No. 811,762. PATENTED FEB. 6, 1906.

E. B. CADE.

TIDE POWER.

APPLICATION FILED DEC. 10, 1904.

3 SHEETS—SHEET 1.

Fig. 1.

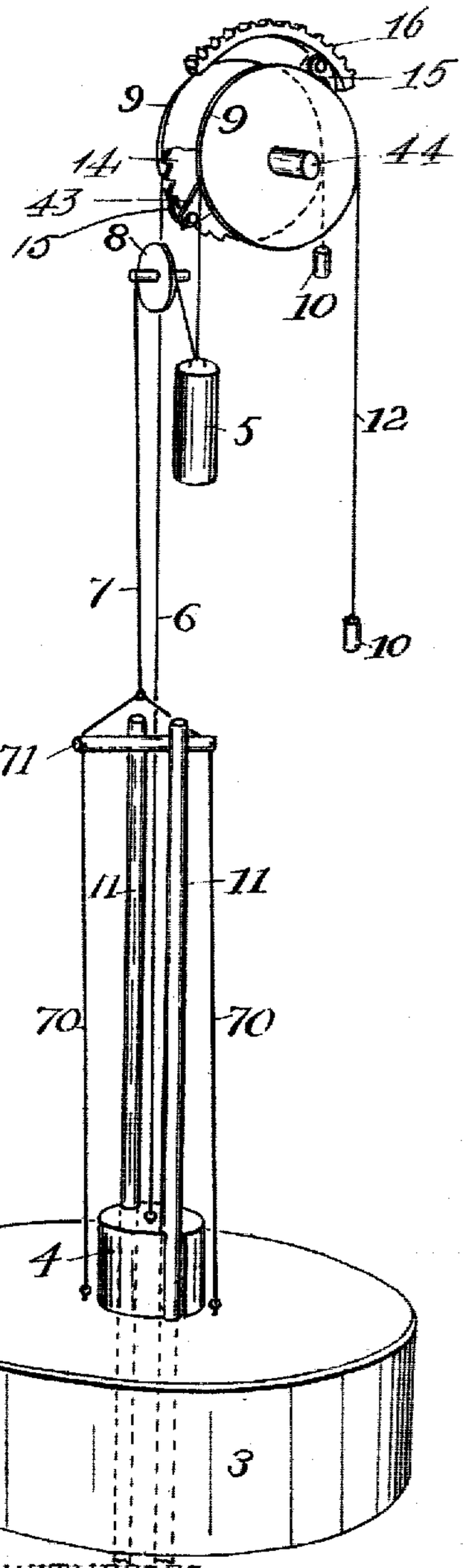
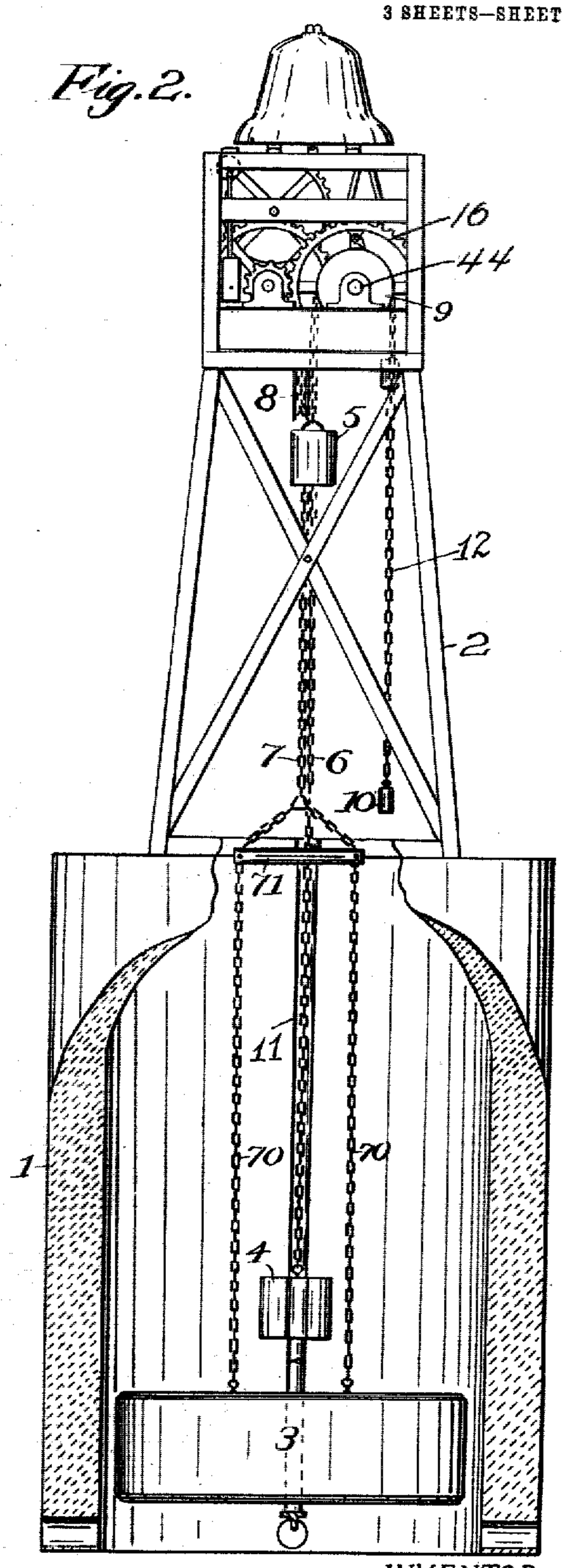


