(No Model.) 3 Sheets—Sheet 1.

# W. G. STITT.

## PUMP.

No. 426,476. Patented Apr. 29, 1890.

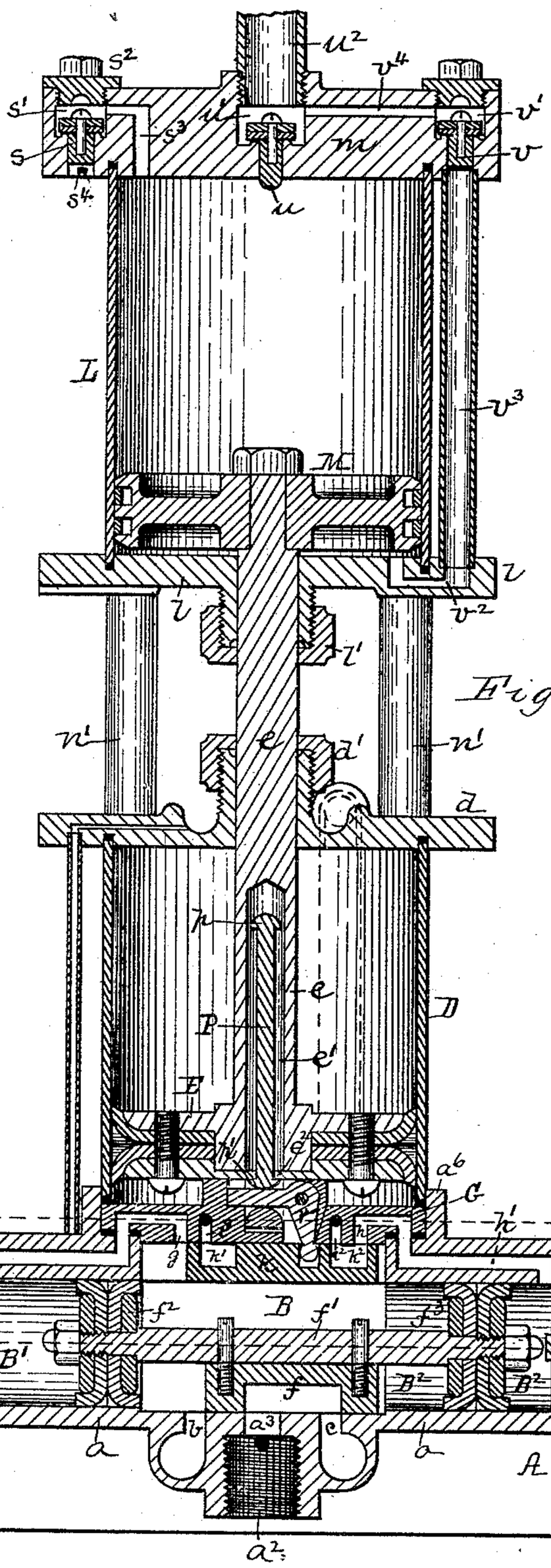


Fig. 1.

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Fig. 3.

