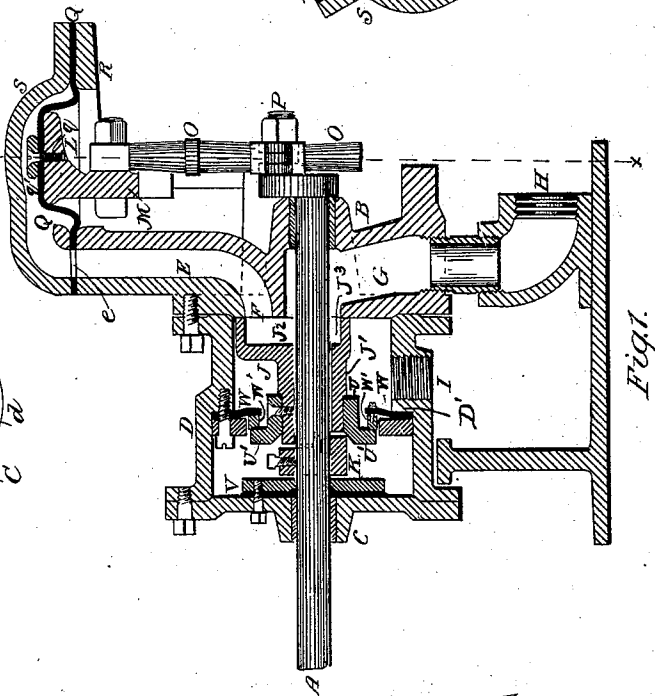
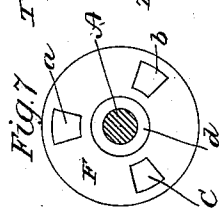
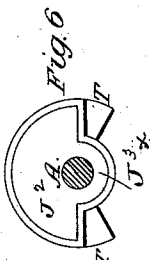
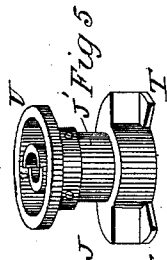
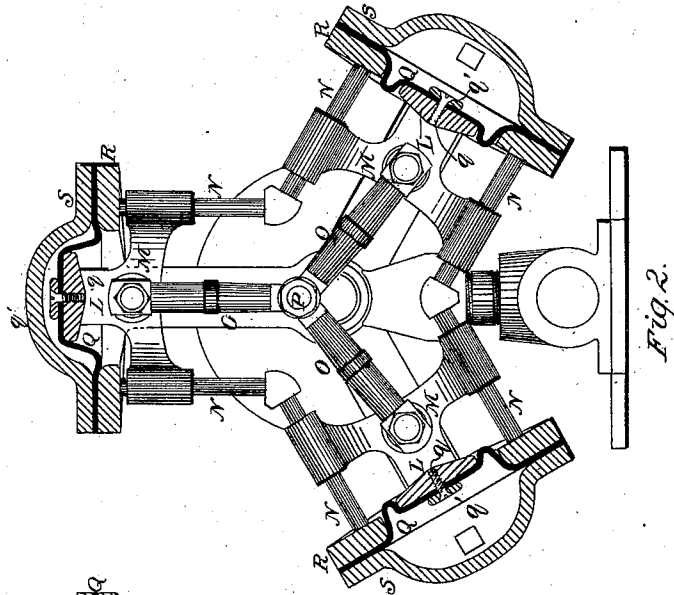
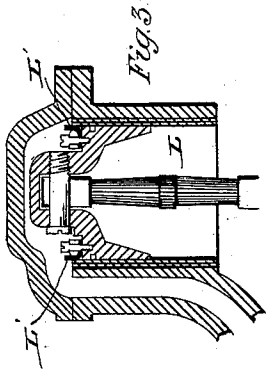
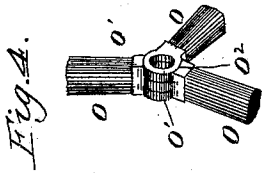


(No Model.)

F. A. HINDS.
WATER MOTOR.

No. 368,089.

Patented Aug. 9, 1887.



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UNITED STATES PATENT OFFICE.

