

No. 772,699.

PATENTED OCT. 18, 1904.

M. J. DAVIDSEN.
BALL GRINDING MILL.
APPLICATION FILED OCT. 13, 1902.

NO MODEL.

Fig:1.

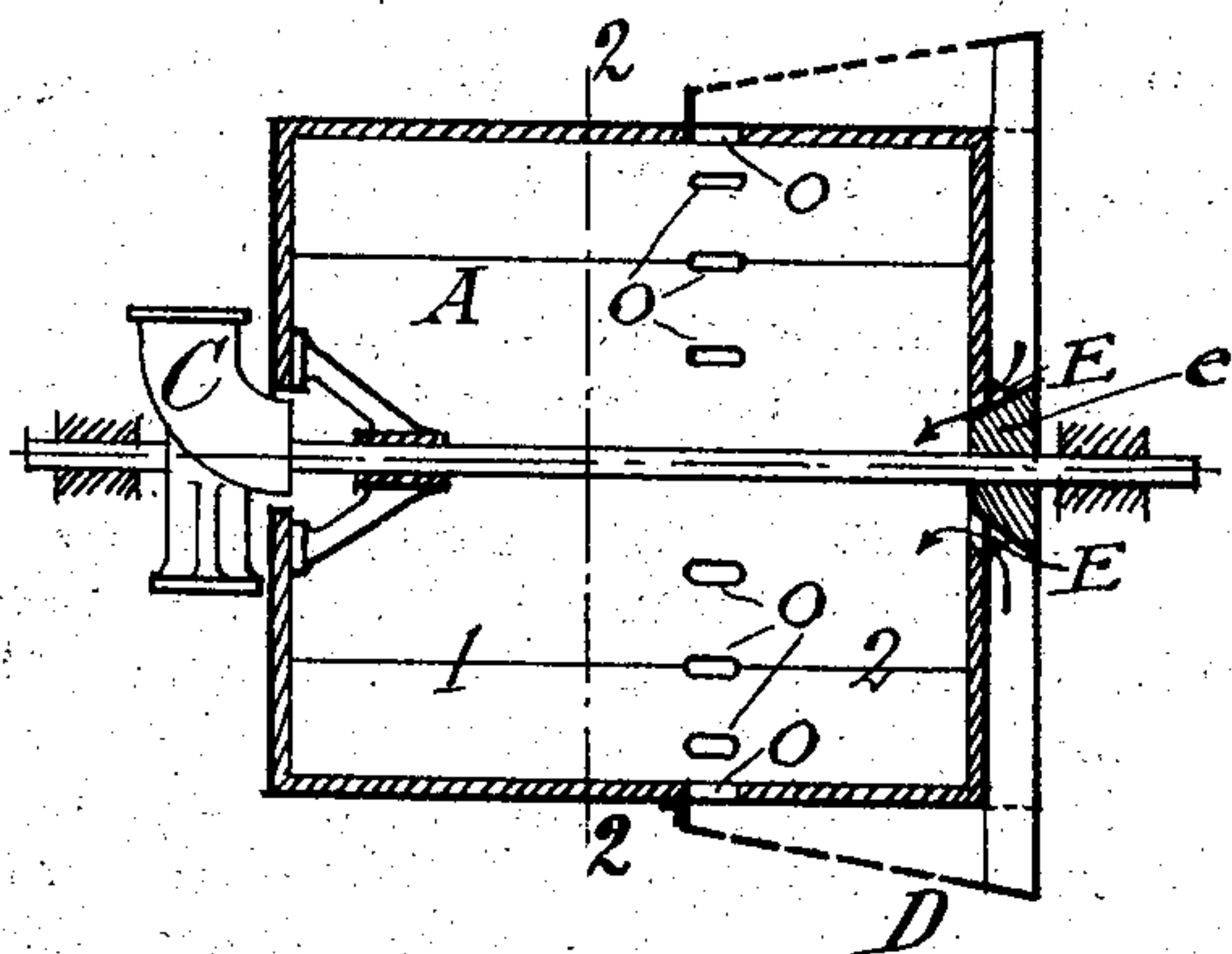


Fig:2.

