

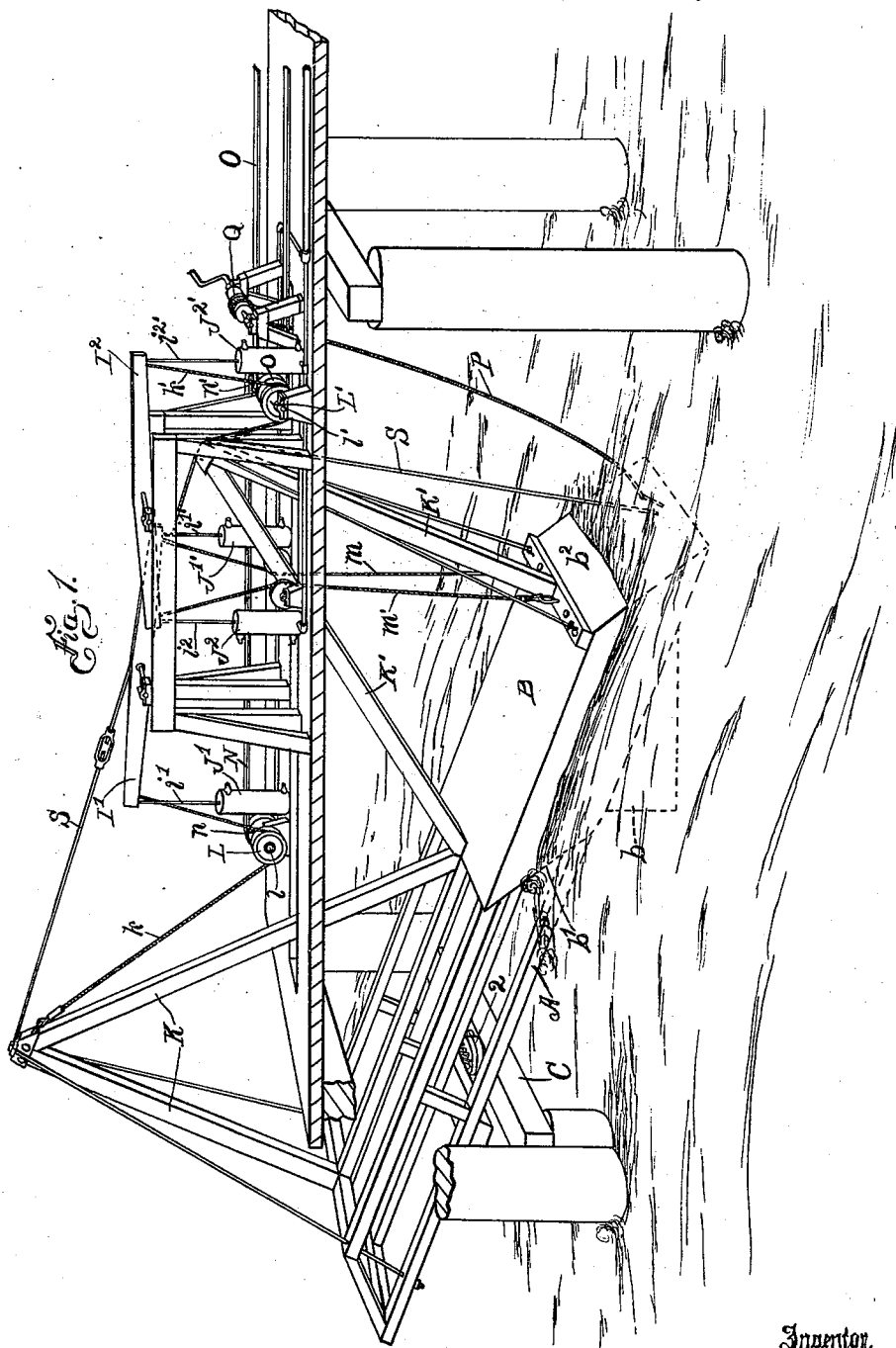
(No Model.)

2 Sheets—Sheet 1.

J. A. MOORE.
WAVE MOTOR.

No. 543,137.

Patented July 23, 1895.



WITNESSES.
P. H. Harbeson.
Alfred I. Townsend.

Inventor.
J. A. Moore.
By
Hazard & Townsend
His Attys.

