2 Sheets—Sheet 1.

G. F. BLAKE.

STEAM PUMP.

No. 108,554. Patented Oct. 25, 1870.

Fig. 1.

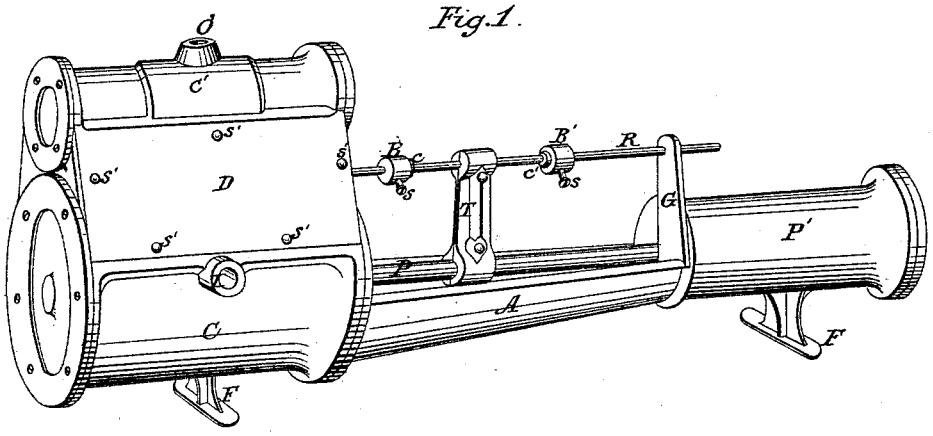


Fig. 3.

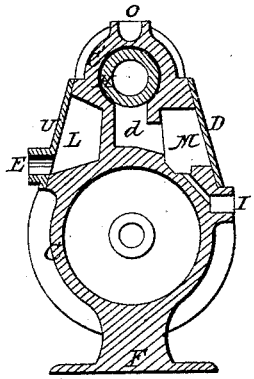


Fig. 2.

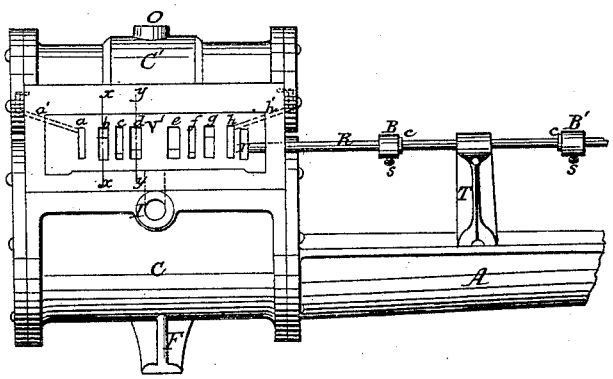


Fig. 4.

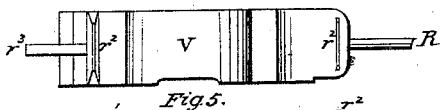


Fig. 5.

Fig. 6.

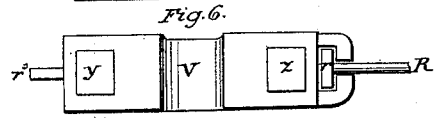


Fig. 7.

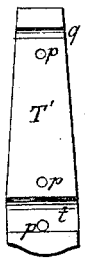
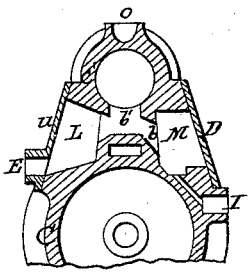


Fig. 8.

Fig. 9.



Witnesses.

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STEAM PUMP.

2 Sheets—Sheet 2.

No. 108,554. Patented Oct. 25, 1870.

Fig. 10.