FRANK A. HINDS, OF WATERTOWN, NEW YORK.

WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 368,089, dated August 9, 1887.

Application filed March 16, 1887. Serial No. 231,204. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. HINDS, a citizen of the United States, and a resident of Watertown, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Water-Motors; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to water-motors; and its object is to obtain increased efficiency in operation by diminishing the loss from friction in a motor of this class adapted to be operated by water under pressure.

With these objects in view my invention consists in the improved construction, arrangement, and combination of parts of a water-motor, which will be hereinafter fully described and claimed.

Referring to the accompanying drawings, Figure 1 is a vertical longitudinal central sectional view of my improved water-motor. Fig. 2 is a transverse vertical sectional view of the same, taken on the plane indicated by line *x x*, Fig. 1. Fig. 3 is a vertical central sectional view of a modification of my invention, which will be hereinafter described. Fig. 4 is a perspective detail view of the compound joint formed at the inner ends of the three pitmen. Fig. 5 is a detail view of the valve. Fig. 6 is a plan view of the same, and Fig. 7 is a detail view of the valve seat.

The same letters of reference indicate corresponding parts in all the figures.

Referring to the several parts by letter, A indicates the main shaft or crank-shaft of my improved motor, which is supported and turns in central bearings, C B, in the two ends of the main casing of the motor, as shown, D indicating the valve-chamber. Upon the crank-shaft A, within the valve-chamber D, is loosely mounted the valve J, the interior space in the tubular neck J' of the valve being larger than the diameter of the crank-shaft, for the purpose hereinafter set forth. The valve is caused to turn with the shaft A. by means of a clutch-ring, K, which is rigidly but adjustably secured upon the shaft, and engages with the notched rear end of the tubular neck of the valve. The operative face of the valve is formed with a

large semicircular recess, J², and a much smaller semicircular recess, J³, opening together and both concentric with the shaft A, the operative face of the valve being also formed with wings T T, arranged as shown. The forward edge of the valve bears against or comes in contact with the valve-seat F, which is formed with three inlet-ports, *a b c*, arranged equidistant from each other around a circle whose center is the crank-shaft.

E E E indicate passages which lead from each of the inlet-ports in the valve seat to the spaces behind the pistons.

L L indicate the pistons, each of which is formed with a cross-head, M, which slides on guide-rods N N, there being three of such pistons and cross-heads, as shown. Each cross-head is pivotally connected by a pitman, O, with the crank-pin P on that end of the crank-shaft, the inner converging ends of these pitmen being reduced and formed with a ring, O', and a segmental shoulder, O², which fits over the outside of the rings of the other connecting-rods or pitmen, and thus transmits its power through all the rings to the crank-pin, the three rings fitting on the crank-pin, one occupying the portion of the pin nearest the crank, another in the middle, and the third the portion nearest the outer end, the ring ends of the pitmen thus forming a compound joint.

Resting upon each piston and secured thereto by a screw, *q*, passing through a small block, *q*, the edges of which are rounded, is a loose or cup-shaped diaphragm, Q, of leather, one or more sheets of canvas cemented together and covered with india-rubber, or similar suitable flexible material. The edges of these flexible diaphragms are secured between the rings or flanges R and the covers S, which form part of the outer casing of the motor, the passages E, previously described, leading through these flanges and through ports *e* in the covers S, (see Fig. 1,) so that water admitted through these passages E finds its way behind the diaphragms and exerts its pressure upon the pistons.

Upon the rear end of the tubular valve stem is secured a flanged hub, U, secured in position by a screw, as shown in Fig. 1; or it may be cast with the valve. Within the valve-chamber D, against an annular shoulder, D', formed therein, is secured by screws an annular diaphragm, W, of leather, rubber, or other

suitable flexible material, having its inner edge provided with a light metallic ring, W' , which bears against the front side of the flange U' of the hub U . The area of the flange U' is a little less than that of the head or operative end of the valve J , for the purpose hereinafter described.