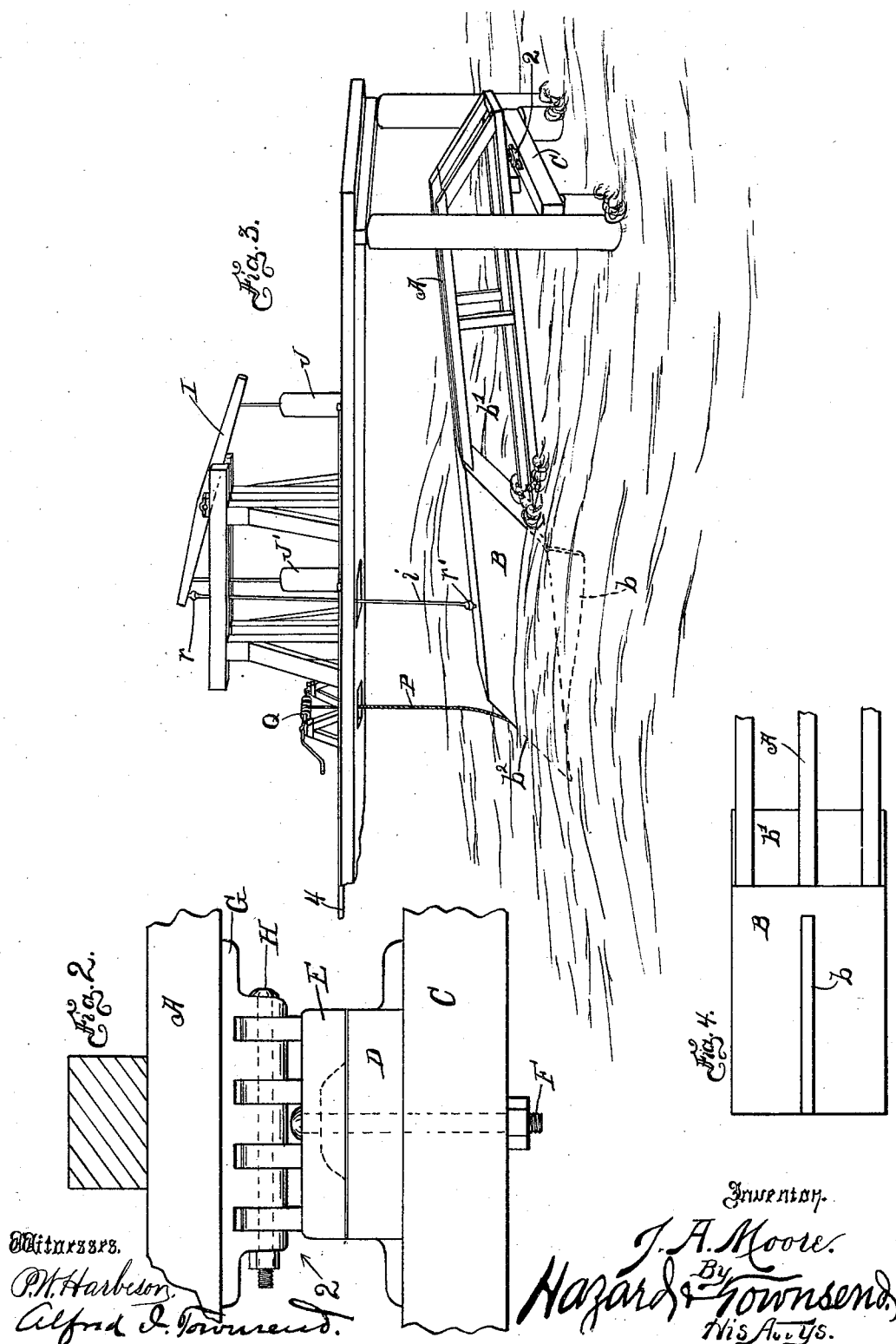
(No Model.)

2 Sheets—Sheet 2.

J. A. MOORE.
WAVE MOTOR.

No. 543,137.

Patented July 23, 1895.



UNITED STATES PATENT OFFICE.

JAMES A. MOORE, OF LANCASTER, CALIFORNIA.

WAVE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 543,137, dated July 23, 1895.

Application filed December 27, 1894. Serial No. 533,053. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. MOORE, a citizen of the United States, residing at Lancaster, in the county of Los Angeles and State of California, have invented new and useful Improvements in Wave-Motors, of which the following is a specification.

