

A. KNUDSON.
WAVE MOTOR.

No. 560,002.

Patented May 12, 1896.

Fig. 1.

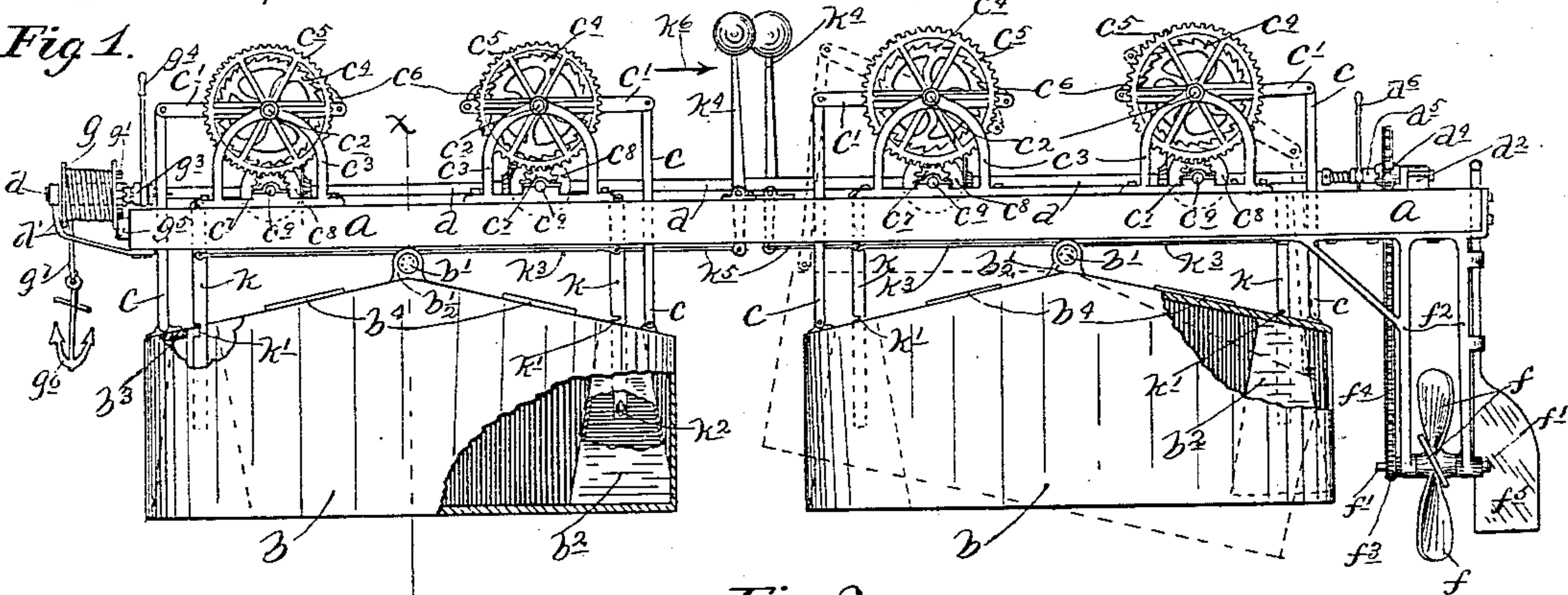


Fig. 2.

