

G. LANE.
GRINDING MILL.

APPLICATION FILED MAY 23, 1912.

1,062,481.

MODEL.

Patented May 20, 1913.

Fig. 1.

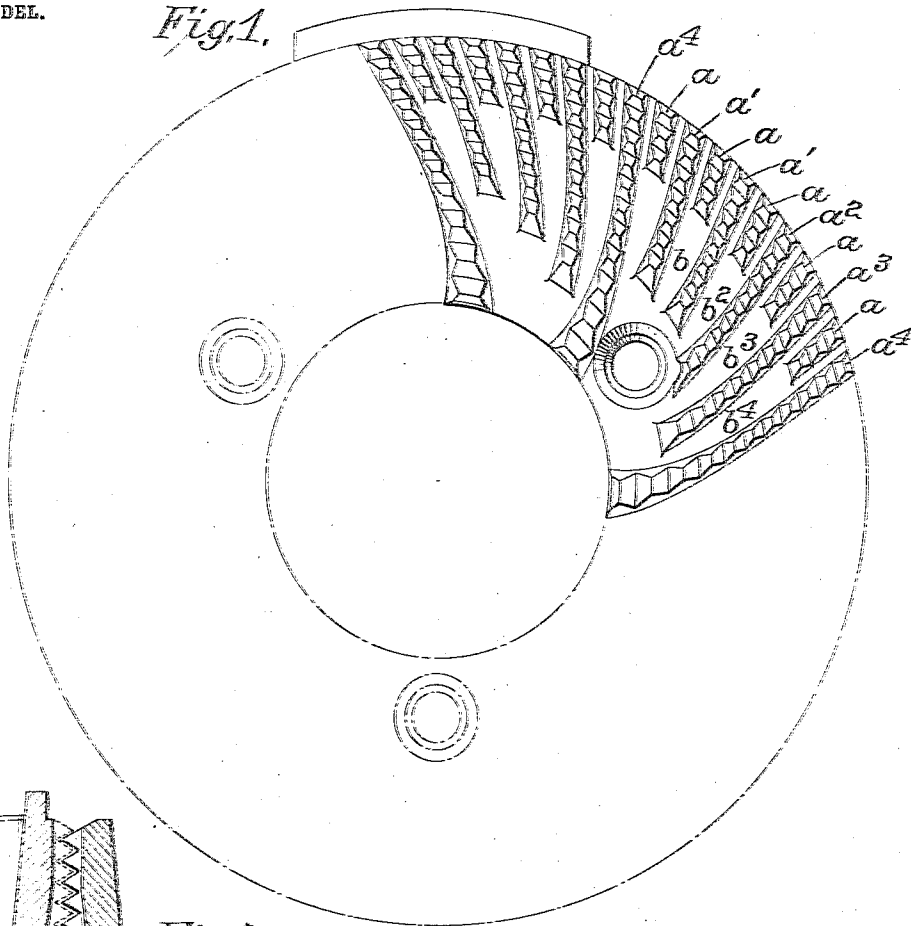
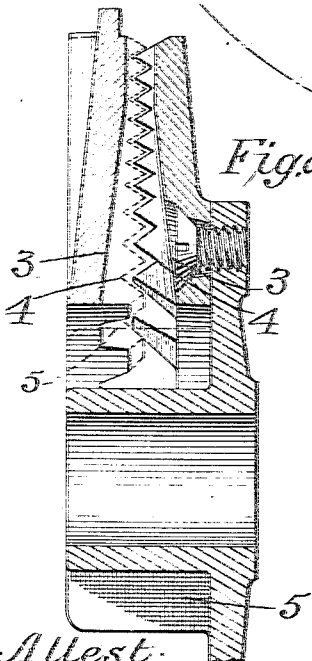


