

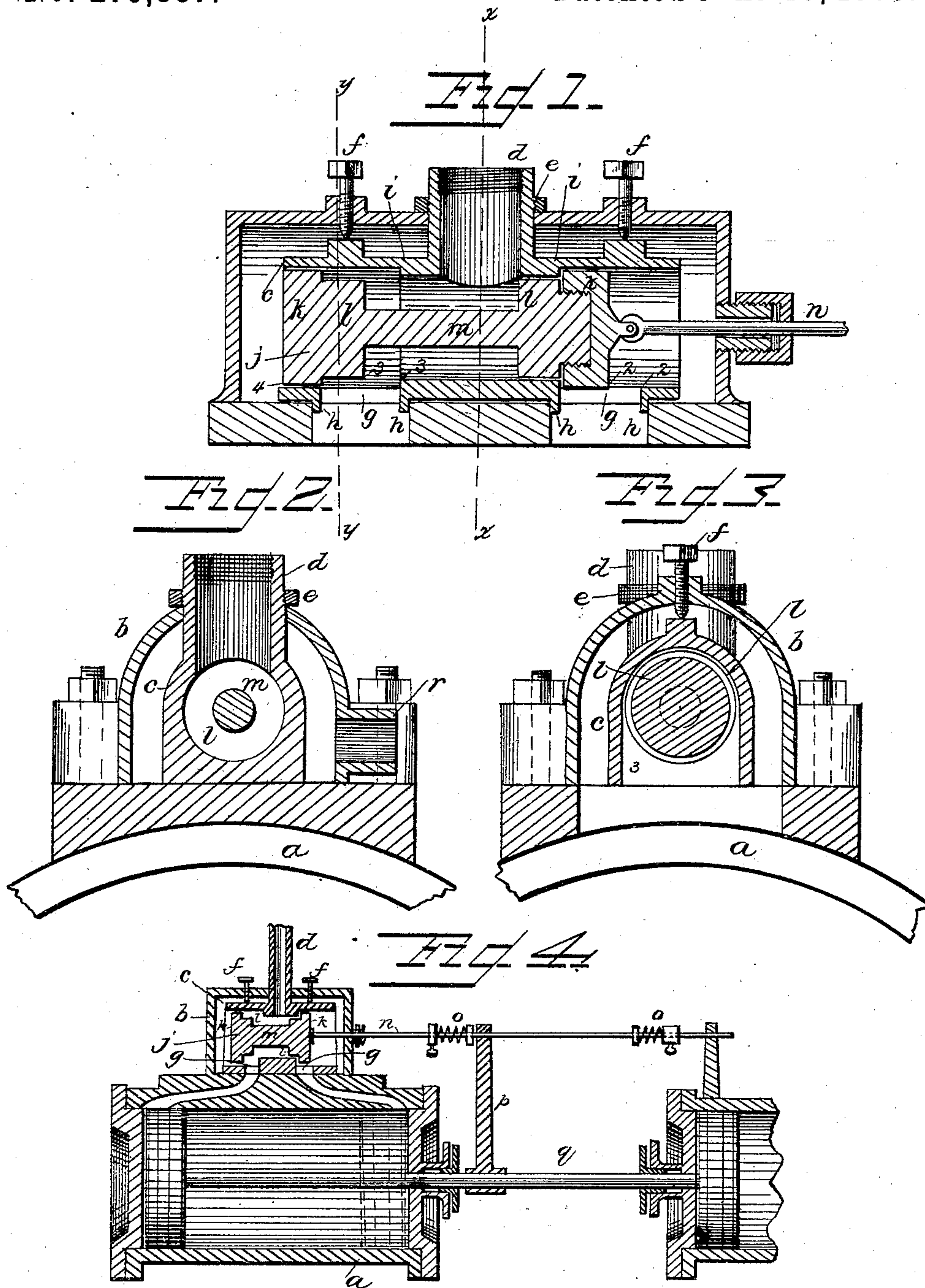
(No Model.)

F. STITZEL.

PISTON VALVE.

No. 279,887.

Patented June 19, 1883.