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

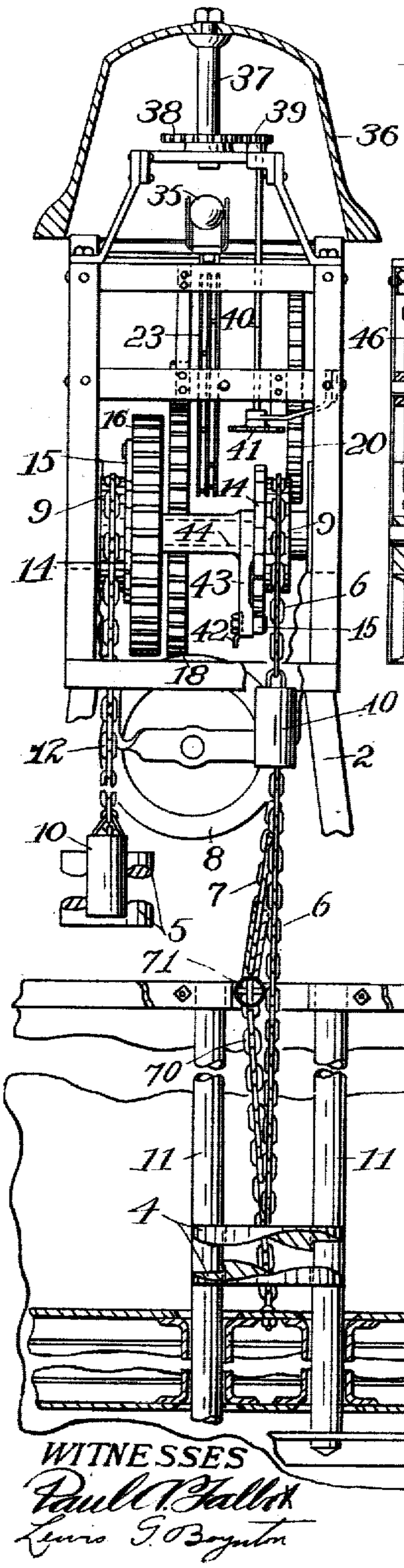


Fig. 5.