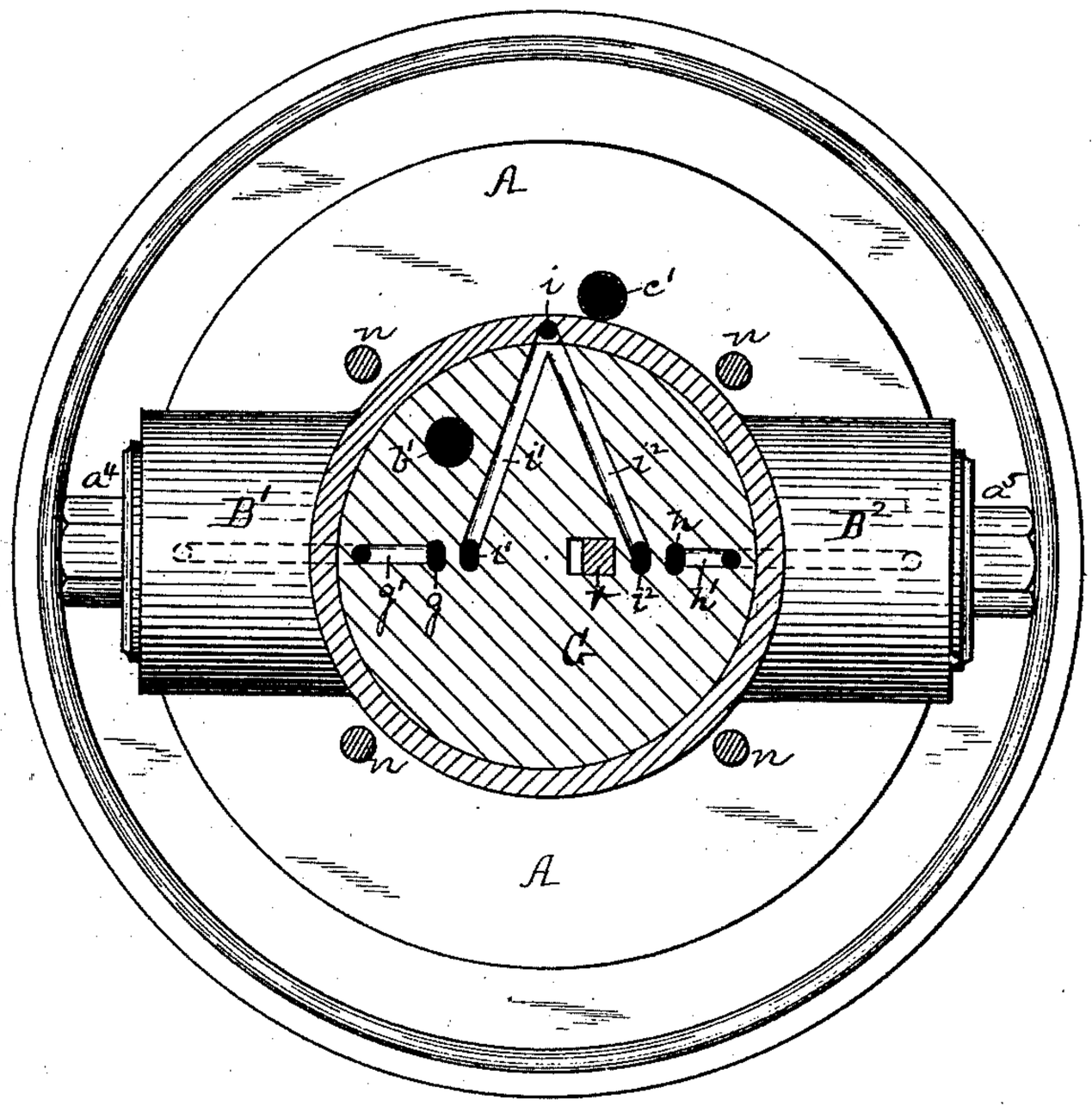
