April 1, 1930. F. MAXWELL 1,752,533

CANE MILL

Filed June 23, 1927

Fig. 1.

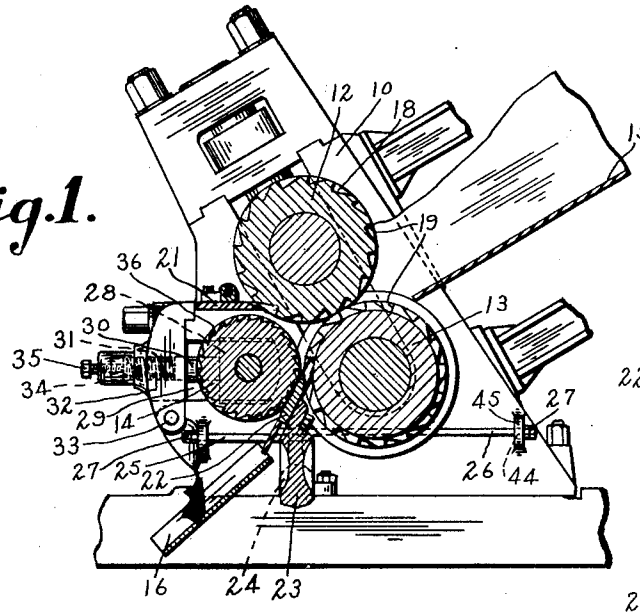


Fig. 4.

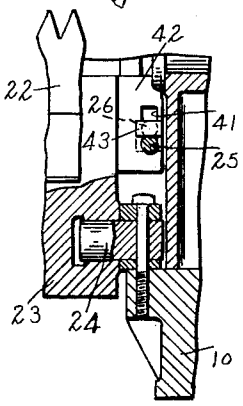


Fig. 2.

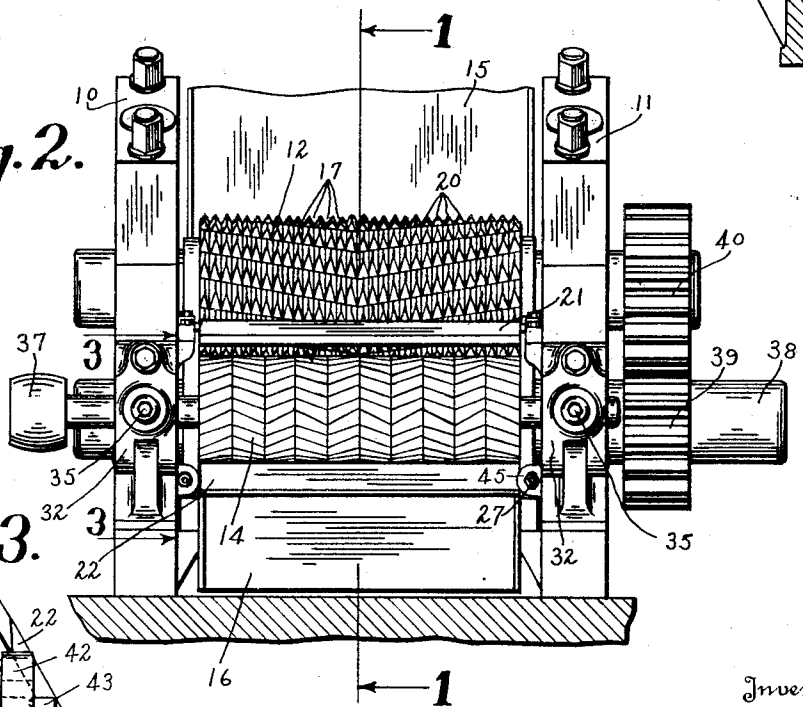
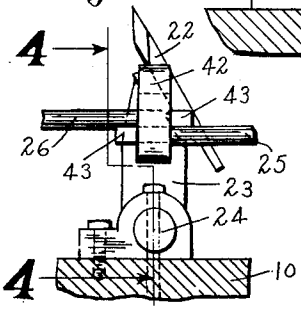


Fig. 3.



Inventor

Francis Maxwell

By Rockwell & Bartholow

Attorneys

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UNITED STATES PATENT OFFICE

FRANCIS MAXWELL, OF WALLINGTON, ENGLAND

CANE MILL

Application filed June 23, 1927. Serial No. 200,890.

