Nov. 17, 1936. W. D. HYMERS 2,061,196

MEANS FOR MACERATING BAGASSE

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Fig. 1.

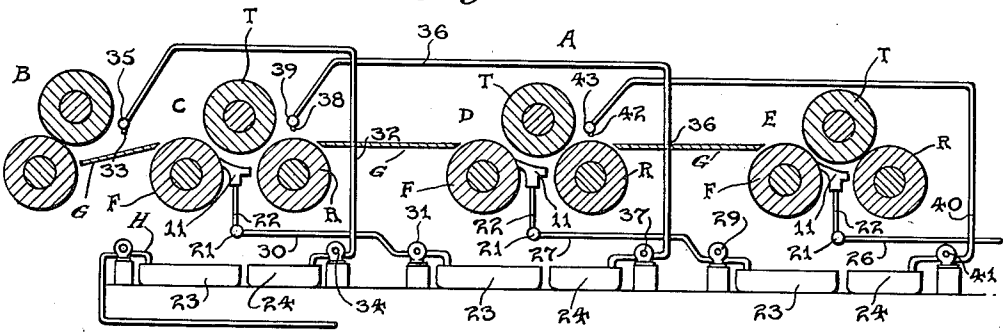


Fig. 3.

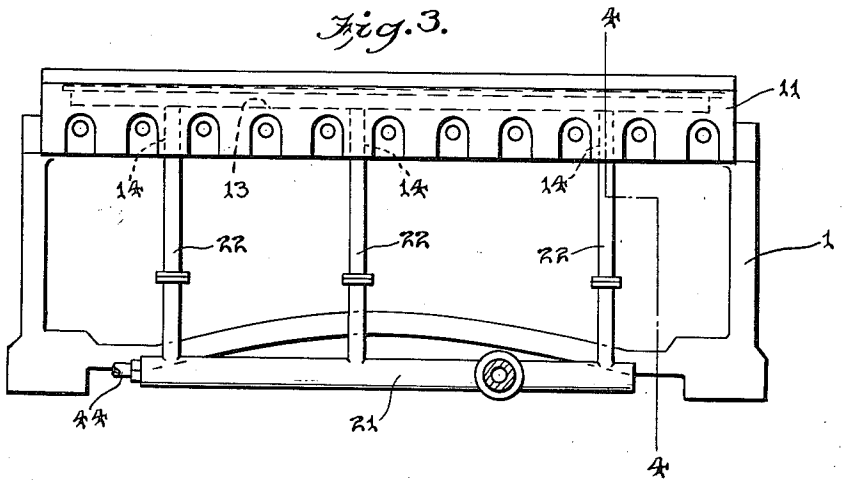


Fig. 4.

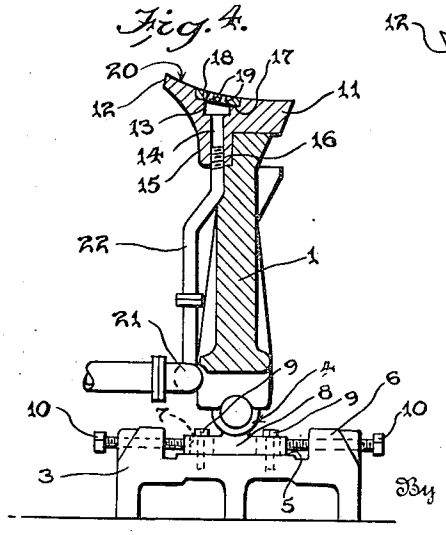
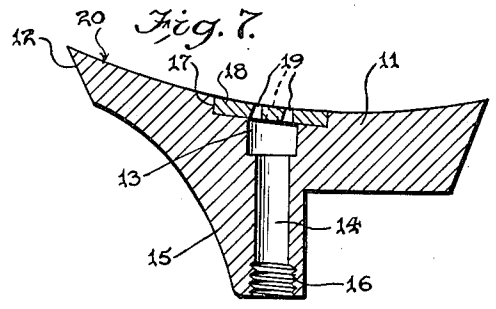


Fig. 7.



