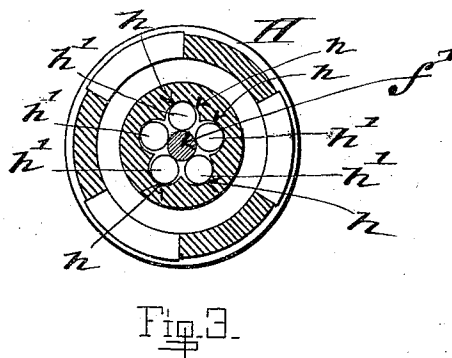
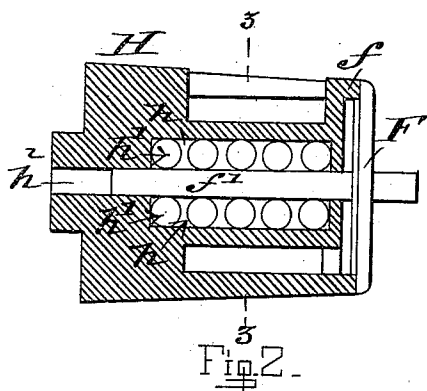
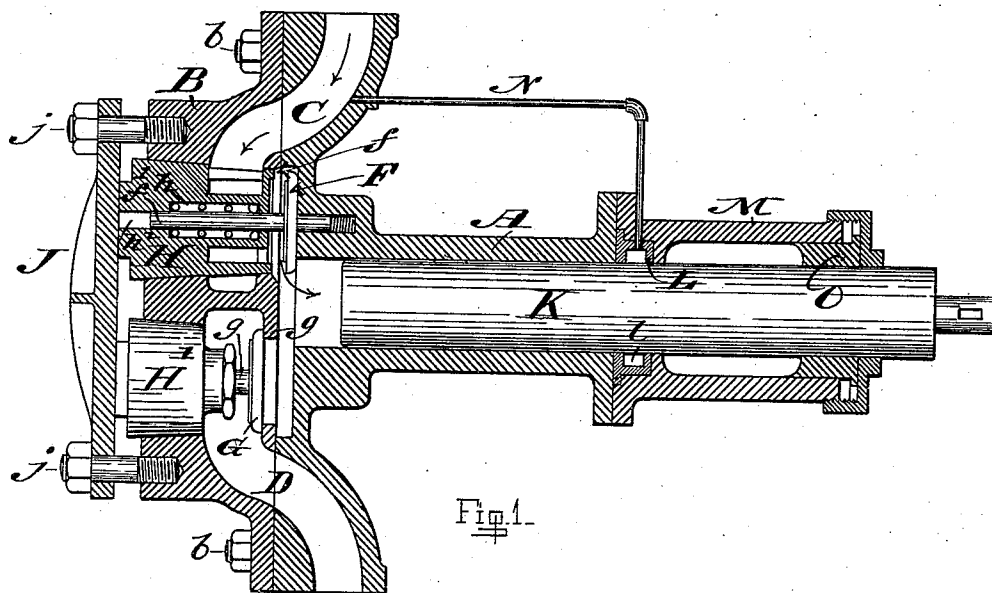


(No Model.)

J. C. MACK.
PUMP.

No. 313,353.

Patented Mar. 3, 1885.



Witnesses
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Inventor
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UNITED STATES PATENT OFFICE.

JAMES C. MACK, OF ST. LOUIS, MISSOURI.

PUMP.

SPECIFICATION forming part of Letters Patent No. 313,353, dated March 3, 1885.

Application filed December 24, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES C. MACK, of St. Louis, Missouri, have made a new and useful Improvement in Pumps, of which the following is a full, clear, and exact description, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a longitudinal section of that part of the pump with which the improvement in question is immediately connected; Fig. 2, a longitudinal section, upon an enlarged scale, of one of the valve-stem plugs; and Fig. 3, a cross-section on the line 3 3 of Fig. 2.

The same letters of reference denote the same parts.

This invention is applicable more especially to pumps used in circulating volatile liquids—such as ammonia—and particularly to that class of such pumps whose valve-stems work horizontally.

By means of the improvement the efficiency of the pump is sensibly increased.

It consists partly in the means for reducing the friction of the valve-stems and partly in the means for preventing leakage through the packing of the piston-rod.

A represents the pump-cylinder.

B represents the head of the cylinder, and attached thereto by means of the bolts *b b*. The gas or liquid is introduced into the cylinder through the head B, C representing the passage leading into the cylinder, and D representing the passage leading from the cylinder.

