PENWYLLT HAULAGE

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The question of transport of material has recently occupied the attention of engineers in almost all branches of the industry. Among the many devices for overcoming the difficulties incidental to such transport, amongst the most efficient is rope haulage on the endless rope, main-and-tail, and other systems which have been in use for some years in the underground conveyance of coal. At the Penwyllt Dinas Silica Brick Company Ltd works, where a quantity of sand was required to be conveyed a distance of two and a quarter miles over very uneven country, transport was originally effected by means of a mountain railway (4ft $8^1/_2$in guage) four and a half miles long, which followed the main line for one mile, and then took a zigzag course up the mountain side for the remainder of the distance.

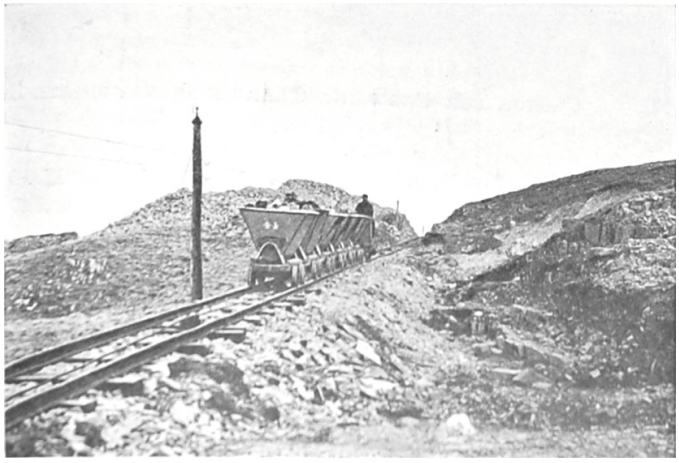
On account of the heavy and irregular gradient, this arrangement was found to be slow and expensive and Mr Kershaw, the managing director of the Penwyllt Company, called in Mr Alfred W Lewis, consulting engineer, of Merthyr Tydfil, who has designed some of the heaviest hauling plants in South Wales, to consider the question of bringing the sand down from the pits to the mill by means of a light tramway. After due consideration of the exceptionally rugged country and trying gradient, which rises 535ft in a distance of two and a quarter miles, it was decided to adopt a special system of endless rope haulage on account of its low initial cost and its economy in working.

A light tramway was laid down to a 2ft 3in guage with steel rails 40lb per yard, screw-clipped to the creosoted sleepers. The haulage is divided into two sections, connection being effected by means of a Heywood and Bridge's improved patent friction clutch installation at the mills. The power is transmitted from the engine to a cast steel pinion with double helical teeth which gears with a large cast steel wheel on the second-motion shaft. On this second-motion shaft is keyed a taper haulage pulley fitted with brake gear. The rope is taken four times round the haulage pulley and over the tension pulleys, and is led on to the tramway after passing through an oil box for lubricating purposes. Contrary to the usual practice the line is laid down with a single pair of rails between which both the outward and inward rope run on cast steel sheaves. In a haulage of this length there are of course many bends which are negotiated by the rope by means of the usual upright angular sheaves.

Terminus at the Works

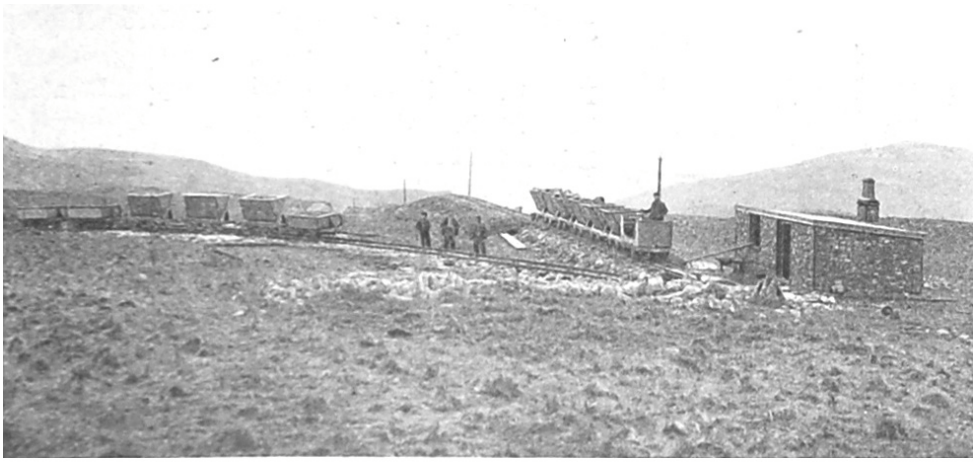
On the end of the first section of the tramway the rope again winds round a taper tread haulage pulley. On the same shaft another haulage pulley fitted with a Heywood and Bridge's improved patent friction clutch drives the second section of the haulage, the object of the clutch being to disconnect the two portions so that the limestone quarry which is at the intermediate station may be worked independently from the silica sand pits. From this intermediate station the rope is taken up to the sand pits, 1¼ miles away and there passes round a sheave fitted with tension gear. By this arrangement of dividing the line into two sections a considerable amount of wear and tear is saved on the rope, it being so arranged that the upper length of rope is not put into

operation until the journey of trams has arrived at the intermediate station. The clutch is put in and out of gear by means of a hand wheel from the platform which forms the junction for the limestone quarry.



