No. 677,328. Patented June 25, 1901.

F. L. REEDER & A. B. FREVILLE.

STEAM ACTUATED VALVE.

(Application filed Jan. 15, 1901.)

(No Model.) 2 Sheets—Sheet 1.

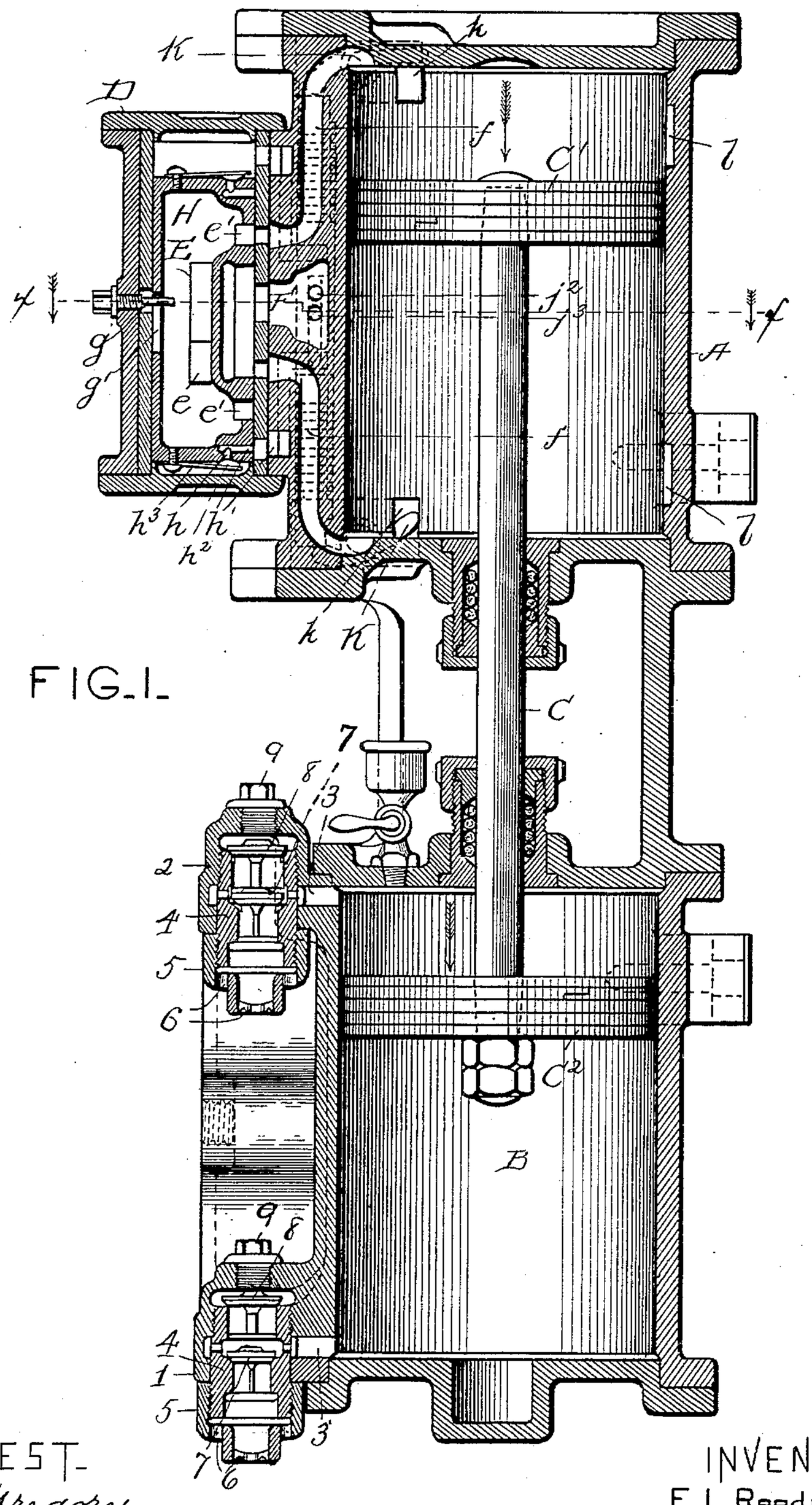

FIG. 1.

