

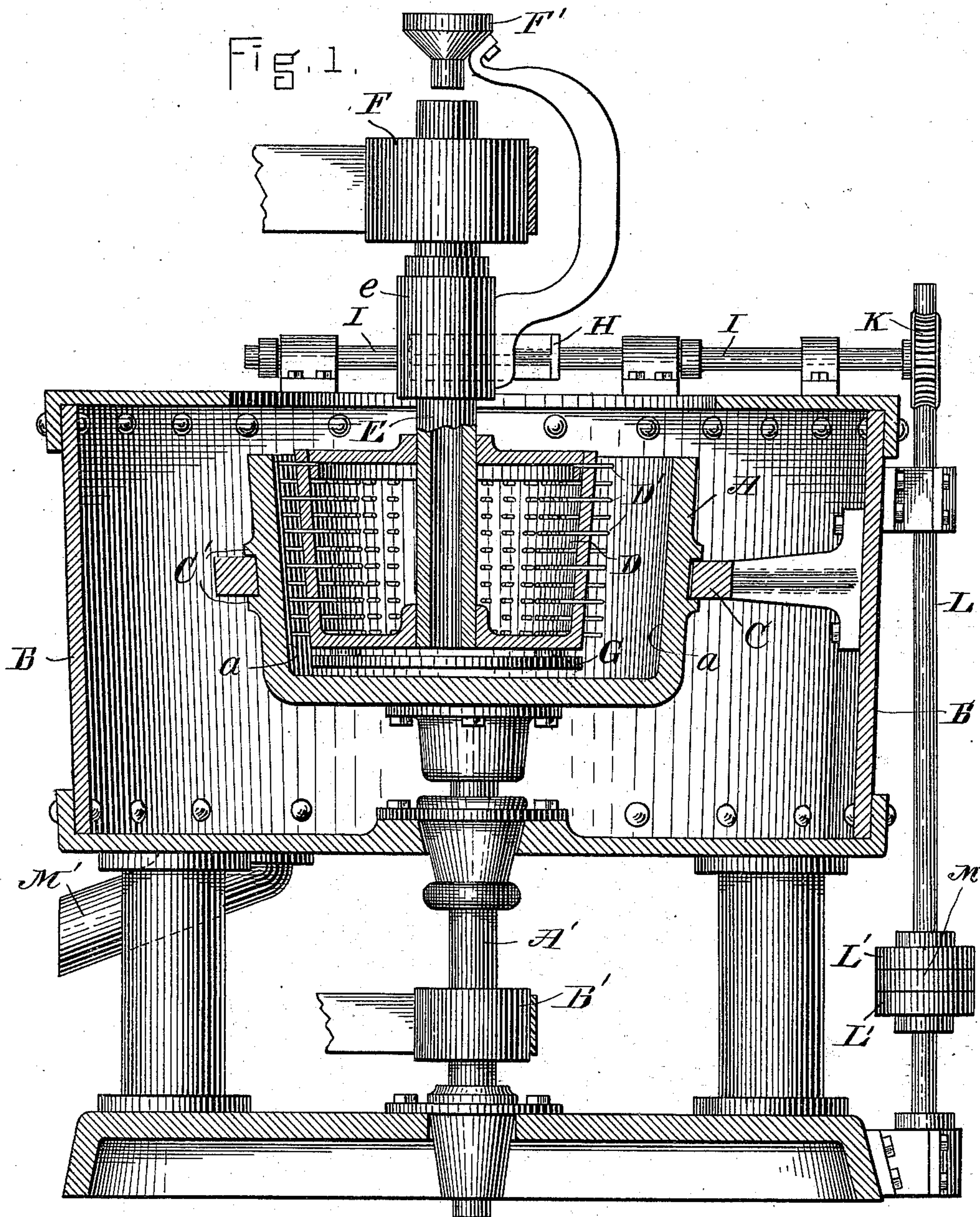
(No Model.)

3 Sheets—Sheet 1.

O. B. PECK.  
CENTRIFUGAL SEPARATOR.

No. 560,636.

Patented May 19, 1896.



WITNESSES.

*S. Henry Marsh.*  
*S. H. Cobb.*

INVENTOR.