View of the Line

Telegraphic communication is provided between the journey and the engineman in the following way:- The driver of the gripper car makes contact between the two wires by means of a short iron rod. This completes the circuit and rings a bell in the engine-room at the mills. A code of signals is arranged for stopping and starting and also to indicate if the driver wishes to be placed in telephonic communication with the mill. For this purpose he carries a movable or field telephone which can be applied to the wires at any point on the route. By this means any defect or accident which may occur is at once communicated to the man who is responsible for the proper working of the system. This provides for rapid attention to breakdowns and is a valuable factor in the efficient working of the system. The arrangement is found to work very satisfactorily.

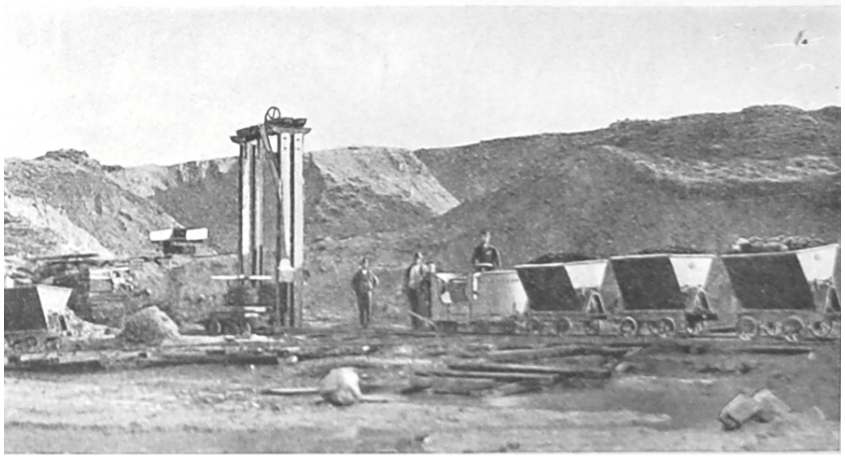


Branch Line to the Limestone Quarry

No difficulty is experienced with the ropes (patent flattened strand), which were supplied by Messrs Latch and Batchelor of Birmingham, and the hauling gears, which are entirely the work of Messrs David Bridge and Co, Castleton Ironworks, Manchester, and are found to be quite equal to the demand made upon them. The friction clutch at the intermediate station, which is responsible for the transmission of power from one section to the other, starts the load gradually but without slip once the two friction surfaces are revolving at equal velocity.

Terminus at the Silica Quarry

The gripper car* is of special form, designed by the consulting engineer, and is constructed of mild steel plates, angles and "L" sections. In the centre of the body of the car an upright steel box contains the screws for the two grippers, which are so arranged to grip either the ingoing or outgoing rope. The box also acts as a support for their trunnions when the grippers are in working position. The grippers themselves are interlocked so that when one of them is in use the other is kept clear of the sheaves which carry the rope. Lateral movement is given to the gripper by foot-levers, for gripping-on or taking-off, and vertical movement by a hand-wheel actuating a screw.

