W. J. WHITE.

TIDE MOTOR.

APPLICATION FILED AUG. 7, 1908.

917,823.

Patented Apr. 13, 1909.

4 SHEETS—SHEET 1.

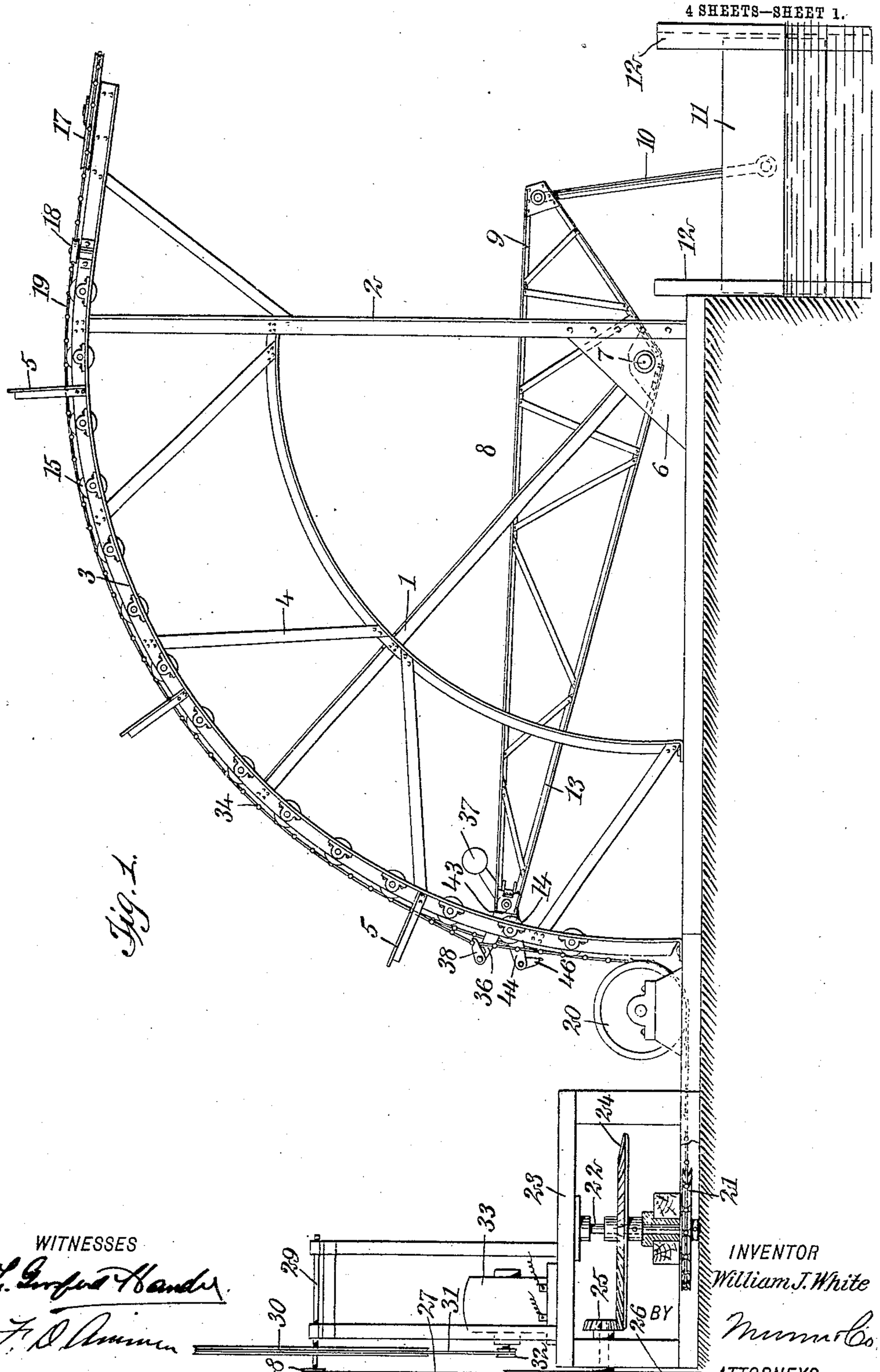

Fig. 1.

