(No Model.) 3 Sheets—Sheet 1.

# W. R. HINSDALE.

## SLIDE VALVE.

No. 444,438. Patented Jan. 13, 1891.

*Fig. 2.*

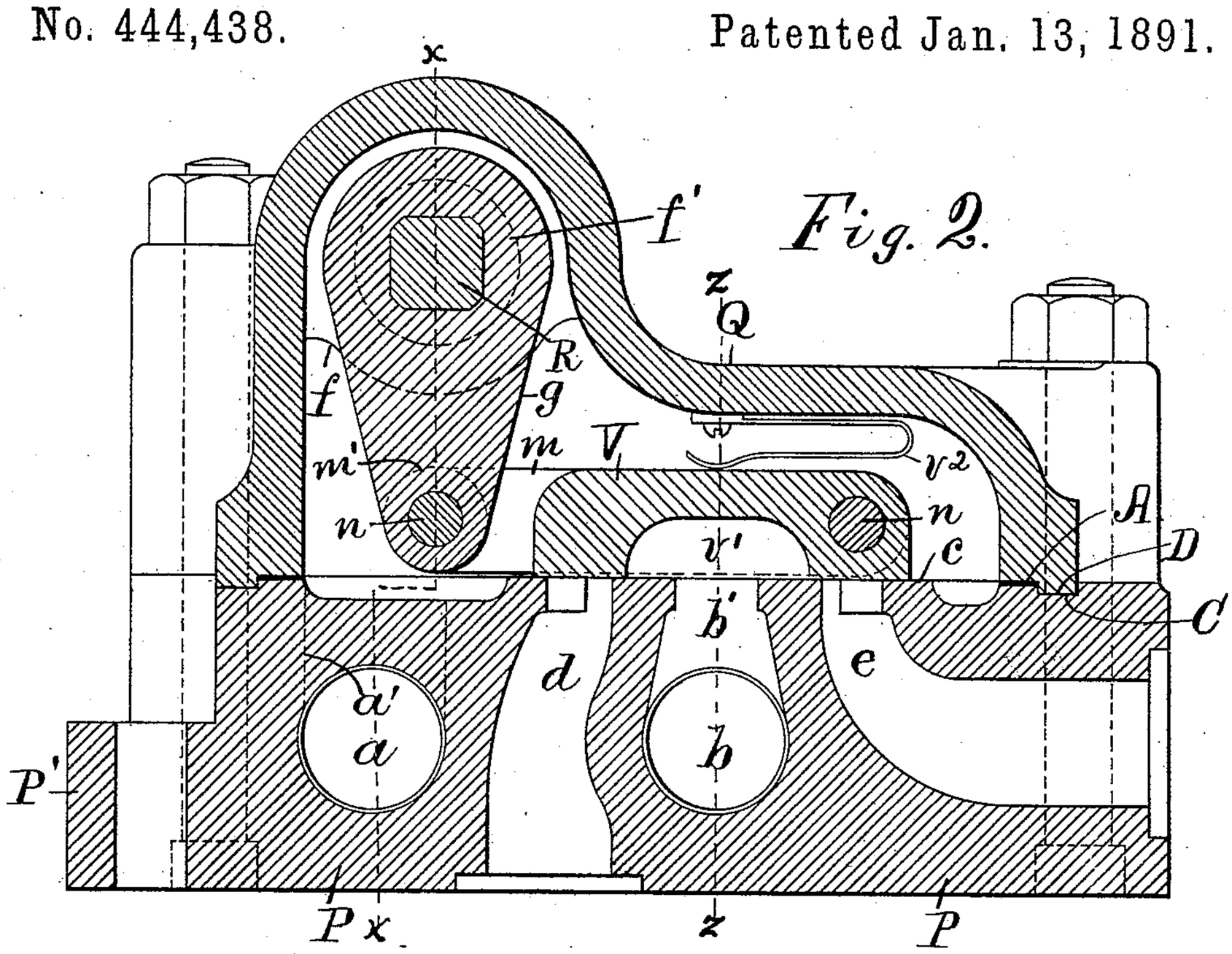