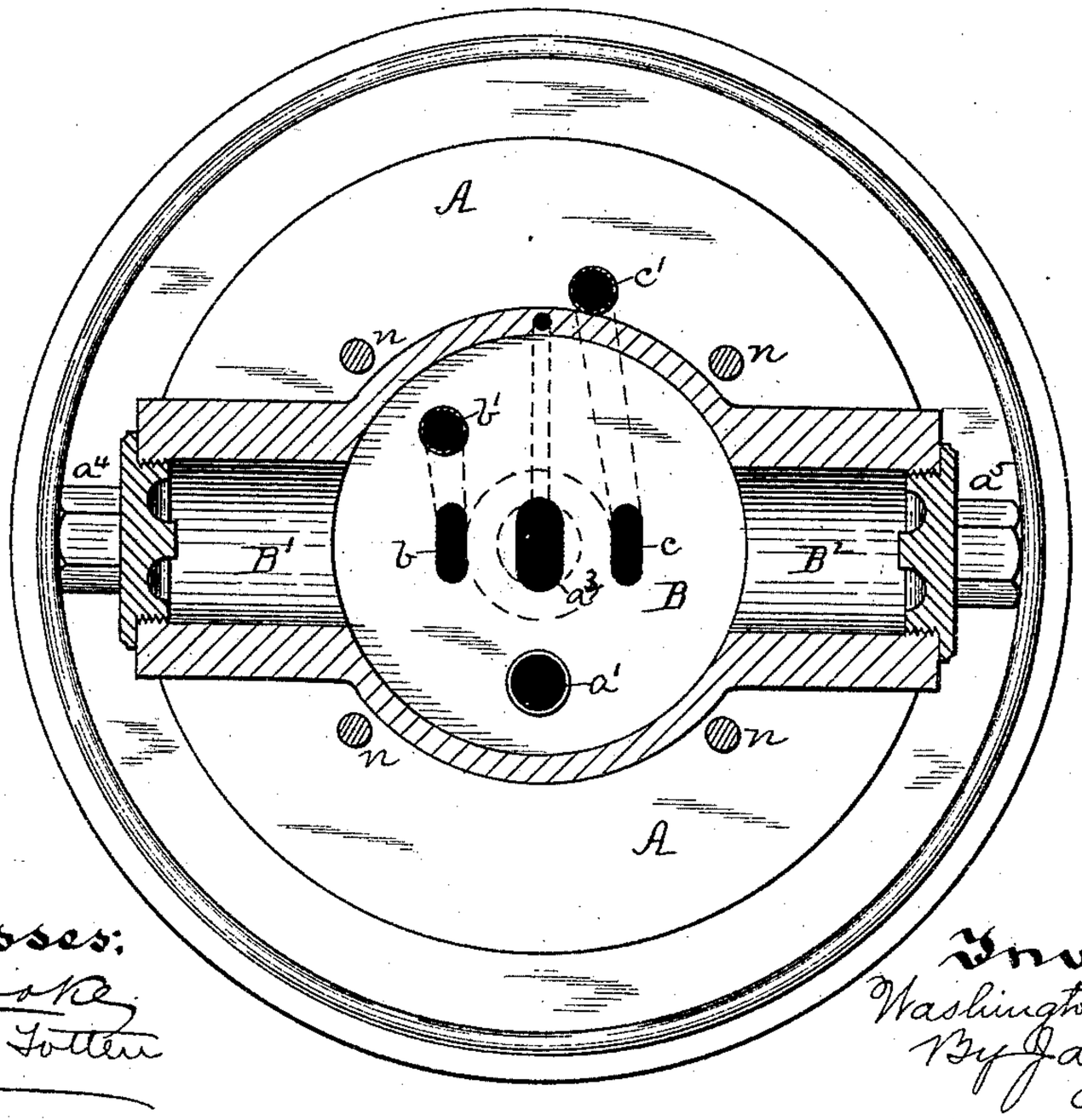