F represents the inlet-valve, and G represents the outlet-valve. These valves are adapted to work in plugs H H', respectively. These plugs pass through the head, and are held therein by means of the cross-bar J, which bears against the outer ends of the plugs, and is fastened to the head B by means of the bolts *j j*. The valve F seats at *f*, and the valve G seats at *g*. Each of the plugs, as shown more distinctly in Figs. 2 and 3, has a series of grooves, *h h h h*, extending longitudinally in the plug, and arranged uniformly around the longitudinal axis of the plug. Each of these grooves has a series of balls, *h' h'*.

The various series of balls constitute the bearing in which the valve-stem *f' g* works, the valve-stem working in the center of the

series, and bearing against all of the balls of all of the series. With this construction the friction of the valve-stem is greatly reduced.

The improvement is useful in operating a valve in an inclined position, and particularly in a strictly horizontal position. The outer end of the valve-stem works in a perforation, $\frac{1}{2}$, in the plug. The pump-plunger K is extended in the same diameter through the bushing L and stuffing-box M. The bushing L at the inner end of the stuffing-box M is chambered out, forming an annular chamber, *l*. Any gas or liquid which may escape past the plunger is received in the chamber *l*, and thence is conducted through the pipe N into the inlet-passage C.

In operation a reciprocating motion is imparted to the plunger K. A vacuum is formed in the cylinder, causing the inlet-valve to open. The liquid or gas enters through the passage C, past the inlet-valve, into the cylinder. Upon the return-stroke the inlet-valve closes and the outlet-valve opens, and the contents of the cylinder are discharged into the passage D.

In pumping against a pressure some of the liquid continuously works backward into the chamber *l* in the bushing. If there were no relief provided for this, the pressure on the packing would soon increase until it equaled that of the resistance of the plunger K. This would cause leakage past the packing, or a loss of power from excessive friction, owing to the necessity of tightening the gland O to prevent the leakage; but by means of the hollow bushing and passage N this loss is obviated. I do not lay claim, broadly, to the use of a hollow bushing and passage leading therefrom.

In the Letters Patent No. 210,134, granted me November 19, 1878, I use a fixed hollow bushing and pipe, but for a different purpose from that of the present application, and the pipe has no connection with the pump-cylinder; also, in various forms of pumps for pumping liquids and gases it has sometimes been the custom to have a passage leading from the inlet side of the pump to the space in rear of the piston for the purpose of preventing a vacuum, which otherwise would cause the pump to labor and unnecessarily consume power; also, in many double-acting pumps a

pipe has been provided, by means of which the gas which has leaked by the packing is passed into a hollow movable bushing having a pipe leading therefrom to the inlet side of the pump, so that the leakage may pass back to the suction side of the pump. None of the constructions alluded to, however, will serve my present purpose, for in a construction such as last above named, where the packing is between the bushing and the cylinder, the pump must be packed against the compression-pressure, whereas in the present construction, with the bushing between the packing and the cylinder, the pump has to be packed against the suction-pressure only, and as the suction-pressure is much less than the compression-pressure the packing need not be nearly as tight, and the friction on the rod or plunger is greatly reduced. It will be noticed, also, that in the present construction a plunger is used instead of a piston and rod. There is therefore no space within the cylinder in rear of the plunger in which gas to any great extent can collect.

So far as the bushing L is concerned, I do not desire to be confined to what is technically styled a "bushing." The chamber *l* may be formed directly in the stuffing-box or in the cylinder, and not in a part like a bushing, which is held within the stuffing-box. The only essential is locating the chamber *l* between the stuffing-box packing and the out-

ward limit of the plunger-stroke. Nor do I wish to be restricted to the precise means shown for holding the balls in the plugs; but it is always desirable to hold them in series, substantially as shown, in order to prevent them from falling and concentrating at or toward the under side of the valve-stem.

In practice I use steel balls of about five-sixteenths of an inch in diameter.

I claim—

1. The combination, substantially as described, of the valve-stem holder H, having the grooves *h h h* and the series of balls *h'*, with the valve-stem *f*, said grooves and said stem being parallel with each other, and each groove having its own series of balls, as described.

2. The combination, substantially as described, of the cylinder A, the head B, together forming the passages C D, the plugs H H', the valves F G, and the cross-bar J, as described.

3. The plug H, having a chamber provided with balls, in combination with the valve F, having the stem *f*, said chamber and said series of balls being extended in the direction of the length of the valve-stem, as and for the purpose described.

JAS. C. MACK.

Witnesses:

C. D. MOODY,
J. W. HOKE.