(No Model.) 2 Sheets—Sheet 1.

E. BARTHOLOMEW.

STEAM ACTUATED VALVE.

No. 481,520. Patented Aug. 23, 1892.

Fig. 1.

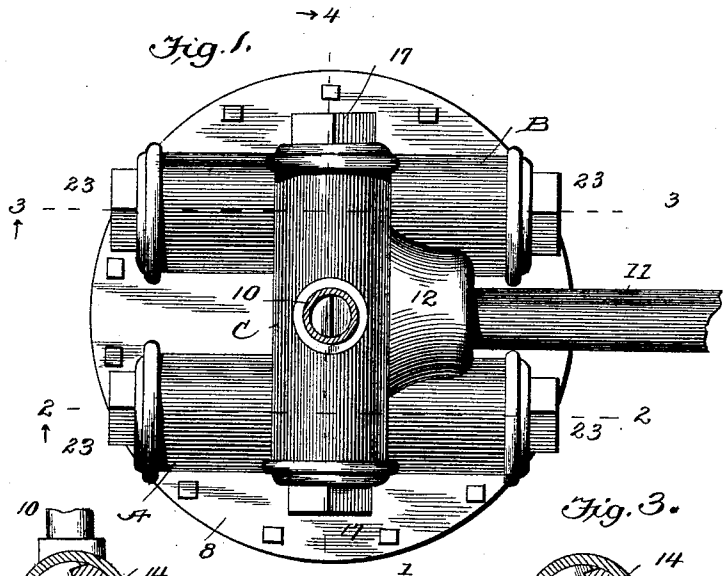


Fig. 2

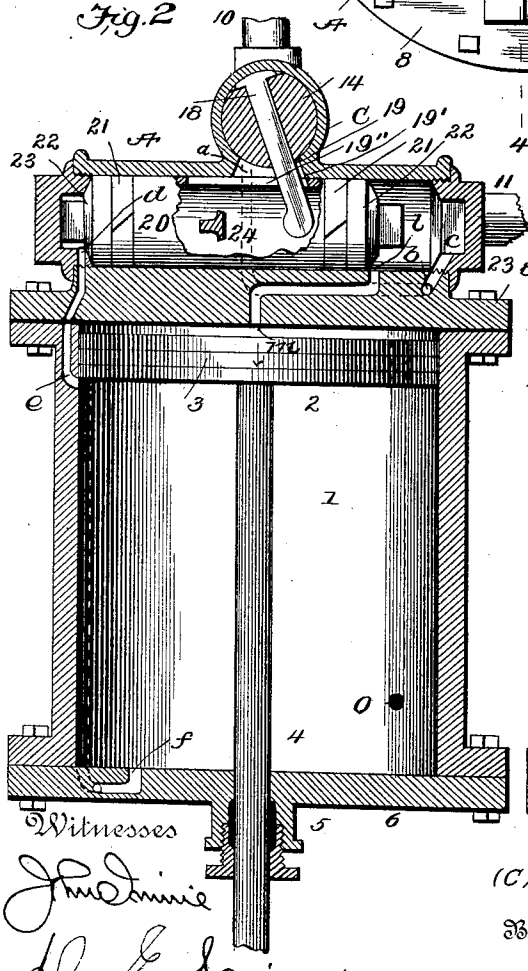
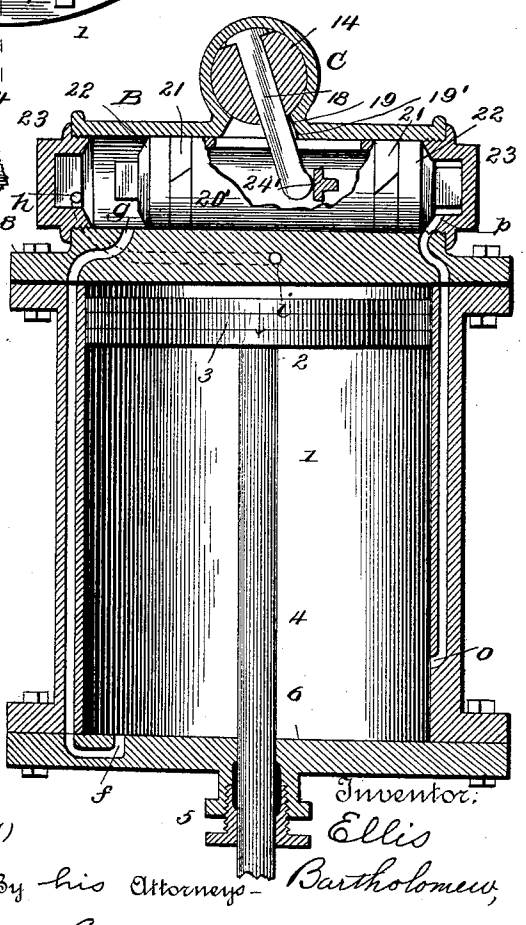


Fig. 3.



