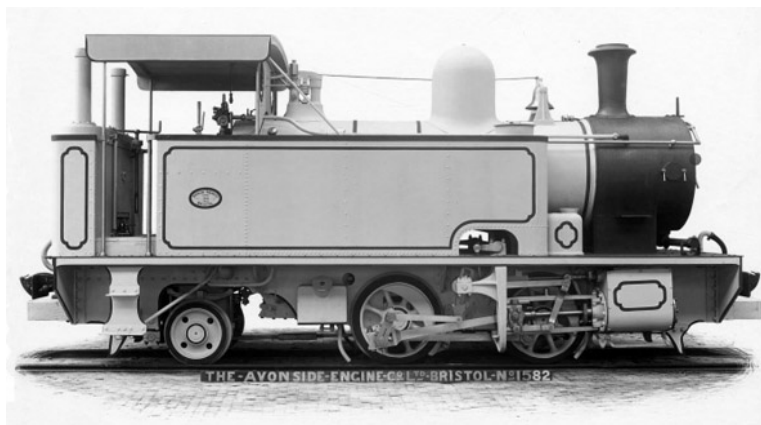
Binns says d/w 35½".

27 w/n 1581

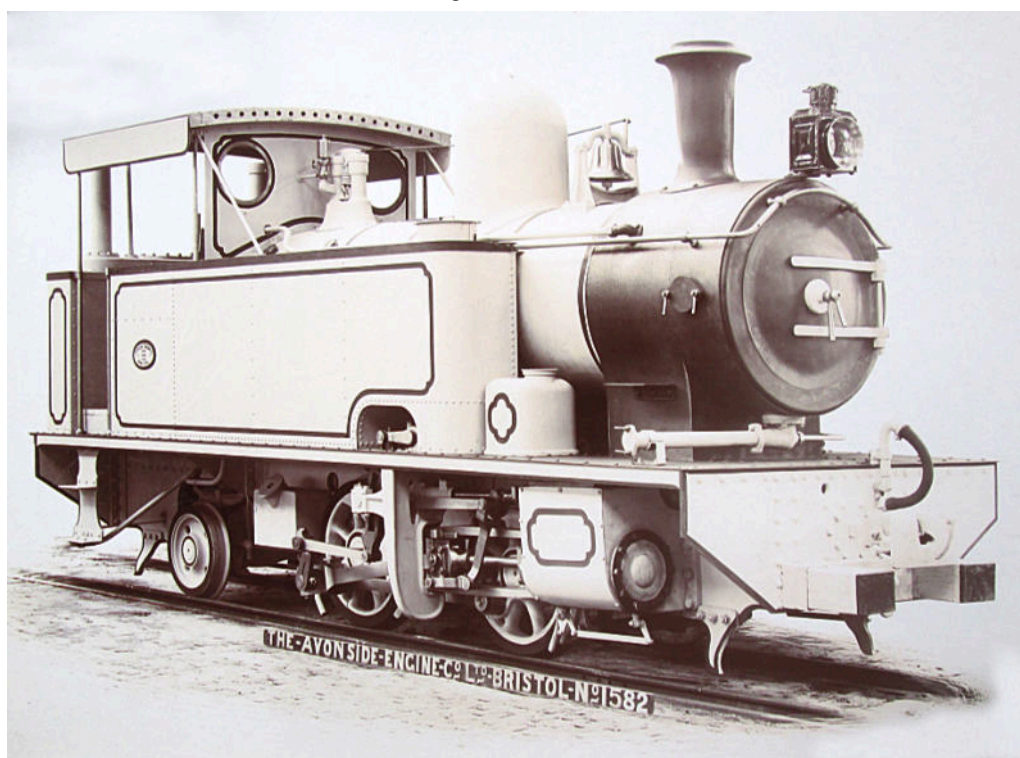
28 w/n 1582

In 1926 four ACNC 0-4-2Ts were working at *Oficina Coya Sur*, probably including these engines and Kitsons **16** and **17**.

[27] suggests that an *FCTT* 0-4-2T was eventually sold to the *FC de Taltal*. It might have been one of these two.



Avonside 1582, image from Bristol Museums website.



A front three-quarter view of the same engine, this time found at the Hunslet archive at Statfold Barn Farm, Staffordshire, England.

2-6+6-2T Kitson-Meyers d/w 38½", cyls. 15"x21", built by Kitson in 1910 (29-30), 1911 (36) and 1912 (37)

Modifications during the Guggenheim era (1924-1929) included the addition of air brakes, electric lighting, cab windows, knuckle couplers, oil burning, and alterations to the rear bunker and sandboxes.

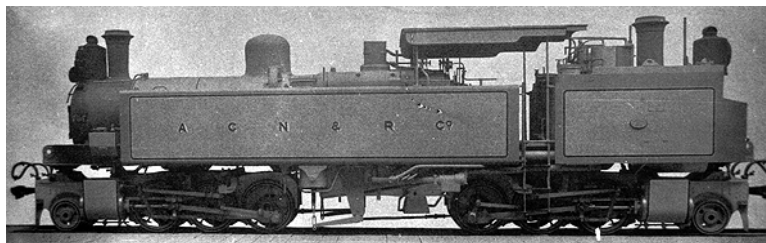
29 w/n 4735 Photographed by Brian Fawcett at María Elena in 1939 [20].

30 w/n 4736

36 w/n 4853

37 w/n 4854

Was there one extra K-M loco of this later type? One report suggests there were five of them.



Kitson builders' photo, via Binns' *FCTT* book.



Loco **29** after modification.

The fleet in 1925 and around 1928

The take-over by the ACCNC in 1924 was the prelude to a complete take-over by the Guggenheim Brothers in 1925. Source [27] lists the fleet taken-over as including all of the locos above apart from the two double Fairlies **8** and **9**. Note that this includes all four of the original 4-8-4Ts nos. **1-4**. In other words the one supposedly destroyed in the 1893 accident might have been rebuilt later. However, the 1930 US report [26] differs slightly. It states that there were only three of the original four 4-8-4Ts in service, which suggests that the one destroyed in 1893 was indeed withdrawn permanently at that time. Finally, it completely ignores the presence of the Baldwin Mallets mentioned in the following section.

Electrification

The 'hill section' of the mainline, from El Tigre down to Tocopilla, was electrified in 1926, whilst steam continued in use on the more level pampa sections. At the same time a new 45 km link from El Tigre to María Elena was built, avoiding the need to haul north to Toco before turning west.

Six immigrants from Taltal in 1945

Foreign Office documents found in Britain's National Archives at Kew show that in 1945, when the *FC de Taltal* was really struggling owing to closure of most oficinas, the *FCTT* offered to buy six of the Taltal Meyer locomotives for £2500 each, and that this was accepted. The numbers of the engines are not known.

Dieselisation

The first diesel to arrive seems to have been a Whitcomb in 1952, and then a number of GE road locos and road switchers began work in 1957-8.

Copeland says steam finished on the *FCTT* in 1959, at which point five 2-6-2T and possibly six K-Ms went to Taltal.

2.4.6 The Anglo-Chilean Nitrate & Railway Company's 'mina' fleet out on the pampa

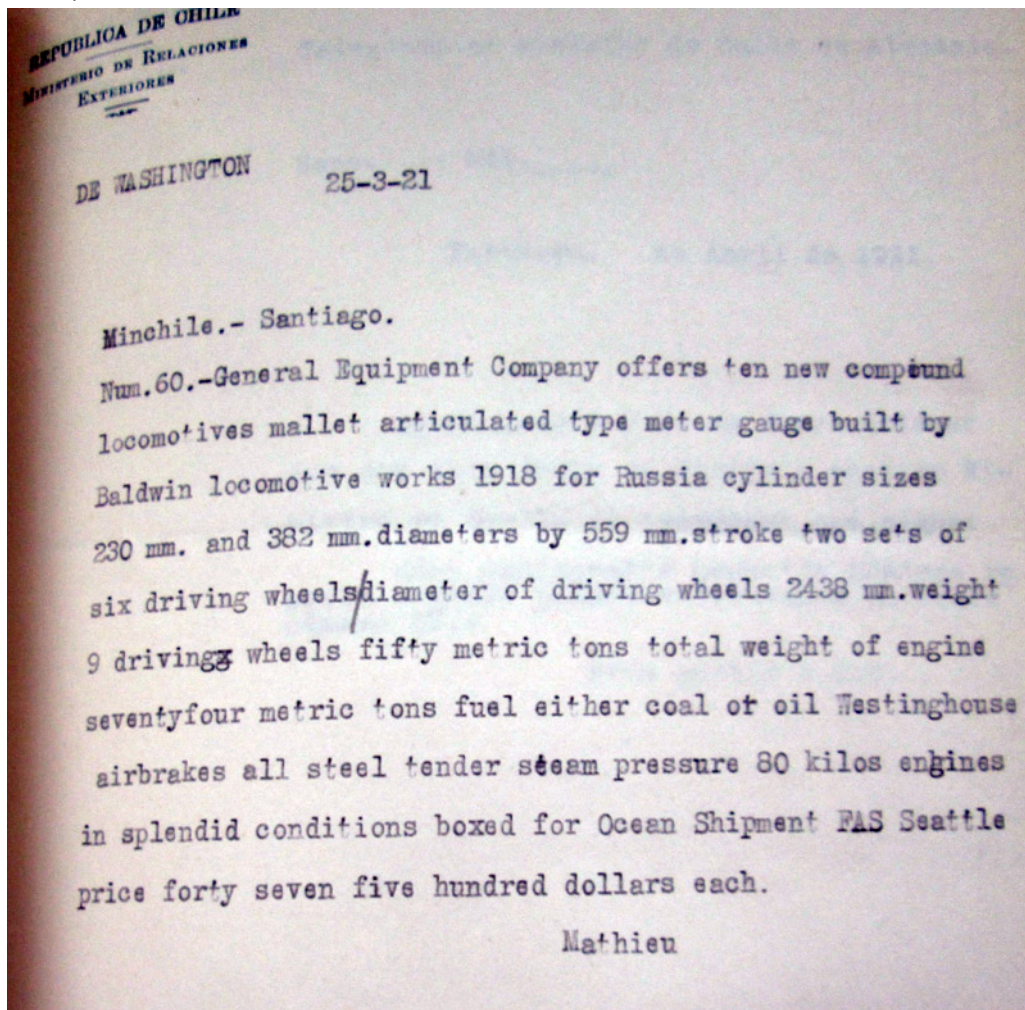
Background

It is apparent that whilst the *FCTT* mainline fleet of locos worked the routes to El Tigre and down the hill to the coast, there were other engines, managed completely separately, for bringing caliche in to the various *oficinas* and later for trip workings between the modern Guggenheim process plants at María Elena and Pedro de Valdivia. These locos did not appear in the main *FCTT* fleet lists or in documents such as the 1930 US report [26].

It is possible that the following set of locomotives is very incomplete.

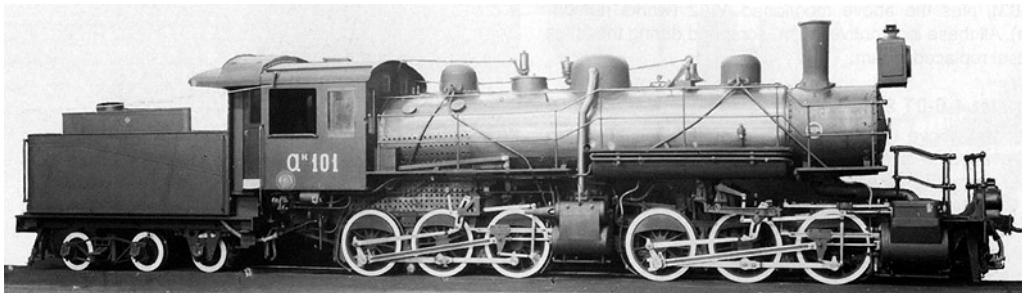
0-6-6-0 Mallets d/w 44" cyls. 13+18x22", built by Baldwin in 1917

These had been part of a batch of 53 for the Russian Government but were not delivered owing to the October revolution and the subsequent Treaty of Brest-Litovsk. They had been intended for use on the short-lived Makinskaya railway in Armenia and Azerbaijan. Purchased by 'Anglo Chilean Consolidated Nitrate Co.' One photo shows **105** with *FCTT* on tender at *Oficina María Elena* in 1939, and another (the second one below) seems to show no. **103**. Donald Binns doubted the existence of others on the *FCTT*, and in any case said that they must have been in a separate mines fleet or else they would have been renumbered into the main *FCTT* series. Harold Middleton suggests that nine were purchased for Chile, and this is supported by the figure given in Sr. Huidobro Diaz's 1939 book, page 67 [33]. Sr. Huidobro also makes it clear that the Mallets were used out on the pampa and into the various *oficinas*, rather than on the steeply-graded mainline. The running numbers were those allocated for use in Russia but the photos show them still identified thus. Ten of these locos had been advertised for sale by The General Equipment Co. around the end of 1920, as lying at the dockside in Seattle. This was flagged up in a *DOP* memo dated March 1921 [MOBR3076]. The quoted price was \$47,500 each.

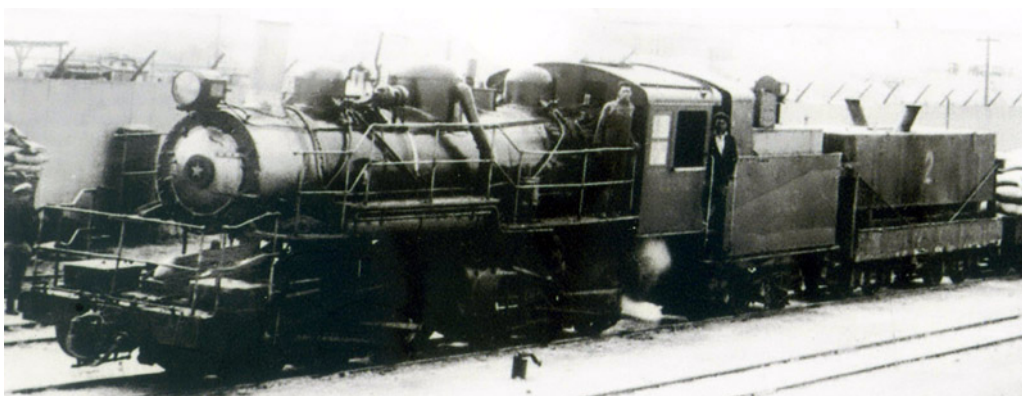


Note that they are described as being of metre gauge, though the Archangel to Vologda line was of 3' 6" gauge. The cylinder diameters are shown as 230mm and 382mm, which equate to 9" and 15", considerably smaller than those shown on the opposite page, in fact unrealistically so. However, the driving wheel diameters are also totally unrealistic too.

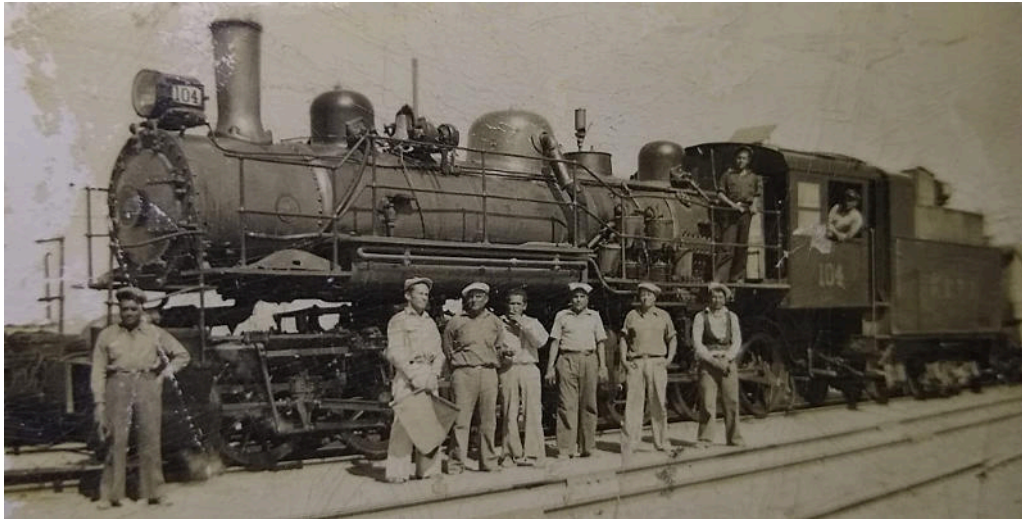
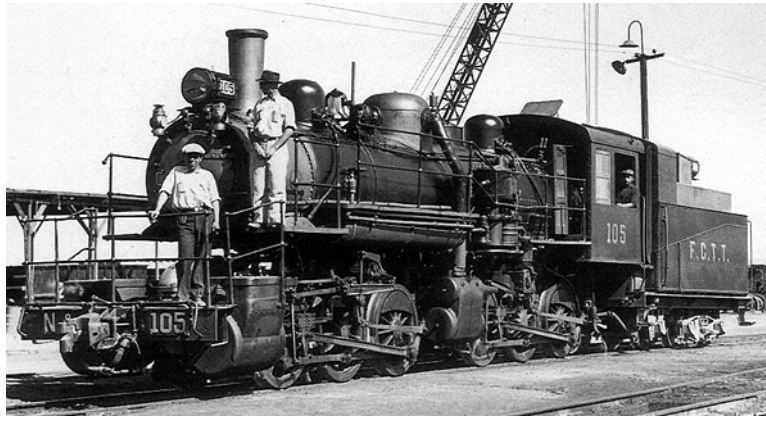
- 101 w/n 46494 HMN confirms number and works number [LI issue 91].
- 102 w/n 46495 HMN confirms number but not works number [LI issue 91]. Visible in photo of loco shed at PdV in 1934.
- 103 w/n 46496 Photographed on a train of bagged nitrate with an auxiliary water tender attached.
- 104 w/n 46497
- 105 w/n 46529 Photographed by Brian Fawcett at María Elena in 1939 [20]. HMN confirms number and works number [LI issue 91].
- (106 w/n 46550 went to Pampauga Sugar Mill in the Philippines [Gene Connelly's BLW list]) but as a stationary boiler not as a loco.)
- 107 w/n 46531 HMN confirms number and possibly works number [LI issue 91]. Visible in photo of loco shed at PdV in 1934.
- 108 w/n 46603 HMN confirms number and works number [LI issue 91].
- 109 w/n 46604
- 110 w/n 46605



Hi-res versions of this works pic are available from the Pennsylvania Railroad Museum. Note the extremely short tender mounted on a single front axle and rear bogie. These tenders seem to have been retained in Chile, albeit with a modified tender cab – no doubt necessary in the vastly different conditions from arctic Russia.



Note the additional water tender, and the comprehensive set of hand-rails to ensure that the crew did not slip from the running boards during frozen Russian winters.



The first photo above suggests that the original air brake equipment may have been removed before delivery to the ACNC. However, air brakes were introduced in 1928, after the Guggenheim take-over of the railway. This may have necessitated refitting of the air pumps and associated gear and various modifications to the locos. By then knuckle couplers had replaced the original link-and-pin couplers.

A photo of the loco shed at Pedro de Valdivia taken in 1934 includes four of these Mallets, as well as two Kitson-Meyers and other locos.

2-6-2T d/w 44", cyls. 15x20", built by Baldwin in 1917

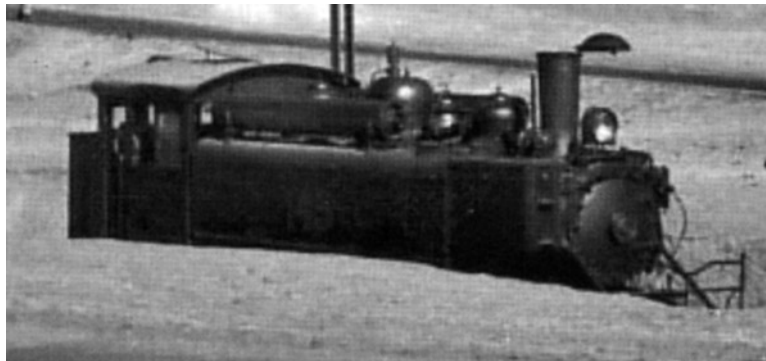
These were purchased from *oficina José Francisco Vergara* in 19??. A photo showing one at María Elena in 1930 is in Pablo Moraga's book *Tiempo de Trenes*. They had been bought new by the Antofagasta Nitrate Co. as their nos. **1** and **2**, and were supposedly metre gauge originally.

143 w/n 47434 Ex ANCo no. **1**.

144 w/n 47435 Ex ANCo no. **2**.



A published photo showing 2-6-2T no. **144** on a passenger train to Pedro de Valdivia.
The smokebox number plate still carries the loco's original ANCo number, **2**.



This view at María Elena suggests that the right hand tank had been extended forward alongside the smokebox with a utilitarian welded box-section. The left hand side carried the air-pump and so may not have been extended in the same manner.

The Anglo-Chilean Nitrate & Railway Co. also bought a number of 2' 6" gauge Manning Wardle and other locos, for use in individual nitrate *oficinas*. See the 'Chilean sub-metric gauge steam locos' file for details, section 4.3.1.

