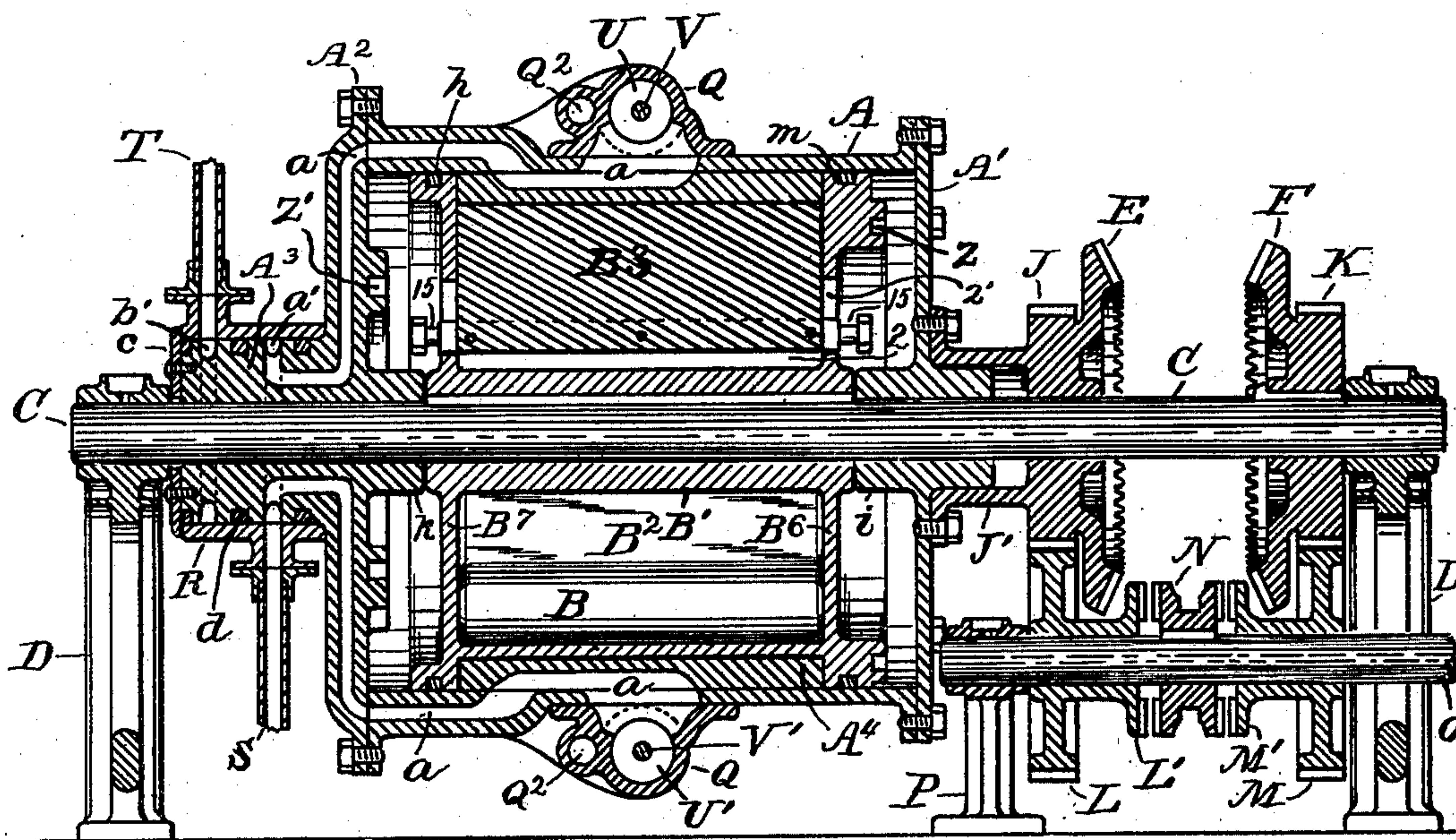
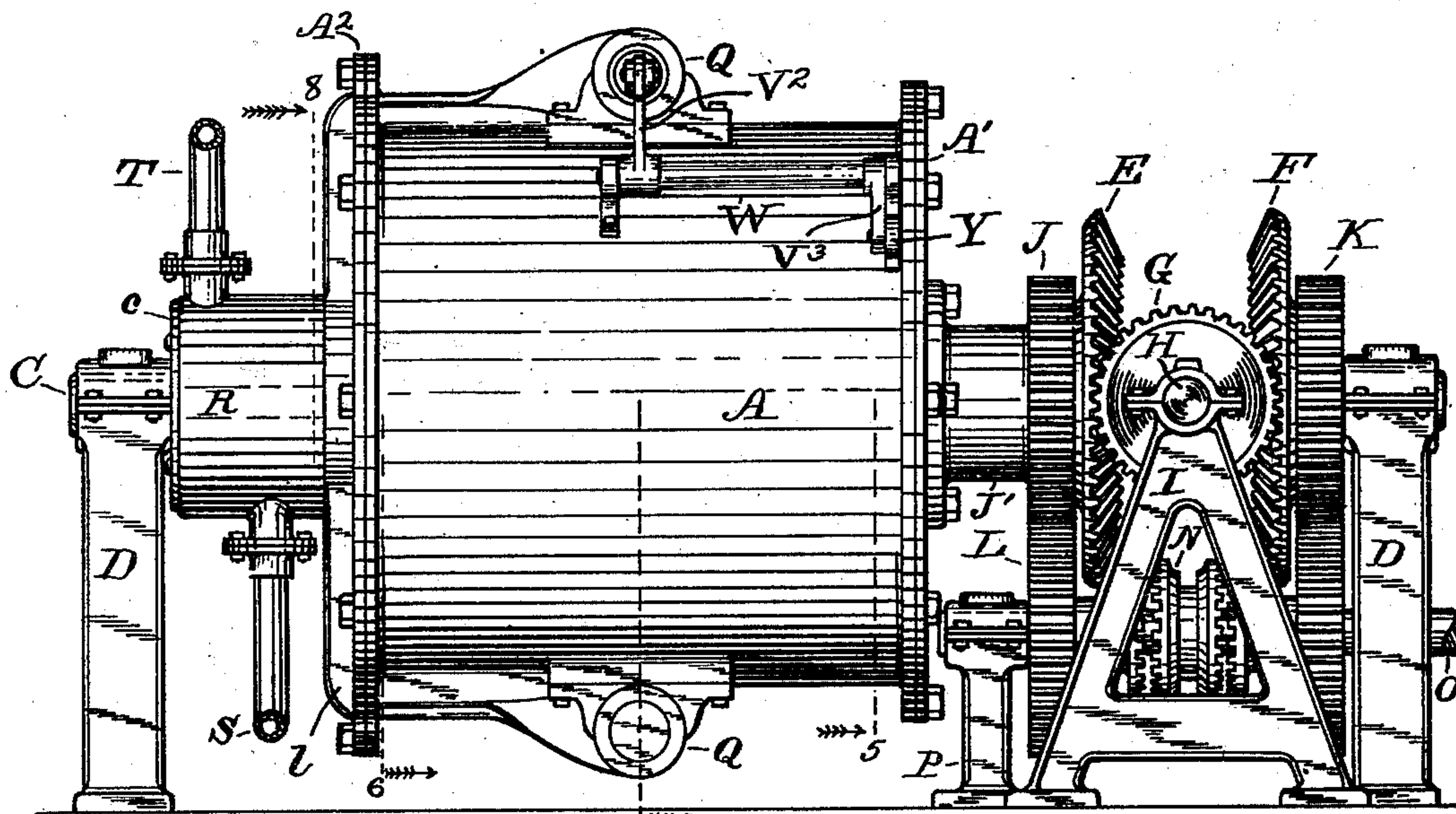


**Patented Jan. 15, 1901.**

(Application filed Mar. 2, 1899. Renewed Aug. 29, 1900.)

**4 Sheets—Sheet 1.**



Witnesses:

Wm H. Payne.  
P. C. Doll

*Inventor:*

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No. 666,013.

Patented Jan. 15, 1901.

J. JACKSON.  
ROTARY ENGINE.

(Application filed Mar. 2, 1899. Renewed Aug. 29, 1900.)

(No Model.)

4 Sheets—Sheet 2.

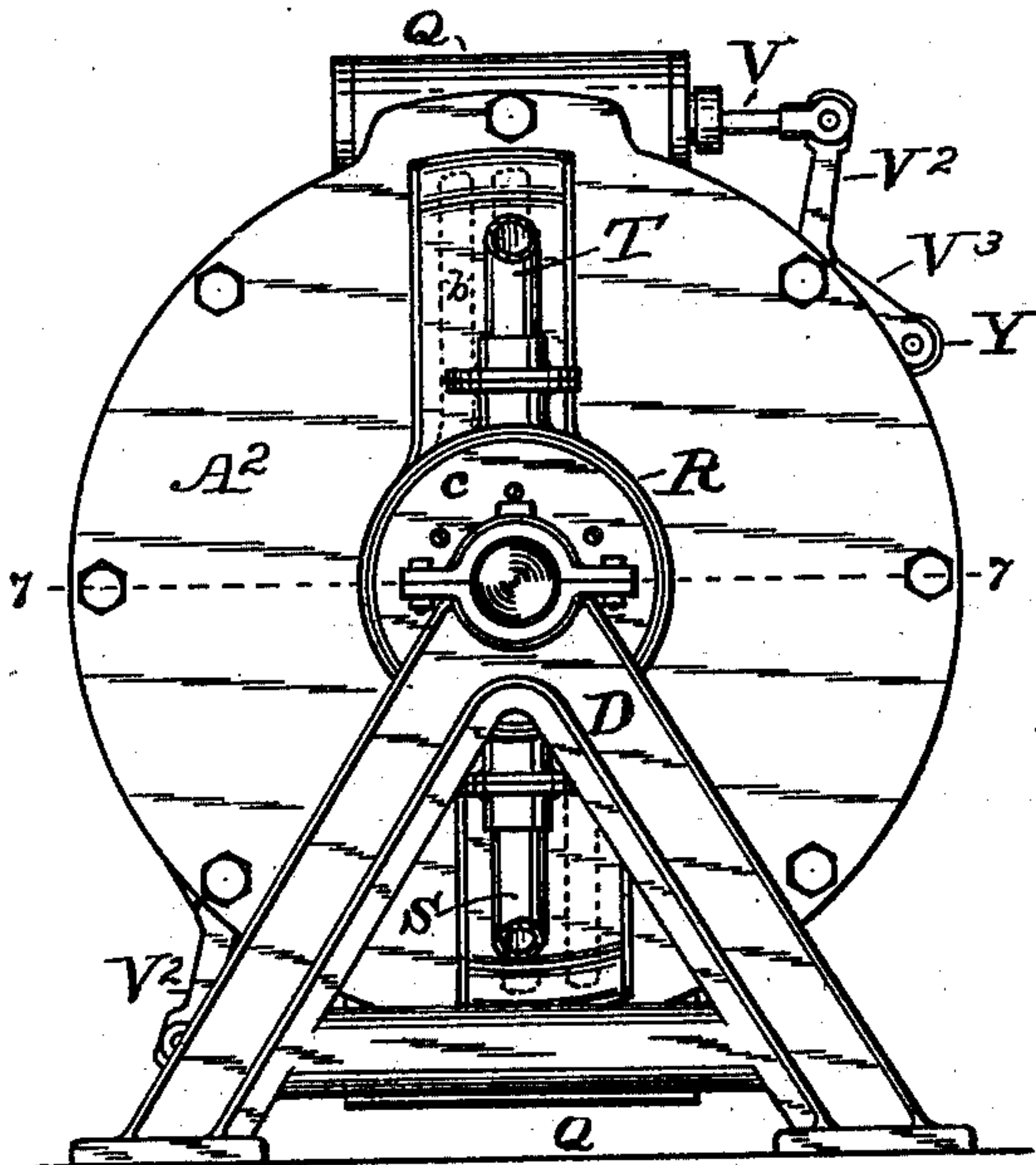


Fig. 3.

