J. WALKER.

GRINDING MILL.

APPLICATION FILED NOV. 11, 1909. RENEWED MAR. 26, 1914.

1,114,320.

Patented Oct. 20, 1914.

2 SHEETS—SHEET 1.

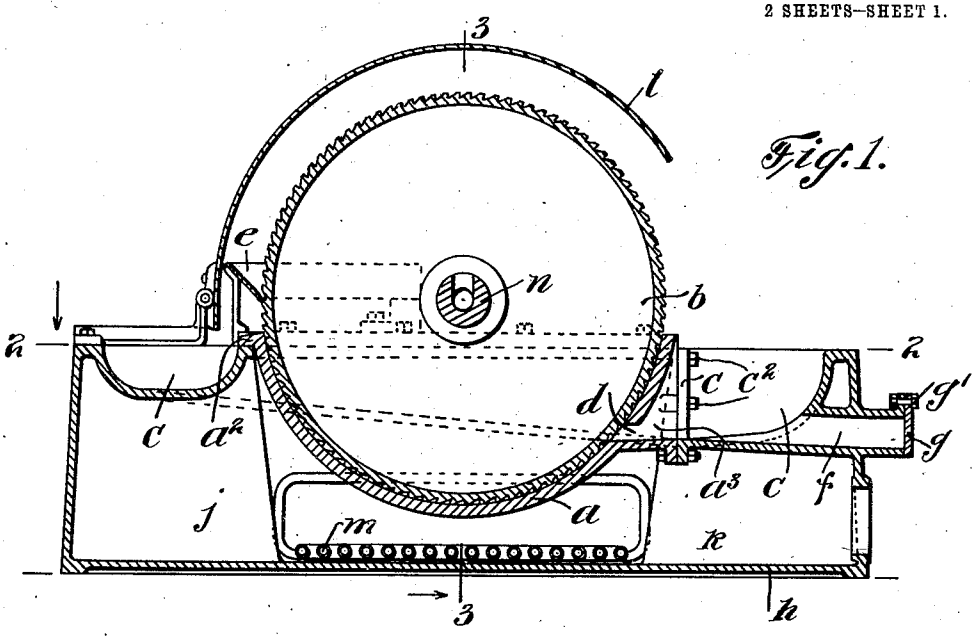
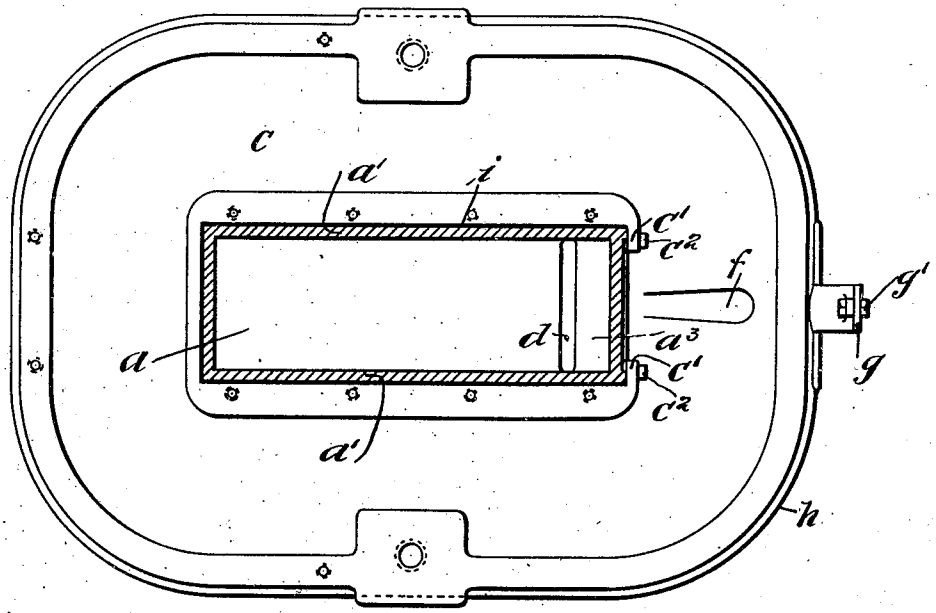



Fig. 1.

Fig. 2.




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2 SHEETS—SHEET 2.

Fig. 3.

