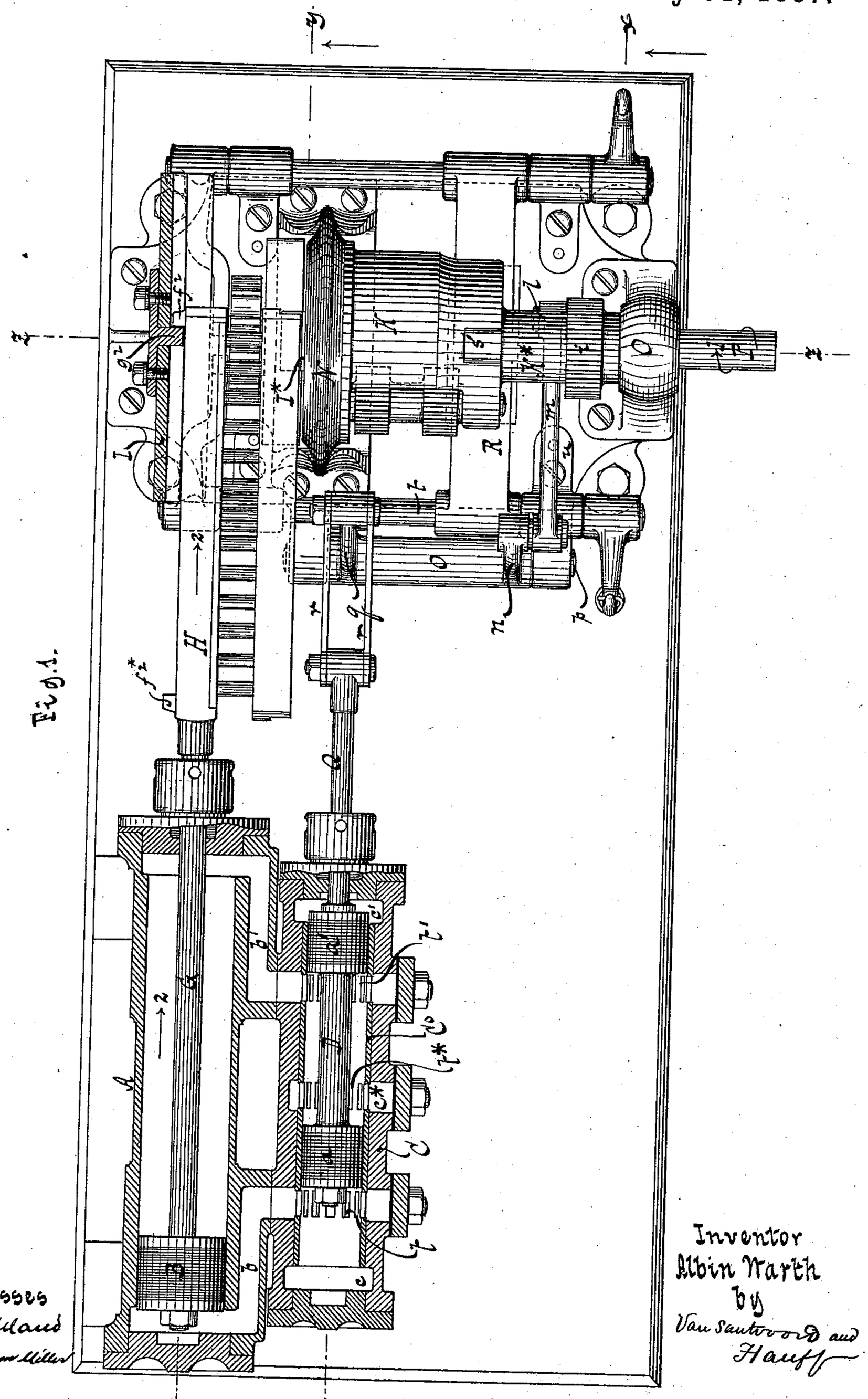
(No Model.)

3 Sheets—Sheet 1.

A. WARTH.

PUMP.

No. 364,068. Patented May 31, 1887.



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his att'ys

(No Model.) 3 Sheets—Sheet 2.

A. WARTH.

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Fig. 2.