ATTEST-
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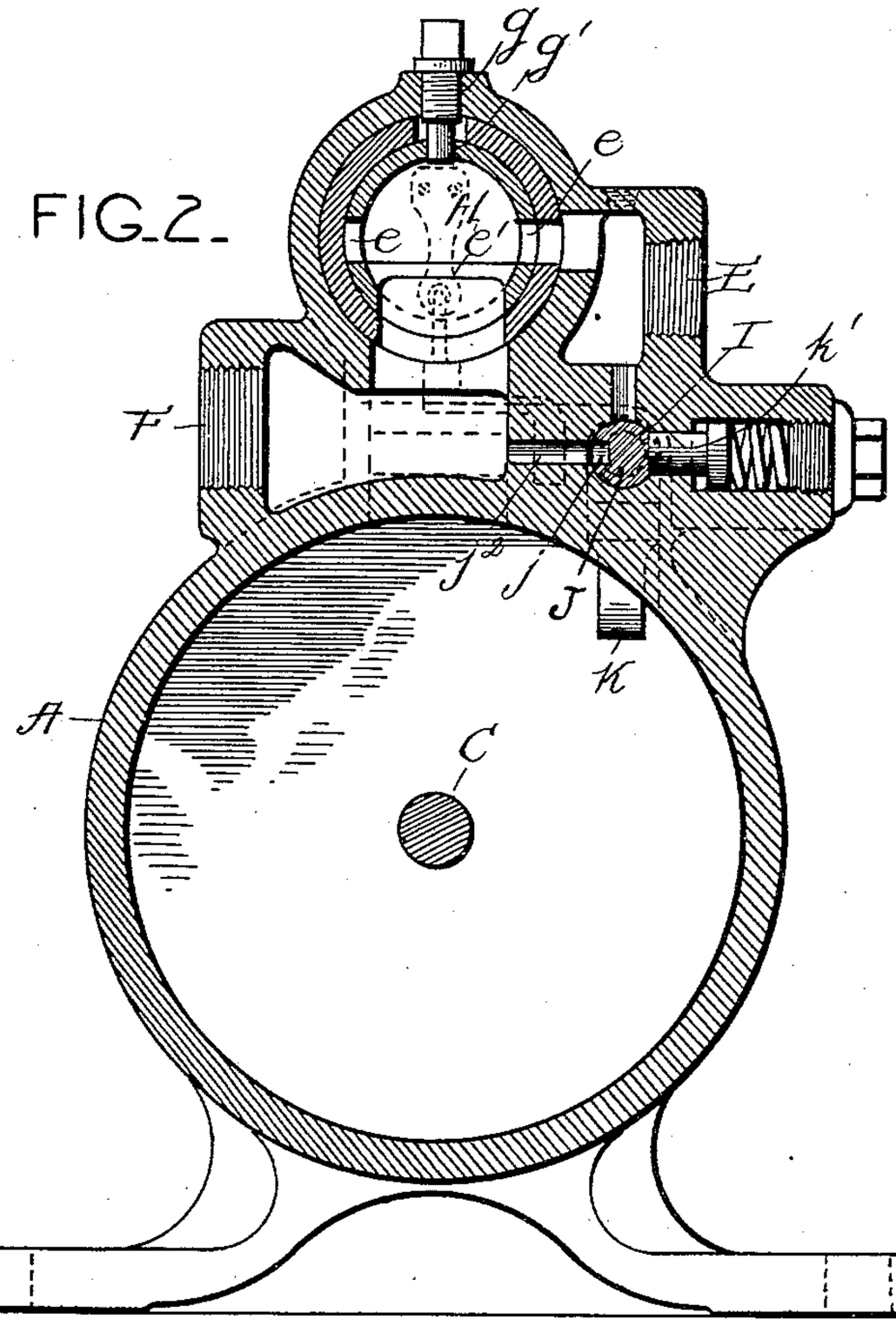
FIG. 2.



