(No Model.) 2 Sheets—Sheet 1.

T. J. RIDER.

PUMP.

No. 405,680. Patented June 18, 1889.

Fig. 1.

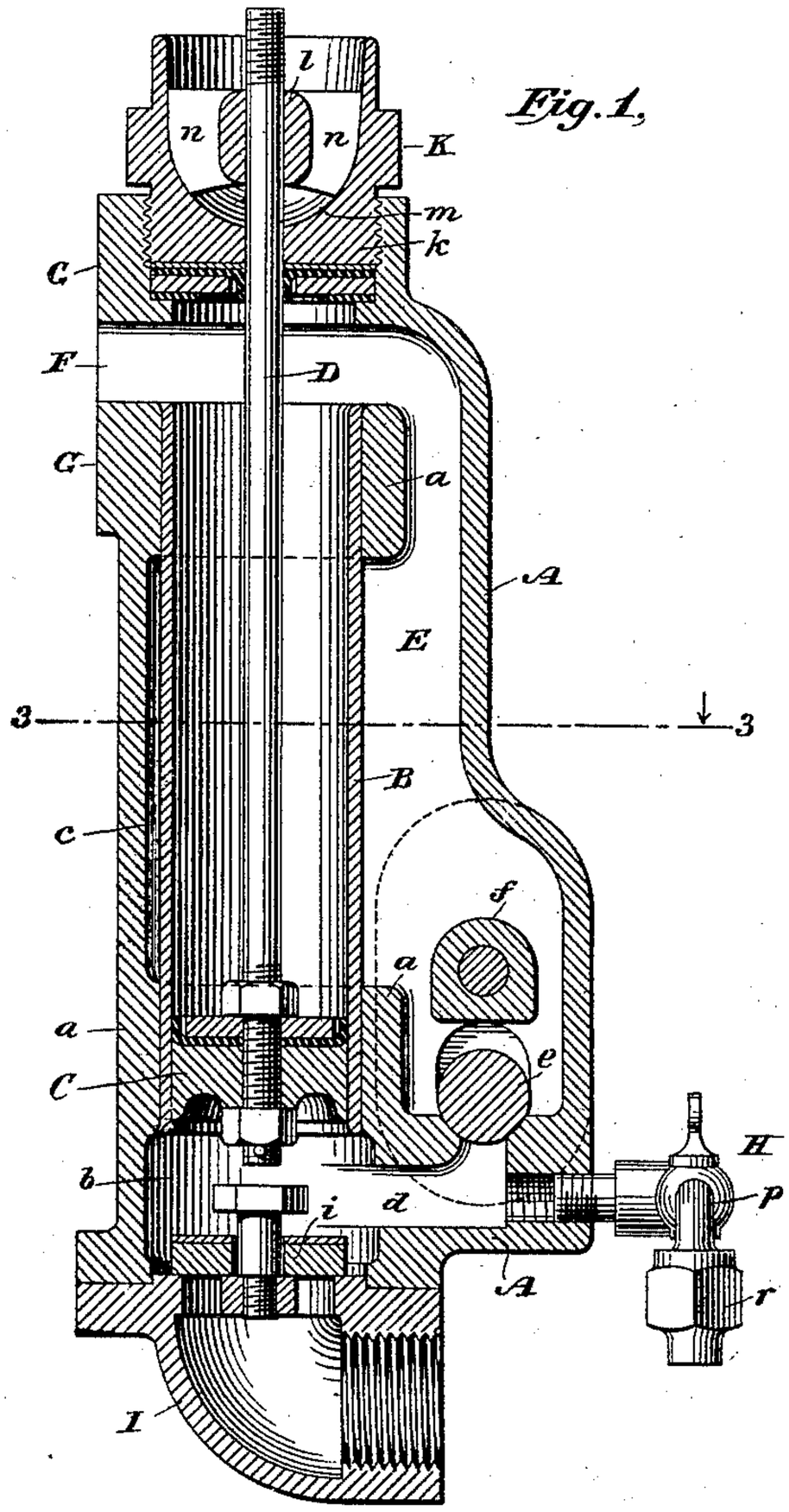


Fig. 2.

