

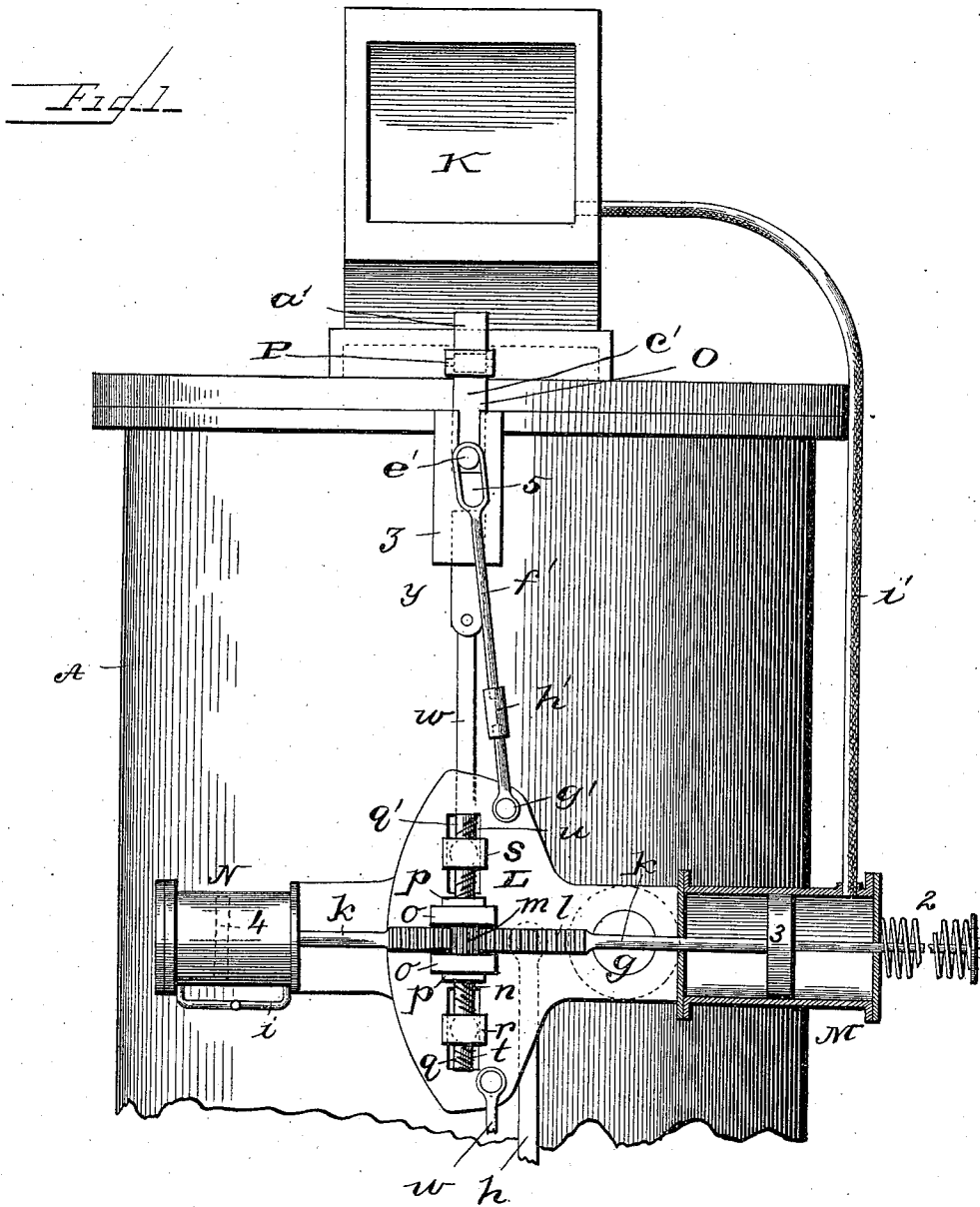
(No Model.)

3 Sheets—Sheet 1.

A. A. WEIMER.
COMPRESSING OR BLOWING ENGINE.

No. 577,568.