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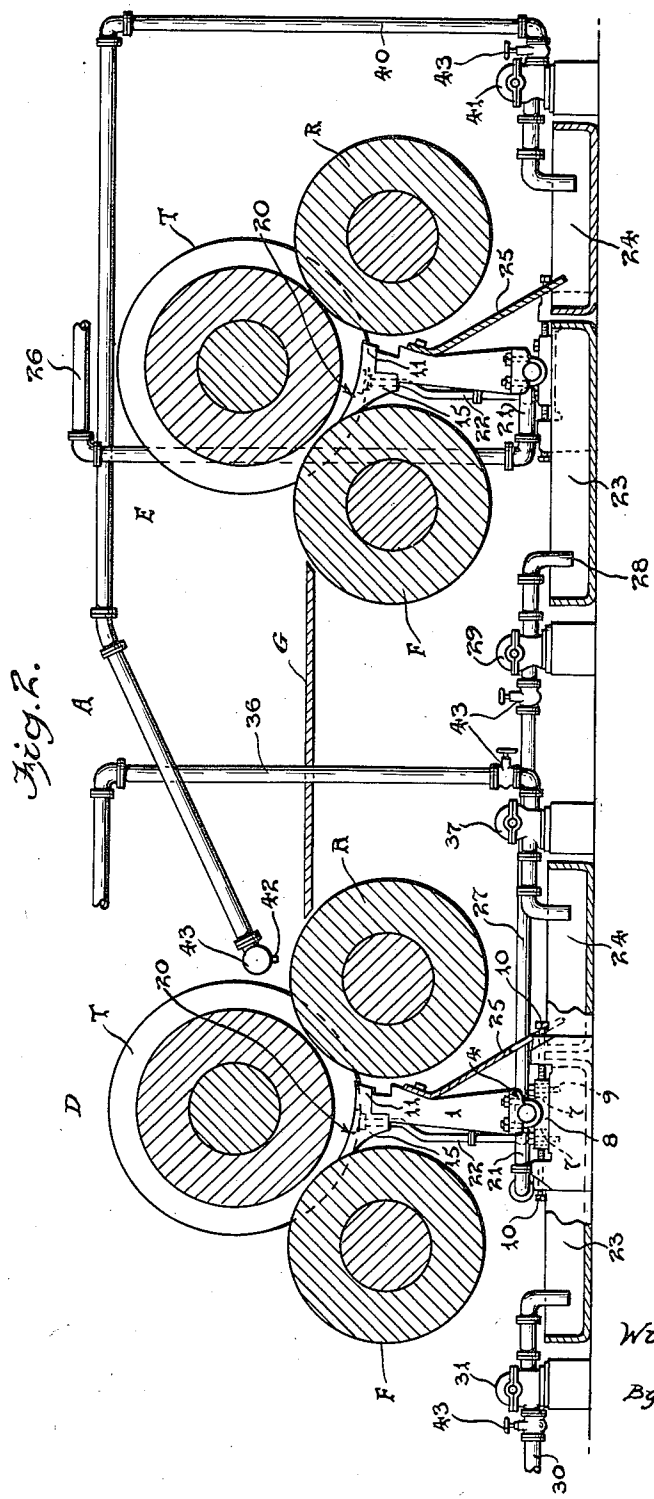


Fig. 2.

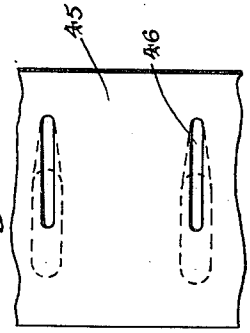


Fig. 6.

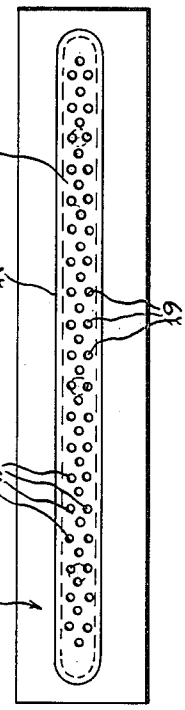


Fig. 5.

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2,061,196

MEANS FOR MACERATING BAGASSE

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Application September 7, 1934, Serial No. 743,071

1 Claim. (Cl. 100—47)

This application is a continuation in part, of my application filed September 1, 1933, Serial No. 687,791.

This invention relates generally to juice-expressing apparatus, and more specifically to an improved means for macerating bagasse during passage thereof through a juice-expressing apparatus, the predominant object of the invention being to improve the operation of macerating the bagasse to such extent that the efficiency of the juice-expressing apparatus is very greatly increased.

