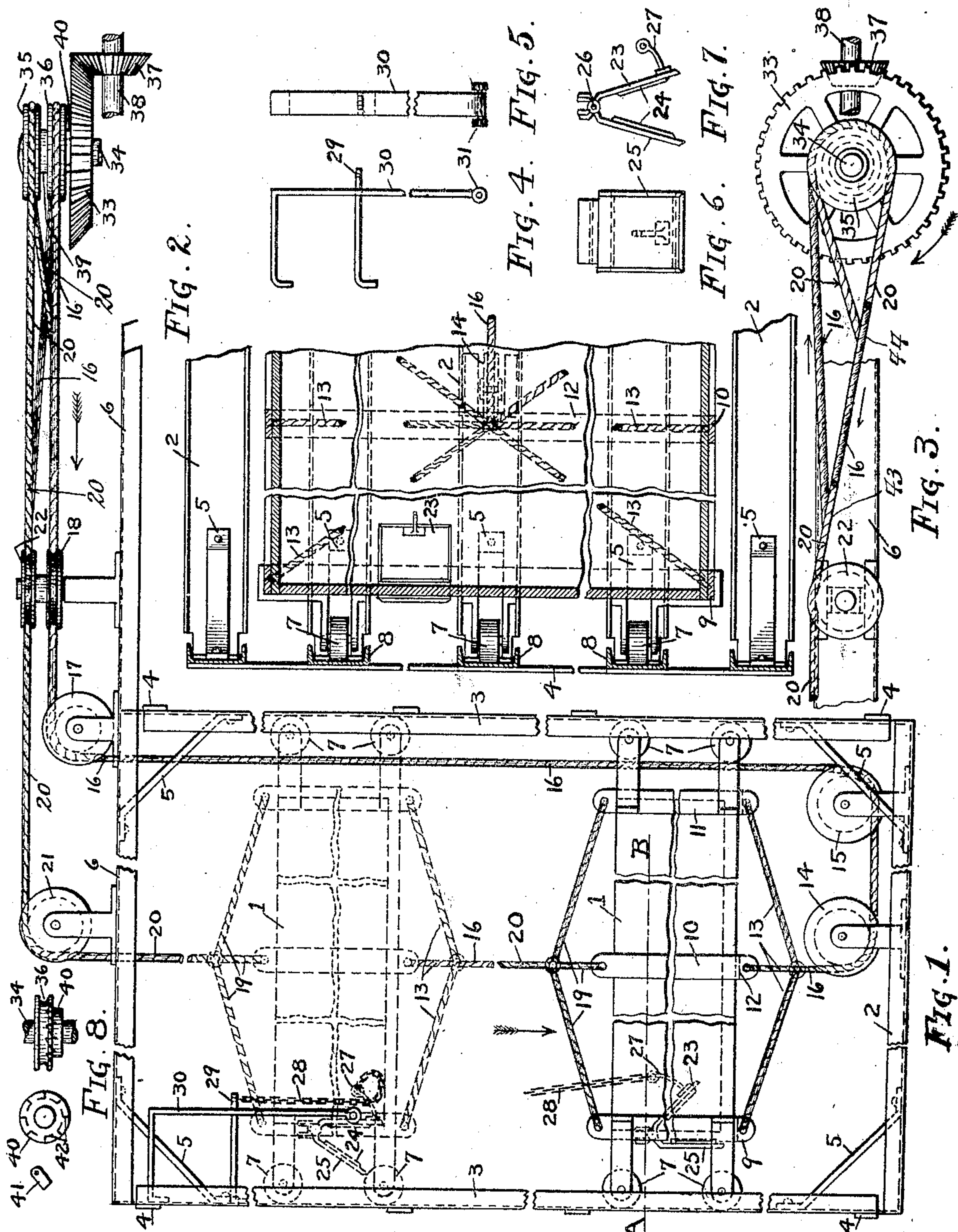


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TIDE AND WAVE MOTOR.  
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925,581.

Patented June 22, 1909.



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## TIDE AND WAVE MOTOR.

No. 925,581.

Specification of Letters Patent.

Patented June 22, 1909.

Application filed April 4, 1908. Serial No. 425,098.

To all whom it may concern:

Be it known that I, CHARLES S. KENDALL, a citizen of the United States, residing at the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Tide and Water Motors, of which the following is a specification.

This invention relates to an improvement in devices for utilizing water for the purposes of generating continuous power, and the object is to provide an apparatus whereby the rise and fall of the tide either of the sea, river, tributary streams, and reservoirs connected therewith may be utilized to produce power for the operation of machinery of various kinds and for various purposes, the results being accomplished both in the rise and in the fall of the tide, or other rise and flow of water operating upon the device which I have invented.

