

L. M. DEVORE & D. C. STOVER.

GRINDING MILL.

No. 269,923.

Patented Jan. 2, 1883.

Fig. 1.

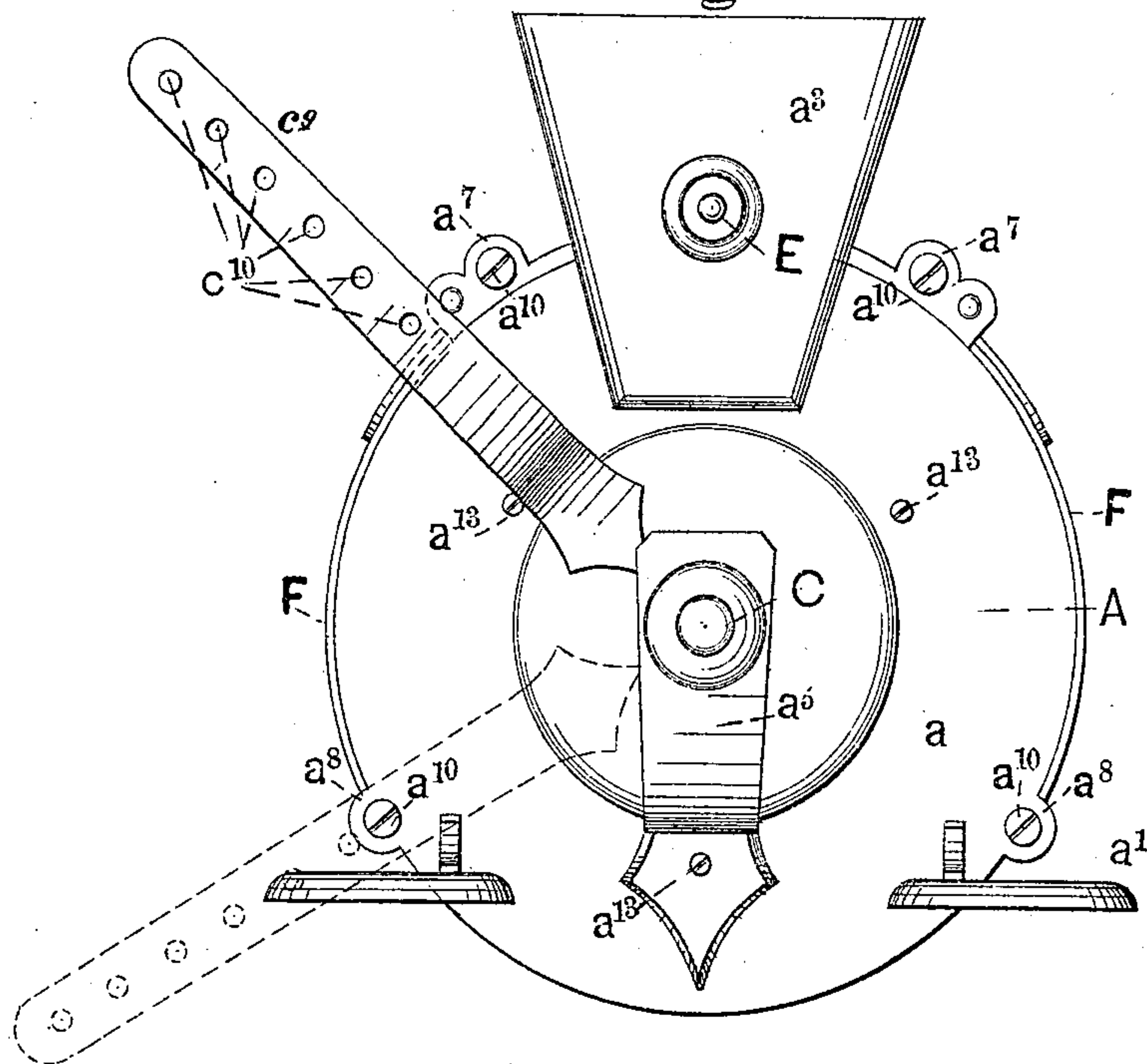
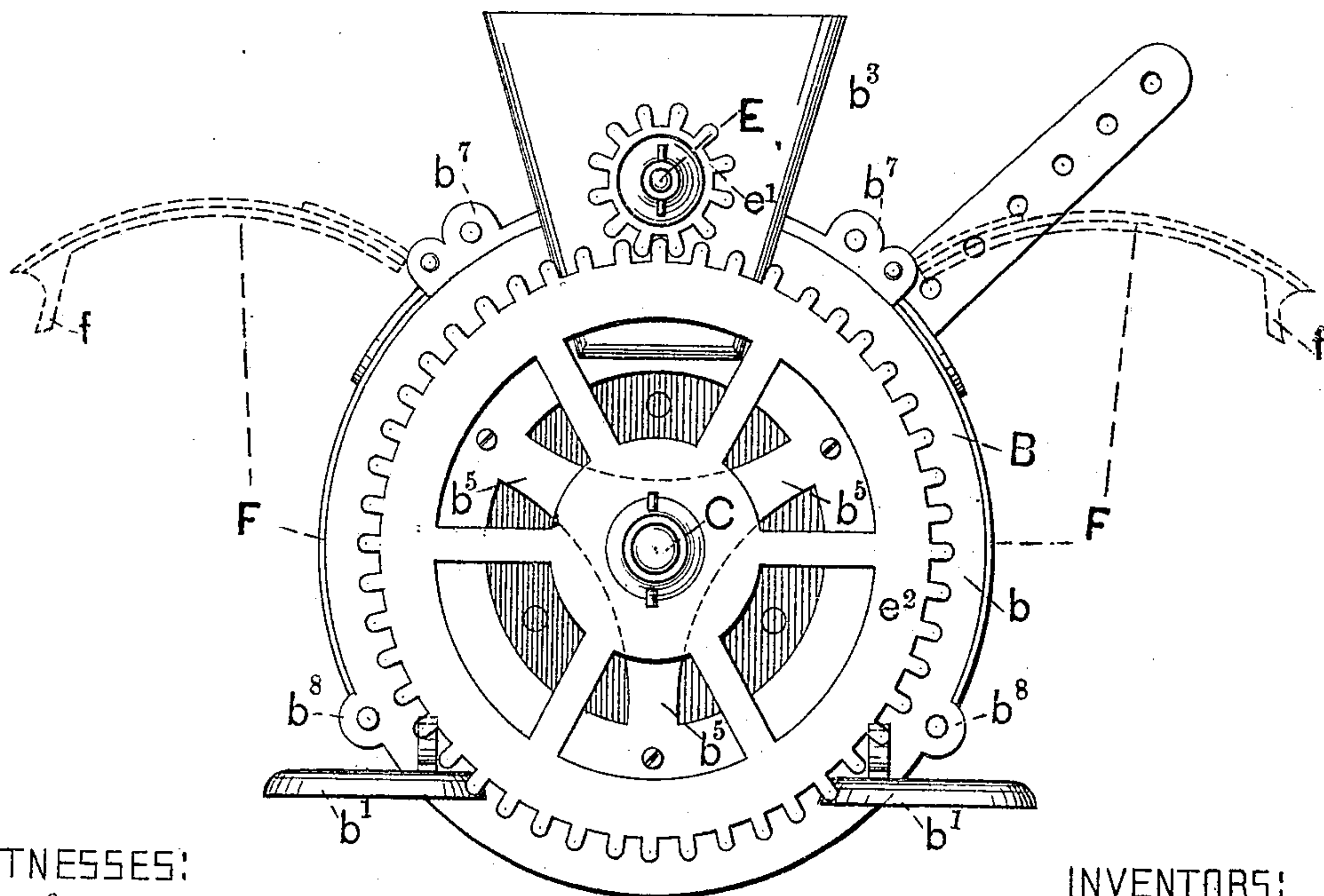


Fig. 2.



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Fig. 3.

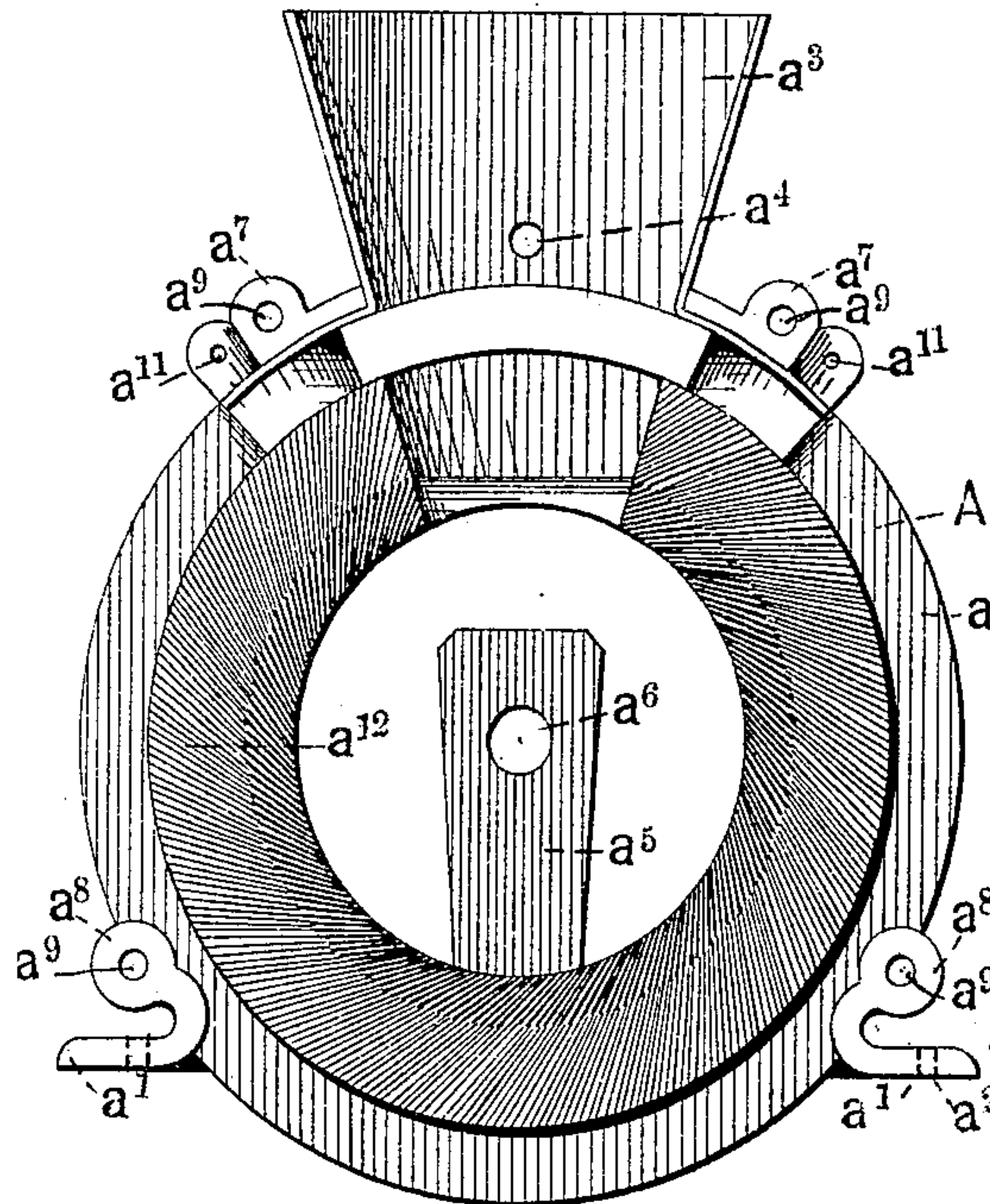


Fig. 4.

