

H. P. MOLANDER.  
WAVE MOTOR.

APPLICATION FILED JAN. 3, 1911.

Patented June 27, 1911

2 SHEETS-SHEET 1

996,112.

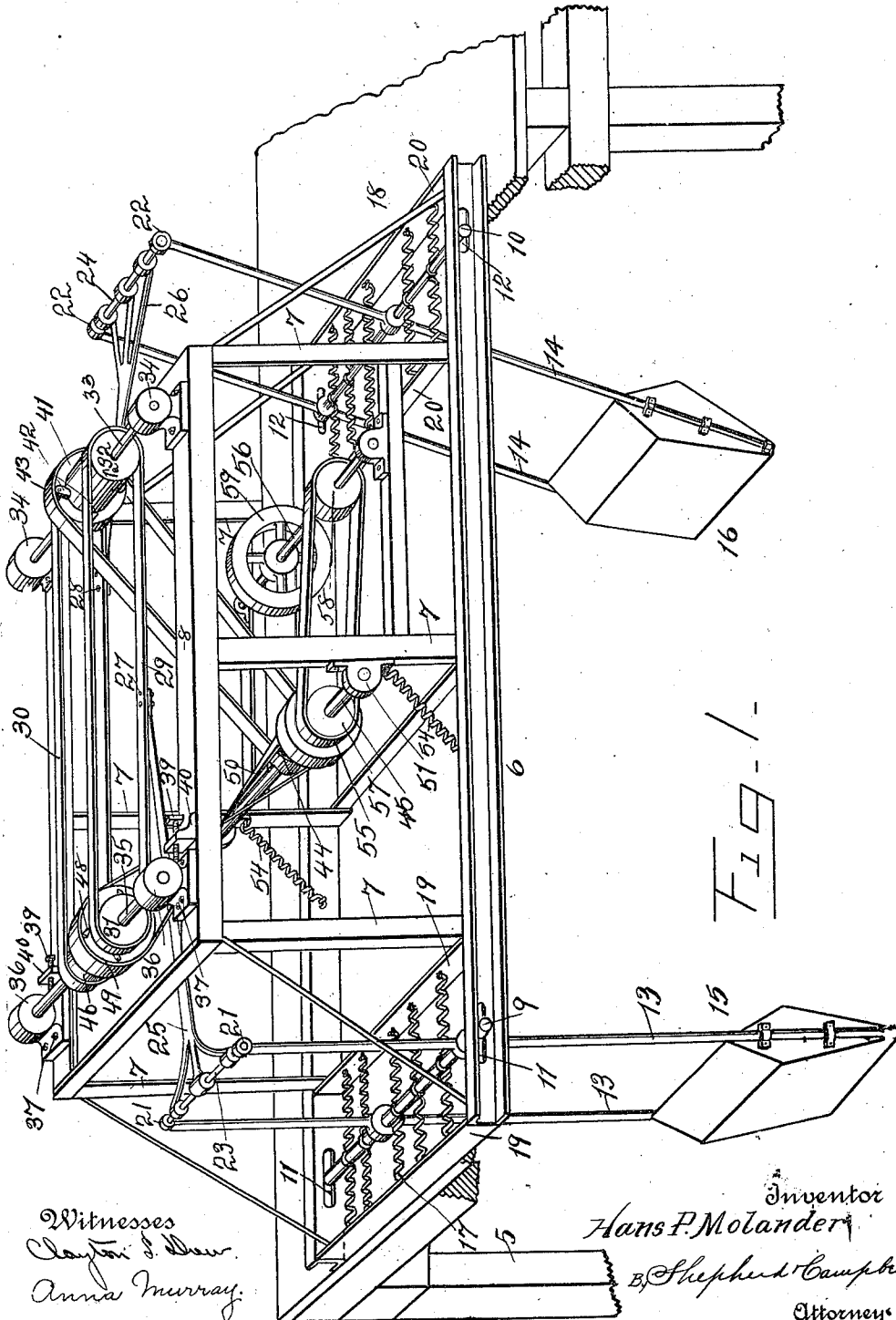


FIG. 1-

Witnesses  
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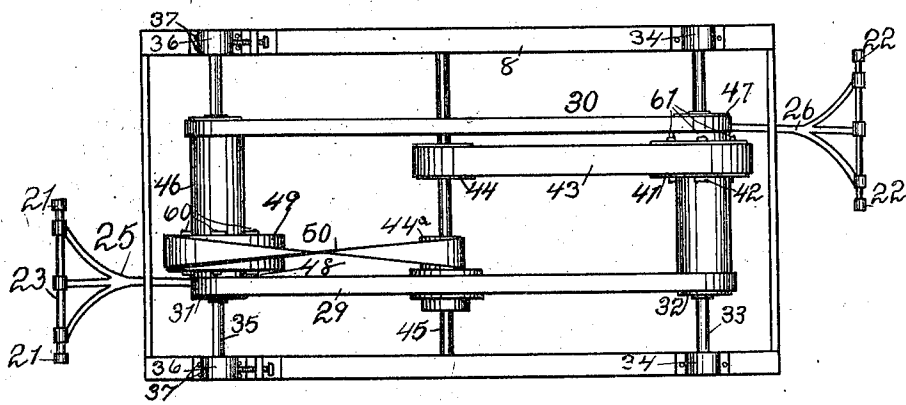


Fig. 2.

