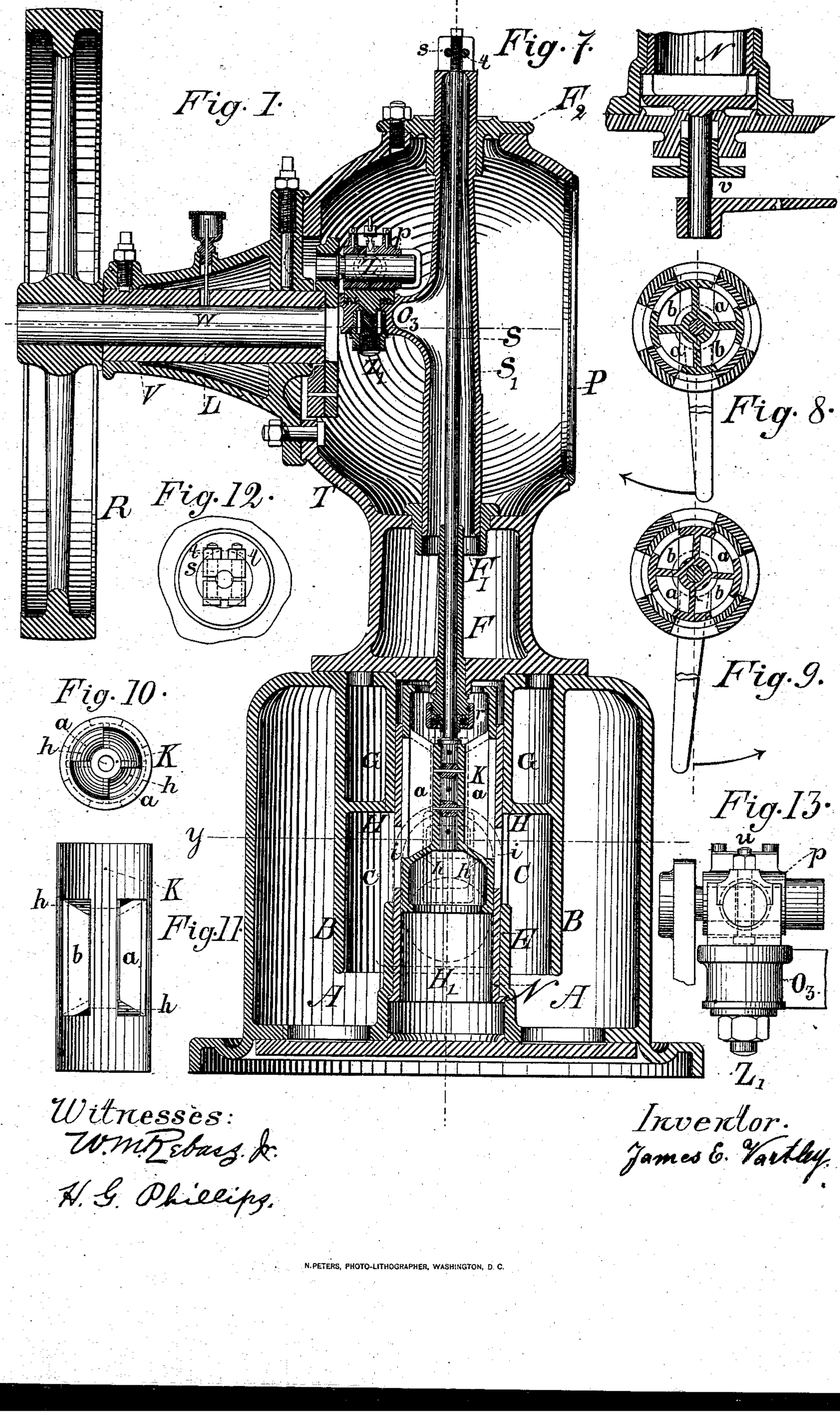
(No Model.)

2 Sheets—Sheet 1.

J. E. VARTLEY.

Water Motor.

