No. 882,269.

PATENTED MAR. 17, 1908.

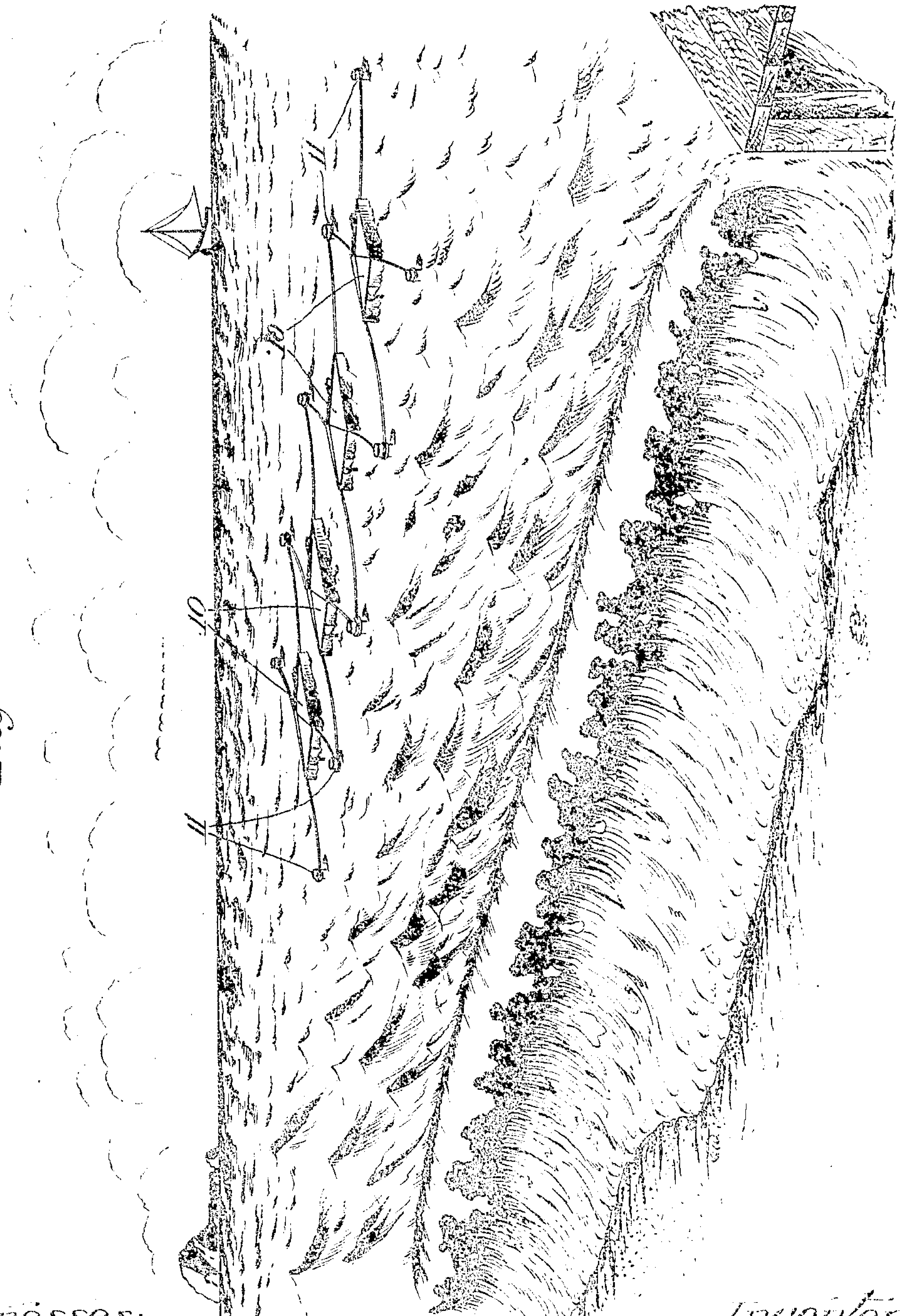
F. M. PRATHER.

WAVE MOTOR.