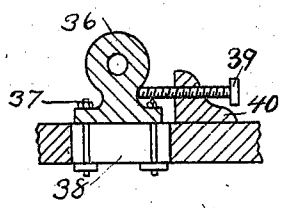


Fig. 4.

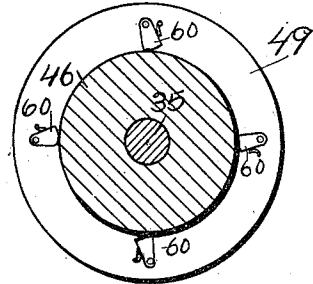


Fig. 3.

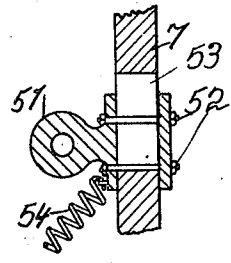


Fig. 5.

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# UNITED STATES PATENT OFFICE.

HANS P. MOLANDER, OF SAN DIEGO, CALIFORNIA.

## WAVE-MOTOR.

996,112.

Specification of Letters Patent. Patented June 27, 1911.

Application filed January 3, 1911. Serial No. 600,577.

*To all whom it may concern:*

Be it known that I, HANS P. MOLANDER, a citizen of the United States of America, residing at San Diego, in the county of San Diego and State of California, have invented certain new and useful Improvements in Wave-Motors, of which the following is a specification.

This invention relates to wave motors and has for its object the provision of a device of this character constructed to utilize the power of the ocean's waves and to transform such power, by means of improved mechanism, into continuous rotation in one direction of a power shaft.

Further objects and advantages of the invention will be set forth in the detailed description which now follows:

In the accompanying drawings, Figure 1 is a perspective view of a wave motor constructed in accordance with the invention, Fig. 2 is a plan view of the upper portion thereof with the remainder of the structure omitted, Fig. 3 is a detail face view of one of the clutches employed, Fig. 4 is a sectional view illustrating the mounting of one of the shafts hereinafter described, and Fig. 5 is a detail view illustrating the mounting of another of said shafts.

Like numerals designate corresponding parts in all of the figures of the drawing.

Referring to the drawings, the numeral 5 designates a pier upon which is mounted a supporting frame 6. Standards 7 support an additional rectangular frame 8 upon their upper ends. Transverse shafts 9 and 10 are mounted in slots 11 and 12 of the frame 6. Secured to these shafts are vertical bars 13 and 14. These bars carry between them at their lower ends, wedge-shaped paddles 15 and 16. Springs 17 and 18 are connected at one end to the transverse members 19 and 20 of the frame and at their opposite ends are connected to the shafts 9 and 10 so that these shafts are capable of a limited sliding movement longitudinally of the frame 6, this sliding movement being cushioned by said springs in both directions. The upper ends of the bars 13 and 14 are formed with bearings 21 and 22 in which shafts 23 and 24 are mounted. Pivotaly mounted upon these shafts 23 and 24 are connecting arms 25 and 26,

the opposite ends of these arms being riveted at 27 and 28 to the lower flights of belts 29 and 30. The belt 29 passes over pulleys 31 and 32. The pulley 32 is loose upon a shaft 33 which is mounted in bearings 34. The pulley 31 is loose upon a shaft 35 which is mounted in bearings 36. The bolts 37 which secure the bearings 36 in place, pass through slots 38 formed in the side members of the frame 8, by virtue of which construction a limited movement may be imparted to these bearings to tighten the belts by means of set screws 39 which are threaded into brackets 40. A pulley 41 is loosely mounted upon the shaft 33 and carries pawls 42 which engage the periphery of pulley 32 in such manner that when said pulley rotates in the direction of the arrow "a" in Fig. 1, said pawls will serve to likewise rotate pulley 41. A belt 43 passes over pulley 41 and over a pulley 44 which is fast upon a transverse shaft 45. The belt 30 passes over pulleys 46 and 47, pulley 47 being loosely mounted upon shaft 33 and pulley 46 being loose upon shaft 35.

Pawls 48 carried by a pulley 49 which is loose upon the shaft 35 engage the periphery of pulley 46. A cross belt 50 passes over pulley 49 and pulley 44. The shaft 45 is mounted in bearing blocks 51, these bearing blocks being held in position by fastening members 52 which pass through the slots 53 formed in the standards 7 to which said blocks are connected.

