

## The Transandine Railway: a Hundred Year Long Financial Disaster that still Attracts Investors

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**The geographical context.** The Ferrocarril Transandino (Transandine Railway) was not the highest railway to be constructed across the Andes, even though it lies between the highest mountain in the entire Andes/Rockies chain, i.e. Mount Aconcagua, which soars to 6 960 meters above sea level, and Mount Tupungato, which at 6 550 meters is not too far behind. The railway crosses the international divide at almost half the altitude of Tupungato. On both sides of the border it climbs through the valleys of rivers fed by melting snow. On the Chilean side those concerned are the Juncal and the one known as Aconcagua itself. (Chile hosts the river, Argentina the mountain.) In Argentina, the railway's path threads through the valleys of the Las Cuevas and Mendoza rivers, a tributary of which rose to engulf stretches of the railway in the 1930s. Nature has never been a friend of the Transandino. In the worst years, the railway was out of action for half of the time. See table 1.

The Chilean section is 71 kms long, and starts from a town formally known as Santa Rosa de Los Andes, but normally called just "Los Andes". Los Andes lies at 835 meters above sea level, and from there the line climbs gently along the south bank of the Aconcagua river, switching to the north bank at the village known as Río Blanco, 34 kms further on. Río Blanco is the railhead of the only segment of the Transandino currently operating. Just beyond Río Blanco the first rack section commences. From Km 50, the line gains height by winding around the Juncal valley, first on the south side and then crossing to the north. The frontier is crossed in the middle of a tunnel located at 3 200 meters above sea level. Once out of the tunnel, trains descended by the Las Cuevas valley to the village of the same name, which, for operational purposes, was the point at which locomotives were switched, a Chilean Transandine one being detached, from eastbound trains, and one from its Argentinian counterpart being hooked on. The Argentinian section is 179 kms long and since the altitude of its terminus in Mendoza is only 135 meters lower than that of Los Andes, is less steeply inclined and less difficult to operate than the Chilean section, even though both include rack sections, graded at up to almost 8% in Chile and to slightly more than 6% in Argentina. The steepest grades on any railway in Chile worked by locomotives were found on the Transandine. See figure 1.

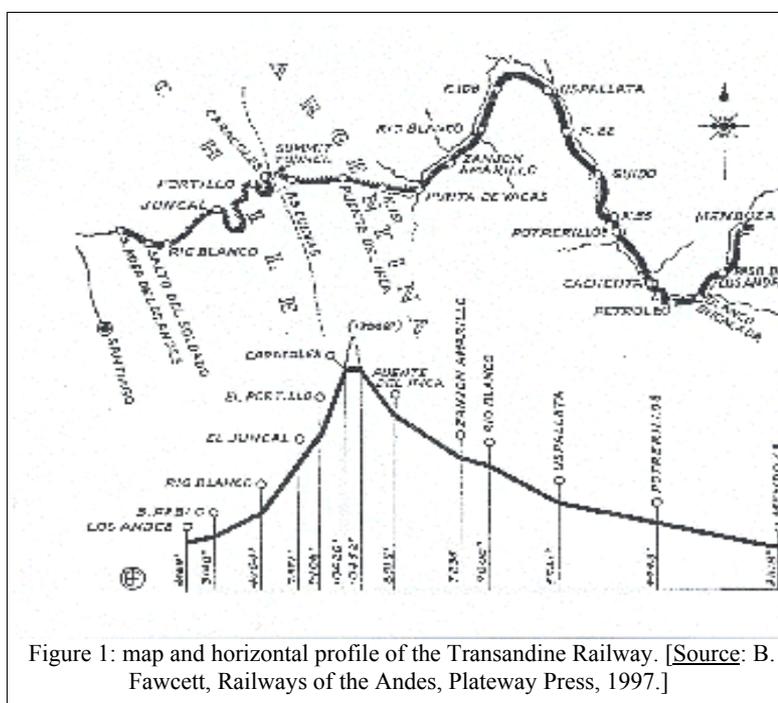


Figure 1: map and horizontal profile of the Transandine Railway. [Source: B. Fawcett, Railways of the Andes, Plateway Press, 1997.]

At Las Cuevas the snow is usually half a meter deep in August and September. On the Chilean side, and as far as Punta del Inca, 18 kms from the border on the Argentinian side, the precipitation occurs mainly in the winter, in the form of snow at the higher altitudes, whereas towards the city of Mendoza, situated at 700 meters above sea level, it falls mainly in summer. The average winter temperature at Punta del Inca, some 2 720 meters up, is precisely zero degrees.

