3 Sheets—Sheet 1.

J. MILLS.

Cooling and Ventilating Device for Grinding Mills.

No. 237,120. **Patented Feb. 1, 1881.**

Fig. 1

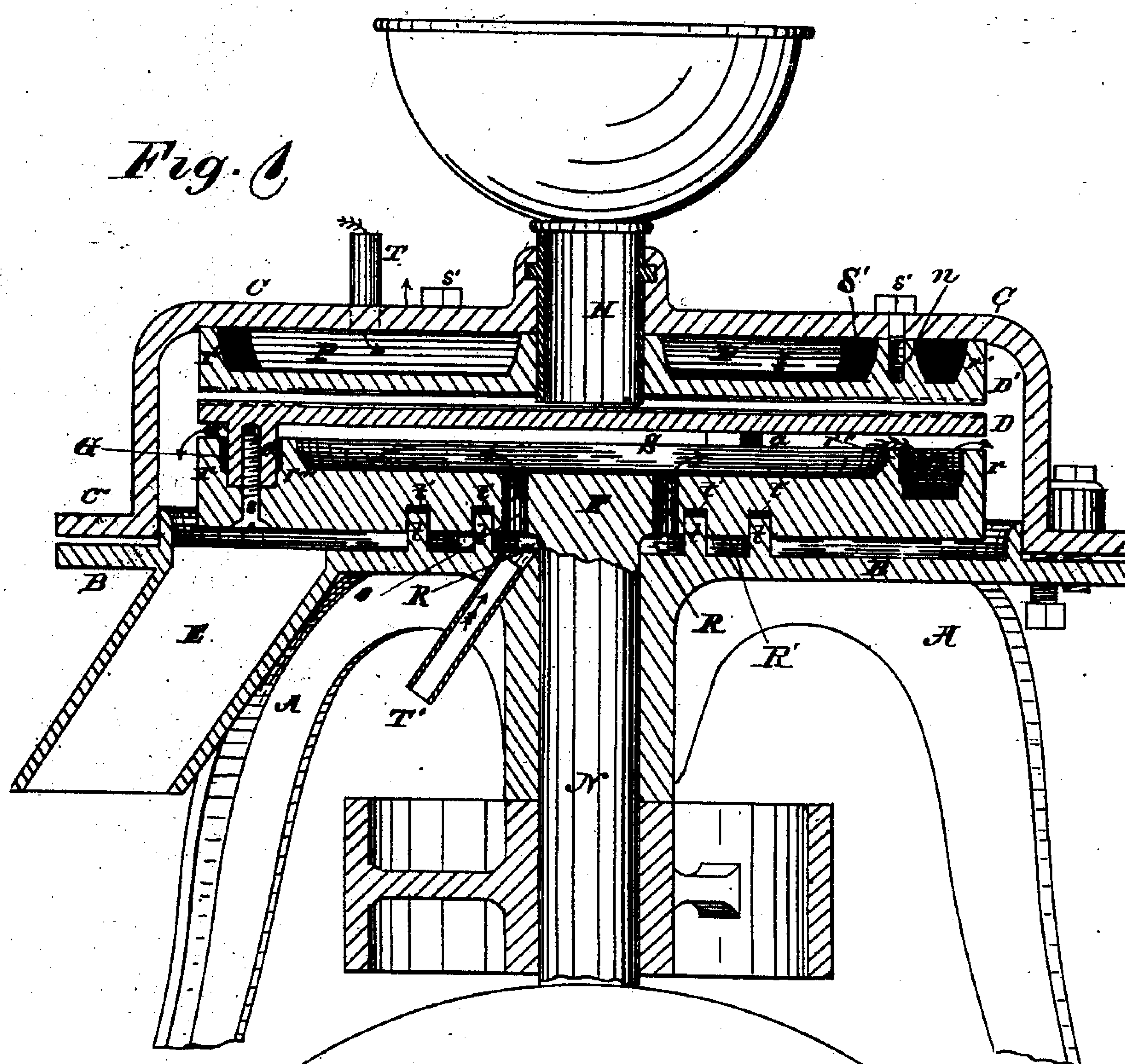

Fig. 2

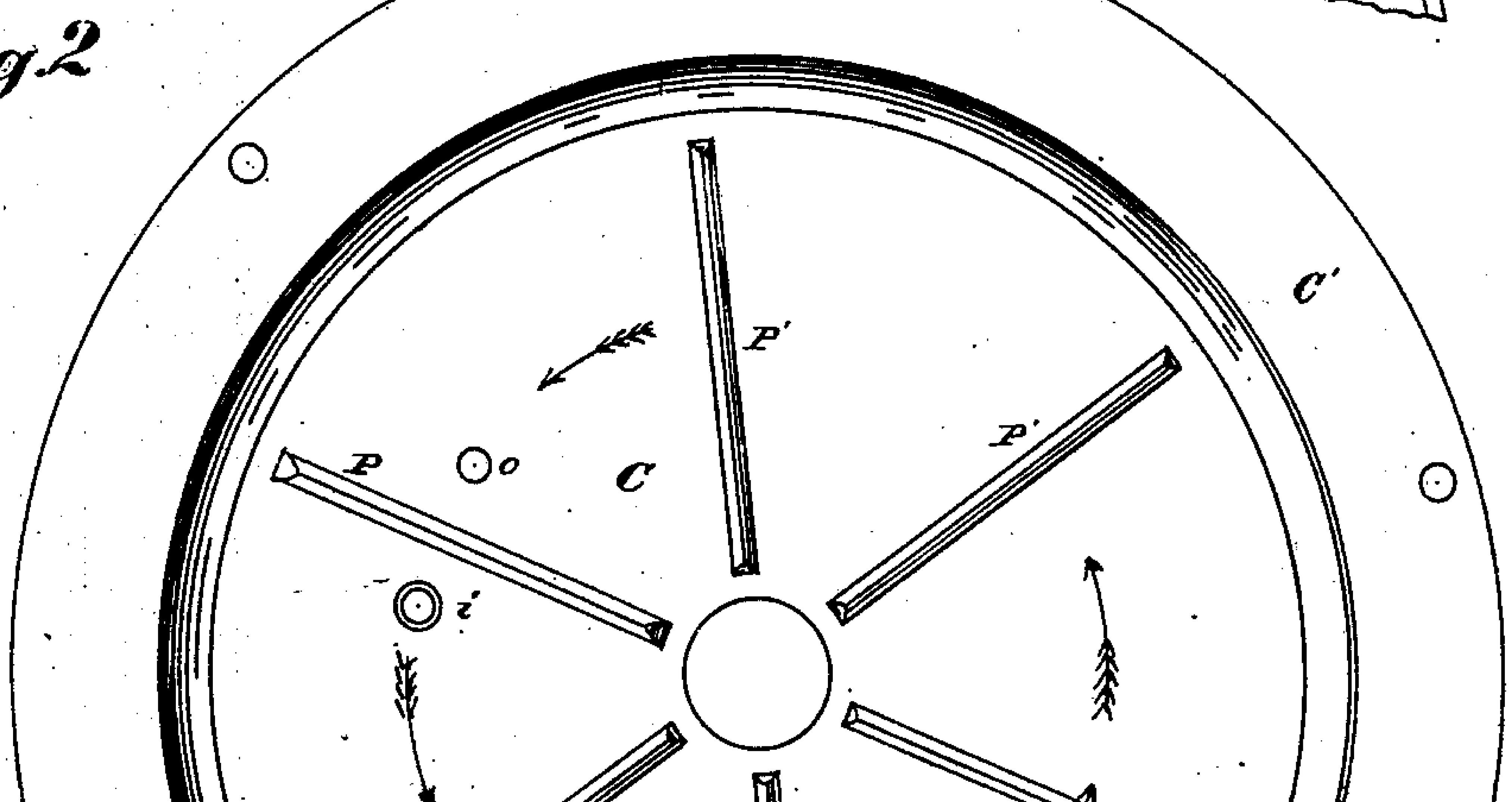

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Fig. 3

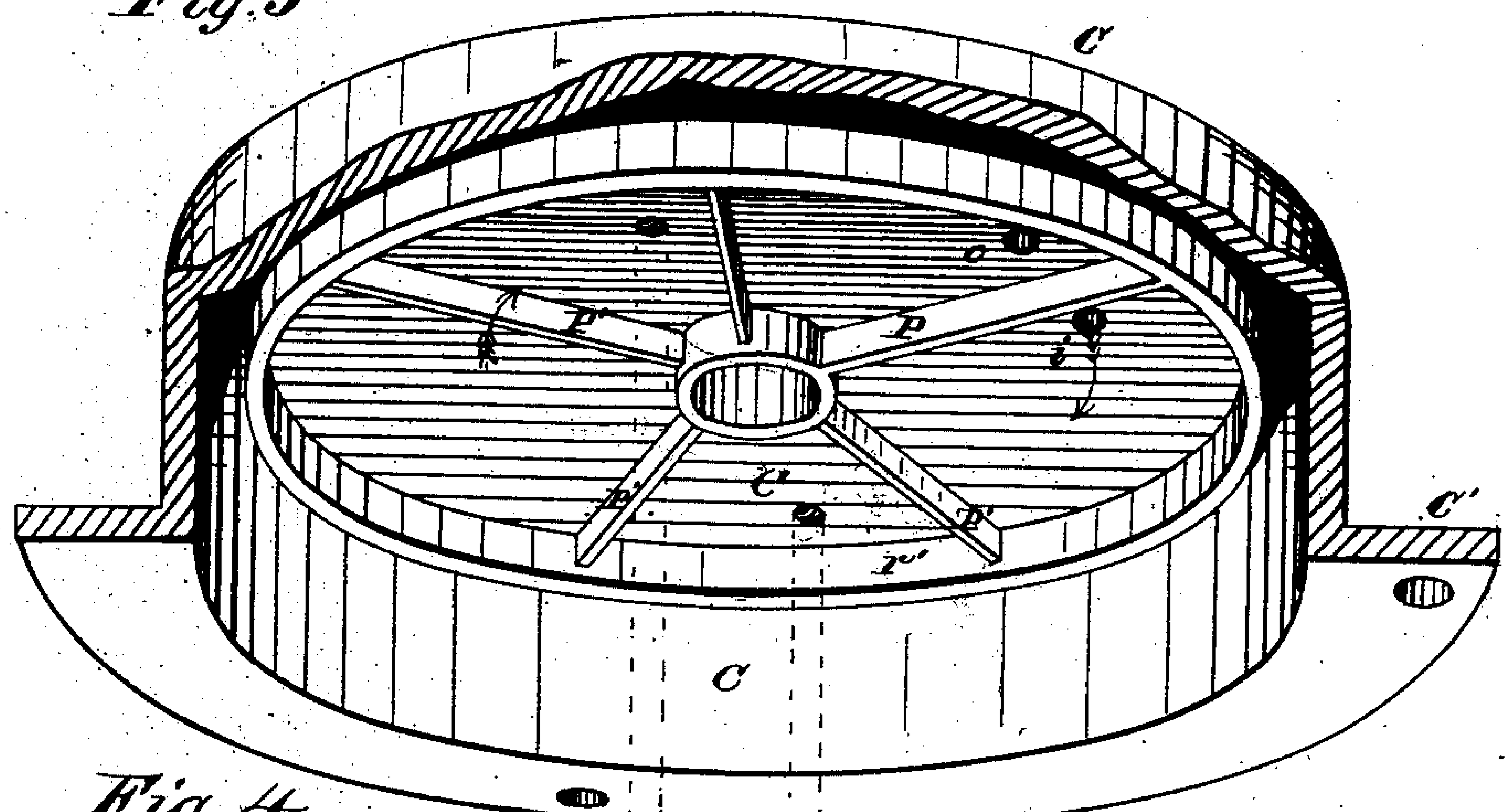

Fig. 4

