

ON MESSRS COX AND WILSON'S PORTABLE SINGLE-ACTING STEAM ENGINE.

The subject of the present paper is a small Portable High-Pressure Steam Engine, differing from other engines of the kind, mainly, in the simplicity and economy of its construction, the small number of its parts, and the consequent diminished liability to derangement, and greater durability.

An engine similar to the present one was suggested some four years ago, by Mr. J. W. Wilson. It consisted of a solid plunger working in an oscillating cylinder, the steam acting only one way ; the engine was partly drawn out at that time, but no further steps were taken, until the subject was again brought forward, recently, and a drawing was made by the author, who introduced the self-acting trunnion valves, as being more simple and less expensive than the slide-valve and gearing. One of these engines was made and set to work at the Oxford Works, in September, 1852, and has been at work ever since, and is now in as good order as the first day it was started, although running at an average rate of 150 strokes per minute.

This engine is shown in Plates 13 and 14, and one of the engines is exhibited on the table.

Fig. 1, Plate 13, shows a side elevation, with the trunnion in section.

Fig. 2, a front elevation, with the cylinder and trunnion in section.

A is the cylinder of cast-iron, bored out its whole length, the bottom screwed in, and the trunnions B and C cast on. In the trunnion C are the steam ports, shown in the cross section at D ; the steam-way E connects the ports in the trunnion with the bottom of the cylinder. F is a cast-iron plunger packed with hemp and connected to the crank G ; H H two A frames, I the fly wheel, L the steam pipe, K eduction pipe.

In Fig. 1, the engine is shown taking in steam, the plunger being at half stroke and the steam-way open ; and in Fig. 4, the engine is

K

exhausting and the eduction port open. In the working of this engine, the steam forces up the plunger, the inertia of the wheel assisted by the weight of the plunger bringing it down. As it is single-acting, the pressure is always on the valve, working in fact like an ordinary slide valve, only on a curved instead of a flat surface.

This engine has worked with the cap of the trunnion plummer-blocks removed, without leaking.

Fig. 5, Plate 14, shows the general arrangement of the engine and boiler fixed on wheels, and Fig. 6, a section of the boiler. The boiler O, is set in a cast-iron box with fire bricks, the fire being under the boiler at P, and returning through the two tubes Q Q. R is the water gauge, consisting of a piece of tube working in a stuffing box; a cock is fixed on the side of the pipe with the end turning down into the tank S, from which the engine draws its water. When it is required to ascertain the height of the water in the boiler, this cock is opened, and if it blows steam the tube is pushed down till it reaches the water, if water, it is raised till it blows steam, and the level of the water in the boiler is indicated by the graduations upon the tube, forming a very simple and cheap water gauge.

The principal advantages claimed for this engine are, its simplicity of construction, and consequent cheapness, and the very slight probability of its getting out of order, even in the hands of an inexperienced person, together with its compactness and portability.

Some of the purposes to which it is proposed to be applied, are as follows :—

When placed with a boiler on wheels, as shown in Fig. 5, to be used in a factory where a number of machines are driven by a large engine; now if it is required to do some overwork, in which, as is often the case, it is only necessary to drive one or perhaps two lathes, or other machines, this engine may with a very little trouble be wheeled up to its place and set to work, and the expense of running the large engine and shafting be saved.

Also, in repairing the large engine in case of a break-down, a great saving of time will be effected in not having the work done out.

For a donkey engine for feeding the boiler of marine and locomotive engines ; and as a pumping engine for tank houses at Railway Stations, or other purposes. In this case it is proposed to place the pump in a similar position to the steam cylinder, but opposite, on the other side of the frame, and to work the pump by a crank, the two cranks being in opposite directions, so that the steam pressure acts to force the water.

It will be very applicable for small manufacturers and amateurs, &c., who may require a cheap and simple engine, and one not likely to get out of order.

