J. T. WILSON.

BALANCED VALVE.

APPLICATION FILED DEC. 11, 1908.

914,471.

Patented Mar. 9, 1909.

3 SHEETS—SHEET 1.

FIG. 1.

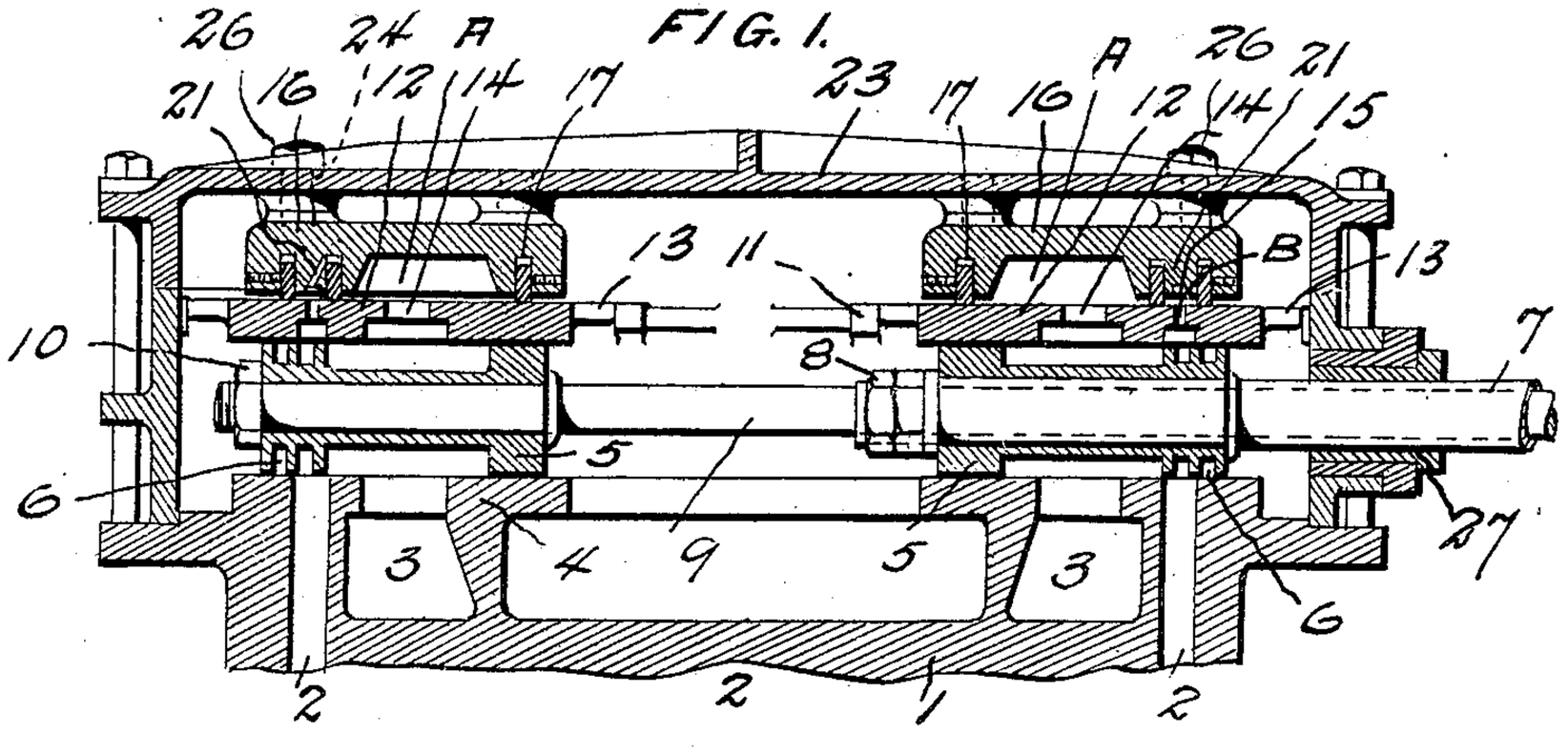
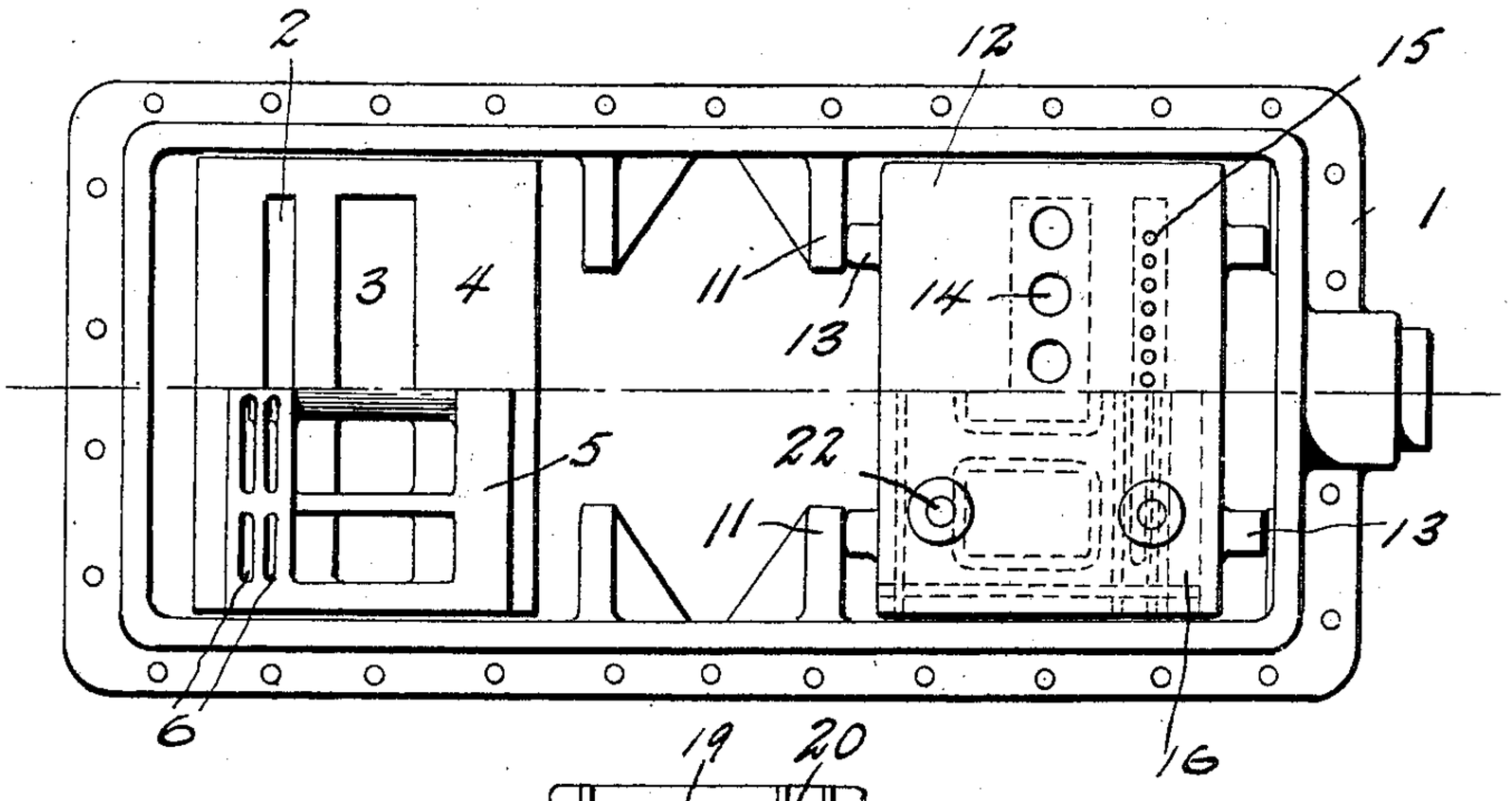


