J. WALKER.

GRINDING MILL.

APPLICATION FILED MAR. 17, 1909.

950,972.

Patented Mar. 1, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

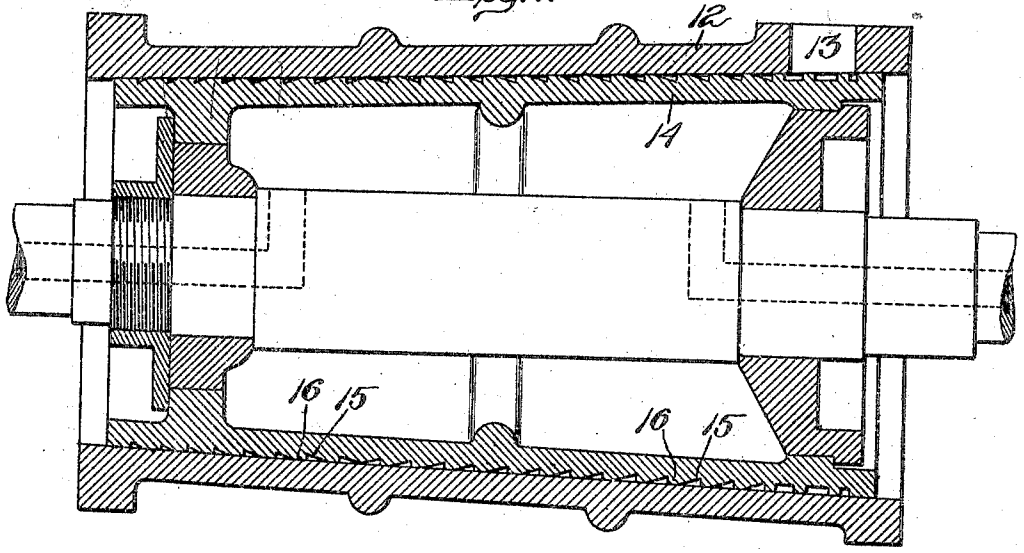
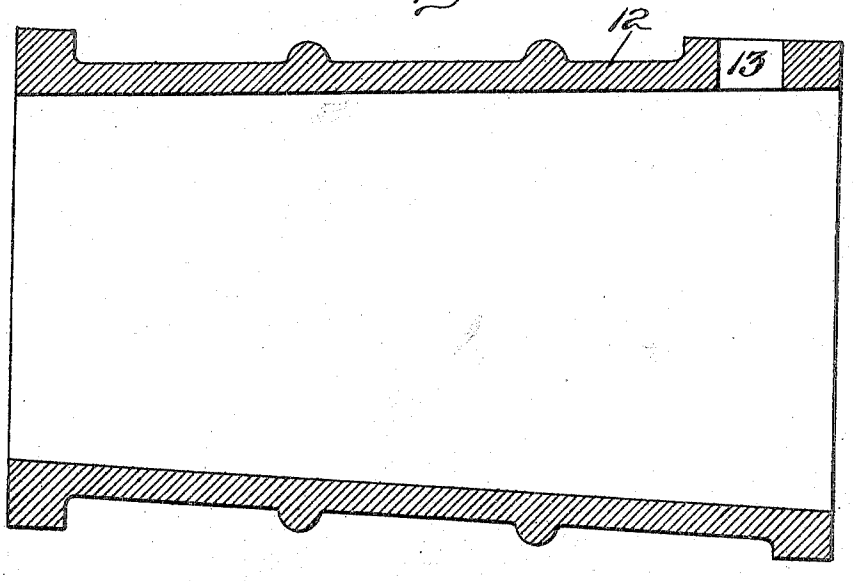


Fig. 3.



Witnesses:

Arthur L. Randall

F. R. Railstone

Inventor:

John Walker

By Wright Brown Quinby & May

Attys.

J. WALKER.

GRINDING MILL.

APPLICATION FILED MAR. 17, 1909.

950,972.

Patented Mar. 1, 1910.

2 SHEETS—SHEET 2.

Fig. 2.

