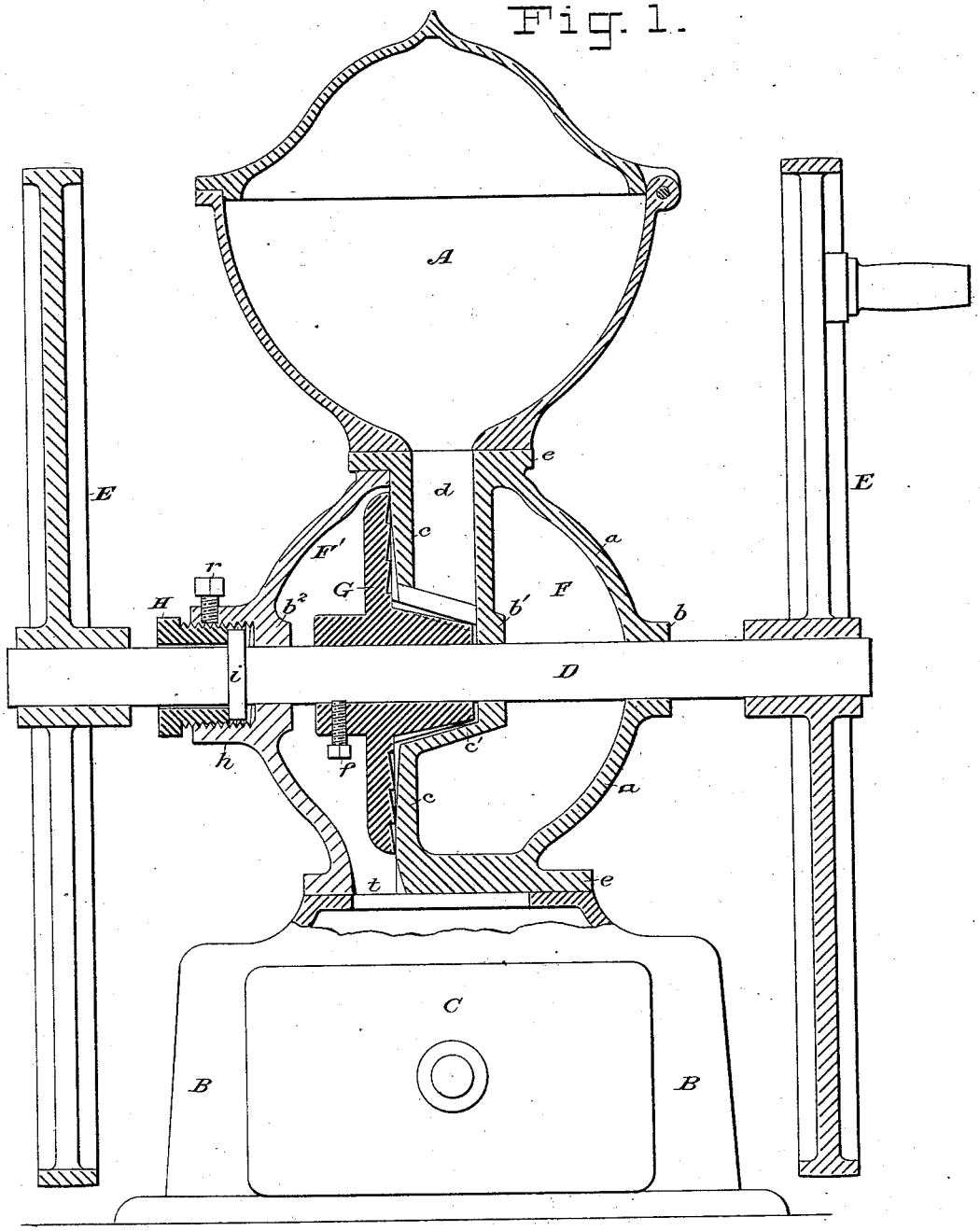
(No Model.) 2 Sheets—Sheet 1.

C. A. FREDERICKS.

GRINDING MILL.