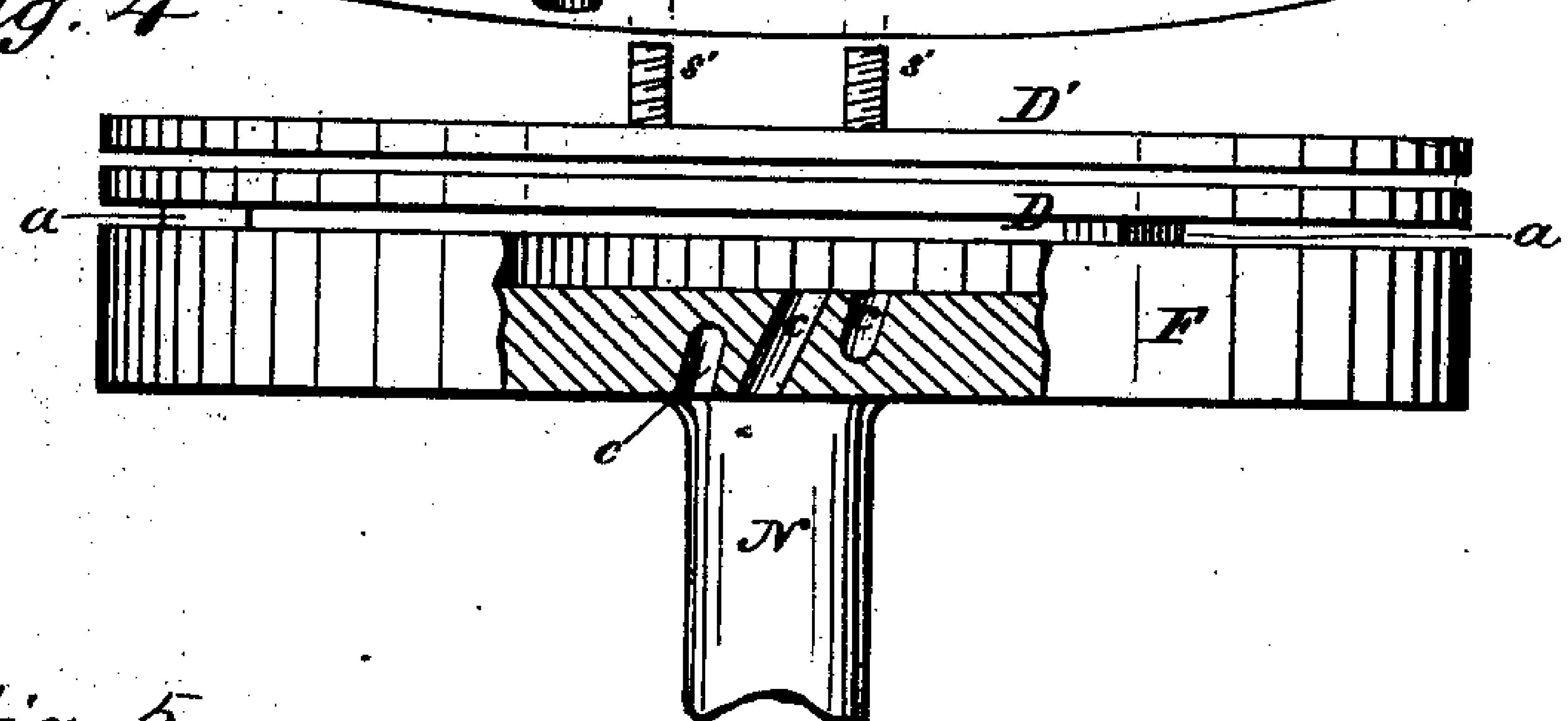

Fig. 5

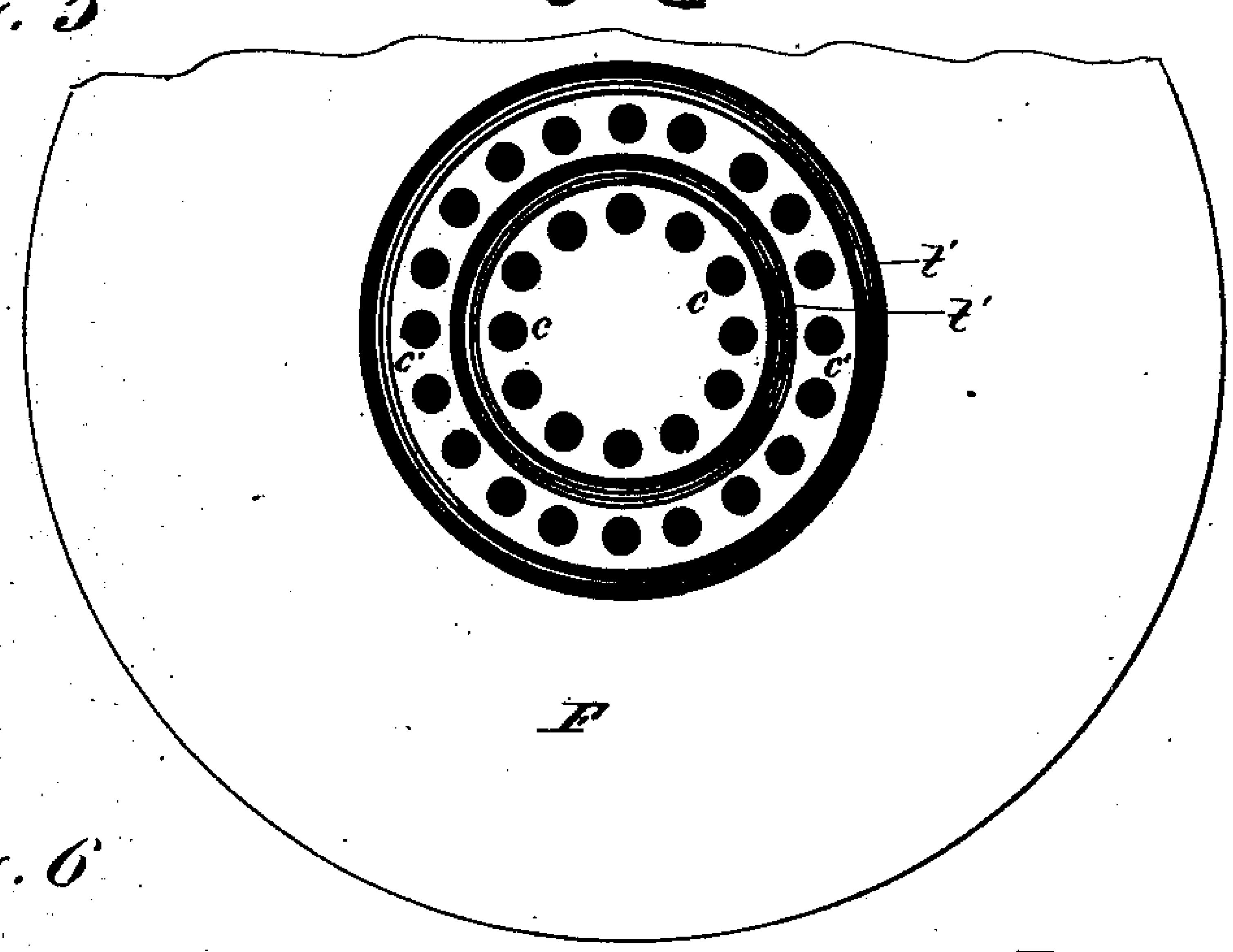

Fig. 6

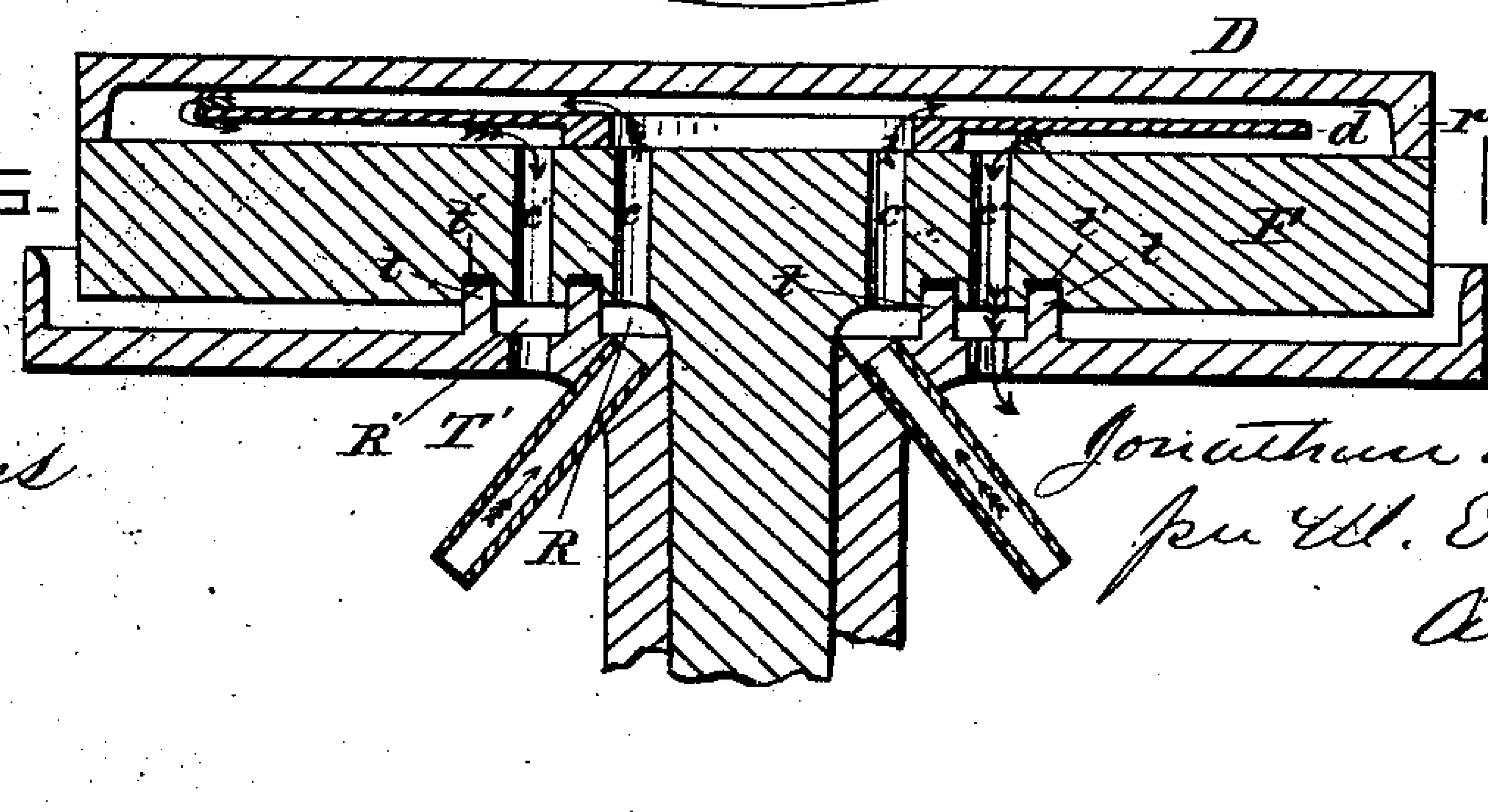

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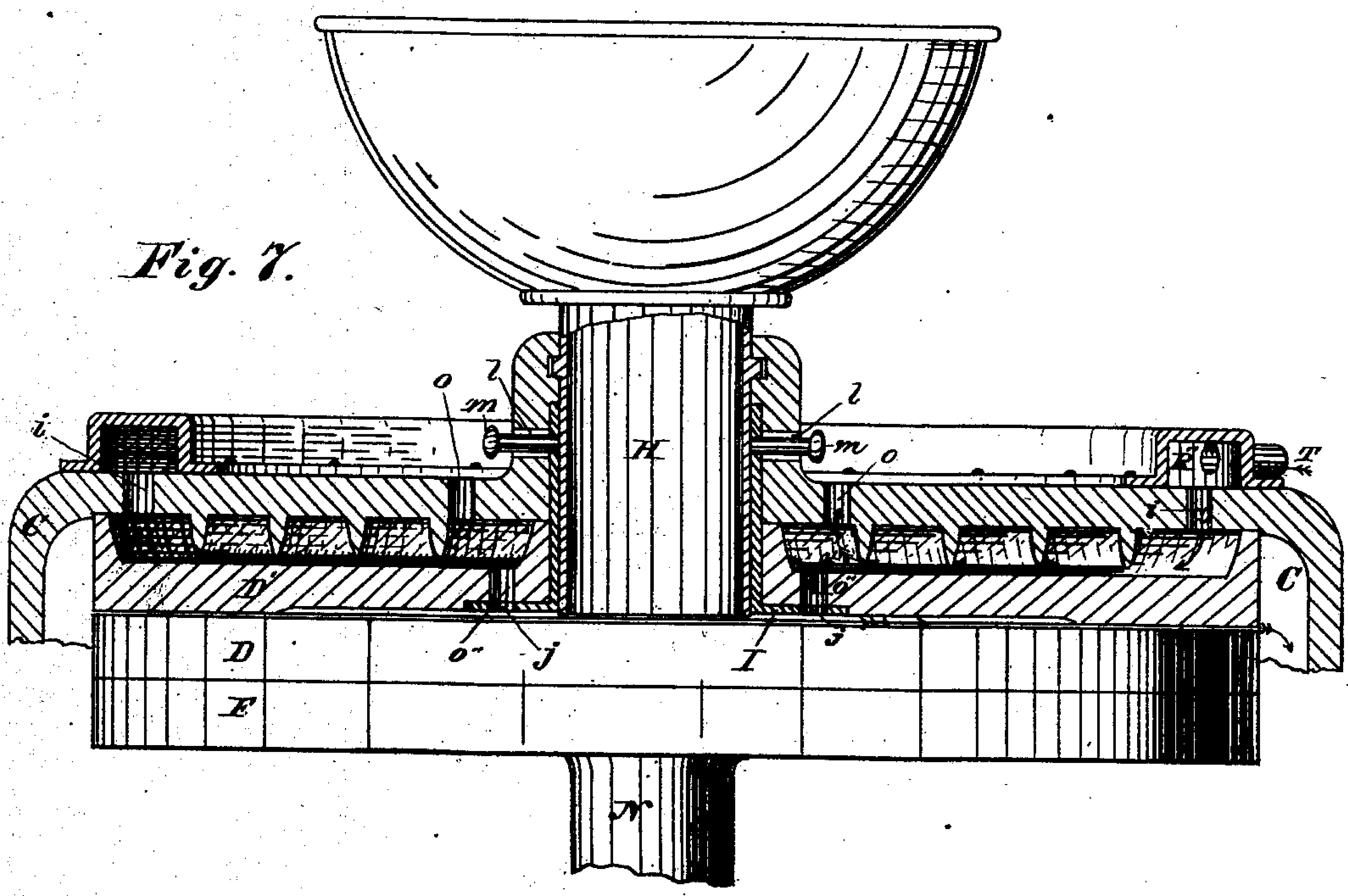
Fig. 7.



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UNITED STATES PATENT OFFICE.

JONATHAN MILLS, OF MILWAUKEE, WISCONSIN.

COOLING AND VENTILATING DEVICE FOR GRINDING-MILLS.

SPECIFICATION forming part of Letters Patent No. 237,120, dated February 1, 1881.

Application filed September 24, 1879.

To all whom it may concern:

Be it known that I, JONATHAN MILLS, of Milwaukee, in the county of Milwaukee, State of Wisconsin, have invented certain new and useful Improvements in Grain-Reducing Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The object of this invention is to provide a construction in grinding-mill disks whereby a changing body of air may be passed beneath the working-faces of the disks for the purpose of keeping them reasonably cool. I am aware that numerous devices have heretofore been made for the same purpose, wherefore I do not broadly claim novelty for the general features of the construction here shown; but my invention consists in the matters hereinafter described, and pointed out in the claims.

The accompanying drawings, forming part of this specification, in general illustrate my improvements applied to a stiff under-runner horizontal-disk mill, wherein the operating-disk faces are metal, such as are used by me in my degerminating and reducing apparatus, for which patent has been granted to me; but the improvements may be applied to disks having faces of other material and form of dress.

