(No Model.) 2 Sheets—Sheet 1.

F. M. BROUN.

STEAM PUMP.

No. 421,159. Patented Feb. 11, 1890.

Fig. 1.

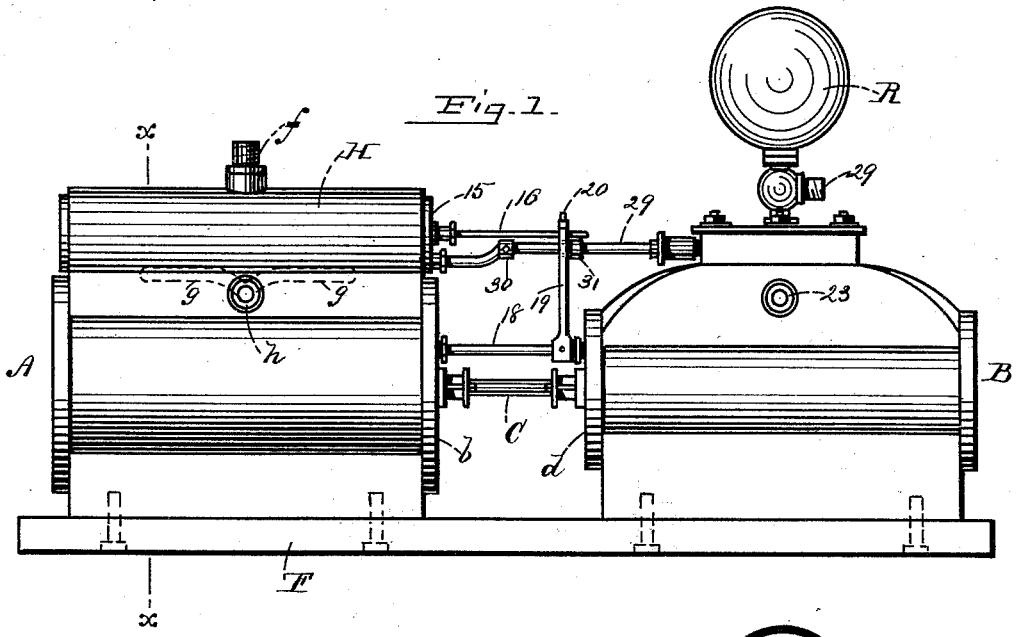


Fig. 2.

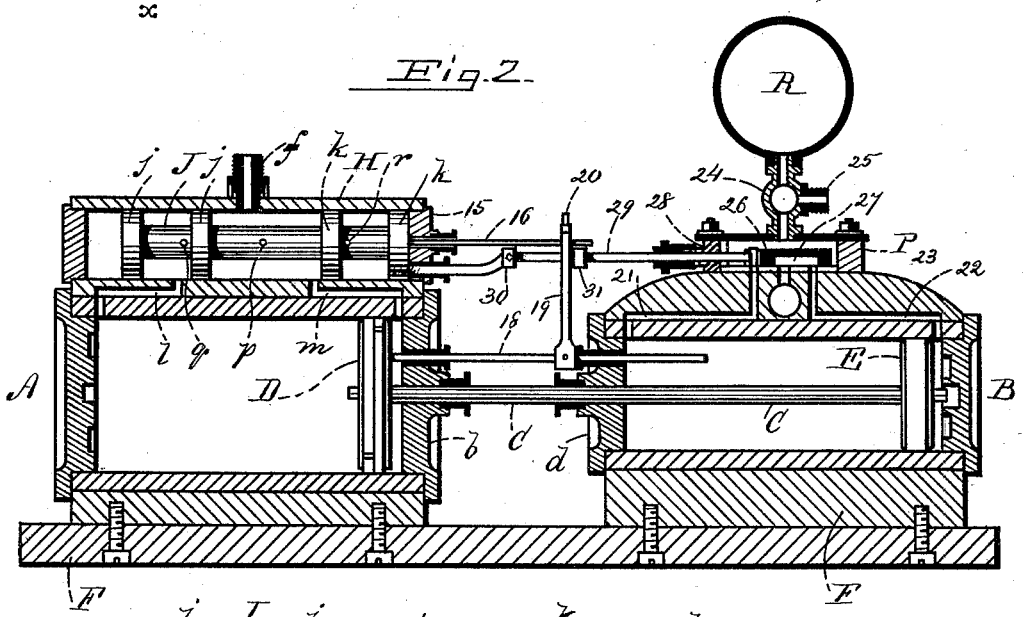
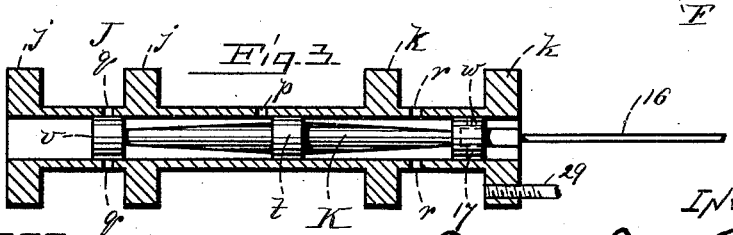


