(No Model.) 2 Sheets—Sheet 1.

J. C. WALKER.

WAVE MOTOR.

No. 516,034. Patented Mar. 6, 1894.

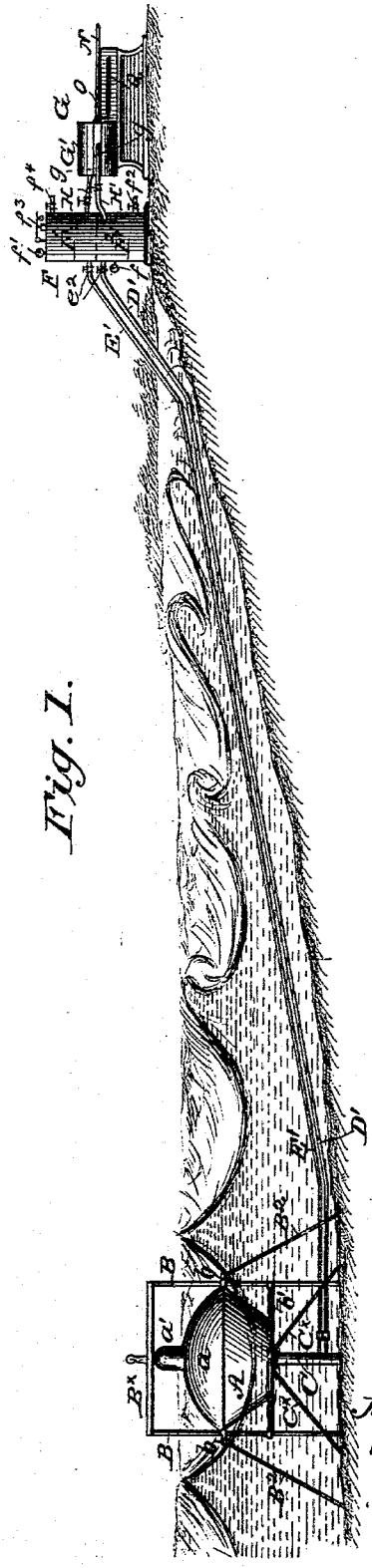

Fig. 1.

WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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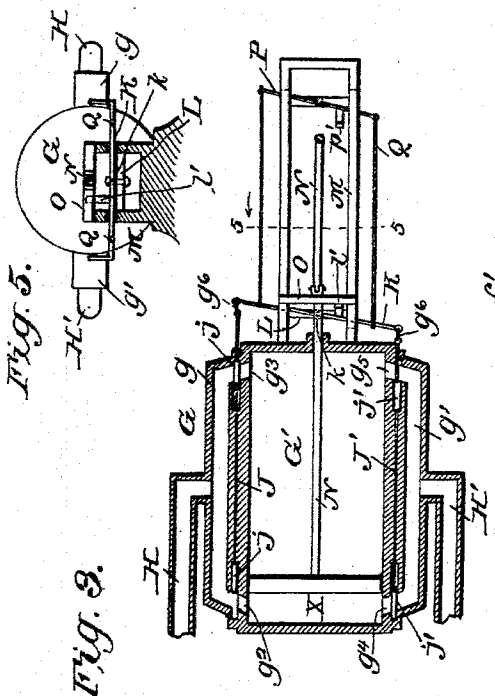

Fig. 5.

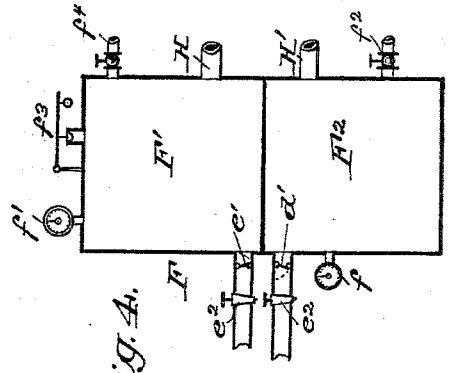

Fig. 4.

Fig. 3.

