No. 656,943. Patented Aug. 28, 1900.

T. C. CLARKE.

WAVE POWER.

(Application filed Apr. 29, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. I.

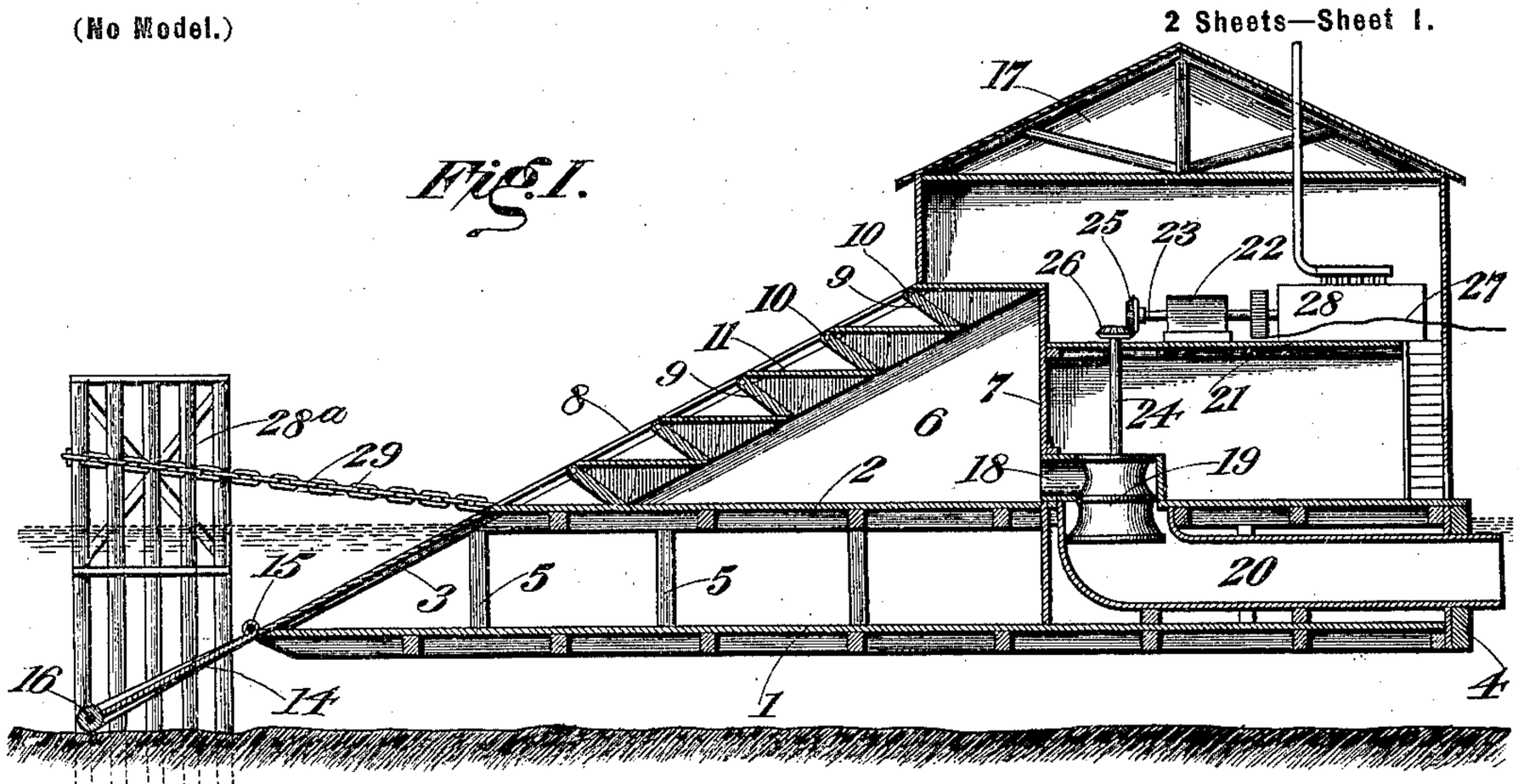

Fig. II.