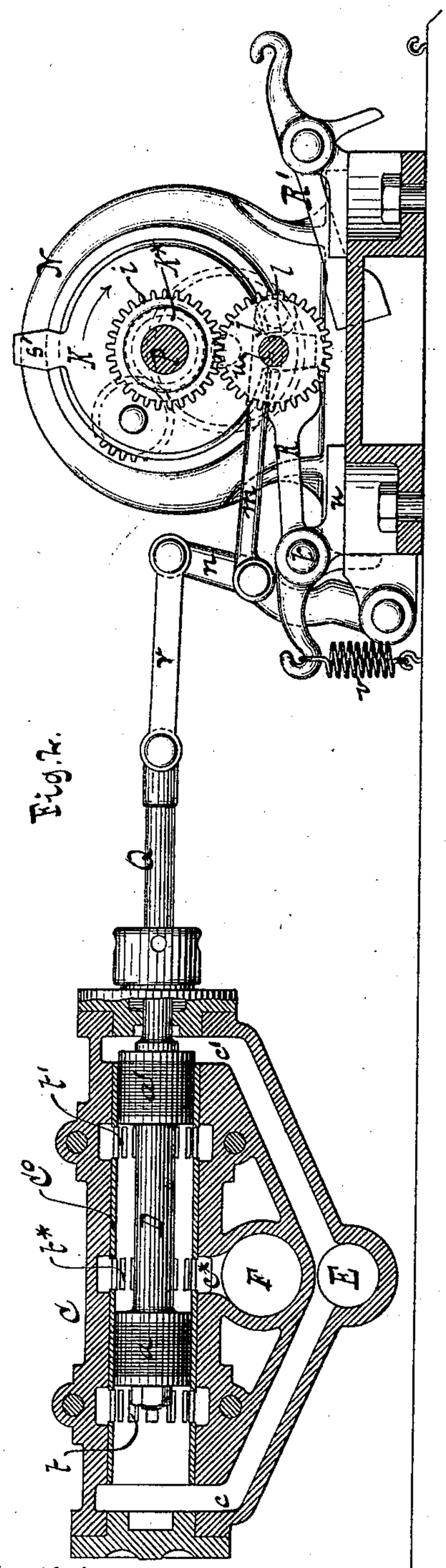
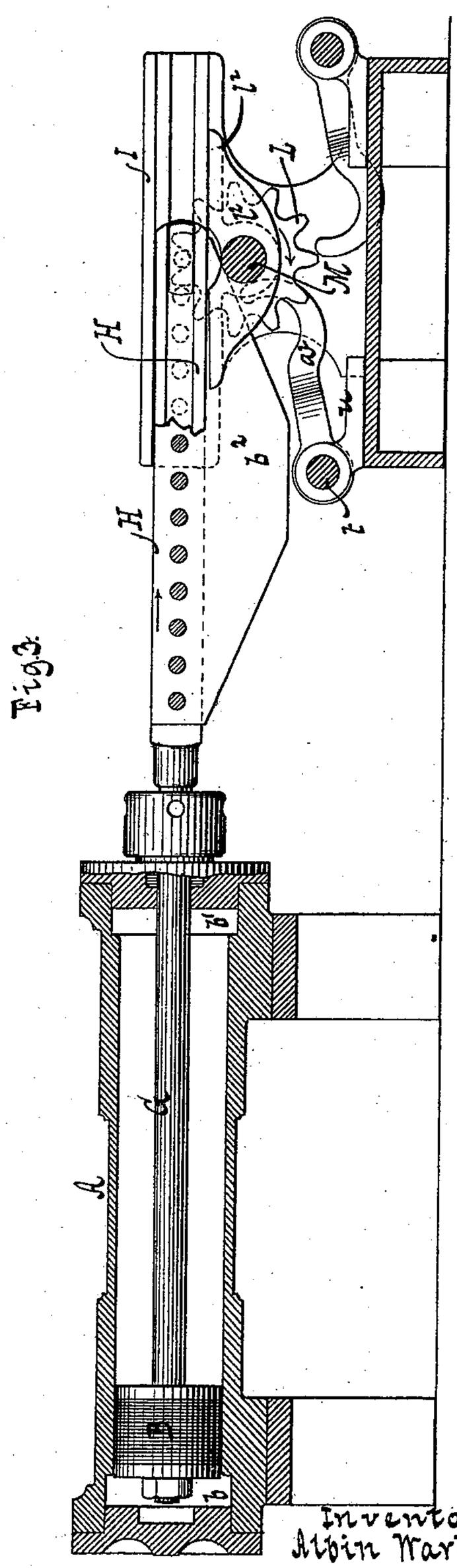


Fig. 3.



