(No Model.) 3 Sheets—Sheet 1.

F. L. CLARK.

PUMP.

No. 574,664. Patented Jan. 5, 1897.

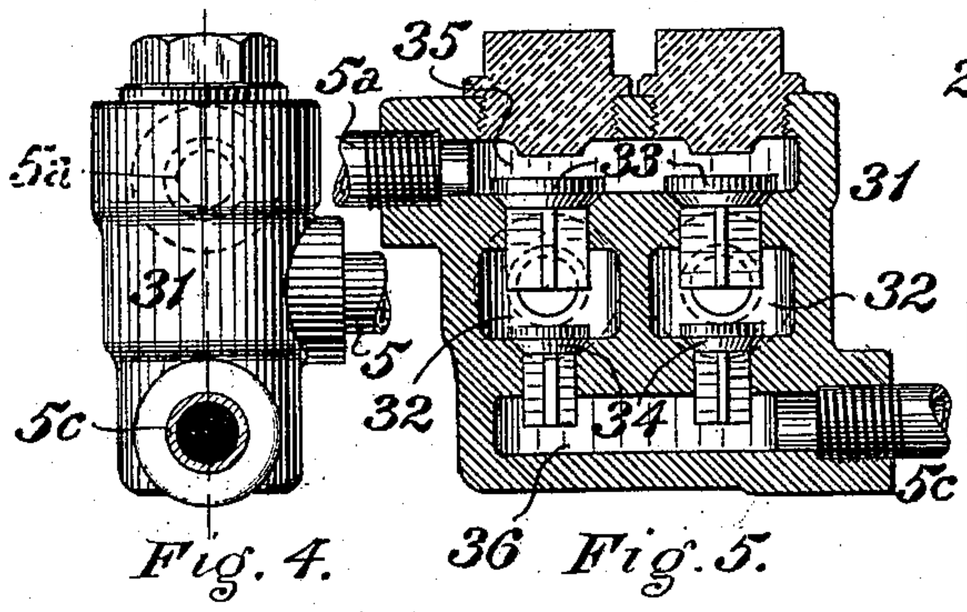

Fig. 4. Fig. 5.

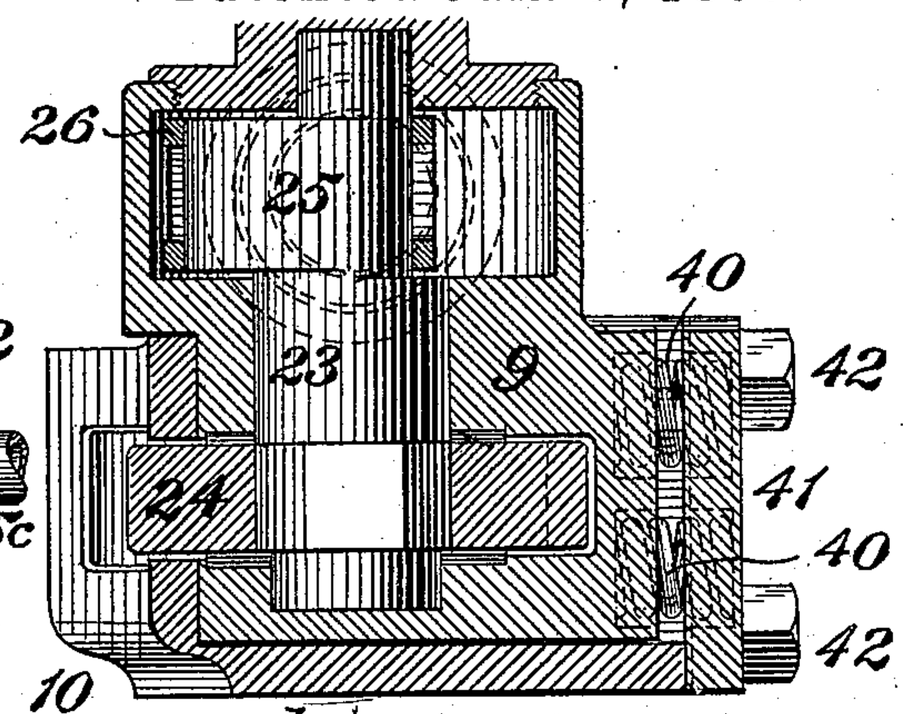

Fig. 3.