Fig. 3.



WITNESSES:
E. F. McCarty
M. Lamson

INVENTOR:
Frederic M. Broun
PER C. A. Shawtleo.,
ATTYS.

(No Model.) 2 Sheets—Sheet 2.

F. M. BROUN.

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Fig. 4.

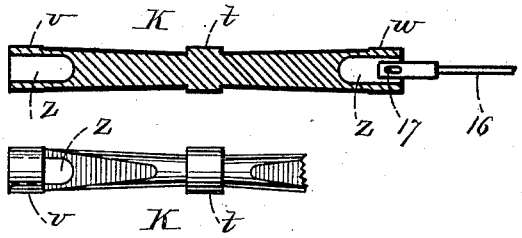


Fig. 5.

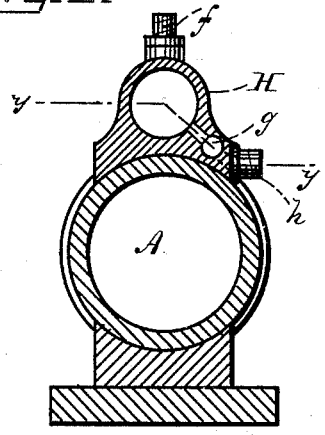


Fig. 6.

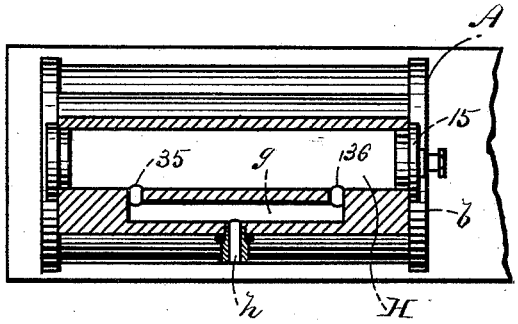
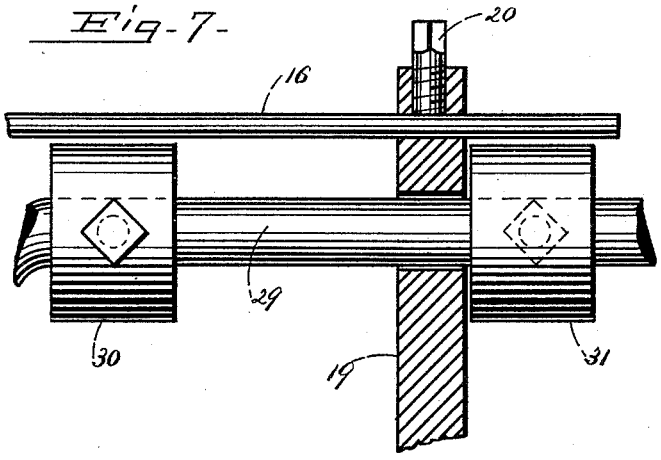


Fig. 7.



WITNESSES:
E. F. McCarty
M. Lawson

INVENTOR:
Frederic M. Broun
PER C. A. Shawvee,
ATTY.

UNITED STATES PATENT OFFICE.

FREDRIC M. BROUN, OF WARREN, ASSIGNOR TO HIMSELF, AND JOSEPH A. HOAR, OF NEWPORT, RHODE ISLAND.

STEAM-PUMP.

SPECIFICATION forming part of Letters Patent No. 421,159, dated February 11, 1890.

Application filed August 3, 1889. Serial No. 319,627. (No model.)