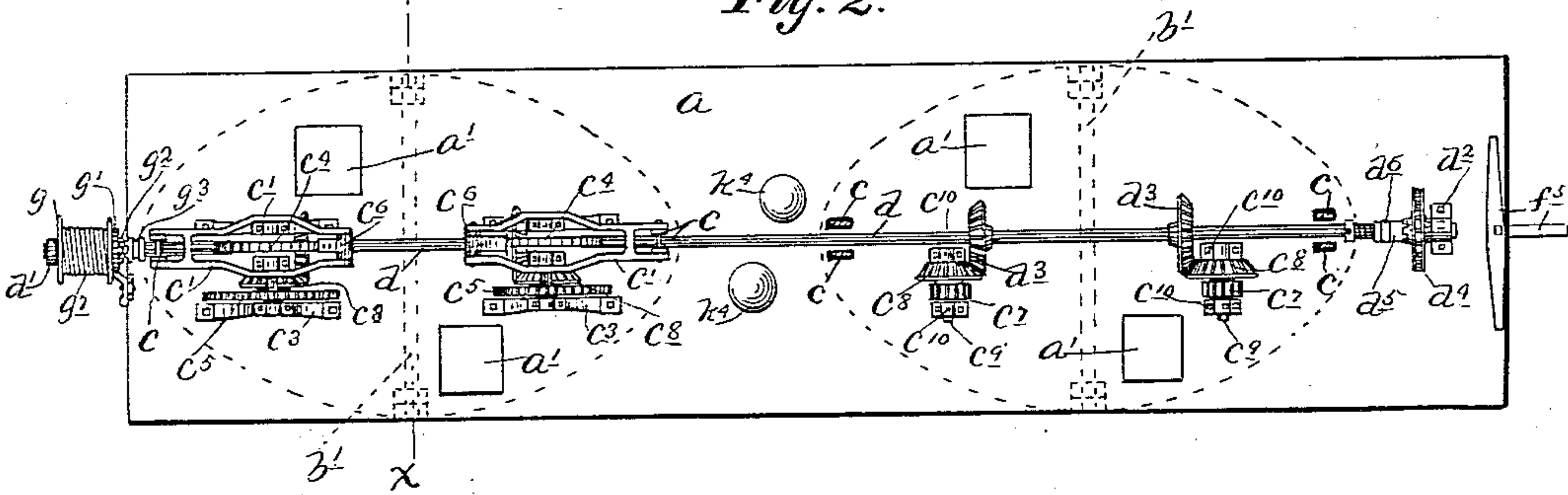


Fig. 3.

