The Crabtree Foundation (Australian Chapter)
1983 Annual Oration
Joseph Crabtree, Ingenieur Extraordinaire

Nicholas Hudson
February 1983

REVELATION, Mr President, is a fickle lady, whose utterances must be treated as those of her late Aunt Dodona, Priestess of the Pythian Apollo at Delphi; in short, with acute caution.

The alleged message that I was to be your orator for this year should have given us all food for concern; but her message about the direction my researches should take was still more ambiguous. You will remember that Dr Hiscock produced a bottle of port-style wine, bearing the likeness of a railway locomotive, and spoke at some brevity of Crabtree's childhood addiction to toy trains.

That this was the voice of Revelation was clear. But what did she mean? For it is common knowledge, even to the most ignorant member of this Foundation, that there were no trains, toy or otherwise, during the period of Crabtree's childhood.

Revelation was playing Dr Hiscock a cruel jest; her allusion was to those coarse wits who maintain that Crabtree' s second childhood followed his first at so short an interval that they can be considered as one; and the word 'toy' was a conjectural interpolation of Dr Hiscock's.

Once this interpolation had been expunged from the recension, the archetypal text of the revelation was restored. Puffer trains, Mr President, real puffer trains; that was what Dr Hiscock was being shown. But enough of prolegomena. We have work of prodigious length before us, so I will start.

John Locke, 1693...

I must pause for a brief digression. I find myself in an insecure position, high up here in the topmost canopy of this Grove of Academe, when I so clearly belong down in its undergrowth; nay, as a saprophyte in its forest litter. Having, therefore, inadequate academic credentials, I must obey the rules applied to the postulant, viz., to provide full acknowledgement of the sources I will adduce. However, rather than interrupt the flow of the argument by presenting the apparatus viva voce, I have prepared some sheets carrying details of my sources, together with certain relevant illustrations. I have also provided myself with an instrument with which to indicate that a footnote should be consulted.

John Locke, 1693 (1), has observed:

> *Vice, if we may believe the general complaint, ripens so fast nowadays, and runs up to seed so early in young people, that it is impossible to keep a lad from the spreading contagion. . .*

(1) Locke, John, *Thoughts Concerning Education*, London, 1693, p.102.

It is a very good thing, for which my learned predecessor Richard Belshaw and his professional colleagues deserve our most profound thanks, that this is no longer true today; but in the 1760s and 70s, Joseph Crabtree's formative years, Locke's statement still held.

Despite being distracted from the path of achievement for many years, however, his harvest, though late, was abundant. By the time of Crabtree's death, the sun never set upon railways of his creation, railways distinguished in gauge and in many other ways from the accepted norm, and on ships of prodigious size; all of which came together, as we will see, in his crowning achievement, the Echuca and Chipping Sodbury Grand Junction railway.

Nonetheless, the early years were not altogether wasted. As a lad, Joseph Crabtree was deeply influenced by the writings of Euclid, and in particular by the poetry of the proposition:

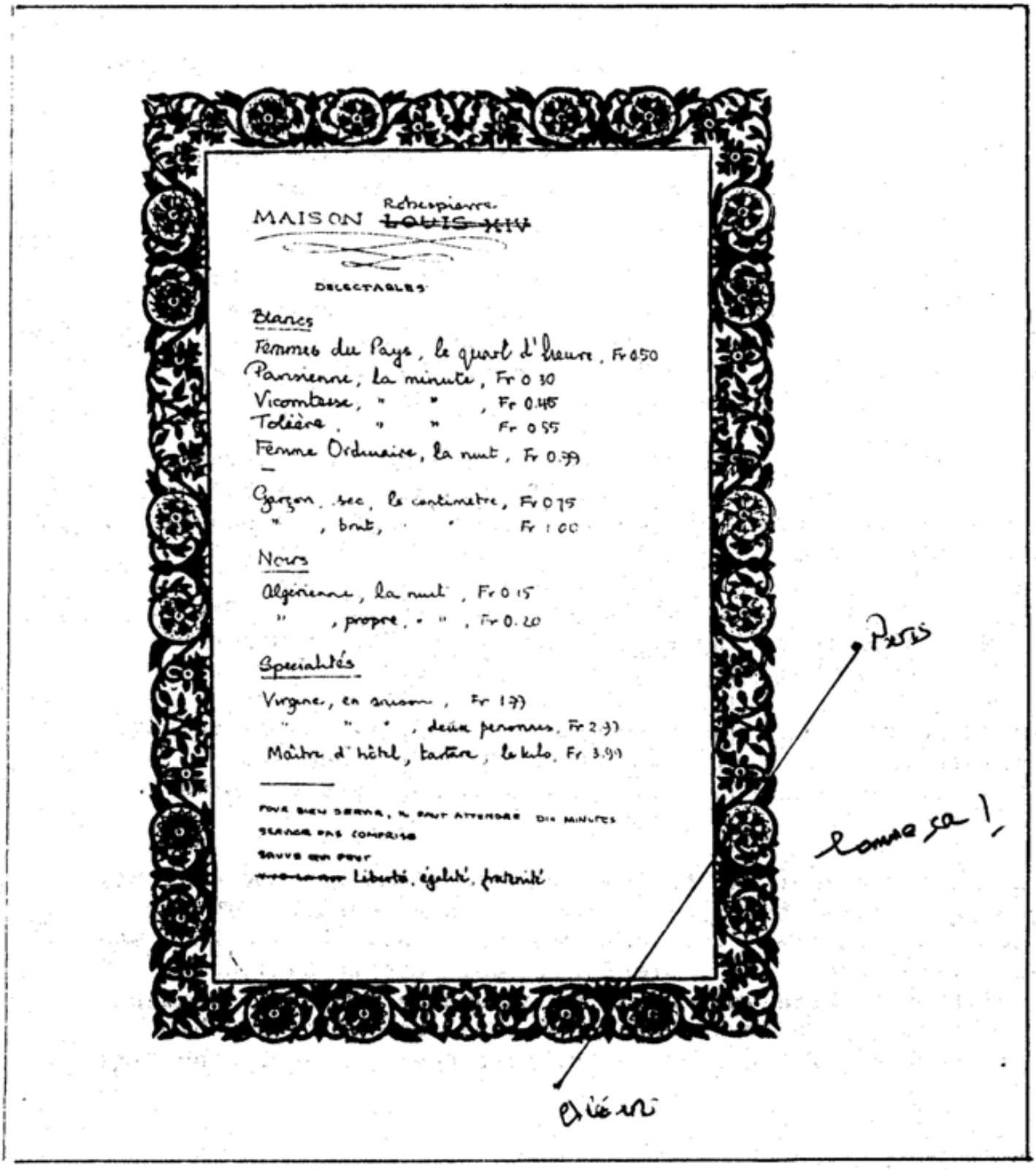
A straight line is the shortest distance between two points. (2)

(2) Euclid, ap. Klott, Ernst, *Grundlegung der Griekischen Vormathematiker*, Leipzig, 1744, p.642.
Translated by the present author.

This precept must have remained in the mind of the young Crabtree, for it gave rise to the first revealed example of his engineering genius. Scanning the Napoleana files in the French National Archive, I discovered the document reproduced as Figure One in your notes.

