(No Model.)

T. McDONOUGH.

GAS ENGINE.

No. 315,808. Patented Apr. 14, 1885.

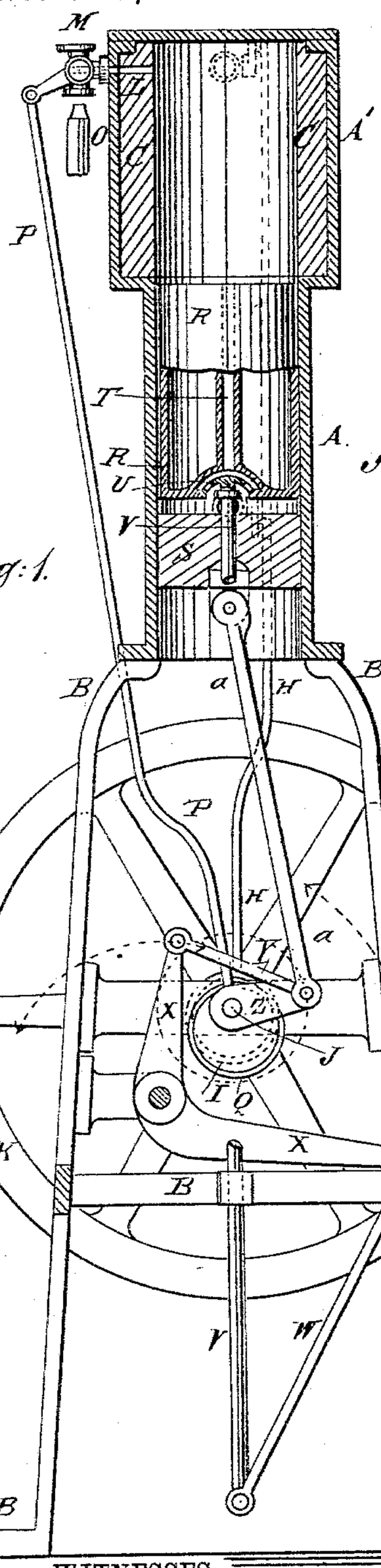

Fig. 1.

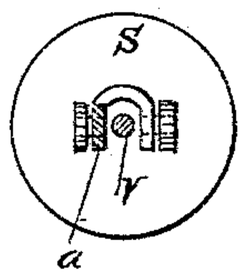

Fig. 3.

Fig. 4.

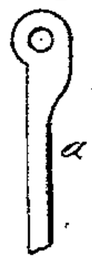

Fig. 5.

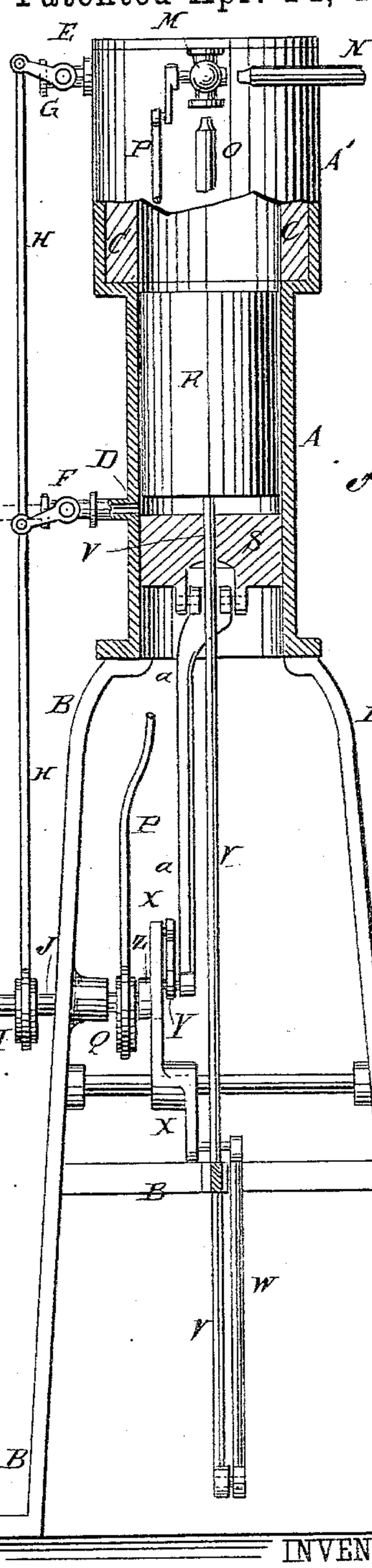

Fig. 2.

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THOMAS McDONOUGH, OF MONTCLAIR, NEW JERSEY.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 315,808, dated April 14, 1885.

Application filed November 11, 1884. (No model.)

To all whom it may concern:

Be it known that I, THOMAS McDONOUGH, of Montclair, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Gas Engines, of which the following is a full, clear, and exact description.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of one of my improved gas-engines. Fig. 2 is a side elevation, partly in section, of the same turned one-quarter around from the position shown in Fig. 1. Fig. 3 is a plan view of the lower end of the lower or short piston, the piston-rods being shown in section. Fig. 4 is a front elevation of the upper end of the piston-rod of the lower piston. Fig. 5 is a side elevation of the same.

The object of this invention is to provide gas-engines constructed in such a manner as to economize heat and power, and thus obtain better results than are attainable with gas-engines constructed in the ordinary manner.

