April 22, 1941. M. S. BYERS 2,239,497

ATTRITION MILL FLINGER

Filed July 13, 1939

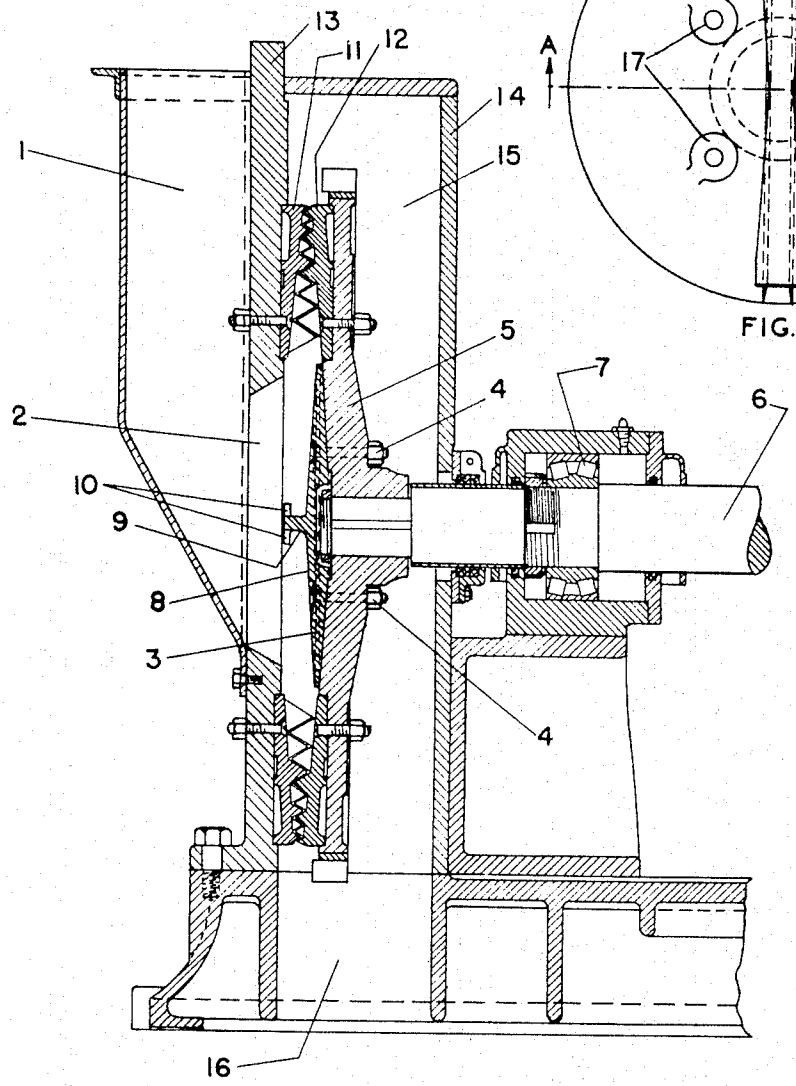


FIG. 1

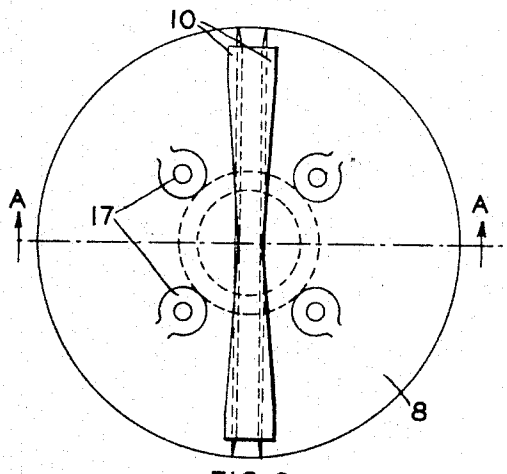


FIG. 2

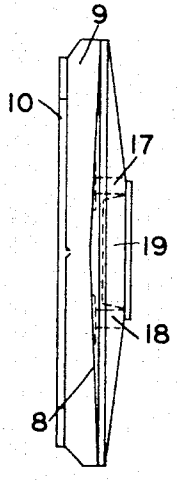


FIG. 4

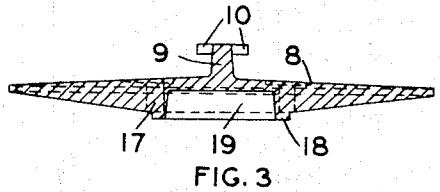


FIG. 3

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ATTRITION MILL FLINGER

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7 Claims. (Cl. 83—8)

This invention relates to attrition mills and more particularly it relates to an improved flinger plate for feeding material to the grinding members of such mills.