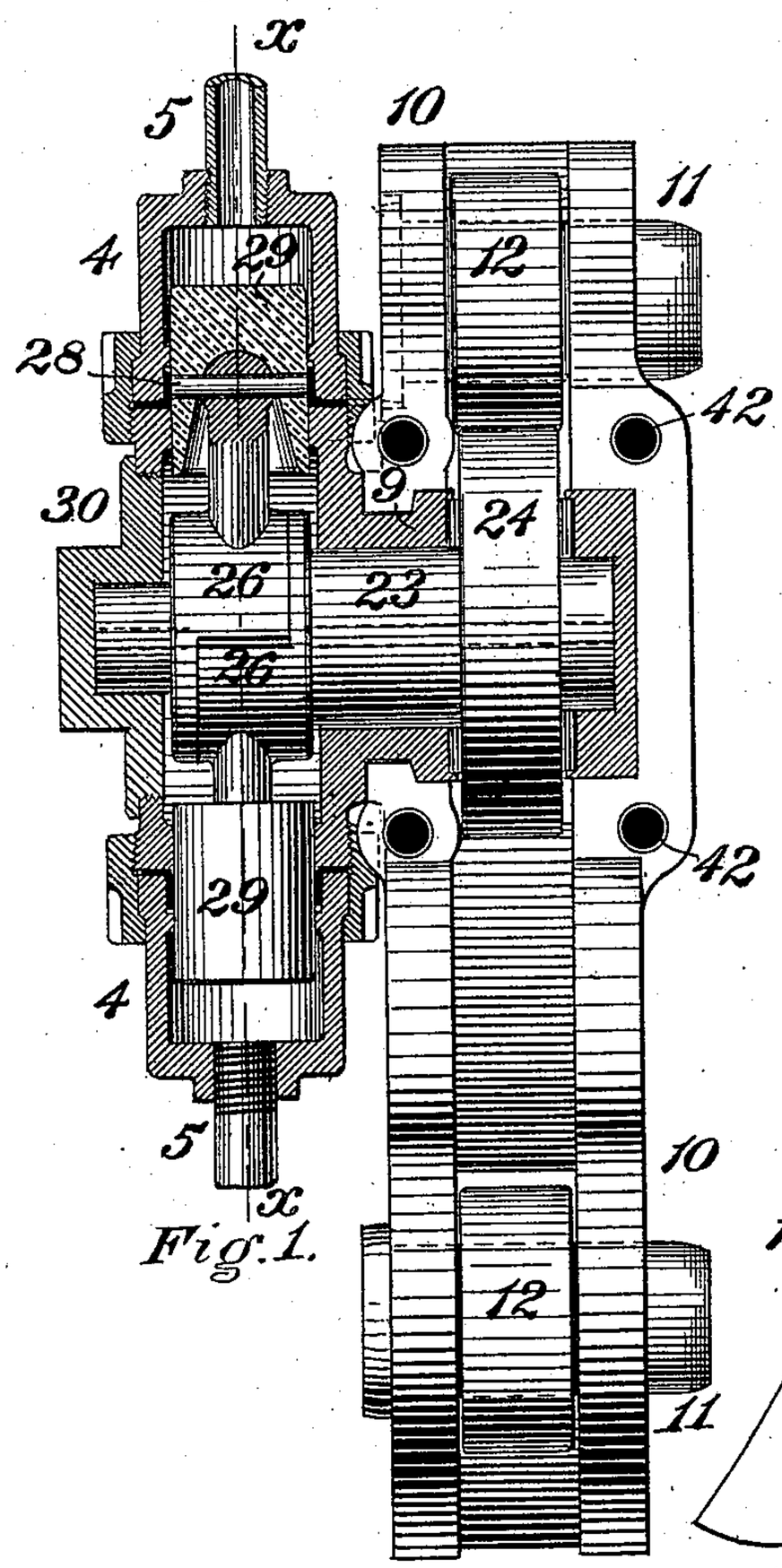

Fig. 1.