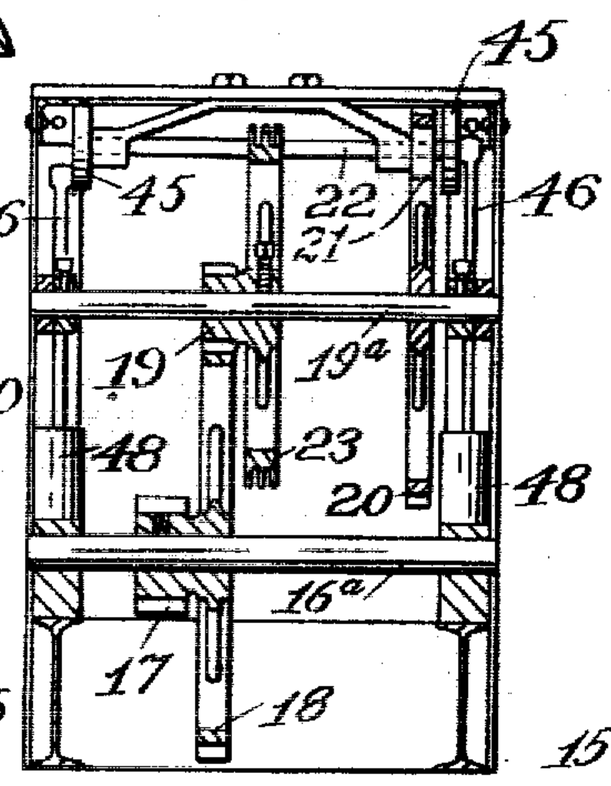


Fig. 6.

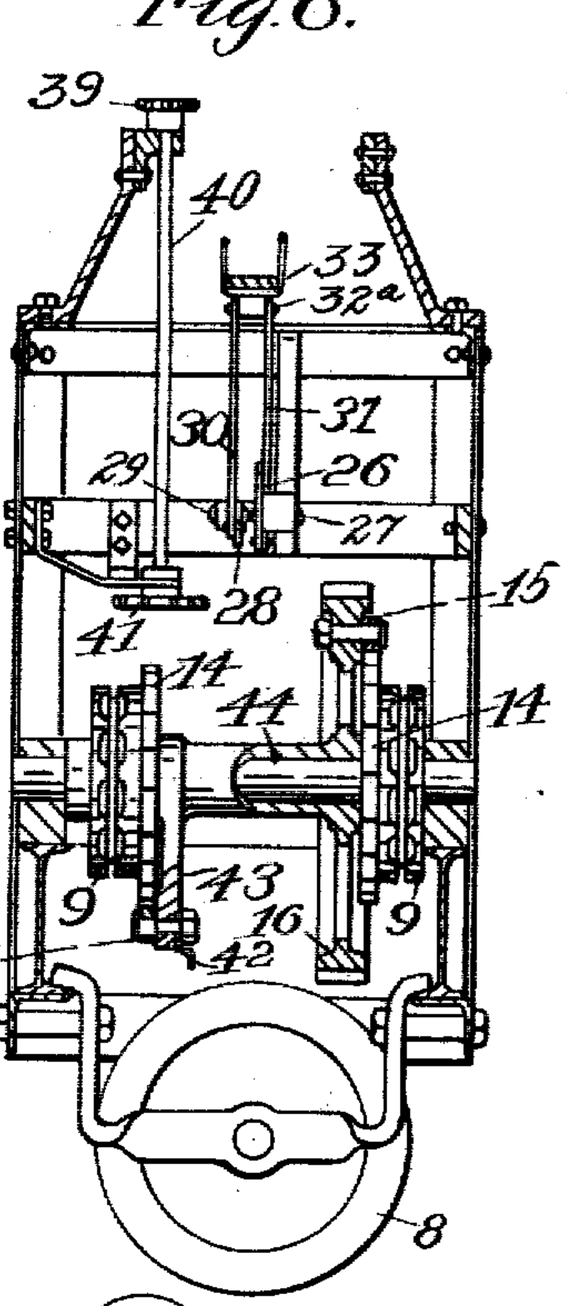
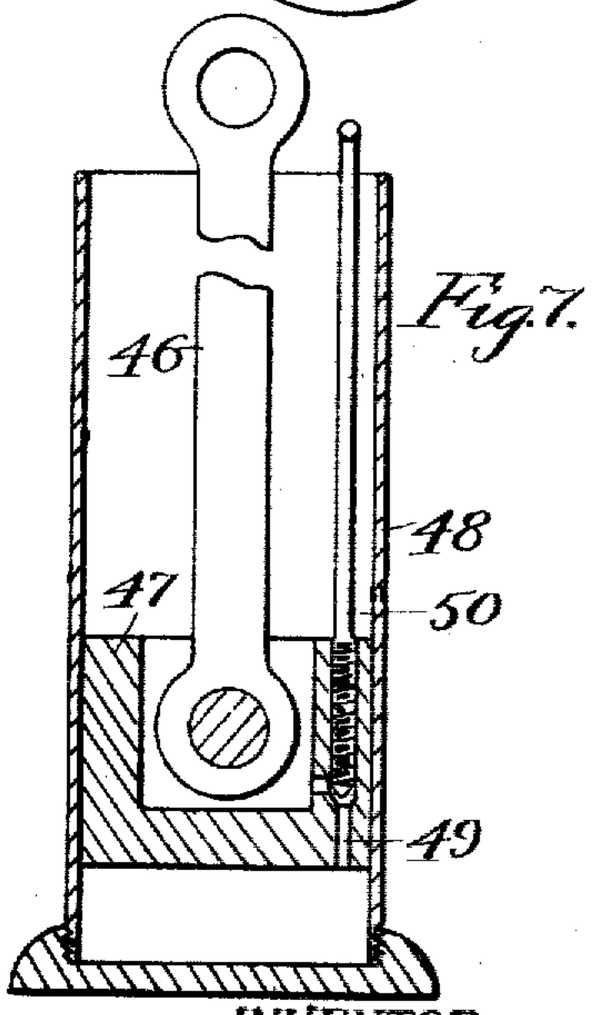