With this and other objects in view, the invention consists in certain constructions and combinations of parts which will be hereinafter fully described and then specifically pointed out in the claims hereto appended.

In the accompanying drawings, which form part of this specification, and in which like characters of reference indicate the same parts, examples of my invention are disclosed.

Figure 1 is side view of an example of my invention, in which the tank is shown in full lines at its lower position, and in dotted lines at its higher position. Fig. 2 is a sectional view of part of Fig. 1, indicated by the line A, B, looking in the direction of the arrow. Fig. 3 is a top view of a device to which power may be applied by my invention, and such as is indicated connected with the device shown in Fig. 1. Figs. 4, 5, 6, 7 and 8 are views of details.

In carrying out the invention, I provide one or more suitable tanks, such as or similar to the one shown at 1, which is arranged to float upon the water at low tide, and is placed in position within a suitable frame. This frame may be constructed of base pieces, 2, 2, uprights 3, 3, and suitable braces, 4, 4. The parts are suitably and firmly secured and braced to each other at desired points by angles, as the pieces 5, 5, and across the top of the frame, extending to any required distance, and supported in any suitable manner, is a bearing part or way, 6.

The tank or vessel 1, which may be conveniently made of any suitable material, and of any desired shape, is water tight, and is provided with two or more guide rollers, 60 7, 7, which impinge and move against uprights, 8, 8, by which the up and down movements of the tank, 1, are preserved substantially straight up and down. The tank, 1, may be braced with metal straps and connecting parts, as 9, 10, 11, 12, etc., as may be desired, depending upon the size of the tank. At each corner of the tank the above metal parts, as 9, 11, are secured, and to the lower ends of these and to the lower end of the part 10, arranged intermediate between them ropes or chains, 13, 13, 13, are attached, which are carried to a central point under the tank, 1, as indicated in Fig. 2. Beneath the tank at the central point mentioned, a pulley, 14, 75 is strongly secured to one of the base pieces, 2, and in line therewith, and near one end of the frame, another pulley, 15, is likewise secured. To the central connecting point of the ropes or chains, 13, 13, another rope or chain, 16, is attached, and this is carried downward and beneath the pulleys, 14, 15, and thence upward and over a pulley, 17, on the bearing way, 6, and forward against a horizontal pulley, 18, on the same part, 6. 85 The metal pieces, 9, 10, 11, at their upper ends, are also provided with ropes or chains, 19, 19, 19, which are gathered to a central point above the tank, and to these a rope or chain, 20, is secured, the arrangement of these ropes or chains at the upper part corresponding to the similar arrangement at the bottom of the tank, 1. The rope or chain, 20, is carried upward, and over a pulley, 21, arranged on the bearing way, 6. This pulley, 21, may be higher than the pulley, 17, or to one side of the pulley, 17, and the rope or chain, 20, is carried against the pulley, 22, arranged above or beside the pulley, 18, and thence forward, as will be described, and as shown in the drawings. 100

The two figures of the tank, 1, shown in Fig. 1, represent the same tank in different positions, the lower representation indicating the position of the tank at low water, the upper representation indicating the tank at high water. The tank, 1, is furthermore provided with one or more openings, to each of which a double acting closing device is attached. This closing device consists of two valve closing plates or leaves, one, 23, to close the opening at the inner face of the 110