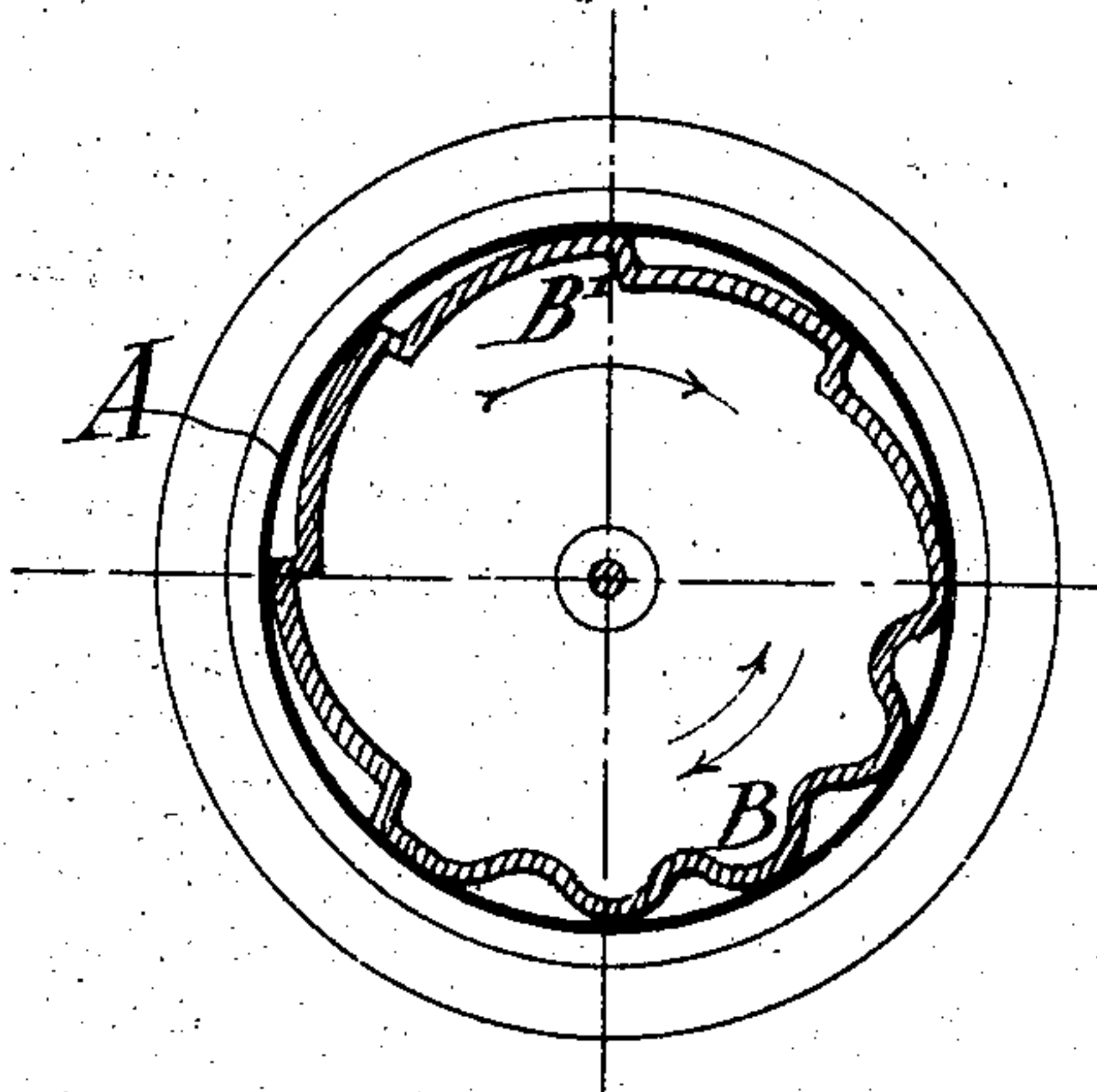


Fig:3.

