



Philosophical Magazine Series 2

ISSN: 1941-5850 (Print) 1941-5869 (Online) Journal homepage: http://www.tandfonline.com/loi/tphm13

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To cite this article: Philip Taylor Esq. (1827) L. Description of a horizontal pumping engine erected on the Mine of Moran in Mexico, Philosophical Magazine Series 2, 1:4, 241-245, DOI: 10.1080/14786442708675579

To link to this article: http://dx.doi.org/10.1080/14786442708675579



Published online: 10 Jul 2009.



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THE

PHILOSOPHICAL MAGAZINE

ANNALS OF PHILOSOPHY.

[NEW SERIES.]

APRIL 1827.

L. Description of a Horizontal Pumping Engine erected on the Mine of Moran in Mexico. By PHILIP TAYLOR, Esq.

[With an Engraving.]

To the Editors of the Philosophical Magazine and Annals.

Gentlemen,

THE first steam-engine erected in the Real del Monte, was put in action on the 12th of last August, at the Mine of Moran. So novel a sight to the natives of Mexico, naturally attracted vast numbers of all ranks; and having heretofore seen no other means of raising water from their mines than such as were adapted to the comparatively feeble power of men or mules, they were of course astonished at the gigantic and untired efforts of one of these great servants to the arts.

As this engine differs in construction from any hitherto employed for pumping water, a short description of it may interest your readers.

I believe no doubt was ever entertained by those competent to form an opinion, that, if steam-engines could be transported to the mines of America, and fuel found to work them, such mines as admitted of their application would become far more productive. The difficulties anticipated were as to the conveyance of such ponderous machinery over so rugged a country, and as to the erection of it when arrived on the spot.

To obviate these difficulties as much as possible, I endeavoured to invent a powerful engine which at the same time should consist of such parts as would be easily conveyed, and so constructed that it could be erected and put to work without the usual labour and expense of building an enginehouse, &c.

New Series. Vol. 1. No. 4. April 1827. 2 I In

242 Mr. P. Taylor on a Horizontal Pumping Engine

In Plate I. is a section (fig. 1.) and a plan (fig. 2.), showing the principal parts of the engine now at work on the mine of Moran,—which was constructed by Messrs. Taylor and Martineau.

A A. The foundation on which the engine is fixed, being merely a level bed of masonry, with pieces of timber introduced to receive the bolts, &c. which hold down the engine.

B B. Two cylinders, each 10 feet in length and 18 inches interior diameter. These are fixed in a horizontal position and exactly parallel to each other, by means of the four castiron saddles CCCC, which embrace both cylinders, and are secured to the foundation.

Each of these cylinders has a metallic piston; one of which is shown (a) fig. 1. and it will be observed that both the pistons are fixed on the *middle* of the piston rods DDDD, which work through stuffing boxes at each end of the cylinders.

E E. Two strong cross heads, into which the four extremities of the piston rods are firmly fixed.

FFFF. Four friction wheels fitted on the ends of the cross heads. These wheels are grooved on their edges and traverse between parallel guide rods, which are kept in a state of tension by the screws at their extremities GGGG, their other ends being made fast to the saddles CC, which confine the cylinders.

H H. The connecting rods attached to the cross heads EE, by which the power may be applied to pumps placed either at one or both ends of the engine.

I I. The tappet rod fixed also to the cross heads E E, by the reciprocating motion of which the valves are opened and shut.

J J. The passages in the valve nozles to admit steam from the boiler.

K K. The passages through which the steam escapes after it has given motion to the piston.

The steam entering through the passages JJ, is admitted by the action of the values (b), to both cylinders at the same instant through the cross passages LLLL (fig. 2.) While in like manner the steam from the opposite ends of both cylinders passes off through the passages K K.

The pistons are 18 inches in diameter, and make a 9-feet stroke. The boilers attached to the engine are calculated to supply them with steam of a pressure equal to 50 pounds on the square inch with perfect safety.

The speed of the engine is regulated by a cataract, and the valves are so arranged as to allow of its being worked expansively or otherwise, as circumstances may render desireable.

Phil. Mag. & Annals, N.S. Vol. 1. Pl.1.



Fig.1.

W.H.Treffry del.

M."Philip Taylor's Horizontal Dumping Engine .

Erected on the Mine of Moran in Mexico.

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able. These parts cannot be shown in a drawing on a small scale.

The arrangements which are more especially novel in this engine are, the mode of combining the effect of the cylinders, and the carrying the piston rods through both ends of the cylinders.

The horizontal position affords a facility of concentrating the power derived from even 4 or 6 cylinders upon one point, and the carrying the piston rods through both ends of the cylinders has the effect of preventing the weight of the piston from producing unequal friction, owing to the state of tension in which the rods are constantly kept.

It is obvious that with an engine thus constructed, the power may be divided and applied at each end; or it may be directed wholly to one end, by attaching at the opposite extremity a balance bob, or beam with a weight equal to half the power of the engine.

A common pumping engine with a beam requires that the engine-house should be built close to the mouth of the shaft in which the pumps are placed, which is often attended with much inconvenience. The engine above described may be merely covered by a shed, and this placed at any convenient distance from the shaft. As mining engines are often removed from one situation to another, the greater the facility of fixing them, and the less masonry required, the more will time and expense be saved.