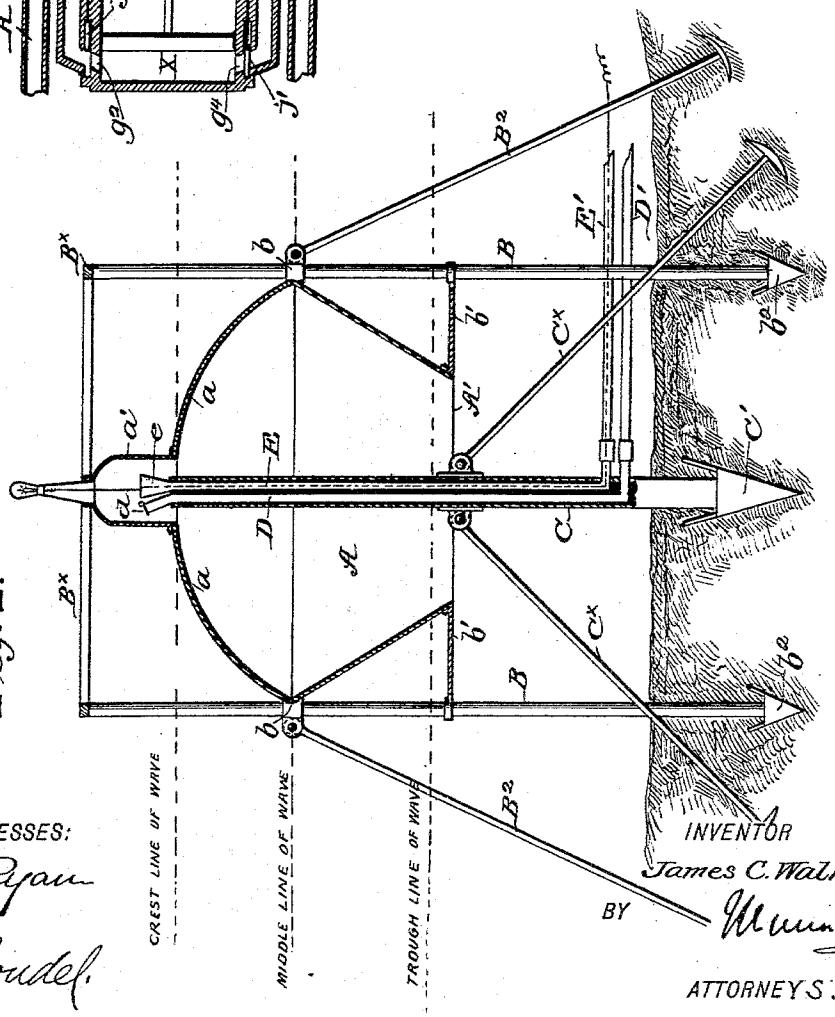

Fig. 2.

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JAMES C. WALKER, OF WACO, TEXAS.

WAVE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 516,034, dated March 6, 1894.

Application filed June 8, 1893. Serial No. 476,956. (No model.)

To all whom it may concern:

Be it known that I, JAMES C. WALKER, of Waco, in the county of McLennan and State of Texas, have invented a new and Improved Wave-Motor, of which the following is a specification.

My invention relates to means for securing and using wave power, and it has for its object to provide an apparatus which is adapted to receive the full force of the rise and fall of the waves, during their highest and lowest movements.

It has also for its object to provide suitably arranged means for storing up the power obtained by such motor, and for using such power to render the operation of the motor the more effective and positive, and at the same time serve to operate a drive shaft, from which power may be transmitted to be used as desired.

To these ends my invention consists in the peculiar combination and novel arrangement of parts, all of which will hereinafter be fully described in the specification and particularly pointed out in the claims, reference being had to the accompanying drawings in which—

Figure 1 is a side elevation of my improved wave motor apparatus, showing same in an operative position. Fig. 2 is a vertical section of the wave motor mechanism proper. Fig. 3 is a horizontal section of the air engine. Fig. 4 is a vertical section of air tanks, and Fig. 5 is a cross section of the air engine taken on the line 5—5 Fig. 3.

Referring to the accompanying drawings A indicates an air tight vessel, which in the practical construction should be substantially of the shape shown, its upper end being rounded as at a terminating in a central focus or dome like portion a' while the lower portion of such vessel tapers inwardly to form a contracted open mouth as at A'. This vessel which I term the buoy is fixedly held upon four strong tubes or standards B, by strong bands b b, and inwardly extending ring like braces b' b' as shown, and such tubular standards it should be stated have anchor barbs b^2 b^2 whereby they are securely held when driven into the sand or earth at the sea bottom, it being manifest that by being tubular they can be readily put in such position by hydraulic means. These standards B are connected at their upper ends by cross bars $B^\times$ $B^\times$, and are braced by the brace or anchor members B^2 B^2 as shown. Extended centrally up into the buoy A, with its upper end projected into the dome portion a' is a tubular pipe C open at the top and closed at the bottom and formed at such end with a barb anchor C' whereby it is secured in the sea bottom, it being braced by the lateral anchor members $C^\times$ as shown. The pipe C is of a diameter large enough to admit within it two smaller pipes D and E, which extend at their top above such pipe C, one of which D has an automatic valve d, at its discharge end which prevents air from the buoy entering the pipe D, but permits air to escape therefrom to the interior of the buoy as will hereinafter be more fully explained, while the other E has a funnel mouth e projected up into the dome a'. The pipes D and E pass through openings in the pipe C near the ground line and have water tight union joints with pipes E' D', which extend to the shore and connect respectively with the compressing chamber F' and vacuum chamber F^2 of an air receiving tank F, the pipe E' having a back pressure check valve e' to hold the air under pressure in the chamber F' from passing back into the said pipe, the pipe D' being also provided with a check valve d' which prevents air from passing from the pipe D into the vacuum chamber F^2, both pipes D' and E' being further provided with cut off valves e^2 as shown. The tank F the construction of which is most clearly shown in Figs. 1 and 4 of the drawings, has an upper compressed air holding compartment F' and a partial vacuum compartment F^2, beneath the compartment F', such lower compartment having a vacuum gage f and regulating valve f^2, while the air section has a pressure gage f', a safety valve f^3 and a regulating valve f^4.