FIG. 2.



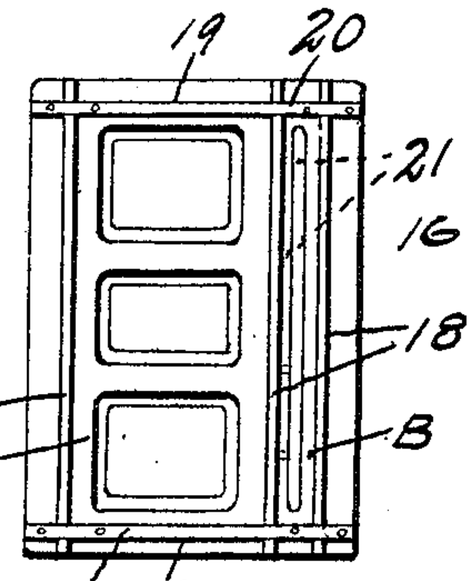


FIG. 3.

WITNESSES

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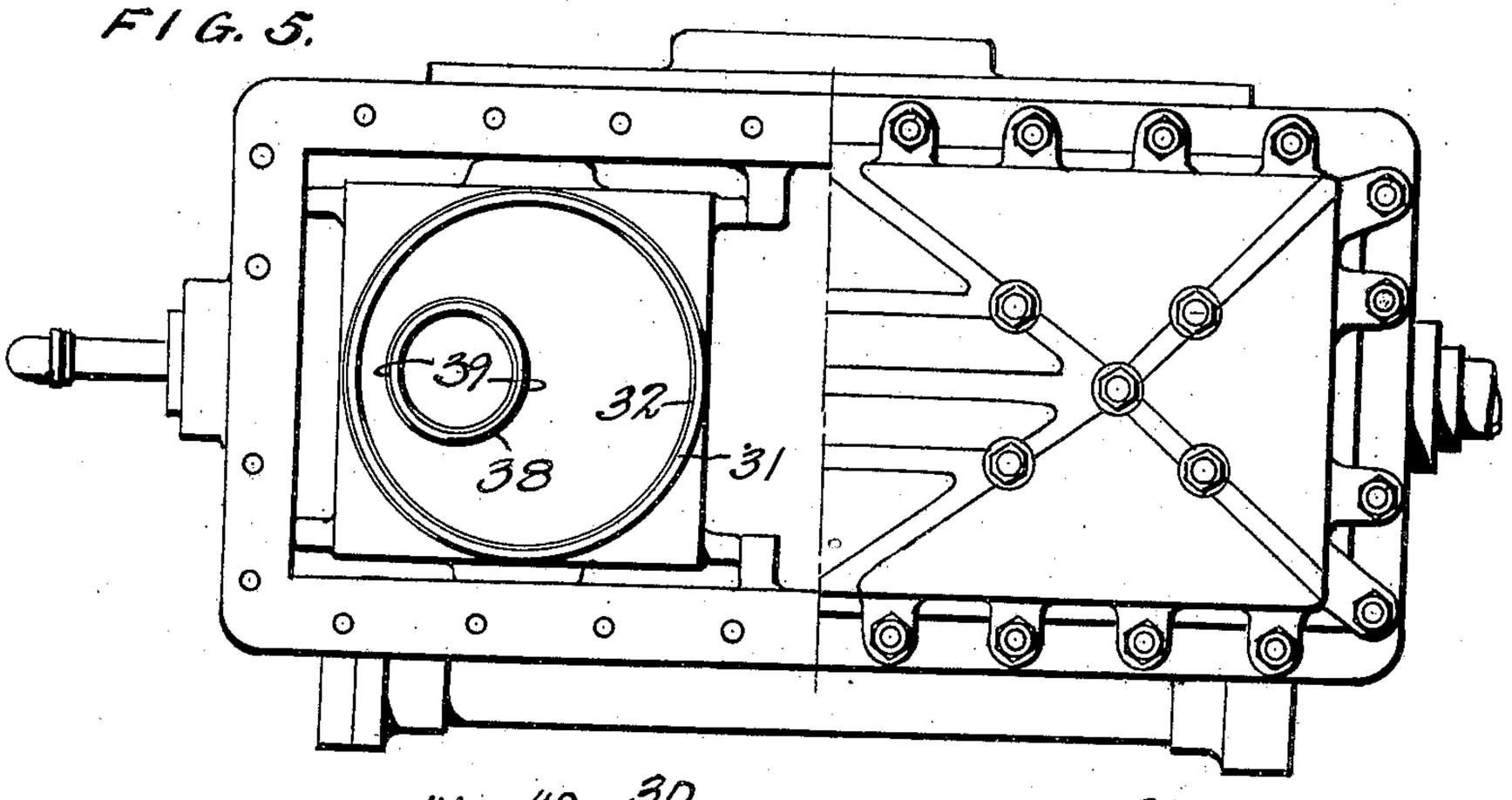
3 SHEETS—SHEET 2.

FIG. 5.