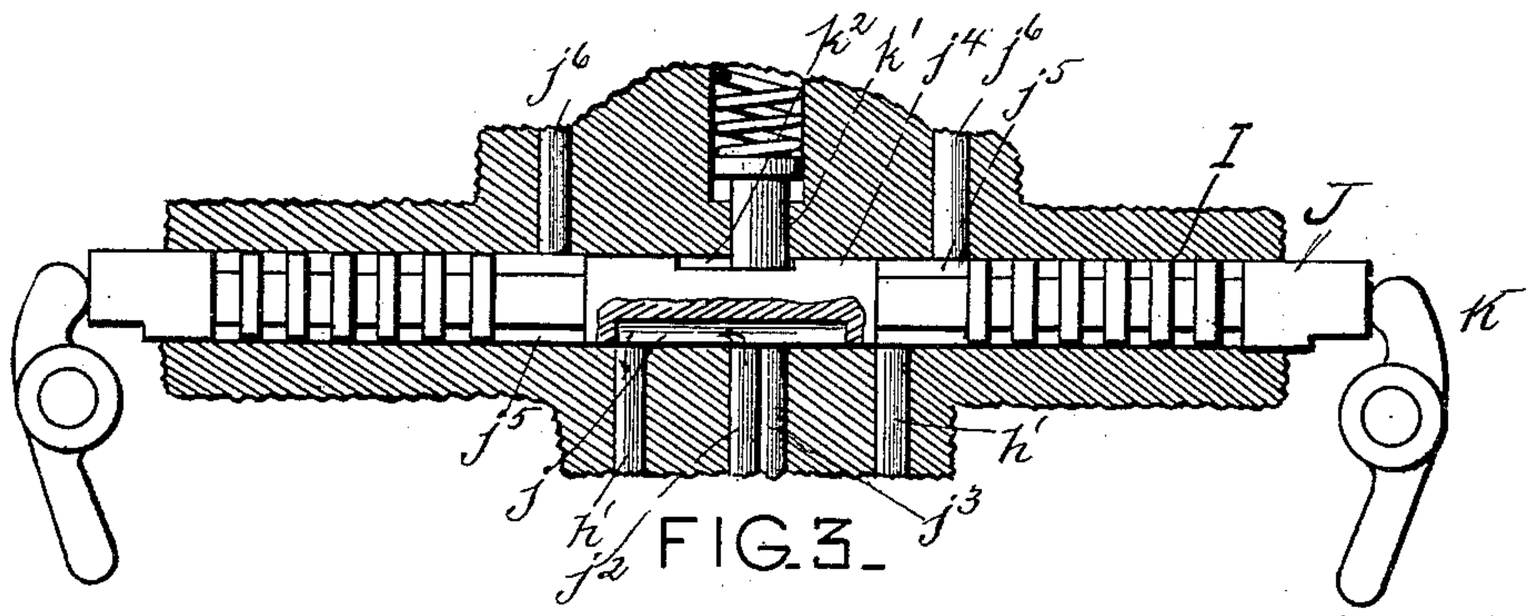


FIG. 3.

ATTEST-
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UNITED STATES PATENT OFFICE.

FRANK L. REEDER AND ALBERT B. FREVILLE, OF LOUISVILLE, KENTUCKY, ASSIGNORS TO THE NATIONAL FOUNDRY AND MACHINE COMPANY, OF SAME PLACE.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 677,328, dated June 25, 1901.

Application filed January 15, 1901. Serial No. 43,310. (No model.)

To all whom it may concern:

Be it known that we, FRANK L. REEDER and ALBERT B. FREVILLE, citizens of the United States, and residents of Louisville, in the county of Jefferson and State of Kentucky, have made a certain new and useful Invention in Steam-Actuated Valves; and we declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the invention, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

Figure 1 is a central vertical section of our pump. Fig. 2 is a section on the line x x, Fig. 1. Fig. 3 is a detail fragmentary section on the line y y, Fig. 1, the levers K K being shown in side elevation.

This invention has relation to steam-pumps, the object being to provide an improvement upon the steam-actuated valve for which Letters Patent were granted April 27, 1886, and numbered 340,819.

With this object in view the invention consists in the novel construction and combination of parts, all as hereinafter described, and pointed out in the appended claims.

Referring to the accompanying drawings, the letter A designates the steam-cylinder of an air-compressor, and B the air-compressing cylinder, having a common piston-rod C and pistons C′ and C².

D is the steam-chest, and E and F the induction and eduction passages, respectively, for steam to and from the cylinder.