WITNESSES

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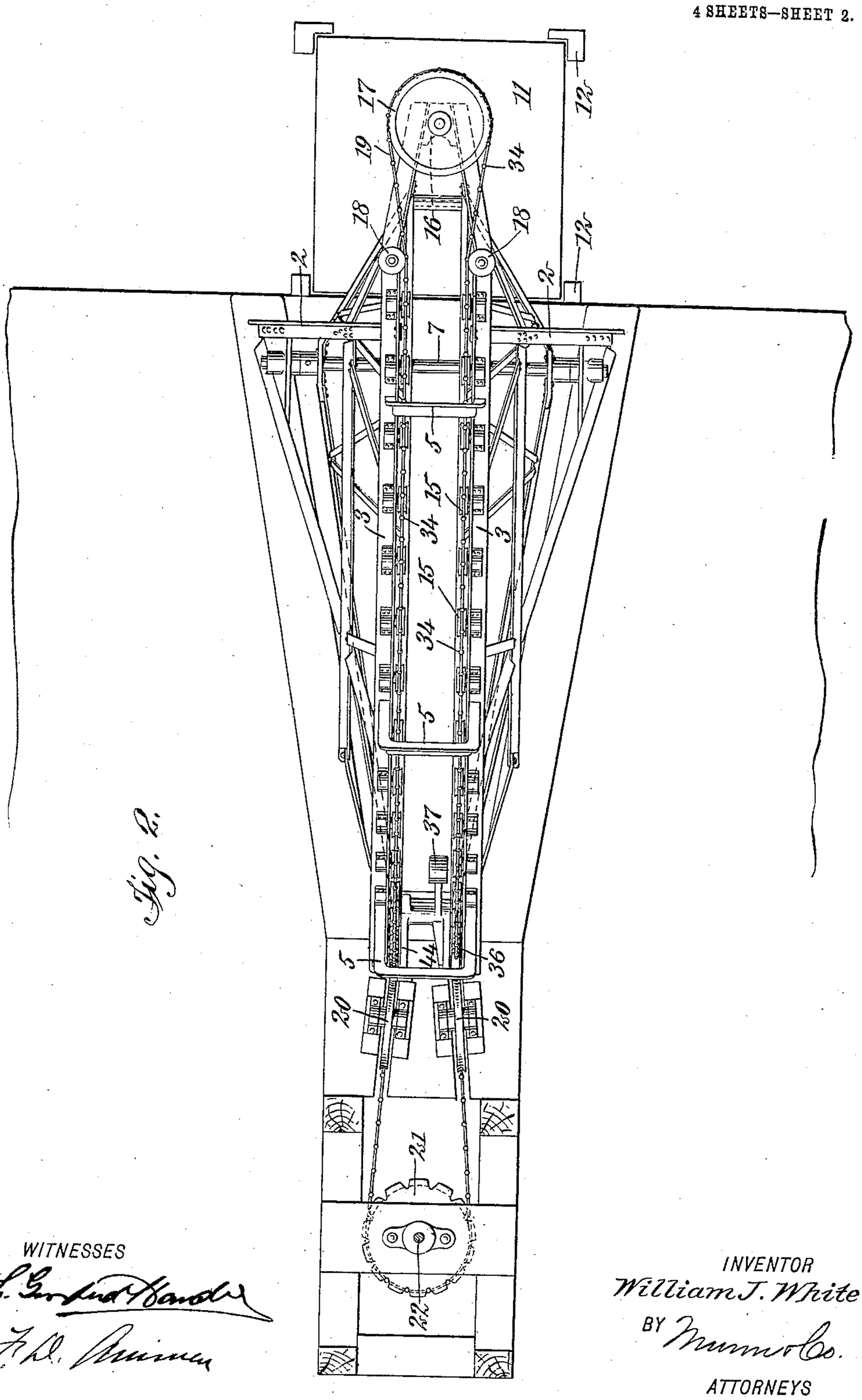

Fig. 2.