The story behind this document is as follows: Napoleon Bonaparte had travelled one evening from Paris to Orleans. Exhausted from the journey, he and his companions had repaired to a local hostelry, where they were discussing the tedium of travel. A tall foreigner approached them, and said that he could give them assistance. Taking the menu of the establishment, he drew a quick sketch map showing the relative positions of Paris and Orleans, and then, drawing a ruler from his fob, and placing it across the map from the centre of Paris to the centre of Orleans, drew the Euclidean solution. 'Comme ça', he wrote, in fluent French.

Figure One: Crabtree's original plan for the Paris-Orleans highway. Reproduced by courtesy of the Concierge des Toilettes, Archive Nationale de la France.



Bonaparte was delighted. He carried the document the length and breadth of France, using it as a blueprint for the layout of the network of roads erroneously known as Routes Napoleon, which should of course be called Routes Crabtree.

Happily, however, the blessing of the Euclidean insight was not to be bestowed only on the French. How did Australia, that land of, in Dampier's phrase, 'the most miserablest people on earth' (3), become Australia Felix, Happy Oz, the Lucky Country? The answer must now be revealed, in a narrative which started, as many of the world's greatest epics started, in Chipping Sodbury.

(3) Dampier, William, *Round Australia on a Shoestring* (or some such), recalled in tranquillity by the present author.

At the turn of the century, all was not well in Chipping Sodbury. War with France had caused a Garlic Curtain to descend over Europe, cutting off the supply of Saxon wool for the great blanket foundries on which the prosperity of the town depended. The Captains of Industry turned to Joseph Crabtree for assistance; and not in vain.

'Be comforted', he told them (or words to this effect, for I must admit that I am at this moment following the example of Thomas Kenneally, and cloaking the facts in a veneer of fictional dialogue). 'Be comforted, for I am this day to travel to a distant land, where wool may be had in abundance.'

The following day, he set sail. But on reading the tourist literature (4) thoughtfully left on his hammock by the bo'sun, he was alarmed to learn that New South Wales (for this was his destination) produced nothing at all, least of all wool.

(4) The work in question was probably Marsden, Rev W. *What's On in Botany Bay*, Farm Cove, 1798, of which the present author has been unable to locate a copy.

Nothing daunted, he set about to remedy the defect. His solution was characteristically brilliant: when the ship made its scheduled call at Cape Town, he would go ashore and buy some sheep.

Unfortunately, one of his fellow passengers was reading over his shoulder as he made the relevant entry in his journal. This passenger was a military gentleman whose modesty of intellect was matched only by his lack of breeding, one Captain Macarthur. Realising that Crabtree was a man of altogether superior acumen and connections, the rogue engaged a venal sailor to row him ashore in advance of the rest of the passengers, and, by the time Crabtree reached the town, had bought every sheep in the market.

Thus it was that Crabtree was denied his proper recognition as the man who brought the Merino to Australia. But where Dame Fortune frowned on Crabtree, Dame Retribution smiled. Shortly after arrival in the colony, Crabtree became engaged in a contretemps with the then Governor, one Captain Bligh,R.N., over a small matter of some

rum. The whole affair got out of hand, and a brawl, somewhat portentously called ‘The Rum Rebellion’ by grandiloquent Colonial historians, ensued.

The jest was that, at the height of the trouble, Bligh called for (and I quote) (5): that *good-for-nothing sheep shagger* to be put in irons, meaning Crabtree. But his words were interpreted as referring to the luckless Macarthur. Such are the devious ways in which Dame Retribution strikes.

(5) Bennelong, *Bang goes the Neighbourhood*, oral transmission, translated by the present author from the version current in the Imperial Hotel, Mudgee.

Thus Crabtree went free, and on the change of Governorship was able to commence that career in Law, Education and the Liberal Arts which has been revealed by my revered predecessors. But he was to start almost immediately on his engineering works, without doubt the most spectacular and visible of his contributions to our island continent.

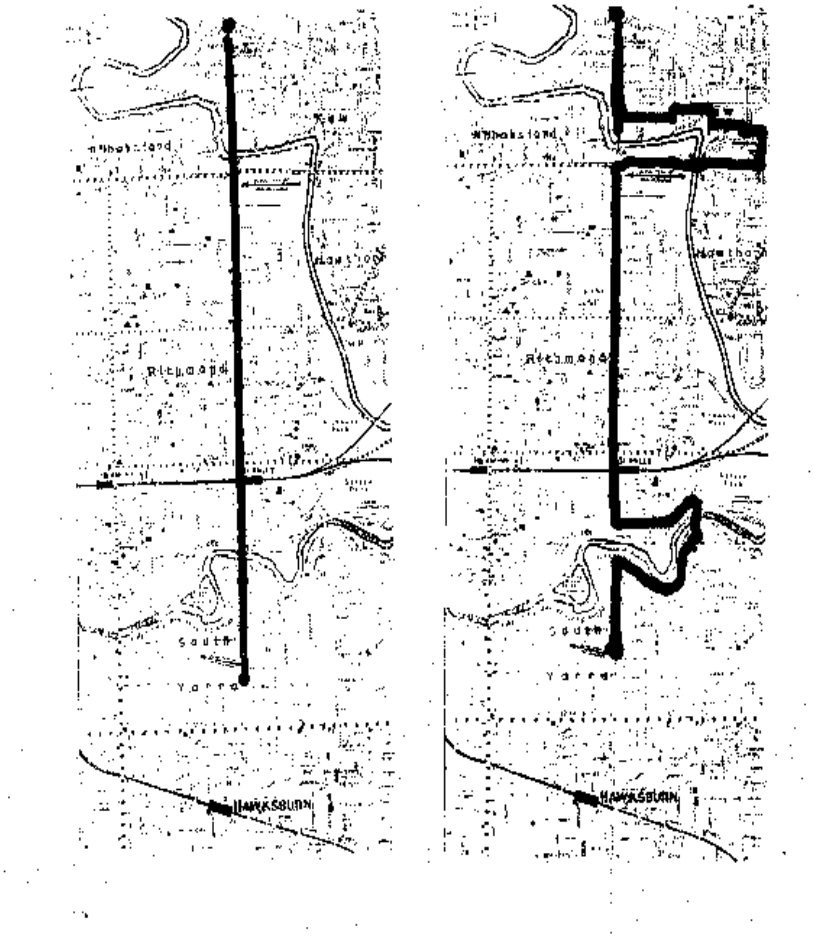
Once again, he invoked his beloved Euclidean Principle, and the characteristic Crabtree Roads of Australia were the result. Straight as a die, they suffer, according to his critics, from only two shortcomings, which are both the fault of Australia rather than Crabtree:

The first small problem is that, when he sought places on the map to connect, as he had done so successfully in France, he soon found that there were none; he therefore applied the best principles of modern geophysical analysis, and inserted a random yet regular array of points on his map of the continent, and connected them with bold straight lines. The result is that many Crabtree roads, especially those in western New South Wales, tend to start and finish in somewhat isolated and arbitrary locations .

The Second small problem is that the landscape of Australia is not quite as featureless as the maps available to Crabtree suggested. Members will be aware that maps of the period tended to show only a coastline, the interior being blank. Crabtree drew in a complete network of roads; but when his successors came to build the roads in question, they frequently found precipitous cliffs and rivers interrupting the smooth flow of Crabtree’s design.