Fig. 7.



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3 SHEETS—SHEET 3.

Fig. 4

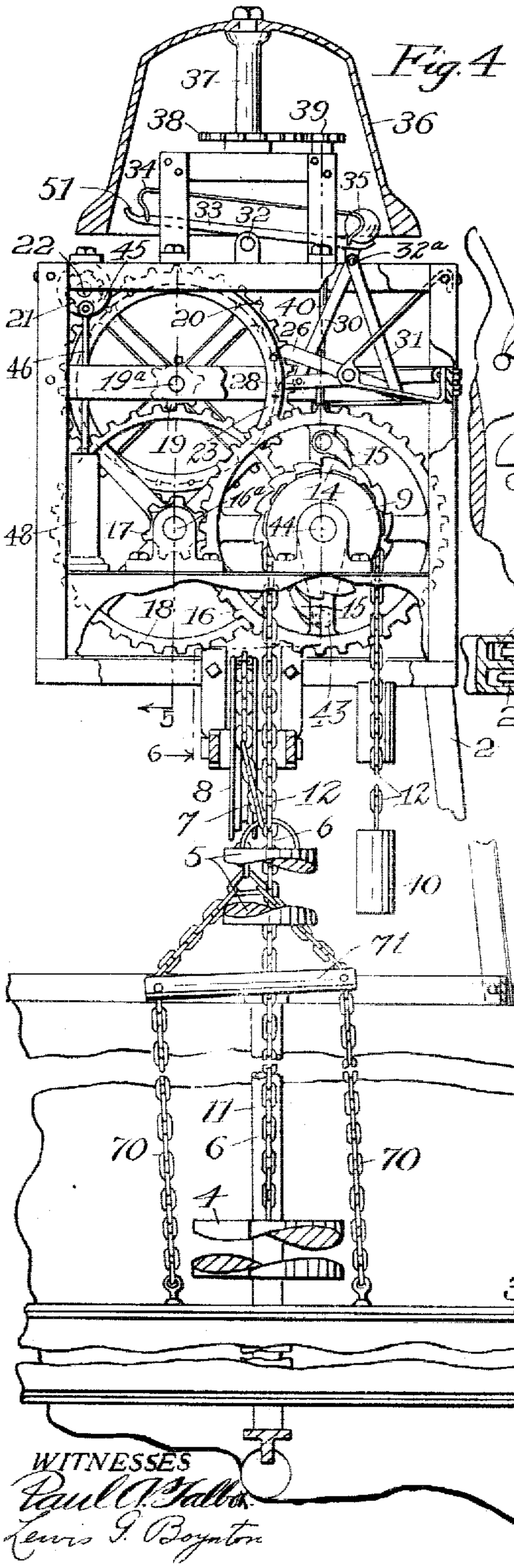


Fig. 8.

