No. 607,072. Patented July 12, 1898.

J. McA. PALMER.

DIRECT ACTING WAVE POWER.

(Application filed June 14, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

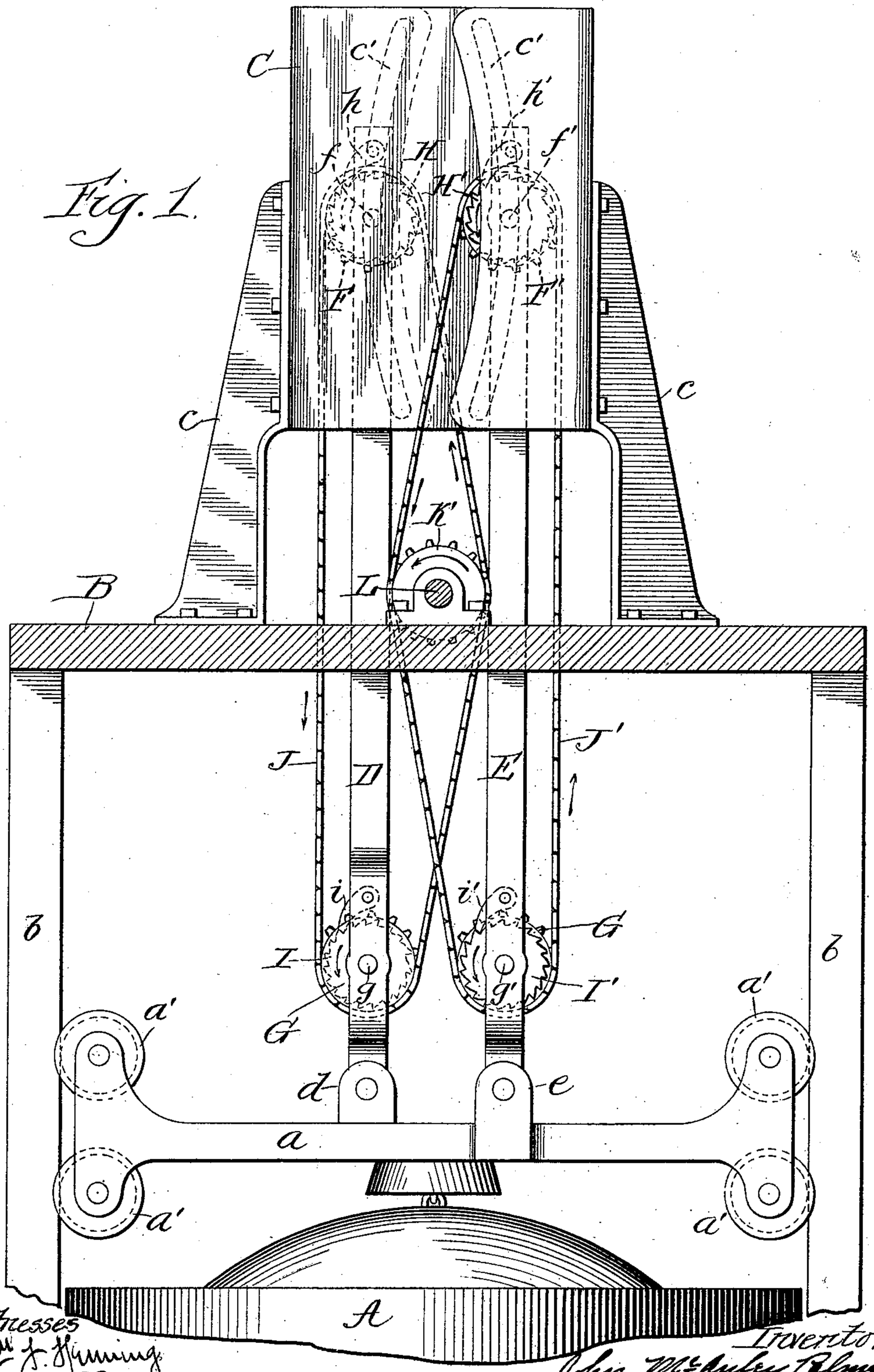

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Fig. 2.

