J. S. Barden,

Rotary Steam Engines,

No. 84,251, Patented Nov. 24, 1868.

Fig. 1.

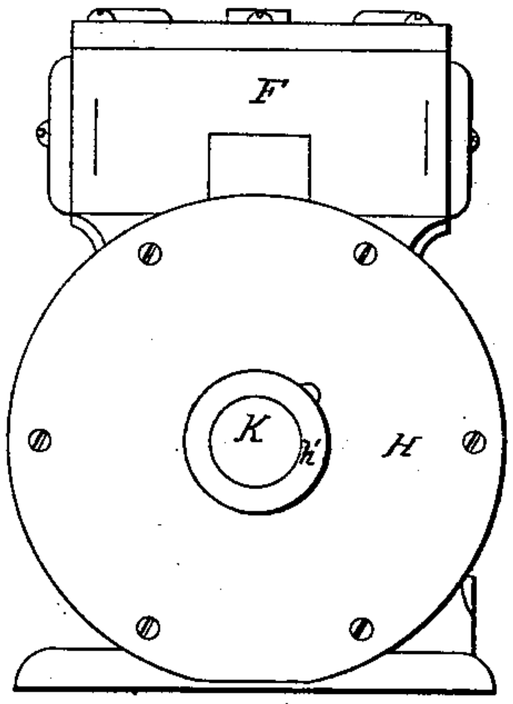

Fig. 2.

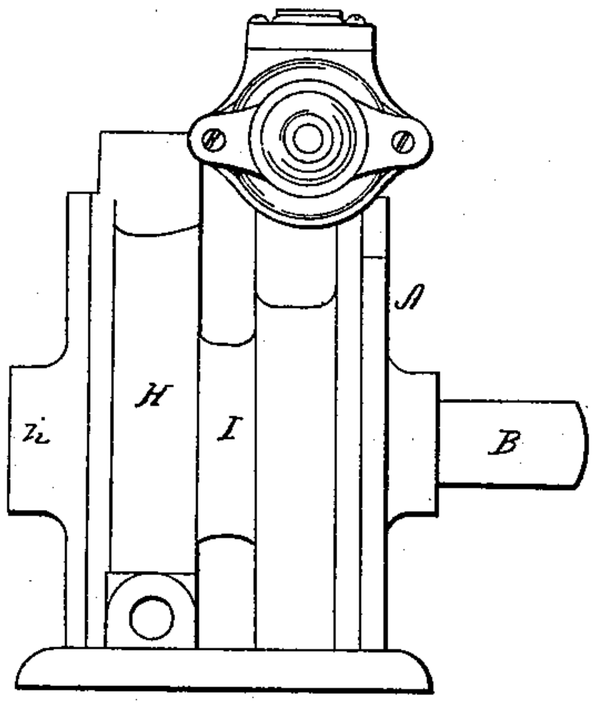

Fig. 3.

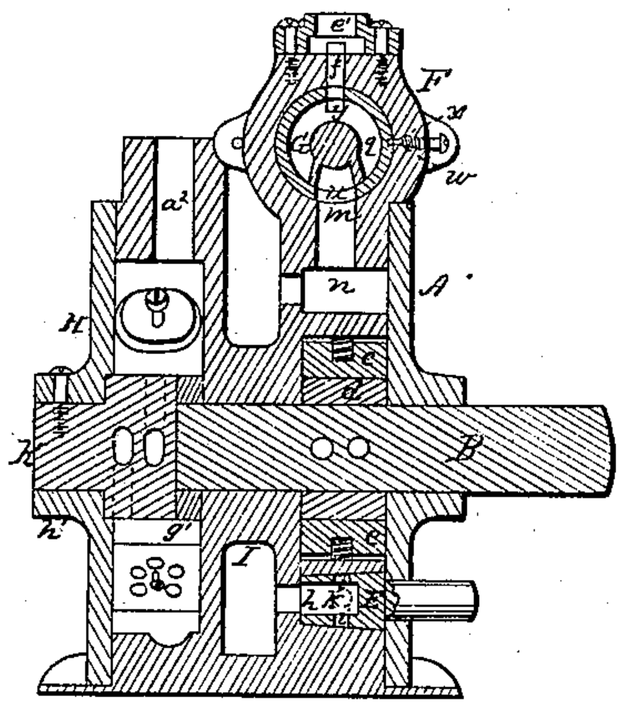

Fig. 4.