There are many examples of this even in suburban Melbourne. Although not as spectacular as some of the Crabtree roads in the Blue Mountains of New South Wales) with their sudden dramatic vertical sections, we need not cringe: for example,, the Crabtree road between Como park and Studley Park shows both the power of the conception and the poverty of the realisation, as is shown in the two maps which make up Figure Two on your sheets.

Figure Two: The Crabtree road between Studley Park and Como Park, Melbourne: (a) As conceived by Joseph Crabtree. (b) As it exists today.



I am happy to report to this foundation that, although little recognised by the received historical record, Crabtree's contribution to the Australian road system is commemorated in the names of at least two roadways in Melbourne, viz., Crabtree Crescent, Reservoir, and Crabtree Court, Bundoora. The choice is a happy one, both streets being dead ends.

Crabtree completed this work in the summer of 1829, and returned to England. Here he found the country in the grip of railway fever, and he threw himself into the new technology with enthusiasm. He had no previous experience of railways as such, though he had a vicarious association with its handmaiden, steam power, through the activities of his Uncle William, inventor of the steam corset, after whom the famous early locomotive Puffing Billy was named. William Crabtree had, however, died a disappointed man in 1810, just after the unsuccessful private publication of his great work, The London Telephone Directory, L - R, which proved to be ahead of its time .

Joseph Crabtree, by contrast, was a man positively doomed to succeed, and we have the immense good fortune to have positive evidence of the great mind at work at the very outset of his ferroviarian career. Hudson, 1978 (6) records inscriptions found under successive layers of brown paint on the back of the door of a 'platelayer's hut' beside the track of the Liverpool and Manchester Railway at Parkside, Lancashire.

(6) Hudson, N.J. *The Parkside Palimpsest,* 1978, Englewood Cliffs (rejected)

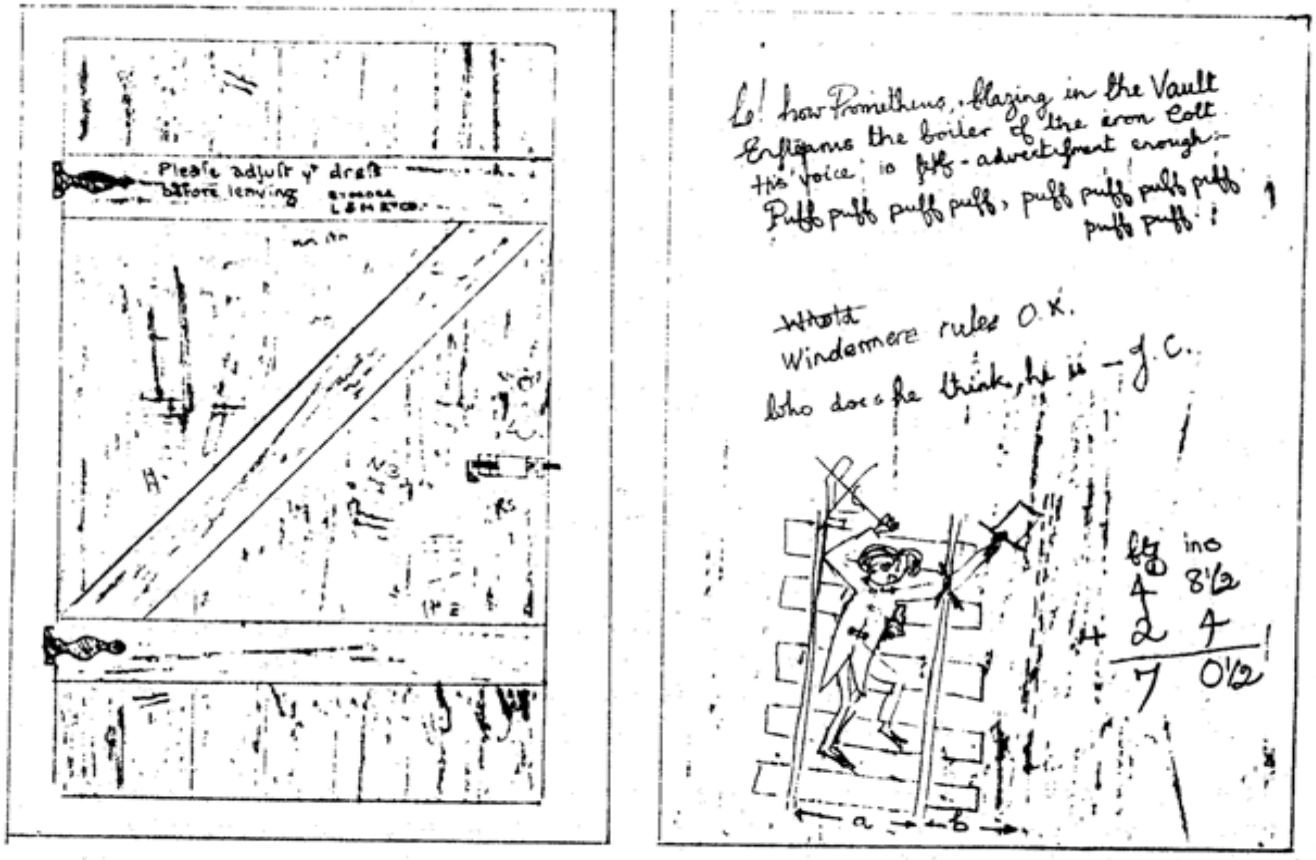
Parkside was, of course, the site of the opening ceremonies for the new railway, at which Mr Huskisson, President of the Board of Trade, met a tragic end when he was accidentally beckoned into the path of the locomotive, Rocket, by his political opponent, the Duke of Wellington. So much for the received historical record. What the Parkside Palimpsest adds is clear evidence of Crabtree's presence on that occasion, and the brilliance of the mind he brought with him.

The relevant additional evidence is reproduced as Figure Three in your notes. This is the first stratum of paint, conclusively attributed by carbon-14 dating to the year 1743, which, since the door was not made until 1829, indicates that it is, if I may venture a technical term of archaeology, very old. We can now show that the inscriptions date from the very day of the opening of the railway, May 17 1830.

The reconstruction of that historic day is as follows. A certain poet (let his identity for the moment remain shrouded in mystery) together with another poet, were among the revellers. Poet Number One, taken unexpectedly short for reasons which need not detain us, retired into the platelayer's hut for relief. While there, he idly penned the iambic couplets you see before you, which read:

La! How Prometheus, blazing in its vault
Ensteams the boiler of the iron colt!
His voice is self-advertisement enough:
Puff puff puff puff; puff puff puff puff puff puff!

Figure Three: The Parkside Palimpsest, Stratum I: 1830
(a) The complete door (b) Detail of lower right quadrant.



That these lines are attributable to Crabtree - are, indeed, one of the few surviving autograph fragments - is clear enough from their grace and style. But we epigraphers require evidence more rigorous than that of mere aesthetics; and it is available. For the hand of the second poet, identifiable from external evidence as that of William Wordsworth, has written below it:

Windermere Rules OK

to which the first hand has replied:

Who does he think he is — J.C.

