J. V. HAMILTON.

CANE GRINDING MACHINERY.

APPLICATION FILED JULY 11, 1908.

981,643.

Patented Jan. 17, 1911.

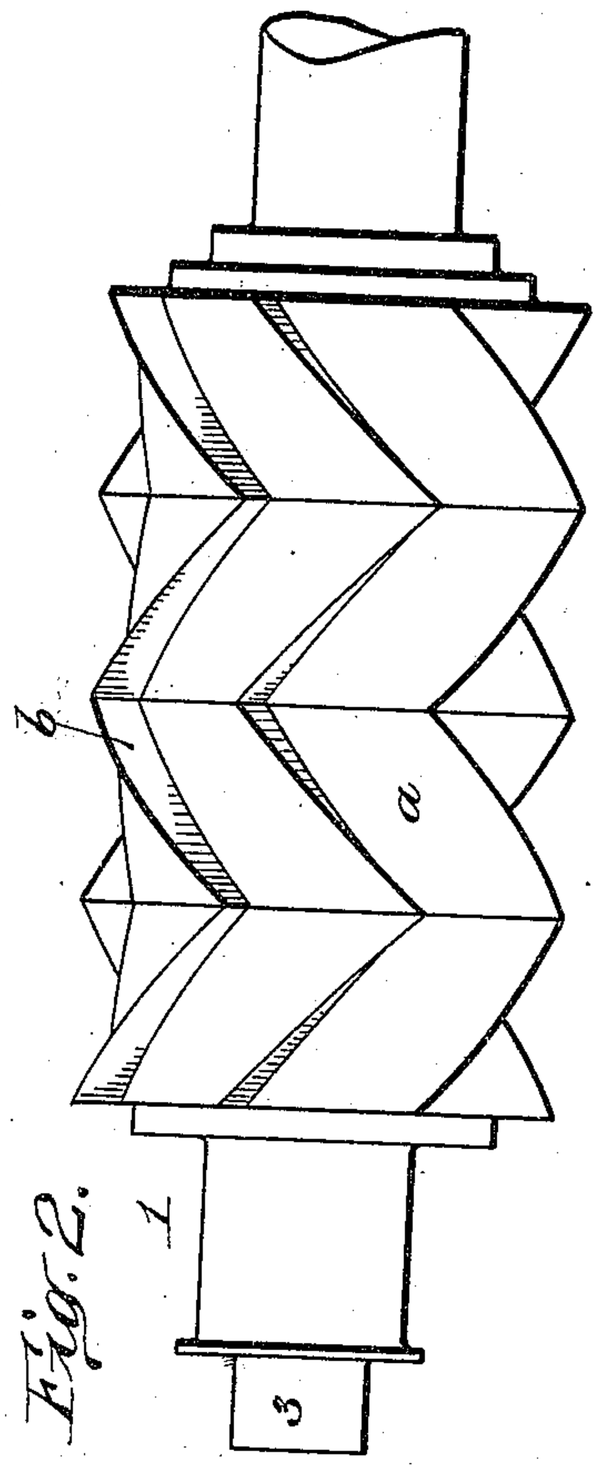

Fig. 2.