To all whom it may concern:

Be it known that I, FREDRIC M. BROUN, of Warren, in the county of Bristol, State of Rhode Island, have invented a certain new and useful Improvement in Steam-Pumps, 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 enlarged longitudinal section of the main steam-valve removed, the inner or small valve being shown in side elevation; Fig. 4, views showing a horizontal longitudinal section and plan view of the small steam-valve; Fig. 5, a vertical transverse section of the steam end of the pump, taken on line *x x* in Fig. 1; Fig. 6, a top plan view of the steam end, a portion being shown in horizontal section, taken on line *y y* in Fig. 5; and Fig. 7, an enlarged sectional view 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 that class of steam-pumps which are provided with horizontal steam and pump cylinders wherein the water-valve is actuated directly by the steam-valve; and it consists in certain novel features, hereinafter fully set forth and claimed, the object being to produce a simpler, cheaper, and more effective device of this character than is now in ordinary use.

The nature and operation of the improvement will be readily understood by all conversant with such matters from the following explanation.

In the drawings, A represents the steam-cylinder, and B the water-cylinder, said cylinders being horizontally in alignment and secured to bed-pieces F. A single piston-rod C works horizontally in the adjacent heads *b d* of said cylinders, and is provided at one end with a steam-piston D and at the opposite end with a water-piston E. A cylindrical steam-chest H is disposed on top of the steam-cylinder, and is provided in its top with a supply-port *f*. A longitudinally-arranged chamber *g* (see Fig. 6) is formed in one wall of the chest H, and is connected centrally with an exhaust-port *h*, said chamber opening at each end into the steam-chamber, as shown in Figs. 5 and 6. Steam supply and exhaust ducts *l m*, respectively, lead directly from the steam-chest into opposite ends of the cylinder A. A cylindrical plunger-valve J (see Fig. 3) is provided with four annular flanges *j k*, which fit steam-tight into said chest, and upon which said valve slides. A steam-port *p* enters the valve J centrally between the inner flanges *j k*, and similar ports *q r* enter said valve, respectively, between the flanges *j j* and *k k*.

Fitted to slide in the main or plunger valve J there is a small solid valve K, provided centrally with a solid annular flange *t*, adapted to close the port *p* of the plunger. At each end of said valve there is an annular flange *v w*, respectively adapted to close the ports *q r*. The body of the valve K is flattened at each end near the flanges *v w* and chambered centrally through its ends at *z* (see Fig. 4) in such manner that a duct or steam-passage is formed into the plunger-valve when said valves are in position, as shown in Figs. 2 and 3.

Fitted to slide horizontally in the chest-head 15, adjacent to the pump, there is a suitably-packed rod 16, the inner end of which is secured by a pin 17 in the end of the small valve K. A rod 18, parallel with the rod 16, is fitted to slide in the cylinder-heads *b d* and project into the cylinders A B sufficiently far to be engaged by the pistons D E. A vertical bar 19 is secured to the rod 18 between said cylinder-heads. The rod 16 passes through the top of said bar, (see Fig. 7,) in which it is adjustably secured by a set-screw 20.

A water-chest P is disposed on top of the water-cylinder B. Two ducts 21 and 22 connect said chest with each end of the cylinder respectively. A water-supply port 23 opens into said chest (see Fig. 2) between the mouths of said ducts. An air-chamber R is connected by a coupling 24 with the top of said chest, and a discharge-port 25 opens into said coup-

ling. A flat sliding valve 26 is fitted to work on the bottom of said chest over the mouths of the ducts 21 and 22 and the port 23. The under side of said valve is chambered at 27 sufficiently to connect said port with one of the ducts during each stroke of the valve. A suitably-packed rod 29 is fitted to slide horizontally in the water-chest head 28 and steam-chest head 15, said rod passing through the vertical bar 19, as shown in Fig. 7. One end of the bar 29 is screwed into a flange *k* of the plunger-valve J, and its opposite end is detachably secured to the flat sliding valve 26. Two collars 30 and 31 are adjustably secured by set-screws on the rod 29—one at each side of the bar 19—in position to be engaged thereby at determined points in the stroke of the piston.

