(No Model.)

W. W. WOODBURN.

HYDRAULIC MOTOR.

No. 307,418. Patented Oct. 28, 1884.

Fig. 1.

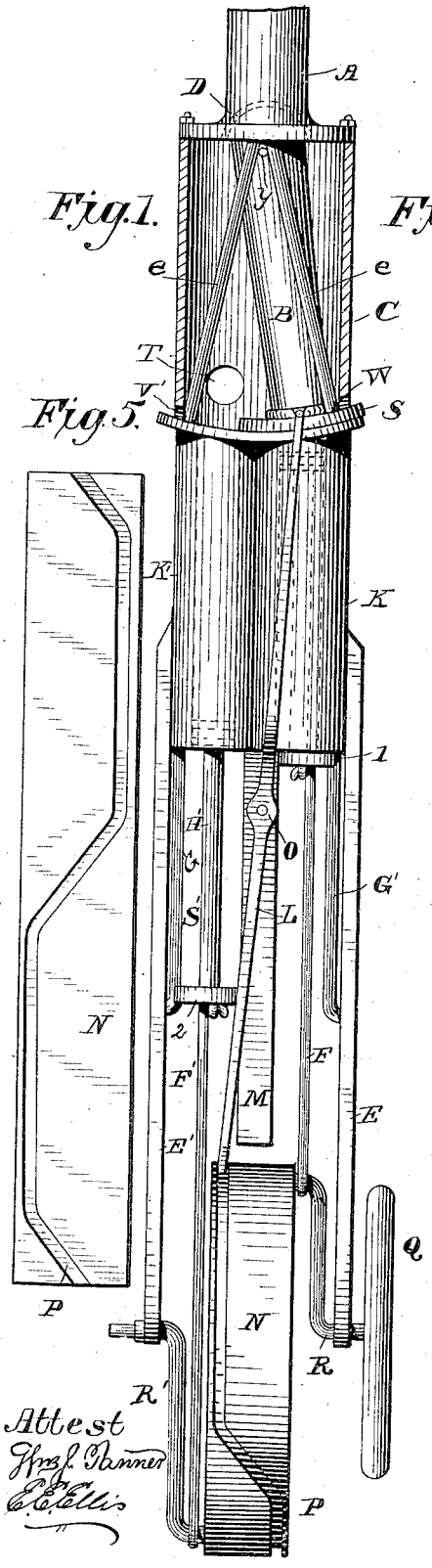

Fig. 2.

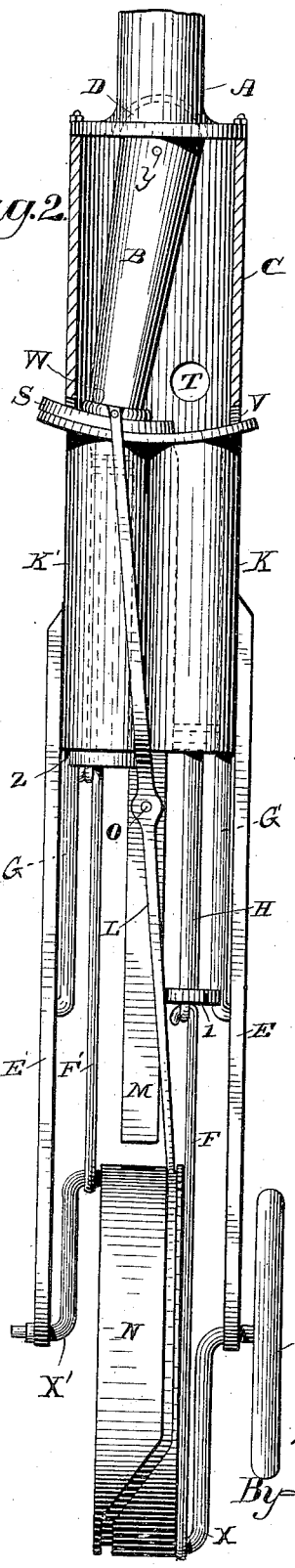

Fig. 3.

