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HYDRAULIC DEVICE FOR PUMPING AND OTHER PURPOSES.

APPLICATION FILED MAY 5, 1915.

1,279,912. Patented Sept. 24, 1918.

Fig. 1.

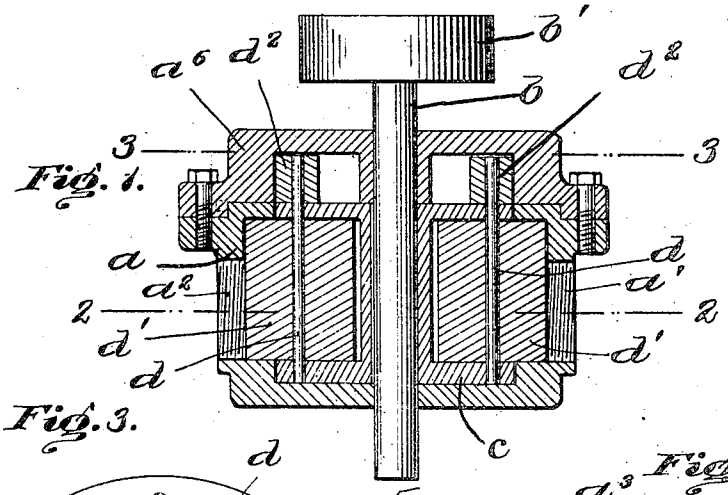


Fig. 3.

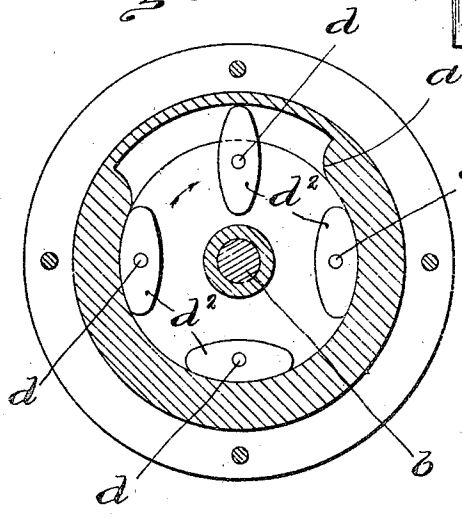
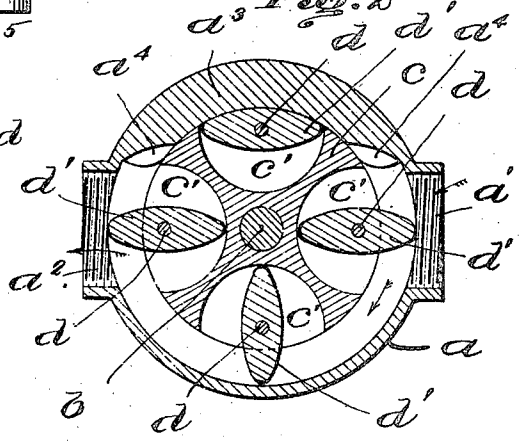


Fig. 2.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC DEVICE FOR PUMPING AND OTHER PURPOSES.

1,279,912. Specification of Letters Patent. Patented Sept. 24, 1918.

Application filed May 5, 1915. Serial No. 25,949.

To all whom it may concern:

Be it known that I, EUGENE ROBERTS, citizen of the United States, and resident of Salt Lake City, Utah, have invented certain new and useful Improvements in Hydraulic Devices for Pumping and other Purposes, of which the following is a specification.

This invention relates to hydraulic devices capable of use for pumping liquids and which are reversible in respect to the power applied so as to render them capable of use as water-driven motors.

The present invention consists essentially in a hollow casing in which is mounted a planetary arrangement of rotatable revolving vanes so related to the surrounding casing as to expel through a suitable outlet the water which is admitted through an appropriate inlet passing around one side of the casing, the vanes being operatively controlled by suitable abutments or stationary cam surfaces properly located within the casing. The main revolving element is rotated continuously in one direction, while the individual vanes or blades are intermittently rotated on their individual axes through engagement with the side of the casing at predetermined intervals in their revolving movement.

These and other features of the invention will be described in detail hereinafter and will be defined in the claims annexed hereto.

In the accompanying drawings I have illustrated a simple and efficient form embodying the principles of this invention, in which:

Figure 1 is a vertical central section of the assembled device.

Fig. 2 is a horizontal section on the plane 2—2 of Fig. 1.

Fig. 3 is a horizontal section on plane 3—3 of Fig. 1.

I have herein shown the apparatus designed to be operated as a pump through the agency of the driving pulley b' attached to the central shaft b, to which central shaft is secured a revolving member or wheel c formed with a series of peripheral pockets or recesses c', in each of which is mounted a rotatable shaft d parallel with the axis of rotation of the revolving member c, around which a series of shafts d are concentrically arranged.

These pockets are of approximately semi-cylindrical form and are slightly shorter than the axial depth or length of the revolving wheel or rotor so as to close the ends of said pockets, the opposite ends of the rotor form, as it were, heads closing the opposite ends of the pockets.

