

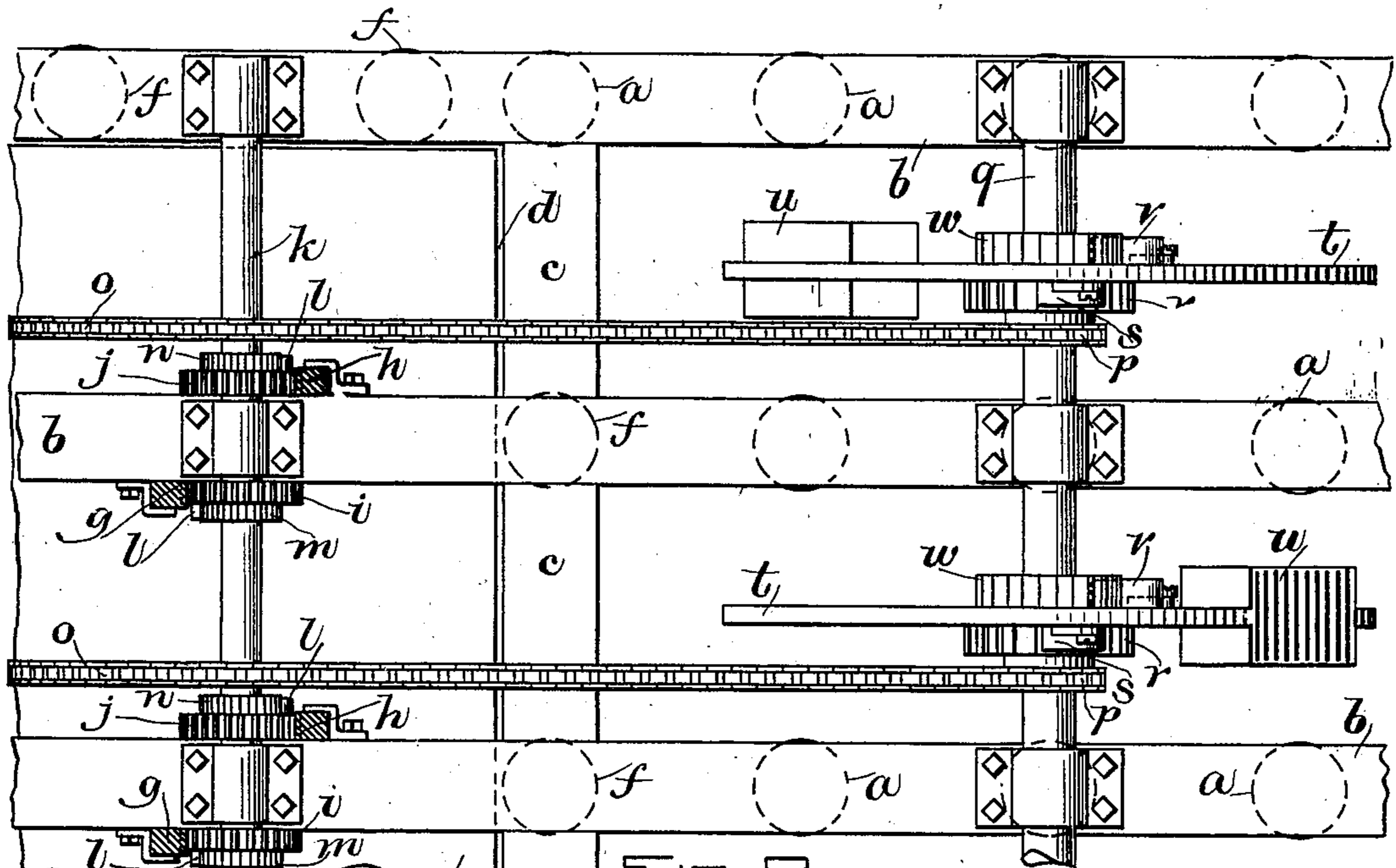
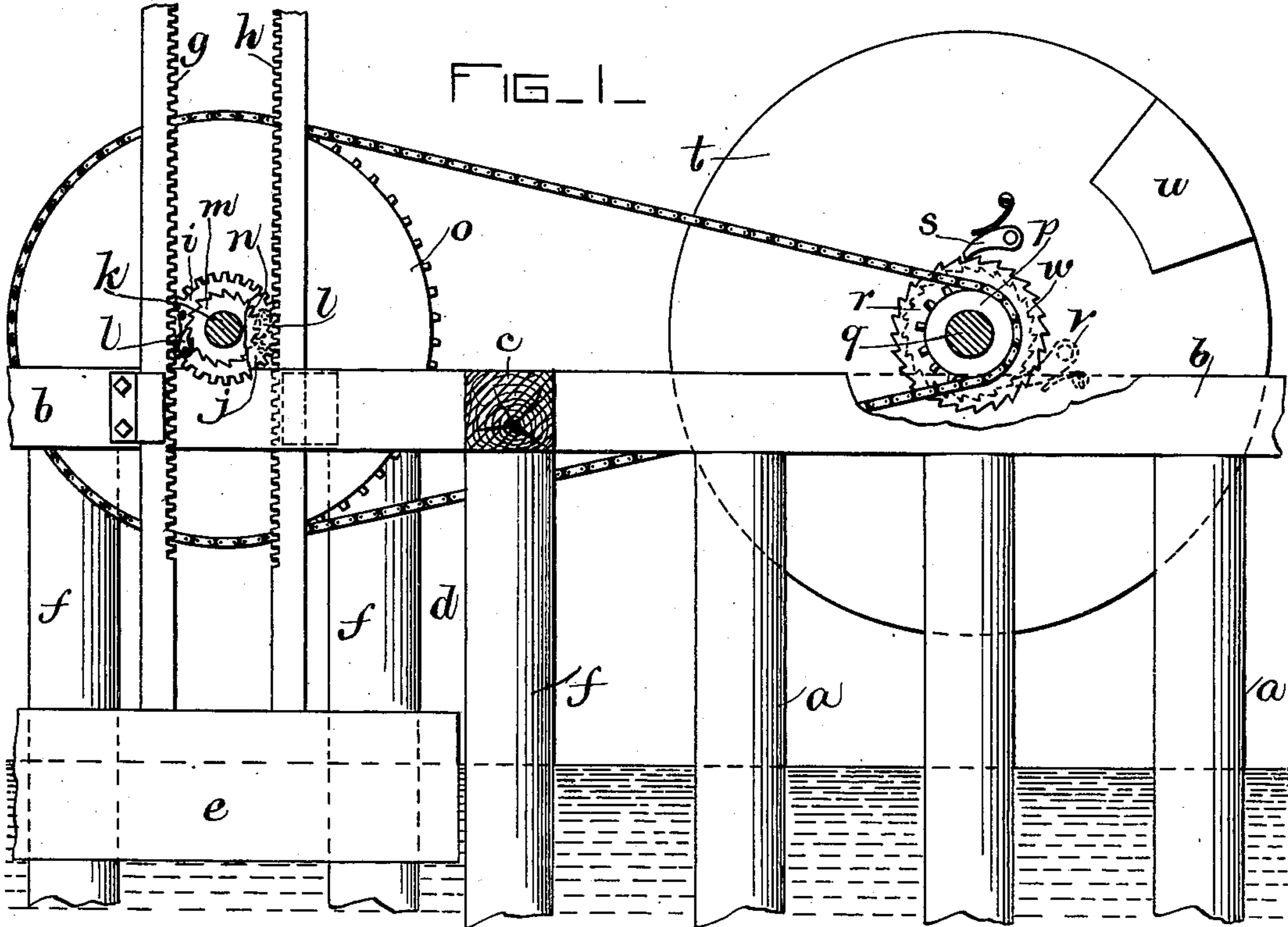
No. 657,943.