Fig. 2.

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(No Model.)

3 Sheets—Sheet 3.

# W. G. STITT.

## PUMP.

No. 426,476. Patented Apr. 29, 1890.

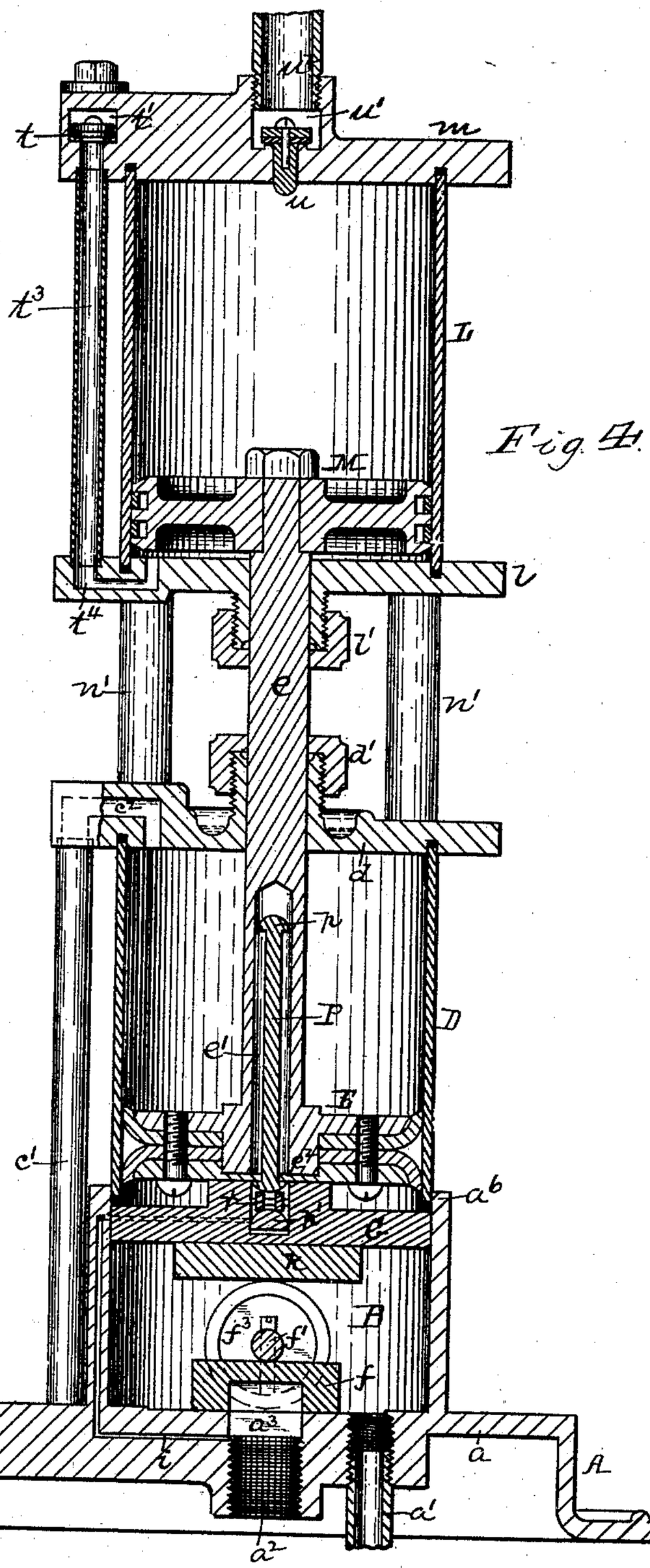


Fig. 4.

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# UNITED STATES PATENT OFFICE.

WASHINGTON G. STITT, OF ALLEGHENY, PENNSYLVANIA.

## PUMP.

SPECIFICATION forming part of Letters Patent No. 426,476, dated April 29, 1890.

Application filed August 3, 1889. Serial No. 319,629. (No model.)

*To all whom it may concern:*

Be it known that I, WASHINGTON G. STITT, a resident of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Pumps; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to hydraulic pumps for compressing air, ammonia, or other gases for refrigerating purposes, or for compressing other fluids, its special object being to provide a simple and compact direct-acting pump which can be operated by the water at the ordinary city pressure, and which, through its construction, insures a direct action of the pump in sustaining the necessary pressure, even where the air or other fluid compressed is utilized only at intervals.

The special improvements covered by my invention aim at the operation of the valve by such direct action of the reciprocating piston and of the reversing-valve by the water-pressure as controlled by said valve operated by the piston, and to other improvements, all of which will be particularly hereinafter described and claimed.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a longitudinal central section of the pump embodying my invention. Fig. 2 is a cross-section on the line 2 2, Fig. 1, the valve being removed. Fig. 3 is a cross-section on the line 3 3, Fig. 1; and Fig. 4 is a longitudinal section on the line 4 4, Fig. 3.