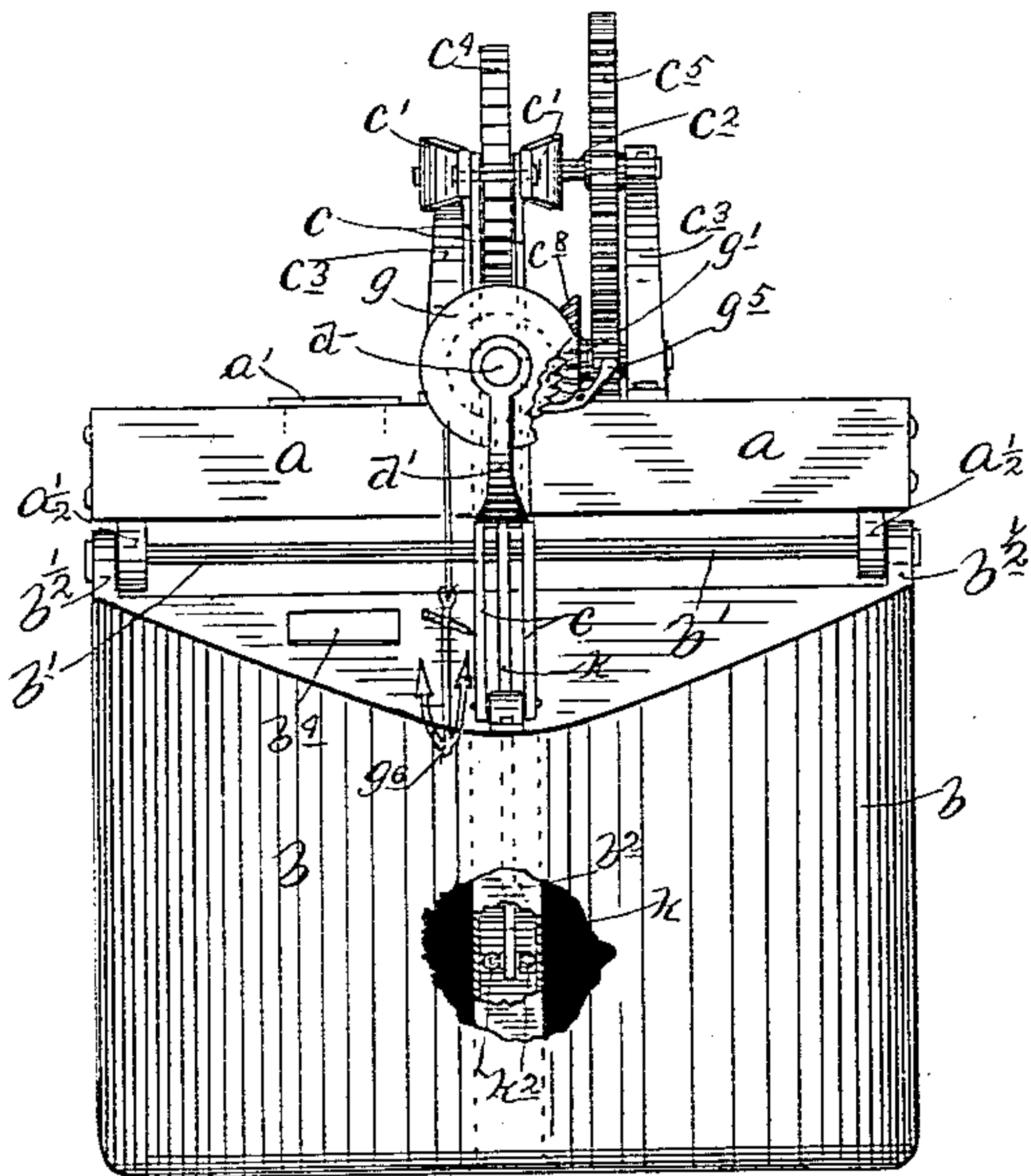
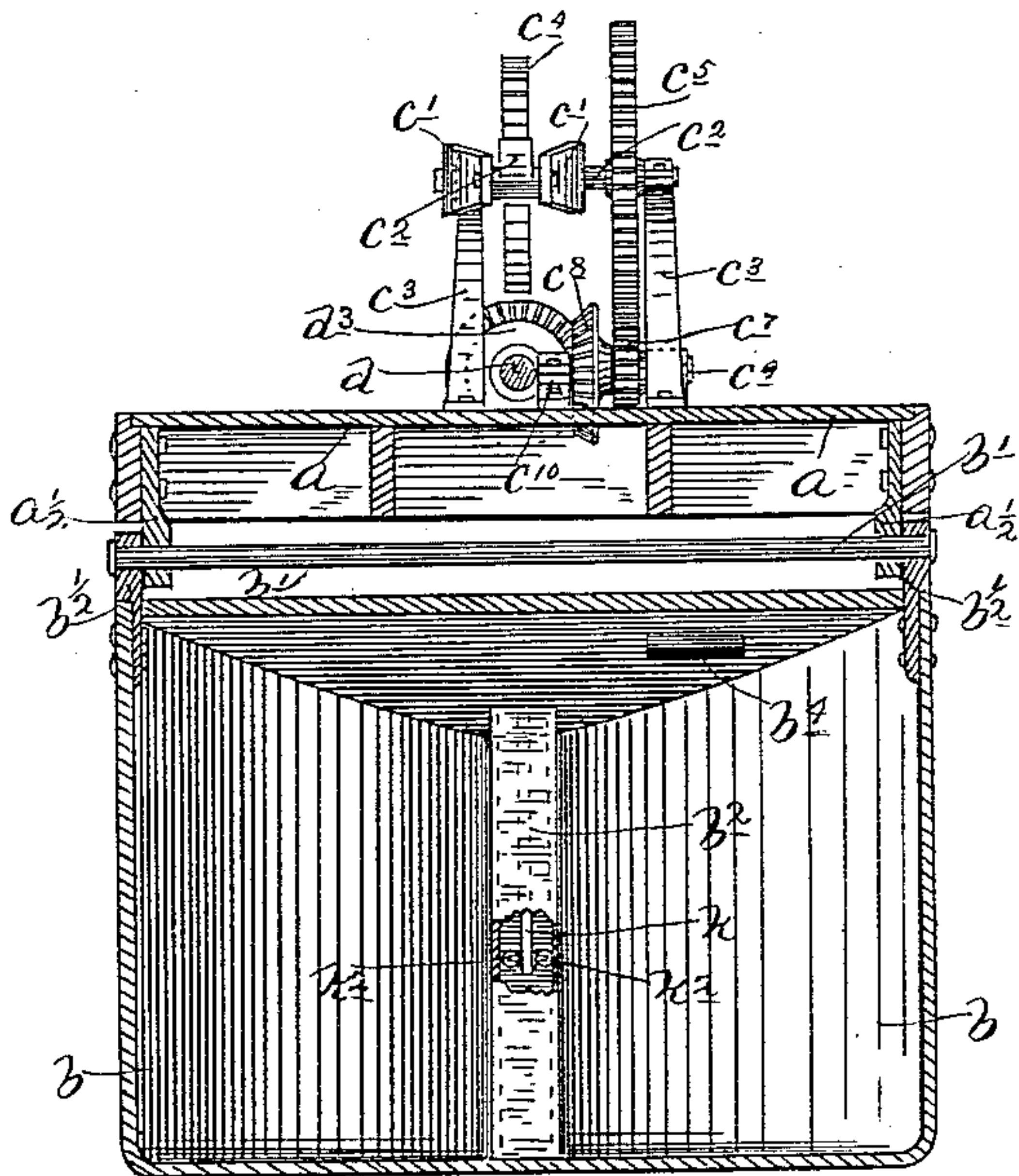