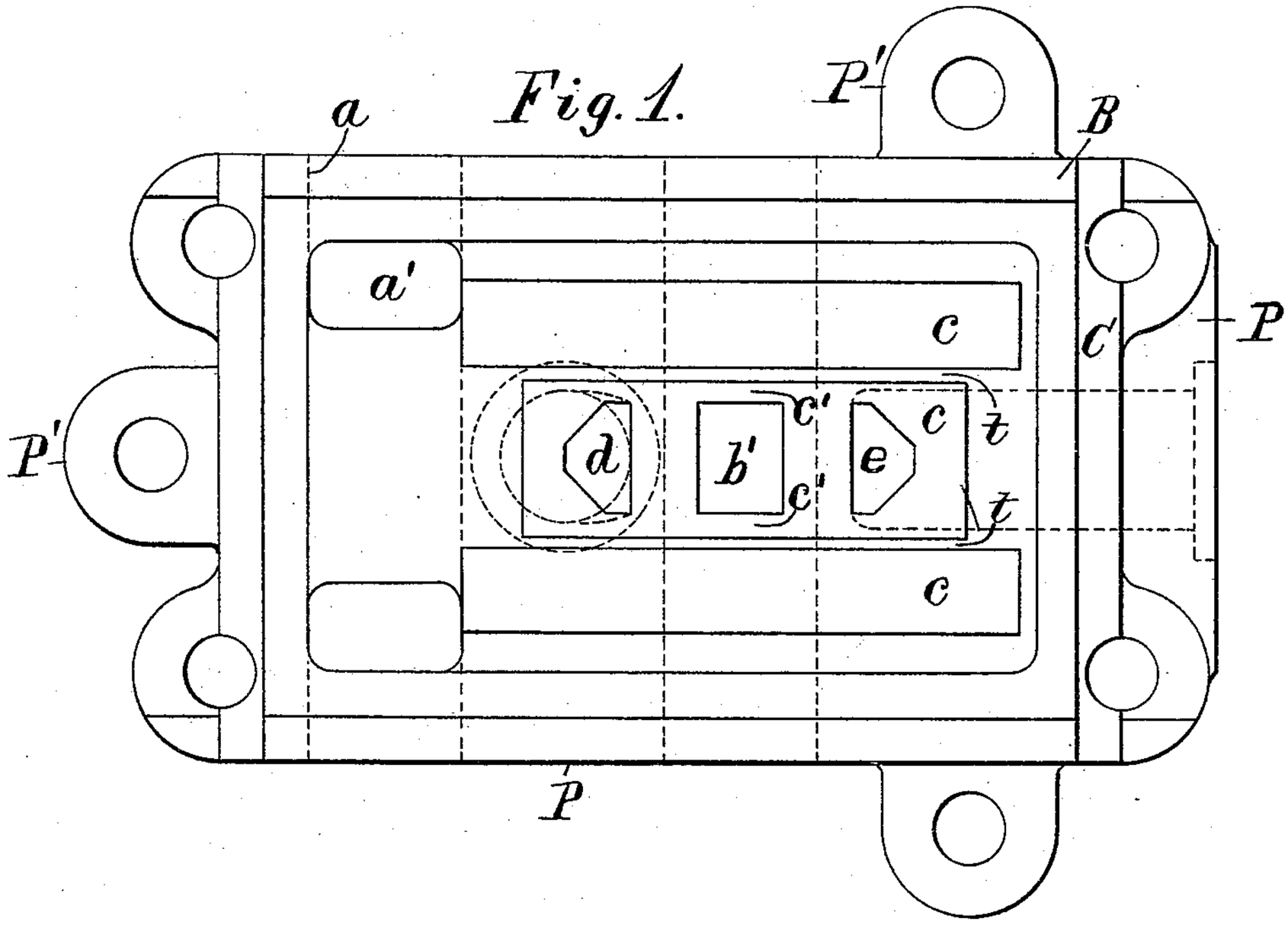



*Fig. 1.*

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(No Model.) 3 Sheets—Sheet 2.

