

G. P. ABORN.
VALVE.

APPLICATION FILED MAR. 27, 1912.

1,055,995.

Patented Mar. 18, 1913.

3 SHEETS—SHEET 1.

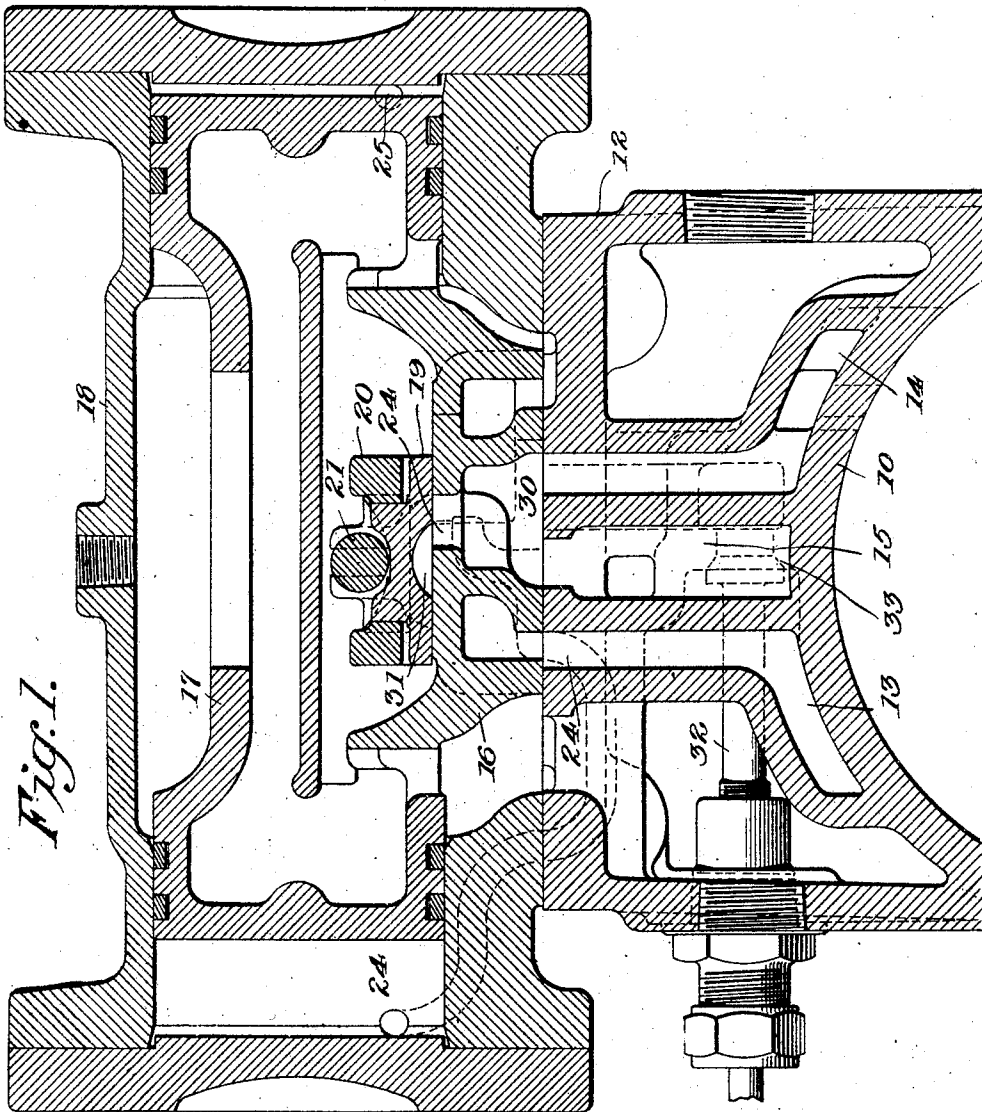


Fig. 1.