Like letters of reference indicate like parts in each figure.

The pump has the base A, provided with the bottom plate $a$, into which the supply-pipe enters at $a'$, the discharge-pipe $a^2$ connecting with said plate through the port $a^3$. Said plate has also ports $b$ $c$, forming communication with the chamber B, the port $b$ leading through the pipe $b''$ to the base of the hydraulic cylinder D, and the port $c$ leading through the pipe $c'$ and through the passage $c^2$ in the top head $d$ of the hydraulic cylinder D to said hydraulic cylinder above the piston E therein. Within the chamber B is the reversing-valve $f$, which controls the communication between the several ports $b$, $c$, and $a^3$, this valve being secured to the valve-rod $f'$, which carries at the ends thereof the pistons $f^2$ $f^3$, respectively, these pistons sliding within the cylindrical chambers B′ B², leading out of the chamber B. The stroke of the pistons is limited by the heads $a^4$ $a^5$ at the ends of the chambers B′ B², the stroke of the valve $f$ being thus controlled, and the valve as it reciprocates within the chamber B opening communication from the water under pressure within said chamber to the port $b$, and thence to the space below the piston E in the cylinder D or to the port $c$, and thence to the space above said piston, the movement of the valve also opening communication between said ports $c$ or $b$, respectively, and the discharge-port $a^3$. The end of the chamber B′ communicates with the chamber B through the port $g$ and passage $g'$, leading therefrom to the end of the cylindrical chamber B′, and the end of the cylindrical chamber B² communicates with the supply-chamber B through the port $h$ and passage $h'$, leading therefrom. These ports $g$ $h$ are formed in the plate or disk G, the parts of which are clearly shown in Fig. 3, said disk forming the base of the hydraulic cylinder D, as shown in Figs. 1 and 4.

The ports $g$ $h$ before referred to are controlled by a reciprocating slide-valve $k$, having recesses $k'$ $k^2$ therein, which open communication with exhaust-ports $i'$ and $i^2$, these ports leading, as shown in Fig. 3, to a down-take passage $i$, which opens into the discharge port or passage $a^3$. The valve $k$ alternately uncovers the ports $g$ and $h$, respectively, so as to permit the water under pressure to pass to the end of the cylindrical chamber communicating therewith, and cuts off such communication from the supply-chamber B, and opens communication from the port $g$, through the recess $k'$, to the discharge-port $i'$, and from the port $h$ to the recess $k^2$ to the discharge-port $i^2$, so providing for the operation of the reciprocating valve $f$ according as pressure is admitted to either chamber B′ or B², above referred to.

The cylinder D is preferably made from tubing, brass tubing being suitable for the purpose, and it rests within the flange $a^6$ of the base A and upon the disk G, before referred to, its top cylinder-head $d$ being con-