WITNESSES.

F. L. Ourand.

Geo. M. Finckel.

INVENTOR.

Frederick Stitzel.

by Wm. H. Finckel Attorney.

UNITED STATES PATENT OFFICE.

FREDERICK STITZEL, OF LOUISVILLE, KENTUCKY.

PISTON-VALVE.

SPECIFICATION forming part of Letters Patent No. 279,887, dated June 19, 1883.

Application filed October 16, 1882. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK STITZEL, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented a certain new and useful Improvement in Piston-Valves, of which the following is a full, clear, and exact description.

This invention relates more particularly to steam-valves for direct-acting pumps, although admitting of more general application; but for convenience I will herein confine its description to that class of steam machinery.

The invention consists in a reciprocating piston-valve surrounded longitudinally by and sliding in a shell within a valve-case which is attached to the steam-cylinder, the live steam being admitted to the valve proper centrally of the case, between the heads of the valves, and acting against the inner faces of said heads to aid in opening the ports to the cylinder, one of which ports acting as an inlet, and the steam exhausting from the opposite port into the valve-case outside the valve-shell, and thence escaping through a suitable outlet, it being noticed that the cylinder-ports act alternately as inlet and exhaust with respect to said cylinder, thus dispensing with a special exhaust. The effect of this arrangement is that the valve holds the ports open until the piston has moved nearly to the end of its stroke under the pressure of the live steam, when the tappet of the piston-rod causes the reversal of the valves substantially simultaneously with the end of the stroke of the piston, cushioning the piston and seating the pump-valve quietly and without shock.

In the accompanying drawings, illustrating my invention, in the several figures of which like parts are similarly designated, Figure 1 is a vertical longitudinal section of my valve. Fig. 2 is a vertical cross-section on the line *x x*, Fig. 1, and Fig. 3 is a similar section on the line *y y* of said figure. Fig. 4 is a vertical longitudinal section of sufficient of a direct-acting steam-pump to show the application of my valve.

The steam-cylinder *a* is suitably ported and adapted to receive the valve-case *b*, which may be bolted thereto, as are ordinary valves. The case *b* is preferably an elongated half-cylinder provided with a gland for the valve-stem.

Within this case is a shell, *c*, of such smaller diameter and length as to leave a space all around between it and the case. This shell has a live-steam inlet, *d*, in the form of a tube about centrally of its length, and projecting out through the case *b*, and secured steam-tight in said case by a jam-nut, *e*. Set-screws *f f*, tapped in the case, bear upon the shell to adjust it properly within the case. Ports *g g* are made in this shell, leading to opposite ends of the cylinder, and serving alternately as inlet and exhaust, as hereinafter more particularly set forth. Lugs *h h* may be employed on the shell to project into the cylinder-openings to insure the correct registering of the shell-ports therewith, and to aid in keeping the shell in place. The central internal diameter of the shell is contracted to form shoulders *i i* to co-act with the valves.

The valve proper, *j*, may be a tubular or solid piston. I will describe it as shown—viz., solid. Each end or head of the valve has an outer or exhaust face, *k*, of larger area than the inner or live-steam face, *l*, and these heads are connected by a stem, *m*, of still smaller diameter. One head (shown at the right-hand end of Fig. 1) has its larger face made as a screw-cap, screwed to the smaller face, so as to permit the handling of the valve for insertion in and removal from its shell. The valve is arranged within the shell to slide longitudinally therein. Its heads are of sufficient size to cover the ports, and the rear of the larger faces of the valve seat against the shoulders *i i* of the shell, the smaller faces fitting within the smaller diameter of such shouldered portion of the shell. To provide for differences in height between the valve and the pump, the valve-rod *n* is jointed to the valve substantially as shown. This valve-rod may be provided with adjustable spring-stops *o o*, against which the tappet *p* of the piston-rod *q* acts to operate the valve. *r* is the outlet for the exhaust-steam, which outlet communicates only with the space between the shell and case.