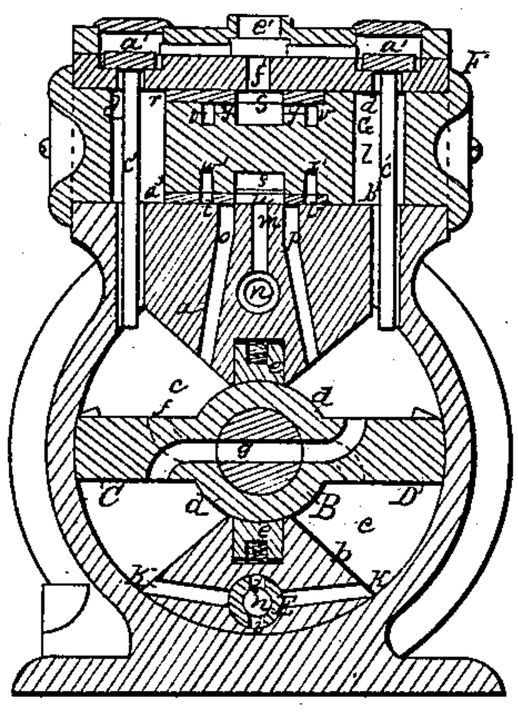

Fig. 5.

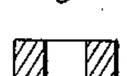

Fig. 7.

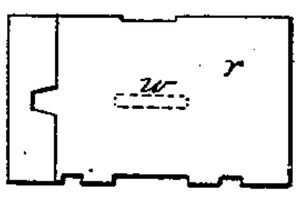

Fig. 8.

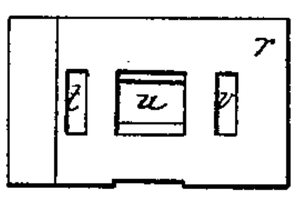

Fig. 9.

Fig. 6.

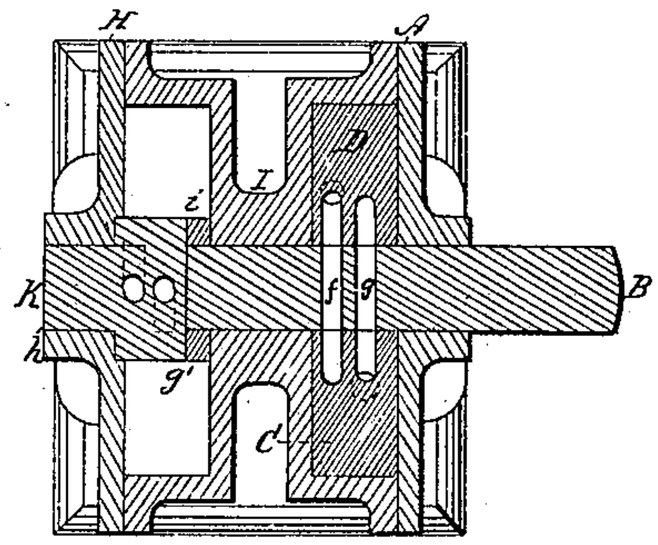

Fig. 12.

Fig. 10.

Fig. 11.

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by his attorney
H. A. Eddy,

United States Patent Office.

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Letters Patent No. 84,251, *dated November* 24, 1868.

IMPROVEMENT IN STEAM-PUMPS.

The Schedule referred to in these Letters Patent and making part of the same.