Witnesses

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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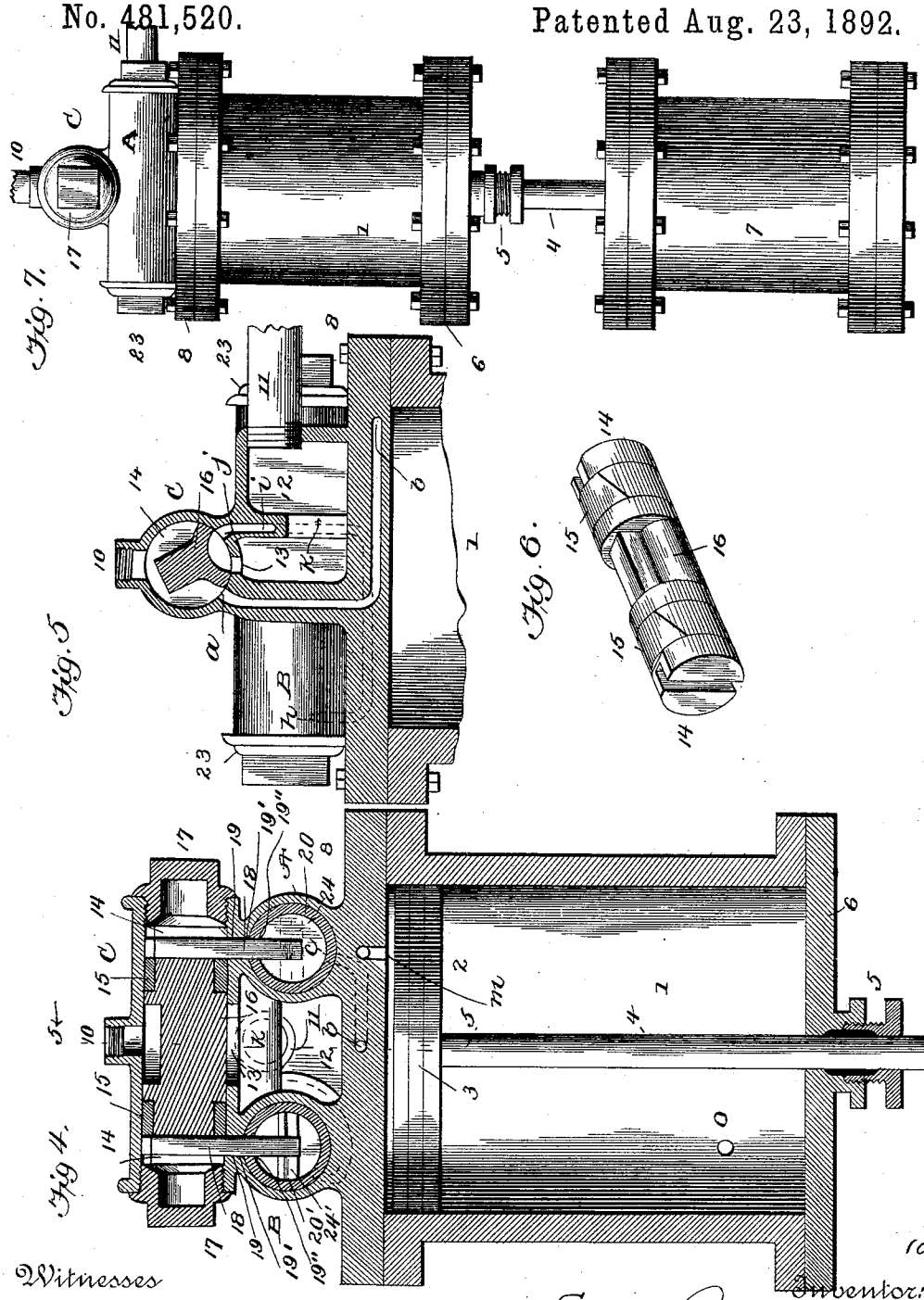

Fig. 7.

Fig. 5

Fig. 6.

Fig 4.

(C)

Witnesses

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UNITED STATES PATENT OFFICE.