This arrangement of cylinder and valves does very well for a force pump, the water being drawn through the steam pipe and forced out at the eduction pipe : in this case it is proposed to make use of it as a garden engine, or a small fire engine.

The governor that is proposed to be used for this engine, the invention of Mr. Wilson, is shown in Fig. 3, Plate 13, and consists of a cast iron or brass ball A, placed in the steam pipe B C, which at the governing point is tapered and curved upwards, as shown in the drawing, a stop being fixed at C to prevent the ball going so high in the pipe as to stick fast. The action of this governor is as follows : as the steam rushes along the pipe it carries the ball with it, which as it ascends, decreases the area that the steam has to rush through, and the higher it rises in the curve, the greater is this contraction, and the greater must be the pressure of the steam to counteract the force of gravity on the ball. The governor now exhibited has been applied to the $\frac{1}{2}$ horse-power engine at the Oxford Works, and is found capable of regulating it so well, that when all the work is thrown off it will not allow the engine to run more than about 90 revolutions per minute.

Mr. CHELLINGWORTH exhibited one of the Engines of $\frac{1}{2}$ horse power ; also, the governor detached, to show the action. In answer

to a question, he stated that the cost of the engine exhibited was £10, and £18 complete with the boiler on wheels, as shown in the drawing.

The CHAIRMAN inquired whether the expense of working the engine had been tried ?

Mr. WILSON said that the engine at the Oxford Works was supplied from the boiler of another engine, so that there was no means of ascertaining the consumption of fuel ; the engine had been working constantly for six months, and had proved very useful and satisfactory.

Mr. E. A. COWPER observed, that he had seen the engine at work several times ; it kept very fairly steam-tight, and he considered it would be usefully applicable to a great variety of purposes, on account of its being a very cheap construction and a good engine.

Mr. MIDDLETON thought the engine remarkably cheap, and a simple and convenient arrangement.

Mr. CHELLINGWORTH remarked that there were very few parts in the engine, only about a dozen separate pieces altogether. The engine was often worked very fast, from 150 to 200 revolutions per minute, and although so small, it was found very useful. It had drilled a number of $1\frac{1}{8}$ inch holes in a large cylinder cover, $1\frac{1}{4}$ inch thick, in $4\frac{1}{2}$ minutes each. The surface of the valve was found to wear quite even, and after it had been at work a short time it appeared burnished, and had remained so.

The CHAIRMAN said he thought it was a very ingenious and simple construction of engine ; and though it did not admit of the economy of working the steam expansively, yet the whole consumption could be only so small, as to make that point of little consequence, and he thought it would be found very useful and economical in many applications. He proposed a vote of thanks to Mr. Chellingworth, which was passed.

A Paper, by Mr. Andrew J. Robertson, of London, was then read, being a continuation of his former Paper—On the Mathematical Principles of the Centrifugal Pump.

(The publication of this Paper has been unavoidably postponed.)

The meeting then terminated.

After the meeting a variety of specimens illustrative of a new mode of ornamenting the surface of metals, were exhibited by Mr. R. W. WINFIELD and Mr. R. F. STURGES, of Birmingham; the process of the ornamentation being very simple, and consisting in placing a sheet of perforated metal or paper, thread lace, net, &c., between the two plates of metal to be ornamented, and then passing the whole through a pair of ordinary rolls, such as are employed for rolling metal; this produces a very clear, sharp, and even deep impression of the pattern employed upon the sheets of metal which it is desired to ornament. The depth of the indentation is such that the metal so ornamented can be subjected to the various operations of stamping, spinning, &c., for producing the manufactured article in its complete form, without any injury to the pattern; specimens of sheet steel were shown which had been ornamented with ordinary thread lace, and the delicate skeletons of leaves had left an impression on the surface of a copper-plate, from which engravings had been printed in the manner of the ordinary copper-plate printing, copies of which were exhibited.

