B. H. PELTON.

WAVE MOTOR.

APPLICATION FILED MAR. 26, 1918.

1,289,533.

Patented Dec. 31, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

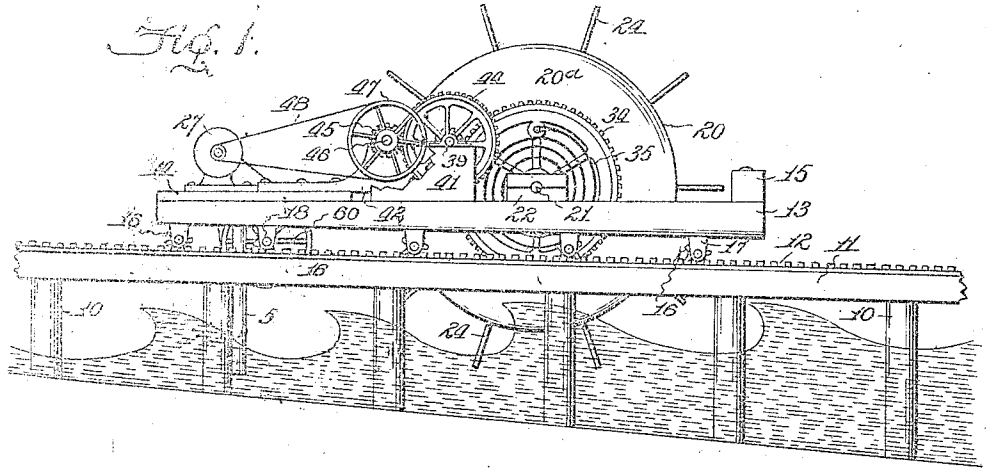
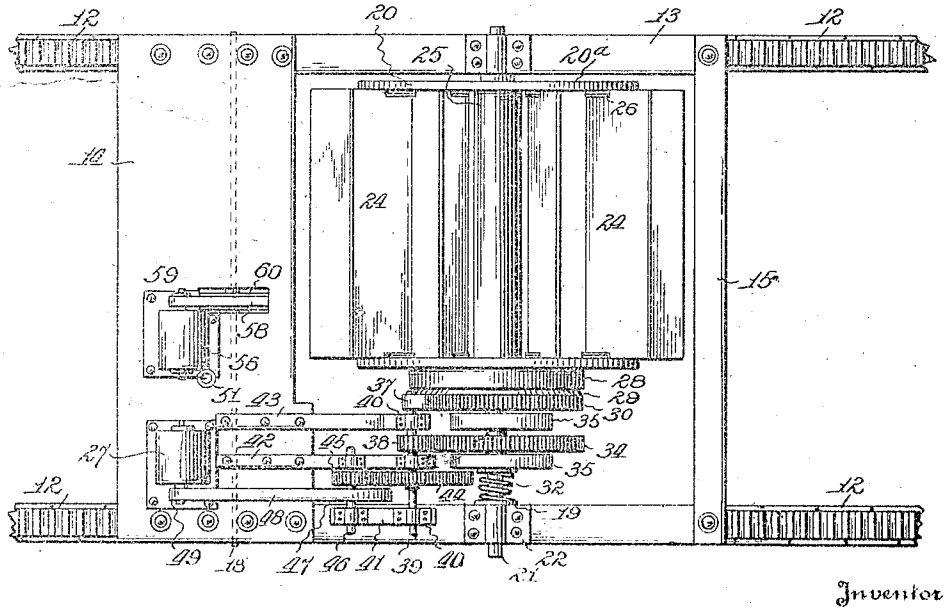