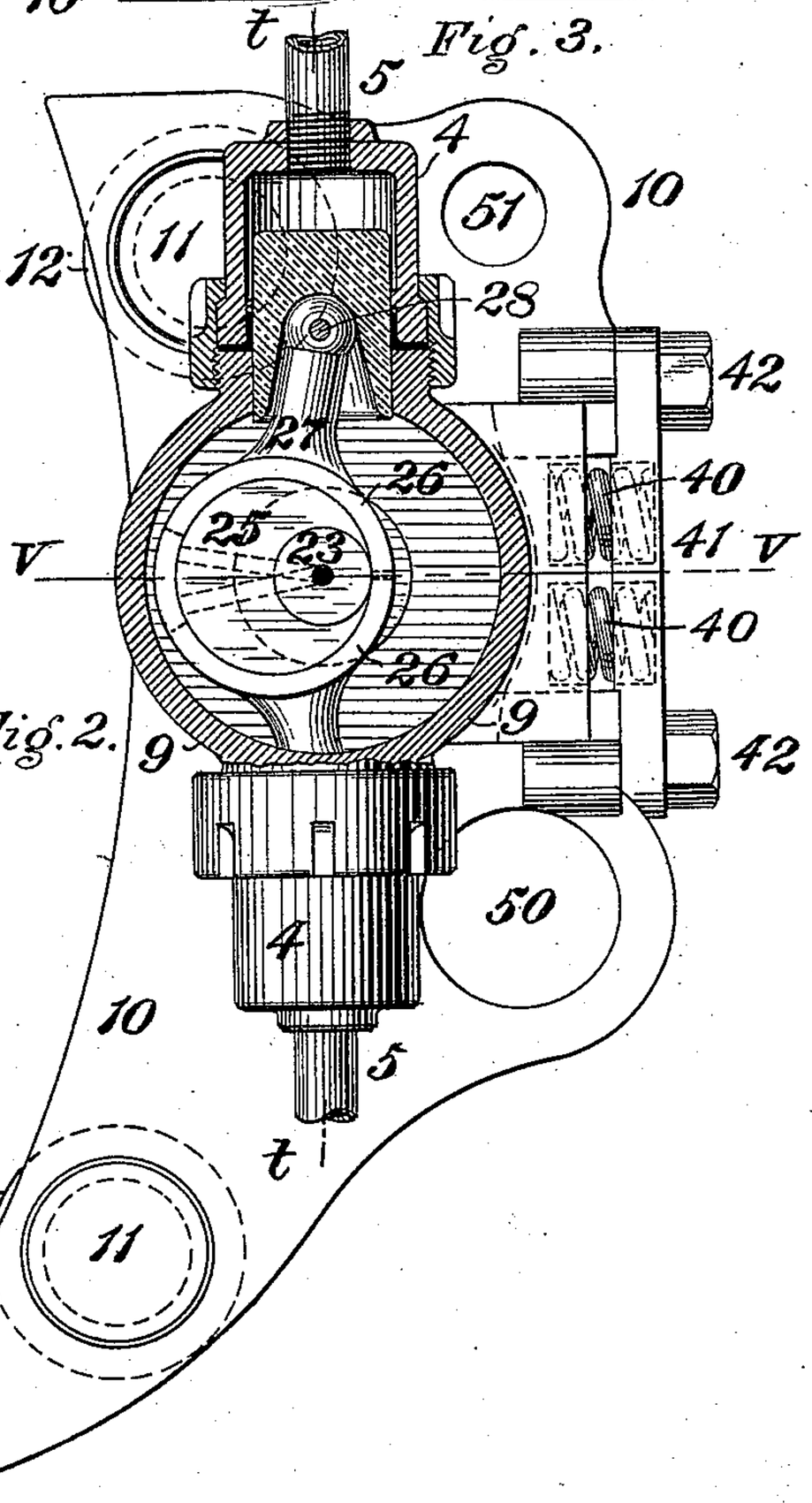

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

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No. 574,664. Patented Jan. 5, 1897.

