# C. BUCKNER.

## Wave Powers.

No. 138,474. Patented May 6, 1873.

Fig. 1.

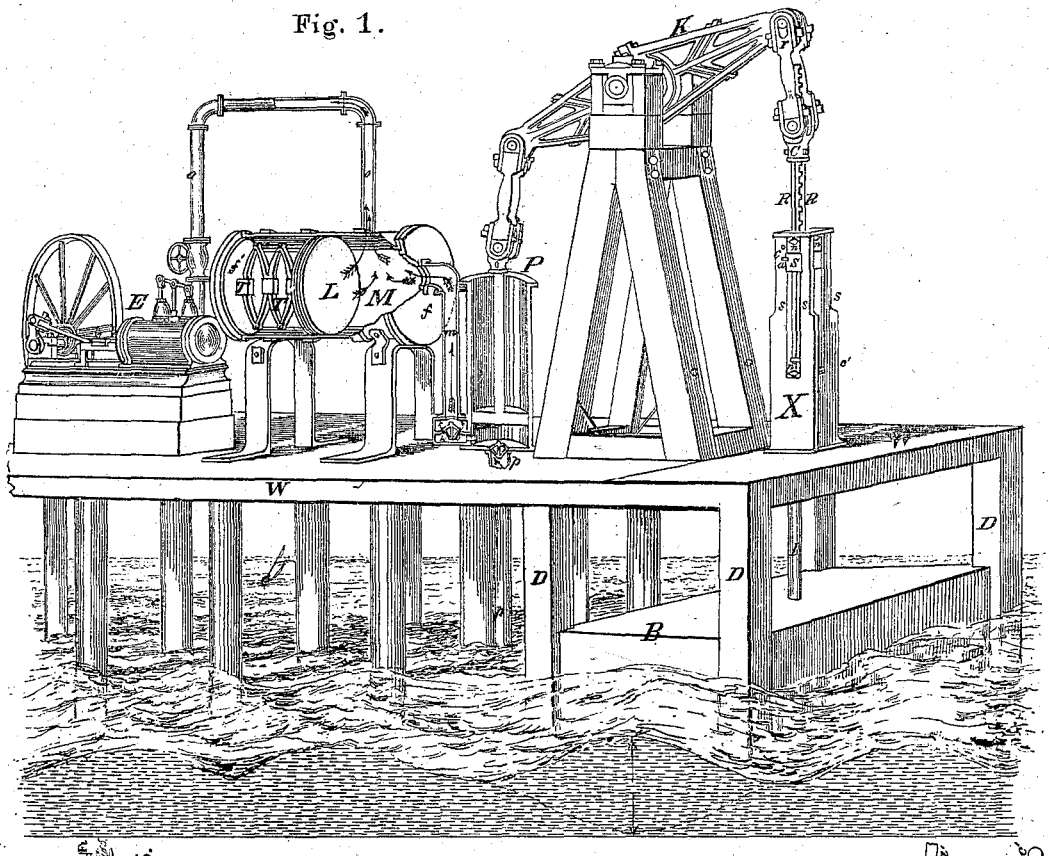



Fig. 5.

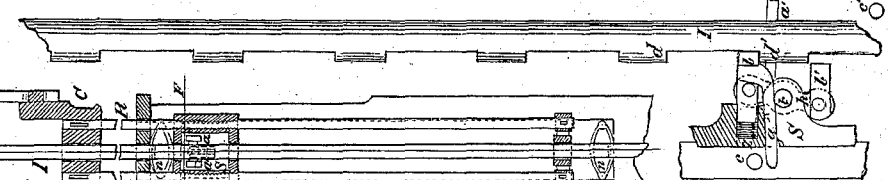


Fig. 3.



Fig. 2.

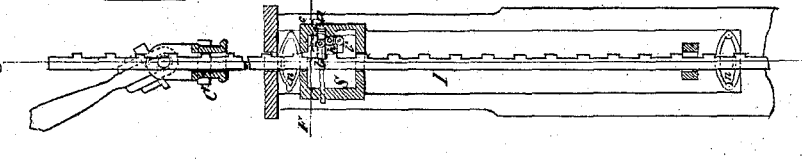
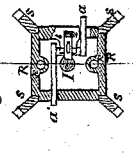


Fig. 4.



WITNESSES:

Lewis Varnas

Arvel Fuller

INVENTOR.

Charles Buckner

# UNITED STATES PATENT OFFICE.

CHARLES BUCKNER, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF PART INTEREST TO HENRY BRUNE, JOHN REINERS, JOHANN H. A. LUDWIG, AND ISAAC M. WARD, OF SAME PLACE.

## IMPROVEMENT IN WAVE-POWERS.

Specification forming part of Letters Patent No. **138,474**, dated May 6, 1873; application filed July 25, 1872.

