

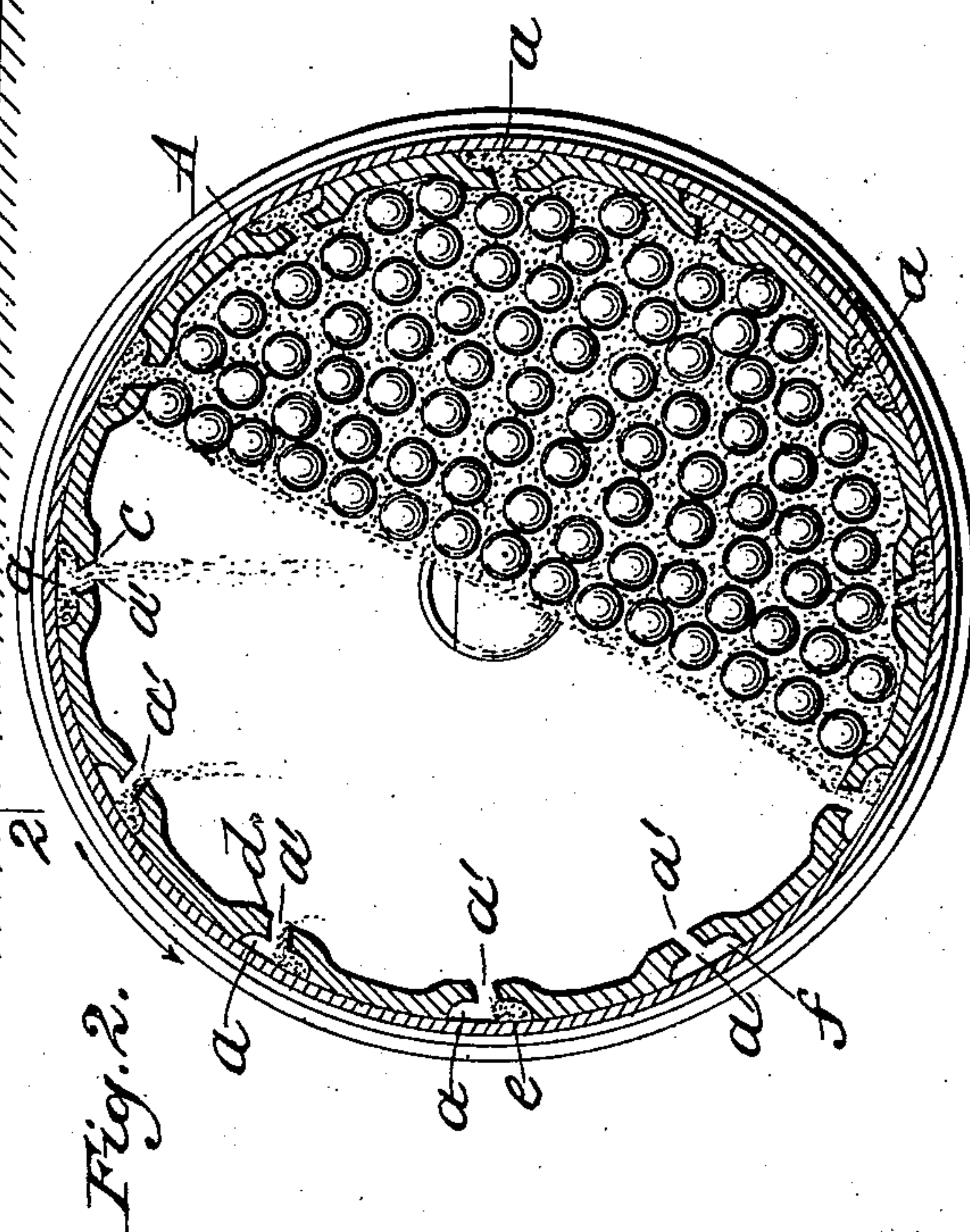
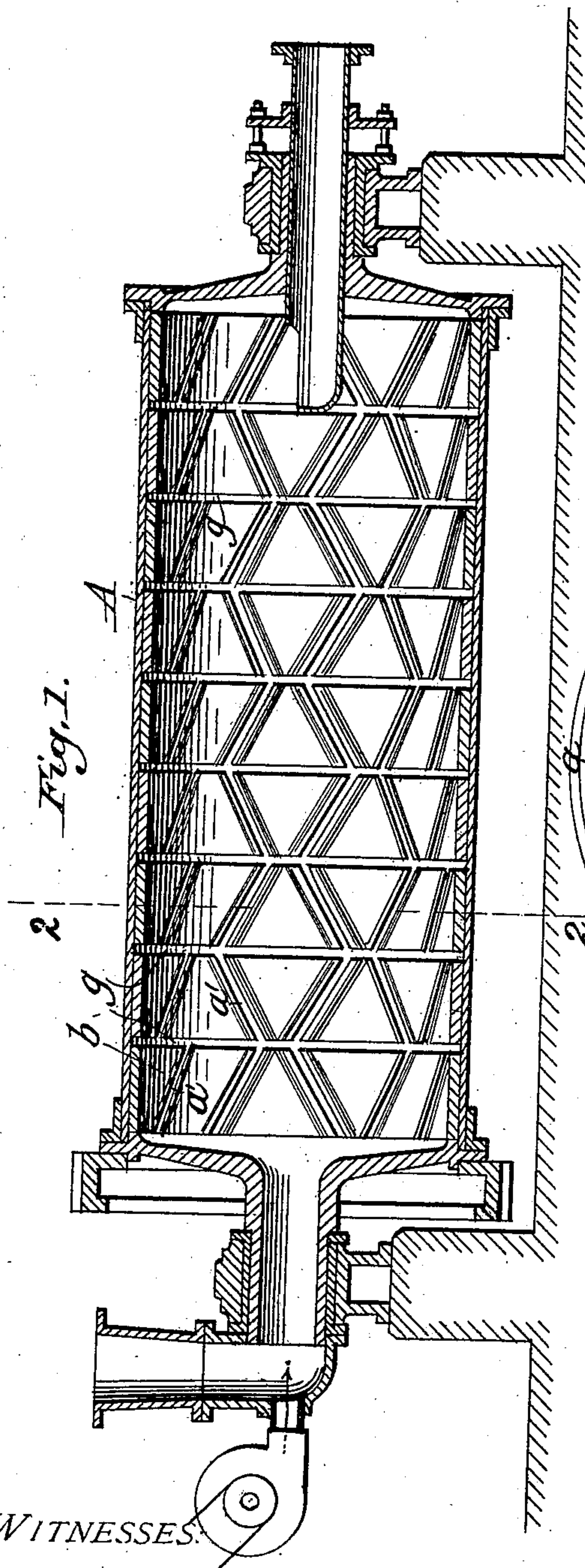
No. 689,347.