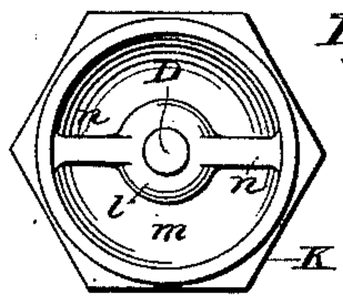


Fig. 3.

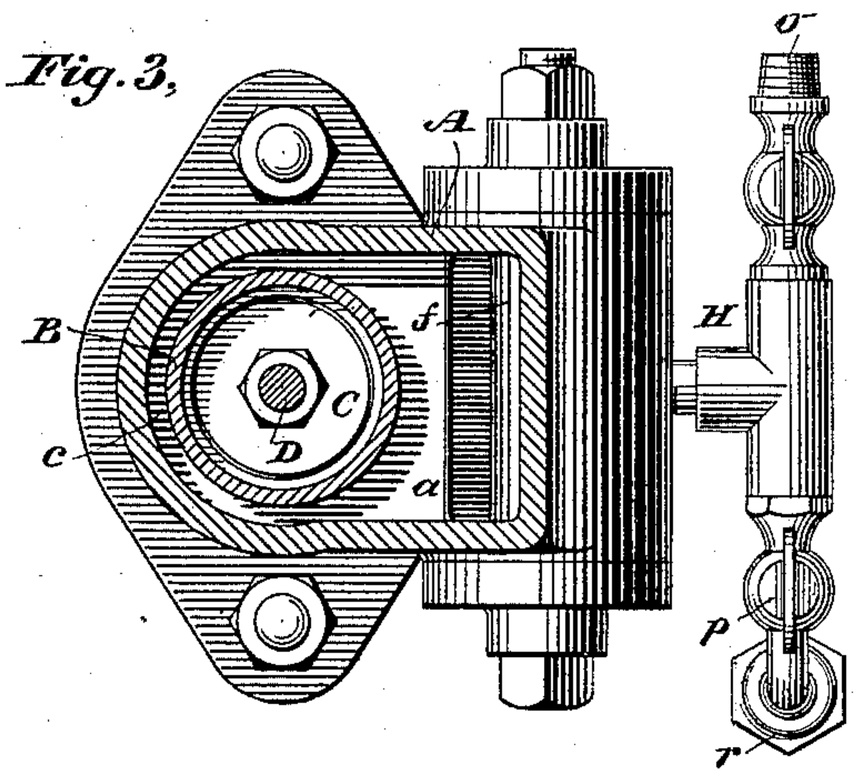
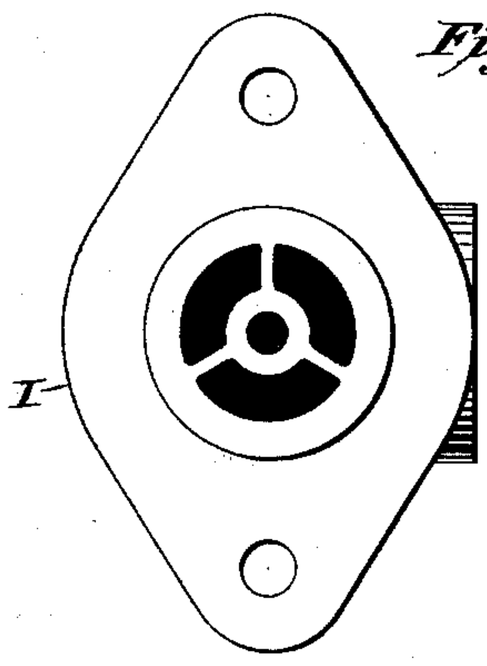


Fig. 4.