2.4.7 Minor industrial 3' 6" gauge railways

Soc. Carbónifera de Magallanes

Background

A tramway to help shift the coal to the town had been begun as early as 1869, first with horsepower though later with at least one locomotive. The engineer was José Clemente Castro, and the concessionaire initially a Señor Rojas (possibly he who developed mines on the northern edge of Coronel) but eventually the Sociedad Carbonífera de Magallanes of 1872. In October 1869 the governor of Magallanes was able to write, "that the railway, although using animal power for now, is well advanced and I believe that by the end of December it will be able to provide coal for those ships that need it."

Usually reported as being 3' gauge, but the loco below was for 3' 6".

This was the fore-runner of the Mina Loreto metre gauge railway on the same alignment.

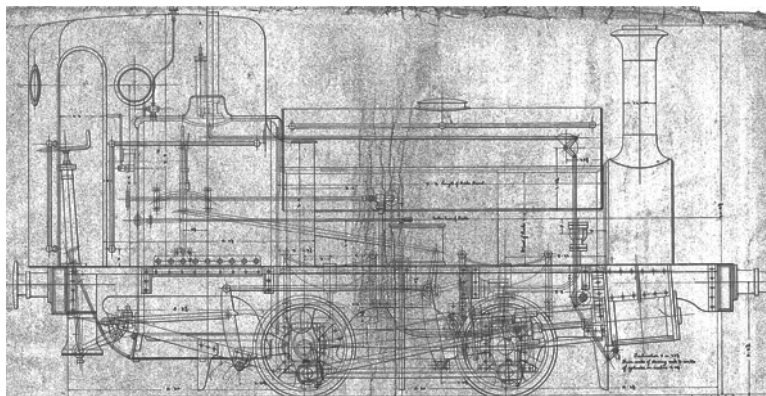
0-4-0ST d/w 33", cyls. 12"x18", built by Manning Wardle in 1876

Delivered via Bates Stokes & Co to the Straits of Magallan. MW 'Class H special'. Note the side buffers, and the unusual curved cab backsheet and side spectacles.

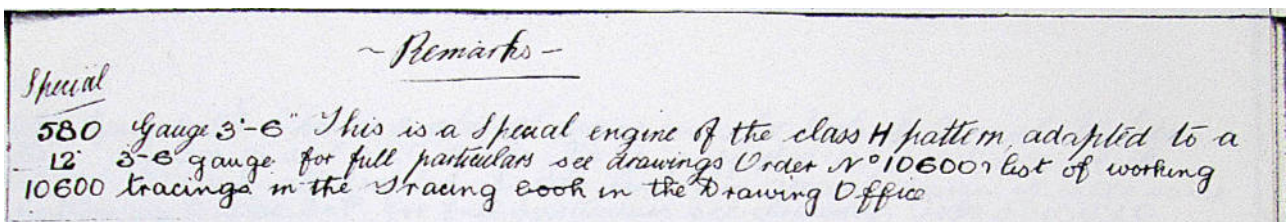
? w/n 580 Was lying derelict in the 1890s.



Photo from an 1880s album of Sr. Rodolfo Stubenrauch, courtesy of Sr. Mateo Martinic.



The MW GA side elevation and plan for loco 580 is conserved at the Staffold Barn archives.



The fate of the railway and loco

J. R. Spears of the *New York Sun*, visiting during the 1890s, was rather caustic about Punta Arenas and its industries.¹⁹ “A worse industry than brick-making, however, was started some years ago in the town. What they called a vein of coal was discovered some five miles from the beach, and, after some talk, a company was formed to exploit it. A pier was built at the beach, a railroad laid thence to the mine, and rolling stock brought out from England. This done, they found that they had a lignite instead of a coal mine. The pier has gone to pieces, and the old locomotive could be seen partly buried in the sand not far from the head of the ruined pier. This is the coal of which all the writers who have visited the strait speak enthusiastically.”

Another commentator writing in the *Estadística Minera de Chile* in 1906, records that in 1889 or 1890 two locos half-overturned lay out in the open air and that the railway track was entirely destroyed. If there was indeed a second engine it has not been identified, though of course other types of boiler are often mistaken for locos by the uninitiated.

The Lautaro Nitrate Co.'s railway

Background

In the *Departamento de Taltal* the LNC had a substantial length of 3' 6" gauge, approaching 30 miles long, from Lautaro via *oficinas Atacama, Chile* and possibly *Alemania*, and then west to Santa Luisa. At both ends there were junctions with the *FC de Taltal*. In other areas the company had locos on 2' 0" and metre gauges.

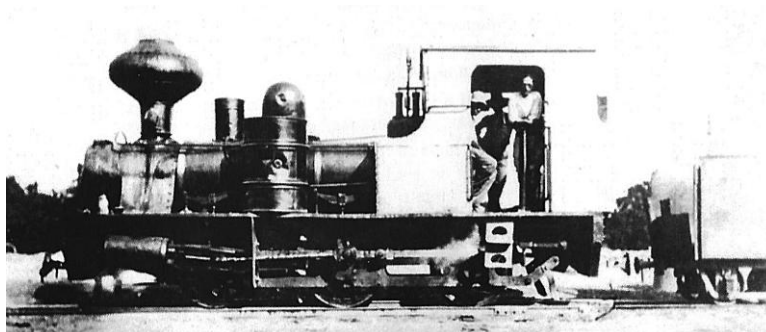
0-6-0T d/w 33½" cyls. 11x16½", built by Bagnall in 1883

Ordered via Schulte & Scheinmann) possibly for Lautaro Nitrate Co. Spares for these later (1894 to 1906) ordered by Lautaro Nitrate, but locos may have originally gone to a predecessor or an oficina later taken over by Lautaro. Completed June 1883. Cost £730. Customer charged £826. No names. 10' 0" wheelbase. Spares ordered 1894, 1902, and for 523 in 1906. These locos may well have appeared very similar to the later Bagnall 0-6-0Ts listed below.

? w/n 523

? w/n 524

Issue 186 of *The Industrial Locomotive* from 2022 contained an article by Allan Baker speculating on whether the photo below, which was in the Bagnall archive but unaccompanied by any notes, shows one of the above-listed pair of engines after a substantial rebuild and re-boiling. Whilst nothing above the running-plate gives any clues, the bottom end could possibly be by Bagnall though the frames are outside the wheels in contrast to the later Bagnall 0-6-0Ts operated by Lautaro.



The mystery loco as seen in a Bagnall archive photo published accompanying an article by Allan Baker in *The Industrial Locomotive* issue 186 in 2023.

0-6-2T d/w 37", cyls. 13x20", built by Sharp Stewart in 1893 and 1894

SS order nos. E1016 and E1031. A blue-print drawing is available in the NBL drawings collection at the NRM in York, their ref. ALS6/PP01/S. The E1016 order book page is dated 26th October, and mentions “six wheels coupled

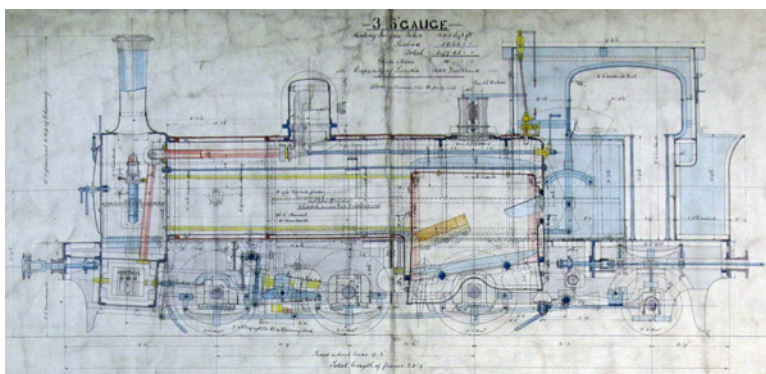
3.1, truck behind (Bottomley) 2 wheels 2' 2", all wheels cast steel, hand brake, side tanks 1000 galls., coal behind 25 cwt, steel boiler copper firebox brass tubes.

The E1031 order book page was dated October 24th 1893, One tank engine (to be) as No. 1016. Name etc.

“CATALINA No. 6” by a note added on 14/11/93.

‘LAUTARO 5’ w/n 3900

‘LAUTARO 6’ w/n 3982 Possibly originally inscribed ‘CATALINA No. 6’. Not 3902 as stated in [27].



Sharp Stewart elevation drawing 8304, held at the NRM in York, their reference ALS6/PP01/S.

(Nos. 17 and 18 were on 2' 0" gauge; see the appropriate file for details.)

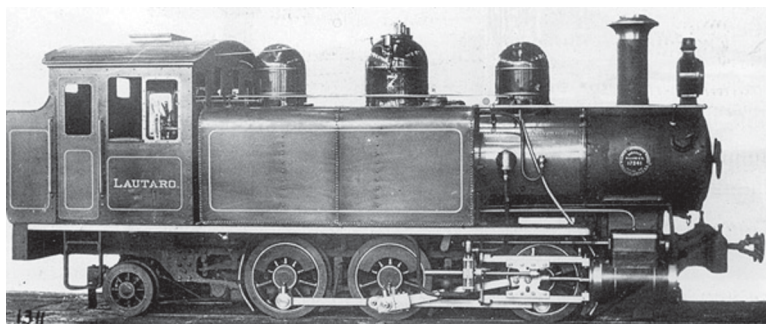
0-6-2T d/w 37", cyls. 13"x20", built by Baldwin in 1900, 1917 and 1918

Baldwin class 8-20 1/3D numbers 1, 56 and 57. Specs. of last are in vols. 54 p369 and 66 p380. Erecting card drawing numbered 476A-93 9090 is in the DeGolyer Library collection. ‘Lautaro’ name to be on cabside, and number on front, back and dome.

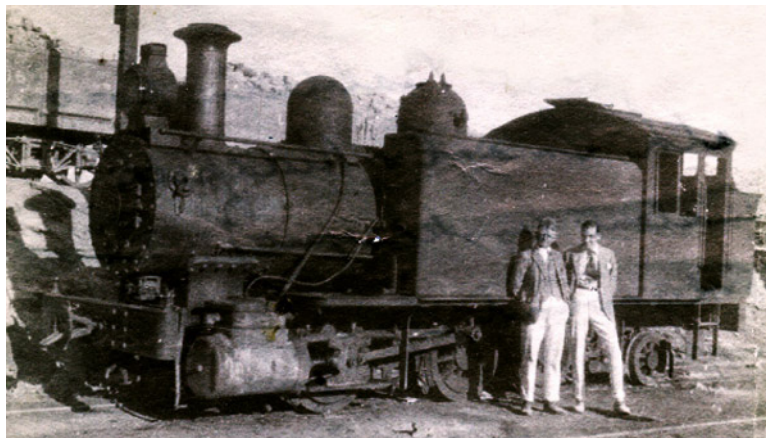
‘LAUTARO 7’ w/n 17341

‘LAUTARO 19’ w/n 45572

‘LAUTARO 20’ w/n 51268



Lautaro no. 7. BLW publicity photo via Binns & Middleton’s book on the FC de Taltil.



One of these three Baldwins as later modified with taller tanks.

0-6-0T d/w 33½" cyls. 11x16½", built by Bagnall in 1907 and 1911

Spec for 1841 says outside cyls., inside frames, cab. Completed 22-06-1907, cost £917. Customer charged £985.

Shipped via Liverpool. Spares ordered 1912, and in 1915 replacement boiler supplied with Crosby pop safety valves.

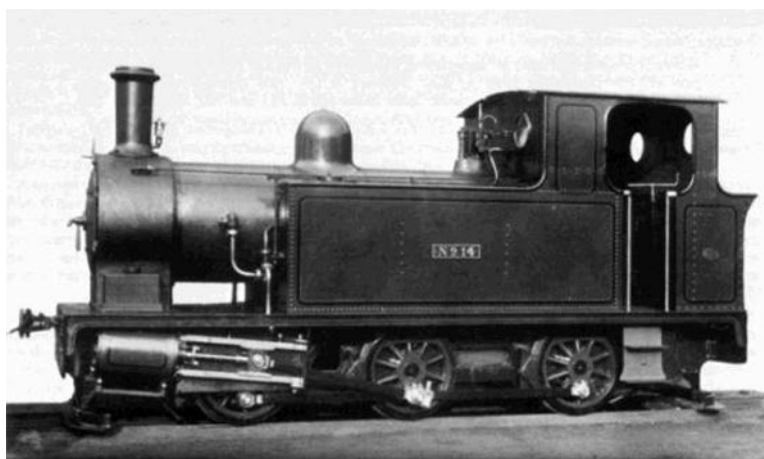
Spec for 1933 similar but completed 24-03-1911, cost £790, customer charged £965. Shipped 24-03-1911.

Spec for 1996 similar, and specifically mentions rear bunker to be as on 1933. Completed 13-06-1914. Customer charged £1015. New boiler sent 1920 to Lautaro Nitrate with Crosby pop safety valves. Axlebox guides sent in 1951.

No. 9 w/n 1841 Via Baburizza & Co.

No. 14 w/n 1933 Wheels 33¼".

No. 16 w/n 1996 Wheels 33¼".



Bagnall publicity photo.

0-6-2T d/w 37", cyls. 13x20", built by North British in 1904, 1908 and 1913

NBL order nos. L5, L271, L283 (same design as L271) and L540 (same design as L271).

Order of April 15th 1903 (L5): one 6w.c. radial tank engine, as per Atlas offer of 9th and their acceptance of 14th inst. Delivery in 6 months. One Radial Tank Engine, exactly as E1031.

Order of 5th August 1907 (L271): one 6w.c. radial tank engine, identical in every respect with L5. Delivery in 7 months.

Order of 25th October 1907 (L283): one 6w.c. radial tank engine, exactly similar to L271. Delivery along with L271.

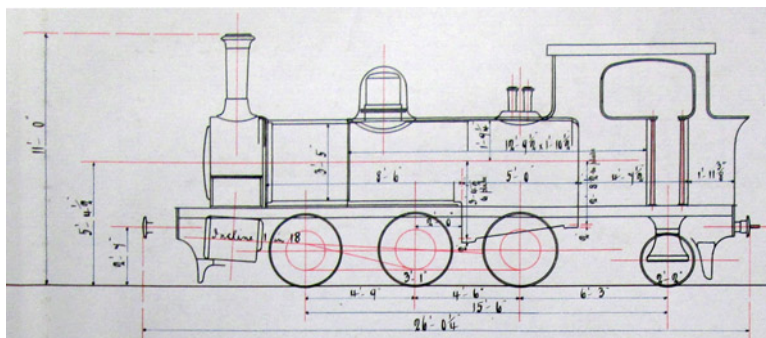
Order of 26th November 1912 (L540): S&R order 3027 for 'one Side Tank Locomotive, gauge 3' 6", 0-6-2 type, cyls, outside 13"x20", identical in every respect with that supplied to their order 1572 of 2/8/07 and to our specification dated 17/7/07'. Delivery to be in 6 months.

8 w/n 16027

Later on *FC de Taltal* as '**Los DONES**' [16] which source also says this loco was ex *Oficina Pedro de Valdivia*. NBL list gives Lautaro Nitrate as original purchaser.

12	w/n 18312	NBL order L271. Later on the <i>FC de Taltal</i> as no. 41 ?
13	w/n 18377	NBL order L283.
15	w/n 20236	NBL order L540.

One or other of these possibly sold to *FC de Taltal* carrying no. **41** which was reportedly as it had run in Lautaro service [27], though see paragraph below for doubts about this.



Sketch diagram from NBL weights book.

A mystery

Binns & Middleton's Taltal Railway book suggests the loco named '**Los DONES**' which went to the *FC de Taltal* was not by NBL but was Kilmarnock Engineering no. 515. KE was a short-lived builder housed in the former Dick Kerr works in Kilmarnock. Certainly Strain & Robertson included KE when circulating loco builders with invitations to tender for nitrate *oficina* locos.

S&R notes include information that in the lead up to contract 49 with Antony Gibbs in 1920, tenders were invited for the supply of a loco. KS suggested the water capacity required an Orinoco type loco plus a tank wagon. Tenders were received from Kilmarnock Eng., Avonside, Bagnall, MW, KS, AB, BLW, with Kilmarnock being recommended. Kilmarnock were awarded the contract in November 1920. This was to be a side and saddle tank loco to meet water capacity requirements. Sharon couplers were to be fitted. Oil burning.

Lautaro Nitrate Co.Ltd. oficinas

, with the locos listed in the 1927 *Album Zona Norte de Chile*. These will have been of various gauges.

- **Aconcagua** close to station La Noria on *FCAB*, 6 locos Bagnall and Koppel of 18, 15, and 12T.
- **Agustin Edwards** at station Central of *FCAB*, 4 locos.
- **Anibal Pinto** 1km from station Maipu of *FCAB*, 10 locos Koppel, 2 of 32T, 6 of 16T, 1 of 18T, 1 of 12T.
- **Araucana** 5km from station Union on *FCAB*, 5 locos Henschel of 16 and 12T.
- **Aurelia** 4km from station Salinas of *FCAB*, 2 Jungs of 10T, 2 of 12T.
- **Ausonia** 3 1/3km from station Peinelas on *FCAB*, 5 locos 'Koppel Wagnal' of 24, 22, 20T, 2 locos of 16T.
- **Avanzada** near Yungay station on branch off *FC de Aguas Blancas*, 5 locos, 1 Henschel of 8T, 2 Koppel of 10T, 2 Americana of 27T.
- **Blanco Encalada** 7km from station Salinas of *FCAB*, 3 locos: 1 Henschel of 33T, 1 Koppel of 18T, 1 Avonside of 18T.
- **Carlos Condell** near station Carmen Alto of the *FCAB*, 5 Bagnalls of 30T, 2 Avonside and Koppel of 18T.
- **Carmela** 7km from station Salinas of *FCAB*, 4 locos Bagnall of 16T, 1 Avonside of 18T.
- **Chacabuco** 1km from station Salinas on *FCAB*, 7 locos, 5 Bagnalls of 30T, 1 Avonside and 1 Koppel both of 18T.
- **Filomena** close to station Solitario on *FCAB*, 9 locos, 3 Bagnall of 12T, 2 Americana of 24T, 4 Henschel (1 of 32T, 2 18T, 1 of 30T.) Gauge 0.75m.
- **Francisco Puelma** 300m from station Carmen Alto on *FCAB*, 1 Bagnall of 7T, 2 Koppels of 16T, 1 Bagnall of 16T, 3 Baldwins of 28T, 1 Henschel of 30T.
- **José Francisco Vergara** 10km from *FC Longitudinal*, 5 locos, 4 Baldwins of 45T, 1 Koppel of 20T.
- **José Santos Ossa** at station Jose Santos Ossa on *FCAB*, 5 locos.

- **Los Dones** 10km from Los Dones station on *FC Longitudinal*, 10 locos, 3 of 30T, 1 of 36T, 1 of 8T, 1 of 16T, 2 of 14T, 2 of 10T.
- **Perseverancia** 4km from station Solitario on *FCAB*, 4 locos, 2 Henschels, 1 Koppel, and 1 Americana.
- **Sargento Aldea** near station El Buitre of the *FCAB*, 3 locos.
- **Savona** 2km from station Savona on branch to Boquete, 5 locos, one Henschel of 22T, 2 Arn Jung of 18T, 1 Baldwin of 18T, 1 'Americana' of 18T.

Baldwin drawings

The collection of Baldwin drawings at the deGolyer Library, Southern Methodist University, includes side elevation (SE) or cross section (CS) drawings for one design built for the Lautaro Nitrate Co.

Index#	DWG#	Tracing#	Road name	Road#	Date	Baldwin class	Number	Wheel	Dwg typ	Size
476A-93	9090	-	Lautaro Nitrate Ltd.	19	1917	08-20 1/3 D	56	0-6-2	SE/CS	3

The list of drawings in which these details were found is at <https://www.smu.edu/~media/Site/Libraries/degolyer/pdf-s/BLW-EDWG-RoadName.pdf> whilst arrangements to purchase copies can be found at <https://www.smu.edu/libraries/degolyer/Research/Permissions>

Oficina Chile

3' 6" gauge. 80km inland from Taltal. Founded 1906.

0-4-0T d/w ?, cyls. ?, built by Borsig in 1907

Supplied via Griesse of Hamburg. Standard small Borsig 0-4-0Ts of type 51.

?	w/n 6501
?	w/n 6502
?	w/n 6503

Proyecto del ferrocarril entre La Calera i Iquique, Propuesta J. Henry Thomas

Around 1890 this proposal was put forward, summary details of the scheme being in file [MOBR173]. The gauge was to be 3' 6" and the locomotive fleet to be comprised of 100 engines. Of these 75% were to be 'Consolidation' 2-8-0s for freight work, and 25% 'Mogul' 2-6-0s for passenger trains. The latter were to be fitted with air brakes.

Another proposal recorded in the same file suggests that 100 2-6-2 locos weighing 25 tonnes, with cylinders of 14"x22" and 1500 gallon tanks, would be required. Ten locos of 18 tonnes each would be needed for shunting.

2.4.8 Unidentified locos for the 3' 6" gauge

Black Hawthorn

0-4-2T d/w 30" cyls. 6x12", nos. 45-6, built in 1867 for W. & J. Lockett.

This agent worked extensively in Chile so the locos may have arrived here. The Tongoy Railway opened in 1867 on this gauge. See above.