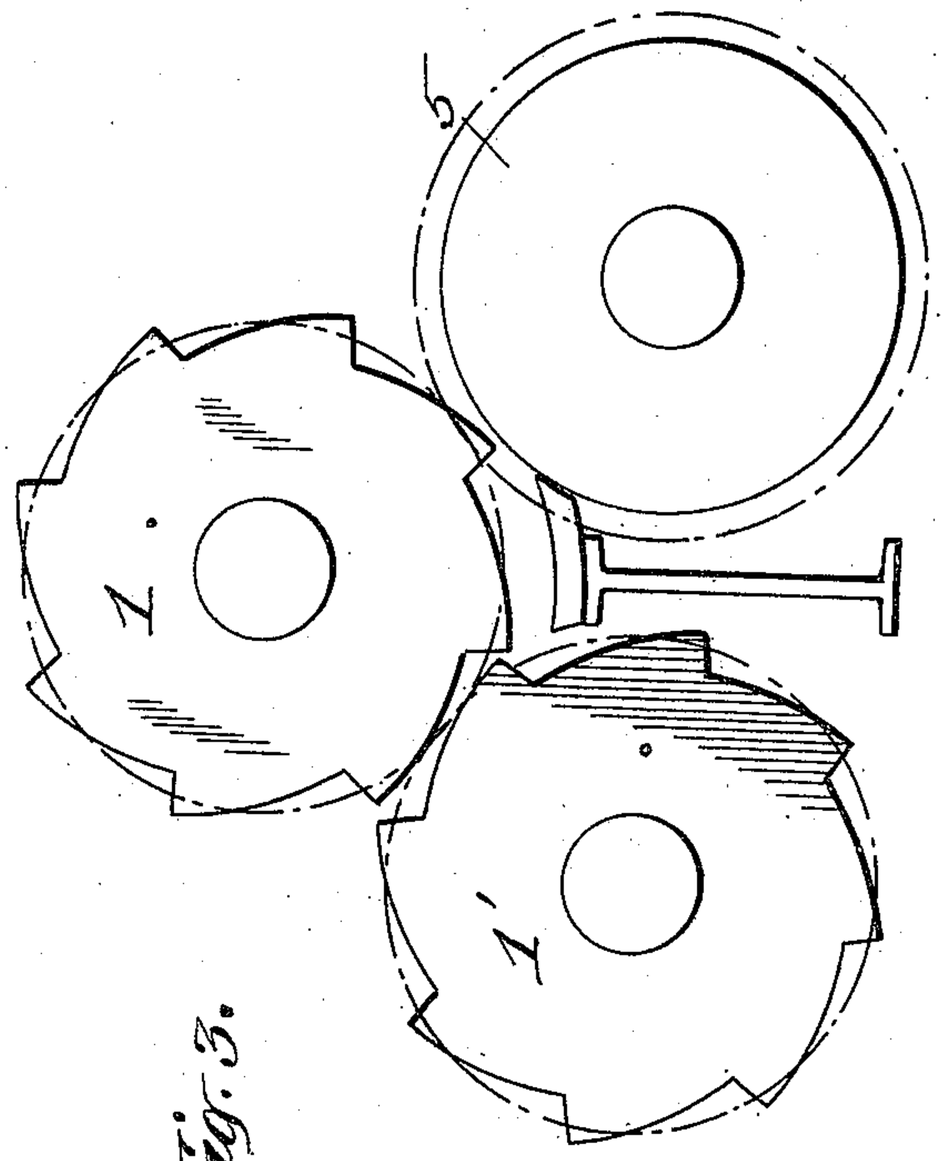

Fig. 3.

