D. B. Caldwell;

Slide Valve.

No. 107,161. Patented Sep. 6. 1870.

Fig. 1.

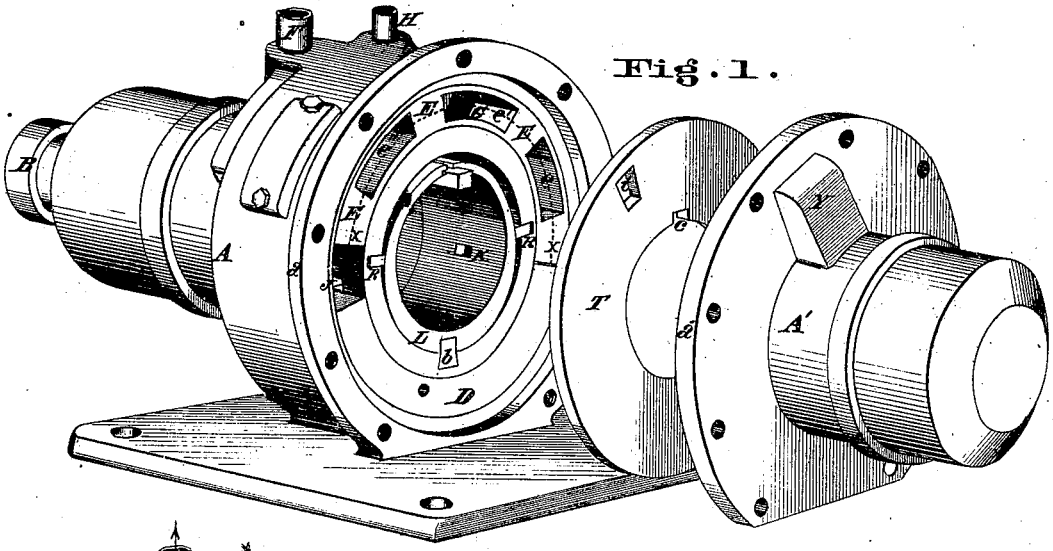


Fig. 2.

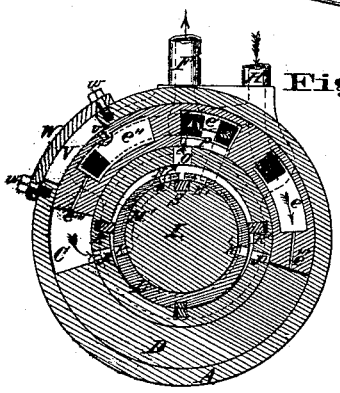


Fig. 3.

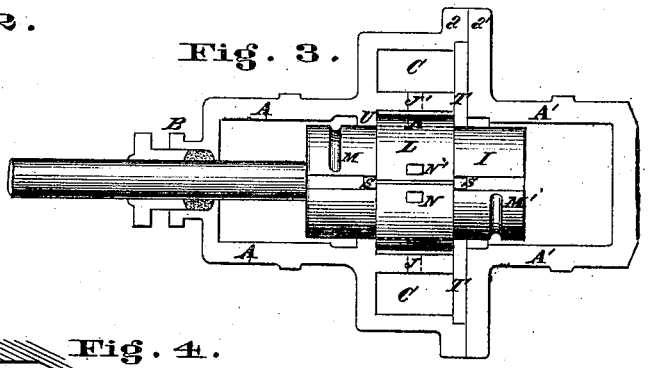
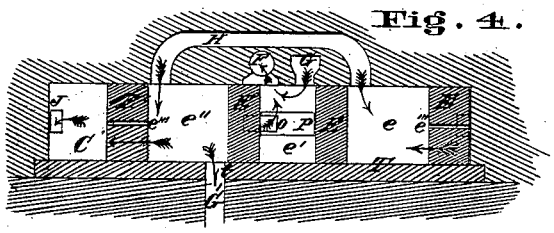


Fig. 4.



Attest,
E. Layman
James Hall

Inventor.
David B. Caldwell
By F. Millward
Attorney

UNITED STATES PATENT OFFICE.

DAVID B. CALDWELL, OF CINCINNATI, OHIO, ASSIGNOR TO HIMSELF AND JOHN H. McGOWAN, OF SAME PLACE.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **107,161**, dated September 6, 1870.

To all whom it may concern:

Be it known that I, DAVID B. CALDWELL, of Cincinnati, Hamilton county, State of Ohio, have invented certain new and useful Improvements in Steam-Engines; and I do hereby declare the following to be a sufficiently full, clear, and exact description thereof to enable one skilled in the art to which my invention appertains to make and use it, reference being had to the accompanying drawing, making part of this specification.

Nature and Objects of Invention.

My invention relates to the class of steam-engines, adapted more particularly to steam-pumps, in which the steam is admitted through a full width of port at or about the beginning of each stroke, and continued with a full opening throughout the entire length of stroke; and my invention consists, first, in connection with a peculiar arrangement of steam-ports for admitting and discharging steam from the engine, of a semi-annular valve of rectangular section, which, by partial rotation, governs the ports; second, in connection with small steam-apertures for operating the semi-annular valve, of a peculiarly-constructed piston for the cylinder; third, of a new device for packing the piston.