Witnesses
Geo. W. Breck.
Edward Thorpe.

Inventor
Thomas J. Rider
By his Attorneys
Ritter & Kenyon

(No Model.) 2 Sheets—Sheet 2.

T. J. RIDER.

PUMP.

No. 405,680. Patented June 18, 1889.

Fig. 5.

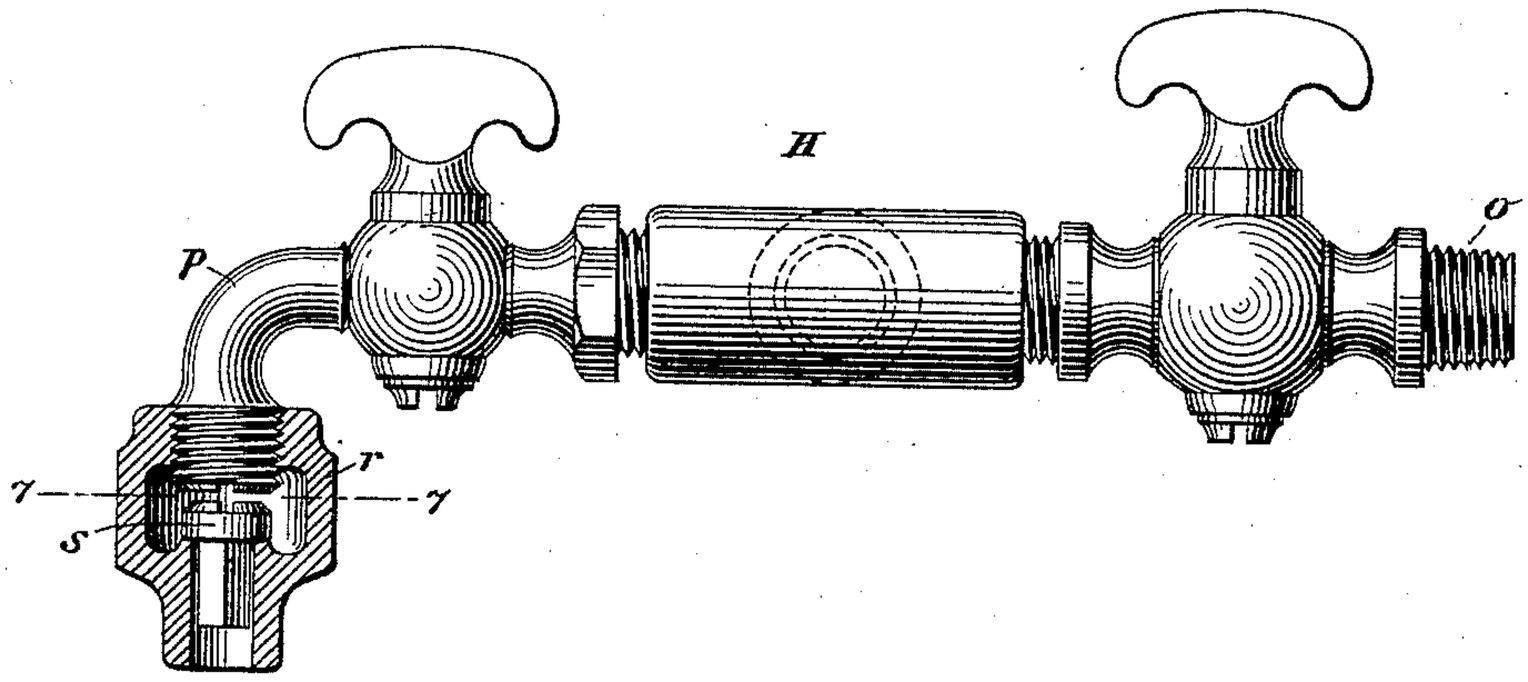


Fig. 6.