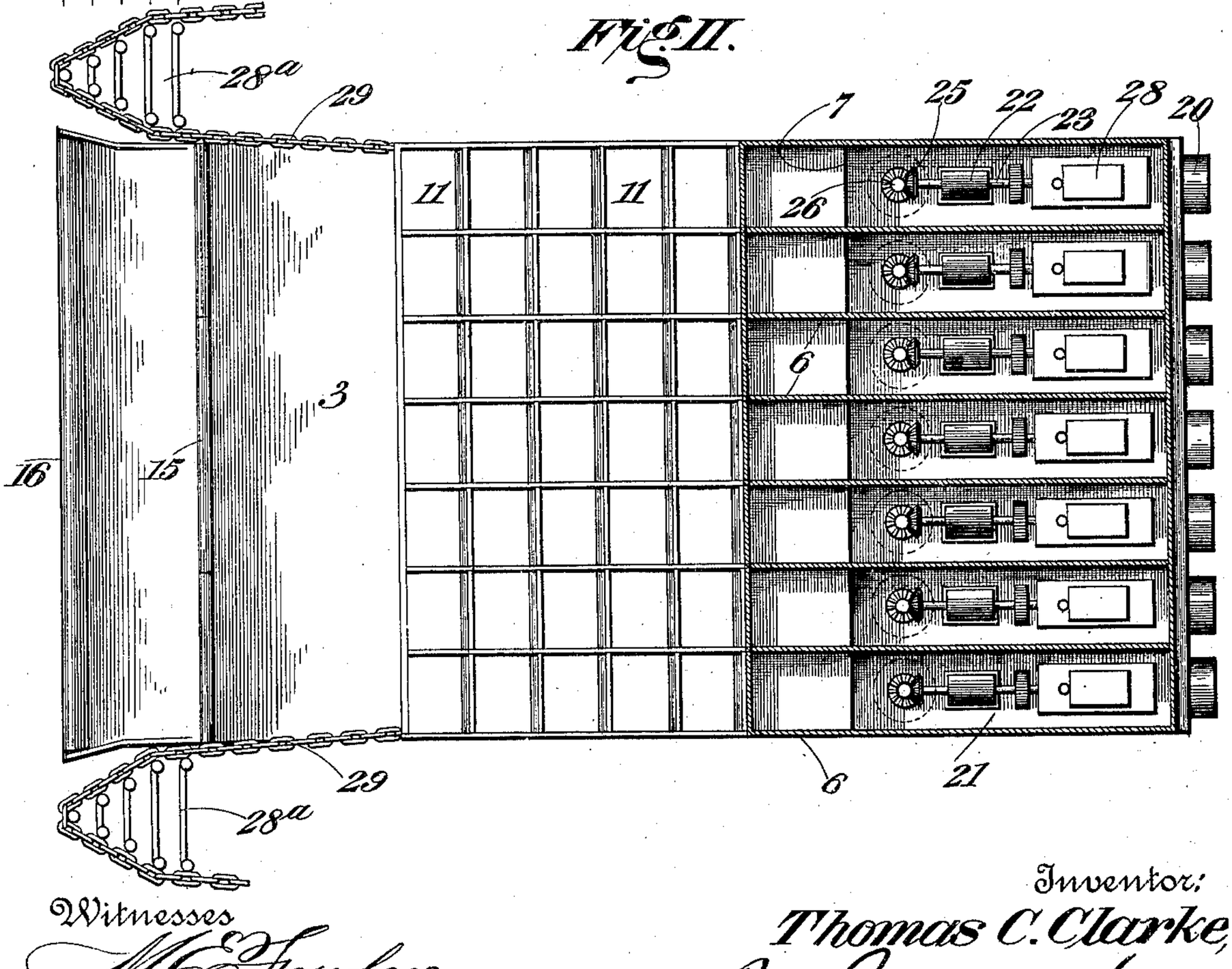

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Fig. III.