WITNESSES

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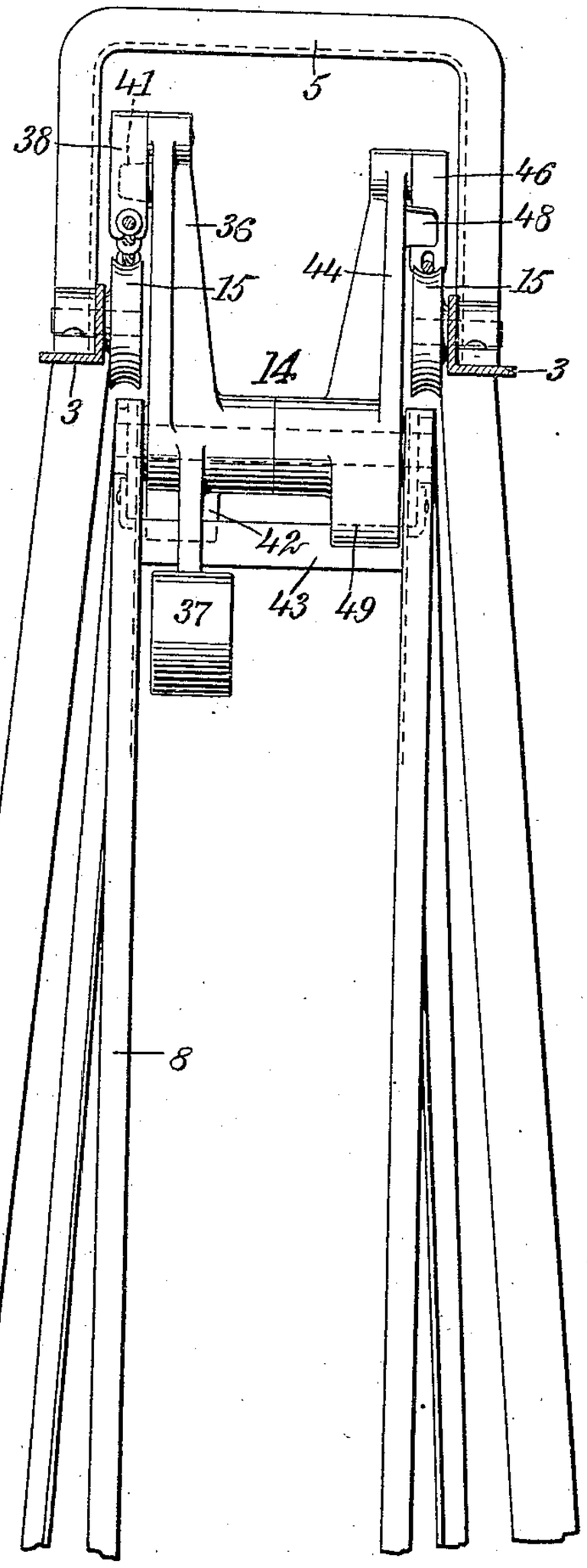

Fig. 3.

WITNESSES

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4 SHEETS—SHEET 4.

Fig. 4.