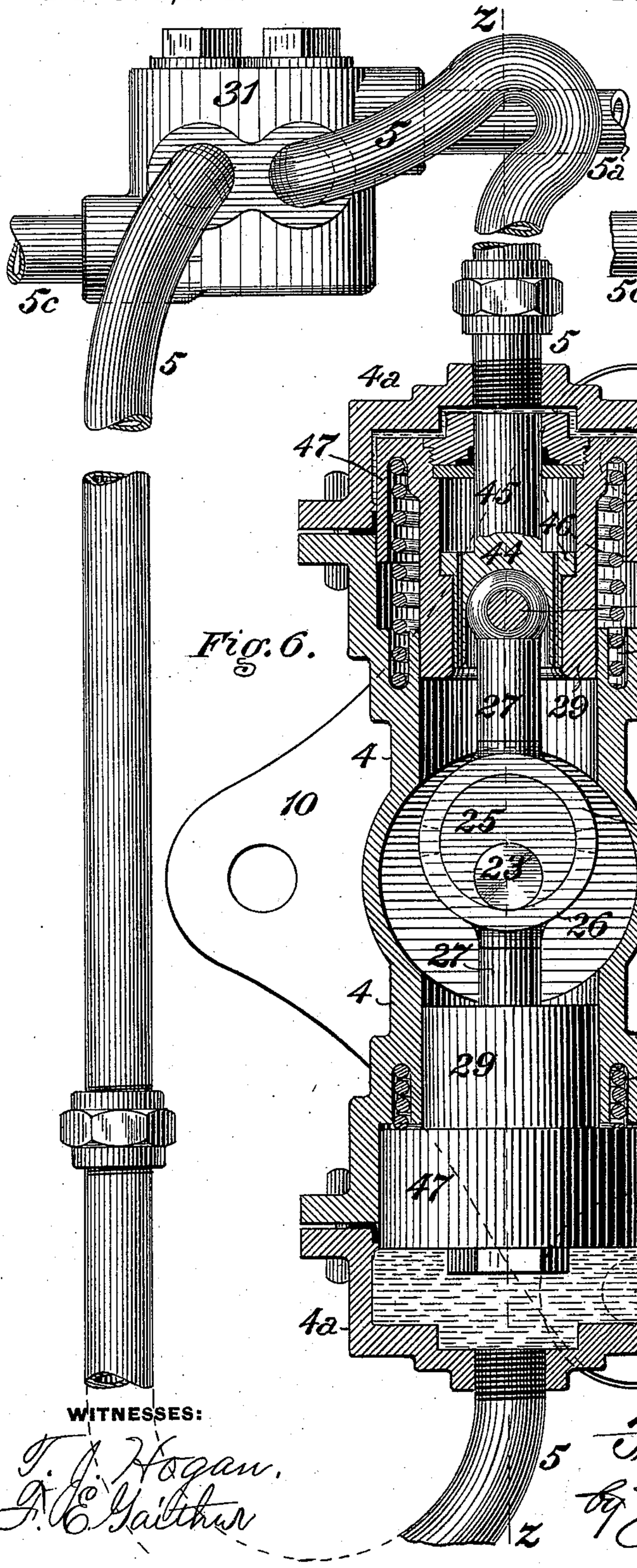

Fig. 6.