It is well known that the great difficulty to be overcome with wave-motors arises not so much from devising mechanism which will utilize the power as it does from devising mechanism which will not be destroyed by the action of storm-waves beating against the floats. For this reason it becomes necessary to avoid making the float unnecessarily large, and any means whereby one can increase the effectiveness of the float without adding to its size is of importance. The lifting power of a float is only equal to the weight of the water above its own weight which it displaces when submerged, so that if a float is of such specific gravity that it will barely float, it will not exert much lifting power, but will exert great power as it lowers after the wave leaves it. I have found by experiments that at certain points along the Pacific coast the waves not only rise and fall, but they also advance and retreat, or, in other words, a reflux action takes place after the wave has risen to its highest extent, evidently caused by the water flowing backward into the trough of the succeeding wave.

One object of my invention is to produce a float which will be light enough to exert great lifting power, and to so arrange it that any reflux action of the wave will tend to cause the water to flow up onto the float, thus to add weight to the float, so it will exert more power as it descends than it would if the gravity of the weight alone was depended upon.

Another object of my invention is to provide a practical wave-motor having a power-receiving float arranged to present an oblique surface to the waves and on which the force of the waves will operate to drive the machine without breaking it.

The accompanying drawings illustrate my invention.

Figure 1 is a perspective view of the preferred form of wave-motor in operation. Fig. 2 is a detail of the universal joint or pivotal connection for mounting the float. Fig. 3 is

a perspective view showing an application of my invention in a simpler form. Fig. 4 is a view showing the under side of the float or weight.

My invention comprises a wave-motor having a pivoted lever arranged sloping downward from its pivotal point and provided at its end with a floating weight, which has a flat bottom sloping in the same general direction as the lever and has flat ends sloping in the same general direction as the lever and oblique to the bottom of the float, so that the waves moving in one direction (from pivot to float) will lift upon the weight to raise the weighted end of the lever while the reflux of the wave will flow up onto the floating weight and press downward the weight upon and cooperate with the weight to drive the lever in the opposite direction.

In the drawings I have shown a sloping lever A, consisting of suitable framework with a weight B at its lower end. The lever A is mounted upon and pivoted intermediate its ends to a suitable support C by a universal joint 2, consisting of the bed-plate D, the lower hinge-plate E seated thereupon and pivoted thereto by the king-bolt F, and the upper hinge-plate G hinged to the lower hinge-plate by the hinge-pin H. The upper end of the lever A is secured to the upper hinge-plate and the lever slopes downward therefrom.

The floating-weight B is provided on its under side with a keel or centerboard *b*, so that the movement of the water will keep the weight B and the lever in direct line with the motion of the waves. The weight B is connected with suitable power-converting mechanism by suitable means.

In Fig. 3 I have indicated a simple appliance for converting and transmitting the power. I indicates a walking-beam connected with the floating weight B by a connecting-rod *i*, and also connected and arranged to operate air-compressors or water-pumps J J'. The rise and fall of the float are thus made to pump water or air which is conducted through a pipe 4 to proper mechanism for driving machinery, description and illustration of which are here unnecessary.

In Fig. 1 I have shown mechanism which I have invented, and which, in combination with the lever and weight hereinbefore de-

scribed, constitutes a compound air-compressing engine.

K K' are two truss-standards arranged projecting upward from the rear and front ends of the pivoted lever A and trussed by the truss-rod S.

I' I² are two walking-beams, each of which has its opposite ends connected with suitable air-compressors by suitable connecting-rods *i*', &c. One end of the walking-beam I' is connected with the truss-standard K by a cable *k*, which runs beneath a depression-pulley L, the whole being so arranged that the movement of the lever A, when the weight B rises, will operate the walking-beam I' to compress air in the air-compressor J'. The other end of the walking-beam I' is connected with the weight B by the cable *m* in such a manner that the downward movement of the weight B will operate the walking-beam in the opposite direction and drive the air-compressor J' to compress air in such compressor. The truss-standard K' is connected with one end of the walking-beam I² by means of the cable *k'*, so that the upward movement of the float will operate the walking-beam I² to compress air in the air-compressor J², and the other end of the walking-beam I² is connected with the weight B by the cable *m'*, so that the downward movement of the weight will operate the walking-beam to drive the air-compressor J².

The truss-standards K and K' extend above the level of the pulleys L L' and the cables *k k'*, which respectively connect said standards with the walking-beams, I' I², are attached to the standards respectively above said pulleys and pass downward around the pulleys and then up to the walking-beams respectively. Thus the upper member K of the truss forms practically one end of the lever A, and the pivotal point of the lever is arranged intermediate the ends of the lever, so that by attaching the rope *k* to one end of the walking-beam I' and the rope *m* to the other end of the walking-beam and of the lever, the upward motion of the float operates through the medium of the truss K and rope *k* to draw one end of the walking-beam I' down, while the downward movement of the float operates through the medium of the rope *m* to draw the other end of the beam down, and I am thus enabled to use flexible connections between the lever and the walking-beam and yet to obtain a positive action.