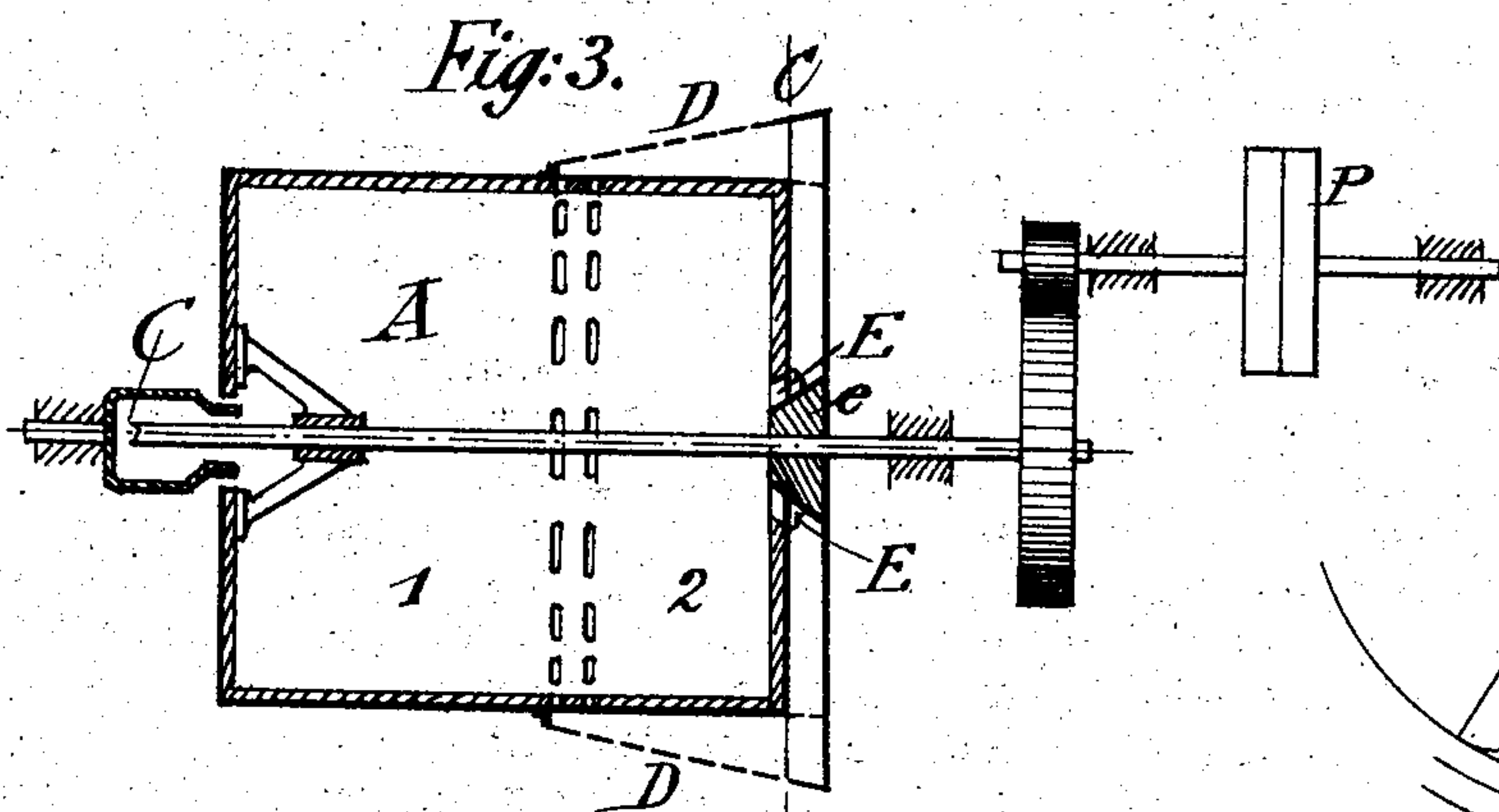


Fig:4.

