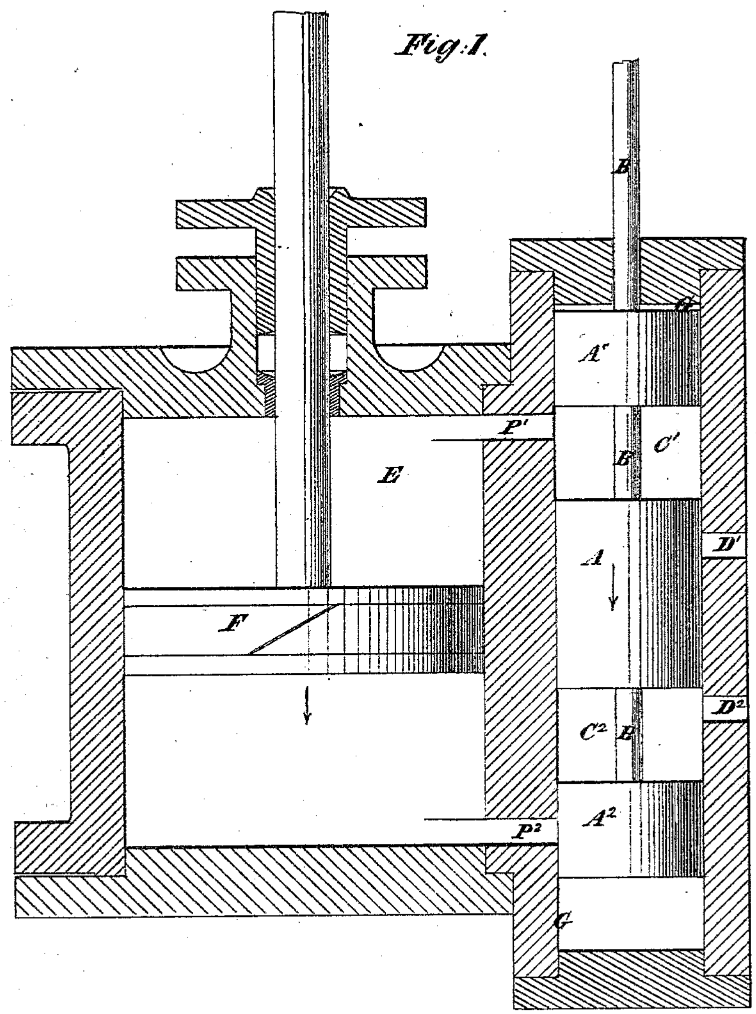
2 Sheets--Sheet 1.

R. M. MARCHANT.

Improvement in Processes of Obtaining Motive Power.

No. 115,876. Patented June 13, 1871.

Fig. 1.



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2 Sheets--Sheet 2.

R. M. MARCHANT.

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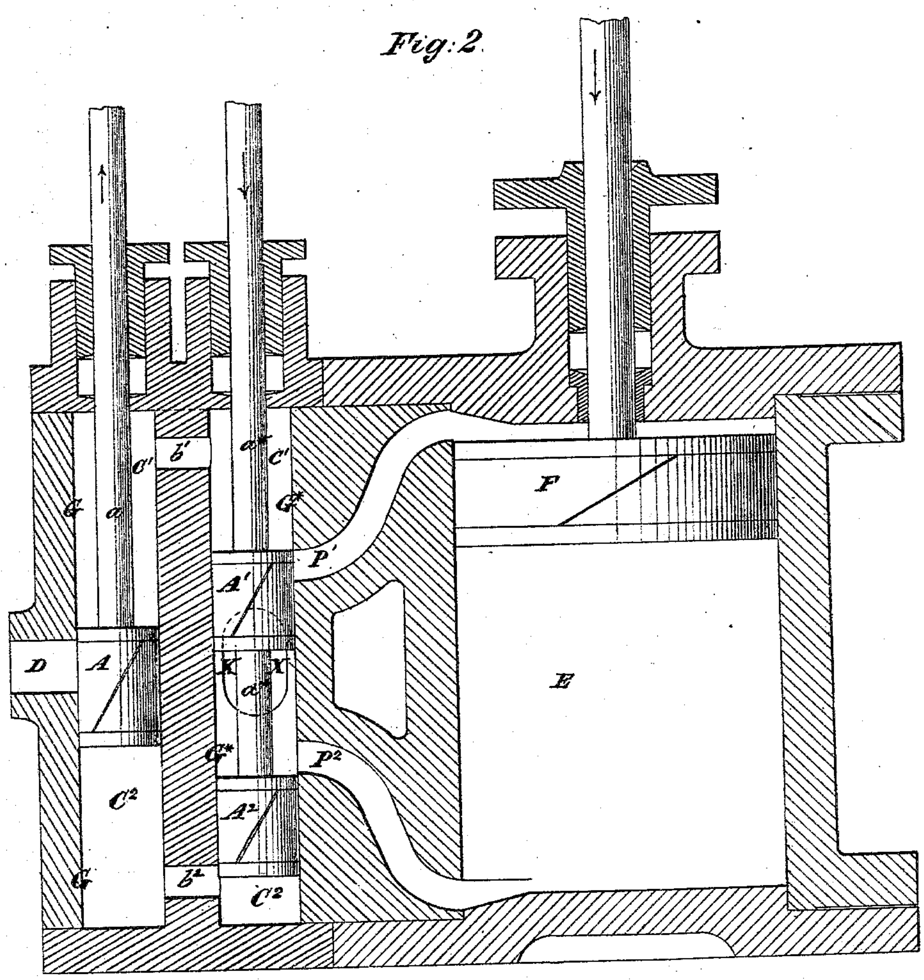
Fig: 2.