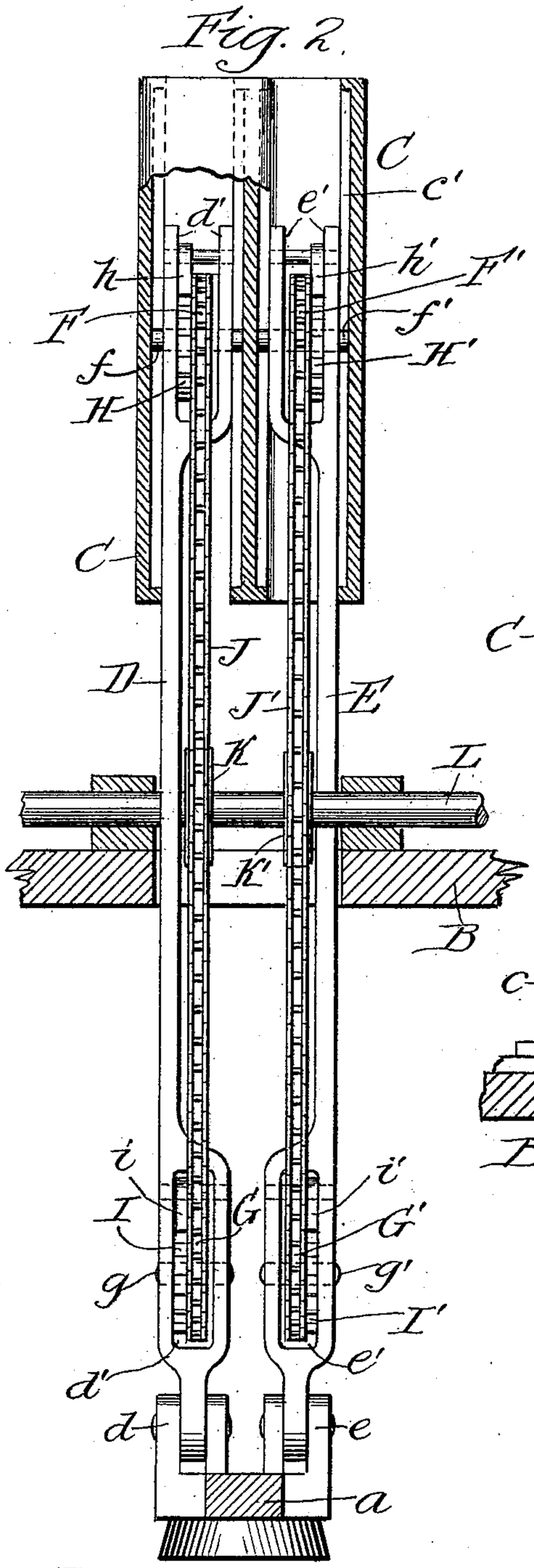
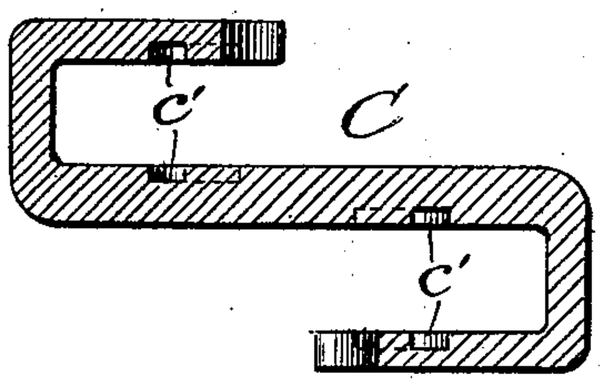