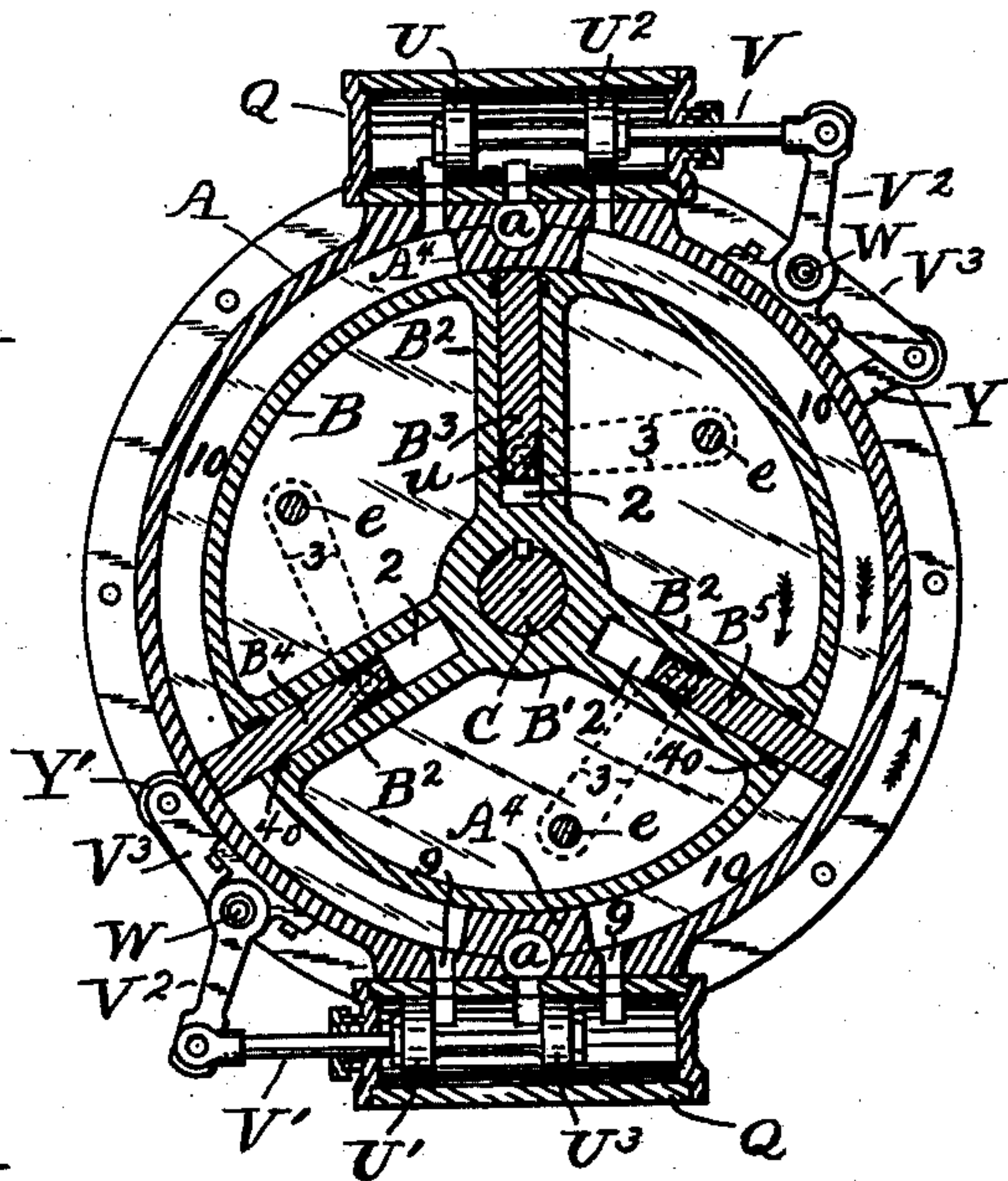


Fig. 4.

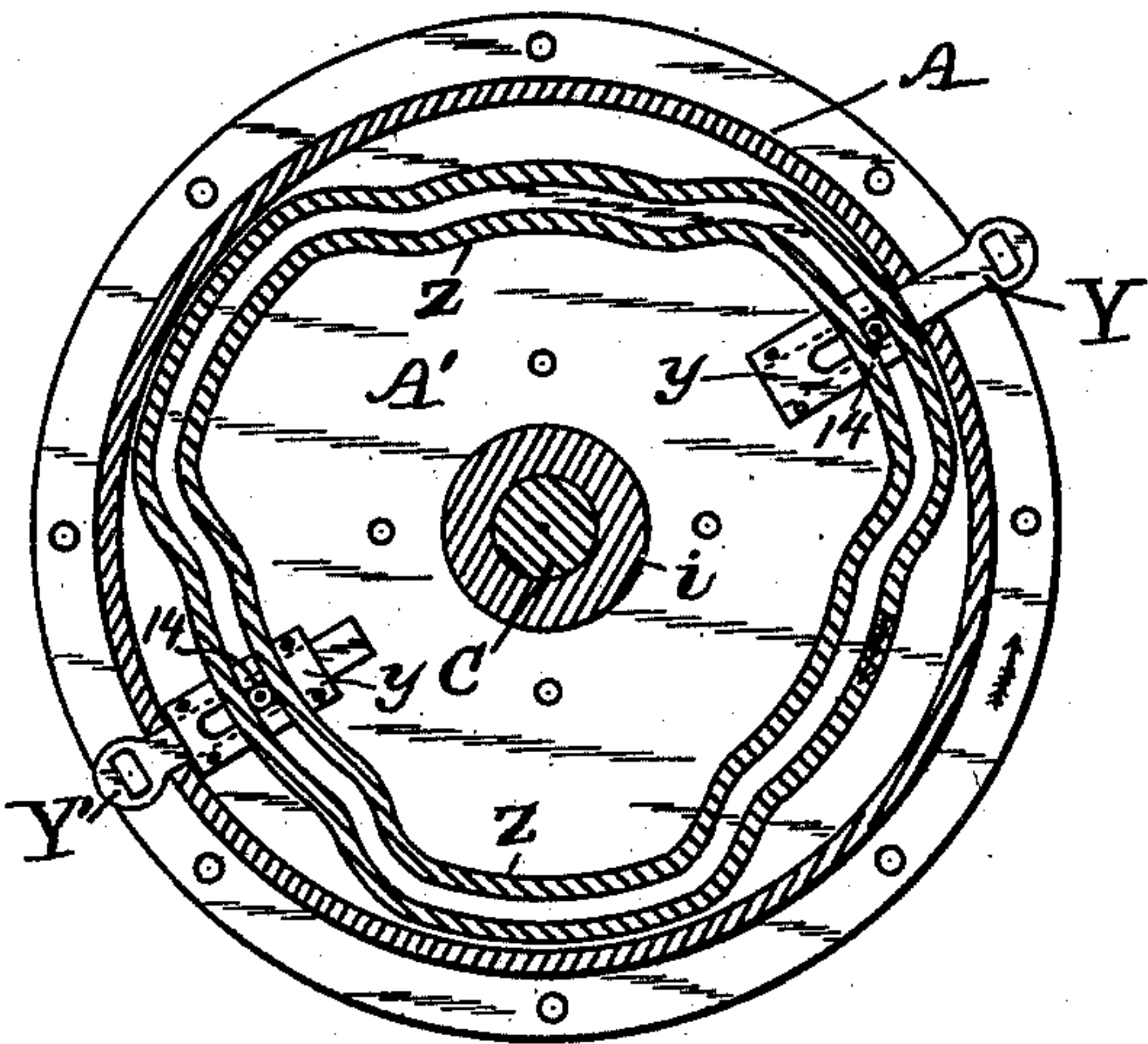


Fig. 5.

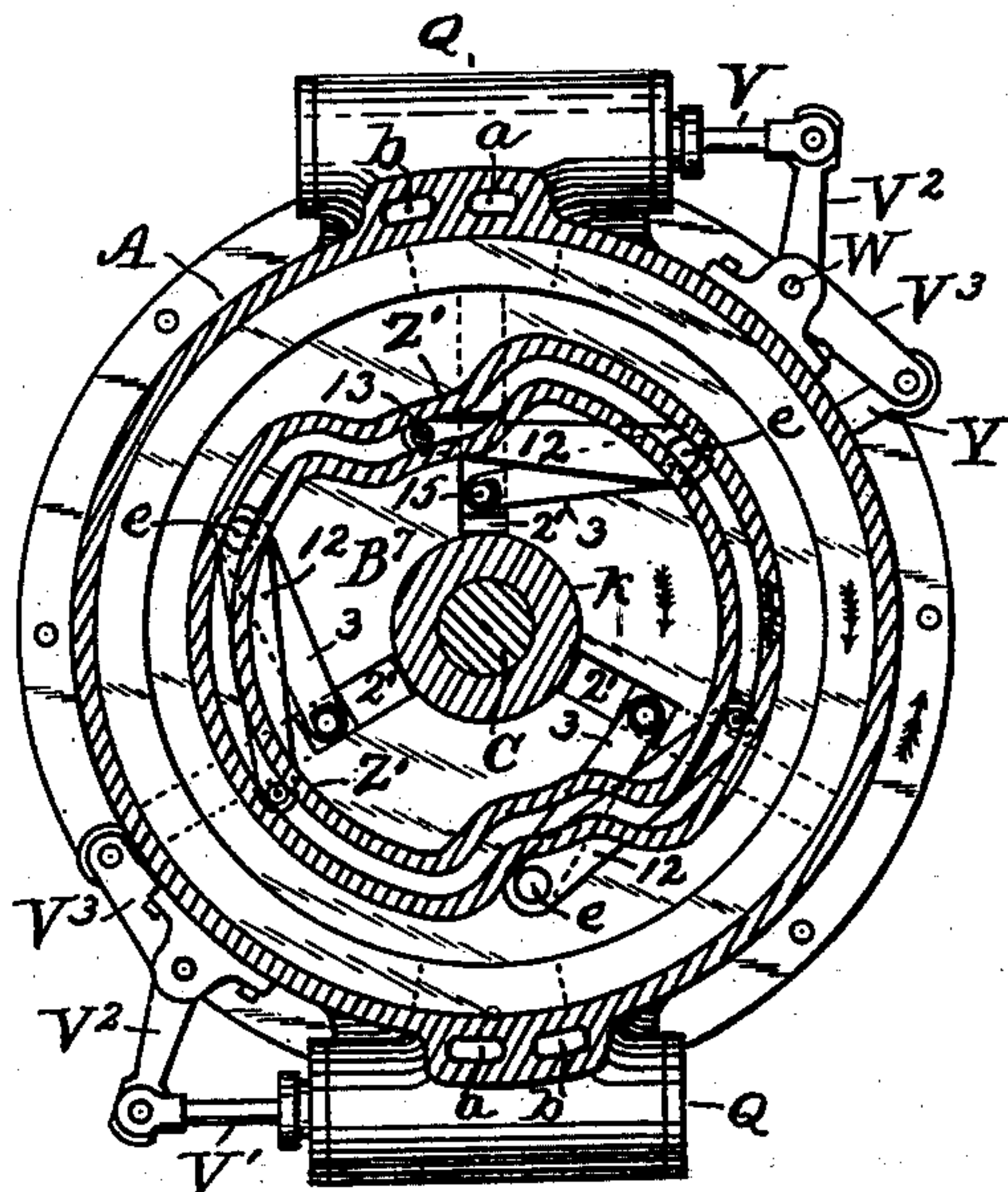


Fig. 6.