*O. B. Peck*

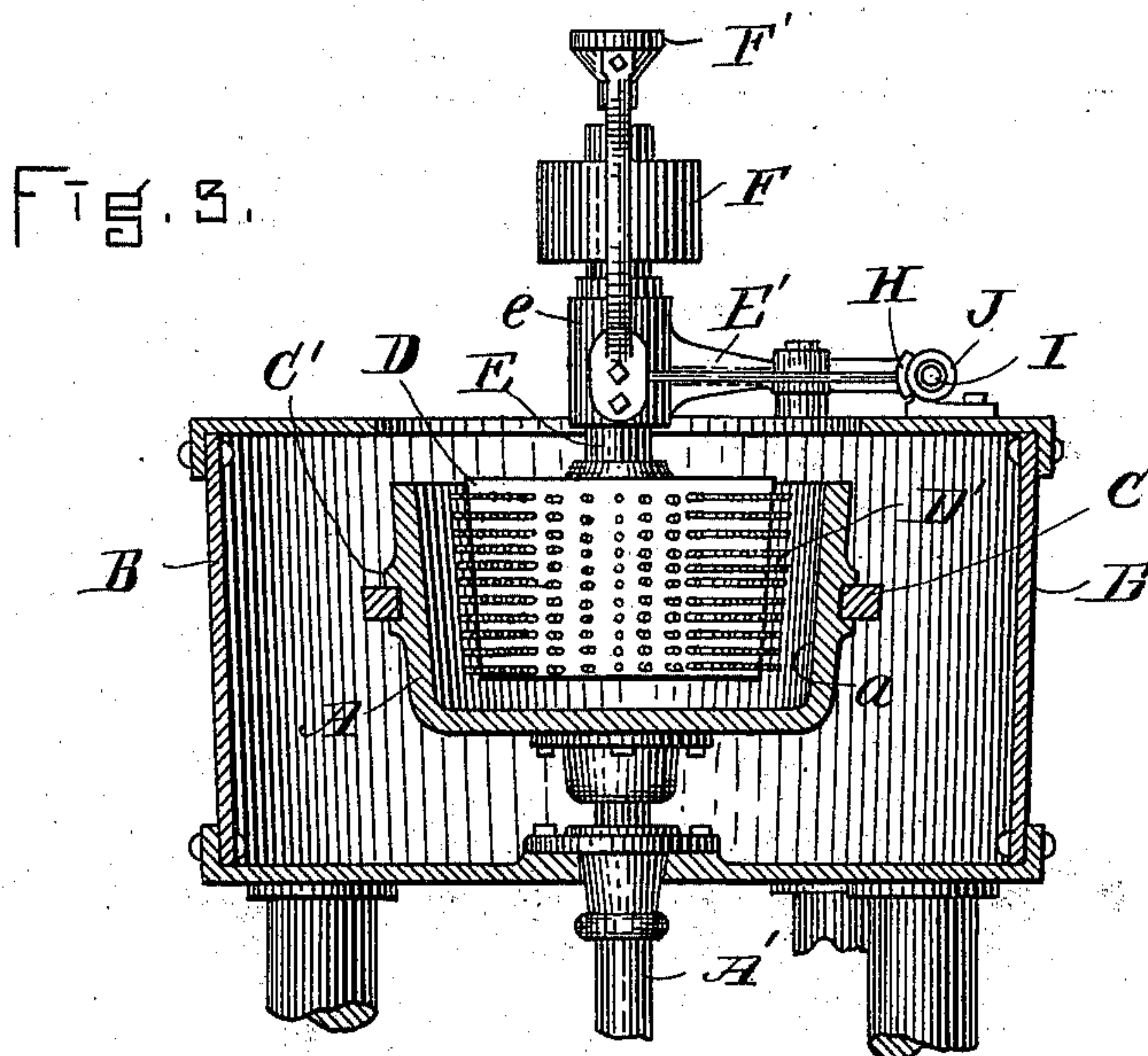
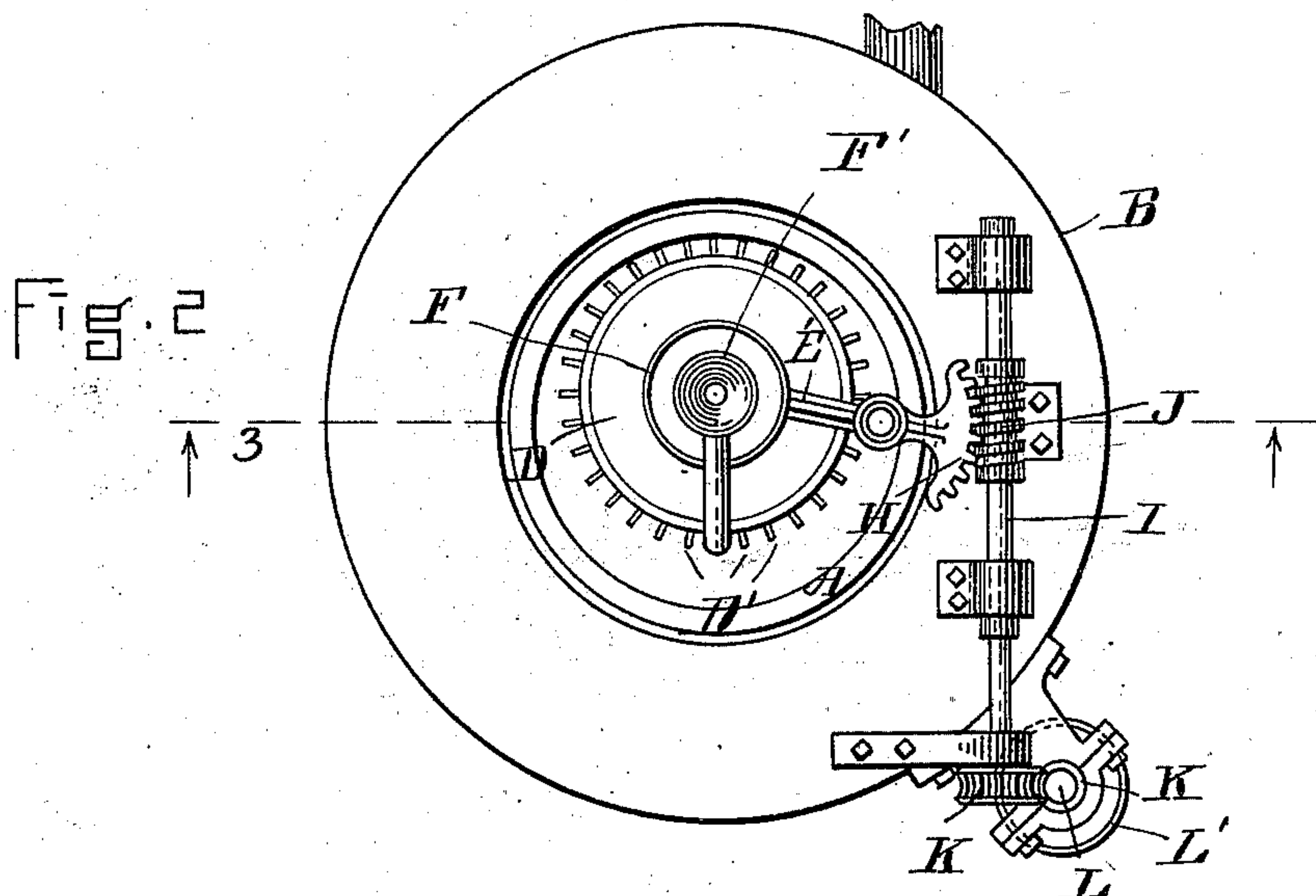
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Fig. 4.