**Precursors of transandine railways.** The idea of building a transandine railway occurred first of all to William Wheelwright, a U.S. citizen who spent most of his life bringing technological progress to South America. Wheelwright envisaged extending his Caldera-Copiapó railway, opened for traffic at the beginning of 1852, through to Argentina via the San Francisco Pass, but he never succeeded in financing the international link. In subsequent years, Wheelwright's ideas evolved with the times and in September 1872 he offered to sponsor a railway through the Aconcagua valley., but never got the chance to do so. His fellow U.S. citizen Henry Meiggs, who provided the entrepreneurial impetus behind a series of railway construction projects, also mulled over the idea of a railway between Santiago and Buenos Aires. However before he could draw up any firm plans, Meiggs left Chile for Perú, where he died during the construction of the magnificent Central Railway, which climbed the western slope of the Andes without ever coming down the other side. Were Meiggs to have built the Transandino, it might have climbed via zig-zags rather than by the rack and pinion option which was in fact installed.

**TABLE 1: PROFITS, LOSSES AND NUMBER OF DAYS OF TRAFFIC INTERRUPTION DUE TO CLIMATIC FACTORS IN THE FIRST DECADE OF OPERATIONS OF THE CHILEAN TRANSANDINE RAILWAY**

Year	Days during which the Railway was closed for climatic reasons	Profits in Chilean pesos (at the 18 pence exchange rate)	Losses in Chilean pesos (at the 18 pence exchange rate)	Rate of return on capital
1910	17	193 030		n/a
1911	18	12 706		n/a
1912	143		192 470	- 1.8%
1913	2	137 575		+ 0.8%
1914	190		324 192	- 1.6%
1915	131		107 337	- 0.5%
1916	4	60 865		+ 0.3%
1917	7	170 752		+ 0.7%
1918	25	503 105		+ 2.3%
1919	160		94 198	- 0.4%

Source: *Ferrocarril Transandino de Chile*, by an unknown author, printed by Casa Mackenzie, Santiago, 1920.

**Dreams of an interoceanic link.** The real origins of the Transandino as built cannot be traced back to Wheelwright or Meiggs, but rather to two brothers John and Matthew Clark, Chilean citizens born in Valparaíso but, appropriately enough, with an Argentinian mother and British father. The Clark brothers were responsible for laying the first telegraphic cable connexion between Argentina and central Chile, in 1870 and 1871, during the course of which they spent a lot of time wandering around Andean passes. Three years later they published a report which showed the advantages of a Transandine Railway via Aconcagua, as opposed to the northerly route initially proposed by Wheelwright. In it they claimed that imports to the Mendoza region from Europe would

be railed from Valparaíso, rather than through Buenos Aires, and even mention a speech delivered by the British Admiral Robert Fitz-Roy to the Royal Geographical Society, in which he states that a transcontinental railway would form part of the shortest route between Europe and Australia,<sup>1</sup> seemingly having people believe that the shortest path equated to the least costly one. In 1910, the Chilean Undersecretary of Public Works suggested that passengers, but not freight, moving between Australia and Europe would use the Transandine Railway.<sup>2</sup>

**The lengthy process of financing and building the Railway.** The Clarks concluded that the only stretch where it would not be possible to insert a relatively conventional railway would be between Juncal and Las Cuevas, separated by a straight line distance of just 12 km.<sup>3</sup> They had dreamt of a lengthy tunnel between these points but there was no way to finance its construction (and, in steam days, no way to operate it either). The Clarks' original dream of a railway expensive to build, but easy to operate, had to be sacrificed for one cheaper to build, and hence able to be financed, but which was going to prove an operational nightmare.

By the mid 1870s, the Clarks had obtained concessions to build a transandine railway granted by the national congresses on both sides of the border.<sup>4</sup> But the bankers were not sure of the line's commercial viability, which made raising finance to build it extremely difficult. Money was being generated in the industrialized world to build railways in developing countries, but investors preferred to put it into schemes where traffic was more assured, trains would not have to climb 2 500 meters within 70 kms of the starting point and then descend by a like vertical distance to get to the other end of the line, there not two governments involved which sometimes showed belligerent tendencies towards each other, and especially, attractive guarantees were offered on the required investment. Investment guarantees were critical to raising finance. In 1872 the Clarks asked the Chilean Congress for a guarantee of 7% on an investment of £ 1 100 000, getting, two years later, the requested rate, but on a very much lesser sum of £ 600 000, which proved not enough to entice the bankers. The terms of the guarantee were revised on various occasions, as detailed in table 2, and those which finally succeeded, some thirty years later, in having the Chilean section completed assured a rate of 5% on a sum of £ 1 500 000, but by that time a part of the line had already been built, partially with the Clarks' own money.