Fowler

0-4-0ST d/w ? cyls. 9x14", no 3589 of 1878

was delivered to an unknown destination via Duncan Fox & Co., who were active in Chile. Gauge 3' 6". Despatched 6-9-1878. In 1878 the Tongoy railway had been open for a number of years as had the *Cia. Carbonifera de Magallanes*, the *FC de Taltal* was not to open for another four years, and the Lautaro company did not begin operations until 1889. Other operators began even later, and by 1878 the Magallanes coal line had closed. If this loco operated in Chile, then the Tongoy railway or a related mine-owner was the most probable purchaser, all others being most unlikely.

German-built 0-6-2T, by Henschel



This might not be on the 3' 6" gauge, but looks fairly large and was found on a Tocopilla-related Facebook page.

2.5 Appendices

2.5.1 Appendix 1: The Yorkshire Engine Company's double Fairlie locos 219-228 of 1874

There has been endless speculation down the years about these engines, and indeed some other Fairlies built for railways around the world. Two principal reasons for the confusion have been, first the Avonside Engine Company's habit of giving two works numbers to each double loco, and second later researchers such as Rowland Abbott and Donald Binns taking cautious suggestions by the earlier P. C. Dewhurst as gospel truth.

Close or indeed incestuous connections between relevant businesses

Several Fairlie-using railways, including the Poti-Tiflis line in Transcaucasia, the *FC Mexicano* and the Glasgow & Cape Breton Railway in Canada were constructed by G. B. Crawley & Co. One of their senior engineers, William Gill, had trained under R. F. Fairlie. Also the London offices of the Iquique and Pisagua Railways at that time were in the same building as the offices of Robert Fairlie's company! Judging by a substantial number of drawings surviving in Sheffield but originating from the Fairlie Engine Company, it seems likely that many or all of the double Fairlies built by the YEC Co and maybe by Avonside as well were designed by the FECo, and were ordered from those builders by Fairlie rather than by the customer railway or the usual agents.

The order for ten double Fairlies to be built by the YEC Co

A letter from don Manuel Montero in Iquique dated October 1872 stated that an order will be placed for 'ten engines on the Fairlie system' (see Appendix 3, following). The Montero brothers had promoted the construction of the Iquique and Pisagua railways which later became the Nitrate Railways. YEC Co contract E41 was then placed in February 1873, almost certainly by Robert Fairlie's company, on behalf of the Montero Brothers in Peru (YEC Co Directors' minutes Feb 1873). Terms: 1/3 to be deposited before work starts, 80% of remainder due on completion of engines, and final payment (13.33% of total amount) in exchange for delivery order. The order book page for February 25th 1873 merely says: "Contract 41, 10 Fairlie engines to specification". These were to be YEC Co builders' numbers 219 to 228.

A request to delay construction

Fairlie then wrote to the YEC Co sixteen months later saying that the Monteros wanted work to be stopped (YEC Co Directors' minutes July 1874 reporting letter of 24 June 1874). This was precisely at the time that the new National Nitrate Railways Company of Peru was taking over control of the railways from the Monteros. Note that the letters were not necessarily cancelling the order but certainly were wanting completion and payment to be delayed. However, after some debate and correspondence (both with their solicitors and with Robert Fairlie) the Yorkshire Engine Company refused as construction was well under way by then and materials and parts had been ordered. Interestingly the following Appendix 2 reports that the new National Nitrate Railways Co. of Peru was in July 1874 about to purchase four Fairlies "on the point of completion" from the General South American Co. A new credit line of £20,000 had been opened at the Anglo-Peruvian Bank in order to pay for them. These engines were probably from this batch, but as will become apparent the deal did not go through for some reason.

Four then sold to Russia

By November of 1874 the Poti-Tiflis Railway in Transcaucasia had seemingly agreed to take four of the locos (YEC Co Directors' minutes). Page and de Pater's book on Russian locos (*Russian Locomotives vol. 1, 1836-1904*, Retrieval Press 1987) states that these were YEC Co nos. 225-8, ie. the final four of the ten, which makes sense as slightly longer axles would have been needed for the Russian 5' 0" gauge, and it would be easier to fit those to later locos that had not yet been erected. It may well be that work was then concentrated on those four locos, as their purchaser most defi-

nately wanted them! Certainly orders began to be placed for spares for those engines as early as January 1875, presumably in anticipation of normal wear and tear as it seems unlikely that the locos were needing replacement of major parts such as wheels and cylinders as early as that. In April 1875 the YEC_o were checking with their solicitors as to whether payment in full (£16,500) was due from the Russians and whether it was to be allocated to the credit of the contract as a whole. Dewhurst was given information by the YEC_o that five sets of axles had been ordered for a wider gauge, and that seems to have induced him to conclude that five of these engines were actually shipped to Russia. However, it may merely have been that materials were being ordered whilst negotiations with this alternative purchaser were in progress and that the company had hedged their bets in case a fifth loco could be disposed of to Russia. Perhaps five were already well in hand, and there were five left to order axles and other fundamental parts for. For the sake of completeness and cross-referencing, the four locos that went to Trans-Caucasia were originally numbered **55-58** there, later becoming class **L 105-108**, and with the survivors in 1912 becoming class **F1 9818-9820** [Info supplied via Jeremy Harrison from V. A. Rakov's book].

The remaining six

Jan 1875 the first five “Montero engines” (ie five of the six locos remaining) were steamed (YEC_o Directors’ minutes). At this point the 80% of the remaining moneys for those five became due, but the General South American Company, who were presumably financing the deal for the Monteros, refused to pay up. On 24th February there is an order book entry debited to R. F. Fairlie for the supply of “Tallow (?), lead and brushes to their man for Con(tract). 41”, which would seem to imply that locos still on site needed protecting against the weather. In April 1875 there was talk in YEC_o directors’ board meetings about the six remaining engines, there being a question as to whether they could be put up for sale, even though the GSAC_o had a lien (ie. a financial interest) on them. Clearly no more than four had gone to Russia.

One goes to Warwickshire for a while

However, just three months later (ie July-August 1875) there were only five still standing in the Meadowhall yard, to be painted in two coats of “lead colour” at the expense of the GSAC_o. It is probable that the sixth was the machine modified and sent to the rather poverty-stricken East & West Junction Railway in Warwickshire for a period. YEC_o had built locos for that line and may therefore have had a good relationship with the company. Certainly in November 1875 the E&WJR accounts recorded a couple of £25 payments to the Fairlie Engine Co. for “hire of engine” and this may have been regular. In Feb 1876 R. F. Fairlie requested the repair of a lubricator for the “EWJ engine” (YEC_o order book). In August 1876 spares were being ordered which suggests that it was in use. Further spares were ordered in October and December 1876, and then in January and February 1877, but there appear to be no further orders after that. At some point the loco at the East & West Junction Railway probably returned to Sheffield. P. C. Dewhurst apparently seems to have thought that this was in 1878, though his source of information is unknown. Certainly the E&WJR was an impoverished line and its passenger service was withdrawn in July 1877 which may have made this loco directly or indirectly redundant.

Additional evidence for it having been this locomotive which worked on the E&WJR can be found in the proceedings of an arbitration by the Railways Commissioners between Feb 14th and March 2nd 1876 [60]. This case was between the E&WJR and the Northampton & Banbury Jcn. Railway, over which the E&WJR had running powers. The N&BJR objected to the use of this Fairlie loco on the grounds of unfitness for use upon their line. The dimensions given very closely match those of the YEC_o contract 41 engines, and demonstrate that this particular loco had been narrowed along the length of the cab, thus requiring the provision of a new cab structure. The Commissioners concluded that the engine was indeed appropriate for use over the N&BJR though not within their sidings at Blisworth.

Five still stand in the YEC_o’s Meadowhall yard

In December 1876 five large tarpaulin sheets were ordered by the GSAC_o to cover the Fairlie engines in store in the YEC_o yard, and in April 1877 a man was to attend to these five engines, with the request having been made by the GSAC_o. As the one on the E&WJR was in service in both October 1876 and February 1877, this confirms that that

engine was a sixth.

If the locos stored in the Meadowhall Yard for several years were in fact owned by the General South American Company, rather than the YEC_o, there is less likely to have been temptation to sell them off cheaply when the original YEC_o went into administration in 1880, though a YEC_o directors' meeting in 1879 noted that the GSAC_o owed a sum of £1105 for storage. [Minutes of meeting on 1st July 1879] The GSAC_o itself had gone bankrupt in 1875 but seems to have continued under administration and then maybe was re-financed.

Attempts to sell them

In August 1878, Dewhurst noted, an advert in *The Engineer* stated 'For Sale. Five Fairlie Locomotives, built by the Yorkshire Engine Company, Sheffield... quite new... apply to George A. Cade... London.'

Dewhurst reports that there was then correspondence between Robert Fairlie and the YEC_o about the five locos, beginning in September 1881, with Fairlie requesting that one loco be stripped for examination. I have not yet found that correspondence, but see below for quotes from it forwarded to Dewhurst in 1932. It would seem sensible if the loco to be stripped was the one that had been working in England, but if that one was back in Sheffield why were they not writing of six locos rather than five?

All six eventually to Tarapacá, probably in batches of one and five

The Nitrate Railways General Manager Mr. G. Wood informed Dewhurst in 1951 that locos no. **32-37**, ie six in total, had come from the Yorkshire Engine Company around 1880. I suggest that this was correct, but that it hides the fact that one had come out first, as an 0-6-6-0T, perhaps actually in 1880. I speculated earlier that this was probably one of the five that had been in store, but a recently discovered photo shows clearly that 0-6-6-0T no. **32** arrived with the metal cab fitted for operation in Warwickshire. There would then have remained for a further short period the five in store at Meadowhall.

Robert Fairlie inspects five engines

In 1932, the YEC_o wrote on 13th September to P. C. Dewhurst, saying "On September 8th 1881 Mr. Fairlie visited our works to inspect 5 locomotives... One locomotive was taken to pieces for inspection. These five locomotives were later modified to include 'Bissel Bogies' [not correct] and 'Radial Axle boxes' (Sharp's Patent) at both ends. These modifications were carried out in conjunction with Mr. Fairlie and Messrs. Henry Kendal & Son [who were financiers rather than engineers]. There is a complete specification for the repairing and modification of the locomotives and we quote from the last paragraph, 'This is the work required to be done on the 5 engines which will make them suitable for the Iquique Railways.'"

"In the official order book and on the frame arrangement drawing for the modified locomotives their destination is stated as being Peru. ... Mr. Fairlie writes about the truing up of the axles and repairing other items and since the original 0-6-6-0 engines were built in 1874..."

Unfortunately that complete specification does not appear to have survived the demise of the YEC_o, and has not been found amongst the surviving documentation in the Sheffield Archive Office.

Chris West has, however, found the following profit and loss summary for 'The Yorkshire Engine Company, in Liquidation', for the year ending 30th June 1883. Amongst the items listed is one which after the abbreviations have been expanded reads "Contract 41. 5 Fairlie Engines, Repairs, £7839 18s 0d." Chris points out a) that this being the accounts for the liquidators explains why there was no reference in the accounts, order book or directors' minutes of either the original YEC_o or the post-1884 successor company, and b) that the sum involved is a large one, with the expense for each engine being roughly equivalent to that which would have been needed for the building of a new tank locomotive and about one third of that involved for building each of the contract 60 Fairlies for Mexico mentioned on the subsequent line.

The Yorkshire Engine Company Limited, in Liquidation.

Dr.

PROFIT AND LOSS ACCOUNT, YEAR ENDING 30th JUNE, 1883.

Cr.

	£	s.	d.		£	s.	d.		£	s.	d.		£	s.	d.
To Work in Progress, July 1st, 1882 ..				5372	19	9		By Sales—							
„ Workmen's Wages, Materials, Fuel, Carriage, &c.				43,187	7	11		„ Tramway Engines	59	11	11				
„ Balance, being Gross Profit				13,780	7	1		„ Iron Castings	758	7	10				
								„ Brass Castings	10	5	10				
								„ Wheels and Axles	12,432	8	9				
								„ Loco. Duplicates	2381	9	10				
								„ Miscellaneous Work	25,362	10	8				
								„ Cont. 41. 5 Fairlie Eng., Reprs.,	7839	18	0				
								„ „ 60. 2 Fairlie Engines	9650	0	0				
												58,494	12	10	
								„ Work in Progress, June 30th, 1883,				3846	1	11	

The profit and loss account of the YECo liquidators for 1882-3. The five contract 41 Fairlies are mentioned in the right hand column, seventh item.

The rebuilding of five as 2-6-6-2Ts

New drawings prepared in 1882 [and surviving in the Sheffield Archive Office] show that the rebuild to a 2-6-6-2T configuration involved completely new power bogie frames (of two proposed variants), and that the first two of the five remaining locos were to be rebuilt with European style side buffers and a coupling height of 3' 4 1/4" which is close to European norms, whilst the final three were to be fitted with centre link and pin couplers at a height of about 2' 8" and were explicitly for Peru (by then actually Chile). The variants might well be clearly distinguishable in photos, as those locos with the higher full width buffer beam required an S-bend in the top line of the frame plates to bring their outer ends up to the top line of those buffer beams. Of course whilst the drawings for the two variants were created, it seems likely that in the event all five were reconstructed to the Peru layout with centre buffer-couplers.

These variants involved different frame plates, with the first two having thinner front ends to their frames perhaps to compensate for the heavier full-width buffer beams. The new carrying wheels were in fact mounted in radial axle-boxes rather than the Bissell trucks commonly stated. Note that the drawings show all five remaining as standard gauge locos rather than the first two being constructed for the Russian 5' 0" gauge. There is no direct evidence as to where the first two locos, those with European buffers, were to be sold to, but again it may be that negotiations were in hand with more than merely the Nitrate Railways. Nor is there any evidence for who decided upon the rebuild to 2-6-6-2T configuration, though it is unlikely to have been the Nitrate Railways themselves, which ordered an additional pair of Fairlies from the YECo some years later exactly as the original contract 41 locos had been built, ie as 0-6-6-0Ts. I suggest that the rebuilds to 2-6-6-2T must have been at Robert Fairlie's suggestion or request and probably with a view to sales elsewhere that never came off. The change of wheel arrangement may have been an inconvenience to the NR but not an extreme one as presumably most parts from the earlier bogies would have been re-used and would therefore be standard. They may even have been happy to take locos that would probably have had less flange wear

than the 0-6-6-0Ts, though their later purchase of locos to the original 0-6-6-0T design suggests that the advantages of the rebuilds were not sufficient to outweigh the additional cost and reduced adhesive weight.

Summary

It certainly appears that six Fairlies in total and including all five of the rebuilt engines eventually went to Tarapacá. In 1882 of course the Nitrate Railways ownership had changed to the new London-based company, which certainly had more cash to play with. £845,000 of bonds were offered in 1882, of which £660,000 were required in order to redeem outstanding bonds from the previous company, and “The remainder of the net proceeds is to go in providing additional rolling stock, and for other purposes of the undertaking.” By then both the YECo and the GSACo, each having been in administration, may have been amenable to almost any offer, and they may have suggested to the NR a bargain that they couldn’t refuse.

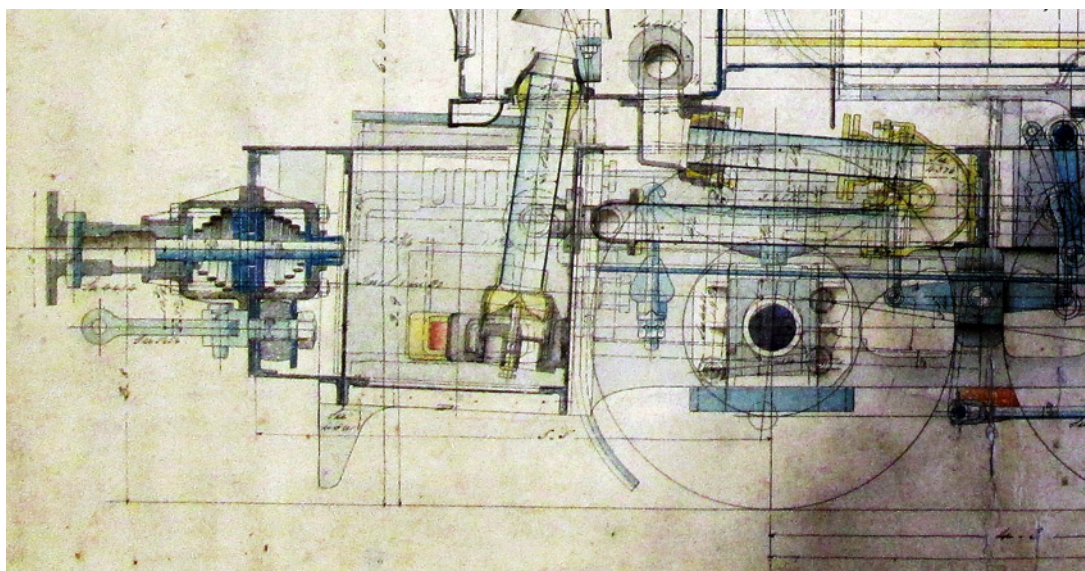
The Nitrate Railways classify six engines together

The scene then shifts to Peru/Chile, where six NR locos **32-37** were seen in many spares orders as a single class, whilst in other orders they are designated as classes 32 and 35. The spares ordered for class 32 seem to have been for at least six individual locos though of course the almost identical (to the original contract E41 0-6-6-0T design) later Fairlies **64-65** and **73** may have been lumped in as part of the same class particularly as there were no spares orders specifically for class 64 until 1910. I believe therefore that six of the big order for ten went to Peru/Chile, though almost certainly one went out first as an 0-6-6-0T before the rest followed as five 2-6-6-2Ts. I think the rebuilds to 2-6-6-2T must have been at Robert Fairlie's suggestion or request and possibly with a view to sales elsewhere that never came off.

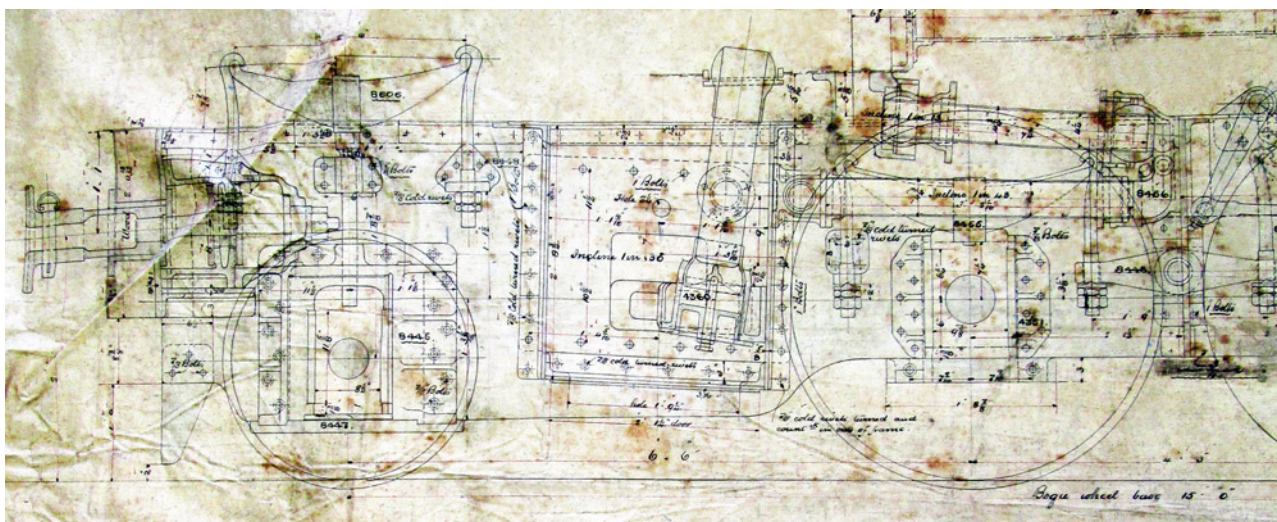
3rd February 1883, one set of 16 wheels was ordered from the YECo for these Fairlies, via Bailey Hawkins agents, definitely implying that the loco involved was a 2-6-6-2T, also 2 sets of tyres, and a wide variety of other spares.