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

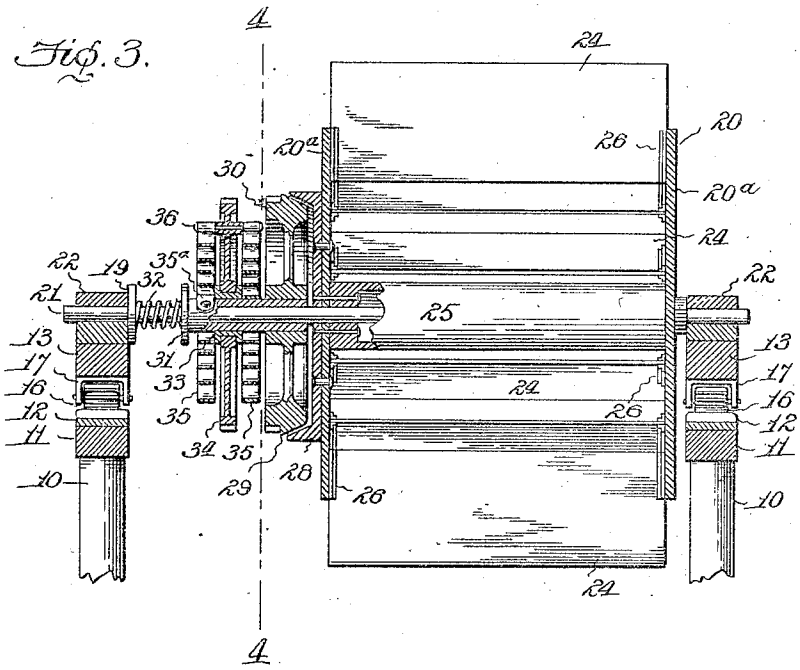


Fig. 4.

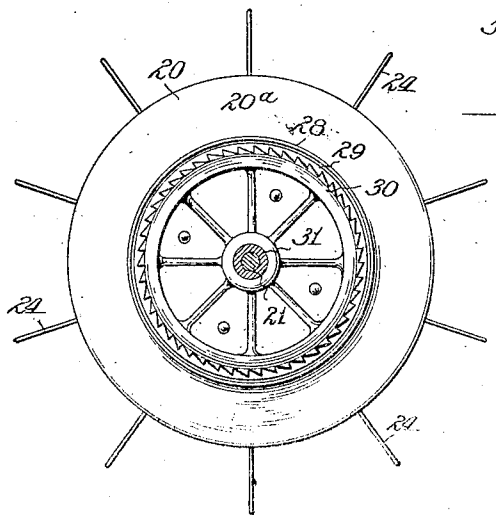


Fig. 5.

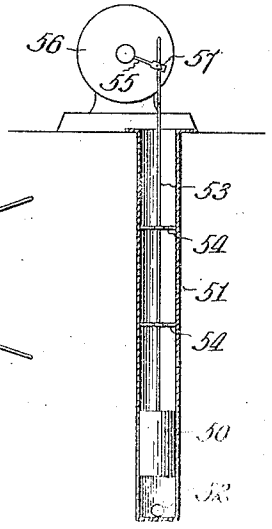
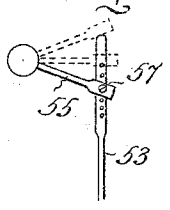


Fig. 6.



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UNITED STATES PATENT OFFICE.

BENJAMIN H. PELTON, OF SANTA MONICA, CALIFORNIA, ASSIGNOR TO B. H. PELTON, JR., OF CASPER, WYOMING.

WAVE-MOTOR.

1,289,533. Specification of Letters Patent. Patented Dec. 31, 1918.

Application filed March 26, 1918. Serial No. 224,852.

To all whom it may concern:

Be it known that I, BENJAMIN H. PELTON, a citizen of the United States, residing at Santa Monica, in the county of Los Angeles and State of California, have invented a Wave-Motor, of which the following is a full and complete specification.

My invention is an improvement in motors of that particular class which are designed for utilizing wave force in developing power economically that may be converted to a useful purpose, such as generating electricity, &c.

One of the objects of my present invention is to provide a wave motor of this general character in which the paddle-wheel operated by the force of the incoming waves is supported in such manner that it will be automatically raised and lowered coincident with the rise and fall of the tide, so that the paddles will receive the full propelling effect of each successive wave.

A further object of my invention is to provide a mechanism, for transmitting the power produced by the paddle-wheel, of such construction that it will impart a regular or constant motion to the driven wheel, as a belt-pulley, from which the power is taken for the purpose of operating an electric current generator or other machinery.