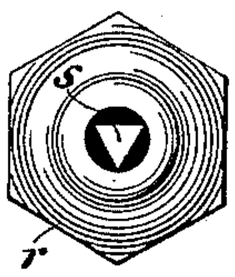
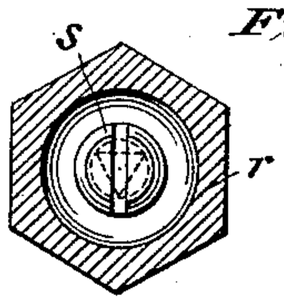


Fig. 7.



Witnesses
Geo. W. Breck
Edward Thorpes

Inventor
Thomas J. Rider
By his Attorneys
Potter & Kenyon

UNITED STATES PATENT OFFICE.

THOMAS J. RIDER, OF NEW YORK, N. Y., ASSIGNOR TO C. H. DE LAMATER, OF SAME PLACE.

PUMP.

SPECIFICATION forming part of Letters Patent No. 405,680, dated June 18, 1889.

Application filed December 15, 1888. Serial No. 293,726. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. RIDER, a citizen of the United States, residing in the city of New York, State and county of New York, have invented a new and useful Improvement in Pumps, of which the following is a specification, reference being had to the accompanying drawings, which form a part thereof.

My invention has special reference to single-acting pumps of small size, such as are commonly used with hot-air engines of the Ericsson type.

The general objects of my invention are to improve the construction, and thereby the operation, of such a pump, to simplify the method and reduce the cost of its manufacture, to combine its parts more accurately and securely, to reduce the wear upon its different parts, to render the pump more durable, and to increase its capacity and general efficiency.

In the accompanying drawings, Figure 1 is a vertical section of my improved pump. Fig. 2 is a top view of the bonnet or upper head. Fig. 3 is a horizontal section on the line 3 3 of Fig. 1. Fig. 4 is a top or plan view of the bottom section. Figs. 5, 6, and 7 are enlarged detailed views of the air-cock attachment, Fig. 6 being a bottom view of the valve attachment and Fig. 7 a sectional view on the line 7 7 of Fig. 5.

Similar letters of reference designate corresponding parts in all the drawings.

A is the body-piece of my improved pump. This is formed in a single casting, and is preferably made of iron. It is provided with a chamber to receive the barrel of the pump. At the ends of this chamber are two cylindrical projections or collars *a a*, which are bored, so as to receive and fit accurately the separate barrel or lining-piece B. This barrel is made preferably of material which will not be corroded by the liquid which is pumped. The barrel is made somewhat longer than the distance over the collars. After the collars *a a* of the body-piece have been properly bored the barrel B is inserted in the body-piece, as shown in the drawings, and the ends of the barrel are expanded into the collars and the extreme ends of the barrel are turned back upon the edges of the collars *a a*, thus securing the barrel firmly in its position. Between the barrel or lining-piece and the outer body-piece is an open space or passage *c*, extending from one collar to the other and partly encircling the barrel and connected with the side passage E.

C is a valveless piston constructed in any suitable way so as to accurately fit the barrel in which it works, being made preferably with a cup-leather packing, as shown, and having its metal portions made preferably of brass or other non-corrosive metal.

D is the piston-rod, which is also preferably made of non-corrosive metal.

The body-piece of the pump is constructed with an enlarged space or chamber *b* at its lower end. This is the suction-valve chamber in which the suction-valve works.

d is a port or opening in the body-piece connecting the chamber *b* with a discharge-passage E in one side of the body-piece. At the opening between the port and the discharge-passage is a discharge-valve *e*, which controls the opening or passage between these two parts. The valve *e* is a rolling cylindric valve.

f is a bridge which stops the upward motion of the valve *e*. The discharge-passage E is formed partly by the barrel or lining-piece, and is connected with the passage *c*, encircling the rest of the barrel. At its lower end the discharge-passage E is widened to afford ample space for the discharge-valve *e* to work in and free passage for the water around that valve. At its upper end the discharge-passage E opens into the upper end of the barrel, as shown.