Later rebuildings back to 0-6-6-0T configuration

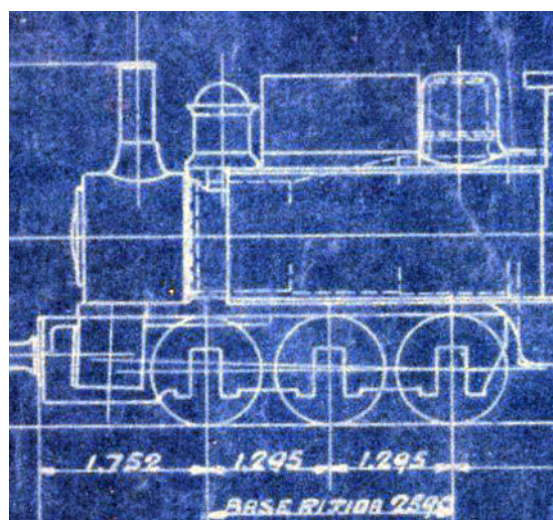
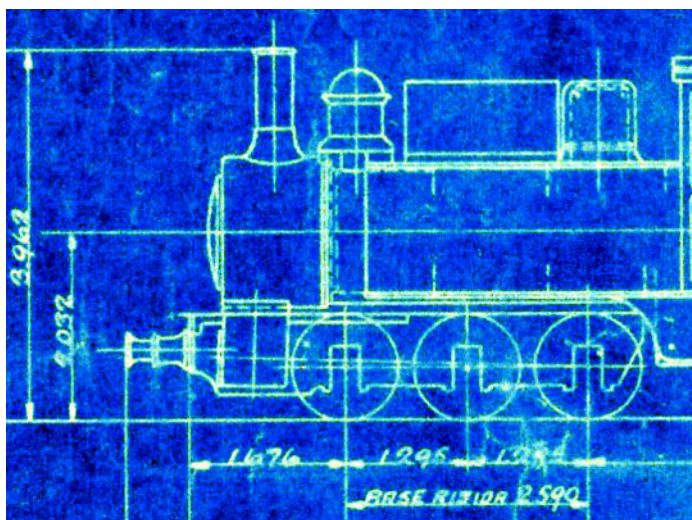
NRC fleet lists from early in the 20th century show no traces of any 2-6-6-2T Fairlies, and this has caused some to doubt whether they ever existed. However, examination of the following drawings clarifies the situation a little.



The YECo drawing above shows the outer end of an original contract E41 power bogie, ie a bogie as fitted to NRC locos 32, to locos 33-37 when they were first built in Sheffield, to 63 and 64, and possibly to loco 73 when it was assembled in Iquique early in the new century. Note particularly the small step upward in the lower frame profile outboard of the stone-guards and that the distance from the outer driving axle c/l to the buffer beam is roughly 66".



This drawing, on the other hand shows the outer end of a replacement 2-6-0 power bogie almost certainly as fitted to five of the E41 batch when they were belatedly sold to the NRC in 1882 after eight years of sitting under tarpaulins at Meadowhall in Sheffield. These engines then became nos. 33-37 in Tarapacá. The new frames extend to the radial axleboxes of the added carrying wheels and then to the buffer beam which is now about 42" further forward.



Finally, let us look at parts of the NRC 1920s diagrams for these locos (by courtesy of Harold Middleton). Above left are Fairlies 63-64, ie the repeat order of the contract E41 design as built in 1889. Above right are locos 32(? probably actually 33)-37. The left diagram shows a step up in the bottom profile of the bogie frame at the front of the cylinders and the distance from outermost axle c/l to the buffer-beam is shown as 66" which matches our estimate above. The right hand diagram shows a rather deeper and slightly longer frame extension beyond the cylinders, and with no step. This is just what one might expect if the 2-6-0 power bogies had been cut back behind the original radial carrying axleboxes. Note also the longer smokeboxes in both cases, reaching to the front of the cylinders, in contrast to the original seen on the previous page which only stretched as far as the mid-point of the cylinders.

In 1929 The NR official list implies that all except **33** were in use then [11]. An Article in *The Locomotive* in March 1932 says all withdrawn by that year.

Whilst there are photos showing loco no. **32** in its earlier and later states, as an 0-6-6-0T in both cases, so far no images have come to light showing any locos working as 2-6-6-2Ts in Chile. Such a find would go a long way to clear-

ing up this mystery.

2.5.2 Appendix 2: ‘La Compañía Nacional de los Ferrocarriles Salitreros del Peru – Letters and Translations from Lima, 1874-5’

References to the railways’ locomotives

This hand-written book of about 400 pages mainly comprises copies and translations of letters written from the President of the NNRCPC committee in Lima, Sr. Candamo, to the Managing Director, Sr. Alejandro de Gessler, in London. However, the latter part of the book also contains a number of letters to and from the Engineer in Chief at Iquique, Mr. G. Bush, and documents from others such as the Montero Brothers and the Anglo-Peruvian Bank. It would appear that most of the letters were originally written in English, with translations into Spanish being made for the benefit of those who required them.

The majority of the topics concern the finances of the new company as it took over the running of the railways from the Montero Brothers. Contrary to the impression previously received, it seems that the hand-over by the Monteros was a very reluctant one, probably forced by their bankers. The new company was clearly beset from all sides, by a wholly inadequate loco fleet, by nitrate producers whose product was thus not being shipped in a timely fashion, by bankers wanting their interest payments, by friction between Mr. Bush the Engineer in Chief in Iquique and Sr. Candamo the President of the company’s committee in Lima, and by the Monteros generally stirring things up (including pretending on occasions to still own the railways and later encouraging the Peruvian government to add the railways to the then current proposal to nationalise the nitrate producers). Only a very small percentage of the text mentions the locomotive fleet, but those paragraphs that do can give us useful insights into the development of that fleet.

The book is laid out with the main letters ordered chronologically and then with ancillary documents in the latter part of the book. The references reproduced here have been put into one single chronological sequence.

Page & paragraphs Date Source and destination of letter

4 para 2 27 June 1874 Lima committee to MD in London

We note your advice... also with regard to the immediate despatch of 2 engines, rails and fuel...

12 para 5 6 July 1874 Iquique to Lima committee

On my arrival at this post I found the locomotives in a condition very far from satisfactory, for which reason, the conveyance of the nitrate, which should employ at least 5 engines daily during 3 months, cannot be effected with the desired expedition.

At the present moment we have at our disposal 3 locomotives and very often only 2, and until our locomotive power is increased we cannot expect to improve the business of the company.

22 para 2 14 July 1874 Iquique to Lima committee

I continue to introduce improvements in all the branches of this business, in order to establish a better system than that which has been carried out to the present, but regret that the new engines have not been shipped by steamer; today we have only had one engine running but during the present week I hope to have another in working order, which has been undergoing repairs for several months.

26 para 4 22 July 1874 Lima committee to Mr. Bush in Iquique

We note with regret the bad state of the Engines and that there have been days in which there has only been one to carry on the traffic and we can only urge you to use every means in your power to remedy this deplorable state of things and hope to receive by next steamer a more favourable report.

27

We have the pleasure of informing you, that on the 16th ult., the ‘Pampero’ was to sail, and herewith enclose Charter Party and 2 B/L (bills of lading?) for

2 Fairlie locomotives Nos. 2 & 3.

1206 rails with tons 265.18.0.15

You will therefore give the necessary instructions as to what port this vessel is to be discharged at; she will however go to Yquique for orders.

The Board has decided to purchase from the Genl. Sth. American Company 4 new Locomotives (Fairlie) which were on the point of completion and 500 tons rails.

The Fairlie locos 2 and 3 that are mentioned here may merely have been the 2nd and 3rd locos in one particular order. The locos to be purchased from the General South American Co. may well have been four of the batch of ten Yorkshire Engine Co. engines 219-228, in which case it looks like the sale did not go through at that time though eventually six of the ten did arrive some years later.

36 paras 4 & 5 21 July 1874 Iquique to Lima committee

Possession of Railways. *I beg to inform you that I have taken possession officially since the 25th ultimo in the name of the Co. and in accordance with the powers you were pleased to forward me.*

Tomorrow one of the Engines "La Argentina" which has been under repair for some time past, will increase our motive power and two others will soon be in running condition.

We have no indication of which loco was named 'La ARGENTINA'.

143 para 2 7 August 1874 Iquique to Lima committee

We are very much in need of the material I asked for before leaving London, for repairs of locomotives and I must inform you that we have only sufficient coal on hand for 4 or 5 days.

We are daily expecting the arrival of a ship load of coal (Lancashire) purchased from Prenash(?) and Company by the Messrs. Monteros.

This coal is not suitable for locomotives. I therefore, on arrival here, wrote the board in London, informing them of our requirements so that we might secure our supplies regularly.

153 para 5 12 August 1874 Lima committee to Mr. Bush in Iquique

Locomotives. *We shall be glad to have particulars of their condition and to know the number you have in daily service.*

166 para 2 19 August 1874 Lima committee to Iquique

Traffic. *We are desirous of being furnished with full particulars in this respect as well as with regard to the state and number of the locomotives in working order and undergoing repairs etc. Since your esteemed favor of the 21st ulto. you have not again referred to these matters.*

160 paras 5 & 6 21 August 1874 Iquique to Lima committee

Locomotives. *The state of these has not improved much since I last wrote to you for want of the requisite material to repair them.*

Coal. *The best coal for locomotive purposes is that which comes from Cardiff and have purchased 1000 tons which hope to receive within 3 weeks.*

167 paras 2-5 23 August 1874 Iquique to Lima committee

Locomotives. *There are two for sale at Ilo belonging to Government which we wish to purchase if suitable, in order to put a stop to the complaints of the nitrate traders through the absence of sufficient power to convey their nitrate, as well as for the purpose of increasing the receipts of the Railways which at present are anything but encouraging.*

We beg that on receipt of this you will immediately send to Ilo a proper person having a thorough knowledge of locomotives to inspect minutely the two above mentioned "Ilo" and "Pacocha" ascertaining whether they are sufficiently powerful and adapted to working the Iquique Section if the boilers are not burnt out or otherwise injured, as we are informed might be the case, so that should the same be favourable we may proceed to their purchase.

The inspector should likewise inform us of the means for their conveyance and with regard to the freighting of a ship. We herewith enclose the advertisement of July 1873 offering to dispose of the locomotives by public auction so that

you may tell us, in view of the specifications, the number of tons of nitrate they are capable of drawing along that line and we enclose as well an order from the Government to the Manager of the Ilo and Moquegua Railway so that he may allow our inspector to carry out this commission.

The FCIM loco ‘ILO’ was a Rogers 2-6-0 built in 1871 and probably rendered redundant by the very disappointing traffic levels on the Ilo to Moquegua railway. Whilst the name ‘PACOCHA’ does not appear in Bob Whetham’s loco list for that line, the engine may well have been a similar Rogers 2-6-0, named there as ‘MOQUEGUA’. The town of Pacocha lay immediately north of Ilo on the Peruvian coast. However, the remains of both ‘ILO’ and ‘PACOCHA’ seem to have been still at Ilo in 1896 along with those of other engines destroyed during the War of the Pacific, though those of a Baldwin mogul ‘OTORA’ and an unidentified Danforth mogul do not.

44 para 1 27 August 1874 Lima committee to MD in London

Respecting the traffic upon the lines & Locomotives he merely says that the situation has improved very little since the date of his last communication on these subjects.

46 paras 3 & 4... 13 September 1874 Lima committee to MD in London

Locomotives. *We are not yet in possession of the report with regard to the 2 locomotives at Ylo, belonging to the State, and which we are thinking of purchasing if suitable.*

With regard to the 17 engines at present in our possession at Yquique & Pisagua, you will find amongst the enclosed documents a few interesting particulars we have obtained from Mr. Bush.

47

In order to insure the success of our railways the main point is to secure a good number of Locomotives in proper working order, there always being freight in sufficient quantity. We are therefore anxiously awaiting the arrival of the “Pampero” with the two coming by that vessel and to hear that you had made arrangements to forward by steamer the 3 others that you mention were ready for shipment.

We are pleased to hear that the Board had resolved, at the meeting of the 20th July, to purchase 4 locomotives, for the payment of which a fresh credit for £20,000 had been opened with the Anglo-Peruvian Bank.

49

We are very pleased to hear from Mr. Bush, that with the old and defective locomotives at his disposal the returns for the first six days of the present month amount to \$28,000 say \$140,000 for the month.

We may look forward to a better state of things when the new locomotives arrive and trust that a similar improvement may take place upon the Pisagua section.

53 paras 2 & 3 27 Sept 1874 Lima committee to MD in London

We beg to call your attention to Mr. Bush’s letter of the 7th inst. (copy of which we remitted to you on the 13th) in which he states that he would require at least 14,000 tons of coal per annum the daily consumption for each engine being 9,000 lbs.

Boilers. *We have been compelled to purchase 2 ordered from N York by Messrs. Montero Bros. and which are to arrive shortly at Valparaiso...*

55

Yquique. *With a letter just received dated 22 inst. we are in possession of the statements of traffic from the 1st to the 15th inst. showing the receipts upon the Yquique section to have amounted to \$60,525.17 and on the Pisagua section to \$8,859.22 being in both cases an important improvement which we are pleased to communicate.*

The two American boilers are a mystery, unless they were for both the Cooke 2-6-0 and the Danforth 4-6-4T.

59 para 3 27 October 1874 Lima committee to MD in London

Corcovado arrived here on the 23rd after having discharged our locomotive at Yquique.

Pampero arrived at Yquique on the 7th and her discharge is being proceeded with.

The loco mentioned was probably one of the six Avonside Fairlies which received the running numbers up to 22. It looks as the sea journey from the UK had taken about two and half months.

62 para 3 13 November 1874 Lima committee to MD in London

Liguria. Arrived safely and the locomotive which it brought was landed with as good fortune as the former three.
Ditto.

69 para2 27 November 1874 Lima committee to MD in London

South American Coy. Mr. Bush has already taken possession of the 1000 fire bars, the invoice of which you have sent us, and as the amount of same is charged in the a/c ?? presented to us by Messrs. Montero Bros. those Gentn. will have to pay for the same.

178 paras 4 & 5 27 December 1874 Montero Bros. to Lima committee

Under date of the 16th June the Managing Director of the Railways, Mr. A. de Gessler, writes as follows:—

“As you will see from our letters to the Bank, a vessel has already sailed with 2 locomotives, and everything will be arranged, so soon as matters are put straight at Lima, to continue sending the materials, and with the £150,000 which we have already obtained, we shall be enabled to place the lines in proper working order.” (This letter contains several further references to these locos but only in order to argue about the finances of the railways).

188 15 January 1875 Extract of letter from Anglo-Peruvian Bank at Iquique to the MD of the bank in Lima

In our opinion all the difficulties and inconveniences would be overcome by the Company acquiring 10 more locomotives.

One can but wonder if this was a dig at the new company, given that the Montero Brothers had in fact ordered precisely that number of new Fairlies but had then had to request that their completion be delayed.

81 para 1 27 January 1875 Lima committee to MD in London

We enclose copy of the minute of a meeting held at Iquique on the 10th inst. for the purpose of seeking means to avoid the injury which is being caused to the Nitrate owners on account of the insufficient locomotive power of the railways to convey the whole up and down freight which is offered to them.

Comment extends through the following two pages, generally affirming that the complaint is justified.

88 para 3 27 February 1875 Lima committee to MD in London

Traffic returns. The Iquique receipts from the first to the 14th... \$78,039.08

" " " " " " " " " Pisagua \$ 14,530.39

These figures are presented here to illustrate the relative importance of Iquique and Pisagua, and thus the probable relative numbers of locos and of trains.

93 para 2 & 3 13 April 1875 Lima committee (Calderoni in Candamo's absence on trip to (Spanish only) Europe) to MD in London

Nos hemos impuesto de los otros puntos y estamos complacidos de ver que las dos maquinas Fairlie llegaron por vapor Mor???? a ellas se podra regularizar el servicio y aumentar al trafico, y no dudamos que el resultado sera de dia a dia mas satisfactorio.

Los productos del mes de Marzo ascienden a la suma de

\$202,995.90 por la seccion de Yquique

\$36,692.29 de la Pisagua, o sea

\$239,688.19 lo que es un aumento de \$41,611.?? sobre el mes de Febrero, no obstante las dificultades que se han presentado por la falta de agua.

Por la correspondencia de Yquique vera ?? el estado de las maquinas y que es muy

94

importante tener las suficientes para que se habia siempre siete listas para el servicio. Este numero basta segun el Sr. Rowland para portear toda la carga.

Two Fairlies arriving in April 1875 can only be the last of the Avonsides, no. 22, and the first of the Yorkshires, ie no. 23. No more Fairlies arrived after that until the end of the decade.

95 paras 2 & 3 27 April 1875 Lima committee (Calderoni) to MD in London

We take note of the arrangement with the Anglo-Peruvian (Bank) respecting the two Fairlie locomotives, and trust that the working of the lines will now be regular and sure, which up to the present it has not been the case.

As you will see in the Iquique correspondence, the same locomotives have to run daily and the tubes of which we have none may require changing at any moment. We have requested their despatch by letter and telegram and doubtless they have already been forwarded and the traffic will not consequently be endangered through the want of them.

97 paras 2 & 4 13 May 1875 Lima committee (Calderoni) to MD in London

Locomotives. *We are pleased to hear of their despatch, for they were greatly wanted as you will please to see in the Iquique correspondence. Their short number made it indispensable to keep them constantly at work, but with the new ones, we shall be able to keep them in better condition allowing them time to get cleaned, without interfering with the traffic.*

Tubes. *Mr. Rowland has been instructed by us to give his orders for material in good time, so as to avoid any delay through the want of any.*

Accidents. *We have to regret several as you will see in the Iquique letter of the 30th of April. All necessary steps will be taken to find the parties concerned in order that they may be delt (sic) with all the severity that the law permits.*

98

Passenger trains. In conformity with a resolution of the Salitreros (ie the oficina managements) and with the sanction of the Prefect; it has been decided to run only three passenger trains per week allowing of an increase in the nitrate traffic.

99 para 3 20 May 1875 Lima committee (Calderoni) to MD in London

Iquique. *Locomotive No. 22 has been handed (over?) according to Mr. Rowland's reports, who also states that a sufficient number of tubes has not arrived, only fifty of them being available for locomotives 18, 19 & 22 in consequence of the urgency shown by Mr. Rowland the following telegram has been forwarded to you.*

100

Send more tubes for engines 18, 19 & 22

We also particularly call your attention to the fact that on account of the excession (sic) work of the Locomotives, the tubes are subject to a great strain and suffer consequently, and as we are unable to procure them here, it is indispensable to have a good stock of them.

The importance of the lines and the sure increase of which the traffic is able, make it indispensable to have always the required material.

The Iquique letter of the 14th inst. furnishes a statement of the condition of the locomotives, the same which we most earnestly beg you to take into serious consideration.

Locos 17 to 22 were the last of the Avonside double Fairlies. It is strange that nos. 17, 20 and 21 do not get a mention, but possibly they had not yet been erected, or one or more of them may have been working from Pisagua, which terminus was apt to be neglected in these letters. If no. 22 had arrived in April then its erection must have been completed in six weeks or less.

192 20 May 1875 Protest document by Messrs. Montero Bros. against the NNRC

...The company had besides the service of 5 new locomotives, which circumstance alone ought to have shown a great difference in the earnings of the railways.

This was a reference to the comparative states of affairs before and after the takeover by the NNRC and not an indication of new locomotives at the time of writing.

101 para 2 27th May 1875 Lima committee (Calderoni) to MD in London

Traffic. *In consequence of the failures in the locomotives there has been a decrease of 22,147.55 during the last fortnight. In the Iquique letter of the 21st ulto. Mr. Rowland refers to a locomotive 20 tons, at present in Arica and which*

can be bought. The committee are waiting for some information before coming to any decision and in the mean time call your attention to the subject.

The loco at Arica must have been small if only of 20 tons. It may well have been the Hawthorn 0-4-0ST no. **3**, built in 1869, which did eventually move to the NR fleet though possibly not until around 1889.

104 paras 1 & 2 13th June 1875 Lima committee (Calderoni) to MD in London

We hope though that this month will, with the help of the new locomotive which has been erected, show more satisfactory results.

Locomotives. *There is one in Arica, the purchase of which would according to Mr. Rowland's opinion be very advantageous. We have requested the latter gentleman to make further and most particular enquiries and should the issue thereof be still satisfactory to address Mr. Jameson begging for this authority in the purchase of same.*

At a guess, "the new locomotive which has been erected" will have been no. **23**, the YECo double Fairlie originally built for Switzerland.

**109 paras 6 & 7 5 July 1875 Lima committee (Calderoni) to MD in London
(Spanish only)**

Material y Combustible. *Quedamos impuestos de lo que nos dice de las compras hechas.*

Conforme a sus deseos pediremos el Sr. Rowland nos informe hasta que punto es competente la fuerza locomotora, y que gasto anual sera necesario hacer para su mantenimiento y renovacion.

No English version included.

116 para 2 13th August 1875 Lima committee (Calderoni) to MD in London

Material. *Note is taken of the sailing of the "Peru" with 590 tons fuel on board as well as of the steps taken by the Directors for the purchase of two locomotives on a new principle and of the stores urgently asked for.*

The "two locomotives on a new principle" were presumably the first of the Sharp Stewart 0-6-0Ts designed for working back-to-back in pairs.

**118 para 3 27 August 1875 Lima committee (Calderoni) to MD in London
(Spanish only)**

Locomotoras. *Nos complacemos ??? el Directorio ha ?????????????????? se ocupa en compra los otros materiales pedidas, a fin de que lejas de disminuir puedan llegar a major cifra.*

**119 paras 2 & 3 13 September 1875 Lima committee (Calderoni) to MD in London
(Spanish only)**

Coches de 1a Cl. Iquique. *Nos complacemos en ?? la venta hecha por ese Directorio a la Empresa de los ferrocarriles de Lima de 2 coches de 1a clase que se hallan en Yquique por la cantidad de £1500 ???? y que esta suma se deber a invertir en carros de carga de que ?????*

Material. *Hemos tomado nota del material en camino y, abriga mas la ???ranza de que con il se ?????????????? las locomotoras en buen estado hasta que lleguen de los ?????? en construccion.*

121

Trafico. En el mes de Agosto ???? de

En la seccion de Yquique a \$188,860.04

" " " " Pisagua a \$33,757.79

Total \$224,621.93

No English version included. Back in February the traffic to Pisagua had been less than 1/5 of that to Iquique. Sixth months later the relative proportions were not that different though the totals had increased by around 140%.

