Sept. 15, 1942. H. L. GLAZE 2,295,838

PELLET MILL

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FIG. 1.

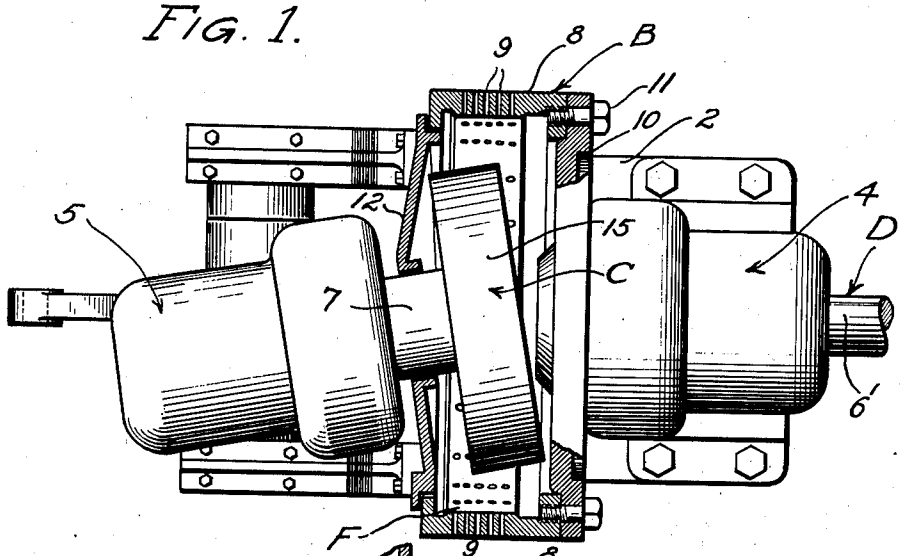
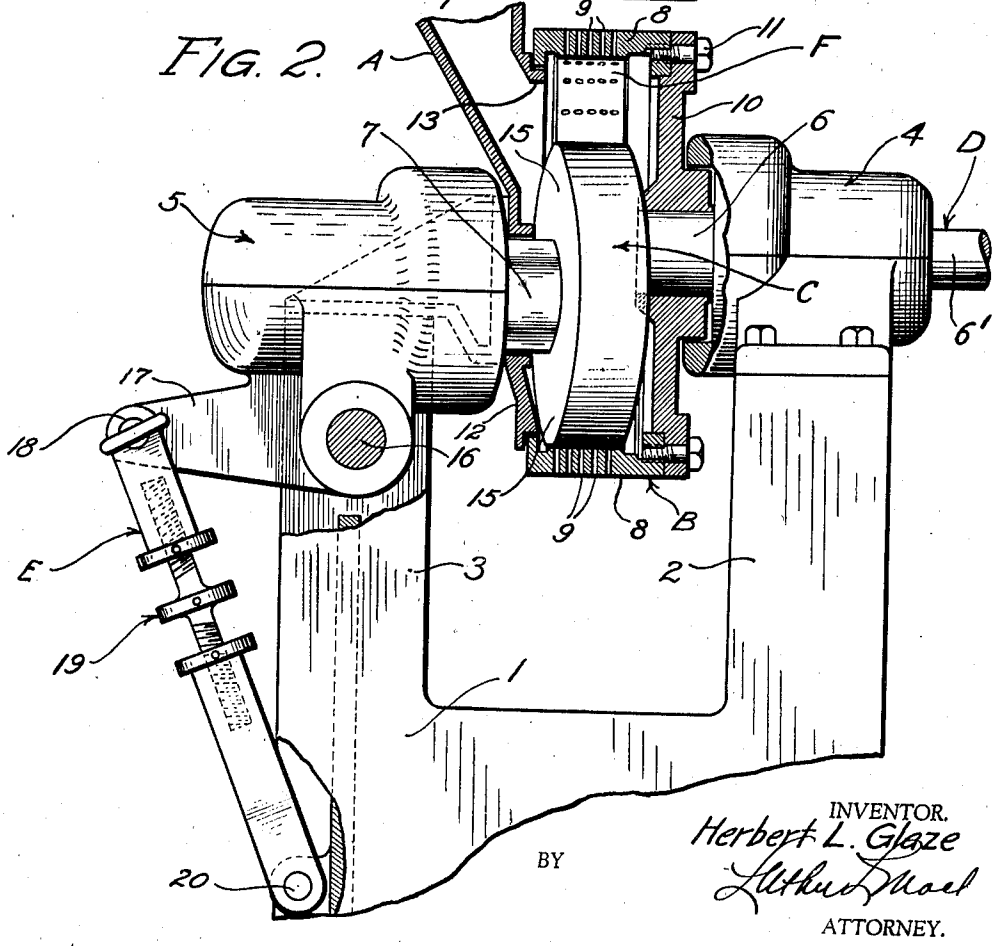


FIG. 2.



