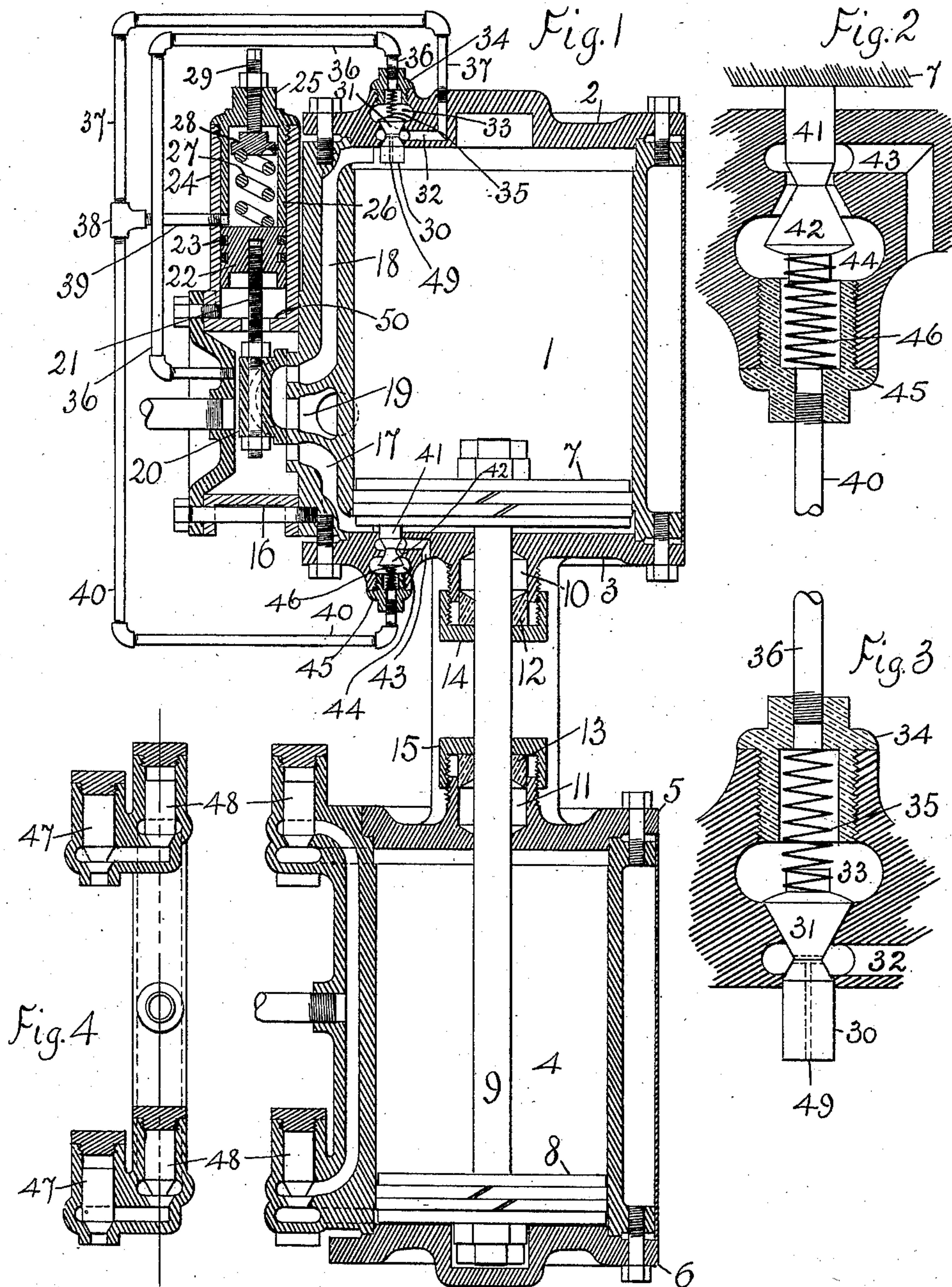


W. K. RANKIN.
VALVE MECHANISM.
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986,592.

Patented Mar. 14, 1911.



