

No. 692,396.

Patented Feb. 4, 1902.

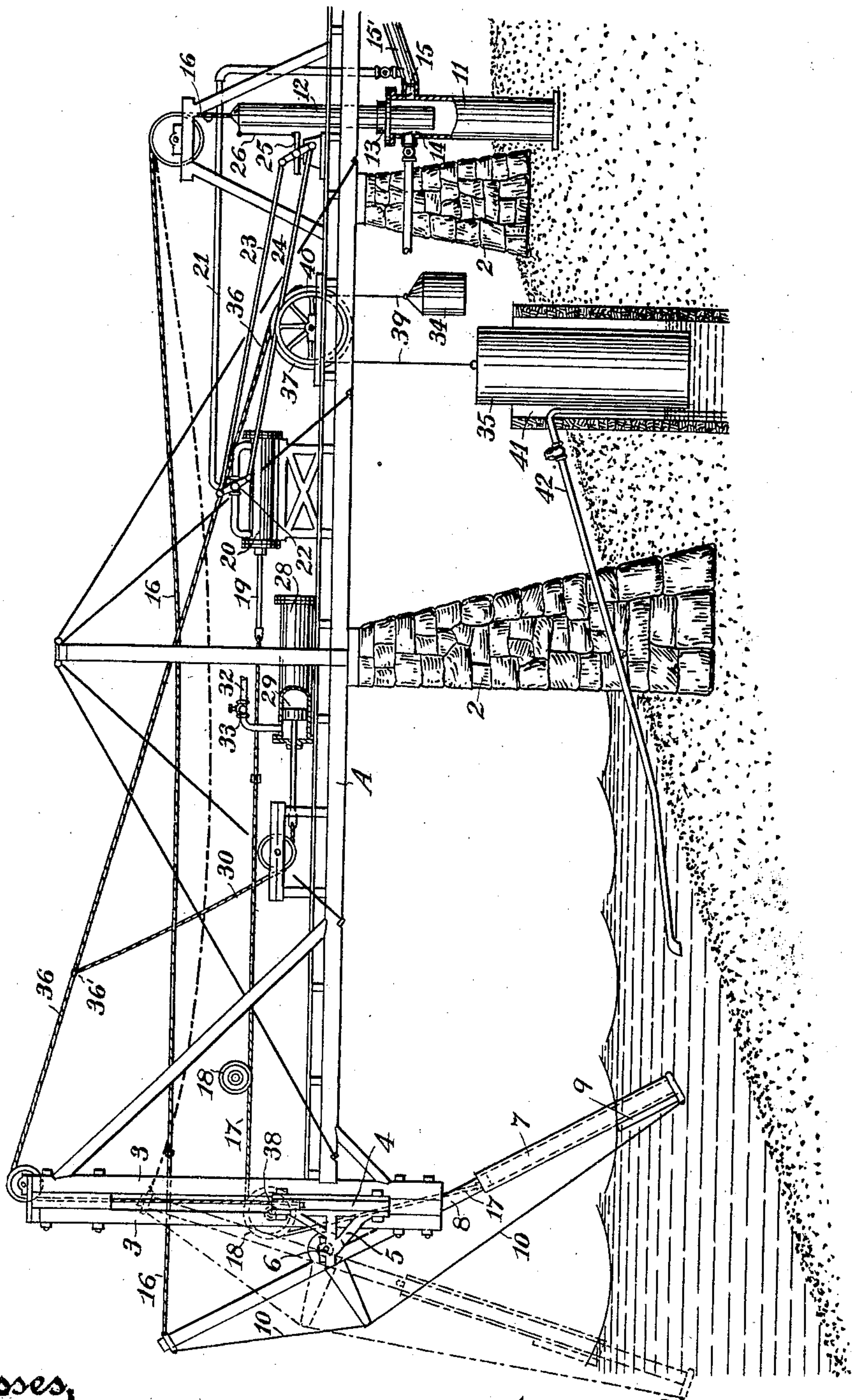
J. R. WILCOX.
WAVE MOTOR.