APPLICATION FILED APR. 30, 1907.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

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Inventor

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By [signature]

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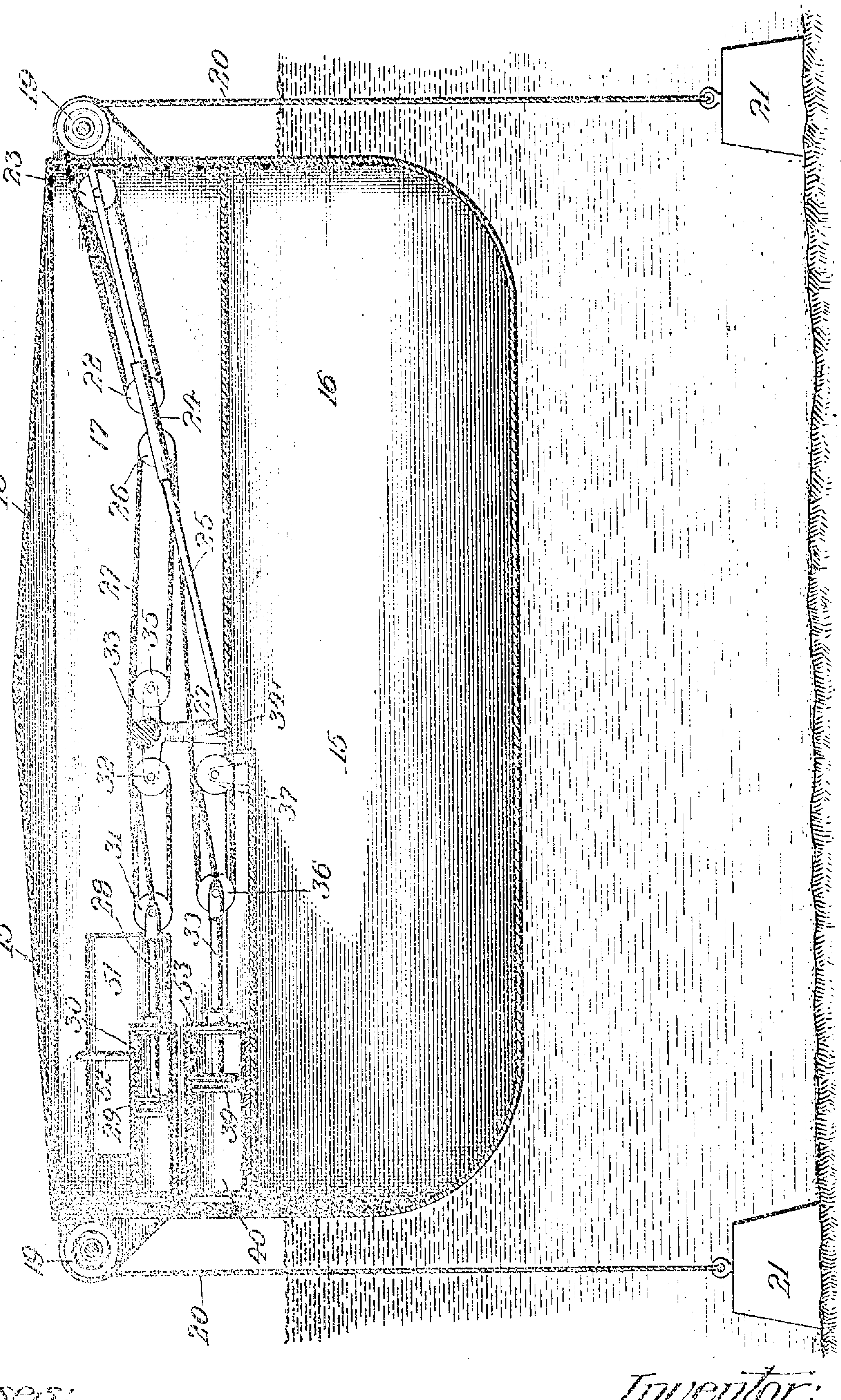
Fig. 2.