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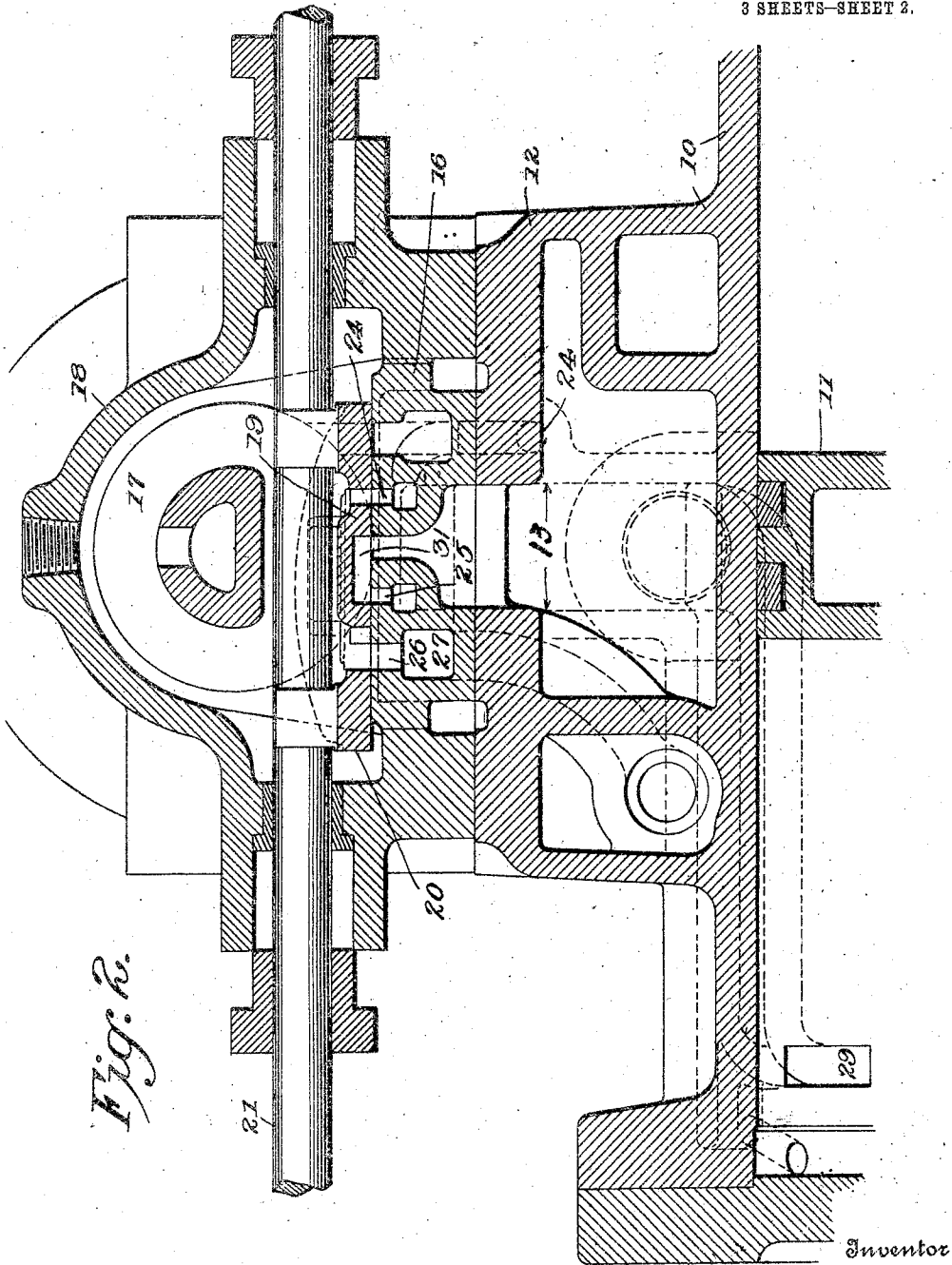


Fig. 2.

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3 SHEETS—SHEET 3.