# W. R. HINSDALE.

## SLIDE VALVE.

No. 444,438. Patented Jan. 13, 1891.

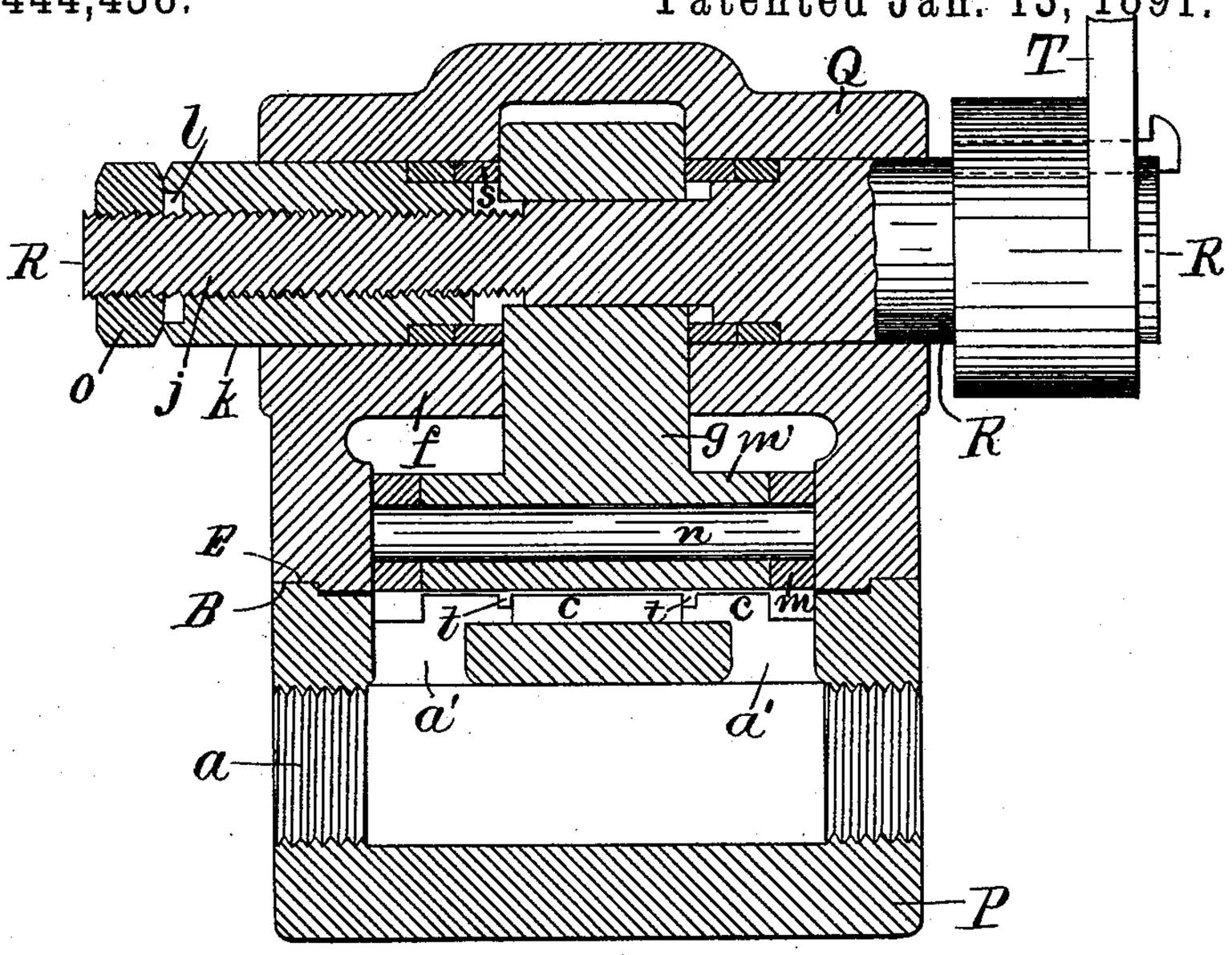


Fig. 3.

