A. CARVER.

PUMP.

No. 48,707. Patented July 11, 1865.

Fig. 1.

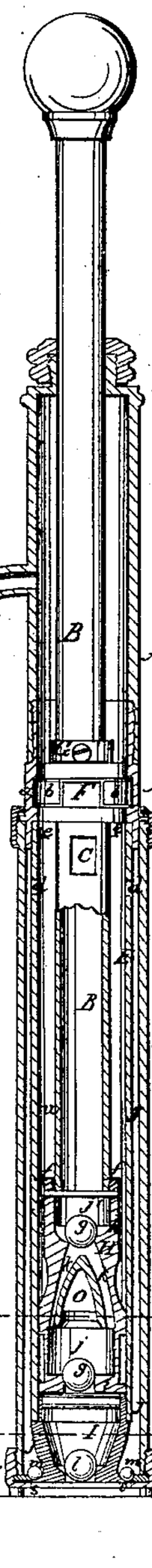


Fig. 2.

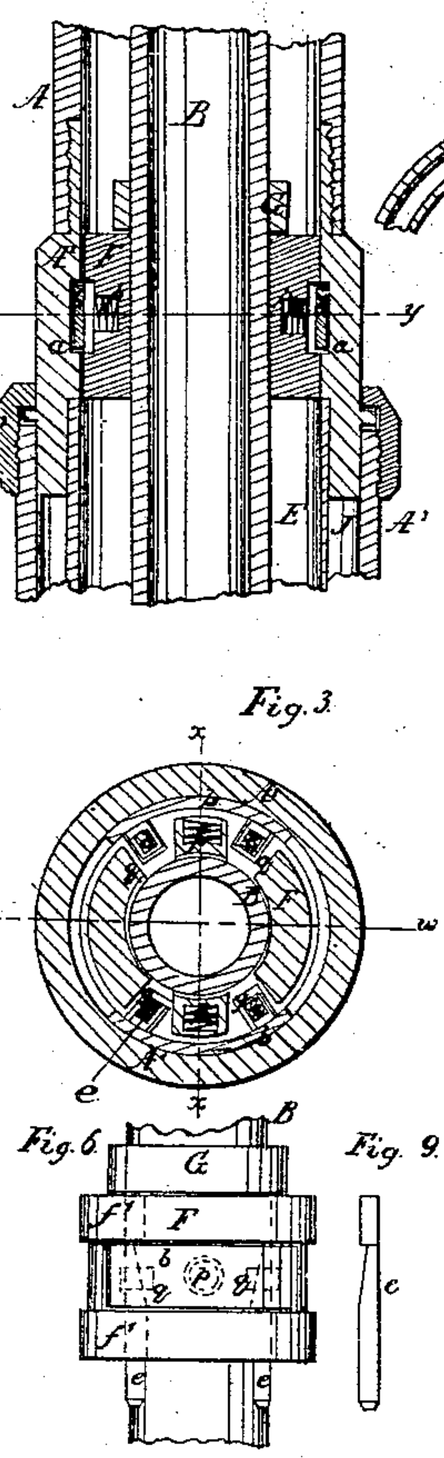


Fig. 3.

Fig. 6.

Fig. 9.

Fig. 8

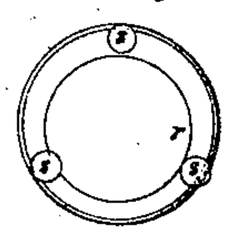


Fig. 4.

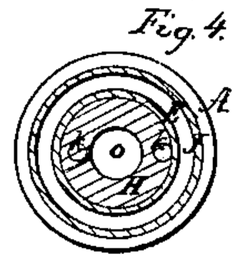


Fig. 5

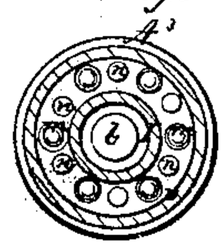
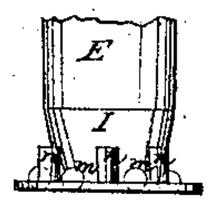


Fig. 7.



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UNITED STATES PATENT OFFICE.

AARON CARVER, OF LITTLE FALLS, NEW YORK.

IMPROVEMENT IN PUMPS.

Specification forming part of Letters Patent No. **48,707**, dated July 11, 1865.

To all whom it may concern:

Be it known that I, AARON CARVER, of Little Falls, in the county of Herkimer and State of New York, have invented a new and useful Improvement in Pumps for Oil and other Wells; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an axial section of a pump made according to my invention. Fig. 2 is an axial section of a portion of the pump, taken on the line *x* of Fig. 3. Fig. 3 is a cross-section taken on the line *y* of Fig. 2. Fig. 4 is a cross-section on the line *z* of Fig. 1. Fig. 5 is a cross section on the line *z'* of Fig. 1. Fig. 6 is an elevation of the locking-collar F. Fig. 7 is an elevation of the lower part of the inner cylinder of the pump. Fig. 8 is an inverted view of the pump. Fig. 9 is a detailed view of one of the keys of the collar F.