The pulley L, under which cable *k* passes, is fixed upon an axle *l*, which is provided with a belt-pulley *n*, and the pulley L', under which cable *k'* passes, is fixed upon a shaft *l'*, which is provided with a belt-pulley *n'*. The belt-pulleys *n* and *n'* are connected by a belt N.

O is a power-transmitting belt driven by a pulley on the shaft *l'*. By this arrangement the movement of the weight B not only operates the air-compressor, but also the belt O.

In case more power is exerted by the upward movement of the weight or float than

by the downward movement of the same, then, in order to equalize the movement, the air-compressors which are driven by the downward movement of the weight are made of a lower pressure than the air-compressors driven by its upward movement.

P indicates a cable connected with the weight B and wound over a windlass Q to enable an attendant to draw the weight B up out of the water when desired. Before drawing the weight out of the water the cables *k k'* and *m m'* may be disconnected from the standards and float.

I will now describe the operation of the motor, reference first being had to the form shown in Fig. 3, in which the sea end is at the right. The incoming wave strikes upon the sloping seaward end *b'* of the rectangular float or weight B, and also upon the sloping bottom of such weight, and lifts the weight and swings the lever upward, thus operating the rod *i* to actuate the walking-beam I and drive the pump or air-compressor J. When the wave returns it runs up on the sloping face *b²* at the shoreward end of the weight and the gravity of the outgoing wave is thus added to that of the floating weight B to draw the connecting-rod *i* down and operate the walking-beam I in the opposite direction to drive the pump J'. The pumps J J' are arranged to be adjusted to produce different degrees of pressure, the same being adjustable as to pressure so that the machine can be adjusted to equalize the strokes and counteract the difference in power which is exerted by the upward and downward operations of the floating weight.

Now referring to the operation of the form of machine shown in Fig. 1, the movement of the lever in one direction operates the cable *k* and the cable *k'* to drive the walking-beams I' and I² to operate the pumps J' J². At the same time these cables drive the pulleys L and L' and their connecting-belt N and drive the belt O. On the descent of the weight the cables *k* and *k'* drive the pulleys L L' in an opposite direction, but provision is made by a suitable ratchet connection, so that the pulleys L L' may return freely while the shafts *l l'* continue to rotate in the direction in which they have been driven by the first movement of the cables. The ratchets are not shown in the drawings, for the reason that the same are well understood in mechanics and need no illustration. The pulleys *n n'* and *o* are ratchet-pulleys, each being connected with their respective shafts by a suitable ratchet device. (Not shown.) On the reflux of the wave the water runs up onto the sloping face *b²* and the top of the weight and adds its gravity to that of the weight, as before described, and as the weight depresses it operates the cables *m m'* to draw down the opposite ends of the walking-beams I' and I² and operate the low-pressure pumps J' and J².

When the walking-beam and the weight are connected by a rigid connecting-rod, as

indicated in Fig. 3, the connections between the rod and the weight and walking-beam should be a ball-and-socket joint $r\ r'$ to allow deflection of the lever. The keel or center-board b is arranged along the mid-line of the bottom of the floating weight parallel with the axis of the lever, and is acted upon by the moving water to thus cause the weight to present its sloping end to the waves in such a way as to receive their full lifting force—in one direction—and to allow the reflux of the wave to fully flow up onto the lower end and the top of the weight.

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

1. A wave motor comprising a pivoted lever; a rectangular floating weight attached to the lower end of such lever, and having its flat bottom arranged oblique to the surface of the water, and having its shoreward end beveled from the flat bottom of the float upward to form with such bottom, a sharp point to dip into the water, and having its seaward end beveled from the bottom upward, to cause

the float to ride upon the incoming wave, substantially as set forth.

2. A wave motor provided with a floating weight which is arranged upon a sloping pivoted lever and has its bottom arranged oblique to the surface of the water, and has its ends oblique to the bottom and also oblique to the surface of the water in the same general direction as the slope of the lever and provided with a keel or centerboard arranged on the bottom of the floating weight parallel with the axis of the lever.

3. The combination of the sloping pivoted lever provided with a floating weight; the walking beams; the depression pulleys; the truss standards extending above the pulleys; the cables respectively passing under said pulleys and connecting said standards respectively with one end of each walking beam, and the cables arranged connecting the other end of each walking beam with the weight.

JAMES A. MOORE.

Witnesses:

GEORGE GEE,
B. E. HANNAH.