F is the final discharge-opening, through which the contents of the pump are forced upon the upstroke of the piston. This discharge-opening is placed directly opposite the upper end of the discharge-passage E, and around it the body-piece is shaped to form a flange G, by means of which the pump is attached to a hot-air engine, the discharge-opening F being adapted to connect with the opening into the water-jacket of such an engine.

H is an air-cock attachment, which is connected with the interior of the body-piece A

between the suction-valve and the discharge-valve of the pump. This attachment consists of a middle T-shaped portion, which is connected by a suitable pipe-nipple with the body-piece A, as shown in Fig. 1. An ordinary air-cock *o* is screwed into one end of this T-shaped portion, and a bib-nozzled air-cock *p* into the other end. The bib end of the cock *p* is provided with a screw-thread, and onto this end a valve attachment *r* is screwed. (See Fig. 5.) The valve attachment has a central valve-chamber with an opening into the external atmosphere. This opening is fitted with an inlet check-valve *s*, as shown in Fig. 5. Both the bib end of the cock *p* and the upper side of the valve *s* are made with slots or saw-cuts, so that when the valve *s* is forced up against the end of the cock *p* the air-passage will not be closed. I prefer to place this cock attachment H just below the discharge-valve, making it connect with the port *d*, as shown in Fig. 1. It is evident that the cock *p*, with its check-valve, may be separated from the cock *o* and connected with the suction-pipe of the pump, instead of being connected as shown in the drawings.

I is the bottom section of the pump, and is adapted to be attached to the lower end of the body-piece, forming in this way the lower head of the pump-cylinder. At the outer end of this bottom section a screw-thread is provided for the attachment of the suction-pipe. The inner end of the bottom section forms the seat for the suction-valve *i*. The shape of this valve-seat and of the openings between the bottom section and the suction-valve chamber *b* is clearly shown in Fig. 4. The valve *i* is circular or disk-shaped, and slides upon a central pin provided at its upper end with a head to act as a stop for the valve. The openings between the bottom section and the suction-valve chamber are also circular in shape, as shown in Fig. 4, and the valve *i* is thus seated at its inner edge as well as at its outer edge.

K is the bonnet of the pump. It is fastened to the upper end of the body-piece by a screw-thread or other suitable means. I prefer to employ a cup-leather packing, as shown in Fig. 1, between the bonnet and the body-piece.

The bonnet K is made comparatively deep. Its lower end *k* is made to fit the piston-rod closely, and forms a guide for that rod. The upper portion of the bonnet is made cup-shaped to form an oil-receptacle *m*. At the upper part of the bonnet is the extra guide *l*, which is supported by the ribs *n*. (See Fig. 2.) Any number of ribs *n* can be employed as may seem best. As shown, the bonnet is made in a single piece or casting, preferably of brass or some other non-corrosive metal.

The operation of my improved pump is as follows: At the upstoke of the piston water is drawn in through the suction-valve to fill the cylinder. At its downstroke the water in the cylinder below the piston is forced through the port *d* and discharge-valve *e* into the discharge-passage E, filling also the passage *c*. At the next upstroke of the piston water is again drawn in through the suction-valve to fill the cylinder below the piston. At the next downstroke the water in the cylinder below the piston is forced through the port *d* and discharge-valve *e* into the discharge-passage E and passage *c*, and the water in the passages E and *c* is forced over into the barrel above the piston. At the next upstroke of the piston the water in the barrel above the piston is finally discharged through the opening F and more water is drawn into the cylinder, as already explained.

These pumps are frequently placed in positions high above the water, so that it is necessary to prime them in order to catch the water at the beginning. To enable the pump to catch the water at as great a distance as possible without priming, it is constructed in the manner shown, so that the clearance or space between the suction and discharge valves and the piston in its lowest position is reduced to a minimum; but when the pump will not catch the water without priming a pipe is attached to the cock *o*, and the other end of the pipe is inserted in a pail of water. The cock *o* is then opened and the pump started. In this way sufficient water is drawn into the pump from the pail to displace all the air and to fill the spaces and clearances in a very short time and with very little trouble. The pump is thus made to catch the water in the suction-pipe, after which the cock *o* is closed.