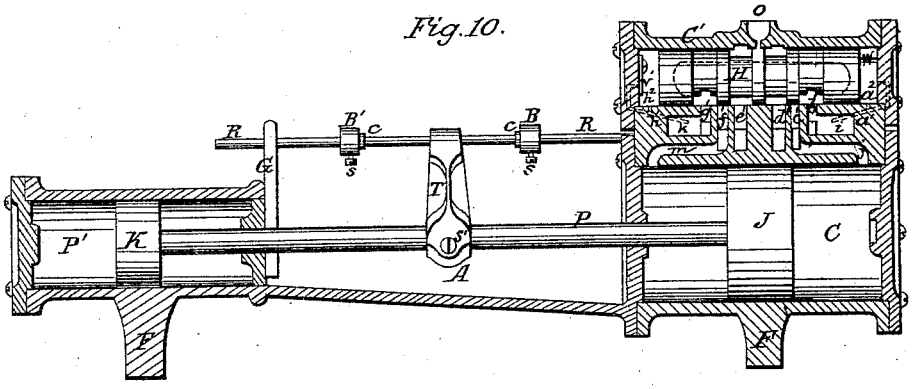


Fig. 11.

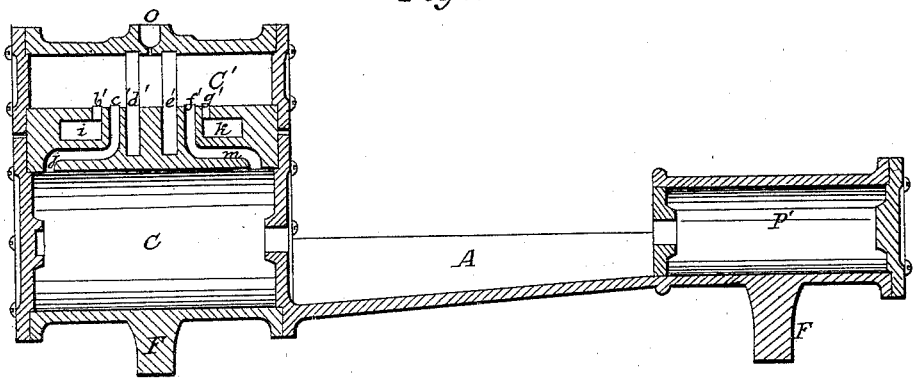


Fig. 12.

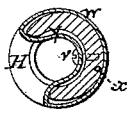


Fig. 13.

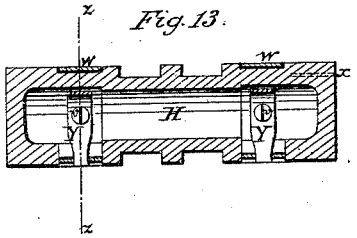


Fig. 14.

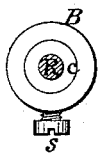
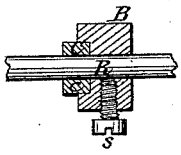


Fig. 15.



Witnesses.

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Letters Patent No. 108,554, dated October 25, 1870; antedated October 20, 1870.

IMPROVEMENT IN STEAM-PUMPS.

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

To all whom it may concern:

Be it known that I, GEORGE F. BLAKE, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam-Pumps; and I do hereby declare the following to be a full and correct description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of my improved pump complete.

Figure 2 is a side view of the steam-cylinder and adjacent parts, with the plate which covers the steam-chest removed.

Figure 3 is a transverse vertical section on the line *x x* of fig. 2.

Figures 4, 5, and 6, are, respectively, top, side, and bottom views of the slide-valve.

Figures 7 and 8 are views of the two halves of the tappet-arm in different positions.

Figure 9 is a transverse vertical section on line *y y* of fig. 2.

Figure 10 is a vertical longitudinal central section looking toward the exhaust side of the pump.

Figure 11 is a vertical longitudinal central section looking toward the inlet side of the pump.

Figure 12 is a transverse section of the hollow plunger.

Figure 13 is a longitudinal section of the same; and

Figures 14 and 15 are views illustrating the construction of the tappet-nuts and the mode of their attachment to the tappet-rod.

The same letter indicates the same part wherever it occurs.

The nature of this invention consists in improvements in the steam-pump, having for their object and result—

First, to secure, by a double method of exhaust, a very rapid discharge of the steam after doing its work, thereby preventing the pounding of the cylinder-heads, so apt to occur when running at high speed, and also relieving the steam-cylinder from back pressure.

Second, to prevent leakage between the ports and diminish the wear of the working parts.