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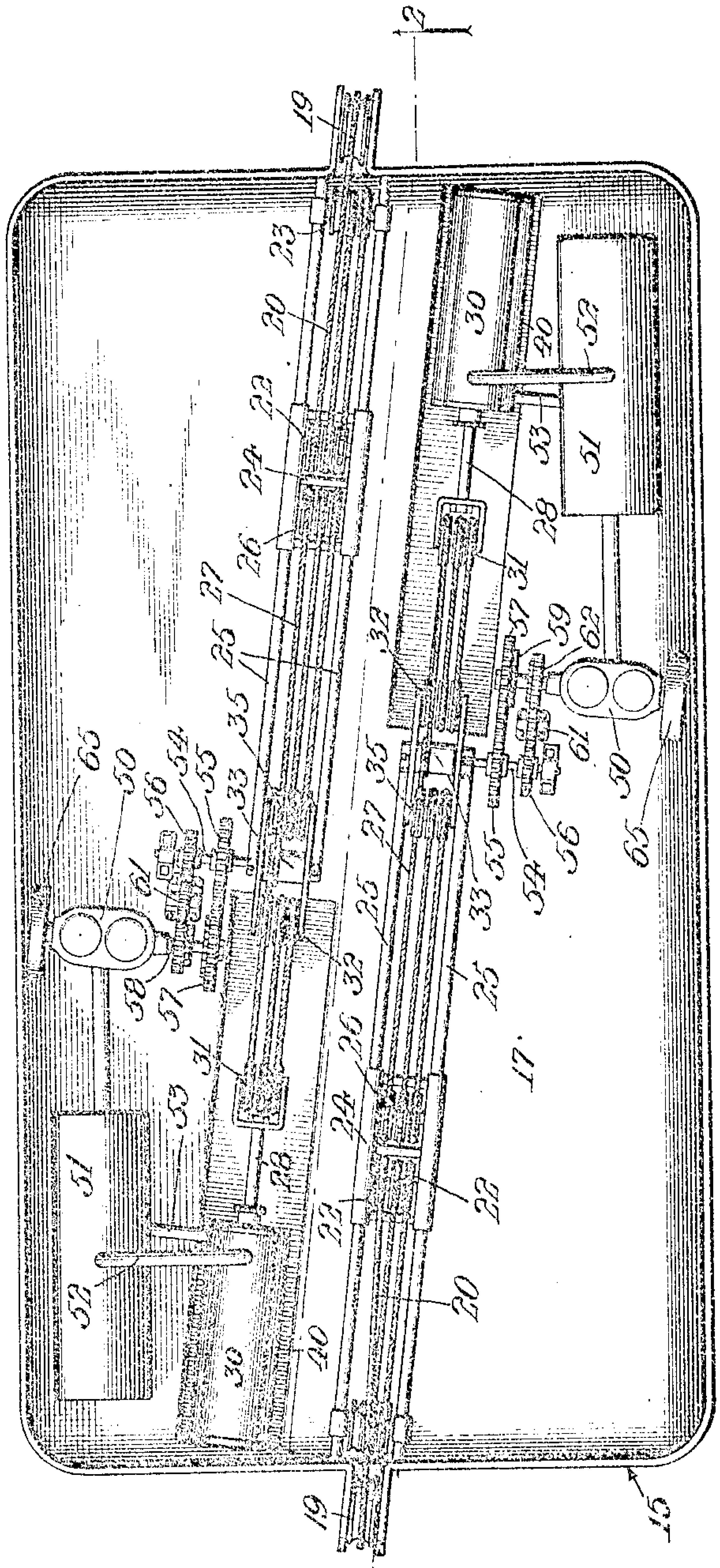
4 SHEETS—SHEET 3.

Fig. 3.



