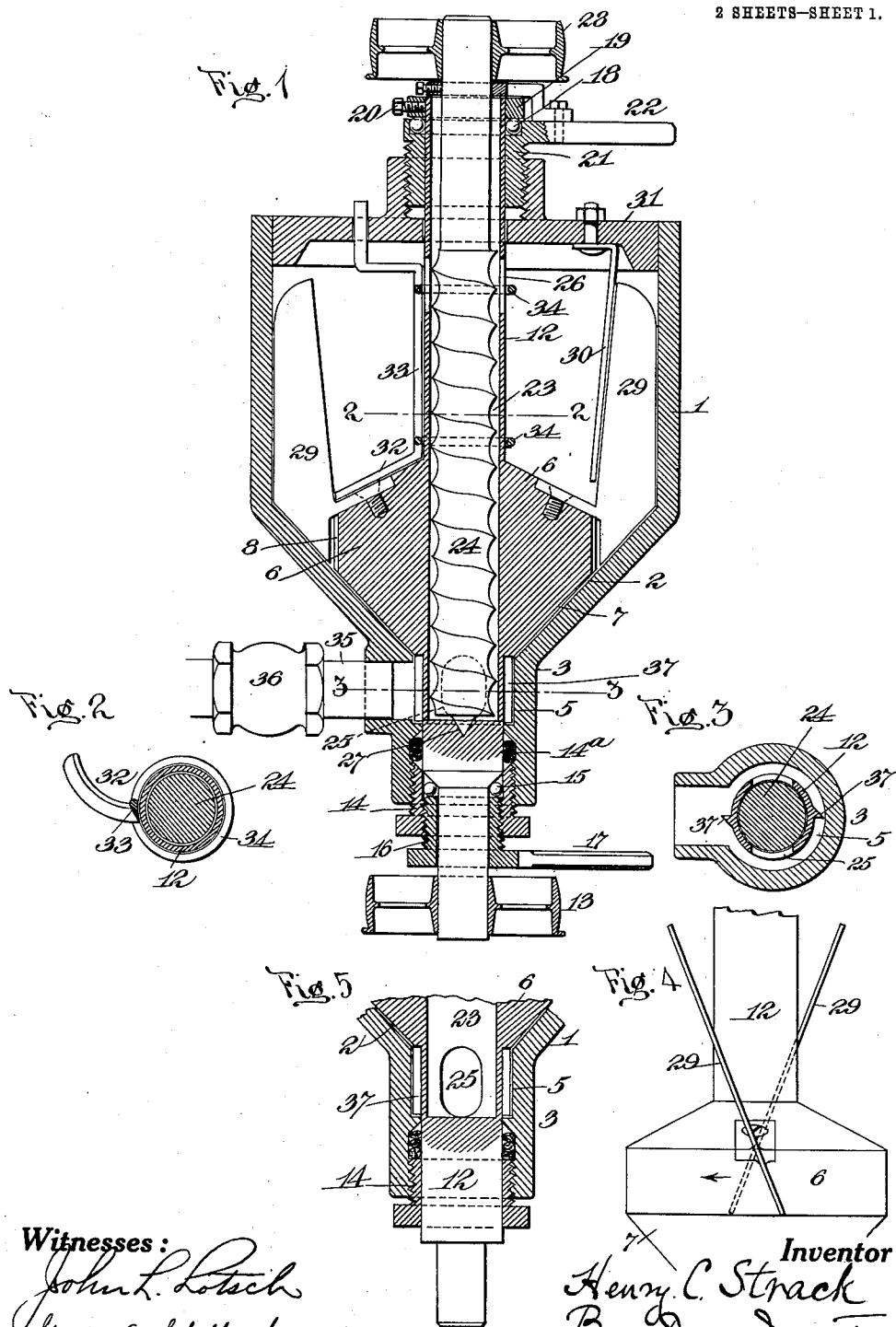


H. C. STRACK.
GRINDING MILL.
APPLICATION FILED MAY 3, 1912.

1,074,299.

Patented Sept. 30, 1913.

2 SHEETS—SHEET 1.



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UNITED STATES PATENT OFFICE.

HENRY C. STRACK, OF OWEGO, NEW YORK.

GRINDING-MILL.