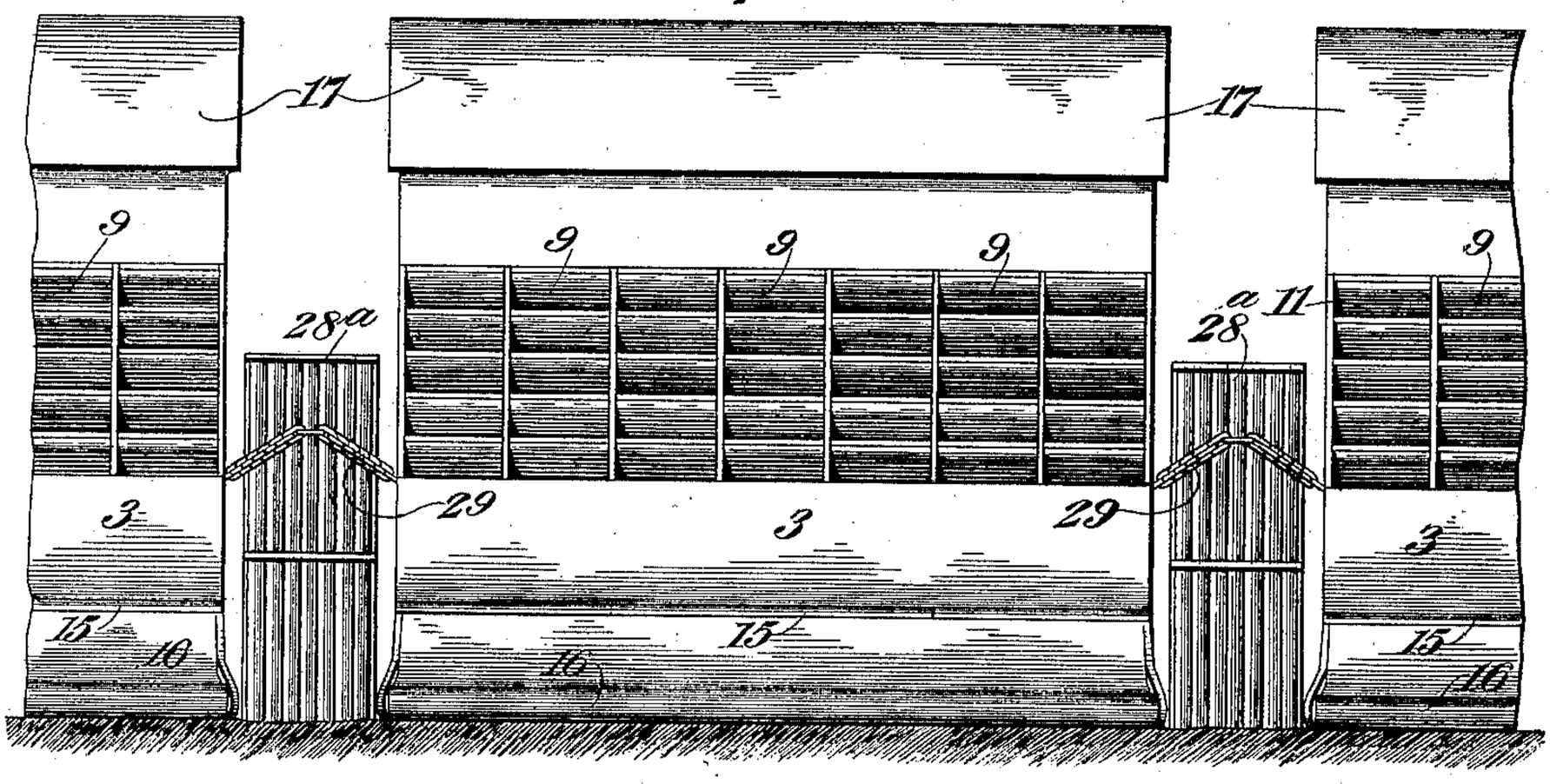
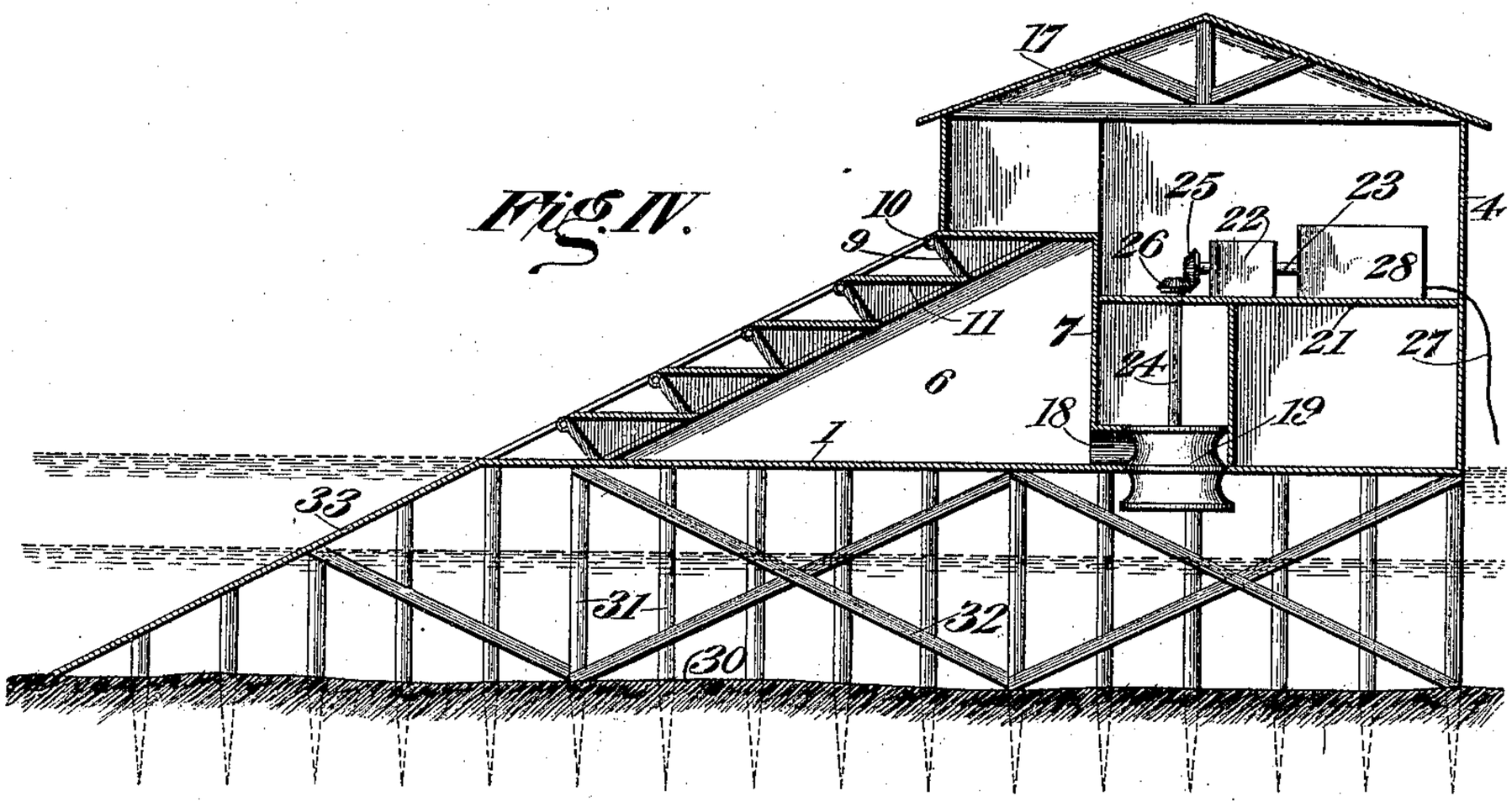