Springs 54 are connected at one end to the frame 6 and at their opposite end to the blocks 51 and normally hold said blocks at the bottom of said slots, these springs providing a cushion mounting for the shaft 45 against the pull of the belts 43 and 50. Additional pawls 60 and 61 (see Fig. 2) corresponding to the pawls 42 and 48 are mounted upon the rear faces of the pulleys 41 and 49 in Fig. 1 and engage the peripheries of pulleys 46 and 47.

The operation of the device is as follows: It will be understood that the pier is located above the water and in such position that the incoming and receding waves will act against the paddles 15 and 16 to impart a back and forth or swaying movement to the bars 13 and 14, which movement of the

bars is cushioned by the springs 17 and 18 as hereinbefore described. The connecting rods 25 and 26 change this swaying movement to a back and forth movement of belts 29 and 30. The belt 29 imparts an oscillatory movement to the pulleys 31 and 32. The belt 30 imparts an oscillatory movement to the pulleys 46 and 47. The remainder of the structure transforms this intermediate oscillatory movement of these pulleys into continuous rotation of a power shaft by means of the clutches formed by the pawls 42, 48, 60 and 61, and the pulleys by which these pawls are carried.

The movement of the pulley 32 in one direction, viz., the direction of the arrow "a", actuates the shaft 45 in a corresponding direction by means of said clutch as hereinbefore set forth through the medium of the straight belt 43. The movement of pulley 31 in the opposite direction imparts the same rotation to shaft 45 through the medium of the cross belt 50, the pawls 48 at this time coming into action.

The pawls 60 and 61 upon the rear faces of the pulleys 41 and 49 serve a corresponding function in transmitting the back and forth movement of the belt 30 to pulleys 41 and 49 as will be readily understood. It will therefore be seen that continuous rotation in one direction is imparted to shaft 45 and this rotation is transmitted by a belt 55 to the power shaft 56 through pulleys 57 and 58. A rotative member 59 is preferably mounted upon the shaft 56.

From the foregoing description, it will be seen that simple and efficient means are herein provided for accomplishing the objects of the invention but while the elements shown and described are well adapted to serve the purposes for which they are intended, it is to be understood that the invention is not limited to the precise construction set forth, but includes within its purview such changes as may be made within the scope of the appended claims.

Having described my invention, what I claim is:

1. In a device of the character described, the combination with a paddle carrying member, of a member forming a pivotal mounting therefor, springs connected to the last named member for cushioning it, a belt, pulleys over which said belt passes, a connection between the paddle carrying member and said belt, a rotative member, and means for converting the back and forth movement of said belt into continuous rotation of said rotative member.

2. In a device of the character described, the combination with a supporting frame, of a pivot shaft mounted for limited sliding movement in said frame, springs connected

with said shaft for cushioning its movement in both directions, bars pivoted by said shaft in said frame, a paddle member at the lower ends of said bars, a connecting member pivotally connected to the upper ends of each of said bars, a rotative member, and means for transforming back and forth movement of said connecting members into continuous rotary movement of said rotative member.

3. In a device of the character described, the combination with a pivotally mounted member, of a paddle member carried thereby, a connecting rod pivotally connected thereto, a belt to which said connecting rod is secured, pulleys over which said belt passes, a rotative member, and clutch connections between said pulleys and said rotative member for converting back and forth movement of said belt into continuous rotation of said rotative member.

4. In a device of the character described, the combination with a pivotally mounted member, of a paddle member carried thereby, a connecting rod pivotally connected thereto, a belt to which said connecting rod is secured, pulleys over which said belt passes, a rotative member, clutch connections between said pulleys and said rotative member for converting back and forth movement of said belt into continuous rotation of said rotative member, the pivotal mounting of the pivotally mounted member being capable of a limited sliding movement, and means for cushioning such movement in both directions.

5. In a device of the character described, the combination with a supporting frame, of a pair of transverse shafts located therein and capable of a limited sliding movement, means for cushioning such sliding movement in both directions, bars carried by said shafts, paddle members carried by the lower ends of said bars, connecting rods at the upper ends of said bars, a pair of belts to each of which one of said connecting rods is secured, loose pulleys over which each of said belts passes, an additional pair of pulleys, clutch members between said additional pulleys and said loose pulleys, an additional transverse shaft, a pulley mounted thereon, and straight and cross belts leading from said additional pair of pulleys to the pulley on the additional transverse shaft.

6. In a device of the character described, the combination with a supporting frame, of a pair of transverse shafts located therein and capable of a limited sliding movement, means for cushioning such sliding movement in both directions, bars carried by said shafts, paddle members carried by the lower ends of said bars, connecting rods at the upper ends of said bars, a pair of belts to each of which one of said connecting rods is secured, loose

5 pulleys over which each of said belts passes, an additional pair of pulleys, clutch members between said additional pulleys and said loose pulleys, an additional transverse shaft, a pulley mounted thereon, straight and cross belts leading from said additional pair of pulleys to the pulley on the additional transverse shaft, and spring controlled

bearing members for said additional transverse shaft. 10

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

HANS P. MOLANDER.

Witnesses:

H. M. VOLLMER,

G. U. FRY.