

## **ELECTRICITY IN CORNWALL – PART 1** **CAMBORNE & REDRUTH TRAMWAY**

by **Eric Edmonds**

*Eric Edmonds is a member of both our Society and the Trevithick Society in Cornwall. Eric has written a considerable thesis consisting of 6 articles in the Trevithick Society Annual Journal No.29 and he has agreed that we can extract extensively his material for two supplements of our newsletter, now in December and the second edition in April 2003. The first such supplement, Part 1 is as titled above and Part 2 "Cornwall Electric Power Company" (CEPCo). As you will read there are three elements in this story of early electricity supplies in Cornwall, which are intertwined, Supplies to Mines, Supplies to Tramways and Public Electricity Supply, all by Edmundson's. It is highly appropriate to publish this article at this time in the year 2002(just!) to celebrate the Centenary of the inauguration of the Tramway in 1902.*

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### **First Use of Electricity in Cornwall**

The first industrial use was undoubtedly by primary cells supplying telegraph circuits such as the Truro-Penzance line opened in April 1859. However 'the electric light' as it was called, was demonstrated as early as 26<sup>th</sup> Sept. 1850 by Mr.J.N.Hearder in a lecture on Batteries to Truro Literary Institution. A Staites arc-light was fixed to the Assembly Room tower and lighted up adjacent land-marks and far down the river as Tolverne (2miles).

The first sub-marine telegraph cable from Porthcurno to Lisbon, Gibraltar & Malta was in service in June 1870, so a bank of primary cells must have been used there initially, though by 1906 they had an engine & dynamo charging a bank of secondary cells, which also supplied the offices & quarters. Perhaps the first use of plant was at the Lizard Lighthouse, where Trinity House installed generators to electrify the navigation light on 28th March 1878.

In 1879 the Redruth Rifle Corps Supper was held under electric lights and on the following day, a floodlight match was arranged by Redruth Rugby Football Club. The generators for both functions were provided by C.W. Probis & Co of Manchester. Mr. Probis being a Redruth boy. The football match was lit by two 12,000 C.P. and two 2,400 C.P. lamps, 13<sup>th</sup> January 1879. The butcher's shop of W.Williams in Redruth was lit in 1891 and between 1890-92 part of the house of Mr.R.H. Michell was supplied by a wind generator.

In November 1892 Broad & Co, Drapers, installed five arc-lights and a noisy gas engine to light the Arcade between Fore St. & Penryn St., Redruth. The coming-of-age of Mr. A.R. Bassett was celebrated by flood-lighting the grounds of Tehidy House in 1894 and also the rebuilt Tabb's Hotel, Redruth had electric light installed.

### **The First Supply Companies in Cornwall**

The Devon and Cornwall Electric Light and Power Co. was incorporated on 12.5.82. They planned for supplies in Exeter and Penzance, including manufacturing, generation and distribution, and marketing. They had an agency for the items manufactured by Mr. Brush, but were wound up in 1883.

Veale & Co. Ltd. were the first in the field, supplying St. Austell town in 1886, whilst the Mevagissey Electric Supply Co. Ltd. claims to be the first to provide public lighting in 1895.

### **Private Installations**

There were obviously a number of private installations, which were not publicized, but quite a few were, incl. :-

1898 Poldhu Hotel, Mullion- Being built and will have oil engine for dynamo. Mullion Bay Hotel-Dynamo for lights and ext'n down to harbour & pier.

1898 Lanhydrock House, Bodmin - Drake & Gorman installed wood-fuel boiler, engine & 100v dynamo for lighting. SWEB supply after 1948.

1902 Polwbele, Truro -Dynamo driven by waterwheel.

1903 Prideaux House, Padstow - Lighting plant.

1904 County Mental Hospital, Bodmin - Two Belliss & Morcom type C3 steam dynamo sets.

1908 Porthgidden, Feock - Generator at Harcourt Fm.

1910 Truro Skating Rink - Now the "Hall for Cornwall". Sale Notice stated "lit by electricity".

c1914-21 Mullion Airship Station - Sale Notice included Campbell SG engine, one 10kW & two 40kW dynamos.

1920's St. Michael's Mount - Ruston petrol engine, dynamo & battery for lights. SWEB supply by 11kV cable across causeway soon after 1948.