Witnesses:

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(Application filed Mar. 2, 1899. Renewed Aug. 29, 1900.)

(No Model.)

4 Sheets—Sheet 3.

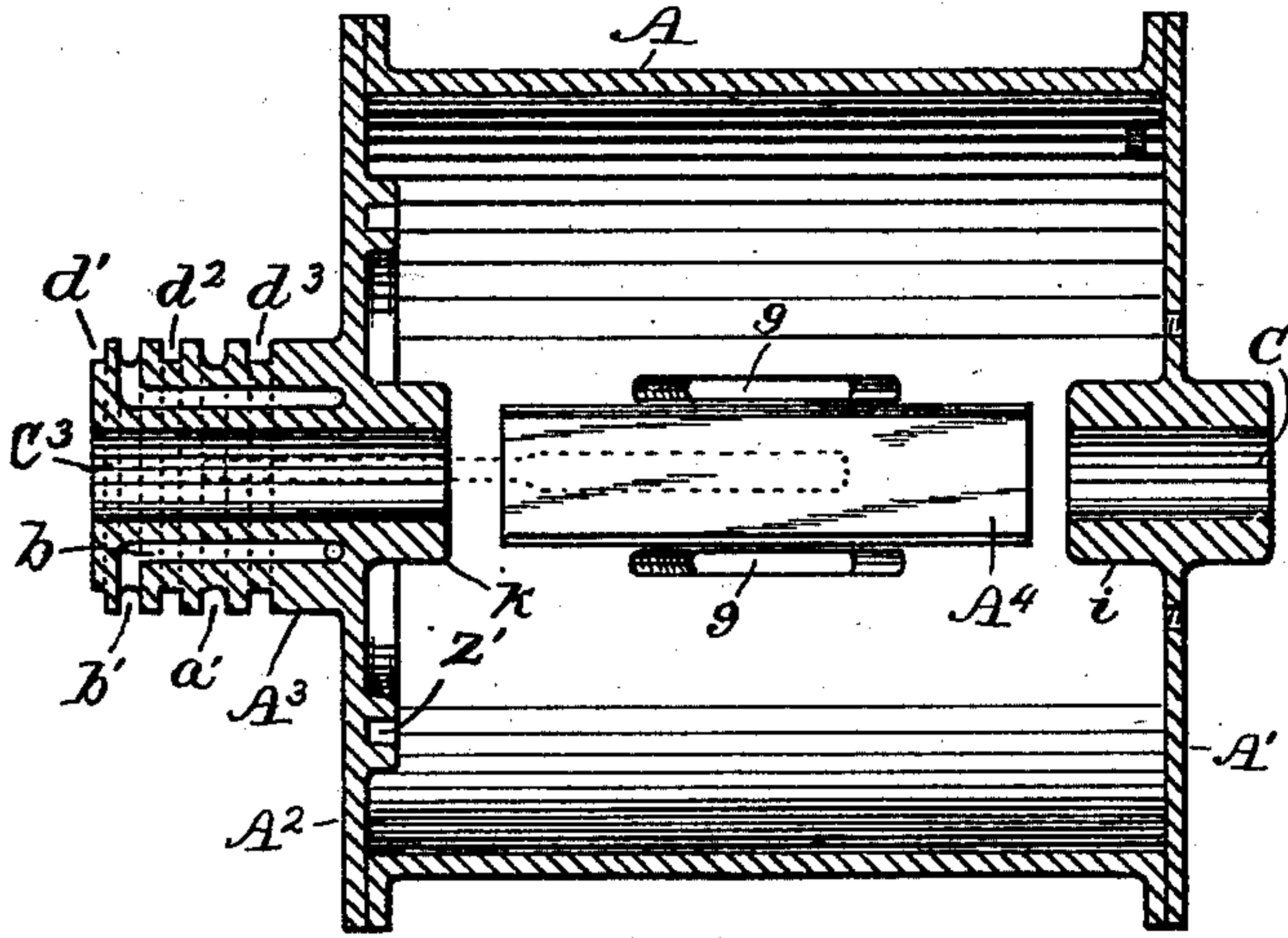


Fig. 7.

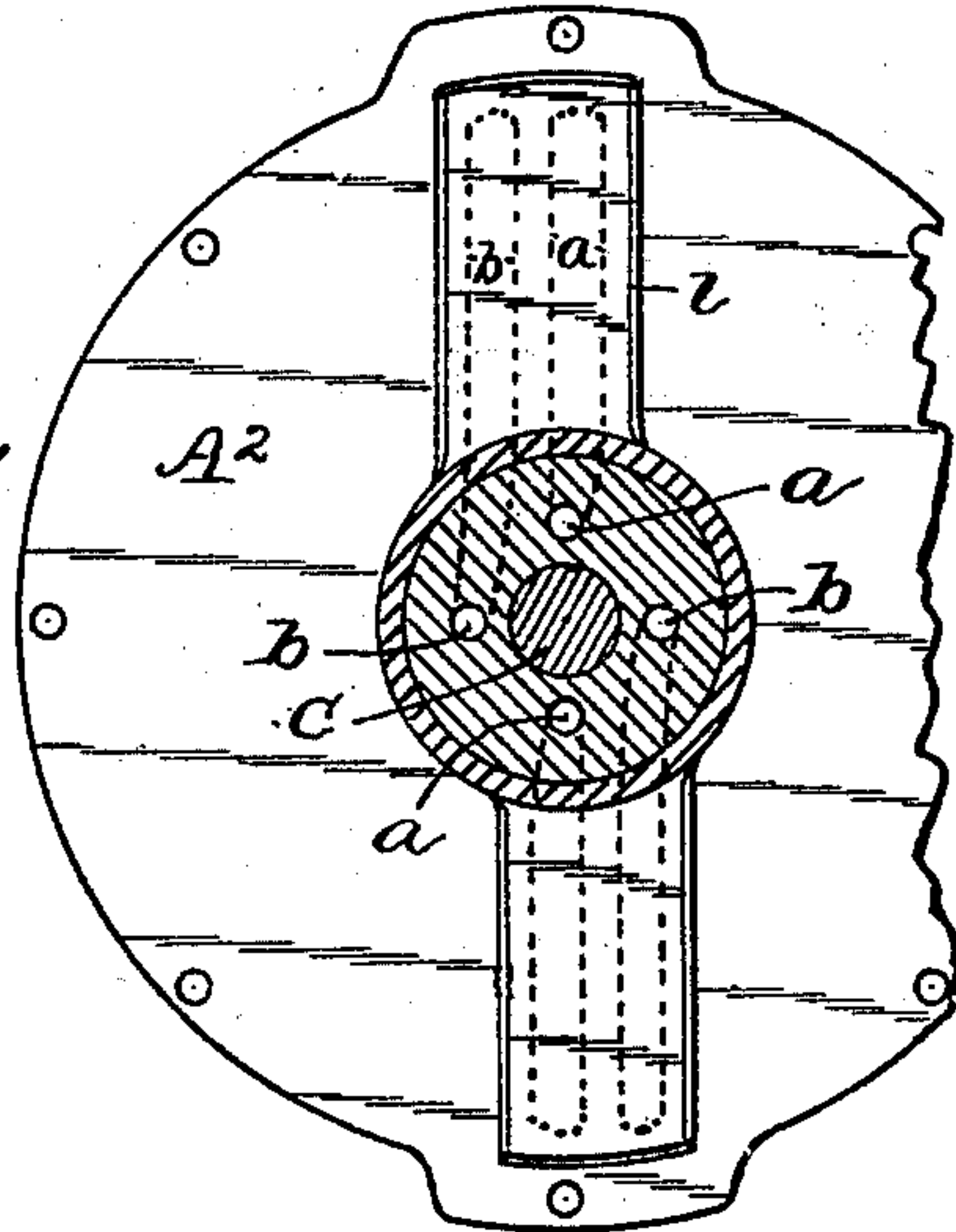


Fig. 8.

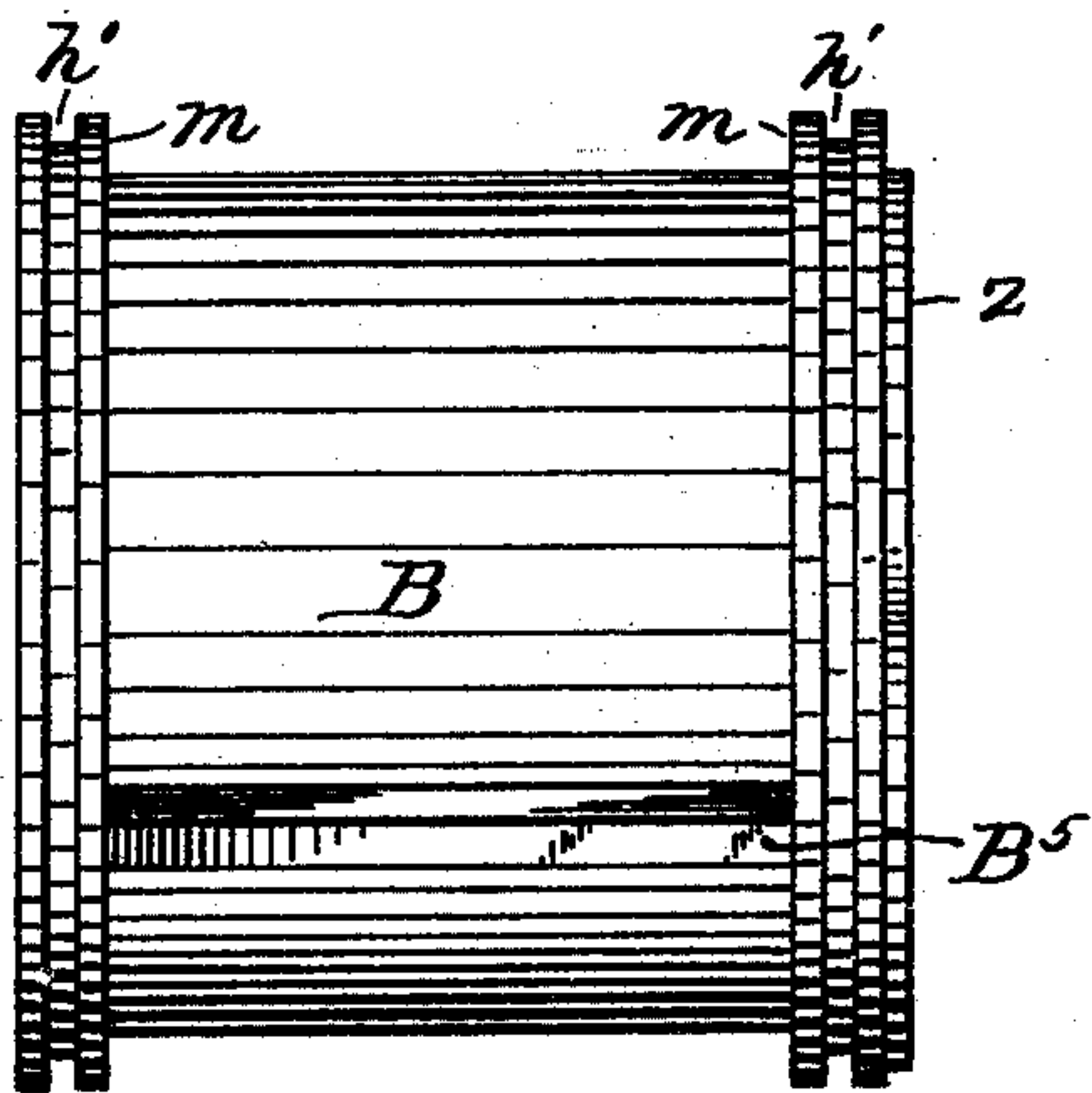


Fig. 9.