The newly formed, Clark controlled but London based, Buenos Ayres and Valparaíso Transandine Railway Co. Ltd. began construction on 1st January 1887 on the Argentinian side, where the guarantee offered was also of 7%, but on the per kilometer cost of each section opened for traffic, seemingly without any limit being set to this cost.<sup>5</sup> Construction did not start until 5th April 1889 in Chile. Progress was slow east of the mountains and even slower to the west of them. On average less than 7 kms of track per year were lain between the date of the concessions being granted and the day the first international train ran. By 1903 tracks had been lain over the 173 kms between Mendoza and Las Cuevas on the Argentinian side, whereas in Chile construction was only just getting under way to the east of Salto del Soldado, a rocky barrier where the Aconcagua valley narrows to virtually nothing, located just 28 kms from Los Andes, and which for more than ten years was the Chilean railhead. Mules served as a sort of legged land bridge between the respective railheads, which were very slowing closing in on one another. This was a highly unsatisfactory and extremely costly arrangement which

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<sup>1</sup> Clark and Co., *Ferro-carril Trasandino por Aconcagua*, Imprenta del Mercurio, Valparaíso, 1874.

<sup>2</sup> Daniel Riquelme, *El Trasandino Clark*, Imprenta Universitaria, Santiago, 1910.

<sup>3</sup> S. Vicuña, *Los ferrocarriles de Chile*, fourth edition, Imprenta Cervantes, Santiago, 1916.

<sup>4</sup> M.López, *Historia de los ferrocarriles nacionales, 1866-1886*, Editora Lumiere, Buenos Aires, 1994.

<sup>5</sup> Article 3, point 2, of a law of 18<sup>th</sup> September, 1877, which amended the 1874 contract.

deterred traffic. The line was open for traffic between Mendoza and Uspallata in 1891, but lost money in each of the next five years. The government guaranteed return should have been paid from this point in time, but doubts exist as to whether it really was. Shares in the Argentinian Transandine Railway Company, which had been quoted at £120 in 1888, were worth only £ 50 five years later.<sup>6</sup> Clearly the monied gentry had only limited interest in buying into a would-be international railway which terminated in a kind of void, since the neighboring country was not doing its part.

**TABLE 2: TERMS OF CHILEAN GOVERNMENT GUARANTEES FOR THE TRANSANDINE RAILWAY**

Period	Amount	Rate	Year requested or granted
20 years	£ 1 100 000	7%	Requested by the Clarks in 1872
20 years	£ 600 000	7%	Granted to the Clarks by the Government in 1874
?	£ 750 000	5%	Revised Clarks' concession 1887
?	£ 1 200 000	4%	Revised Clarks' concession 1893
?	£ 1 300 000	4½%	Revised Clarks' concession 1895
20 years	£ 1 500 000	5%	New concession 1902

Source: Chilean government laws and decrees.

On both sides of the border there were various company reorganizations and bids to secure new capital, during the course of which the Clark brothers lost control of the project and receded to the role of advisors or mere figureheads. In 1898 the Chilean company fell into the hands of its creditors and in 1901 the London based Transandine Construction Co. Ltd. acquired, for £ 90 000, the stretch already built and set about extending the line eastwards towards Río Blanco. It was then that the Chilean government, no doubt under some pressure since the line had almost reached the border on the Argentinian side, asked Congress for authorization to put out to tender the construction of the rest of the line. This was granted by Law 1 588 of February 1903, which offered sufficiently enticing financial conditions. The winning bid was tendered by The Transandine Construction Co. Ltd., and in April 1910 first train passed through the 3½ km long tunnel straddling the border. The full story is told in quite recent and currently available publications.<sup>7,8</sup> By then John Clark had already died, in Valparaíso in 1907, and hence never lived to see Esslingen built articulated, rack equipped, 0-6-8-0T locomotive No. 10 pass through the tunnel with the first official passenger train.