ELLIS BARTHOLOMEW, OF LIMA, OHIO, ASSIGNOR OF FOUR-FIFTHS TO OSCAR W. BELL, OF SAME PLACE, AND OLIVER JAY AND DANIEL W. JAY, OF ST. MARY'S, OHIO.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 481,520, dated August 23, 1892.

Application filed April 18, 1892. Serial No. 429,613. (No model.)

To all whom it may concern:

Be it known that I, ELLIS BARTHOLOMEW, a citizen of the United States, residing at Lima, in the county of Allen and State of Ohio, have invented certain new and useful Improvements in Steam-Actuated Valves, (Case C;) 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 invention relates to steam-engine valves, and more especially to such valves when they are actuated by steam; and the object of the same is to effect certain improvements in valves of this character.

To this end the invention consists in the device hereinafter more fully described with reference to a steam-actuating pump, the novelty being set forth in the claims, and the preferred construction being illustrated on the accompanying two sheets of drawings, wherein—

Figure 1 is a plan view of this device. Figs. 2, 3, and 4 are vertical sections on the lines 2 2 3 3 4 4 of Fig. 1. Fig. 5 is a vertical section of the upper part of Fig. 4 on the line 5 5 thereof. Fig. 6 is a perspective detail of the valve proper. Fig. 7 is an exterior elevation showing the device connected to a steam or air pump.

Referring to the said drawings, 1 is a cylinder within which moves a piston-head 2, having a packing-ring 3, and its stem 4, passing through a suitable stuffing-box 5 in the lower head 6 of the cylinder and leading to or communicating with any device or machine which is to be driven, a steam-pump 7 being shown in the present instance, as in Fig. 7.

On the upper head 8 of the cylinder 1 is mounted a pair of cylinders A and B, standing parallel with each other, and above these cylinders is located a cylinder C, standing at right angles thereto and comprising the valve-casing.

10 is the steam-supply pipe leading into the center of the casing C, and 11 is the exhaust leading from a box 12, which is situated between the cylinders A and B and communicates, as at 13, with the bottom of the casing C. Within the latter is located the valve, (best seen in Fig. 6,) comprising two cylindrical heads 14, each having a packing-ring 15, and a triangular stem 16, connecting these heads and whose cross-section is of the shape shown in Fig. 5. The ends of the casing are tightly closed by heads 17.

Secured to the heads 14 of the valve are arms 18, which depend therefrom through openings 19 in the lower side of the casing C and through openings 19′ in the cylinders A and B.

In the cylinders A and B are located reciprocating pistons 20 and 20′, having packing-rings 21 near their ends, outside of which the nuts 22 are adapted to move into similarly-shaped and socketed heads 23 of the cylinders. The bodies of such pistons are hollow, as seen in Figs. 2 and 3, and through the slots 19″ in the upper sides thereof project the arms 18, above mentioned, whose lower ends are adapted to be struck by the cross-bars or pins 24 or 24′ within said pistons. Said pistons are duplicates, except that the cross-bars are arranged, as seen in Figs. 2 and 3, so as to strike against the opposite sides of the two arms 18 of the valve.

It will be understood that the ports and passages hereinafter described are susceptible of considerable change in location and arrangement from that illustrated so long as they lead from and to about the points indicated and so long as their effect upon the operation of the machine remains unchanged. It will perhaps be best to describe these passages by indicating the course of the steam as it flows through the machine in the operation of the latter. Live steam entering the casing C at the point 10 (see Fig. 2) passes, as at *a*, into a feed-passage *b*, which leads, as at *c*, into the right end of the cylinder A and forces the piston 20 to the left, the dead steam or air behind this piston having an exit, as at *d*, through an upper side passage, which opens, as at *e*, into the main cylinder 1 below the upper limit of movement of the piston-head 2, thence out at *f* in the lower end of this main cylinder and through a lower end passage which opens, as at *g*, into the space at the left end of the cylinder B, thence out