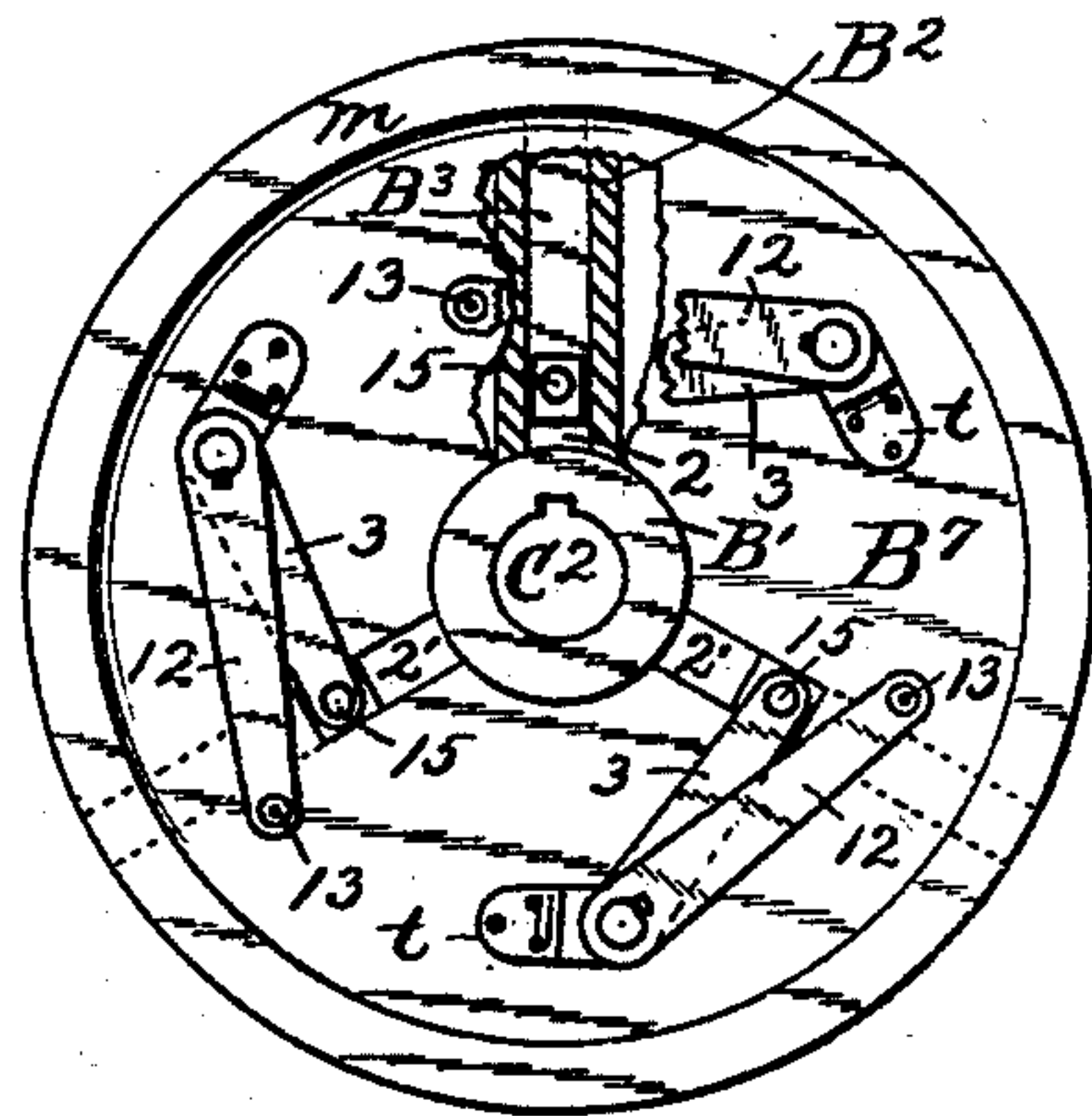


Fig. 10.

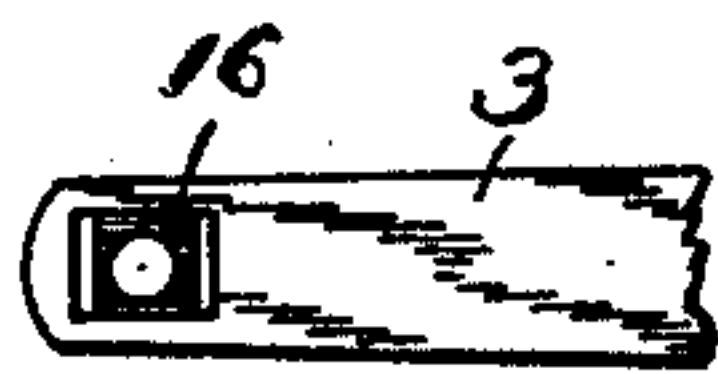


Fig. 11.

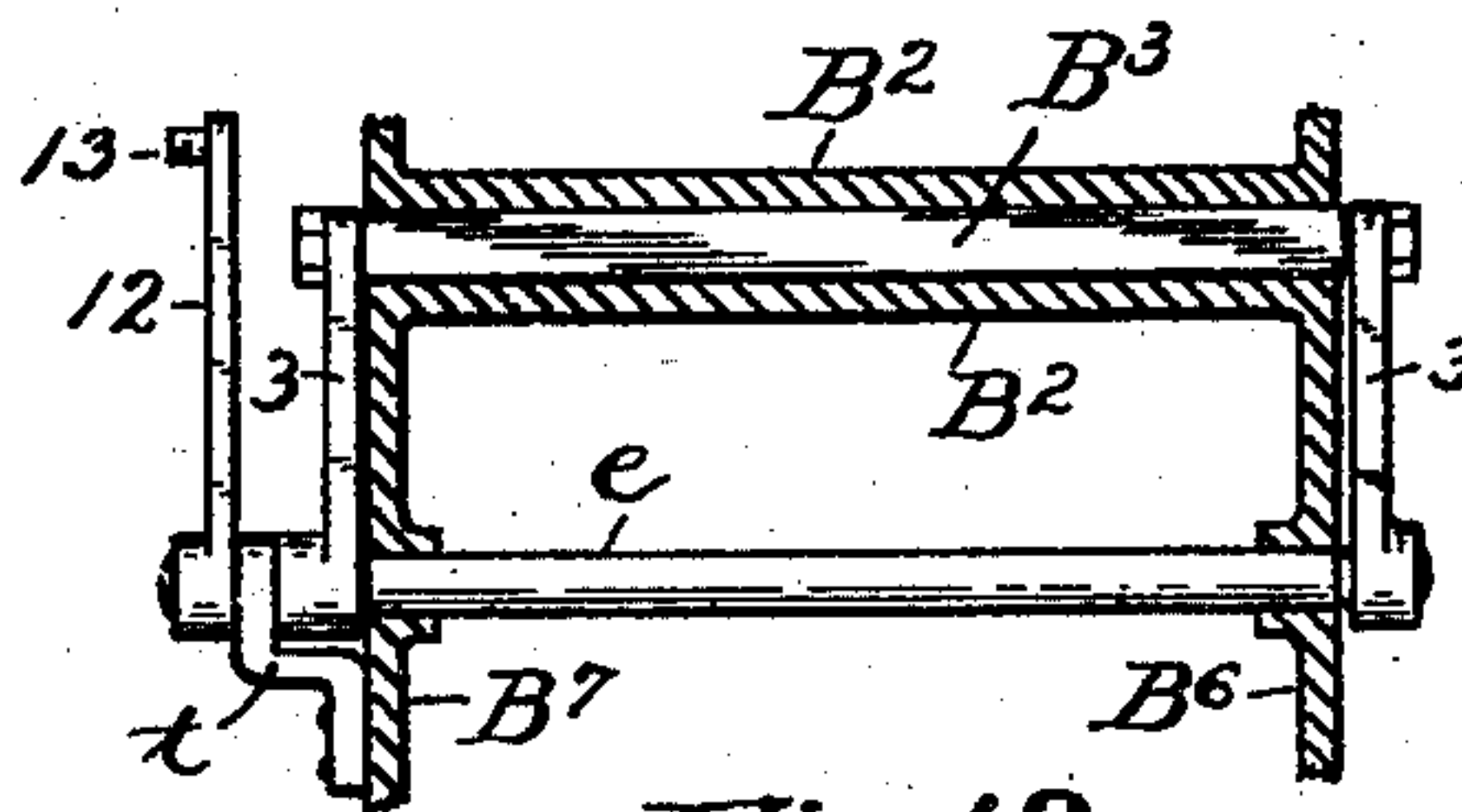


Fig. 12.

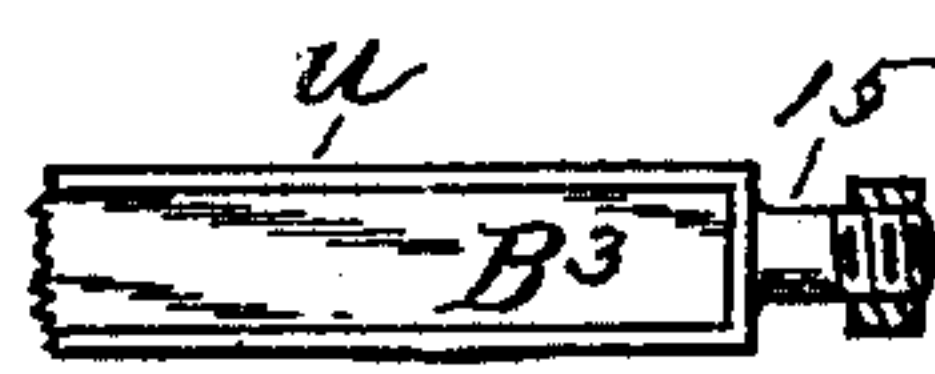


Fig. 13.

Witnesses:

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(Application filed Mar. 2, 1899. Renewed Aug. 29, 1900.)

(No Model.)