The engine which I have described, with three others built in Cornwall under the superintendence of Mr. Woolf, and a complete out-fit of founders', engineers', and millwrights' tools, implements, &c., also saw-mills and stamping-mills, were shipped on board the Melpomene, at Falmouth, on the 30th of March 1825, and arrived off the coast of Mexico the 27th of May following.

The Castle of St. Juan de Ulloa, which commands the harbour of Vera Cruz, being at that time in the possession of the Spaniards, the cargo was obliged to be landed on the beach at Mocambo, a league to the southward, which could not be accomplished until the 10th of June, when the setting in of the rains, and of the unhealthy season on the coast, occasioned great suffering and the death of some of the transport party. These circumstances prevented the machinery being carried further than Santa Fé, which is about four miles from the coast.

Here Lieut. Colquhoun of the Royal Artillery, who had taken the charge of this most arduous enterprise, remained to recruit the health and strength of the party under his command, mand, as well as to procure mules and make arrangements for moving up the country on the return of the dry season. In the January following the great bulk of the machinery was forwarded by different convoys to a depôt on the table-land near Jalapa; and on March 31st, a train of 52 waggons, carrying the engine above described, with the various other articles, proceeded to the Real del Monte, and reached the Mine of Moran, on the 1st of May 1826. It has been already stated that this engine was in action on the 12th of August, an instance of dispatch which does great credit to Mr. Blackaller who had the charge of erecting it, under the orders of Captain Vetch, the first commissioner of the Real del Monte company.

The following particulars are from the letters of a gentleman who was present when the engine went to work.

"The engine went off in great style with 20 pounds steam, and very soon brought the water up to the launders to the surprise of the native spectators of all classes, who were greatly astonished at this visible proof of her power. In 40 minutes she lowered the water in the shaft 10 inches. Before connecting with the bobs, we had tried her friction as the boilers heated; she began to move with $2\frac{1}{2}$ pounds steam."

"From the 12th of August to the 7th of September the engine continued to work regularly, as far as the repairs of the shaft would permit; it being necessary to remove decayed timber, and replace it with new, clear obstructions, and drop the pumps from time to time as the water lowered. The average time of the engine working amounted to about six hours per day—the steam in the boiler being at 25 pounds pressure—worked expansively—the steam valve closing at about half stroke. At the above date the water was drawn out to the depth of 18 varas (the vara being nearly a yard)."

A later account mentions that on the 24th of September the water was lowered to 45 varas, which is one half the depth of the mine.

There is every reason to think from these statements that when this mine is once drained, it will be easily kept clear of water.

The fuel employed under the steam boilers is small oak with a little pine, which is so abundant that its cost will not exceed that for coals in Cornwall.

I am, gentlemen, yours very truly,

Jan. 22, 1827.

PHILIP TAYLOR.

P. S. The following is an extract from a letter addressed to Messrs.

Messrs. Taylor and Martineau, by Mr. J. Blackaller, and dated Real del Monte, Oct. 18, 1826.

"In the early part of May last I had the pleasure of having the erection of the first of your engines at the mine of Moran placed under my direction and superintendance; and on the 12th of August started the same, to the no small surprise and satisfaction of the numerous visitors who had assembled on the occasion. The engine has continued to work beyond our most sanguine expectations, not a thing having failed or required alteration.

"Our foundry has been at work a short time, and we have turned out some decent castings, both in brass and iron."

On the 31st of October, Captain Vetch also writes: "I am happy to state that Moran Mine may now be considered as dry; that is, the water has been sunk to the bottom of the shaft; but it will be necessary by means of flat rods to drain some of the *pozos* (pits or winzes) in the lowest level, to get at the rich ores."

LI. Analysis of a Sulphuretted Water from the Northern Part of the Yorkshire Coal-field. By E. S. GEORGE, F.L.S. Hon. Mem. Y.P.S.*

THIS mineral water is very extensively employed in the fulling of woollan cloths — a process to which form the fulling of woollen cloths,-a process to which, from the absence of earthy salts, it is peculiarly adapted. It formerly issued in a considerable spring at the village of Holbeck near Leeds, and was used medicinally: it appears in most cases to rise from a thick bed of shale lying below the flagstone, and so large is the supply that it has been procured in every situation in which borings to a sufficient depth have been made. There are in Leeds near fifty borings, and about 200,000 gallons of the water are pumped up daily. The depth at which the water is procured, from 70 to 200 yards, according to the situation of the well as regards the inclination of the strata. The amount of both gaseous and saline contents varies with the occurrence of higher springs, affected by heavy rains or by sudden elevations of the river Aire.

The water analysed was from Johnson's Well in Campfield, Leeds; the depth of the boring 90 yards: upon the surface is a bed of gravel about four yards thick, communicating with the river Aire, from which the well is about 200 yards distant: the water in the gravel is prevented from mixing with that in

^{*} Read to the Yorksh. Phil. Soc. Jan. 2, 1827; and communicated by the Author.