of this space, as at *h*, into an exit-passage *i*, which opens, as at *j*, into the casing C, this opening being at this time thrown into communication by the valve 16 with an opening *k* into the box 12, and thence to the exhaust 11. The steam in front of the piston 20 moves it to the left, Fig. 2, until it enters at *l* the upper end passage, which opens, as at *m*, above the piston-head 2, and the live steam thus being thrown into the main cylinder above the piston-head the latter descends. As it passes the opening *e* the exit therefrom has of course ceased, as the piston 20 has then completed its movement, and what steam here enters the upper side opening and flows back, as at *d*, behind the piston 20 will not affect the latter, as will be clear. The piston-head 2 continuing to descend, it finally passes an opening *o*, leading to the lower side passage, which communicates, as at *p*, with the right end of the cylinder B. Live steam being thus admitted in front of the piston 20′, the latter moves to the left, (the openings *h*, *i*, *j*, and *k* to the exhaust 11 permitting,) and as the piston makes this movement the pin 24′ strikes one of the arms 18 and forces the valve 16 to a position opposite to that shown in Figs. 2, 3, and 5, the other pin 24 being at this time remote from the other arm 18, as seen in Fig. 2, and thus offering no impediment to such movement of the valve. The latter now directs the live steam from the supply-pipe 10 at *j* back into the exit-passage *i* and out therethrough, as at *h*, into the space at the left of the piston 20′ and causes its immediate return to the position shown in Fig. 3. This is permitted by reason of the fact that the dead steam at the right end of this piston passes directly back its path through the lower side passage *p* and *o*, above the piston-head 2, through *m l c b a*, under the valve 16, (which now stands opposite the position shown in Fig. 5,) through the opening *k* into the box 12 and out the exhaust 11. The live steam at the left of the piston 20′ having moved said piston back to its original position then finds a path through the opening *g*, along the lower end passage, and out, as at *f*, beneath the piston-head 2, which now commences to rise, and, passing the opening *o*, the live steam is admitted to the lower side passage and passes out, as at *p*, at the right of the piston 20′, but will not move that piston, as in the case above. As the piston-head ascends, the dead steam is permitted to pass through the opening *m* to the exit over the course indicated, and as the piston-head passes the opening *e* the live steam is allowed to enter the upper side passage and passes out, as at *d*, at the left of the piston 20 in the cylinder A, whereby that piston is moved back to its original position and the exhaust is interrupted at *l* just as the piston-head 2 has reached the upper limit of its movement. This return movement of the piston 20 causes its pin 24 to strike the arm 18, (which, it will be understood, then stands against said pin,) and the valve 16 is reset for renewed operation, as above explained. Fig. 2 shows the piston 20 as having made its first movement. The said "original position" would be with the pin 24 against the arm 18 in this view. It will thus be seen that while the construction of the two cylinders is almost the same their ports are different, as are the operations of the two pistons therein. The movements of the latter are, first, the piston 20 to the left; second, the piston 20′ to the left, (which shifts the valve 16;) third, the piston 20′ immediately back, (which leaves the valve in its new position,) and, fourth, the piston 20 back to its original position, (which returns the valve also to its original position.) These movements are controlled entirely by the movements of the piston-head 2 as it opens and closes the openings *e* and *o*, and hence it will be clear that the main cylinder 1 can be of considerably greater length than here shown, as when a longer stroke is desired.

It is my intention to employ this device in connection with a fluid-pump 7, as seen in Fig. 7, although it is obvious that it may be put to other uses without departing from the spirit of my invention.

What is claimed as new is— .

1. The herein-described valve, comprising a cylindrical casing having a supply-opening in its top, an exit-opening opposite thereto leading to the exhaust, and openings at the sides of the exit-openings, and a valve within said casing having near its ends heads provided with packing-rings and at its center a three-way shank, in combination with cylinders to which said side openings lead, reciprocating pistons in said cylinders, and connections, substantially as described, between said pistons and the valve for oscillating the latter, as set forth.

2. The herein-described valve, comprising a cylindrical casing having near its ends transverse slots and at its center a supply-opening in its top, an exit-opening opposite thereto leading to the exhaust, and openings at the sides of the exit-opening, and a valve within said casing having near its ends heads provided with packing-rings, at its ends depending arms passing through said slots, and at its center a three-way shank, in combination with cylinders having longitudinally-slotted tops registering with the slots in said casing, passages connecting said side openings with the opposite ends of the two cylinders, openings leading from the other ends of the two cylinders, cylindrical pistons within said cylinders and having slots in their tops registering with those in the cylinders, said arms projecting through the three registering-slots into the pistons, and transverse pins in said pistons at opposite sides of the two arms, as and for the purposes set forth.

3. The herein-described valve, comprising a cylindrical casing having near its ends transverse slots and at its center a supply-open-

ing in its top, an exit-opening opposite thereto leading to the exhaust, and openings at the sides of the exit-opening, and a valve within said casing having near its ends heads provided with packing-rings, at its ends depending arms passing through said slots, and at its center a three-way shank, in combination with cylinders having longitudinally-slotted tops registering with the slots in said casing, passages connecting said side openings with the opposite ends of the two cylinders, reciprocating pistons within said cylinders, and pins on the pistons at opposite sides of said arms, as and for the purposes set forth.