130 paras 4 & 5 27 November 1875 Lima committee (Calderoni) to MD in London

(Spanish only)

Maquinas. Recibimos de Iquique el siguiente telegrama: Telegrama Londres anuncia 4 locomotoras preparandose demas ??? su barcandose.

Tenemos que estas 4 locomotoras sean de pequenas que trabajan a dos o sea un poder de las locomotoras grandes lo que en las circunstancias actuales no bastaria.

Para atender al servicia con debida puntualidad necesitamos de las menos las maquinas de fuerza, y llamamos la atencion de Ud. sobre este punto muy serio para que ese Directorio las remita a la brevedad posible y por vapor. Solo de este modo podrar contentar la Co. a las Salitreros y salvar sus intereses comprometidos.

Ensenamos el telegrama de Yquique al Gobierno el que tambien es de opinion de que se necesitan a lo menos 6 maquinas y que no esta muy satisfecho con la Compania por su es caso material.

No English version included. These four small locomotives will have been some of the six Sharp Stewart 0-6-0Ts which became numbers **26** to **31**. Although two had been ordered initially, a second order for four more had been placed very quickly and certainly before the first pair had been completed.

134 para 3 27 December 1875 Lima committee (Calderoni) to MD in London

(Spanish only)

Carbon ex Atlantico. Una de las causas del servicio irregular ha sido la mala calidad de ese carbon. Contenia poco calorifico y era imposible producir bastante vapor por cual motivo tenia que para el tren frecuentemente en el camino. El Sr. Rowland espera con anciedad los cargamentos en camino.

2.5.3 Appendix 3: Letter from Robert F. Fairlie published in *Engineering* on 7th March 1873

Background

In March 1874 the journal *Engineering* published a very lengthy (3400 word) letter from Robert Fairlie, refuting suggestions from M. M. Meyer about the capabilities of Fairlie locomotives and citing enthusiastic letters in support from railway engineers in a number of different countries. A large part of the letter related to the use of Fairlies on the railways of Tarapacá. A shortened version of the letter is reproduced below, but omitting many of the paragraphs which referred to other parts of the world:

“MEYER v. FAIRLIE ENGINES.

TO THE EDITOR OF ENGINEERING.

SIR,—I have again to thank you for your very able article in the cause of truth and justice. Indeed, since the Fairlie engine became known to you and your able contemporary *The Engineer*, you have both warmly advocated its adoption, and the fact that every scientific journal in this country, without a single exception, has, since the very beginning, constantly upheld the principle on which it is based, has been a source of great comfort and consolation to me when hope of success had almost died out.

...(omitted paragraphs responding to comments by M. M. Meyer)...

My reply to this assertion is simply to give you herein a few extracts from letters and reports lately received from those employing the Fairlie engine. I do not hesitate to give the names and addresses, that interested persons may, if they think fit, satisfy themselves as to the *bonâ fides* of the facts I give.

...(omitted paragraphs about the use of Fairlies in Ireland and Luxembourg)...

The following extracts from letters and reports I have received speak for themselves. The letters, &c., from which they are taken, I send with this for your perusal, and I take this opportunity to state that I shall only be too happy to show them to all inquirers.

...(omitted paragraphs about the use of Fairlies in Mexico, New Zealand and Nova Scotia)...

In explanation of the following, I beg to say that Mr. W. Walter Evans, of New York, is a very strong disbeliever in the Fairlie engine, and he (I must put it so, for Mr. Evans's credit, without, however, endorsing it in any way) desiring, in the interests of the owners of the Tarapaca railways, to prove the inferiority of the Fairlie engine compared with the American type of engine, as improved by himself, requested, and obtained; permission to build and place an engine of his special design, which—so he he (sic) said—was “to run the Fairlie engine off the face of the earth.”

It must be understood that the Iquique section of the Tarapaca Railway is exceptionally heavy, the maximum gradient on the first 10 miles being 4 per cent. (1 in 25); on the next 11 miles 4.3 per cent. (1 in 22) ; and on the next 3 miles at per cent. (1 in 29), with numerous curves of small radii. The water used in the engines has to be distilled from sea water, and costs, delivered in the engine tanks, 4 to 5 cents, 2d. to 2½d. per gallon. It will therefore be plain to every one, the great importance to the owners of a railway with such conditions, that their engine stock should be the most perfect that can be produced, both in respect to hauling power and economy in consumption of water and fuel.

The following extract from a letter dated Iquique, 6th October, 1872, received from the locomotive superintendent of the Tarapaca Railways, will explain itself with reference to the performances of the Evans against the Fairlie engines on the Iquique section of the railways : “I am at last able to furnish you with some facts respecting the working of your engines and the one especially designed by Mr. W. W. Evans, of New York, to compete with them in working this line. I have for the last two months taken notes with every care and impartiality to compare the performance of the Fairlie with the Evans American engine. This latter is about the same weight as your engines, and has a four-wheeled bogie at each end, the coupled or drawing wheels being between these, say 14 wheels altogether.

“The American Evans engine, in good working order, hauls from Iquique to San Juan, 24 miles, three loaded American cars weighing 16 tons each, and one supplementary tank of water, 12 tons, making total gross load of 60 tons. With this load up and the return journey down empty, she consumes 3200 gallons of water, which is 133 gallons per mile, or 2.2 gallons per ton of load per mile. I only calculate the up journey, because she requires no water or steam to

come down. The grade up to San Juan is very heavy all the way, a great many miles being 4 or 4½ per cent. (1 in 25). " The Fairlie engine, in good working order, hauls from Iquique six loaded American cars, 16 tons each, two supplementary tanks of water, 12 tons each, picks up the three loaded cars left at San Juan by the Evans engine, goes on to La Noria, 35 miles, and brings back 500 tons to Iquique. Calculating the 220 tons only, and not taking into account the three wagons picked up at San Juan, and hauled to La Noria and back to San Juan, after which little or no steam is required, the consumption of water is 130 gallons per mile, or 1 gallon per ton hauled per mile, 6000 gallons being the quantity consumed during the whole journey ; the consumption of fuel is less, being in proportion to the water used. It therefore follows that the Fairlie engine does not consume one-half the fuel per ton of work done that the Evans American engine does. If you go into these figures, you will find them correct; I have avoided fractions.

"Extract from a letter received from Senor Don Manuel Montero, managing director and joint owner with his three brothers of the Iquique and La Noria Railway and Sal de Obispo Railway, Peru, dated Iquique, Oct. 4, 1872 :

"For the present, I inform you that probably by the next mail my house will give an order for the construction of ten engines on the Fairlie system. During the time that I have been at the head of this railway, I have been able to perceive the great difference which exists between your system and the American (Evans); in my judgment it would be better to pay 5000l. for each of your locomotives than to get the American engines for nothing, on condition to carry the traffic from this place to San Juan (24 miles), a distance of severe gradients.

"Extract from a letter received from the engineer-in-chief of the Tarapaca Railways, dated Iquique, 7th October, 1872:

"Don Manuel has taken the post of general manager, and he has seen with pleasure, and fully appreciates, the powers of the Fairlie engine. The 'Hercules' goes daily to La Noria with five loaded goods cars, and one passenger car, while the American Evans engine just manages to take up seven empties to San Juan, whence the 'Hercules' takes them, together with her own load, to La Noria. These practical results have so satisfied Don Manuel that he has decided to write you by this mail, saying he will order ten more engines; pray let them be even better than these we now have."

Extract from another letter received from Senor Don Manuel Montero, dated 6th November, 1872: "For the present I cannot give particulars about the traffic, nor the details about the advantages of the locomotives ; but I can already say that your system is three times better. Be so good, therefore, as to put in hand for the earliest delivery ten more of these Fairlie engines. I leave the matter to you as to whether they should be even stronger than those you are now building for us."

Extract of another letter from the locomotive superintendent of the Tarapaca railways, dated Iquique, 6th November, 1872 :

"Don Manuel has ordered the name of the great American Evans engine to be changed ; and what do you think he has christened her?—' Desengano'—which in English is 'swindle.' So much for the great American Evans."

This evidence is confirmed by the the following letter and the above Table, received from the locomotive superintendent by the mail which arrived on Saturday last.

The letter is dated Iquique, January 21st, 1873, and says, "I inclose you Table of experiments and diagram of running trains, which may perhaps give you a better idea of the work to be done than any explanation I could give in any other way. The Table does not show the result of any particular experiment, but the average of a number made under various circumstances, which has taken considerable time to make, my object being to put all the engines on their own merits."

Can any one require evidence stronger than this?

By a coincidence the Evans engine was named "Iquique," after the port of that name, and one of the Fairlie engines, told off to work against it, was likewise named "Iquique;" but by reason of the failure of the Evans engine to do any one of the things it was intended by that gentleman to do, the owners of the railway, seeing that they had been greatly misled by Mr. Evans, ordered the name of his engine to be changed from "Iquique" to "Desengano," the meaning of which, putting it gently, is, Deceived, Deception.

Comparative Performance of Engines Working on the Iquique and La Noria Railway.

Engines.	Diameter of Cylinders.	Length of Stroke.	Diameter of Wheels.	Weight of Engine Empty in Tons.	Gross Load Hauled in Tons.	Maximum Grade.	Minimum Grade.	Miles Run.	Water Used.	Coal Used.	Pounds of Coal per Ton per Mile.	Gallons of Water per Ton per Mile.
Fairlie, 4 cylinders	ft. 15	ft. 22	ft. in. 3 6	44	120	4½ per cent. (1 in 22)	3½ per cent. (1 in 29)	24	gals. 5000	cwt. 30	1.17	1.73
Evans, 2 cylinders	17	22	3 4	43	60	„	„	„	3200	22	1.71	2.2

...(omitted paragraphs containing complimentary comments about Fairlies in Utah, Canada, Sweden and Russia)...

I could add more certificates, but I have, I fear, trespassed already too much on your valuable space; however, I could not very well give less, it being entirely a question of evidence.

I have the honour to be your obedient Servant,

ROBERT F. FAIRLIE.”

Apart from adding colour and context to the argument between two flamboyant salesmen from opposite sides of the Atlantic – Robert Fairlie and Walton W. Evans, this letter provides supporting evidence for the statement cited in Appendix 1, that the Montero Brothers had publically expressed their intent to order ten Fairlie locomotives, which became the Yorkshire Engine Company’s order E41, six of which did reach Tarapacá but only after several years’ delay. One puzzle is Fairlie’s suggestion that the ‘Evans’ loco, which was presumably the Danforth Cooke 4-6-4T, arrived as a response to the first Fairlies in Tarapacá. Given that the Danforth was probably built in early 1869 and that the first Fairlies arrived in 1870, this is difficult to reconcile. However, it might be merely that the 4-6-4T was Evans’ answer to the news that Fairlie locos had been ordered.

2.5.4 Appendix 4: Arica Tacna Railway Company reports – references to locomotives

Background

Examining a more-or-less full set of directors's report to shareholders and reports of company AGMs from 1857 to 1939, there was the usual dearth of technical detail. However, a few reports did contain relevant information on locomotives, albeit not identifying engines individually.

Notice to shareholders 15th July 1854

16th October 1857

2nd half-yearly report 15th April 1858

3rd half-yearly report 26th October 1858

4th half-yearly report 30th May 1859

5th half-yearly report 28th December 1859

6th half-yearly report 7th June 1860

7th half-yearly report 23rd May 1861

(8th half-yearly report missing)

9th half-yearly report 16th December 1861

(10th half-yearly report missing)

11th half-yearly report 31st December 1862

12th half-yearly report 27th July 1863

13th half-yearly report 14th December 1863

14th half-yearly report 10th December 1864

15th half-yearly report 6th July 1865

16th half-yearly report 18th December 1865

17th half-yearly report 6th July 1866

18th half-yearly report 24th December 1866

19th half-yearly report 9th July 1867

20th half-yearly report 23rd December 1867

21st half-yearly report 10th July 1868

22nd half-yearly report 12th November 1868: "This, however, is of slight interest, compared with the communication which it is the painful duty of the Directors to make, having reference to the disastrous Earthquake which, on the 13th of August last, devastated the Coast of Peru, and was felt with fatal effect at Arica, where the sea, retiring, and returning with great velocity, rising, as it is calculated, forty feet above high-water mark, swept away three-fourths of the Town, including our Railway Station, Buildings, Machinery, Stores of Fuel, and other necessities, besides three Locomotives, and more than half of our Rolling Stock. Arrangements were being made for repairing the track as far as practicable, and it was hoped that a partial resumption of traffic might follow in the course of three or four months."

23rd half-yearly report 31st July 1869: "It will be recollected that but one single locomotive remained available for service. It has been run with light trains only on alternate days since the commencement of the year, and the Returns that have come forward for the first five months are as follows:-

The arrival of two new locomotives that were ordered in the United States, and reached Arica only last month, after an unusually long voyage, will have placed our Manager in a position to resume daily service as before...

We still have to pay for two other locomotives that are now in the course of construction at Newcastle, for shipment in September or October..."

24th report 22nd July 1870

25th report 20th June 1871

26th report 21st December 1871

27th report 22nd July 1872

28th report 12th December 1872

29th report 21st June 1873

30th report 20th December 1873

31st report 22nd June 1874 (hand-written): “The track and rolling stock, including three new locomotives and sundry passenger cars, are now in a most efficient condition.”

32nd report 30th June 1875

33rd report 30th June 1876. Death of John Hegan.

34th report 22nd June 1877: “But the most unsatisfactory feature of this Report remains to be touched upon. Telegrams have been received from various sources announcing the occurrence of another severe earthquake, accompanied by a tidal wave, along the greater part of the Coasts of Chili and Peru, on the 9th and 10th of May last. Full details are not yet to hand, but from a telegram which was despatched by our agent in Arica, immediately after the occurrence, we are not without hopes that, though it can hardly fail to have caused a great deal of damage, it will turn out to be at all events less serious than the catastrophe of 1868. The only request contained in the telegram mentioned above, was for a locomotive turntable, which has been got ready with the greatest expedition possible, and was shipped by Steamer on the 13th inst, from Liverpool. ”

35th report 27th July 1878: “It will be seen that the net receipts, although in themselves unsatisfactory, do not show such a heavy falling off as might have been anticipated, when we consider the serious results of the earthquake of 9th May, intelligence of which disaster had just reached us by cable when we issued our last Report. The Station at Arica, together with Machine Shop, Foundry, &c., were completely destroyed, and the road itself washed away by the sea for a distance of five miles. The work of re-construction was promptly commenced, and energetically carried on, by our Locomotive Superintendent, Mr. Ansdell, ably seconded by the staff of workmen under him, but two months elapsed before direct communication with Arica could be re-established, and it was not until the 15th September that they were able to run daily trains as before. Under these circumstances, and with the same disadvantages to struggle against which we laboured. under in 1876, viz., depression in trade, a low rate of Exchange, and the undisguised efforts of the Government to divert the traffic from the Tacna route, in order to feed the line running from Arequipa. to Puna, we may fairly congratulate ourselves on the result of the past years' working.

The recurrence, after so short an interval, of an earthquake, scarcely less disastrous in its results than that of 1868, has shown the necessity of being in some measure prepared for these convulsions of nature – of taking steps at least to reduce the harm they can do us to a minimum. With this object it was at first proposed to move back on to higher ground both the Station at Arica, and the five miles of railway which skirt the margin of the bay, but the expenses attendant on such a step were found to be very heavy, and we have been obliged to content ourselves with moving the Sheds, Workshops, &c., up to Tacna, where also all the Rolling Stock will be housed, and rebuilding the Station at Arica in the lightest and most inexpensive manner possible. This has entailed, on the other hand, a heavy outlay for the enlargement of the Station at Tacna, the purchase of the necessary land, &c., as will be seen by reference to the Statement above.”

36th report 11th July 1879

(37th report missing)

38th report 30th June 1884

39th report 30th June 1885

40th report 15th July 1886

From here on the annual reports are stapled booklets, rather than merely a single folded sheet.

41st annual report for OGM on 7th July 1887

42nd annual report for OGM on 2nd August 1888

EGM notice for 11th April 1889

43rd annual report for AGM on 2^{5th} Julyt 1889

44th annual report for AGM on 11th November 1890

45th annual report for AGM on 12th November 1891

46th annual report for AGM on 2nd August 1888

47th annual report for AGM on 21st November 1893

48th annual report for AGM on 22nd November 1894

49th annual report for AGM on 21st November 1895

50th annual report for AGM on 16th July 1896

51st annual report for AGM on 27th May 1897

52nd annual report for AGM on 16th June 1898

53rd annual report for AGM on 13th July 1899

54th annual report for AGM on 14th June 1900

55th annual report for AGM on 27th June 1901

56th annual report for AGM on 19th June 1902

57th annual report for AGM on 25th June 1903

58th annual report for AGM on 23rd June 1904

59th annual report for AGM on 1st June 1905

60th annual report for AGM on 14th June 1906

61st annual report for AGM on 18th June 1907

62nd annual report for AGM on 1st July 1908

63rd annual report for AGM on 29th June 1909

64th annual report for AGM on 1st July 1910: During the meeting, the Chairman Mr. C. J. Hegan, stated, “There are additional reasons why we should make this new departure at the present moment. Having regard to the fact that the new line from Arica to Paz, must, when completed, take away from us a large portion of the goods traffic which has hitherto passed over our line, it behoves us to do all we can to develop the passenger traffic and to attract people to Tacna, which, from a residential point of view, is unquestionably the most favoured spot on that part of the West Coast. With this object in view, we have decided to institute an accelerated service of trains between Arica and Tacna which will do the journey in 1 hour 20 minutes – that is to say, in about half the time which an ordinary train now takes to run up to Tacna. For this particular work we intend to send out a couple of steam motor coaches, such as are in use in many parts of this country, and we are already in communication with a leading firm of manufacturers of this class of rolling stock. But we are advised by our General Manager in Tacna that this accelerated service will necessitate the relaying of the line with steel rails being completed forthwith, ...”

65th annual report for AGM on 19th July 1911: During the meeting, the Chairman Mr. C. J. Hegan, stated, “In this connection I may mention that the first of the new motor coaches which I alluded to in my speech last year is on the point of being shipped, and should arrive in the Port of Arica about the end of August or early in September.”

66th annual report for AGM on 27th June 1912: During the meeting, the Chairman Mr. C. J. Hegan, stated, “The steam autocars or motor-coaches are a great success. They started running in the month of January last, and neither at the time of their erection, nor subsequently, has any criticism been passed upon them – a fact which reflects great credit on the makers, Messrs. Kerr, Stuart and Co. All accounts that reach us tend to show that the improved and accelerated service between Tacna and Arica is great appreciated. As stated two years ago, this accelerated service of trains necessitated pushing on with the relaying of the line somewhat faster than would otherwise have been necessary, the old iron rails which were laid down upwards of 55 years ago not being equal to the strain of faster traffic.”

67th annual report for AGM on 26th June 1913

68th annual report for AGM on 25th June 1914

69th annual report for AGM on 22nd July 1915

70th annual report for AGM on 24th July 1916

71st annual report for AGM on 6th September 1917

72nd annual report for AGM on 23rd December 1918

73rd annual report for AGM on 29th December 1919

74th annual report for AGM on 30th December 1920

75th annual report for AGM on 29th December 1921

76th annual report for AGM on 29th December 1922

77th annual report for AGM on 2nd August 1923

78th annual report for AGM on 18th December 1924

79th annual report for AGM on 10th November 1925

80th annual report for AGM on 21st December 1926

81st annual report for AGM on 22nd December 1927

82nd annual report for AGM on 20th December 1928: “The Motor Lorry competition has been met by our General Manager undertaking a “door-to-door” collection and delivery service by our own vehicles. As Shareholders are already aware, a large proportion of the passenger service on this Railway for some years past has been performed by petrol motor coaches fitted to run on rails. We now have under consideration a scheme for extending this service to goods traffic, involving possibly the almost complete abandonment of steam traction on the Line. As this will be a new departure, the problem is one that requires careful study ; but in the present circumstances, it may prove a solution of the competition with which we are faced.”

Also Chairman's hand-written note re expenditure on electric light in coaches and locos.

83rd annual report for AGM on 20th December 1929

84th annual report for AGM on 19th December 1930: “In the interests of further economy, it will probably be necessary to complete the change of the motive power from steam to internal combustion engines. This matter has been under consideration now for two or three years, and it seems likely that if suitable units can be secured, some steps will be taken to equip the Line entirely with motor traction.”