No. 238,186. Patented Feb. 22, 1881.



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(No Model.)

2 Sheets—Sheet 2.

J. E. VARTLEY.

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Fig. 2.

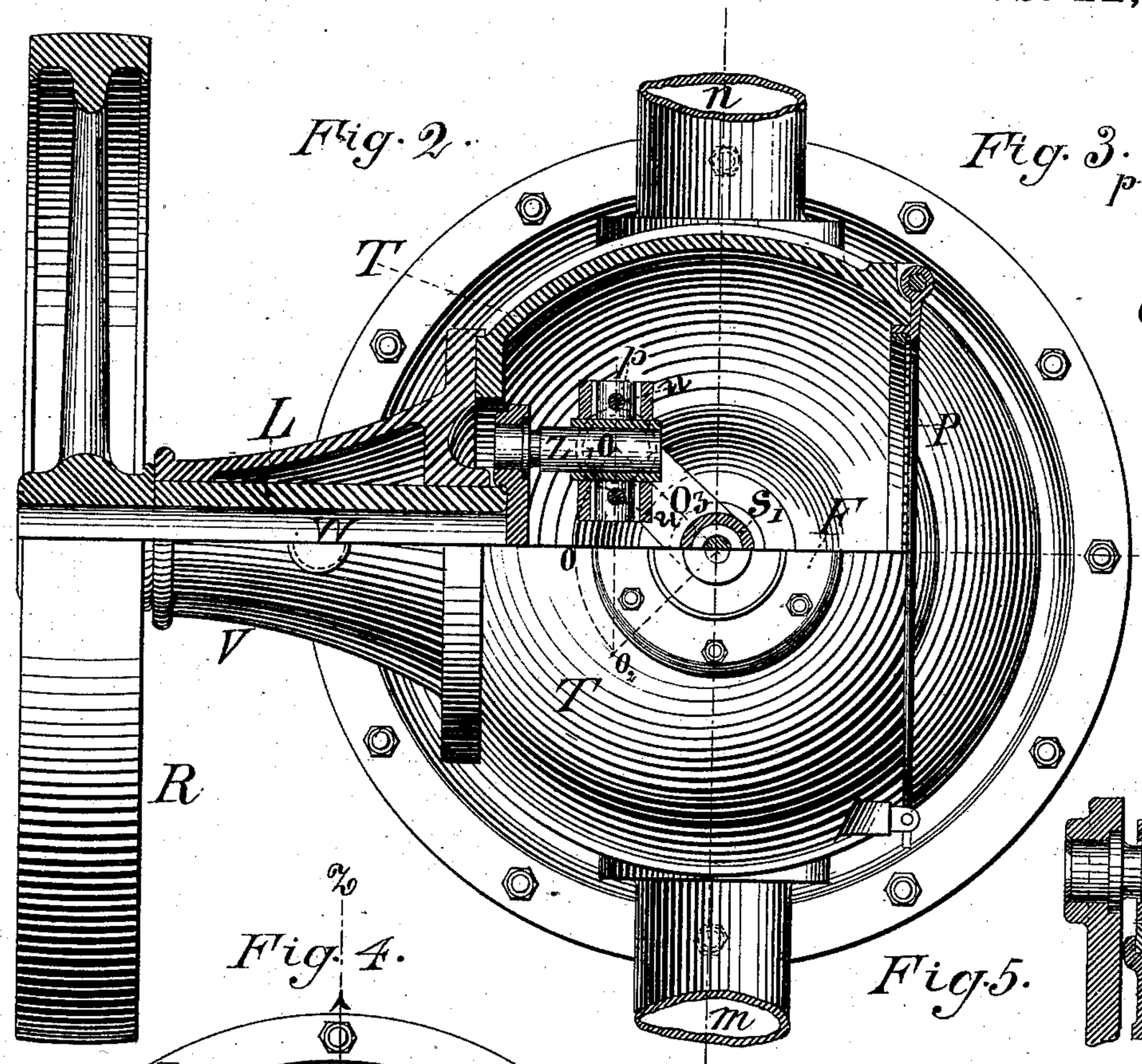


Fig. 3.