1921 Tregothnan - Installation by CEPCO contracting department.

## **Water Power for Generating Electricity in Cornwall**

Water has been used for years in Cornwall to drive mills and machinery, but only to a small extent to produce electricity. Records survive of a number of interesting proposals and schemes, which were actually carried out -

### Mines, industrial consumers and private houses

In 1890 Tregeagle Mine, Trevenner, installed a 180 HP Escher Weiss turbine, 73ft head, to drive the pumps and ropeway. By 1907 it also drove a dynamo for lighting and later a 16ft double vertical British Empire turbine was installed, which drove two dynamos 54kW & 6kW, but closed in 1912. Northwood Clay Pit on Bodmin Moor had a turbine driving a dynamo from 1908 until it closed in 1914. Moresk Mills, Truro generated their own supply by water from around 1905. In later years they exported their surplus to the Truro LV network, until they closed. Magdalen Mine, Ponsanooth, near Redruth had a Gilkes Francis-type reaction turbine from 1913, driving machinery and a small dynamo until the mine closed in 1930. Loggans Mill, Hayle, installed a Francis-type turbine to drive an alternator. In 1904 W.Visick & Sons, Basset Works, Devoran, near Truro built a new dam across Mellingey Creek and erected on it an undershot waterwheel to drive lathes, etc, and also a 5kW dynamo for lighting. Wheal Martha, Luccett was reopened in 1947 as New Consols, with water power used for generation, but evidently to no great extent, if at all, before the mine closed in 1954. There were other premises supplied by water power, including Trecarrel Mill, Launceston, and Addicraft Mill, near Rilla Mill, Liskeard.

### **Public Supply Companies**

The Camborne ESCo Ltd. obtained the 1899 ELO to use water from the Polstrong Stream, but nothing came of this scheme and Camborne ESCo and the 1899 ELO were acquired by Edmundsons in 1910 for Urban ESCo.

Bickford Smith, Ponsanooth evidently had a water power scheme at Kennal Vale. The CEPCo records show an entry on the sheet for the Carnon Valley for a 10kV wood pole line reading "Transfer from Ponsanooth Water Power Scheme & HT Mains Suspense A/C. £21.15.0", being between 1914 and December 1916.

Penryn ESCo Ltd started a non-statutory supply in 1915, using the waterwheel at Tresooth Mill to drive a dynamo, until it was replaced by a Fielding SG engine.

### **Tidal Generation**

The Cornwall Electric Power Syndicate Ltd. considered tidal generation at Hayle before applying for the Cornwall Electric Power Act, 1902, but decided against it. In 1931 Tidal Energy Ltd. applied for approval of a scheme to use the River Gannel at Newquay for tidal generation, by means of a dam across it, and on which there would be a road, but this

application was refused by the Board of Trade.

### **Edmundsons Electricity Corporation**

This Company was registered on 7.4.1897 and took over the assets of Edmundsons Ltd, on the following day. They formed the Urban Electric Supply Co Ltd In 1898, for the purpose of obtaining Parliamentary powers to work electric lighting and tramway undertakings in various places in England and Scotland.

### **Prospectus of the Urban Electric Supply Co. Ltd.**

On 25th June 1901, it opened a Subscription List for the raising of Share Capital totalling £500,000 for the construction of generating stations and associated works in various towns and districts, for which it had acquired parliamentary powers.

The proposal for Camborne and Redruth was a combined lighting scheme and tramway. The parent company, Edmundson's Electricity Corporation Ltd. undertook the construction of the works under separate agreements each dated 6.2.1901.

The Engineer's Report supporting the prospectus had a paragraph, which may cause some amusement :-

'Camborne and Redruth are two important towns in Cornwall .... Camborne has the larger number of inhabitants, but is devoid of good shops, so that almost its whole population is forced to come for its shopping to Redruth, which is a market town with excellent shops. There are houses on both sides of the road the whole distance between Camborne and Redruth and some of the chief mines in Cornwall are along the route.'

Edmundsons had also undertaken to subscribe or procure subscriptions for the whole issue.

### **Opening of the Carn Brea Branch Office**

In 1901 Mr. F.S. Hanning was appointed Engineer and Manager of this branch of the Urban Electric Supply Co. Ltd., with Mr. J.E. Edmundson as Assistant Electrical Engineer. He was drowned bathing at Hayle in September 1911. On 6.12.01 two contracts were signed between the Urban ESCo. Ltd. and Edmundsons.