tank, and one, 25, to close the opening at the  
 outer face of the tank, each of which is pro-  
 vided with a rubber piece, 24, 24, chamfered  
 at the edges to fit tightly into the opening of  
 the tank, one on its outer face, the other is  
 provided with a similar piece, to fit tightly  
 into the opening of the tank on its inner face.  
 The two plates forming this closing device,  
 are arranged to move or swing upon a jour-  
 nal, 26, so that when one part is held against  
 the opening in the tank the other is drawn  
 away therefrom. To the inner plate, 23, of  
 this closing device an arm, 27, is attached,  
 and to this a rope or chain, 28, is attached,  
 which chain is carried up to a hold fast, 29,  
 and secured there in such adjustment that  
 when the tank, 1, is at the lowest point of its  
 movement, the interior leaf or part 23 of  
 the closing device is drawn up by the chain,  
 28, and the opening in the tank is closed, the  
 tank, 1, then being empty and light. As the  
 tank, 1, is carried up by the rising water, the  
 chain, 28, falls into the tank, but the opening  
 in the same is held closed by the pressure of  
 the water on the outer leaf, 25, of the closing  
 device. In its continued upward movement,  
 however, a tripping leg, 30, on the hold fast,  
 29, passes into the tank, and engages the in-  
 ner leaf 24 of the closing device, gradually  
 forcing out the outer leaf 25 thereof. This  
 tripping device may be provided with fric-  
 tion roller or rollers, 31, as shown in Figs. 4  
 and 5. As soon as the opening is thus freed  
 the water rushes into the tank, the adjust-  
 ment of the parts being such that the tank is  
 substantially filled and loaded with water  
 before the inner leaf 23 of the closing de-  
 vice is forced against the opening by the  
 part 30, and when it is forced fully against  
 the opening on the inner side of the tank,  
 the weight of water in the same keeps the  
 leaf 23 firmly against the opening, thus re-  
 taining the water in the tank, and weighting  
 the same for its work as it descends with the  
 outgoing tide. As soon, however, as the tank  
 reaches the desired point in its descent, the  
 chain, 28, according to the adjustment, grad-  
 ually draws up the inner leaf 23 of the clos-  
 ing device, permitting the water in the tank  
 to escape, until the tank reaches a point at  
 which it is substantially emptied, at which  
 point, according to the adjustment of the  
 parts, the outer leaf 25 of the closing device  
 is forced and held against the opening in the  
 tank, by the pressure of water from without.  
 In other words, the adjustment of the parts  
 is such that for a part of the movement of  
 the tank, 1, the opening in the tank is closed  
 by the pressure of water within the tank, and  
 for a part of the movement the opening in  
 the tank is closed by the pressure of the water  
 without the tank. Thus the light and empty  
 tank moving upward, draws up with it the  
 rope or chain, 16, and the weighted tank  
 moving downward draws down with it the

rope or chain, 20. The power thus generated  
 may be employed in any manner desired. I  
 show herein one of the ways in which it may  
 be employed.

At a suitable point a standard or other  
 support is provided, on which a gear wheel  
 33 may be mounted horizontally on a suit-  
 able journal, 34. On this same journal and  
 operatively connected with the gear, 33, two  
 pulleys, 35 and 36 are secured with their  
 peripheries hollowed out suitably to take in  
 and choke the ropes passing around them.  
 Or in case it is desired, these pulleys, 35 and  
 36, may be replaced by sprocket wheels, and  
 the ropes by suitable chains to engage there-  
 with.

The adjustment of the ropes or chains, 16  
 and 20 to each other, and to the pulleys, 35  
 and 36, is such that when the tank, 1, is at  
 the lowest point of its movement, and com-  
 mences to rise, the rope, 20, is substantially  
 slack, having performed its work as the tank  
 descended. The situation of the ropes, 16  
 and 20, in Figs. 1 and 3, is shown at the  
 point where the tank commences to rise. It  
 must be noted that in the example of the in-  
 vention shown in the drawing, the rope, 16,  
 is vertically below the rope 20. The outer  
 end of 16 is joined to 20 at the point marked  
 43, in Fig. 3, and the outer end of the rope  
 20 is joined to 16 at the point marked 44, in  
 Fig. 3, and in that figure the rope 20 is  
 broken away on the lower edge of Fig. 3 in  
 order to show the rope 16 below it. As the  
 tank commences to rise, the rope, 16, on the  
 lower part of the tank commences to draw  
 the pulley, 36, in the direction of the arrow,  
 as shown in Fig. 3. At the desired point on  
 the rope, 16, the outer end of the rope, 20, is  
 secured, in such adjustment that, as the tank  
 rises and the rope, 20, slackens, the slack  
 part thereof is taken up by the movement of  
 the rope, 16, so that the rope, 20, which  
 passes around the pulley, 35, is held sub-  
 stantially taut, during the entire upward  
 movement of the tank. The outer end of  
 the rope, 16, correspondingly is attached to  
 the rope, 20, in similar adjustment, that is to  
 say, when the tank, 1, has reached its high-  
 est position, and commences to descend, the  
 rope, 20, having had its slack taken up by  
 the movement of the rope, 16, now com-  
 mences to turn the pulley, 35, also in the di-  
 rection of the arrow shown in Fig. 3, and in  
 its movement takes up the slack of the rope,  
 16, so that that rope remains substantially  
 taut, as the tank descends. To the larger  
 gear wheel, 33, a smaller gear, 37, is con-  
 nected which is attached to a shaft, 38, which  
 shaft may be suitably supported, extended  
 and connected to other gears to multiply the  
 movements of the device or utilize the same  
 in any manner desired.