G indicates an air engine which comprises a cylinder proper G', air pipes g g' at the opposite sides which open into the opposite ends of the cylinder as at g^2 g^3, g^4 g^5, with the upper one g of which connects a valved pipe H, lead-

ing from the air compartment F′, of tank F, and with the other g', connects a valved pipe H′ opening from the vacuum chamber F^2.

J J′ indicate slide rods, which have cut off valves $j\,j'$, arranged to be reciprocated in unison but in reverse directions to alternately open and close the ports $g^2\,g^4$, and $g^3\,g^5$. To this end the slide rods J J′ are connected by means of link members g^6 with the opposite ends of a centrally pivoted lever arm K, pivoted at k on a bar L secured on the cross head bearing M at a point below the crank rod N to which the cross head O is attached. Near the outer end of the cross head frame is centrally pivoted a lever P the ends of which are connected by the pitman rods Q with the lever K which lever as also the lever P has an upwardly projecting stud $l'\,p'$ which studs project up in the path of the reciprocal movement of the cross head.

The manner in which my improved apparatus operates is as follows, the buoy being so arranged as to give the greatest rise and fall of water caused by the wave, say the buoy contains air down to the trough line of wave, and the wave equals in perpendicular height the crest line of wave. When the wave strikes the buoy the water rises within it to the crest line, this forces the air in the buoy through the pipe E—E′, into air chamber F′, valve pipe H being at this time closed; as the wave recedes, the check valve e' in pipe E′ will hold the accumulated air in the said chamber F′. The fall of the water in the buoy (the valve in pipe H being closed) draws air out of the compartment F^2 through pipe D, and its valves into the interior of the buoy, and as each succeeding wave rises and falls the process is repeated until the capacity of the machine is reached or an equilibrium between the compressed air and weight of water is reached, then as each succeeding wave comes and goes, there will be but a small margin of reciprocal action between the water and compressed air, but the smaller the air space in top of buoy is reduced, by the operation of the wave, the greater will be the compression in tank section F′ and the greater the vacuum in F^2. After the required pressure is stored up, the valves in pipes H H′ are opened, which allows for an application of the air in the piston X and as the piston is operated the cut offs over the ports $g^5\,g^3\,g^2$ and g^4 will be alternately shifted through the cross head engaging with levers L and P to reverse the piston travel, the air exhaust being continuously drawn back into the vacuum chamber F^2 and out again into the buoy.

It is manifest that the higher or stronger the wave movement, the greater will be the air compression, and as the wave lift decreases, the air force will also decrease, it being also obvious that the force may be increased by decreasing the area in the dome or enlargement of the buoy, or increasing the diameter of the piston according to the height of the wave.

The funnel on top of pipe E is constructed in length nine times the diameter of the pipe and the mouth three times the diameter of such pipe E.

At the top of the dome portion a' is arranged a hollow conical like chamber in which is held an electric light the wires of which pass down through the pipe E, from which at a point on the shore they pass out and connect with the proper electric generating devices, (not shown.)

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

1. A wave motor mechanism comprising an air holding tank, an air buoy or chamber, having an open bottom disposed at a point below the trough line of the wave, and an upper portion extended above the crest line, and a pipe connection extended within the buoy opening into the upper or extended portion, said pipe communicating with the air holding tank and formed with back pressure valves, all arranged substantially as shown and for the purposes described.

2. A wave motor comprising an air holding tank, an air buoy having a dome portion extended above the crest line of the wave, and an open bottom disposed below the trough line of the wave, a pipe connection between such buoy and the air holding tank, having one end extending up into the dome portion of the buoy and provided with a back air pressure check valve, all arranged substantially as shown and described.

3. In a wave motor mechanism in combination, an air buoy having an air chamber at its upper end, in which air is forced by the impact of the wave, an air holding tank having a compressed air compartment and a partial vacuum compartment, pipes D and E connected with such compartments and extended into the air chamber of the buoy, the pipe D having an automatic valve over the outer face of its free end, and a back air pressure valve, the pipe E having a back pressure valve, all substantially as shown and described.

4. A wave motor mechanism, comprising a hollow open bottom buoy fixedly held in the sea having a compressed air holding portion at its top, air and vacuum tanks, having valved pipe connections opening into such air holding portion of the buoy, an air engine having its inlet and exhaust connected by valved pipes with such tanks, all arranged substantially as shown whereby as the compressed air from one tank will serve to operate the engine from one side, the vacuum will also serve to operate it upon the other, substantially as specified.

5. In a wave motor the combination of the air holding tank, the supporting frame dis-

posed in the sea, having lateral anchor braces, the hollow vessel A having an open bottom, and an air dome at the top projected above the crest line of wave, said vessel rigidly secured to the supporting frame, the central pipe C, the pipe E connected to the air tank and extended up into the pipe C and held to discharge into the air dome said pipe having a back air pressure check valve substantially as and for the purposes described.

JAMES C. WALKER.

Witnesses:
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SOLON C. KEMON.