With these principal objects in view my invention consists in the construction of the motor, and the construction and arrangement of the apparatus by which the paddle-wheel, transmission mechanism and carriage shifting device are supported in a frame or carriage adapted to travel back and forth on an inclined track, whereby the motor will be supported stationary at the proper elevation above the body of water and therefore not affected by the waves beyond the proper application of the force of the same against the paddles to turn the paddle-wheel in an effective manner; all as hereinafter fully described and specifically set forth in the appended claims.

In the drawings:

Figure 1 is a side elevation of a wave motor or power generating apparatus constructed in accordance with my invention.

Fig. 2 is a plan view of the same.

Fig. 3 is a sectional view through the paddle-wheel on a line with the main supporting shaft and including that part of the transmission mechanism carried by said shaft.

Fig. 4 is a sectional view on the line 4—4 of Fig. 3, showing the ratchet-wheel, clutch and paddle-wheel in elevation.

Figs. 5 and 6 are detail views illustrating the float device employed for automatically shifting the supporting carriage with respect to the approximate level of the body of water.

In carrying out my invention a runway or track is constructed to extend over the body of water out from the shore a suitable distance, and as the carriage supporting the wave motor and power converting mechanism travels back and forth on this track, according to the ebb and flow of the tide, the said track is preferably extended well beyond the usual line of breakers so that the waves will properly act on the paddle-wheel. In the present instance the track or runway is constructed by driving into the bed of the ocean, or other body of water, two parallel rows of piles 10, supporting beams or stringers 11 upon which the rails—in the form of rack-rails 12—are bolted or otherwise secured. In building this runway or track it is gradually inclined downward from its inner or shore end, at a one and a half per cent. grade, more or less, for the purpose hereinafter explained.

The carriage, which travels on this inclined track, is made up of longitudinal side beams 13, 13, supporting a platform 14 at the rear ends and connected at their forward ends by a transverse beam 15, a sufficient space being left between the platform and connecting beam to receive the paddle-wheel, hereinafter described, and the side beams are spaced apart to correspond with the width of the track so as to overlie the rack-rails 12, each beam having a number of toothed-wheels 16 in mesh with said rack-rails for supporting the carriage movable thereon and for holding the same firmly and stationary against the force of the waves acting on the paddle-wheel. The toothed supporting-wheels are journaled in U-shape brackets 17, bolted or otherwise secured to the underside of the side beams 13, two of said wheels—at the opposite sides of the carriage and below the platform—being connected by a shaft 18, forming in the present instance a driving-shaft

by which the carriage is moved upon the track through the intervention of the float mechanism hereinafter described.

Supported in the movable carriage between the platform and front cross-beam, and extending down between the rails of the track, is a paddle-wheel 20 mounted loosely on a shaft 21 supported at its ends in bearings 22, 22 on the side beams 13 of said carriage, so that the paddles or blades 24 of said paddle-wheel may successively travel in the path of the waves, as illustrated in Fig. 1 of the drawings. This paddle-wheel may be of any approved construction, for instance having circular heads 20^a receiving the shaft and braced centrally by a tube 25, the paddles or blades 24 being secured between the outer edges of said ends by angle plates 26, leaving a space between the inner edge of each blade and the tube for the passage of excess water from a wave. Of course the paddle-wheel is turned by the waves striking against the paddles or blades successively, and the power thus imparted to the wheel is utilized in the present instance for operating an electric current generator 27 through the intervention of certain transmission devices which I shall now proceed to describe.

Attached to one of the ends of the paddle-wheel is a member 28 of a friction-clutch, the other member, 29, of which is preferably formed integrally with or as a part of a large ratchet-wheel 30 fast on the inner end of a sleeve 31 slidable on shaft 21 and engaged by an expansion spring 32 pressing against the outer end thereof to effect frictional engagement of the members of the clutch. The spring bears at its outer end against a disk 19, which may be threaded on the shaft 21 for adjustment, to increase and decrease the force of the spring and consequently vary the frictional engagement of the members of the clutch, forming a governor device which will permit the paddle-wheel to run independently of the movable clutch-member when said paddle-wheel is propelled at an excessively high speed. There is also mounted on the sleeve 31, in a centering collar 33, a large gearwheel 34, for transmitting the power to an auxiliary shaft, hereinafter referred to, and as this large gearwheel is not fixed to the supporting-collar motion is imparted thereto in the present instance by means of one or more strong spiral springs 35, 35, disposed at one or both sides thereof and each attached at its inner end to the sleeve, at 35^a, and at its outer end to a bolt 36 passing through a spoke of said gearwheel (see Fig. 3). In this manner, as will be noted, the springs 35 by which the power from the paddle-wheel turning the sleeve 31 through the clutch 28—29 is transmitted to the gearwheel 34 first stores or houses a certain amount of energy before it imparts rotary motion to said gearwheel, resulting in a regular motion of said gearwheel though the paddle-wheel is operated or propelled intermittently as the paddles are struck by successive waves; in other words the springs continue the motion of the gearwheel by unwinding during the interval between each wave impulse. Backward motion of the movable clutch-member and sleeve fixed thereto is prevented by a suitably supported pawl 37 engaging the ratchet-wheel 30 of the aforesaid movable clutch-member.