To all persons to whom these presents may come:

Be it known that I, JOHN S. BARDEN, of the city and county of Providence, and State of Rhode Island, have made a new and useful invention, having reference to Semi-Rotative Pumping-Engines, to be operated by steam or other suitable elastic motor; and I do hereby declare the same to be fully described in the following specification, and represented in the accompanying drawings, of which—

Figure 1 is a front elevation,

Figure 2, a side view of a pumping-engine of my improved construction.

Figure 3 is a vertical section, taken through and in line of the axis of the shaft of the engine.

Figure 4 is a transverse and vertical section, taken through the steam-engine.

Figure 5 is a similar section of the pump.

Figure 6 is a horizontal section, taken through the shaft-axis.

Figure 7 is a side view,

Figure 8 is a bottom view, and

Figure 9, a top view of the shell or outer case of the piston-valve.

Figure 10 is a side elevation,

Figure 11, a bottom view, and

Figure 12, a top view of the body-part of such valve.

The cylinder of the steam-engine is shown at A, as composed of a cylindrical vessel, having its interior space divided, by two partitions, *a b*, and a cylinder, *d*, into two sectional chambers, *c c*. The cylinder *d* is fixed on the shaft B concentrically, and such shaft extends axially through the cylinder A, in manner as represented.

Packings, *e e*, to rest against the periphery of the cylinder *d*, are inserted in the divisional partitions *a b*.

Two pistons or wings, C D, extend diametrically from the cylinder *d*, to the inner periphery of the case A. There are also two passages, *f* and *g*, leading through the pistons, the cylinder *d*, and the shaft B. These passages go parallel to one another through the shaft B and the cylinder *d*. Thence, each goes through the two pistons in opposite directions, in manner as shown in fig. 4, the same being so as to open communication between the space over each piston with that below the other piston.

Within the partition *b* is a faucet or plug, E, provided with a discharge-passage, *h*, and two inlets, *i i*, arranged in it in manner as represented. To this faucet two branch-passages, *k k*, lead through the partition *b*, to the extreme lower parts of the two chambers *c c*, the purpose of the faucet and these passages *k k* being to enable the chambers to be freed from water resulting from the condensation of steam in the chambers.

On the cylinder A is a cylindrical valve-chest, F, whose interior, *l*, is a cylindrical space, closed at its ends.

An eduction-passage, *m*, leads out of the middle of the bottom of this space *l*, and into a discharge-passage, *n*, going through the partition *a*, and the rear head of the cylinder A. Furthermore, two ports or passages, *o p*, lead from the space *l*, through the partition *a*, and into the two chambers *c c*, such passages, *o*, *m*, and *p*, being arranged as represented in fig. 4.

A cylindrical piston-valve, G, is arranged within the space *l*, and is to fit thereto and move therein, as a piston-head usually fits to and moves within a cylinder.

This piston-valve is constructed of a body, *q*, and an outer cylindrical tube or case, *r*, which are arranged concentrically, and formed as represented in figs. 7, 8, 9, 10, 11, and 12.

In the top of the case *r* is a rectangular opening, *s*, and through its bottom are three other such openings, *t u v*. There is also a groove, *w*, made in its side, to receive the end of a stud or screw, *x*, which, with the groove, limits the extent of longitudinal movement of the piston-valve, and holds it in its right position.

In and around the part *q*, are two grooves, *w' x*, which are directly over the ports *t u*. Furthermore, there is a small chamber, *y*, in the bottom of the port *q*, which is a continuation of the opening *u*, leading through the shell *r*. The opening *s* is continued into the body *q*, and communicates with the annular passages *w x*, by horizontal passages *y y*.

Over the port *l* of the steam-chest are two valve-chambers, a^1 a^1, within each of which is a valve, b^1, provided with a long stem, c^1. The two valve-chambers communicate by a cross-passage, *e'*, into which the steam to operate the engine is to be led through a passage, *d'*. A port or passage, *f'*, leads from the middle of the passage *e'*, into the space *l*.

The stems c^1 c^1, of the valves b^1 b^1, extend down through the space *l*, and into the chambers *c c*, and directly over these pistons, so as to be raised alternately by the said pistons during their oscillatory movements.