Patented Feb. 23, 1897.



Witnesses

G. A. Pauberschmitt.

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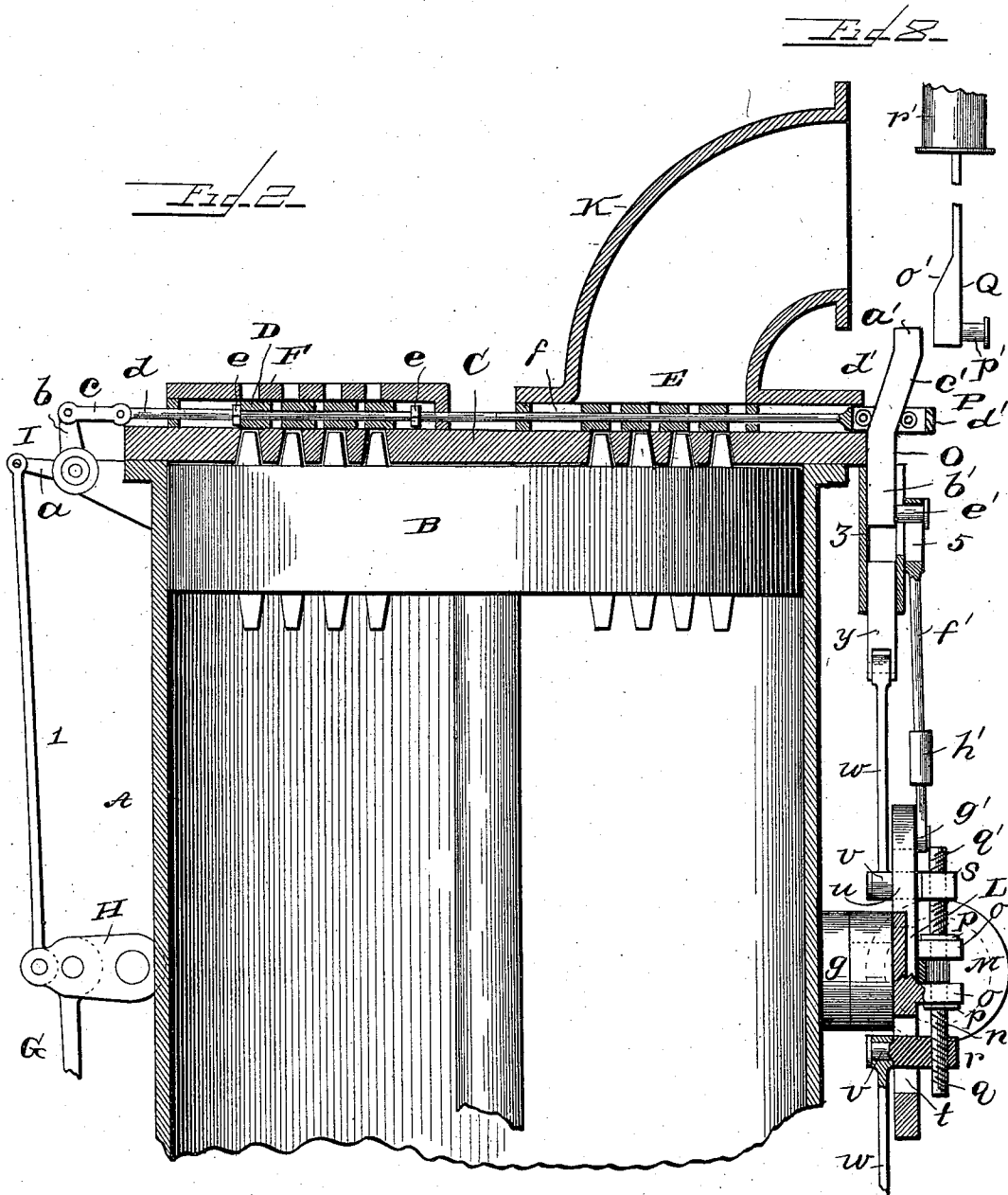
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