H is a balanced piston slide-valve reciprocating in the steam-chest, of hollow cylindrical form throughout, the interior of which is in constant communication with the passage E at e, having steam-ports at e' e' in alternate communication with passages f f to admit steam to the cylinder, the chamber H′ in the lower wall of which valve is in alternate communication with passages f f to exhaust steam from the cylinder. g is a pin engaging slot g' of said valve to prevent turning thereof, and ports e are provided upon both sides of such valve, so that no matter which way it is inserted in place there will be no blocking of induction-passage E.

In each end wall of piston-valve H is a steam-port h to passage h', extended downwardly into communication with the cylindrical chamber I, extending longitudinally of the cylinder at one side of the steam-eduction passage F, said ports h being closed to prevent the escape of steam in the vertical engine shown by valves h^2, carried by flat springs h^3, secured to the valve-wall.

Reciprocating in chamber I is a cylindrical rod-valve J, having passage j, alternately connecting passages h' with passages j^2 j^3, leading from eduction-passage F into chamber I. This rod-valve is reciprocated by means of short intermediately-pivoted levers K K, having the work-arms thereof acting against the end of the valve and the power-arms thereof extended downwardly and projecting through the end walls of the cylinder to a slight extent in the path of the moving piston when it has about completed the stroke. Passages k k connect the cylinder with chamber I at each end thereof, in which passages said levers K K work. The rod-valve consists of a central portion j^4, in which is passage j, reduced portions around which is a wide annular groove j^5 at each side of part j^4, and a series of narrow alternating annular grooves and ribs extending to near each end of the rod-valve to reduce the weight and friction of said valve and act as a water-packing. The annular grooves j^5 serve to alternately connect exhaust-passages j^6 with passages h' to exhaust steam from between the end walls of the piston slide-valve and the steam-chest. A spring-pressed pin k' bears in a guideway k^2 of said rod-valve to prevent vibration of the molecules thereof, which vibration has been found objectionable in practice.

In operation when the piston nears the end of each stroke levers K K are actuated to bring passage j of the rod-valve into communication with the exhaust-passage f to open valves h^2 and admit exhaust-steam between the end walls of the steam-chest and the piston-valve to actuate such valve.

In order to cushion the piston at the end of

the stroke thereof and to aid in the reversal of the movement of the piston, we provide a steamway *l* in the inner wall of the cylinder, at each end thereof, of a length a little greater than the width of packing-rings *c'* of the piston, whereby when the piston has almost completed a stroke steam finds its way around the piston to the opposite side thereof.

Referring to the air side of our pump, the cylinder B thereof is provided at each end with the double valve-chambers 1 and 2, each in direct communication with said cylinder by short passages 3 of a length equal to the thickness of the cylinder-shell at such points. 4 indicates the valve cage or bushing, having a tapered threaded engagement with each said chamber and provided each with a jam-nut 5, having air-inlet openings 6. These bushings have intermediate perforations communicating with grooves in the inner walls of the valve-chambers, which grooves communicate with the short passages aforesaid. The bushings have double valve-seats, for which inlet and exhaust valves 7 and 8 are provided.

The lift of the exhaust-valves is adjustably limited by screw-plugs 9, and the lift of the inlet-valves is limited by the radial guide-flanges of the exhaust-valves.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a steam-pump, a reciprocatory rod-valve, and means in connection with said valve for admitting exhaust-steam between the end walls of the slide-valve and of the steam-chest just before the piston has completed its stroke, substantially as specified.

2. In a steam-pump, a rod-valve, levers engaging said valve, and extending in the path of the moving piston just before it has completed its stroke to reciprocate said valve, and means in connection with said rod-valve for admitting exhaust-steam alternately between the opposite end walls of the slide-valve, and of the steam-chest, substantially as specified.

3. In a steam-pump, a reciprocatory rod-valve, an integral piston slide-valve, cylindrical throughout its length, means for preventing rotation of said piston slide-valve, and means in connection with said rod-valve and slide-valve for admitting exhaust-steam between the end walls of the slide-valve, and of the steam-chest, just before the piston has completed its stroke, substantially as specified.