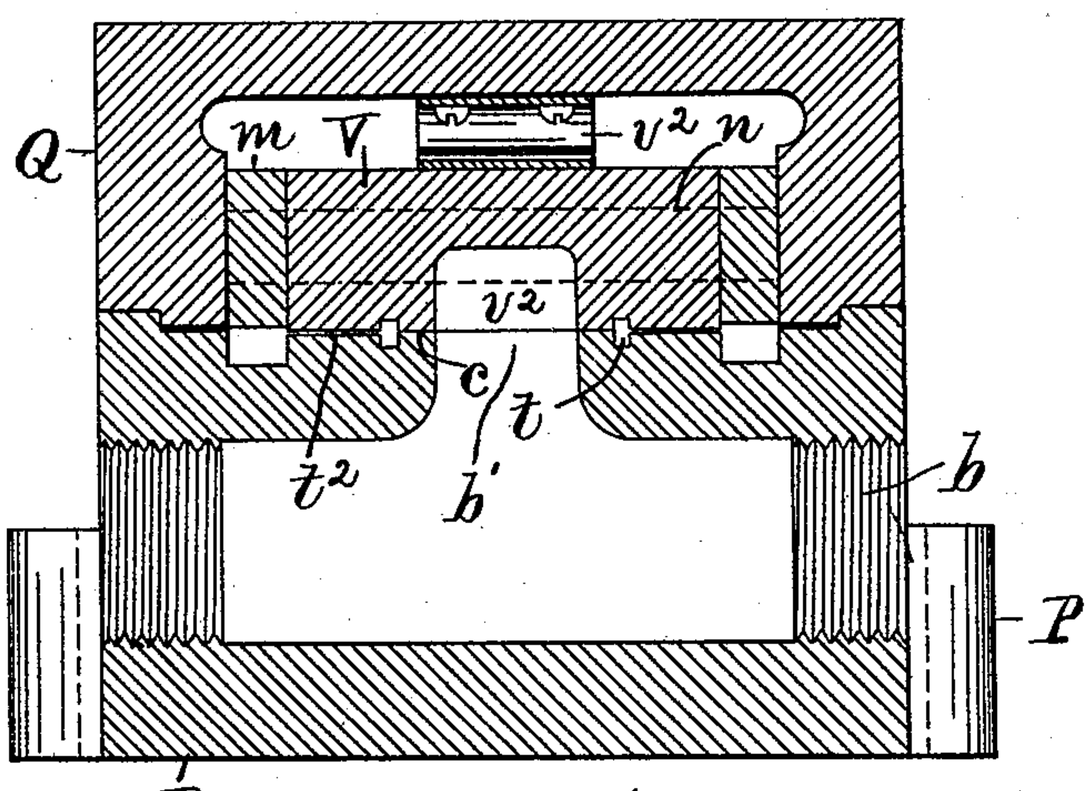


Fig. 4.

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(No Model.) 3 Sheets—Sheet 3.

# W. R. HINSDALE.

## SLIDE VALVE.

No. 444,438. Patented Jan. 13, 1891.

Fig. 6.