The object of my invention is the production of an engine which can be "finished" and fitted almost entirely by lathe-work, and one that can be manufactured cheaply and be not liable to get out of order.

Description of Accompanying Drawing.

Figure 1 is a perspective view of the parts of the engine detached, with the piston of the engine entirely removed. Fig. 2 is a cross-section through the cylinder and semi-annular valve. Fig. 3 is an axial or central horizontal section through the engine, with the piston and packing in elevation. Fig. 4 is a circular section through the semi-annular valve at line X X, Fig. 1, converted into a plane surface in order to exhibit clearly the arrangement of the ports in the cylinder.

General Description.

The cylinder is composed of two parts, A A′, connected near the center by flanges *a a′*. The part A is formed with a stuffing-box, B, and annular recess or chamber C. This chamber or recess is formed true in the lathe or otherwise, and is occupied in part by the semi-annular block D and the partially-rotating valve E. The block D is fitted tightly into place, and is permanent. The valve is fitted to slide snugly in the recess C, and the distance the valve E and block D lack of occupying the entire circle of the recess C is equal to the required "throw" of the valve E. The valve is provided with three open-ended chambers, *e e′ e″*, the central one, *e′*, of which is at all times in communication with the exhaust-port F of the engine, and alternately with the ports or side pipes G G′, which convey steam to and from the respective ends of the cylinder. The end chambers, *e e″*, are always in communication with the supply-pipe H from the boiler, and alternately with the ports G G′.

It will be easily understood, by reference to to Fig. 4, that steam is admitted and discharged from the cylinder of the engine by the oscillation to and fro of the valve E in the recess C.

In order to operate the valve automatically at each end of the stroke of the piston I of the engine, I provide ports of small size in the valve E at *e‴*, ports J J′ in the cylinder, ports K K′ in the packing-ring L, ports M M′ in the piston, ports N N′ in the packing-ring, port O in the cylinder, and port P in the valve, the latter communicating with the exhaust-port F.

To provide against the constant communication of steam from the recess or valve-chamber C to the exhaust-port F, I provide the spring packing-gibs R. Owing to the intervention of these gibs the steam in the chamber C cannot exhaust through ports J J′ except at the ends of the stroke, when one or other of the ports M M′ opens the communication by reaching a point opposite the ports K K′.

The motion of the valve E is produced by exhausting more rapidly at one end of the valve than steam can be received at that end, the ports *e‴* being of small size. The result is unbalanced pressure and consequent motion of the valve E. The port M opens an exhaust for the motion in one direction and M′ in the other. When the valve is in motion, the di-

rection of the steam-currents to and from the valve at the ends, and to and from the ends of the cylinder of the engine, is clearly shown in Figs. 2 and 4.

The packing-ring L tightly enclasps the piston I, and is prevented from becoming displaced by the key or feather *b*. The piston I is prevented from turning by the feather S, over which the ring L "breaks joint" in the manner shown, the feather extending beyond the ring and entering seats *c* in the follower T and the collar U of the cylinder-casting. The collar U and follower T serve to make the steam-tight joint on the ends of the packing-ring L.

There is no necessity of "boring" the cylinder A A′ throughout the length of the barrel, it being sufficient to bore the collar U and follower T to fit the piston I. The costly work of cylinder-boring is, therefore, avoided.

In order that the valve may be moved, when necessary, from the outside in starting the engine, or at any other time, I provide an aperture, V, in the cylinder and hole *u* in the valve E, for the insertion of any convenient tool or lever, and close the same when not in use by detachable plate W and bolts *w*.

The port G communicates with end of cylinder A at any point beyond the collar U, and the port G′ with the end of the cylinder A′ at any point beyond the follower T, the steam passing at this end through aperture *t* and side pipe Y.

When the valve E is so fitted to the recess C as to form a completely tight steam-joint the plate W may be dispensed with.

The head A′ and follower T may, if desired, be cast in one piece; but I prefer the construction shown, inasmuch as it permits of a rubber gasket being used between the case A′ and follower T, which can extend to the outside and make the joint between the flanges *a a′*.

Claims.

1. In connection with the ports F G G′ H, arranged substantially in the manner described, the valve E, having recesses or chambers *e e′ e″*, and operating in the manner and for the purpose set forth.

2. In combination with the valve E *e e′ e″ e‴* P and ports J J′ K K′ N N′ O, the piston I, provided with side grooves or ports M M′, as described, and for the purpose stated.

3. In connection with the collar U and follower T A′, the spring packing-ring L and feather S, as described, and for the purpose specified.

4. In connection with the spring-ring L, the spring packing-gibs R R′ and feather *b*, as described, and for the purpose stated.

In testimony of which invention I hereunto set my hand.

DAVID B. CALDWELL.

Witnesses:
FRANK MILLWARD,
J. L. WARTMANN.