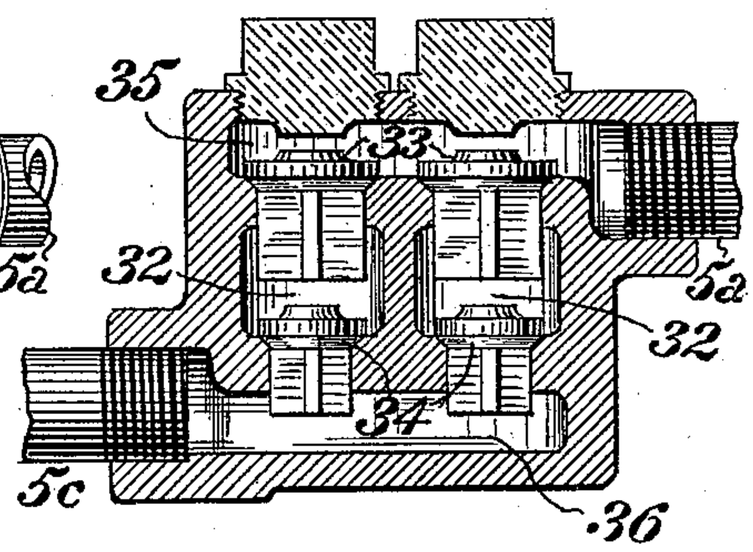

Fig. 7.

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(No Model.) 3 Sheets—Sheet 3.

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No. 574,664. Patented Jan. 5, 1897.