4 Sheets—Sheet 4.

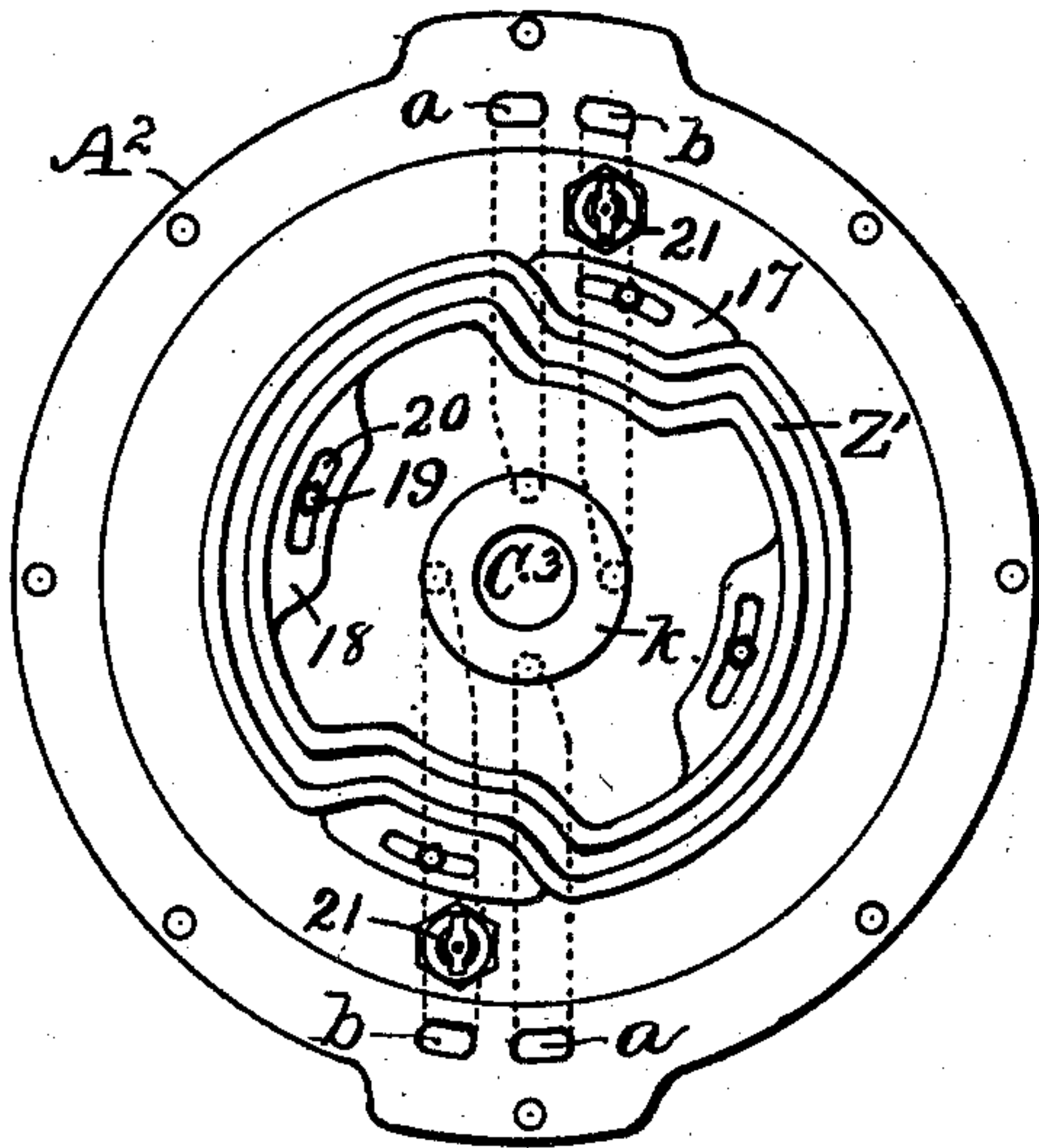


Fig. 14.

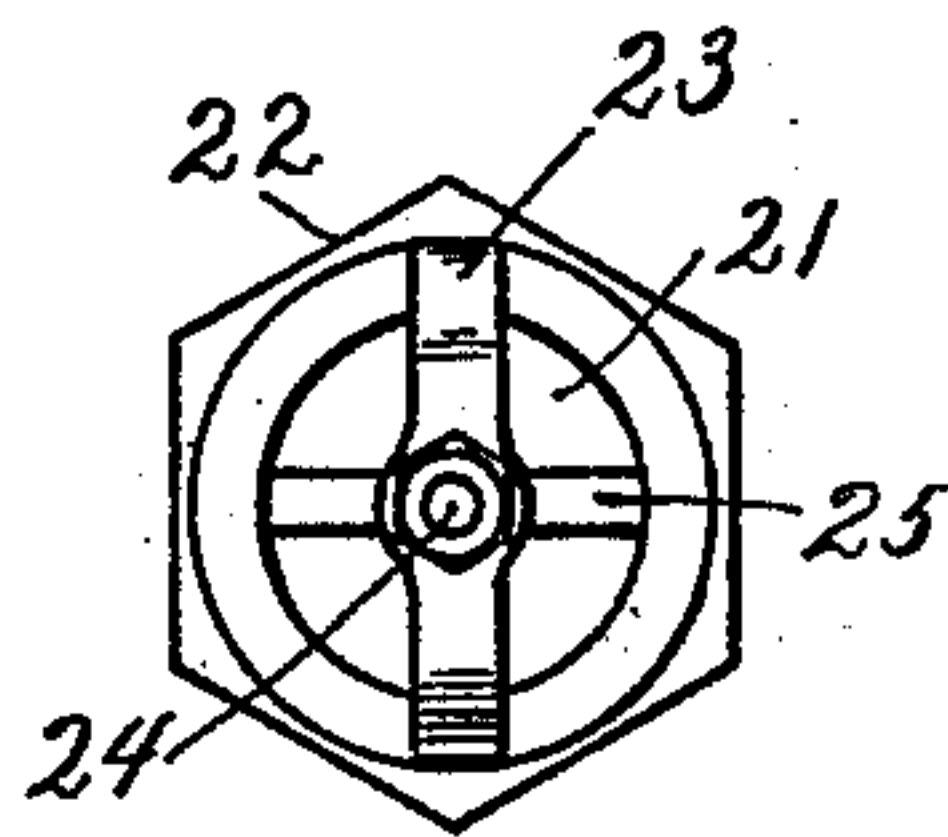


Fig. 15.

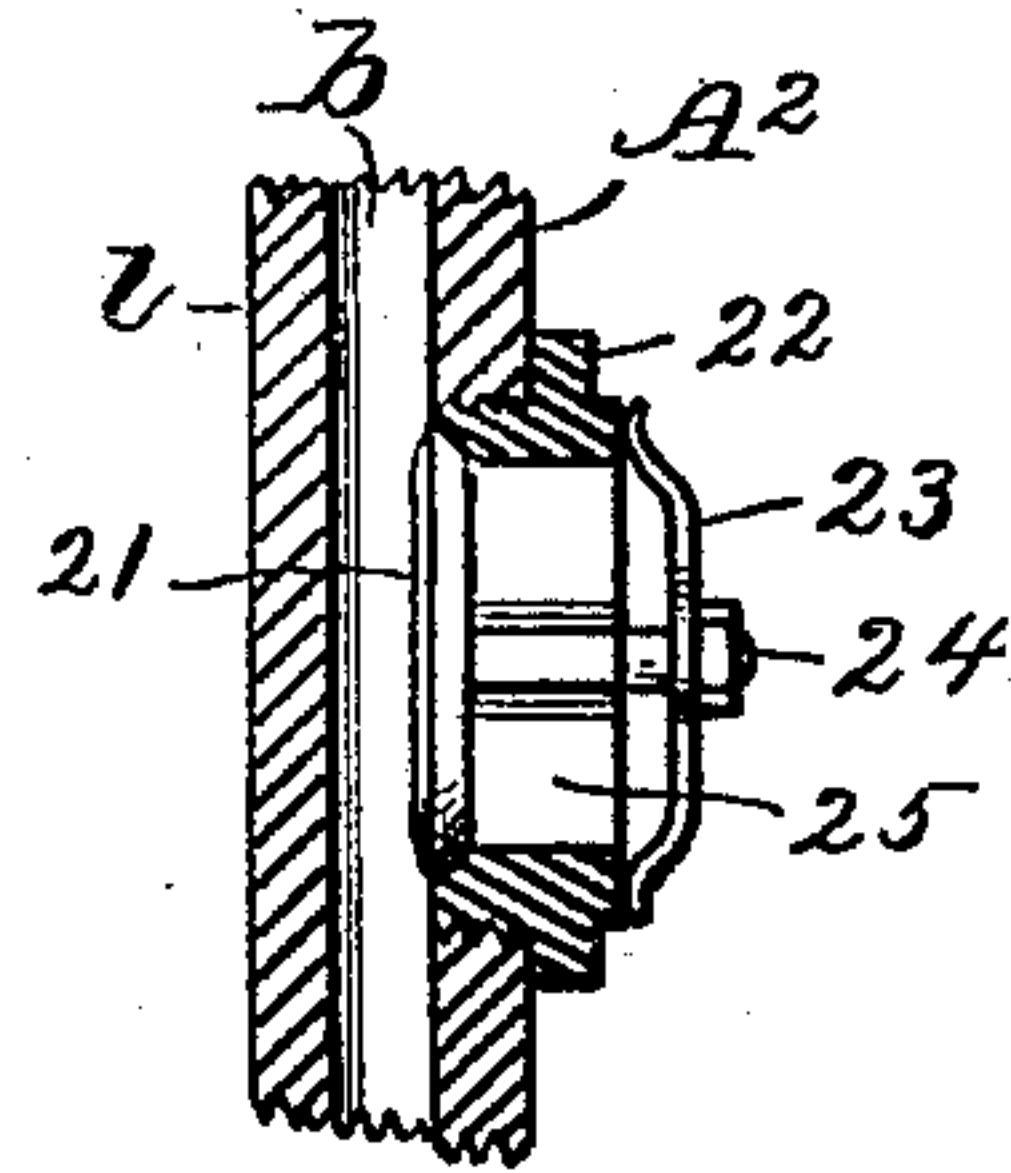


Fig. 16.

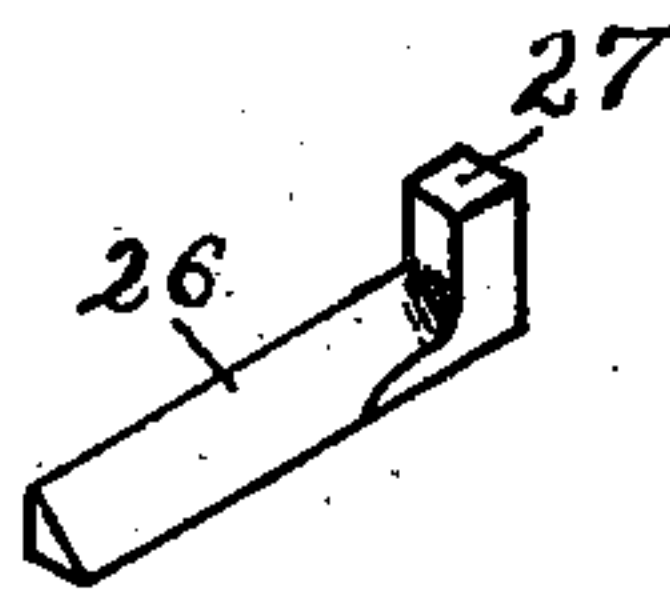


Fig. 17.

