(No Model.) 2 Sheets—Sheet 1.

W. A. WOOD.

HYDRAULIC MOTOR.

No. 479,868. Patented Aug. 2, 1892.

Fig. 1

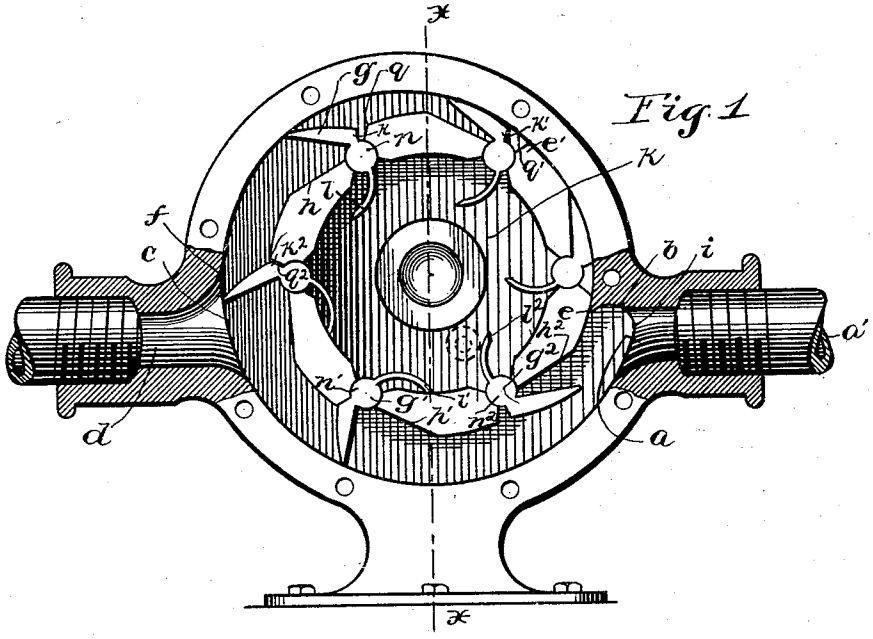
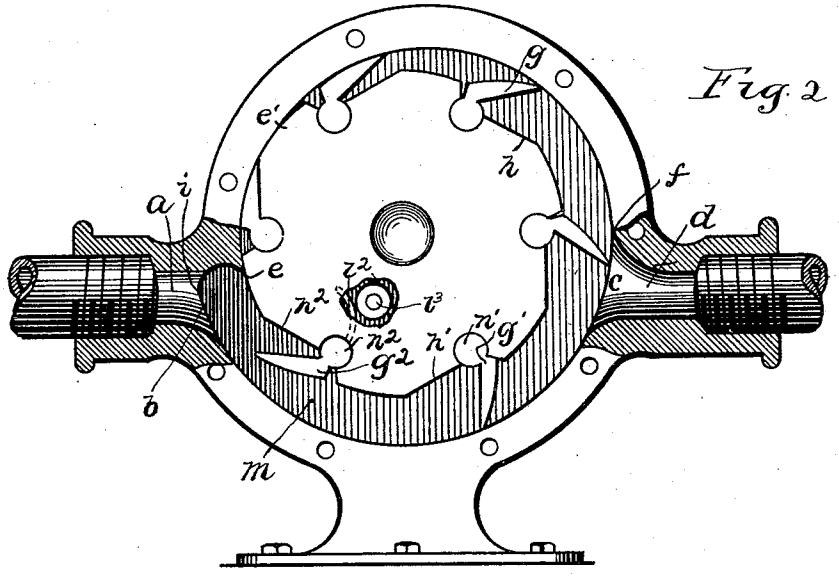


