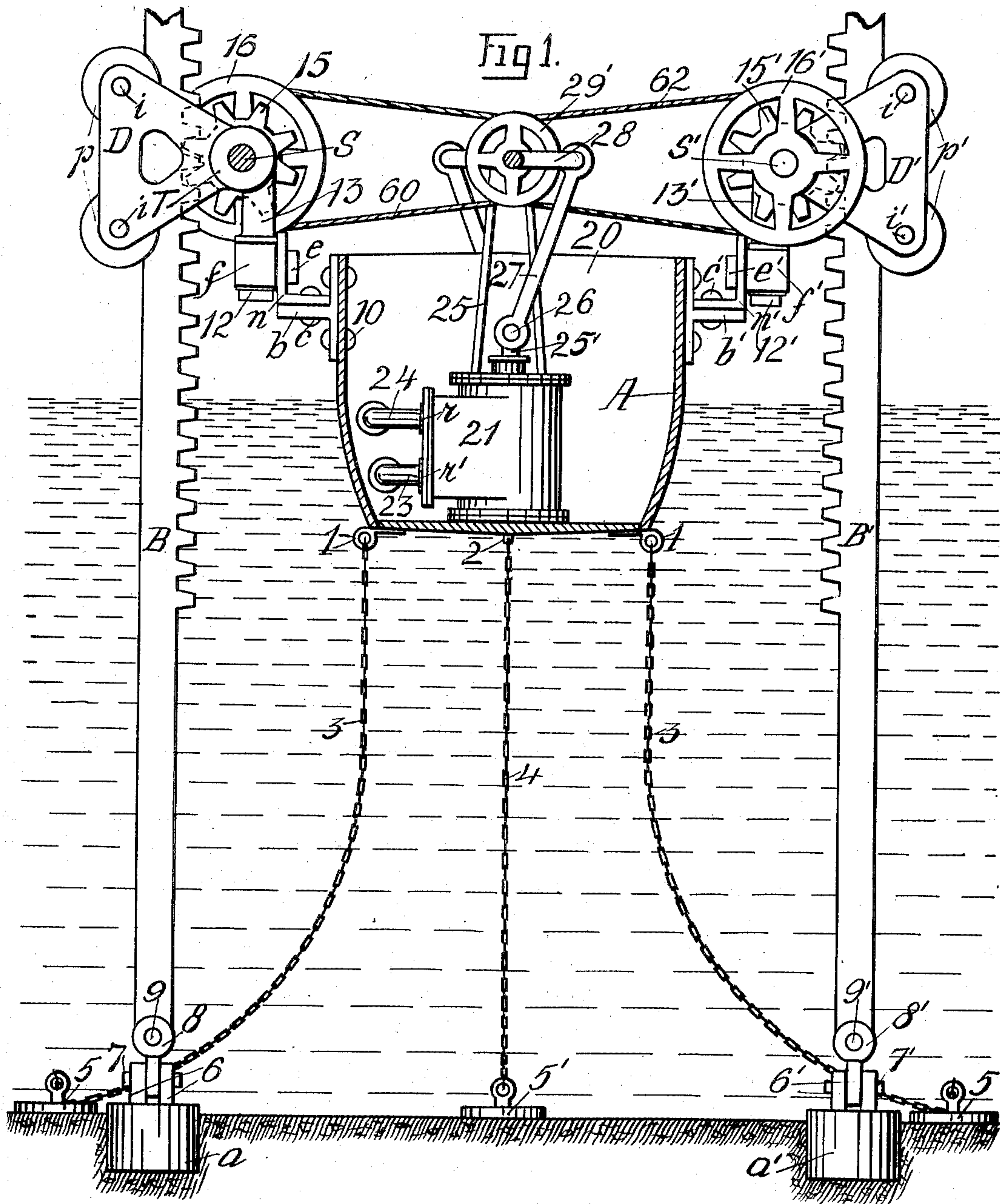


No. 817,318.

PATENTED APR. 10, 1906.

