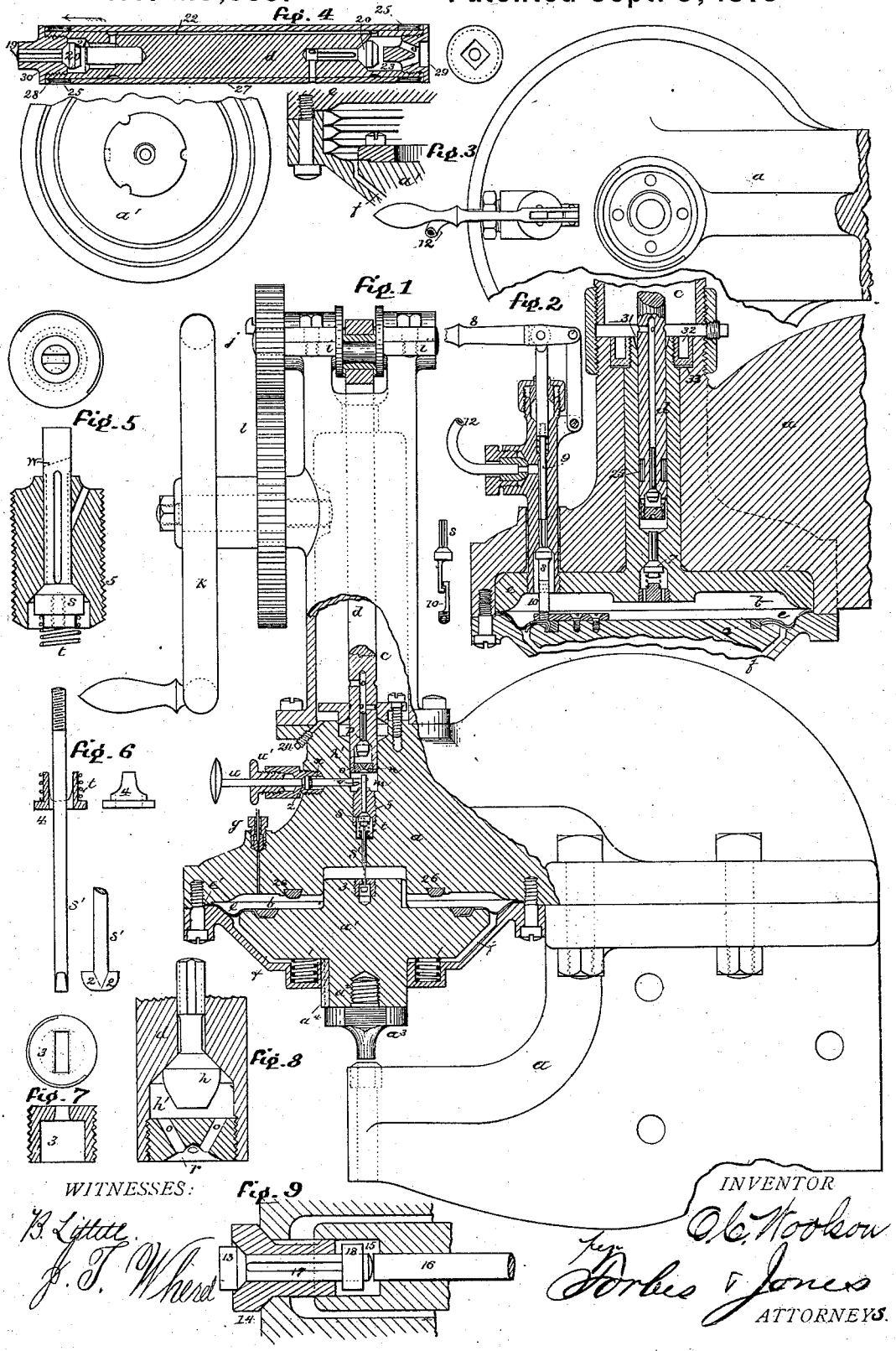
O. C. WOOLSON.

Hydraulic-Power Machine.

No. 219,555. **Patented Sept. 9, 1879**



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IMPROVEMENT IN HYDRAULIC-POWER MACHINES.

Specification forming part of Letters Patent No. **219,555**, dated September 9, 1879; application filed April 10, 1879.

To all whom it may concern:

Be it known that I, OROSCO C. WOOLSON, of the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Hydraulic-Power Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 represents a side elevation, partly in section, of a machine embodying my invention; Figs. 2 and 3, modifications of parts of the same; and Figs. 4, 5, 6, 7, 8, and 9, enlarged and detached views of certain details, hereinafter more particularly referred to.

This invention relates to hydraulic punches, shears, presses, and other classes of hydraulic apparatus in which the liquid acts upon the piston connected with the operative devices.