The operation is as follows: The valve, as in the drawings, is supposed to be applied to a direct-acting steam-pump upon its steam-cylinder. As shown in full lines, the valve has been at the moment reversed, and the piston in the cylinder is moving to the right, the valve being stationary at the left, letting in

live steam through the port at that end, and exhausting from the right. The inner faces of the left-hand head of the valve, being fully exposed, present a larger live-steam-pressure area than the head at the right, since the inner face of the said right-hand head is covered by the shoulder *i* of the shell, and only its smaller face is exposed. Now, when the tappet on the piston-rod strikes the outer stop *o*, it moves the valve, and so soon as the valve is moved sufficiently by the tappet to take the inner face of the left-hand head to its shoulder *i* the live-steam-pressure areas of the two heads are made equal, and both ports closed. At this time there is evidently pressure to the amount of work done in the cylinder to the left of the dotted-line piston, Fig. 4, and none to the right, the steam having been exhausted from that end, and there is an amount of steam in the chamber between the valve-heads equal to that at the left of the piston, there is no pressure on the exhaust ends of the valve-heads, the movement of the piston and the difference of pressure to the right and left of the piston in the cylinder will now consequently move the valve to open that port which enters that end of the cylinder containing the greatest pressure, and a lead of one thirty-second of an inch will suffice to throw the valve by the pressure of the steam.

So far as I am aware, in all prior steam-pumps, instead of the valve being moved direct, it has been necessary to employ a small slide-valve, or its equivalent, which actuates a steam-piston, by which latter the valve proper is actuated, the valve proper being thus auxiliary or secondary, and if the least out of order it will let the piston strike the cylinder-heads, often-times knocking out such heads. The valve is precluded from "hanging" by the provision of the spring-stops on its stem; but these are not absolutely necessary, unless the valve is too nearly balanced, since this valve is absolutely direct. By my invention the pump-piston is precluded from striking the cylinder-heads, as the steam and water pistons slow up near each end of their strokes. The object in making the live-steam faces of the valve-heads smaller than the exhaust-faces is to slightly overbalance the valve, and it is this overbalance that actuates the valve. In other words, the movement of the valve is accomplished by its live-steam part or head being smaller than the exhaust.

What I claim is—

1. A reciprocating valve having two heads, each with different inner and outer areas, against the outer and larger faces of which

heads exhaust-steam flows, and against the inner and smaller of which live steam acts, combined with an inclosing-shell, the interior of which is of different diameters to correspond with the heads of the valve, and a case for the whole, substantially as shown and described.

2. A valve-case, a valve-shell within the same having ports which alternately serve as inlets and exhausts, and also provided with shoulders *i i*, a reciprocating valve within said shell having two heads at opposite ends of a connecting-stem, the inner or live-steam faces of said heads being of smaller area than that of the outer faces, substantially as and for the purpose described.

3. A valve-case, a valve, and a valve-shell arranged within said case and having a space between it and the case to receive exhaust-steam, combined with an inlet into said shell for live steam, substantially as shown and described.

4. In a valve, the inclosing-shell arranged in a valve-case provided with an inlet and a jam-nut therefor, and set or adjusting screws, substantially as and for the purpose described.

5. A valve having heads the faces of which are of different areas, a shell provided with a steam-inlet, and a contracted and shouldered portion between the faces of smallest diameter, and ports in said shell, which alternately act as exhaust and inlet ports, substantially as shown and described.

6. A direct-acting valve having live-steam faces of variable areas, exhaust-faces of fixed areas, and two ports acting alternately as live-steam and exhaust ports, combined with a piston, all arranged substantially as shown and described, whereby the movement of the piston and the differences of pressure areas on the valve effect the opening and closing of the ports and the movement of the engine, as specified.

7. The combination of a valve-case, an inclosing-shell having a central contracted or shouldered interior, and a valve within said shell having a reduced center and heads of different diameters, one of the said heads at its larger diameter being made detachable to permit the removal or insertion of the valve, substantially as described.

In testimony whereof I have hereunto set my hand this 14th day of October, A. D. 1882.

FREDERICK STITZEL.

Witnesses:

JULIUS A. STEGE,
WM. D. REILING.