In attrition mills, material is ground by the action of two serrated plates one or both rotating so as to achieve differential motion. These plates are essentially annular disc-like members, the central portion of the discs being cut away to provide feeding space. The material to be ground is fed radially from the central opening to the serrated plates between which it is ground. Feeding is accomplished by means of a rotating flinger cone or feeding flinger centrally located with respect to the serrated discs. Curved vanes projecting from the substantially conical face of the feeding flinger throw the material outwardly to the grinding members of the mill.

The efficiency of the mill depends upon the ability of the feeding flinger to provide material to be ground to the full capacity of the grinding members and their power source at all times. Feeding devices in the past have not accomplished continuous full capacity feeding at all times, particularly when the material to be ground is irregular and non-uniform in size and when the material is low in density. When chipped or coarsely shredded wood, for example, is fed into an attrition mill, the feeding devices heretofore known have not been capable of providing a uniform, sufficient flow equal to the full capacity of the grinding members. In addition, jamming of the feed opening of the mill has been frequent due to inefficiency of the flinger, causing interruption of the grinding operation and requiring the services of an attendant to punch the jammed material into the mill. Furthermore, the feeding flinger has worn rapidly, especially when the material being fed contained grit, in spite of the use of special hardened steel or stellited surfaces in the construction of the flinger.

It is an object of this invention to provide an improved feeding flinger for attrition mills which will feed material to be ground to the full capacity of the grinding members, and further to accomplish this object when material, such as chipped or shredded wood, which is irregular and of non-uniform size and of low density, is being fed.

It is a further object to provide a feeding flinger so designed as to substantially eliminate jamming of the material being fed in the mill feed opening.

It is a still further object to provide a feeding flinger which will wear less rapidly.

It is also an object to provide a reversible flinger having a second set of wearing surfaces available.

Other objects will appear as this invention is described.

Now in accordance with this invention there is provided a new feeding flinger for attrition mills, the flinger having a substantially flat or moderately convex substantially conical face with a projecting vane diametrically thereacross, the vane being flanged along its projecting diametrical edge. The flange extends forwardly in the operating direction of motion of the vane. Preferably, the flange extends symmetrically both sides of the vane and perpendicularly to the plane thereof, the flanged vane thereby becoming T-shaped in its cross-sectional aspect. Preferably the flange is wider at the ends of the vane than at the center portion, the flange being progressively narrower along a portion of the vane as the center is approached. At or near the center, the flange may be very narrow or altogether eliminated. The feeding flinger is provided with means for mounting onto a rotatable shaft connected to a suitable source of power.

Having indicated in a general way the purposes and nature of this invention, there follows a more detailed description of a preferred embodiment thereof and its manner of operation in connection with the accompanying drawing. In the drawing:

Figure 1 is an assembly view with parts in cross-section, of an attrition mill showing the improved feeding flinger in its operating position in the mill,

Figure 2 is a plan view of a preferred form of feeding flinger,

Figure 3 is a cross-sectional view of the feeding flinger along plane AA indicated in Figure 2, and

Figure 4 is elevation view of the feeding flinger shown in Figure 2.

The manner of operation of the feeding flinger will be described with reference to the attrition mill assembly shown in Figure 1. The chute 1 leads to the feed opening 2 of the mill. The feeding flinger 3 is opposite the opening and is mounted by bolts 4 upon the runner head 5 which is in turn mounted upon the rotatable shaft 6 which is supported by the bearing 7 and which is connected to a suitable source of power. The face 8 of the feeding flinger 3 is provided with a projecting T-shaped vane 9 having flanges 10. Beyond the periphery of the feeding flinger 3 are the two sets of serrated grinding plates 11 and 12 which make up the two annular grinding discs of the mill. One set is bolted to the fixed

support 13, the other to the runner head 5. The casing 14 provides space 15 for the ground material and is provided with an outlet 16.