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FIG. 3.

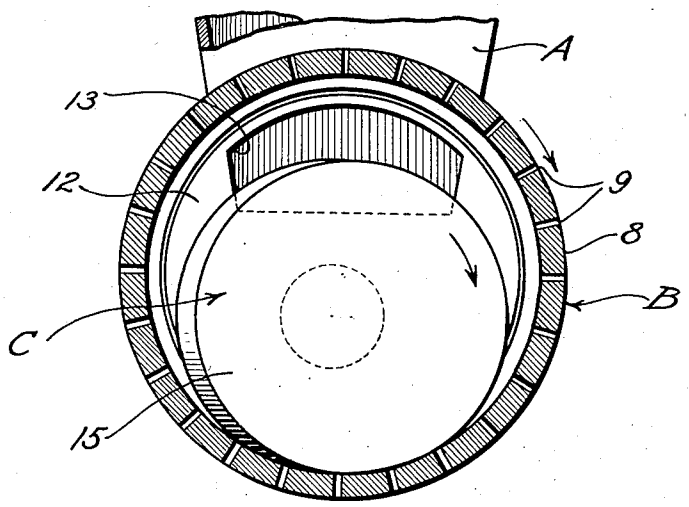
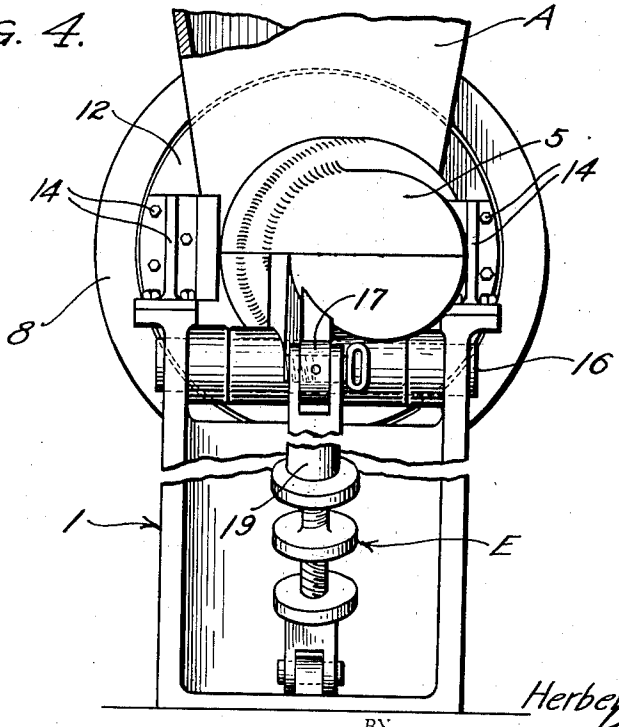


FIG. 4.



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PELLET MILL

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Application April 17, 1937, Serial No. 137,548

7 Claims. (Cl. 107—8)

This invention relates to improvements in mills for preparing stock and poultry feed or other materials in the form of pellets.

An object of this invention is to provide a pellet mill which will be superior to mills heretofore used, in point of, production of pellets having more uniform desirable characteristics, simplicity and inexpensiveness of construction and operation, and freedom from clogging, frequent shutdowns, undue wear, replacement of parts and breakage.

An important object of the invention is to provide a pellet mill wherein the objects and advantages hereinbefore noted are obtained by the employment of die and pressure members which are so constructed, relatively arranged and operated to produce a sliding, wiping, scraping, kneading and pressing action upon the pellet forming material disposed between them, whereby to extrude said material in the form of pellets.

Another object is to provide a pellet mill of the character described wherein objects and advantages of the invention are attained by disposing a rotatable pressure member and a rotatable pellet forming die in axial angularity to one another.

A further object is to provide a pellet mill such as described wherein an annular die member and a pressure member are so related that the latter will have a wiping contact obliquely or angularly across the die and vice versa whereby to not only effectively extrude the material through the die without the jamming or clogging of the material, but to effect a cleaning action of said members.

The invention also resides in provision of a pellet mill wherein the objects and advantages herein noted are obtained by employment of coacting cylindrical die and pressure members which are mounted in angularly related positions or in other words are disposed in skewed tangential relation whereby the pellet forming material will be compressed and extruded through the die orifices upon appropriate movement of one or both of said members.

Another important object is to provide a pellet mill having adjusting means for varying the axial angularity of the die and pressure elements for varying the cooperative actions thereof and for compensating for wear.