The invention consists in certain improvements in the construction and arrangement of various parts of such machines, which I will first proceed to describe, and subsequently to point out in the claims what I consider the novel features thereof.

In the drawings, *a* represents the frame-work of the machine; *b*, the chamber, in which the piston a^1 is arranged; and *c*, the liquid-reservoir, which communicates with the piston-chamber through the pumping-plunger *d*.

The piston a^1 is constructed in substantially the form shown, the central boss, a^2, projecting through the casing of the chamber and carrying the fixture a^3, designed for the special use desired. The boss a^2 is also provided with a feather, a^4, to prevent the piston from rotating.

The novel feature connected with the piston a^1 consists in permitting it to move within the chamber without frictional contact therewith, the connection with the casing consisting of a flexible diaphragm, *e*, preferably secured to the casing between the separable portions at *e'*, and to the head of the piston, as shown.

The diaphragm covers the annular space *f* between the casing and piston-head, and effectually seals the bottom of the liquid-chamber *b*. The outer edge of this diaphragm, when held and compressed in the joint formed by the respective parts of the chamber, will also serve as a fixed packing therefor, and the necessity of other expedients in this particular is avoided. The diaphragm may be composed of any suitable material for this purpose, (brass or steel being preferred,) of such shape and construction to conform to any contour of the casing or piston, and secured in any suitable manner. One or more leaves or layers in contact may also be employed, extending fully or partly across the intervening space, as shown in the modification, Fig. 2; or the diaphragm may be constructed in the form of a series of corrugations, substantially as shown in Fig. 3, and yet fulfill the purpose intended.

In machines necessitating an extended movement of the piston this diaphragm may be composed of a substance of the requisite flexibility to permit of the desired movement without injury.

The pumping apparatus for forcing the liquid within the chamber *b* to depress the piston a^1 is contained within the frame-work *a* and the casing of the reservoir *c*, and consists of a reciprocating plunger, *d*, operated by an eccentric, *i*, on the driving-shaft *j*, this shaft receiving its rotary motion from a hand-wheel, *k*, through the intermediate gearing *l*, or from other suitable sources.

The plunger *d* is constructed with a chamber, *h'*, at its lower end, which communicates with the reservoir *c* and an intermediate chamber, *m*, respectively, through the induction-ports *n n* and eduction-ports *o o*.

A check-valve, *p*, is arranged within the chamber *h'*, which closes the passage from the induction-ports, when the plunger *d* acts to force the liquid toward the piston a^1, and is unseated by its own gravity in the return movement of the plunger *d*, and opens the communication with the reservoir *c*.

A removable head, *r*, is fitted to the end of the plunger *d*, through which the eduction-ports *o o* are arranged, as shown in the enlarged sectional view, Fig. 8. These eduction-ports are directed at an angle with the valve-chamber *h'*, in order that the force of the returning liquid from the chamber *b* in discharging will pass at the sides of the valve *p* and avoid seating the same, the passage being required open at this time. Between the chamber *m* and the piston-chamber *b* a check and relief valve, *s*, is placed, to check the return

of the liquid to the chamber *m* when the plunger ascends, and to subsequently act as a relief or discharge valve when the chamber *f* is exhausted. This valve *s* is retained in its seat by a spring, *t*, the tension of which being sufficient to overcome its gravity, the valve being opened by the force of the liquid in the descending movement of the plunger *d* to permit the passage of the liquid to the piston-chamber *b*. When acting as a relief and discharge valve in the return flow of the liquid from the chamber *b*, it may be opened by means of a hand-spindle, *u*, as shown in Fig. 1, or by the downward movement of the plunger *d* acting in contact with the spindle of the valve, the travel of the plunger being extended the proper distance beyond the point necessary to complete its prime function.

The hand-spindle *u* projects from the side of the frame-work, passes through the same, and engages with a slot in the spindle of the valve, the inner end of the spindle having a beveled face, *v*, that acts upon the bottom of the slot *w* and forces the valve open in its inward movement, an outward movement of the spindle permitting the valve to seat itself.

The spindle passes through a chamber, *x*, in the frame-work *a*, and is provided with a double-faced valve, *z*, that limits its movement, and renders the joint close at the extreme positions. A stuffing-box and gland, *w'*, may also be added, if necessary.

The valve *s* may also be opened by the depending rod *s'*, (shown in the enlarged view, Fig. 6,) this rod being rigidly attached to the valve by a screw-thread or otherwise, and its opposite end caused to connect with the piston *a'* at such a point in its stroke that will open the valve sufficiently before the full stroke is reached.

The rod *s'* is provided at its lower end with opposite lateral projections 2 2, that may be passed through an elongated slot in the threaded bushing 3 in the piston-head, and when such projections are turned in a transverse position to the slot the engagement with the piston is effected.