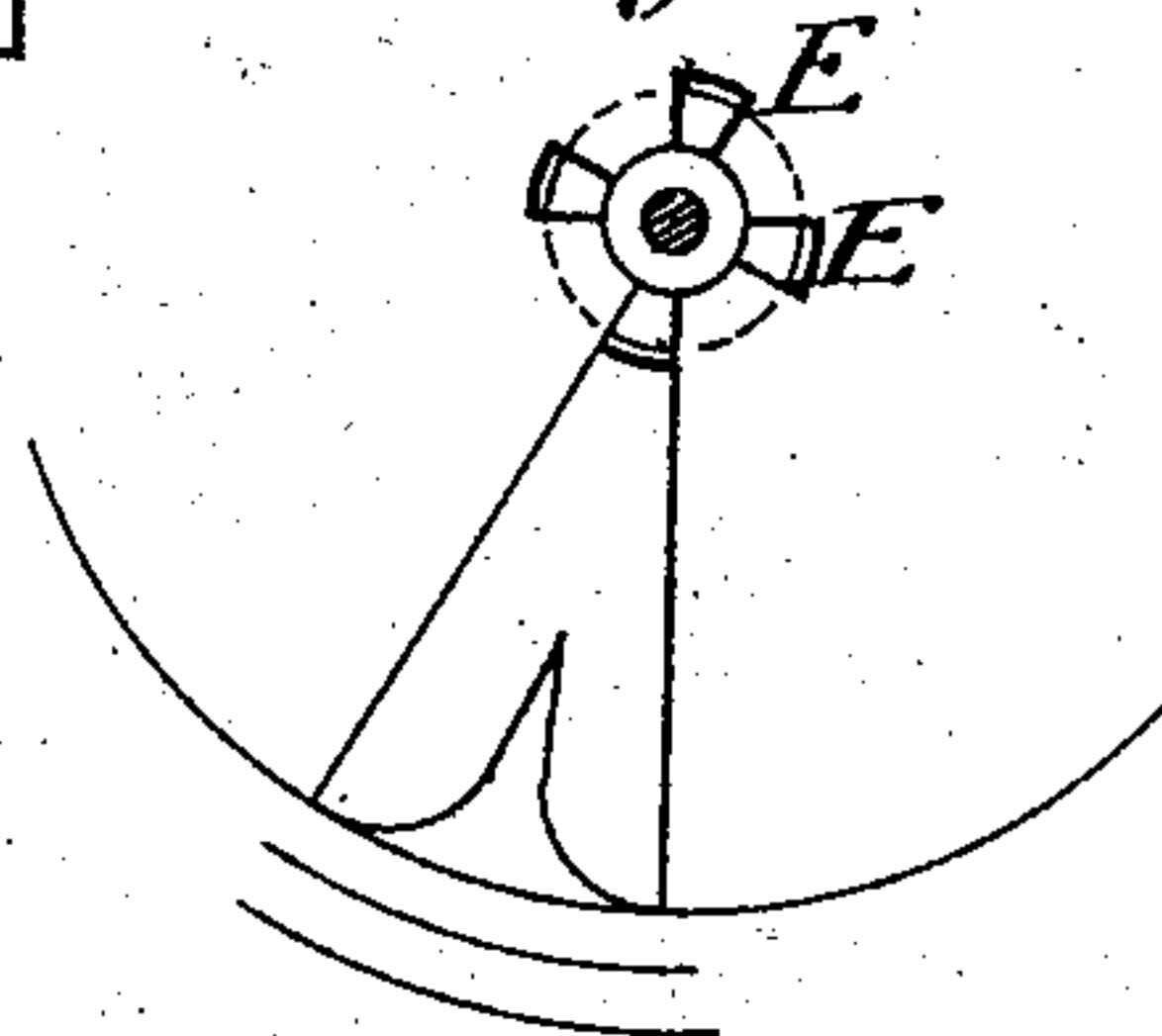
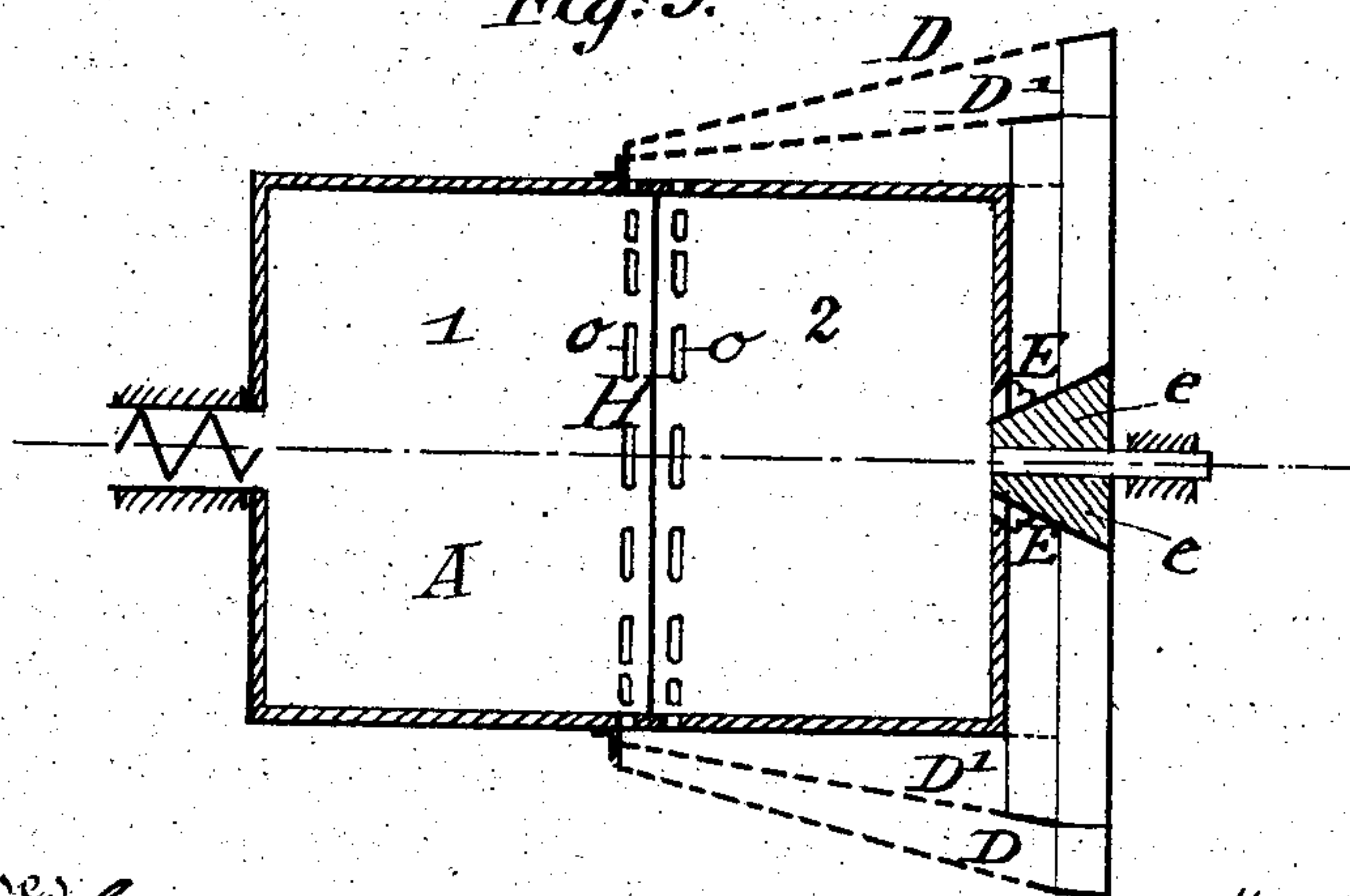