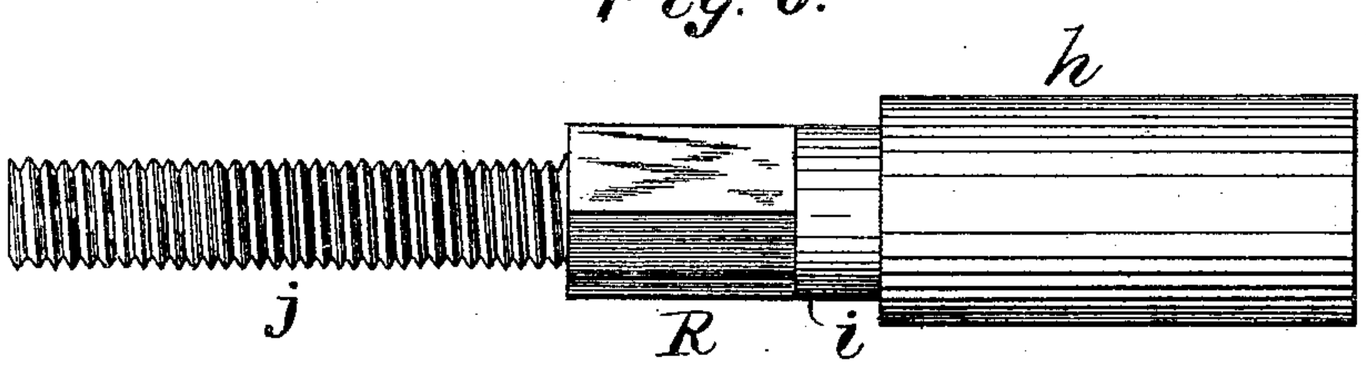



Fig. 7.

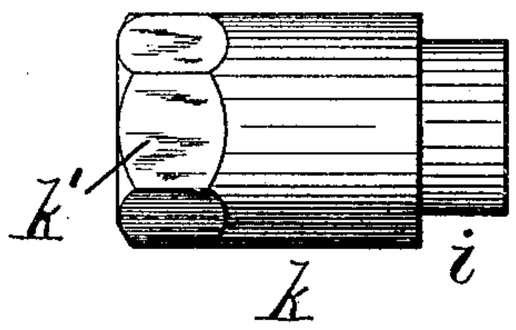



Fig. 10.

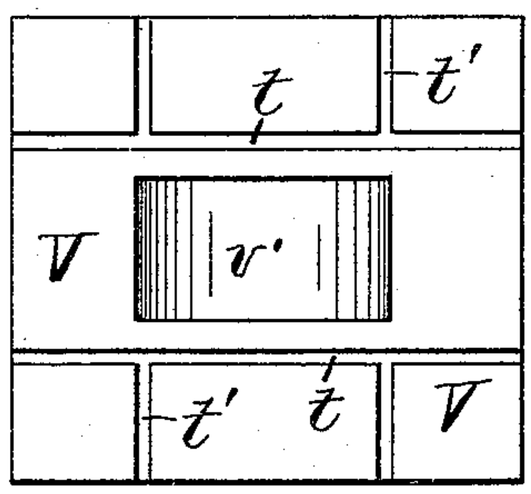
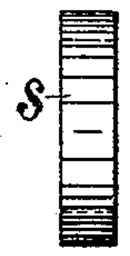



Fig. 9.