Fig. 4.



Witnesses:

C. F. Kilgore

R. D. Merchant

By his Attorney.

Inventor:
Adolph Knudson,

Gas. F. Williamson.

(No Model.)

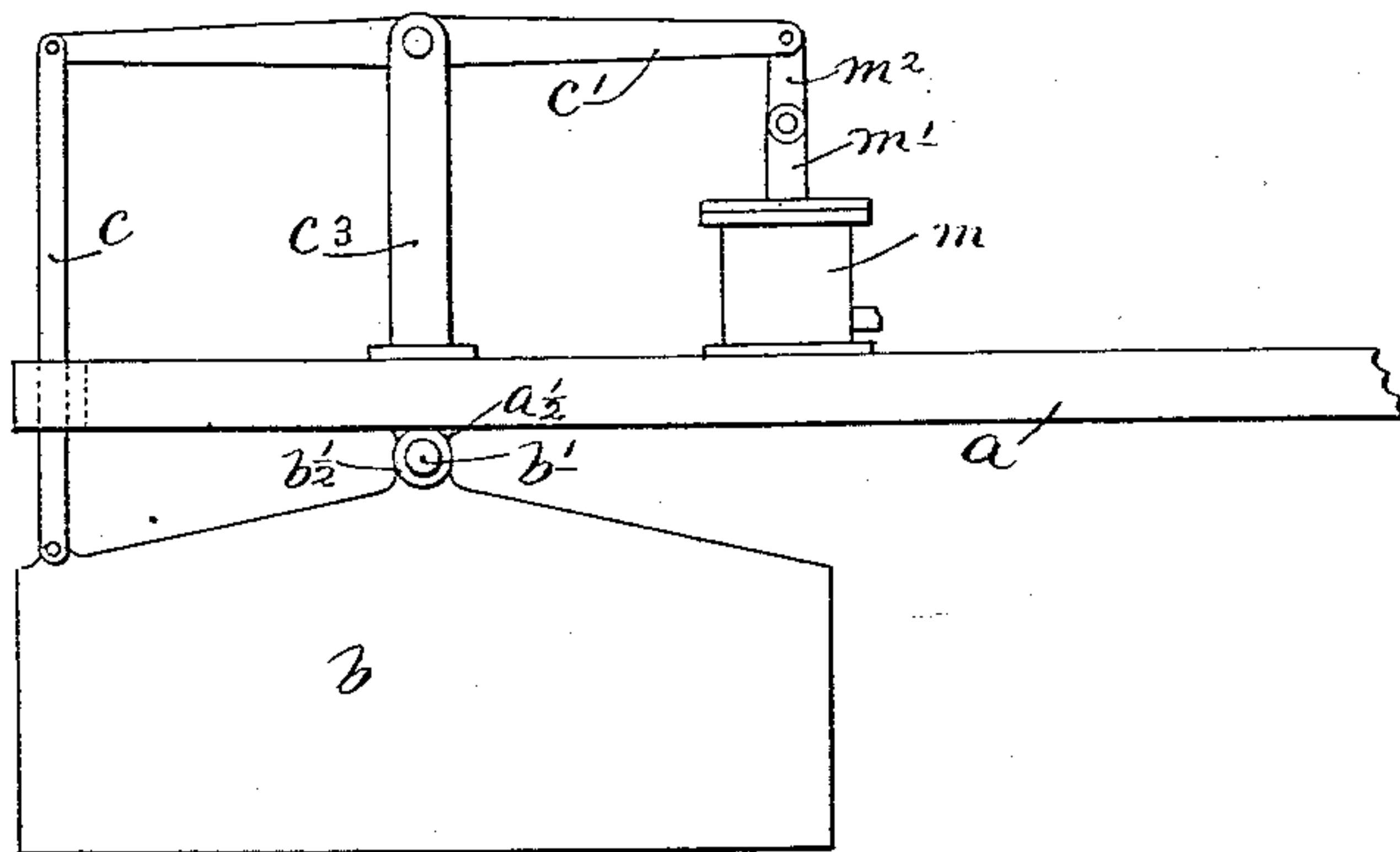
2 Sheets—Sheet 2.