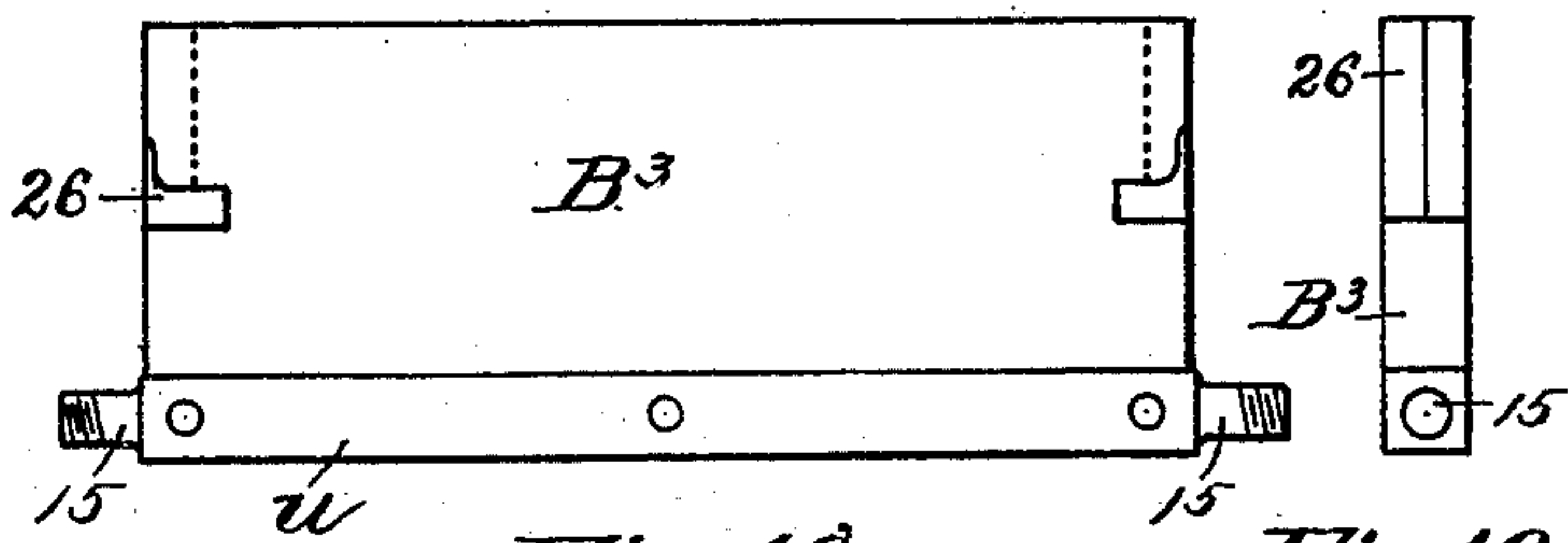


Fig. 18.

Fig. 19.

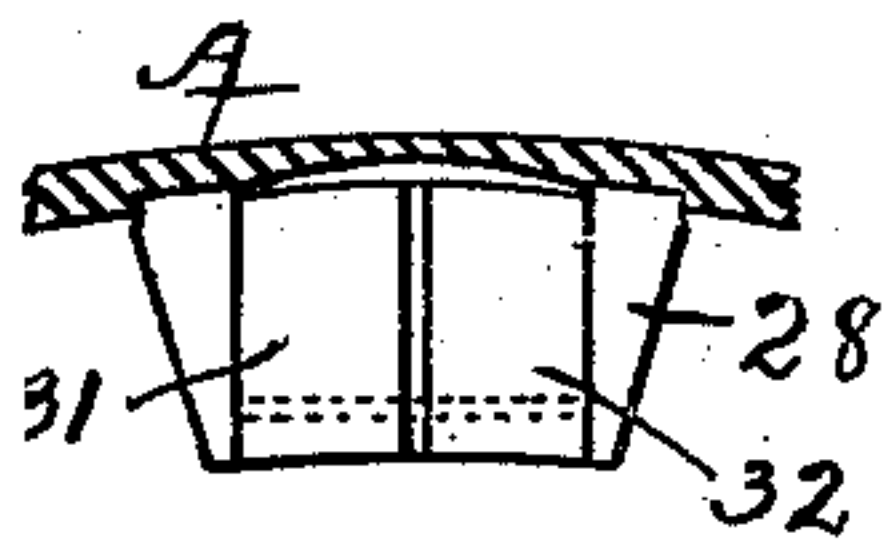


Fig. 21.

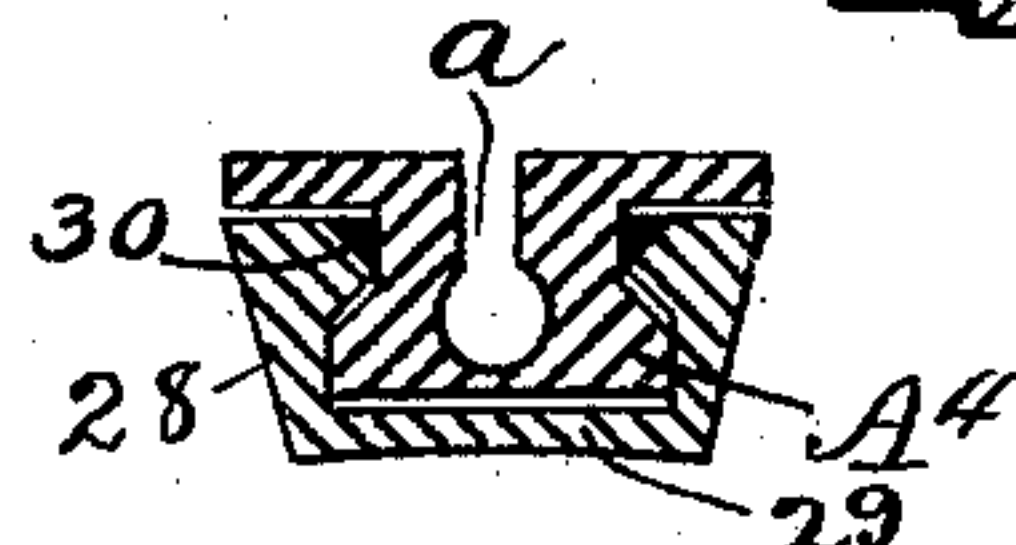


Fig. 22.

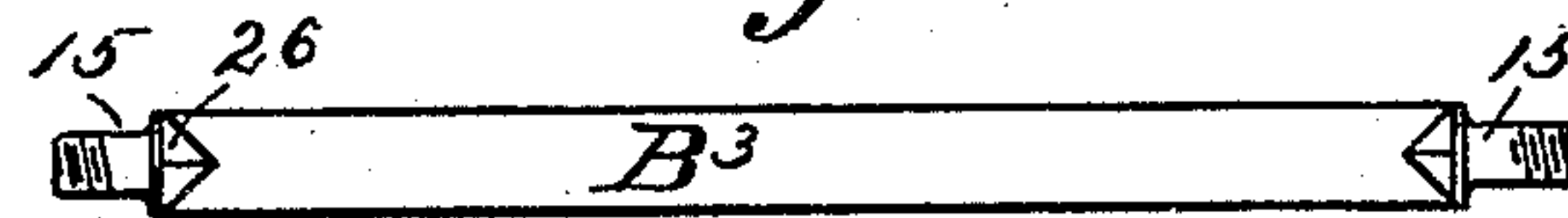


Fig. 20.

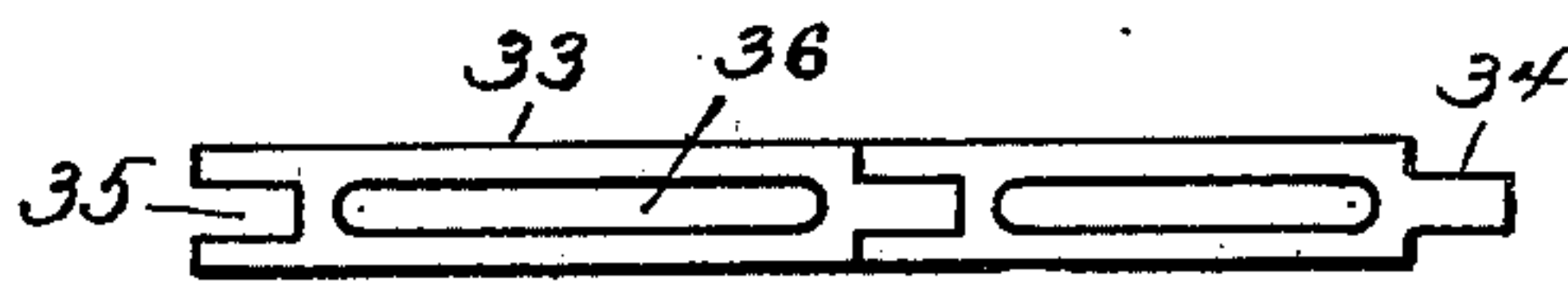


Fig. 25.

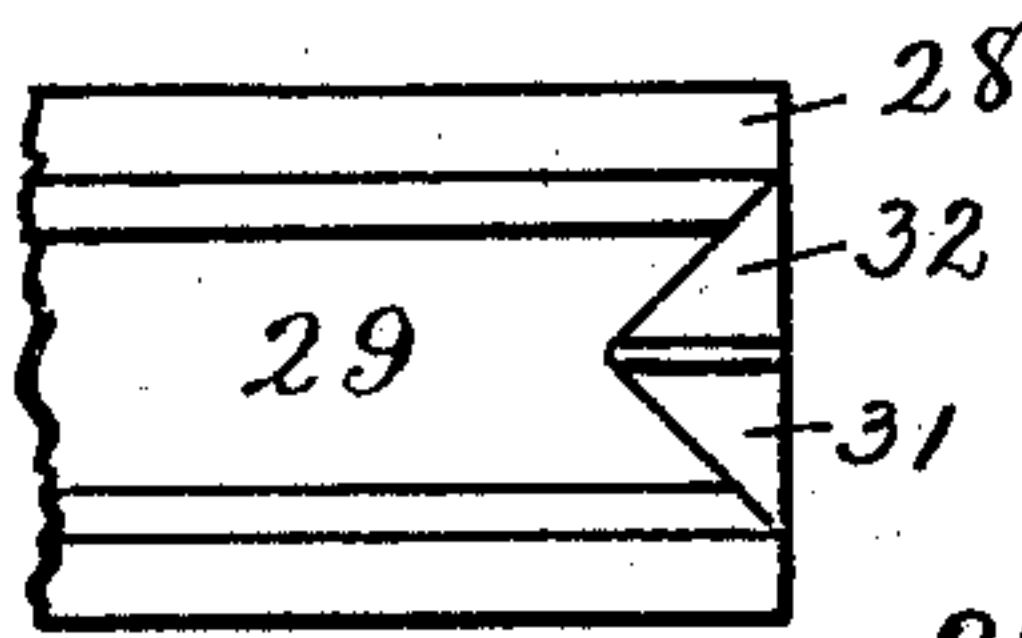


Fig. 23.

