No. 888,721. PATENTED MAY 26, 1908.

S. R. MILBURY,

WAVE MOTOR.

APPLICATION FILED JULY 22, 1907.

Fig. 1.

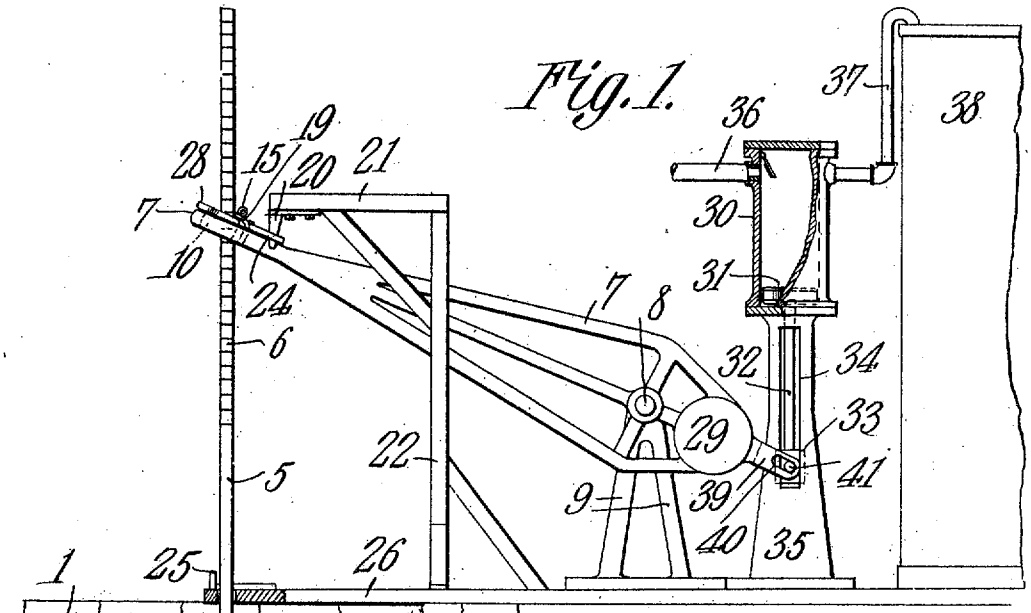
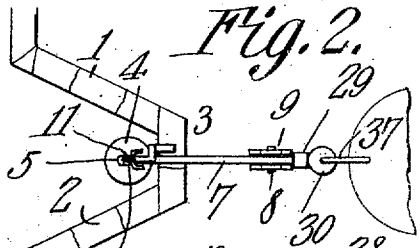
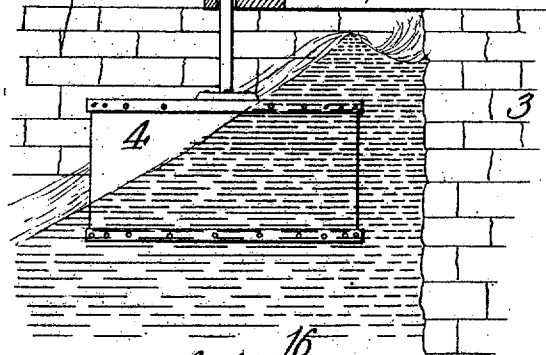


Fig. 2.





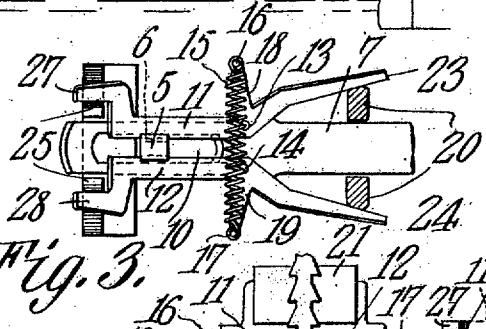


Fig. 3.

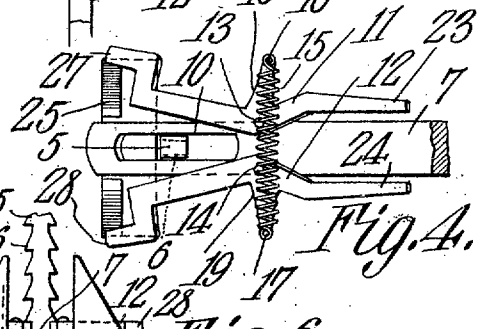


Fig. 4.

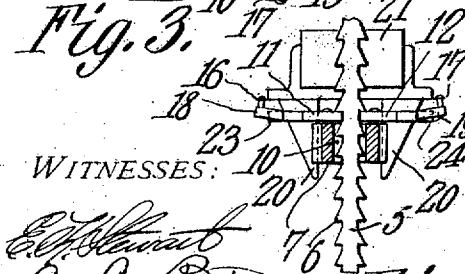


Fig. 5.

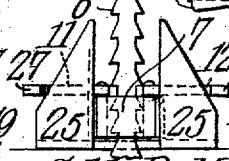


Fig. 6.

WITNESSES:

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UNITED STATES PATENT OFFICE.