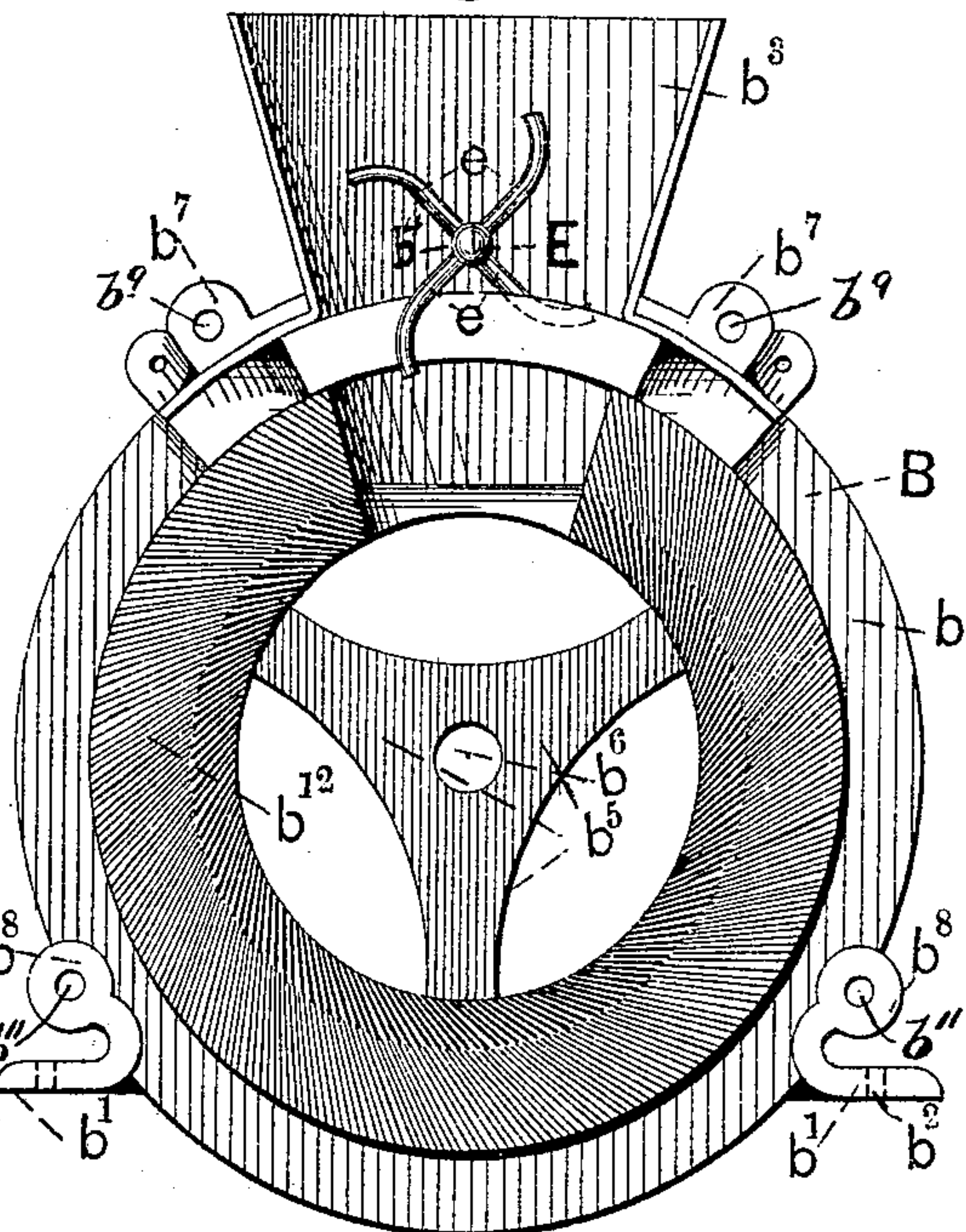


Fig. 5.

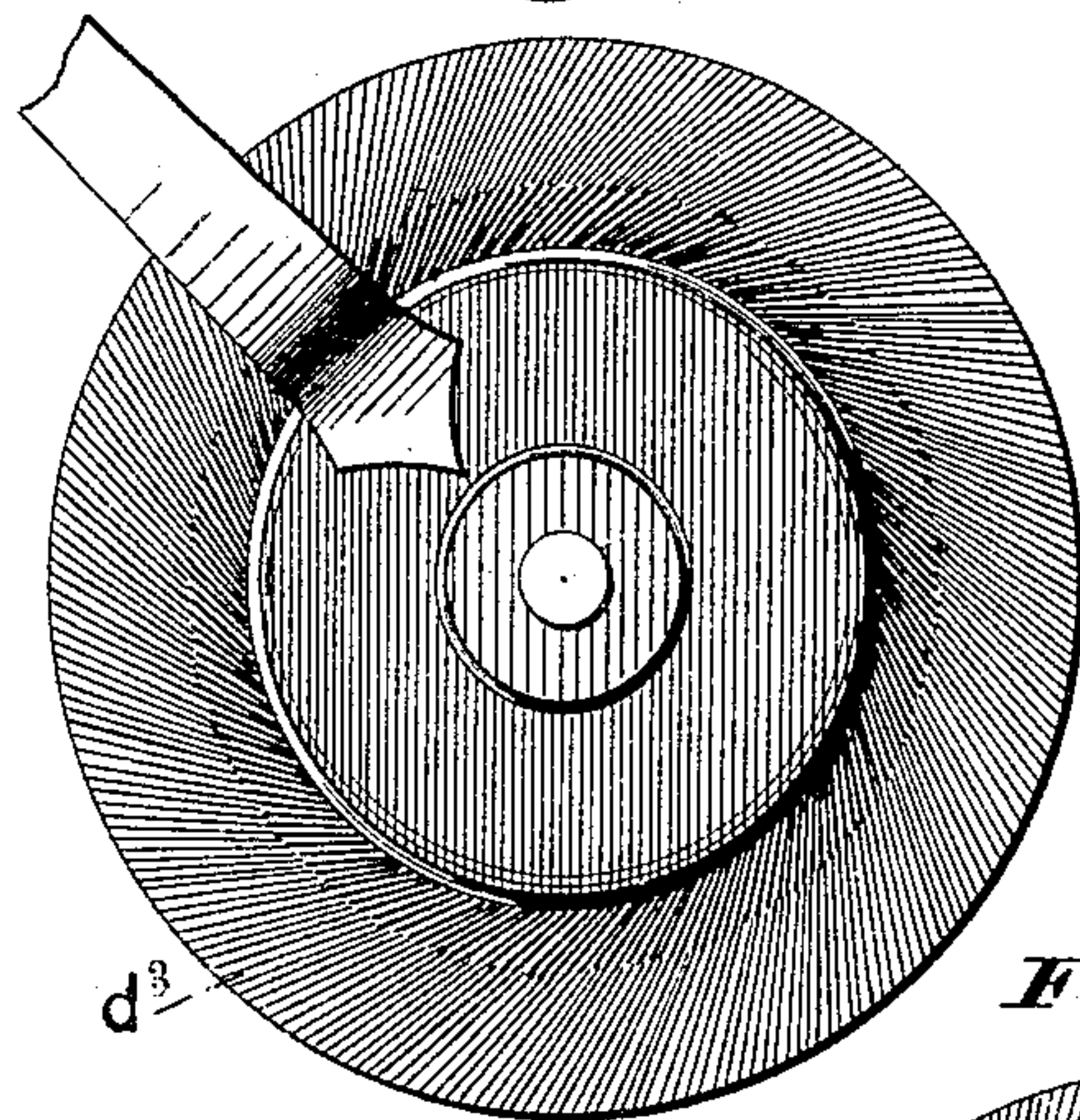


Fig. 6.