Messrs. SALT and LLOYD, of Birmingham, also exhibited specimens of a new process for raising or stamping vessels, &c., formed from sheets of iron, tin, brass, &c., by which greater economy and rapidity are obtained than by the ordinary process. A heavy ram of $1\frac{1}{2}$ tons weight is raised by steam power a short distance of about a foot between guides, having the convex die attached to the under side of the ram, and the concave die or matrix is secured to the bottom of the frame as in ordinary stamping; the edges of the flat metal plate to be raised or stamped are then forcibly held down upon the matrix by a metal ring pressed down by eccentrics, whilst the blow is struck by the ram falling and driving the die through the ring into the matrix, which it fits accurately, the pressure of the ring on the edges of the metal plate being so adjusted as to allow the plate to draw uniformly into the required form without the edges becoming puckered; the metal is stamped cold.

Fig. 1. *Side*

Elevation.

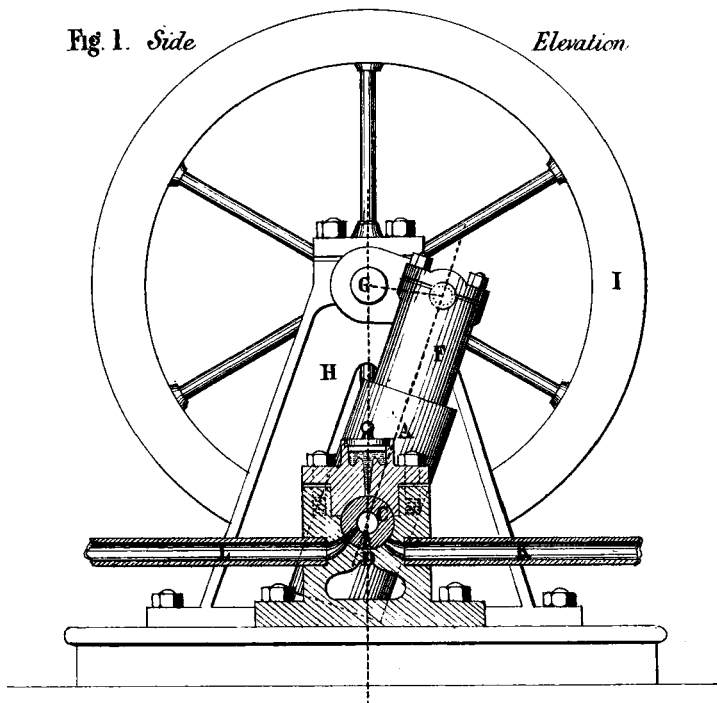


Fig. 2.

Section of Cylinder

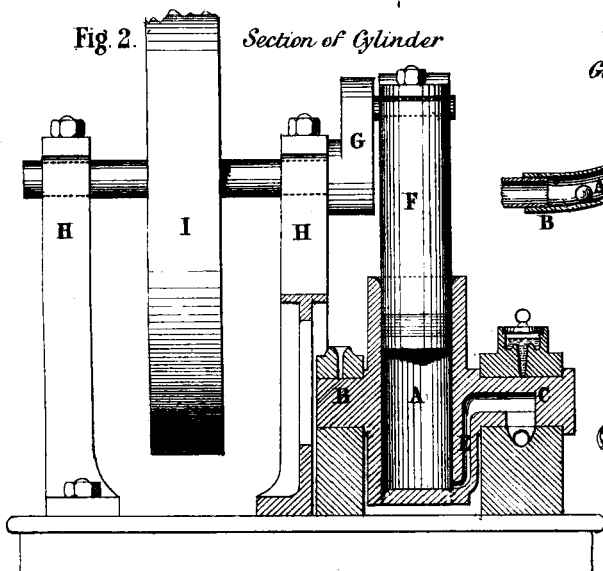


Fig. 3.
Governor

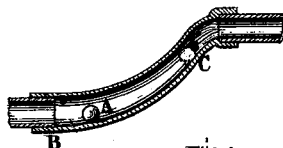
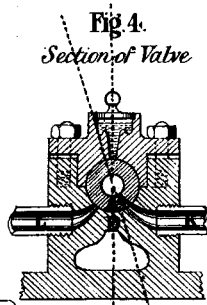