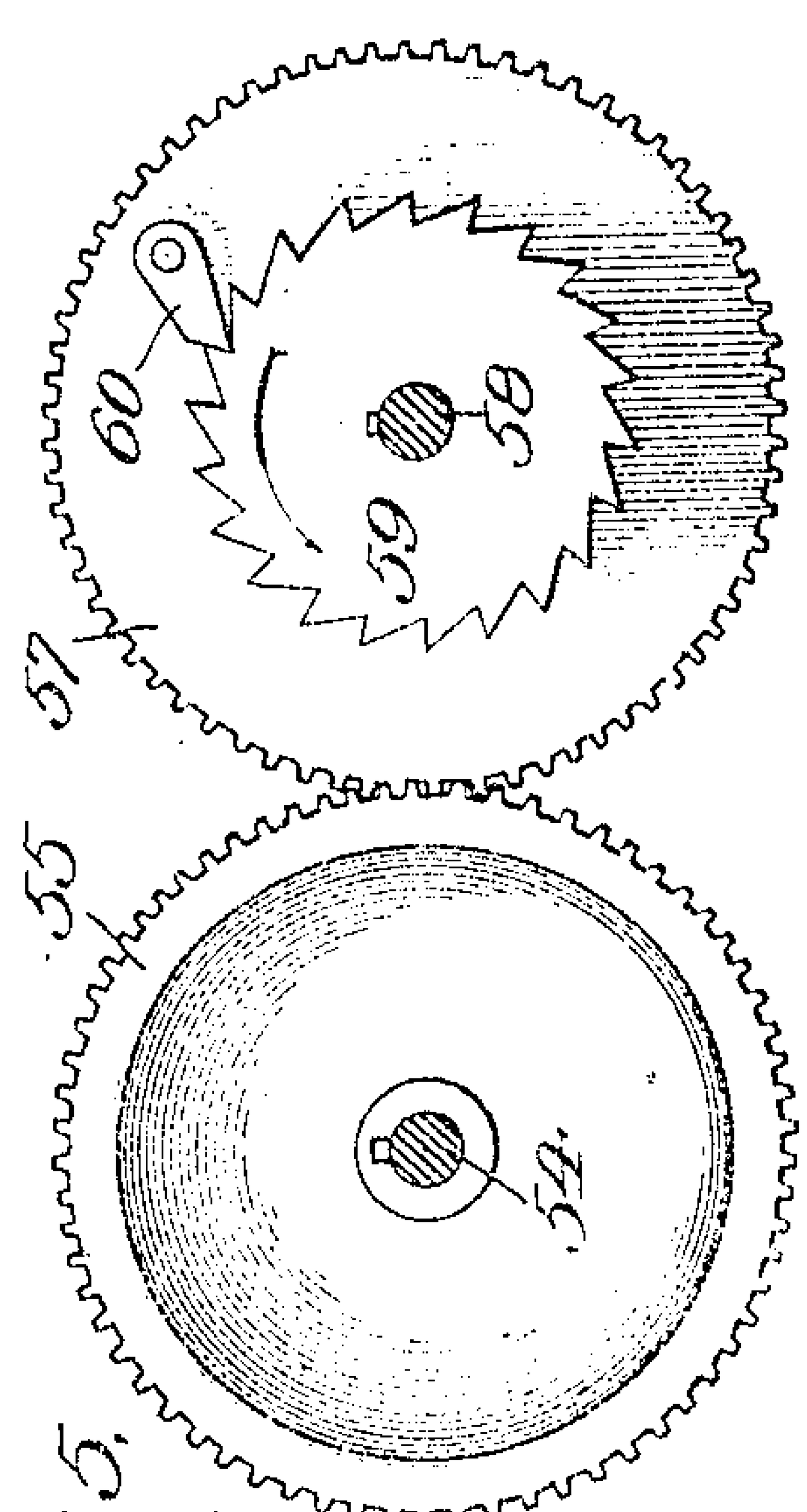


Fig. 5.