(Application filed June 3, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



Witnesses,

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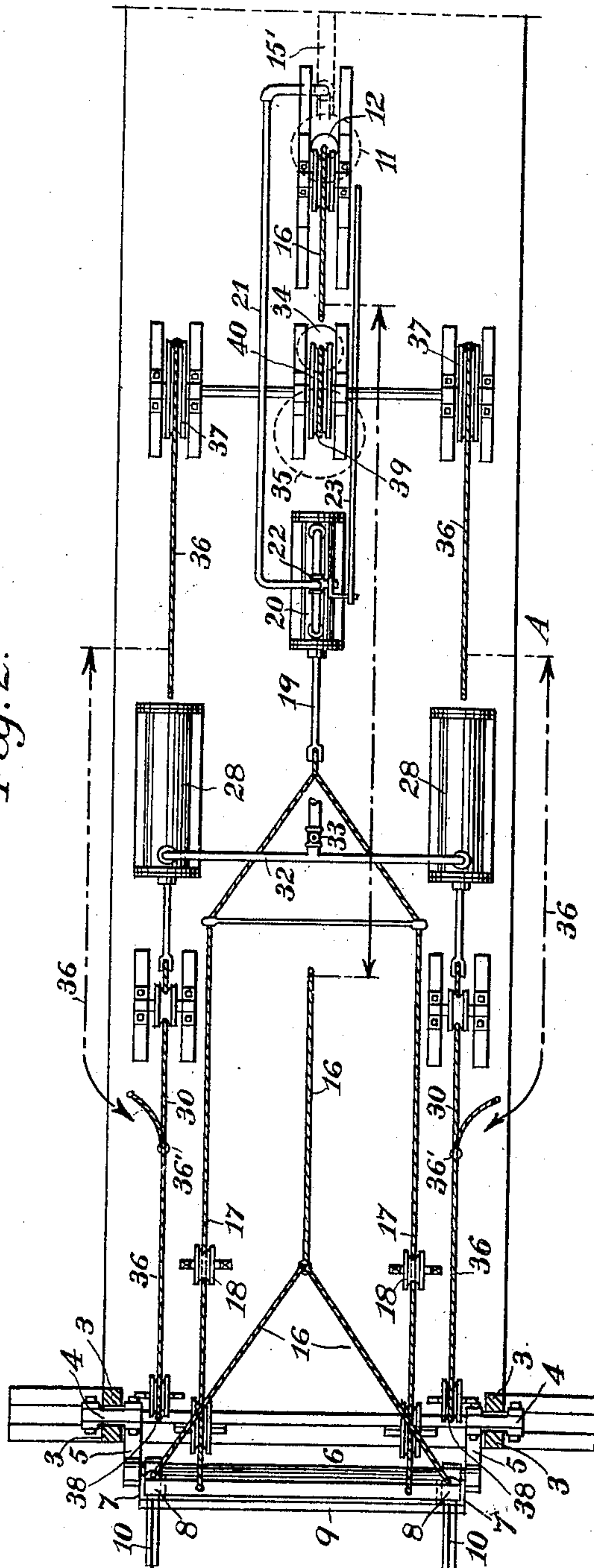
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2 Sheets—Sheet 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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WAVE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 692,396, dated February 4, 1902.

Application filed June 3, 1901. Serial No. 62,928. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH R. WILCOX, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Wave-Motors; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in engines in which the motive power is furnished by the action of the incoming waves of the ocean.

It consists, essentially, of a framework supported and extending over the water and carrying at its outer end a pivoted paddle adapted to be oscillated by the waves, guides in which the journals of the fulcrum-shaft of said paddle are movable, whereby said paddle is adjusted in relation to the height of the tide, means by which said adjustment is made automatically, and means by which the power generated by the oscillation of the paddle is utilized or conserved.

It also comprises details of construction more fully to be hereinafter set forth, having reference to the accompanying drawings, in which—

Figure 1 is a longitudinal elevation of my invention. Fig. 2 is a plan.