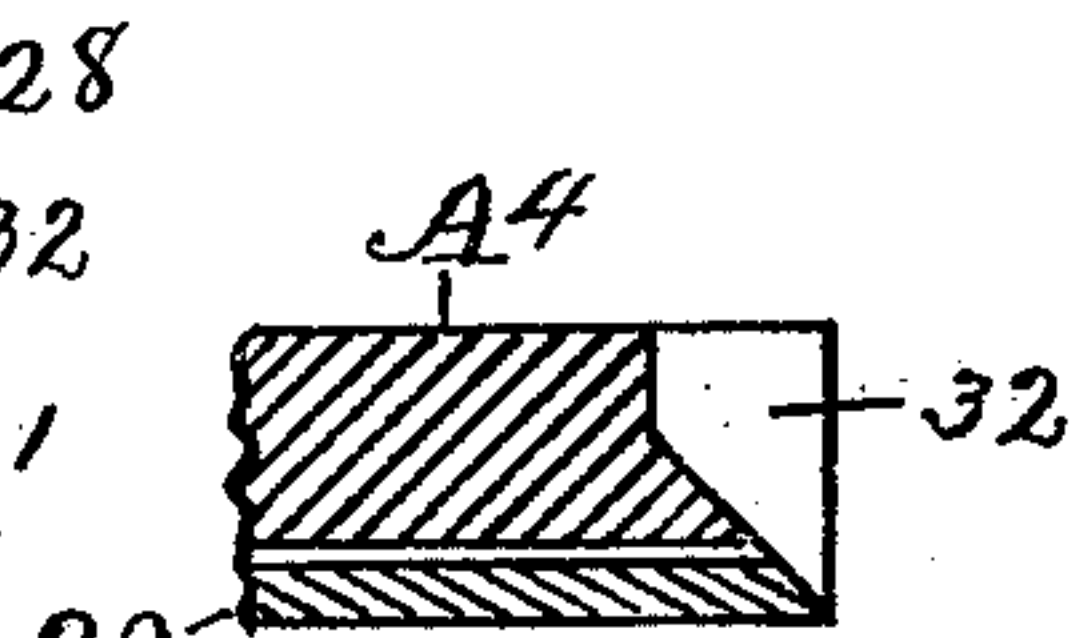


Fig. 24.

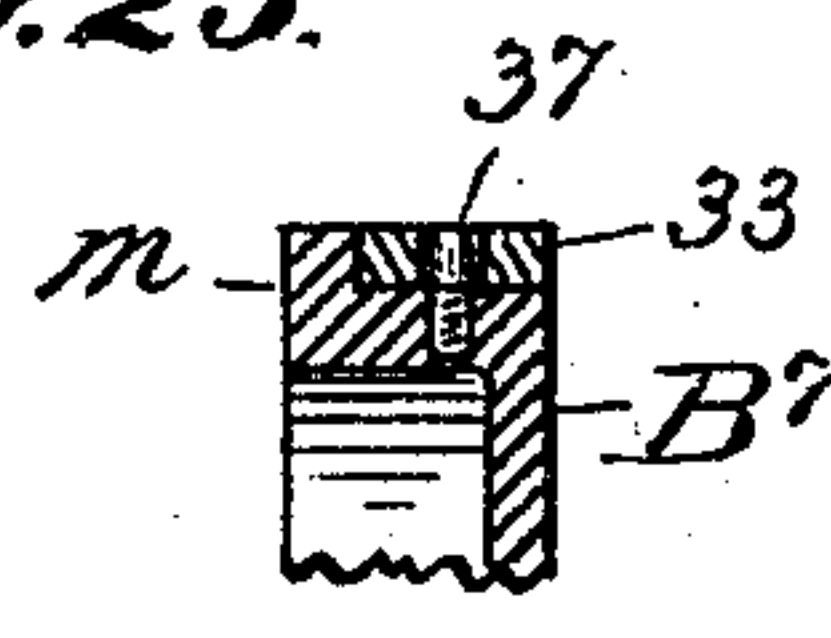


Fig. 26.

Witnesses:

*Wm H Payne*  
*B. E. Doll.*

Inventor:

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# UNITED STATES PATENT OFFICE.

JEROME JACKSON, OF INDIANAPOLIS, INDIANA.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 666,013, dated January 15, 1901.

Application filed March 2, 1899. Renewed August 29, 1900. Serial No. 28,428. (No model.)

*To all whom it may concern:*

Be it known that I, JEROME JACKSON, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Rotary Engines; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to that class of engines or motors which are usually denominated "stationary engines of the rotary type" and using steam or other fluid as a motive force; and it consists in an engine having a new and novel form of construction, whereby the main moving parts are mounted upon a common axial shaft, the cylinder or its equivalent rotating in one direction and the equivalent of the piston rotating in the opposite direction, both perfectly balanced, and the minor parts balancing one another, thereby eliminating the jarring and thrusting inseparable from engines having a cylinder secured to a stationary bed-plate.

It consists, further, in the parts and combination and arrangement of parts, as will be hereinafter fully described and claimed.

My objects are to generally improve the construction of rotary engines, to eliminate the disadvantages of reciprocating parts, and provide a steam-engine which may be operated economically and yet be inexpensive to manufacture and which shall be adapted for use in limited spaces. These are attained in my invention, which, furthermore, may be adapted, with minor changes in valve mechanism, for using gas or compressed air in lieu of steam.

Referring to the drawings, Figure 1 represents an elevation of an engine constructed in accordance with my invention; Fig. 2, a central vertical sectional view; Fig. 3, an end elevation; Fig. 4, a transverse sectional view on line 4 of Fig. 1; Fig. 5, a transverse sectional view on line 5 of Fig. 1; Fig. 6, a transverse sectional view on line 6 of Fig. 1; Fig. 7, a horizontal sectional view on line 7 7

of Fig. 3; Fig. 8, a transverse sectional view on line 8 of Fig. 1; Fig. 9, an elevation of the core, and Fig. 10 an end view of the same; Figs. 11, 12, and 13, detail views; Fig. 14, an elevation of the inside of a head of the case; Figs. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, and 26, fragmentary detail views.

In the several figures like letters and numerals designate corresponding parts.

The direction in which the sectional figures are viewed is indicated by arrows at the lines specified.

For the purpose of attaining brevity in description, A designates the case; B, the core; C, the main shaft; D D, the main frames, supporting the engine proper; E F G, the equalizing gear-wheels; H, the intermediate shaft; I, the intermediate-shaft frame; J K L M, the transmitting gear-wheels; N, the reversing-clutch; O, the line or connecting shaft; Q, the valve-chests; A' A<sup>2</sup>, the heads or ends of the case; A<sup>4</sup>, the abutments, equivalent to cylinder-heads proper; B<sup>3</sup> B<sup>4</sup> B<sup>5</sup>, the disappearing pistons, being equivalents; Z, the valve-cam, and Z' the piston-cam.

In construction the cylinder-case A may be made in any number of sections, preferably two halves, and may be suitably divided on the line 7 7 of Fig. 3, suitable flanges being provided for bolting them together. The case is bored to a true circle of uniform diameter, after which the abutments A<sup>4</sup> are suitably secured in position, as by keys and hidden bolts, the drawings merely indicating their positions rather than exact form of construction. I illustrate the smaller and medium sizes of engines; but in large sizes it may be desirable to employ four abutments, four sets of valves and chests, six pistons, and corresponding duplicated parts affected thereby. The outside of the case has raised portions through which are supply-ports *a a*, passing through the abutments and into the valve-chests Q Q, which latter are preferably cylindrical and suitably secured detachably, and exhaust-ports *b b*, connecting with the valve-chests, a cross-port Q<sup>2</sup> affording communication with both ends of the chest. Ports 9 9 at the sides of the abutments communicate with the valve-chest.

The head A' is suitably secured to the cylindrical case A as a supporting part and not



necessarily steam-tight and has a hub *i* and bore *C'* centrally with the cylinder and fitting as a revoluble bearing on the main shaft *C*, antifrictional bearings being permissible, if desired, but must be accurate and not liable to develop lost motion, this description also applying to the hub *k*, having the bore *C''* passing through the exterior projection *A''* of the head *A'*, the latter having also a raised portion *l*, through which are the ports *a* and *b*, continuing through the projection *A''* to the annular ports *a'* and *b'*, respectively, at the outside of the projection and covered by the casing *R*, having a connecting supply-pipe *S* and an exhaust-pipe *T*, suitably connected. The projection *A''* is provided with grooves or recesses *d'* *d''* *d'''*, fitted with suitable packing *d*. A collar *c* maintains the casing in its proper position. The inside of the head *A'* carries the cam *Z'* for operating the pistons, and it may be cast integrally, but is preferably made separately with flanges 17 18, having slots 20, in which are retaining-bolts 19, by which the cam may be adjusted. At the inside of the head is also one or more escape-valves 21, communicating with the exhaust-port *b* to relieve the clear spaces within the cylinder or core of any pressure that might arise on account of leakage from the steam-chambers. A suitable form of valve comprises a case 22, screwed into the wall, a valve 21, having guide-wings 25 and stem 24 and threaded nut, and a spring 23, holding the valve to its seat with a slight pressure only.

The shaft *C* is made of suitable size and supports the case and core, as well as the minor parts, and is mounted revolubly in suitably-designed frames, as *D D*, or otherwise, which may rest upon a suitable connecting base or bed-plate. Other supports for large engines may be provided, if desired, at the ends of the case to prevent vibrations.

The core *B* consists of a bored hub *B'*, rigidly secured to the shaft *C*, and a cylindrical shell having ends or heads *B''* and *B'''* of greater diameter than the shell, forming annular flanges *m m*, having grooves *h' h''*, in which is suitable packing *h h'*, working against the inner walls of the case. The cylindrical part is of less diameter than the bore of the case and is turned to a true external surface, so that the space 10 between each two abutments comprises the steam-chamber, in which the pistons or slides operate. A cam *Z* is attached to or cast integrally with the end *B''* of the core to operate the supply-valves. Radial hollow partitions *B''* connect the cylindrical part of the core to the hub and comprise parallel walls between which is a space 2, in which the piston is carried, the latter being packed by suitable packing 40, set into the walls. Apertures 2' in the ends of the core register with the inner portion of the spaces 2. Shafts *e* of suitable number are mounted longitudinally and extend through the ends of the core, being suitably journaled therein, and at the outside of each end are counterpart

arms 3 3, rigidly secured to the shaft and having their free ends connected to journals 15, secured to the bottom of a piston, as by means of a yoke *u*. A bracket *t* supports the longer end of each shaft *e*, to which is secured a lever 12, having a roller-pin 13 running in the groove or channel of the cam *Z'*, by which a piston is controlled to disappear at the proper time to pass an abutment. Each piston is provided with end packing comprising right and left triangular strips 26, having each a lug 27 to prevent end movement, the whole being set into suitable recesses. Suitable packing is provided between the core and the abutments, comprising, preferably, a shoe loosely dovetailed to the abutment and having a face 29 and sides 28 and triangular strips 30 to prevent steam passing around the back of the shoe, and right and left end pieces 31 and 32, having beveled sides and lower ends. The arms 3 are fitted with sliding boxes 16.

In each valve-chest *Q* are two piston-valves, as *U' U''*, adapted to cover a port and so secured to a stem *V* that when one valve covers a cylinder-port the other valve is beyond the inlet-port and at the near edge of the opposite port to the cylinder, as shown in Fig. 4. Each valve-stem passes through a packed head and is connected by a rocking arm *V''*, secured to a suitably-supported shaft *W* at the outside of the case, which is operated by an arm or lever *V'''*, connected to a sliding bar *Y* or *Y'*, mounted in slideways *y*, the bar having a roller-pin 14 running in the channel of the cam *Z*, whereby the valve is operated. As shown, the case and core rotate in opposite directions, (indicated by the arrows,) the valves working at one side of the longitudinal center of the chest, nearest the packed heads. If the stems *V* were suitably longer, the valves would work in the opposite end of the chest, and consequently the engine would run in a reversed direction. The engine may thus be made reversible by providing a suitable reversing-gear for shifting the valves. In the present case the ports at the piston-valves *U''* and *U'* are the supply-ports, while those at the opposite pistons are the exhaust-ports, which latter always remain open, the adjacent valves simply preventing escape of live steam from between the pair of valves in each chest.