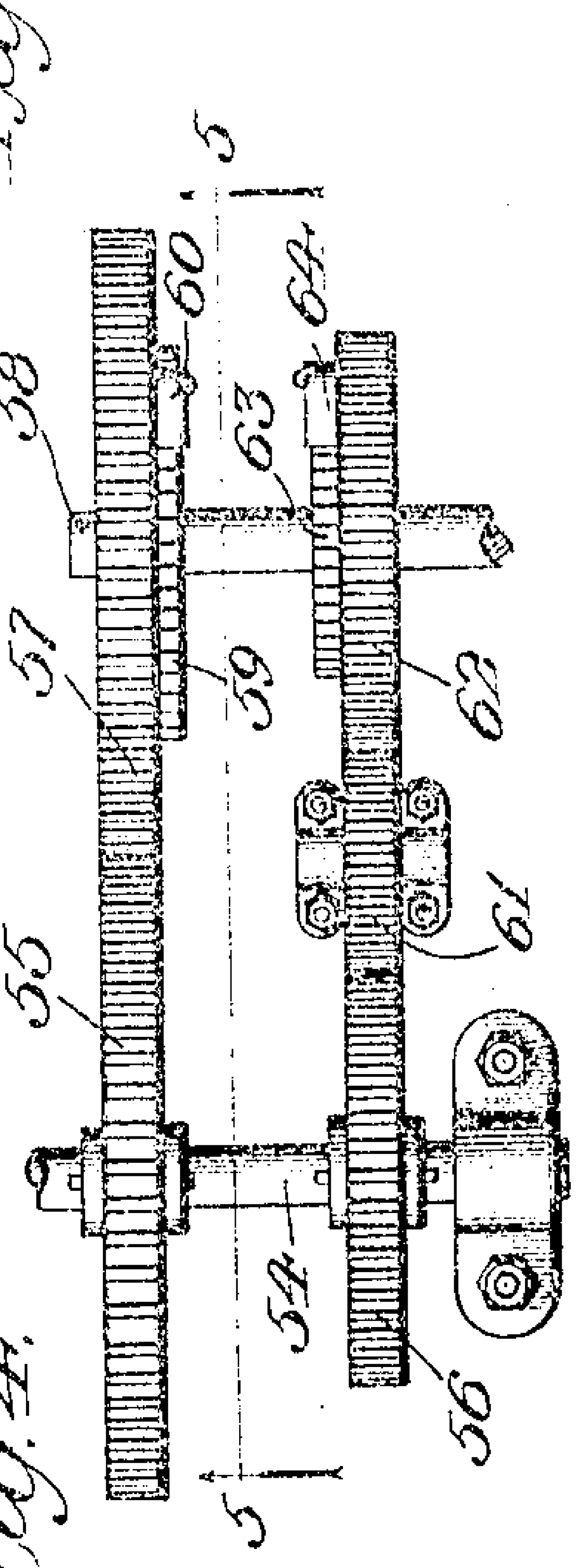


Fig. 4.

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4 SHEETS—SHEET 4.