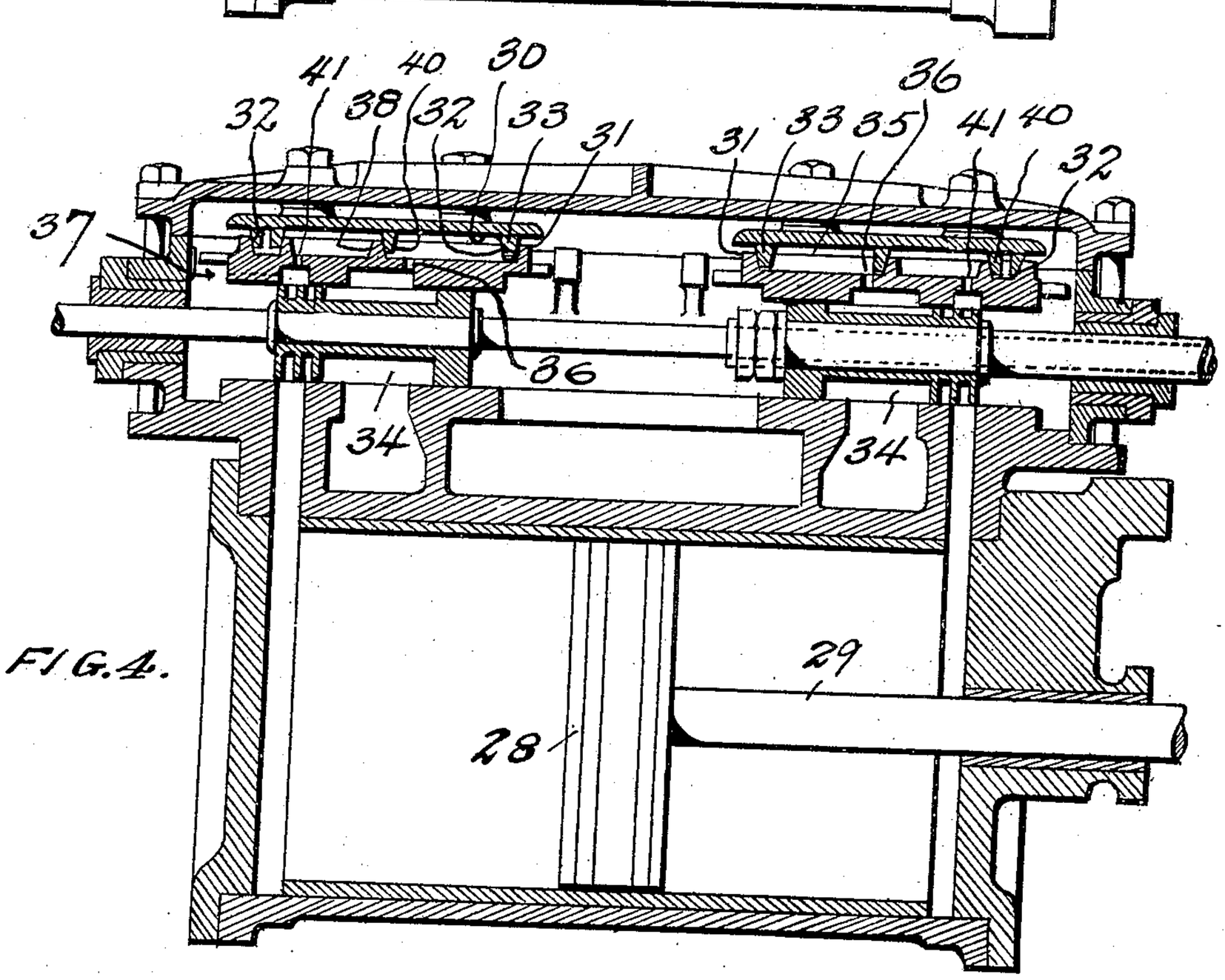


FIG. 4.

WITNESSES

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3 SHEETS—SHEET 3.