When the work of pumping is finished, it may be desirable to clear the pump of water, as in a case where the pump is exposed to severely-cold weather, and there would be danger of the water freezing if left in the pump. This can be done by opening the cock *o* and turning the engine over two or three times, which will clear it of all the water it contains.

If at any time there should be a "water-hammer" in the pipes connected with the pump, this can be easily stopped or remedied by opening the cock *p* and working the engine, whereby sufficient air can be drawn in through the valve *s* to form a cushion in the air-chamber, with which such a pump is always provided, and to thus do away with the water-hammer.

The extra guide *l* in the bonnet operates, in connection with the lower guide *k*, to guide the piston-rod accurately and prevent its having a lateral motion, and thus to guide the piston itself accurately and prevent a cramping of the piston in the barrel. The oil-receptacle *m* is kept supplied with oil, which, by the action of the piston-rod, is fed to the extra guide above and the lower guide, thus lubricating them both.

In my improved pump it is apparent that the water-passages are extremely large and liberal and are as straight as possible. This

obviates all extra friction and reduces the work in pumping a given quantity of water to a minimum. At the same time the parts of the pump are closely and compactly arranged, and thus the size and weight of the pump, relatively to its capacity, are largely reduced, securing economy and convenience. In my improved pump also the clearance—that is, the space between the suction and discharge-valves and the piston when in its lowest position—is made very small.

By constructing the body-piece in the manner shown and described and employing a separate barrel or lining-piece the cost of making the pump is materially reduced. Hitherto in casting the body-piece of a pump in a single casting it has been difficult for the molder to construct his core, as the core was necessarily crooked, small, and irregular, and it was difficult to make it sufficiently strong to keep its proper form, and as it was also difficult to make the core with sufficient vents to allow the gas formed in the casting to escape, it was also a difficult thing in such a case to remove the core and core-irons after the casting was made. In my improved pump the body-piece is of such a construction that the core required in casting it is substantially solid and continuous and simple in its form. Each core, therefore, is easily and economically made. In my body-piece, also, there is no unnecessary or waste metal, and as the body-piece can be made of cast-iron, the working parts only being made of non-corrosive metal, the pump can be made in a very solid and substantial manner, obviating liabilities of being broken in shipment or from any excess of pressure which may be brought upon it in actual use, and yet the cost of the pump be considerably reduced.

In fitting the barrel into the body-piece no long portion of the body-piece has to be bored and fitted to the barrel, but only the collars *a a*. In practice the body-pieces are cast with cores through the collars *a a* of a diameter slightly less than the diameter of the smallest size of barrel. The holes in these collars are then bored to fit whatever size of barrel is to be employed in the pump, the other parts of the body-piece being cast of a size to be suitable for any of the usual sizes of barrels. Thus the same size of body-piece can be employed for any of the usual sizes of pumps, and without any appreciable waste or added expense of metal in either the larger or the smaller sizes. A single size of pattern and core-boxes will be all that is required to make the body-pieces for the different sizes of pumps. This will simplify and cheapen the manufacture of the pumps. Moreover, the use of but one size of casting prevents confusion in the casting-storehouse, as any casting does for any size of pump.

Another advantage of my invention is that several sizes of pumps can be used with the same engine without changing the engine in any respect, for my pump is constructed in such a manner that the distance from the center of the piston-rod to the flange where the pump is fastened to the engine will remain constant, though pumps having barrels or cylinders of various diameter may be substituted for one another, depending upon the location of the pump and the height it is to pump.