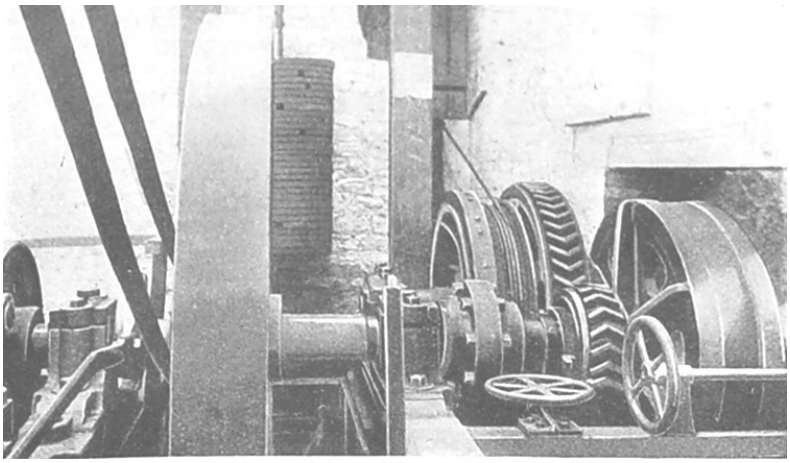


Terminus at the Silica Quarry

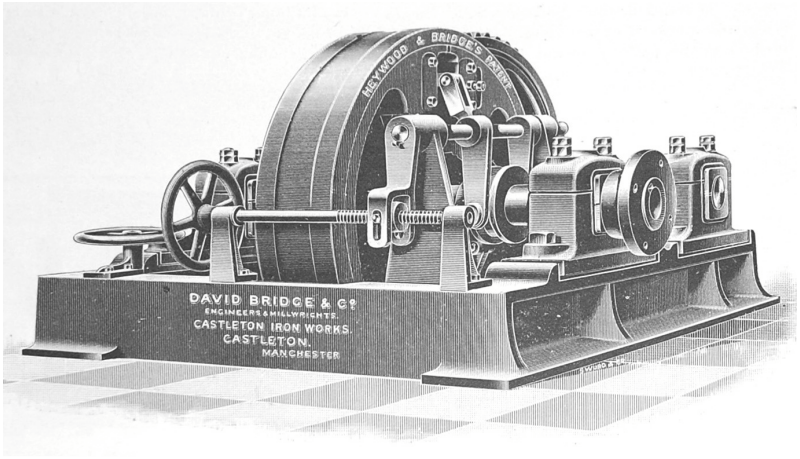
The working load on the rope is 20 tons and each tram carries 25cwt. The trams for conveying the silica sand are side-tippers. For the limestone they are open at the side but are tipped on a tilting table. When the journey arrives at the crushing mills, the trams containing limestone are run on to a gantry to be tipped into the railway company's wagons and into the stone crusher which is of the usual form for crushing limestone for road-metalling and other purposes. The trams which have brought down silica sand are tipped direct into the crushers which grind up the sand according as it is to be used for the manufacture of silica cement and silica bricks.

The cost of transport when in full work by the new method is 2d per ton, as compared with 1s 4d per ton by the old railway. These figures are sufficiently significant of the saving which can be effected in many instances by the adoption of modern methods of transport. A saving so great as this may easily, and in most cases would, spell the difference between profitable and unprofitable working. There must be many similar undertakings where the greater part of the profit is being swallowed up by wasteful and inefficient transport of material.

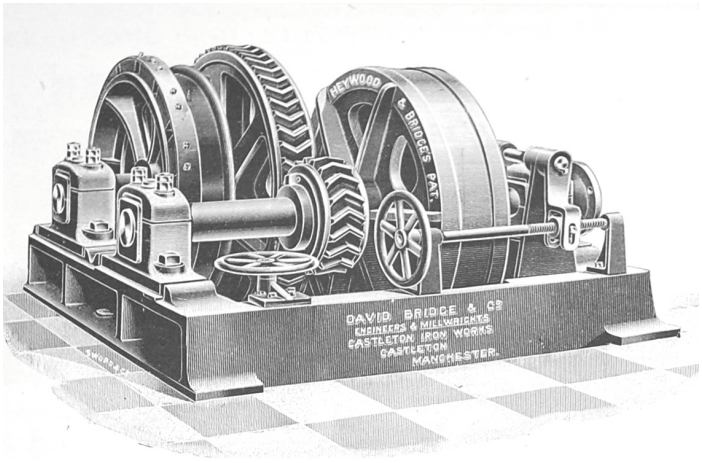
* The gripper car and trams were supplied by Messrs Kerr, Stuart and Co of London.



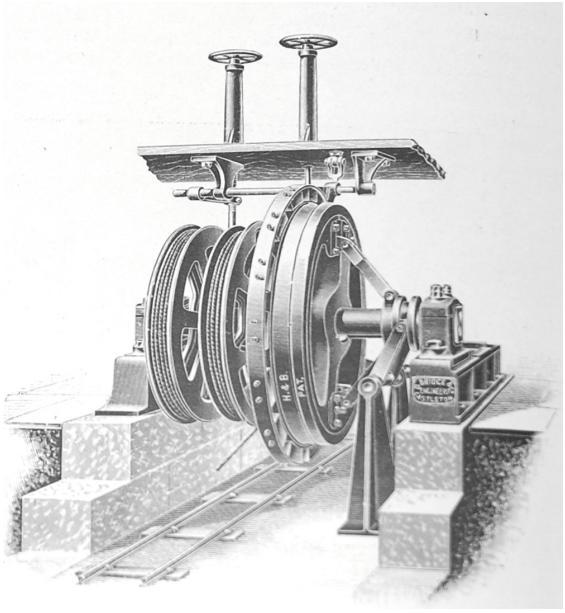
Hauling Gear Inside the Engine House



Hauling Gear



Hauling Gear



Clutch for Changing Gear at Intermediate Station

Assembled by Brian Jones 2008