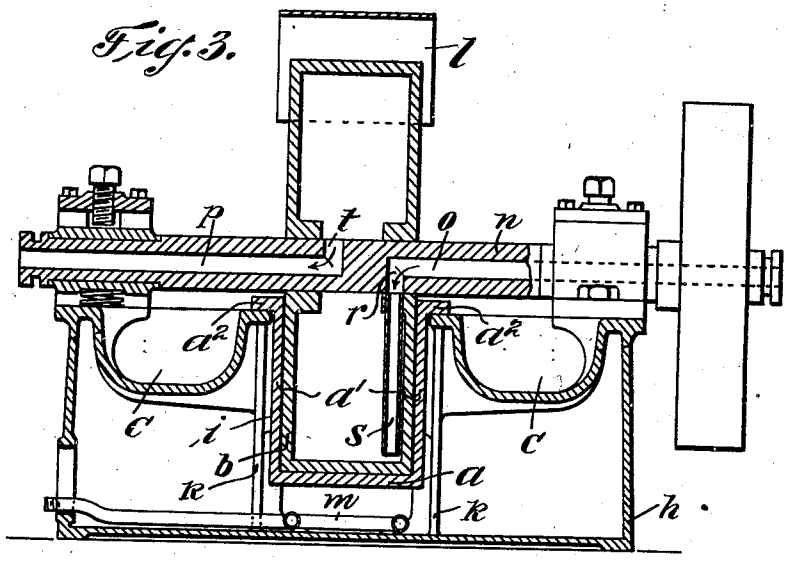
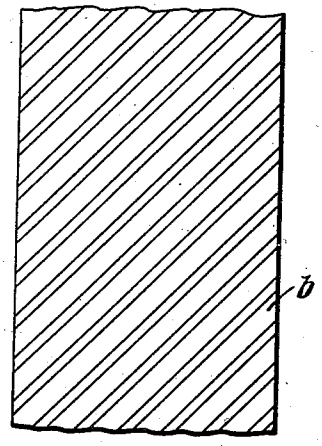



Fig. 4.

Fig. 5.



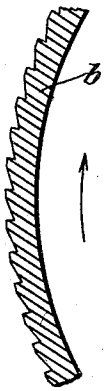
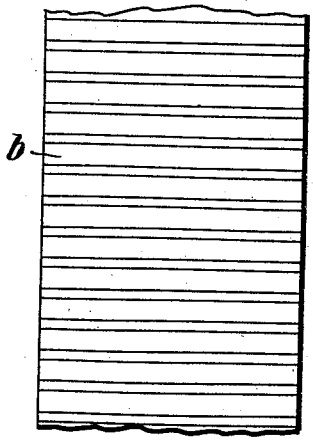




Fig. 6.




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# UNITED STATES PATENT OFFICE.

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

## GRINDING-MILL.

1,114,320. Specification of Letters Patent. Patented Oct. 20, 1914.

Application filed November 11, 1909, Serial No. 527,375. Renewed March 26, 1914. Serial No. 827,486.

*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 grinding mills and particularly to machines of this general character which are particularly adapted to grind chocolate or other substance when prepared in a semi-fluid condition.

The principal object of the invention is to provide a mill which is adapted for automatically grinding the material over and over again as many times as the nature of the substance may require.

A further object is to provide means for heating the mill and for causing a circulating fluid to flow through the rotating grinding cylinder thereof for either cooling or heating the same.

A construction of mill by which the above objects may be carried into effect and in which the form of the invention at present preferred by me is embodied, is shown in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of the grinding mill. Fig. 2 is a sectional plan view of the base portion of the mill on line 2—2 of Fig. 1. Fig. 3 is a vertical cross-section on line 3—3 of Fig. 1. Fig. 4 is a detail sectional view on a large scale of the grinding cylinders showing the dress with which the same is provided. Fig. 5 is a partial elevation of the surface of the cylinder showing one form of dress. Fig. 6 is a view similar to Fig. 5 showing another form of dress.

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

The essential parts of the mill consist of a trough or concave $a$, a grinding cylinder $b$, a conduit or gutter $c$ and an inlet $d$ from the conduit to the interior of the concave. The latter is preferably cylindrical in form, being approximately a semi-cylinder. It has a cylindrically-curved inner surface which surrounds the lower portion of the grinding cylinder and plane end members $a'$ which embrace the lower parts of the cylinder ends. The conduit or gutter $c$ surrounds the concave and cylinder and is of greater depth on one side thereof than on the other. The inlet $d$ extends from the deepest part of the conduit into the interior of the concave and admits the material to be ground into the latter so that it may be crushed between the adjacent surfaces of the concave and cylinder.

A scraper $e$ is mounted close to the cylinder slightly above the point at which the latter emerges from the concave, and scrapes the ground material therefrom so that it may fall into the shallower part of the conduit. The material runs thence past the ends of the cylinder into the deepest part of the conduit and thence back through the inlet $d$ for regrinding. The conduit thus provides for a circulation of the material by which after it is ground it may be conducted back to the starting point and be reground repeatedly as many times as desired until, when the particles are sufficiently fine, it may be drawn off through an outlet $f$. This outlet extends from the deepest part of the conduit and is normally closed by a gate $g$ which can be opened when the material is to be drawn off.