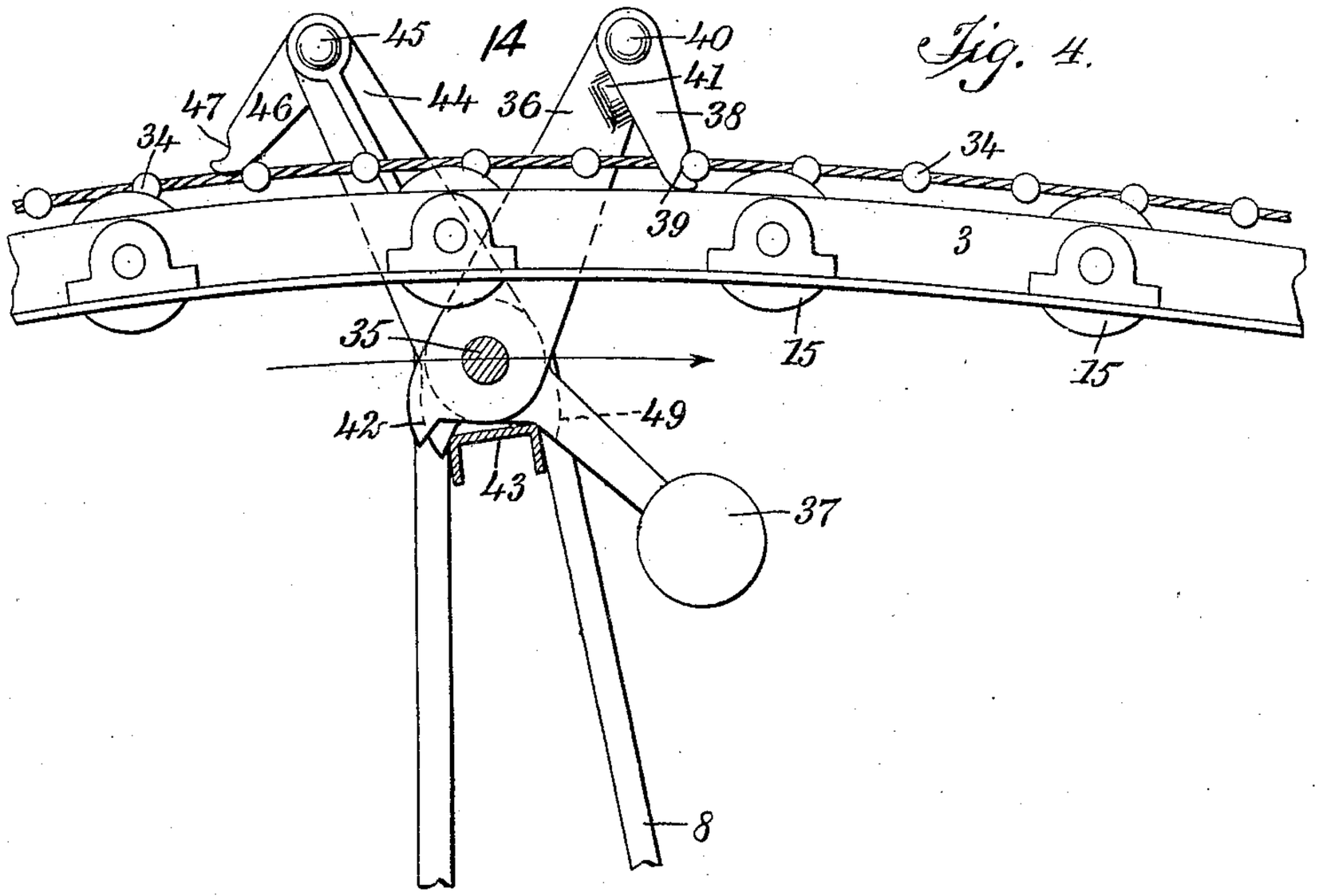
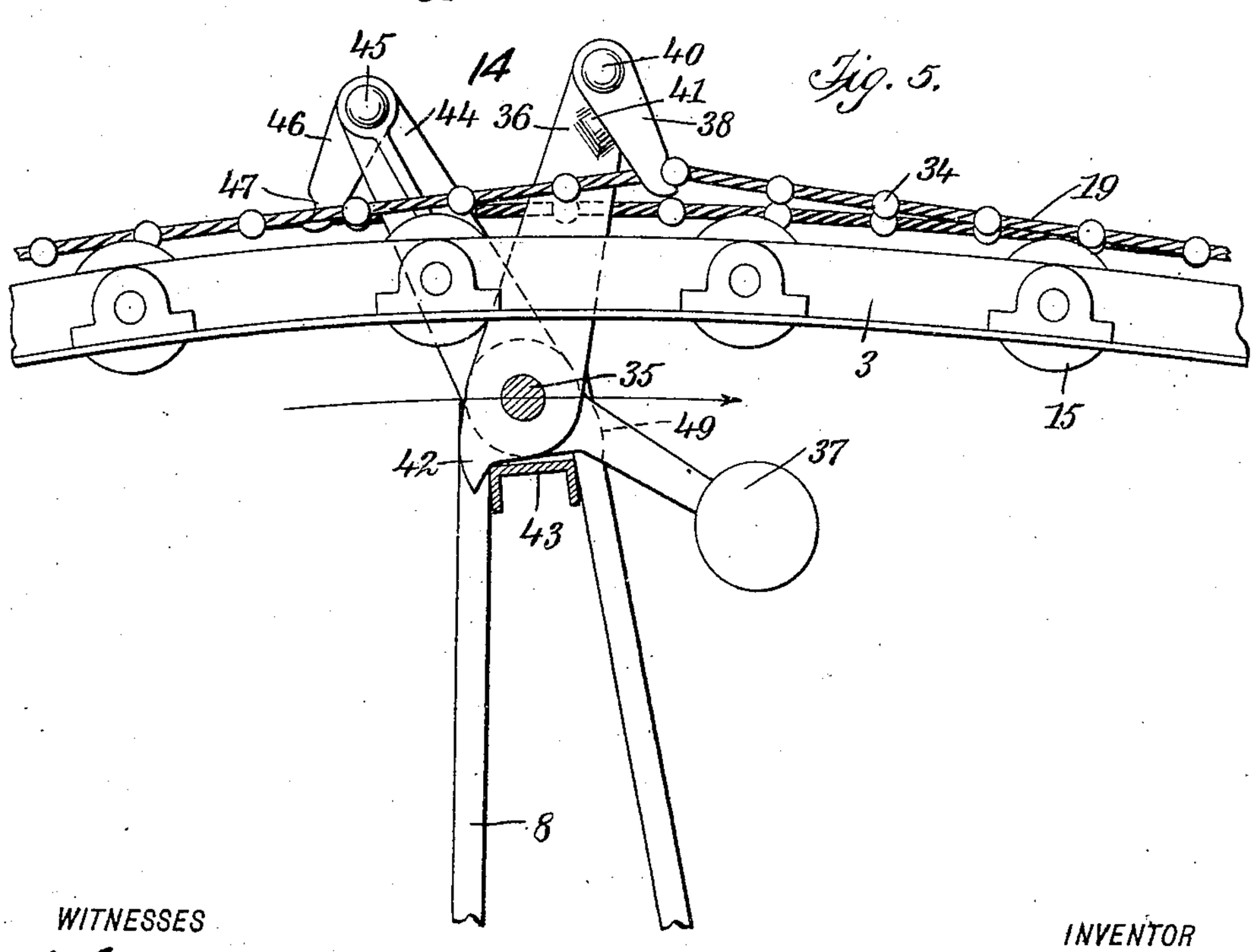