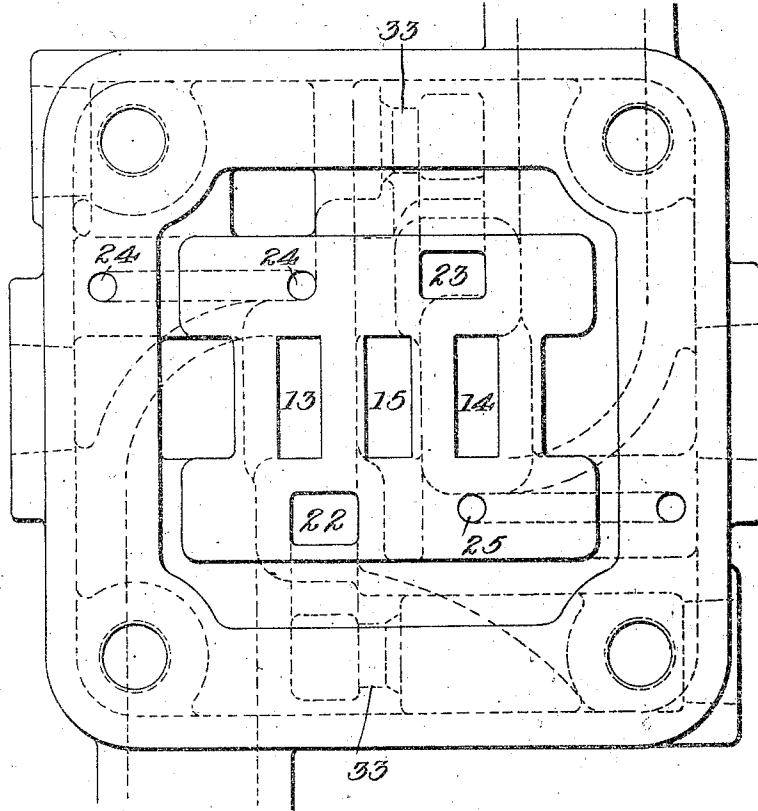


Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE P. ABORN, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO THE BLAKE & KNOWLES STEAM PUMP WORKS, A CORPORATION OF NEW JERSEY.

VALVE.

1,055,995.

Specification of Letters Patent.

Patented Mar. 18, 1913.

Application filed March 27, 1912. Serial No. 686,562.

To all whom it may concern:

Be it known that I, GEORGE P. ABORN, a citizen of the United States, residing at Brookline, county of Norfolk, and State of Massachusetts, have invented certain new and useful Improvements in Valves, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates generally to steam engines and pumps, and more particularly to engines equipped with fluid-actuated valves of the general class shown and described in Letters Patent to Hall, Nos. 737,609 and 737,610.

One object of the invention is to secure economy in steam consumption by working the steam expansively.

Another object, when the invention is used in connection with pumps, is to slow down the piston stroke near its end to allow the valves in the pump cylinder to seat quietly and with little shock, and to allow an easier reversal of the piston stroke.

Another object is to secure a simpler form of mechanism to effect these results than has hitherto been used; and a still further object is to reduce to a minimum the clearance spaces in the cut-off ports and the expansion of steam therein.

In the drawings, Figure 1 is a section transverse to the steam cylinder. Fig. 2 is a section longitudinally of the cylinder and on the line of the valve rod, and Fig. 3 is a plan of the valve seat on the steam cylinder showing port connections.

In Fig. 1, the main cylinder is indicated at 10, and the main piston is partly shown at 11 in Fig. 2. The valve seat 12 of the main cylinder is equipped with three main ports, 13 and 14 being the inlet ports and 15 the exhaust port. The main slide valve 16 is moved by an auxiliary piston 17 inclosed in the auxiliary steam cylinder 18. The cylinder 18 is shown positioned at right angles to the axial line of the main cylinder which it surmounts, and this is the preferred arrangement although not essential to the broader features of the invention.