This invention relates to machines for shredding sugar cane or the like, and thereby prepare it for subsequent juice expressing operations. More especially this invention relates to improvements in the structure of machines for such a use, wherein the feeding, crushing or pressing and shredding means are incorporated into a machine unit, having associated parts of each cooperating with the other to form an economical structure to manufacture, and a device efficient in operation.

In machines of this type, it is occasionally desirable to provide a pair of rolls which are grooved both peripherally and longitudinally, each of the peripheral grooves being substantially V-shaped and being a continuous groove around the periphery of the roll, the longitudinal grooves intersecting all of the peripheral grooves to form teeth to assist in drawing the cane therebetween. According to the usual practice, when this form of roll is used, a scraper plate is required to free crushed cane from the V-shaped grooves thereof.

One of the objects of this invention is to provide a machine of the crusher-shredder type in which the crusher rolls have substantially V-shaped peripheral grooves, and in which is provided a scraper bar having teeth adapted to enter said V-shaped grooves, the scraper bar being operatively associated with the shredding mechanism and adjustable with respect to the shredding mechanism and the crusher rolls.

Another object of this invention is to combine a shredder roll with a pair of feeding, crushing or pressing rolls having substantially V-shaped peripheral grooves, and requiring a scraper bar therefor, in such a manner that the shredder roll will be adjustably and resiliently associated with the scraper bar to assist in the operation of the machine.

A still further object of this invention is to provide a machine wherein a pair of relatively slow rotating rolls having substantially V-shaped peripheral grooves therein and a scraper bar therefor, are associated with a shredder roll operable at a relatively high rotating speed, whereby the cane will be shredded as it leaves the crusher rolls, by a cooperative action between the scraper bar and the shredder roll.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a sectional side elevation of a machine unit, embodying the features of this invention, the section being taken on line 1—1 of Fig. 2;

Fig. 2 is a front elevation of the same machine unit;

Fig. 3 is a section of a portion of the machine unit, on lines 3—3 of Fig. 2, and

Fig. 4 is a section on line 4—4 of Fig. 3.

The machine unit illustrated, generally, comprises the side bearing standards 10 and 11, a pair of toothed rolls 12 and 13 supported thereby and adapted to feed, press or crush sugar cane or the like passing therebetween, and a shredding roller 14 also supported by the standards 10 and 11. A chute 15 is provided to guide the cane toward the rolls 12 and 13, and a chute 16 at the discharge end of the unit receives the shredded cane to guide it away therefrom.

The rolls 12 and 13 are each provided with peripheral grooves 17, in this instance shown V-shaped and continuous about the roll. Longitudinally disposed grooves 18 intersect each of the grooves 17 to form teeth 19. The grooves 17 of one roll intermesh with the ridges 20 formed by the grooves 17 in the other roll. The grooves in one roll are arranged relatively to the other roll whereby the teeth 19 formed therein grip the incoming cane from the chute 15, and feed or draw it therebetween. Due to the pressure pro-

vided between the rolls 12 and 13, the cane is pressed thereby and is crushed or broken into relatively small pieces.

A scraper bar 21, having teeth along an edge thereof, adapted to enter into the peripheral grooves 17 in the upper roll 12, and a scraper bar 22 having teeth adapted to enter the peripheral grooves 17 in the lower roll 13, are provided. The scraper bars 21 and 22 extend longitudinally of the rolls over the entire length thereof. The bar 22 is mounted upon a support 23, which is rotatably mounted between the side frames or standards 10 and 11, upon trunnions 24, secured thereto in a block 46, secured to each of the frame members 10 and 11. Rods 25 and 26 extending respectively toward the front and rear of the machine unit, are adapted by suitable means, such as adjusting nuts 27, to swing the support 23 and with it the scraper bar 22 toward and away from the roll 13 and also toward and away from the shredder roll 14, between which it is disposed.