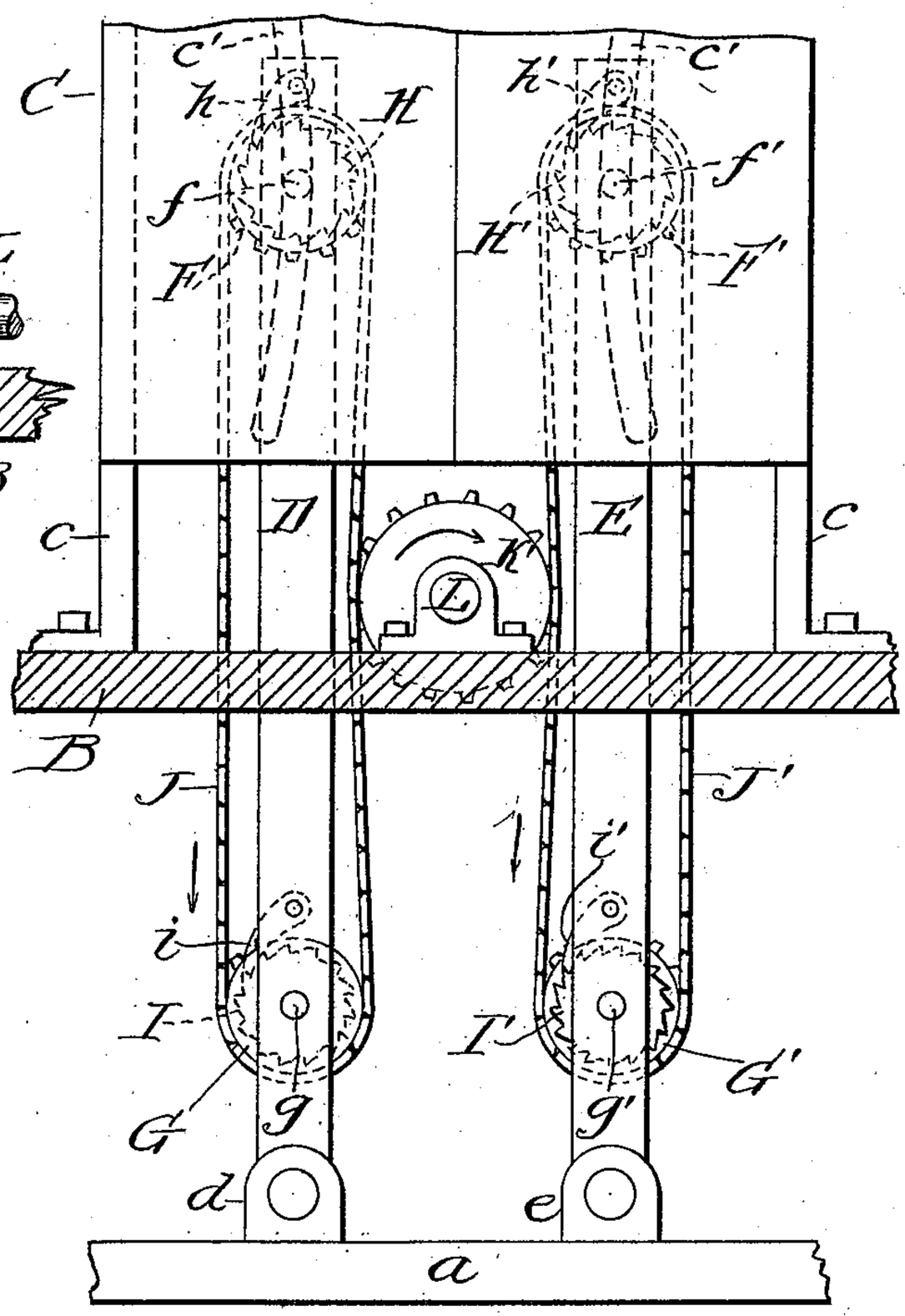


