(No Model.) 3 Sheets—Sheet 1.

F. M. BROWN.

STEAM ACTUATED VALVE.

No. 467,274. Patented Jan. 19, 1892.

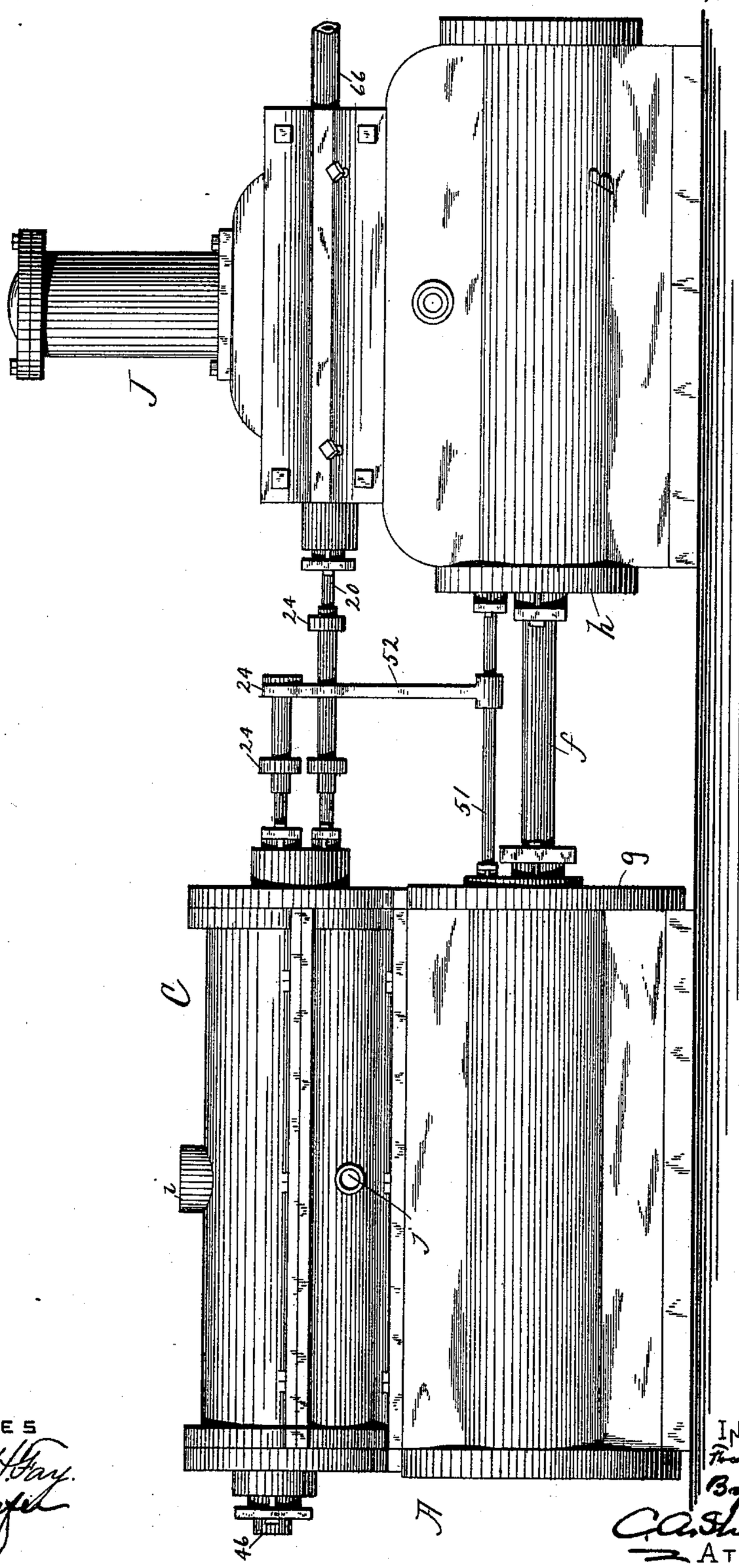

Fig. 1.