We, too, cannot be sure why Wordsworth signed himself 'O.K.' My own conjecture is that it was a fanciful allusion to the character of Old Kaspar in Robert Southey's great epic of the Battle of Blenheim. But the identity behind the initials 'J.C' is unequivocal.

This intermittent stychomythia (for we cannot imagine that the two gentlemen were on those Stygian premises at the same time) occupied them until the arrival of the ducal party. Thus Joseph Crabtree was outside in time to witness the tragic bisection of Mr Huskisson. In the ensuing confusion, he alone remained calm. Drawing from his fob his invaluable ruler, he quickly measured the severed portion of Mr Huskisson, plus top hat, and retired into the platelayer's hut to draw the 'graphic model' (as we cyberneticists call it) of the incident, visible in Figure Three (b); together with the calculations you see beside it. We will return to this crucial evidence shortly.

Three years later, the mists of time part again, this time to reveal the Strangers' Gallery in the House of Commons, Westminster. In it we find the person who is about to play Horatio to Crabtree's engineering Hamlet, one Esambard Kingdom Brunel. The importance of his role warrants a short biographical comparison of the two men, for the two present a fascinating contrast, a classic example of the attraction of opposities: between inspiration and perspiration; between poet and peasant.

Brunel was the younger of the two men, by some fifty years. His father, Marc Isambert Brunel (and I quote his name in this form to remind members that he had the misfortune to be of Gallic extraction) was an inveterate digger of tunnels, a vice to which he exposed his son at an early age, Indeed, it was only through a happy accident, namely, the inundation of Brunel Senior's Thames Tunnel in 1828, that young Brunel ever emerged above ground at all.

Shaking the mud of the French Connection from his name, he became Isambard Kingdom Brunel, and, after years of dogged toil, he eventually, at. the age of twenty seven, rose to be engineer of the embryonic Great Western Railway Company.

It was this that brought him to the Houses of Parliament, for the occasion was the debate on the Great Western Railway Bill. I would strongly urge members with a taste for the absurd to read the account of the debate, since it illustrates the vacuity of the intellectual bucket into which Crabtree poured his own mental effluvia. Anyway, on the announcement of the division, a tall figure rose at the other end of the Stranger's Gallery and called out:

'Il est coccu, le Chef de Gare' (7)

(7) 'He is cuckolded, the Stationmaster'. The words were subsequently incorporated in the popular French song, which the present author will render on payment of a performance fee of fifteen (15) centimes and a guarantee of assistance with the chorus.

The astonishing irrelevance of this remark had the whole gallery buzzing. Brunel, who was accustomed to gibes at his French ancestry, thought that the barb was aimed at himself. After the session, he detained Crabtree (for it was he) on the stairway, and a bout of fisticuffs might well have ensued, but for Crabtree's rapid explanation that his reference was to the cuckolding of Charles Maurice de Talleyrand-Perigord (perhaps better known to some of you as Talleyrand) by Robert Stewart, Viscount Castlereagh, during one of the former's longer speeches to the Congress of Vienna.

I have to say that I find this explanation far-fetched; but since we are not here concerned with French Proletarian mythology, I will forebear to give you my own semantic theory, and content myself with saying that the explanation satisfied the young Brunel. Indeed, the two men retired together to a chop-house in Praed Street, prophetically close to the as yet undreamed of Paddington Station, where, over an excellent meal and copious draughts of porter, they laid the foundations of a friendship which was to last for twenty years.

It was during this meal that Crabtree raised the question of the gauge of the new railway. I would like at this point to refer you back to Figure Three, and in particular to the diagram and its accompanying calculations. The diagram is quite clearly of the unfortunate President of the Board of Trade, showing the point of bisection. (It is, I would add, an interesting comment on the medical skill of the day that a wound in the upper arm proved fatal; had Crabtree's mind not been on higher things, he could doubtless have saved the gentleman's life).

Careful examination of the diagram reveals, however, that Crabtree has drawn a third rail, just beyond the extremity of Mr Huskisson's hat, and has entered on the diagram the measurement he took with his rule, 2 feet and 4 inches. In the calculation, he has added this distance to the gauge of the Liverpool and Manchester Railway, 4 feet and 8 1/2 inches, to come up with the sum of 7 feet and half an inch.

Crabtree explained to Brunel that 7 feet and half an inch was the gauge to which the Great Western would have to be built if its trains were to pass over a recumbent member of parliament without damage to his person or his headgear. Brunel was deeply moved by this narrative, and so it was that the Great Western came to be built to this impressive gauge.

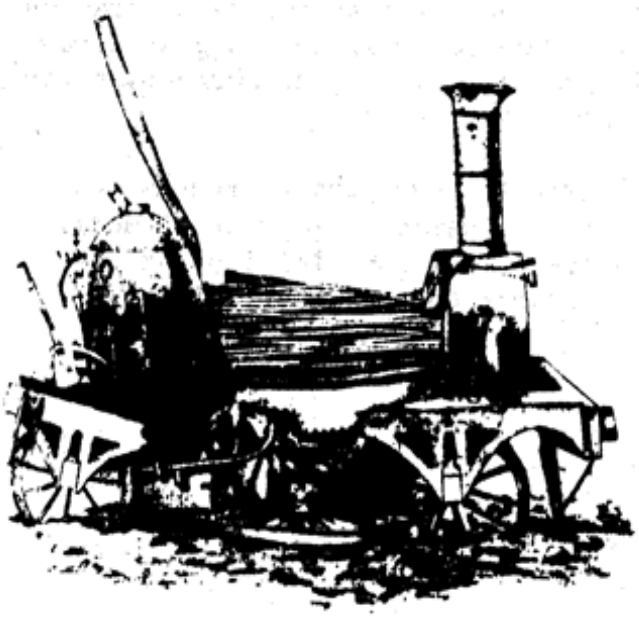
Work on the new railway proceeded apace, and the question of locomotives soon arose. Brunel, who was no mechanical engineer, turned naturally to his new friend. It is at this point that the received historical record comes nearer to actual mention of Joseph Crabtree than at any other known to me. Let the official historian of the Great Western, E.T.Macdermot, speak for me:

> *It may safely be stated, without exaggeration, that in the whole history of British Railways there has never existed such a collection of freak locomotive as those which were built for the Great Western and delivered during the period of eighteen months from November, 1837.* (7)

(8) Macdermot, E.T. *History of the Great Western Railway*, London, 1927, Vol. 1, p.372.

Macdermot goes on to quote Brunel himself, saying that the principle dimensions of the locomotives had been recommended by the best authority, a clear reference to Crabtree. The fiasco was, however, inevitable when the designs of a genius like Crabtree were realised by the jumped-up blacksmiths who were the locomotive builders of that day.

Figure Four: The Crabtree locomotive, *Aeolus.*



Sadly, few of the locomotives survived long enough to be captured on canvas. But the one authentic portrait which survives, reproduced as Figure Four, has the particular merit of being a cut-away view, giving us a clear picture of the interior planning as well as the external appearance of the locomotive.

I could, Sir, have filled many long evenings with a recital of boiler pressures, piston velocities, axle loadings and the myriad other technicalities which beset us Mechanical Engineers, but I had the strong feeling that it would have been deeply offensive to you. Suffice to say that the original versions of the Crabtree locomotives were not a success; but Crabtree's successor, Mr (later Sir) Daniel Cooch, had only to alter a few details like the number and size of wheels, length, diameter and pressure of boiler, bore and stroke of cylinders, etc., and he had locomotives whose design was the envy of the world. That it was Gooch rather than Crabtree who got the knighthood was due to the poverty of public perception.