A represents a framework on which the various parts of my device are mounted. This framework is suitably supported, as upon the piers 2, and may be braced and trussed as the exigencies of the case require, the desire being to form a firm rigid structure capable of withstanding the severe strains put upon it. On the outer end of this frame are the vertical guide-timbers 3. A sash 4 is supported and slidable in these guides, and on this sash are fastened the brackets 5, in which latter the shaft 6 is journaled. A paddle is secured to this shaft in such manner that its greater length will hang below the shaft and oscillate with the incoming waves. This paddle is an open frame made in two parts, the one, 7, inclosing and slidable in relation to the other or pivoted portion 8. The sliding portion 7 consists simply of metal sleeves connected by a heavy horizontal plank or paddle member 9. The opposite ends of the

pivoted portion are suitably joined, and the whole paddle is reinforced by the trusses 10. The utilization or conservation of power generated by the oscillation of this paddle is effected as follows: Situated at a convenient spot, generally from two hundred to three hundred feet from the outer end of the frame A, is a pump whose cylinder 11 is fixed in upright position. The plunger 12 is a heavy metal column of lesser diameter than the interior of the cylinder. This plunger extends without the cylinder, and a packing 13 forms a suitable tight joint. Respective inlet and outlet valves 14 and 15 are provided in the cylinder, and the compression and expulsion of fluid within the cylinder are effected by the displacement occasioned by the falling plunger. A cable 16 connects the outer end of the plunger and the upper end of the paddle, so that as the inflowing wave pushes with its tremendous force against the paddle the latter is moved to lift the plunger and draw in the fluid through valve 14. The return outward again of the paddle allows the plunger to fall by gravity and expel the fluid in the cylinder. As these machines are placed at the seashore, where the force exerted by the waves is immense, it is readily seen that the weight of the plunger is practically limited only by the size of the paddle.

An important feature of my invention is the use of the long heavy cable 16, for the sag that occurs therein when the plunger has dropped to its lowest point serves to relieve all wrenching or rending asunder of the parts when a wave strikes the paddle, which would occur if the connections between the paddle and the pump were rigid.

In order to allow a more ready return outward of the lower end of the paddle and not retard the fall of the plunger unduly, I have devised a means to lift the member 9 from the water automatically during this outward movement and to return said member to position for the next inward movement. This lifting of the member is done as follows: Cables or ropes 17 are secured to the top of the sleeves 7, to which latter the member 9 is attached and by suitable guide-sheaves 18 lead to the piston-rod 19 of the working cyl-

inder 20. Connecting the cylinder 20 and the outlet pipe 15' of the pump is a pipe 21, through which fluid under pressure may be admitted to the working cylinder and behind the piston to drive the latter forward and lift the sleeves and member 9 of the paddle. A three-way cock 22 in the pipe is adapted to be turned to admit the fluid to or discharge it from the cylinder by means of connecting-rods 23 and 24 and an oscillating rod 25, arranged in relation to the movement of the plunger 12. Attached to the plunger and rod is a cord or chain 26, whereby the rod is turned on the upward movement of the plunger to open the valve 22 and admit the fluid behind the piston of the working cylinder. As the member 9 is lifted the resistance of the water against the paddle is accordingly overcome and the plunger begins its descent. On its descent the cord pulls downward on the rod 25 and so turns the valve 22 to allow discharge of the fluid from the working cylinder, causing a return of the piston of the latter, and a falling of the member 9 again into position. The rod 25 is preferably hollow and adapted to contain a quantity of quicksilver, which assists in the rapid positive action of the valve 22.

Provision must be made for the continual variation in the height of the tide and for undue stress of weather. This is done by raising the sash 4, which carries the paddle in the guides 3. For ordinary variations in tide this raising is accomplished automatically. The adjustment of the paddle to the continual rising and falling of the tide is effected by means of a weight 34 and a balance-float 35. The weight is attached to cables 36, which pass over sheaves 37 and connect to the sash at 38. This weight is ordinarily heavy enough to raise the sash and paddle clear of the water; but the float 35 serves as a balance to adjust the paddle to the height of the tide. This is done by means of a cable 39, which connects the weight and float, and this cable passes over the sheave 40. The float operates in a pit or well 41, which latter is connected with the ocean by means of a siphon 42. One end of this siphon reaches to the bottom of the pit and the other extends below the line of lowest water. Accordingly as the tide rises or falls the water in the pit will be maintained at a corresponding level. As the float rises it allows the weight to lower, which action causes a corresponding elevation of the paddle, and as the float lowers it raises the weight and lowers the paddle, so that the position of the latter is always relatively the same as to the water in which it dips. Where the paddle is to be raised clear of the water, as in case of a storm, I employ similar means as to raise the member 9—that is, I have a supplementary set of cylinders 28, which I designate as “storm-cylinders.” They have pistons 29, whose rods are connected by cables 30 with the cables 36 at 36'. A pipe 32 admits fluid under pressure from the pump behind the piston to move the

latter and raise the paddle. A valve or cock 33 controls the flow of this fluid.