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STEAM ACTUATED VALVE.

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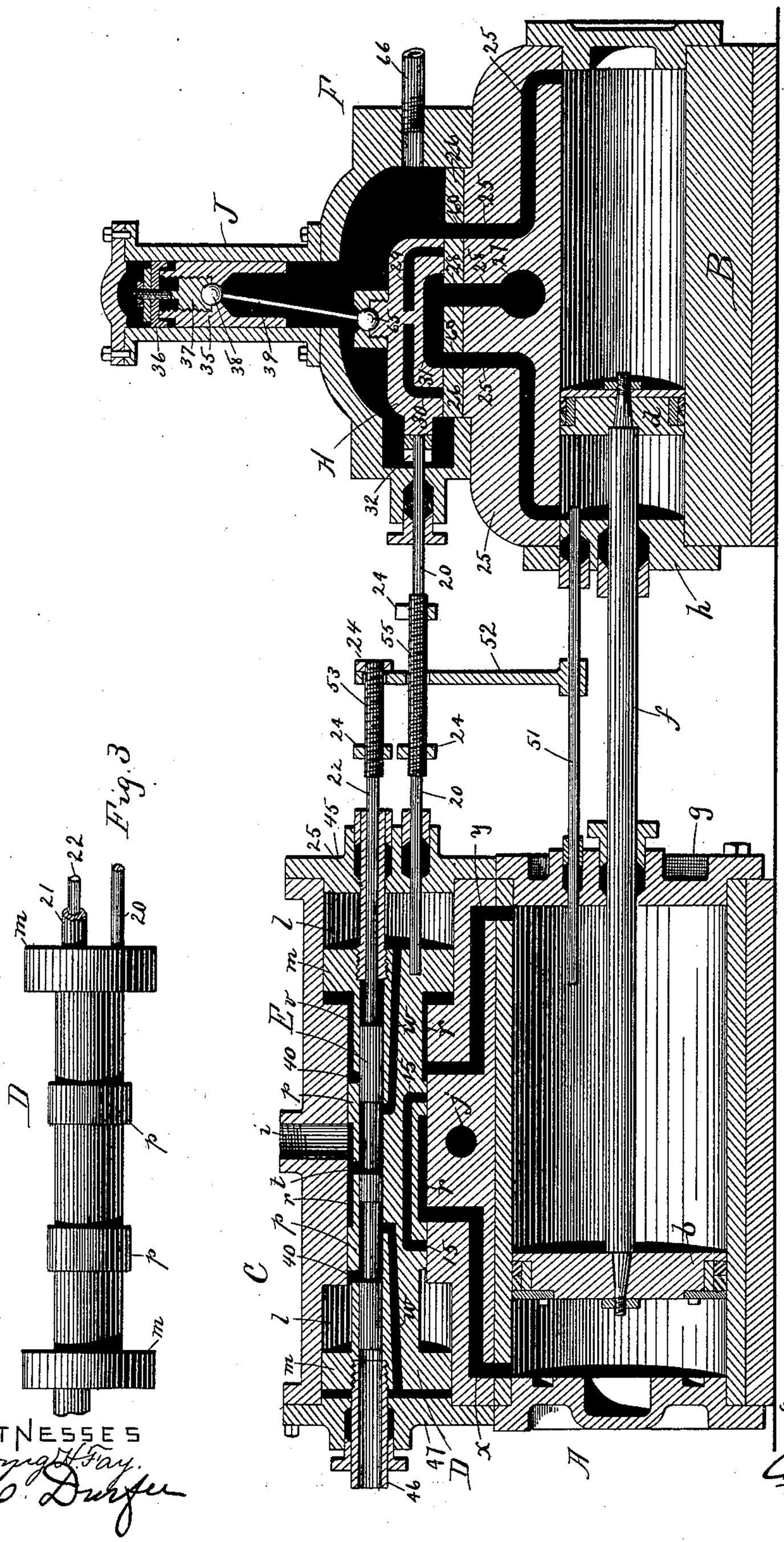

Fig. 2.