A somewhat similar problem beset Crabtree's next contribution, leading GWR historian Macdermot (op.cit.) to call it 'the Atmospheric debacle'. The facts are as follows:

Brunel was involved in extending the Great Western past Exeter and through to Plymouth. In the way lay the steep escarpment of Dartmooor. There seemed to be no alternative to a lengthy detour round the coast, and Brunel turned naturally to his mentor, Joseph Crabtree.

Crabtree was at the time engaged in the invention of the drinking straw, and conceived a peculiarly lateral solution to the problem. Observing that matter could be made to travel vertically up a drinking straw, he suggested that, if a straw of sufficient magnitude could be built, coupled to stationary engines of sufficient exhaustive power, trains could be sucked straight up over the escarpment. He set about immediately with the appropriate designs, and three days later the Atmospheric System was ready for registration at the Patents Office.

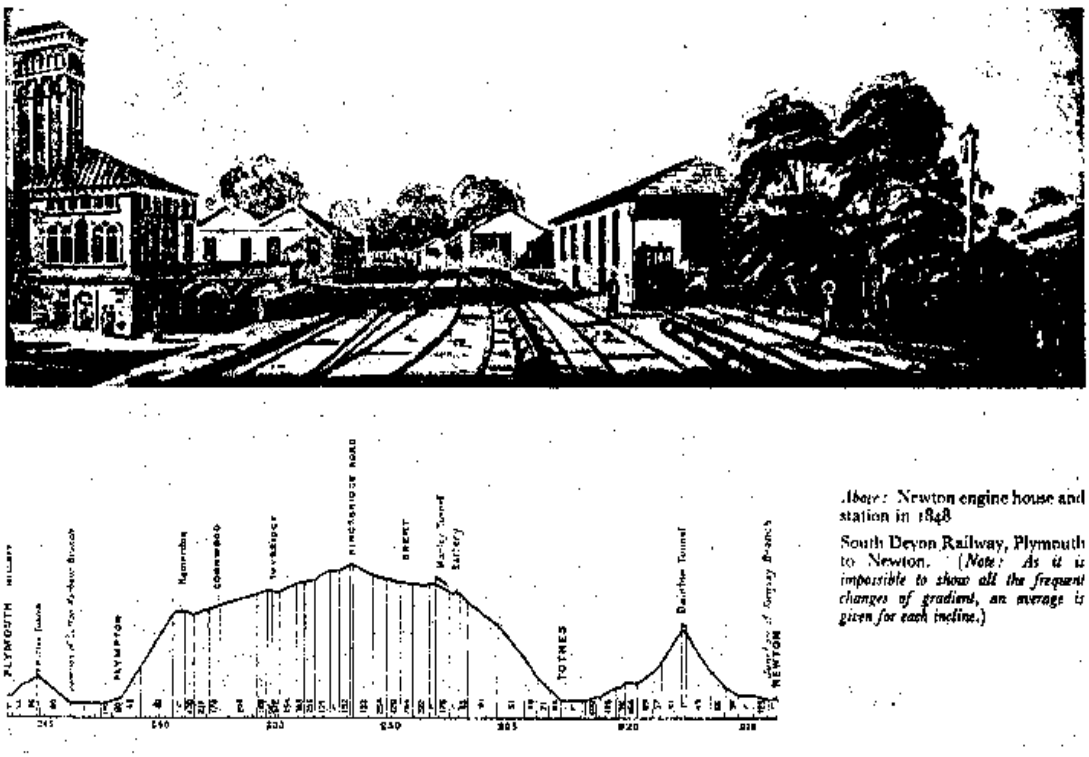
The precise details of what happened next are in some dispute. The testimony of Crabtree himself is in some conflict with that of the serving wench. What is clear is that he was distracted from his study, and when he clambered down the long stairway from the domestic quarters some hours later, he found that his study had been burgled and the plans stolen.

It was no casual crime, for within hours the criminals had registered the design in their own names, Clegg and Samuda. Brunel had no option but to transfer responsibility for the execution of the Atmospheric System to the interloping patentees.

Needless to say, once the scheme was shorn of its guiding genius, it was bound to fail. The cast iron pipe which stood duty for the 'drinking straw', and more specifically the leather valve with which it was closed, were rapidly corrupted by the vigorous Devonshire air and the voracious Dartmoor rodents. In short, as we Computer Engineers put it, the downtime on the system was considerable, amounting so far to some one hundred and forty one years.

Figure Five shows the key features of the system. Note the abrupt gradients made possible by the system, and the italianate grandeur of the engine houses. One of these still stands, and if this Foundation wished to place a memorial plaque on a building which embodied the spirit of the Crabtree genius, I can think of no better.

Figure Five: The *Atmospheric System*, popularly attributed to Clegg and Samuda but now revealed to be the work of Joseph Crabtree .



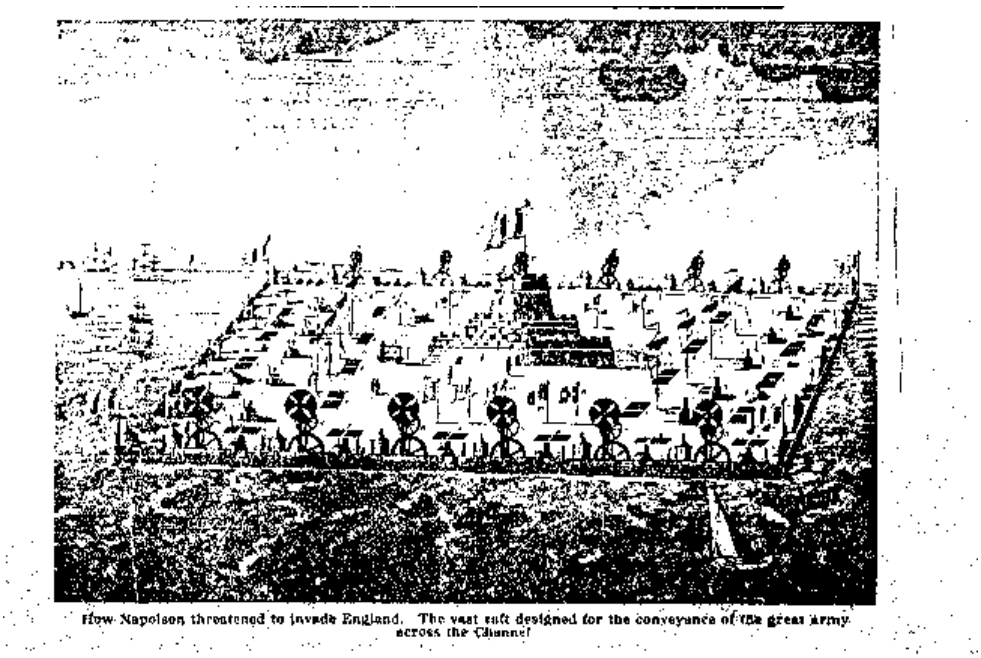
Above: Newton engine house and station in 1848

South Devon Railway, Plymouth to Newton. (*Note: As it is impossible to show all the frequent changes of gradient, an average is given for each incline.*)

The stage was now set for Crabtree's triumphant return to Australia; but I must first break for a moment with the discipline of historical sequence and deal briefly with his involvement with Great Ships, for it was this which, in many ways, can be said to have prompted his return.