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(No Model.)

3 Sheets—Sheet 3.

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Fig. 4.

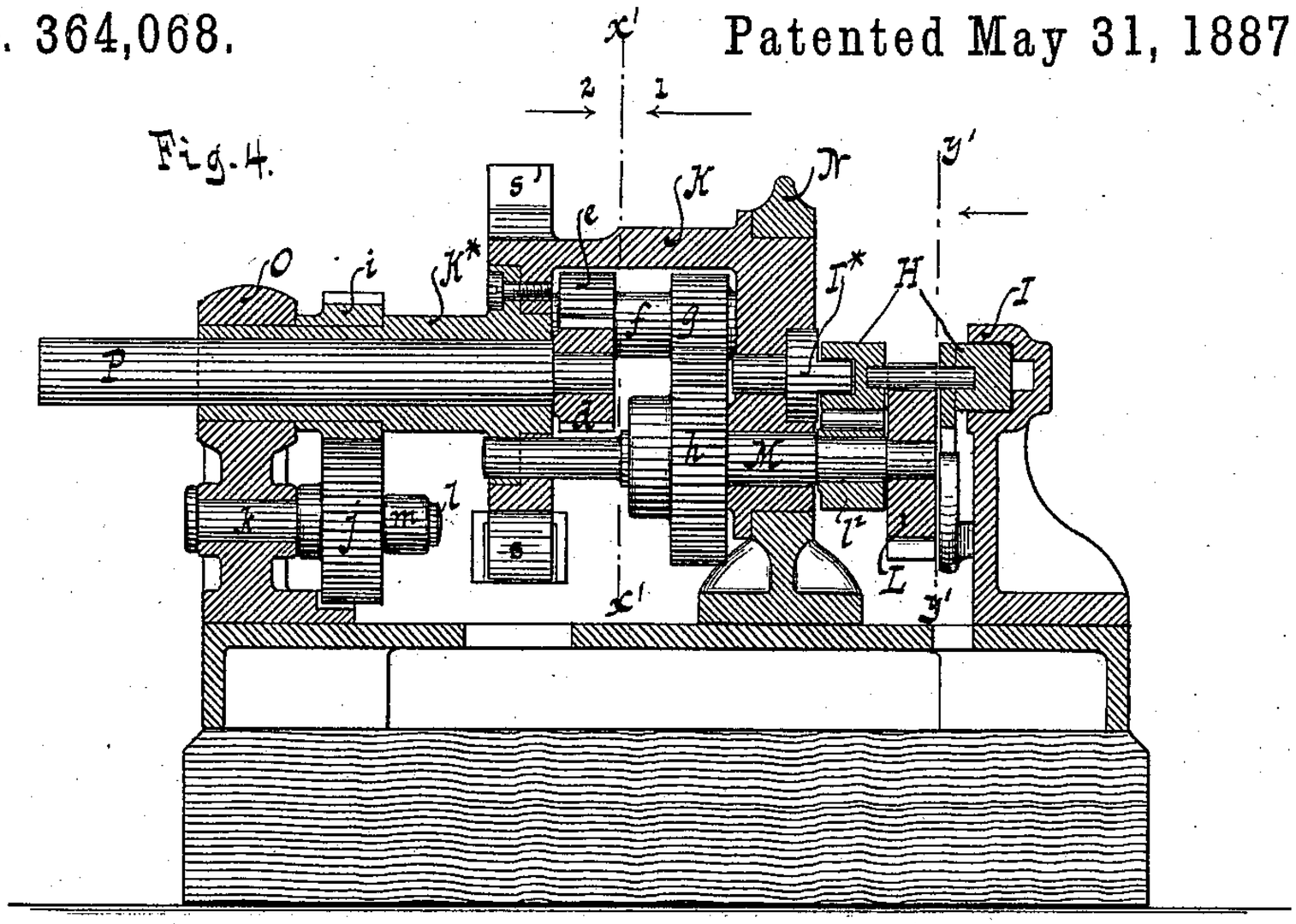


Fig. 5.