Fig. 3.

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STEAM ACTUATED VALVE.

No. 467,274. Patented Jan. 19, 1892.

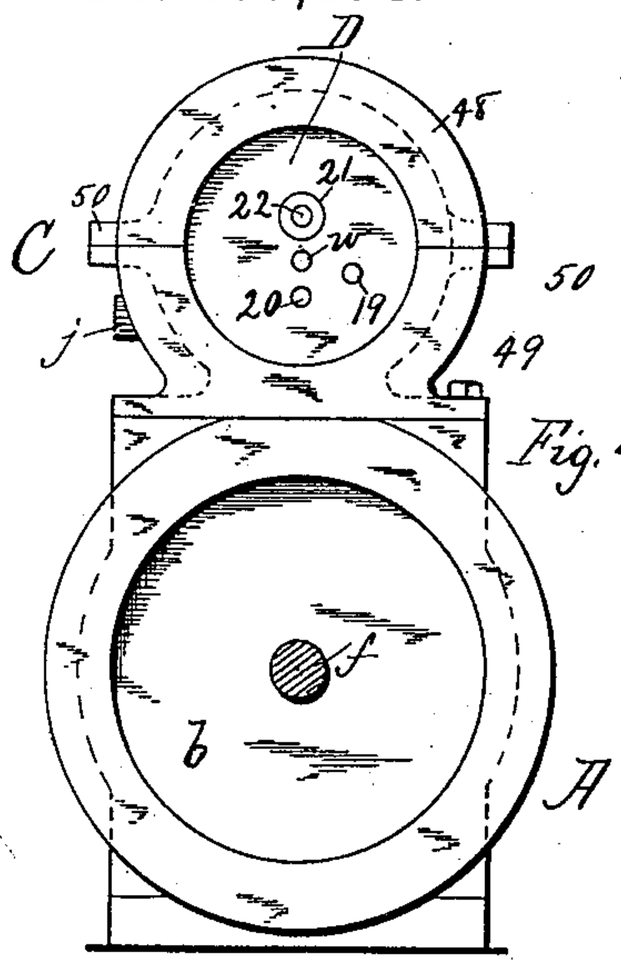

Fig. 4.

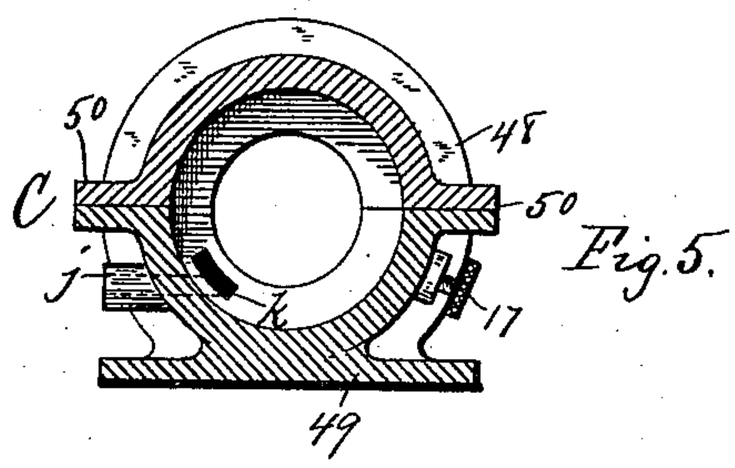

Fig. 5.