4. The herein-described valve, comprising a cylindrical casing having near its ends transverse slots, and at its center a supply-opening in its top, an exit-opening opposite thereto, and openings at the sides of the exit-opening, and a valve within said casing having near its ends heads provided with packing-rings, at its ends depending arms passing through said slots, and at its center a three-way shank, in combination with cylinders standing beneath the ends of the casing at right angles thereto and having longitudinally-slotted tops registering with the slots in said casing, passages connecting said side openings with the opposite ends of the two cylinders, reciprocating pistons within said cylinders, pins on the pistons at opposite sides of said arms, a box between the cylinders communicating with said exit-opening, and an exhaust-pipe leading from said box, as and for the purpose set forth.

5. The combination, with a valve comprising a cylindrical casing having a supply-opening in its top, an exit-opening leading to the exhaust, and openings at the sides of the exit-opening, a valve within said casing having near its ends heads provided with packing-rings and at its center a three-way shank, auxiliary cylinders to which said side openings lead, reciprocating pistons in these cylinders, and connections, substantially as described, between said pistons, and the valve for operating the latter, of a main cylinder, a piston-head therein, and passages connecting this cylinder with the auxiliary-cylinders, as and for the purpose set forth.

6. The combination, with a valve comprising a cylindrical casing having near its ends transverse slots and at its center a supply-opening in its top, an exit-opening opposite thereto leading to the exhaust, and openings at the sides of the exit-opening, a valve within said casing having near its ends heads provided with packing-rings, at its ends depending arms passing through said slots, and at its center a three-way shank, two auxiliary cylinders having longitudinal slots in their tops registering with those in the casing, passages connecting said side openings with the right end of the first and the left end of the second auxiliary cylinder, reciprocating pistons within these cylinders, and pins on the pistons at opposite sides of the arms, of a main cylinder, a piston-head therein, an upper end passage leading from near the right end of the first auxiliary cylinder to the top of the main cylinder, an upper side passage leading from the left end of the first auxiliary cylinder to the side of the main cylinder just below the upper limit of movement of the piston-head therein, a lower end passage leading from near the left end of the second auxiliary cylinder to the lower end of the main cylinder, and a lower side passage leading from the right end of the second auxiliary cylinder to the side of the main cylinder just above the lower limit of movement of the piston-head therein, as and for the purpose set forth.

7. The combination, with a valve comprising a cylindrical casing having a supply and exit openings and openings at the sides of the exit-opening, a valve within said casing having a three-way shank, two auxiliary cylinders to which said side openings lead, pistons in these cylinders, and connections, substantially as described, between said pistons and the valve for oscillating the latter, of a main cylinder, a piston-head therein, and passages connecting this cylinder with the auxiliary cylinders, as and for the purpose set forth.

8. The combination, with a valve comprising a casing having supply and exit openings and openings at the sides of the exit-openings, a valve within said casing having a three-way shank, two auxiliary cylinders to which said side openings lead, pistons in these cylinders, and connections, substantially as described, between said pistons and the valve for oscillating the latter, of a main cylinder, a piston-head therein, an upper end passage leading from near the right end of the first auxiliary cylinder to the top of the main cylinder, an upper side passage leading from the left end of the first auxiliary cylinder to the side of the main cylinder just below the upper limit of the movement of the piston-head therein, a lower end passage leading from near the left end of the second auxiliary cylinder to the lower end of the main cylinder, and a lower side passage leading from the right end of the second auxiliary cylinder to the side of the main cylinder just above the lower limit of movement of the piston-head therein, as and for the purpose set forth.

9. The combination, with a casing having a three-way valve therein, two auxiliary cylinders, passages for supplying steam from the casing alternately to opposite ends of these cylinders, pistons in the latter, and means, substantially as described, for shifting said valve, of a main cylinder, a piston-head therein, an upper end passage leading from near the right end of the first auxiliary cylinder to the top of the main cylinder, an upper side passage leading from the left end of

the first auxiliary cylinder to the side of the main cylinder just below the upper limit of movement of the piston-head therein, a lower end passage leading from near the left end of the second auxiliary cylinder to the lower end of the main cylinder, and a lower side passage leading from the right end of the second auxiliary cylinder to the side of the main cylinder just above the lower limit of movement of the piston-head therein, as and for the purpose set forth.

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

ELLIS BARTHOLOMEW.

Witnesses:
A. S. GRAHAM,
J. L. SITZMAN.