C. W. LORD.

Mechanism for Utilizing Wave Power.

No. 202,113. Patented April 9, 1878.

Fig. 1.

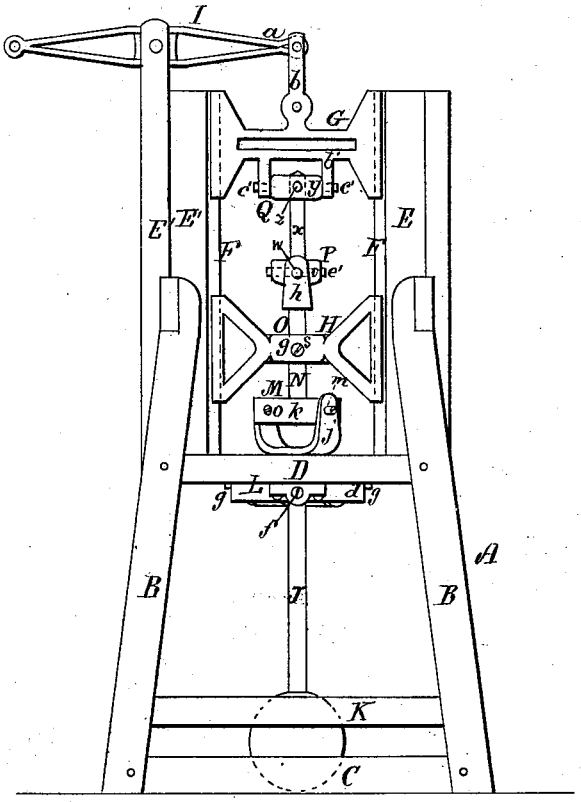


Fig. 3.

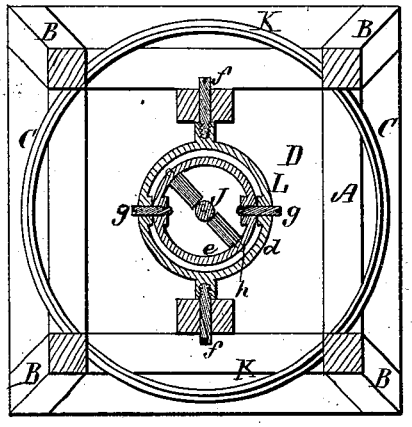
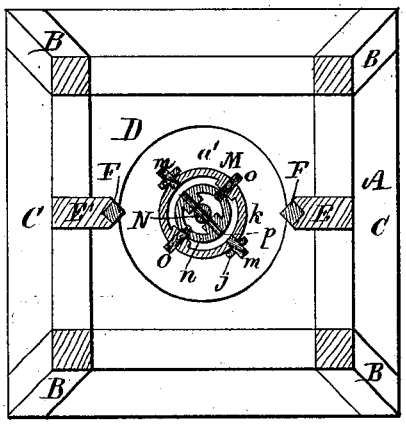


Fig. 4.



Witnesses.
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Inventor.
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F. Curtis. Atty.

C. W. LORD.

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Fig. 2.

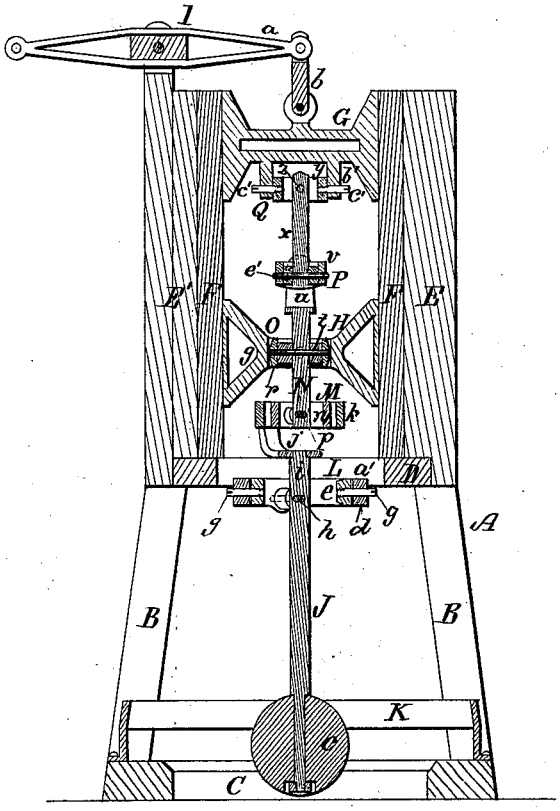


Fig. 5.

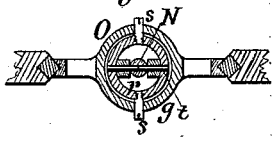


Fig. 6.