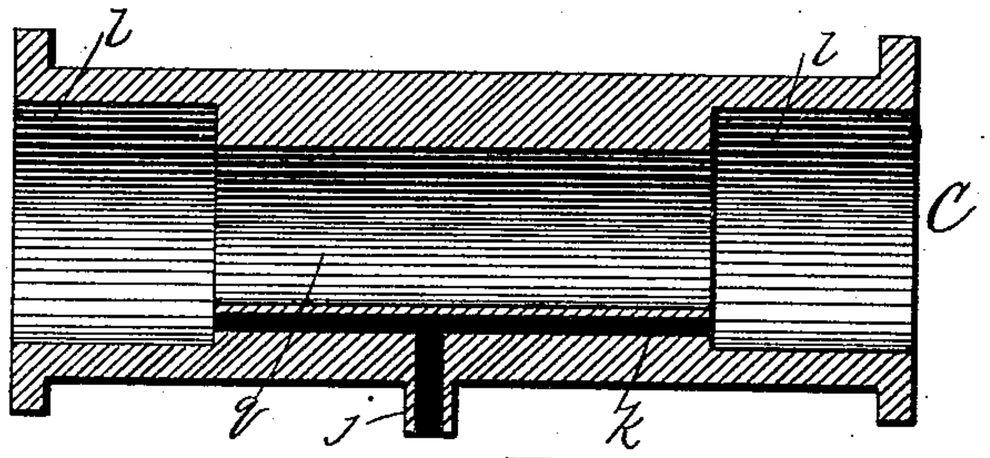

Fig. 6.