The rods 25 and 26 extend through an elongated opening 41 in a part 42 of the support 23, and are each provided with a head portion 43, which engages the part 42. The head portions are disposed one on either side of the part 42. The rods 25 and 26 extend toward opposite sides of the machine and pass through openings 44, in a part 45, secured to or a part of the frames 10 and 11, at each side thereof. The outer ends of rods 25 and 26, in this instance, are threaded and the nuts 27 engage the same and abut the outer surfaces of the parts 45. By proper manipulation of the nuts 27, the support 22 and scraper bar 23 may be moved and worked about its pivot upon the trunnion 24, due to the engagement of the rods at their head portions 43 with the part 42. In this instance, it is preferable that the rods 25 and 26 engage the support 23 intermediate the pivot point at the trunnion 24 and the toothed portion of the scraper bar 22.

The shredder roll 14 is journaled in a bearing block 28, which is slidably mounted in a guideway 29, formed in the standards 10 and 11. A member 30 extends from the block 28 into an opening 31 in a swingable guideway cap 32, pivoted at 33 to each of the standards 10 and 11. A coiled compression spring 34, the tension of which is adjustable by means of the screw 35, engages the member 30 to urge and retain the bearing block 28 and shredder roll 14 in operative position, and to allow the same to move outwardly under certain conditions during the operation of the machine unit.

The shredder roll 14 is provided with any desired form of shredding teeth 36, and is disposed relatively to the scraper bar 22, and the roll 13, so that the cane emerging from the rolls 12 and 13 will be acted upon by the shredding teeth 36 in cooperation with that part of the scraper bar 22, which lies between the crusher roll 13 and the shredder roll 14. The arrangement is such that substantially all of the material passed through the rolls 12 and 13, will necessarily be forced by the feeding action thereof to pass through the restricted passageway between the outer surface of the scraper bar 22 and the shredding roll 14. In passing through this restricted passageway, the material or sugar cane is completely shredded into a mass of loosely intermingled fibres or shreds of cane, that feed down the chute 16 toward subsequent juice expressing mechanisms (not shown.) The shredder roll 14 is preferably driven at a relatively high rate of speed by suitable means, such as power driven belt in engagement with the pulley 37, while the rolls 12 and 13 are driven at a relatively slow rate of speed by means of suitable power means in connection with the shaft end 38, the rolls rotating together due to the intermeshed gears 39 and 40.

In the operation of this machine unit, sugar cane or the like, is supplied thereto from the chute 15 and is drawn in between the rolls 12 and 13 by the feeding action thereof, and especially by the teeth thereon when the same are provided. While between the rolls 12 and 13, the cane is pressed, crushed and broken up and is fed toward the roll 14.

The scrapers 21 and 22 relieve and free adhering cane from the rolls 12 and 13 respectively, and clean out the peripheral grooves thereof so that substantially all of the cane will be directed and forced into the restricted passageway between the scraper bar 22 and the roll 14. The scraper bar 22 by the adjusting means comprising the headed rods 25 and 26 and nuts 27, may be adjusted toward and away from the roll 13, and the shredder roll 14. This adjustment varies the scraping effect thereof upon the roll 13 and varies the opening between the scraper bar and the roll 14, whereby the shredding action thereof may be controlled.

While passing between the scraper bar 22 and the roll 14, the cane is thoroughly shredded by the cooperative action therebetween, and upon emerging therefrom is carried away in the chute 16. By arranging the shredder roll to act upon the crushed cane as soon as the same emerges from between the crusher rolls and before it can expand to any appreciable degree after the pressing sustained therebetween, a more efficient and thorough shredding action will be obtained. The resilient action of the spring 34 upon the roll 14, permits the same to yield in a direction away from the scraper bars 22, under a condition where a surplus of cane or a foreign body attempts to pass therebetween, thereby relieving these parts from undue strains.

While I have shown and described a preferred embodiment of my invention, it is to be understood that the same is not limited to all of the details shown, as many modifications and variations are possible, which will lie within the spirit of the invention and the scope of the appended claims.

