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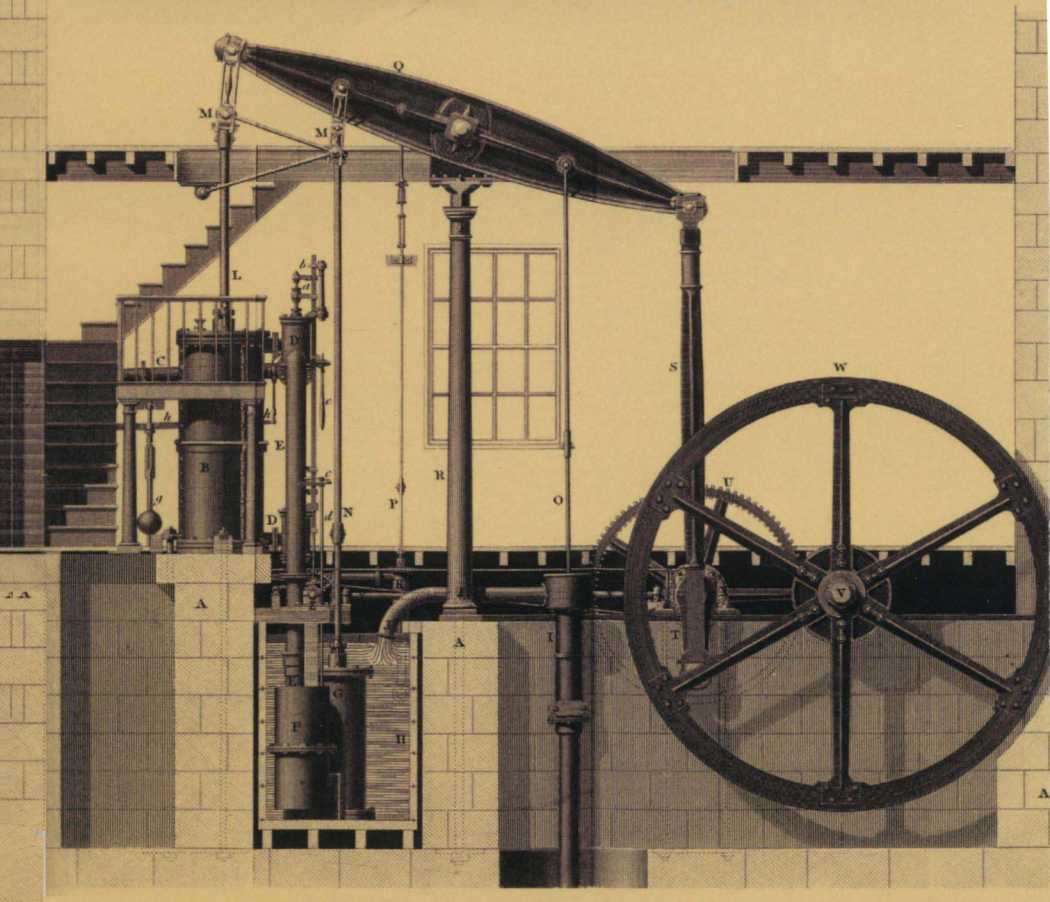
TORICAL AND DESCRIPTIVE ACCOUNT OF THE STEAM ENGINE

CHARLES FREDERICK PARTINGTON



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An Historical and Descriptive Account of the Steam Engine

Comprising a General View of the Various Modes of Employing Elastic Vapour as a Prime Mover in Mechanics