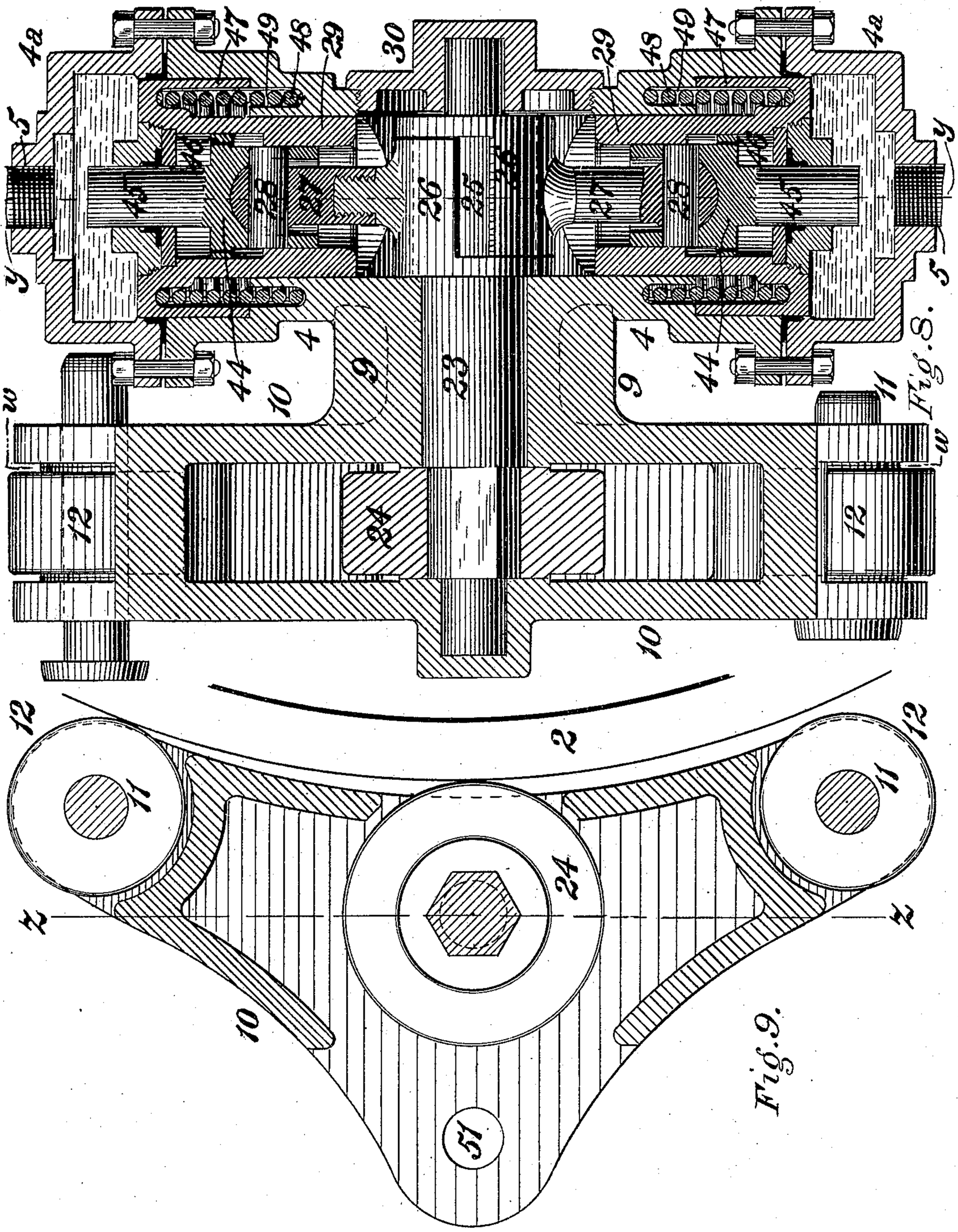

Fig. 9.

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UNITED STATES PATENT OFFICE.

FRANCIS L. CLARK, OF STEWART STATION, PENNSYLVANIA.

PUMP.

SPECIFICATION forming part of Letters Patent No. 574,664, dated January 5, 1897.

Application filed February 17, 1896. Serial No. 579,512. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS L. CLARK, a citizen of the United States, residing at Stewart Station, in the county of Westmoreland and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Pumps, of which improvement the following is a specification.

The object of my invention is to provide a simple, compact, and effective device for forcing a liquid against pressure which shall be especially adapted to the requirements of a hydraulic-brake apparatus, as well as desirably applicable in connection with hydraulic jacks and other hydraulic-pressure devices in effecting compression to such degree as may be required.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal section through a pump, illustrating an embodiment of my invention at the line *t t* of Fig. 2; Fig. 2, a transverse section at the line *x x* of Fig. 1; Fig. 3, a similar section at the line *v v* of Fig. 2; Fig. 4, an end view in elevation of the valve-casing; Fig. 5, a longitudinal central section through the same; Fig. 6, a vertical transverse section through a pump having supplemental pistons at the line *y y* of Fig. 8; Fig. 7, a longitudinal central section through the valve-casing of the same; Fig. 8, a vertical longitudinal section through the pump at the lines *z z* of Figs. 6 and 9, and Fig. 9 a transverse section at the line *w w* of Fig. 8.

In the practice of my invention I provide a pump-supporting frame 10, adapted to be located in proper relation to an element for imparting power, which in this instance is indicated as the tread of a car-wheel 2, but which may without variation of operative principle be located upon any suitable shaft rotated either by hand or other motive power. The pump is of the two-cylinder single-acting type, and the pump-cylinders 4 4 are secured one opposite the other and in axial line to a casing 9, which may be either formed integral with or connected to the supporting-frame 10. A pump-shaft 23, which is fitted to rotate in bearings in the casing 9, carries upon a squared portion of its length located between the side bars of the supporting-frame 10 a driving-roller 24, the periphery of which projects beyond the frame 10 on one face thereof. Friction-rolls 12 are journaled on pins 11, fixed in the frame 10 near its ends, their peripheries projecting beyond the frame similarly to that of the driving-roller 24, so as to be rotated, as is said roller, by frictional contact with the wheel 2, from which the driving-power is imparted.

An eccentric 25 is formed or fixed upon the pump-shaft 23 at the portion thereof which is located between the pump-cylinders 4 4, and two eccentric-straps 26 26 are fitted around it, each strap being provided with a short arm or rod 27, which is coupled by a pin 28 to a piston 29, fitting the adjacent pump-cylinder 4. Each of the eccentric-straps 26 is cut away for the major portion of its width, so as through said portion to only surround about one-half of the periphery of the eccentric. The remaining minor portion of the width of each eccentric-strap completely encircles the eccentric, and the complete and cut-away portions are located at alternately opposite ends of the respective straps, as seen in Figs. 1 and 9. By this construction a large bearing-surface for the eccentric-straps is provided during the forcing strokes of the pistons, and the bearing of the pistons on the eccentric is made more nearly central than would otherwise be the case. The end of the casing 9 farthest from the frame 10 is closed by a screw-cap 30, which serves as an end bearing for the pump-shaft 23.