A. KNUDSON.
WAVE MOTOR.

No. 560,002.

Patented May 12, 1896.

Fig. 5.



Witnesses.

E. F. Elmore
R. D. Merchant,

By his Attorney,

Jas. F. Williamson.

Inventor.
Adolph Knudson.

UNITED STATES PATENT OFFICE.

ADOLPH KNUDSON, OF ST. PAUL, MINNESOTA.

WAVE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 560,002, dated May 12, 1896.

Application filed June 3, 1895. Serial No. 551,486. (No model.)

To all whom it may concern:

Be it known that I, ADOLPH KNUDSON, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Wave-Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Broadly considered, my invention is in the nature of a wave-motor, but has for its special object to provide an improved and economical means for propelling boats.

To these ends my invention comprises the devices and combinations of devices hereinafter described, and defined in the claims.

The accompanying drawings illustrate my invention, wherein like letters refer to like parts.

Figure 1 is a side elevation with some parts broken away, illustrating one of the forms which the boat may take when constructed in accordance with my invention. Fig. 2 is a plan view of the boat shown in Fig. 1. Fig. 3 is a front elevation of the same, some parts being broken away. Fig. 4 is a transverse vertical section taken through the boat on the line xx of Figs. 1 and 2; and Fig. 5 is a view in side elevation showing a portion of a boat and illustrating a modification of my invention.

a represents a flat platform forming the deck of the boat, and b are hollow oblong floats arranged longitudinally of the deck a and pivoted for a rocking motion to the under side of said deck by means of transverse rods b' , working through lugs b'' on said floats and depending lugs a'' from said deck a . To each of the free ends of these floats b are pivotally connected links c , which extend upward through suitable passages in the deck a and are connected at their upper ends to rocking beams c' , pivoted near their centers on short shafts c^2 , loosely mounted in upwardly-extending brackets c^3 , supported by the deck a . Rigidly secured to each of these loose shafts c^2 is a ratchet-wheel c^4 and a large spur-wheel c^5 . The free ends of the rocking beams c' are provided with driving-pawls c^6 , which engage with the teeth of the corresponding ratchet-wheel c^4 . The large spur-wheels c^5

engage with relatively small spur-wheels c^7 , made rigid, together with corresponding beveled wheels c^8 on short shafts c^9 , mounted in bearings c^{10} .

d indicates a longitudinally-arranged driving-shaft, which is supported at its front end by a bracket d' , and at its rear end by a bracket d^2 , both of which brackets are supported by the deck a . This shaft d is provided with beveled wheels d^3 , which engage or mesh with the beveled wheels c^8 . At the rear end of this shaft d is mounted a loose sprocket d^4 , and a sliding spring-held half-clutch d^5 , which is subject to the action of a hand-operated shifting-lever d^6 . The sprocket-wheel d^4 is provided with a half-clutch, which is engaged by the sliding half-clutch d^5 , and said sliding half-clutch d^5 is caused to rotate with the shaft d by means of a groove and feather connection. (Not shown.)

f represents a screw-propeller, rigid on a loose shaft f' , mounted in a depending bracket f^2 , secured to the rear end of the deck a . The forward end of this shaft f' carries a small sprocket-wheel f^3 , which receives motion from the sprocket-wheel d^4 on the shaft d through an endless link chain f^4 , passing over both of said sprocket-wheels.

f^5 represents a rudder mounted for vertical pivotal motion in the bracket f^2 .