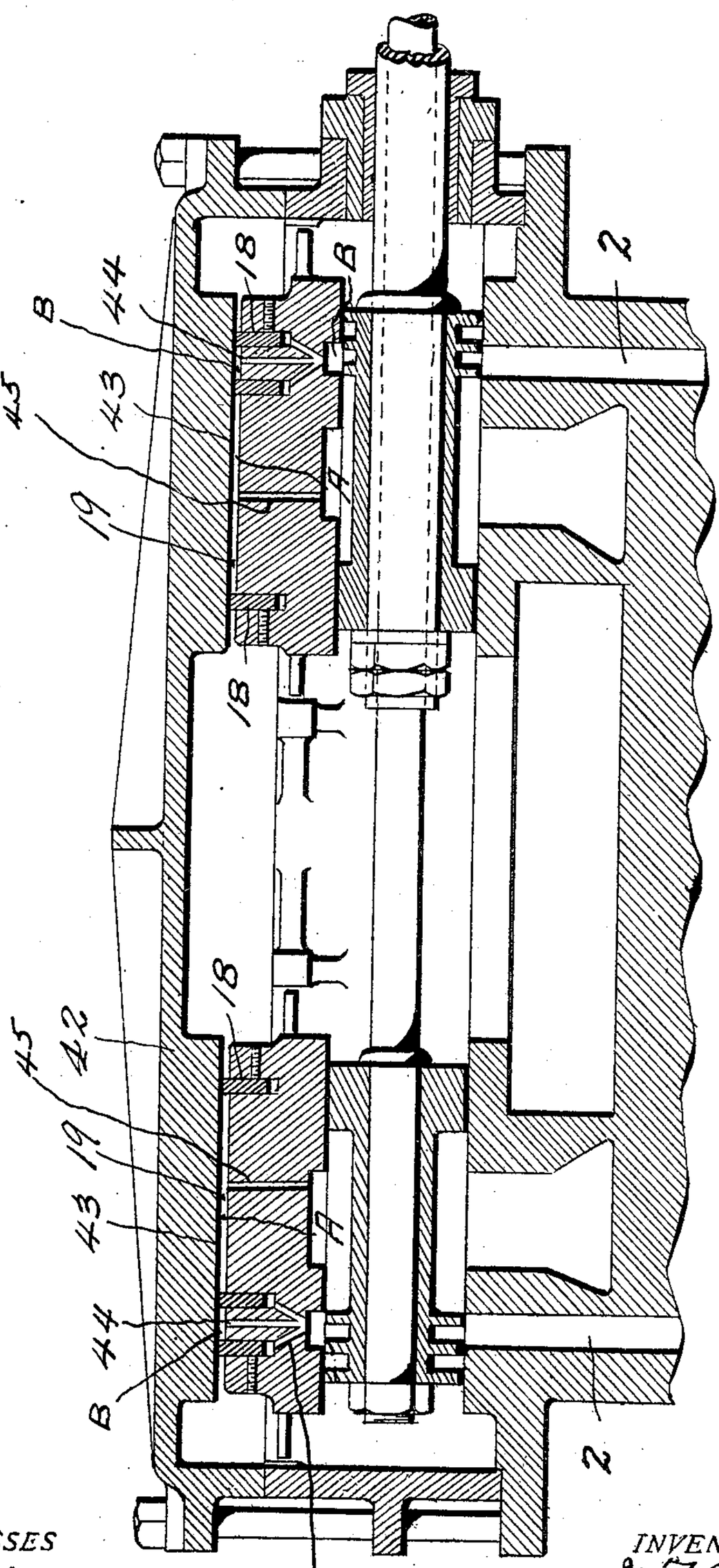

FIG. 6.

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UNITED STATES PATENT OFFICE.

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BALANCED VALVE.

No. 914,471. Specification of Letters Patent. Patented March 9, 1909.

Application filed December 11, 1908. Serial No. 467,101.

To all whom it may concern:

Be it known that I, JOHN T. WILSON, a citizen of the United States, residing at Jersey Shore, in the county of Lycoming and State of Pennsylvania, have invented certain new and useful Improvements in Balanced Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of my invention is the provision of balanced valves especially adapted for use with the improved Stevens valve gear disclosed in my application for Letters Patent filed December 11, 1908 Serial No. 467,038, and wherein two valves and two valve stems are shown in connection with means for imparting motion to both valves and supplemental means for imparting an independent variable movement to each valve, whereby one valve may cut off at any required point and the other valve prolong the exhaust until the stroke of the piston is approximately completed.

The accompanying drawings illustrate three examples of the physical embodiment of the invention constructed according to the best modes I have so far devised for the practical application of the principle; one example being adapted for internal admission and the others for the external admission of the motive fluid.