Figure 1 is a central vertical section of the main working portions of the mill. Fig. 2 shows the cap-plate of Fig. 1, inverted. Fig. 3 is a view of the cap-plate tilted backward from the position shown in Fig. 1, and having its front portion broken away. Fig. 4 is an elevation of the runner-disk, having a portion broken out, revealing a section in a vertical plane in front of the center. Fig. 5 is an under-side view of the runner-bed, showing a special construction. Fig. 6 is a central vertical section of the runner, comprising the bed shown in Fig. 5, and a construction in other respects adapted to said bed. Fig. 7 shows, in fragmentary central vertical section, an elaboration of my invention applied to the stationary upper disk.

A represents the supports of a horizontal-disk mill. B is the bottom plate, and C is the cap-plate, which together inclose the working-disks. The lower disk is herein shown as being formed in two parts—first, the strong bed F, cast upon or rigidly secured to the spindle N; and, second, the metal plate D, bearing a chilled working-surface, properly depressed or finished for its purpose, and secured to the bed F by the bolts *s*. These two parts may, however, form a single piece.

The upper disk, D′, is secured to the cap-plate C by the bolts *s*′. The upper disk, D′, is recessed on its upper surface and has the marginal raised rim *r*′ fitted more or less closely to the cap-plate C, as may be required to form the chamber S′. It preferably has, also, a central hub or rim rising into contact with the cap-plate around the central hopper-tube or feed-opening H, as shown in Fig. 1. Any desired number of lugs *n* are provided at suitable points for support, and to furnish attachment to the cap-plate by means of the bolts *s*′. This construction of the disk permits the face to be cast on a chill, and at the same time leaves the metal at the top of the rim and lugs in condition to be turned to fit the cap-plate. Fig. 3, however, shows the rim *r*′ and the central flange spoken of cast solid with the cap-plate C. It is not material, but it is preferable that the annular flanges be formed on the disk for greater strength. Both plates D and D′ are made as thin as is consistent with strength and permanent truth of form, having in view the nature of the work to which they are to be applied.

P and P′ are radial depending flanges, cast or secured to the cap-plate in proper position to sit down into the recess or chamber S′ of the disk D′. One of these flanges, P, is intended to extend to the upper surface of the disk, and the others, P′, reach to within a short distance of said surface. On either side of the partition-flange P a hole is made in the cap-plate, into one of which, *i*, the tube T is set. This tube serves as a connection for a flexible or other pipe by which air may be conveyed into the chamber S′ of the disk from a suitable fan or other forcing device. The other hole, *o*, serves as an outlet for the air admitted through the inlet *i*. In its passage through the chamber the air is forced to pass beneath the several partitions P′, and thus to impinge more or less forcibly in a thin sheet upon the disk D'. By this means the temperature of the disk may be kept as low as may be desired during continuous working of the mill.

The interior of the runner-disk may be supplied with an air-current in a variety of ways; but, of course, by none so simple as those applicable to the stationary disk D', so far described.

In Fig. 1, *t t* are annular flanges rising from the base-plate B, and entering and running closely in corresponding grooves *t' t'* in the under face of the runner-bed F. Between the spindle and the inner flange, *t*, is thus formed an annular chamber, R, and between the two flanges another similar chamber, R'. The first of these only is concerned in the cooling devices applied to the runner-disk, as shown in Fig. 1. In said figure the plate D is supported by the lugs *a*, and is without a marginal rim bearing upon the runner-bed F. The space S beneath said plate, therefore, openly communicates with the general interior or the "meal-space" of the mill. The bed F is cut away on its upper surface, if desired, to give a number of annular rims or flanges, *r' r''*, which will serve to break up the air-body and more effectively cool the plate D. Around the spindle N the bed F is provided with a number of holes, *c*, which give communication between the chamber R and the space S beneath the plate D. Air is admitted to the chamber R by means of the tube T', set in the base-plate B, as shown. From the chamber R the air passes through the apertures *c* into the space S beneath the disk D, and escapes at the margin of the disk into the meal-space, as indicated by the arrows, finally emerging with the product of the mill at the spout E.

In Fig. 4 the passages *c* through the runner-bed F are shown to be inclined from a vertical line. The object of this construction is to obtain a draft upward through the passages without the use of or in aid of the fan. For this purpose the bottom of the aperture is advanced and the top receded with reference to the direction in which the runner is rotated.