In order to obviate the imposition of undue strain upon the pump, which might otherwise be occasioned by the driving-roller 24 being held in contact with the wheel by which it is rotated with greater force than that necessary to insure efficient frictional contact, the casing 9 and its accessories may be connected to the supporting-frame 10 through the intermediation of a yielding or elastic medium. As shown in Figs. 1, 2, and 3, the casing 9 is fitted in a transverse recess in the frame 10, with the capacity of a limited degree of traverse toward and from the periphery of the wheel 2, from which power is transmitted to the driving-roller 24, which is held to its bearing against the wheel 2 by springs 40,

which abut against the casing 9 and against a bearing-plate 41, secured to the frame 10 by bolts 42.

The outer ends of the pump-cylinders 4 4 are connected by pipes 5 5 with chambers 32 in a valve-casing 31, which may be located and supported in any convenient position relatively to the pump. Openings or passages are formed in the upper and lower sides of the chambers 32, which openings are controlled, respectively, by upwardly-opening delivery-valves 33 and receiving-valves 34, and lead, respectively, to an upper outlet-chamber 35 and to a lower inlet-chamber 36. A receiving-pipe 5^c leads from any suitable source of fluid-supply into the inlet-chamber 36 and a delivery-pipe 5^a leads from the outlet-chamber 35 to any desired point of delivery or discharge.

In operation the inward stroke of each of the pistons 29 draws liquid from the pipe 5^c and inlet-chamber 36 into one of the chambers 32, raising the inlet-valve 34 and tending to close the outlet-valve 33 thereof. The opposite or outward stroke of each piston forces liquid from one of the chambers 32 into the outlet-chamber 35 and discharge-pipe 5^a, raising the outlet-valve 33 of the chamber 32 and tending to close the inlet-valve 34. The liquid discharged from the valve-casing through the pipe 5^a may be conveyed to any desired point of delivery against pressure, or, in a hydraulic-brake apparatus or other apparatus in which such traverse is desired, may be circulated through a pipe system and returned to the valve-casing through the pipe 5^c. The yielding resistance of the springs 40 maintains a normal degree of frictional contact between the driving-roller and the wheel by which it is rotated and prevents undue strain if the supporting-frame 10 should be held too closely to the shaft of said wheel. The frame 10 may obviously be either fixed to a suitable base or stand or connected by links or suspension-rods through openings 50 51, provided for the reception of connecting-bolts, or through one of the pins 11, to the framing of an apparatus in connection with which it is employed, as, for example, a car frame or sill when used in a hydraulic-brake system, so that by being moved toward or from the wheel which imparts rotation to the driving-roller 24, and thereby bringing said members into and out of frictional contact, the pump may either be actuated or remain inactive, as required.

Figs. 6 to 9, inclusive, illustrate a modification in which, by the employment of a supplemental piston in each pump-cylinder, a large amount of fluid may be pumped at comparatively low pressure, and thereafter a smaller amount may be pumped at a substantially higher pressure. The pump-casing 9 is in this instance made integral with the supporting-frame 10, and the pump-shaft 23 is journaled in bearings in the casing and its cap 30, as in the former case. The driving-roller 24, friction-rolls 12, eccentric 25, straps 26, rods 27, valve-casing 31, and inlet and outlet valves and connecting-pipes are also all substantially similar to the corresponding members before described. The main pistons 29 are not, however, connected directly with the rods 27, as in the instance first described, but are actuated therefrom through the intermediation of supplemental pistons 44 of smaller diameter, which work in cylindrical chambers in the main pistons and are coupled to the eccentric-rods 27 by pins 28. A peripheral flange or collar 46, which is formed on the outer end of each of the supplemental pistons 44, engages a corresponding shoulder in the inclosing chamber of the main piston 29, and thereby moves said piston with the supplemental piston 44 during the inward traverse thereof. The outward traverse of the main pistons is effected by helical springs 48, which surround the main pistons and bear at their outer ends on circumferential flanges thereon, from which sleeves 47, fitting enlarged bores in the pump-chambers 4, extend toward the shaft 23 and inclose the springs 48 for a portion of their length. The inner ends of the springs bear on the bottoms of annular recesses 49 in the pump-chambers, said recesses and the sleeves 47 serving as guides for the springs. The supplemental pistons are provided with central extensions 45 of smaller diameter on their outer ends, fitting corresponding bores in the outer end caps of the main pistons.