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

1. A wave-motor consisting of a frame or support, vertical guides at the outer end thereof, an oscillating paddle slidable in said guides and connections of said paddle with a plunger-pump, said paddle including two parts one slidable in relation to the other.

2. A wave-motor comprising a frame or support, a paddle including two parts one slidable in relation to the other and one of said parts pivotally mounted, vertical guides on said support and in which said paddle is slidable, a cylinder and a plunger operating therein, and connections between the plunger and paddle.

3. In a wave-motor, the combination of a frame or support, guides thereon, a paddle adjustable in said guides, a weight and a cable connecting said weight and paddle, a weight, a float and a cable connecting said weight and float, said float so operating when it is moved upward as to cause the weight to descend and raise the paddle and when said float is lowered to raise the weight and lower the paddle.

4. In a wave-motor, the combination of a support, vertical guides thereon, a sash carrying an oscillating paddle slidable in said guides, a weight, and connections of said weight and sash whereby the former tends continually to raise the latter and consequently to lift the paddle out of the water, a balance-float, and connections of said float and weight, a well in which said float is contained and a siphon-pipe connecting said well and the water in which the paddle normally dips, whereby the water within the well and that without are constantly maintained at the same level, and as the float rises the weight lowers and the paddle is raised and vice versa as the float lowers the weight rises and allows the paddle to lower.

5. The combination in a wave-motor, of a frame or support, vertical guides thereon, an oscillating paddle pivoted upon a sash slidable in said guides, storm-cylinders in each of which a piston is movable, connections of the rods of said pistons and sash whereby the latter, with the paddle, is moved vertically when the pistons are reciprocated, and means for admitting fluid under pressure to said cylinders to move the pistons.

6. The combination in a wave-motor, of a support, an oscillating paddle, said paddle having a vertically and independently slidable horizontal portion, a cylinder in which a piston is reciprocable, connections between said horizontal paddle portion and the rod of said piston, and means whereby fluid under pressure is admitted to said cylinder to move the piston, and raise said horizontal portion.

7. The combination in a wave-motor of a support, a paddle pivoted thereon, said pad-

dle having a vertically and independently slidable horizontal portion and having its longer lower portion normally in contact with the water, and a shorter portion above its pivotal points, and said support having a vertical guide for the paddle, a cylinder, a plunger operating therein, and a cable connecting said plunger with the said shorter portion of the paddle whereby the piston is reciprocated by the oscillation of the paddle.

8. The combination in a wave-motor of a support, a paddle pivoted thereon and adapted to be oscillated by the waves, said paddle having a vertically and independently slidable horizontal portion normally offering a resisting-surface to the flow of the water, a cylinder in which a piston is reciprocable, connections of the rod of said piston and said horizontal paddle portion, means by which fluid under pressure is automatically admitted to said cylinder to move the piston and raise the horizontal portion, and by which the fluid is discharged from said cylinder and the said portion lowered.

9. A wave-motor consisting in combination

of a support, guides thereon, an oscillating paddle slidable in said guides, an independently-slidable horizontal portion on said paddle, said horizontal portion normally offering a resisting-surface to the flow of the water, a pump having a weight-plunger adapted to be raised by the alternate oscillations of said paddle, and to fall by gravity on the successive oscillations thereof, a cylinder in which a piston is reciprocable, connections of the rod of said piston with the horizontal paddle portion, a pipe connecting said cylinder and pump, a three-way cock in said pipe, and means by which said cock may be turned to admit fluid under pressure to the cylinder on alternate reciprocations of the pump-plunger, and to turn said cock to discharge the fluid from the cylinder on the successive reciprocations of said pump-piston.

In witness whereof I have hereunto set my hand.

JOSEPH R. WILCOX.

Witnesses:

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CHAS. E. TOWNSEND.