Third, to improve the construction and attachment of the tappet-arm, and of the parts connected therewith, all as hereinafter more particularly set forth.

To enable others skilled in the art to make and use my improved steam-pump I will proceed to describe its construction and operation, referring to the accompanying drawings by the figures and letters of reference marked thereon.

The general form and arrangement of the pump is clearly shown in fig. 1, which represents the inlet side.

C marks the steam-cylinder, which is of usual form, and is cast in one piece with the plunger-cylinder C′, which surmounts it, all the ports and passages between them being embraced in the same casting.

This method of construction obviates the necessity of joints, and, therefore, prevents leakage of steam between the ports.

D is a plate or bonnet, which covers the steam-chest M, and is attached thereto by the bolts or screws *s*′.

The inlet-pipe I connects the steam-chest with the boiler.

On removing the plate D we lay open the steam-chest M, in which slides the slide-valve V, the details of the form of which are shown clearly in figs. 4, 5, and 6.

This valve is introduced into or removed from the steam-chest by taking off plate D without disturbing any other part. The steam enters under the middle of the valve, and passes into the steam-chest around it.

This valve is attached to the tappet-rod R, by its head *r*, which enters a recess in the face of the valve.

It has two cups, *y z*, which serve to connect ports in the ordinary way.

The ribs r^1 r^2, on the back of the valve, confine it to its seat, and the rod r^3 limits its rearward motion. The function of this valve is to control the course of the steam in its supply to the steam and plunger-cylinders, as hereinafter described.

The removal of the valve V discloses the valve-seat V′, fig. 2, with its eight ports *a b c d e f g h*, of which *a* and *h* lead, respectively, to the rear and front ends of the plunger-cylinder C′, and *b c d e f g* lead, respectively, to the ports in the plunger-cylinder, marked, in figs. 10 and 11, *b*′ *c*′ *d*′ *e*′ *f*′ *g*′.

The ports *b*′ and *g*′ communicate with the openings *i* and *k*, leading to the exhaust-chamber L, on the opposite side of the cylinder to the plate D.

d d′ and *e e*′ are the inlet-ports; *b b*′ and *g g*′ are exhaust-ports; and *f f*′ and *c c*′ are ports leading to the passages *j m*, which conduct steam to either end of the steam-cylinder.

In the cylinder C is a hollow plunger-valve, H, which is driven by steam, as hereinafter described, and regulates the supply and exhaust of the steam-cylinder C, by means of the six ports on its seat, *b*′ *c*′ *d*′ *e*′ *f*′ *g*′, which correspond with the six ports on valve-seat V, marked *b c d e f g*. The form of this plunger is clearly shown in figs. 10, 12, and 13. It is hollow from end to end, as shown in the last-named figure, and has two openings in the lower portion, which serve to carry steam from port to port.

Two spring rings W W, serve as packing to keep the plunger in its seat, and to prevent leakage between the ports.

These spring rings are less than the whole circumference of the plunger, by the width of the lower openings, and they are set out or drawn in by means of the curved arm Y, regulated by the set-screw *v*. Their length being such as not to encroach upon the lower openings in the plunger, they allow the plunger to pass over the ports without injury to them or to the spring rings.

The plunger-cylinder C', as before observed, is cast in one piece with the steam-cylinder.

The plunger H has a reciprocating motion in this cylinder, being driven by steam admitted through passage-ways a^1 and h^1, figs. 2 and 10.

The openings of these ways on the inside of the cylinder-heads, are covered by spring valves *e'*, (see fig. 10,) which open inward.

Short passages a^2 and h^2 connect the interior of C', near its ends, with the passages h^1 a^1, as shown. The object of this arrangement is to form a steam-cushion for the ends of the cylinder, after passing the upper orifices of passages a^2 h^2.

The plunger H is driven by the steam alternately taken and exhausted by cylinder C', through the passages h^1 a^1, leading respectively to ports *a* and *h*, under the valve V, fig. 2. Those ports connect alternately with the exhaust-ports *b* and *g*.

Plunger H is kept from turning on its longitudinal axis by a guide-rod, *w*, fig. 10, passing through the upper cylinder-head, into a hole, *x*, in the plunger, (see figs. 10, 12, and 13.)