The power transmitting gearwheel 34 is in mesh with a pinion 38 on an auxiliary shaft 39 journaled in bearings 40 on suitable supporting standards, as 41, 42, 43, bolted to the carriage, said shaft having a large gearwheel 44 in mesh with a pinion 45 on a stub-shaft 46, thus forming a train of gearing to said stub-shaft, and the latter has keyed thereon a band-pulley 47 over which passes a band or belt 48 to the pulley 49 of the electric-current generator 27. Any conventional type of electric generator may be employed, and it should be provided with a suitable governor device (not shown), to regulate the speed. It may be here stated, however, that although I have shown the wave motor applied for running an electric-current generator I do not, of course, restrict it to this use, as obviously it may be employed for operating any kind of machinery.

In such instances where the apparatus is located over a body of water the level of which is affected by tide it is necessary that said apparatus be raised and lowered with the ebb and flow of the tide, and it is for this purpose the track is inclined—so the apparatus may be lowered by moving outward on the track as the tide falls, and vice versa. It is also necessary, from an economical and practical standpoint, that this movement of the apparatus to accommodate the varying tides be entirely automatic, and it is accomplished in the present instance by means of a float device coöperating with a motor geared to the shaft 18 carrying two of the toothed-wheels supporting the carriage and in mesh with the rack-rail of the inclined track. This float device consists of a float 50 working in a tube 51 depending from the carriage and closed at its lower end with the exception of a hole 52 through which the water may slowly pass into and out of the tube to raise and lower the float according to the changes in the sea level. The float has a perpendicular rod 53, guided by spiders 54 in the tube, this rod serving to operate the reversing switch-lever 55 of an electric motor 56, having a sliding connection with the outer end of said switch-lever for adjustment and held in attached position by a screw 57, or any other suitable connection

may be employed. The connection between the motor 56 and shaft 18 is by means of a belt 58 (Fig. 2) passing over a pulley 59 on said motor and a band-pulley 60 on said shaft. In Fig. 6 the different positions of the switch-lever are indicated by full and dotted lines; for as the tide falls the float also falls shifting the lever to the limit of its downward movement to start up the motor, say forward, and, conversely, when the tide rises the elevation of the float shifts said lever to the limit of its upward movement, reversing the operation of the motor, the intermediate position of the switch-lever being the neutral position at which the carriage is held stationary after each operation of the float device. This arrangement therefore provides for shifting the apparatus back and forth on the inclined track coincident with the rise and fall of the tide; and, as will be noted, its operation is entirely automatic and positive in effecting the desired result.

From the foregoing description of the construction and arrangement of the parts constituting my improved wave motor the operation will be readily understood, for the carriage being properly located on the inclined track with the paddle-wheel in position to receive the force of the waves said paddle-wheel will be turned and the clutch-members in connection therewith being in frictional engagement through the pressure of the spring 32 against the collar to which the movable clutch member is fixed the strong spiral springs 35 attached to said collar will be wound up to a certain extent and then turn the gearwheel 34 from which the power is transmitted through the train of gearing to the driving-pulley 47 connected to the generator 27, operating the latter to generate electric current for whatever purpose desired. After the impulse of each wave against one or more paddles, and before the succeeding wave reaches the paddle-wheel, the wound springs 35 unwind to continue the motion of the gearwheel 34 until the direct power of the paddle-wheel is again applied under the impulse of the succeeding wave, and so on. As the level of the sea changes under the influence of the tide the float device operates automatically, in the manner hereinbefore described to move the apparatus along the track so that it will, at all times, maintain its proper relation to the level of the sea.