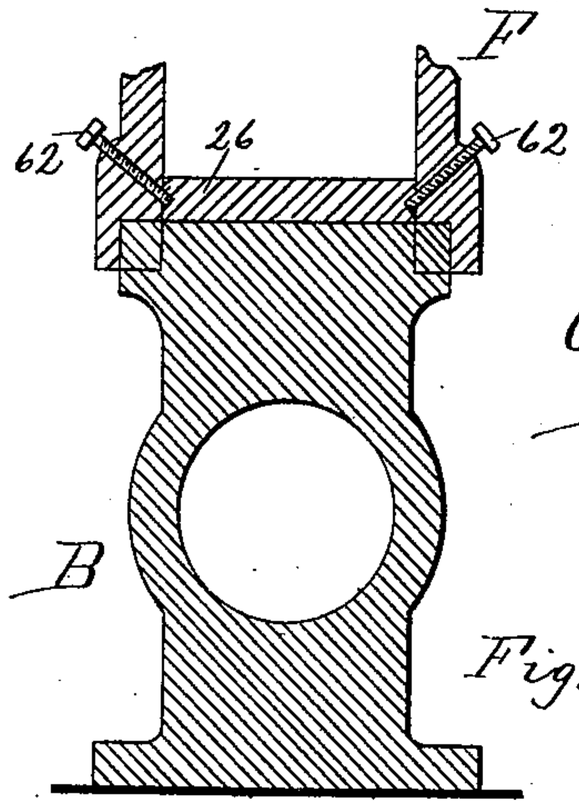

Fig. 8

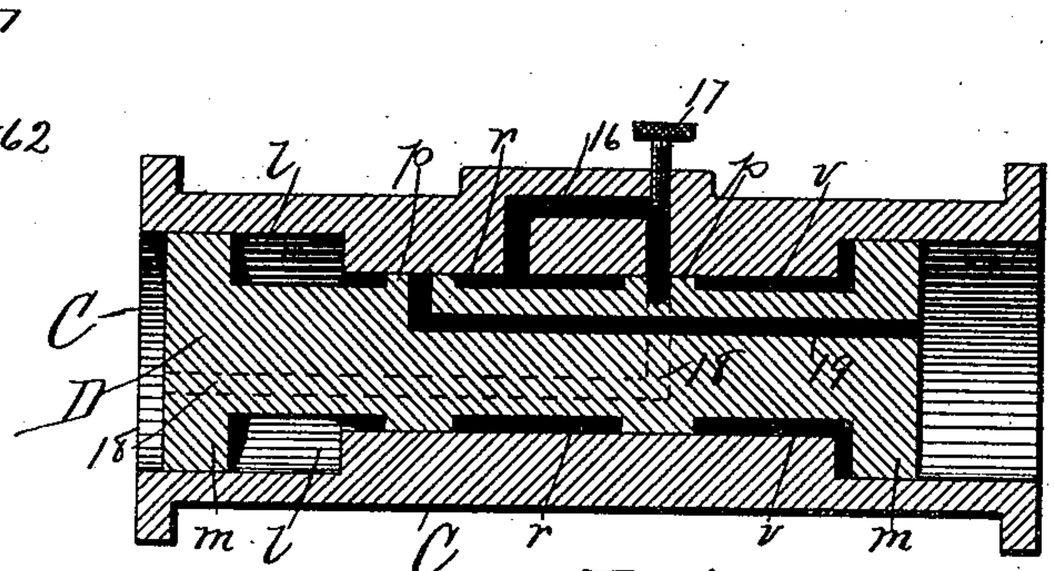

Fig. 7.

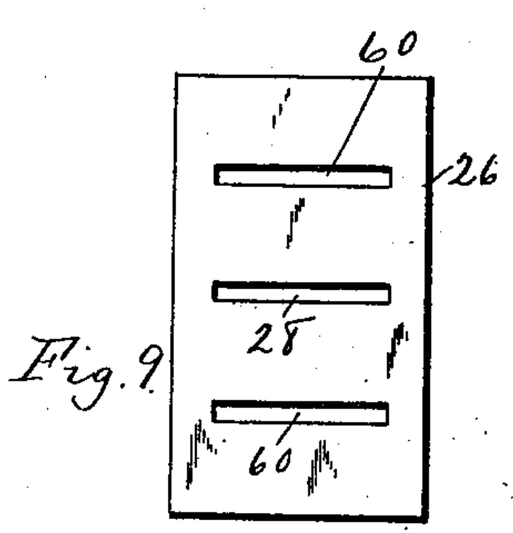

Fig. 9

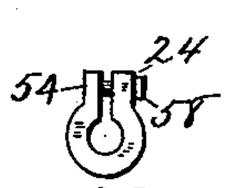

Fig. 12.

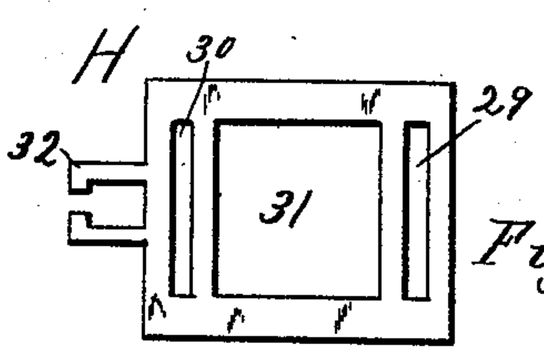

Fig. 10.

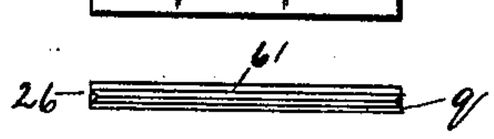

Fig. 11.

WITNESSES

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UNITED STATES PATENT OFFICE.

FREDRIC M. BROWN, OF WARREN, RHODE ISLAND.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 467,274, dated January 19, 1892.

Application filed April 28, 1891. Serial No. 390,808. (No model.)

To all whom it may concern:

Be it known that I, FREDRIC M. BROWN, of Warren, in the county of Bristol, State of Rhode Island, have invented certain new and useful Improvements in Steam-Actuated Valves, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of my improved pump; Fig. 2, a vertical longitudinal section of the same; Fig. 3, an elevation of the main steam-valve detached; Fig. 4, an end elevation of the steam-cylinder chest, looking from the right in Fig. 2, the heads being removed; Fig. 5, a vertical transverse section of the steam-chest; Fig. 6, a horizontal longitudinal section of the same, showing the exhaust; Fig. 7, a like view of the steam-valve; Fig. 8, a cross-section of the water-cylinder, showing the method of fastening the valve-seat; Fig. 9, a plan view of the valve-seat; Fig. 10, a face view of the water-valve; Fig. 11, an edge view of the valve-seat, and Fig. 12 an elevation illustrating certain details of construction.

Like letters and figures of reference indicate corresponding parts in the different figures of the drawings.