CHARLES FREDERICK PARTINGTON

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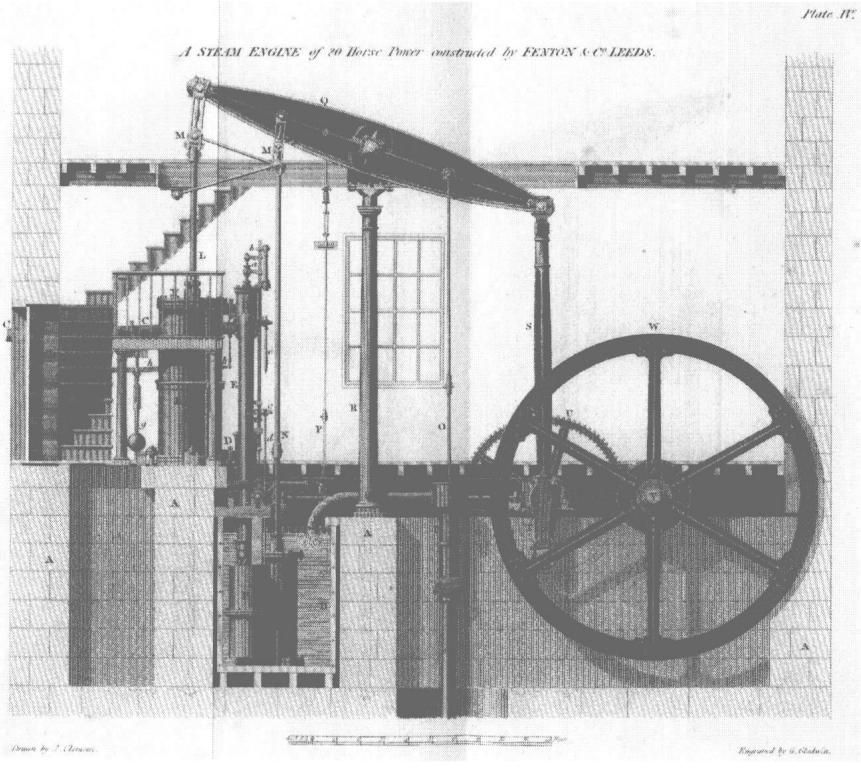
Technology

The focus of this series is engineering, broadly construed. It covers technological innovation from a range of periods and cultures, but centres on the technological achievements of the industrial era in the West, particularly in the nineteenth century, as understood by their contemporaries. Infrastructure is one major focus, covering the building of railways and canals, bridges and tunnels, land drainage, the laying of submarine cables, and the construction of docks and lighthouses. Other key topics include developments in industrial and manufacturing fields such as mining technology, the production of iron and steel, the use of steam power, and chemical processes such as photography and textile dyes.

An Historical and Descriptive Account of the Steam Engine

Though much about his life is uncertain, Charles Frederick Partington is known to have lectured at the London Institution between 1823 and 1830 on a variety of technical topics, and he delivered some of the first lectures specifically designed for young people. He had a particular interest in the steam engine, and this book, reissued here in the first edition of 1822, was one of the earliest overviews of its history and development. A third edition appeared in 1826. Noting the excessive frequency with which 'the faults of any new invention are unjustly magnified, while its real advantages are seldom duly appreciated', the author is keen to act as evangelist. Detailed and illustrated descriptions of various early engines are included, comparing their characteristics and advantages. Also of note are Partington's descriptions of early attempts to mitigate the 'smoke and noxious effluvia which proceed from their capacious vomitories'.



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HISTORICAL

AND

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OF THE

STEAM ENGINE,

COMPRISING A GENERAL VIEW OF THE VARIOUS MODES OF EMPLOYING ELASTIC VAPOUR AS A PRIME MOVER IN MECHANICS;

WITH

AN APPENDIX

OF PATENTS AND PARLIAMENTARY PAPERS CONNECTED WITH THE SUBJECT.

BY CHARLES FREDERICK PARTINGTON,
OF THE LONDON INSTITUTION.

"Soon shall thy arm, unconquer'd Steam! afar!
Drag the slow barge, or drive the rapid car;
Or on wide-waving wings expanded bear
The flying chariot through the fields of air." *Darwin.*

Illustrated by Thirteen Engravings and Diagrams.

London:
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1822.

J. and T. Bartlett, Printers, Oxford.

TO

WILLIAM HASLEDINE PEPYS, Esq.

FELLOW OF THE ROYAL AND LINNEAN SOCIETIES; A VICE-PRESIDENT OF THE GEOLOGICAL SOCIETY; MEMBER OF THE ROYAL INSTITUTION, OF THE ASTRONOMICAL SOCIETY, &c. &c. AND HON. SECRETARY OF THE LONDON INSTITUTION:

As a Tribute of Respect for his high Scientific Attainments, and liberal encouragement of Philosophical Learning; this Historical Account of one of the most valuable applications of Science to the Arts and Manufactures of a great Commercial Nation, is, with his permission, respectfully inscribed,

By his much obliged,

and faithful humble Servant,

CHARLES FREDERICK PARTINGTON.

INTRODUCTION.

THE great practical use of machinery to a commercial country is so well known, and its superiority to animal force so universally acknowledged and felt in every branch of our manufactures, that but little apology will be necessary for introducing to the man of science and practical artizan, a work, the avowed object of which is, to render the uses and general principles of the Steam Engine familiar to every class of persons. That it has enabled England to support a proud pre-eminence, both in arts and political power, is equally apparent; and it is a fact much to be deplored, that while some of the least important of the arts connected with domestic life, have been illustrated and explained by men celebrated for scientific research, a description and account of the uses of this stupendous machine, have been left to the Cyclopædias and other works of a general nature.