In operation the water is admitted under pressure into the valve-chamber of the motor through the inlet-opening I , and fills the valve-chamber surrounding the valve between the valve-seat and the flange U' , pressing the diaphragm W against the said flange, so as to make a water-tight joint, and thus by the pressure of the water against the flange U' relieving the pressure of the valve against the valve-seat. The area of the flange U' being only a little less than that of the head or other end of the valve, the valve is only pressed forward by the pressure of the water with sufficient force to insure a good contact with the valve-seat, the friction between the valve and seat being thus reduced to the minimum. It will be seen that the valve J , being of the peculiar form shown, will always cover two of the inlet-ports in the valve-seat, leaving the third port open, so that the water entering the valve-chamber can pass through one port and through one of the passages E to the space back of that particular piston, thus exerting pressure upon the said piston, distending the diaphragm Q , and forcing the cross-head M inward along its guide-rods, thus through its pitman O transmitting the full power upon the crank P , and thus rotating the crank-shaft. The valve J , turning with the main shaft, opens the ports $a b c$ in regular succession as the crank passes the center and comes in position to be moved forward under the power received from each piston, and the full chambers exhaust into the recessed space $J^2 J^3$, the semicircular space J^2 being sufficiently large to extend over or inclose the inlet-ports as it passes over them, while the small semicircular recess J^3 , being inside of the port-circle, permits one of the ports to communicate with the valve-chamber. The water from the full chambers then escapes from the space J^2 and J^3 around the main shaft to the passage G and out through the outlet H . The tubular neck of the valve, fitting loosely upon the main shaft A , allows any water that may escape between the diaphragm W and flange U' of the tube to the rear end of the valve-chamber to pass through it into the exhaust-passage G , and prevents this part of the valve-chamber from filling up, and thus equalizing the pressure.

To prevent the water which may enter the rear part of the valve-chamber from leaking through the journal C as the latter becomes worn, I secure by screws to the inner side of that head of the valve-chamber a disk, V , which holds in place packing which prevents such leakage.

In Fig. 3 of the drawings I have shown a piston and cylinder which may be used in place of the piston and flexible diaphragm shown in

Figs. 1 and 2. In this construction, which is adapted for use where the water is free from grit, I employ a cylinder, L , and the piston working therein is provided with an annular or cup-shaped packing, I' , or any other similar packing, this construction dispensing with the flexible diaphragm shown in Figs. 1 and 2. Where the water is charged with sand or grit, unless the pressure is too severe, it is better to employ the diaphragm, as working with less friction.

As the face of the valve J wears away upon the valve-seat F , the ring upon the valve-diaphragm W and the flange U' will wear away in the same ratio, and thus keep the relative length of the valve the same. The valve-seat F may be faced with a plate of hard metal, which, as it wears away, can be renewed without renewing the other valve parts.

I have shown and described three pistons and pitmen working upon the one crank; but the shaft may be worked with any number of pistons from one upward.

A large fly or balance wheel is mounted on the outer end of the main shaft, and by means of a suitable belt passing around the said wheel power is transmitted to operate any desired machinery. The momentum of the fly-wheel is necessary where only one or two pistons are used; but with three or more pistons the fly-wheel is not so essential.

From the foregoing description, taken in connection with the accompanying drawings, the construction, operation, and advantages of my improved water-motor will be readily understood.

It will be seen that my invention is simple and strong in construction, and exceedingly efficient in its operation.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination, with the crank-shaft and the valve-seat, of the valve having the tubular stem loosely mounted on the crank-shaft, the flanged hub secured on the rear end of the said stem, the clutch-ring rigidly secured upon the crank-shaft and engaging with the notched rear end of the tubular valve stem, and the flexible annular diaphragm provided with the light metallic ring.

2. The combination, with the crank-shaft and the valve-seat, of the valve having the tubular stem loosely mounted on the crank-shaft, the flanged hub secured on the rear end of the said stem, the clutch-ring rigidly secured upon the crank-shaft and engaging with the notched rear end of the tubular valve-stem, the annular diaphragm provided with the light metallic ring, and the packing-disk V , substantially as set forth.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

Witnesses: FRANK A. HINDS.
E. W. SMITH,
HIRAM M. WILBUR.