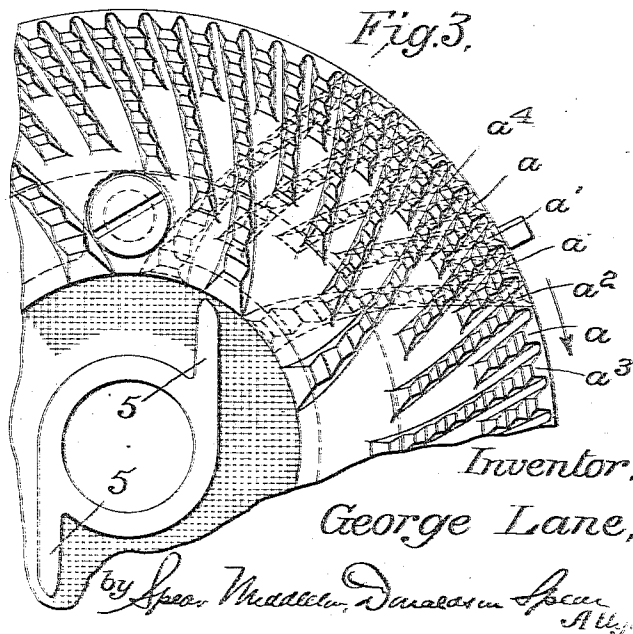
Fig. 2.



Attest:

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Fig. 3.



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UNITED STATES PATENT OFFICE.

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GRINDING-MILL.

1,062,481.

Specification of Letters Patent.

Patented May 20, 1913.

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To all whom it may concern:

Be it known that I, GEORGE LANE, a citizen of the United States, residing at Poughkeepsie, New York, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification.

My invention hereinafter described, relates to the grinding plates of mills for grinding coffee, or materials of like grinding qualities, of that class in which the grinding plates are of the interlocking toothed type, a form which has the advantage of retarding the blunting or dulling of the teeth. In this my invention, I have sought to retain this important advantage, and, by the combination therewith of other elements of shape and arrangement in respect to the grinding plates, have added thereto the other important advantages of uniform feed and uniform granulation, and have greatly increased also the working capacity of the mill and improved the quality of the product.

I have illustrated the best form known to me, of embodying my invention, in the accompanying drawings, in which—

Figure 1 represents the face or plan view of part of the fixed grinding disk, the full outline of the disk being indicated in dotted lines, only a portion of the teeth, however, being shown, it being understood that the arrangement of teeth disclosed is repeated to cover the whole face of the disk. Fig. 2 shows a developed sectional view, the teeth on the fixed disk being shown in dotted lines in the position they would individually occupy in passing therethrough; collectively they would not appear as shown, as will be obvious from the crossing of the rows of teeth indicated in Fig. 3; Fig. 3 is a face view of part of one disk with the rows of teeth of the other disk in dotted lines.

Referring to these figures, it will be observed that the face of the disk is formed with rows of teeth or serrated ribs extending from skirt to, or toward, the eye, and approximately in lines tangential to the hub of the disk, (that is to say, in lines oblique to radial lines on the face of the disk) but preferably slightly curved, the convex side of the curve being the front in the movement of the revolving disk, and fronting in the movement the corresponding side of the

rows of the opposing disk, and the rows at all points having the same rake or angle.

Three rows marked a , a' , a^2 , a^3 and a^4 , are separated by grooves marked b , b^2 , b^3 , b^4 , which slope substantially from the outer edge of the disk downward, to the central opening or feed space, so that at the eye or center, where the entire grains or berries are fed in, the groove or channel, which conducts the grist outwardly, is deeper at the contracted space in the region of the inner edge, and grows shallower toward the outer edge or skirt. But, by reason of the special arrangement of the rows and grooves, the channels are subdivided by the series of longer and shorter alternating groups of rows. This construction is shown in Fig. 1, where appear the shorter rows a , of equal length alternating with the longer rows a' , a^2 , a^3 , and a^4 . These are arranged in groups, the longest a^4 being the leading member of the group, the others following (as the disk revolves) in echelon form on the inner flank. On the outer flank the shorter rows a , alternate as mentioned, with all the others, filling the wider spaces between the diverging rows, and forming a continuous zone of three teeth (as here shown), around the margin of the disk.

It will be observed that only the longest (a^4) rows extend from skirt to eye. The others follow in orderly succession, as explained, excepting that extra shorter rows are introduced, where needed by reason of the space occupied by the screw holes. But all the rows are at the same angle or rake.