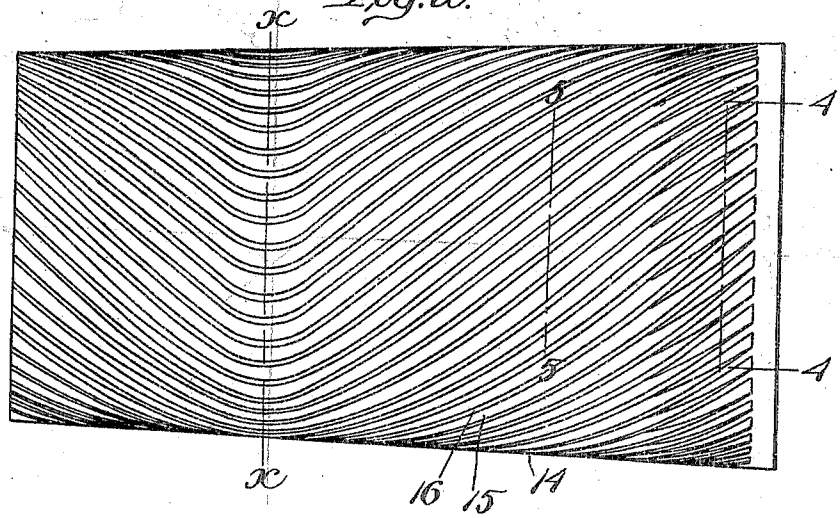


Fig. 4.

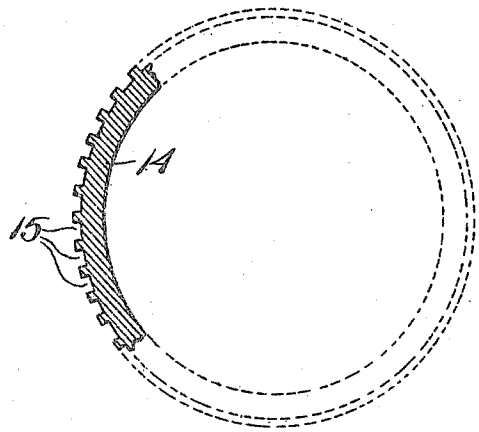
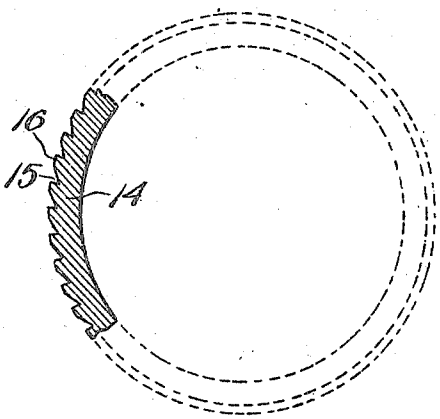


Fig. 5.



Witnesses:

Arthur E. Randall.

F. R. Roulstone

Inventor:

John Walker.

By Wright Brown Quinby & May

Attys.

UNITED STATES PATENT OFFICE.

JOHN WALKER, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO JOHN WALKER MACHINE COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

GRINDING-MILL.

950,972. Specification of Letters Patent. Patented Mar. 1, 1910.

Application filed March 17, 1909. Serial No. 483,895.

To all whom it may concern:

Be it known that I, JOHN WALKER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification.

This invention relates to machines for triturating, mixing, and levigating material of a more or less oily nature, such as cocoa, and relates particularly to grinding mills for the manufacture of chocolate from the cocoa bean.

The invention is embodied in a mill comprising a fixed outer member or shell having an inlet for the crude material at one end, and an outlet at the opposite end; and an inner rotary member or runner shaped to conform closely to the interior of the outer member, the opposed levigating faces of the outer and inner members being in close proximity to or rubbing contact with each other, and being of tapering or frusto-conical form, so that the levigating surfaces can be given absolutely accurate relative positions by shifting or adjusting one member longitudinally relatively to the other. The levigating face of one of the members, preferably that of the inner member, has a dress composed of helical furrows, separated by helical smooth surfaces. In accordance with my invention, the inclination of said furrows is changed between the inlet and outlet, so that the furrows have abruptly inclined feeding portions which act on the crude material introduced at the inlet, and tend to force the same at a relatively rapid rate toward the outlet end while reducing the material, the inclination of the furrows being changed between the inlet and outlet to form delivering portions extending from a point between the inlet and outlet to the outlet, whereby the movement of the material toward the outlet, caused by the feeding portions, is checked to create a back pressure on said material, and a regrinding by the feeding portions, the material being additionally ground and conducted to the outlet end of the mill by the delivering portions, and at the same time subjected to retarding pressure thereby.

Of the accompanying drawings, forming a part of this specification,—Figure 1 represents a longitudinal section showing the two members operatively related to each other. Fig. 2 represents a side elevation of the inner member. Fig. 3 represents a longitudinal section of the outer member, the inner member being removed. Fig. 4 represents a section on line 4—4 of Fig. 2. Fig 5 represents a section on line 5—5 of Fig. 2.

The same reference characters indicate the same parts in all the figures.

In a pending application for Letters Patent of the United States, for an improvement in grinding mills, filed by me October 29, 1908, Serial No. 460,011, I have shown a grinding mill which includes a fixed outer member or shell, and a rotatable inner member or runner, together with suitable means for supporting said members, adjusting one endwise relatively to the other, rotating the inner member, and cooling the members while they are in operation.