Patented Sept. 18, 1900.

F. R. KIMBALL.  
TIDE MOTOR.

(Application filed Apr. 2, 1900.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

FRANKLIN R. KIMBALL, OF SALEM, MASSACHUSETTS.

## TIDE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 657,943, dated September 18, 1900.

Application filed April 2, 1900. Serial No. 11,170. (No model.)

*To all whom it may concern:*

Be it known that I, FRANKLIN R. KIMBALL, a citizen of the United States, residing in Salem, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Tide-Motors, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to mechanism for utilizing the power of the tides to rotate shafting at suitable velocities for use as a prime mover.

Tide-motors have usually been constructed by connecting a float with a long train of speed-increasing toothed gearing, so that the shafting may rotate at a suitable speed, this arrangement of the shaft permanently connected to the gearing resulting in such frictional losses as to be of no value for motive purposes.

This invention consists in devices that are adapted to utilize the capacity to perform work of the great mass but low velocity of the tides to raise bodies which are released and allowed to fall unimpeded by the mechanism that elevated them, so that the effect of their weight and velocity of fall may be imparted to the shaft to be driven in such a manner as not to impede the shaft when the weights become inert.

An embodiment of the invention might comprise a suitably-guided float carrying racks meshing with pinions to drive a motion-multiplying train of gearing provided with suitable clutching devices, so that weights supported in proper relation to the shaft to be driven may be raised, and upon release from the elevating devices clutched to the shaft to be driven, so that in their fall the effect of gravity alone may rotate the said shaft, thus giving to it a velocity that is independent of the elevating mechanism of the weights. For the purpose of rendering the motion more regular the number of weights may be increased, and for greater power the size of the weights is also increased, each of the weights acting to deliver its impulse upon release, in an analogous manner to the pressure of gases in an engine-cylinder, to aid in rotating the shaft that is to be driven. Energy transmitted by the several impulses may be stored up in a heavy fly-wheel or other

suitable means connected with the shaft to be driven to maintain more constant speed of rotation.