During the meeting, the Chairman Mr. J. A. Goudge CBE, stated, “The prospects for the year 1930 are not encouraging as to profits, if there are any. Consequently, it behoves us to see whether the scheme, which we have had under consideration for the last three years, for the complete abandonment of steam traction would not lead to some further economy. It is a drastic remedy, and if we adopt it, we are practically risking the whole amount of capital we have in hand. That involves one being fairly certain of the result before we do anything of that kind. The developments in motor traction have been so great that, from one month to another, we have not known which would be the best system to adopt. Therefore, we are still going into the question. ”

85th annual report for AGM on 23rd December 1931: During the meeting, the Chairman Mr. J. A. Goudge CBE, stated, “The position with regard to our possibly abandoning steam traction and using other methods is quite simple. For three years now we have been considering the possibility of petrol traction or Diesel engine traction, but I am sorry to say we have not been able to assure ourselves that the change would give a satisfactory result. It means that we should embark practically the whole of our existing resources in another trial. We do not want to do anything of that sort until we are assured of the results.”

86th annual report for AGM on 29th December 1932

87th annual report for AGM on 16th February 1934

88th annual report for AGM on 14th December 1934: During the meeting, the Chairman Mr. J. A. Goudge CBE, stated, “If things begin to improve, our rolling stock and our locomotives require attention. We would like to get a Diesel engine or two, and scrap our steam locomotives entirely ; but we have not any hope at the moment of buying any locomotives.”

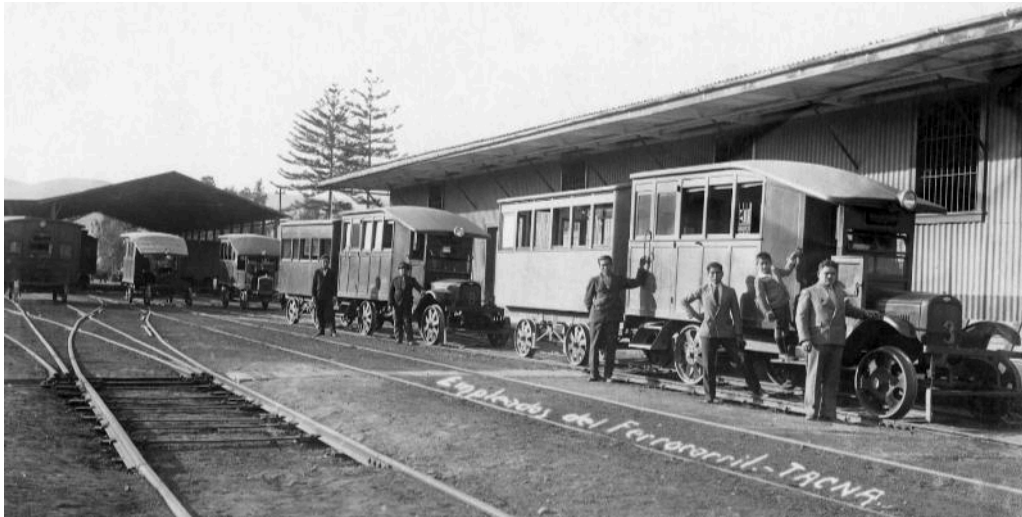
89th annual report for AGM on 5th November 1935

90th annual report for AGM on 23rd October 1936: During the meeting, the Chairman Mr. J. A. Goudge CBE, stated, “For some years past we have told you that we have been doing our best to suppress the steam locomotives. There are now eight petrol passenger cars with three trailers and two motor freight vans doing the bulk of our passenger and light goods service, and these are saving steam mileage, which is more expensive. Those vehicles are being well maintained , but I wish I could say the same of our old steam locomotives, which are very old indeed—in fact, I wonder how these have been kept going. During the current year it has been absolutely necessary to order one new boiler to keep up the steam service, and in consequence our small cash resources will be depleted to the extent of about £1,700. If traffic is maintained at its present volume, or improves, there is the possibility of our having to order another locomotive boiler. ”

91st annual report for AGM on 7th October 1937

92nd annual report for AGM on 1st December 1938: During the meeting, the Chairman Mr. J. A. Goudge CBE, stated, “We have been doing nothing but the merest necessary repairs, and fortunately we have had no or exceptional expenditure to deal with during the past year ; but, as I have said on previous occasions, our track is not good. We are only replacing the necessary sleepers, and generally doing what is essential to keep running. We have cut everything to the bone, but now and again we are obliged to incur expenditure. For instance, this year we are putting a new boiler into a locomotive. With our restricted means on the other side, I may tell you that it takes more than a year to generally overhaul and repair one engine.”

93rd annual report for AGM on 21st December 1939



Whilst these files major on steam traction, this particular appendix makes the point that internal-combustion-engined competition was present from a very early date. This view of Tacna station yard, probably in the 1920s, shows at least five railcars, two of which, nos. **3** and **8**, are hauling trailers.

2.5.5 Appendix 5: The Nitrate Railways' claim against the government after the Chilean civil war of 1891

In August 2022 I discovered the following two documents in the archives of the British Government's Foreign Office, at The National Archives in Kew. No doubt they had been gathered as part of the normal observation of British-owned companies overseas, and possibly because the Nitrate Railways Company was asking for government pressure to be applied during its claim against the Chilean government after the civil war.

Document 1, in Spanish

being a summary of the witnesses who had testified to damage caused to each locomotive during the conflict in Tarapacá during January, February and March 1891.

LOCOMOTORAS

Honorable Comisión:

J. Mayne Nicholls, Gerente General de la Compañía de Ferrocarriles Salitreros Limitada, en el expediente del reclamo interpuesto por la Compañía que representa contra el Gobierno de Chile, por servicios prestados y daños sufridos durante la guerra civil de 1891, á la Honorable Comisión con el debido respeto, exponen:

I. Los cargos que se formulan en las páginas 1 a 5 de las cuentas impresas comprenden 22 locomotoras, á saber:

Números **1 - 3 - 6 - 7 - 8 - 9 - 12 - 13 - 14 - 18 - 27 - 28 - 30 - 38 - 39 - 40 - 42 - 47 - 48 - 50 - 51 - 58**

que fueron empleadas exclusivamente, durante el período activo de las hostilidades, en el transporte de tropas ó en servicios militares; y tres locomotoras, á saber:

Números **34 - 35 - 53**

que fueron dañados en la Estación de Iquique durante el bombardeo del puerto por la Escuadra el 19 de Febrero de 1891.

LOCOMOTIVES

Honourable Commission:

J. Mayne Nicholls, General Manager of the Nitrate Railways Company Limited, in the file of the claim filed by the Company he represents against the Government of Chile, for services rendered and damages suffered during the civil war of 1891, to the Honourable Commission with due respect, state:

I. The charges made on pages 1 to 5 of the printed accounts comprise 22 locomotives, namely:

Numbers **1 - 3 - 6 - 7 - 8 - 9 - 12 - 13 - 14 - 18 - 27 - 28 - 30 - 38 - 39 40 - 42 - 47 - 48 - 50 - 51 - 58**, that they were employed exclusively, during the active period of hostilities, in the transport of troops or in military services; and three locomotives, namely:

Numbers **34 - 35 - 53** that were damaged in the Iquique Station during the bombardment of the port by the Squadron on February 19, 1891.

(As an aside, locomotives nos. **2, 5, 21, 24, 25, 26, 27, 29, 32, 33, 34, 35, 36, 37, 45, 54, 55, 57** and **59** were also listed as having been use during this period, but presumably escaped without damage.)

Las locomotoras que poseía la Empresa en 1891 ascendían á 61, como se desprende del estado que se acompaña en copia bajo el N.º 1 y que se refiero al cuadro de servicio correspondiente al 31 Diciembre de 1890. Muchas de las 36 locomotoras que no fueron dañadas estuvieron tambien al servicio de las fuerzas contendientes.

II. – El precio de. costo de las 25 locomotoras dañadas asciendo á £95.918, según se manifiesta en el estado que se acompaña bajo el No.2.

cada una de las fâcturas correspondientes está á la disposición de la Comisión en esta Oficina.

III. – Veintitres de las 25 locomotoras dañadas se encontraban en buen estado de servicio el 31 de Diciembre de 1890, como lo acreditan los libros de esta Compañía y el certificado del Notario Público que se acompaña bajo el N.º 3.

Otra de las locomotoras, la No. **39**, estaba ese día 31 de Diciembre en reparación, pero fué entregado al tráfico, reparada y en buena condición, con fecha 6 de Enero de 1891 (Certificado Notarial No. 4.)

La locomotora No. **53** estaba todavía en la Maestranza de Iquique, cuando fué dañada por el bombardeo del puerto.

IV. – El estado de destrozo en que las 23 locomotoras incluidas en el certificado No. 3 y la locomotora No. **39** á que se refiere el certificado No. 4, volvieron á los talleres de la Maestranza, después de haber sido empleadas en servicios militares, es el mismo que detallan las cuentas, según se acredita con el examen de los libros del Departamento de Locomotoras hecho por el Notario Público y el traductor de inglés Don Manuel Leverett. (Certificado No. 5.)

V. – En 1891, cuando fueron presentadas las cuentas del reclamo á la Excma. Junta de Gobierno, la suma en que se estimó el valor de las reparaciones que necesitaban las 25 locomotoras dañadas fué de £8,938.

El costo efectivo de la reparación solo ascendió á £8.851, según lo establecen los libros de esta Compañía y el Certificado del Notario Público que acompaño bajo el No. 6.

Debe tenerse presente que la diferencia que se nota entre la suma presupuesta para la reparación de la locomotora No. **9** y la suma invertida depende de que no fué reparado sino el caldero de la locomotora.

El costo de las reparaciones – £8,851 – equivale al 9.22% del costo de las locomotoras.

VI. – Como comprobantes parciales de cada uno de los items de las cuentas, tengo ahora el honor de acompañar ;

The locomotives owned by the Company in 1891 amounted to 61, as can be deduced from the statement that is attached in a copy under No. 1 and which is referred to the service chart corresponding to December 31, 1890. Many of the 36 locomotives that were not damaged were also at the service of the contending forces.

II. - The price of. The cost of the 25 damaged locomotives amounts to £95,918, as shown in the accompanying statement under No.2.

each one of the corresponding invoices is at the disposal of the Commission in this Office.

III. – Twenty-three of the 25 damaged locomotives were in good working order on December 31, 1890, as evidenced by the books of this Company and the certificate of the Notary Public that is attached under No. 3. Another of the locomotives, No. **39**, was on that day, December 31, under repair, but it was delivered to traffic, repaired and in good condition, dated January 6, 1891 (Notary Certificate No. 4.)

Locomotive No. **53** was still in the Maestranza de Iquique, when it was damaged by the bombardment of the port.

IV. – The state of destruction in which the 23 locomotives included in certificate No. 3 and locomotive No. **39** referred to in certificate No. 4, returned to the Maestranza workshops, after having been used in military services, it is the same one detailed in the accounts, as evidenced by the examination of the Locomotive Department's books by the Notary Public and the English translator Don Manuel Leverett. (Certificate No. 5.)

V. - In 1891, when the accounts of the claim were presented to the Excma. Board of Governors, the estimated value of the repairs needed by the 25 damaged locomotives was £8,938.

The effective cost of the repair only amounted to £8,851, as established by the books of this Company and the Notary Public Certificate that I accompany under No. 6.

It should be borne in mind that the difference between the amount budgeted for the repair of locomotive No. **9** and the amount spent depends on the fact that it was not repaired but (solely) the boiler of the locomotive. The cost of the repairs – £8,851 – is equivalent to 9.22% of the cost of the locomotives.

VI. – As partial proof of each of the items in the accounts, I now have the honour to accompany ;

Loc. No 1. — Dañada por excesivo trabajo anormal y por choque en Pozo Almonte con la locomotora No. 50.

Declaración marcada con la letra A:

Señores J. M. Nicholls, Superintendente del Departamento de Locomotoras en 1891.

" E. Cook, Mayordomo del taller de Mecánico en 1891a J. Ward, Mayordomo del taller de Cal, defería en 1891.

A esta locomotora se refiere además la declaración prestada ante el Cónsul de S. M. B. por el maquinista Harper, No. 31 del expediente consular.

Loc. No 1. — *Damaged by excessive abnormal work and by collision in Pozo Almonte with locomotive No. 50.*

Statement marked with the letter A:

Messrs. J. M. Nicholls, Superintendent of the Locomotive Department in 1891.

" E. Cook, Mechanic's Shop Steward in 1891a J. Ward, Cal's Shop Steward, deferred in 1891.

This locomotive is also referred to in the statement given before the Consul of His Majesty by the driver Harper, No. 31 of the consular file.

Loc. No. 3 – Dañada por excesivo trabajo anormal.

Declaración marcada con la letra B:

Señores Nicholls, Cook y Ward.

Loc. No. 3 – *Damaged by excessive abnormal work.*

Statement marked with the letter B:

Messrs Nicholls, Cook and Ward.

Loc. No. 6 – Dañada por excesivo trabajo anormal y por desrielamiento en el cambio de Buen Retiro.

Declaración C:

Señores Nicholls, Cook y Ward. Puede verse además la declaración del maquinista Soss, No. 39 del cuaderno consular.

Loc. No. 6 – *Damaged due to excessive abnormal work and derailment at the Buen Retiro points.*

Statement C:

Messrs Nicholls, Cook and Ward. You can also see the statement of the driver Soss, No. 39 of the consular notebook.

Loc. No. 7 – Dañada por excesivo trabajo anormal, por mal manejo de los maquinistas puestos á cargo de ella por las fuerzas militares y por dos desrielamientos, uno en Ramírez y el otro en Tres Marías.

Declaración D:

Señores Nicholls, Cook y Ward.

Loc. No. 7 – *Damaged due to excessive abnormal work, due to mishandling of the drivers put in charge of it by the military forces and due to two derailments, one in Ramírez and the other in Tres Marías.*

Statement D:

Messrs Nicholls, Cook and Ward.

[Locomotives 8-22, Double Fairlies built by Avonside]

Loc. No. 8 – Dañada por excesivo trabajo anormal.

Declaración E:

Señores Nicholls, Cook, B. Manley, Mayordomo del taller de Herrería en 1891, y William Bull, Mayordomo del taller de Toldería, desde los primeros meses de ese año.

Loc. No. 8 – *Damaged by excessive abnormal work.*

Statement E:

Messrs. Nicholls, Cook, B. Manley, Butler of the Blacksmith shop in 1891, and William Bull, Butler of the Toldería shop, from the first months of that year.

Loc. No. 12 – Armada durante un tiempo con dos ametralladoras Gatling.

Dañada por excesivo trabajo anormal y por mal manejo de los maquinistas puestos á cargo de ella por las fuerzas Militares. Declaración F:

Señores Nicholls, Cook, Ward y Manley, Puede verse además la declaración del maquinista Parsons No. 19 del cuaderno consular.

Loc. No. 12 – Armed for a time with two Gatling guns.

Damaged by excessive abnormal work and by mishandling of the drivers put in charge of it by the Military Forces. Statement F:

Messrs. Nicholls, Cook, Ward and Manley, You can also see the statement of the driver Parsons No. 19 of the consular notebook.

Loc. No. 13 – Dañada por balsa, por excesivo trabajo anormal y mal manejo de un maquinista, puesto a cargo de ella por las fuerzas militares.

Declaración G:

Señores Nicholls, Geo. J, Clarke, Gerente en 1891 de la Sección de Pisagua, Cook y Ward.

Loc. No. 13 – Damaged by raft, due to excessive abnormal work and mishandling of a driver, put in charge of it by the military forces.

Statement G:

Messrs. Nicholls, Geo. J, Clarke, Manager in 1891 of the Section of Pisagua, Cook and Ward.

Loc. No. 14. – Dañada por excesivo trabajo anormal y mal manejo de los maquinistas puestos á cargo de ella por las fuerzas militares.

Declaración H:

Señores Nicholls, Clarke, Cook, Ward y Manley.

Loc. No. 14. – Damaged due to excessive abnormal work and mishandling of the drivers put in charge of it by the military forces.

Statement H:

Messrs Nicholls, Clarke, Cook, Ward and Manley.

[Locomotives 26-31, 0-6-0Ts built by Sharp Stewart]

Loc. No. 28. – Dañada por excesivo trabajo anormal y por mal manejo de los maquinistas puestos á cargo de ellas por las fuerzas militares.

Declaración I:

Señores Nicholls, Cook, Ward y Manley.

Loc. No. 28. – Damaged due to excessive abnormal work and due to mishandling of the drivers put in charge of them by the military forces.

Statement I:

Messrs Nicholls, Cook, Ward and Manley.

Loc. No. 30. – Dañada por excesivo trabajo anormal.

Declaración J:

Señores Nicholls, Cook, Ward y Manley.

Puede verse además la declaración del maquinista Conley, No. 9 del cuaderno consular.

Loc. No. 30. – Damaged by excessive abnormal work.

Statement J:

Messrs Nicholls, Cook, Ward and Manley.

You can also see the statement of the driver Conley, No. 9 of the consular notebook.

[Locomotives **38-41**, 2-6-0T ordered from Sharp Stewart but actually built by the YECa]

Loc. No. 38. – Dañada por excesivo trabajo anormal y por un desriellamiento que sufrió en la Oficina Tres Marías.

Declaración K:

Señores Nicholls, Cook, Ward y Manley.

Puede verse además la declaración del maquinista Bull, N.º 3 del cuaderno consular.

Loc. No. 38. – Damaged due to excessive abnormal work and a derailment that occurred in the Tres Marías Office.

Statement K:

Messrs Nicholls, Cook, Ward and Manley.

You can also see the statement of the driver Bull, No. 3 of the consular notebook.

Loc. No. 39. – Dañada por excesivo trabajo anormal y por mal manejo de los maquinistas puestos á cargo de ella, por las fuerzas militares.

Declaración L:

Señores Nicholls, Clarke, Cook, Ward y Manley,

Loc. No. 39. – Damaged due to excessive abnormal work and due to mishandling of the drivers placed in charge of it, by the military forces.

Statement L:

Messrs Nicholls, Clarke, Cook, Ward and Manley,

Loc. No. 40. – Blindada para el servicio del tren torpedo. Dañada por excesivo trabajo anormal.

Declaración M:

Señores Nicholls, Cook y Ward.

Loc. No. 40. – Armored for the torpedo train service. Damaged by excessive abnormal work.

Statement M:

Messrs Nicholls, Cook and Ward.

[Locomotives **42-49**, 4-6-0T built by Fowler]

Loc. No. 42. – Dañada por excesivo trabajo anormal.

Declaración N:

Señores Nicholls, Cook, Ward y Bull.

Loc. No. 42. – Damaged by excessive abnormal work.

Statement N:

Messrs Nicholls, Cook, Ward and Bull.

[Locomotives **50-55**, 2-6-2T built by Fowler]

Loc. No. 53. – Dañada por balas y por el desriellamiento ue sufrió en la Oficina Rosario de Huara. Dañada también por excesivo trabajo anormal.

Declaración O:

Señores Nicholls, Clarke, Cook y Ward.

Puede verse además la declaración del comerciante don Santiago Langley No. 45 del cuaderno consular.

Loc. No. 53. – Damaged by bullets and by the derailment that it suffered in the Rosario de Huara Oficina. Also damaged by excessive abnormal work.

Statement O:

Messrs Nicholls, Clarke, Cook and Ward.

You can also see the statement of the merchant Don Santiago Langley No. 45 of the consular notebook.

Las declaraciones procedentes concuerdan todas de estos puntos :

- a) Que las locomotoras estaban en buen estado de servicio al estallar la revolución ;
- b) Que su emplearon exclusivamente en el transporte de tropas ó en servicios militares ;
- c) Que al regresar á los talleres se encontraban en el estado de destrozo que relata cada uno de los ítems de las cuentas ;
- d) Que los daños provinieron de su empleo en condiciones anormales y al servicio de alguno de los ejércitos delirantes ;
- e) Que las reparaciones fueron hechas en los talleres y á costa de la Empresa.

The preceding statements all agree on these points:

- a) That the locomotives were in good working order at the outbreak of the revolution;
- b) That they were used exclusively in the transport of troops or in military services;
- c) That when they returned to the workshops they were in the state of destruction that each one of the items in the accounts recounts;
- d) That the damages arose from their employment in abnormal conditions and at the service of one of the delinquent armies;
- e) That the repairs were made in the workshops and at the expense of the Company.

VII.--Respecto de las locomotoras que no están comprendidas en el número anterior, existen las siguientes declaraciones en el cuaderno consular:

VII.--Regarding the locomotives that are not included in the previous number, there are the following statements in the consular notebook:

Loc. No. 9. — Declaración N.º 1, señor Juan Bartos, austriaco, Inspector de la vía en 1891;

Id. N.º 27, señor W. Gee, inglés, maquinista;

Id. N.º 51, señor R. Mac Crae, inglés, maquinista;

Id. No. 14, señor C. Monar, peruano, jefe de la Estación de Huara en 1891;

Id. N.º 19, señor O. Parsons, inglés, maquinista;

Id. No. 39, señor P. Soza, chileno, maquinista;

Id. N.º 60, señor F. White, Administrador de la Oficina Salitral <The Julia Nitrate Co. Ld.>, presente en Huara en 1891.

Loc. No. 9. — Statement No. 1, Mr. Juan Bartos, Austrian, Inspector of the road in 1891;

Id. No. 27, Mr. W. Gee, English, driver;

Id. No. 51, Mr. R. Mac Crae, English, driver

Id. No. 14, Mr. C. Monar, Peruvian, head of the Huara Station in 1891;

Id. No. 19, Mr. O. Parsons, English, driver;

Id. No. 39, Mr. P. Soza, Chilean, driver;

Id. No. 60, Mr. F. White, Administrator of the Salitral Office <The Julia Nitrate Co. Ld.>, present in Huara in 1891.