Witnesses.
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UNITED STATES PATENT OFFICE.

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VALVE MECHANISM.

986,592.

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To all whom it may concern:

Be it known that I, WILLIAM K. RANKIN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Valve Mechanism, of which the following is a specification.

This invention relates to valve mechanism, and its novelty is comprised in the combination of valves whereby an economy in the use of steam is gained by caring for leakages and condensation, and the operation of the main valve in one direction by a piston wholly by live steam, and in the opposite direction by the combined use of live steam and a spring.

The accompanying drawing illustrates one means employed for the purpose stated, in connection with an air compressor and wherein like parts are indicated by similar reference characters, and in which—

Figure 1 is a central vertical section of the steam and air cylinders. Fig. 2 is an enlarged central section of the relief valve. Fig. 3 is an enlarged central section of the auxiliary valve, located in the upper head, of the steam cylinder. Fig. 4 is an elevation view of the inlet and outlet valves of the air cylinder.

The steam cylinder 1 is provided with the usual heads 2, 3, and the air cylinder 4 has heads 5, 6. The cylinders have pistons 7, 8, attached to a common piston rod 9 passing through stuffing boxes 10, 11 with followers 12, 13 and nuts 14, 15. Cylinder 1 has a steam chest 16 with steam ports 17, 18 to the cylinder and an exhaust port 19. Steam chest 16 incloses main valve 20 having a stem 21 which adjustably attaches it to a piston 22 provided with packing rings 23, in a cylindrical extension 24 of the steam chest 16. The extension 24 has a cover 25 with an integral projection 26 passing inward and acting as a stop to piston 22 when the valve 20 is shifted to admit steam to port 17 and below piston 7. A spring 27 is confined within projection 26 and it is seated against piston 22 and has an upper cap 28 with an adjusting screw 29.

Cylinder 1 has an auxiliary valve (see Fig. 3) seated in head 2, the valve having a cylindrical part 30 extending into cylinder 1, a conical head 31 separating a port 32 and a chamber 33, the chamber being closed

at the top by a hollow cap 34. A spring 35 is seated between cap 34 and head 31, and pipe connections 36 lead from chamber 33 to steam chest 16. Port 32 has a pipe connection 37 to a T 38 and a pipe 39 which enters extension 24 above piston 22. From T 38 connections 40 lead to the relief valve in head 3 of cylinder 1.

The relief valve (see Fig. 2) is similar in construction to the auxiliary valve already described, having an interior projection 41, coned head 42, separating a port 43 which leads to the atmosphere from its chamber 44, a cap 45 and a spring 46.

The compressor cylinder has inlet valves 47 and outlet valves 48 at each end which may be of any of the usual or preferred forms adapted for the purpose.

The operation of cylinder 1 and its attachments is as follows. Piston 7 being at its lower position, as seen in Fig. 1, and valve 20 in position to admit pressure from steam chest 16, to port 17 the piston 7 will ascend and spring 46 will close the relief valve 41—42. As piston 7 nears its upward position it abuts part 30 of auxiliary valve 30—31 and opens the valve to admit pressure from steam chest 16 through connections 36 to chamber 33, port 32, connection 37, T 38 and connection 39 to the interior of extension 24 and against piston 22 which then coöperates with spring 27 to overcome the steam chest pressure opposed on piston 22, and moves valve 20 to open port 18 to live steam and port 17 to exhaust port 19, reversing the movement of piston 7 and allowing auxiliary valve 30—31 to be closed by its spring 35 and the pressure from steam chest 16. Live steam now flows from cylinder 1 through opening 49 and the connections to the interior of the extension 24 to maintain the position of piston 22 and valve 20 and guarding against loss of pressure from condensation or leakage. Relief valve 41—42 is opened when piston 7 reaches its downward course, and the pressure in extension 24 against piston 22 is exhausted through connections 38, 39, 40 and port 43 to the atmosphere, thus allowing the steam chest pressure against piston 22 to overcome spring 27 and shift valve 20 to admit pressure to port 17 and again moving piston 7 up. Any leakage by piston rings 23 being exhausted through connections 37, 39 and port 32 to and through opening 49 into