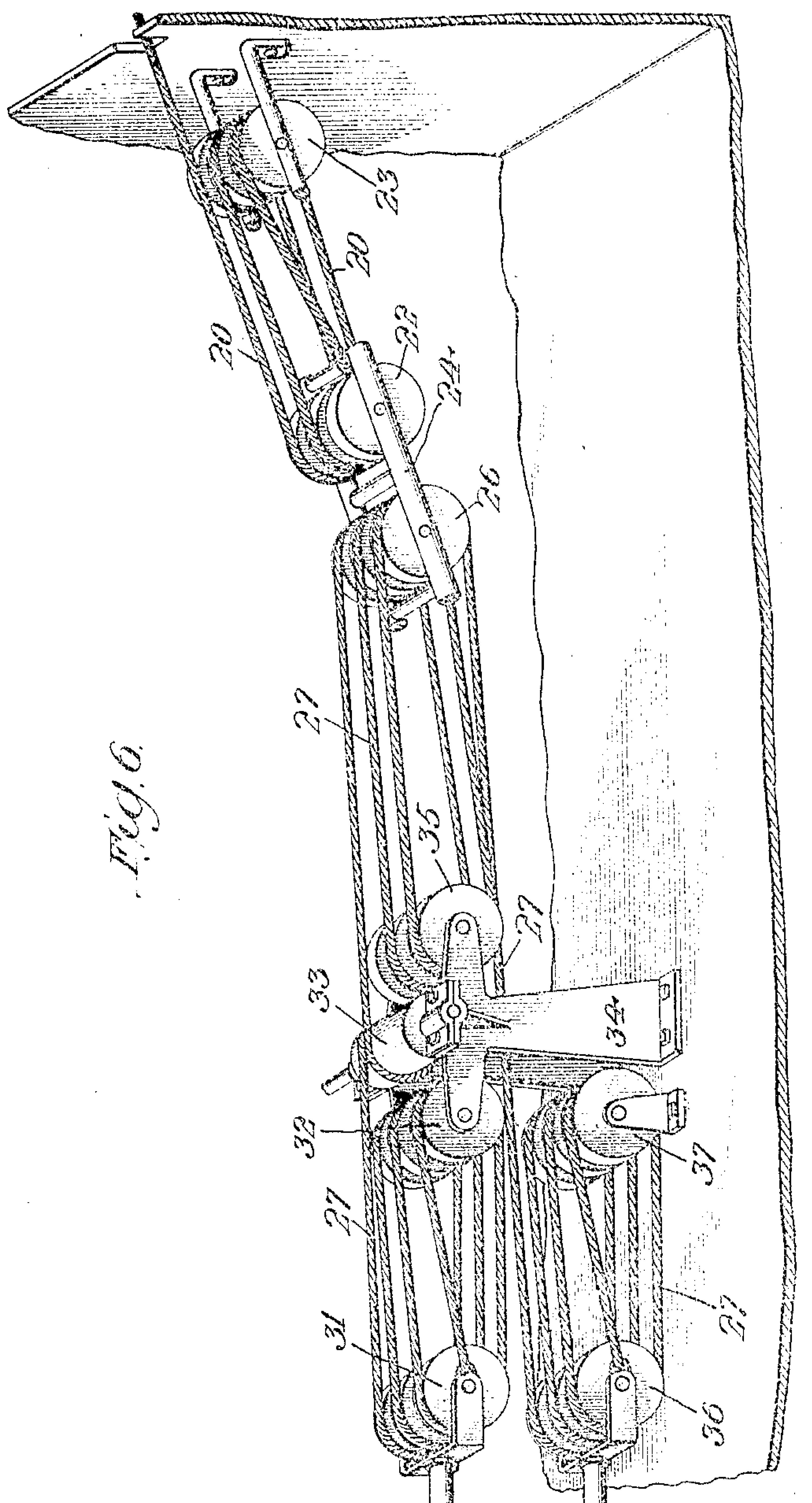

Fig. 6.

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[illegible]
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UNITED STATES PATENT OFFICE.

FRANK MONROE PRATHER, OF LOS ANGELES, CALIFORNIA.

WAVE-MOTOR.

No. 882,269. Specification of Letters Patent. Patented March 17, 1908.

Application filed April 30, 1907. Serial No. 371,110.

To all whom it may concern:

Be it known that I, FRANK MONROE PRATHER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and Improved Wave-Motor, of which the following is a specification.

My invention relates to that class of wave motors which utilize the wave induced movements of a barge or similar structure floating on the surface of the water, and in which the barge carries all the apparatus necessary for the conversion of the movements of the barge into useful forms of energy.

The prime object of my invention is to provide a wave motor which will ride the seas through storms without injury thereto.

A further object is to provide mechanism whereby any sudden movement of the barge will be utilized to the fullest extent for power purposes.

A further object is to provide an arrangement whereby movements of the barge in any direction are utilized.

I accomplish these objects by means of the device described herein and illustrated in the accompanying drawings, in which:—

Figure 1— is a view of a sea coast showing a number of units of my improved wave motor anchored off the shore. Fig. 2— is a vertical longitudinal section of a unit taken on line 2—2 of Fig. 3. Fig. 3— is a plan view of the barge, the roof of the same being removed. Fig. 4— is an enlarged detail of the transmission gears. Fig. 5— is a vertical section taken on line 5—5 of Fig. 4. Fig. 6— is a diagrammatic perspective view of the cables and sheaves.

Referring to the drawings and more particularly to Fig. 1, my complete wave motor consists of a plurality of units 10 which are preferably anchored at a short distance from the shore to piles 11 or other anchorage means. These units are preferably small as I prefer to derive a given amount of power from a large number of small units rather than from a small number of large units. This arrangement does away in a large measure with the liability of demolition during storms or gales as a small unit is much better adapted to withstand the action of the waves than a large unit.