Crabtree's first involvement with great ships dates back to the early part of the century. His friend Napoleon Bonaparte had confided in him a grand design to invade Switzerland by sea, and had asked him to design a ship large enough to accommodate the invasion force. Crabtree agreed, and the result is as shown in Figure 6.

Figure Six: Crabtree's design for an Army Transporter.



How Napoleon threatened to invade England. The vast raft designed for the conveyance of the great Army across the Channel

The perfidious Corsican had, of course, deceived Crabtree - his plan was for an assault on England. As soon as he discovered this trickery, Crabtree withdrew from the project - no charge of treason can be laid at his door - and the craft was never built.

However the magnitude of the conception remained in his mind, to be resurrected in the 1840s. Once again, the story starts in Chipping Sodbury, where problems of wool supply had again arisen. The mill owners had negotiated a large contract for the delivery of wool by a pastoralist they knew as John Fraser, a dour Scot who had squatted in the Port Phillip District of New South Wales. They had, in accordance with this contract, despatched a number of bills of exchange, all of which had been duly encashed, but no wool had arrived. In response to their enquiries, Fraser had replied with true Calvinist resignation. 'Let me make it perfectly plain', he had said 'that the problem is one to which it would be wrong to pretend that a simple solution exists'. Re advised the mill—owners to prepare themselves for a further downturn in their fortunes. 'Life', he said, commenting on the report that his deceased father's name appeared on the weigh bill which had caused one of the missing consignments to materialise in his second cousin's warehouse in Belfast, while all the other consignments of wool had apparently sunk to the bottom of sundry harbours 'wasn't meant to be easy'.

Crabtree immediately saw both the source of and the solution to the problem. If only a direct transport link could be forged between the heartland of Australia and Chipping Sodbury, controlled by himself, all would be well. He set sail immediately for the colony.

The ship made landfall at Glenelg, in the newly—founded colony of South Australia. Here, Crabtree made a courtesy call on the Colonial Surveyor, Colonel Light,

and disclosed to him his ideas about the proper design of cities. Together, they stood on a hillock overlooking the blasted plain that was to become Adelaide, and Light described his plan for a doughnut—shaped city, with a huge park in the middle. 'Doughnut—shaped it should be' said Crabtree, 'but my vision is of a doughnut of parkland with a hole for a city'. Now known inappropriately as Light's Vision, the spot on which they stood is marked by an obelisk, overlooking a city which remains, as in Crabtree's vision, a hole .

Moving, on to the Port Phillip District, which by then had become the Colony of Victoria, they were met on the waterfront by a large crowd, carrying banners bearing the legend 'No convicts for Victoria', and, no doubt because of his travel—stained attire and unshaven mien, he had difficulty in getting ashore. He then attempted to visit his old friend Batman, but was unable to get through a picket line of Aborigines, who had spread a small pile of pitiful trinkets on the ground, and were asking for a contract they had signed to be revoked under the 'Cooling Of f Period' requirements of the Trade Practices Act, a request which Batman, ever an upholder of the law, was rejecting on the very proper grounds that the legislation in question was not expected to be passed into law until the next session of the Executive Council, and that in any case it would be a deplorable precedent to make it retrospective. I mention these seeming irrelevances because they help to explain what was shortly to ensue. Crabtree never forgave the citizens of this fair city for welcoming him so ill.

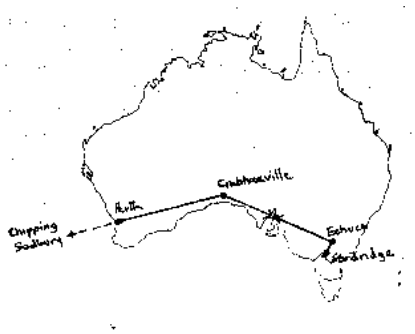
Finding Melbourne thus so deeply uncongenial, Crabtree immediately engaged a post chaise and set out for the Western District. Arriving there, he instantly recognised what was wrong. Here was not the honest toiling Scot he had been lead to expect, but a man he had known in his time as a circuit judge, one Murphy O'Hooligan, whom he had oftimes sentenced to long terms at Norfolk Island, Emu Plains, accurst Toongabbie, etc. Whether O'Hooligan recognised him is not known, for his years in crime had given him an unresponsive, granite—like demeanour. Wishing him and his descendents well, a habit he had acquired from the Arabs during his archaeological work in Egypt, Joseph Crabtree departed, knowing that no solution would be found in this quarter.

The assertion of some authorities — that he was then attracted to Northern Victoria by the man who was to enjoy the vicarious distinction of having fathered Ned Kelly, is one I have been unable to verify. Certain it is, however, that he found himself in Echuca, and instantly recognised it as the Chipping Sodbury of the South, groaning under a wealth of untransportable and hence unsaleable wool. All that was now needed was the transport link.

His first thought was of a railway to Perth. The plan of this, which is reproduced as Figure Seven in your notes, is now of purely historical interest, firstly because his survey for a large part of the line was subsequently used, resulting in Australia possessing the longest stretch of straight line in the world, and secondly because he also designed the bridge which was, as you will see from Figure Seven, required to span the upper reaches of Spencer Gulf. The plans for this were not lost, but were acquired by one William Bouch, who won a knighthood by executing them across the Firth of Tay, in Scotland.

Figure Eight, which shows the condition of this bridge shortly after Sir Thomas received his knighthood, shows that some vital elements in Crabtree's design had not been understood.