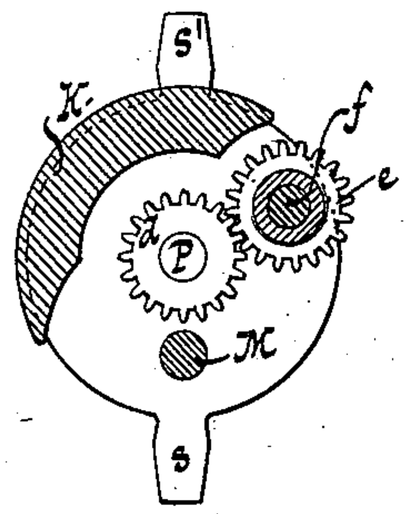


Fig. 6.

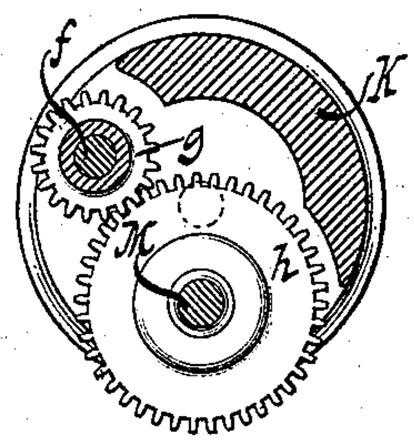
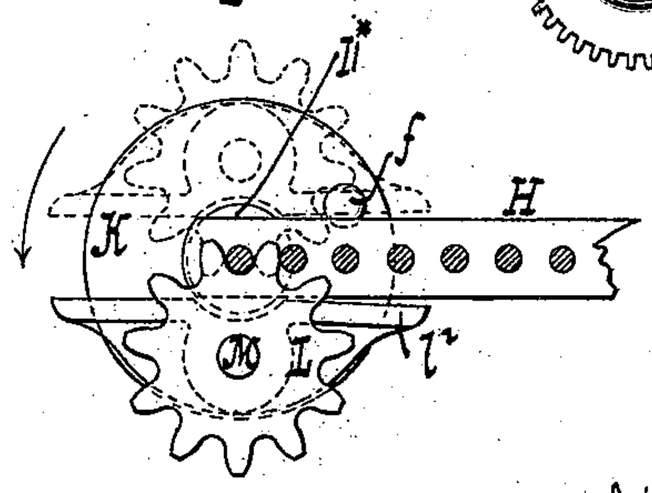


Fig. 7.



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UNITED STATES PATENT OFFICE.

ALBIN WARTH, OF STAPLETON, NEW YORK.

PUMP.

SPECIFICATION forming part of Letters Patent No. 364,068, dated May 31, 1887.

Application filed September 24, 1885. Serial No. 178,070. (No model.)

To all whom it may concern:

Be it known that I, ALBIN WARTH, a citizen of the United States, residing at Stapleton, in the county of Richmond and State of New York, have invented new and useful Improvements in Pumps, of which the following is a specification.

This invention consists in an improvement in pumps, as more fully set forth in the following specification and claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a plan or top view, partly in section. Fig. 2 is a longitudinal section in the plane *x x*, Fig. 1. Fig. 3 is a similar section in the plane *y y*, Fig. 1. Fig. 4 is a transverse section in the plane *z z*, Fig. 1. Fig. 5 is a section in the plane indicated by the line *x' x'*, Fig. 4, looking in the direction of arrow 1 opposite that line. Fig. 6 is a section in the same plane looking in the direction of arrow 2. Fig. 7 is a transverse section in the plane *y' y'*, Fig. 4.

Similar letters indicate corresponding parts.

In the drawings, the letter A designates the pump-cylinder, and B is the plunger fitted into said cylinder. C is the valve-chamber, and D is the valve. As shown in the example in the drawings, the valve-chamber can be made in the form of a cylinder, and the valve composed of two pistons, *a a'*, mounted at a suitable distance apart upon the same stem. Other valves, such as a disk-valve or plug-valve, may be substituted for the double piston-valve. The cylinder A communicates with the valve-chamber C through ports *b b'*, and the valve-chamber is provided with three ports, *c c' c**, the ports *c c'* being in communication with the suction-pipe E, and the port *c** in communication with the delivery or discharge pipe F. The mechanism which imparts motion to the plunger B and to the valve D is of such a nature that the valve is moved while the plunger is stationary and the plunger is moved while the valve is stationary. It will be readily seen that for this purpose a large number of different devices may be used, and I do not wish to confine myself to certain specific mechanism for the purpose above stated; but I prefer to use mechanism such as illustrated in Figs. 1 to 6, inclusive, which enables me to impart to the plunger B a stroke of any desired length, as will be seen from the following description.