No. 282,068. Patented July 31, 1883.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

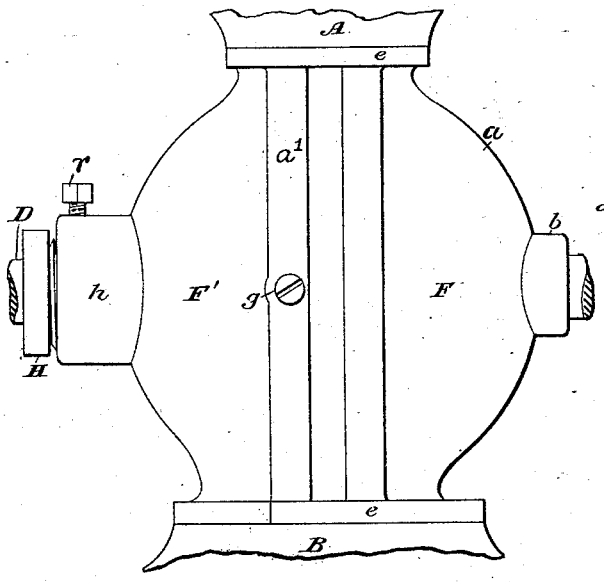


Fig. 3.

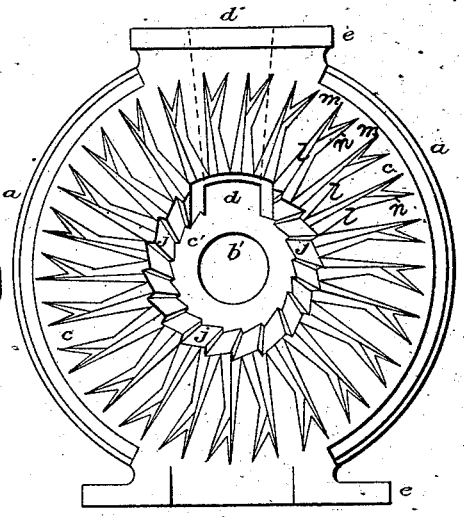


Fig. 4

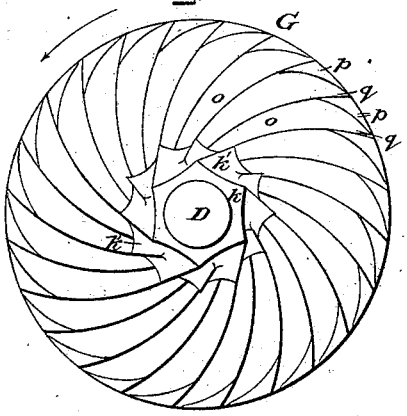


Fig. 5.

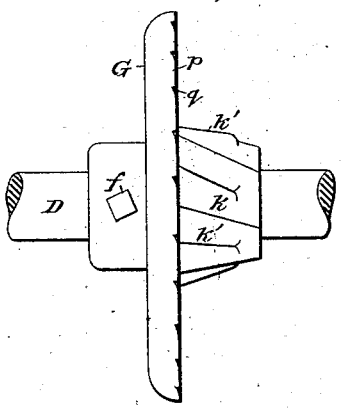
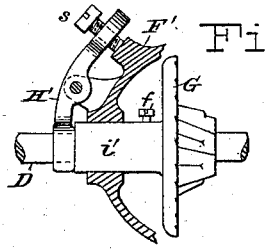


Fig. 6.



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UNITED STATES PATENT OFFICE.

CHRISTIAN A. FREDERICKS, OF BROOKLYN, NEW YORK.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 282,068, dated July 31, 1883.

Application filed April 26, 1883. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAN A. FREDERICKS, a citizen of the United States, and a resident of Brooklyn, Kings county, New York, have invented certain Improvements in Grinding-Mills, of which the following is a specification.

My invention relates most particularly to coffee, spice, and drug mills; and it consists in part in the formation of the grinding-faces of the mill, and in part in the general construction of the mill, whereby greater accuracy and durability are attained than in mills as ordinarily constructed, with less expensive construction and less liability to get out of order.

In the drawings, which serve to illustrate my invention, Figure 1 is a vertical mid-section of a mill provided with my improvements, the section being taken in the plane of the axis of rotation of the grinder. Fig. 2 is a side elevation of the casing of the mill, the hopper and base being broken away. Fig. 3 is a front elevation of the fixed or non-rotating grinding face or plate. Fig. 4 is a front elevation, and Fig. 5 is a side elevation, of the rotary grinder. Fig. 6 is a modification of the means for adjusting the rotary grinder.