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM JOHN WHITE, OF OYSTER BAY, NEW YORK.

TIDE-MOTOR.

No. 917,823. Specification of Letters Patent. Patented April 13, 1909.

Application filed August 7, 1908. Serial No. 447,392.

To all whom it may concern:

Be it known that I, WILLIAM J. WHITE, a citizen of the United States, and a resident of Center Island, Oyster Bay, in the county of Nassau and State of New York, have invented a new and Improved Tide-Motor, of which the following is a full, clear, and exact description.

This invention relates to motors adapted to be operated by the rising and falling of a water level. On the rising of the water level the motor is operated by the buoyancy of the float, and on the downward movement it is operated by gravity.

While the invention is especially applicable as a tide motor, it can be used wherever there is a rising or falling of the water level from any cause whatever.

The invention consists in the construction and combination of parts to be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which drawings like characters of reference indicate like parts throughout the views, and in which—

Figure 1 is a side elevation of a motor constructed according to my invention; Fig. 2 is a plan and partial section; Fig. 3 is a section taken through a part of the mechanism and illustrating details of its construction; Fig. 4 is a side elevation and partial section illustrating details of the construction, and showing the manner in which a clutch operates to advance an endless cable; Fig. 5 is a view similar to Fig. 4, but illustrating how the clutch operates to hold the cable clear of the guide sheaves.

Referring more particularly to the parts, 1 represents the frame of the motor, which is in the form of a quadrant and built up of steel angle bars, as shown. This frame comprises two vertical standards 2 which support curved guide bars 3, which are disposed about an arc struck from the base of the verticals 2 as a center. The frame 1 includes intermediate or brace framing 4 which gives stiffness and strength to the structure. At intervals the guide bars 3 are connected by yokes 5 which are U-shaped and inverted, as indicated. At the bases of the standards 2 gusset plates 6 are provided to form a bearing for a horizontal shaft 7. On this shaft there is rigidly mounted a sweep 8, said sweep being built up of steel framing, as shown. This sweep has a short arm 9 which projects out over the water, and this arm is connected by a link 10 with a float 11, said float being mounted to rise and fall in guides 12, as indicated. This sweep 8 has a long arm 13 which extends over to a point on the guide bars 3, and on the extremity of this arm a two-way clutch 14 is mounted. The construction and purpose of this clutch will be described more fully hereinafter.