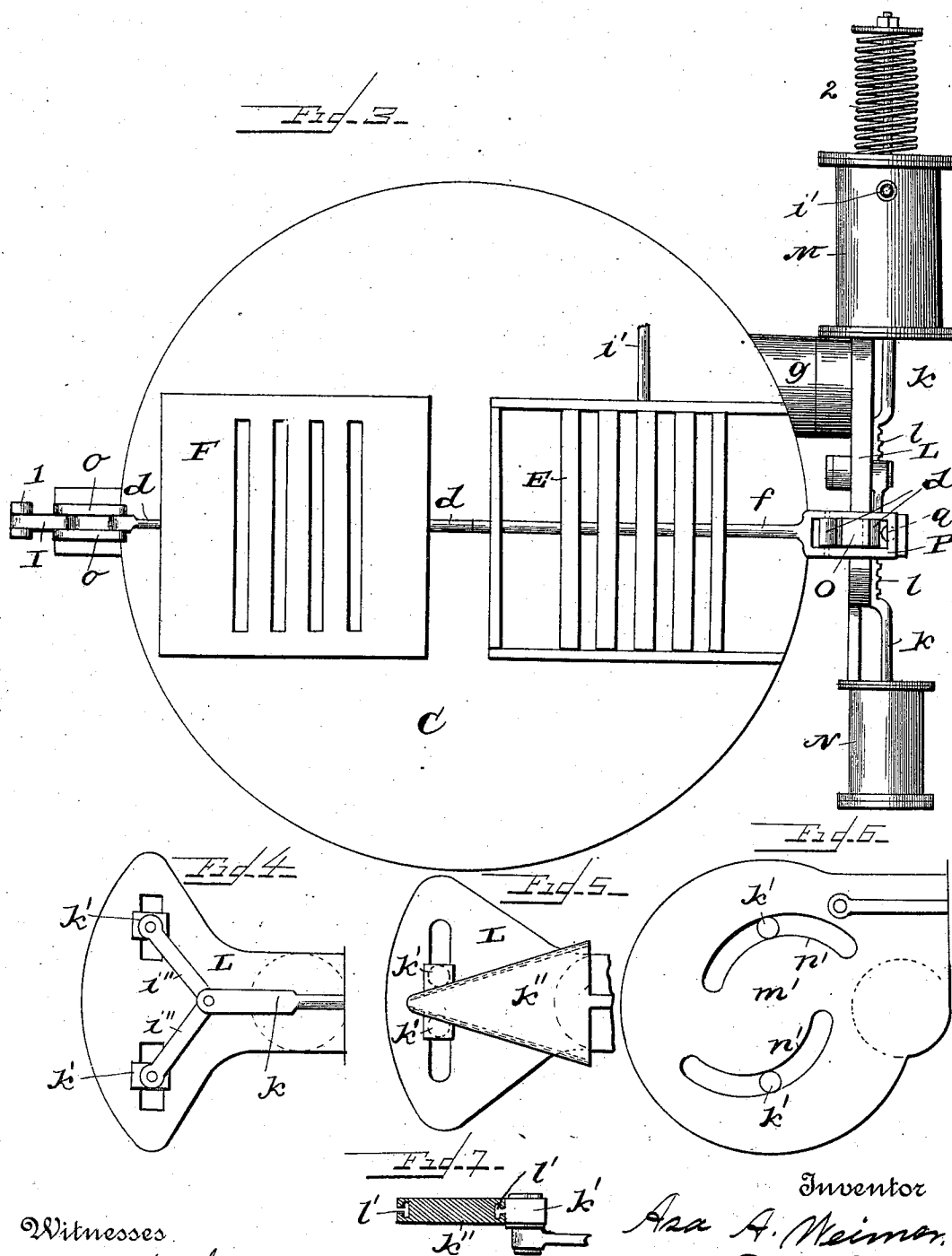
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UNITED STATES PATENT OFFICE.

ASA A. WEIMER, OF LEBANON, PENNSYLVANIA.