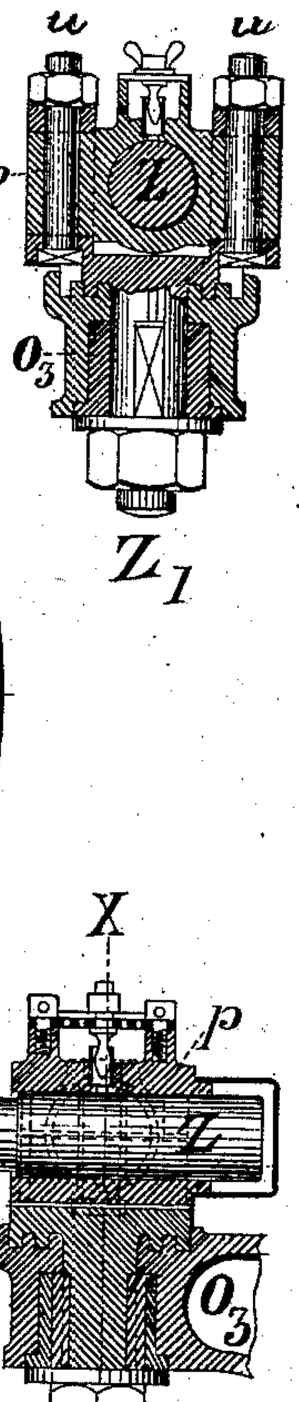


Fig. 4.