My invention relates to steam-pumps provided with horizontal steam and pump cylinders, and is designed, especially, as an improvement on the device shown in my Letters Patent, No. 421,159, dated February 11, 1890, and granted to me for new and useful improvements in steam-pumps.

In the drawings, A represents the steam-cylinder and B the water-cylinder, these parts being arranged horizontally in alignment and the water-cylinder being less in diameter than said steam-cylinder, as best shown in Fig. 2. The piston *b* of the steam-cylinder and the piston *d* of the water-cylinder are rigidly connected by a piston-rod *f*, which works horizontally in the cylinder-heads *g h*.

The steam-chest C, provided in its top with a supply-port *i*, is mounted on top of the steam-cylinder A and is provided centrally at its rear side with an exhaust-port *j*, which opens into a horizontal duct *k*. (See Fig. 6.) The ends of said chest are enlarged anteriorly at *l*, and the duct *k* is formed in the walls of said chest, its ends opening into said enlarged portion.

D represents the steam-valve considered as a whole. This valve works longitudinally in the chest C, its ends being provided with annular flanges *m*, which work in the enlarged portions *l* of said chest. The valve is provided centrally with flanges *p*, of less diameter, which work in the main-chest cylinder *q*. A solid valve E (see Fig. 2) is fitted to slide longitudinally in the main valve D.

An annular steam-chamber *r* in the top of the valve D has a duct *t* opening into the seat of the valve E, the steam-supply port *i* opening into said chamber. A similar annular steam-chamber *v* is formed in the main valve near its forward flange *m*. Ducts *w* lead, respectively, from the bottom of the seat of the valve E at equidistant points from the port *t* through the body of the valve D and open into the steam-chest at opposite ends thereof. Ducts *x y* respectively lead from the bottoms of the chambers *r v* into opposite ends of the steam-cylinder A. A balance-port 15 is formed in the bottom of the main valve D and is of suitable length to connect the ports *x y* at a determined point in the travel of said valve. Exhaust-ports 40 are formed in the top of the valve-body and open into the seat of the solid valve E. A cushion-port 16 has one end opening into the live-steam chamber *r*, its opposite end opening into a horizontal duct 18 (see Fig. 7) in the body of the valve D, said duct 18 opening through one of the flanges *p* and leading longitudinally outward through the end of the valve D. A similarly-arranged duct 19 (see Fig. 7) opens through the companion flange *m* and leads through the opposite end of the valve D. A regulating screw-valve 17 is turned through the wall of the chest C and projects into the port 16. A valve E is provided with suitable flanges for closing the exhaust 40, port *t*, and ducts *w*. The stem 22 of said valve (see Fig. 2) slides in a bushing 21, which has its inner end threaded and turned into the end of the seat of said valve E, said bushing being suitably packed and fitted to slide in the chest-head 45. A tube or bushing 46 is turned into

the opposite end of the valve D, registering with the seat of the valve E, and is fitted to slide in the opposite chest-head 47, said tube being opened at its outer end, so that the valve E may be readily withdrawn therethrough, if desired, without dismounting the chest walls or heads. The chest is formed in two sections 48 and 49, having flanges 50, which are bolted together, (see Figs. 4 and 5,) such construction being essential in order to mount the valve D therein. A rod 51 is fitted to slide longitudinally in the cylinder-heads *g h*, said rod projecting into said cylinders in position to be engaged by their respective pistons. A vertical bar 52 is secured to said rod between the water and steam cylinders. The outer end of the valve-stem 22 is threaded at 53 and is fitted to slide freely through the upper end of the rod 52. Strap-nuts 24, turned onto said stem, regulate the stroke thereof. Said nut is shown in detail in Fig. 12 and has laterally-projecting lugs 54, connected by a screw 55, whereby it may be clamped onto said stem to prevent its working loose.