In the operation of the mill shown in Figure 1, the material to be ground is placed in the chute 1 from which it passes through the mill feed opening 2 to the feeding flinger 3. The flinger rotates at a fairly high speed, for example at 1200 R. P. M. with the shaft, runner head 5 and grinding member 12. The vane 9 of the rotating flinger forces the material to be ground continuously between the grinding members 11 and 12, the face 8 of the flinger and the flanges 10 providing positive guidance for the material. The material is ground between the members 11 and 12 and passes through the casing space 15 to the outlet 16.

Figures 2, 3, and 4 are plan, cross-sectional and elevation views respectively of a preferred form of feeding flinger according to this invention. The face 8 of the flinger is a conical surface, the cone having a very low aspect ratio, i. e. 0.025, defining aspect ratio as used herein and in the claims as the height of the cone divided by the diameter of its base. The vane 9 projects from and extends diametrically across the face 8 of the flinger. The vane is flanged at its projecting diametrical edge by the flanges 10, which give the vane a T-shape in its cross-section aspect at the flanged portions. The flanges are widest at the end portions of the vane, that is, toward the periphery of the flinger. The width of the flanges is uniform for a portion of the vane and becomes progressively less along a portion of the vane as the central axis of the flinger is approached. At the center the width is zero. The flinger is provided with suitable bolt holes 17 so that it may be connected rigidly with the shaft of a mill, for example, by bolting to the runner head of the mill. The surface 18 is a seating surface which rests against a suitable connecting member such as a runner head when the flinger is assembled in a mill. The recess 19 provides room for suitable fixing devices to hold a runner head upon the end of a mill shaft.

The face of the finger shown in the drawing is slightly convexly conical so that space may be provided for the hereinabove mentioned recess 19. However, a flinger with a flat or plane face may be used where the mill member or members adjacent to the flinger are of such shape as to allow a substantially plane face to be used. In general, it is preferred to make the face of flinger as flat as possible, preferably keeping the aspect ratio of the face below about 0.05. As the aspect ratio of the face is increased above about 0.05, the advantages of this invention are in part decreased, although they are not entirely lost at, say, an aspect ratio of about 0.25. A moderately concave face may also be used within the scope of this invention. Where the shape of the face of the flinger departs from a plane surface, the use of a conical face is preferred but a lenticular face may also be used. A lenticular face is considered to be within the scope of the term, substantially conical face, as used herein.

Desirably the diameter of the feeding flinger is at least equal to the feed opening of the mill in which it is used; preferably the diameter is only slightly less than the inner diameter of the annulus of the grinding members of the mill.

The height of the diametrical vane of the flinger may be varied but preferably will be made sufficient to feed material to the grinding members to their full capacity. At the periphery of the flinger the height of the vane inside its flange is desirably approximately equal to the opening between the faces of the grinding plates. The width of the flanges may be varied but preferably will be sufficient to retain upon the vane the full quantity of material desired to be fed to the grinding members when the mill is in operation, but not greatly in excess of this width for too wide a flange would hinder access of the material to the vane and reduce the feeding rate. Although it is not essential to vary the width of the flange across the face of the flinger, the width is preferably reduced, say to zero at the center, as the center is approached from the peripheral ends of the vane. Improved access of the material to the working surfaces of the flinger vane is thereby achieved, increasing the efficiency of the feeding device. The outward, flanged edge of the vane preferably follows a single straight line parallel to the plane of the periphery of the flinger, but this is not essential as, for example, the edge may follow a different straight line on each side of the center or may be curved.

It will be appreciated that the advantages of this invention in providing positive, continuous, high capacity feeding of material will be obtained if the flanges of the vane of the flinger extend from the vane only in the direction of motion of the flanged portion of the vane assumed when the mill is in operation. However, it is preferable to extend the flanges on both sides of the vane so that its cross-sectional aspect is T-shaped and so that the flinger as a whole is symmetrical about the diametrical plane of the vane. With this construction, the life of the feeder is doubled, for, the face and flange along one side of the vane having become worn, the direction of operation of the mill need merely be reversed to expose a new set of surfaces, such reversal conveniently also providing a similar exposure of a new set of working surfaces on the grinding members. This advantage is lacking in previous feeding devices.