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UNITED STATES PATENT OFFICE.

ROBERT MUDGE MARCHANT, OF LONDON, ENGLAND.

IMPROVEMENT IN STEAM AND OTHER MOTIVE-POWER ENGINES.

Specification forming part of Letters Patent No. 115,876, dated June 13, 1871.

To all whom it may concern:

Be it known that I, ROBERT MUDGE MARCHANT, of London, England, have invented a new and useful Improvement applicable to Steam and other Motive-Power Engines; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing forming part of this specification.

This invention relates to improved means of controlling and regulating the supply to the cylinder of an engine of steam, compressed air, or other gaseous body from which motive power is obtained; such means having for their object more especially the use of very highly-compressed steam, air, or other gas or mixture thereof in an effective and economical manner. It consists in the provision, between the cylinder and the generator, reservoir, or other source of the supply of the steam, air, or other gaseous body, of one or more measuring-chambers and valves, whereby a specific and measured charge or volume of such body, bearing a definite proportion to the total capacity of the cylinder, can be delivered thereinto when the piston is at any determined position therein or during any portion of the revolution of the engine. By this means I am enabled to deliver the steam, air, or other gaseous body to the engine at any determined pressure, and to regulate the supply, working each stroke of the piston or revolution of the engine in such manner that I can apply the whole expansive power of the steam, air, or other gaseous body which is comprised between the extreme pressure provided and the pressure of the surrounding atmosphere into which it is finally delivered without loss of pressure by its delivery into such atmosphere at any pressure exceeding that due to the density of the atmosphere itself.

The construction and arrangement of the measuring-chambers and valves may be varied without departing from the principle of my invention, and I have shown in the accompanying drawing, Figure 1 and Fig. 2, two different constructions and arrangements.

I will first describe the construction and operation of my invention with reference to Fig. 1, which represents a central longitudinal sectional view of an engine-cylinder with its valves and measuring-chambers. E is the main or working-cylinder of the engine, having attached to one side a smaller cylinder, in which are fitted three tight pistons, A A^1 A^2, which constitute valves all attached securely to the same rod B, which is to be worked by an eccentric or other device arranged on the main shaft of the engine, or to which motion is imparted by the piston F. The spaces C^1 C^2 between the piston A, and those A^1 and A^2 within the cylinder G, constitute two measuring-chambers, in which definitely-measured charges or volumes of steam, air, or gas are received from the generator or reservoir through the ports D^1 and D^2, respectively, and from which it is delivered, by the travel of the pistons A A^1 A^2 through the ports P^1 and P^2, to the cylinder E above and below its piston F. The distances between the ports D^1 D^2 P^1 P^2, the depth of the piston A, and the distance between the pistons A^1 and A^2 are so arranged that, by the motion of the pistons, charges will be received in the measuring-chambers C^1 and C^2 alternately, and delivered to the cylinder E above and below its piston, each measuring-chamber being closed to its respective receiving-port D^1 or D^2 by the piston A covering the said port before the said chamber is opened to its respective delivery-port, P^1 or P^2, by the uncovering of the said port by its respective piston A^1 or A^2.

It is evident that each charge, after its delivery to the cylinder E, expands behind the piston F to the full capacity of the cylinder during the stroke of the piston, and that the whole expansive power due to the proportion of the capacity of the chamber C^1 or C^2 to the capacity of the cylinder E, excepting, of course, any loss by condensation or leakage, is transmitted through the piston F to the shaft or other device for giving out the power of the engine.