In Figs. 2 and 3 I have illustrated the mechanism of one unit which I will now describe. A barge 15 of suitable size is constructed with a lower water tight compartment 16 and an upper apparatus compartment 17, a roof 18 being provided to prevent the entrance thereto of water in case the waves should wash or break over the top of the barge. At either end of the barge is located a pulley 19 over which cables 20 pass extending downwardly from the barge and being secured to weights 21 which rest upon the sea bottom and which are heavy enough to withstand the buoyancy of the barge. These weights may also be provided heavy enough to act as anchorages for the barge, so that the piling may be dispensed with, allowing the barge a wider latitude of movement. Ropes 20 pass into the upper apparatus chamber in the barge and are attached to and operate the mechanisms which are adapted to utilize the power of the movement of the barge. As both of these mechanisms are exactly identical only one will be described.

Cable 20 passes over sheaves 22 and sheaves 23, sheaves 22 being mounted in a sliding frame 24 which is adapted to reciprocate on guide rods 25, and sheaves 23 being rigidly pivoted to the guide rods 25. The number of turns in cable 20 over sheaves 22 and 23 will depend upon the size of the barge and its maximum vertical movement, as it will be seen that this arrangement of sheaves is merely for the purpose of reducing the magnitude of motion of sliding frame 24 in the barge. In localities where the wave and tide movements are comparatively small cables 20 may be attached directly to sliding frame 24 without the intervention of any sheaves for the purpose of reducing the amount of motion of the sliding frame. Also mounted on sliding frame 24 are sheaves 26 over which a cable 27 passes, one of its ends being secured to a piston rod 28 attached to piston 29 in cylinder 30. Air pressure is provided, as will be hereinafter explained, in front of piston 29 so that piston 29 is always held at the rear end of cylinder 30. Sheaves 31 are provided on the end of piston rod 28 in conjunction with sheaves 32 mounted in bearings secured to the floor of the barge, so as to reduce the amount of necessary motion of piston 29 and also to reduce the length of cylinder 30. Cable 27 passes around sheaves 31 and 32 and then around a drum 33 mounted in bearings 34, then around sheaves 26 on sliding frame 24 and sheaves 35 mounted in bearings 34. After passing around these last named sheaves, cable 27 passes around

sheaves 36 and 37. Sheaves 36 are secured to the end of piston rod 38 attached to piston 39 in cylinder 40. Air pressure is supplied to cylinder 40 in front of piston 39 so as to hold piston 39 at the rear of cylinder 40. Sheaves 37 are mounted on the floor of the barge and the end of cable 27 after passing around sheaves 36 and 37 is finally attached to the end of piston rod 38. Cylinder 40 is larger than cylinder 30 so that when sliding frame 24 is moved on rods 25 by the upward movement of the barge, piston 39 will remain stationary and piston 29 will be drawn outwardly by cable 27. Drum 33 is rotated by any movement of cable 27 in either direction as piston 29 will immediately bring cable 27 and sliding frame 24 back to their normal positions on the subsidence of the barge.

On any sudden upward movement of the barge the inertia of the machinery connected to the drum 33 will prevent the drum from immediately starting to rotate. Frame 24 will be forced to move, however, and in doing so will temporarily pull piston 39 forward in large cylinder 40 and thus relieve the mechanism from any undue strain. When the sudden movement of the barge has ceased piston 39 will be moved rearwardly by the air pressure in front of it and will by this action pull piston 29 in small cylinder 30 forwardly and thereby rotate drum 33 and with it the machinery connected thereto. It will thus be seen that I have provided a means whereby all sudden strains on the mechanism are avoided and all the power of the movement of the barge ultimately utilized.