The central portion of the valve piston 17 is of a reduced semi-cylindrical cross-section as shown in Figs. 1 and 2, and in the space thus formed between the valve piston and the main slide valve 16, the auxiliary valve 19 and the cut-off valve 20 are located. The

auxiliary valve controls the admission and exhaust to and from the valve piston and is moved by the cut-off valve within which it is loosely inclosed. The cut-off valve controls the supply of steam passing through the main valve and is moved by valve rod 21, which is actuated in turn by the usual tappet arrangement, not shown.

As best shown in Fig. 2, the cut-off valve straddles the auxiliary valve and the dimensions of these valves is such that there is a certain amount of lost motion between them. Both valves have their seats upon the upper face of the main slide valve 16, and their movement, in line with the valve rod 21, is at right angles to the line of motion of the main slide valve 16 and the valve piston 17. The opening and closing of the ports of the auxiliary cylinder are determined by the combined movements of the auxiliary and the main slide valves, as will presently be described.

Referring now to Fig. 3, the seat of the main slide valve is shown as being equipped with seven ports. These ports are the main exhaust at 15, the two main inlets at 13 and 14, two supplementary steam supply ports 22 and 23 through which steam may be supplied to the main valve independently of the cut-off when steam is used for the full stroke, and the two ports 24 and 25 communicating with the auxiliary cylinder. As is obvious, the arrangement of these ports is such also as to secure in the usual way the preadmission of steam to prevent shock upon the beginning of a piston stroke in the main cylinder, the pocketing of steam at the end of the stroke for the same reason, and also, by means of the related ports, to cushion the movements of the auxiliary piston 17.

The described mechanism operates as follows: Assuming the auxiliary piston 17, as viewed in Fig. 1, to be in its extreme right-hand position, as shown, it will be held in this position by steam admitted to the left of the auxiliary piston through ports 24, 24 as shown in Figs. 1 and 2. The main valve 16 will also be in a similar position and will allow steam to pass through ports 26, 27, 13 and 29 (Fig. 2) into the main cylinder 10, causing the piston 11 to move to the right. At the same time steam will exhaust through port 14 (Fig. 1) to the cavity 30 in main slide valve 16 and the central

exhaust port 15. At a predetermined point in the travel of the main piston 11, the usual tappet gear (not shown) will move the valve rod 21 to the right, as viewed in Fig. 2. The cut-off valve 20 attached there-
 5 to will thereupon close port 26, cutting off the supply of steam to the main piston thus causing the steam to work expansively during the remainder of the piston stroke. As
 10 the cut-off valve 20 closes port 26, it comes into contact with projections on auxiliary valve 19, causing the latter valve to move to the right until port 25 in main valve 16 is open to steam and port 24 open to the ex-
 15 haust cavity 31 in auxiliary valve 19. Steam is now exhausted from the left of the auxiliary piston 17 through the channel indicated generally by 24, 24, while at the same time steam is admitted through the
 20 opposed ports indicated at 25. This causes the auxiliary piston and main slide valve to move to the left until the port 24 in the main valve is closed to exhaust by the edge of the cavity 31 in the auxiliary valve 19.
 25 The port 24 being closed, the auxiliary piston cushions on the steam confined between its end and the auxiliary cylinder head, and comes to rest with the main slide valve in the proper position for the return stroke of the main piston. When it is desired to have
 30 the steam follow full stroke in the main cylinder, as in warming up, either one or both of the bleeder valves 32, 32 covering ports 33, 33 may be opened. These valves admit steam through ports 22 and 23 to the main
 35 slide valve through which it may pass into the main cylinder independently of the cut-off arrangement.

The construction as thus shown and de-
 40 scribed is the preferred embodiment of the invention; but it will be understood that the invention is not limited to the specific arrangement of parts illustrated, but that the broader features of the invention, as de-
 45 fined by the claims, may be embodied in other constructions.

The construction shown and described herein includes certain features claimed broadly in my prior applications, Serial No.
 50 659,501, filed November 10th, 1911, and No. 659,968, filed November 13th, 1911.