For clearness, details of parts have been  
 separately shown. Fig. 4 is a side view, and



Fig. 5 an end view of the hold fast and tripping device; Fig. 6 is a side view, and Fig. 7 an end view of the valve or closing device on the tank, 1. Fig. 8 shows details of one of the collars, 40, supporting the pulley, 36, the other collar being of exactly the same form. These collars, 39, 40, are keyed or suitably secured to the journal, 34, to which the gear, 33, is also keyed or secured. The pulleys, 35 and 36, are provided on their lower faces with suitable recesses to take in suitable pawls, 41, and the collars, 39 and 40, are provided in their upper faces with suitably angled notches, 42, 42, into which drop the pawls, 41, 41. The notches, 42, 42, are sloped so as to allow the pawls, 41, 41, to ride over them, and keep the pulleys, 35, 36, free and out of engagement with the collars when the movement on either pulley is in the direction opposite that indicated by the arrow in Fig. 3. That is, when the tank, 1, descends, and the rope, 20, is passing around the pulley, 35, turning the shaft, 34, and with it the gear, 33, and at the same time taking up the slack of the rope, 16, which passes around the pulley, 36, that pulley, 36, is out of engagement with the collar, 40; but as soon as the tank commences to rise and the rope, 16, commences to do its work and take up the slack of the rope, 20, the pulley, 35, is out of engagement with the collar, 39.

While I have shown one method of utilizing the power developed by means of the device of empty and loaded tanks, I do not limit myself to the same; nor do I limit myself to tanks of any particular size, shape or material, or to any particular number of the same; nor to any number or form of valves for emptying the same or retaining the same empty or loaded, nor to the employment of a rope or chain, or pulleys, for utilizing the power developed, but

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

1. A water or tide motor, including a movable tank provided with an orifice and a suitable valve adapted to open and also to close the same automatically at different points of its movements, substantially as described and shown.

2. In a water or tide motor connected with a suitable operating device, a tank provided with an opening adapted to permit the inflow and outflow of water, in combination with a suitable valve and tripping device for the same, adjusted to permit the outflow of water and then close the opening when the tank is near the low water level, and to open such opening and permit the inflow of water when the tank is near the high water level, substantially as described and shown.

3. A water or tide motor consisting of a suitable frame with guideways therein and

suitable pulleys disposed at the top and at the bottom of such frame, suitable connections disposed around such pulleys, and running toward each other, in combination with a tank provided with opening and closing devices adapted to keep water out of the same when in its lower position and to take in and retain water within the same when in its higher position and attached at its top and at its bottom to such connections, substantially as described and shown.

4. A water or tide motor comprising a tank arranged to float upon the water and having an orifice provided with a suitable valve adapted to be automatically closed to exclude water from the tank when it is at one level, and to be automatically opened to admit and include water therein, when the tank is at another level, substantially as described and shown.

5. In a water or tide motor, a tank provided with one or more openings, each of such openings having a valve adapted to be operated automatically to retain water in said tank at one point of its movements, and to exclude water therefrom at another point of its movements, in combination with suitable attachments to operate a gear wheel disposed upon a suitable journal, such attachments adapted to turn such journal in the same direction at all points of the movement of the tank, substantially as described and shown.

6. A water or tide motor, including a tank adapted to rise empty and light with the rise of the water, and to descend loaded and heavy with the ebb of the water, in combination with an operating device consisting of a journal and gear wheels suitably disposed, such journal having rigidly attached collars, and provided with pulleys free to turn around the journal upon such collars, such collars and pulleys being provided with gravitating pawls and corresponding notches adapted to engage with each other and turn such journal in one direction when the empty tank rises, and in the same direction when the loaded tank descends, substantially as described and shown.

7. A water or tide motor, consisting of a tank adapted to rise light and descend heavy with the ebb and flow of the tide, in combination with flexible connections adapted to operate upon a journal or similar device, and turn such journal in the same direction when the tank rises and when it descends, substantially as described and shown.

8. A water or tide motor, consisting of a tank arranged to rise light and descend heavy with the flow and ebb of the tide, in combination with one flexible connection adapted to operate a mechanical device in one direction when the tank rises, and a flexible connection adapted to operate the mechanical device in the same direction



when the tank descends, substantially as described and shown.

9. In a water or tide motor, comprising suitable guideways, a quadrangular tank  
5 movable therein and having a bottom substantially flat, one or more openings above such bottom, each of said openings provided with a valve and suitable devices to open  
and also to close such valve automatically  
10 when the tank is at different points of its

movements, in combination with a flexible connection at the upper part and another flexible connection at the lower part of such tank, such flexible connections adapted conjointly to operate a journal or similar device, 15 substantially as described and shown.

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