Instead of there being two receiving-ports, D^1 D^2, one for each measuring-chamber, a single receiving-port, arranged in a central position relatively to the stroke of the pistons A A^1 A^2, may be made to supply both chambers, the travel of the said pistons being properly arranged, regulated to open the two chambers alternately to the said single port.

In this application of my invention I have shown no eduction-ports or valves to the cylinder E. Suffice it to say on this point that, besides the induction-ports P^1 P^2, the cylinder must be provided with separate eduction-ports fitted with suitable valves.

Fig. 2 is a central longitudinal section of an engine-cylinder, with an arrangement of valves and measuring-chambers by which the same ports which serve as the induction-ports to the cylinder serve also as the eduction or exhaust-ports. E is the main or working cylinder of the engine, having attached or arranged contiguously to it two cylinders, G G*, which are arranged side by side, as close together as convenient, and within which are fitted the pistons A A^1 A^2, which constitute the valves, the two pistons A^1 A^2 being within the cylinder G*, next the main cylinder E, and being both connected securely to the same rod a^*, and the single piston A being in the outer cylinder G, and attached to the separate rod a. The valve-cylinder G has an opening, D, through which the steam or other gaseous body to be used as the motive agent is received from the generator or reservoir. Between the valve-cylinders G and G* there are two passages, b^1 and b^2, and two passages, P P^1, are provided between the upper and lower parts of the valve-cylinder G* and the ends of the main cylinder E. About the middle of the length of the valve-cylinder G* there is a passage, X, leading from said cylinder to the atmosphere, or into any receptacle into which it may be desired to exhaust. The space included within the two cylinders G G*, above the pistons A and A^1, constitutes a measuring-chamber for measuring charges of steam, air, or other gaseous body to be delivered to the upper end of the main cylinder, and the space included within the cylinders G G*, below the pistons A and A^2, constitutes the measuring-chamber for measuring the charges to be delivered to the lower end of the main cylinder. The pistons A A^1 A^2 and the ports D P^1 P^2 are so arranged, and the said pistons have such motion communicated to them by the connection of their rods a a^*, with eccentrics or other devices on the main shaft or other part of the engine deriving motion from the piston F, as to operate in the following manner, the pistons A^1 A^2 always moving in an opposite direction to the piston A. The single piston A always closes the communication from the receiving-port D before either of the ports P^1 P^2, leading to the cylinder E, is opened by its respective piston A^1 or A^2.

We will assume the parts to be in the positions represented in the drawing, and the pistons to be respectively moving in the directions indicated by the arrows marked upon their rods. A measured charge has been received through the port D into the upper measuring-chamber C^1, and all communication with the port D is cut off by the single piston A, which is now moving upward, while the pistons A^1 A^2 are moving downward. The upper port P^1 is about to be uncovered by the piston A^1 for the delivery into the upper part of the main cylinder E of the measured charge from the chamber C^1, and the lower port P^2 has been uncovered by the piston A^2, and the lower end of the main cylinder opened to the exhaust-port X, the exhaust taking place between the pistons A^1 and A^2. The alternating stroke given to the rods $a a^*$ and their pistons reverses the operation of the valves, and so causes a charge to be taken through the port D into the lower measuring-chamber C^2, and delivered through the port P^2 into the lower end of the main cylinder, while the upper end of the latter is opened to the exhaust through the port P^1. The travel of the pistons or valves A A^1 A^2 is so determined by the eccentrics that the alternating rapid and slow movements due to the eccentrics occur at the points where such variation of speed is necessary to perfect the operation.

It will be understood that, by both the within-described methods of carrying out my invention, there is no communication between the main or working cylinder of the engine and the generator or reservoir from which the steam, air, or other gaseous body from which the power is derived at the time of the induction to the said cylinder, but that the measured charges are cut off from the generator or reservoir before being delivered to the working-cylinder, in which they operate only by their expansive force.

What I claim as my invention, and desire to secure by Letters Patent, is—

The provision, between the working-cylinder of a steam or other motive-power engine and the generator-reservoir or other source of supply of the steam or other gaseous body, of one or more measuring-chambers and valves, substantially such as are herein described, whereby charges of the steam or other gaseous body are measured and cut off from the generator-reservoir or other source of supply before their admission to the working-cylinder, as herein set forth.

R. M. MARCHANT.

Witnesses:
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