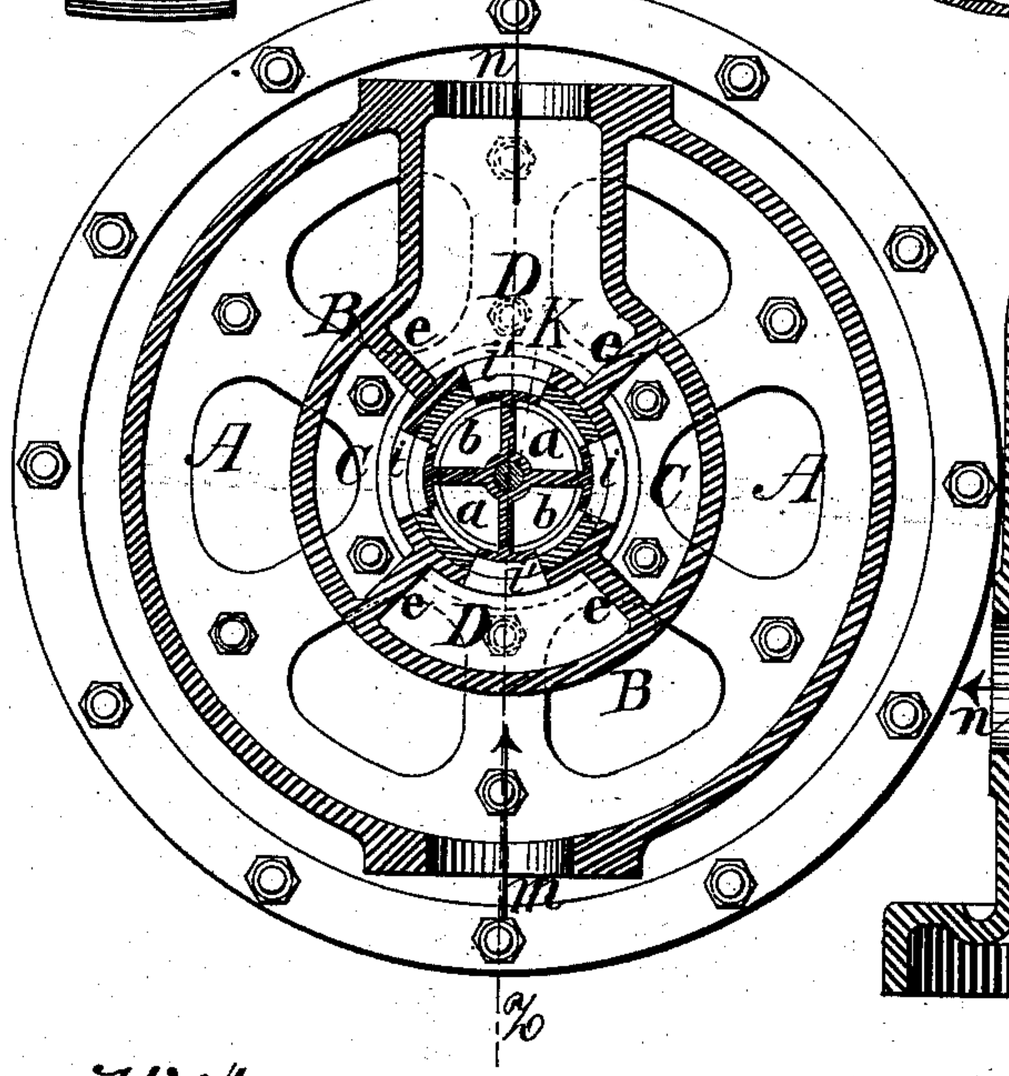
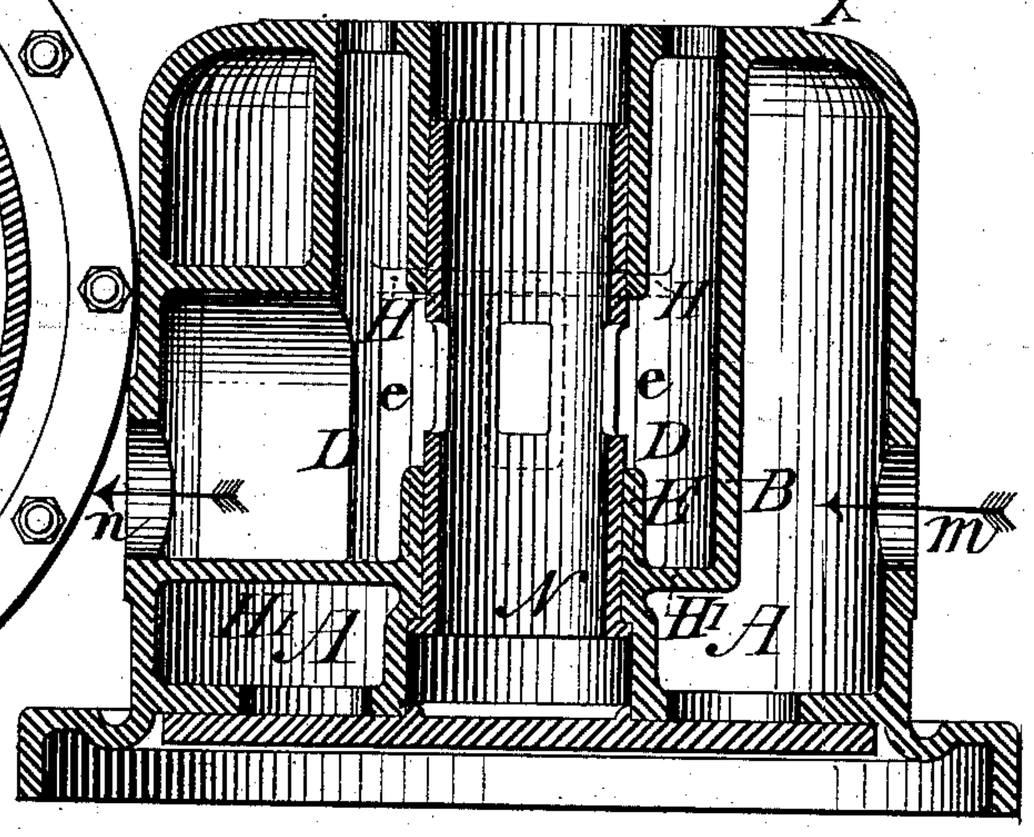


Fig. 5.