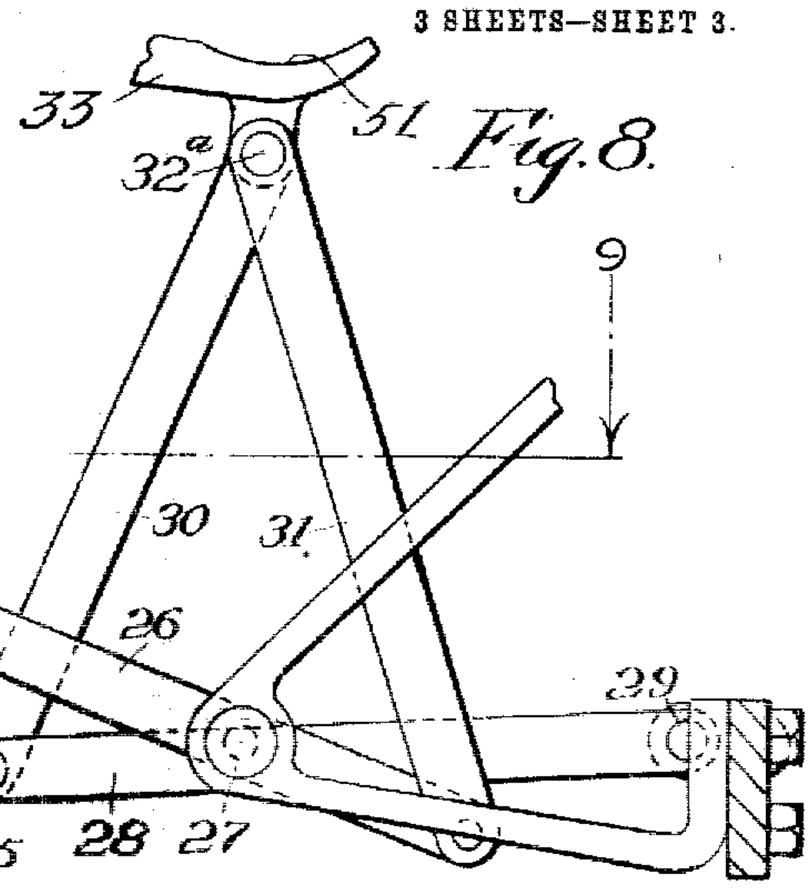


Fig. 9.