**An operating nightmare.** The principal motive power on the more steeply graded stretches was a set of nine Kitson-Meyer articulated rack fitted locomotives, of which three belonged to the Chilean Transandine Company and six to the Argentinian one. They were complicated machines, but were also very successful, operating on both sides of the border until the 1960s. The Chilean Transandine also bought two comparable Esslingen locomotives, one of which soon derailed and ended up in a spot from which it could not be economically recovered. The full story of Transandine

<sup>6</sup> M. López, *Ferrocarriles, deuda y crisis*, Editorial del Belgrano, Buenos Aires, 2000.

<sup>7</sup> I. Thomson and D. Angerstein, *Historia del ferrocarril en Chile*, second edition, Chilean National Library, Santiago, 2000.

<sup>8</sup> P. Lacoste, *El ferrocarril trasandino*, Chilean National Library, Santiago. 2000.

Railway motive power has also been told elsewhere.<sup>9</sup> The Argentinian company acquired four Beyer-Garratt locomotives for the steeper adhesion worked segments.

Operating the *Transandino* by steam was difficult and costly. In 1913 the overall coal consumption on the Chilean section was 46 kgs per km.<sup>10</sup> In later days imported fuel was increasingly substituted by Chilean coal with a lower calorific value and even higher consumption rates. Since the locomotives were working close to their physical limits for a considerable proportion of their time, maintenance was heavy. In steam days, traction accounted for 35% of the Chilean Transandine's operating costs. The rack and pinion system led to a lot of mechanical wear which further increased maintenance costs. In the early days there seems to have been a spate of accidents, about which the Company appeared to wish to keep quiet and to which inadequate maintenance caused by insufficient funding may have contributed. Operating inconveniences derived from the many snowsheds and some genuine tunnels cut through rock. In the tunnels locomotive crews really needed gas masks, and to minimize the hazard from exhaust fumes the norm was to work chimney facing downhill, so that the cabin was always in front when working hard. (However, this complicated controlling the water level in the boilers.) In order to reduce some of traction burden, on both sides of the frontier, thoughts turned to electrification, and on the Chilean side this actually happened, being inaugurated in 1927 between Las Cuevas and Río Blanco but not until 1954 on to Los Andes. In Argentina, the Perón government appeared prepared to electrify at least a part of its share of the line, towards the mid 1950s, but Perón was overthrown and steam remained supreme until diesels took over.

The electrification of the Río Blanco to Las Cuevas section was at the insistence of the Chilean government, as part of a financial rescue exercise (although in 1919 The Chilean Transandine Railway Co. Ltd., which had been formed to operate the Railway, had already commissioned a prefeasibility study on electrification). The section electrified included all the Chilean rack stretches and to work it three sophisticated articulated rack and pinion equipped electric locomotives were acquired from S.L.M. in Switzerland. These could haul 160 ton trains upgrade on the rack stretches, which was however only 25 tons more than the Kitson-Meyers were handling. Electrification should have resulted in a reduction in operating costs, but no such reduction is discernable from the financial returns. A primary cause of this was the fact that the short 34 kms stretch between Los Andes and Río Blanco remained steam worked, whilst the almost equally short continuation to Las Cuevas was handled by the electric locomotives. Anyway, the fact that there were only three electric locomotives meant that the Kitson-Meyers and the surviving Esslingen machine sometimes still worked over the Río Blanco to Las Cuevas section. Any immediate thoughts there may have been towards buying more electric locomotives, or extending the electrification, were laid to rest not only by the worldwide economic recession which hit both countries hard from 1930 onwards, but also by the premature winding-up of a merger between the administration of the Argentinian and Chilean sections and the destruction of stretches of line on the Argentinian side by the greatest enemy the *Transandino* ever had, i.e. Nature.

Normally the Railway was inoperative for a few weeks each winter, due to snowdrifts, a problem which, as table 1 suggests, state-of-the-art steam powered rotary snow ploughs could alleviate but not eradicate. But in January 1934 nature dealt an especially severe blow. A wall of ice and earth, behind which a lake had formed, gave way and burst forth into the Mendoza valley, breaking the banks of the river and carrying with it anything found in its path, including the railway line. The damage was so severe that international rail services were not restored until ten years later. A pair of Beyer-Garratt locomotives

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<sup>9</sup> See, for instance, D. Binns and I. Thomson, *The locomotives of the Transandine Route*, *Locomotives International*, Skipton, England, editions 1, 2 and 5.

