Feb. 9, 1943. A. M. TAYLOR 2,310,816

WATER MOTOR

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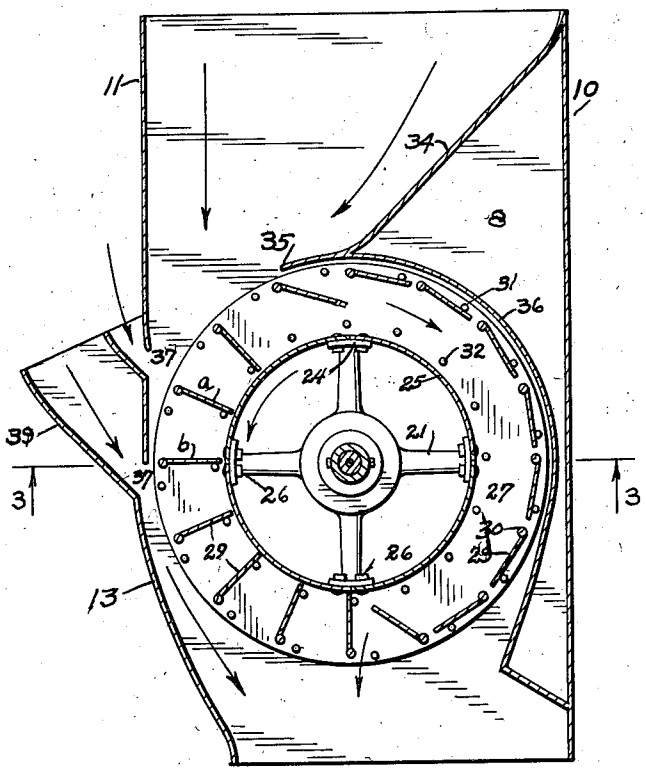

FIG. 2.

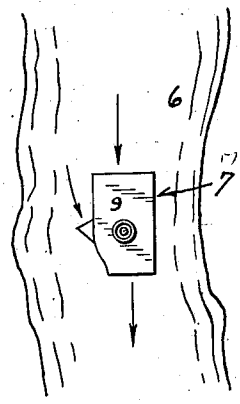

FIG. 1.

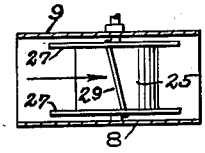

FIG. 4.

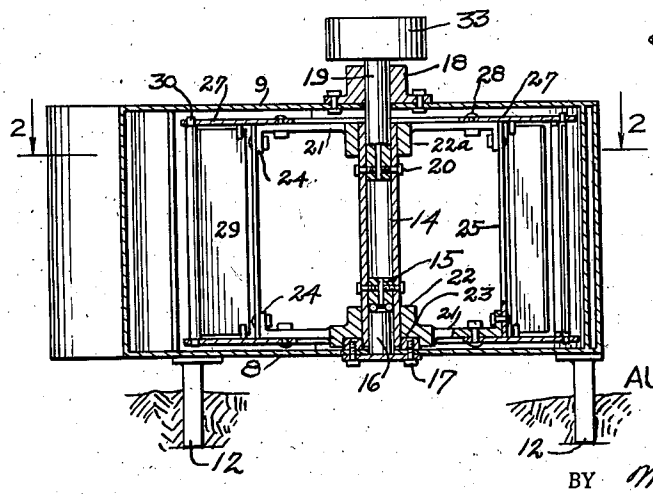

FIG. 3.

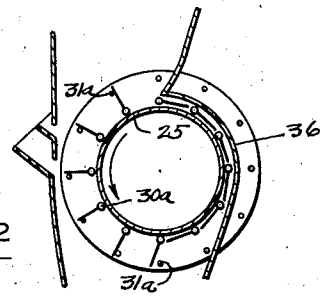

FIG. 5.

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WATER MOTOR

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2 Claims. (Cl. 170—119)

This invention relates to improvements in water motors of the type sometimes referred to as immersible stream operated water motors.

It frequently happens that a stream of water of considerable volume is available and that an easy and convenient manner of obtaining power from such stream is desirable.

In the ordinary method of converting the potential energy of a stream of water into power, it is customary to build a dam and direct the water into a reaction turbine or an impulse turbine. Such a procedure naturally involves a large amount of labor and expense which is warranted only where a permanent power installation is desired. It is the object of this invention to produce a water motor that can be quickly positioned in a stream of water and which can be made available for the production of power with a comparative small amount of labor and in a short time. Such water motors are especially well adapted where the use of the power is of a temporary nature and where the production of power is desired at different points along the stream.