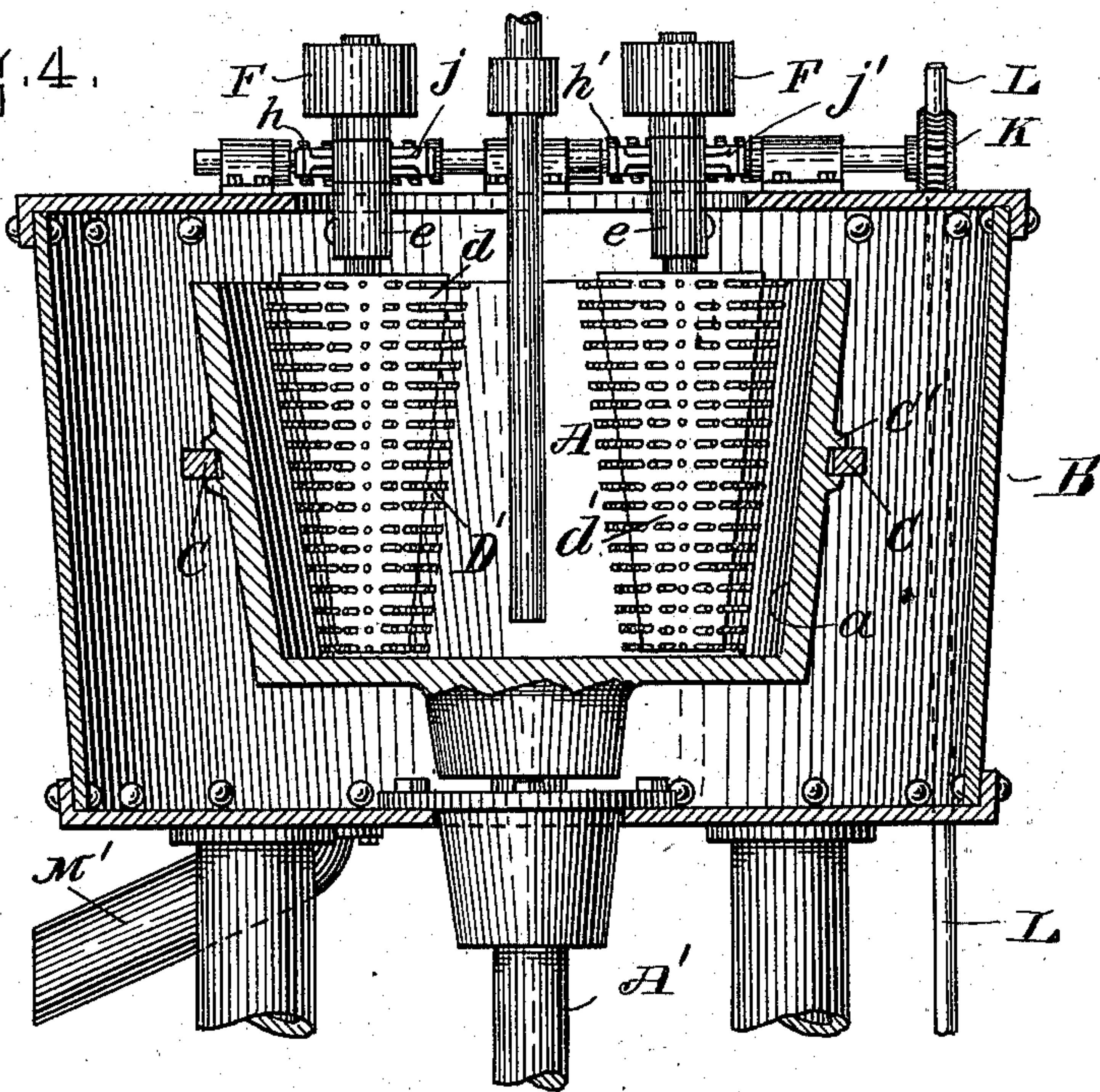