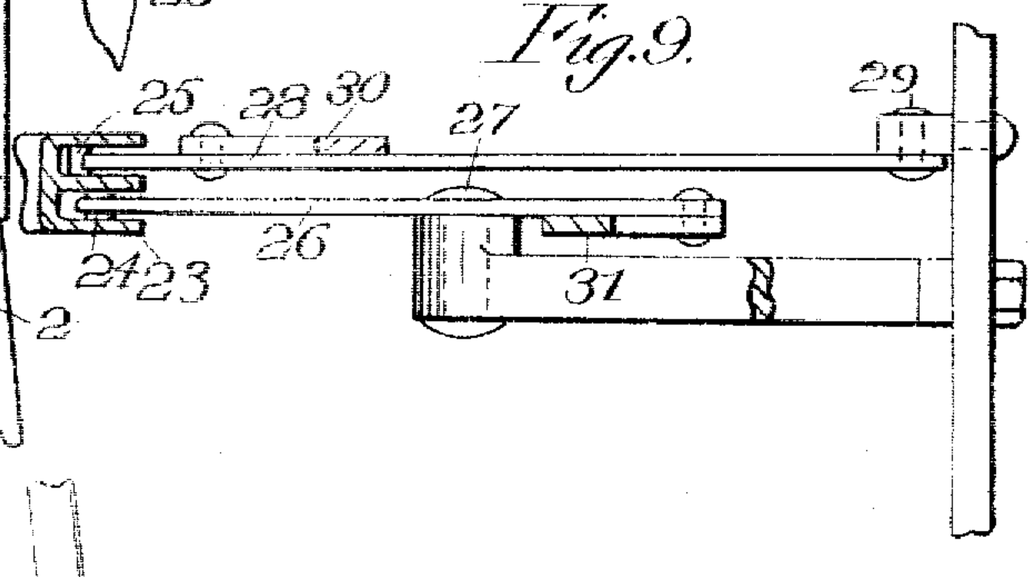
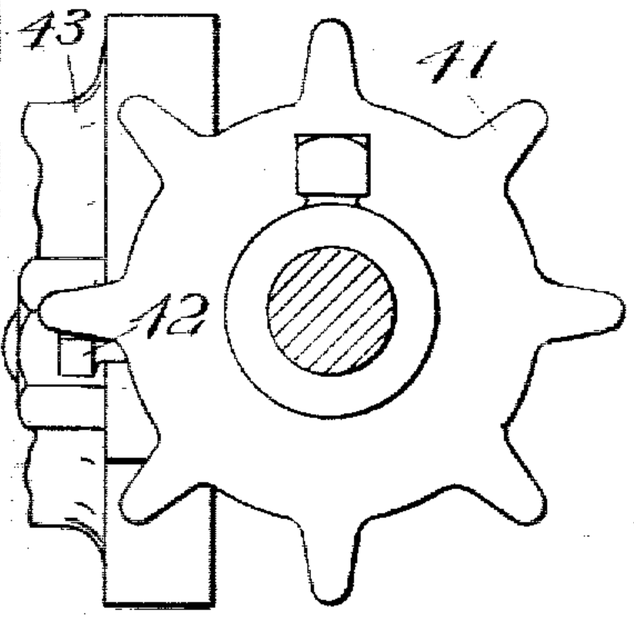


Fig. 10.



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UNITED STATES PATENT OFFICE.

ENOS B. CADE, OF SEATTLE, WASHINGTON.

TIDE POWER.

No. 811,762. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed December 10, 1904. Serial No. 236,364.

To all whom it may concern:

Be it known that I, ENOS B. CADE, a citizen of the United States of America, and a resident of the city of Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Tide Power, of which the following is a specification.

My invention relates to improvements in tide power; and the primary object thereof is to provide an improved and simplified construction.

The invention further consists in the novel arrangement and combination of parts disclosed in the drawings and fully described in the following description and defined in the appended claims.

In the accompanying drawings, forming a part of this specification, and wherein like numerals of reference indicate like parts throughout the several views, Figure 1 is a diagram showing the arrangement of the weights, ropes, and float relative to the drive-wheels of the motor mechanism. Fig. 2 is an elevation in partial section of my device. Figs. 3 and 4 are elevations, on a larger scale, showing my invention from two different viewpoints, parts being broken away and parts being in section to more clearly show the construction. Fig. 5 is a section on line 5 of Fig. 4. Fig. 6 is a section taken on line 6 of Fig. 4 with parts of the device removed. Fig. 7 is a section of the dash-pot or speed-controlling mechanism. Fig. 8 is a detail showing the mechanism used to cause the tilting action of the ball-race. Fig. 9 is a section taken on line 9 of Fig. 8. Fig. 10 is a detail showing the star-wheel mechanism used to turn the bell.

In carrying out my invention I provide a float 3, which is preferably inclosed by a protecting-casing 1 in the form of a cylinder of any suitable material, as concrete, masonry, or iron. This casing forms a well within which the water is comparatively quiet and not subjected to the violent and extensive fluctuations of the waves. The well is of course connected with the outside by openings of sufficient size as to permit free rise and fall of the water in conformity to the variations due to the tide, but not of sufficient size to make it responsive to the wave variations.