Fig. IV.



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UNITED STATES PATENT OFFICE.

THOMAS CURTIS CLARKE, OF NEW YORK, N. Y.

WAVE-POWER.

SPECIFICATION forming part of Letters Patent No. 656,943, dated August 28, 1900.

Application filed April 29, 1899. Serial No. 715,044. (No model.)

To all whom it may concern:

Be it known that I, THOMAS CURTIS CLARKE, of New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Wave-Powers, of which the following is a complete specification, reference being had to the accompanying drawings.

My invention relates to improvements in that type of wave-power comprehended particularly in the application of Juan Tonkin Th., Serial No. 693,797, filed October 17, 1898.

The object of the invention is to facilitate and cheapen the operation of the machine without diminishing its efficiency and also by rendering the machine movable to take advantage from time to time of the best points of location for operation.

With respect to the last-named object of the invention it may be stated generally that along a coast where the sea-level changes by tidal action there are certain lines in proximity to which the waves break highest. Those lines, depending chiefly upon the depth of water, which changes with the varying tides, may be observed, and by rendering the apparatus movable and changing its location from time to time as the tide ebbs and flows the greatest efficiency of wave energy may be continuously obtained. I prefer to make my apparatus movable by building it upon pontoons, which being secured by suitable anchorage, as to clusters of piles, may be moved from place to place as required. Moreover, the employment of the pontoons floating at a determinate depth in the water will afford means of disposing of the water after it has been utilized for creating power without the employment of a special discharge-tank for the purpose, although the discharge-tank may be employed, if preferred.