1. Generating Station and Distributing System - £38,500 - Sub-contract to Callenders Cable & Construction Co. for the cable system.
2. Tramway - £35,000 - Direct labour for track and overhead conductors, Sub-contracts to G.E Milnes, Birkenhead. for the tramcars and to B.T.H. for the control gear and motors.

### **SEE APPENDIX 1 for Carn Brea Generating Station**

### **L.V. Cables**

These were laid by Callenders Cable & Construction Co. Ltd, and were of the system known as "Vulcanised Bitumen" or VB laid in wooden troughs. They consisted of Tramway Feeder, Lighting Feeder, Lighting Distributor Telephone and pilot cables and

spare duct for future H.V. cable. The snag soon became apparent that the Distributor cable, which was on the inside of the footpath, should have been laid 6inches higher and not at the same level as the others. This meant that a rather elaborate service connection was required.

### The Track

The laying of the track started on 7.4.02. and the men were paid 4d/hour. They struck on the next day - refused 4 1/2d and then settled for 5d/hour after one hour. No strike has occurred in electrical distribution in Cornwall since that day, not even during the General Strike of 1926. The track was 3ft 6inch gauge, the rails spaced by tie-rods, 8ft apart, and was all single track with eight loops and double tracks at each end. It was in the centre of the road, to B.O.T. requirements. The sharpest curve was 40ft radius and the steepest section 1:15 on East Hill. The rails were laid on 6inch of concrete, with 5inch x 4inch stone sets extending 16inch on either side of each rail, with macadam between and outside. These rails, weighing 83lb/yard as well as the steel trolley wire poles, were shipped in through Portreath. The "Neptune" type bonds and the 50lb fish plates were supplied by Dick Kerr & Co. The various points and the railway crossings, across the North Roskear, North Crofty and Portreath branches of the G.W.R., were supplied by the Steel Casting Co. Whilst the track was being laid down East Hill, Tuckingmill, a traction engine got too near to the north side and the nearside rear wheel went over the edge of the wall, blocking the road for over 24 hours.



Fig.1 Track Laying in 1901

### The Trolley Wire

This consisted of duplicate 0.324" diam. H.D. copper (Standard Gauge 0) attached to insulated hangers which were on the plain bracket fixed to steel pole. All these poles were on the north side of the road, except between East Hill and the depot, at Rounding Walls and over the double tracks. Here the insulated hangers were suspended on strung wires, which were erected

by means of a Rawlinson Trolley Ladder (horse-drawn). Single wires went into the depot and into the two mines.

In 1913 a system of signalling lights was added at exits to loops at Roskear, East Hill, Illogan Highway and Barncoose. The trolley arm made contact with a copper strip, which energised a relay and so altered two 240 volt bulbs in series, thus indicating whether or not a tram was coming in the opposite direction on that section of single track. At Commercial Square and West End, the trolley arm had to be swung around to trail for the return journey, a rope being attached for this purpose.

### Supply to Trolley Wires

One traction cable was laid from the generating station to Camborne and the other to Redruth. The B.O.T. requirement was that the overhead wire was split into sections of less than 1/2 mile and these sections were fed by cables teed on to the traction cable and connected through cast iron boxes on certain poles, as under :-

- |                            |                                      |
|----------------------------|--------------------------------------|
| 1. (a) Depot               | 2. (e) Depot                         |
| (b) Pool Chapel            | (f) Pendarves Street,<br>Tuckingmill |
| (c) Illogan Highway Chapel | (g) Wesley Street                    |
| (d) Blowinghouse           |                                      |

### The Tram Cars

Initially there were six – Nos. 1 to 4 open top deck, Nos. 5 & 6 single deck. The open-top units were to the Bellamy Reversed Staircase pattern, with three windows and unvestibuled end canopies with a sliding door to the driving position. The reversed stairs to the upper deck gave some weather protection to the driver, but restricted his view on the near side. The seats were hole-pattern plywood and those on the top deck had swing-over back. The top deck had a two bar railing and decency boards, which formed the base for advertisements. A column at each end supported a light, which also covered the stairs.