The arrangement so far described, manifestly distributes the space in relation to the two functions, one of conveying the material from eye to skirt, and the other of comminuting said material in its passage. The important points of observation are, (looking for rapid and even grinding) that the outward movement of the material ground, shall keep all regions of the disk constantly and evenly supplied, and, as the material is, or should be, more and more finely comminuted as it passes from zone to zone toward the skirt, it is necessary that all zones shall be provided with comminuting surfaces, (such as the teeth hereinafter described), suited to the condition of fineness on which every zone is to act. This is provided for by the arranging of the rows ex-

plained above. The material (such as the berries of coffee) are at the outset entire, and these are received from the eye of the mill, into the largest spaces between the inner ends of the longest rows, which, in the form shown, terminate on the inner margin. This and the echelon arrangement of the succeeding rows, affords broad spaces and easy entrance, which meet two needs; the requirements, first of space for the greater or rather the greatest size of particles such as entire coffee berries, and second, space for the passage of the mass of particles, which, at the shortest zone about the eye, requires entrance and passage room equal or approximately equal to that in any subsequent zone. The spaces are the largest between the inner marginal teeth, and are fit to receive the unbroken berries, for subjection to the rotary action upon the largest teeth. Further, while these open spaces or channels are narrower in the outer zone, where the shorter ribs occur, the echelon arrangement causes that the grist, thrown outward by the centrifugal motion, the movement of the rows of teeth, and the crowding of the material, (due also to the rake or angle of the rows) shall pass in even distribution in the channels in front of the subsequent rows, and therefore readily thereinto and onward. These narrower passages are fitted to receive the fragments of the berries, broken by the first teeth and their narrowness is compensated for by their greater number. The same principle governs in the interposition of the shorter rows of teeth, in the outside zone, and while I have shown these parts and their proportions as best I can, it will be understood, in the matter above described, and in that which follows, that I do not confine myself to the exact proportions of width of channels and rows, the principle being to afford full, even and complete feed of material to all parts or zones of the grinding disks.

I now turn to another feature, coöperating in effect with those hereinbefore described. It is important, at each stage of the comminution, and when the teeth of any zone have performed their functions, that the material shall have the freest possible passage to the next zone. It will be understood that the teeth are formed by notches in the rows or ribs heretofore described. These notches are in concentric circles on the disks, and are arranged so that the teeth of one disk may run in the circle of notches of the other and the shearing edges of these interlocking teeth constitute the immediate grinding or cutting parts of the mill. For this free passage of the material outward from these cutting parts I provide, between the rows, channels deeper than these cutting surfaces or edges; that is to say, below the teeth. These deeper channels and their re-

lation to the teeth are shown in the sectional figure, where 3 marks the bottom of the channel, and 4 the base line of the teeth. This arrangement for the instant discharge of material from any zone of teeth, is in obvious coöperation also with the general principle of my invention above described. It will be observed that the bottom of these deeper channels form parts of the general inner surface on which the rows of teeth stand, and that this surface slopes downward in relation to the plane of the teeth, from skirt to eye. This not only gives increased clearance, but also enlarges the entrance spaces above described, from the eye and between the inner ends of the teeth rows. This whole construction admits that the teeth points may all be in the same plane, and that plane at right angles to the axis of the mill.

It is important that the teeth at the eye, should be largest and strongest, not only that they may be able to act on the entire berries, but also that they may be sufficiently strong to resist any hard foreign matter, such as a nail or screw, and to hold without breaking until the safety device in the driving mechanism yields. To this end also the teeth ribs not only increase in height from skirt to eye, but are made broader also. The annular notches (V shaped approximately) which form the teeth of these ribs, are made gradually deeper, from skirt to eye, so that the teeth are larger successively in that direction.

It will be understood that the material is fed to the mill in the usual way, and is distributed by the hub wings 5, on the rotary disk; that the disks are adjustable in relation to each other, to increase or diminish the feed space, and in this construction the adjustment is uniform throughout the entire grinding surfaces.