G. W. HAZEL.
TIDE OR WAVE MOTOR.
APPLICATION FILED AUG. 9, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

D. J. Sues
Marion S. Poehle.

BY

INVENTOR

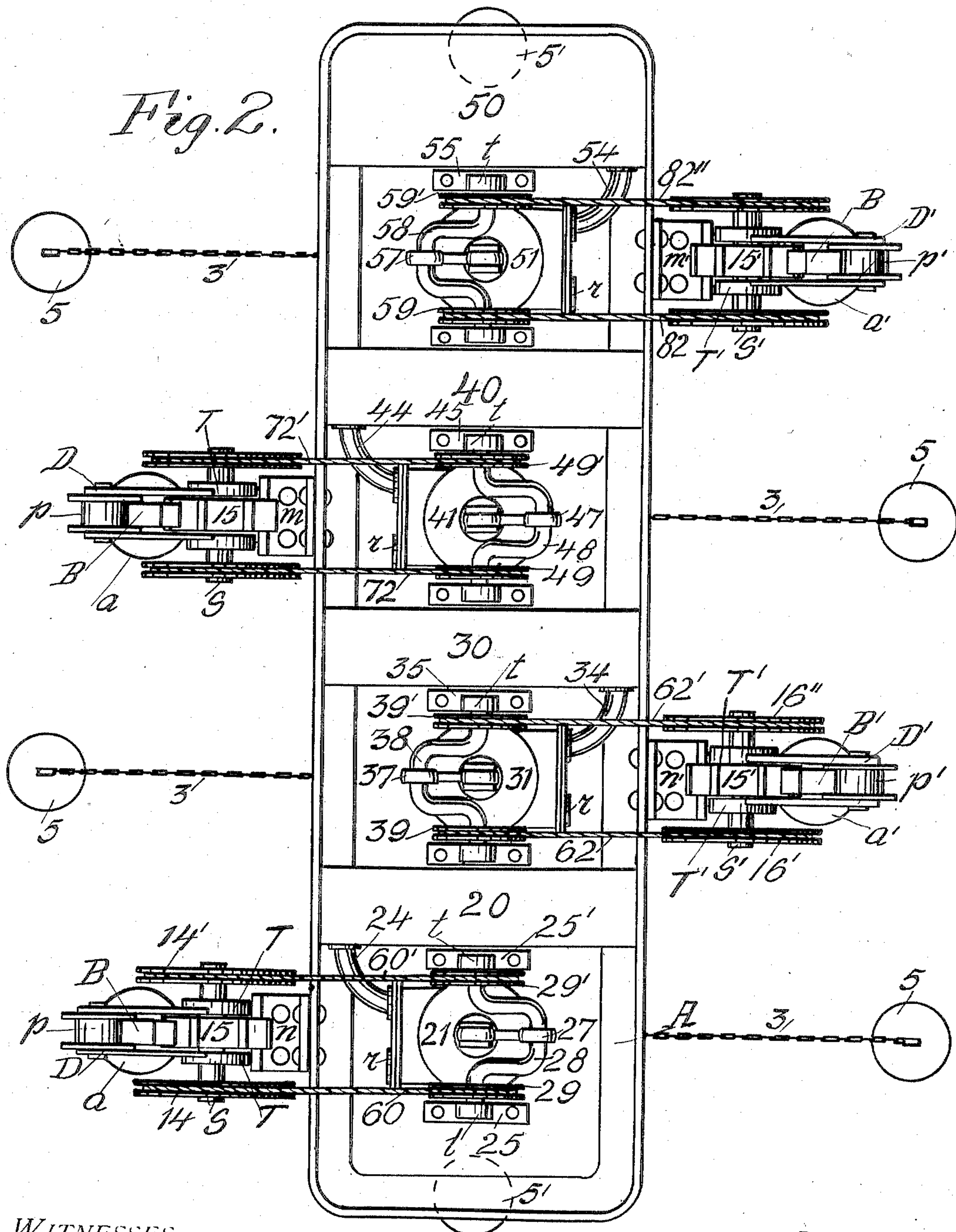
G. W. Hazel
D. J. Sues
Attorney

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WITNESSES:
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UNITED STATES PATENT OFFICE.

GEORGE W. HAZEL, OF AURORA, ILLINOIS.

TIDE OR WAVE MOTOR.

No. 817,318.

Specification of Letters Patent.

Patented April 10, 1906.

Application filed August 9, 1904. Serial No. 220,111.

To all whom it may concern:

Be it known that I, GEORGE W. HAZEL, a citizen of the United States, and a resident of Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Tide and Wave Motors, of which the following is a specification.

The aim of my invention is to utilize the movements and motions of a floating bouyant body to convert the movement of said bouyant body into a power to be later utilized, and my invention embodies certain combinations described more fully hereinafter.

In the accompanying drawings I have shown in Figure 1 a sectional view of a tide and wave motor with portions broken away embodying my invention, while Fig. 2 shows a top view of my tide and wave motor.

In carrying out the aim of my invention I provide a bouyant body, such as a vessel A, of any suitable conformation, which vessel is divided by means of the air-tanks 20, 30, 40, and 50, as shown in Fig. 2, into a plurality of compartments, within which compartments are held suitable air-compressors, (marked 21, 31, 41, and 51 in the drawings, where I have shown a vessel equipped with four air-compressors.)

The vessel is secured and anchored by means of a plurality of slack side chains 3 3, fixed to suitable ears 1, forming part of the vessel, and which chains below are secured to suitable anchors 5, embedded within the ocean or lake bed, as shown in Fig. 1. At the ends I also provide the slack anchor-chains 4, secured to suitable anchors 5', as disclosed. Now these slack retaining-chains secure the vessel in place, but permit a movement of the vessel, allowing the same to rock, rise, and fall within certain limits in obedience to the action of the winds, swells, waves, and tides.