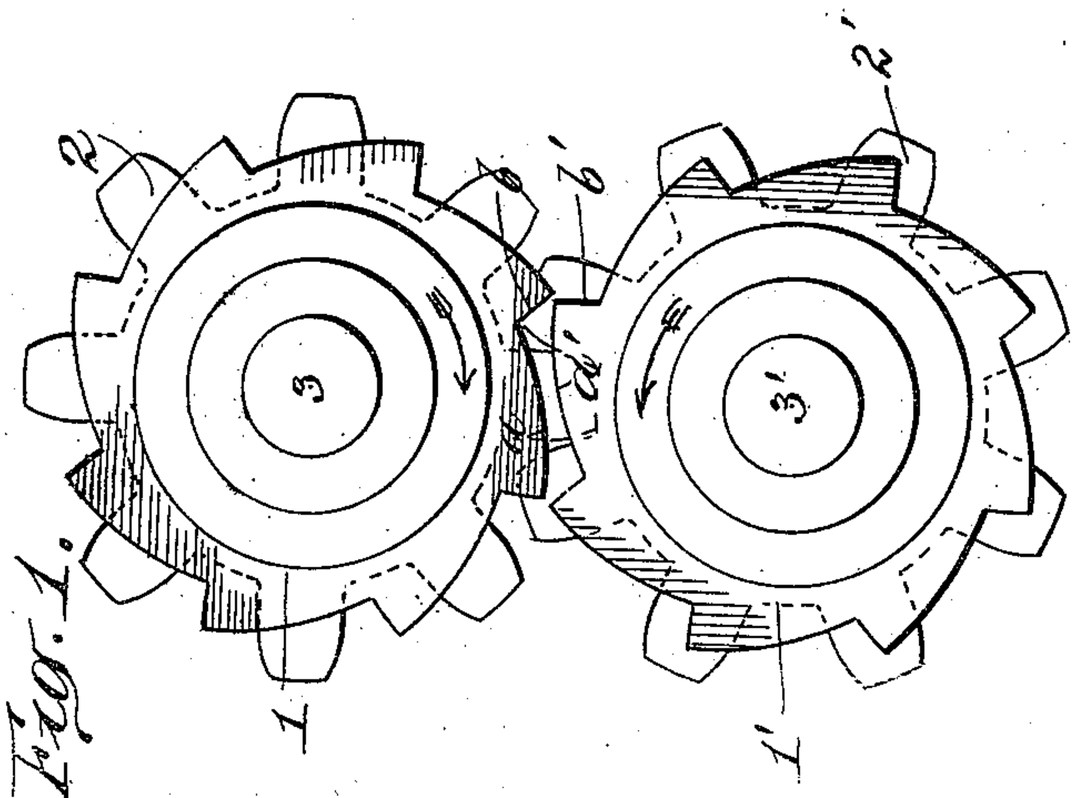

Fig. 1.

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CANE-GRINDING MACHINERY.

981,643. Specification of Letters Patent. **Patented Jan. 17, 1911.**

Application filed July 11, 1908. Serial No. 443,111.

To all whom it may concern:

Be it known that I, JAMES V. HAMILTON, a citizen of the United States of America, residing at New York city, county of Kings, State of New York, have invented certain new and useful Improvements in Cane-Grinding Machinery, of which the following is a specification.

This invention relates to improvements in cane grinding machinery.

The principal object of the invention is to obtain an increase in efficiency over that obtainable with the appliances and apparatus heretofore known in the art.

A particular object is to provide grinding rolls whereby between a single set cane may not only be cut as heretofore done in what is known as a crusher, but compressed as in the usual type of smooth roller mill; in other words, to combine in one set of rolls the functions of both crusher and mill.

I attain these highly desirable results by use of the means described herein.

In the drawing Figure 1 is an end view of a pair of cutting and grinding rolls; Fig. 2 is a view in side elevation of one of the rolls shown in Fig. 1, showing their shafts and connecting gears; while Fig. 3 represents a modified arrangement of the rolls of Figs. 1 and 2 with a plain roll of the usual type.

The essential feature of the invention is the use of rolls which combine the cutting or breaking function of the usual crusher with the compressing function of the usual plain roller mill. This double function is obtained by the use of two mutually acting and adjacent rolls having a plurality of curved compression faces so formed that the distance between acting compression faces of the two rolls is maintained practically constant, while interruptions of the curved surfaces provide cutting or crushing teeth. This construction, of course, involves the use of surfaces of varied radius of curvature and such relative adjustment and relation of the rolls as to progressively oppose compression surfaces of which the radii of curvature differentially vary. The curved surface which best meets the conditions desired is that of which the cross-section normal to the axis of the roll is a portion of a spiral.