Again, my improved bonnet, with its lower guide *k* and extra guide *l*, controls the motion of the piston-rod accurately, causing it to move backward and forward in exactly the same path without lateral motion. This decreases the wear upon the packing and keeps the packing tight for a much longer time. The motion of the piston is also accurately controlled, and the cramping of the piston in the barrel, which happens when the piston-rod is not accurately guided, is prevented, and the friction between the piston and the barrel is materially reduced. In this way the wear upon the piston itself and upon the barrel is reduced. The packing on the piston will also last longer. The barrel of my improved pump can be made of much thinner metal than is usually employed, thereby decreasing the cost of the pump, especially when the barrel is made of brass or other non-corrosive metal, which is costly. These advantages are of great importance in pumps which are used with hot-air engines, where the motion of the piston is rapid and its stroke is long, requiring a long working-barrel.

By forming the passage *c* around the barrel less metal is used in making the pump and the water is made to circulate around the barrel, thus keeping the temperature of the barrel the same on all sides and preventing its unequal expansion and contraction, which would cause leakage.

Some parts of my invention may be used without others or in other combinations. I therefore do not limit my claim to a combination of all the parts shown.

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

1. The combination of a body-piece formed in a single casting and provided with a chamber to receive a barrel and with a collar at each end of the chamber to support the barrel, the collar being integral with the body-piece, and with a discharge-passage on one side connecting the two ends of the chamber and with a discharge-opening at its upper end, a separate barrel fitted and supported in the collars, a valveless piston, a piston-rod passing through the head of the pump, a suction-valve opening into the lower end of the body-piece, and a discharge-valve in the discharge-passage, substantially as shown and described.

2. The combination of a body-piece formed in a single casting, a separate cylinder in said body-piece, a valveless piston working in the cylinder, a piston-rod passing through a stuffing-box, a bottom section secured to the lower end of the body-piece, a suction-valve seated on the bottom section, a discharge-passage in

one side of the body-piece connecting the two ends of the body-piece, a discharge-valve in the discharge-passage, a discharge-opening at the upper end of the body-piece, an air-cock connected with the lower end of the body-piece, and a second cock provided with an inlet check-valve at its outer end and connected with the lower end of the body-piece between the suction and discharge valves of the pump, substantially as shown and described.

3. In a pump, an air-cock provided with an inlet check-valve at its outer end and connected with the cylinder of the pump below the discharge-valve, substantially as shown and described.

4. The combination of a body-piece formed in a single casting, a separate barrel supported in the body-piece, a valveless piston working in the barrel, a piston-rod, a bonnet in the top of the body-piece composed of a stuffing-box and an extra guide for the piston-rod, and an oil-receiver between the stuffing-box and the guide, a bottom section secured to the lower end of the body-piece, a suction-valve seated on the bottom section, a suction-valve chamber in the lower end of the body-piece, a discharge-passage in one side of the body-piece opening into the upper end of the barrel, a port connecting the lower end of the discharge-passage with the suction-valve chamber, a rolling cylindric valve at the opening between the discharge-passage and the port, an air-cock connected with the port, a second air-cock also connected with the port and provided with an inlet check-valve at its outer end, a discharge-opening at the upper end of the body-piece on the side opposite the discharge-passage, and a flange around the discharge-opening for attachment to the engine, all substantially as shown and described.

THOMAS J. RIDER.

Witnesses:
ROBERT N. KENYON,
EDWIN SEGER.

Correction in Letters Patent No. 405,680.

It is hereby certified that Letters Patent No. 405,680, granted June 18, 1889, upon the application of Thomas J. Rider, of New York, N. Y., for an improvement in "Pumps," was erroneously issued to "C. H. De Lamater," as assignee of the entire interest in the patent; that said Letters Patent should have been issued to *William De Lamater and Leander A. Bevin*, both of New York, N. Y.; said De Lamater and Bevin being owners of the entire interest in said invention as shown by assignments of record in this office; and that said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 25th day of June, A. D. 1889.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

ROBERT J. FISHER,
Acting Commissioner of Patents.