It may not always be desirable to discharge the air into the meal-space. For the purpose of securing other discharge of the air-current in the case of the runner, as in that of the stationary disk, I employ the devices illustrated in Figs. 5 and 6. In these figures a second series or circle of holes, *c'*, are bored through the runner-bed F, to connect the space or chamber R' with the cavity of the runner-disk or the space S beneath the plate D, and suitable passage is provided in the base-plate B to afford escape from said chamber. The marginal flange *r* on the bed F in this case rises, or an equivalent one upon the plate D depends, and incloses the space S, and prevents other escape of the air admitted to said cavity than by the holes *c'*. In order to insure the passage of a forcible current to all parts of the under surface of the disk D, a spreader or deflecting-plate, *d*, Fig. 6, may be introduced and supported by the annular vertical portion resting in the bed F between the circles of apertures *c* and *c'*. The outer holes, *c'*, if inclined, are inclined in the direction opposite that of the holes *c*, so as to tend, in the rotation of the runner, to draw the air downward and outward, and thus to co-operate with the other or inner circle of inclined holes, *c*, to induce a current without, or in aid of, a fan.

The current of the upper or stationary disk may be discharged into the meal-space, if desired, either at the outer margin of the disk, as shown, of the runner in Fig. 1, or into or about the central feed-opening, as shown in Fig. 7. In the latter case the air-current will act on both surfaces of the disk D', on the upper surface of the lower disk-plate, D, and also on the material being reduced. When the current is thus applied it may be so regulated as to assist desirably in the delivery of the grain to the working-disk surfaces, and to promote the prompt discharge of the reduced portions of grain, and thus both increase the capacity of the mill and prevent the retention of any part of the reduced grain long enough to become heated. Of course an air-current so applied will equally operate to carry off the moisture set free from the grain in grinding.

In the use of metal disks a somewhat more forcible current will generally be necessary for cooling purposes than can be well permitted to escape between the disks, as last pointed out, consistently with the proper working of the mill. In other words, a limited outflow of air between the disks may be useful, while a violent current will be harmful. Both methods of discharge may therefore be advantageously employed to the stationary disk in the same mill, the greater portion of air being provided escape in the manner first above described and a lesser portion between the disks, as last described. The amount of such partial inner central discharge may also be regulated or entirely cut off by means shown in Fig. 7, in which I is an annular register surrounding the feed-tube H, provided with holes *j*, corresponding with holes *o''* in the disk D'. The register I has a vertical portion rising between the tube H and the disk, and is rotated a suitable distance to wholly open or wholly close a passage through *o'' j* by means of an arm, *m*, projecting through a suitable slot, *l*, in the neck of the cap-plate C.

When the upper disk is provided with either circumferential or central opening for the discharge of the air within the meal-space, annular flanges should be employed, as seen in Fig. 7, instead of radial ones, (shown in Fig. 1,) in order to secure the proper distribution of the air-currents.

An outer air-chamber, R'', may be applied to the stationary plate C, through which several openings, *i*, are formed to insure more uniform distribution of air, as also shown in Fig. 7.

In those constructions herein shown wherein the outlet is wholly independent of the meal-space it is practicable to make the joints close enough to permit a current of water to be employed in place of air, and I intend that my following claims shall not be limited to the use of air, but shall embrace any other cooling medium adapted to be employed with the particular construction used.

If desired, the parts F and D, or the parts D′ and C, need not be formed separately and joined as shown, but may be cast in a single piece, though obviously the construction shown is, for many reasons, preferable.

The chamber R interposed between the fixed tube or passage T′ and the moving holes or passages *c* secures an uninterrupted flow of air from one to the other.

Having thus described my invention, I claim—

1. In combination with the chambered mill-disk described, having inlet and outlet openings for the passage of air through the chamber, one or more deflecting plates or flanges located within the disk-chamber for the purpose of directing the air-current more closely into contact with the under surface of the face-plate of the disk, substantially as described.

2. A mill-runner having the inner chamber, S, cut off from the meal-space of the mill and provided with the passages *c* and *c′*, combined with distributing-plate *d*, substantially as described.

3. The combination, in a mill-disk runner, of the chamber S, extending beneath the working face-plate of the disk, the inclined inlet air-passages *c* and outlet air-passages leading from the chamber S, either at the margin of the disk or substantially below the face of the disk, as shown, whereby on the rotation of the disk a current of air is induced through the chamber for the purpose of cooling the working face-plate of the disk, as set forth.

4. The combination, in a mill-disk runner, of the flat-chamber S, extending beneath the working face-plate of the disk, the inclined inlet air-passages *c*, and the outlet air-passages *c′*, both connecting with the chamber S through the bed-plate F, substantially as shown and for the purposes set forth.

5. The combination in the stationary disk, of the flat annular chamber S′, extended over the working disk-face, the inlet air-passages *i*, the outlet air-passages *o* through the cup-plate, the alternative outlet air-passages *o″*, leading from the chamber to the meal-space, and the register I, adapted and arranged to regulate the relative amount of air passed through the several outlets *o* and *o″*, substantially as shown.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

JONATHAN MILLS.

Witnesses:

M. E. DAYTON,

S. S. CHISHOLM.