The gear-wheels *E* and *J* are preferably cast together with a truncated hub *J'*, which is either cast with or bolted to the head *A'*, the wheels being bored and adapted to rotate upon the shaft *C*. The wheels *F* and *K* are secured to the shaft *C*. The wheel *G* meshes with both the wheels *E* and *F* and is mounted upon a shaft *H*, suitably supported on a frame *I*. The line-shaft *O* is mounted in suitable frames or pedestals *P* and has a loose gear-wheel *L* meshing with the wheel *J* and a like wheel *M* meshing with the wheel *K*, each having clutch parts, as *L' M'*, adapted to be engaged by a clutch *N*, sliding on a spline between, so that



either may be engaged. By the application of a suitable lever the direction of motion of the line-shaft may be reversed. If the engine be designed to operate the line-shaft in one direction only, the shaft H may be continued as a line-shaft.

In Fig. 25 is shown a plan of the packing  $h$  or  $d$ , comprising links having a tongue 34 at one end and a recess at the opposite end connected by side bars 33, by which an opening 36 is provided, at each end of which is a dowel 37, secured in the groove, whereby the links are carried by the cylindrical parts. In lieu of a groove  $h'$  the packing-rings may be placed in a side recess, as shown in Fig. 26, so that the sides of the packing-rings act to some extent also.

The operation will be readily understood by reference to the drawings. In Fig. 4 it may be assumed that steam has been admitted behind piston  $B^5$  and is cut off and operating expansively and will be exhausted when the piston is withdrawn to pass the approaching abutment, the exhaust-port before it being open constantly. Valve  $U'$  is admitting steam to piston  $B^4$  and will be cut off when the bar  $Y'$  is carried outward by its cam. Piston  $B^3$  has been withdrawn and the steam behind it exhausted and is passing an abutment, after which it would project into the steam-chamber filled with expanded steam and a charge admitted behind it by the valve  $U^2$ . There are no dead-points, so that it may be started from any point of its revolution, which is a great advantage. The contour of the cams may be varied, so as to provide for economical use of steam or like fluid.

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

1. An engine comprising a cylindrical case provided with central journal-bearings, a substantially cylindrical core situated centrally within the case and bored centrally and provided with a packed annular flange at each end thereof in contact with the cylindrical wall of the case, internal abutments carried by such case, radiating slides carried by such core and means whereby the same are operated, operating-valves carried by such case and means whereby the same are controlled, a central supporting-shaft secured in the bore of such core and working in such journal-bearings, and means whereby such case and such core are caused to rotate in opposite directions.

2. An engine having a frame, a rotating shaft mounted thereon, a cylindrical case mounted rotatably upon the shaft and having fixed abutments therein and supply and exhaust ports, a cylindrical core secured to the shaft and rotatably within the case and having disappearing pistons or blades projecting into the space between the outer periphery of the core and the inner periphery of the case, means by which the pistons are controlled, valves carried by the case whereby the mo-

tive fluid is controlled, means whereby the valves are operated, and ports communicating with the valves, substantially as set forth.

3. An engine having a frame, a rotating main shaft mounted upon the frame, a cylindrical case mounted revolubly upon the shaft and carrying a gear-wheel and a bevel gear-wheel, a cylindrical core secured to the shaft and rotatably within the case, abutments carried by the case between its inner wall and the outer wall of the core, disappearing pistons or slides carried by the core and projecting to the wall of the case, a cam and intermediate mechanism whereby the pistons are operated, valves and ports for supplying and exhausting the motive fluid, a cam and intermediate mechanism whereby the valves are operated, a gear-wheel and a bevel gear-wheel secured to the shaft, a bevel or miter gear-wheel mounted revolubly upon the frame and meshing with both of the said bevel gear-wheels whereby said case and said core are caused to rotate in opposite directions, a separate or line shaft mounted adjacent to said main shaft and having two loose gear-wheels thereon and meshing with said gear-wheels first described, and a clutch rotating with said line-shaft and adapted to engage either of said last-described gear-wheels, whereby the direction of motion transmitted by said engine may be reversed, substantially as set forth.

4. A rotary engine comprising a frame, a revoluble shaft journaled in the frame, a cylindrical casing comprising the outer part of the steam-chambers for pistons and revoluble upon the shaft, a bevel gear-wheel carried by the case, a core mounted within the case rigid with the shaft and comprising the inner part of the steam-chambers for pistons, disappearing pistons or slides mounted in the core and adapted to project into the steam-space between the outer wall of the core and the wall of the case, means for operating the pistons, valves and chests therefor carried by the case, abutments in the steam-space, supply and exhaust ports for the valves, cams and levers for operating the valves, a bevel gear-wheel secured to the shaft and a transversely-mounted shaft and a bevel gear-wheel mounted thereon and engaging said two gear-wheels, substantially as set forth.

5. A rotary engine comprising a rotating case and a core mounted therein and adapted to rotate in an opposite direction to the case, steam-spaces between the peripheral walls of said case and said core, abutments in the steam-space, disappearing pistons or slides in the steam-space and carried by the core, a supporting-shaft extending through the core and secured thereto and through the case whereby they are supported, journals and supports for the shaft, means whereby the case and the core are caused to rotate in opposite directions, and valves and operating mechanism therefor and communicating ports, substantially as set forth.



6. In a rotary engine, a core and a case comprising together oppositely-rotating members providing steam-spaces between the peripheral walls thereof, a supporting rotating shaft therethrough and secured to the core, supporting-journals for the shaft, abutments carried by the case and dividing the said steam-spaces, valve-chests carried by the case and valves therein, a port at each side of an abutment and communicating in pairs with a valve-chest, pistons or slides carried by the core and working in the steam-spaces, means for controlling the pistons to pass the abutments, means for operating the valves whereby steam may be admitted to the steam-spaces at one abutment and exhausted at the next adjacent abutment, and equalizing-wheels whereby the core and the case are caused to rotate in opposite directions, substantially as set forth.

7. In a rotary engine, the combination of a cylinder element composed of two parts one rotating within the other and in opposite directions with the steam-space between, abutments forming heads in the steam-space, disappearing pistons or slides working in the steam-space, valves for controlling steam to and from the steam-spaces, with means whereby the cylinder element is supported and the two parts thereof are caused to rotate in opposite directions when in operation, substantially as set forth.

8. In a rotary engine, the combination with a frame, of a revoluble shaft mounted thereon, a cylindrical case revoluble on the shaft and having oppositely-disposed heads forming supports, a gear-wheel and a bevel-wheel carried by one of said heads and loose on said shaft, an outwardly-projecting hub attached to the other one of said heads and having ports therein and annular ports in the periphery thereof, a stationary case over said hub and having steam-pipes connected thereto, packing between said hub and said case, a cam at the inner face of one of said heads, abutments secured to said case and projecting inwardly, a port at each side of each abutment, a valve-chest and a valve at each abutment, packing seated in the abutments, a core secured to the shaft within the case and having a cylindrical shell working against the abutments and provided with radial slideways opening from the periphery thereof, packed slides or disappearing gate-pistons mounted in the ways and working against the inner surface of the wall of the case, levers and mechanism whereby said slides are controlled by said cam, a cam at one end of said core and mechanism whereby the same may control said valves, a gear-wheel and a bevel-wheel secured to said shaft, a transverse shaft journaled on the frame, a bevel gear-wheel carried by the transverse shaft and engaging said bevel-wheels, a line-shaft suitably journaled, a pair of gear-wheels loose on the line-shaft and provided with clutch mechanism whereby either one may be locked

to operate its shaft by the connecting one of said gear-wheels before mentioned, substantially as shown and described.

9. In a rotary engine, the combination with a bed-plate having the supporting-frames D, D, provided with journal-bearings, of the main shaft, the case A having the ends A', A<sup>2</sup> and rotatably mounted on the shaft, the core B secured to the shaft and having the packed flanges m, m, the packed abutments A<sup>4</sup> attached to the case and bearing against the core and inner faces of said flanges, the valve-chests Q carried by the case, the valves in said chests, the ports at each side of said abutments and communicating with said chests, the cam Z at one end of said core, the slides Y carried by said case and engaging said cam, the connecting-levers V<sup>2</sup>, V<sup>3</sup>, and shaft W, the stem V and suitable connections whereby said valves are controlled by said cam, the slideways 2, the piston-slides B<sup>3</sup> in said slideways, the shafts e and arms 3 connected with said slides, the levers 12 secured to said shafts e, the cam Z' carried by said end A<sup>2</sup> and engaging said levers 12, the hub A<sup>3</sup> attached to said end A<sup>2</sup> and having the ports therein and extending to said chests, the case R having the inlet-pipe and the outlet-pipe connected thereto, the equalizing-wheels E, F, G, the communicating wheels J, L, and K, M, shaft Q, and clutches L', M', N, all operating substantially as and for the purposes shown and described.

10. In a rotary engine, the combination of the main shaft, the case provided at each end with a journal-bearing in which the main shaft rotates and provided with internal peripheral abutments, an adjustable cam supported by the case, valve-chests supported by the case, valves in the chests, ports communicating with the valve-chests, the cylindrical core central within the case and secured to the main shaft and provided with the disappearing slides operating as pistons between the abutments and between the walls of the case and the core, the shafts mounted in the core and the arms or levers whereby the slides are controlled by the adjustable cam, a cam attached to the core and connected shafts and levers whereby such cam may operate the valves, substantially as set forth.

11. In a rotary engine, the combination of the main shaft, the case provided at each end with a journal-bearing in which the main shaft rotates, the cylindrical core operating within the case and secured to the main shaft, the valve-chests supported by the case, the projection at the end of the case and the supply-ports and exhaust-ports communicating with the valve-chests, and the relief-valve whereby the fluid-pressure within the case may escape into the exhaust-ports, substantially as set forth.

12. In a rotary engine, the combination of the cylindrical case, the core mounted rotatably within the case and provided with the annular flanges, the annular groove in such



flange, the link packing in the grooves and bearing against the sides thereof and against the wall of the case, and the dowels set in such grooves whereby such packing is caused to rotate with such core, substantially as set forth.

13. In a rotary engine, the combination of the main shaft, journal-supports for the main shaft, the core secured to the main shaft and provided with the disappearing slides and the annular flanges between which the slides operate, and the case surrounding the core and loose on the main shaft and comprising a cylinder provided with abutments at the inner periphery thereof and extending between said flanges, a port at each side of such abutments, and a supporting-head at each end of the cylinder; valve-chests at the outer periphery of the cylinder; and supply and exhaust ports in one of the heads and communicating with such valve-chests, substantially as set forth.

14. In a rotary engine, the combination of

the main shaft suitably supported revolubly, the core secured to the main shaft and comprising a cylinder the ends of which are of greater external diameter than the main body portion thereof, radial slideways opening in the periphery of the body portion having the smaller external diameter, slides in the said ways and movable therein so as to project to the greater periphery aforesaid, means whereby the slides are controlled; and the case surrounding the core and journaled on the main shaft and provided with abutments extending to the body portion of said core and between the said enlarged end portions, substantially as set forth.

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

JEROME JACKSON.

Witnesses:

WM. H. PAYNE,  
E. T. SILVIUS.