In the accompanying drawings, Figure I is a central vertical section, partially in elevation, of one form of embodiment of my invention. Fig. II is a top plan view thereof with the power-house removed by horizontal section. Fig. III is a front elevation of the subject-matter of Fig. I, showing upon opposite sides thereof portions of additional plants. Fig. IV is a view corresponding to Fig. I, showing a modified form of embodiment of my invention, in which the supply-tank and power-house although stationary are supported above the bottom of the sea, so as to allow a free sweep of water underneath the structure.

Referring to the numerals on the drawings, 1, 2, 3, and 4 in Fig. I indicate, respectively, the bottom floor and opposite end walls of a pontoon or buoyant structure, which may be made in any suitable and preferred manner and possessing a buoyancy sufficient to sustain at required level a determinable superimposed weight. I prefer to divide the pontoon, as by vertical partitions 5, into separate water-tight compartments; but that is a mere detail of construction, which, as above stated, may be indefinitely varied to any preferred extent.

Above the floor 2 suitable water-tight walls 6 and 7 define the boundaries of an air-supply tank, whose inclined front wall 8 is provided with wave-entrapping mechanism—such, for example, as a series of automatic water-inlet gates. The gates of the series may be of any preferred form, number, shape, and size; but I prefer the gate illustrated, which consists, essentially, of an obliquely-disposed valve 9, pivotally supported, as indicated at 10, in the frame of the wall 8. These valves work between horizontal platforms 11, solidly incorporated with the frame of the wall 8 and at such distances apart, respectively, as to limit the movement of the valves 9 to the oblique positions which they occupy, as illustrated in Fig. I. The valves 9, respectively, are of suitable weight to close automatically under force of gravity by turning upon their pivotal supports 10. The incoming force of the waves serves to open them, so that the water is admitted to the interior of the supply-tank, and then closing to entrap the water therein. The broad platforms 11 below each of the valves 9 afford convenient standing-room for making necessary repairs from time to time upon the valves or other portions of the apparatus which are accessible from said platforms. The wall 8 is, as appears from the illustration, a broken or perforated wall and is preferably in the same oblique plane with the front wall 3 of the pontoon, from the lower end of which extends an apron 14, preferably pivoted, as indicated at 15, to the pontoon, and preferably terminating at its lower edge in a roller 16. The

apron 14 is designed to prevent sand deposits in front of the apparatus by rising with the reflux of the wave and permitting the free sweep of water underneath the pontoon. With the influx of the wave the apron 14, the front wall 3, and the wall 8 constitute in effect a continuous inclined wall upon which the waves rise and actuating the valves 9 create a head of water in the supply-tank.

Upon the portion of the pontoon not occupied by the supply-tank and preferably in the rear of said tank I provide a power-house 17 of any suitable shape, construction, and dimensions. The supply-tank discharges as through a flume 18, which leads through a water motor or turbine 19 to a tail-race 20, that carries off the waste water. This tail-race may communicate with a discharge-tank like the one described in the application above referred to and carried upon the pontoon. I prefer, however, to permit the discharge directly into the sea, this mode of discharge being made practicable by the buoyancy of the pontoon, which preserves a constant relation between the turbine 19 and the water-level of the sea without.

Within the house 17 and preferably well elevated above the floor 2 I provide a second floor 21 and upon that an electrical generator 22, operatively connected to the turbine, as by its shaft 23, and the turbine-shaft 24, united as by beveled gears 25 and 26 upon those respective shafts.

27 indicates one of the conductors or line-wires by which power may be transmitted from the generator 22 to a distant point for use.

28 indicates diagrammatically a gas or other engine adapted to operate the generator independently of the turbine 19. The office of the engine 28 is to temporarily supply the place of the turbine, as when it is not in operation on account of repairs or for any other reason; but it performs a special function in affording means for shifting the location of the apparatus for purposes previously specified in the foregoing general statement. Its function in this respect may be understood by study of the means by which the apparatus is located in operation.