What I claim is:

1. In a cane mill, a pair of cooperating cane crushing rolls and a cane shredding roll, said rolls being mounted in a standard with the axes of said shredding roll and one of said crushing rolls disposed substantially in alignment horizontally and below the axis of the other crushing roll, and the axis of the upper crushing roll being disposed substantially intermediate the axes of said shredding roll and the lower crushing roll, whereby cane passing between said crushing rolls may be directed against the periphery of said shredding roll intermediate the same and the lower crushing roll, and a scraper bar having an edge adapted to bear against said lower crushing roll and having its upper surface substantially tangent with the periphery of said shredding roll to cooperate therewith to shred cane passing therebetween, the point of cooperation between said shredding roll and said scraper bar being intermediate the axes of said shredding roll and the lower crushing roll, and substantially in alignment with the direction of flow of the cane emerging from between said crushing rolls whereby said shredding roll and said scraper will act upon such cane before the same has appreciably expanded from its crushed and pressed condition caused by said crushing rolls.

2. In a cane mill, a pair of cooperating cane crushing rolls and a cane shredding roll, said rolls being mounted in a standard with the axes of said shredding roll and one of said crushing rolls disposed substantially in alignment horizontally and below the axis of the other crushing roll, and with the axis of the upper crushing roll disposed substantially intermediate the axes of said shredding roll and the lower crushing roll whereby cane passing between said crushing rolls may be directed against the periphery of said shredding roll intermediate the same and the lower crushing roll, and a scraper bar having an edge adapted to bear against said lower crushing roll to remove cane therefrom and receive it upon the upper surface thereof, the upper surface of said scraper bar extending from the crushing roll engaged thereby in a straight line substantially tangent to the periphery of said shredding roll beyond the latter, and cooperating with the teeth of said shredding roll to shred the cane passing therebetween, the point of cooperation between said shredding roll and said scraper bar being intermediate the axes of said shredding roll and the lower crushing roll, and substantially in alignment with the direction of flow of the cane emerging from between said crushing rolls whereby said shredding roll and said scraper will act upon such cane before the same has appreciably expanded from its crushed and pressed condition caused by said crushing rolls.

2. In a cane mill, a pair of cooperating cane crushing rolls and a shredding roll, one of said crushing rolls and said shredding roll being disposed below the other crushing roll with their axes substantially in horizontal alignment, said upper crushing roll being disposed with its axis intermediate the axes of the aforesaid rolls whereby crushed cane emerging from between said crushing rolls will flow substantially toward adjacent points on the peripheries of said aligned shredding and crushing rolls, and a scraper bar having an edge thereof in engagement with the lower crushing roll to remove cane therefrom and to receive the cane from said crushing rolls upon its upper surface, the upper surface of said scraper bar extending in a straight line from the engaged point on said lower crushing roll and tangent with the periphery of said shredding roll, and being disposed adjacent thereto to cooperate therewith to shred cane passing therebetween whereby the cane emerging from said crushing rolls will be directed in substantially a straight line therefrom past said crushing roll and before the same has appreciably expanded from its crushed and pressed condition caused by said crushing rolls, thereby obviating clogging of the cane between said rolls.

4. In a cane mill, a pair of cooperating cane crushing rolls and a shredding roll, one of said crushing rolls and said shredding roll being disposed below the other crushing roll with their axes substantially in horizontal alignment, said upper crushing roll being disposed with its axis intermediate the axes of the aforesaid rolls whereby crushed cane emerging from between said crushing rolls will flow substantially toward adjacent points on the peripheries of said aligned shredding and crushing rolls, and a scraper bar having an edge thereof in engagement with the lower crushing roll to remove cane therefrom and to receive the came from said crushing rolls upon its upper surface, the upper surface of said scraper bar extending in a straight line from the engaged point on said lower crushing roll and tangent with the periphery of said shredding roll, and being disposed adjacent thereto to cooperate therewith to shred cane passing therebetween whereby the cane emerging from said crushing rolls will be directed in substantially a straight line therefrom past said shredding roll and before the same has appreciably expanded from its crushed and pressed condition caused by said crushing rolls, thereby obviating clogging of the cane between said rolls, and a scraper bar acting by engagement with said upper crush-

ing roll to remove cane therefrom and to direct it downwardly toward and upon the periphery of said shredding roll at a point substantially intermediate the vertical axes of said lower crushing roll and said shredding roll for engagement by the latter to carry this removed cane between the shredding roll and the first mentioned scraper bar.

In witness whereof, I have hereunto set my hand this 20th day of May, 1927.

FRANCIS MAXWELL.