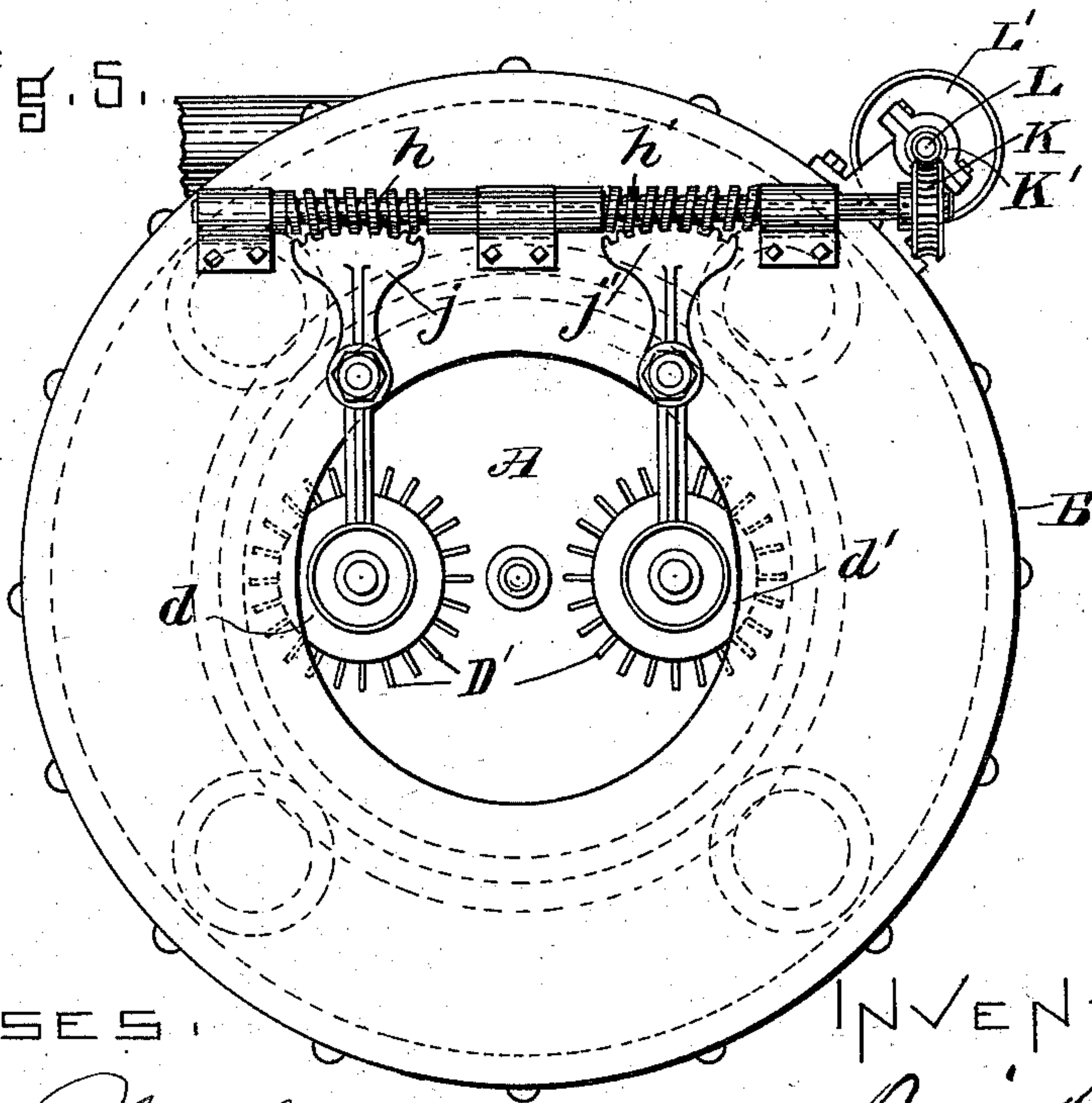