Fig. 3.





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UNITED STATES PATENT OFFICE.

JOHN McAULEY PALMER, OF FORT GRANT, ARIZONA TERRITORY.

DIRECT-ACTING WAVE-POWER.

SPECIFICATION forming part of Letters Patent No. 607,072, dated July 12, 1898.

Application filed June 14, 1897. Serial No. 640,600. (No model.)

To all whom it may concern:

Be it known that I, JOHN MCAULEY PALMER, a citizen of the United States, residing at Fort Grant, in the county of Graham and Territory of Arizona, have invented certain new and useful Improvements in Direct-Acting Wave-Powers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My present invention relates to certain new and useful improvements in wave-powers, and particularly to that type in which the impulses of the waves communicate power directly to a shaft or other device.

The primary object of my invention is to provide a simple construction and arrangement of parts adapted to communicate power derived from impulses of waves to automatically drive a shaft or other device directly.

Another object of the invention is to utilize the power derived from the impulse of the wave during its ascent and its descent for the purpose of driving a shaft or other device; and a further object of the invention is to guide the operative parts of my improved apparatus in such a way that the tension of the chains which operate the power-shaft shall always be maintained substantially constant and invariable.

With these and other ends in view my invention consists in the peculiar construction, arrangement, and combination of parts, hereinafter described, and shown in the accompanying drawings, in which—

Figure 1 is a side elevation showing the construction and arrangement of the operative parts of my invention, the manner and means for guiding the driving-rods being indicated in dotted lines. Fig. 2 is a sectional view showing the arrangement of the operating-chains and the sprockets with which they engage. Fig. 3 is a horizontal sectional view of the guide-frame. Fig. 4 shows another form in which my invention may be embodied.

Referring to the drawings, in which like letters of reference denote corresponding parts in all of the figures, A designates a float, which is actuated by the wave impulses and guided in some suitable manner, forming no part of my present invention. This float is connected with a cross-piece *a*, carrying guide-rollers *a'*, which operate on the ways or tracks *b*.

A guide-frame C is secured upon suitable supports *c*, mounted on the platform B, and it is preferably S-shaped, as indicated in Fig. 3, although this particular form is not absolutely essential and may be varied as desired.

Driving-rods D E are pivotally secured at *d* and *e* to the cross-piece *a*. These driving-rods project upward through an opening provided in the platform B and are bifurcated at each end, as indicated by *d'* and *e'*, to receive the sprocket-wheels F F' at the top and G G' at the bottom, these sprocket-wheels being carried by the shafts *f f' g g'*, respectively, which are journaled in suitable bearings in the bifurcated portions of the driving-rods.

The sprocket-wheels are each faced with a ratchet-wheel H H' I I', and pawls *h h' i i'* are carried by the driving-rods and arranged to engage the ratchet-wheels.

The shafts *f f'* project through the bifurcated ends of the driving-rods, as indicated in Fig. 2, and operate in curved grooves or ways *c'* in the guide-frame, so that when the guide-rods are projected upward by the movement of the float under the upward impulse of the waves the upper ends of said driving-rods travel in a curved line, being guided in the curved grooves or ways *c'*.

Instead of extending the shafts *f f'* beyond the bifurcated ends of the driving-rods to engage the grooves *c'* these shafts may be cut off flush with the outer faces of the driving-rods and studs secured on the outer side of the driving-rods to engage said grooves, this change being obviously the substantial equivalent in every respect of the construction shown in the drawings.

Sprocket-chains J J' are arranged to travel over the sprocket-wheels F G and F' G', respectively. These sprocket-chains also engage sprocket-wheels K K', respectively, which are carried by the power-shaft L, mounted in suitable bearings on the platform B. The sprocket-chains are arranged, preferably, so that each chain will operate on its wheel K or K' on the side opposite the other chain—that is to say, the chain J, for example, will engage its sprocket-wheel K on the right side, looking at Fig. 1, while the sprocket-

chain J′ will engage its sprocket-wheel K′ on the left side. The same result, however, may be accomplished substantially in every respect as well by means of the construction shown in Fig. 4, in which the chains J J′ are not crossed, but operate entirely on opposite sides of the shaft L. In this construction the ways or grooves *c′* are curved outward; but the operation is the same as in the construction shown in Fig. 1.