The trolley arm pole was on the north-side of each car to be near the street poles carrying the conductors. Contact was by a copper wheel on the end of the insulated and internally sprung trolley arm, which moved round the trolley pole. This arm had to be trailing when running and so had to be reversed with a rope by the Conductor or Brakesman at each terminus. The capacity was 48 persons - 22 below and 26 above. They were 28ft long x 6ft 3inch wide. with 6ft 6inch interior and weighed 11 tons and were built by G.E Milnes of Birkenhead and had the Milnes girder truck or bogey (of German design) with two 25 H.P. motors driving through enclosed gears all being standard B.T.H. design. There were controls at each end, the first four notches connecting the two motors in series, and then in parallel with regenerative braking. The brakes on the wheels had cast iron shoes, slipper brakes were added following the B.O.T. Inspector's recommendation being Milnes pattern.

The two single deck cars had short two window central saloons and back-to-back cross bench seats behind the platform at each end. The outer seat was thus very close the Driver. The girder truck was identical to the others. The central trolley pole was mounted on the clerestory roof and there were 34 seats. These were known as the American cars as this pattern was in common use out there and were used to supplement the service.

The colour scheme was dark green and cream with the name in gold and crimson blocking and thick gold framing around the panels. The front and rear lights were lit by a change-over plug, which also lit the light over the staircase. Later when expenses were rising, the cars were painted green only. All cars were fitted with Jerrard's Automatic Track Cleaner, which was a length of iron with a shaped end, attached to each bogey.

### The First Supply on the Network

The first consumers were connected in August, 1902. A public Lighting Agreement was signed on 15.5.02 with the Redruth U.D.C. for 2 Arc Lamps, 28 all-night lamps and 148 ½ night lights, which were connected by 1903.

### Opening of the Tramway

The members of the Camborne and the Redruth Councils were taken for rides on the trams on the 1.10.02, and the B.O.T. Inspector made his formal inspection on 25.10.02; passing the whole tramway for use, except for a recommendation on slipper brakes. On 7<sup>th</sup> November, 1902, 200 local dignitaries were invited, with Mrs. Wigham, wife of an Edmundson's Director, the guest-of-honour. After lunch, they were all taken for a trip and then the cars went into normal service. The crowd at the depot were given tea and sandwiches.

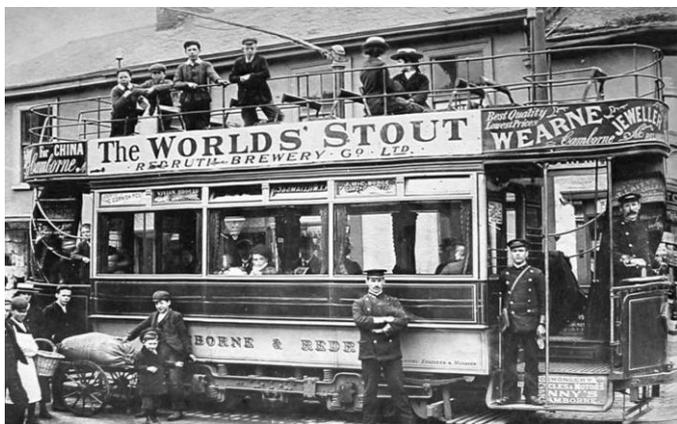


Fig.2 Electric Tram – Redruth to Camborne

### Timetable

At 5.30am the Miners' Special, then half-hourly with 4 cars to 8.00am, then quarter-hourly with 6 cars. On Fridays the service was every 7 minutes, 2.00-7.00 p.m. and to 9.00pm on Saturdays. The last through tram from either end went at 11.05pm and then back to the Depot. The time for the full journey was 23

minutes and the fare initially 2d. Extra trams were put on for holiday and big football matches - all County Rugby matches being then played at Redruth.

Special cars could also be ordered, but owing to the single line, such passengers had to be very careful to be at the agreed place by the agreed time. Clocks were installed in the waiting rooms in Camborne and Redruth, being carefully checked each day. A parcels service was provided, conducted by a special porter. The "pasty special" was the 12 noon from Redruth. and bicycles could be carried on the front platform of any tram for 6d until 1918. From February 1904, a letter box was attached to specific trams at the rear, with a G.P.O. sign on the near side top deck rail, and from that date also the G.P.O. mail was picked up daily from Pool Post Office.

Inevitably, there was rowdiness and overcrowding, particularly at night. The "Electrical Times" of 4.2.04 reported that notices had appeared in the trams :- "The Camborne public will confer a favour on Urban ESCo, the Camborne Council and themselves, by not over-crowding the cars. Wait until the next." They added the comment that they hoped that Urban ESCo was willing to meet the Camborne public half-way by providing extra cars at times of peak load. However, this trouble continued, and in 1909 by-laws were introduced for operating the tramway and the rights of passengers.