The details of construction of the mill are preferably such as are illustrated. The conduit is formed in the upper part of a cast metal base $h$ and entirely surrounds a central opening $i$ in said base. The outer rim of the conduit is supported by the walls of the base and its inner portion is supported by a number of webs $j, k$ which extend from the walls of the base nearly to the corners of the opening or recess $i$.

The concave or semi-cylindrical trough $a$ is set into the opening $i$ and is provided with a peripheral lip $a^2$ which rests on the inner rim of the conduit. At its inlet end the concave has flanges $a^3$, which are secured to flanges $c'$ of the conduit by such means as the bolts $c^2$. The inner wall of the conduit is open where attachment is made with the nipple $a^3$ in order that the material may flow into the inlet $d$.

The outlet $f$ previously referred to is a tube extending from the bottom of the conduit at its lowest point out through the adjacent wall of the base. The gate $g$ is a plate which is detachably secured over the end of the outlet by any convenient means such as a bolt or bolts $g'$.

As shown in Figs. 4, 5 and 6 the periphery of the cylinder is provided with a dress which may be either inclined as shown in Fig. 5, or straight across the face thereof as shown in Fig. 6. The dress is formed by parallel grooves, each of which prefer-

ably has one wall abrupt and the other wall formed on a general slant. There is also a grinding action between the end walls of the concave and cylinder, which walls may be also dressed in a similar manner, if desired. The material of which the cylinder and concave are made may be either metal, as steel or cast iron, or stone, if preferred.

A hood *l* extends over the upper part of the cylinder to prevent spattering.

A heating coil *m* is contained within the base below the concave for the purpose of maintaining the temperature of the latter and of the material being ground up to the desired point. There is also provided a means for flowing circulating fluid through the cylinder for either preventing the latter from becoming over-heated or maintaining it at a certain temperature. For this purpose a shaft *n* of the cylinder is provided with passages *o* and *p* extending from opposite ends as far as the interior of the cylinder, which is made hollow. The passage *o* has an outlet *r* from which a tube *s* extends out to the peripheral wall of the cylinder and an inlet *t* permits the overflow to pass out through the passage *p*. Any form of connection usual for such purposes may be made between the ends of the shaft and pipes for the circulating fluid.

I claim:

1. A grinding mill, comprising a grinding cylinder arranged with its axis horizontal, a concave surrounding substantially the lower half of the cylinder, a conduit surrounding the open mouth of the concave, extending on a downward slant from the side at which the cylinder emerges from the concave to the side at which it enters, and an inlet leading into the concave from the lower side of the conduit, for effecting a gravity feed of material once ground back for regrinding.

2. A grinding mill, comprising a grinding cylinder arranged with its axis horizontal, a concave surrounding substantially the lower half of the cylinder, a conduit surrounding the open mouth of the concave, extending on a downward slant from the side at which the cylinder emerges from the concave to the side at which it enters, an outlet leading from the bottom of the conduit adjacent to said inlet, and means for closing or opening the outlet to draw off sufficiently ground material.

3. A grinding mill comprising a grinding cylinder, a concave embracing the bottom and ends of said cylinder, and a conduit of gradually increasing depth extending around said cylinder and concave, from one side thereof to the other.

4. A grinding mill comprising a grinding cylinder, a concave embracing the bottom and ends of said cylinder, a conduit of gradually increasing depth extending around said cylinder and concave from one side thereof to the other, and an inlet from the deepest part of said conduit to the interior of said concave.

5. A grinding mill comprising a grinding cylinder, a concave embracing the bottom and ends of said cylinder, a conduit of gradually increasing depth arranged to receive the ground material expelled from the concave, and extending around said cylinder and concave from one side thereof to the other, and an outlet from the deepest part of said conduit for discharge of the ground material.

6. A grinding mill comprising a coöperating rotary cylinder and concave, a scraper located to act on the upwardly traveling side of said cylinder above the concave, and a conduit into which the material issuing from between the cylinder and concave and removed from the cylinder by said scraper falls, extending downwardly to the lower portion of the concave and having an admission inlet thereto.

7. A grinding mill adapted to accomplish successive grindings of the same material, comprising a grinding cylinder and a concave, which constitute coöperating grinding elements, said cylinder being surrounded only at its lower portion by said concave, whereby the ground material is caused to be ejected from between the cylinder and concave at the point of emergence of the former from the latter, said concave having an inlet at a point below its highest point, and a circulating conduit extending from the side of the concave at which the ground material is expelled therefrom on a gradual incline to said inlet.

8. In a grinding mill, a concave open at the top and having an inlet at a lower point, and a conduit surrounding said concave and communicating with said inlet, said conduit having its greatest depth at the said inlet.

9. A grinding mill having a grinding couple consisting of a cylinder and a concave, provisions for feeding material to be ground into said concave, the concave having its upper termination below the top of the cylinders, means for removing material adhering to the cylinder as the latter emerges from the concave, and means for conducting the material so removed to the inlet of the concave.

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

JOHN WALKER.

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