On the front end of the shaft d , outward of the forward end of the deck a , is mounted a loose drum or windlass g , having on its rear face a ratchet-wheel g' and a half-clutch g^2 . This drum g may be given motion with the shaft d by means of a sliding half-clutch g^3 , secured to said shaft by means of a groove and feather, (not shown,) and engageable with the half-clutch g^2 of said drum. The sliding half-clutch g^3 is controlled by a shifting-lever g^4 , and the drum g is held from return or unwinding movement by means of a retaining-pawl g^5 , pivoted to the deck a and engaging the ratchet g' of said drum.

g^6 indicates an anchor, which is secured by means of a cable g^7 wound on the drum g .

For the purpose of stopping the rocking action of the floats b when desired I provide a pair of locking devices, one for each float. These locking devices comprise each a pair of lock-bars k , pivoted at their upper ends to the deck a , and working with their free ends

in pockets b^2 in the ends of the floats b . Near their central portions the lock-bars k are provided with notches or detents k' , which normally clear, but may be made to engage with
 5 lock-flanges b^3 , formed in the upper edges of said pockets b^2 . The free lower ends of the levers k are provided with laterally-projecting antifriction-rolls k^2 , which, under the rocking motion of the floats, bear against the
 10 inner sides of the pockets b^2 , thus serving the double purpose of preventing frictional contact between the lock-bars and the pockets, and also of guiding the detent-notches k' to their proper engagement with the lock-
 15 flanges b^3 . The members of each pair of lock-bars are connected for a common movement by a tie-rod k^3 , and are moved from a shifting-lever k^4 , pivoted to the deck a , and having its lower free end connected to the inner member
 20 of the lock-bars by a link k^5 .

It will be noted that, as shown, both of the levers k^4 are moved in the direction shown by the arrow k^6 , and that all of the locking-bars k are moved in the same direction when
 25 thrown into their locking position. This arrangement might of course be varied if so desired.

a' represents trap-doors in the deck a .

b^4 are trap-doors located in the tops of the
 30 floats b , immediately below the trap-doors a' in the deck. These trap-doors b^4 are constructed to be made air-tight when closed.

In the modification illustrated in Fig. 5 all the parts may be the same, as above described,
 35 with the exception of the driving-gearing. In this modification I have shown an air-pump m , the piston-rod m' of which is connected by means of a link m^2 to the free end of the rocking beam c' . In this construction the air gen-
 40 erated from the pump may be used to drive an air-engine, from which power may be transmitted in the ordinary manner.

The operation of my invention is as follows: The boat being floated or launched the floats
 45 b will sink into the water according to the load carried by the boat, but never to such an extent that the floats will be entirely submerged. Under the action of the waves the floats will be rocked in the manner illustrated
 50 by dotted lines in Fig. 1. Under this action the rocking beams c' , acting through their driving-pawls, will turn the ratchet-wheels c^4 at each oscillation of the float, and it will be noted that the arrangement of these parts is
 55 such that the rocking beams and their driving-pawls, which are connected for motion from the opposite ends of the float, operate in alternate order. In other words, the rocking beams are arranged to drive on the down-
 60 strokes of the free ends of the float to which they are connected. By this means a practically continuous driving action is made available on the driving-shaft d , and hence on the propeller f .

65 When it is desired to release the propeller f from the driving-gear, it may be done by

disengaging the sliding half-clutch d^5 from the sprocket d^4 by means of the lever d^6 .

In case it is desired to stop the rocking action of one or both of the floats b , either to
 70 decrease the speed of the boat or on account of the intensity of the wave action on the floats, it may be done, as already indicated, by causing the engagement of the detent-notches k' of the lock-bars k with the lock-
 75 flanges b^3 of said floats. This may be done, as already stated, by throwing the levers k^4 in the direction indicated. When thrown into this position, the levers k will remain where set, under the action of the gravity of
 80 their weighted heads.

When the anchor is to be used, the windlass may be released by disengaging the retaining-pawl g^5 from the ratchet-wheel g' , thus allowing the anchor to sink and unwind
 85 the cable g' under the action of gravity. The anchor may be raised and the cable rewound on the drum by engaging the sliding half-clutch g^3 with the half-clutch g^2 on said drum.