Loc. No. 18. — Declaraciones de los señores Bartos, Gee, Parsons, Sosa y White, citados en el párrafo que

precede.

Loc. No. 18. — Statements by Messrs. Bartos, Gee, Parsons, Sosa and White, cited in the preceding paragraph.

Loc. No. 27. — Declaración N.º 2, señor W. Bramley, inglés, maquinista.

Id. **No. 3**, señor W. Bull, inglés, maquinista;

Loc. No. 27. — Statement No. 2, Mr. W. Bramley, English, driver.

Id. **No. 3**, Mr. W. Bull, English, machinist;

Loc. No. 47. — Declaración N.º 3, señor W. Bull, inglés, maquinista.

Id. **N.º 59**, señor W. G. Watts; inglés, jefe de la Estación de Pozo Almonte en 1891.

Loc. No. 47. — Statement No. 3, Mr. W. Bull, English, driver.

Id. **No. 59**, Mr. W. G. Watts; English, head of the Pozo Almonte Station in 1891.

Loc. No. 48. — Las misma siete declaraciones que se refieren á la locomotora No. 9.

Loc. No. 48. — The same seven statements that refer to locomotive No. 9.

Loc. No. 50. — Declaración N.º 31, señor J. Harper, inglés, maquinista, actualmente al servicio de los Ferrocarriles del Estado;

Id. **N.º 21**, señor J. Rawlings, inglés, maquinista

Loc. No. 50. — Declaration No. 31, Mr. J. Harper, English, engineer, currently in the service of the State Railways;

Id. **No. 21**, Mr. J. Rawlings, English, driver

Loc. No. 51. — Declaraciones No. 3, de Bull, No. 39, da Sosa y No. 59, de Watts, citadas anteriormente.

Loc. No. 51. — Statements No. 3, from Bull, No. 39, from Sosa and No. 59, from Watts, cited above.

VIII. – Me permito además hacer presente que én el cuaderno consular figuran las declaraciones de los siguientes maquinistas:

VII. – I would also like to point out that the consular notebook contains the statements of the following locomotive drivers:

W. N. Bramley No. 2

James Conley No. 9

J. Fox No. 24

W. Gee No. 27

G. Hennings No. 32

G. Lawson No. 47

W. Lefevre No. 48

A. Lumsden No. 50

R. Mac Crae No. 51

J. Mac Pherson No. 54

R. H. Miñano No. 56

Francisco Nuñez No. 16

C. Parsons No. 19

T. Price No. 20

T. Reid No. 65

John Rawlings No. 21

Amos Savage No. 35

S. Silva No. 37
P. Sosa No. 39
James Taylor No. 69
P. Terrazuriz No. 41
H. Watts No. 58
J. L. Wilcockson No. 61
J. Harper No. 31

Todos los cuales concuerdan en los puntos siguientes;

- a) Que las locomotoras al servicio de las fuerzas militares estuvieron constantemente bajo vapor de día y de noche, y
- b) Que sus sueldos fueron como siempre pagados por la Empresa y que todos los artículos de consumo, carbón, aceite, etc., era tomado de los depósitos de la Empresa.

All of whom agree on the following points;

- a) That the locomotives at the service of the military forces were constantly under steam day and night, and*
- b) That their salaries were as always paid by the Company and that all consumables, coal, oil, etc., were taken from the Company's warehouses.*

IX. – Declaran, por fin, en el expediente consular las siguientes personas, en cuanto á las locomotoras:

Declaración No. 7, señor E. Cook, mayordomo en 1891 del taller de Mecánica de la Maestranza de Iquique;

Id. No. 15, señor J. M. Nicholls, Superintendente en la misma época del taller de locomotoras;

Id. N.º 40 J. R. Stephen, jefe del tráfico en la sección de Iquique, en 1891;

Id. N.º 68, señor Tomás Wilson, ingeniero, residente en 1891 de Iquique;

IX. – Finally, the following persons declare in the consular file, regarding the locomotives:

Statement No. 7, Mr. E. Cook, steward in 1891 of the Mechanics workshop of the Maestranza de Iquique;

Id. No. 15, Mr. J. M. Nicholls, Superintendent at the same time of the locomotive shop;

Id. No. 40 J. R. Stephen, traffic chief in the Iquique section, in 1891;

Id. No. 68, Mr. Tomás Wilson, engineer, resident in 1891 in Iquique;

Los señores Cook y Nicholls afirman en general, respecto de todas las locomotoras dañadas, los mismos puntos que comprenden las declaraciones particulares enumeradas en el párrafo VI de este escrito.

El señor Stephen declara:

- a) Que al poco tiempo de estallar las hostilidades quedó suspendido el tráfico ordinario y las locomotoras y el material rodante de la Compañía dedicados exclusivamente á los servicios militares ;
- b) Que las locomotoras, bajo órdenes militares, fueron mantenidas con vapor muchas días y noches, llegando en algunos casos hasta dos y tres semanas sin botar los fuegos ;
- c) Que algunas locomotoras, coches y carros fueron malogrados ó destruidos como consecuencia de su empleo como máquinas de guerra.

El señor Wilson, ingeniero inglés, que se encontraba en Iquique en 1891, afirma que avarias veces tuvo oportunidad de ver los coches y locomotoras al ser éstos regresados del interior después de estar ocupados en movilizar las fuerzas militares, y notó que tanto las máquinas como los coches y algunos carros, estaban en pésimo estado, y era fácil á una persona entendida, como lo es el declarante, ver que las máquinas necesitaban muchas composturas».

Messrs. Cook and Nicholls generally affirm, with respect to all the damaged locomotives, the same points that comprise the particular declarations enumerated in paragraph VI of this writing.

Mr Stephen states:

- a) That shortly after the outbreak of hostilities, ordinary traffic was suspended and the locomotives and rolling stock of the Company exclusively dedicated to military services;*

- b) That the locomotives, under military orders, were maintained with steam for many days and nights, reaching in some cases up to two or three weeks without dropping the fires;
- c) That some locomotives, coaches and wagons were damaged or destroyed as a result of their use as war machines.

Mr. Wilson, an English engineer, who was in Iquique in 1891, affirms that several times he had the opportunity to see the cars and locomotives when they were returned from the interior after being busy transporting the military forces, and he noticed that both the machines and the cars and some wagons were in terrible condition, and it was easy for a knowledgeable person, such as the declarant, to see that the machines needed a lot of repairs».

X. En conformidad á las indicaciones que se ha dignado hacerme la Honorable Comisión, tengo el honor de acompañar (anexos Nos. 7 y 8) dos cuadros que indican en detalle el costo de las reparaciones de las locomotoras Nos. 9 y 40.

X. In accordance with the indications that the Honourable Commission has deigned to make me, I have the honour to attach (attachments Nos. 7 and 8) two tables that indicate in detail the cost of the repairs of locomotives Nos. 9 and 40.

Iquique, 5 de Junio de 1901.

Iquique, June 5, 1901.

J. MAYNE NICHOLLS.

Document 2, in English

being a summary itemised invoice of the damage caused to each locomotive, coach, wagon and other item of equipment and of the services rendered by the operation of trains during the conflict in Tarapacá during January, February and March 1891.

ACCOUNT OF DAMAGES suffered by the Nitrate Railways Company during the months of January, February & March 1891 in consequence of the civil war.

	COST OF REPAIRS					
	Congress Portion			Mr. Balmaceda's portion		
	£	S	D	£	S	D
Statement of locomotives, coaches and cars damaged and destroyed						
Locomotive No. 1. – Buffer plate buffer box and strengthening plate broken, feeding tube broken, frame very much twisted, crown plate of fire-box badly burnt .						
(This happened on the 7th. March 1891 at 3.15pm more or less, after the battle of Pozo Almonte this locomotive being in the hands of and worked by the sailors of the Chilian fleet who formed -part of the Army under the Command of General Canto, collided with Locomotive No. 50 which at that moment was arriving at Pozo Almonte from Montevideo station, and after reversing and backing some distance, was again made to go forward and collide with No. 50						
						461

which was at a standstill.)

Locomotive No. 3. – Buffers broken, plates twisted, spring boxes broken, steps, life guards and handrails broken, crown plate of fire box had to be renewed. 319

(This Locomotive having been taken in Zapiga by the Congress party in February 1891 in which station it had been stationed for some time, was taken to Pisagua and used for some time for transport of Troops and amunition; it was constantly kept under steam and worked day and night, and when eventually sent to Iquique was found to be in very bad condition ; the copper plates of the fire-box were burnt and completely destroyed through bad management.)

Locomotive No. 6. – Buffer plates knocked in, buffers and buffer boxes broken, lifeguards bent, cab very much damaged, crown plate and tubes of fire box. in very bad condition and had to be renewed. 142 10 142 10

(This Locomotive was in the hands of Mr. Balmaceda's forces from the beginning of the revolution until February 26th. 1891 when it was taken by the Congress party, and was not returned to the shops until after the battle of Pozo Almonte. On being examined it was found that owing to bad management which the engine had undergone at the hands of both parties, the fire box was completely destroyed, and there were many other serious damages. The cost of repairs is divided between the two parties.)

Locomotive No. 7. – Buffer plate damaged, buffers at both ends, life-guards, sand pipes and cylinder cocks broken, foot plate of Locomotive and feed pipe of pump twisted, crown plates of fire-box burnt. 287

(This Locomotive was stationed at Pozo Almonte station during the months of January, February, and early part of March, and was used for the transport of War stores, troops and water to various parts of the line by Mr. Balmaceda's forces, was seriously damaged owing to bad management, and owing to the incompetency of the Drivers employed by the forces.)

Locomotive No. 8. – Connecting rods bent, brasses broken, axle box brasses melted, crown plate of fire box cracked in two places owing to excessive heat. 295

(This Locomotive was stationed in Pozo Almonte during the months of January, February, and early part of March, and was use was worked without the necessary quantity of water and oil, the result being, the fire box top was completely destroyed and the connecting rods, brasses etc, burnt and broken.)

Carried forward 922 10 724 10

Brought forward 922 10 724 10

Locomotive No. 9 – The front of bogie «A» very much damaged, the frame twisted, braces longitudinals and spring boxes broken, right hand cylinder broken, motion plates and motion bars twisted, the two tank wells broken by the leading wheels, one of the axles of leading wheel broken, the eccentric rods and motion gear much injured, &c. (On February 17th 1891 during the battle of Huara, the driver of this Locomotive received orders from Colonel Soto to start it off at full speed and abandon it to its fate. Locomotive No. 48 had been started off in the same way a little before, with the object of colliding with a convoy which was approaching from the opposite direction, and in this manner block all communication. This collision took place, and shortly afterwards No. 9 collided with No. 48 with such force that both engines were very much damaged.)

Locomotive No. 12 – Buffer and buffer box plates broken, foot plate twisted, crown plate and tube plate of one fire box cracked, and tube plate of the other fire box required patching &c . 393

(This Locomotive was used by the Congress party during the months of January & February carrying troops and munition, and having been armed with two Gattling Guns was used as a «War Engine»: it was constantly kept under steam in order to facilitate the retreat of the troops to Pisagua at any given moment, and eventually in the battle of Dolores or San Francisco, owing to the confusion, it was left short of water, consequently the fire-box was destroyed, and this and other serious damage left it unserviceable.)

Locomotive No. 13 – The tank wells, chimney and brass dome cover riddled by bullets, the Whistle destroyed, &c. and all the motion gear in bad condition. 287

(This Locomotive was stationed in Pisagua and the Congress party took charge of it to transport their troops to fight Balmaceda's Forces, and on one occasion the driver being unable to manage it, one of the Congress party tried to run it, but failed, and had to return to Pisagua with the Locomotive very badly damaged. This took place in February 1891.)

Locomotive No. 14 – Motion plate badly twisted, motion gear cross-head and cylinder cover broken, crown plate and tube plate of Fire-box cracked. 468

(This Locomotive was taken by the Congress party in Pisagua on February 6th 1891 and from that date was kept constantly under steam for some weeks. The damage done owing to this, was such that when it was delivered over in March it was found so badly damaged that was useless for service.)

Locomotive No. 18 – Buffer plate and Buffer boxes considerably damaged, bogie frames twisted, tank and cab damaged. 394

(On February 17th 1891 during the battle of Huara this Locomotive was approaching with her , convoy, conveying troops and artillery for

Colonel Canto, and was pushing before her an empty car. Colonel Soto ordered Driver Wiggs to start Locomotive No. **48** at full speed against the former ; the collision which took place about one and a half miles from Huara, completely destroyed the car which No. **18** had before her, and caused the said No. **18** considerable damage.)

Locomotive No. 27 – Buffer plate, smoke box and Frame of Engine knocked in, left-hand cylinder broken, fire box plates considerably damaged.

(This locomotive was stationed on the line in Molle sta-

Carried forward	2464	10	2096	10
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Brought forward	2464	10	2096	10
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tion on the morning of February. 20th having no signal lights visible, Colonel Soto having given orders to that effect, was run into by Locomotive No. **51**, had also received orders to show no lights. Locomotive No. **27** was damaged to such an extent as to remain unserviceable. The Drivers of both Locomotives had strict orders to put out their lights and not blow their whistles.)

Locomotive No. 28 – Buffer plates and Buffer boxes broken Engine frame bent, suction and delivery pipes &c. broken and the tanks considerably damaged. (This Locomotive. after being used by Mr. Balmaceda's forces, from the beginning of January to 13th February 1891, was captured on that date by the Congress party at the battle of San Francisco and was then used by them. It was left in the Interior until the battle of Pozo Almonte, and when it returned to Iquique was found to be completely useless, The two contending parties are consequently equally responsible for the damage, and half the cost of repairs is charged to each.)

Locomotive No. 30 – Axle box brasses melted and motion gear in very had condition, buffer plates, and buffer boxes missing.

(This Locomotive was in the service of Mr. Balmaceda's forces front the beginning of January until the last days of February, at which time a reconnoitring party of the Congress forces captured and sent it to Iquique, when it was found to be completely useless.)

Locomotive No. 34 – Smoke box exhaust pipe, Lamp and bracket broken, hand rail bent and lubricators broken.

(This Locomotive was standing in Iquique station during the bombardment of February 19th, and was damaged by shot and shell from the Fleet.)

Locomotive No. 35 – The Dome and Dome Cover riddled by shot, Injector broken, feed pipes and exhaust steam pipes perforated and

other minor damages.

(This Locomotive was damaged though the same cause as the former one.

Locomotive No. 38 – Engine tanks damaged, buffer plates knocked in 366
buffer boxes broken, life guards and sand pipes missing.

(This Locomotive, with two coaches, Nos. 16 and 24 and five (5) cars left Huara at about midnight on February 11th for Negreiros. The convoy was occupied by Colonel Robles, officers, troops and horses. At 1.45 A. M. on arriving at the branch at oficina «Tres Marias», the Locomotive left the track. The Driver on alighting found that the switch had been partly opened by means of iron bolts,. which caused the derailment. After a delay of sixteen hours the Locomotive was again got on the rails and taken to Huara. by Locomotive No. 30, when it was found to be very badly damaged and unserviceable.)

Locomotive No. 39 – Buffer plate knocked in, bogie badly twisted, 394
buffer spring boxes broken, and Engine frame bent.

(This Locomotive was taken from Zapiga to Pisagua by the Congress party in January 1891, suffered considerable damages whilst it was in their service at the battle near Oficina «Compañía» and also suffered considerably through bad management during the time it was in possession of the forces.)

Locomotive No. 40 – Axle-box-brasses melted, engine gear in very bad 120 10 120 10
condition, fire-box plates collapsed indicating too much heat.
(This Locomotive was used alternately by the Forces of

Carried forward 3460 3050

Brought forward 3460 3050

Mr. Balmaceda and those of the Congress party from the beginning of January until March 7th, and having been in constant use day and night suffered serious damage through bad management and too much work, at the same time it was considerably damaged owing to having been used as an armed battery for the Artillery. The cost of the damages is charged equally between the two parties.)

Locomotive No. 42 – Both cylinder covers broken, buffer plate bent, 288
cylinder cocks, life guards, sand pipes, etc. broken, axle-box brasses melted and crown plate of Fire-box burnt.

(This Locomotive was used by Mr. Balmaceda's forces during the months of January, February and March carrying troops, and was worked day and night, and on various occasions while being pursued by the opposite party, the Officer in command obliged the Driver to keep running although short of Water and oil. When the Locomotive returned to the shops, it was found that the axle box brasses were melted, the

boiler plates damaged, and the Valves destroyed, besides other damage.)

Locomotive No. 47 – Buffer and spring boxes broken, brake gear damaged, cylinder cocks missing, fire box crown plate burnt, indicating too much heat.

227

(On February 10th 1891 this Locomotive was on its way from Huara to Pozo Almonte following another convoy, which was a short distance ahead and in which were Colonel Soto and his officers. When nearing Pozo Almonte station some soldiers tired on the first train, consequently it was ordered to stop, and Núm. 47 advancing collided with it and suffered serious damages in consequence.

Eventually it was found that those who attacked were of Mr. Balmacedas party and that they had mistaken the soldiers in the train for the enemy.)

Locomotive No. 48 – Buffer box knocked in, frame and foot plate of the Locomotive twisted, side rods, sand boxes, brake gear and tubes damaged, tank and chimney riddled by shot, hand rail broken, cab and bogie damaged

689

(On February 17th 1891 during the battle of Huara, the Engine Driver of this Locomotive was ordered by Colonel Soto to start it off at full speed towards the north and abandon it. This was done, and after the Locomotive had run a distance of one and a half miles more or less, it collided violently with a train which was approaching Huara carrying troops and artillery for Colonel Canto. The damage was augmented in consequence of another collision occasioned by Locomotive No. 9 which was sent off from Huara by orders of Colonel Soto, with the object of colliding with the two engines that had already been in collision. Both Engines were left unserviceable.)

Locomotive No. 50 – Buffer plate bent, and all engine gear in bad condition.

156

(This Locomotive was in charge of Driver Harper and was sent by Colonel Canto on March 7th 1891 from Monte Video towards Pozo Almonte, and on entering the station was run into by Engine No. 1 which was managed by Marines of the Chilian fleet. Both Locomotives were reversed for some distance, but No. 1 again advanced and collided violently with No. 50. Both suffered considerable damage from the collision.)

Locomotive No. 51 – Buffer plate knocked in, side tanks riddled by shot, and tank shifted and twisted, and the engine gear in very bad condition.

297

(On February 16th 1891 this Locomotive was proceeding from Huara towards Pozo Almonte carrying Colonel Soto and other officers in Coach No. 7, on nearing Pozo Almonte

Carried forward	3616	4551
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Brought forward.	3616	4551
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some soldiers fired on the train and it stopped ; Locomotive No. **47** which was coming a short distance behind, ran into said train destroying Coach No. 7 and damaging Locomotive No. **51**. On another occasion on February 20th 1891 about 2.15 A. M., Locomotive No. **51**, was sent from Huara station, to the interior and arriving at Santa Rosa received orders to return to Molle, when she collided with No. **27**, which was at a standstill on the line at Molle. Neither Locomotive carried lights, the Drivers having received instructions from Colonel Soto not to show lights or blow their whistles.)

Locomotive No. 53 – Lagging of fire box, lefthand side platform, smoke box and hand rails broken, Engine frame bent, and other minor damages.	485
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(This locomotive was stationed in Iquique during the bombardment of 19th February 1891 and was several times struck and damaged by shot and shell from the fleet).

Locomotive No. 58 – Gear and eccentrics broken, motion lifting links broken, one eccentric rod broken, buffer and front of buffer box broken, motion plate twisted, cylinder cocks, life guards, sand tubes and brake gear broken, right hand connecting rod broken and cab riddled by rifle shot.	286
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(This Locomotive was carrying troops on the night of 5th February 1891 from Pisagua and was derailed at Rosario de Huara in consequence of the line having been intentionally pulled up. The Locomotive suffered serious damage)

Second class Coach No. 1 – Windows and steps broken doors and locks damaged.	17
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(This coach was carrying Mr. Balmacedas. troops which were defeated at the battle of Dolores on February 15th 1891, and the damages it suffered were occasioned by the shots from the Congress party)

Second class Coach No. 2 – The two buffers broken.	12
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(This happened as in the previous. case.)