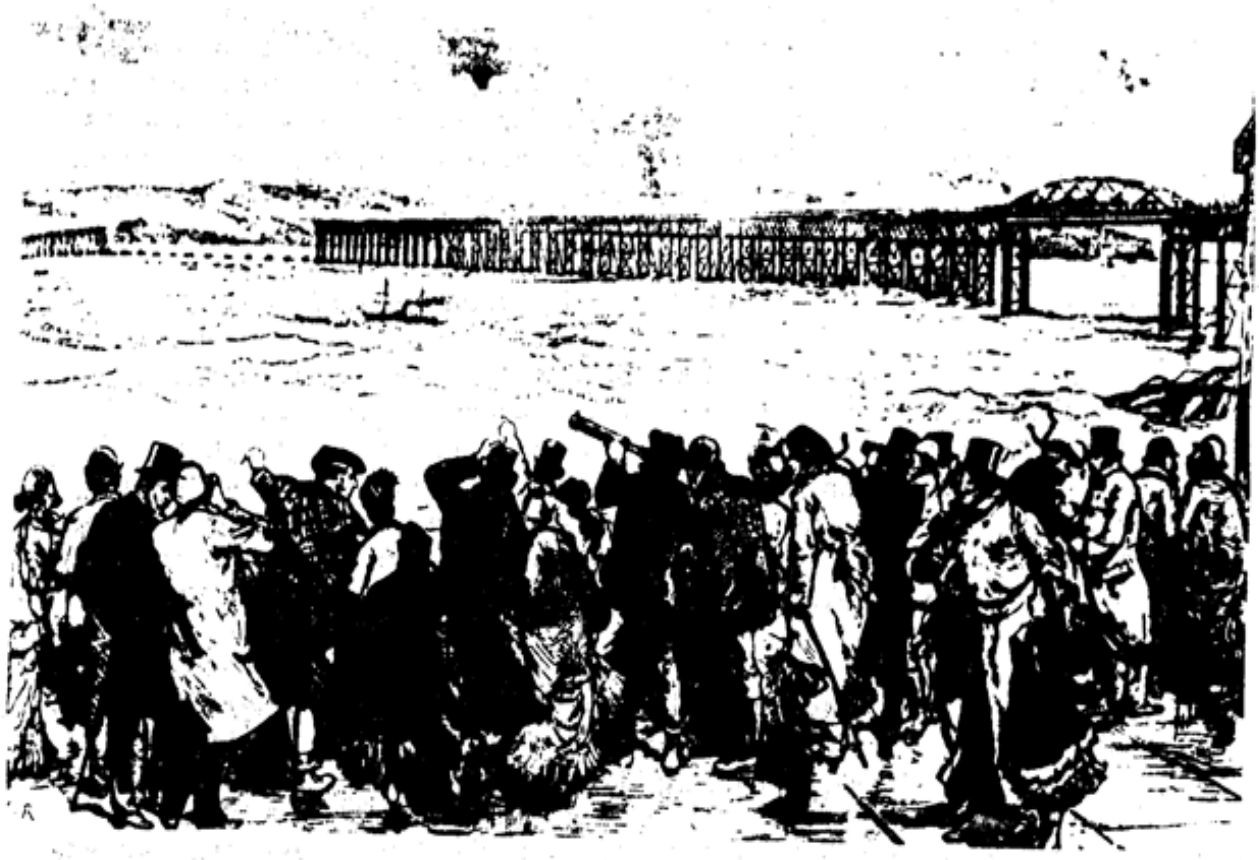
Figure Seven: Crabtree's first plan for the Echuca-Chipping Sodbury Railway (Australian Section).



At this point, I must insert a word of conceptual explanation Purists may wonder how Crabtree dared give the name 'Echuca and Chipping Sodbury Railway' to a line which so clearly would never reach the latter metropolis. Crabtree's argument was that, just as 'London' in the title of a railway did not imply that it was at every Londoner's front door, so Chipping Sodbury in the title did not imply that the railway actually reached that metropolis. In developing this argument, Crabtree drew heavily on the German concept of Glaubensbahn, celebrated in the Bach cantata, 'Trite auf den Glaubensbahn'.

Although the first stage of the railway proved difficult, the second stage -the section between Perth and Bristol - was in an advanced state. Resurrecting some of the working drawings for the great ship he had designed for Napoleon Bonaparte, he performed some minor modifications and sent them through to Brunel for execution. His concept was of a colossal ocean-going train ferry to operate between Fremantle and Bristol, from whence the trains would be conveyed to Chipping Sodbury over existing lines, thereby completing the link and justifying the name.

The great ship was six times as large as any built before her, so vast that she required all possible help in getting under way. Crabtree thus stipulated screws and paddles driven by five boilers emitting smoke though five tall chimneys, interspersed with six great masts carrying a huge spread of sail. Sadly, Crabtree never saw her completed, but the Great Eastern, as she was called, launched sideways in the Thames shortly after his death, went down in history as one of the few ships which could in every sense be called a landmark in steam navigation.



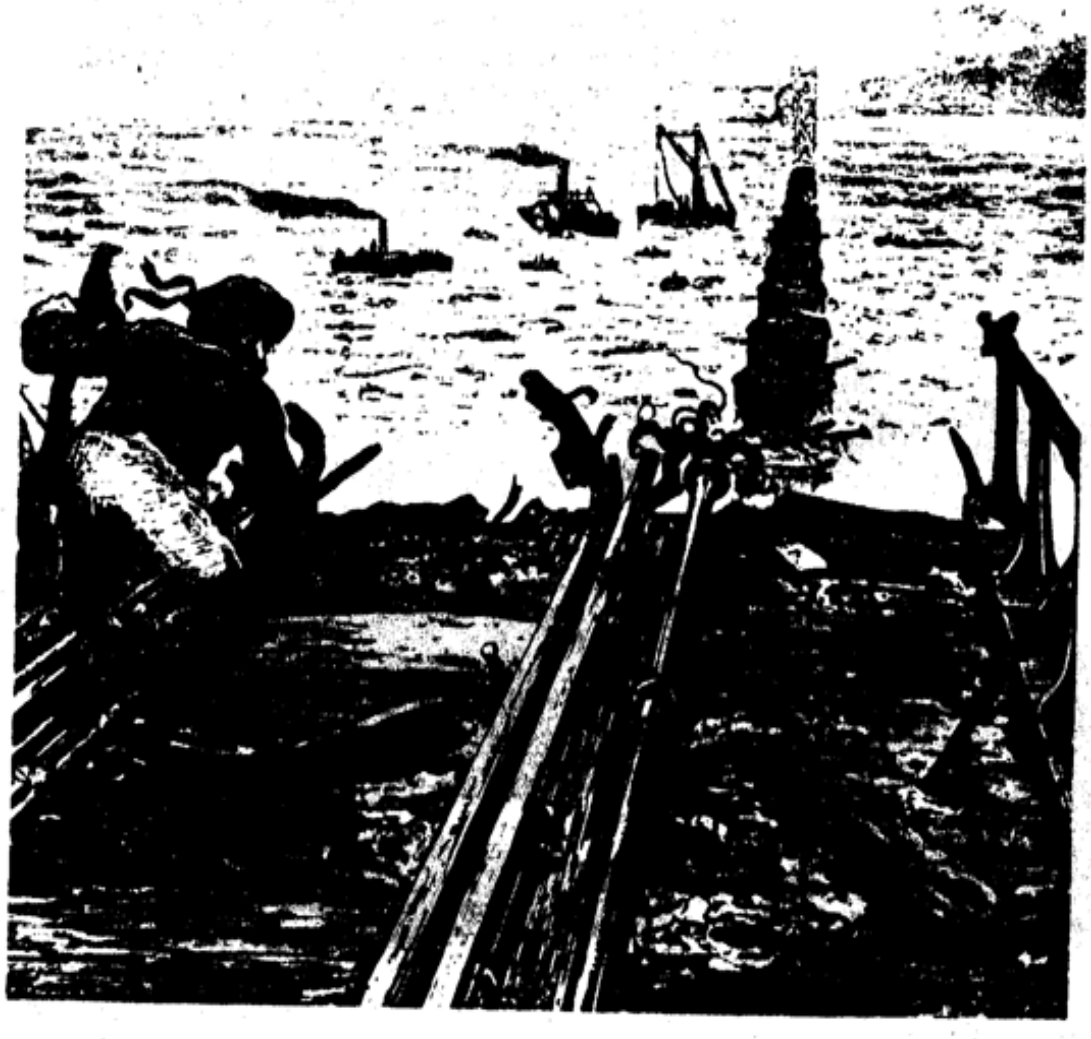
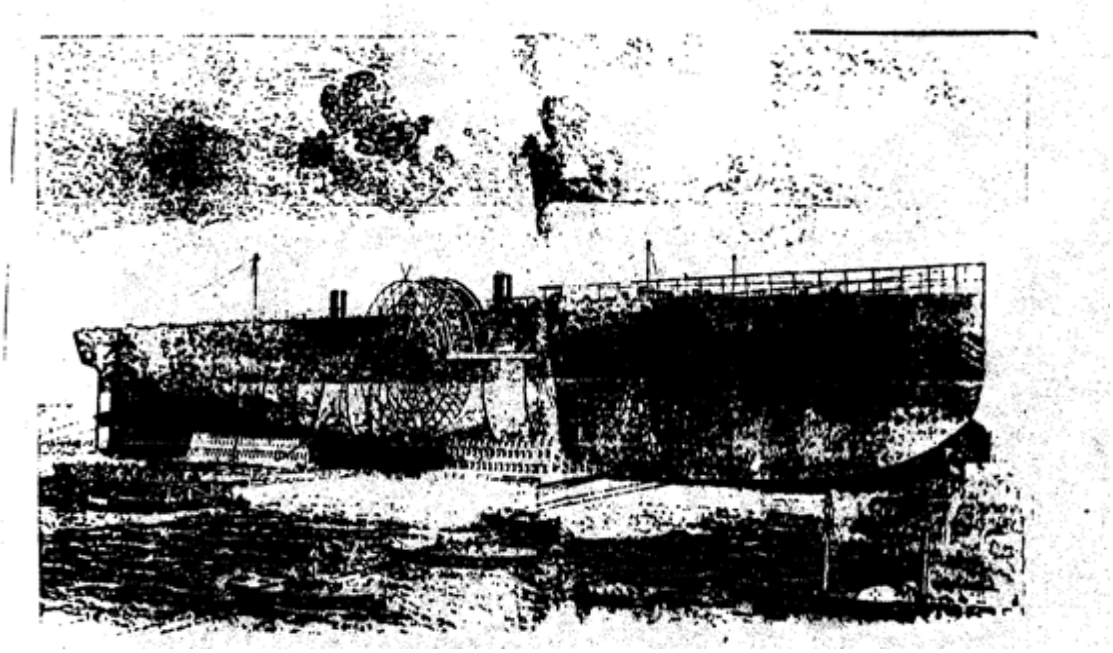