Fig. 2



Witnesses
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

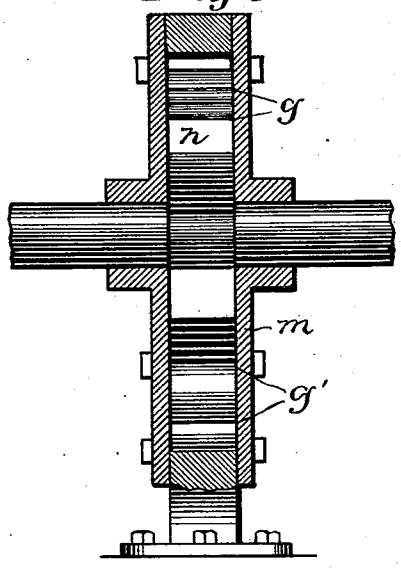
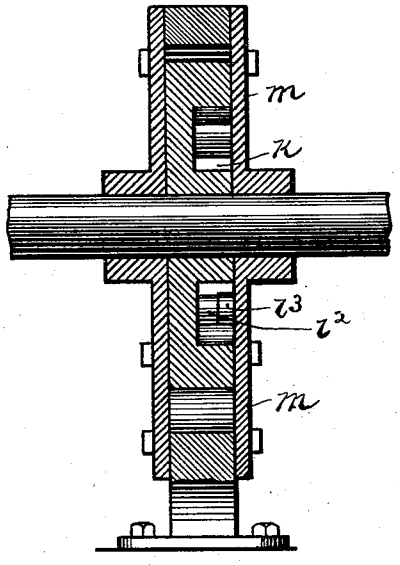


Fig. 4



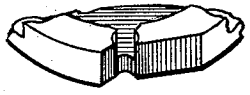


Fig. 5

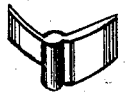


Fig. 6

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UNITED STATES PATENT OFFICE

WILLARD A. WOOD, OF BROOKLYN, NEW YORK.

HYDRAULIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 479,868, dated August 2, 1892.

Application filed January 9, 1892. Serial No. 417,448. (No model.)

To all whom it may concern:

Be it known that I, WILLARD A. WOOD, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Hydraulic Motors, (Case No. 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to hydraulic motors. Its object is to provide means whereby the blades or buckets of the motor may receive and utilize the full impact and also the pressure of the water and at the same time to overcome the harmful effects and waste of energy caused by back-pressure.

In the previous manufacture of hydraulic motors much time and thought have been expended on the construction of the bucket. None has been made to my knowledge which will not churn the water upon discharging it; nor have any been made which will overcome the resistance offered by the large amount of wet surface they expose. My invention is particularly designed to overcome this large waste of energy.

A better understanding of my invention will be had by reference to the accompanying drawings, in which—

Figure 1 is a side view of my motor with the front portion of the case removed, so as to disclose the blades, buckets, or valves and the positions which they assume during the revolution of the wheel. Fig. 2 is a view from the other side. Fig. 3 is a front view with the casing in section. Fig. 4 is a sectional view on line $x\ x$ of Fig. 1. Fig. 5 is a front perspective of one of the bearings in which the blades or buckets rest and partially revolve. Fig. 6 is a perspective view of one of my blades.

Like parts are indicated by similar letters of reference throughout the different views.

Referring now more particularly to Figs. 1 and 2, I show an opening provided at a, through which water is admitted from supply-pipe a'. After having entered, the water passes through that portion of the annular space between points b and c, performing its work in its passage and discharging at opening d. The space in which the wheel proper revolves is bounded by the arcs of three circles, two of the arcs being arcs of concentric circles and the third arc joining them.

The radii from the center of the wheel to the points $e\ e'$ of the case are equal to the radius of the wheel. From point e' of the case to point f is described an arc with its center removed such a distance from the center of the wheel as to afford a gradually-contracting space, which causes the blades $g\ g'$ g^2, &c., to gradually seat themselves upon the plane surfaces $h\ h'\ h^2$, cut in the rim of the wheel.

It is desirable that the annular space between the wheel and casing which forms the passage for the water shall be sufficient to allow the full play of the blades with as little clearance as possible. It must on this account be uniform. Therefore with a center coincident with that of the wheel I describe an arc from point f to point i, where the annular space suitably terminates. The difference between this radius and that of the wheel is sufficient to permit of the full extension of the blades.