On the adjacent faces of the guide bars 3 I provide guide sheaves 15 which are disposed an equal distance apart, as shown. The upper and outer edges of these guide sheaves project slightly beyond the outer edges of the bars, as shown. At their upper ends the guide bars 3 are brought together and connected through a block 16, in which there is supported a large guide pulley or sheave 17, which is in a substantially horizontal plane. Near this point on the outer sides of the guide bars, guide pulleys 18 are provided as indicated. Around the pulley 17 an endless chain or cable 19 passes. This chain passes up and down respectively on the sheaves 15, resting upon the outer edges of the sheaves as indicated in Fig. 1. At the lower ends of the guide bars 3 this endless chain or cable passes around guide pulleys 20. From these guide pulleys it passes around a chain wheel or sprocket wheel 21 which is attached rigidly to the lower end of a shaft 22, said shaft 22 being mounted in a frame 23, as shown. The shaft 22 has a rigid bevel gear wheel 24 which meshes with a pinion 25. This pinion is rigid with a large belt wheel 26, which is connected by a belt 27 with a small belt wheel 28. This belt wheel 28 is mounted rigidly on a shaft 29 which also carries rigidly a large belt wheel 30, this belt wheel being connected by a belt 31 to a small belt wheel 32 carried by the shaft of a generator 33. The endless chain or cable 19 consists simply of an ordinary cable of rope or wire, which is provided with equidistant balls or blocks 34.

The construction of the clutch 14 will now be described, referring especially to Figs. 3 to 5 inclusive. This clutch comprises a pin or shaft 35. Upon this pin there is loosely mounted a main arm 36 which extends outwardly between the guide bars 3. This arm is provided with a counterweight 37 which tends to rotate the arm in a right-hand direction. On the end of the arm 36 a pawl 38 is pivoted, which pawl projects back toward

the space between the bars 3. The inner extremity of the pawl is formed into a jaw 39 which is adapted to engage with the balls 34 so as to advance the chain 19. The rearward movement of the pawl rotating on its pivot pin 40 is limited by a stop or projection 41, which extends out from the side face of the arm 36, as indicated. The pawl 38 is adapted to engage with the cable so as to advance it when the long arm 13 of the sweep 8 is moving upward. Near the shaft 35 the arm 36 is provided with a toe 42 which limits the rearward rotation of the arm by coming against the edge of a bracket plate 43 which is mounted on the end of the arm, as shown. When the sweep 8 begins to move in the direction of the arrow, as indicated in Fig. 4, the counterweight 37 will hold the arm 36 in the position shown, so that the pawl 38 will engage one of the balls 34 of the cable. A further movement of the arm in the direction of the arrow will be resisted by the cable and this will tend to rotate the arm 36 slightly toward the left, that is, rearwardly with respect to the direction of advance of the sweep 8. In this way the arm rotates outwardly and the pawl 38 draws the cable away from the edge of the guide sheave so that the end of the pawl 38 will clear the chain as the sweep rises. On the pin 35 there is also loosely mounted an arm 44, which inclines in an opposite direction to the arm 36, and this arm is provided with a pivot pin 45 carrying a pawl 46 which inclines oppositely to the pawl 38. The end of this pawl 46 is formed with a jaw 47 to engage with the balls 34. When the motion of the sweep 8 is in the direction of the arrow, this pawl will trip over the balls without being stopped by them, but upon a reverse movement the jaw 47 will engage with the balls so that as the sweep returns it will advance the cable in this direction. It will be observed that the action of gravity upon the arm 44 is always such as will hold it in a position inclined toward the left, or downwardly. The pawl 38 operates on one side of the cable, that is, on the near side as shown in Fig. 1, while the paw l46 operates on the other side of the cable. The pawl 46 is limited in its rearward movement by a stop or projection 48 which extends out from the side face of the arm 44, as indicated in Fig. 3. The arm 44 is provided near the pin 35 with a toe 49 which permits a limited rearward rotation of the arm, that is, a rotation toward the right. By reason of this arrangement, when the sweep is moving toward the left, as viewed in Figs. 4 and 5, the arm 44 will rotate rearwardly a slight amount before it commences to advance the cable. This rearward movement is sufficient to rotate the end of the pawl 46 out of the range of the sheaves 15. The mode of operation of this arm and toe 49 in this connection is similar to that of the arm 46 and its toe 42.