F. HUNDESHAGEN.
BALL GRINDING MILL.

Patented Dec. 17, 1901.

(Application filed Aug. 6, 1901.)

(No Model.)



WITNESSES:

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FRITZ HUNDESHAGEN, OF MÜLHEIM-ON-THE-RHINE, GERMANY.

BALL GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 689,347, dated December 17, 1901.

Application filed August 6, 1901. Serial No. 71,035. (No model.)

To all whom it may concern:

Be it known that I, FRITZ HUNDESHAGEN, a citizen of Saxony-Weimar, residing at Mülheim-on-the-Rhine, Germany, have invented certain new and useful Improvements in Ball Grinding-Mills; and I do hereby 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.

This invention relates to ball-and-drum mills for grinding grain and other material; and the object of the same is to provide such mills with means for gradually feeding the grist material forward and to insure the proper degree of fineness and uniformity for the resultant meal, the flour, or the powder as the same emerges from the discharge-orifice.

In my application, Serial No. 71,033, filed concurrently herewith, I have described a ball grinding-mill in which the grist material is gradually fed forward by means of a series of forwardly-inclined grooves, preferably communicating with vertical annular grooves, said forward feeding being effected under the influence of the rotating movement of the drum. Moreover, in my application, Serial No. 71,034, filed concurrently herewith, I have described a ball-and-drum mill in which such forward feeding is primarily effected by tumbling devices, which raise the grist material above the level of the contents of the mill and then drop the same back into the drum, said tumbling devices acting in conjunction with an air-blast, which not only thus feeds the material forward, but assorts the same, so that the finer particles are fed forward faster than the heavier particles. Secondly, the above arrangement may, according to the said application, be used in conjunction with forwardly-feeding inclined grooves and also with retarding oppositely-inclined grooves in the inner periphery of the drum. By the proper selection of such grooves and tumbling devices and the regulation of the blast the amount of the feed can be accurately controlled, so that no particles of the grist will reach the discharge-orifice of the mill until they have acquired the necessary degree of fineness.