This invention, briefly described, consists of an elongated casing, preferably formed from sheet metal, which has a top and a bottom spaced by side walls in such a way as to form a housing, open at both ends. This housing is provided with means for anchoring it in the bottom of a stream in a position where the water may flow through the housing. A water wheel is mounted for rotation within the housing and a deflector extends from the intake end of one side wall inwardly inclined, towards the opposite wall so as to direct the stream of water into the space between the wheel and the other wall. The wall against which the stream is directed is preferably provided with an arcuate section and the center of the wheel is positioned a short distance nearer the inlet opening than the center of the arcuate section so that the space between the wheel and the arcuate section increases in the direction of the outlet opening. The wheel is provided with a plurality of angularly spaced vanes that are mounted for pivotal movement about the axes in such a way that they can move from positions substantially radial to positions substantially tangential to the wheel.

Having thus described the invention in a general way, the same will now be described in detail and for this purpose reference will be had to the accompanying drawing in which the invention has been illustrated, and in which:

Figure 1 is a view showing a stream and showing the water motor positioned therein;

Figure 2 is a section through the water motor, taken on line 2—2, Figure 3;

Figure 3 is a section taken on line 3—3, Figure 2;

Figure 4 is a diagrammatic view showing a slightly modified form of construction; and

Figure 5 is a horizontal section somewhat similar to that shown in Figure 2, and shows another modification.

In the drawing reference numeral 6 indicates a stream of water and reference numeral 7 indicates a water motor positioned therein.

In Figure 2 a horizontal section of the water motor has been shown and from this, as well as from Figure 3, it will be observed that the water motor consists of a bottom 8 and a top 9 that are connected along opposite edges by side walls 10 and 11. The ends are open and the end at the top of Figure 2 is the intake, while the outlet is located at the bottom as indicated by the arrows. Secured to the bottom are a plurality of anchoring legs 12 that are immersed in the bottom of the stream and serve to hold the motor in place during operation. The side wall indicated by numeral 11 is provided with an arcuate section 13. Positioned in the housing and mounted for rotation in suitable bearings is a water wheel which will now be described. The water wheel consists of a tubular center member 14 that is provided near its lower end with an elongated ball race 15 which cooperates with an upwardly projecting ball race 16 secured to the bottom 8 by means of bolts or screws 17. Secured to the upper surface of the top 9 is a bearing 18 in which the shaft 19 is journalled. The shaft extends into the upper end of tubular member 14 and is held against rotation by means of bolts or set screws 20. Secured to the tubular member 14 are two spiders, each having at least four spokes 21 radiating therefrom. The lower spider has a hub 22 provided with an opening for the reception of the lower end of tubular member 14 and is provided on its lower surface with a rabbet 23. A ring is secured to the upper surface of the bottom 8 by the screw 17 and extends into the rabbet 23. The upper spider has a hub 22a which may be of the same construction as the one at the bottom but which has been shown as of slightly different design. Each spoke is provided with an angular projection 24 to which the arcuate segments 25 that form the cylindrical portion of the hub are secured by means of bolts or rivets 26. Annular sheets or plates 27

are attached to the spokes by means of bolts **28** and project some distance beyond the cylindrical hub plates **25** as shown quite clearly in Figures 2 and 3. A plurality of vanes **29** are each provided along one edge with a pivot **30** that projects through openings in the plates **27** and form pivots about which the vanes can turn. These pivots are spaced at equiangular distances as shown quite clearly in Figure 2 and stops **31** are provided which limit the outward movement of the vanes to a substantially tangential position. Other stops **32** are provided in the plates **27** adjacent the cylindrical plates **25** and serve to limit the inward movement of the vanes to a substantially radial position as shown in Figure 2. It is possible to omit the stops **30** and make the vanes slightly wider than the distance between the pivots, in which case the pivots **30** serve as stops, thereby avoiding the use of stops **31**. This construction is shown in the upper vane in Figure 2.

Secured to the upper end of shaft **19** is a pulley **33** from which power may be transmitted through the medium of a belt. An inclined deflector plate **34** extends from the intake end of the side wall **10** in a downwardly inclined direction as shown in the upper part of Figure 2 and terminates at point **35**. The water which enters the inlet opening is deflected by means of plate **34** towards the opposite side wall and flows downwardly between the side wall **11** and the cylindrical hub **25** of the water wheel. Any of the vanes that are positioned to the left of the vertical diameter of the wheel, as shown in Figure 2, turn about their pivots into substantially radial positions and the movement of the water acting against the vanes produces a counterclockwise rotation of the water wheel. All of the vanes on the right side of the water wheel will turn into tangential positions as shown thereby leaving a free space from the inlet opening to the outlet through which water may flow. The water that flows down along the righthand side of the wheel subtracts to some extent from the power generated, but due to the inclined deflector **34**, that directs the water towards the other side of the wheel, the objectionable action of this stream is reduced to a negligible amount.