1,074,299.

Specification of Letters Patent.

Patented Sept. 30, 1913.

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To all whom it may concern:

Be it known that I, HENRY C. STRACK, a citizen of the United States, and a resident of Owego, Tioga county, State of New York, have invented a certain new and useful Improvement in Grinding-Mills, of which the following is a specification.

This invention is chiefly intended to be applied to mills for making liquid paints, inks, pastes, varnishes, stains and the like. The materials which it is intended to operate upon are graphite, asphalt, earths and pigments, as well as flour, grain, vegetables, chemicals, clays, rocks, earths and mineral ores and similar materials. These materials are ground in either the dry state, without the admixture of liquid, or with vehicles such as oil, japan, alcohol, water or other solvent or solvents.

The objects I have in view are to eliminate waste, reduce labor, and shorten the time incident to the grinding operation.

A further object is to make the operation of continual grinding automatic, the material passing a plurality of times between the grinding surfaces.

A still further object is to allow the grinding operation to be continued indefinitely until the desired degree of fineness is secured.

Another object is to produce a grinding machine which will not expose the contents of the mill to the air.

Another object is to avoid losses due to handling and to transferring the material being acted upon from one apparatus to another.

These and further objects will more fully appear from the following specification and accompanying drawings, considered together or separately.

In the drawings, Figure 1 is a vertical section of the preferred embodiment of the invention. Fig. 2 is a detail section on the line 2—2 of Fig. 1, showing one form of scraper. Fig. 3 is a detail section on the line 3—3 of Fig. 1, showing one form of scraping wings. Fig. 4 is a side elevation of a portion of a rotary grinder showing the location and position of the plows thereon. Fig. 5 is a detail section of a modification of the support for the rotary grinder. Fig. 6 is a horizontal section taken on the line 6—6 of Fig. 7, and showing a modified embodiment of the invention; and Fig. 7 is a section on

the line 7—7 of Fig. 6, of the devices illustrated in Fig. 6.

In all of the views, like parts are designated by the same reference characters.

Referring to the drawings, the shell or inclosing casing 1, is made of suitable material, and of the proper size. It has a grinding surface 2, on its lower portion. This grinding surface is preferably inclined, as shown. The lower part of the shell terminates in a neck 3. The grinding surface 2 is preferably provided with grooves 4, for assisting in the grinding operation. The neck 3 contains a discharge chamber 5. This discharge chamber collects the material which is being ground, and which naturally flows downward.

The grinder 6 rotates within the shell, and is adapted to grind the material between its lower face and the grinding surface 2. The grinder is preferably made in the shape of a cylinder, with a conical bottom face 7. This conical bottom face is best provided with grooves 8 to assist in the grinding operation. The perpendicular surface of the grinder face is preferably provided with grooves, as shown, to produce a crushing surface. The upper face of the grinder is preferably conical so that the material contained within the shell will freely flow from the center toward the periphery of the grinder.

The grinder is supported upon a shaft 12. This shaft is rotated by any suitable means, such as by the pulley 13. In the embodiment of the invention illustrated in Figs. 1 and 5, the shaft 12 extends through an opening in the bottom of the shell, at the end of the neck 3. In order to prevent leakage of the material through this opening, a gland 14 is provided. This gland compresses and retains in position suitable packing material 14^a.

For the purpose of supporting the shaft 12, a bearing 15 is provided. This bearing is preferably a ball bearing, as shown. This bearing is supported upon a screw-threaded ring 16. An arm 17 controls the position of the ring. By moving this arm, the ring is rotated in a nut, and the vertical position of the bearing is adjusted. This adjustment of the bearing will result in the vertical adjustment of the rotary grinder in relation to the grinding surface. In some situations, a bearing 18 at the top may be

used (see Fig. 1). The shaft is provided with a collar 19, held in position by a set screw 20. This collar rests upon the bearing 18. The bearing is mounted in a screw-threaded ring 21, similar to the ring 16, already described. This ring 21 is provided with an arm 22, controlling its position. By moving this arm, the ring is rotated, and, through the screw-threads, its vertical position is adjusted. When the two rings 21 and 16 are employed, in order to have the weight properly adjusted upon the bearings, it is necessary to actuate the arms 22 and 17 together. If, however, it is desired that more weight be upon one bearing than the other, then the two separate adjustments by the two arms permit this to be done. By means of these bearings the vertical position of the grinder in relation to the grinding surface can be adjusted, as has been described, so that the parts may be adjusted to accommodate material of different degrees of coarseness or fineness.