My improved wave motor may be installed on the sea-coast at any point where effective wave operation may be had, and as the driving impulses are imparted by the force of recurring waves the operation is effected at little or no expense and without special attention, producing an economical power for commercial uses. Its application is not restricted to the sea-coast, for obviously it may be installed on the shore of any inland water, as a lake or river, affording the desired amount of wave force. In such instances where the body of water is not affected by tide it may not be necessary to incline the track.

I claim:

1. In a wave motor, the combination with a supporting-frame and shaft, of a paddle-wheel mounted to revolve on the shaft, a friction clutch having a member attached to the paddle-wheel and a movable member, a governor spring pressing against the movable clutch-member, a spiral spring attached at one end to said movable member, and a gearwheel connected to the other end of said spiral spring; together with means for transmitting the motion of the gearwheel to the operation of a machine.

2. In a wave motor, the combination with a supporting-frame and shaft, of a paddle-wheel mounted to revolve on the shaft, a friction-clutch having a member attached to the paddle-wheel and a movable member carrying a sleeve, a spring pressing against the sleeve to effect resilient engagement of the clutch members, means for regulating the pressure of the spring with respect to the movable clutch-member, spiral springs attached at their inner ends to the sleeve, and a gearwheel loose on the sleeve and connected to the outer ends of the spiral springs to receive rotary motion therefrom; together with means for transmitting the motion of the gearwheel to the operation of a machine.

3. In a wave motor, the combination with an inclined track, of a carriage movable back and forth thereon, a paddle-wheel revoluble on a shaft mounted in the carriage, an electric-current generator, and means for driving said generator from the paddle-wheel; together with a driving-motor, means for propelling the carriage from said motor, and a float device controlling the operation of the driving-motor.

4. In a wave motor, the combination with an inclined track, of a carriage movable back and forth thereon, a paddle-wheel revoluble on a shaft mounted in the carriage, an electric current generator, and means for driving said generator from the paddle-wheel; together with an electric motor having a switch-lever, a float device suspended from the carriage and connected to the switch-lever, and means for propelling the carriage from the motor.

5. In a wave motor, the combination with an inclined track, of a carriage movable back and forth thereon, a paddle-wheel mounted in the carriage for generating power from the force of waves against the paddles, a motor driven from the paddle-wheel, means for propelling the carriage from the motor, and a float device suspended

from the carriage and controlling the operation of the aforesaid motor.

6. In a wave motor, the combination with an inclined track having rack-rails, of a carriage having toothed supporting-wheels in mesh with the rack-rails, a paddle-wheel revoluble on a shaft mounted in the carriage and depending between the rails of the track to receive the waves against the paddles of the wheel, a friction-clutch one member of which is attached to the paddle-wheel and the other member fast to a sleeve slidable on the shaft, a spring pressing against the sleeve to effect engagement of the clutch members, spiral springs attached at their inner ends to the sleeve, a gearwheel connected to the outer ends of said springs to receive rotary motion therefrom, and transmission gear for applying the power; together with means for moving the carriage on the inclined track.

7. In a wave motor, the combination with an inclined track having rack-rails, of a carriage having toothed supporting-wheels in mesh with the rack-rails, a paddle-wheel revoluble on a shaft mounted in the carriage and depending between the rails of the track to receive the waves against the paddles, a friction-clutch one member of which is attached to the paddle-wheel and the other member fast to a sleeve slidable on the shaft, means for effecting normal engagement of the clutch members, spiral springs attached at their inner ends to the sleeve, a gearwheel connected to the outer ends of said springs, an electric-current generator on the carriage, and transmission gear between the aforesaid gearwheel and said generator; together with an electric motor having a switch-lever, means for propelling the carriage from said motor, and a float connected to the switch-lever for controlling the operation of the motor.

In testimony whereof I have signed my name to this description and specification in the presence of two subscribing witnesses.

BENJAMIN H. TELTON.

Witnesses:
JNO. W. MARCH,
CHARLES B. BARKER.