I prefer to provide in required localities and at suitable intervals clusters of piles 28ª. They may be arranged in pairs adapted to receive between them one or more pontoons. They may be driven at the farthest extremity to which the apparatus would be in practice advanced into the sea and may be supplemented or not, as preferred, with additional corresponding clusters between the outermost pair and the shore. Between a pair of these clusters is secured—moored or anchored, as by chains 29—one of my machines. The location of the machine may be changed toward or from the piles 28 by drawing in or paying out the chains. This may be accomplished by suitable and ordinary mechanism for the purpose not necessary to illustrate, said mechanism being driven either by the turbine 19 or by the engine 28. Now it might occur frequently in practice that the head of water in the supply-tank would be insufficient to operate the turbine unless the machine were properly located. This would be particularly true if the machine were allowed to remain at rest for even a short space of time. In order therefore to provide for gaining a head of water in the supply-tank, the engine 28 may, in addition to its other function, be employed for locating the apparatus in required position, after which the head of water immediately accumulating in the supply-tank would afford means for driving the turbine and operating the generator 22 independently of the engine 28. I have specified a gas-engine by preference, because that affords a simple form of motor; but, as suggested, any other form of engine may be employed.

Within each house 17 I prefer to provide a plurality of turbines communicating through respective flumes 18 with the supply-tank. Any preferred number of turbines, with their generators, may be employed, seven being illustrated in Fig. II. Each pontoon, with its load of supply-tank, power-house, and machinery therein, constitutes a unit of which any number may be used conjointly, three units being indicated in Fig. III as located in series.

In Fig. IV of the drawings I illustrate the supply-tank and power-house with the machine contained therein as mounted above the bed of the sea, (indicated at 30,) as upon pilings 31, strengthened, as by cross-braces 32, the groups of pilings being faced by an inclined wall 33, constituting a continuation of the wall 8 and analogous to the wall 3, already described. This manner of mounting the supply-tank through which the head of water is created and the means through which said head of water is utilized is intended to illustrate a method for preventing, in connection with a fixed plant, the accumulation of sand deposits in such proximity to the apparatus as to affect its operation and impair its efficiency.

What I claim is—

1. The combination with a buoyant structure or pontoon, of a supply-tank provided with wave-entrapping mechanism adapted to create a head of water for driving a motor, substantially as set forth.

2. The combination with a buoyant structure or pontoon, of a supply-tank thereon for creating a head of water for operating a motor, and an inclined side on one side of the supply-tank and motor, and wave-entrapping mechanism communicating through the inclined side with the supply-tank, substantially as set forth.

3. The combination with a buoyant structure or pontoon of a supply-tank thereon provided with wave-entrapping mechanism, an inclined side on one side of the supply-tank and pontoon, and a hinged apron con-

stituting a movable extension of the inclined side, substantially as set forth.

4. The combination of a floor sustained above the level of the bed of the sea, a supply-tank thereon provided with wave-entrapping mechanism, an inclined side where the wave-entrapping mechanism is located, and a hinged extension of said inclined side, substantially as set forth.

5. In a wave-power, the combination with a supply-tank of wave-entrapping mechanism adapted to create a head of water for the purpose of operating a motor, said wave-entrapping mechanism consisting of horizontal platforms and hinged gates working between the same, substantially as set forth.

6. In a wave-power, the combination with a supply-tank of wave-entrapping mechanism adapted to create a head of water for the purpose of operating a motor, said wave-entrapping mechanism consisting of horizontal platforms and inclined hinged gates working between the same, substantially as set forth.

7. The combination with a buoyant structure or pontoon, of a supply-tank thereon provided with wave-entrapping mechanism, a water-motor in operative relations with the supply-tank, and means upon the pontoon for disposing of the waste water from said motor, substantially as set forth.

8. The combination with a buoyant structure or pontoon, of a supply-tank thereon, provided with wave-entrapping mechanism, a water-motor in operative communication with the supply-tank, and a tail-race communicating with the motor and adapted through the buoyant support of the pontoon to carry off and discharge the waste water from the motor, substantially as set forth.

9. The combination with a buoyant structure or pontoon, of a supply-tank thereon provided with wave-entrapping mechanism, and a power-house also carried on the pontoon, substantially as set forth.

10. The combination with a movable structure provided with a supply-tank and wave-entrapping mechanism adapted to create and store a head of water, of mechanism upon said structure for shifting the location thereof from place to place, substantially as and for the purpose specified.

In testimony of all which I have hereunto subscribed my name.

THOMAS CURTIS CLARKE.

Witnesses:

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