Figure Nine: The Great Eastern, two years after the first attempt to launch her.



That the ship was a failure cannot, in the light of the Incontrovertible historic record, be denied, but this should not be laid at Crabtree's door, any more than should the shoddy realisation of his design for an unsinkable hull, applied no less than sixty years after his death to the White Star liner Titanic .

But we must return to our muttons, for the climax is in sight. Denied by an accident of economics the opportunity to build the Echuca—Fremantle line, Crabtree sought an alternative. His own genius came to his rescue yet again. Standing on the steps of the Echuca Mont de Piete, he noticed what no one had noticed before- that there, directed like a twirling arrow at the very heart of Chipping Sodbury itself, lay the highway of his dreams - the River Murray.

For a moment, he thought that the great railway was complete, for could not the Great Eastern steam majestically up the Murray and tied up at Echuca Ocean terminal? Happily, he was not one to ignore details, and after less than three months of painstaking research had determined that one of the bends in the river would have to be quite extensively modified if a ship of the Great Eastern's size was to navigate in safety.

The plan was immediately modified. Ships of more modest dimensions would be used to carry the wool to the mouth of the river, where they would make a rendezvous with the Great Eastern. Once again, the link appeared to be complete.

The ships were duly built, Figure Ten being a photograph of one of them, lying at anchor in Goolwa Roads some years later.

Figure Ten: A Crabtree river boat, showing the prescient way in which he anticipated some of the design characteristics of the modern nuclear submarine.

It was then, however, that Crabtree became aware of the last barrier to his great design - the sandbars at the mouth of the Murray. Members who have visited the area will know that Murray Mouth carries a remarkably unimpressive volume of water; indeed, that, unlike most of the world's great rivers, it sometimes fails to reach the sea at all, disappearing instead into the thirsty sands of Lake Alexandrina.

The long term solution was clear - to deepen and widen the channel, allowing the sea to flow in and provide the river with what Nature had bestowed so sparingly, namely, water. In the meantime, however, a more immediate solution had to be found.

So it was that the last and greatest of Crabtree's engineering achievements came into being. As a terminal for the river boats, he chose the port of Goolwa, and as the ocean terminal for the Great Eastern he designated a windswept beach the far side of the dunes, designated Port Elliott. And between the two, he laid out what was described in the prospectuses as the Echuca and Chipping Sodbury Grand Junction railway.

This railway, at least under its current designation, 'the Goolwa Loop', is so well covered in the historical record that I hardly need say more. It was not built to the ideal seven foot gauge of the Great Western, for Crabtree had absorbed sufficient of colonial egalitarianism to realise that parliamentarians in Australia did not wear top hats; so it was cut back to five feet and three inches, allowing a cloth-capped parliamentarian to be run over in safety.

This is in many ways Crabtree's most lasting contribution to Australia, for the authorities, then planning the first Victorian and South Australian railway lines

followed him in adopting this admirable gauge. Only New South Wales clung to the archaic Stephenson gauge of four feet eight and a half inches. So it was that New South Wales acquired the narrow and awkward trains it still has today, while Queensland and Western Australia adopted the still narrower gauge of 3 feet and six inches to match the overall dimensions of their midget politicians. Only the Victorians and South Australians can enjoy the splendour and political safety of Crabtree's five foot three. Vive la difference!

Alas, Crabtree never saw the line opened. He received an urgent call from Brunel for assistance with getting the Great Eastern into the water, and departed. Thus it was alone and without their great leader that the navvies toiled though the hot summer of 1853/4 to lay the railway. In June, 1854, all was ready. Goolwa and Port Elliott were decked with bunting, and the patient Shire horses Crabtree had selected to do duty until the arrival of the steam locomotives were harnessed in the shafts of the first train to run on a railway in Australia. But lo! On the horizon, a black sail. What could it portend? It was a brigantine, three months out from Bristol, bearing dreadful news: Joseph Crabtree, ingenieur extraordinaire, had been gathered to the great shunting yard in the sky.

Ever heedful of his wishes, the revellers took it in their stride; indeed, even the Adelaide journalists, through whose descriptions we have knowledge of the events of that day, understood enough of Crabtree's modesty not to mention him at all. *Sic transit gloria Crabtri.*

Sir, I fear that the density of the argument and the atmosphere are about to overcome you. 'Quousgue tandem abutere, Catalina, patientia nostra (9)', I hear you say., Stand not upon the order of your going, but go at once (10). Semper ego auditor tantum (11). In the name of God, go (12).' And who am I to dispute so clear a Presidential command, particularly when I have run out of revelations. 'Wovon mann nicht sprechen kann, daruber muss mann schweigen (13).' But if this oration has added just one peppercorn to the casserole of Crabtree's record, your suffering will not have been in vain.

(9) (10) (11) (12) and (13). While acknowledgement for the conceptual structure of this passage must be given to the late T.S.Eliot, the specific words belong to M.T.Cicero, W.Shakespeare, D.J.Juvenal, O.Cromwell and L. Wittgenstein, without whose patience and help with the typing this paper would have qwertyuioped.

- END -