Figure 1 is a vertical section of part of a cylinder, steam chest, and valves of the external admission type. Fig. 2 is a top plan view with the steam chest cover removed showing at the left half of the valve seat and half of the valve, and at the right half of the balance plate and half the pressure plate. Fig. 3 is a bottom plan view of a pressure plate with the packing strips in their relative positions. Fig. 4 is a vertical section of a cylinder, steam chest, and valves of the internal admission type. Fig. 5 is a top plan view of Fig. 4 with half the steam chest cover removed at the left showing a top plan view of the balance plate, and at the right a top plan view of half the steam chest cover. Fig. 6 is a vertical section of a third example, and of the external admission type.

Referring to Figs. 1, 2 and 3, the numeral 1 designates the upper part of a cylinder; 2, the admission ports; 3, the exhaust spaces; 4, the valve seats; 5, the valves proper; 6, slots at one end only of each valve; 7, a back valve stem in the form of a tube for the valve at the right; 8, a nut upon the end of the tube where it projects through a passage in the valve; 9, the front valve stem located inside the back valve stem and movable relative thereto; 10, a nut applied to the end of the stem where it projects through a passage in the valve; 11, lugs projecting from the interior surface of the chest, as shown; 12, the balance plates, each having plain top and bottom surfaces lying in parallel planes; 13, lugs which loosely engage the lugs 11 and the inner surface of the end of the steam chest for holding a plate in position, but allowing it to have a slight rocking motion; 14, a hole or holes through the centers of the plates for connecting the back of a plate with an exhaust space; 15, a series of holes through each plate, each series being substantially in line with a cylinder port; 16, the pressure plates; 17, three longitudinal slots in the under surface of each plate; 18, projecting packing strips of any suitable material in the slots; 19, two end slots at right angles to the longitudinal slots; 20, packing strips in the slots 19 with their inner surfaces in contact with the ends of the packing strips 18, forming steam-tight joints; 21, passages for steam to the back surfaces of the packing strips for forcing them outwardly against the top surface of a balance plate; 22, threaded holes in the tops of the pressure plates; 23, the steam chest cover; 24, holes through the cover; 26, bolts for holding the pressure plates in proper positions; and 27 is the opening in the chest for the passage of the tubular valve stem. It will be observed that the packing strips form two spaces separate from each other at the top surface of each balance plate, designated as A and B, the spaces A being in communication with the exhaust spaces and the spaces B in line with the holes 15 and the cylinder ports. In each particular application the locations of the outside longitudinal packing strips and the end packing strips are such that the normal desired pressure of the balance plate upon the valve will be secured, as is obvious. When a valve is moved upon its seat to admit steam to a port an opening will also and simultaneously be given for the steam to space B at the edge of the pressure plate which will compensate for the increased area of surface exposed to steam pressure

at the under surface of the edge of the balance plate caused by the movement of the valve upon its seat. When the valve moves in the opposite direction and opens a passage from the cylinder port to the exhaust the space B is also opened to the exhaust and the steam therein allowed to escape. This mode of operation obviously secures a substantially constant pressure of the balance plate upon the valve throughout different positions of the valve when reciprocating upon its seat.

The second mode of the application of the principle of the invention is shown by Figs. 4 and 5. The cylinder is here shown in section and the piston 28 and piston rod 29 in elevation. The valve seats, valves, separate valve stems and steam chest cover and means for holding the pressure plates in position are of the same construction as shown in Figs. 1 and 2 and need not be described. The differences in construction relate to the top surface of the balance plate, the under surface of the pressure plate and the packing strips. The under surface 30 of the pressure plate is a plain surface. The top surface of each balance plate is provided with a raised outer edge 31 of a circular shape having a beveled inner surface 32, in connection with which is a circular packing strip 33 with a beveled surface in frictional contact with the beveled surface 32, as shown. Any suitable lapped steam-tight joint may be used at the meeting ends of the packing strip so it can expand and still prevent the passage of steam at the joint. As this valve is of the internal admission type, the live steam chambers are at 34 and live steam is admitted by holes 36 to the space 35 inclosed by the packing 33 and holds the valve to its seat. The space or area 35 inclosed by the packing strip 33 is determined experimentally for specific sizes of the valve as a whole and should be such as will secure the requisite pressure of the plate upon the valve proper. Owing to the shape of the packing in cross section and the upwardly and outwardly inclined surface 32, steam will force the top surface of the packing into close contact with the under surface of the pressure plate as the packing expands and prevent the escape of steam to the exhaust chamber 37 which surrounds each valve and the plates as shown. Within the area inclosed by the circular packing strip 33 is an inclosed area formed by a circular rib 38 with a beveled surface 39, the bevel being oppositely disposed to the beveled surface 35 for the packing 33, and an expansible packing ring 40 with a steam-tight lapped joint at the ends, of any suitable type, and with a beveled surface fitting the beveled surface 39 of the rib. The holes 41 and the inclosed space B, substantially in line with a port, correspond with the passages or holes 15 and inclosed space B of the first example, as is obvious. The mode of operation and the preservation of a substantially constant balance of the valve is also the same as in the first example. When a valve moves and admits steam from chamber 34 to a cylinder port steam is also admitted to the space B and when the port is uncovered to the exhaust chamber 37 the space B is simultaneously opened to the exhaust chamber. Thus each valve is balanced as it moves from one position to another upon its seat.