COMPRESSING OR BLOWING ENGINE.

SPECIFICATION forming part of Letters Patent No. 577,568, dated February 23, 1897.

Application filed January 7, 1895. Serial No. 534,097. (No model.)

To all whom it may concern:

Be it known that I, ASA A. WEIMER, a citizen of the United States, residing at Lebanon, in the county of Lebanon and State of Pennsylvania, have invented certain new and useful Improvements in Compressing or Blowing Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to compressing or blowing engines, and has for its object certain improvements in the construction of valve-operating mechanism for such engines to secure steady and regular action, avoid undue strain upon the engine, and waste of power by automatically opening the discharge-valve at the point in the stroke of the piston when the pressure in the compressing-cylinder and the discharge conduit or reservoir are equal.

The invention consists in certain novel features of construction for the purpose which will be fully disclosed in the following specification and claims.

In the accompanying drawings, which form part of this specification, Figure 1 represents a side elevation of part of a compressing or blowing engine cylinder with the fluid-pressure cylinder of the valve-operating mechanism in vertical longitudinal section; Fig. 2, a vertical transverse section of the same; Fig. 3, a top plan view; Figs. 4, 5, and 6, plan views of modifications of parts of the structure; Fig. 7, a transverse section of the wedge shown in Fig. 5, and Fig. 8 a modification of the block for operating the discharge-valve.

Reference being had to the drawings and the letters and figures thereon, A indicates the cylinder; B, the piston; C, the head of the cylinder; D, the receiving-valve, and E the discharge-valve.

The piston B is shown at one end of its stroke in the cylinder and both the valves closed, the latter having just closed and the former ready to open as the piston recedes from the head C to take in a charge of atmospheric air. The travel of the receiving-valve D in its chest F is regular and fixed and is operated by a pitman G, connected at one end to the engine which propels the piston B and at its opposite end to a rocker-arm H,

which is connected by a rod I to one arm *a* of a bell-crank lever L, whose other arm *b* is connected by a link *c* to the valve-rod *d*, which opens the valve at one end of the stroke of the piston and closes it at the opposite end of the stroke. On the valve-rod *d* are two collars *e e*, which are set farther apart than the width of the valve, so that the valve shall remain at rest for a short interval when wide open and when closed. The valve-rod moves loosely in the valve, and as it is reciprocated by the bell-crank lever L pushes and draws the valve by means of the collars *e e*, which engage the opposite sides of the valve, and the valve-rod extends through the inner wall of the chest F and engages the inner end of the rod of the discharge-valve E.

As the receiving-valve must open at one end of the stroke of the piston and the discharge-valve close at the same time the same means may be employed for effecting this motion of the two valves, and for this purpose the valve E is provided with a valve-rod *f*, which is fixed thereto and extends across the cylinder-head to a point where it is engaged by the rod *d* of the valve D, which closes the valve E at the same time that the valve D is opened; but to operate the engine economically the valve E must be opened at a point in the stroke of the piston when the pressure in the cylinder A is equal to the pressure in the conduit K or in a receiver into which the compressed air is conducted, and for this purpose I provide a balanced wrist-plate L, which oscillates or vibrates upon a fixed trunnion *g* and is operated by an eccentric or other suitable device attached to the engine and connected to the wrist-plate by a rod *h*, so as to cause the wrist-plate to vibrate regularly. The wrist-plate supports at one end an air-cylinder M and a coiled spring 2, and at the opposite end of the wrist-plate is a cataract-cylinder N, which is provided with the ordinary piston, and pipe *i* connecting the two ends of said cylinder and the ordinary by-pass valve for controlling the passage of the liquid, preferably oil, from one end of said cylinder to the opposite end alternately.