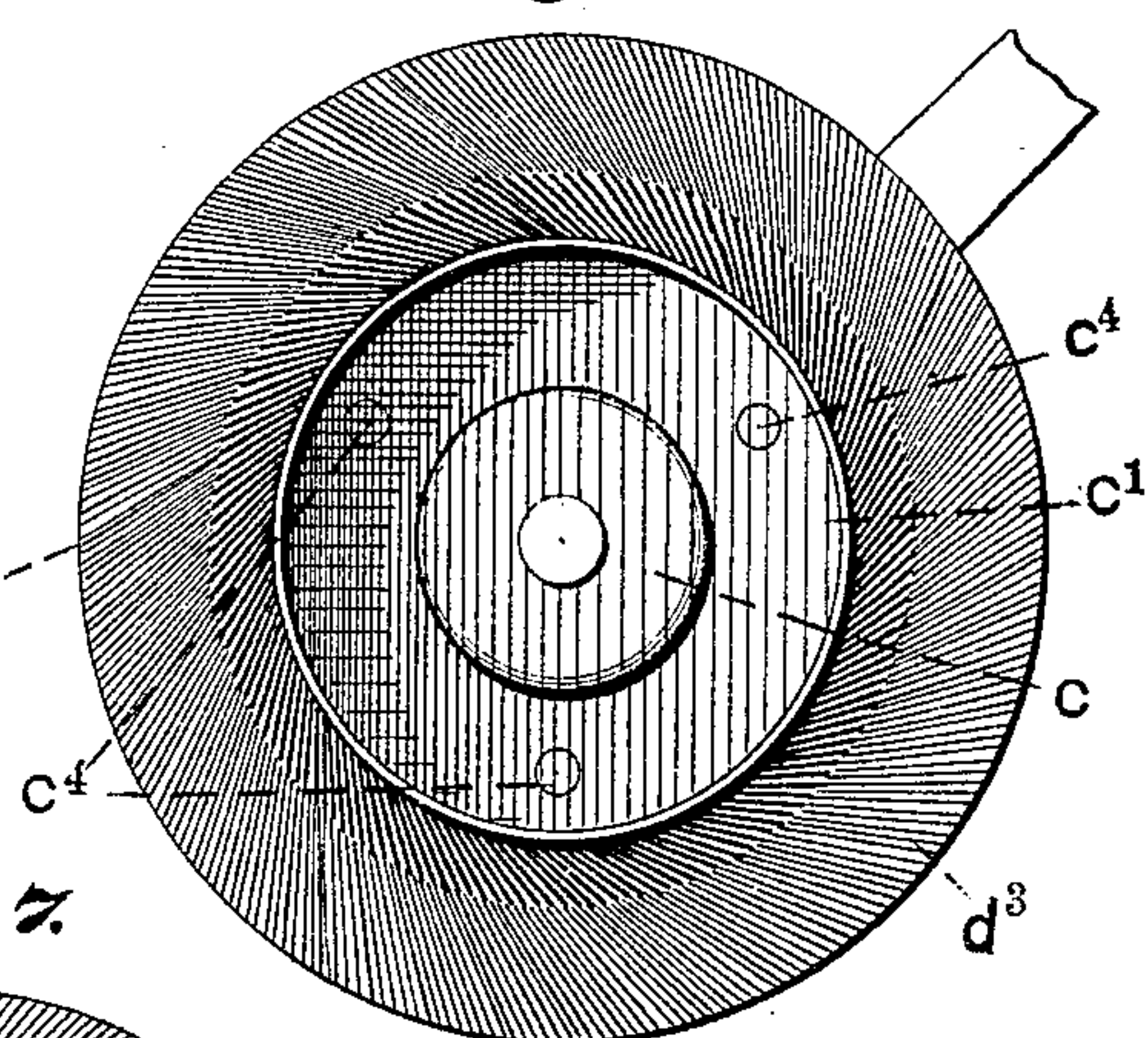
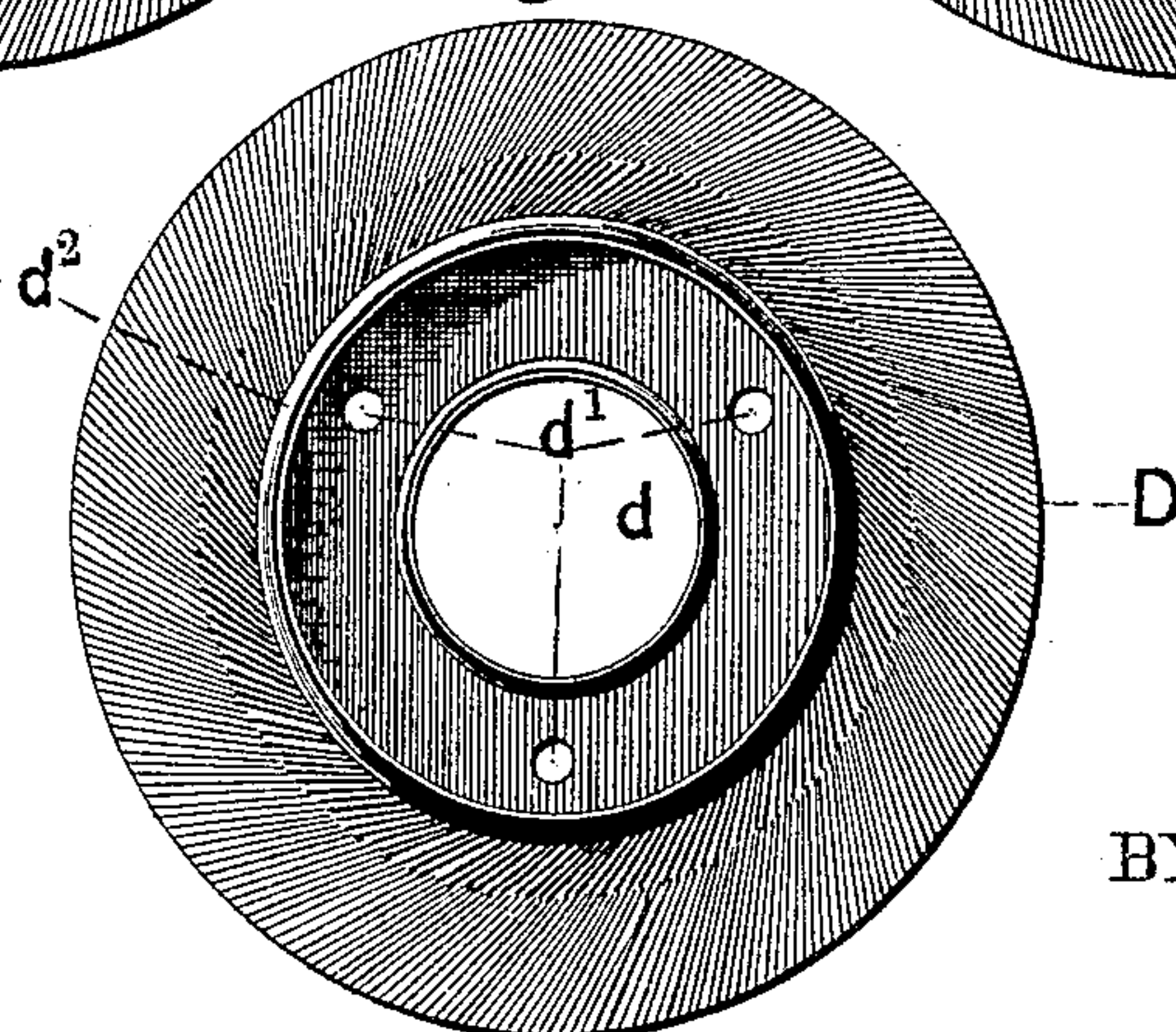


Fig. 7.



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Fig. 8.

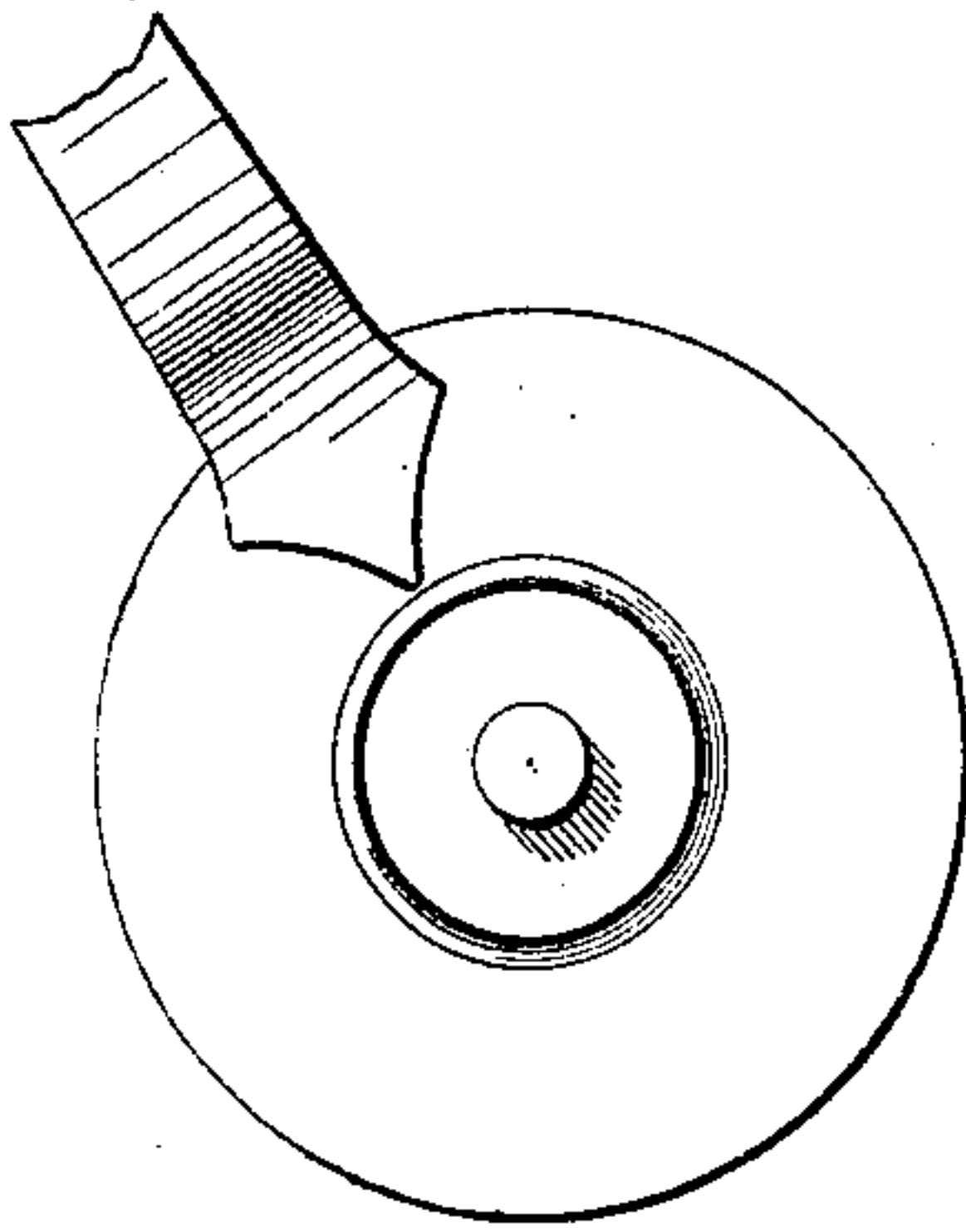


Fig. 9.