*To all whom it may concern:*

Be it known that I, CHARLES BUCKNER, of San Francisco city and county, and State of California, have invented certain Improvements in a "Machine for Utilizing and Storing the Power Produced by the Rise and Fall of the Waves," of which the following is a specification:

The first part of my invention relates to the combination of a floating buoy with a pump, reservoir, and water-engine, in such manner that the said floating buoy, by its rise and fall, shall be capable of working the pump and feeding the reservoir, so that the reservoir, by an arrangement of powerful springs within, can serve as a store for power to continually supply and work the water-engine; the object of this part of my invention being to utilize the motion of the waves by means of this buoy, pump, reservoir, and engine. The second part of my invention relates to the regulation of the motion of the floating buoy for the rise and fall of the tides; and consists of a mechanical contrivance for allowing the sliding central upright rod attached to the same to be lengthened or shortened for the difference of the level of flotation, thereby preventing any excess to a certain fixed limit of stroke.

Figure 1 is a perspective view of a machine embodying my invention. Fig. 2 is a vertical longitudinal section of the parts of the slide and slide-bar rods, involving the mechanical contrivance for regulating the length of the sliding rod I. Fig. 3 is a vertical transverse sectional view of Fig. 2, showing arrangement of cross-head C, sliding rod I, and rods R R. Fig. 4 is a sectional plan of Fig. 2 through the line F F. Fig. 5 is an enlarged view of the bolts *b b'*, and their connections with a portion of the rod I.

W W represents a wharf extending into the water, and the height between the trough and crest of the waves supposed to be equal to the extreme limit of the stroke. B is a square-shaped floating buoy, which rises and falls with the water surrounding the wharf, and slides vertically up and down on the square posts D D, supporting the same. To the top of the buoy B, in the center, is firmly attached a stout iron rod, I, which passes through the planking of the wharf, and is attached to a contrivance within the sliding box S, through which it also passes. The sliding box S has four slides to work up and down on, *s s s s*, and is fastened to the cross-head C, belonging to the walking-beam K, by two rods, R R, on each side of I, which also slides through this cross-head. The walking-beam K, actuated by the rise or fall of the buoy B, works an ordinary force-pump, P, drawing the water up through the pipe *p*, and sending it into the reservoir M through the pipe *m*. The reservoir M consists of a very strong cast-iron cylinder, bound round with wrought-iron bands, and having the covers *f f'* adjustable. A piston, L, works backward and forward for a certain distance within the cylinder M, its motion being produced by the water (forced in from the pump for the outlet-pipe *o*) causing compression of several powerful springs, T T, attached to it in the rear, and also by their expansion on the release of such pressure, so that a certain power is continually stored in this reservoir M, for when the buoy has finished its stroke and forced into M as much as it will allow, the pressure also brought to bear on the piston and springs T T makes them, on their extension, force gradually back all the water they can through the outlet-pipe *o* to the water-engine E, which is, therefore, driven by the combined pressure, and a working power is the result of the rise and fall of the waves on the floating buoy B. For the regulation of the floating buoy for the rise and fall of the tides, so that a certain extreme limit of stroke should never be exceeded, the shaft or rod I has a kind of rack cut on it for about half its length from the top. Into this rack two bolts, *b b'*, are made to shoot alternately, and hold it in position. For this purpose the slide-box S is made up in pieces which fit together, one side having an indentation for the end of the top bolt *b* to slide into, and work on a powerful spiral spring, *z*. The bolt *b'* is also attached to the top bolt *b* by a lever-arm, *h*, (see Fig. 5,) which moves on the central pivot *t*. Two fixed arms, *a* and *a'*, extend right and left from the top bolt *b* through opposite sides of the slide-

box S, and strike projections *c c'*, fixed on the slide-bars *s s*, when the length of stroke has commenced to exceed its limit by the rise or fall of the tide.

By the striking of the arm *a* on the top projection *c*, the bolt *b*, which rests on one of the teeth of the rod I, such as *d*, is shot back, and the bolt *b'* suddenly pushed forward, sliding along the space between any two of the teeth, such as *d d'*, (which space is just the distance between the top of one bolt and the bottom of the other,) while the rod I is forced upward by the buoy B till it rests on the top of the tooth *d'*, and as soon as the arm *a* is released the bolt *b* immediately takes the place of *b'*, and rests on the top of the tooth *d'* instead of *d*, the rod I having ascended a space exactly equal to the pitch of the teeth. In the same manner, by the fall of the tide, the arm *a'* is struck by the projection *c'*, and the buoy B falls proportionately.

In order to prevent the contact with the arms *a a'* and projections *c c'* being too sudden, four springs, *h n*, top and bottom of the slide-bar frame X, are fixed so as to ease the approach as much as possible; also, the bearing of the walking-beam at *r* has to be of oval shape, so as to prevent the extension of these springs after release, affecting the bolts *b* and *b'* at the commencement of the stroke or the end of the same.

I make no claim to the water-engine E, pump P, walking-beam K, or a floating buoy, B, separately; but—

I claim as my invention—

1. The reservoir M, provided with the springs T T and piston L, in combination with the floating buoy B, pump P, and water-engine E, substantially as and for the purpose hereinbefore set forth.

2. The rod I, provided with a rack in which bolts *b b'* work on spring *z*, and lever *h* actuated by the arms *a a'* and projections *c c'*, together with the slide-box S, and springs *n n*, and oval slot *r*, substantially as and for purposes set forth.

CHAS. BUCKNER.

Witnesses:

LIONEL VARICAS,

ARNOLD FULLER.