The pistons 3 4 of the two cylinders M and N are attached to a piston-rod *k* common to both pistons, and in the center of the piston-rod is formed a toothed rack *l*, which en-

gages a pinion *m* on the shaft *n*, which is supported in bearings *o o* on each side of the pinion, and is provided with thrust-collars *pp* to secure the pinion in its proper position with relation to the rack *l* on the piston-rod. One end of the shaft *n* is provided with a right-hand screw-thread *q*, and the opposite end with a left-hand screw-thread *q'*, which screw-threads engage corresponding threaded nuts *r* and *s*, one on each side of the pinion *m*. The nuts *r s* slide in slots *t u* in the wrist-plate and are each provided with a pin *v v*, to which the pitman-rods *w w* are attached, and to the opposite ends of said rods *w w* are attached blocks or heads *y*, only one of which is shown, and said block or head works in a guide *z*, so as to reciprocate therein.

Above the head *y* is a block *O*, having ends *a' b'*, provided with parallel sides, but the ends arranged in different vertical planes, and between said ends is an inclined portion *c'*, and the lower end *b'* reciprocates in the upper end of the guide *z*. The block *O* engages with a yoke or frame *P* on the outer end of the valve-rod *f* of the discharge-valve *E*. The yoke is provided with friction-rollers *d' d'*, and the block *O* with a pin *e'*, to which is attached a rod *f'*, having an elongated eye *5*, which engages the pin, and the opposite end of said rod engages a pin *g'* on the wrist-plate *L*, and is provided with an adjusting-nut *h'* to adjust the length of the rod between the pins *e'* and *g'* to time the opening of the discharge-valve. The rod *f'*, with its eye *5*, closes the discharge-valve positively in its downstroke, and draws the block *O* down in its downstroke, should the block not fall by its own gravity, and thus constitutes a safety device.

The air-cylinder *M* is connected to the conduit *K* or the air-receiver, when one is used, by a flexible pipe *i'*.

The operation is as follows: The wrist-plate *L*, being connected to the engine by the rod *h*, is made to oscillate on its trunnion *g*. There being no air or blast pressure in the conduit or blast-pipe *K* the spring *2* on the piston-rod *k* expands and draws the rack *l* outward to the end of its stroke, which causes the shaft *n* to revolve and move the nuts *r s* to the outer ends of the slots *t u*. When the nuts are in this position, the block or head *y* is against the block *O*, and any outward movement of said blocks will open the discharge-valve *E*, but by the time the piston *B* has reached the end of its stroke the motion of the wrist-plate *L* has been reversed and the rod *f'* commences to draw the block *O* inward, which closes the valve by its contact with the rollers *d' d'* in the yoke *P*.

It will be observed that the discharge-valve opens immediately at the beginning of the compression-stroke of the piston. The pins *v v* are at the extreme outer ends of the slots *s t*, and this causes the block *y* to come in contact with the block *O* correspondingly sooner than if they had been at the inner ends of

said slots, and also to move the block *O* higher up; but as the incline *c'* on the block *O* is only of sufficient length to open the discharge-valve *E* to its full extent any further upward movement of the block cannot move the valve. On the return or suction stroke of the piston *B* the block *y* moves away from the block *O*, which allows the valve to remain stationary for a time. As the wrist-plate *L* returns from its position at the time the piston *B* is at the end of its compression-stroke the rod *f'* moves down or inward without disturbing the block *O* until the outer end of the slot *5* comes in contact with the pin *e'*, when the rod *f'* draws the block *O* down and closes the valve *E*, which it does just at the end of the compression-stroke of the piston and as it begins to recede and in the opening of the receiving-valve *D*, which occurs at the same time the inner end of the rod *d* butts against the inner end of the valve-rod *d*, and assists in closing the discharge-valve.