The above construction will operate very

effectively when the velocity of rotation of the mill-drum is not too great. For greater velocities of rotation the grist material and the grinding-balls will be thrown to one side of the drum and accumulate there to such a height that the inclined feeding-grooves will not rise above the level of the contents of the drum until they reach almost the top of the drum. The consequence of this will be that the grist material contained in the forwardly feeding and inclined grooves, with the retarding-grooves, will not be fed forward in said grooves but be dropped back into the drum in the form of a spray. The effect of these grooves will therefore be nullified, particularly where any air-blast is carried through the drum. In order to obviate this objection for rapidly-revolving mills, I shape these inclined grooves in the form of pockets having a constricted throat or outlet into the drum.

Further features of my invention will be set forth hereinbelow and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 represents a vertical longitudinal central section of a ball-and-drum mill embodying my invention; Fig. 2, a transverse section, on an enlarged scale, on line 2 2 of Fig. 1.

Referring to the drawings, it will be noted that the drum A of the grist-mill therein shown is provided on its inner periphery with pocket-like channels or grooves *a*, which channels communicate with the constricted openings or throats *a'*, leading into the interior of the drum A. It will be further noted that these throats *a'* are preferably inclined with reference to the radii of the drum, or, in other words, they are inclined away from the radii of the drums in the direction of the rotation of the said drum. (Indicated by the arrow in Fig. 2.) The purpose of this will be explained later on. These pocket-like grooves *a* may be formed in each zone of the grinding-bed *b* where the same is formed in a single piece, or these grooves may be formed between the sections of a sectional zone, as shown in Fig. 2.

In operation when the drum rotates in the direction of the arrow, Fig. 2, the grinding-balls and the grist material will be thrown to one side of the drum, so as to accumulate in

a high semicircle or segmental heap, rising near to the top of the drum. As the conveying-grooves *a* emerge from the said heap, as shown at *c*, Fig. 2 of the drawings, a portion 5 of the grist material contained therein is dropped in the form of a spray back into the drum, said spray passing through the constricted throat *a'*. In case means for producing an air-blast are used this spray is fed forward to a certain extent, so that the lighter particles are carried considerably farther than the heavier particles. The main bulk of the grist material in the grooves remains therein and passes forward until it about 15 reaches the point *d*, when it begins to slide down the groove, owing to the incline. This incline is increased when the groove reaches the point *e*, and, finally, when the groove arrives at the point *f* the material therein has 20 been completely fed forward into the annular vertical groove *g*, Fig. 1, of the drum, which has been previously emptied by reason of the gravity of the grist material therein. The grooves *a*, with their throats *a'*, hence 25 constitute a combined feeding or retarding and tumbling device for the grist material, whereby the same is thoroughly mixed, graded, and gradually fed forward, particularly in the case an air-blast is employed, so 30 that the ground material that emerges at the discharge-orifice will have attained the desired degree of fineness and will be uniform. All this has been carefully explained in my aforesaid applications, Serial Nos. 71,033 and 35 71,034, and need not be entered into in detail here.

By reason of the incline of the throats *a'* away from the radius and in the direction of the rotation of the drum I secure the advantage of retaining the greater amount of the 40 grist material in the pockets, including the throat, as will be clearly understood by reference to the drawings, noting particularly the position of the pocket at the point *d*.

I do not claim in this application the feeding-drum provided with forwardly-inclined 45 feeding-grooves, nor the rearwardly-inclined retarding-grooves, either alone or in combination with each other or in combination with vertical annular grooves, as shown, (although 50 these features have been shown and described herein,) for the reason that they form the subject-matter of my aforesaid application, Serial No. 71,033; nor do I claim the combination of tumbling devices with an air-blast 55 for feeding and sorting the grist material either alone or in combination with forwardly or rearwardly feeding grooves, or with both, since these have formed the subject-matter of my application Serial No. 71,034. 60

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In a grist-mill, a drum provided on its interior periphery with pockets and narrow 65 throats communicating therewith and leading into the drum.

2. In a grist-mill a drum provided with inclined feeding-pockets and narrow throats communicating therewith, and leading into 70 the interior of the drum.

3. In a grist-mill, a drum provided on its interior periphery with pockets having constricted throats communicating therewith, leading into said drum, said throats being 75 inclined with reference to the radii of the drum.

4. In a grist-mill, a drum, provided with a series of pockets, having constricted throats communicating therewith and leading into 80 the drum, in combination with means for throwing an air-blast through the drum.

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

FRITZ HUNDESHAGEN.

Witnesses:

CARL SCHMITT,

CHARLES LEDIMPLE.