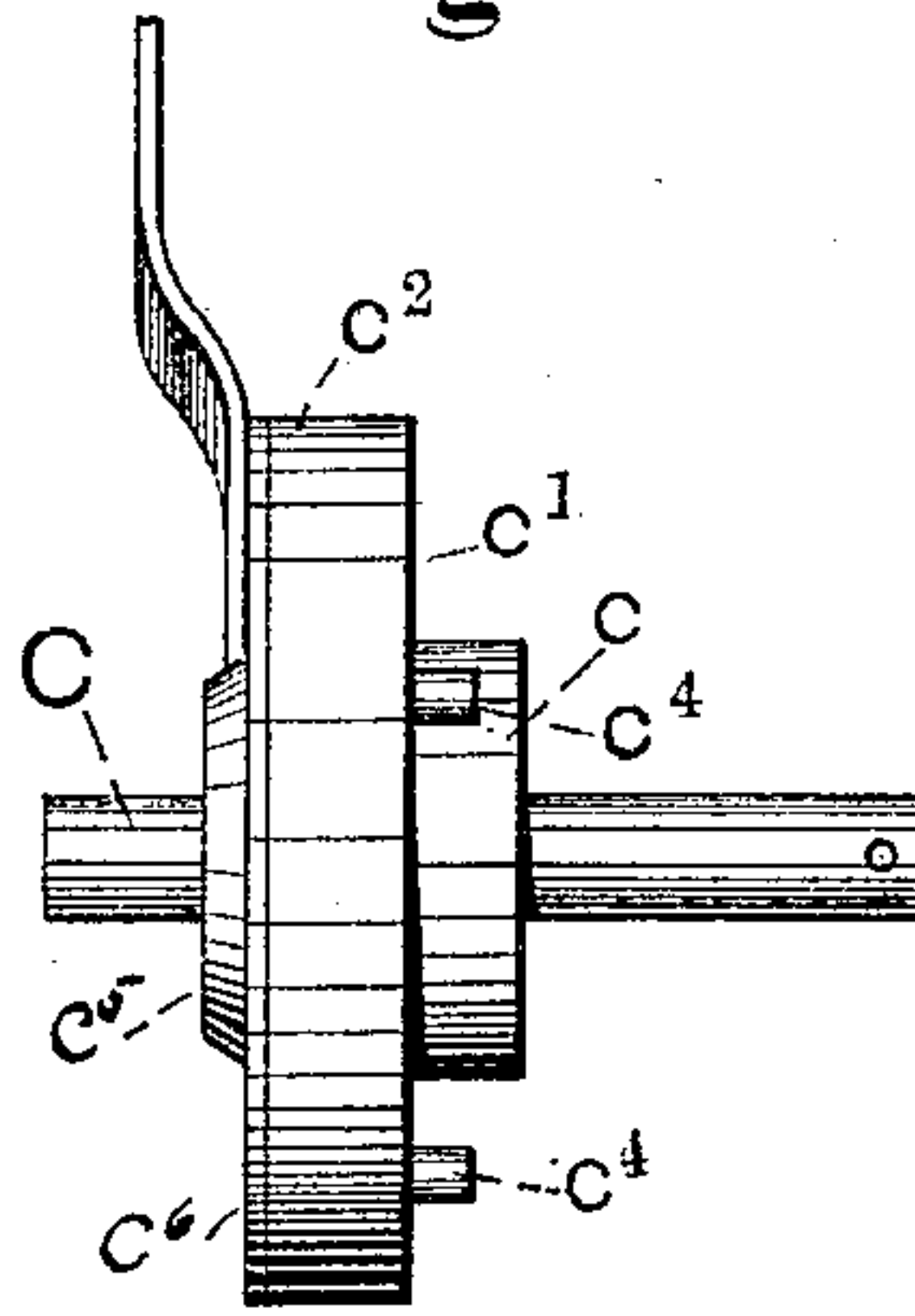


Fig. 10.

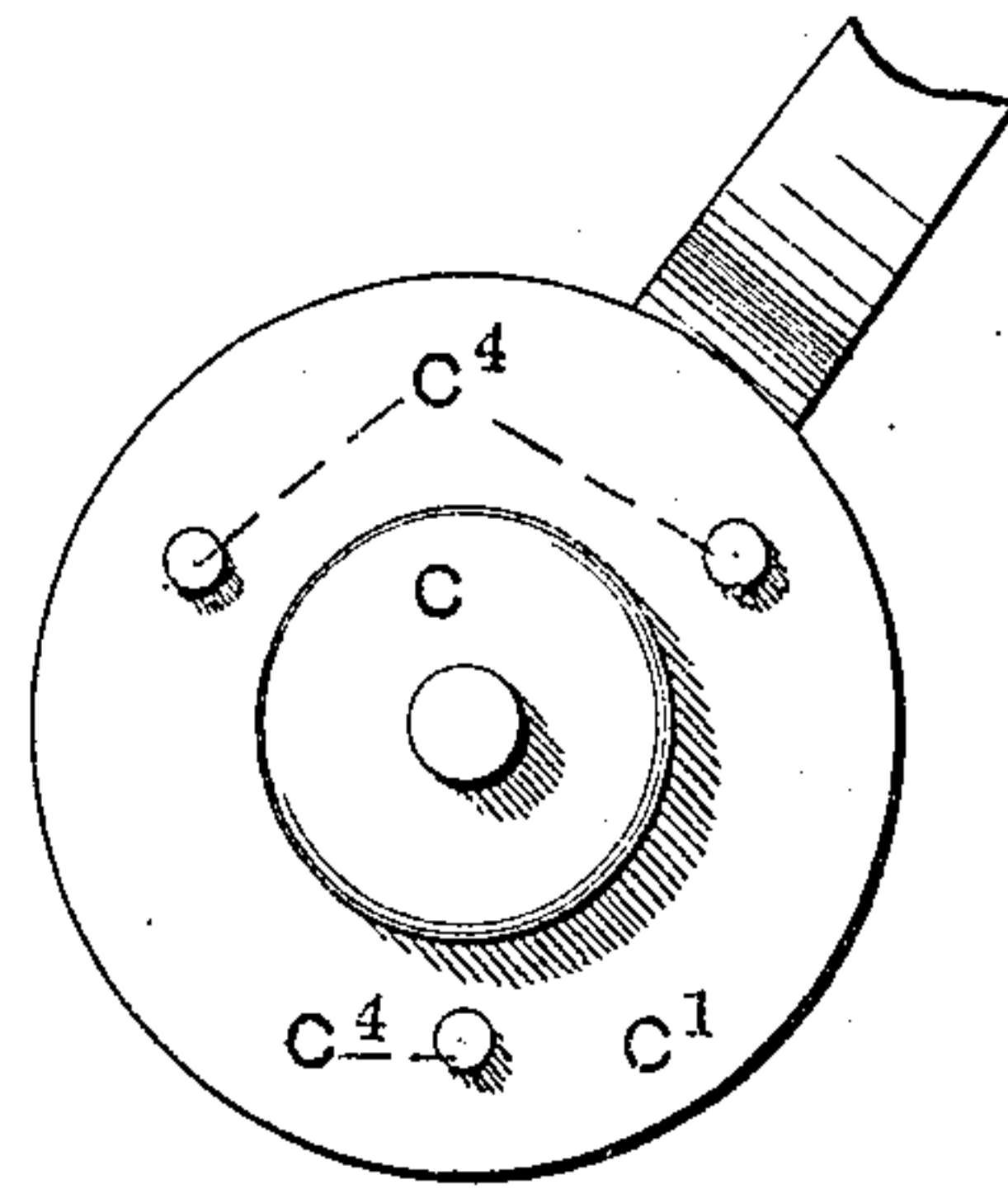


Fig. 11.

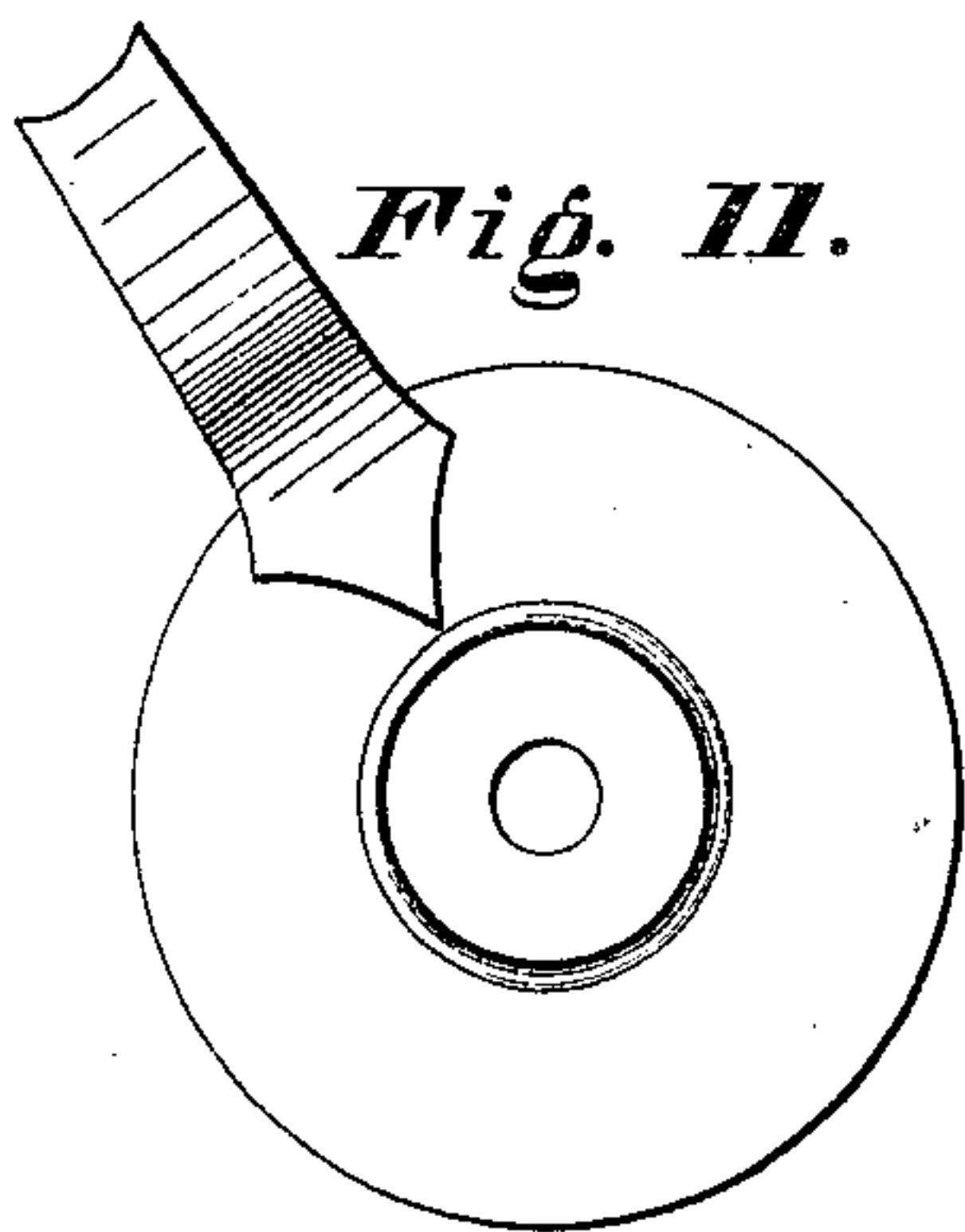


Fig. 12.