The mode of operation of the entire motor will now be described. As the tide falls, the float 11 moves down by its own gravity. In this way the float operates to raise the sweep. As the sweep moves upwardly the pawl 38 engages one side of the chain or cable, and advances the same as the sweep rises. When the tide ceases to fall and begins to rise, an upward movement of the float will begin to return the sweep toward the position in which it is shown in Fig. 1. When this occurs the pawl 38 releases itself from the cable and the pawl 46 engages with the opposite side of the cable. As the sweep moves downwardly this pawl advances the cable, and it will be seen that this advance of the cable will be in the same direction, that is, the endless cable will move substantially continuously in one direction. Any ratio of the long arm of the sweep to its short arm may be provided so that the amount of movement of the float can be modified as desired. The continuously moving cable 19 rotates the large bevel gear wheel 24, which rotates the small pinion 25 at an increased velocity. The velocity of rotation of the pinion 25 is increased again at the shaft 29 on account of the pulley 28 being much smaller than the pulley 26. Another increase of velocity occurs between the wheel 30 and the shaft of the generator. With this arrangement I am enabled to utilize the comparatively slow moving float 11 to produce a high velocity of rotation of the shaft of the generator 33. The current generated can be transmitted to any point where the power is to be used to run motors or to charge storage batteries.

While I have referred to the motor as a tide motor, it is obvious that it could be operated by the rising or falling of the level of the water supporting the float 11, whatever may be the cause of the change of level. It is obvious that on the upward movement of the water level the buoyancy of the float would operate the sweep, while on the downward movement of the water level the weight of the float would operate the sweep.

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

1. A float adapted to rest upon the water, and adapted to rise and fall with the change of level thereof, a sweep connected with said float and adapted to be swung to and fro by the movement of said float, an endless cable, means for guiding said cable adjacent to said sweep, means for advancing said cable by said sweep on its forward movement, and means for advancing said cable by said sweep on its return movement.

2. A float adapted to rest upon the water, and adapted to rise and fall with the change in level thereof, a sweep connected with said float and adapted to be moved to and fro

thereby, an endless cable, means for guiding said cable adjacent to said sweep, and a two-way clutch mounted on said sweep, and adapted to engage one side of the said cable on the forward movement of said sweep and the other side of said cable on the return movement of said sweep.

3. A float adapted to rest upon the water, means for guiding said float as the water level rises and falls, a sweep pivotally mounted, a link connecting said sweep with said float, a guide frame having curved guide bars lying adjacent to the end of said sweep, an endless cable, means for guiding said endless cable along said guide bars, and a two-way clutch mounted on the said sweep and coöperating with the said cable to advance the same in either direction of movement of said sweep.

4. A float adapted to rest upon the water, means for guiding said float as the water level rises and falls, a frame comprising a pair of curved guide bars, a sweep having a pivot about which it swings, said guide bars being curved about the pivot of said sweep as a center, guide sheaves carried by said guide bars, an endless cable guided along said sheaves, and a two-way clutch carried by said sweep, adapted to engage one side of said cable on the upward movement of said sweep and the other side of the cable on the downward movement of said sweep.

5. A frame having oppositely disposed curved guide bars, having substantially the form of a quadrant, guide sheaves mounted upon said guide bars, a guide pulley at the upper end of said guide bars, an endless chain passing along said guide sheaves and around said guide pulley, a shaft, means for guiding the lower end of said endless cable around said shaft, means for generating power actuated from said shaft, a sweep mounted to swing and having its end disposed adjacent to said guide bars, a float adapted to rise and fall with a change in water level and connected with said sweep, and a two-way clutch engaging said cable and adapted to advance the same in either direction of movement of said sweep.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM JOHN WHITE.

Witnesses:
HELEN S. WHITE,
T. C. GRAHAM.