My invention in its general use as a wave-
 90 motor may be applied either to propel boats, as above set forth, or it may be utilized as a motor for propelling stationary machinery. As must be obvious, by simply securing the platform or deck a or its equivalent against
 95 traveling motion a floating mill might be readily constructed.

My invention in its use as a wave-boat will probably be found best adapted for use as a
 100 freight-carrying boat; but it may be used for either passenger or freight, or for both. The floats b , being hollow water-tight shells, afford available space for the storage and ship-
 105 ment of freight. These hollow floats as carrying vessels are best adapted for the carrying of light material, such as cotton and wool, in which case the floats might be entirely filled without destroying the buoyancy of the float; but these floats may be used for carry-
 110 ing heavy materials, such as grain or oil.

In case the boat is designed to carry passengers the cabin and passenger departments would be constructed on the upper portion of the deck.

From the above description and drawings
 115 it will be seen that a very high rate of speed will be developed on the propeller from the slow rocking motion of the floats, from which it follows that my boat may be made to run
 120 either with or against the current of the waves.

It will be noted by reference to the dotted position of the float, as shown in Fig. 1, that, while it is the downward stroke of the free ends of the float that causes the driving action on the lever c' and pawls c^6 , the power is
 125 chiefly obtained by the rising action of the waves on the opposite end of the float.

It will be understood that various alterations in the details of construction of my invention may be made without departing from
 130 the principles involved in the same.

What I claim, and desire to secure by Let-

ters Patent of the United States, is as follows:

1. In a wave-boat, the combination with the main body of the boat and propelling devices carried thereby, of a pair of rocking floats pivoted to said boat-body and supporting said body above the same, and driving connections from one or more of said floats to said propelling device for imparting an advancing motion to the boat, under the wave action, on said floats, substantially as described.

2. In a wave-boat, the combination with the main body of the boat and propelling devices carried thereby, of a pair of rocking floats pivoted to said boat-body on their transverse centers and supporting said body above the same, and driving connections from one or more of said floats to said propelling device, for imparting an advancing motion to the boat, under the wave action on said floats, substantially as described.

3. A wave-motor, comprising a relatively-fixed body, a rocking body pivoted thereto, subject to the rocking action of the waves, a locking device for locking said rocking body to said fixed body, and driving connections extending from said rocking body, for transmitting motion therefrom, substantially as described.

4. In a wave-boat, the combination with the boat-body, and propelling devices carried thereby, of the pair of hollow shell-like floats pivoted to said boat-body and supporting said boat-body above the same, watertight trap-doors affording ingress and egress to said floats, and driving connections from said floats to said propelling device, substantially as described.

5. In a wave-boat, the combination with the boat-body, and propelling devices carried thereby, of a hollow shell-like float, pivoted

to said boat-body, on its transverse center, and provided with vertical guide-pockets at its opposite ends, the pivoted lock-levers with the detent-notches and antifriction-rolls, working in said guide-pockets, the locking-flanges at the mouth of said pockets engageable with the detent-notches of said lock-levers, lever connections for moving said lock-levers, and driving connections attached to both of the free ends of said float, and extending to said propelling device, substantially as described.

6. The combination with the deck *a* and the propeller *f* carried thereby, of the hollow floats *b* pivoted to said deck *a* by the transverse rod *b'*, the links *c* connecting the free ends of the floats *b* with the rocking beams *c'*, provided with pawls *c⁶*, the ratchet-wheels *c⁴* and spur-wheels *c⁵* on common shafts, wheels *c⁷* and *c⁸* on common shafts, the main shaft *d*, provided with beveled wheels *d³*, the sliding half-clutch *d⁶* and loose sprocket *d⁴*, and the chain *f⁴* connecting sprocket *d⁴* with sprocket *f³*, carried by the propeller *f*, substantially as described.

7. The combination with the deck *a* and floats *b*, pivoted thereto, of the main shaft *d*, receiving motion from said floats, the anchor drum or windlass *g*, loose on shaft *d*, provided with ratchet *g'* and half-clutch *g²*, the sliding half-clutch *g³*, engageable with half-clutch *g²*, the lock-pawl *g⁵*, engageable with ratchet *g'*, and the anchor *g⁶* connected by cable *g⁷* to the drum *g*, substantially as described.

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

ADOLPH KNUDSON.

Witnesses:

A. H. OPSAHL,
P. D. MERCHANT.