Fig:5.



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UNITED STATES PATENT OFFICE.

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BALL GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 772,699, dated October 18, 1904.

Application filed October 13, 1902. Serial No. 127,120. (No model.)

To all whom it may concern:

Be it known that I, MEYER JOSEPH DAVIDSEN, a citizen of the Kingdom of Denmark, residing in Copenhagen, in the Kingdom of Denmark, have invented certain new and useful Improvements in Ball Grinding-Mills, of which the following is a specification.

This invention relates to improvements in tubular ball grinding-mills, by which the tailings that are obtained after the first grinding and screening are not mixed with the fresh material fed into the ingoing end of the mill, but returned into the drum and ground separately therefrom.

In the ball grinding-mills heretofore in use, which are provided with screens that are attached to the drum in a permanently-fixed position, the ground material is conducted from the drum to the screens by means of openings that are located either at the outgoing end of the grinding-drum farthest away from the ingoing end of the same or the openings are arranged over the entire surface of the drum. In these mills the screened material or "tailings" that after the first grinding are still too coarse to pass through the screen are automatically conducted back into the grinding-drum through apertures arranged either in one of the ends of the drum or at some other suitable place on the same. By thus returning the tailings in the manner described to the drum they are mixed with the fresh material which is fed to the ingoing end of the drum, so that consequently the same grinding-balls have to deal with two kinds of material. As the tailings, however, have already been ground once, they are finer than the fresh material fed to the same, and it is therefore evident that as the tailings are mixed with the fresh material the crushing action of the balls on the latter will be considerably impeded. This is a great drawback, inasmuch as the grinding-balls being prevented from acting with their full force will necessarily cause a reduction of the grinding capacity of the mill.