4. In a steam-pump, a chamber I in the cylinder having ports j^2, j^3 communicating with the steam-eduction passage for the cylinder, and ports *h'*, *h'* communicating with the steam-chest, ports *h*, *h*, in the slide-valve in said steam-chest in alternate communication with said ports *h'*, *h'*, valves controlling said ports *h*, *h*, a rod-valve having a passage alternately connecting ports j^2, j^3 with ports *h'*, *h'* to alternately admit exhaust-steam between the opposite end walls of slide-valve and steam-chest, means for reciprocating said rod-valve just before the piston has completed its stroke, and exhaust-ports alternately communicating with said ports, *h'*, *h'*, substantially as specified.

5. In a steam-pump, a reciprocatory rod-valve, and means acting in connection with said valve for admitting exhaust-steam between the end walls of the slide-valve and of the steam-chest just before the piston has completed its stroke, consisting of a chamber in which said rod-valve reciprocates, ports or passages connecting said chamber with the steam-eduction passage of the cylinder, and with the steam-chests, ports in the slide-valve, and valves for controlling such ports, said rod-valve having a passage in alternate communication with alternate ports connecting said chamber, and steam-eduction passage, and with alternate ports connecting said chamber and steam-chest, exhaust ports or passages in alternate communication with said ports connecting chamber and steam-chest, together with levers engaging the end portions of said rod-valve and extending in the path of the moving piston, substantially as specified.

6. In a steam-pump, a reciprocatory rod-valve, and means in connection with said valve for admitting exhaust-steam between the end walls of the slide-valve and of the steam-chest just before the piston has completed its stroke, consisting of a chamber in which said rod-valve reciprocates, ports or passages connecting said chamber with the steam-eduction passage of the cylinder, and with the steam-chest, the integral piston slide-valve cylindrical throughout its length, and having ports, and valves carried by flat springs, for such ports, said rod-valve having a passage in alternate communication with alternate ports connecting said chamber and steam-eduction passage, and with alternate ports connecting said chamber and steam-chest, exhaust-ports in alternate communication with said ports connecting chamber and steam-chest, together with levers engaging the end portions of said rod-valve, and extending in the path of the moving piston, substantially as specified.

7. In a steam-pump, a reciprocatory rod-valve, and means in connection with said valve for admitting exhaust-steam between the end walls of the slide-valve and of the steam-chest just before the piston has completed its stroke, together with a spring-pressed pin engaging said rod-valve to check molecular vibration thereof, substantially as specified.

8. In a steam-pump, means for cushioning the piston at the end of its stroke, consisting of a groove in the inner wall of the cylinder at each end thereof, and spanning the packing of said piston, to allow the steam to pass around the piston, substantially as specified.

9. In a steam-pump, a reciprocatory rod-

valve, and means acting in connection with said valve for admitting exhaust-steam between the end walls of the slide-valve and the steam-chest just before the piston has completed its stroke, consisting of a chamber in which said rod-valve reciprocates, ports or passages connecting said chamber with the steam-eduction passage of the cylinder, and with the steam-chest, ports in the slide-valve, and valves for controlling said ports, said rod-valve having a passage in alternate communication with alternate ports connecting said chamber and steam-chest, said rod-valve having also annular grooves and exhaust ports or passages in alternate communication through such grooves with said ports connecting chamber and steam-chest, together with levers engaging the end portions of said rod-valve, and extending in the path of the moving piston, substantially as specified.

10. In a steam-pump, a reciprocatory rod-valve, having alternate annular grooves and ribs to form a water-packing and reduce friction, and means in connection with said valve for admitting steam between the end walls of the slide-valve and of the steam-chest just before the piston has completed its stroke, substantially as specified.

11. In a steam-pump, a reciprocatory rod-valve, a balanced piston slide-valve, and means in connection with said rod-valve for admitting exhaust-steam between the end walls of said slide-valve and of the steam-chest just before the piston has completed its stroke, substantially as specified.

12. In a steam-pump, a reciprocatory rod-valve, a balanced piston slide-valve of cylindrical form, and integral throughout, and means in connection with said rod-valve for admitting exhaust-steam between the end walls of said slide-valve and of the steam-chest just before the piston has completed its stroke, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

FRANK L. REEDER.
ALBERT B. FREVILLE.

Witnesses:
CHARLES H. FREVILLE,
FRANK. M. LOSEY.