Fig. 5.



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*R. Henry Marsh.*  
*S. H. Cobb.*

INVENTOR.

*O. B. Peck*



# UNITED STATES PATENT OFFICE.

ORRIN B. PECK, OF CHICAGO, ILLINOIS.

## CENTRIFUGAL SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 560,636, dated May 19, 1896.

Original application filed October 31, 1894, Serial No. 527,576. Divided and this application filed September 12, 1895. Serial No. 562,330. (No model.)

*To all whom it may concern:*

Be it known that I, ORRIN B. PECK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Centrifugal Separators, of which the following is a specification.

My invention has for its object certain improvements in centrifugal ore-separators, hereinafter more fully described and claimed.

In the drawings, in which like letters of reference designate similar parts throughout, Figure 1 is a central vertical section of my improved separator. Fig. 2 is a top plan view thereof somewhat reduced in size. Fig. 3 is a section on the line 3 of Fig. 2, looking in the direction of the arrows. Fig. 4 is a central vertical section of another form of my invention, certain parts being omitted; and Fig. 5 is a top plan view thereof.

A designates a treatment vessel or bowl provided with a separating-surface  $\alpha$  and mounted upon the upper end of a vertical shaft A', which is journaled in a base-plate and in a casing B, which surrounds the bowl. Upon the shaft A' is a pulley B', by which the treatment-vessel is rotated by a belt extending to a suitable counter-shaft. The casing B, the principal function of which is to receive the discharge from the treatment-vessel, has secured to its interior a retaining-ring C, encircling the vessel with its inner periphery in close proximity thereto. If for any reason the vessel begins to move from its proper position, it will come in contact with this retaining-ring and be maintained in place, or if the movement should tend to continue the frictional contact of the vessel with the ring will decrease its velocity of rotation or entirely check it. Ribs C' C' upon the vessel on each side of the ring prevent the movement of the former longitudinally of its axis. The contact between the vessel and this retaining-ring or auxiliary support might be brought about by the melting of the antifric-tion-metal bushing in the journal-boxes from the heat generated by its rapid rotation or by the expansion of the vessel itself by centrifugal force. Whatever the cause it is liable, by being thrown from place or bursting, to

destroy the machine and endanger the lives of persons about it unless this auxiliary retaining-ring is used. The casing may also be made of sufficient strength to serve as an additional safeguard.

Within the treatment vessel is an agitating cylinder or deflector D, its exterior being provided with projections or studs D' to effect agitation of material over the separating-surface. It is supported upon the lower end of a hollow shaft E, which is journaled in a bearing  $e$  upon the end of a horizontal arm or lever E'. The agitating-cylinder is rotated by a pulley F, driven by a belt from any source of power. At the top of the shaft E, above its open end, is a funnel F', which may be supported on an arm or bracket carried by the journal-bearing. Into this funnel is fed ore or other material, in a finely-divided state and mingled with water, which passes through the hollow shaft onto the surface of a horizontal plate or distributor G, supported upon the agitating-cylinder, below and a short distance from it. The material is thrown therefrom, by the centrifugal force developed by its rotation, upon the separating-surface near the bottom of the vessel.

At the opposite end of the arm E' from the bearing  $e$  is a segment of a worm-gear H, meshing with a worm J on a horizontal shaft I, journaled, preferably, upon the top of the casing B. At or near one end of this shaft is a worm-wheel K, which engages a worm K', secured upon a vertical shaft L, mounted near the side of the casing. This shaft L is alternately rotated in opposite directions by pulleys L' L', fast thereon and preferably driven by an open and a crossed belt from a counter-shaft. Between pulleys L' L' is a loose pulley M, upon which one of the belts is allowed to run while the other is rotating the shaft L by its engagement with one of the pulleys L'.

In operation the treatment vessel is rotated at a speed sufficient to develop the desired degree of centrifugal force, and ore, in a finely-divided state and mingled with a suitable quantity of water, is fed through the hollow shaft upon the distributing-plate, from which it is thrown outward upon the separating-



surface. At the beginning of the period of separation the agitating-cylinder will be in the position shown in Fig. 1 and rotating at a different speed from the treatment vessel, preferably somewhat slower. The centrifugal force generated by the rotation of the vessel causes the material to move toward a position around its circumference, and heavier substances to lodge on the separating-surface, while the projections moving through the material and water agitate it and assist separation by maintaining more or less of the lighter substances in suspension. As separation progresses and heavier material accumulates on the separating-surface the agitating-cylinder, by its supporting-arm and actuating mechanism previously described, is gradually moved away from the separating-surface, permitting this layer to form, the lighter portion being thrown off into the casing and conducted away by a spout M'. This continues until a desired quantity of heavier substances have accumulated, when the feed of material is preferably stopped and clear water introduced instead, the belts are shifted on the pulleys L' M, reversing the direction of travel of the agitating-cylinder and moving it toward the separating-surface, plowing through the layer of heavier substances, dislodging them, and causing them to be carried away by the flow of water and discharged into the casing, from which the spout delivers to a suitable receptacle placed to receive them. When the heavier substances have been discharged, the feed of material is resumed, the direction of travel of the agitating-cylinder reversed, and the period of separation again begins. If desired, by running the driving-belts at different speeds the travel of the agitating means toward the separating-surface for discharge may be more rapid than that for separation, effecting a considerable saving of time.

The agitators not only disturb the material coming within their field of action, assisting the water and centrifugal force to effect separation, but they maintain a uniform surface over the accumulating layer, immediately filling any channels or grooves resulting from the erosion of the surface by the flow of water or wholly preventing their tendency to form.