Fig. 4.
Section of Valve



Scale $\frac{1}{8}$ in. 12 Ins. 9 6 3 0 1 Feet

Fig 5
Elevation of Engine and Boiler

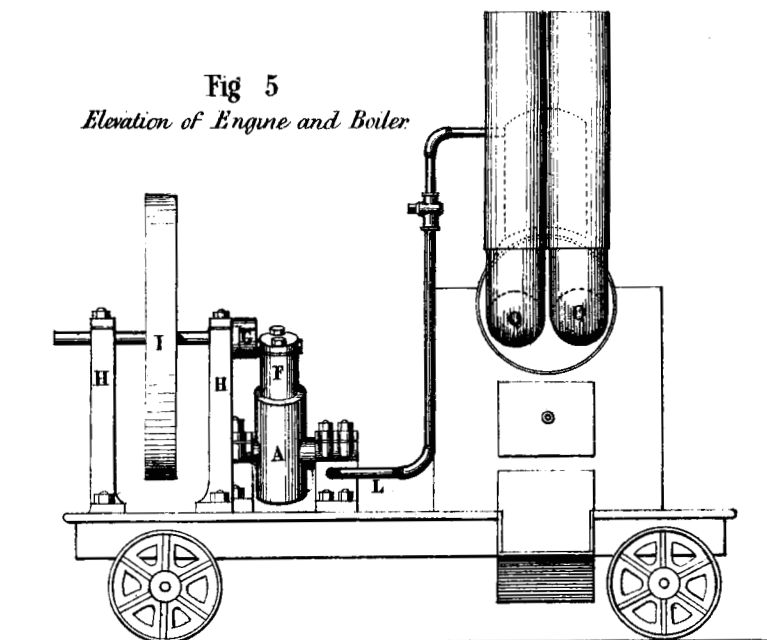
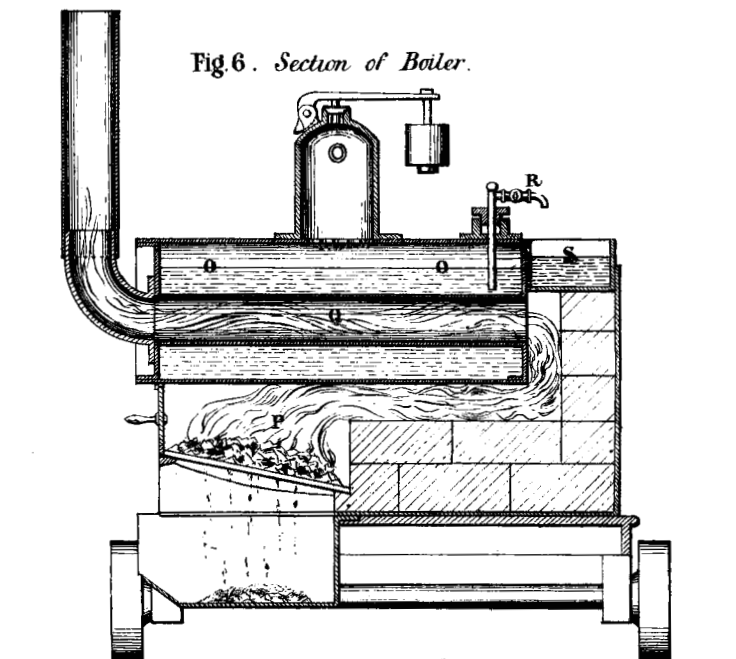


Fig.6. *Section of Boiler.*



Scale $\frac{1}{2}$ in $\frac{1}{4}$ in 0 1 2 3 Feet