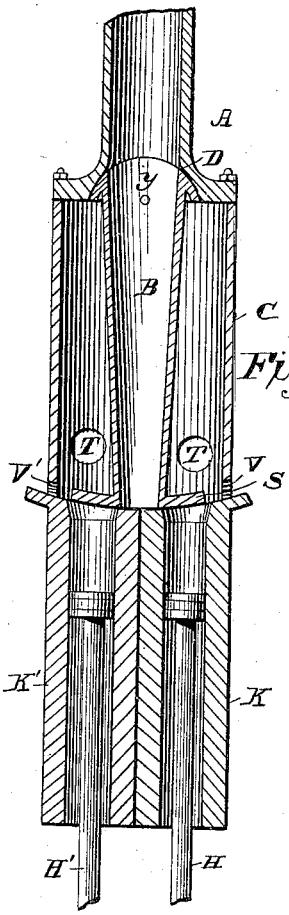

Fig. 4.

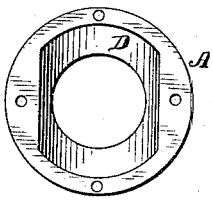

Fig. 5.

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WILLIAM W. WOODBURN, OF WILLIS, TEXAS.

HYDRAULIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 307,418, dated October 28, 1884.

Application filed May 6, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. WOODBURN, of Willis, in the county of Montgomery and State of Texas, have invented certain new and useful Improvements in Hydraulic 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, and to the letters of reference marked thereon, which form part of this specification.

My invention relates to that class of devices known as hydraulic motors; and it consists, broadly, in alternately directing a moving column of water or like fluid into two cylinders placed side by side, and containing working-pistons united at their outer ends to crank-arms connecting with the power-shaft and with a cam-wheel operating the cut-off mechanism.

My invention also consists in certain details of construction hereinafter described, and particularly pointed out in the claims.

Referring to the drawings forming a part of this specification, and to the designating-letters marked thereon, Figure 1 represents a plan view of my invention, partly in section. Fig. 2 represents a like view of the same at a different period of the stroke. Fig. 3 represents a longitudinal section of the cylinders, cut-off, and exhaust-chamber at a still different period of the stroke, the piston-rods being shown in plan and partly broken away. Fig. 4 represents an end view of the cover of the exhaust-chamber. Fig. 5 represents, on an enlarged scale, a side elevation of the cam-wheel.

In the several figures like letters indicate like parts.

A represents a pipe or conduit for conveying the motive fluid. This pipe is provided with a flange by which it is rigidly bolted or otherwise attached to the end of a cylinder, C. The pipe A has a flaring end, D, of partially-circular contour, forming with the outwardly-rounded corresponding end of the cut-off pipe B a knuckle-joint, permitting an oscillating motion of the other extremity of said pipe. A pivot, Y, prevents the pipe B from crowding upon the inlet-pipe or upon the top of the cylinders. The chamber C is mounted upon the dished or concave head of the twin cylinders K K′, and is provided with basal slots V V′, through which play the opposite sides of the pipe-flange S. The chamber is provided with outflow or exhaust openings T T.

To the sides of the cylinders K K′ are attached the arms E E′, supporting in suitable bearings the horizontal portions of two opposite crank-arms, X X′, rigidly united at diametrically opposite points on the periphery of a wheel, N. The diameter of the wheel N is equal to the length of stroke of the pistons. The piston-rods H H′, provided with notched collars 1 2, which serve as guides playing between the guide-rods G G′ attached to the arms or frame E E′ and a central longitudinal bar, M, connecting-rods F F′, unite the piston-rod with the crank-arms, as shown.

To the upper side of the bar M is pivoted, at O, a lever, L, one end of which is pivoted to a fixed collar, W, upon the cut-off B, and the other end of which plays in a cam-groove cut in the periphery of the wheel N.