cylinder 1 and its ports 18, 19. Piston 8 coöperates with piston 7 and valves 47, 48 automatically admit and discharge the air from cylinder 4. Projection 26 and partition 50 limit the movement of piston 22 and valve 20.

I claim:

1. The combination with a cylinder having suitable inlet and exhaust passages, of a main valve for controlling said passages, a chamber having movable means mounted therein connected to said main valve, means for supplying pressure to one side of said movable means to move the same in one direction, resilient means mounted in said chamber and acting on the opposite side of said movable means to assist in moving the same in the opposite direction, means for supplying pressure to said opposite side of the movable means to assist the resilient means in moving the same and means for exhausting the pressure from the said opposite side of the movable means.

2. The combination with a cylinder having suitable inlet and exhaust passages of a main valve for controlling said passages, of a piston attached to said valve and operative in one direction wholly by fluid pressure; a spring opposed to said pressure against the piston, a chamber for the spring; a piston in the cylinder; a valve to admit pressure to the chamber, with connections to the chamber; a valve to exhaust pressure from the chamber, with connections thereto, these admission and exhaust valves being operated by the cylinder's piston.

3. The combination with a cylinder having suitable inlet and exhaust passages of a main valve for controlling said passages, with means for its movement in one direction by fluid pressure, and means for its movement in the opposite direction by combined resilient and fluid pressure; a piston for the cylinder; an auxiliary valve operated by the cylinder's piston, and with a passage to supply fluid pressure to coöperate with the resilient pressure to move the main valve; and a reversing valve also operative by the cylinder's piston, with a passage to exhaust the fluid pressure coöperating with the resilient pressure to permit the reverse movement of the main valve.

4. The combination with a cylinder having suitable inlet and exhaust passages of a main valve for controlling said passages,

of a chest for the valve, an extension of the chest, a piston therein and attached to the valve and subjected to fluid pressure on its side next the valve, a spring in the chest's extension and bearing on the valve's piston, opposed to pressure from the chest; a piston in the cylinder; an auxiliary valve operated by the upward action of the cylinder's piston, and having connection to the chest's extension, and an opening in the valve in communication with the cylinder, and whereby when the valve closes pressure from the cylinder may still pass to the chest's extension.

5. The combination with a cylinder having suitable inlet and exhaust passages of a main valve for controlling said passages, a chest inclosing the valve, a piston adjustably attached to the valve, an extension of the chest inclosing the piston, a spring in the extension, bearing against said piston, and having means to adjust its pressure upon the piston, whereon it is seated, opposite the main valve; a piston in the cylinder; an auxiliary valve opened by the cylinder's piston, having connection to the main valve's chest and also from the valve to the chest's extension, and an opening in the reversing valve whereby when the valve is closed pressure from the cylinder will flow to the chest's extension.

6. The combination with a cylinder having suitable inlet and exhaust passages of a main valve for controlling said passages, a chest for the main valve, an extension of the chest and a piston therein adjustably attached to the main valve, a spring in the extension with adjustable pressure means, said spring being seated upon the piston opposite the main valve; means for supplying pressure to the chest's extension a piston in the cylinder; a relief valve opened by the cylinder's piston, and having connections to the chest's extension and to the atmosphere, and whereby the fluid pressure in the chest's extension may be exhausted to permit the fluid pressure in the main valve's chest to overcome the spring in the chest's extension and shift the main valve.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM K. RANKIN.

Witnesses:

CHARLES E. WILLIAMS,
R. C. WRIGHT.