My wheel is of a useful and original construction. Referring to Figs. 1 and 4, it will be seen that an annular space k is provided between the rim and hub, thus allowing full play of the arms $l\ l'\ l^2$ of the blades. Pin l^3 (shown in dotted lines in Fig. 1) is fastened firmly upon case-plate m and adapted to move within the annular space k and to be in the path of the arms of the blades, as hereinafter specified. The blades or valves are of a width equal to the distance between the case-plates, as most clearly shown by reference to Fig. 3. These blades are provided with journals $n\ n'\ n^2$, as most clearly shown in Fig. 6, which fit snugly in bearings provided for them in the rim of the wheel. (Clearly shown in Fig. 5.) The arms of said blades are preferably made in the manner shown. The blade proper, journal, and arm are preferably made of one piece of metal.

We will suppose the motor to be set in motion. The water upon entering strikes against a blade g^2, put in position by its arm coming in contact with lug l^3. This lug or pin turns the blade in its bearing, removing it from its resting-place provided in the periphery of the wheel, thus exposing its surface to the wa-

ter. In order to allow the blades to withstand the pressure of the driving fluid, I provide shoulders k k' k^2 upon them and corresponding seats q q' q^2, adapted to support said shoulders, in the rim of the water-wheel. By this means the blades are allowed to receive the full force of the impact of the fluid, and the shoulders of the blades being firmly seated upon their corresponding seats while said blades are being pressed by the fluid causes the wheel to be rotated. This operation is repeated by the lug and the blades as fast as the latter are caused to come in contact with the former by the revolution of the wheel. The water is thus aided in its office by the lug l^3 and the arms of each of the blades. The blades upon passing point e' are entirely closed, the plane surfaces of said blades coinciding with the plane surfaces or seats before mentioned and the convex surfaces thereof falling flush with the periphery of the wheel and the concave surface of the casing. By this means and construction I entirely obviate back-pressure.

The construction of the blade is especially valuable to overcome the churning before mentioned.

The water-wheel I have described and shown is one known as an "overshot water-wheel." By placing the supply of water on a level with the horizontal diameter my motor would assume the form of a breast-wheel. By placing the supply of water above the level of the horizontal diameter of the wheel my motor would be known as an "overshot water-wheel."

In the modifications mentioned the position of the wheel proper with reference to the supply must be relatively the same as that shown and described. By inclining the plane surfaces of the blades sufficiently I can form my motor into a horizontal overshot water-wheel or a sort of turbine.

I do not desire to confine myself to the precise manner of construction shown and described, as my invention admits of several mechanical changes without any alterations of its principles. More especially do I not desire to limit myself to the peculiar form of blade and arm shown nor to the method of mounting and operating the same.

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

In a hydraulic motor, the combination, with the inclosing case, whose inner surface is that of three arcs of circles, two being concentric and united by the third, of an inlet leading into and an outlet leading from the portion of said case having the greatest radius, said inlet being immediately adjacent to the portion of the case having the shortest diameter and said outlet being provided with a flaring opening from the case, a rotating disk having a radius equal to the shortest radius of the interior of the inclosing case, said disk being mounted in said case and adapted to rotate therein with its periphery in contact with the inner periphery of the case at the point thereof having the shortest radius and immediately above the inlet, and swinging gates attached to said rotating disk, said gates being provided with arms adapted to engage with a pin and to open to receive the impact of the liquid entering through said inlet, said gates being also provided with shoulders adapted to rest upon seats provided upon the periphery of said disk, whereby said gates are held to receive the impact of the liquid entering the inlet and said disk is caused to revolve, substantially as described.

In witness whereof I hereunto subscribe my name this 23d day of December, A. D. 1891.

WILLARD A. WOOD.

Witnesses:
GEORGE P. BARTON,
GEORGE L. CRAGG.