A represents the ordinary hopper for the substance to be ground; B, the base of the mill, containing a drawer, C, to receive the ground substance; D, the shaft, and E E the fly and crank wheels fixed thereon. These are all, generally speaking, constructed in the usual way.

The casing or shell, which contains the grinding mechanism, may be of any desired form. I have herein shown it as globular. It is composed of two parts, F and F′, the latter being a removable cap. The part F comprises the shell portion *a*, wherein is formed the outer bearing, *b*, of the shaft, the fixed grinding-face *c*, provided with the depressed eye or recess *c′*, which furnishes the inner bearing, *b′*, of the shaft, and the chute *d*, which leads the substance to be ground from the hopper to the recess or eye *c′*. These are all cast in one piece, by preference, with suitable attaching-flanges, *e e*. By this means I insure the greatest rigidity and firmness of the fixed grinding-face and its correct setting at right angles with the shaft. The two bearings *b b′* being fixed with reference to face *c*, it is only necessary to see that these bearings are bored properly to be sure that the grinders shall always be properly presented to each other, face to face. The cap F′ is made to fit up to and take over the part F—that is to say, at its upper end (see Fig. 1) it takes under the flange *e* on F, while at its bottom or lower end it rests on the top of C. At its sides (see Fig. 2) it is provided with a shouldered flange, *a′*, which takes over the adjacent edge of F. It is secured to F by means of two screws, *g*, one on each side. This cap F′ is bored to form a third bearing, b^2, for the shaft after it is fitted and secured to F, which insures the proper alignment of the three bearings at all times whenever the cap is removed and replaced.

G is the rotary grinder, which is mounted fixedly, but removably, on the shaft D by means of a set-screw, *f*, or other equivalent means.

In F′ is provided, as before stated, a third bearing, b^2, for the shaft D, and in it is also formed a socket, *h*, internally screw-threaded to receive a brush or gland, H, which screws down against a fixed collar, *i*, on the shaft D. This enables me to adjust the rotary grinder G up to the fixed grinding-face *c*, so as to grind coarse or fine, as desired. It will readily be seen that any pressure exerted on the collar *i* by the gland H will move the shaft endwise (to the right in Fig. 1) and carry the grinder G with it.

I will now describe the peculiar construction of the grinding-faces with reference particularly to Figs. 3, 4, and 5.

In some mills the grinding-faces consist, substantially, of small pyramidal projections arranged in concentric circles, the circle on one face taking into the space between the adjacent circles on the other face. These mills rely on breaking and crushing the substance—coffee, for example—and when worn or dull they cannot be made to grind finely and evenly. I seek to produce grinding-faces which will practically never become dull, even when worn down very materially, that will not break or crush the coffee except at the first, as will be explained, but will shear or scrape it off in fine particles or shavings, and that will gradually

feed it as it is being cut away to the skirt or periphery or discharging-point of the grinder. Referring then to the fixed grinder shown in Fig. 3, *j j* are cutting or breaking ribs formed in the eye or recess *c'*, and *k* is a coned projection, Figs. 4 and 5, on the rotary grinder G, which takes into recess *c'*, and is provided with ribs *k'*, opposed to those in recess *c'*. Between these the coffee is broken into bits, and it passes thence out to the vertical grinding-faces. The grinding-face *c* has numerous radial V-shaped leading furrows, *l*, which are quite deep where they start from the margin of the recess *c'*, but run out to nothing at *m*. As these furrows diverge and separate widely at their ends, I provide branch furrows *n* of the same character, which project obliquely from the leading furrows *l*. These serve to break up the otherwise smooth face of the grinder between the furrows. The furrows *l* and *n* are simply designed to hold the bits of coffee or other substance. The cutting or shearing is done by the rotary grinder, which I will now more minutely describe with reference to Figs. 4 and 5. The face of this grinder is divided up into furrows *o*, which are oblique to the radius and preferably curved. These furrows, as indicated in Fig. 1, have a perpendicular side or face and a slightly-inclined face, thus dividing up the face of the grinder into perpendicular offsets and slightly-inclined faces; but these furrows *o*, like the furrows in the fixed grinding-face, are deepest near the center of the grinder—that is, at the base of *k*—and become shallower and narrower toward the skirt or periphery, the triangular portions *p* representing the level normal face of the grinder, and *q* the shallow outlets for the ground coffee or other substance. The grinder G rotates in the direction of the arrow in Fig. 4, and thus the obliquity of the furrows causes them to move outward with a shear or draw cut over the bits of coffee held in the furrows in the fixed grinder, and to feed the substance toward the outlets *q* and expel it therefrom at the same time that it shears off the top of each bit. These grooves *o* cut with their abrupt or vertical surfaces.