The principal object to be attained by the employment of the Steam Engine, as well as every other species of machinery, being the reduction of animal labour, it may be advisable, before we proceed to the more immediate subject of the present work, to compare the various species of artificial power that have hitherto been employed for that purpose; and by this method we may be enabled to calculate with certainty and precision, on the most economical mode of producing a given force. To form, however, an accurate estimate of the saving thus effected, it will be necessary to examine, though but briefly, the amount of animal force and its result as applied to machinery.

From the most accurate observations, it appears, that the physical powers of the human race differ very widely, not only in various individuals, but also in different climates; the value of a man therefore, as a working machine, will not be so great beneath the torrid zone as in the more temperate climate of Europe. This will serve to illustrate the great advantage which our Colonists, particularly in the West Indies, would derive from the more general employment of inanimate force; the day labour of a negro in the sugar

countries, amounting to little more than one-third of that performed by an European mechanic.

A labourer working ten hours per day, can raise in one minute a weight equivalent to 3750 pounds one foot high, or about sixty cubic feet of water in the same time; while the power of a horse working eight hours per day, may be correctly averaged at 20,000 pounds. Smeaton states, that this animal, by means of pumps, can raise two hundred and fifty hogsheads of water ten feet high in an hour. It is a well known fact, also, that men when trained to running, are able on the average of several days being taken, to outstrip the fleetest horse; and yet it will be seen from the above statement, that his force, if properly applied, is at least six times that of the most powerful man.

The use of water as an impelling power, both for the turning of machinery and other purposes connected with the useful arts, appears to have been known at a very early period. Vitruvius describes a variety of machines for this purpose, the earliest of which were employed merely to raise a portion of the fluid by which they were impelled. The

most simple method of applying this element as a mechanical agent, evidently consisted in the construction of a wheel, the periphery of which was composed of a number of float-boards. This, on being exposed to the action of a running stream, was afterwards employed to give motion to a variety of mills, and is at the present time employed in almost every species of machinery.

Among the most celebrated hydraulic machines, we may enumerate the Machine of Marly. This, when first constructed, appears to have produced one-eighth of the power expended, so that seven-eighths of its power were usually lost. This misapplied power has been injurious to the engine; and the wear it has occasioned, has reduced the mechanical effect very materially. But this may be considered as an extreme case, and we select it merely as an instance of that total ignorance of the first principles of mechanics, which characterized some foreign engineers of the last century.

It may, however, be advisable to examine the ratio of power expended in comparison with that of the effect produced in some of the most simple hydraulic machines; and by

this calculation, the amount of friction, &c. may be accurately ascertained.

	Power	*Effect*
Undershot water wheel	9	= 3
Overshot do.	10	= 8
Hydraulic Ram. (This machine will make from 20 to 100 strokes per minute.)	10	= 6
Large machine at Chremnitz, (each stroke occupying about three minutes.)	9	= 3

But the water-mill, which is the usual machine employed, even in its most improved form, is far from being beneficial either to the agriculturist or the manufacturer. The former is injured by the laws which prohibit the draining of mill-streams for the purposes of irrigation, by which much improvement is kept back that would otherwise take place; while the health of the latter, in the immediate neighbourhood of manufacturing districts, is much injured by the stagnant condition of the water which is thus unnecessarily dammed up.

Wind, which we may consider as the next substitute for animal power, appears to have been first employed to give motion to machinery in the beginning of the sixth century.

The use of this species of mechanic force, is however principally limited to the grinding of corn, the pressing of seed, and other simple manipulations; the great irregularity of this element precluding its application to those processes which require a continued motion.

A windmill with four sails, measuring seventy feet from the extremity of one sail, to that of the opposite one, each being six feet and an half in width, is capable of raising 926 pounds, two hundred and thirty-two feet in a minute; and of working on an average eight hours per day. This is equivalent to the work of thirty-four men; twenty-five square feet of canvas performing the average work of a day labourer. A mill of this magnitude seldom requires the attention of more than two men; and it will thus be seen, that making allowance for its irregularity, wind possesses a decided superiority over every species of animal labour.

To shew, however, the great advantage the Steam Engine, even in its rudest state, possesses over mere pneumatic or hydraulic machinery, we will now examine its effective force when employed in the working of pumps. It has been already stated, that