As shown in Fig. 4, the valve E is mounted in the valve D above the center, the duct *w* being formed vertically below said valve-seat and the duct 19 in a vertical plane parallel therewith. A rod 20 has one end secured in the valve D below the duct *w* and is fitted to slide freely in the head 45 of the steam-chest. Said rod is threaded at 55 and passes freely through the vertical rod 52, nuts 24 being disposed on said threaded portion.

The water-cylinder B has ports 25 leading from the bottom of the water-chest F, disposed on the top of said cylinder, into opposite ends thereof. The supply-port 27 opens by a duct 28 into the bottom of the water-chest F centrally between the ports 25. The valve-seat 26 is disposed on the floor of the chest F. Said seat is provided with ports 60, (see Fig. 9,) which register with the ports 25 and with a central port 28, registering with the supply-port. The valve-seat is grooved longitudinally at 61 on its edges, (see Fig. 11,) and is held in position by a set-screw 62, (see Fig. 8,) passing through the walls of the chest F into said grooves.

The valve H is shown in face view in Fig. 10. Said valve is provided with a link 32, by which it is secured to an end of the rod 20. The valve slides flatly on the seat 26 and is provided with a central duct 31, of sufficient length to connect the supply 27 with either of the ports 25. Chambers 29 and 30 are formed in the valve in position to register with the ports 25. A vertical cylinder J is disposed on top of the chest F and opens therein. A piston 35 is fitted to slide in said cylinder. Said piston is provided centrally with a socket, in which a ball 38 on one end of a rod 39 is mounted. A take-up screw 37, turned into said piston, engages said ball and forms the upper wall of the socket. Packing 36 is held in position by being turned onto the stem of said take-up screw. A ball 65 is formed on the lower end of the rod 39 and works in a suitable socket disposed centrally in the top of the valve H. The purpose of said piston, ball, and socket is to balance said valve by direct water-pressure. A discharge-port 66 opens into the forward end of the valve-chamber of the chest F.

The parts are shown in the drawings as in the position they assume at the completed stroke of the piston. For the return stroke the steam, entering the steam-chest through the chamber *r*, passes through the port *x* and drives the piston *b* forward. When said piston engages the rod 51, the valve-stem 22 is moved thereby, drawing the valve E with it. The central flange of said valve passes the port *t*, admitting steam from the chamber *r* through the port *w* and between the outer head of the valve D and piston-head 47, the corresponding exhaust 40 being at the same time closed by the end flange of said valve. The main valve D is thus driven forward, and during its forward movement the balance-port 15 will for a moment register with the cylinder-ports *x* and *y* and convey steam from one end of the cylinder to the other and equalize the pressure, preventing the piston from striking the cylinder-heads when running at a high rate of speed. As the valve D reaches the end of its forward movement the flange *p* and port 18 register with the cushion-port 16 and steam is admitted behind the valve D, thus cushioning the movement of said valve and balancing the same. An inner exhaust 40 of the main valve is opened by the movement of the solid valve E, permitting the steam to be exhausted from the inner end of the chest through the port *w* into the exhaust *k*. The movement of the valve D drives the rod 20, and with it the water-valve H. The forward movement of the water-piston *d* forces the water through the port 25 and out the discharge 66. The pressure of the water in the chest-chamber bears against the piston 35 and downward into the valve H. As the valve moves forward its port 31 connects the outer port 25 with the supply-port 27, enabling the water to be drawn into the cylinder on the return stroke of its piston. The pressure of the water being upward on the piston 35 relieves or counteracts the downward pressure on the valve H, the ball-and-socket joint working freely and not interfering with the action of said valve. As the ports 29 or 30 of the valve H register, respectively, with the water-ports 25, the spaces formed by said ports 29 and 30 serve to cushion the water in the cylinder and prevent said valve from rising from off its seat 26.

By constructing the valve E solid and arranging the ports as described I am enabled to increase the diameter of the flanges *m* of the piston-valve D without increasing the waste or leakage from the steam-valve. This enables any desired amount of power necessary to move the water-valve H to be attained

without increasing the size of the steam-valve. Moreover, by arranging the balance-port 15 as described I am enabled to convey steam from one end of the cylinder to the other and equalize the pressure, preventing the piston from striking the cylinder-heads when at high rate of speed.