In operation the inward strokes of the main pistons 29 draw liquid from the pipe 5^c and their outer strokes discharge it through the pipe 5^a, as in the instance first described, the piston areas effective for this purpose being those of the enlarged outer ends of the main pistons. When the pressure against which the liquid is pumped becomes sufficiently great to overcome the tension of the springs 48, the latter are compressed and their coils closed down upon one another by the main pistons, which thereafter remain inactive at the limits of their inner traverse, and the further action of the pump is effected by the reduced piston areas of the extensions 45 of the supplemental pistons, which then act to force a smaller quantity of liquid against a higher pressure. Upon a diminution of pressure below that equal to the tension of the springs the pump again operates on the liquid through the maximum piston areas, *i. e.*, those of the outer ends of the main pistons.

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

1. The combination, substantially as set forth, of a frame adapted to be supported adjacent to a power-imparting shaft, a pump-casing connected to said frame, a pump-shaft journaled in said casing, pump-cylinders connected to said casing, a frictional driving-roller and an eccentric, each fixed on the pump-shaft, pistons fitting the pump-cylin-

ders and coupled to straps on the eccentric, and friction-rollers journaled in the frame with their axial planes parallel to that of the pump-shaft.

2. The combination, substantially as set forth, of a frame adapted to be supported adjacent to a power-imparting shaft, a pump-casing fitting movably in said frame, an elastic medium, as one or more springs, holding said casing to a bearing against the frame, a pump-shaft journaled in said casing, pump-cylinders connected to said casing, a frictional driving-roller and an eccentric, each fixed on the pump-shaft, and pistons fitting the pump-cylinders and coupled to straps on the eccentric.

3. The combination, substantially as set forth, of a pump-cylinder, a main and a supplemental piston, of larger and smaller diameters respectively, fitted to traverse therein, a spring for effecting the traverse of the main piston in one direction, separable bearing-faces on the main and supplemental pistons, through which either coincident movement of both pistons may be effected, or inaction of the main piston permitted, and connections coupling the supplemental piston to a rotatable shaft.

4. The combination, substantially as set forth, of a pump-cylinder, a main piston fitting therein, a supplemental piston of smaller diameter fitted to traverse in the main piston, a spring bearing longitudinally on the main piston and on the pump-cylinder, a projection on the supplemental piston adapted to abut, in one direction of its traverse, against the main piston, and connections coupling the supplemental piston to a rotatable shaft.

5. The combination, substantially as set forth, of a pump-cylinder, a main piston fitting therein, a supplemental piston of smaller diameter, fitted to traverse in and independently of the main piston, connections coupling the supplemental piston to a rotatable shaft, a spring acting on the main piston and tending to effect its traverse in one direction independently of the supplemental piston, and a projection on the supplemental piston which engages the main piston and effects its traverse in the opposite direction, when and only when it has been moved by the spring.

6. The combination, substantially as set forth, of a pump-cylinder, a main piston fitting therein, a supplemental piston of smaller diameter fitted to traverse in the main piston, a spring bearing longitudinally on the main piston and on the pump-cylinder, a projection on the supplemental piston traversing freely in one direction in the main piston, a shoulder or bearing-face on the main piston against which said projection abuts, in the opposite direction, when and whenever the main piston is brought into position therefor by the spring, and connections coupling the supplemental piston to a rotatable shaft.

In testimony whereof I have hereunto set my hand.

FRANCIS L. CLARK.

Witnesses:
F. E. GAITHER,
T. J. HOGAN.