A distinctive feature of this invention is the absence of any permanent connection between the shaft to be driven and the mechanism for storing up gravity through the work of the tide, and the arrangement of the shaft so it is not impeded by the actuating devices is another useful feature.

The invention further consists of the devices and their combinations which will be more at large set forth.

In the drawings, Figure 1 is a partial sectional elevation of a form of my tide-motor. Fig. 2 is a partial plan of the same, with the float lifting a weight while another weight is driving the shaft in its fall.

A suitable supporting structure may consist of piles *a*, to which stringers *b* may be secured with treenails, the stringers being connected by headers *c* to form a rigid structure. Stringers *b* project beyond the pier and together with the end sills (not shown) inclose the well *d*, within which moves the float *e*, bounded by the guiding-piles *f* of the well, so its motion is substantially vertical. From the float long spars extend upward, carrying racks *g* and *h*, running in guides secured to the stringers, that mesh with pinions *i* and *j*, which are loosely mounted on the arbor *k*, each pinion carrying a spring-pawl *l* to engage the ratchets *m* or *n*, secured to the arbor. Upon the arbor *k* are secured sprocket-gears *o*, connected by chains with sprocket-pinions *p*, sleeved upon the shaft *q* which is to be driven. Connected with the sprocket-pinions upon the same sleeves are ratchets *r* in driving relation, by means of spring-pawls *s*, with wheels *t*, also free to revolve on the shaft *q*, which wheels may, if necessary, have heavy rims, so that they may act as fly-wheels. Each of the wheels *t* has a large mass or weight *u* formed on the rim. Spring-pawls *v*, attached to the wheels, act to engage with ratchets *w*, fast on the shaft *q*, so the wheels may rotate the shaft in one direction or the shaft may run free of the wheels. It is understood that frictional clutching mechanism may be utilized instead of the ratchets described when better suited to the work to be performed. The racks are dupli-

cated, so any pitching movement of the float may act to revolve the sprocket-wheels, as well as the normal rise and fall of the tide.

In the drawings the tide is illustrated as  
 5 nearly in. As it continues to rise the rack *g* turns the pinion *i*, which is loose on the arbor *k*, and by means of the spring-pawl *l*, meshing with the ratchet *m*, which is secured to the arbor, the sprocket-gear *o* is revolved.  
 10 If the tide were to fall, the rack *h* would turn pinion *j* and by means of a spring-pawl *l*, meshing with the ratchet *n*, which is secured to the arbor, would revolve the sprocket-gear. This arrangement utilizes either the  
 15 rise or fall of the tide to rotate the sprocket-wheel. The rack which is not working merely revolves its pinion without turning the ratchet, as its pawl *l* slips over the teeth of the ratchet.

20 Whenever one of the sprocket-wheels turns the attached chain revolves the connected sprocket-pinion *p*, that runs loosely on the shaft *q*, and the connected ratchet *r*, by means of a spring-pawl *s*, revolves a wheel *t*, and  
 25 thereby lifts a weight *u* above the shaft, and as it passes the center the weight, acting under the velocity due to gravity, revolves the wheel at greater speed than the speed the ratchets *r* derive from the float, so the wheel  
 30 now, by means of the spring-pawls *v*, attached to the wheel, in connection with the ratchet *w*, secured to the shaft *q*, drives the shaft at the greater velocity during the time that the weight is falling.

35 Having described a way for carrying my invention into effect, I claim and desire to secure by Letters Patent of the United States—

1. In a tide-motor, a suitably-guided float, racks meshing with pinions having connections to rotate speed-increasing gears, pinions 10 connected with the gears and having detachable connections adapted to lift weights, combined with clutching devices to apply the weights as they fall to rotate a shaft, substantially as described. 45

2. In a tide-motor, the combination with devices for imparting the energy of tidal motion to a train of speed-increasing mechanism that is arranged to elevate pivoted masses, of means for temporarily connecting the masses 50 as they fall to a shaft having means for absorbing energy, so the successive impulses may cause constant rotation, substantially as described.

3. In a tide-motor, devices to receive and 55 transmit the energy of tidal motion to mechanism for raising isolated pivoted masses, combined with clutches to unite the several masses to a concentric shaft so it may receive intermittently-rotative impulses, substan- 60 tially as described.

4. In a tide-motor, the combination with mechanism actuated by the tide to position bodies in opposition to the forces of gravity, of devices to connect the bodies while falling 65 with a shaft, substantially as described.

In testimony whereof I have hereunto subscribed my name this 30th day of March, A. D. 1900.

FRANKLIN R. KIMBALL.

Witnesses:

B. M. WETMORE,  
 GEO. A. DENHAM.