What is claimed is:—

1. In combination, a fluid actuated valve gear including an auxiliary cylinder, an
 55 auxiliary piston, a main slide valve attached to and moved by the piston, an auxiliary slide valve, a cut-off valve, the said auxiliary slide valve and the cut-off valve being mounted upon the main slide valve
 60 and nested in said piston, but having their respective movements independent of the piston.

2. In combination, a fluid actuated valve gear including an auxiliary cylinder, an
 65 auxiliary piston, a main slide valve at-

tached to and moved by said piston, an auxiliary slide valve, and a cut-off valve, the said auxiliary slide valve and the cut-off valve being mounted upon the main slide valve and located between the main slide
 70 valve and the auxiliary piston.

3. In combination, the valve seat of a main cylinder, the main slide valve working upon said seat, an auxiliary cylinder, a piston located within the auxiliary cylinder,
 75 the said valve and piston being coupled together to move as a unit, the valve being moved by the piston, an auxiliary valve seated upon the main slide valve and movable thereupon in a direction at right angles
 80 to the line of movement of the main slide valve, ports in the main slide valve cooperating with the auxiliary valve, ports in the valve seat of the main cylinder connected with the auxiliary cylinder and cooperating
 85 with the said ports in the main slide valve and with the auxiliary valve, the arrangement being such that the said piston is primarily controlled by the movement of the auxiliary valve upon the main slide
 90 valve, and is secondarily controlled by the movement of the main slide valve under the auxiliary slide valve, and a cut-off valve seated upon the main slide valve and controlling the movement of the said auxiliary valve.
 95

4. In combination, the valve seat of a main cylinder, the main slide valve working upon said seat, an auxiliary cylinder, a piston located within the auxiliary cylinder and adapted to move the said slide valve, an
 100 auxiliary valve seated upon the main slide valve and movable thereupon, passages in the auxiliary valve, in the main slide valve, and in the valve seat of the main cylinder whereby the said piston is primarily con-
 105 trolled by the movement of the auxiliary valve upon the main slide valve, and is secondarily controlled by the movement of the main slide valve under the auxiliary valve, and a cut-off valve seated upon the
 110 main slide valve and adapted to control the movement of the auxiliary valve.

5. In combination, a main slide valve, fluid actuated means to move said valve, an auxiliary valve controlling the fluid actu-
 115 ated means, and a cut-off valve controlling both the movement of the auxiliary valve and the supply of fluid to the main slide valve, the said auxiliary and cut-off valves being located between the fluid actuated
 120 means and the main slide valve.

6. In combination, a main slide valve, fluid actuated means to move said valve, an auxiliary valve controlling the fluid actuated means, a cut-off valve controlling the move-
 125 ment of the auxiliary valve and adapted to limit the supply of fluid to the main slide valve, the said auxiliary and cut-off valves being located between the fluid actuated means and the main slide valve, and means
 130

to supply fluid to the main slide valve independently of the said cut-off valve.

5 7. In combination, a cylinder, a main slide valve controlling the movement of fluid to and from the cylinder, fluid actuated means to move the main slide valve, a cut-off valve controlling the passage of fluid to the main slide valve, an auxiliary valve controlling the fluid actuated means, the said auxiliary
10 valve being controlled by the movement of the cut-off valve, both the auxiliary and the cut-off valves being located upon the main slide valve.

15 8. In combination, a main cylinder, a main slide valve, an auxiliary cylinder, an auxiliary piston located within the auxiliary

cylinder and controlling the main slide valve, a cut-off valve controlling the movement of fluid to the main slide valve, an auxiliary valve controlling the movement of fluid to the auxiliary cylinder, the said auxiliary valve being controlled by the movement of the cut-off valve, both the auxiliary and the cut-off valves being located between the said piston and the main slide valve. 20 25

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

GEORGE P. ABORN.

Witnesses:

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C. G. CHAPMAN.