It will be observed that the engine starts or begins work with no pressure in the conduit *K*, and the discharge-valve is opened instantly, allowing the piston *B* to discharge the full contents of the cylinder into the conduit *K*. If this volume of air meets with resistance, it produces pressure which is instantly transmitted to the cylinder *M* by means of the pipe *i*, and this pressure moves the piston *3* inward, compressing the spring *2*, and the rack *l* rotates the pinion *m* on the shaft *n* and draws the nuts *r s* and pins *v v* nearer the center of the wrist-plate, and just as much as these nuts and pins have been brought in toward the center just so much later proportionately will the discharge-valves of the cylinder *A* be opened, and the tension on the spring *2* is so graduated that it will allow the piston *3* to move just far enough to place the nuts *r s*, and pins *v v* in position for opening the discharge-valves at the proper time for the pressure under which the engine is working. For example, if the engine is working under fifteen pounds pressure the pressure behind the piston *3* in the cylinder *M* will move the nuts *r s*, and pins *v v* are at such a point in their travel that they will open the discharge-valves when the piston *B* has reached half-stroke and has compressed the air in front of it to fifteen pounds pressure.

To prevent any sudden movement of the parts, the cataraft-cylinder *N* is provided, and the liquid in the cylinder takes up any jar that may have been produced.

Fig. 4 shows a modification in which links *i' i'* are attached to the piston-rod *k* for operating the pins *k' k'*.

Fig. 5 shows another modification in which a double inclined wedge *k'*, having grooves *l' l'* in its edges, engages the pins *k' k'*.

Fig. 6 shows an oscillating disk *m'*, which is provided with curved slots *n'* and is secured on the face of the wrist-plate.

Fig. 8 shows a modification of the block O, to be used when the discharge-valve is closed entirely by the rod of the receiving-valve. The block Q is provided with only one inclined surface o' to open the discharge-valve and is operated by a rod connected to the pin p' in the same manner as in the use of the block O, but it is returned by means of a pressure-cylinder r' , a spring, or a weight (not shown) after it has opened the valve.

Having thus fully described my invention, what I claim is—

1. In a compressing or blowing engine, a receiving-valve and means for operating the same, in combination with a discharge-valve, an oscillating plate, a fluid-motor supported by said plate, controlling mechanism between said motor and the discharge-valve and operating mechanism between said plate and said discharge-valve.

2. In a compressing or blowing engine, a receiving-valve and means for operating the same, in combination with a discharge-valve, an oscillating plate, a fluid-motor supported by said plate, connections between the said discharge-valve and plate, and means connected with the fluid-motor on the plate to vary the time at which the discharge-valve is operated.

3. In a compressing or blowing engine, a receiving-valve and means for operating the same, in combination with a discharge-valve, a fluid-motor, an oscillating plate supporting said motor, a block having an inclined surface engaging the valve-rod and means connected with the motor for varying the time at which said block is operated.

4. In a compressing or blowing engine, a receiving-valve and means connected with the engine for operating said valve, in combination with a fluid-pressure motor connected to the discharge-conduit, an oscillating wrist-plate, laterally-movable pins on said plate operated by the motor, mechanism between

said pins and the discharge-valve for varying the time at which the discharge-valve is operated and suitable rods connecting the plate to the discharge-valve.

5. In a compressing or blowing engine a receiving-valve and means for operating the same, in combination with a discharge-valve, an oscillating wrist-plate, a fluid-motor cylinder and a liquid-containing or cataract cylinder suitably connected to said motor-cylinder and supported by said plate, means connected with said fluid-motor cylinder for varying the time at which said discharge-valve is opened.

6. In a compressing or blowing cylinder, a receiving-valve and means for operating the same, in combination with a discharge-valve, an oscillating wrist-plate provided with a fixed and a movable pin, a block connected to the movable pin on said plate and a block connected to the fixed pin on the plate.

7. In a compressing or blowing engine, a receiving-valve and means for operating the same, in combination with a discharge-valve, an oscillating wrist-plate, a fluid-motor supported on said plate, a slot in the plate, a pin movable in said slot and connections between the valve and said pin and the motor.

8. In a compressing or blowing engine, a receiving-valve and means for operating the same, in combination with a discharge-valve, an oscillating wrist-plate a fluid-motor supported on said plate, connections between the motor and the discharge-valve for opening the same and a separate connection between the wrist-plate and the discharge-valve for positively closing the valve.

In testimony whereof I affix my signature in presence of two witnesses.

ASA A. WEIMER.

Witnesses:

D. C. REINOHL,
D. WEIMER REINOHL.