The parts being disposed as described, the operation of my invention is as follows: The water or other fluid entering at A (the pipe B being in the position shown in Fig. 1) is directed into the cylinder K above the piston-head in such cylinder. It causes the piston, therefore, to recede, and with it the piston-rod H and connecting-rod F, the collar 1 sliding between the guides G and M. The movement of the connecting-rod F revolves the compound crank-arm R within its bearings, causing a like revolution of the cam-wheel N toward the cylinders K K′. During the greater part of this movement the free end of the cut-off lever L travels along that part of the cam-groove which is nearest and parallel to the outer edge of the wheel N. When the piston begins to approach the end of its stroke, the free end of the lever enters the diagonal cross-groove leading to the straight groove on the other side of the wheel. The lever accordingly turns upon the pivot D, and that end which is attached to the collar W moves toward the cylinder K′. The cut-off or main valve B accordingly moves with it, turning upon the pivot Y and knuckle-joint D,

first closing off the supply to the cylinder K, as shown in Fig. 3, and finally reaching the position shown in Fig. 2, wherein its open end is situated directly in front of the open end of the cylinder K′. The motive current is accordingly diverted from cylinder K to cylinder K′, and is directed upon the piston-head in the latter cylinder, which in the meantime has advanced from the position shown in Fig. 1 to that shown in Fig. 2. The fly-wheel Q enables the cut-off to pass the dead-point between the two cylinders without sensible diminution of speed. The free end of the lever enters the straight groove on the opposite side of the wheel N just as the pipe B comes in line with the cylinder K′. The piston of the latter, its piston-rod F′, and connecting-rod E′ are accordingly driven outwardly, and a second half-revolution in the same direction as before is given to the wheel N and the power-shaft through the medium of the crank R′. At each succeeding half-revolution the cut-off is oscillated from one cylinder to the other, and consequently a continuous rotary motion is imparted to the power-shaft, irregularities in the motion being equalized and dead-points overcome by the fly-wheel Q, or if the cranks are arranged at right angles to each other the engine will overcome the dead-centers itself. The motion may be transmitted to the point of use by means of a band adapted to fit over the fly-wheel. The pivot Y may, if desired, be dispensed with; but I prefer to use it for the reason hereinbefore set forth.

Instead of pivoting the lever L to the collar W, the latter may be loose and the lever L rigidly attached to it.

I have described my engine as in a horizontal plane. It may, however, be vertically superposed upon a structure, Figs. 1 and 2 being in each case elevations of the same. The liquid contained in each cylinder at the end of their respective strokes is expelled during the succeeding return-stroke through the port-holes T T into a convenient discharge-pipe connected with the latter.

Where the engine is used in the open air in mill-work and the like, the chamber C may be entirely dispensed with, and in its place four or more brace-rods, *e*, connecting the cylinders K K′ with the inlet-pipe A, may be substituted, the exhaust-outflow escaping directly upon the ground or in the stream.

It is evident that by suitable provision a machine constructed on the principle of my liquid motor may be advantageously employed with any aeriform fluid—such as steam, gas, air, ammonia, and the like. It would be necessary in such case to add suitable stuffing-boxes, packing, and the like, as is well understood. For the same power, moreover, a lesser diameter for such fluids would be necessary than for hydraulic purposes.

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

1. In a motor, the combination, with the supply-pipe, of the double-acting cylinders and the oscillating cut-off or valve, the latter being connected with the cylinder-pistons by intermediate cam mechanism, substantially as described.

2. In a motor, the combination, with the supply-pipe, of an oscillating cut-off or valve, twin cylinders provided with double-acting pistons connected with and operating two crank-shafts, a grooved cam-wheel, and a pivoted cam-lever loosely connected at one extremity to the end of the cut-off and its free extremity playing in the cam-groove, substantially as described.

3. In a motor, the combination, with the cylinders and the main supply-pipe, of the automatic cut-off or valve described, consisting of a pipe-section connected with the cylinders by a sliding joint and with the supply-pipe by a knuckle-joint, substantially as set forth.

4. The combination, with the supply-pipe, the double-acting cylinders having dished or concaved heads, and the oscillating cut-off having curved basal flange, of intermediate valve mechanism connected with the cylinder-pistons, substantially as and for the purpose set forth.

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

WILLIAM W. WOODBURN.

Witnesses:
O. E. DUFFY,
F. O. MCCLEARY.