fined in place by the binding together of the entire pump, as hereinafter referred to. Above the cylinder-head D is the lower cylinder-head *l* of the air-cylinder L, said cylinder having the top cylinder-head *m*, and the bolts *n*, connecting the several parts of the pump together, extending from the base A upwardly through the top cylinder-head *d* of the hydraulic cylinder D and through the cylinder-heads *l m* of the air-cylinder L, sleeves *n'* fitting between the cylinder-heads *d* and *l*, and suitable nuts screwing onto said bolts above the top cylinder-head *m*, and so confining all the parts together. Working in the hydraulic cylinder D is the piston E, which is secured to the piston-rod *e*, said piston-rod extending through the stuffing-boxes *d' l'* and having secured at the upper end thereof the compressing-piston M. The lower end of the piston-rod *e* is formed tubular or hollow, as at *e'*, and has at the base of said hollow portion the inwardly-projecting lip $e^2$, and working in said tubular portion *e'* is the bar P, having a head *p* at the upper end thereof and carrying a yoke *p'* at the lower end. Pivoted in the disk G is the crank-lever *r*, one end of which passes through the yoke *p'* at the base of the bar P, while the other extends into a seat of the valve *k*. By such construction, when the piston E approaches the upper end of its stroke, the lip $e^2$ strikes the head *p* of the bar P, and by raising the same causes the crank-lever *r* to operate the valve *k*, so closing communication from the supply-chamber B to the cylindrical chamber B' and opening communication from said supply-chamber to the cylindrical chamber $B^2$, and at the same time opening communication between the port *g* and the exhaust-passage *i*, and so causing the reverse movement of the valve *f*, so as to open communication from the supply-chamber B, through the port *c*, to the upper end of the cylinder D, and from the port *b*, communicating with the lower end of the cylinder D, to the exhaust-passage $a^3$. This causes the reverse movement or stroke of the piston E, and the piston descends within its cylinder until the lip $e^2$ comes against the yoke *p'*, thus, through the crank-lever *r*, throwing the valve *k* to its opposite position, which opens communication from the supply-chamber B to the cylindrical chamber B' and from the cylindrical chamber $B^2$ to the exhaust-passage $i^2$, so reversing the valve *f* and causing the reversal of the stroke of the piston E.

The air-compressing cylinder has its valves arranged in the upper cylinder-head *m*, this being preferred for the reason that it gives opportunity for examination and repair of the valves without taking the pump apart.

The inlet-pipe for the upper end of the cylinder is arranged as shown in Fig. 1, the upwardly-opening valve *s* being seated in a valve-chamber *s'*, closed by a screw-plug $s^2$ and having the passage $s^3$, leading from the upper part of said chamber through the upper cylinder-head into the upper part of the cylinder, the lower end of the valve-chamber *s'* being open, so as to permit the passage of air into the same when the pump is pumping air. The supply-valve communicating with the lower end of the cylinder L is placed on the upper cylinder-head and is upwardly opening, as shown at *t*, said valve *t* being located in a valve-chamber *t'*, opening at its base to the atmosphere and communicating through a passage in said cylinder-head with the pipe $t^3$, leading to the passage $t^4$ in the lower cylinder-head *l*, opening through said head into the lower end of the cylinder L.

Where the pump is employed for pumping ammonia-gas or other fluid supplied to the pump, the supply-pipe can communicate with one or the other valve-chambers *s'* or *t'* and a passage be formed through the upper cylinder-head *m* to the other valve-chamber, such passage being shown at $s^4$, and the lower end of the valve-chamber being closed by suitable plug.

The discharge-passages from the compressing-cylinder L are preferably arranged in the following way: Opening directly through the top cylinder-head *m* is the valve-chamber *u'*, controlled by the upwardly-opening valve *u*, this valve-chamber communicating directly with the discharge-pipe $u^2$ and the valve being seated by the pressure within the discharge-pipe and the chamber *u'*. The discharge-passage from the lower part of the cylinder is formed in the lower cylinder-head *l* at $v^2$, said passage communicating with the pipe $v^3$, which communicates in turn with the valve-chamber *v'* in the top cylinder-head *m*, in which is located the upwardly-opening valve *v* and the passage $v^4$, leading from chamber *v'* to the chamber *u'* above the valve *u*.

The several valve-chambers above referred to are closed by screw-plugs, as shown, so providing access to all the supply and discharge valves without the necessity of the pump being taken apart, while the valves are all in position easy of access to the attendant.