### The Mineral Line

Following the failure of the electric telfer in the 1890's, East Pool Mine had had to revert to carrying their tinstuff to Tolvaddon Stamps by horse and cart, and this was inefficient and costly. On 13.5.03. Urban ESCo signed an Agreement with the East Pool and Agar United Mines Adventurers to carry their tinstuff on the tramway at 6d/ton over the weighbridge, to provide 24 hours storage of 200 tons; the mines providing the labour for loading and unloading. Two open locomotives were purchased based on the same Milnes bogey, 2 x 25 H.P. motors, and 14 wagons - eight 2½ ton and six 3 ton.

The Agreement provided for these trains to be run between 7.00 a.m and 5.00 p.m. daily. except Sundays, Christmas Day and Good Friday, and the cost was increased to 6 1/2d/ton in 1911. East Pool was the only cost-book company with which the Urban ESCo had any Agreements.

### Staff

The first Engineer in charge of the Tramway was Mr. F.T. Crow, who was killed in a motor-cycle accident in 1913 and was succeeded by Mr. H.S. Sowell. There were two Inspectors and initially eight Motormen, one of whom. Mr. Joe Smith, served right through from 1902 to 1934. Normally there were eight and two spare, each with a Conductor, as permanent pairs. The uniform was dark blue with green piping, and designation on a peaked cap. The jackets were of the

chauffeur cross-over type, but later loose fitting single-breasted tunics were issued. The Motormen were also issued with waterproof capes fastening up at the back, and wooden shoes. Mr. R.D. Gill, an Assistant Engineer on the supply side, had left to join Cornwall Consolidated Tin Mines Ltd. around 1906 as Superintending Engineer. Mr. H.G.Vowles joined the staff around that time.



**Fig.3 A Tram competing with old transport**

### **Maintenance of the Tramway The Track and Main Road**

The condition of the road alongside the rails had been a continual cause for complaint from the County Council from the start and in 1910 the Board of Trade Inspector was called in. He adjudged the Company had failed to comply with conditions of the Camborne and Redruth Tramway Order 1900. An Agreement was made on 24.10.10 with the County Council, to relay the tramway by the original contractors and the track to be laid on new foundations, with Macadam inside and outside the rails at a higher level for 2,800 yards. The Company had also to pay the County Council and Redruth U.D.C. £200/annum for maintenance. A further Agreement was signed on 14.7.22 when the annual maintenance payment was raised to £400/annum.

### **Trams and Trolley Wire**

The Company was virtually self-reliant for all repairs, and all work on the trams and locomotives was done at Carn Brea. Tram bodies were repaired and painted and the wooden frame of at least one open-deck tram was almost completely replaced due to wet rot following the ingress of water between joints of the panels. A pair of beam jacks was used to lift the body clear of the bogey, after removing the bolts. Routine overhauls

were carried out on the bogies. The wheels had new tyres shrunk on and skimmed in the lathe and commutators were also skimmed, when beyond the wear that could be dealt with by the commutator grindstone. The tyres, bearings and brake shoes were all cast in the depot and this foundry work was later extended to include parts for 10kV Switchgear. All trolley wire inspections and repairs were carried out using a telescopic tower wagon. There was a water tank for softening mud in the rails, a track tool truck, which was towed out behind a tram and then lifted off the rails, and also a 4-wheel "ambulance" to deal with cases of broken axles.

### **Accidents on the Tramway**

The B.O.T. requirements were for the track to be in the middle of the road and this led to several accidents over the years. On 29.11.02 at Barncoose, a man was run over and died following the amputation of a leg. In 1905 a 2 1/2 year old child died after falling under the lifeguard and in 1907 a blacksmith on a bicycle was knocked over at Foundry Lane. Horses were often frightened and on one occasion a pony in a trap bolted, resulting in a lady being killed, two persons injured and itself also being killed, when it collided with a trolley-wire pole. On 16th January 1926, a 13-year old part-time parcel boy, son of one of the Inspectors, was injured near Camborne by a motor cyclist, as he alighted as a passenger, and died from his injuries. On 8.6.08 a conductor was removing the trolley rope from the standard, prior to swinging the arm around at Commercial Square, when the rope was caught by the head of a man riding on the top of the outgoing tram. He suffered a contused wound on the neck and severe bruising of the larynx.