The construction will be clearly understood by reference to the drawing. In Fig. 1 1, 1′ are the two rolls connected together and maintained in the proper relation by the gears 2, 2′ on their respective shafts 3, 3′. The direction of rotation is shown by the arrows. It will be seen that the ends of a cross-section of the compression surfaces show a spiral curve, as at *a*, *a*′, the steps between successive compression surfaces forming a series of cutting or crushing teeth, *b*, *b*′. It results that the distance between opposing compression surfaces of the rolls is maintained practically constant, although the opposing cutting edges are successively varied in degree of approximation. The preferred form of compression face presents the surface which would be generated by the motion of the appropriate line of cross-section normal to the axis along a helix or a portion of a helix around the axis of the roll. Such a construction as shown in Fig. 2 where the compression surfaces are such as would be generated by the motion of their spiral cross-sections along successive portions of right and left-hand helices of equal pitch. A great variety of surface configuration can be had while still maintaining the essential characteristic that acting opposing surfaces shall be maintained at a constant distance and that the interruption of adjacent compression faces shall act as cutting edges.

It will be seen that the peculiarly novel structure presents distinct advantages. The teeth serve to cut or crush as well as to draw the cane between the rolls while it is compressed between the curved surfaces in almost precisely the same manner as in a plain roller mill, the only difference being that on account of the differentially varying radial distances of the compression surfaces the mass of crushed cane is subjected to additional tangentially acting stresses which aid in expressing the cane juice.

In Fig. 3 is shown a similar pair of rolls in conjunction with a third roll having a smooth cylindrical surface. In this construction the teeth of the roll 1′ serve to draw the cane between the rolls 1′ and 5, the preliminary cutting or breaking being effected between these two, while the partly crushed cane is further crushed and compressed between the rolls 1 and 1′.

As a modification of the arrangement shown in Fig. 3, I may employ an additional roller of the form of 1, 1′ instead of the smooth roller 5 if it should be found desirable to do so.

While I am aware, of course, that toothed or corrugated crushing rolls have been long

known in cane milling and other arts, yet so far as I am aware it has never been proposed to combine in one set or pair of rolls the functions of cutting and compressing as described herein, nor so far as I am aware has it ever been suggested to give to the compression surfaces of such rolls a cross-section of such shape so as to allow of the formation of cutting teeth while preserving a practically constant approximation of the active compression surfaces of the two rolls, and thus to secure the important advantages of the present invention.

Wherever in the specification and in the claims hereto appended, the terms "shear" or "shearing" are employed, these terms are used in the sense that the separation or division of the cane is effected as follows:— One of the sections of the stalk to be separated is supported, while a pressure is applied to an adjoining unsupported section at a point thereof immediately adjacent the support. This pressure is transverse to the axis of the stalk, so that the unsupported section thereof is torn and moved bodily from the supported section, in the direction of pressure. This shearing action is to be distinguished from the ordinary cutting action, in which the stalk is supported at and on both sides of the line of division during the separating action, which latter is effected by a blade passing through the stalk toward the support. The Krajewski patent of record exemplifies a cutting action as distinguished from applicant's shearing action.

Having described my invention what I claim is:

1. In a cane crusher, comprising two rolls having a series of annularly-disposed zig-zag teeth running lengthwise of each roll and intermeshing, each tooth being provided with angular cutting and shearing edges and with slightly curved pressing faces, with gearing adapted to maintain the predetermined relation between the oppositely disposed teeth and pressing faces.

2. In a cane crusher, two rolls each having a series of teeth running lengthwise of the roll and intermeshing with the teeth on the other roll, the teeth being provided with shearing edges and with slightly curved pressing surfaces, and gearing adapted to maintain the predetermined relation between the oppositely disposed shearing edges and pressing surfaces.

3. In a cane crusher, two rolls each having a series of teeth running lengthwise of the roll and intermeshing with the teeth on the other roll, the teeth being provided with shearing edges and with pressing surfaces which latter are curved in such a way as to maintain a constant distance between the opposing pressing surfaces during the coöperation of the same, and gearing adapted to maintain the predetermined relation between the oppositely disposed shearing edges and pressing surfaces.

Signed by me at New York N. Y. this 9th day of July 1908.

JAMES V. HAMILTON.

Witnesses:
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