In the operation of the pump as above described the water under pressure is admitted through the supply-opening *a'*, the pump being operated by the pressure of the street-mains, and this pressure being generally about eighty pounds to the square inch. During the upward stroke of the piston E the valves are located as shown in Fig. 1, the water under pressure passing through the port *g* and passage *g'* to the end of the cylindrical chamber B' and forcing the valve *f* to the position shown in Fig. 1. The water then passes through the port *b* and pipe *b'* into the lower end of the cylinder D and forces the piston E upward, this continuing until the lip $e^2$ engages the head *b* of the bar P, and during this upward stroke the air being drawn into the compressing-cylinder L through the supply-valve *t* and forced from said compressing-

cylinder through the valve $u$ to the discharge-pipe. As soon as the lip $e^2$ engages the head $p$ from the bar P it raises said bar P, and through it causes the movement of the crank-lever $r$ and the movement of the slide-valve $k$, so cutting off communication from the supply-chamber B to the port $g$ and chamber B′, and opening communication from said port to the exhaust-passage $i'$ and opening the port $h$ and permitting the flow of the water under pressure through said port to the cylinder-chamber $B^2$. By pressure on the piston $f^3$ the valve $f$ is then forced over, opening communication from the chamber B to the port $c$ and cutting off the port $b$ from said chamber and opening communication from said port to the discharge-port $a^3$. This causes the reverse stroke of the piston E, the water passing through the port $c$ and pipe $c'$ and passage $c^2$ to the upper end of the hydraulic cylinder D, and the water passing in from the lower end of said cylinder, through the pipe $b'$ and port $b$, to the discharge-port $a^3$. The piston E then descends in the cylinder D, the air entering the compressing-cylinder L above the compressing-piston M through the valve $s$, and said piston M forcing the air through the passage $v^2$ and pipe $v^3$, through the valve-chamber $v'$, and thence to the discharge-pipe $u^2$. When the lip $e^2$ on the piston E strikes the yoke $p'$ of the bar P through the crank-lever $r$, it forces the valve $k$ to the position originally occupied by it, so cutting off the port $h$ from the supply-chamber B and opening communication from that port to the exhaust-passage $i^2$, and at the same time uncovering the port $g$, so that the water under pressure will pass from the supply-chamber B to the cylindrical chamber B′ and force the valve $f$ back to the position shown in Fig. 1, causing the flow of the water under pressure through the port $b$ and pipe $b'$ to the lower end of the hydraulic cylinder and causing the reverse stroke of the cylinder, as above described.

The movements of the different parts of the pump are regular and direct acting, while the parts employed are simple in construction and not liable to get out of order.

Practical operation of the pump has proven it effective for the purposes intended.

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

1. In pumps, the combination of the base A, having the supply-chamber B and cylindrical chambers B′ $B^2$, the passages $g'$ $h'$, extending between the chamber B and outer ends of the cylindrical chambers B′ $B^2$, respectively, the reversing-valve $f$, operated by pistons in said cylindrical chambers, the horizontal sliding valve $k$ in the chamber B, controlling the passages $g'$ $h'$, the pumping-cylinder directly above the chamber B, the piston E, reciprocating therein, lever-connections from said piston to the slide-valve $k$, passages leading to the respective ends of the pumping-cylinder and controlled by the valve $f$, and a compressing-piston operated by the pump-piston, substantially as and for the purposes set forth.

2. In pumps, the combination of the base A, having the supply-chamber B and cylindrical chambers B′ $B^2$, and having passages $g'$ $h'$, extending between the chamber B and outer ends of the chambers B′ $B^2$, respectively, the reversing-valve $f$, operated by pistons in said cylindrical chambers, the slide-valve $k$ in the chamber B, controlling the passages $g'$ $h'$, the pumping-cylinder resting on the base A, the piston E, reciprocating therein, the bar $p$, sliding within the piston, and the lever $r$, pivoted in the lower head of the pumping-cylinder and engaging with the bar $p$, valve $k$, passages leading to the respective ends of the pumping-cylinder and controlled by the valve $f$, and a compressing-piston operated by the pump-piston, substantially as and for the purposes set forth.

In testimony whereof I, the said WASHINGTON G. STITT, have hereunto set my hand.

WASHINGTON G. STITT.

Witnesses:
JAMES I. KAY,
J. N. COOKE.