From the fact that the field of action of the agitation is only over a portion of the separating-surface at a time, the material is subjected to the action of water and centrifugal force alone and then to the combined action of the agitators and the water and centrifugal force, the separating-surface at each rotation of the treatment vessel passing completely through the field of action of the agitators and that of the unobstructed action of the water.

In the form of separator shown in Figs. 4 and 5 instead of a single agitating-cylinder operating from the center of the treatment

vessel toward the separating-surface at one side two smaller agitating-cylinders  $d$   $d'$  are shown, placed substantially diametrically opposite one another and moved toward and from the separating-surface by worms  $h$   $h'$ , whose threads run in opposite directions and engage similar segmental worm-gears  $j$   $j'$ . The rotation of these worms alternately in opposite directions is effected in the same way as in the preceding form. Material and water are supplied by a pipe N, extending to a point near the bottom of the vessel at its center. This machine is otherwise similar in construction and operation to that previously described, except that the material during the process of separation will pass at each rotation of the treatment vessel through two fields, in which it is subjected to agitation, force of flowing water, and centrifugal force, and through intermediate fields, in which the water and centrifugal force act alone.

Though for convenience the agitator or deflector is termed a "cylinder," it is not necessary or desirable that it be truly cylindrical in shape, but preferably conforms to the inclination of the separating-surface.

In my application, Serial No. 527,576, filed October 31, 1894, of which this is a division, I have claimed certain features shown and described but not claimed herein.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a centrifugal separator, the combination of a rotatable treatment vessel, means to effect agitation of material therein movable toward a portion of the separating-surface, and pivoted arms or levers to support the same, substantially as described.

2. In a centrifugal separator, the combination of a rotatable treatment vessel, rotatable means to effect agitation of material therein the axis of which is movable toward and from the separating-surface, and pivoted arms or levers to support the same, substantially as described.

3. In a centrifugal separator, the combination of a rotatable treatment vessel, and means to effect agitation of material therein mounted upon one end of pivoted arms or levers moving in planes at right angles to the axis, the opposite ends of which engage mechanism to effect their reciprocation, substantially as described.

4. In a centrifugal separator, the combination of a rotatable treatment vessel, and means to effect agitation of material therein mounted upon one end of pivoted arms or levers moving in planes at right angles to the axis, the opposite ends of which gear with a shaft adapted to alternately rotate in opposite directions, substantially as described.

5. In a centrifugal separator, the combination of a rotatable treatment vessel, one or more cylinders therein provided with agitating projections and movable toward and from



the separating-surface, and pivoted arms or levers to support the same, substantially as described.

5 6. In a centrifugal separator, the combination of a rotatable treatment vessel, and two rotatable agitators movable toward and from the separating-surface in opposite directions, substantially as described.

10 7. In a centrifugal separator, the combination of a rotatable treatment vessel, two agitators movable toward and from the separating-surface, and pivoted arms or levers to support the same, substantially as described.

15 8. In a centrifugal separator, the combination of a rotatable treatment vessel, two agitators therein movable toward and from the

separating-surface, pivoted arms or levers to support the same, and mechanical means for moving said arms, substantially as described.

9. In a centrifugal separator, the combination of a rotatable treatment vessel, and two agitators movable toward and from the separating-surface, each mounted upon one end of a pivoted arm or lever the opposite ends of which gear with a common shaft alternately rotated in opposite directions, substantially as described. 20 25

ORRIN B. PECK.

Witnesses:

MARTHA W. RIDDELL,  
RAYMOND H. GARMAN.

It is hereby certified that Letters Patent No. 560,636, granted May 19, 1896, upon the application of Orrin B. Peck, of Chicago, Illinois, for an improvement in "Centrifugal Separators," were erroneously issued to said Orrin B. Peck as sole owner of the invention; whereas said Letters Patent should have been issued to *The Patent Title Company, of same place*, said The Patent Title Company being assignee, by mesne assignments, of the entire interest in said invention, as shown by the assignments of record in this Office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 23d day of June, A. D. 1896.

[SEAL.]

JNO. M. REYNOLDS,  
*Assistant Secretary of the Interior.*

Countersigned:

S. T. FISHER,  
*Acting Commissioner of Patents.*