By the ports 18 and 19 and cushion-ports 16 direct steam is supplied for cushioning the main valve D. The amount of such steam may readily be gaged by means of the screw-valve 17.

By mounting the steam-valve E above the center of the main valve D room is effected for conducting the driving-port *w*, balance-port 15, and cushion-ports 18 and 19.

My peculiar construction of steam-chest, whereby said chest is formed in sections bolted together, enables the valve D to be mounted therein without forming the valve-flanges separable. The bushing 21 and tube 46 prevent the steam outside the main valve D from acting on the ends of the solid valve E and interfering with its proper action by steam from the ports. By removing the nuts 24 and threaded sleeve 53 from the valve-stem 22 said valve-stem may readily be withdrawn from the tube 46 without removing the main valve D.

In the Letters Patent above referred to the flanges *p m* on the valve D are constructed of the same size. In my improvement the end flanges are of much greater diameter than the central flanges *p*, whereby the steam-leakage is greatly reduced and a larger amount of direct power on the water-valve is attained.

The peculiar method of mounting the valve-seat 26 for the water-valve enables the same to be readily removed for grinding or replacing by detaching one of the sides of the water-chest.

Having thus explained my invention, what I claim is—

1. The combination, with the steam-chest provided with the supply and exhaust ports and the cushion-port 16, of the main valve D, provided with the ducts 18 and 19, arranged to operate substantially as specified.

2. The combination, with the steam-chest, of the main valve fitted to work therein and provided with the ducts 18 and 19, a cushion-port in said chest adapted to register with said ducts, and a regulator, as 17, for said port, substantially as described.

3. The combination of the valve-chest formed in two sections 48 and 49, having a central contracted portion and enlarged ends, and the valve D, having central flanges fitting the contracted portion of the valve-chest and enlarged end flanges fitting the enlarged ends of said valve-chest, substantially as described.

4. The combination of the steam-cylinder, steam-chest, and connecting-ducts, the main valve provided with a chamber for a sliding valve and having a steam-supply chamber alternately communicating with said ducts, ports communicating with said steam-supply chamber and with the opposite ends of the steam-chest, a cushion-port in said steam-chest, ports in said main valve communicating with the opposite ends of the chest and alternately communicating with said cushion-port, and a sliding valve located in the said chamber in the main valve, substantially as described.

5. The combination of the steam-cylinder, the steam-chest having enlarged ends, connecting-ducts, the main valve having enlarged end flanges fitting in said enlarged ends of the chest and provided with a chamber for a sliding valve, a sliding valve fitting within said chamber, the main valve having a steam-supply chamber alternately communicating with said ducts, ports communicating with said valve-chamber and with the opposite ends of the steam-chest, and an exhaust-port located in the steam-chest and communicating with the enlarged ends of said chest at points between the enlarged flanges of the main valve, substantially as described.

6. The main valve D, provided with a seat for a sliding steam-valve, in combination with the valve E, mounted in said seat, a tube registering with said seat and opening through the chest-head, and a bushing in the opposite end of said seat fitted to slide in the opposite chest-head, substantially as described.

7. The combination of the valve E, provided with the stem 22, having a threaded portion 53, with the nut-strap 24, disposed on said threaded portion, and actuating mechanism for said valve, substantially as set forth.

8. The steam-cylinder, chest, and connecting-ducts, in combination with the main valve provided with the cushion-ports and balance-ports, and the steam-valve mounted eccentrically in said main valve, substantially as and for the purpose set forth.

9. The combination of the steam-cylinder, water-chest, connecting-ducts, water-cylinder, steam-chest, the connected pistons, the main valve in said steam-chest provided with the balance and cushion ports, the solid steam-valve disposed eccentrically in said main valve, the water-valve and water-actuated-balance mechanism, and mechanism actuated by the cylinder-piston connecting said valve, substantially as described.

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Witnesses:
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