The shaft of the engine extends a short distance into a cylindrical pump-case, H, fixed to the engine-cylinder by a neck, I, and arranged with respect to it in manner as represented. On the part of the shaft B, which enters the interior space *g'* of the pump-case, is a ring, I', which is fixed to and so as to be revolved by the shaft. This ring, and the end of the shaft B, abut directly against a cylinder, K, which is fastened to the outer head *h'* of the pump-case.

Within the pump-case, and so as to radiate in opposite directions from the ring I and the cylinder K, and fastened to the said ring, are two pistons or wings, *i' k'*, which extend to the inner periphery of the case. These pistons are arranged in sectoral chambers *l' m'*, which are separated from two other sectoral chambers, *n' o'*, by partitions, *p' q'*, arranged and formed as represented.

Openings, *r' s' t' u'*, provided with valves, *v' w' x' y'*, arranged as shown in fig. 5, are made through the partitions so as to open communication between the chambers *l' m' n' o'*.

An induction-passage, *z'*, leads into the chamber *o'*, and there is an eduction-passage, a^2, leading out of the chamber *n'*.

There are also two passages, b^2 c^2, leading through the block K. Each of such passages opens communication between the space below one piston and that above the other of the pump-chambers l' m'. By the employment of the stationary cylinder K, arranged with the partitions r' q', the passages of communication, the shaft B, and the pistons i' k', and their connecting annulus I', I am enabled to make the passages b^2 c^2 much larger than I could were I to make them through the shaft B. The same may be said with respect to my arrangement of the passages f g of the steam-engine, as, by arranging them in the pistons C D, and through the shaft B and cylinder d thereof, they may be made much larger than they could be were they to be run through the part d and the shaft B, for in such case they would have to be very narrow, on account of the pistons, when at work, approaching so closely to the partitions a b.

When steam is let into the passage e' of the steam-chest of the engine, and the shaft B is turned so as to cause one of the pistons C to rise and throw off its valve b^1, steam will pass through the seat of such valve into the steam-chest l, and, by acting against the piston G, will move it endwise within the chamber l, so as to enable steam to pass through the passage f', and into the passages s, y, w, and x, of the piston-valve G. In this case the annular passage w' will be directly over the port o leading to the raised piston. The passage u will open communication between the port p and the eduction-passage m. The steam will rush, through the passage o, into the space over the piston c, and will also pass, through the passage f, into the space below the piston D. The steam, acting against the pistons, will move them in opposite directions, until the piston D may be thrown up against the valve-stem c^1, so as to raise the valve b^1 thereof. As soon as this may take place, the steam will enter the chamber l and drive the piston-valve in the direction opposite to which it was previously moved, so as to cause the steam to produce a reverse movement of the pistons. The exhaust steam of the chamber l will flow through the valve-stem passage a^1 leading from the space l, into the space over the piston C. Such passage a^1 should have a diameter a little greater than that of the valve-stem. The same may be said with respect to the passage b^1 of the other valve-stem. Each passage, however, should be of such diameter as to discharge the exhaust steam so slowly as to cause the piston-valve to be "cushioned" by the steam, while the valve may be in movement, the cushioning of the valve being to prevent its momentum from breaking its stop or stud, x, or otherwise doing damage.

The pistons will be moved with oscillatory movements, so as to impart to the shaft B a reciprocating rotative motion, and cause it to work the two pistons of the pump, which is a double-acting lifting and force-pump.

What I claim as my invention in the above-described pumping-engine, is as follows, viz:

The combination of the stationary cylinder K, and its passages b^2 c^2, with the pump-pistons i' k' connected with the shaft B, and arranged in the pump-case, provided with valves, and partitions, and induction and eduction-conduits, as explained.

Also, the arrangement of the steam-engine and the pump, and their connection by the neck I, and the shaft B, as described.

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Witnesses:
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F. P. HALE, Jr.