The invention further contemplates the provision of a mill of the character described wherein a cylindrical die and pressure members are mounted to rotate on angularly related axes that are disposed in parallel planes.

Other objects may appear as the description progresses.

I have shown a preferred form of the invention in the accompanying drawings, subject to modification within the scope of the claims appended hereto, without departing from the spirit of the invention.

In said drawings:

Fig. 1 is a horizontal sectional view of the mill taken through the die but showing the pressure member in plan,

Fig. 2 is a vertical sectional view taken through the mill showing the pressure member in side elevation,

Fig. 3 is an enlarged vertical sectional view showing the relation of the die and pressure members,

Fig. 4 is a fragmentary end elevation of the mill particularly showing the adjusting means.

One embodiment of the pellet mill of this invention may as shown in the accompanying drawings, essentially comprise a hopper A, a rotary die member B, a rotary pressure member C, a drive means D for rotating one of said members, and adjusting means E for varying the relative positions of said members.

In a broader sense the invention contemplates an arrangement of substantially cylindrical die and pressure members such that they may be moved in angularly related paths which intersect at a point of approximate or actual contact of said members with one another, whereby the pellet forming material will be compacted and acted upon, adjacent to and at said point by and between said elements, with a laterally applied sliding, wiping, scraping and pressing action. In other words, the said members are disposed in skewed tangential relation and the action resulting from this arrangement is most effective for cleaning off the die and pressure elements, to prevent clogging and jamming, and at the same time causes an extrusion of the material as pellets having uniform desirable characteristics, and without crushing the material or compacting it to such an extent as to form pellets of undersirable hardness.

In other words the mill may be said to have the die and pressure members in axially skewed tangential relation and preferably with each member disposed concentric with and for rotation about a horizontal axis to the other member.

More specifically the mill here shown comprises a frame 1 including spaced standards 2 and 3 on which are mounted suitable bearings 4 and 5 and

shafts 6 and 7 which support the die and pressure members B and C respectively.

The die B is formed as a cylinder and includes a detachable cylindrical band 8 having a plurality of pellet forming orifices 9 extending radially therethrough. One side of the die cylinder is closed by a circular wall 10 to which the band 8 is detachably secured by fastenings 11. The other side of the die cylinder is closed by a wall 12 which supports the hopper A, said hopper discharging the pellet forming material into the die cylinder through an opening 13 in the wall 12.

While either or both of the members B and C may be driven, as here shown the die member B only is arranged to be driven by the shaft 6 on which latter said member is keyed. This shaft has one end extended, as at 6', for actuation by a suitable motor or prime mover (not shown).

To provide for the setting of the die and pressure members in axial angularity, the bearing 5 and shaft 7 and pressure member C are skewed or disposed at an angle to the corresponding elements of the die, yet shaft 7 is in a horizontal plane or a plane paralleling the axial plane of the die shaft.

The pressure member C comprises a cylindrical roller 15 which as here shown is concentric with the shaft 7 and has its periphery slightly greater in width than that of the orificed face F of the die, it being noted that this face F is raised or extended from the remainder of the band 8.

With this arrangement the pressure roller 15 is angularly disposed relative to the die and is also eccentrically related thereto in such manner that opposed portions of said die and roller member are disposed in contact at the lower sides of said band and roller as particularly shown in Figs. 2 and 3. This arrangement creates a crescent shaped space between the outer periphery of the roller 14 and the inner periphery of the band 8, whereby intake opening 13 disposed at the larger part of said space, provide for an adequate intaking of material. The material entering this space from the hopper will gravitate downwardly and pass between the faces of the die and roller to be kneaded, compressed and extruded with a skewed action as herein noted.

As here shown the pressure roller 15 is fixed against adjustment in a horizontal plane, or in other words, against movement about a vertical axis, but it is obvious that such an adjustment could be provided as within the scope of this invention. However, the adjusting means D provides for adjustment or movement of the pressure roller up or down about a horizontal axis. This is desired to compensate for the wear of the die and roller or either of them whereby to maintain the fixed axial angularity which is best suited to successful milling operations. On the other hand the adjustment could be effected to vary the spacing of the roller and die to introduce another angularity factor such that the opposed contacting faces of the die and roller would be angularly related instead of disposed in parallel planes which latter is the normal relation contemplated for operation of the mill.