The motor mechanism is operated not directly by the float but indirectly through the means of two weights 4 and 5. The weight 4 is directly engaged by the float to raise it. The weight 5 is raised by the float during its descent by means of a flexible connection, which extends from the float over an idler-pulley 8 to the weight 5. The connection shown consists of the chain 7, which divides into two branches 70, which are kept separated by the spreader 71. The weight 4 is engaged with guides, as the bars 11, which insure its travel in the desired path and prevent possible entanglement with the chain 70. These bars 11 are rigidly secured at their upper and lower ends and extend through the float 3, (see Fig. 3,) which is slidable thereon. Flexible connections, as chains 6 and 12, lead, respectively, from the weights 4 and 5 over two drive-wheels 9, which are mounted to turn upon the main power-shaft 44. These drive-wheels are loose upon this shaft, but each have a ratchet-wheel 14 secured thereto. One of these ratchet-wheels engages a pawl 15, carried by the gear 16, and the other engages a pawl 15, carried by the arm 43, said gear and arm being both secured to the shaft 44, whereby the weight 4 turns the said shaft when the float is falling, and the weight 5 turns the shaft when the float is rising. Take-up weights 10 are attached to the free ends of the chains 6 and 12 to return the chains positively while their weights are being raised. Gear-wheel 16 meshes with pinion 17, fixed on shaft 16, which also has a gear-wheel 18 secured thereto, and wheel 18 meshes with pinion 19, carried upon shaft 19^a. Gear-wheel 20 and pin-wheel 23 are also secured to shaft 19^a. Gear-wheel 20 meshes with pinion 21 upon shaft 22.

A mechanism such as that described, if unrestrained, is likely to run at such a rate of speed that it will run down too soon, and the apparatus would be stopped for a time during the change from ebb to flood tide, or vice versa. To prevent this, I provide a regulator of the speed. The regulator shown consists of two dash-pots 48, which are connected with the mechanism and tend to slow it to such an extent that the power-weights will not have reached the limits of their working travel when the float has paused at the change of tide. There is thus provided a means whereby the action of the apparatus is made continuous.

The dash-pot pistons 47 are connected by piston-rods 46 with crank-pins carried by disks 45, secured to shaft 22, the crank-pins being preferably placed at right angles, so as to secure a more uniform resistance. The

dash-pot piston is provided with a passage 49, which may be more or less closed by a valve formed on the end of the rod 50. By proper adjustment of this valve the rate of movement of the mechanism may be controlled.

The mechanism above described is carried upon a tower 2 at such an elevation as to be above the reach of the waves. A bell 36, which is the signal employed, is mounted at the top of the tower, so that it may be readily turned about a vertical axis. This I secure by mounting the bell upon the vertical shaft 37. This shaft carries a gear-wheel 38, which meshes with a gear-wheel 39, carried by shaft 40, to the lower end of which is secured a star-wheel 41. This star-wheel is engaged by a finger 42, carried by arm 43 upon shaft 44, so that for each turn of the shaft 44 the bell is moved through a slight angle, thereby presenting different portions of the bell to the action of its striker. The means employed for striking the bell consist of a ball 35, mounted to roll in a ball-race 33, which is pivoted upon a pivot 32, located, preferably, near the middle of its length. This ball-race is tipped first one way and then the other by mechanism operated by the pin-wheel 23, whereby the ball is caused to run from one end of the race to the other and strike the bell. The pin-wheel 23 is formed with two peripheral grooves. These grooves are formed by three rim-flanges, which are suitably spaced apart, and a set of pins 24 is arranged between the center flange and one of the outer flanges and another set of pins 25 between the center flange and the other outer flange. The pins of the respective sets are arranged in alternate relation to one another. Two levers 26 and 28 are pivoted, 26 at 27 and 28 at 29, the free ends of these levers extending each between its respective flanges of the pin-wheel and in position to engage their respective sets of pins, and by reason of the arrangement of the sets of pins relatively to each other it will be observed that the free ends of said levers will be alternately raised. These levers are connected to links 30 and 31, which are pivoted, as at 32^a, to the ball-race, one being designed for tilting the ball-race in one direction and the other for tilting it in the other direction. The ends of the ball-race are preferably provided with a depression or hollow, as shown at 51, so that the ball will be retained until the race has been raised well above a level, whereby when the ball does start it will run with sufficient force to strike a smart blow.