On each shaft d is secured a blade or vane d' whose opposite sides are preferably curved to conform to the curvature of the circumference of the wheel or revolving member c. The vanes are of a size to lie wholly within their respective recesses when they are in feathered or inactive position.

An approximately cylindrical hollow casing a provided with an inlet opening a' and an outlet opening a^2 surrounds the central revolving member. On one side for somewhat more than semi-circumference there is an annular clearance space between the peripheral wall of the casing and the periphery of the revolving wheel c and this forms the water or piston passage through which water flows from the inlet a' to the outlet a^2. On the opposite side between the inlet and the outlet passages, the wall of the casing is extended inwardly to the peripheral line of the revolving member c, as indicated at a^3, so that the opposite sides of the casing are concentric with the axis of the wheel but are described on radii of unequal length.

The thickened portion a^3 of the peripheral wall of the casing forms, so to speak, an abutment extending to the line of the revolving wheel to completely cut off the passage of water from the inlet to the outlet around this side of the wheel. The extremities of this abutment are suitably curved to form a cam surface which acts by contact with the successive vanes to turn the vanes into inoperative or feathered position while they are passing through this portion of their revolution. The cylindrical surface of the abutment a^3 when the vane is formed and arranged to rest in close contact therewith, serves to keep the vane perfectly feathered during this part of its revolution.

Both sides of the vanes are symmetrically

curved with relation to their individual supporting shafts in order that the opposite sides of each vane may, on alternate revolutions of the rotor, form suitable contact with the correspondingly curved concave face of the abutment a^3.

To allow the escape of water from each successively passing recess or pocket c', the end shoulders of the abutment a^3 are cut away for a portion of their depth, as indicated at a^4, so that the water displaced from the pocket by the turning of the vane therein as the vane engages the shoulder may escape through this passage to the outlet a^2. Since the device is reversible, these passages a^4 are provided at each end of the abutment.

While the vanes are turned into feathered position by contact with the side of the casing, as above described, other provision must be made for turning and maintaining them in their radial position while they are passing through the working portion of their revolution. To this end the shafts d are extended out through one of the heads of the revolving member or wheel c a sufficient distance to receive a series of actuating buttons or cams d^2 which are secured to their outer ends and which are arranged to engage an inwardly projecting ledge or abutment a^5 formed on the inside encircling face of the cover section a^6 of the casing. These buttons or cams d^2 are similar in contour or cross section to the vanes themselves and are secured to the vane shafts at substantially right angles to the vanes so that each cam button will be in feathered or circumferential position when the vane is in radial position, and will be in radial position when the vane is in circumferential or feathered position. The ledge or abutment forming the cam surface for operating and controlling the cams d^2 is located on the opposite side of the casing to the ledge or abutment a^3 which acts directly upon the vanes, but, of course, in an axially off-set plane to correspond to the plane of the cams.

The upper section or cover a^6 is tightly bolted to the lower section so that it can be readily removed when desired.

The structure and operation are very simple. Each vane in its feathered position approaches the inlet opening a' through the movement of the revolving wheel or spider c. Immediately upon its approach, its radially extended button d^2 engages the adjacent shoulder of the ledge or abutment a^5 so that the further revolution of the wheel turns the button in a contra-clock-wise direction into its circumferential position, and simultaneously through the connecting shaft d, the vane is turned into radial position with its outer edge in contact with that portion of the peripheral wall of the casing that bounds the annular water passage. As the blade is maintained in this radial position by its cam d^2 in contact with the abutment or track a^5, it pushes the column of water in front of it to the outlet opening a^2. As the blade passes the outlet opening, its cam button loses contact with the cam surface or abutment a^5 while the blade itself engages the adjacent shoulder or end of the ledge a^3 and is turned to feathered position entirely within its pocket, with its opposite or reverse side outward to contact with the concave face of the abutment a^3. The individual rotative movement of each vane is always in a direction opposite to the direction of rotation of the rotor itself, hence, this results in alternately exposing opposite sides and opposite ends of the individual vanes to contact for engagement with the surrounding wall of the casing and by distributing wear, prolongs the life of the parts.

No change in the structure of the device is needed to convert it into a motor or meter, since if the water under pressure enters at a' it will force the successive blades or vanes around to the outlet, whence it escapes, thus continuously maintaining the rotation of the wheel c by its pressure, and transmitting the power through the shaft b and the pulley b' to any desired apparatus. By reversing the flow of water, the wheel may be revolved in the opposite direction.

It will be seen that each blade or vane has a substantially planetary movement. That is, it is revolved or carried around the central axis bodily while it is rotated on its own individual axis by reason of the revolving motion, each complete revolution involving a half rotation of the vane.

As the bearings in the two sections of the casing can be made perfectly water-tight, and as the joint between the two casings can also be made perfectly water-tight, it will be seen that the possibility of leakage is reduced to a minimum, while the device has perfect accessibility, since the removal of the cover a^6 allows all the vanes to be turned to feathered position to permit the revolving wheel, the vanes and the shaft to be lifted axially entirely out of the casing.