The rod G of the plunger B is connected to a carriage or sliding rack-bar, H, which moves in guides I I*. The guide I is formed in a standard secured to the bed-plate of the pump, Figs. 1, 3, and 4. The guide I* is loosely inserted in a rotating head, K, which will be hereinafter referred to. To the rack-bar H an intermittent reciprocating motion is imparted by a cog-wheel, L, mounted on the shaft M. This shaft has its bearings in the head K, which head is fitted into a standard, N, Fig. 4, so that the head can turn in said standard. The head K has secured to it a tube, K*, which has its bearings in the standard O. Through the tube K* extends the driving-shaft P.

On the shaft P is mounted a pinion, *d*, which gears into a pinion, *e*, mounted on a shaft, *f*. The shaft *f* has its bearings in the head K and is geared together with the shaft M by cog-wheels *g h*. The shafts M and *f* are mounted eccentrically in the head K, Figs. 5 and 6, while the driving-shaft P is concentric with said head.

On the tube K* is firmly mounted a cog-wheel, *i*, which gears into a cog-wheel, *j*, mounted loosely on a stud, *k*, and provided with an eccentric wrist-pin, *l*, which connects by a rod, *m*, with a lever, *n*, Figs. 1 and 2. This lever extends from a sleeve, *o*, which connects by a link, *r*, with the valve-rod Q.

On the head K are stops *s s'*, which co-operate with a movable stop, R, extending from a rock-shaft, *t*, which is mounted in lugs *u*, secured to the bed-plate of the pump. A spring, *v*, Fig. 2, has a tendency to throw the stop R into the path of the stops *s s'*, and as long as one of these stops abuts against said stop R the head K is prevented from rotating in the direction of the arrow marked on it in Fig. 2. On the rock-shaft *t* is firmly mounted a tappet-arm, a^2, which is in the path of a cam, b^2, secured to the sliding rack-bar H, Fig. 3.

If the working parts occupy the positions shown in the drawings and the shaft P is turned in the direction of arrow 1, Fig. 1, the sliding rack-bar H and the plunger B move in the direction of arrow 2, and the liquid or fluid in front of the plunger is forced through the

port or channel *b'* into the space between the two pistons *a a'* and into the discharge-pipe F, Fig. 2. At the same time liquid passes from the suction-pipe through channels or ports *c b*, Figs. 1 and 2, into the pump-cylinder behind the plunger. When the sliding rack-bar has reached the outer end of its stroke it is arrested by the nose f^{2}* striking against the stop g^{2}, Fig. 1. A corresponding nose, f^{2}, arrests the motion of the rack-bar in the opposite direction.

During the movement of the rack-bar in the direction of arrow 2 the cam b^{2}, Fig. 3, which is attached to the rack-bar, and which is roof-shaped and provided with a flat apex, acts on the lever a^{2}, and when the flat apex of said cam arrives over the tip of the lever the rock-shaft *t* has been turned far enough to throw the stop R down clear of the stop *s*, which up to that time has rested against the end of said stop R, thereby preventing the head K from turning. As soon as the stop R has been depressed, as above stated, the head K turns very little—that is to say, as far as the dead motion between the teeth of the cog-wheel L and the rack-bar H will permit—and the stop *s* is brought to overlap the front end of the stop R far enough to prevent said lever from rising until the rack-bar reaches the position shown in Fig. 7. At this point the rack-bar remains stationary, but the cog-wheel L is in position to turn round the end of the rack-bar from the position shown in full lines to that shown in dotted lines. This movement is effected by a semi-revolution of the head K, which at that point, being free to turn, follows the movement produced by the action of the pinion *d* upon the pinion *e*, which is ineccentric, so that the pinion *d* acts upon it as upon a crank, Figs. 4 and 5. As soon as the head K turns in the direction of the arrow shown thereon in Fig. 2 the stop *s* is moved away from the stop R, and this stop is raised by the spring *v*, so that it catches the opposite stop, *s'*, of the head K and prevents the latter from turning beyond one hundred and eighty degrees. By the semi-revolution of the head K and sleeve K* the valve D is changed through the action of the pinion *i* on the pinion *j*. As soon as the cog-wheel L has passed around the end of the rack-bar the return-stroke of the plunger commences, and is completed in the same manner as the stroke already described.