Similar letters of reference indicate like parts.

This improvement in pumps is especially designed for deep wells, such as oil and other Artesian wells, and it embraces several novel features, one of which is confining a piston in the cylinder of a pump by means of a detachable collar, which is fastened in place and unfastened automatically by means of the piston-rod without requiring the removal of the pump-cylinder. Another is a novel construction of piston, whereby its lower valve is relieved of the load of the column above it. Other new features are referred to below.

A designates the pump-tube of an oil or other well, and D its discharging-spout. Its length is to be sufficient to extend from above the surface of the earth, or from the place where power is applied to work the pump, down to or near to the place of the working-cylinder, where it is connected to a short cylinder, A', whose lower end is connected to the top of a cylinder, A^3, by the aid of an annular cap, A^2, the upper part of which fits over an external flange extending from the periphery of the cap, and the lower part of which is screwed over said cylinder A^3. These connections may be made in any other convenient manner instead of being made as here shown, and the section A' may extend upward to a greater length, if desired. The cylinder A^3 is the inclosing-cylinder of the pump, and extends to the bottom of the valve-box I of the working-cylinder, which is secured in place by means of an annular cap, *r*, the bottom of which has an interior flange which comes up against the outer rim of the valve-box, while the top of the cap is screwed to the bottom of the cylinder A^3. Legs *s* (three or more in number) extend downward from the bottom of the cap, and serve to support the pump on the bottom of the well.

B is a hollow piston-rod moving through a stuffing-box, C, on the top of the cylinder A. The interior of the piston-rod is put into communication with the interior of the pump by means of an opening, *e*, in the sides of the piston-rod, through which opening the fluids and liquids received within the piston are conveyed into the upper parts of the pump on their way to the place of discharge.

H is the piston. Its lower end has a valve-seat, *i*, and a ball-valve, *g*, which works in a valve-chamber, *j*, and its upper end has another valve-chamber, *j'*, with a valve, *g*, resting on a valve-seat, *h*. These valve-chambers communicate with each other by means of passages K K, which commence in the sides of the piston H in the upper part of the chamber *j*, and, proceeding upward, meet just below the seat *h* of the upper valve.

O designates a transverse opening of arch-like form, made through the valve-box above the valve-chamber *j* and between the passage-ways K K. This transverse opening makes a communication between the valve-chamber *j* and the annular space U, which is found between the outside of the piston-rod and piston (above its packing) and the wall of the working-cylinder E, while the side passages, K K, make a communication between the two valve-chambers *j j'*. The working-cylinder is indicated by the letter E. Its top comes against a shoulder formed on the inside of the short cylinder A', which cylinder A' extends down a little way so as to fit between the upper parts of the cylinders E and A^3. The inside circumference of the cylinder E and of the short cylinder A' are in coincidence, and their diameter is such as to allow the piston to pass through them with ease. The lower part of the cylinder E carries a valve-box, I, in the bottom of which

is a valve-seat and ball-valve, *l*. The bottom of this valve-box has a circular rim, *v*, which extends nearly or quite to the outside circumference of cylinder A^3, so as to enable the screw-cap *r* to bind the said rim between itself and the bottom of said cylinder A^3. This rim forms the bottom of the annular space J, and it is perforated with several openings which form seats for ball-valves *m*. These valves control communication between the said space J and the bottom part of the well. The valves are prevented from becoming displaced by means of pins *n*, extending upward from the rim between each of the valves *m*.

Figs. 2, 3, 6, and 9 are detailed views which illustrate the construction and operation of the device for locking the piston to the pump.

F designates a collar placed loosely on the piston-rod. A circular groove is made around it at the middle of its length, as seen most clearly in Fig. 6.

The letters *b b* designate curved plates of a width and thickness to allow them to lie snugly in the said groove. Each plate has at either end a staple, *q*, which is received in a recess made therefor in the grooved part of the collar F. These staples are locked to the collar by keys *e e*, which pass through its ends *f' f'* and through the staples. These keys are beveled on one or on two sides, as seen in Fig. 9, one of the beveled sides being presented toward the outsides of the staples, so that when the keys are pushed down, observing the illustration thereof in Fig. 6, their sides are withdrawn out of contact with the straps of the staples. The object of this construction is to enable the curved plates *b* to be forced outward by means of springs *p p*, one of which is shown beneath each plate. These springs are in this example nested in recesses formed on the collar, in such positions as to bring the springs beneath the middle of the plates; but there may be several springs for each plate, if desired, and the springs may be any desired form and construction.