To provide for adjustment of the pressure roller through manipulation of the means D the bearing 5 is mounted to turn on a horizontal axis indicated at 16 and has a crank arm 17 extended outwardly therefrom. The outer end of this arm is pivoted as at 18 to a turn buckle link 19 which is pivoted as at 20 to the frame 1. Upon appropriate adjustment of this link the bearing 5 will be moved so as to vary the position of the roller 15 relative to the die for the purposes aforementioned. When it is desired to change die bands the wall 12 carrying the hopper A, together with said hopper, must be moved laterally outwardly on the shaft 7, so as to clear the band 8. In order to so move this wall and hopper the angle arms 14 which are secured by suitable fastenings to the frame 1 and wall 12, must also be removed. With the wall 12 thus moved outwardly, it is only necessary to disassemble the adjusting means E, as by disconnecting it at the pivot 18, in order that the bearing 5, shaft 7, roller 15, and wall 12 may be tilted upwardly and outwardly to permit of access to the band 8 for removal and replacement thereof. Upon removing the fastenings 11 the band 8 may be detached and desired substitute bands then mounted in place. It will be noted that the roller 15 will clear the band 8 when said roller is tilted upwardly and outwardly as aforesaid. While as here shown, the wall 12 is swung outwardly with the shaft 7, it is obvious that a sectional construction of the wall would obviate the necessity of taking down the entire wall, inasmuch as only the section which would obstruct the tilting movement of the shaft 7 need then be removed.

In the operation of the mill of this invention the material to be formed into pellets while in a plastic or semi-plastic state, is fed into the die from the hopper A through the intake opening 12 and gravitates and is moved into position between the opposed lower sides of the die and roller. Assuming for example that the die is rotated in a clockwise direction by the application of a driving force to the shaft 6, the frictional engagement of the die with the roller 15 causes the latter to rotate correspondingly. Owing to the angular disposition of the roller it is seen that as the die revolves the roller will effect a kneading action tending to effectively compress the pellet forming material and to cause it to be extruded through the die orifices in the form of pellets at and adjacent the point where the roller and die are in contact. This angular disposition of the face of the roller also produces a transverse or what may be termed, a skewed wiping action whereby the die and roller scrape or wipe across the opposed faces of one another. This provides the effective pellet forming action and prevents clogging of the die orifices.

It should be noted that this invention contemplates the provision of a mill by means of which advantages, some of which are described herein, are obtained by having substantially cylindrical cooperative members or their equivalents, skewed tangentially and subject to movement of one of both thereof, whereby to more efficiently extrude plastic material in the form of pellets of highly desirable characteristics.

I claim:

1. A pellet mill comprising coacting rotary cylindrical members adapted to compress between them material to be formed into pellets, means for rotating one of said members, one of said members having pellet forming orifices, and means for supporting said members in axially skewed tangential relation, with the axes of said members disposed in parallel planes.

2. A pellet mill comprising a frame, a rotary cylindrical die member having pellet forming orifices, a drive shaft on which said member is mounted, a bearing for said shaft, said member having an intake opening in one side thereof,

a hopper for introducing material through said opening into the interior of said member, a cylindrical pressure roller mounted in skewed tangential relation to and interiorally of said die member, a shaft for said roller, an adjustable bearing for said shaft and means for adjusting said last-named bearing.

3. A pellet mill comprising a frame, a rotary cylindrical die member having pellet forming orifices, a drive shaft for said member, a bearing for said shaft, said member having an intake opening in one side thereof, a hopper for introducing material through said opening into the interior of said member, a cylindrical pressure roller mounted in skewed tangential relation to and interiorally of said die member, a shaft for said roller, a bearing for said shaft adjustable about a horizontal axis, and means for adjusting said last-named bearing, said bearings supporting said shafts in parallel planes.

4. A pellet mill comprising a cylindrical rotary die having pellet forming orifices in the cylindrical wall thereof, means closing one side of said die, a stationary wall closing the other side of said die, means for feeding material into the die through said stationary wall, a pressure roller mounted within said die, and means supporting said pressure roller for tilting movement into and out of cooperative relation to said die.

5. A pellet mill comprising a cylindrical die member having pellet forming orifices in the cylindrical wall thereof, means for rotatably supporting said die, a pressure roller disposed within said die member, a shaft supporting said pressure roller, means supporting said shaft for tilting movement, whereby the pressure roller may be moved into and out of said die.

6. A pellet mill comprising a die member having a right cylindrical surface containing pellet forming orifices, a pressure member having a right cylindrical surface coacting with said right cylindrical surface of said die member, said pressure member being disposed eccentrically within said die member and adapted to compress material between said right cylindrical surfaces, whereby to extrude said material through said orifices, and means supporting said members in skewed tangential relation.

7. A pellet mill comprising a die member having a right cylindrical surface containing pellet forming orifices, a pressure member having a right cylindrical surface in frictional driving engagement with said surface of said die member, means for rotating one of said members whereby material between said surfaces thereof will be compressed and extruded thru said orifices, and means for supporting said members in skewed relation.

HERBERT L. GLAZE.