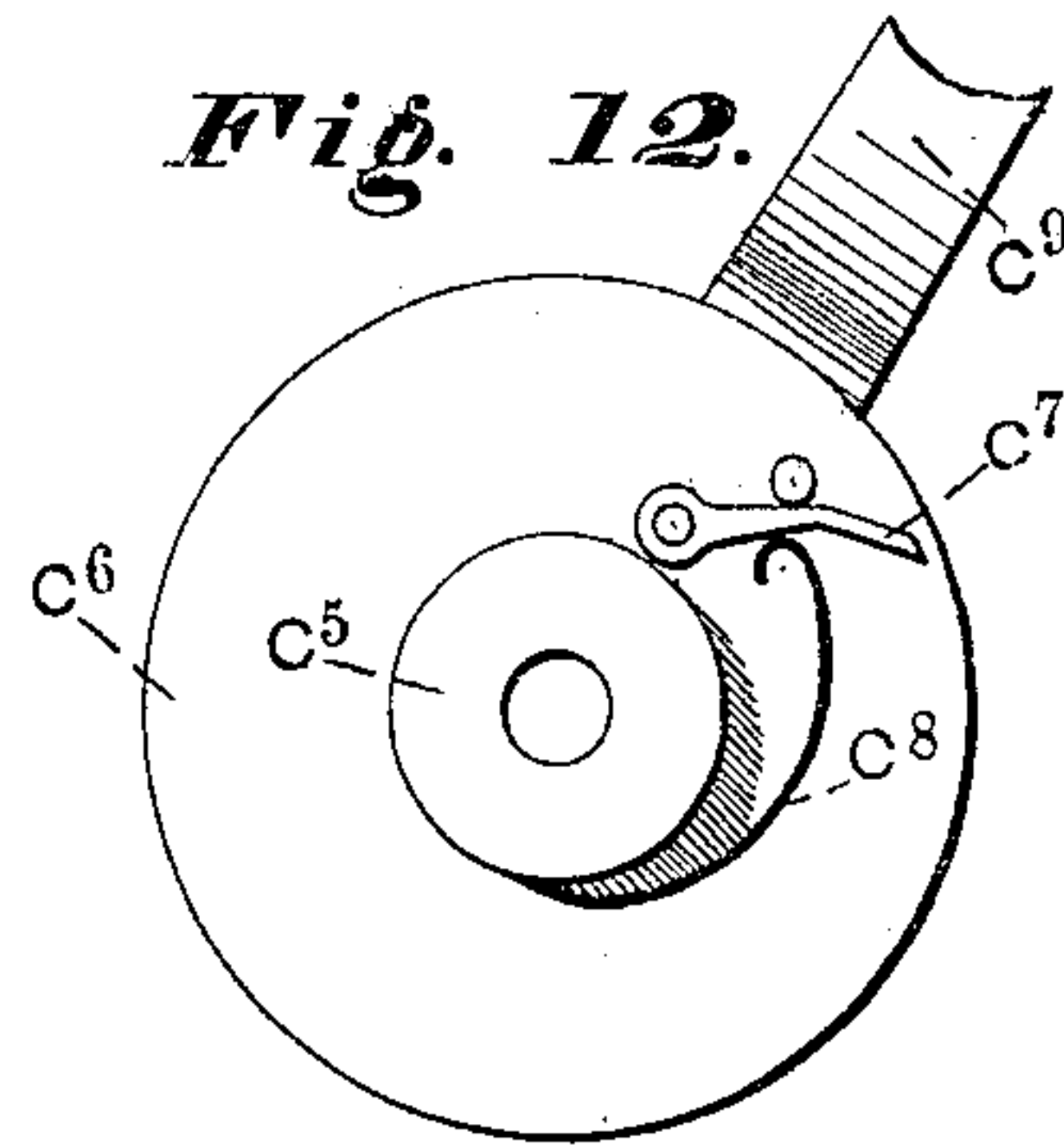


Fig. 13.

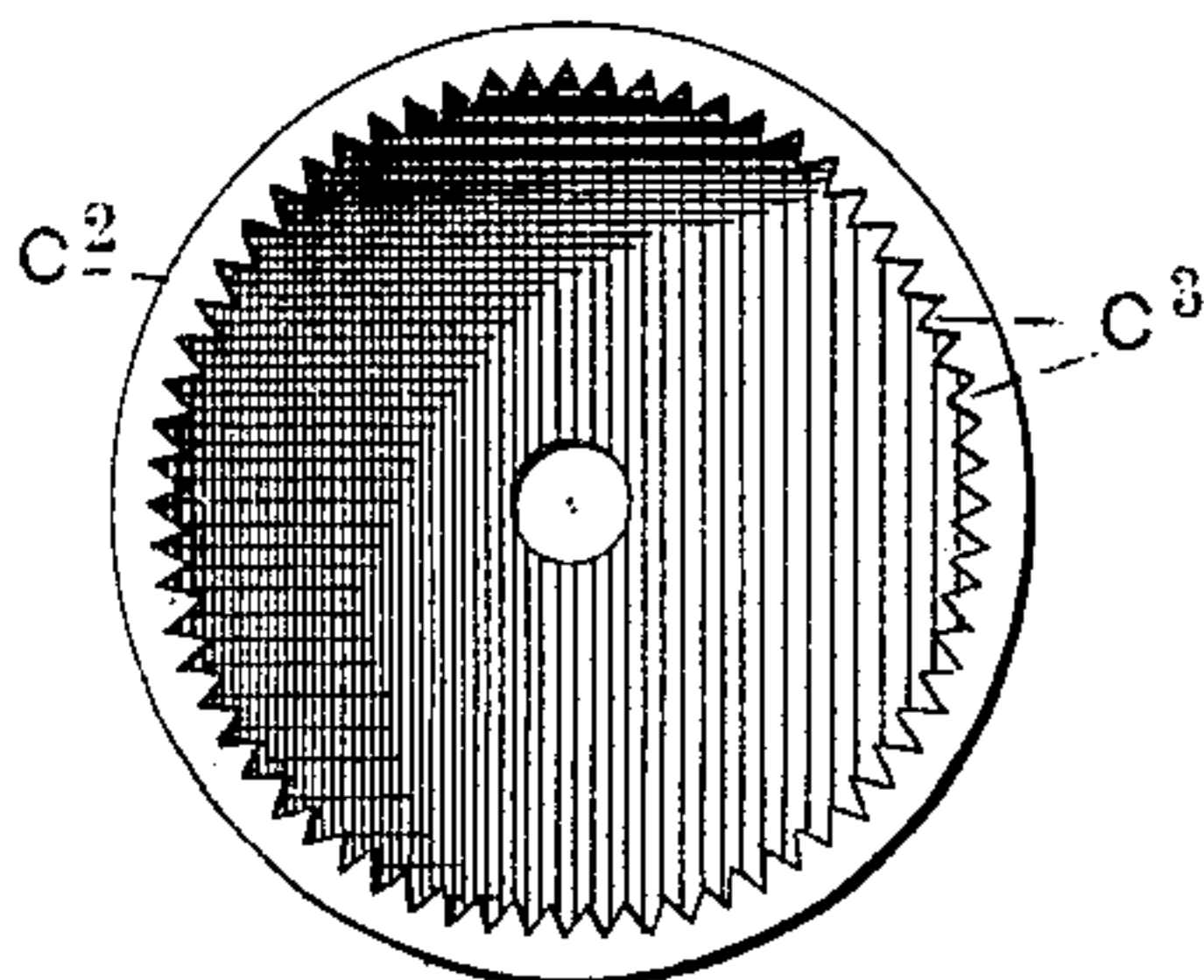
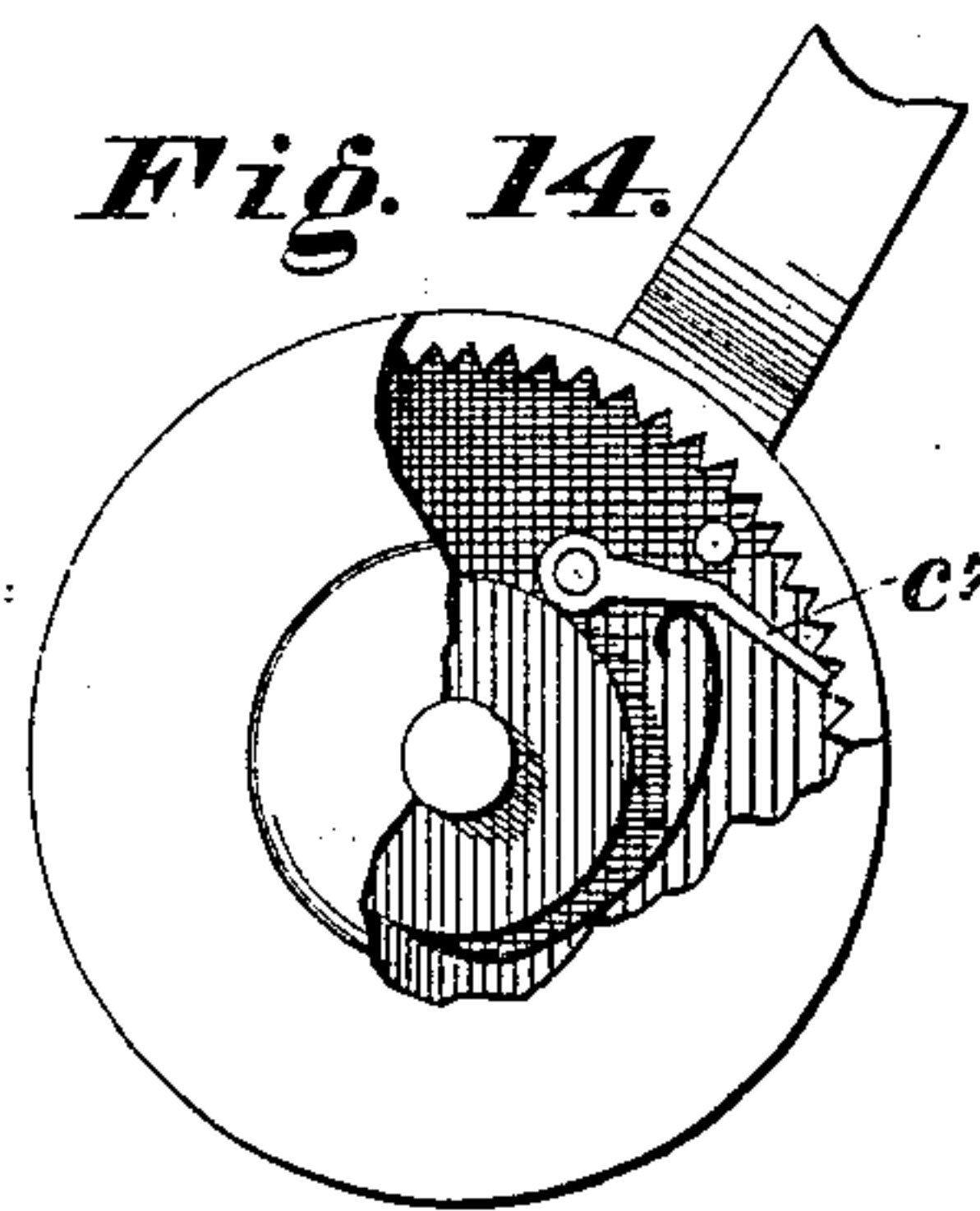