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WAVE-MOTOR.

No. 888,721. Specification of Letters Patent. Patented May 26, 1908.

Application filed July 22, 1907. Serial No. 384,937.

To all whom it may concern:

Be it known that I, SETH R. MILBURY, a citizen of the United States, residing at Rahway, in the county of Union and State of New Jersey, have invented a new and useful Wave-Motor, of which the following is a specification.

This invention relates to improvements in motors of the type that derive their power from the vertical displacement of the water of the ocean or other bodies of water due to the waves or swells thereof.

One object of the invention is to provide an improved motor wherein the buoy or float is free to rise on the crest of the wave or swell, and as the swell recedes, the weight of the buoy or float will operate the motor on its power strokes, thereby insuring a uniform operation of the motor and the devices driven thereby, automatically actuated devices being employed for operatively connecting the motor and the buoy or float during the descending movements of the latter, and for disconnecting these parts to permit a return motion of the motor, the motor being so constructed that it will automatically compensate for tidal variations so that uniform operation of the motor at all times is insured.

With these and other objects in view, the invention comprises the various novel features of construction and combination and arrangement of parts, which will be hereinafter more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings:—Figure 1 is a side elevation of a wave motor constructed in accordance with the present invention. Fig. 2 is a top plan view showing the setting for the motor. Fig. 3 is a detail view of the latches which serve to operatively connect and disconnect the vertically movable float and the coöperating parts of the motor, the latches being shown in position to transmit the movement of the float. Fig. 4 is a view similar to Fig. 3 showing the latches disengaged from the float. Fig. 5 is a detail view in elevation of the latches, the parts being in the relative position shown in Fig. 3. Fig. 6 is a detail view, in elevation, showing the latches in the relative position indicated in Fig. 4.

Corresponding parts in the several figures are indicated throughout by similar characters of reference.

In order to utilize the wave energy to the greatest degree, it is preferable to provide an improved setting for the motor whereby the vertical rise and fall of the surface of the water will be amplified or increased over that of the water at points distant from the shore or other abutments that cause the waves to break, and in order to accomplish this purpose, a pair of convergently arranged jetties 1 and 2 are employed, in the present instance, which are arranged in proximity to a bulk-head or other relatively fixed support 3, the wider ends of the jetties being directed toward the body of water, so that the waves entering the space between the jetties will strike the convergent walls thereof and thereby increase the swell or vertical rise and fall of the water at the apex or relatively narrower end of the jetties. A similar result may be obtained by placing the float of the motor in a sluiceway or in proximity to a breakwater.

The motor shown in the present embodiment of the invention comprises a float 4 which may be of any suitable construction, a hollow metal tank being preferably employed as the air space therein affords the requisite buoyancy, and the weight of the tank is sufficient to actuate the motor and the devices that are operated thereby, and, if necessary, the float may be suitably weighted in order that the maximum power may be derived from the motor.

The float is arranged at the apex or toward the narrower ends of the jetties, in order that it may utilize the power of the waves at the point where the greatest swell occurs, and it is provided with a vertical standard 5 having one or more sets of ratchet teeth 6 suitably spaced vertically thereon, the underside of the teeth forming shoulders, and the upper sides thereof being inclined, in order that the float may rise freely relatively to the coöperating latches, while a locking action between the latter and the ratchet teeth occurs when the float begins to descend. Any suitable device may be employed for receiving the power from the float and transmitting it to the driven elements or the devices that it is desired to operate, a lever or walking beam 7 being shown in the present instance which is mounted to turn on a horizontal axis 8 supported by a relatively fixed standard 9, the latter being pivotally secured to the bulk-head or other stationary support. One end of the walking beam projects over the edge of the bulk-head and it is provided

with a longitudinal slot 10 through which the standard on the float will operate freely, and mounted in coöperative relation with the said standard are a pair of latches 11 and 12 which are arranged to turn about the pivots 13 and 14, respectively and have portions at their proximate sides adapted to cooperate with the ratchet teeth on the standard of the float. It is preferable to provide suitable means for retaining the latches either in or out of coöperative relation with the standard, the device shown in the present instance comprising a helical tension spring 15 having its ends attached to pins 16 and 17 arranged on the outer ends of the arms 18 and 19 which are rigid on the respective latches, the pins connecting the outer ends of the spring being so located that they will pass to one side of the pivots of the latches when the latter are turned in one direction, and they will move across the center and to the opposite side of the said pivots when the latches are turned into a reverse position.