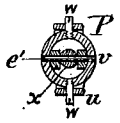
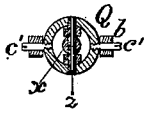


Fig. 7.



Witnesses.
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UNITED STATES PATENT OFFICE.

CHARLES W. LORD, OF NEWTON, MASSACHUSETTS.

IMPROVEMENT IN MECHANISMS FOR UTILIZING WAVE-POWER.

Specification forming part of Letters Patent No. **202,113**, dated April 9, 1878; application filed March 2, 1878.

To all whom it may concern:

Be it known that I, CHARLES W. LORD, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Mechanism for Utilizing Wave-Power, of which the following is a specification:

This invention relates to means for utilizing wave-power by transmitting and adapting the rolling or pitching motions of a navigable vessel or other floating object to produce oscillating motion in a walking-beam or lever, which, in turn, drives a pump or other mechanism; and the invention consists, mainly, in the employment of a weighted pendulum, suspended from a suitable frame or support by gimbals or other universal joints, in such manner as to be permitted universal freedom of swinging motion, the upper end of the pendulum, which extends above the point of suspension a distance equal to the power or leverage desired, being connected with the walking-beam or other transmitter of power (mounted in the upper part of the frame) by an intermediate lever or rod, and a sliding cross-head, which traverses vertical slides affixed to the frame of the machine and over the pendulum, the intermediate rod being swiveled at some point between its ends by a universal joint to a second cross-head, disposed below the first, and sliding upon the same guides or in the same path of movement as the first, and the whole being so arranged that swinging motions of the pendulum in any direction shall, by means of its upper arm and the rod before named, impart oscillating motions to the lever or walking-beam, which motions are adapted by any suitable mechanism to work a pump or effect other useful purposes.

Details of the machine will be duly described.

The drawings accompanying this specification represent, in Figure 1, a side elevation, and in Fig. 2 a vertical section, of a machine embodying my invention. Fig. 3 is a horizontal section of the lower gimbal-joint, which constitutes the suspensory of the pendulum, while Fig. 4 is a like section of the joint which connects the pendulum with the oscillating lever, to be explained. Figs. 5, 6, and 7 are sections of the remaining gimbal-joints, to be explained.

The drawings accompanying this specification represent, at A, a stage or upright frame, which I have employed in the present instance, whereby to support the working parts of the machine, such frame being composed of four rectangularly-arranged upright corner-posts, B B B B, united at bottom by cross-ties C, &c., and, at about the center of the structure, by a platform, D, which has a central opening, *a'*, while upon opposite sides of this platform I erect upright posts E E', each of which bears upon its inner side or edge a V-shaped slide or guide, F, to support two cross-heads, G H, which slide up and down in such guides, and will be hereinafter described, the upper cross-head being arranged at the upper part of the said guides, and the lower cross-head being disposed at the lower part thereof.

A horizontal working-beam or lever, I, is pivoted to the extreme upper part of the post E', and its inner end or arm *a* projects inward over the center of the cross-head G, and is connected with the latter by a link, *b*, or in any suitable manner.

The outer end of the walking-beam is to be connected with a pump or other machinery by any suitable device which shall properly transmit the oscillating motions of the beam to do the work required of it.

I have not, in the present instance, shown any device to connect the beam with the pump, as this is a matter of ordinary skill of a mechanic, to which I do not confine myself, and may be varied indefinitely.

J, in the drawings, represents a pendulous rod or bar, carrying at bottom a weight, *c*, the length of this pendulum and the size of the weight being determined by the amount of power required, or the size of the space which is available for the movements of the pendulum.

Surrounding the weight *c*, and affixed to the lower part of the structure or stage A, is an annular guard, K, which serves to control the movements of the pendulum and restrict them to reasonable bounds.

The support of the pendulum J is a gimbal-joint, L, such as is used in marine compasses, and consists of two horizontal rings, *d e*, the outer one, *d*, of which is pivoted at its opposite sides to the under side of the platform D by

pivots *f f*, while the inner ring *e* is pivoted within the first by pivots *g g*, arranged at right angles to the pivots *f f*. The pendulum is pivoted to the inner gimbal-ring *e* by a horizontal pin or rod, *h;* and I prefer, for certain reasons, that this pivot shall not only be disposed below the pivots *f* and *g*, but quartering with the latter, as shown in the drawings.

I do not confine myself to this disposition of the pivot *h*, though in practice I have found it preferable in some respects; nor do I confine myself to the two rings *d e*, as a third ring may be employed, and, if so, the pivots which connect it with the ring *d* should be at right angles with the pivot *h*.

This method of suspending the pendulum, before explained, permits of universal freedom of swinging motion, so that, when the machine is placed on board a navigable vessel or other floating object acted upon by wave-power, the pendulum shall be caused to describe a movement in some direction by the rolling and pitching movements of the vessel.