The sectional cylinder A' has a groove, *a*, formed in its inner circumference wide enough to receive the plates *b*, into which grooves these plates are projected by the action of the springs *p* whenever the keys are in proper position to allow the springs to produce that action. The keys are held in place by friction, or, if desired, springs may be used to keep them in place, and they are pushed to and fro in their seats, so as to act on the staples or to be withdrawn from such action by means of a collar, G, on the piston-rod and a shoulder, *f*, on the piston, the latter being made to act on the keys when the piston is drawn upward to the top of the working-cylinder. The keys are then driven upward by the shoulder *f*, and their thick parts act on the staples *q* and draw the plates *b* out of the groove *a*, above mentioned, and bring them down snugly into the groove of the collar, so that they no longer project beyond the surfaces of the parts *f' f'* of the collar. The piston can now be pulled up out of the working-cylinder and out of the pump-tube, the upper section, A, being first removed, or the cap of the pump where the cap is of the full diameter of the pump-tube. When the piston is to be replaced it is let down again in the tube, the collar F being pushed down before the fixed collar G. The diameter of the movable collar is to be such that a slight degree of force will be required to push it down before the fixed collar G, so as to insure that the keys *e* will be acted upon by that collar as the movable collar is pushed before it. When the plates *b* have arrived opposite the groove *a* the springs *p* will throw them outward and the movable collar will be locked, forming the top of the working-cylinder. Instead of relying upon the friction of the collar F, or upon the friction of its plates *b* against the walls of the pump, to retard its descent, the diameter of the working-cylinder E may be a little less than the said collar, so as to arrest it when it gets into position opposite the said groove *a*. This construction enables me to remove the piston from the pump at pleasure without disturbing the cylinder, and to replace it when work is to be resumed, thereby saving the necessity also of removing the packing of the well-tube. The well will therefore be left in good condition while the piston is out of the pump.

Other ways and modifications may by employed for locking the piston and its rod and for closing the top of the working-cylinder and opening it again, so that the piston can be taken out; but the example here given will be sufficient to show how it may be done automatically by means of the piston-rod and piston.

In the operation of the pump the descent of the piston causes the small valves *m* to be raised by the pressure of the liquid in the well when the annular space J becomes filled, and the oil or other liquid will pour through the openings *d* into the space U of the working-cylinder. When the piston is raised the valves *m* are closed and the liquid in the space U passes through the opening O into the valve-chamber *j*, and thence up through the passages K K into the upper valve-chamber, *j*, whence it is forced upward by the continual ascent of the piston into the hollow space of the piston-rod B and through the opening *c* into the well-tube. The opening *c* of the piston-rod will be above the collar F when the liquid is forced through it into the well-tube. While the piston is moving upward the lower pump-valve, *l*, will be opened, and the chamber I and the lower part of the working-cylinder will become full of oil or other liquid present in the well, which, on the next descent of the piston, will pass up through its valves *g g*. It will be observed that by the construction here shown I provide large way or room for the passage of the liquids into the working-cylinder from the outer valves, *m*—to wit, an annular space around the said working-cylinder—without interfering with the symmetry of the said cylinder and without making confined and tortuous passages for the

said liquids. Moreover, by placing a supplementary valve in the upper part of the piston, I relieve the lower valve of the weight of the column of liquid which is above in the piston-rod and well-tube, thereby facilitating its operation and dividing the labor which comes upon the piston.

When the pump is in operation the stroke of the piston is less than the distance between the collar G and the shoulder *f*, so that the keys *e* are not acted upon; but when the keys are to be acted upon the stroke is lengthened so as to bring the shoulder *f* against them, when the collar F will become unlocked, as above set forth.

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

1. The piston constructed substantially as described—that is to say, with a supplementary upper valve restraining the downward pressure of the contents of the piston-rod or pump-tube upon the lower valve of the piston, substantially as described and represented.

2. So fitting the piston-rod of a double-action pump to the working-cylinder thereof as that it can be detached and withdrawn thereout and replaced therein at pleasure, automatically, by increasing the length of the stroke, substantially as described.

3. Separating the cylinder of a pump from the pump-tube above by a removable inner collar, within which the piston-rod works, and which is capable of being detached, so as to allow the piston to be withdrawn and replaced again after the piston is replaced by means substantially as described.

4. Connecting the valve-box I, forming the lower part of the working-cylinder, to the outer cylinder, A^3, by means of the screw-cap *r*, constructed and applied substantially as above described.

The above specification of my invention signed by me this 29th day of June, 1865.

AARON CARVER.

Witnesses:
EDWARD H. KNIGHT,
C. D. SMITH.