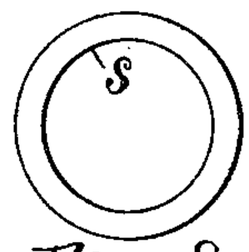
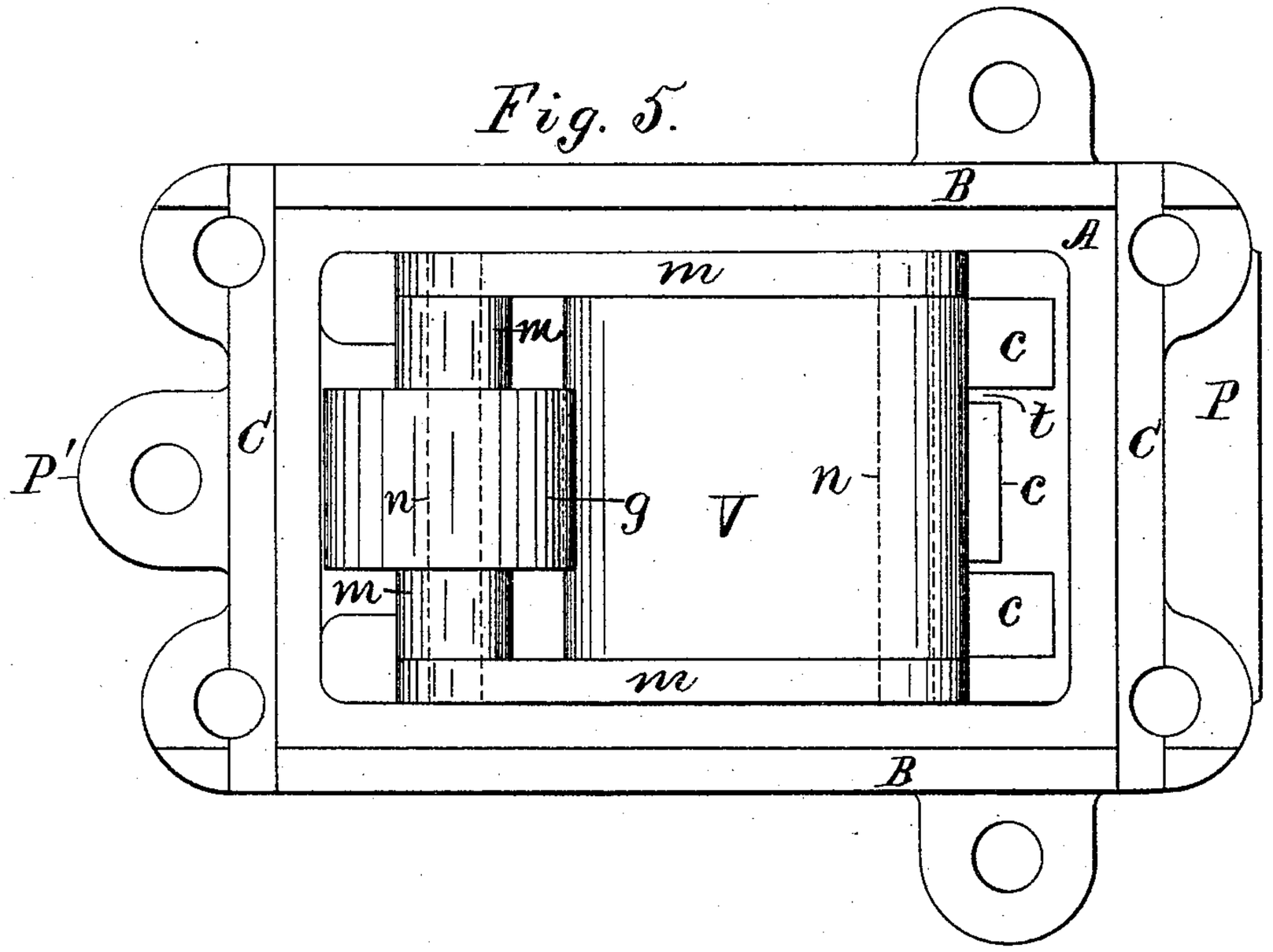




Fig. 8.

Fig. 5.

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# UNITED STATES PATENT OFFICE.

WILLIAM R. HINSDALE, OF NEWARK, NEW JERSEY.

## SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 444,438, dated January 13, 1891.

Application filed March 21, 1890. Serial No. 344,701. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM R. HINSDALE, a citizen of the United States, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Slide-Valves, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to furnish a compact and effective construction for a valve to reverse the flow of liquid in hydraulic or other cylinders to produce a reciprocating motion of a piston therein; and the invention consists in the construction hereinafter described and claimed.

In the drawings, Figure 1 is a plan of the valve-bed. Fig. 2 is a central vertical section of the entire structure. Fig. 3 is a cross-section, where hatched, on line *x x* in Fig. 2, with part of the shifting-lever. Fig. 4 is a cross-section on line *z z* in Fig. 2. Fig. 5 is a plan of the apparatus with the chest and spindle removed. Fig. 6 is a side view of the spindle; Fig. 7, a side view of the packing-sleeve. Figs. 8 and 9 are side and edge views of one of the packing-rings, and Fig. 10 is a view of the valve inverted.

P is the bed, provided with lugs P′ to bolt it upon a suitable support.