In cases where large vanes or high pressures are used it may be advantageous to extend the vane or blade shafts d through both heads of the revolving member and provide both ends of the casing with removable cover sections a^6 formed to engage cam buttons on both ends of each shaft in order to equalize and balance the torsional strains.

What I claim is:

1. A device of the class described embracing in its construction a central shaft, a rotatable drum secured thereto and provided with a series of peripherally arranged pockets, a series of vanes pivotally mounted in said pockets, said vanes having their opposite sides symmetrical to their individual axes, a surrounding casing whose surround-

ing wall for a portion of the circumference is located at a distance from the periphery of said rotor to leave an annular clearance or piston chamber, the opposite portion of its wall being located to form a close contact with the periphery of said rotor with its end portions forming an abutment or cam surface to engage the projecting ends of the successive blades to cause them to fold within said drum, and means secured to the individual vane shafts for turning them again to extended position, substantially as described.

2. A device of the class described embracing a central rotary shaft, a wheel secured thereto, a series of vanes concentrically arranged around said wheel and pivotally mounted therein, a surrounding casing, a portion of whose circumferential wall forms a close contact with the periphery of the wheel, the opposite portion of said wall being concentric with the wheel but lying in a circle some distance beyond the periphery of the wheel, and means for turning the individual vanes from circumferential to radial position and from radial to circumferential position at predetermined points in the revolution of the wheel, said means and the vanes co-acting with cylindrically curved portions of the surrounding casing to positively maintain the vanes alternately in radial and in circumferential positions, substantially as described.

3. The combination of a hollow casing provided with inlet and outlet passages, a central revolving wheel, a series of separate rotatable vanes arranged concentrically in said wheel upon individual axes parallel with the wheel axis, a circumferential abutment or ledge located on one side of the casing between the inlet and the outlet passages to engage the successively approaching vanes and turn them to feathered position, and means for turning the vanes successively to radial position after they have passed by said abutment, substantially as described.

4. The combination of a central shaft a revoluble wheel secured thereto and provided with approximately semi-circular recesses in its peripheral portion, a casing surrounding said drum and having its interior encircling wall formed on cylindrical curves of different radii, the portion of the wall having the shorter radius of curvature lying in contact with the periphery of the wheel, vanes pivotally mounted in said recesses to have a rotating movement during the revolution of the wheel, and alternately moving from circumferential position within their recesses to extended operative position in contact with the portion of the casing having the larger radius of curvature, cam like controlling members operatively connected with the respective vanes, an encircling casing inclosing said cam members having an interior cylindrical portion arranged to engage and control the position of said cam members during a portion of their revolution whereby the vanes are moved alternately into idle and into operative positions and positively maintained in such positions for suitable intervals of time by the engagement of the vanes of the cam members with their respective encircling walls, substantially as described.

5. The combination of a revolving wheel, a series of rotatable shafts mounted in said wheel around and equidistant from the central axis of the wheel and in parallelism with said axis, a series of vanes secured to said shafts to lie within the periphery of the wheel when turned to circumferential position and to extend radially beyond the wheel when turned to working position, a series of cam buttons secured to said vane shafts, and means located inside of the circumferential wall of the casing to engage in alternation each vane and its cam button in order to turn the vane alternately to circumferential and to radial relationship with the revolving wheel, substantially as described.

6. The combination of a hollow casing whose circumferential wall has opposite interior cylindrical faces described about unequal radii and is provided with inlet and outlet passages, said casing being open at one end, a removable cover section for closing the open end of said casing, a revolving wheel centrally mounted in said casing, a series of vanes mounted on rotatable shafts with their opposite sides formed symmetrically to their shafts and extending axially of said wheel and arranged around and equidistant from said axis, a series of buttons secured to the projecting ends of said shafts in position to engage the inside face of the cover for a portion of its circumference, substantially as described.

7. The combination of a hollow casing having inlet and outlet openings, a revolving wheel centrally mounted inside said casing, a series of individually rotatable vanes mounted in peripheral recesses in said wheel, the opposite sides of said vanes being curved to conform to the curvature of the periphery of said wheel, a series of vane-controlling buttons connected with the respective vanes and extending at right angles thereto, a removable cover section secured to one end of said casing, an annular abutment formed on the inside of the casing and of the cover respectively on opposite sides of the center for engaging and rotating the vanes and the buttons in alternation, substantially as described.

8. A device of the class described embracing in its construction a rotor mounted on a central shaft, a series of rotatable vanes mounted in peripheral recesses formed

in said rotor, a series of cam members connected to said vanes by co-axial connecting means, a surrounding casing whose inside wall is formed to cooperatively engage said vanes and said cam members, respectively, to maintain an operative engagement with each cam member while its vane is in extended or operative position and to alternately engage the vane and the cam member to impart rotating movement to the vane in a direction opposite to the direction of rotation of the rotor, substantially as described.

In witness whereof, I have subscribed the above specification.

EUGENE ROBERTS.