Fig. 6.



Witnesses:
W. M. Lebus, Jr.
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UNITED STATES PATENT OFFICE.

JAMES E. VARTLEY, OF ROCHESTER, NEW YORK.

WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 238,186, dated February 22, 1881.

Application filed June 1, 1880. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. VARTLEY, of the city of Rochester, in the county of Monroe and State of New York, have invented certain Improvements on Water-Motors, of which the following is a specification, reference being had to the annexed drawings, in which—

Figure 1 is a central vertical section through my improved water-motor. Fig. 2 is a plan view of the same, showing also a horizontal section through the crank-shaft. Fig. 3 is a section on the line *x x*, Fig. 5. Fig. 4 is a horizontal section through the cylinder, on the line *y y*, Fig. 1. Fig. 5 is a vertical section through the crank and oscillating connecting-arm. Fig. 6 is a vertical section through the cylinder and air-chamber, on the line *z z*, Fig. 4. Figs. 7, 8, and 9 are sectional views, showing the construction and operation of the reversing mechanism. Fig. 10 is an end view of the piston removed from the cylinder. Fig. 11 is a side view of the same. Fig. 12 is an end view of the clamp *s*. Fig. 13 is a side view of the box or universal joint connecting the crank-pin and vibrating arm O_3.

My invention relates to an improved water-motor in which the distribution of the water is effected by a hollow piston provided with suitable ports and connected with the crank, so as to receive an oscillating movement about its longitudinal axis therefrom; and it consists in the mechanical arrangement and construction of the parts, as hereinafter more fully pointed out.

My improved water-motor is shown in the accompanying drawings, in which—

A is the annular water-chamber, the upper part of which serves also as an air-chamber, and which incloses the cylinder E and piston K, and the inlet and outlet passages C C and D D. S is the piston-rod; S_1, the sliding connecting-sleeve; Z, the crank, and R the fly-wheel. The fly-wheel, crank-shaft, and connecting-sleeve are supported by a casting, T, which is placed on the chamber A, and incloses all the working parts, a glass door, P, being provided for convenience of observation and access. The water-chamber A rests on a suitable pedestal, and supports the casting T above it. The chamber is provided with an inlet water-passage, *m*, and outlet-passage *n*. The cylinder E is centrally located in the chamber, and is provided with a removable sleeve, N, in which the piston operates.

Between the cylinder and the outer wall of the water and air chamber A is placed a vertical circular partition, B, attached to the top of the water-chamber. The annular space between the cylinder and the partition B is divided into four equal parts by the vertical radial walls *e e e e*, which extend upward from the bottom of B to the horizontal walls H H, Figs. 1 and 6. The space between the partition B and the cylinder is thus divided into four chambers or water-passages, C C and D D, the first two being for the admission of water to the cylinder, and the second, D D, for the exhaust of water therefrom. The passages C C communicate at their lower ends with the water-chamber A, as the partition B does not extend down to the bottom of the latter, and the passages D D communicate with the outlet water-passage *n*. Communication is established from one of spaces D to the other through the annular passages G G, Fig. 1, and the latter opens into the discharge-pipe *n* The piston itself operates as the valve to control the admission or discharge of water to or from the cylinder. The construction of the crank and connecting mechanism is such that the piston rotates about its longitudinal axis during each stroke, traversing an angle of ninety degrees. The piston is cast hollow, with four radial walls, which divide the interior thereof into four equal water-passages, two of which, *a a*, are open toward the top of the piston, and two of which, *b b*, open toward its bottom. (See Figs. 4, 10, and 11.)