### **The Great War, 1914-1918**

The introduction of the dim-out and the need to connect motors in various factories, which had turned over to munitions, somewhat curtailed the connection of domestic consumers. The call-up of men affected the Urban Company, so that conductresses were recruited. They were issued with breeches, leather leggings, coats and soft caps. They continued in service until 1920, by which time there was a bit of local comment, as so many men could not find work.

### **The Camborne & Redruth Tramway Ceases to Operate The Passenger Service**

In 1919 the Directors had considered proposals for the establishment of Bus Services to protect the Tramway, but the outlay required. £5,750, was not available. The post-war depression reflected on the takings and, following the grant of an increase to Drivers by the Tramway Court, an application was made to the B.O.T. to increase the fares and a 100% increase was authorised for six months in July 1920. The service was reduced by running every half-hour on week-day evenings, the last car going at 10.30p.m. The losses continued and the position was worsened in 1926 when the Cornwall Motor Transport Co, started running a pair of single-deck buses, with starting times a few

minutes before each tram. By September 1927, the losses for the year were already £1,500. The Tramway was offered to the Council, who declined to take it over. The trams and the track were by now worn out and re-equipment was essential if it was to continue. The Directors gave notice of intent to close it on 29th September 1927, and that the 10.30p.m. from each end would be the last to run. Earlier in the evening extra trams were run, to give everyone a chance of a final ride. Needless to say, the School of Mines students were to the fore at Camborne. The last tram duly left, with musical honours, and about 138 persons aboard. It was reported at the time that Mr. S. Harvey was the driver, but recently it has been stated that Mr. Ernest Wallace was driving. Mr. Hards took over at Roskear and drove it into the shed.

So ended the only electrical tramway system in Cornwall. In 25 years the trams had travelled 3,600,000 miles and carried 32,000,000 passengers, with a reputation for punctuality. There were no offers to take over the tramway and soon all the trams were broken up for scrap, though one body survived for years as a greenhouse. The motors and controllers were bought by a local concern and then sold to the Bristol Tramway undertaking as spares. Some of the drivers and conductors got jobs with the C.M.T., whilst others not required on the Mineral Line, were transferred to other jobs, mostly in the Engineering Department.

#### **Mineral Line Carries On**

East Pool Mine closed in February 1921, when the Mitchell Shaft collapsed and the result was that the Mineral Line also closed until December 1923, when the new Taylor's Shaft was in production. The new Substation beside Taylors Shaft Compressor House was established with the following plant :- a 1200cfm Holman Compressor with 215 HP motor and its twin from Grenville with 230 HP Motor and running under automatic control. A new Agreement was signed on 31.10.23. The new terms were 7d/ton of tinstuff up to 85,000 tons/annum, then 6d/ton up to 280 tons/day. If over 280 tons/day, the Mine to pay full cost of additional equipment and rolling stock, with a limit of 420 tons/day and a condition that no other concern could carry any of this tinstuff to Tolvaddon. When the passenger service closed in 1927, the Mineral Line continued to operate. When the second depression started in 1930, nine power consumers were closed down by the end of October, namely Cornish Tin Smelting, Geevor, Jantar at Porkellis, Levant, River Tin at St.Erth, South Crofty, Treskillard Minerals, Wheal Kitty and Wheal Buller. East Pool had discharged 2/3 of the men and was working one shift only with a corresponding reduction on tinstuff to be moved to Tolvaddon. By now the Mineral Line and equipment was in a poor condition and a financial embarrassment to the Company with the additional cost of change of frequency in 1933.

The last agreement was made in 1933, in which the Mine was required to pay the entire running costs, plus

£900/annum. The mine decided to build an Aerial Ropeway from alongside the crusher direct across the fields to Tolvaddon. This was driven by a 20 H.P. motor and capable of 40 tons/hour. The Mineral Line was closed in August, 1934, after 30 years mining and had carried 1,300,000 tons of tinstuff, The remaining trolley wires were dismantled, the locos and trucks sold for scrap, and the track was gradually pulled up. The steel poles were used for street lights and later sold, the local councils using them for years. The Aerial Ropeway continued in service until East Pool finally closed in 1947, and was far more successful than the unfortunate Telfer Line (an overhead conveyor) between 1889-92.



**Fig.4 Carn Brea Generating Station & Offices**