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An experimental inquiry concerning the relative power of, and useful effect produced by, the Cornish and Boulton and Watt pumping engines, and cylindrical and waggon-head boilers

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Introduction.

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INTRODUCTION.

HAVING been occupied at intervals, during the last three years, in making experiments upon the Cornish and Boulton and Watt Engines and Boilers erected at the East London Water-Works, Old Ford, I propose in the following Paper to record the results of my experience. To account for the delay in its publication I have to observe, that the results of the first experiments proving very discordant, I considered it necessary to repeat them, and continue them for a much longer period than I had in the first instance contemplated, in order to arrive at satisfactory practical conclusions.

My object in making these experiments has been to ascertain as accurately as possible the comparative value of the two engines as machines for raising water, to enable me to determine *practically* which is the best in a *commercial* point of view; and therefore, although I may be led to remark upon the *practical* results stated to have been arrived at by others, I shall abstain, as much as possible, either from noticing *theories* broached by others, or offering any myself, leaving every one to form his own opinions upon the facts stated.

As the Cornish Engine on which I have made experiments is the first, I believe, that has been erected and worked in London, the following short statement of the circumstances connected with its introduction may, I think, with propriety be made here.

In the spring of 1835 the Directors of the East London Water-Works Company contemplated making very considerable alterations in one of their engines at Old Ford, and it was then suggested by Mr. Grout, one of the Directors, that

instead of altering the engine in question, it should be taken down, and a Cornish Engine erected in its place; and he stated that the saving in fuel that would be effected by adopting his suggestion, would amply repay the Company for the increased outlay consequent upon the erection of a new engine.

I am told that but little reliance was placed upon the accuracy of this information: my opinion was, however, called for, when I stated, that although I had never seen a Cornish Engine at work, I understood the principle of its action, which my friend, Mr. John Taylor, had explained to me as far back as 1826; and I was also aware of the favourable views entertained by the late Mr. Watt, of the advantages to be derived from using steam expansively, and had therefore no doubt that the effect produced by the Cornish expansive engines was much greater than that produced by the non-expansive engines.

In August, 1835, I was instructed to visit several of the mines in Cornwall, for the purpose of obtaining information respecting the engines in use there; and although my report was highly in favour of them, the opinions expressed in favour of the *old* system, and against the *new*, advocated by me, were nevertheless so numerous, and of such high authority, that it was not until two years afterwards, in 1837, (upon Mr. Grout's information that a good second-hand engine was to be disposed of at a comparatively low price,) that I was instructed to proceed to Cornwall for the purpose of purchasing it.

I have made the foregoing statement, because I consider it due to Mr. Grout for the perseverance which he displayed. I would not, however, wish it to be understood that I consider his colleagues could, in opposition to the opinions of many professional men, have consented to embark the property of the proprietors in what *then* appeared to many a *mere* speculation, without great caution and strong presumptive evidence, amounting almost to proof, that the opinions of the few in favour of the project were correct.

The engine purchased by the Company, which had been worked about 12 months at the East Cornwall Mines, near Callington, had been designed by Mr. William West, and was a counterpart of one designed and erected by him at the Fowey Consols Mines, which performed the greatest duty ever recorded. In August, 1837, contracts were entered into with Messrs. Harvey and Co., of the Hayle Foundry, and Mr. William West, to take the engine down and thoroughly repair it, to make a new boiler, and alter the old ones, to make the pump-work, and the stand-pipe; and to convey the whole of the work to, and

erect it on, the Company's premises at Old Ford ; which work, when completed, cost about £7600.

The principle of working a plunger-pole loaded, discharging the water into a stand-pipe, and dispensing with the air-vessel, was suggested by me with a view of following out the Cornish plan as completely as possible. Messrs. Harvey and West approved the suggestion, and designed the machinery.

Messrs. Harvey and Co. were bound, under a heavy penalty, to effect an average duty during 12 months' regular work of the engine, equal to 90 millions of lb., raised 1 foot high, by the consumption of 94 lb. of good Welsh coals, which was accomplished.

In December, 1838, the engine was first started, and worked very satisfactorily, a great saving in fuel being immediately effected: the pump valves, however, being of extraordinary dimensions, caused so great a blow upon closing, that the concussion shook the whole of the engine-house; several valves variously modified, but similar in principle to those in general use in the Cornish Mines, were made at a great expense to the contractors, but without remedying the defect: at last, however, Messrs. Nicholas Harvey and William West invented the self-acting double beat valves, which were made and set to work in July, 1839. The blow caused by the shutting of these valves is so much less than with the former ones, that there is no necessity for the admission of any air under them, there is no loss of water through them, and consequently a very great saving is effected by the use of them.

I propose dividing this Paper into two parts; the first relating to the boilers and fuel, the second to the engines.