It will be understood that the improvement hereinafter described and claimed, relating to the dress of the levigating surface of one of the members, may be applied to a mill of the general construction shown in the above mentioned application. I therefore deem it unnecessary to illustrate and describe in this application anything more than is sufficient to afford an understanding of the present improvement.

In the drawings, which represent an embodiment of my invention which I have shown for purposes of illustration, 12 represents the fixed outer member or shell, which is rigidly supported in any suitable manner, and has a tapered or frusto-conical internal grinding and levigating surface.

At the larger end portion of the member 12 is an inlet 13 for the crude material. The smaller end of the member 12 constitutes an outlet for the ground material, which may be conducted away from said smaller end by a suitable guide or spout, as shown in the prior application above mentioned.

14 represents the rotary inner member or runner, which is located within the outer member 12, and has an external grinding and levigating face. Each of said grinding faces is tapered, and the two members are so related as to leave between their opposing surfaces an annular conical working space or crevice extending from end to end of the outer member and runner, the material to be treated being fed to one end of said crevice and ejected from the opposite end after

passing through the entire length of the crevice between the opposing faces of the members.

I provide the levigating face of one of the members, and preferably the rotary inner member 14, with a dress which is composed of alternating furrows 15 and intermediate smooth portions 16, said furrows being the equivalent of screw threads of a steep pitch, one side of each furrow being substantially at right angles to the axis of the runner, while the opposite side is inclined to said axis, as shown in Fig. 5.

The portions of the furrows which coincide with the supply inlet 13 may have the rectangular form shown in Fig. 5, the general form of the furrows being preferably substantially as shown and described in the above mentioned application.

In carrying out the present invention, I change the inclination of the furrows and the intermediate smooth surfaces between the inlet and outlet portions of the mill, so that said furrows, instead of extending at a uniform inclination from the inlet to the outlet of the mill, have a different or backward inclination at the outlet end portion, the direction of the furrows changing preferably at a zone indicated by the dotted line *x*—*x* in Fig. 4. The direction of rotation of the inner member is such that the portions of the furrows between the line *x*—*x* and the inlet 30, said portions occupying preferably about two-thirds of the length of the levigating surface, and being hereinafter referred to as the feeding portions, have a tendency to feed the material at a relatively rapid rate from the inlet toward the outlet, while reducing the same. The difference between the inclination of the said feeding portions and the inclination of the portions of the furrows between the line *x*—*x* and the outlet end, these being hereinafter referred to as the delivering portions, is such that the said delivering portions oppose or retard the movement of the material toward the outlet, and thus create a back pressure on the material being acted on by the feeding portions. This back pressure causes a repeated grinding of the material by the feeding portions of the furrows and the intermediate smooth surfaces, the material being gradually forced along the delivering portions of the furrows by its accumulation between the levigating surfaces, the said delivering portions at the same time subjecting the material to a retarding pressure which causes it to be repeatedly ground between all parts of the levigating surfaces. The delivering portions of the furrows extend to and through the smaller end of the levigating surface on which they are formed, so that the ground material issues through them at the outlet end of the mill.

As already stated, the portion of the levigating surface occupied by the feeding portions of the furrows is preferably of considerably greater length than that occupied by the delivering portions of the furrows, so that the pressure of the feeding portions of the material tending to force it to the outlet end, overcomes the retardation caused by the changed inclination of the delivering portions, and thus causes the delivery of the ground material at the outlet end through the delivering portions.

It will be seen from the foregoing that my present invention resides in the described change of the inclination of the furrows at points between the inlet and outlet of the mill, and preferably nearer the outlet than the inlet, and the continuation of the delivering portions so that they constitute collectively the outlet of the mill. The back pressure due to the delivering portions of the furrows enables me to dispense with the smooth or unfurrowed portions of the levigating surfaces at the outlet end portion of the mill, shown in the above mentioned application, so that the material issues from the mill with less resistance than would be the case if said smooth portions were employed, and less power is required to rotate the inner member and force the material through the mill, the material being at the same time effectively reduced.

I claim:

A mill for grinding materials, such as cocoa, said mill comprising a fixed outer member having an inlet for the crude material at one end, and an outlet for the ground material at the other end, and a rotatable inner member in rubbing or levigating contact with the outer member, one of said members having a dress composed of helical furrows and intermediate smooth portions, the inclination of which is changed between the inlet and outlet.

In testimony whereof I have affixed my signature, in presence of two witnesses.

JOHN WALKER.

Witnesses:
C. F. Brown,
P. W. Pezzetti.