The material which is being ground between the grinding surface and the grinder passes into the discharge chamber 5, and means are provided for circulating this material from below the grinder to above the same, so that it may be re-ground as many times as desired. This means includes a passage which is preferably, although not necessarily, located within the shaft. The ground material is conveyed through this passage by suitable conveying means which are preferably, although not necessarily, located within the passage. The devices for accomplishing this are as follows: The shaft 12 is provided with a hollow or center-bore 23. The hollow or center-bore extends from below the grinder to a suitable distance above the same, preferably near the top of the shell 1. For the purpose of elevating the material in this hollow or center-bore, a spiral conveyer or screw 24 is provided. An entrance opening 25 is made through the wall of the shaft into the bore below the grinder, and an outlet opening 26 is made in the top of the hollow or center-bore at the desired position. The opening 25 is preferably located below the entire grinder, as shown, but it is obvious that substantially the same results will be attained if the opening be made at a higher point, but at the same time below the upper edge of the grinding surface, provided that there is sufficient extent of grinder above the opening to pulverize the material. The spiral conveyer or screw 24 is mounted in a bearing 27, so that it may freely turn. The upper end of the spiral conveyer or screw is provided with a suitable device for rotating it. The example chosen for illustration is a pulley 28.

For the purpose of preventing material from accumulating above the grinder, I

provide one or more plows 29. These plows are carried by the grinder. They rotate with it, as shown. The outer edges of the plows are in close engagement with the inner surface of the shell. The grinder, rotating, will force the material away from the inner walls of the shell. In order to assist in the downward flow of the material, these grinders are preferably inclined, as shown in Fig. 4. The arrow on Fig. 4 illustrates the direction of rotation of the grinder in the embodiment chosen for illustration. For the purpose of preventing the accumulation of material upon the plows, I provide one or more knives 30. These knives are preferably carried by the cover 31, as shown. The knife blade is in position coincident to the path of the inner edge of the plow 29. As the plow rotates, any material adhering to the plow will be cut off by the knife.

For the purpose of preventing evaporation of the contents of the shell, or to keep them from contact with the air, I prefer to employ a tight cover 31. This cover 31 also will support the knife 30. It will also support the nut which carries the screw-threaded ring 21.

For the purpose of preventing the accumulation of material upon the top of the grinder and upon the outside of the shaft 12, I employ a scraper 32. This scraper 32, best shown in Fig. 2, extends outward from the shaft to the periphery of the grinder. It is best made curved, as shown in Fig. 2, so as to more effectually remove the material from the upper side of the grinder. This scraper is provided with a vertical shank 33, having a sharp edge. This shank engages with the shaft 12. For the purpose of supporting the scraper in position, it is provided with one or more rings 34. These rings surround the shaft 12, and hold the scraper in contact with it. The upper end of the scraper is shown as extending through an opening in the cover 21. The scraper has some play in this opening, so that the vertical movement of the grinder and shaft will not be interfered with. The weight of the scraper will naturally keep it in engagement with the upper face of the grinder.

The plow 29 and scraper 32 may be employed together, as shown, or one or both may be omitted, and if desired, either or both may be used without the hollow shaft and conveyer.

For the purpose of drawing off the ground material when a proper consistency has been reached, I provide a pipe 35, connected to the discharge chamber 5. This pipe is closed by means of a valve 36. For the purpose of preventing the accumulation of material upon the walls of the discharge chamber 5, I provide scraping wings 37. These wings are preferably attached to the shaft 12 below the grinder.

Fig. 5 illustrates a modification of the invention, in which the bearing 15 and screw-threaded rings 16 and 17, at the bottom of the shaft 12, are omitted.

5 Figs. 6 and 7 illustrate a modification of the invention. In this modification, the spiral conveyer or screw 24, instead of being rotated, is fixed to the shell 1. The relative rotary movement of the spiral and shaft is, therefore, secured by the rotary movement of the shaft alone. In this modification, instead of a cover being employed, a bridge is used. This bridge carries the knife 30, and also the bearing for the upper screw-threaded ring 21.