This being the general construction of my invention, the operation thereof may be described as follows: If the float A receives the upward impulse of a wave, the position of the shaft L being fixed, the driving-rods will rise and the chain J′, engaging the sprocket-wheel K′, will be pulled downward with relation to the driving-rod E and will run freely around the sprocket-wheels F′ G′, the pawls *h′ i′* permitting the ratchets to turn in the direction indicated by the arrows for this purpose. At the same time the sprocket-chain J will tend to move downward with relation to the driving-rod D; but the sprocket-wheels F G are restrained from rotating in that direction by reason of the engagement of the pawls *h i* with the ratchet-wheels H I, and consequently a pull is exerted between the sprocket-wheel K and the top of the driving-rod D, thereby causing the chain J to travel in the direction indicated by the arrows and actuate the sprocket-wheel K. Conversely when the wave recedes and the float and driving-rod descend the chain J will move freely over the sprocket-wheels F G, while the sprocket-wheels F′ G′ will be restrained from turning in the reverse direction, and a pull will be exerted between the left side of the sprocket-wheel K′ and the bottom of the driving-rod E, causing the shaft L to continue to rotate in the direction indicated by the arrows. It will thus be observed that as the float rises the rod D acts as a driver to the shaft L and as the float falls the rod E becomes the driver, the rotation of the shaft L being constantly in the same direction.

The grooves *c′* in the guide-frame are curved in order to keep the tension on the driving-chain J J′ constant. If the driving-rod should rise and fall in an absolutely vertical line, the position of the shaft L being fixed, it is obvious that the tension of the chains will increase as the sprocket-wheels at the ends of the driving-rods approach closer to the shaft L; but by guiding the upper ends of the driving-rods in a curved path these rods will incline slightly toward the shaft L as they move above or below the middle point of the stroke and the tension on the chains will thereby remain constant. The length of the chains is necessarily fixed, and the relative positions of the sprocket-wheels carried by the driving-rods must vary during the operation of the machine. It therefore becomes necessary to vary to a corresponding degree the perpendicular distance from the center of the shaft L to the driving-rod in their successive positions, which is accomplished by the varying inclination of the driving-rods by guiding their upper ends in the curved grooves *c′*. By this construction and arrangement of parts the impulses of the waves can be employed to rotate the shaft L for the purpose of actuating machinery of various kinds, and, if desired, a fly-wheel may be employed on said shaft to balance its irregular increments of energy; but, notwithstanding the irregular movement of the shaft L, the power imparted thereto may be used for many different purposes. The float A may be connected with the cross-piece *a* and the driving-rods or not, as desired, because if it is not connected therewith the weight of the driving-rods will be sufficient to cause the float to descend.

I am aware that changes in the form and proportions of parts and details of construction may be made without departing from the spirit or sacrificing the advantages of my invention, and I therefore reserve the right to make all such changes as fairly fall within the scope thereof.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination with a float capable of a bodily-vertical movement and a power-shaft, of driving-rods having their lower ends pivotally connected with the float and adapted to be actuated by the float, the lower ends of said driving-rods being movable in unvarying vertical planes and the upper ends of said rods having a lateral movement coincident with their vertical movement, and connections intermediate of the power-shaft and said driving-rods to actuate the power-shaft, substantially as described.

2. The combination with a vertically-movable float and a power-shaft, of pivoted driving-rods adapted to be moved vertically by the float, the upper ends of said driving-rods being guided to impart thereto a limited lateral movement, and connections between the driving-rods and the power-shaft for communicating to said power-shaft motion derived from the impulses of the waves acting on the float, substantially as described.