Second class Coach No. 3 – Three steps broken and seats destroyed.	9
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(This happened as in the previous case)

Second class Coach No. 4 – Six windows broken and blinds destroyed.	14
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(The damages were done by the congress party after the battle of Pozo Almonte On March 7th 1891)

Baggage Van No. 5 – The two buffers broken. (This happened as in the former case)	28	
First class Coach No. 8 – Windows and seats very much damaged. (This happened as in the former case.)	15	
First class Coach No. 10 – Windows and seats much damaged. (This coach was damaged whilst in the hands of the congress party at the battle of La Compañia on January 21st 1891)	18	
First class Coach No. 16 – Windows, blinds and seats much damaged, steps, and one axle broken. (This coach was carrying troops for Mr. Balmaceda in their retreat after the battle of Dolores on the 15th February 1891 and the damages were caused by the congress party)	98	
Baggage Van No. 17 – Sides riddled by shot, two buffers broken and the flooring much damaged., (This was caused as in the former case)	154	
First class coach No. 26 – Sides and ends riddled by shot, inside being damaged, window frames and blinds destroyed by balls, Carried forward	4466	4837
Brought forward	4466	4837
the doors torn from their hinges, four steps broken, some seats lost and others damaged. (This coach conducted Mr. Balmacedas troops when retiring, after the battle of Dolores on february 15th 1891, and being the last convoy was exposed to the fire of the quick-firing guns of the Congress party which were mounted on Locomotive No. 13 that followed it up for some distance.)	340	
Baggage Van No. 28 – The Windows, frames, buffers and steps broken, and Postoffice department in bad condition. (This Van served the congress party from march 1891 to transport troops from Iquique; it was afterwards used as a kitchen and Store-Room in Central station and eventually sent to Iquique in a very dilapidated condition)	76	
Coach No. 7 – First class. Window frames, sides, ends and roof, totally destroyed, the only part saved being 2 pairs of Wheels and Axles. (On February 16th Locomotive N.º 51 took this coach containing Coronel Soto and other officers from Huara to Pozo Almonte station, some soldiers opened fire on the convoy in consequence		650

of which it came to a standstill; in the confusion which followed, Locomotive N.º 47 coming along a little behind ran into the coach destroying it completely)

Coach No. 24 – Second class. Windows and blinds broken, door locks, sides of coach and seats damaged. 78

(This coach was damaged by soldiers of the congress party, on March 7th 1891 after the battle of Pozo Almonte, previously also the coach had suffered damage when occupied in carrying troops to the battle of Dolores)

Twenty four. Lancaster Wagon Cos Cars. 7 tons weight each, with double bogie constructed to carry 15 tons: cost 163 £ each: totally burnt during the bombardment of Pisagua. 3912

(These cars were totally destroyed on February 6th 1891 having caught fire during the bombardment of Pisagua by the congress party)

Five. Lancaster Wagon Cos Cars, 7 tons weight each, with double bogie constructed to carry 15 tons, cost 163 £ each, totally destroyed at the battle of Huara 815

(On February 15th 1891 during the battle of Huara, when these cars were being hauled by locomotive No. 10 taking troops and artillery of the congress party towards Huara, the convoy was run into by locomotive No. 48, and shortly after by locomotive No. 9: these latter engines having been despatched by order of colonel Soto to interrupt the traffic and prevent the arrival of the congress troops. The cars were completely destroyed by the violence of the collision)

Six. Lancaster Wagon Cos Cars: 7 tons weight each, with double bogie constructed to carry 15 tons, cost 163 £ each, totally destroyed at the battle of San Francisco. 978

(These cars were totally destroyed at the battle of San Francisco, on February, 15th 1891 owing to collisions and derailments that occurred during the battle)

Four. Lancaster Wagon Cos Cars: 7 tons weight each, with double bogie, constructed to carry 15 tons, cost £ 163 each, totally destroyed at the battle of Pozo Almonte. 652

(These cars were totally destroyed at the battle of Pozo Almonte on March 7th 1891 having been run into twice by Locomotive No. 1 when entering Pozo Almonte station: Locomotive No. 1 was in charge of several marines of the congress party.

Carried forward 10502 6302

Brought forward 10502 6302

Three. Lancaster Wagon Cos Cars, 7 tons weight, with double 489

bogies, constructed to carry 15 tons, cost £ 163 each, totally destroyed during the retreat of Col: Robles to Pozo Almonte.

(These Cars were totally destroyed through being thrown off the line when carrying Col Robles fugitive Troops, after the battle of Pozo Almonte, March 7th 1891.)

Seven. Lancaster Wagon Cos Cars, of 7 tons weight, with double bogies, constructed to carry 15 tons, cost £ 163—each badly damaged in Zapiga, cost of repairing each Car. £ 42. 294

(These Cars were in the possession of Col Canto, and when his troops were obliged to retreat, the confusion was so great, that they allowed the train to escape down the hill, where some other cars were standing, causing a collision and doing serious damage to these seven cars.)

Five, Lancaster Wagon Cos Cars: with double bogies, constructed to carry 15 tons, cost £ 163. each, badly damaged whilst carrying Col: Robles troops from Iquique. cost to repair each car £ 51. 255

These cars were very badly damaged whilst conducting Col. Robles on an expedition from Iquique to the interior. Owing to the disorganization which existed among the officials under military orders that ran the train, there were several collisions and cars off the track which caused much damage to these 5 cars. The remains of these cars that were afterwards brought to Iquique consisted only of the Wheels and Axles and parts of the Wagons.)

One, American Car, 7 tons, with double bogie, constructed to carry animals, badly damaged in Jazpampa, cost to repair. 51

(This car conducted Troops of Col. Canto on his retiring to Pisagua from Jazpampa, when some soldiers fell from the car causing it to leave the line, thus causing the aforesaid damage.)

A list of the damage caused to railway company buildings and static facilities in Pisagua and Iquique by bombardment with shot and shell from the fleet has been omitted here. Ditto the costs of repairs to track and telegraph lines.

Eventual totals after the addition of many more sums for damages caused and services provided.

32457 4 1 16318 15 4

Grand total £48775 19 5

2.5.6 The full loco list of the *FC de Copiapó* from 1881

CUADRO DESCRIPTIVO DE LOCOMOTIVAS
DESCRIPTION OF LOCOMOTIVES

¹ Encontrada en los Talleres de Caldera bajo el número 6.
² Entraron en la compra del *Ferro-carril de Chafinillo*.

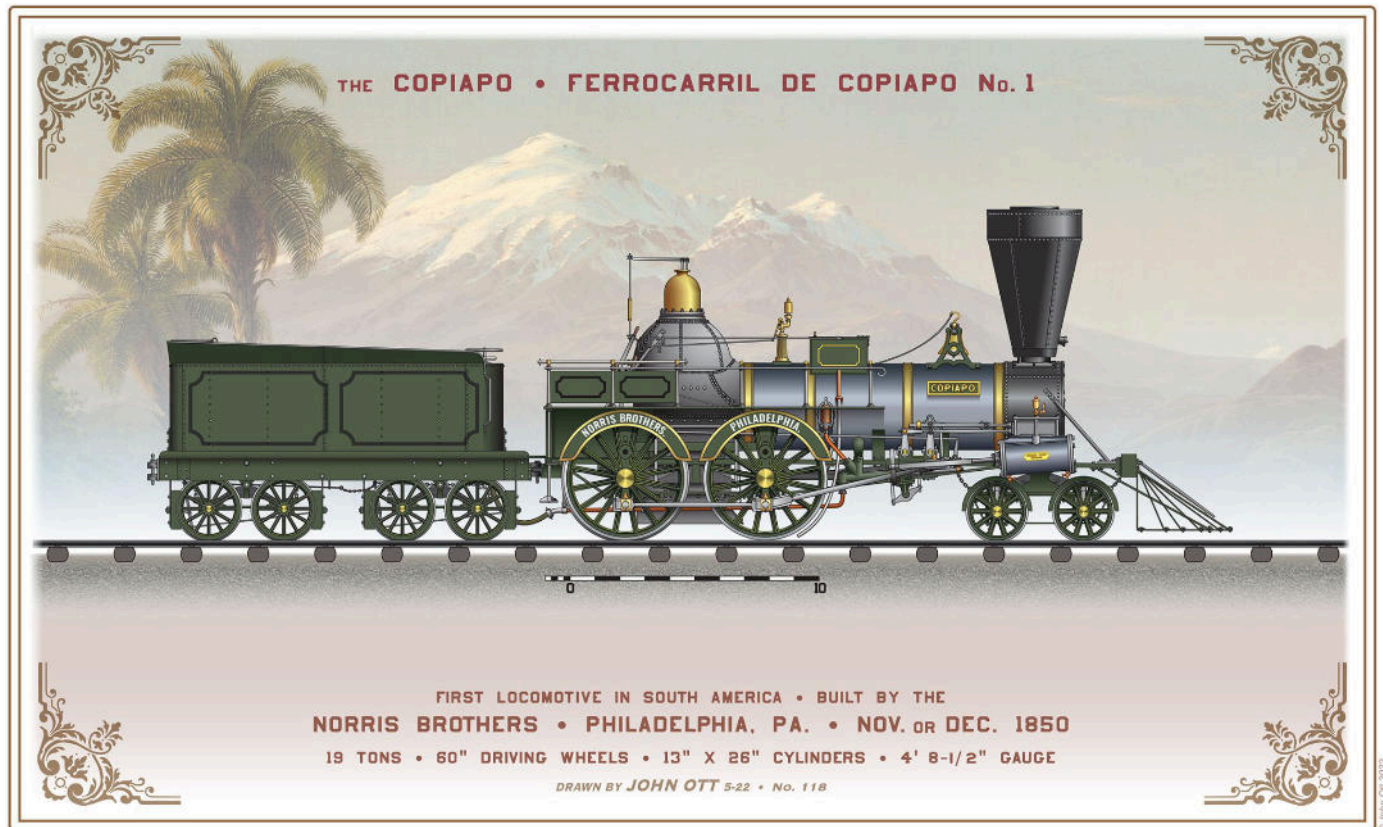
2.5.7 The *FC de Copiapó*'s surviving Norris 4-4-0

by John Ott

Background

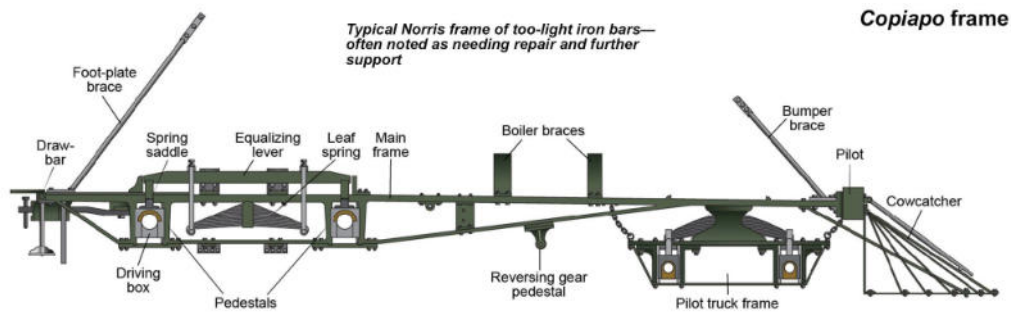
John Ott is an American railroad historian, one of whose particular skills is in the creation of superb shaded and coloured drawings of 19th century locomotives. Many of these can be found in the archive of the Facebook group 'Pre1895 Railroads & Steam Engines' at <https://www.facebook.com/groups/1886828738255343>

John has not only created one of these drawings to illustrate the *FC de Copiapó*'s first Norris 4-4-0 – appropriately named '**COPIAPÓ**' – but has explained the thinking behind many of the engine's distinctive features. I am very grateful that he has given permission for his drawings and text to be reproduced here.



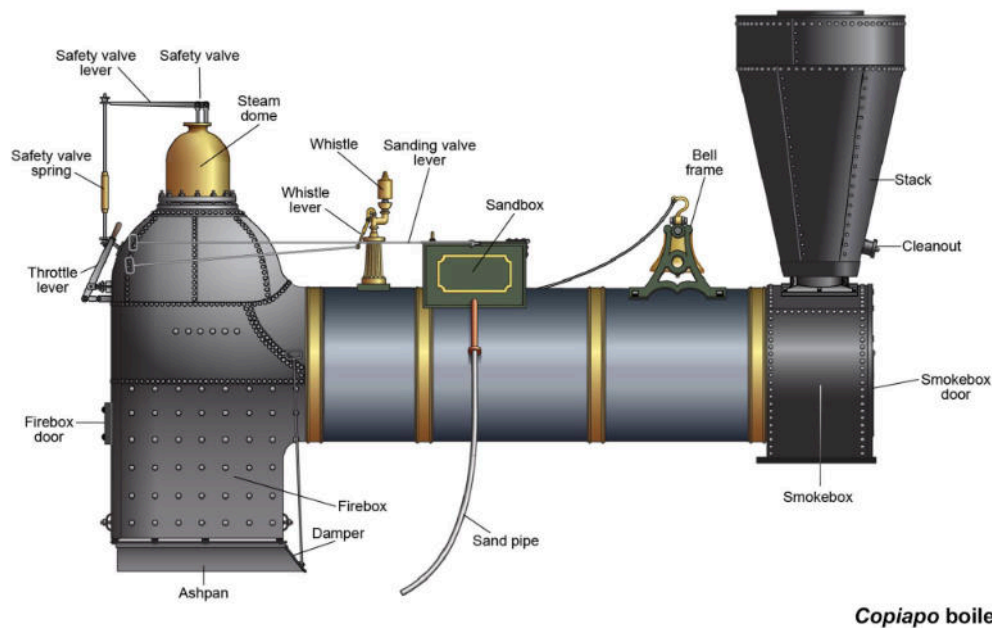
Here is a new drawing of one of the oldest 4-4-0s still in existence, as it would have looked like when new. This one is also a historically important machine in that it's the first locomotive to run in South America, the oldest surviving Philadelphia Norris-built engine (the only other one is the "Gov. Stanford" at the CSRM), and the only locomotive from the 1850s in more or less original un-rebuilt condition. I thought it might be fun to show off the drawing and dissect the layers of components to see what features a typical 4-4-0 of 1850 had.

The "Copiapo" was built for Chile's Ferrocarril de Copiapó (Copiapó Railway) in November or December 1850. The railway, the first in South America, was built to connect the rich silver-mining town of Copiapó with the port of Caldera in northern Chile. The 50-mile line was promoted by a Yankee entrepreneur named William Wheelwright and laid out and engineered by contractors hired from the United States. They brought with them all the tools, rails, spikes, and equipment necessary to build a railroad, including a new locomotive bought from the Norris Brothers of Philadelphia, who were at that time operating the largest locomotive factory in the Americas. "Copiapo" was the first of eight engines the line would buy from Norris. After a long sea voyage around Cape Horn, "Copiapo" arrived at the port of Caldera in July, 1851.



“Capiapo” was a typical Norris machine—and a typical American 4-4-0 for the 1850s. Norris built several hundred similar engines for railroads across the eastern United States. It has a “haystack” or “kettle-dome” firebox, a design taken from Edward Bury of England, that had plenty of space above the boiler’s water level to collect “dry” steam (“dry” meaning without water droplets) for the cylinders. Atop the iron dome is a smaller brass dome to house the throttle and the single safety valve. Bury boilers were difficult to manufacture because the boilermakers were trying to join horizontal and vertical barrels into one steam-tight riveted unit, but Norris, Baldwin, Rogers, and other builders all favored Bury boilers until wagon-top boilers, easier to construct, supplanted them in the early 1850s.

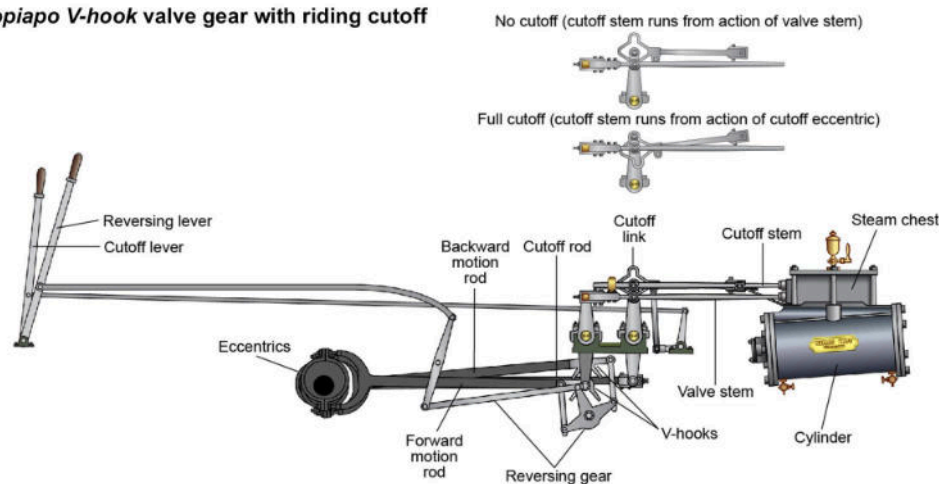
“Capiapo’s” cylinders are mounted to the D-shaped smokebox at a slant. This placement was universal at the time “Capiapo” was built, but the idea was discarded later in the 1850s in favor of horizontal cylinders mounted directly to the frame, a much stronger arrangement. The D-shaped smokebox would be replaced in later engines by one that was a simple extension of the boiler barrel, resting on a cylinder saddle with cast internal piping to take steam to and from the valve chest and cylinders.



The engine has V-hook valve gear, which was the most common type before the popularity of Stephenson’s link motion valve gear. Rogers Locomotive Works was just in the process of introducing Stephenson links in their own engines when the “Capiapo” was built. The “Capiapo” has a riding cutoff of a type developed (or swiped) by Septimus Norris (the only Norris Brother with any mechanical interest) around 1845. The riding cutoff is an additional valve in the upper steam chest that controls the amount of steam flowing to the main valve. It is controlled by a shifting link operated from the cab. When in position with no cutoff, the upper valve runs off the main valve stem in perfect time with the engine stroke and the main valve receives its full amount of steam. When lowered, the shifting link engages a rocker run from a driver axle eccentric (the engine has six—normal engines without cutoffs had four) that slightly changes the timing of the cutoff valve, cutting off the flow of steam before the engine stroke was complete. This conserves steam (and fuel) when the engine is in full motion and can take advantage of momentum to keep the train mov-

ing. No cutoff is used when the train is just starting and the engine needs full power to get up to speed. Every engine manufacturer had their own version of a riding cutoff in the early 1850s. Stephenson links had the overwhelming advantage that they could control the amount of steam flowing to the main valves simply by adjusting the position of the engine's reverse lever. The additional maintenance-intensive eccentrics, links, stems, and valves were no longer necessary and riding cutoffs soon went extinct.

Copiapo V-hook valve gear with riding cutoff



“Copiapo’s” drivers have an interesting Norris feature—doubled crank-pin bosses 180° from each other. The idea was that if the first crank-pin hole wore loose, the driver could be rotated and the pin driven into the spare hole. This seemed to have been a feature only used regularly by Norris. It makes you wonder how often Norris crank-pins came loose. The main and side rods are round in cross-section. Flat rods, which had the same strength but weighed less, didn't become popular until later. The crosshead runs between two bars—not four, as in most other 19th-century locomotives.

The present-day relic of the “Copiapo” has an iron cab, but it surely didn’t come that way. From studying their advertisements and drawings, we can conclude that the Norris Brothers delivered their engines without cabs, the responsibility for installing such “houses” (as they were called in 1850) being wholly that of the purchasing railroad. This was standard practice for all engine-builders in the early 1850s. Likewise, there were no factory-installed headlights. However, Norris was progressive in providing “Copiapo” with a square sandbox and iron-bar cowcatcher. The cannon-mounted whistle and the bell in its Norris A-shaped bell frame were also factory features. The original stack was tall with a top cover over much of the netting, with a cleanout at the bottom of the funnel. The stack got replaced with a shorter dummy balloon stack at some time in the past, possibly for an indoor display where clearance was an issue. A wooden cab and headlight bracket were installed some time after the engine reached Chile.

Compared to later engines, “Copiapo” didn’t have much brass or decoration. The wheel covers were edged in brass. The wheel hubs and boiler bands were also brass. The boiler was jacketed in Russia Iron. The engine would have been painted green, since, as turn-of-the-century railroad journalist C.H. Caruthers noted, “few [Norris] engines appeared in any other hue.” No red wheels, no bright-colored striping or scrollwork. Those weren’t popular until later in the decade.

“Copiapo” had a short working life, which is the biggest reason why it has lasted in something very close to its original condition. Northern Chile is mostly the waterless Atacama Desert—not a friendly environment for wood-fired steam locomotives. The railroad had to build a distillation plant to rid the water of alkali and salt before filling tenders. Finding wood proved to be an intractable problem, and the Norris locomotives were sidelined around 1858 in favor of newer coal-burning engines acquired from England and from the Rogers Works in Paterson, NJ. In that year, the “Copiapo” was brought to Santiago, the nation’s capital, to be part of an International Exhibition. Later, it was displayed at the National Museum, gradually falling into disrepair. In 1901 it traveled to Buffalo, NY, to take part in the Pan-American Exhibition, where it posed for some of its earliest known photographs. It was last repaired and steamed up in 1929, to pull a train of dignitaries at Santiago’s South American Railway Congress. The iron cab and European-

style buffers probably date from that time. The engine was exhibited at the State Technical University, and then returned to the city of Copiapo in 1945 to be displayed at the State School of Mines. It lost its eight-wheel tender somewhere along the way. The school is now the University of Atacama and the locomotive is still there on outdoor display. It was declared a national monument in 1952.

In spite of the travel distance involved, the “Copiapo” is kind of a holy grail to people who study old American steam locomotives. Its preservation in close to original condition is next to miraculous. I’ve taken the meticulous drawings John White used in his book “American Locomotives: an Engineering History, 1830–1880” to make my rendering. For a change, there was very little “reconstruction” to do. All any draftsman has to do is just copy what’s still there with minor changes. “Copiapo” might be the best-preserved early American locomotive in existence.