I have shown connected with drum 33 an air compressor 50 which is adapted to compress air into a storage chamber 51 and from which the compressed air may be taken for power purposes. Pipes 52 and 53 connect storage chamber 51 with cylinders 30 and 40 respectively and provide the necessary air pressure in front of the piston in both cylinders. I have shown compressor 50 connected to drum 33 by a double set of gears which are shown more particularly in Figs. 4 and 5. Shaft 54 is directly connected with drum 33 and on it are mounted two gears 55 and 56. Gear 55 meshes with a gear 57 on shaft 58 of compressor 50. Gear 55 is keyed to shaft 54 and gear 57 is connected to shaft 58 through ratchet wheel 59 and dog 60, so that shaft 58 will be rotated only in the direction shown by the arrow in Fig. 5. Gear 56 meshes with a small idler gear 61 which in turn meshes with gear 62 on shaft 58. Gear 62 is connected with shaft 58 through ratchet wheel 63 and dog 64 which operate to rotate shaft 58 in the same direction as ratchet 59 and dog 60. By means of these gears shaft 58 is driven continuously in the direction shown by the arrow in Fig. 5 whether shaft 54 is rotating in either direction. A fly wheel 65 is provided on the compressor 50 so as to render the motion of the compressor uniform.

It will be observed that I have provided a wave motor which is well adapted to the utilization of the power of sea waves as the system of providing a number of barges of convenient size is very flexible and can be adapted to any particular local conditions. The individual units are practically indestructible on account of the fact that they are not held rigidly by any structure, but on the other hand are allowed freedom of movement on the surface of the water. Any movement of the barge away from the weights or anchors on the sea bottom will cause an operation of the power mechanism in the barge, whether that movement of the barge be directly up and down or horizontal over the surface of the water. On account of superior durability I prefer to make the individual barges comparatively small and to use a large number of them in a single installation, as a small barge is much more sea worthy than a large one.

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

1. In a wave motor, a floating barge, a cable anchored at one end to the sea bottom and passing upwardly to said barge, means to utilize the relative movements of the barge and cable for power purposes, and pressure means attached to the upper end of said cable adapted to pull said cable toward said barge.

2. In a wave motor, a floating barge, a sliding frame mounted on said barge, a cable secured at one of its ends to said sliding frame and at its other end to the sea bottom, a sheave mounted on said sliding frame, an air compressor mounted on the barge adapted to be operated from a rotating drum, an air storage chamber, a small and a large cylinder mounted on the barge, said cylinders provided with pistons and being in open communication with said storage chamber, and a cable attached at one end to the piston of the small cylinder, passing around said rotating drum, over said sheave on said sliding frame, and attached at its other end to the piston in said large cylinder.

3. In a wave motor, a floating barge, a frame slidably mounted on said barge, a cable secured at one of its ends to said sliding frame and at its other to the sea bottom, a sheave mounted on said sliding frame, a rotating drum mounted on said barge, a large and a small air pressure cylinder mounted on said barge, said cylinders being provided with pistons, a cable secured at one end to the piston in said small cylinder, passing around said rotating drum, over said sheave on said sliding frame and secured at its other end to the piston in said large cylinder.

4. In a wave motor, a floating barge, cables anchored to the sea bottom and extending upwardly to said barge, resilient pneumatic pressure means adapted to pull said cable toward said barge, means whereby the movement of said cable in said barge is reduced, and means to utilize said reduced movement for power purposes.

5. In a wave motor, a floating barge, a cable anchored to the sea bottom and extending upwardly to said barge, a reciprocating carriage mounted in said barge and provided with a plurality of sheaves, said barge being provided with a like number of sheaves, said cable passing successively over the sheaves on said carriage and the sheaves on said barge, and pneumatic pressure means connected to said carriage adapted to hold said cable taut.

6. In a wave motor a floating barge, a cable anchored to the sea bottom and extending upwardly to said barge, a reciprocating carriage mounted in said barge and operatively attached to said cable, sheaves mounted on said carriage, a large and a small cylinder mounted on said barge and having pistons therein, means to supply pneumatic pressure to said cylinders, and a cable attached at its ends to said pistons and passing over said sheaves.

In witness that I claim the foregoing I have hereunto subscribed my name this 22nd day of April, 1907.

FRANK MONROE PRATHER.

Witnesses:
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MYRTLE A. JONES.