Fig. 14.



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Fig. 15.

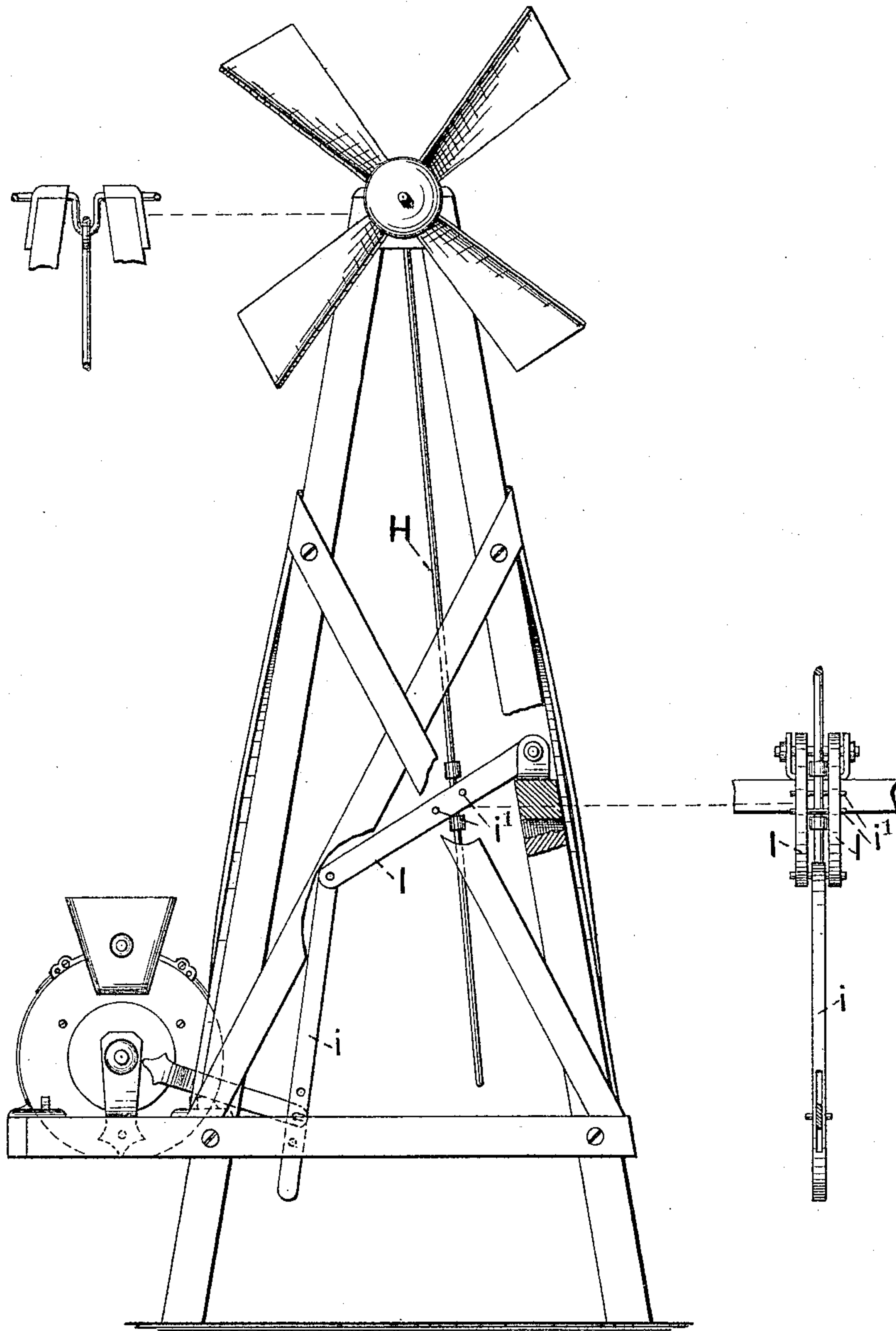
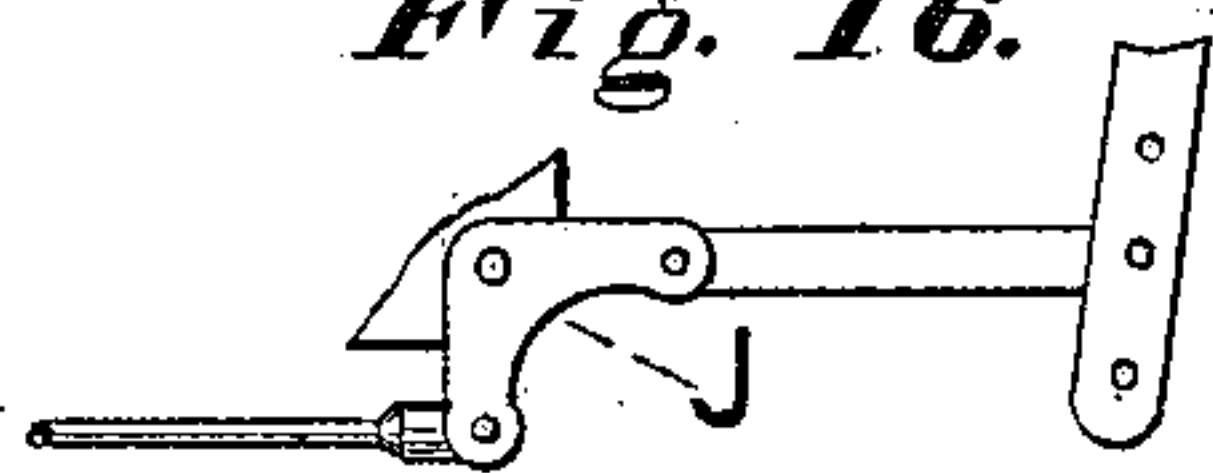


Fig. 16.



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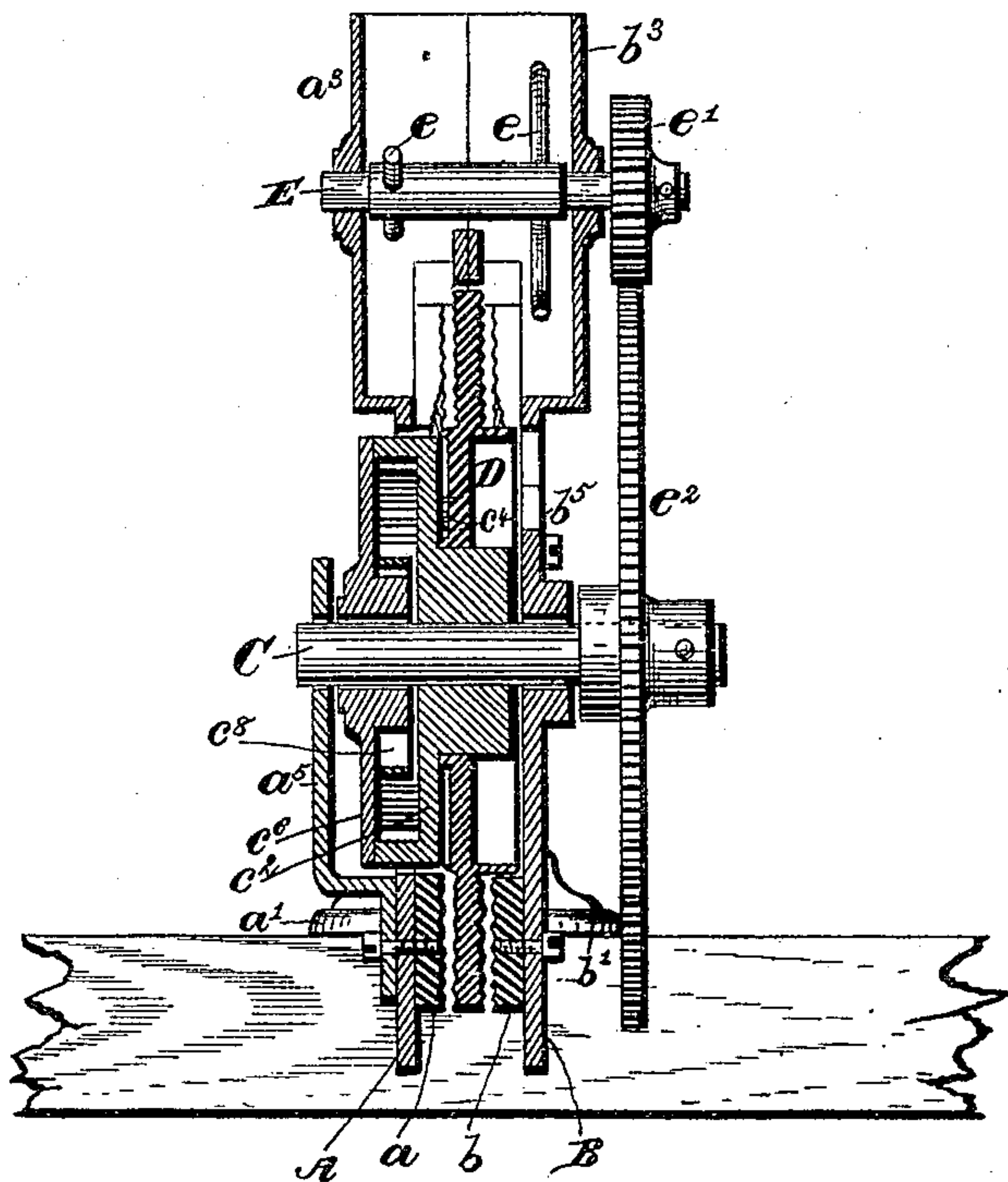
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Fig. 17.



