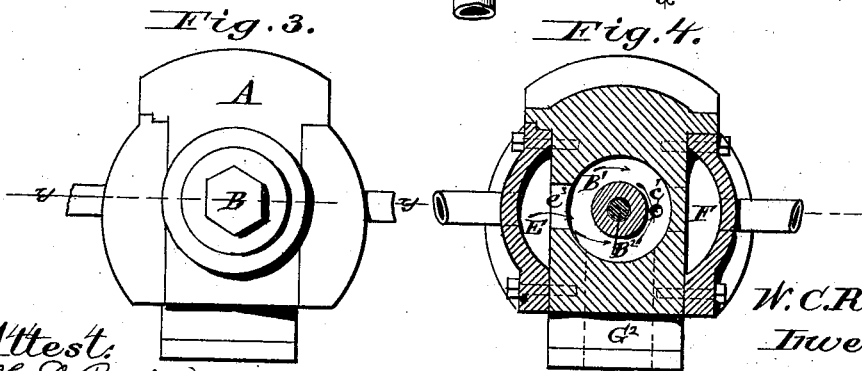
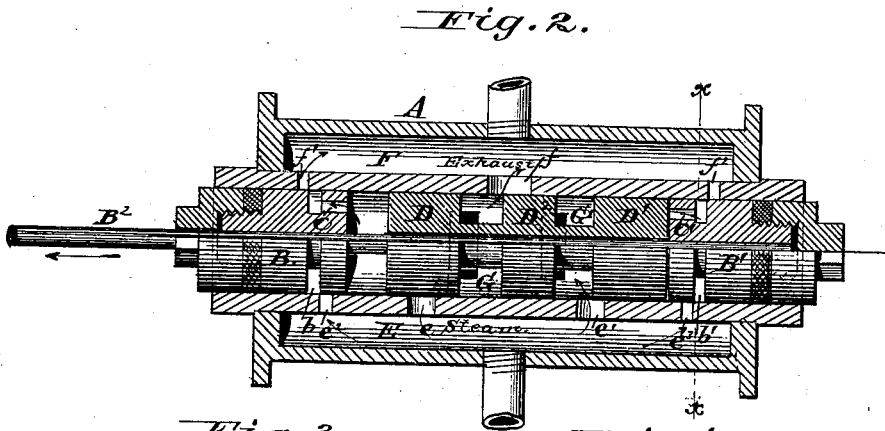
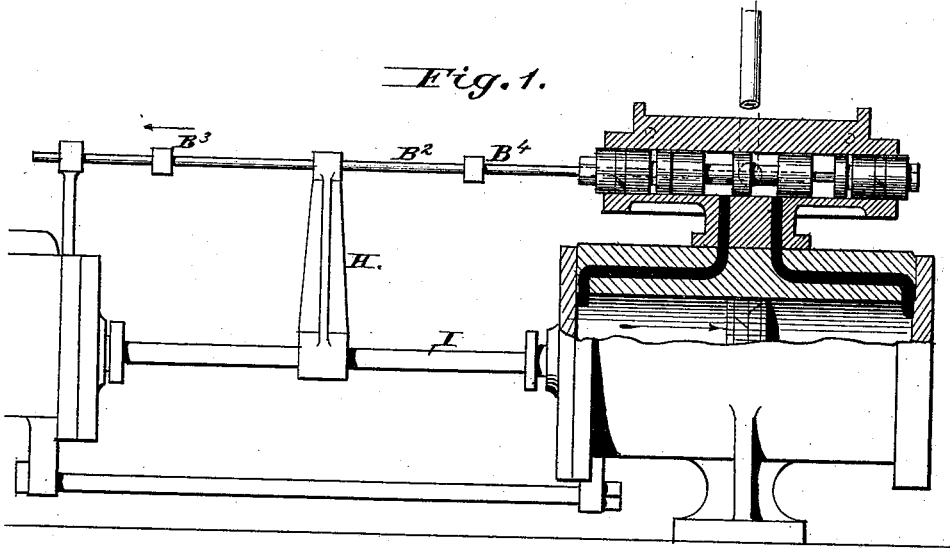


W. C. ROSS.
Piston-Valve.

No. 199,865.

Patented Jan. 29, 1878.



Attest:
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Atty.

UNITED STATES PATENT OFFICE.

WILLIAM C. ROSS, OF CINCINNATI, OHIO.

IMPROVEMENT IN PISTON-VALVES.

Specification forming part of Letters Patent No. **199,865**, dated January 29, 1878; application filed December 18, 1877.

To all whom it may concern:

Be it known that I, W. C. ROSS, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Piston-Valves, of which the following is a full, clear, and exact description.

This invention relates to piston-valves for steam-engines; and my improvement consists, mainly, of the combination, with the main piston-valve, of an auxiliary piston-valve, which mechanically starts the main valve in shifting, and also governs the ports through which steam is introduced and exhausted, to complete the movement of the main valve.

It further consists in so constructing the valve that the piston-heads of the auxiliary valve serve to confine the steam admitted to the valve-chest, so that the latter may be constructed without heads, and thus admit of the withdrawal of the valves at any time for examination and repairs without disturbing any joints.