3. The combination with a vertically-movable float and a power-shaft, of driving-rods adapted to be moved vertically by the float and having a limited lateral movement at their upper ends sprocket-wheels carried by said driving-rods, sprocket-wheels on the power-shaft and sprocket-chains operating over said sprocket-wheels and adapted to rotate the power-shaft in one direction, substantially as described.

4. The combination with a vertically-movable float and a power-shaft, of driving-rods adapted to be moved by said float and carrying sprocket-wheels at their upper and lower ends, sprocket-wheels on the main shaft, sprocket-chains operating over said sprocket-wheels and means for locking the sprocket-

wheels to prevent their rotation in a reverse direction, substantially as described.

5. The combination with a vertically-movable float, of one or more reciprocating driving-rods adapted to be moved by the float and carrying sprocket-wheels, locking devices to prevent said sprocket-wheels from turning in a reverse direction, one or more sprocket-wheels on the power-shaft, and a sprocket-chain operating in contact with said sprocket-wheels to rotate the power-shaft in one direction, substantially as described.

6. The combination with a vertically-movable float and a power-shaft, of pivoted reciprocating driving-rods adapted to be moved vertically by the float, sprocket-wheels mounted on the driving-rods and the power-shaft, sprocket-chains operating over said sprocket-wheels, and means for maintaining the tension of said chains substantially regular and constant, substantially as described.

7. The combination with a vertically-movable float and a power-shaft, of pivoted reciprocating driving-rods adapted to be moved vertically by the float, sprocket-wheels carried by the driving-rods and the power-shaft, sprocket-chains operating over said sprocket-wheels, and means for giving a limited lateral movement to the upper ends of said driving-rods to maintain the tension of the chains substantially constant, substantially as described.

8. The combination with a vertically-movable float and a power-shaft, of pivoted reciprocating driving-rods adapted to be moved vertically by the float, connections between the driving-rods and the power-shaft to rotate said power-shaft in one direction, and a guide-frame adapted to direct the movement of the upper ends of said driving-rods in a curved path, substantially as and for the purpose described.

9. The combination with a vertically-movable float and a power-shaft, of pivoted reciprocating driving-rods adapted to be moved vertically by the float, connections between the driving-rods and the power-shaft to rotate said power-shaft in one direction, a guide-frame provided with curved ways or grooves and projections on the upper ends of said driving-rods to operate in said ways or grooves to give said driving-rods a limited lateral movement, substantially as and for the purpose described.

10. The combination with a vertically-movable float and a power-shaft, of pivoted reciprocating driving-rods adapted to be moved vertically by the float and having their upper ends guided in curved paths to impart thereto a limited lateral movement, sprocket-wheels carried by said driving-rods, sprocket-wheels on the power-shaft, sprocket-chains operating over said sprocket-wheels to impart to the power-shaft a movement in one direction, ratchet-wheels and pawls adapted to prevent the sprocket-wheels on the driving-rods from turning in a reverse direction, substantially as and for the purpose described.

11. The combination with a vertically-movable float and a power-shaft, of driving-rods adapted to be moved vertically by the float and carrying sprocket-wheels, sprocket-wheels on the power-shaft, chains operating over said sprocket-wheels, the driving-rods being located on opposite sides of the power-shaft and the sprocket-chains being crossed to engage opposite sides of the sprocket-wheels carried by said shaft, substantially as described.

12. The combination with a vertically-movable float and a power-shaft, of a cross-piece connected with the float, vertically-reciprocating driving-rods arranged on opposite sides of the power-shaft and pivotally secured to the cross-piece, a guide-frame provided with curved grooves, projections on the driving-rods to engage said grooves and thereby impart to the upper ends of the driving-rods a limited lateral movement, sprocket-wheels at the ends of said driving-rods, sprocket-wheels carried by the power-shaft, sprocket-chains operating over said sprocket-wheels on the driving-rods and being crossed to engage opposite sides of the sprocket-wheels on the power-shaft and devices for locking the sprocket-wheels on the driving-rods to prevent their rotation in a reverse direction, substantially as described.

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Witnesses:
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