It will be observed that the arrangement of the ribs or rows of teeth give the rows the same angle or rake at all points and is such that a radial line on the face of the disk, at whatever point it crosses the rib, will in the curved form of rib shown cross it at the same angle, and this tends also to uniform working; that by reason of the slope of the channel bottoms of the inner faces of the disks toward the center, the open space between the two disks diminishes in depth or thickness as it increases in area, progressively from eye to skirt; and that the teeth diminish in size from eye to skirt, as they increase in number; and that in the form shown the two disks are alike excepting that one is fixed and the other provided with means for revolving it.

I have found that it is not essential to have both disks alike, but that the form of the moving disk is much more important, while the channels or grooves in the sta-

tionary disk may be considerably shallower, or the shape of this stationary disk materially changed without much affecting the efficiency of the mill, the moving disk remaining the same as above described. But I prefer to make the opposing disks of similar construction.

I claim as my invention, substantially as hereinbefore described:—

10 1. In a grinding mill, a disk the face of which is formed with a series of groups of obliquely arranged serrated ribs, each of said groups having ribs of different lengths, the longest in the lead and the others shorter
15 in succession, with channels between said ribs, diminishing in depth from eye to skirt.

2. In a grinding mill, a disk the face of which is formed with a series of groups of obliquely arranged, serrated ribs, said ribs
20 increasing in size toward the eye, each of said groups having ribs of different lengths, the longest in the lead and the others shorter in succession, and a single channel between the inner ends of successive leading ribs
25 communicating with channels between the shorter ribs.

3. In a grinding mill, a disk the face of which is formed with a series of groups of ribs of different lengths, the longest in the
30 lead and extending from eye to skirt and the others shorter in succession, a single channel between the inner ends of the leading ribs of successive groups communicating with channels between the shorter ribs, said
35 channel diminishing in depth from eye to skirt.

4. In a grinding mill, a disk the face of which is formed with a series of groups of ribs of different lengths, the longest in the
40 lead and extending from eye to skirt and the others shorter in succession, a single channel between the inner ends of the leading ribs of successive groups communicating with channels between the shorter ribs,
45 said channel diminishing in depth from eye to skirt and circumferential channels in the ribs, forming the teeth, said channels increasing in depth toward the eye.

5. In a grinding mill, a disk the face of which is formed with a series of groups of ribs of different lengths, the longest in the
50 lead and extending from eye to skirt and the others shorter in succession, a single channel between the inner ends of the leading ribs of successive groups communicating with channels between the shorter ribs,
55 said channel diminishing in depth from eye to skirt and circumferential channels in the ribs, forming the teeth, said channels in-

creasing in depth toward the eye and at 60 all the points of intersection less in depth than the radial channels which they cross.

6. In a grinding mill, a disk which is formed of a series of groups of obliquely arranged curved and serrated ribs, each 65 of said groups having ribs of different lengths, the longest leading and extending from skirt to eye, the other shorter in succession extending from skirt and communicating channels extending from eye to skirt 70 between said ribs.

7. In a grinding mill, a disk which is formed of a series of groups obliquely arranged, curved and serrated ribs each of said groups having ribs of different lengths, the 75 longest leading and extending from skirt to eye, the others shorter in succession extending from skirt and communicating channels extending from eye to skirt between said ribs, and an outer zone of short 80 serrated ribs interposed alternately between the longer ribs.

8. In a grinding mill comprising two disks, a disk having rows of teeth, said rows being of different lengths and extending 85 from the skirt to and toward the central opening, all of said rows being arranged so as to be cut by a radial line at any point at the same angle, said teeth being also arranged in circumferential rows, and radial 90 and circumferential channels between said rows.

9. In a grinding mill comprising two disks, a disk having curved rows of teeth, said rows being of different lengths and ex- 95 tending from the skirt to and toward the central opening, all of said rows being arranged so as to be cut by a radial line at any point at the same angle, said teeth being also arranged in circumferential rows, and 100 radial and circumferential channels between said rows.

10. In a grinding mill comprising two disks, a disk having rows of teeth, said rows differing in length and extending from the 105 skirt to and toward the eye, and in lines approximately tangential to the hub of the disk, whereby radial lines will cut them at the same angle, the teeth of said rows increasing in size continuously from skirt to 110 eye, and corresponding channels between said rows.

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

GEORGE LANE.

Witnesses:

WM. COUCH,

F. EUGENE DAVIS.