In the drawing a curved wall **36** extends along the periphery of the wheel at the right of Figure 1, but this wall can be omitted without any seriously objectionable results when the wheel is constructed as shown in Figures 2 and 3. When the wheel is constructed as shown in Figure 5, the wall **36** serves a useful purpose.

It is evident that any water trapped between two adjacent vanes, as, for example, between the vanes *a* and *b* shown to the left in Figure 2 adds nothing to the power developed and in order to subject as many of the vanes to the reaction of moving water through as long a distance as possible, wall **11** has been provided with one or more openings **37** and deflector plates **39** extend upwardly from points below these openings for the purpose of directing water inwardly and into the space between the water wheel and the arcuate section **13** of the wall. By thus introducing water at different places, a greater amount of power is obtained than if a single stream would be depended on.

Attention is called to the fact that the outlet is of sufficient capacity to let the water escape freely so as to reduce to a minimum any back pressure. In the construction shown in Figures 1 and 2, the vanes lie in axial planes when in their radial positions. It is desirable at times to incline the vanes in the manner shown in Figure 4 so as to get an upwardly directed force which tends to lift the wheel from its bearings. This is, however, a refinement that is only occasionally resorted to.

In Figure 5, a slightly modified form of construction has been shown. In this modification the pivots **30***a* which correspond to pivots **30** in Figures 1 and 2 are positioned adjacent the cylindrical surface **25** and the vanes sweep outwardly against stops **32***a*. This construction permits the vanes to move into tangential position adjacent the cylindrical hub and thereby obstructs the passageway for water along the righthand side of the wheel. In some cases this is found to be a preferable construction. It might appear from Figure 5 that the vanes would experience some difficulty in moving from the tangential to the radial positions, but due to the fact that the water pressure is the same on both sides of the vanes, the force of the incoming water very quickly sweeps them outwardly against the stops **31***a*.

It will be observed that shaft **19** has an axial opening and that the ball race **15** is also provided with an axial opening. The machine is lubricated by inserting a lubricant under pressure through the shaft **19** and forcing it down through the ball race **15** whence it will pass through the ball bearing, thence around the pivot **16** and between the wall of the recess **23** and the surface of ring **24**. The grease or lubricant below the bearing serves as a seal and in this way the bearing can always be properly lubricated.

From the above description it will be apparent that the water motor described is of exceedingly simple construction, that it can be readily transported and positioned in any suitable stream, that as soon as it has been positioned in the stream it is ready to operate and power can be transmitted from the pulley **33** to the shore by any suitable means.

Having described the invention what is claimed as new is:

1. A water motor comprising, a housing having a top and a bottom connected by two spaced side walls, one at least of which has an arcuate portion curved about a center positioned between the walls, both ends of the housing being open, the end facing the concave side of the arcuate portion being the intake, a water wheel in the housing, mounted to rotate about an axis perpendicular to the top and bottom, said water wheel having a central hub and spaced sides projecting radially beyond the hub, a plurality of angularly spaced pivots extending between the sides near their peripheries, vanes carried by said pivots, stops for limiting the angular movements of the vanes, towards the hub, to substantially radial position, the vanes being slightly wider than the distance between the pivots whereby they will be limited in their movements away from the hub to positions substantially tangential, a deflector in the entrance opening for directing the water into the space between the wheel and the arcuate side wall, the vanes being movable to radial position in the direction of wheel rotation, the arcuate wall having at least one opening and an outwardly and upwardly extending deflector plate attached to the housing below the opening, for directing water through the opening and into the housing.

2. A water motor comprising, a housing having a top and a bottom connected by two spaced side walls, one at least of which has an arcuate portion curved about a center positioned between the walls, both ends of the housing being open, the end facing the concave side of the arcuate portion

being the intake, a water wheel in the housing, mounted to rotate about an axis perpendicular to the top and bottom, said water wheel having a central hub and spaced sides projecting radially beyond the hub, a plurality of angularly spaced pivots extending between the sides near their peripheries, vanes carried by said pivots, stops for limiting the angular movements of the vanes, towards the hub, to substantially radial position, stops adjacent the peripheries of the sides, positioned to be engaged by the vanes to limit their movements away from the hub to positions substantially tangential, a deflector in the entrance opening for directing the water into the space between the wheel and the arcuate side wall, the vanes being movable to radial positions in the direction of wheel rotation, the arcuate wall having at least one opening and an outwardly and upwardly extending deflector plate attached to the housing below the opening for directing water through the opening into the housing.

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