Witnesses.

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By West & Bond.

Atty.

UNITED STATES PATENT OFFICE.

LEVI M. DEVORE AND DANIEL C. STOVER, OF FREEPORT, ILLINOIS, ASSIGN-
ORS TO SAID DEVORE AND ELAM B. WINGER, OF SAME PLACE.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 269,923, dated January 2, 1883.

Application filed December 19, 1878.

To all whom it may concern:

Be it known that we, L. M. DEVORE and D. C. STOVER, of Freeport, county of Stephenson, and State of Illinois, have invented new and useful Improvements in Grinding-Mills; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Figures 1 and 2 are side elevations, looking at opposite sides of the mill. Figs. 3 and 4 are elevations showing the insides of the respective plates with the stationary grinding-rings attached; Figs. 5 and 6, side elevations, looking at opposite sides of the central ring and its connecting devices and operating-lever; Fig. 7, a side elevation of the lever side of the central ring with the lever and its disk or plate removed; Figs. 8, 9, and 10, details showing different views of the ring-supporting drum or plate and the operating-lever; Figs. 11 and 12, details showing opposite sides of the lever disk or plate; Fig. 13, a detail showing the interior of the actuating-drum; Fig. 14, a detail showing the drum and the lever-plate, with the drum partially broken away to show the pawl; Fig. 15, a side elevation, showing the manner of connecting the mill with the actuating mechanism of a windmill; Fig. 16, a detail representing the means for connecting the windmill with the grinding-mill when the latter is located at a distance. Fig. 17 is a transverse vertical section through the grinding-mill.

This invention relates to certain improvements in grinding-mills designed more especially for grinding small quantities of material, and adapted to be used with a windmill or other light motive power, and to that class of such mills in which the grinding devices consist of two stationary rings and a central movable ring, between which the material is forced and ground on both sides, the material being placed in a suitable hopper provided with agitators for feeding the material, and the rings being incased or inclosed between plates having a suitable opening for the discharge of the ground material.

The object of this invention is to perfect

and improve the arrangement of the grinding-rings in their relation to each other and to the devices by which the movable center ring is actuated; to improve the form of the case for the ring and the hopper for the material, and the location of the grinding-ring in reference to the hopper, so as to insure a direct and more reliable feed; to improve the form and construction of the stationary grinding-rings; to improve and simplify the connection or attachment between the center grinding-ring and the journal or arbor by which it is actuated and the devices for imparting the required movement to the journal or arbor, and to simplify and improve generally the construction, arrangement, and operation of the mill; and its nature consists in the features of construction and combination hereinafter described and claimed.

In the drawings, A represents a plate of metal forming one of the side plates of the mill, and consisting essentially of a ring or annular portion, a , with flanges or ears a' , having suitable openings, a^2 , through which bolts or other fastening devices can be passed to secure or attach the mill to a frame-work or support of any required form. This plate A has an extension, a^3 , cast or formed therewith, which forms one-half of the hopper, a suitable opening, a^4 , being provided at the proper point for the passage of shaft or arbor of the agitator and to furnish a bearing therefor. As shown, the periphery of the plate A is provided adjacent to the hopper-extension a^3 with an ear or lug, a^7 —one on each side of the base of the hopper. These ears are each provided with two openings, one of which, a^9 , is for the passage of a bolt, a^{10} , by means of which the plate A is connected with its corresponding plate, and the other, a^{11} , is for the passage of a pivot or pin, which forms the hinges for the respective covers, as hereinafter described. As shown, the periphery of the plate at the point just above the flanges or ears a' on each side is provided with ears or lugs a^8 , each of which has an opening, a^9 , for the passage of a bolt similar to a^{10} , and for the same purpose.

B is a plate corresponding to the plate A, just described, and having a ring portion, b , with attaching-flanges b' , with openings b^2 and

extension b^3 , forming the other half of the hopper, and having a hole or opening at the point b^4 for the passage of the agitator-shaft, forming a bearing therefor, and having its periphery provided with ears or lugs b^7 b^8 , with openings b^9 and b^{11} , the arrangement of these several devices being similar to the arrangement of the corresponding devices, a , a^3 , a^4 , a^7 , a^8 , a^9 , and a^{11} , of the plate A, so that when the two plates are brought together their corresponding parts will coincide, and they can be united by passing suitable bolts, a^{10} , through the openings a^9 b^9 in the lugs a^7 b^7 a^8 b^8 , and form a casing and a hopper, as shown in Fig. 1. Each plate A B is provided with a central circular opening.

C is a shaft or arbor, one end of which is supported in an upright or standard, a^5 , secured in any suitable manner to the outer face of the ring or plate A, the unattached end of such standard having a suitable opening, a^6 , to receive the end of the shaft or arbor and form a bearing therefor, and the other end of this shaft or arbor is mounted in a support formed of radiating arms or a spider, b^5 , attached in any suitable manner to the outer face of the plate or ring B, which support or spider is provided with an opening, b^6 , in line with the opening a^5 , through which the end of the shaft C passes, and which forms a bearing therefor. A hub, c , is formed with or firmly attached to this shaft C, and this hub is provided with an annular disk or flange, c' , around the periphery of which is an overhanging flange, c^2 , the inner face of which is provided with serrations c^3 . The face of the flange c' is provided with a series of pins, c^4 , three, as shown, arranged in a circle equidistant from the center of the flange, which pins or studs project out from the face of the disk on the hub side, as shown in Fig. 9. A hub, c^5 , is loosely mounted on the shaft C, which hub is provided with a disk or flange, c^6 , on the face of which, adjacent to the disk c' , is pivoted a pawl, c^7 , the free end of which is arranged to engage with the serrations or ratchet-teeth c^3 of the rim or flange c^2 . This pawl is held in engagement with the serrations or ratchet-teeth by a spring, c^8 , one end of which is attached to the hub c^5 and the other arranged to bear against the pawl in such manner as to hold the pawl in engagement when the plate or disk c^6 is advanced and allow the end of the pawl to ride over the serrations or teeth when the plate or disk is receded. The plate or disk c^6 is attached in any suitable manner to the inner end of an arm or lever, c^9 , which lever is of sufficient length to project beyond the peripheries of the plates A B when the parts are together, and is provided on its outer end with a series of adjusting-holes, c^{10} , for making the connection between the lever and the motive power at different points in relation to the center of motion of the plate c^6 to give a longer or shorter stroke to the lever, and consequently a greater or less arc of rotation to the plate or disk c^6 and the center ring which it operates. When the parts are together the inner face of the

disk c^6 bears at its edge or periphery against the face of the flange or rim c^2 , and the pawl c^7 is in position to engage with the ratchet-teeth or serrations c^3 .

D is the central grinding-ring, consisting of an outer ring having on each side or face grinding-ridges which form the grinding-surface, and having its center provided with a web having a central circular opening, d , adapted to fit the hub c , and provided also with a series of openings, d' , corresponding to the studs or pins c^4 , to receive the studs or pins and connect the ring with the backing-plate c' . At the point of junction of the web and the annular grinding-ring upon one side, extending entirely around, is an outwardly-projecting flange or rim, d^2 . The opposite side, which, when the parts are together, lies adjacent to the face of the plate c' , is left plain or unprovided with a flange or rim, so as to fit against the face of c' , or nearly so, the diameter of the web corresponding to the diameter of the plate, or nearly so, so that the plate can enter the depression formed by the web in the ring D.

The stationary grinding-rings, represented by the letters a^{12} b^{12} , are each formed from an annular ring, not continuous, but having a portion cut away transversely to leave an opening corresponding in length to or nearly to the length of opening in the hopper, through which the material can pass to enter the grinding-surfaces. Each ring corresponds in diameter and width to the diameter and width of the grinding-face or rim portion d^3 of the center ring, and is provided with a grinding-face similar to the grinding-faces of the ring D on that side which lies adjacent to the face of the center ring. The opposite side or face of each ring a^{12} b^{12} is left plain or smooth, approximately, so as to fit against the inner face of the plate A or B, to which the rings a^{12} b^{12} are respectively secured. These rings a^{12} b^{12} are attached to their respective plates, so as to bring the transverse opening of each in line with the hopper-opening, and they may be held securely in place by means of screws a^{13} , as shown, or in some other suitable manner. The circular openings in the center of the ring and the circular openings at the centers of the plates A B are of the same or nearly the same diameter, and the diameter of these openings corresponds to the outer diameter of the flange or rim d^2 and the flange or rim c^2 and plate c^6 , and when the parts are together the plate c^6 has its periphery coinciding with the periphery or face of the opening at the center of the plate A, and lies within such opening. The lever c^9 , which is attached at its lower end to the outer face of the disk or plate c^6 , is bent or curved outward at the circumference of the plate c^6 , so that its main portion will come outside of the plate or ring A.

From the foregoing it will be seen that when the rings a^{12} b^{12} are attached to their respective plates with the transverse opening of each in line with the hopper, and the ring D is connected with the backing-plate c' through the

openings d' in its web or center and the pins c^4 on the face of the plate c' , with the hub c passing into the circular opening d at the center of the web, and the plate c^6 is placed in position with its inner face in contact with the face of the flange or rim c^2 , and the shaft C is mounted in its end supports, $a^5 b^5$, and the plates A B attached together by the bolts a^{10} or in any other suitable manner, the acting or grinding devices are inclosed within the case or shell, and at the same time the drum or rim c^2 , with the flange or rim d^2 , completely fills and covers the space formed by the circular openings at the center of the grinding-rings, and furnishes a support or rest on which the material can lie and a guard to prevent the material from escaping after it has passed to the grinding-surfaces, except at the outer circumference or periphery of the grinding-rings.