Q is the valve-chest; V, a D-valve movable upon a seat *c* on the bed, and R is a spindle fitted transversely through the sides of the chest to move the valve. The bed is shown with inlet *a* and outlet *b*, provided, respectively, with apertures *a′* and *b′*, extended through the face of the bed.

*c* is the valve-seat elevated a little above the surface of the bed.

*d* is a port to one end of the cylinder, and *e* a similar port to the opposite end of the cylinder.

The fluid under pressure enters the chest Q by the apertures *a′* and presses the valve upon the seat *c*. The valve V is of D shape, with arch V′ under its middle in connection with the outlet-aperture *b′*, and the two ends of the valve cover the ports *d* and *e* when in its central position, as in Fig. 2. The reciprocation of the valve therefore directs the fluid alternately into the ports *d* and *e*, and thus causes a reversal of the current in the cylinder.

The chest is made enough wider than the valve to admit links *m* between the sides of the valve and the walls of the chest, and the sides of the chest are thickened with bosses *f* where the spindle R is inserted, and such bosses are bored out of uniform diameter from side to side to form a chamber *f′* for packing around the spindle. Between the bosses an arm *g* is applied to the spindle, which is squared at such point, and the free end of the arm is provided with lugs *m′* at its opposite sides to reach the links *m*. The links are pivoted to the valve and to the arm by pins *n* inserted entirely through the same and held in place by the contact of their ends with the sides of the chest. To pack the spindle at the opposite sides of the arm, and thus prevent leakage from the chest, it is provided with leather packing-rings *s*, fitted to the chamber *f′* and compressed upon the spindle by a sleeve *k*, movable upon a thread *j* on the spindle. The shank *h* of the spindle and the body of the sleeve *k* are both made to fit the chamber, and each is shouldered down to form a collar *i*, upon which the packing-rings *s* are fitted. The packing-rings at their inner edges touch the sides of the arm *g* and are compressed against the sleeve within the packing-chamber by screwing the sleeve upon the thread *j* toward the shank *h*. The end of the sleeve is flattened, as at *k′* in Fig. 7, to apply a wrench, and a jam-nut *o* is applied to the end of the spindle to hold the sleeve in place when adjusted. The end of the sleeve is recessed to receive a leather packing-washer *l*, which is compressed upon the thread by the nut *o*, and thus prevents leakage between the sleeve and spindle. The spindle is thus packed where it passes through the chest without the use of any external glands or the formation of any stuffing-boxes around the spindle-bearing proper. The spindle-bearing may be thus made of uniform bore from one end to the other, by which construction the packing-chamber in which it turns may be made very cheaply, and both the packings at opposite sides of the arm are compressed to prevent leakage by the adjustment of a single piece—namely, the sleeve *k* upon one end of the spindle. The construction is thus made exceedingly cheap, simple, effective, and easy to adjust.

To operate the valve, the spindle would be oscillated by a lever, wheel, or arm, as illustrated in the (broken) handle T in Fig. 3, and the valve is thus moved at pleasure from the central position shown in Fig. 2 into a suitable position to uncover either of the ports *d* or *e*. A spring $v^2$ is shown applied between the chest and the back of the valve to hold it upon its seat, and the actual bearing of the valve upon the seat is shown reduced by scraping down the surface of the seat beyond the narrow strip *c'* at each side of the ports *d* and *e* to diminish as much as possible the area of pressure. Hydraulic pressure, with which such valves are specially adapted to be used, varies in different cases from five hundred pounds to two thousand pounds per square inch, so that the frictional resistance in moving a slide-valve upon its seat is very great. The grooves *t* are formed along the sides of the strip *c'*, and transverse grooves *t'* are also shown formed in the under side of the valve in Fig. 10. The scraped surface of the seat which clears the under surface of the valve very slightly admits a film of fluid, as shown at $t^2$ in Fig. 4, where the film is exaggerated in thickness to make the drawings clearer. The effect of this construction is to facilitate the movement of the valve after it is started in motion, as the space scraped away for the film $t^2$ is too small for the water to flow in readily, and the water in the grooves *t'*, which are then moved over the scraped surface, tends to increase the thickness of the film and thus slightly lift the valve from its bearing upon the strip *c'*. The water distributed from the groove *t'* upon the scraped surface is freely replaced by the water in the chest, with which the ends of the grooves *t'* are in open communication.