In the annexed drawings, Figure 1 is a sectional elevation of my improved piston-valve, showing its application to a steam-pump. Fig. 2 is a plan of the valve, showing the whole of the chest and one-half of the valves in section. Fig. 3 is a front elevation of the same. Fig. 4 is a transverse section.

The same letters of reference indicate identical parts in all the figures.

The valve-chest A has a central bore or valve-chamber extending entirely through it from end to end. In this instance, the valve-chamber is of uniform diameter throughout. The several piston-heads of the main and auxiliary valves are snugly fitted therein, the heads B and B¹ of the auxiliary valves rigidly secured to or formed on the stem B², being provided with glands C and C' and suitable packing, to form tight steam-joints. The heads of the auxiliary valve are provided with recesses or annular grooves *b* and *b'*, respectively, which communicate through holes *e* and *e'* with the valve-chamber. The main valve is fitted to slide on the stem B², between the heads of the auxiliary valve, and consists of three heads, D, D¹, and D², united by hubs, or in any other suitable manner, so as to move together.

The difference between the length of the main valve and the distance between the heads

of the auxiliary valve is determined by the throw of the main valve. On one side of the valve-chamber the chest is provided with a steam-chamber, E, and on the other side with an exhaust-chamber, F. The steam-chamber E communicates with the valve-chamber through the main steam-ports *e* and *e'*, which are controlled by the heads D and D¹ of the main valve, and also through the auxiliary ports *e*² and *e*³, which are controlled by the heads of the auxiliary valve. The exhaust-steam from the cylinder passes from the valve-chamber to the exhaust-chamber F through the main exhaust-port *f*, governed by the head D² of the main valve, and the steam utilized in shifting the main valve escapes to the exhaust-chamber alternately through the auxiliary exhaust-ports *f*¹ and *f*², which are controlled by the heads of the auxiliary valve. The cylinder-ports G and G' of the chest are on opposite sides of the head D², and are controlled by the heads D and D¹ of the main valve.

The valve-stem B² carries tappets B³ and B⁴, which are alternately struck to initiate the shifting of the valve by an arm, H, on the main piston-rod I of the engine, just before the piston completes the stroke.

The operation of the valve is as follows: In the position of the valve shown in Fig. 1, the main steam-port *e* is uncovered, so that live steam enters the cylinder through port G, and drives the piston from left to right. Of the auxiliary steam-ports, *e*² is closed and *e*³ open, while of the auxiliary exhaust-ports, *f*¹ is open and *f*² closed, so that the main valve is held against the head B of the auxiliary valve by the pressure of the steam between the respective heads B¹ and D¹ of the said valves. Just before the main piston of the engine completes its stroke in this direction, the arm H on its rod strikes the tappet B⁴ on the valve-stem B², and moves the auxiliary valve far enough by the time the stroke is completed to cover auxiliary steam-port *e*³ and uncover auxiliary steam-port *e*². At the same time the auxiliary exhaust *f*² is uncovered, to admit of the escape of the steam confined between the respective heads B¹ and D¹ of the valves, and the auxiliary exhaust-port *f*¹ is covered. The main valve is also pushed to the right by the head B of the auxiliary valve by the same movement, and

begins to cover main steam-port *e*, without, however, uncovering as yet main steam-port *e'*, which is not effected until the main valve is further moved by the pressure of the steam behind its head *D*, whereby it is finally thrown against the head *B'* of the auxiliary valve, so as to close port *e* and establish communication between ports *e'* and *G'* at the same time that communication is opened between *G* and ports *f*. The cylinder-ports *G* and *G'* are always open, and in shifting the valve its open main steam-port remains open until the main valve is moved by steam-pressure. The engine will therefore start from any point in the stroke.

The initiatory mechanical impulses given by the auxiliary valve to the main valve in shifting will prevent any sticking of the latter.

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

1. In a piston-valve, the combination, substantially as specified, of the main valve, the movement of which in shifting is initiated mechanically and completed by steam, and an independent auxiliary valve, which is moved mechanically only, merely starting the main valve and reversing the flow of the steam acting thereon.

2. In a piston-valve, the combination, substantially as specified, of an independent aux-

iliary valve, moved mechanically only, and a main valve fitted to slide between heads of the auxiliary valve, which mechanically initiate the movement of the main valve in shifting, besides controlling the ports through which steam enters to complete such shifting of the main valve.

3. The combination, substantially as specified, of the triple-headed main valve, the cylinder-ports, the main exhaust-port, the main steam-induction ports of the valve-chest, the double-headed auxiliary valve, whose heads are provided with steam-passages, and the auxiliary steam and exhaust ports of the valve-chest.

4. The combination, substantially as specified, of the open-ended valve-chamber, the double-headed auxiliary valve, and the main valve confined between the heads of the auxiliary valve, so that both valves can be drawn together endwise from out of the open-ended valve-chamber.

In testimony whereof I have signed my name to the foregoing specification in the presence of two subscribing witnesses.

WILLIAM C. ROSS.

Witnesses:

FRANK CALDWELL,
PATTERSON A. REECE.