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 port *f* passes through duct *m* into the cylinder A between its head *b* and the piston D. This drives the piston back and with it the water-piston E. The steam in the cylinder is driven through duct *l* into the steam-chest between the outer plunger-flanges *j j* and passes into port 35, Fig. 6, of the exhaust-chamber *g*, and thence out of the exhaust-port *h*. As the ports *q* in the plunger are closed by flange *v* of the small valve K, (see Fig. 3,) steam is thus prevented from entering and is forced into the proper exhaust. As the pistons thus advance, the water in the cylinder B is driven by piston E through the duct 21 into the water-chest and out the discharge 25. The piston having advanced a determined distance, the water-piston E engages the sliding rod 18, driving it into cylinder A. This causes the bar 19, secured to said rod, to force the rod 16, attached to the small steam-valve K, inward, driving said valve until its middle flange *t* passes to the other side of the port *p* in the plunger-valve J and its flange *v* away from the ports *q* of said plunger, said ports now acting as exhausts for the valves. The steam enters the port *p* and passes through the opening *z* in the inner end *w* of said small valve, and enters between the chest-head 15 and the outer flange *k* of the plunger-valve. The plunger is thus caused to travel until its inner flanges *j k*, respectively, pass to the opposite sides of the mouths of the ducts *l m*. The duct *l* is now opened to direct steam for the next forward stroke of the piston, and the duct *m* is opened to exhaust into port 36 of the exhaust-chamber *g*. The water-piston E in thus advancing creates a vacuum in the cylinder into which the water flows from supply 23 and duct 22. When the plunger J was moved by said piston, as described, it carried with it the rod 29, and the flat sliding valve 26 was thereby moved until its chamber 27 served to connect the supply 23 with the duct 21 to fill the cylinder at the next forward stroke of the piston. Should the direct action of the steam on the plunger-valve fail to carry it sufficiently far, the bar 19, actuated by a piston D or E, as described, will engage a flange 30 or 31 on the rod 29, secured to said plunger, and complete its stroke.

It will be seen that in my improvement the steam acts directly on the piston and a full exhaust is supplied, thereby preventing the piston-stroke from gradually shortening, as frequently happens in pumps of this description. Moreover, the action is direct, the valves advancing in the same direction and conjointly with the pistons and completing their strokes simultaneously therewith.

Having thus explained my invention, what I claim is—

1. The combination of a steam-cylinder, a water-cylinder in alignment therewith, a piston-rod provided with two pistons at its opposite ends, one in each of said cylinders, an independent slide-rod extending through the adjacent heads of said cylinders, a steam-chest on said steam-cylinder, an exhaust-chamber having two ports opening into said chest, ducts connecting said chamber with opposite ends of said steam-chest, a tubular plunger-valve provided with two sets of flanges at its opposite ends and with a steam-port between each set and between the flange of each set, a smaller auxiliary valve within said tubular plunger-valve, provided with three flanges adapted to close said ports, the body of said auxiliary valve being flattened and chambered at its opposite ends, a water-chamber on said water-cylinder, a water-valve therein for regulating the flow of water into the water-cylinder, a rod connecting the water-valve with said plunger-valve, a vertical bar on said independent slide-rod, a valve connected to said auxiliary valve and adjustable in said bar, and collars on the rod connecting said water-valve and plunger-valve.

2. The combination of a steam-cylinder provided with a steam-chest and connecting-ducts, a water-cylinder provided with a water-chest and connecting-ducts, a piston-rod provided with two pistons at its opposite ends, one in each of said cylinders, an independent slide-rod extending through the adjacent heads of said cylinders, a water-valve in said water-chest, a tubular plunger-valve in said steam-chest, a rod connecting said valves and provided with collars, an auxiliary valve within said plunger-valve, provided with a valve-stem extending through the chest-head, and an upright bar on said independent slide-rod adapted to engage said collars, and a clamping device for adjusting said stem on said bar.

FREDRIC M. BROUN.

Witnesses:
O. M. SHAW,
E. F. MCCARTY.

Correction in Letters Patent No. 421,159.

It is hereby certified that the name of the patentee in Letters Patent No. 421,159, granted February 11, 1890, for an improvement in "Steam-Pumps," was erroneously written and printed "Fredric M. Broun," whereas said name should have been written and printed *Fredric M. Brown;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 4th day of March, A. D. 1890.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

C. E. MITCHELL,
Commissioner of Patents.