10 In accordance with the provisions of the patent statutes, I have described the principle of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is merely illustrative and that the invention can be carried out in other ways.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A grinding mill having a shell with a grinding surface; a grinder within the shell; means for rotating the grinder; a hollow shaft for supporting the grinder; and a conveyer within the shaft for causing the ground material to pass through the shaft from below the grinder to above the same; an inlet to the interior of the shaft below the grinder, and an outlet above the same, the said conveyer extending from the inlet to the outlet; and a plow carried by the grinder and rotating with it.

2. A grinding mill having a shell with a grinding surface; a grinder within the shell; means for rotating the grinder; a hollow shaft for supporting the grinder; means for causing the ground material to pass through the shaft from below the grinder to above the same; an inlet to the interior of the shaft, below the grinder, and an outlet above the same, the said conveyer extending from the inlet to the outlet; and a plow carried by the grinder and rotating with it, said plow being inclined to force the material downward.

3. A grinding mill having a shell with a grinding surface; a grinder within the shell; means for rotating the grinder; a hollow shaft for supporting the grinder; means for causing the ground material to pass through the shaft from below the grinder to above the same; an inlet to the interior of the shaft, below the grinder, and an outlet above the same, the said conveyer extending from the inlet to the outlet; a plow carried by the grinder and rotating with it; and a fixed scraper carried by the shell and lying in the path of the inner edge of the plow.

65 4. A grinding mill having a shell with a

grinding surface; a grinder within the shell; means for rotating the grinder; a hollow shaft for supporting the grinder; means for causing the ground material to pass through the shaft from below the grinder to above the same; a plow carried by the grinder and rotating with it, said plow being inclined to force the material downward; and a fixed scraper carried by the shell and lying in the path of the inner edge of the plow.

5. A grinding mill having a shell with a grinding surface; a rotary grinder within the shell and cooperating with the surface; means for rotating the grinder; a hollow shaft for the grinder; means for passing ground material from below the grinder to above the same through the shaft; and a scraper engaging with the shaft and top of the grinder and cooperating with the same.

6. A grinding mill having a shell with a grinding surface; a rotary grinder within the shell and cooperating with the surface; means for rotating the grinder; a hollow shaft for the grinder; means for passing ground material from below the grinder to above the same through the shaft; a scraper engaging with the shaft and top of the grinder and cooperating with the same; and means for adjusting the relative position of the grinder and grinding surface, said scraper keeping in contact with the shaft and grinder, irrespective of the position of the latter.

7. A grinding mill having a shell with a grinding surface; a rotary grinder within the shell and cooperating with the surface; said shell having a discharge chamber below the grinding surface; an outlet for drawing off the ground material from such chamber; a shaft for supporting the grinder; and wings on the shaft within the chamber for passing the material through the outlet.

8. A grinding mill having a shell with a grinding surface, a rotary grinder within the shell, and a plow carried by the grinder, and moving in juxtaposition to the inside of the shell, said plow being inclined to force the material downward.

9. A grinding mill having a shell with a grinding surface, a rotary grinder within the shell, a plow carried by the grinder and moving in juxtaposition to the inside of the shell and a fixed scraper carried by the shell and lying in the path of the inner edge of the plow.

10. A grinding mill having a shell with a grinding surface, a rotary grinder within the shell, a plow carried by the grinder and moving in juxtaposition to the inside of the shell, said plow being inclined to force the material downward and a fixed scraper carried by the shell and lying in the path of the inner edge of the plow.

11. A grinding mill having a shell with a grinding surface, a grinder within the shell, 130

a shaft for supporting the grinder, and a scraper engaging with the shaft and top of the grinder and coöperating with the same.

12. A grinding mill having a shell with a
5 grinding surface, a grinder within the shell, a shaft for supporting the grinder, a scraper engaging with the shaft and top of the grinder and coöperating with the same, and
10 means for adjusting the relative position of the grinder and the grinding surface, said

scraper keeping in contact with the shaft and grinder irrespective of the position of the latter.

This specification signed and witnessed this first day of May, 1912.

HENRY C. STRACK.

Witnesses:

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