The third mode of the application of the principle is shown by Fig. 6 and is, like the first example, of the external admission type. It differs from the example disclosed in Figs. 1, 2 and 3 as follows: The separate pressure plate is omitted and the steam chest cover 42 provided with two plain surfaces 43, 43. The balance plate is slotted in its top surface identically as is the under surface of the pressure plate shown by Fig. 3 and packing strips 18 and 19 are inserted within the said slots which project therefrom and bear against the plain surfaces 43, 43 at the under surface of the steam chest cover. The inclosed spaces A and B are the same as in the first example. Holes 44 allow steam to pass to spaces B, and holes 45 connect spaces A with the exhaust spaces. Holes, such as 46, may be provided for allowing steam to enter back of the packing strips 18, 19 and force them against the surfaces 43, 43 of the steam chest cover. The mode of operation is the same as set forth in connection with the first example.

It will be observed that each of the two valves in all the examples is connected with a separate valve stem, and that each valve has an inclosed space B located substantially in line with the port to the cylinder, as only one edge of the valve is subjected to substantial variations in pressure and requires means for maintaining it in balance.

What I claim is:

1. The combination with a steam chest and cylinder, of two separate valve seats each having a port leading to a cylinder; two valves, one upon each seat; means for reciprocating the valves; a balance plate and a pressure plate in connection with each valve; and packing between each balance plate and a pressure plate; said packing inclosing two spaces between each balance plate and each pressure plate, one of which spaces is in line with a port, means being provided for admitting steam to each space in line with the port and exhausting it therefrom as the valve moves upon its seat.

2. The combination with a steam chest and cylinder, of two separate valve seats each having a port leading to a cylinder; two valves, one upon each seat; two separate valve stems, one secured to each valve;

a balance plate and a pressure plate in connection with each valve; and packing between each balance plate and a pressure plate; said packing inclosing two spaces between each balance plate and each pressure plate, one of which spaces is in line with a port, means being provided for admitting steam to each space in line with a port and exhausting it therefrom as the valve moves upon its seat.

3. The combination with a steam chest and cylinder, of two separate valve seats each having a port leading to a cylinder; two valves, one upon each seat; means for reciprocating the valves; a balance plate and a pressure plate in connection with each valve; and packing between each balance plate and a pressure plate; said packing inclosing two spaces between each balance plate and each pressure plate, the smaller of which spaces is located at the edge of the balance plate and adjacent one edge only of the valve, means being provided for admitting steam to the smaller of the said spaces and exhausting it therefrom as the valve moves upon its seat.

4. The combination with a steam chest and cylinder, of two separate valve seats each having a port leading to a cylinder; two valves, one upon each seat; means for reciprocating the valves; a balance plate and a pressure plate in connection with each valve; and packing between each balance plate and a pressure plate; said packing inclosing two spaces between each balance plate and each pressure plate, one of which spaces is in communication with a source of steam supply when the engine is operating, and the other of which spaces is located adjacent one edge of the valve, means being provided for admitting steam to each space adjacent one edge of the valve and exhausting it therefrom as the valve moves upon its seat.

5. The combination with a steam chest and cylinder, of two separate valve seats each having a port leading to a cylinder; two valves, one upon each seat; means for reciprocating the valves; a balance plate; and means, embracing packing, inclosing two spaces at the top of each balance plate, one of which spaces is in line with the port, means being provided for admitting steam to each space in line with the port and exhausting it therefrom as the valve moves upon its seat.

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

JOHN T. WILSON.

Witnesses:
W. Bruce Harlan,
Jno. P. Stevens.