The object of this invention is to obviate these objections and to return the tailings to a particular portion of the drum for the repeated grinding of the same separately from the fresh material fed to the ingoing end of

the drum; and for this purpose the invention consists of a tubular ball grinding-mill which comprises a drum that is provided at some distance from its ingoing end with a row of openings through which the tailings are discharged, a screen extending around the end of the drum and beyond the openings, a conical deflector on the shaft of the drum, and apertures in the screen-surrounded end of the drum adjacent to said deflector for returning the tailings into that part of the drum opposite to the ingoing end for regrinding them without mixing with the fresh material fed to the ingoing end of the drum; and the invention consists, further, of certain details of construction, which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of the improved ball grinding-mill. Fig. 2 is a vertical transverse section of the same, taken on line 2 2, Fig. 1. Fig. 3 is a horizontal section of a modified form of ball grinding-mill, showing the means for transmitting rotary motion to the drum thereof. Fig. 4 is a detail end elevation of the drum, showing the openings through which the tailings are returned to the drum, said openings being similar in all the forms of ball grinding-mills illustrated; and Fig. 5 is a horizontal longitudinal section of a second modified form of ball grinding-mill in which a partition is interposed between the two sets of openings for the discharge of the tailings.

Similar letters and figures of reference indicate corresponding parts.

In the construction shown in Fig. 1, A is the drum of the grinding-mill, which is lined with steel-plates B B', having corrugations or steps of various shapes, as shown in Fig. 2, for the purpose of carrying along the grinding-balls for a certain portion of the rotation and then make them fall down from different heights, according to the hardness of the material to be ground. The material to be ground is supplied at the ingoing end of the drum through a funnel C. The surface of the drum A is provided at a certain distance from the ingoing end with circumferential holes or openings o, through which the mate-

rial after having passed through that part of the drum marked 1 is dropped onto the surrounding screen D. That part of the material which has been ground finely enough to pass through the screen D will leave the mill, while the tailings are conducted along the screen D and are dropped in the space between the head of the drum and the head of the screen D onto a conical deflector *e*, that is placed on the shaft of the drum, and returned through inclined openings E in the head of the drum adjacent to said deflector *e* to the interior of the drum. The tailings are delivered through the openings E into that part of the drum which is marked 2, where they are subjected to a second grinding action by the balls in the drum without coming in contact with the fresh material fed into the same. The tailings after being ground a second time are conducted through the opening *o* onto the screen *d* and again returned to the part 2 of the drum.

In Figs. 3 and 5 are shown two rows of openings *o* instead of a single row of openings.

Rotary motion is imparted to the drum A by means of a suitable transmitting mechanism from a driving-shaft provided with a pulley P, as shown in Fig. 3.

When balls of different sizes are to be used, it will be preferable to separate the parts 1 and 2 of the grinding-drum A by means of a partition H, as shown in Fig. 5. In the same figure is also shown a modified arrangement of the screens, as two screens with different degrees of fineness are arranged.

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

1. A ball grinding-mill, consisting of a drum provided at some distance from its ingoing end with a row of openings, a screen extending beyond said row of openings and beyond the opposite end of the drum, a deflector on the shaft of the drum adjacent to the head of the same, apertures in said head adjacent to the deflector for returning the tailings for regrinding them in the end of the drum opposite to the ingoing end without mixing them with the material fed at the ingoing end of the drum, substantially as set forth.

2. A ball grinding-mill, consisting of a drum provided at some distance from the ingoing end of the same with a row of openings, a screen extending beyond said row of openings and beyond the end of the drum opposite to the ingoing end of the same, said screen being provided with a closed head, a conical deflector on the shaft of the drum adjacent to the head opposite to the ingoing end of the same, and apertures in said head adjacent to the deflector for returning the tailings into the end of the drum for grinding them independently of the fresh material fed through the ingoing end, substantially as set forth.

3. A ball grinding-mill, consisting of a drum provided at a certain distance from the ingoing end with several rows of openings, a plurality of screens extending around the openings and that part of the drum on the side opposite the ingoing end of the same, a conical deflector on the shaft of the drum adjacent to the head opposite to the ingoing end of the drum, and apertures in said head for returning the tailings for regrinding them without mixing them with the fresh material fed through the ingoing end of the drum, substantially as set forth.

4. A ball grinding-mill, consisting of a drum provided at a certain distance from the ingoing end with a plurality of rows of openings and a partition between said rows, a plurality of conical screens of different degrees of fineness extending around the openings and the end of the drum opposite to the ingoing end of the same, solid heads for said screens, a conical deflector on the shaft of the drum adjacent to the head of the drum opposite to the ingoing end, and apertures in said head for returning the tailings for regrinding them without mixing them with the fresh material fed through the ingoing end of the drum, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

MEYER JOSEPH DAVIDSEN.

Witnesses:

ERNEST BOUTARD,
EMIL MAURITZEN.