I have found that in practice the valve thus constructed is moved with very great ease after it is started, so that an operator using a hand-lever upon the spindle *r* perceives a very great difference between the resistance at the beginning and during the continuance of the stroke.

It is evident that the grooves in the valve-seat would perform their function with equal effect whether the valve were used for water or steam, as the valve-seat would in the latter case be lubricated by means of the water of condensation which would form thereon.

The joint between the valve-chest and its bed is provided with a yielding packing A, and the seat for such joint is made in a peculiar manner, so as to secure a ledge outside of the seat to prevent the fluid-pressure within the chest from blowing out the packing.

If an elevated ledge were made around the entire seat, it would be difficult to plane the surface of the seat in an ordinary planing-machine, and I therefore provide a projecting ledge B upon two sides only of the packing-seat, and at the other two sides I form a groove C in the bed. To match such ledge and groove, I provide a ledge D upon the bottom of the chest to fit in the groove, and make grooves E along the other edges of the chest to clear the ledges B. The packing, which would be of rectangular form, like a slate-frame, is thus held upon two sides of its external margin by the ledge B projecting upward from the seat A, and upon the other two sides by the ledge D projecting downward from the chest.

An inspection of Figs. 1, 2, and 3 shows clearly the relation of the ledges C and D to the seat A, while Fig. 2 shows that there is no projection above the packing-seat, or above the valve-seat *c* at the ends of the bed. The packing-seat and valve-seat may thus be planed through the bed from end to end between the side ledges B, and the transverse grooves C subsequently planed across the bed to fit the ledges D upon the chest.

The essential part of my spindle-packing consists in the combination, with the spindle having a shoulder at one end, of the packings applied to the spindle at opposite sides of the oscillating arm, and the sleeve *k*, movable upon the other end and adapted to compress both the packings simultaneously.

I do not limit myself to any particular construction for the packing-rings applied to the chamber around the spindle R, as cup-leathers may in some cases be preferred for plain cylindrical rings; but in any case the sleeve *k* would perform the same function to tighten both the packings simultaneously when desired.

It is obvious that in using my invention for supplying water reversibly to the cylinders of lifting-cranes, in which the water is applied under the foot of a movable column, there would be no need of two ports *d* and *e* beneath the valve, as the reversal of the column's movement is effected by gravity, and the reversing-valve is required merely to connect the cylinder with the outlet or exhaust *b*. The valve may therefore be constructed with the various improvements herein described irrespective of the number of ports over which it is moved.

Having thus set forth the nature of my invention, what I claim herein is—

1. In a reversing-valve, the combination, with a seat having inlet and outlet ports, of the chest Q, having the chamber F' formed transversely through its sides, the spindle R, and movable sleeve *k*, shouldered as described, and provided with annular packings, means for moving the sleeve upon the spindle, an arm attached to the spindle between the packings, a slide-valve within the chest, and links connecting the slide-valve with the arm, substantially as herein set forth.

2. In a reversing-valve, the combination, with the valve-seat C, having inlet and outlet ports, and the valve fitted to slide upon the same, of the grooves *t*, formed adjacent to the narrow strips *c'* at each side of the ports, and the surface of the seat outside such grooves being scraped slightly below the surface of

the seat between such grooves, as and for the purpose set forth.

3. In a reversing-valve, the means for retaining the packing between the chest and bed, consisting in the bed provided with the ledges B and grooves C, and the chest formed with the ledges D to fit such grooves, and with grooves E, adapted to clear the ledges B, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM R. HINSDALE.

Witnesses:
THOS. S. CRANE,
HENRY J. MILLER.