As the pin-wheel rotates the pins 24 thereof are moved successively into and out of engagement with the free end of lever 26, said pins when engaged with the free end of said lever raising the same, as shown in Fig. 8, and as the pins move from engagement with said lever one of the pins 25 of the other set engages with the free end of lever 28 and raises the same until the pin moves from engagement therewith. The lever 26 is then in position to be engaged by the next pin 24 of its set.

This apparatus may be employed as a warning-signal in many places where an ordinary bell-buoy would often be of no value. For example, there are many places where there is necessity for a warning-signal, and the waters are so protected that there are very little or no waves much of the time. Such places, if on the shores of the ocean, are sure to have the tides regularly, and one of my devices would operate whatever the weather.

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

1. In an apparatus of the type set forth, a float, two power-weights, one of said weights being directly engaged by the float to be lifted, an elevated guide, a flexible connection between said float and other weight passing over said guide, and mechanism operated by said weights.

2. In an apparatus of the type set forth, a shaft, a float, two power-weights, one of said weights being directly engaged by the float to be lifted, an elevated guide, a flexible connection between said float and other weight passing over said guide, and means whereby said shaft is rotated during the raising and lowering of said weights.

3. In an apparatus of the type set forth, a rotatably-supported shaft, two drive-wheels having releasable driving connections with said shaft, a flexible means passing over one of said drive-wheels, a power-weight connected to said means at one side of said last drive-wheel, a take-up weight on said means at the opposite side of said drive-wheel, a float for raising said power-weight, means whereby said power-weight will lower independently of the float, and means for rotating the other drive-wheel with the shaft during the upward movement of said power-weight.

4. In an apparatus of the type set forth, a rotatably-supported shaft, a float, two drive-wheels having releasable driving connections with said shaft, an elevated guide, two power-weights, a flexible connection between said float and one of said weights passing over said guide, the other of said weights being directly engaged by said float to be lifted, and means connected with said weights for rotating said drive-wheels alternately in a common direction during movement of said weights in one direction.

5. In an apparatus of the type set forth, a rotatably-supported shaft, a float, two drive-wheels having releasable driving connection with said shaft, a power-weight engaging said float to be lifted, a flexible means con-

nected to said weight and passing over one of said drive-wheels, an elevated guide, a flexible means secured to said float and passing over said elevated guide and the other drive-wheel, a power-weight secured to said last flexible means intermediate said guide and drive-wheel, and take-up weights on the free ends of said flexible means.

6. In an apparatus of the type set forth, a rotatably-supported shaft, two drive-wheels having releasable driving connections with said shaft, a float, guides for the float, a weight engaging on said float between said guides, a flexible means connected to said weight and passing over one of said drive-wheels, a flexible means passing over said other drive-wheel and having connection with the float, and means whereby said last-named drive-wheel is operated with the shaft as the float rises.

7. In an apparatus of the type set forth, a float, two power-weights, one of said weights being controlled to be directly engaged by the float to be lifted, an elevated guide, a flexible means connecting the float and other weight and passing over said elevated guide, a motor mechanism operated by the respective weights alternately, and a device for controlling the speed of the motor and reduce the rate of fall of the weights to less than that of the float.

8. In an apparatus of the type set forth, a rotatably-supported shaft, two drive-wheels having releasable driving connections with said shaft, a float, two power-weights, one of said weights engaging said float to be lifted, a flexible means connected to said weight passing over one of said drive-wheels, an elevated guide, and a flexible means secured to the other power-weight and passing over the other drive-wheel and guide and having one of its end portions divided into two branches and secured to the float on opposite sides of said first weight.

9. In an apparatus of the type set forth, two power-weights, one of said weights being controlled to be directly engaged by the float to be lifted, an elevated guide, a flexible means connecting the float and other weight and passing over said elevated guide, a motor mechanism containing two drive-wheels having releasable driving connection with the rest of the mechanism, a flexible means extending from each weight over its respective drive-wheel, and take-up weights connected with the free ends of said last flexible means.

Signed at Seattle, Washington, this 14th day of November, 1904.

ENOS B. CADE.

Witnesses:
ERNEST B. HERALD,
JOHN A. WHALLEY.