The latches are provided for the purpose of operatively connecting the float to the driven elements when the former has been elevated by the swell, and to disconnect the parts after the float has fallen with the receding water, and the devices for operating the latches to perform this function automatically during the rising and falling of the float comprises, in the present instance, a pair of cams 20 which are fixed to an arm 21 on the relatively fixed upright 22, the outer sides of the cams being relatively inclined or tapered and arranged in the path of the arms 23 and 24 of the latches, upward movement of the outer end of the lever or walking beam carrying these arms on the latches in engagement with the inclined surfaces of the cams, the latter serving to separate said arms and thereby cause the latches to engage the ratchet teeth on the standard of the float, the spring 15 serving to retain the latches in coöperative relation. The operative connection is provided between the walking beam and the float so as to transmit the falling movement of the latter, as the wave recedes, to the walking beam, and when the float reaches the limit of its downward movement, the latches are automatically released or disengaged from the ratchet teeth on the standard, the devices shown in the present instance for releasing the latches comprising a pair of coöperatively arranged cams 25 arranged in fixed relation on the outer end of the supporting arm 26 and having oppositely inclined surfaces arranged in the path of the projections 27 and 28 formed on the outer ends of the latches, the descending movement of the outer end of the lever causing the latches to be operated and to thereby release the float standard. The return movement of the lever or walking beam is preferably accomplished independently of the float, the operating parts of the devices driven thereby serving this purpose, or, if desirable or necessary, a suitable counterweight 29 may be provided that will serve to elevate that end of the lever carrying the latches when the latter have been released.

A motor constructed in accordance with the present invention is capable of operating pumps and other mechanisms of various kinds, a fluid pressure pump, preferably an air compressor, being shown in the present instance, which embodies a cylinder 30 having a piston 31 mounted to reciprocate therein, the lower end of the piston rod 32 being provided with a cross head 33 which is mounted to operate between the relatively fixed guides 34 arranged on the base 35 of the pump, the latter being suitably secured in fixed relation to the bulkhead or other support. The pump shown in the present instance is so constructed that the descending movement of the piston serves to draw a charge of fluid, air in the present instance, into the cylinder, and the ascending movement serves to discharge it therefrom, that is to say, the ascending movement of the piston constitutes the working strokes of the pump. Valves of any suitable form and arrangement may be employed, the fluid being discharged from the pump through the pipe 37 and the latter, in turn, discharges into a tank or storage reservoir 38 which may be arranged at any suitable point. Any suitable connection may be employed for connecting the lever of the motor and the pump, the means shown in the present instance for accomplishing this purpose comprising an arm 39 extending radially from the inner end of the lever and provided with a radial slot 40 for receiving a pin 41 on the cross head of the pump, the rocking movement of the lever above this pivot causing a reciprocatory movement of the pump piston.

By so constructing the motor that the rising of the waves causes a lifting movement of the float, and the falling movement of the float serves to operate the pump on its power stroke, uniform action of the motor is insured for the reason that there is a constant actuating force. As the latches disengage the standard of the float each time the latter reaches a predetermined point in its descent, the device is capable of compensating for variations in the height of the surface of the water due to tidal conditions, the latches cooperating with the upper portion of the standard when the tide is low or ebb and coöperating with the lower portion thereof when the tide is high, and by constructing the jetties in proximity to a bulk-head or other support, a firm foundation is provided for the motor and also the devices operated thereby, the novel arrangement of the jetties affording

ample vertical movement of the water to effect the operation of the motor.

What is claimed is:—

1. In a wave motor, the combination with a vertically movable float, of an element to be driven thereby normally tending to operate in one direction, and a device for operatively connecting the float and the said element for operating the latter in a reverse direction.

2. In a wave motor, the combination with a vertically movable float, and an element to be driven thereby, devices for operatively connecting the said element and the float for transmitting the descending movements of the latter to the said driven element, the latter having a normal tendency to operate in a reverse direction.

3. In a motor of the character described, the combination with a vertically movable float having a standard thereon provided with a series of ratchet teeth, of an element adapted to be operated by the said float, and a latch carried thereby and coöperating with the ratchet teeth on the float standard for transmitting movement between the latter and the said element in one direction and permitting a movement between the said parts in an opposite direction.

4. In a motor of the character described, the combination with a vertically movable float, and an element adapted to be operated thereby, of a device for connecting and disconnecting the float and member, and means for coöperating with said device to connect the said member and float preparatory to the descending movement of the latter and for disconnecting the said parts after the float has reached a predetermined point in its descent.

5. In a motor of the character described, the combination with a vertically reciprocatory float having a standard thereon provided with sets of ratchet teeth, of a lever pivoted to operate in a vertical plane, coöperatively arranged latches on the lever adapted to engage the ratchet teeth on the float standard to transmit the descending movement of the latter to the lever and to permit an ascending movement of the float relatively to the lever, devices for moving the latches into coöperative relation with the standard when the lever reaches a given point when moving in one direction, and devices for disengaging the latches therefrom when the lever reaches a given position in moving in a reverse direction.

6. The combination with a motor of the character described embodying a vertically movable float having a standard thereon provided with sets of ratchet teeth, a lever pivoted to operate in a vertical plane, a pair of latches on the lever arranged to coöperate with ratchet teeth on the float standard, devices for causing engagement of the latches with said teeth when the lever operates in one direction, and devices for disengaging the latches when the lever operates in a reverse direction, of a pump having its piston connected to the said lever and operating on its power strokes during the descending movements of the float.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

SETH R. MILBURY.

Witnesses:
HARRY L. SMITH,
CHAS. H. LAMBERT.