The suspensory joint of the pendulum, as last above described, is situated below and concentric with the opening *a'* of the platform D, while the upper end or arm *i* of the pendulum extends upward through the opening, and has a bifurcated head, *j*, which receives the outer ring *k* of a second horizontal gimbal-joint, M, such ring *k* being pivoted at opposite sides to the ears of the head by pivots *m m*, while the inner ring of the joint, which is shown at *n*, is pivoted to the outer by pivots *o o*, arranged at right angles to the first, as before explained, and as universally practiced in gimbal-joints.

N in the drawings represents an upright rod or lever, pivoted at its lower end by a horizontal pivot, *p*, to the inner ring *n* of the gimbal-joint M, last described, this pivot *p* being disposed at right angles to the pivots *o o*, and parallel to the pivot *h* of the joint L.

The lever N is fulcrumed, at or near its center, to the lower cross-head H by a half gimbal-joint, O, the outer ring *g* of which is affixed to or is a component part of the said cross-head, while the inner ring *r* of this joint O is pivoted to the former by oppositely-disposed pivots *s s*, while the lever, in turn, is pivoted to the inner ring *r* by a horizontal pivot, *t*, disposed at right angles to the pivots *s s*, and in alignment with the longest plane of the cross-head H.

The manner of connecting the lever N to the cross-head H, as stated, permits such lever to move in any direction, according as it may be forced by the vibration of the pendulum, and the upper end of this lever is converted into a forked head, *u*, which straddles the ring *v* of a second half gimbal-joint, P, and is pivoted to such ring by oppositely-disposed pivots W W.

The upper cross-head G is connected to the upper end of a rod, *x*, also, by a half gimbal-joint, Q, the ring of such joint being shown at *y*, and the horizontal pivot connecting such ring with the said rod *x* at *z*, while the ring *y* is pivoted to a fork, *b'*, of said cross-head by pivots *c' c'*, arranged at right angles to the pivot *z*.

The lower end of the rod *x* is connected to the inner ring *d'* of the joint P, before named, by a horizontal pivot, *e'*, arranged at right angles to the pivots W W of such joint.

It is obvious that any swinging movement in any direction of the pendulum J will impart a compound movement to the lever or rod N—that is to say, said lever will be thrown into a sloping position or oscillated upon the gimbal-joint, which connects it with the cross-head, while it will also be lowered bodily, and with it lower the cross-head, and vice versa, when the pendulum returns, while with the compound movement of the lever I and the descent of the cross-head the upper cross-head is simultaneously lowered, and with it the inner arm of the walking-beam *a*. It will thus be seen that swinging movements of the pendulum are transmitted by the intermediate rod N to the walking-beam to effect oscillating movements of the latter.

My machine is especially useful on board navigable vessels to effect pumping and other work, and may, with modifications, be adapted to operate the propeller. It may be also used with bell-ships or buoys to effect the ringing of the bell, and is applicable to many purposes which time will not permit me to enumerate.

Having thus described the nature and operation of my invention, I claim, and desire to secure Letters Patent of the United States, the following:

1. The combination of the pendulum J, oscillating lever N, and walking-beam I, substantially as and for purposes stated.

2. A mechanism for utilizing wave-power, consisting of the following: A weighted pendulum suspended from a suitable frame or stage by a universal joint, so as to be permitted universal freedom of swinging motion, the upper part of the pendulum, which extends above the point of suspension a distance corresponding with the desired power of leverage, being connected with a walking-beam or other transmitter of power by an intermediate rod or lever connected to a sliding cross-head, which traverses vertical slides affixed to the frame of the machine and over the pendulum, the said intermediate rod being swiveled at some point between its extremities by a universal joint to a second cross-head, disposed below the first and sliding upon the same guides or in the same path of movement, and the whole being so arranged that swinging movements of the pendulum in any direction shall, by means of its upper arm and the intermediate rod, impart oscillating movements to the walking-beam, substantially as and for the purposes set forth.

3. The combination of the pendulum J, lever N, and cross-head H with the frame A and its slides F F, under the arrangement substantially as described, whereby swinging

movements in any direction of said pendulum effect corresponding oscillating movements of the lever and the cross-head, and vertical movements of the lever and cross-head together, essentially as and for the purposes stated.

4. In combination with the cross-head H and lever N, the cross-head G, pivoted to the lever by a suitable universal joint, substantially as and for the purposes stated.

5. The annular guard K, to determine or restrict the swinging movements of the pendulum J, substantially as and for the purposes stated.

CHAS. W. LORD.

Witnesses:
F. CURTIS,
L. A. CURTIS.