A thimble or sleeve, 4, is placed within the chamber to keep one end of the coiled spring *t* clear of the rod and passage, its opposite end being maintained by a central boss upon the valve *s*. These parts are rendered accessible by removing the threaded bushing 5.

In the modification, Fig. 2, the relief and discharge valve *s* is arranged independently of the inlet-valve 7 and passages, and may be operated by the hand-lever 8 and connecting-rod 9, or by the stud-hook 10, connected to the piston and engaging a corresponding notch in the depending stem of the valve, the latter operation being substantially the same as already referred to in connection with the depending rod *s'*, Fig. 1. When this independently-arranged relief and discharge valve is employed the inlet-valve 7 merely performs the function of a check-valve. In this arrangement the communication with the reservoir *c* is effected by means of the pipe 12.

Fig. 9 shows a desirable construction of the relief or discharge valve when the machine is designed to exert great power.

Two valves, 13 14, of different sizes, are employed, the smaller valve, 13, operating to govern a passage through the larger valve, 14, to a closed chamber, 15, behind the same.

The rod 16, corresponding to the rod 9, Fig. 2, is pressed upon the stem 17 of the smaller valve, 13, and opens the same to the extent permitted by the fixed collar 18, when the liquid rushes into the chamber 15 and communicates the pressure to the back of the larger valve, 14, which assists the opening of the same in the continued movement of the rod 16.

Fig. 4 illustrates a plunger with an arrangement of its valves and passages that will permit the operation of the machine in a reversed position, and may be advantageously applied to portable machines to be used in various situations, the inlet-passage being shown at 19. The movement of the plunger, as indicated by the arrow, causes the liquid to raise the valves 20 20 and permit the same to enter the chamber 21, and through the longitudinal passage 22 to the chamber 23 at its opposite end. The return movement of the plunger closes the valves at the respective ends, and the confined liquid within the plunger and piston-chamber is compressed by the displacement of the plunger itself.

g, Fig. 1, represents a fixture or coupling communicating with the chamber *b*, for the attachment of a pressure-indicator, the notation upon the dial indicating a computation of the total power exerted upon the article treated, deduced from the pressure per square inch of area upon the piston-head, and the total pressure transmitted to the reduced area upon which the punch or other operative device acts. The movement of the piston being frictionless, all the power is utilized upon the work. Its own weight practically balances the tension of the reactionary springs 11, upon which it rests, and by which its return movement is effected.

The liquid is injected or drawn from the reservoir *c* through an aperture at its base, which may be closed by a screw-plug, 24, as shown in Fig. 1.

Suitable packing may be employed in connection with the plunger *d* and elastic cushions, as at 26, Fig. 1, and may be applied to prevent direct contact of the moving parts and consequent jar.

In the modification, Fig. 4, I have shown the plunger incased for the greater part of its length with a metallic sleeve, 27, and packing-rings 25 25, placed at its opposite ends, a groove, 28, being made in such rings to receive the projecting flanges of the adjustable followers 29 30, whereby the packing-rings may be expanded.

The plunger-barrel is slightly beveled at its top (shown at 31, Fig. 2) to facilitate the en-

trance of the plunger-packing and gradually compress the same. In this modification the plunger-barrel is secured in place by the nut 32, which covers the joint with the frame-work, and is seated upon an interposed packing, 33.

The piston *a'* may be depressed directly by the action of an accumulator connecting with the chamber *b*, and its return movement effected by a hydraulic attachment or other suitable means, independent of the reactionary springs, as shown, in utilizing such feature of my invention.

Having thus fully described my invention, what I claim and desire to secure by Letters Patent, is—

1. In hydraulic-power machines, substantially as described, a reciprocating piston suspended within the chamber in which it moves by a flexible diaphragm, substantially as set forth.

2. The diaphragm *e*, constructed of one or additional leaves or layers, covering the intervening space between the casing of the chamber *b* and the piston *a*, and secured thereto in any suitable manner, said additional leaves or layers extending fully or partly across said space, substantially as shown.

3. The combination of the piston *a'*, relief or discharge valve *s*, and intermediate connecting-rod *s'*, substantially as and for the purpose specified.

4. The combination of the piston *a'* and the reactionary springs 1 1, substantially as set forth.

5. The combination of the relief-valve *s*, having the slotted stem *w*, and the hand-lever *u*, provided with the beveled face *v* and double-faced valve *z*, substantially as described.

6. The plunger *d*, constructed with the chamber *h'* and angular ports *o o*, in combination with the check-valve *p*, substantially as and for the purpose specified.

7. The plunger *d*, constructed with the chambers 21 23 and intermediate passage 22, and provided with the check-valve 20, whereby the machine may be operated in a reversed position, as described.

8. The discharge-valve 14, in combination with the valve 13 and chamber 15, whereby the pressure against which such discharge-valve may act in opening is communicated to the chamber 15 and compensated, substantially as described.

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