The material of which the feeding flinger of this invention is constructed may be any material of sufficient strength, toughness, and resistance to wear to serve the purpose. Heretofore, hardened manganese steels or built up stellited surfaces on iron or steel have been employed as the wearing of the member is rapid especially when handling grit-containing materials. Now it has been found, surprisingly enough, that relatively soft metals are preferable in wearing qualities to the extremely hard materials mentioned. Preferably, according to this invention tough, moderately soft metals, especially the cuprous metals such as brass, bronzes, Monel metal, etc., are employed as the material from which feeding flingers are made. Thus, for example, the feeding flinger shown in the drawing may be constructed of cast brass.

The feeding flinger of this invention provides positive, continuous, high capacity feeding of material to the grinding members of a mill with substantially no jamming of the material. It is believed these improved results are brought about by the combination of the flanges on the vane of the feeder with the very low aspect of the face of the feeder as compared with the high aspect or extreme convexity of past devices. It is believed the same features are further responsible for the increased wearing life of the feeder. To the increased wearing life brought about by the said features is added a further increase in life when the moderately soft metals such as

brass, etc., hereinbefore mentioned, are used. The increased wearing life is further doubled by virtue of the symmetrical nature of the flinger of this invention which allows it to be reversed in direction of operation.

It will be understood the feeding flinger of this invention may be used in mills in which a grinding member is fixed and another grinding member is moving as in the mill hereinbefore described, or it may be used in mills in which both grinding members are in motion. The flinger may rotate integrally with a grinding member or, if desired, it may be rotated by suitable means independent of the means driving a grinding member

It will be understood that the details and examples hereinbefore set forth are illustrative only, and that the invention as broadly described and claimed is in no way limited thereby.

What I claim and desire to protect by Letters Patent is:

1. In an attrition mill, a rotatable feeding flinger for feeding material to the grinding members of the mill, comprising a moderately conical faced backing disc with a vane projecting from the disc and extending diametrically across the face of the disc, the vane having a flange along the major portion of its projecting diametrical edge forming a channel increasing in capacity for material from the axis to the periphery of the backing disc.

2. In an attrition mill, a feeding flinger for feeding material to the grinding members of the mill, with a vane projecting from and diametrically across the face thereof, and a flange along at least a portion of the projecting diametrical edge of the vane, the flange extending symmetrically in such a manner as to provide a T-shaped cross-sectional aspect to the vane at the flanged portion thereof.

3. In an attrition mill, a feeding flinger for feeding material to the grinding members of the mill, with a vane projecting from and diametrically across the face thereof, and a flange along the projecting diametrical edge of the vane, the flange extending symmetrically in such a manner as to provide a T-shaped cross-sectional aspect to the vane at the flanged portions thereof, the flange being wider at the portions of vane toward the periphery of the flinger than at the center of the vane and being progressively narrower over a portion of the vane as the center is approached.

4. In an attrition mill, a feeding flinger for feeding material to the grinding members of the mill, having a convex substantially conical face, the aspect ratio of the face being less than about 0.05, with a vane projecting from and diametrically across the face of the flinger, and a flange along at least a portion of the projecting diametrical edge of the vane, the flange extending symmetrically in such a manner as to provide a T-shaped cross-sectional aspect to the vane at the flanged portion of the flinger.

5. In an attrition mill, a feeding flinger for feeding material to the grinding members of the mill, having a convex substantially conical face, the aspect ratio of the face being less than about 0.05, with a vane projecting from and diametrically across the face of the flinger, and a flange along the projecting diametrical edge of the vane, the flange extending symmetrically in such a manner as to provide a T-shaped cross-sectional aspect to the vane at the flanged portions of the flinger, the flange being wider at the portions of vane toward the periphery of the flinger than at the center of the vane and being progressively narrower over a portion of the vane as the center is approached.

6. In an attrition mill, a feeding flinger for feeding material to the grinding members of the mill, having a substantially flat face, with a vane projecting from and diametrically across the face, and a flange along at least a portion of the projecting diametrical edge of the vane, the flange extending symmetrically in such a manner as to provide a T-shaped cross-sectional aspect to the vane at the flange portion.

7. In an attrition mill, a feeding flinger for feeding material to the grinding members of the mill, having a substantially flat face, with a vane projecting from and diametrically across the face, and a flange along the projecting diametrical edge of the vane, the flange extending symmetrically in such a manner as to provide a T-shaped cross-sectional aspect to the vane at the flanged portions, the flange being wider at the portions of vane toward the periphery of the flinger than at the center of the vane and being progressively narrower over a portion of the vane as the center is approached.

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