<sup>10</sup> W. Lucy, *Notes on the working of a rack railway*, Proceedings of the Institute of Mechanical Engineers, London, date unknown, but probably around 1916.

were trapped at Zanzón Amarillo, and two Argentinian Kitson-Meyers, also isolated from Mendoza, worked over the Chilean section, as far as Juncal, visiting the shops at Los Andes for maintenance and repair. Trains ran over the operational section of the railway from Los Andes to Punta de Vacas in Argentina, where passengers and freight transhipped to buses and trucks for the rest of the journey to or from Mendoza.

**An economic disaster.** This physical destruction occurred shortly after something similar happened on the institutional side. The meter gauged *Transandino* had started off on the wrong foot, for various reasons, including the fact that the Argentinian Transandine was under the control of the Buenos Aires to Pacific Railway Company (BAP), which also ran a broad gauge railway from Mendoza to the country's capital and a part of the port of Buenos Aires. Faced with the prospect of how best to send a product such as wine, wool or wheat from western Argentina to overseas, BAP tended to prefer routing it over the 1 000 km of railway it owned between Mendoza and Buenos Aires, accruing to itself freight rates all the way, and then through its own port, rather than heaving it 179 kms up the Andes and then handing it over to somebody else's railway, to be carried to someone else's port. Both Transandine companies were British owned, but between them there was little brotherly love.

The very high freight rates charged on the Argentinian section had the effect of making sure that all transit traffic, not bound to or from Chile, did not use the *Transandino*. Much traffic bound to or from Chile seemed not use it either, leaving the freight trains with little other than westbound livestock, and coal for the hungry locomotives. In 1914, when the weather put the Railway out of operation for more than half the year, the Chilean Transandine carried more internal company freight than that for its clients. The following year the Chilean Transandine Railway Company invited the government to buy its property, but the offer was refused. For some products, customs tariffs were almost prohibitive. To quote an extreme example, a liter of bottled wine sent by the Transandine Railway from Chile to Buenos Aires would have paid 448 Chilean pesos in freight rates and transshipment costs but 2 000 pesos in customs duties.

Freight is less time sensitive than are people. Between 1920 and 1922 the Transandine Railway earned 50% more from passengers, not keen on a lengthy voyage through the Magellan Straits, than from cargo, which was less adverse to such a routing. The *Transandino* was a financial disaster, right from the start. The Panamá Canal had little effect on the *Transandino*, but when opened for traffic in 1914, it further diminished any chance there may have been for routing via the Railway Chile's trade with Europe.

Table 1 includes profit and loss information for the Chilean Transandine, in the first decade of its being open as part of an international rail link. The influence of the climate is obvious. Even when an operating profit was reported, the rate of return represented a disappointment for investors and serious problem for the government, due to the triggering of the guarantee every year. The government had a directed vested interest in solving the Railway's problems.

**Marriage to separation, within eight years.** One of the more well founded proposals to improve matters was that of merging the two hitherto separate company administrations. A coordinated administration started to operate in 1923, and received an added impetus in 1929, when the board of directors started to meet in Argentina and Chile, alternatively, instead of in London. The coordinated operation did seem to have a positive financial impact, as table 3 indicates, but lasted just until 1931, when BAP again took charge of the Argentinian sector. Even before that, the marriage was on the rocks, since Chile had claimed that the Argentinian Transandine was independently setting its own fares, whereas according to a 1922 treaty between the two countries, they should have been set by a Joint Committee. The Argentinian Company responded that it could not abide due

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\* The case refers to the situation in the mid 1920s.

**TABLE 3:  
PROFITS AND  
LOSSES, IN PESOS,  
OF THE CHILEAN  
TRANSANDINE  
RAILWAY, 1918  
TO 1937**

Year	Profit (+) or loss (-)
1918	+ 1 509 309
1919	- 282 591
1920	- 299 328
1921	- 432 591
1922	- 262 620
1923	+ 927 321
1924	+ 167 274
1925	+ 461 283
1926	- 441 257
1927	- 118 124
1928	+ 758 949
1929	+ 1 951 795
1930	- 224 992
1931	- 869 175
1932	- 1 067 852
1933	+ 242 187
1934	- 674 582
1935	- 238 378
1936	- 358 390
1937	- 692 390

Sources: (i) R. Long, *Railways of South America*, part III, U.S. Commerce Dept., 1930; (ii) Carlos Huidobro, Ministerio de Fomento, Santiago, 1939.

to being bound by national legislation. Partly due to the separation and partly due to the worldwide economic recession, traffic plummeted, from 37 500 tons in 1930 to just 5 600 tons two years later. The *Transandino* closed for business for nine months in 1932 and only reopened due to diplomatic pressure. Then it closed down again, as already explained, due to hydraulic pressure.