Placed within the vessel are a plurality of air-compressors of an approved type, and a description of one in my drawings will apply to all. In the accompanying drawings I have shown in the first compartment an air-compressor 21 provided with the upper intake-valves *r* and the lower intake-valves *r'*, while extending from the cylinder or air-compressor 21 are the exit-pipes 24 and 23, emptying into the air-tanks 20, these pipes being provided with the usual valves. Held within this air-compressor 21 is a suitable piston to the projecting stem 25' of which, by

means of a pin 26, is secured the pitman 27, which above is secured to the crank-shaft 28, held within the bearings *t*, (shown in Fig. 2,) supported by means of the standards 25 and 25'. Secured to the crank-shaft 28 are two shives 29 and 29', over which suitable transmission-ropes, cables, or chains 60 and 60' pass, in turn working over the shives 14 and 14', mounted upon a rock-shaft *s*, which rock-shaft is held within the bearings *T*, as shown in Figs. 1 and 2, and interposed between these bearings *T* is the pinion 15. Meshing with this pinion 15 is a rack-bar *B*, which rack-bar below, by means of the pin 9, is secured to the member 8, held by means of the pin 7 between the ears 6 of the anchor *a*, so as to provide a universal connection between the bar *B* and the anchor *a*.

Secured to the side of the vessel at suitable points are the brackets *b* and *b'*. Secured to these brackets *b* and *b'*, by means of the bolts *c* and *c'*, are the holders *n* in the form of L-shaped bearings, to which holders *n* are pivotally secured the sleeves *f f'*, which, by means of the pins *e e'*, are permitted a pivotal movement. Held within these pivotally-supported sleeves are the standards, (marked 13 upon one side and 13' upon the opposite,) these standards being bifurcated to provide suitable bearings *T T'*, between which are held the pinions 15 and 15', mounted upon the shafts *s* and *s'*, as shown in Figs. 1 and 2, the standards being secured by means of the nuts 12 and 12'. Extending from the bearings *T* are the side plates *D*, provided with the pins *i*, mounting suitable grooved pulleys *p*, against which pulleys the rack-bar *B* operates.

Now any rocking movement of the vessel A or any lateral or upward or downward movement of this vessel will carry the pinions 15 15' upward or downward upon the relatively stationary rack-bars *B B'* to rotate the shives 14 and 14' and 16' 16', operating the strands 60 60' and 62 62' to rock the crank-shafts 28 and 38, resulting in the pistons within the air-compressors 21 and 31 being carried upward and downward to compress the air therein, which finds an escape through the pipes 23 24 and similar pipes 34 into the air-tanks 20 and 30. In order to more fully utilize the movement of this bouyant vessel, I provide a plurality of air-compressors, as shown in Fig. 2, where I show the air-compressors 21, 31, 41, and 51 provided with similar connections, as shown.

Upon the opposite side the next air-compressor 31 is provided with the crank-shaft 38, the connections 62 and 62' working over the wheels 16' and 16'', these shives being secured to the shaft s' to drive the pinion 15', which pinion is held within the standards 13', provided with the bearings T' , as shown. From these bearings T' extend the plates D' , supporting the pins 5', mounting the grooved pulleys p' to guide the rack-bar B' . The remaining air-compressors are provided with like parts and are similarly operated. From this it will be seen that in the vessel constructed as shown in the drawings every movement of the vessel is by means of a mechanical transmission converted into a stored power represented by the compressed air which is being collected within the storage-tanks, and these tanks may be arranged to be removed from the vessel to be replaced by empty tanks or the compressed air may be transferred from the same through suitable hose to any point where the same may be used.

It is of course understood that the movement of the rock-shafts s and s' could be utilized to operate some other mechanical appliance, though I believe the best results are obtained in operating an air-compressor.

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

1. The combination with a buoyant vessel,

of a slack anchor-chain securing said buoyant vessel, a standard movably secured to said vessel, a driving-shaft held by said standard, a pinion upon said driving-shaft, an air-compressor secured to said driving-shaft, and a movably-anchored rack-bar held adjacent said buoyant vessel and actuating said pinion.

2. In a device of the character described, the combination with a suitably-anchored and movably-held rack-bar of a buoyant vessel, of a power mechanism within said vessel, a holder movably secured to said vessel, a shaft held by said holder, a pinion mounted upon said shaft and engaging said rack-bar, a means to connect said pinion to said power mechanism.

3. The combination with a suitable anchor, of slack chains extending from said anchor, a buoyant body secured to said slack chains, a power mechanism within said buoyant body, a rack-bar swiveled to said anchor, a holder movably secured to said vessel, a shaft held by said holder, a pinion mounted upon said shaft and meshing with said rack-bar, and a power transmission extending from said pinion to said power mechanism, all arranged as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. HAZEL.

Witnesses:

GEORGE W. SUES,
MAMIE S. POEHLS.