I usually make the fixed grinder *c* of ordinary cast-iron and the rotary grinder G of chilled iron. As the latter wears away in use the perpendicular edges of its furrows still remain sharp. They may be, indeed, slightly undercut instead of perpendicular.

The gland H enables me to readily adjust the mill as to fineness and coarseness of grinding; and to prevent the accidental disarrangement of the adjustment a set-screw, *r*, may be employed. Should any hard foreign substance get into the mill by accident, the gland H may be removed or partially unscrewed, and this will permit the rotary grinder to be drawn back from *c* far enough to permit such substance to fall into the receiver below without the necessity of taking the mill to pieces. Or the cap F' may be detached by simply removing the two screws *g*, when the same result will be attained. This may be done by any one without disarranging the mill, and it requires no special skill. In Fig. 6 I have shown a modification of this adjusting device, in which the boss of the grinder G is prolonged to extend out through the cap F', whereby the collar *i* is rendered unnecessary; and in lieu of the gland H, a forked lever, H', is mounted on the cap F', and its forked end made to straddle shaft D and impinge on the end of the boss, (here lettered *i'*.) A screw, *s*, serves to effect the adjustment. I might, however, use the collar *i* in this construction, and I might substitute the prolonged boss *i'* in the construction shown in Fig. 1. Where a prolonged boss, *i'*, is employed, I might also spline the grinder G on the shaft and omit the screw *f*. In that case the grinder only would be moved in adjusting, and not the shaft.

In order to get at the interior of the casing it is only necessary to remove the two screws *g* at the sides, one of which is shown in Fig. 2. By removing the right-hand wheel E the shaft, with the grinder G, may be entirely removed.

It will sometimes happen that a stone or other hard substance will enter the mill, and in mills as ordinarily constructed this is apt to break the wall of the recess *c'*. To avoid this I make this wall thick and cast it in one with the chute *d* and grinding-face *c*, whereby it is made rigid and very strong. The shell *a* might be made separately from the other parts of F and be screwed thereto; but, for the purpose of increasing the strength and having the bearings *b* and *b'* in one piece, I prefer the construction shown.

It is not absolutely necessary that the furrows *l* and *n* be V-shaped in section. They might, for example, be flutes; but I prefer the construction shown; but in any case these furrows are not designed to have vertical cutting-edges.

In Fig. 1, *t* is the passage for the ground substance from the mill to drawer C.

I have said that I prefer to make the oblique furrows in the grinder G curved, and I will add that I prefer for this purpose that form known as the "caustic" curve as being the best suited to my purpose.

Having thus described my invention, I claim—

1. In a grinding-mill, the grinding-face *c*, provided with an eye or recess, *c'*, having ribs *j j*, and with radial furrows *l*, made deepest at the center and running out at *m*, in combination with the rotary grinder G, provided with a cone, *k*, having ribs *k'*, and with oblique furrows *o*, made deepest at the center of the grinder, and terminating at the skirt in the lesser discharge-outlets *q*, substantially as and for the purposes set forth.

2. A mill for grinding coffee and for other analogous purposes, provided with a fixed

metal grinding-face with continuous radial furrows deepest and widest at the eye, and having inclined faces, as shown, for holding the substance to be ground, and with a rotary grinder of metal having continuous oblique furrows formed substantially as shown, whereby the substance being ground is gradually reduced by shaving and driven outward toward the skirt of the grinder simultaneously, substantially as set forth.

3. In a grinding-mill, the combination of the part F, comprising the shell *a*, the bearing *b*, the grinding-face *c*, recess *c'*, chute *d*, bearing *b'*, and the flange *e*, the cap F', provided with a bearing, b^2, and a flange, *a'*, and arranged to fit between flange *e* and base B, the said base, the shaft, and the rotary grinder all constructed substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CHRISTIAN A. FREDERICKS.

Witnesses:
HENRY CONNETT,
ARTHUR C. FRASER.