**The line reopens, but traffic disappoints.** From 1934, control of the Chilean Transandine Railway Co. Ltd., already 70% owned by the Chilean government as a result of the aforementioned rescue package, passed into State hands and in 1937 Chilean State Railways bought the remaining 30%, formally incorporating the line in 1946. The Argentinian section was nationalized in 1939. Chilean State presumed that the reinauguration of the *Transandino* as an international link would spark such a boom in traffic that extra locomotives would be warranted. Hence reinforcements, both rack and non-rack fitted, were ordered to Los Andes from meter gauge railways in the north of the country. When the boom did not materialize, most of those that arrived were sent back.

International traffic soared temporarily in 1969 to just over 160 000 tons, due to a scarcity of cement in Argentina. The paving of the parallel highway also brought about more traffic in cement, as well as the eventual downfall of the Railway. Local traffic in Chile also jumped since materials were being transported to Río Blanco for the La Andina copper mine, then under construction and, once opened, the mine traffic saved the *Transandino* from a total shut down from the mid-1980s onwards. It was the paving of the highway which ensured that nobody was going to be prepared to invest too much in the *Transandino* after avalanches, this time on the Chilean side, caused severe damage in June 1984. This put an end to the Railway as an international carrier. Anyway, by 1983, trucks on the highway were carrying 1 000% more than the trains of the *Transandino*. The last passenger trains had run in November 1979.

**Possible resurrection.** The line on the Argentinian side was kept servicable until 1990. Around this period, the *Libertadores* project, sponsored by the Spanish government and the Interamerican Development Bank, evaluated various options for increasing transport capacity between Los Andes and Mendoza, but it produced no tangible results. Then, in 2001, *Tecnicagua*, a company based in Mendoza and engaged mainly in the petroleum sector, delivered a prefeasibility study carried out on its behalf by consultants. The incentive for the study was the continuing increase truck traffic on the Los Andes - Mendoza axis and the limited capacity of the highway to carry it. Current traffic amounts to approximately 2.5 million tons annually, to which

should be added considerable bus and car flows, especially in the summer months. The main conclusion from *Tecnicagua*'s study was that reopening the *Transandino* would earn for its backers a rate of return of more than 20%. Pairs of 1 500 hp diesel locomotives would haul trains of 800 tons over the almost 8% grades on the Chilean side without having to use the rack and pinion installations of bygone days. It all seemed too good to be true. *Tecnicagua* had the project declared of public utility by governments on

both sides of the border, but whether or not it was consistent with the laws of gravity was debatable.

*Tecnicagua* then set about reappraising its project, and drew it into line with the said laws, by beefing up the tractive power per train, and reducing the weight of the latter to 430 gross tons over the critical Río Blanco to Las Cuevas sector.<sup>11</sup> The project would require an estimated investment of USD 230 million but *Tecnicagua* still maintained that it would be commercially viable, and to it requiring no subsidy. But to be viable, traffic would have to reach almost 2.5 millions net tons by 2010 and considerable doubts exist as to whether there is enough line capacity to accommodate such a volume. Each day twelve trains would have to climb, and then descend, the single tracked 12 kms section between Juncal and Portillo where gradients reach almost 8% and there are no passing loops, nor much in the way of space to install any. The 2030 traffic projection would require 24 eastward and 20 westward bound trains. The Railway would remain meter gauged, whereas the Mendoza-Buenos Aires and Los Andes-Santiago or Valparaíso lines are broad (1 676mm) gauged. In spite of the doubts of railwaymen, economists and engineers, the two governments were close to inviting tenders in mid September 2004.



foto: P. Dewhurst - derechos: NRM - colección: ithomson

**Figure 2: in early days, the Chilean Transandine was hazardous, not only for investors but also for railwaymen.**

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<sup>11</sup> I. Thomson, *¿Volverá el Ferrocarril Transandino?*, El Reportero Ferroviario, edition 207 especial, Buenos Aires, March 2003.