In Fig. 4 the piston is represented in the position it occupies when the crank is on the dead-point and all the ports through the cylinder and sleeve N are closed. As the crank revolves the piston K rotates on its axis and opens communication, through the inlet-ports *i i*, from the passages C C into the spaces *a a* or *b b* within the piston, according to the direction in which the motor is running. At the same time the discharge-ports *i' i'* will be opened for the discharge of the water contained in the cylinder into the passages D D. The water, entering the chamber A, passes upward under the lower end of partition B into

the water-spaces C C, and thence through the inlet-ports *i i* into one end or the other of the cylinder, according to the position of the piston, and from the cylinder the water passes outward through the discharge-ports *i' i'* into the passages D D, and thence, through the outlet-pipe *n*, is discharged from the machine. The piston is provided at the ends of the water-passages *a a* and *b b*, respectively, with transverse partitions *h h*, Fig. 1, which prevent the flow of water toward the bottom and top of the piston. The lower part of the water-passages D D are closed by the horizontal partitions H_1' H_1', Figs. 1 and 6.

The piston-rod S passes through the stuffing-box *r*, Fig. 1, and extends upward the whole height of the casting T, being attached at its upper end to the sliding connection S_1. This consists of a hollow casting connected to the piston-rod at its upper end by the clamp *s*, (see Fig. 12,) and provided with an arm, O_3, which is attached to the crank Z, by means of the universal joint. (Shown in section in Figs. 3 and 5.) The clamp *s* is formed by slotting the upper end of the connection S_1, so that the parts thereof on each side of the slot may be drawn together by the bolts *t t*, binding the threaded end of the piston-rod between them in the proper position with regard to the crank Z, so that the ports in the piston will come into the proper relations with the ports in the cylinder.

The casting T is provided with removable collars F_1 F_2, through which the connection S_1 slides. It is also provided with a hinged door, P, to exclude dust, and for access to the working parts for the purpose of oiling or making repairs, and which door, if preferred, may be glazed, to permit observation of the machine when in operation.

A hollow arm, V, attached to the casting T, supports the crank-shaft W, which carries at its outer end the fly-wheel R, and at its inner end a disk, into which the crank-pin Z is inserted. The crank-pin and the arm O_3 are connected together by a universal joint, which is composed of a box, *p*, provided with a pin, Z_1, at right angles with the crank-pin, which fits into a journal on the end of the arm. As the arm O_3 vibrates with the motion of the crank through the angular distance between O_1 and O_2, Fig. 2, the pin Z_1 turns in its journal and accommodates itself to the position of the crank. The piston has the same angular motion as the arm O_3. The arm O_3 swings through an angle of forty-five degrees on each side of the plane, passing through the centers of the crank-shaft and the piston-rod, thus giving in all an angular motion to the piston of ninety degrees.

The box *p* on the crank Z is provided with trunnions on each side thereof which fit into suitable journals on the yoke which forms the upper portion of the pin Z_1. By this construction, which is shown in side elevation in Fig. 13, provision is made for any inaccuracy in position of the crank Z. The pins *u u*, Figs. 3 and 13, which secure the caps on the journals above the trunnions of the box *p*, pass through the trunnions in holes sufficiently large to permit of a slight amount of play in the box.

The motion of my improved water-motor may be reversed by providing a lever to rotate the sleeve N within the cylinder. The lower foot of the cylinder would, in this case, be provided with a stuffing-box through which the shaft *v* passes, and which shaft is attached to the sleeve N and provided, at its outer end, with a hand-lever by which the sleeve may be rotated about its longitudinal axis, so as to cause the reversal of the motion of the engine.

The construction of the reversing-gear is shown in Figs. 7, 8, and 9.

I claim—

1. In combination with the water and air chamber A, provided with inner annular partition, B, the cylinder E, water-passages C C and D D, and piston K, having an oscillating motion about its longitudinal axis, and provided with openings *a a b b*, substantially as set forth.

2. In combination with the water-chamber A and cylinder E, provided with suitable water inlet and outlet passages, the piston K, having an oscillating motion about its longitudinal axis, piston-rod S, arm O_3, universal joint *p* Z_1, crank Z, and crank-shaft W, arranged to operate substantially as and for the purposes set forth.

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