E is a shaft, supported at its ends in the openings $a^4 b^4$ of the hopper, and having one of its ends projecting beyond the outer face of the hopper, to which end is suitably secured a pinion, e' , which gears with a wheel, e^2 , located upon the end of the main shaft C, which projects beyond the face of the plate B for that purpose. The shaft E has attached thereto arms or agitators e , which are arranged in two sets or series—one on each side of the center ring—so as to come in line with the hopper-opening and the transverse opening for the feed in the respective rings $a^{12} b^{12}$, so as to act on the material and force it down to pass to the grinding-surfaces through the openings in the stationary grinding-rings.

F are covers, one hinged to each ear a^7 by the pin or pivot which passes through the opening a^{11} . These covers, as shown, extend from their point of connection with the ear a^7 around to or nearly to the ear a^8 , and that portion of the rings a between the terminal points of the covers is left open and forms the opening for the discharge of the material when ground, and, as shown, the terminal point of each cover is provided with a catch, f , to engage with the bolt which passes through the lower lugs, $a^8 b^8$, and locks or holds the cover down. As shown, that portion of the case between the ears or lugs $a^7 b^7$ on each side is closed by inwardly-projecting flanges extending from the base of the hopper portion to the end of the ear, terminating at the point where the cover is applied.

Other means than the ears or flanges could be used for attaching the mill to a suitable frame or support, and the two sections of the casing formed by the plates A B could be secured together by some other arrangement than the arrangement of ears and connecting-bolts shown and described.

In use the lever c^9 is to be connected by any suitable means with the motive power, so as to have given thereto an oscillating or vibrating movement, which movement of the lever gives the plate c^6 an oscillating or rocking movement on the shaft C, and through the

pawl c^7 , engaging with the ratchet-teeth or serrations on the rim or flange c^2 , gives the plate c' an intermittent rotary movement, communicating a corresponding movement to the center grinding-ring, and also producing a similar movement for the shaft C, which shaft operates the wheel e^2 , and through the gear-pinion e' gives an intermittent rotation to the shaft E and the beaters or agitators e .

The operation is as follows: The material to operated upon is placed in the hopper and power is applied to the lever c^9 , giving the center ring, D, shaft C, and beater-shaft E an intermittent rotary movement, as just described. The beaters or agitators force the material from the hopper to the feed-openings into the grinding-surfaces on each side of the center ring, the material being delivered to both grinding-surfaces on each side of the center ring, and being ground by both surfaces through the intermittent rotary movement of the center ring, and, when ground, passing from between the grinding-surfaces at the periphery of the grinding-rings through the discharge-opening, as usual.

As shown in Fig. 15, the mill is shown as being used in connection with a windmill.

H represents the driving-rod of the windmill, having thereon at the proper point two rings or collars arranged to engage with levers l , one end of which is pivoted in any suitable manner to the frame-work of the mill, and the other has pivoted thereto a link or rod, i , the lower end of which can be connected by a pin or bolt, or otherwise, with such one of the openings c^{10} in the lever c^9 as is required to give the lever the desired length of stroke. As shown, two arms or levers, l , are provided, one on each side of the rod H, and stay-pins i' are provided, passing through the levers transversely, forming an opening in which the rod plays. Instead of two levers, l , a single lever could be used, if desired, and other means than the levers and the link could be provided for connecting the rod with the actuating-lever of the mill.

In operation the stroke of the pump-rod or pitman is communicated to the mill-lever, giving such lever its vibratory or oscillating movement and producing the intermittent rotary movement described for the operation of the center grinding-ring and the other devices.

By using the links and levers intermediate between the pump-rod and the mill-lever and providing adjustable collars or rings on the pump-rod, the length of stroke can be increased or diminished by adjusting the collars without changing the stroke of the pump-rod or pitman.

When the grinding-mill is located at a distance from the windmill the connection between the two can be made by means of a quadrant or bell-crank device, J, (shown in Fig. 16,) suitable connecting-rods being provided.

If desired, a large hopper to contain a large

amount of the material may be located over the hopper formed with the plates A B.

The center ring passes between the two stationary grinding-rings and covers the transverse cut-away portion or opening in each ring, into which the material passes, and thus it will be seen the material will be caught by the face of the center ring and carried into the space between the grinding-faces of the stationary ring and the center ring on each side, the center ring acting to this extent to feed the material from the transverse opening into the grinding-space.

By the arrangement shown and described a direct feed from the hopper through the stationary rings transversely is formed, bringing the material in direct contact with the center ring on each side, so that the grinding is performed on both sides of the center ring equally. A housing or support is provided, by which the material is retained and prevented from passing inwardly beyond the line of the grinding-surfaces. A center grinding-ring is mounted, with its actuating devices, on the same main shaft, and the support for this ring, with the actuating devices therefor, are located within and around the center of the ring, occupying but a small space, and forming a guard or support by which the material is retained within the grinding-space. The connection for the grinding-ring is very simple, enabling the attachment of the ring to its driving-shaft to be quickly and readily made, and when in position the ring is free to conform to any slight irregularities in the feed. The same shaft which drives the grinding-ring also furnishes the means for driving the beater-shaft, and the entire arrangement is one that brings the working parts into a very small and compact space, and so as to be inclosed by the plates A B and the covers F to the extent required for protecting such parts, all of which features, when combined as shown and described, produce a mill simple in its construction and arrangement and well adapted for the grinding of small quantities, and which will not be liable to get out of order, as the actuating devices are covered or inclosed, so as not to be injured or broken by obstructions or otherwise.

What we claim as new, and desire to secure by Letters Patent, is—

1. The metal plates A B, having extensions to form the hopper, in combination with stationary grinding-rings, each having a cut-away portion to form a transverse opening, which leads from the circumference to the interior of the ring, for feeding, and adapted to be attached to the plates A B, substantially as specified.

2. The metal plates A B, having extensions to form the hopper, in combination with stationary grinding-rings, each having a cutaway portion forming transverse feed-openings leading from the periphery to the interior of the ring, and a movable grinding-ring, substantially as and for the purposes specified.

3. The metal plates A B, having extensions to form a hopper, in combination with stationary grinding-rings, each having a cut-away portion to form transverse feed-openings leading from its periphery to its interior, and a central opening, a central grinding-ring, and a drum supporting the central ring, substantially as and for the purposes specified.

4. The metal plates A B, having extensions to form a hopper, and stationary grinding-rings attached to the plates and having transverse cut-away portions and central openings, in combination with a central drum adapted to fill the central openings and furnish a support for the material, substantially as specified.

5. A central shaft having a drum, in combination with a central grinding-ring, stationary grinding-rings, each having a feed-opening leading from its periphery to its interior and located directly under the hopper, and plates or casing A B for supporting the central grinding-ring between the stationary grinding-rings, substantially as specified.

6. A central shaft, having a hub and a drum provided with pins or studs, in combination with a central grinding-ring, having a web or center with a central opening and a series of holes coinciding with the drum-pins for attaching the central grinding-ring, substantially as specified.

7. A central grinding-ring and a central shaft, having a hub and a drum for supporting a grinding-ring, in combination with a movable disk carrying devices, substantially as described, to engage with and move the drum, and loosely mounted on the central shaft for operating the central grinding-ring, substantially as specified.

8. An annular grinding-ring having at its center a web provided with a central opening and a series of holes, in combination with a backing-plate provided with a series of pins to interlock with the holes in the web of the ring and connect the plate and ring together, substantially as and for the purposes specified.

9. The combination of stationary grinding-rings, each having a transverse cut-away portion or mouth, and a movable grinding-ring located between the stationary grinding-rings, with a drum or center supporting the central grinding-ring and furnishing a base or support for the material, substantially as and for the purposes specified.

10. The combination of stationary grinding-rings, each having a transverse opening or cut-away portion, and a movable grinding-ring located between the stationary rings, and having a web or center provided with a series of holes, with a drum or plate having a series of pins connecting the drum and center ring and forming a rest for the material, substantially as and for the purposes specified.

11. The combination of stationary grinding-rings, each having a transverse cut-away portion or mouth and a central circular opening, and a central grinding-ring located between

the stationary rings, and provided with a web or center having a series of holes, with a drum or plate having a series of pins, and a shaft on which the drum is mounted, substantially as and for the purposes specified.

12. A shaft or arbor and a drum or backing-plate mounted thereon and provided with a series of pins, in combination with a movable grinding-ring having a web provided with holes for connecting the shaft, drum or plate, and ring, substantially as specified.

13. A shaft or arbor and a drum or backing-plate mounted thereon and provided with a series of pins, in combination with a central grinding-ring having a web provided with holes, stationary grinding-rings, and plates A B for connecting the several parts together, substantially as and for the purposes specified.

14. The combination of the shaft or arbor and movable grinding-ring with a backing or supporting plate which receives and supports the movable grinding-ring, and having a rim or flange on its periphery with internal serrations, substantially as and for the purposes specified.

15. A shaft or arbor, a movable grinding-ring, and a backing or supporting plate which receives and supports the movable grinding-ring of a grinding-mill, and having a flange or rim on its periphery provided with internal serrations, in combination with a movable plate or disk carrying devices to engage the serrations, and means for actuating the movable

plate, substantially as and for the purposes specified.

16. A central ring, a backing or supporting plate therefor having an internally-serrated rim or flange, and a shaft or arbor, in combination with a disk or plate carrying a pawl to engage the serrations, and an actuating-lever for the disk or plate, substantially as and for the purposes specified.

17. The combination, with the grinding-rings, of the beaters *e*, located on a shaft, *E*, in the hopper, and operating to force the material through the openings formed through the stationary grinding-rings, so as to lead from the periphery of each stationary ring to its center, said beaters being located one on each side of the central grinding-ring, substantially as described.

18. The plates A B, stationary grinding-rings, each having a transverse cut-away portion or mouth, movable grinding-ring, shaft, and backing-plate having a serrated flange, in combination with the movable disk or plate carrying a pawl, a lever attached to the plate or disk, and an actuating mechanism for moving the lever, substantially as and for the purposes specified.

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