Instead of arresting the stroke of the head K by the movable stop R and stops *s s'*, I can use a dog, l^{2}, which swings loosely on the shaft M, Figs. 3, 4, and 7, and bears upon the sliding rack-bar H. When this rack-bar has been moved to one end of its stroke, Fig. 7, the cog-wheel L turns round the end of the rack-bar until the dog l^{2} bears upon the opposite surface of the rack-bar, as indicated in dotted lines in Fig. 7. During the time the wheel L passes round the end of the rack-bar H the head K is free to revolve; but as soon as the dog l^{2} is brought to bear upon one of the surfaces of the rack-bar the movement of the head K is stopped. If the driving-shaft P is turned in the direction opposite to arrow 1, Fig. 1, the pipe F becomes the suction-pipe and the pipe E the delivery-pipe. In this case the movable stop R' will be brought into action.

As shown in Figs. 1 and 2, the valve D can be made to work in a lining, C°, which lining is made of metal or other suitable material, and which lining is firmly secured in the valve-cylinder or valve-chamber C. The lining C° is shown as being provided with three sets of openings, *t t' t**. The openings *t* communicate with the channel *b*. The openings *t'* communicate with the channel *b'*. The openings *t** communicate with the port *c**. The lining C° prevents wear of the valve-chamber C, and when said lining C° is worn out or injured it can be removed or replaced by another lining.

The holes *t t' t** are preferably made so small that they prevent any material entering the valve-chamber which would be likely to interfere with the operation of the valve D, and the packing of the valve D, which often may be soft or yielding, is kept from catching or tearing, as the lining C° allows the valve D to move or slide easily, and the holes in the lining C° are so small that the packing of the valve D cannot strike or tear against the edges of the holes *t t' t**.

The valve-chamber C can be connected with the pump-cylinder B by bolts or screws, so that said valve-chamber C can be readily attached to or detached from the apparatus. The holes *t t' t** are shown as of oblong shape; but of course they can be made of any suitable shape—as, for example, circular, square, or any other suitable form. The valve-chamber C should be placed beneath or at the side of the pump-cylinder, so that in case sand or sediment or any heavy impurities are in the pump-cylinder A said sand or sediment or impurities will fall or be driven by the action of the mechanism through the channels *b b'* and out through the discharge-pipe. The action of the mechanism is thus not liable to become checked by impurities becoming fixed in the pump-cylinder, which might occur if the discharge were placed on the top of the pump-cylinder.

If desired, the cog-wheels *i j* and the eccentric wrist-pin *l* can be dispensed with and an eccentric can be properly mounted on the tube or sleeve K*, and by connecting such eccentric with the valve the movements of the eccentric will operate the valve.

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

1. The combination, with the pump-cylinder and the piston fitted therein, of a pump-valve, a driving-shaft, P, head K, loosely connected to said shaft, connection, substantially as herein described, between the head K and the pump-valve, sliding rack-bar H, connected to the pump-piston, a train of gears for transmitting motion from the driving-shaft to the rack-bar, and a movable stop controlled by the motion of the rack-bar and constructed to re-

tain and to release the head K, substantially as set forth.

2. The combination, with the pump-cylinder and the piston fitted therein, of the rack-bar H, connected to the pump-piston, the driving-shaft P, a train of gears for transmitting motion from the driving-shaft to the rack-bar, the pump-valve, the head K, loosely connected to the driving-shaft, and connecting mechanism for transmitting motion from the head K to the pump-valve during the time when the rack-bar remains stationary, substantially as set forth.

3. The combination, with the pump-cylinder and the piston fitted therein, of the rack-bar H, connected to the pump-piston and provided with stops or noses f^2 f^2*, the driving-shaft P, a train of gears for transmitting motion from the driving-shaft to the rack-bar, the pump-valve, the head K, loosely connected to the driving-shaft, and connecting mechanism for transmitting motion from the head K to the pump-valve during the time when the rack-bar remains stationary, substantially as described.

4. The combination, with the pump-cylinder and the piston fitted therein, of the rack-bar H, connected to the pump-piston, the driving-shaft P, a train of gears for transmitting motion from the driving-shaft to the rack-bar, the pump-valve, the head K, loosely connected to the driving-shaft, gear-wheels *i j*, connecting with the head K, an eccentric wrist-pin on one of said gear-wheels, and connection between said wrist-pin and the pump-valve, substantially as set forth.

In testimony whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

ALBIN WARTH. [L. S.]

Witnesses:
D. VAN SANTVOORD,
W. C. HAUFF.