The invention consists in the construction and arrangement of parts, as will be hereinafter fully described and claimed.

A is the engine-cylinder, which is made with an open lower end, and is attached at the said lower end to a supporting-frame, B. The cylinder A is prolonged upward for a distance equal to about two diameters of the said cylinder. The upward extension A′ of the cylinder A is made so much larger than the lower part as to form space for a fire-brick lining, C, and leave the inner surface of the said lining flush with the inner surface of the lower part, A, of the cylinder, as shown in Figs. 1 and 2. The part A′ of the cylinder forms the combustion-chamber, and by this construction the engine is less expensive in manufacture than when the combustion-chamber is made separate and is bolted to the cylinder. By this construction, also, the shell of the combustion-chamber A′ can be made so thin at its junction with the cylinder A that there will be but little conduction of heat through it to the said cylinder A. In the lower part of the cylinder A is formed an inlet-port, D, to admit gas, and in the upper part of the combustion-chamber A′ is formed an exhaust-port, E, for the escape of the spent gas, which ports are provided, respectively, with valves F G, the stems of which are connected with the same rod H, so that both valves will be operated at the same time and by the same mechanism. The lower end of the rod H is connected with an eccentric, I, formed upon or attached to the driving-shaft J, so that the valves F G will be opened and closed at each revolution of the said shaft J. The shaft J revolves in bearings in the frame B, and is provided with a balance-wheel, K, to give steadiness of motion to the various operating parts of the engine.

In the combustion-chamber A′, near its upper end, is formed a port, L, through which ignition of the gas takes place, and which is provided with a valve, M, for controlling the said ignition. The valve M is provided with an ignition gas-jet, N, and a relighting gas-jet, O. The stem of the valve M is connected with the upper end of a rod, P, the lower end of which is connected with an eccentric, Q, formed upon or attached to the shaft J, so that the said valve will be opened and closed at each revolution of the said shaft.

In the cylinder A A′ are placed two pistons, R S, the upper one, R, of which is made long, is provided with a central longitudinal perforation, T, and with a valve, U, opening upward at the lower end of the said perforation to allow the gas to pass upward freely and prevent its return.

To the lower end of the long piston R is attached the upper end of a piston-rod, V, which passes through the lower piston, S, and through a guide-bearing in a bar of the frame B, and to its lower end is pivoted the lower end of the connecting-rod W. The upper end of the connecting-rod W is pivoted to the end of the long arm of an elbow, X, which is pivoted at its angle to a support attached to the frame B, and to the end of its short arm is pivoted one end of the short connecting-rod Y. The other end of the connecting-rod Y is pivoted to the crank Z, formed upon or attached to the shaft J. To the crank Z is also pivoted the lower end of the piston-rod *a*, the upper end of which is forked to pass around the piston-rod P, and is hinged to lugs formed upon the lower end of the short lower piston, S. The pistons R S can be connected with the shaft J by the mech-

anism hereinbefore described, or by any suitable mechanism that will move the piston R to fill the combustion-chamber when the piston S is nearly at the end of its outward stroke, will move the said piston R down upon the piston S when the said piston S is nearly at the end of its inward stroke, and will keep the piston R close to the piston S during most of its outward stroke. The gas is introduced through the port D into the cylinder A between the pistons R S, and passes up through the valve U and the perforation T into the combustion-chamber A′, whence, after ignition and expansion, the spent gas escapes through the exhaust-port E, the various movements and the action of the gas being as follows: When the long piston R begins to move away from the piston S, the gas enters the space between them through the inlet-port D, and at the same time the spent gas from the previous ignition is driven out through the exhaust-port E by the said upward movement of the long piston R. Then the long piston R moves downward and the short piston S moves inward simultaneously, the gas is compressed, opens the valve U, and passes through the perforation T into the combustion-chamber. When the short piston S is at the end of its inward stroke and the long piston R is nearly in contact with it, the gas is ignited and expands, forcing the pistons R S outward and completing the cycle of movements. By this arrangement the gas is introduced into a cold cylinder, compressed, and then transferred to a hot chamber, where it is fired, expanded, and exhausted at each revolution of the shaft.

An ordinary water-jacket may be used, if desired; but when the engine is set vertically the downward conduction of heat is so little as not to affect the lower part of the cylinder.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a gas-engine, the combination, with the cylinder A, closed at its upper end to form a combustion-chamber, and open at its lower end, of the long piston R, the short piston S, below the same within said cylinder, inlet, exhaust, and ignition valves, and an operating mechanism, substantially as described.

2. In a gas-engine, the combination, with the combustion-chamber A′, the cylinder A, the short piston S, and an operating mechanism, of the long piston R, substantially as herein shown and described, whereby the gas will be compressed, ignited, expanded, and discharged at each revolution, as set forth.

3. In a gas-engine, the combination, with the cylinder A, the combustion-chamber A′, the inlet-valve F, the exhaust-valve G, the ignition-valve M, and the shaft J, of the connecting rods H P, and the eccentrics I Q, substantially as herein shown and described, whereby the said valves will be opened and closed at each revolution of the said shaft, as set forth.

4. In a gas-engine, the combination, with the two pistons R S and the shaft J, of the piston-rods V *a*, the connecting-rods W Y, the elbow-lever X, and the crank Z, substantially as herein shown and described, whereby motion will be given to the said shaft, and the said pistons will be made to move at the proper times and in the the proper directions, as set forth.

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Witnesses:
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