The steam-cylinder C is connected with the supply and exhaust-ports by the passages *j* and *m*, in the usual manner.

The steam-piston J is of usual form, and is connected to the pump-piston K, by the piston-rod P.

To this rod the tappet-arm T is attached, which operates the tappet-rod R, from which the slide-valve receives its motion.

The tappet-arm is made in halves, as shown in figs. 7 and 8, united together by screws passed through the holes *p p*.

Grooves *q*, in the upper end of these halves, receive and clamp the tappet-rod R. The piston-rod is also held in the same way by a pair of semicircular grooves in the lower end of the arm.

A set-screw, S', passes through the tappet-arm into a recess cut in the piston-rod P to receive it, and hold the arm in a fixed position.

The upper end of tappet-arm T operates the tappet-rod by striking alternately two adjustable nuts or bumpers, attached to the rod by set-screws *s*. These nuts are seen in enlarged view in figs. 14 and 15, which illustrate their construction and mode of attachment to the tappet-rod R.

Each nut has a cup on that side on which it receives the blow of the tappet-arm, and in that cup is placed a ring of leather, *c*, to break the shock of the blow. These rings, being supported by the sides of the cup, are not so rapidly pounded out and destroyed.

The set-screws *s* enable the nuts to be adjusted to any desired position on the tappet-rod.

The pump is supported on the feet F, and the steam and pump-cylinders are united by the trough A.

An oil-cup, O, provides for the lubrication of the plunger.

The exhaust-chamber L is covered by a plate, U, and is connected with the open air by the exhaust-pipe E.

Operation.

The operation is as follows:

Steam being admitted through inlet-pipe I into the steam-chest, operates the plunger-valve H, by being alternately admitted through ports *a h* to the passages a^1 h^1, through which also the exhaust from the cylinder C' alternately takes place, the ports *a h* being alternately connected by valve V with the exhaust-ports *b g*.

In passing into the cylinder C', the steam opens the spring valve *e'*, which covers the ports at the upper ends of the passages a^1 h^1. As the plunger H approaches either end of the cylinder C', the spring valve at that end closes, and the exhaust takes place through one of the branch passages a^2 h^2.

When the plunger has approached so near the cylinder-head as to cover either of the ports a^2 h^2, the space between the covered port and the cylinder-head remains full of steam, affording a cushion to prevent the pounding of the plunger.

The arrangement of the ports in the top valve-seat is such that a double exhaust from the steam-cylinder is afforded, when the plunger is at either end of its stroke.

In fig. 10 the plunger H is represented as midway in its stroke. If it were moved toward the rear end of the cylinder far enough to uncover ports *c'* and *f'*, the steam-cylinder would then take steam through ports *d' c'*, and exhaust through ports *f' g'*, but the exhaust steam would not only escape through passage *k* into the exhaust-chamber, but passing through the hollow plunger H, would flow through port *b'* and passage *i* into the exhaust-chamber. If, on the contrary, the plunger were moved toward the forward end of the cylinder C' far enough to uncover ports *c'* and *f'*, the steam-cylinder would take steam through *c'* and *f'*, and exhaust through *e'* and *b'*, and also through *g'* and passage *k*, the steam passing through the plunger from *b'* to *g'*.

The advantage of this arrangement is the rapid discharge of steam after it has performed its work, thereby avoiding the pounding of the cylinder-heads when running at high speed, and also any back pressure in the steam-cylinder.

Having thus fully described my invention,

What I claim, and desire to secure by Letters Patent, is—

1. The described arrangement of ports, in combination with a hollow valve or plunger, by which exhaust steam can be discharged, by the operation of one valve, from two ports at the same time, as set forth.

2. The hollow plunger-valve, constructed as set forth.

3. The spring packing-ring *w*, constructed and arranged as described.

4. The tappet-arm T, constructed in halves, and arranged as described.

5. The recess or cup in the tappet-nuts, constructed and arranged as set forth.

The above specification of my said invention signed and witnessed at Boston, this 8th day of March, A. D. 1869.

GEO. F. BLAKE.

Witnesses:

B. E. PERRY,

D. G. THOMPSON.