The predominant feature of this invention resides in the fact that the turnplate of the mill forming a part of a juice-expressing apparatus constructed in accordance with the invention, or of each of such mills when the apparatus includes a plurality of mills, is so constructed and arranged that macerating liquid may be discharged therefrom into the mat of bagasse passing over said turnplate. A number of advantages arise because of this arrangement, the most important of which is that the bagasse may be more completely macerated than heretofore, as will be apparent after consideration of the detail description of the invention, which will be hereinafter set forth. Also such arrangement of the turnplate permits of said turnplate being arranged very much lower than was the case heretofore, whereby more room is provided for expansion and swelling of the bagasse. This results in the bagasse absorbing the macerating fluid much more easily and permits said macerating fluid to be pumped into the bagasse at a lower pressure than would be possible if expansion of the bagasse were restricted by the turnplate. In addition to the foregoing, it has been found in actual practice that the lowered turnplate reduces the friction on the mills, and also that the hydraulic pressure on the top rolls of the mills may be reduced almost to a minimum. In fact, in actual operation of an apparatus constructed in accordance with the invention the hydraulic pressure on the top rolls of the mills has been reduced from 504 tons pressure to 140 tons pressure, while maintaining the same sucrose extraction and sucrose and moisture contents in the bagasse.

Other features of the invention relate to the particular construction of the improved macerating turnplate and the connections of same, and the particular improved method of distributing the macerating juices so as to obtain the maximum macerating effect.

Figure 1 is a diagrammatical view illustrating the improved method of distributing the macerating liquids in accordance with this invention.

Figure 2 is a fragmentary view, partly in vertical section and partly in elevation, of a juice-expressing apparatus constructed and arranged in accordance with this invention.

Figure 3 is a front elevation of the trash bar and turnplate which constitute parts of the invention.

Figure 4 is a vertical section on line 4—4 of Figure 3.

Figure 5 is a plan view of the turnplate showing the liquid-discharge orifices thereof.

Figure 6 shows a modified form of a part of the invention.

Figure 7 is a vertical sectional view through the turnplate.

In the drawings, wherein are shown for the purpose of illustration, merely, several embodiments of the invention, A designates in Figures 1 and 2, the improved juice-expressing apparatus, generally. In Figure 1 the apparatus A is illustrated as comprising a preliminary crusher B, a first mill C, a second mill D, and a third mill E. In Figure 2 only the second mill D and the third mill E are illustrated in order that said view might be made on a larger scale. The apparatus A, of course, includes the usual transfer mechanisms for conducting sugar cane to the preliminary crusher and for moving the bagasse between the various mills and conducting said bagasse away from the final mill, but as such transfer mechanisms form no part of the present invention and are of common and well known construction, the same have been illustrated diagrammatically only in the drawings hereof and lettered G. The mills illustrated in Figures 1 and 2 and the preliminary crusher shown in Figure 1 are of the usual construction and arrangement, and it will therefore not be necessary to describe the constructions of these parts of the apparatus in detail herein, it being sufficient to say for the sake of clearness of description of the invention that the crusher is of the usual two-roll type while the mills are each comprised of three rolls arranged in the well-known manner as illustrated.

Associated with each of the mills C, D, and E is a trash bar 1, which in the present instance is illustrated as being adjustably supported upon a base 3, as will now be set forth. The bar includes a bearing block 4 seated within a channel 5 of the base 3, defined by upstanding ribs 6. The block 4 has slots 7 formed in the base flange 8 for reception of mounting bolts 9 which engage

within respective screw-threaded apertures in the base of the channel 5. In each of the ribs 6 there is threadedly engaged an adjusting bolt 10, the inner ends of which are in abutting relation with the base flanges 8. With this construction it will be readily seen that the trash bar 1 may be adjusted longitudinally with respect to the base 3, in order to vary the relation of the trash bar and the feed roll.

At its upper end each trash bar is provided with a turnplate 11, said turnplate being fixed to the trash bar in any suitable manner and having an edge or toe portion 12 which is shaped to contact closely with the circumferential face of the feed roll F of the associated mill in the usual manner. The turnplate 11 of each trash bar is provided with an elongated opening 13 (Figs. 3 and 4 and 7) which constitutes a header and extends longitudinally thereof, and formed vertically in said turnplate is a plurality of fluid passage-ways 14 which communicate at their upper ends with said elongated opening 13. The fluid passageways 14 are formed in the portion of each turnplate which includes the downwardly extended portion 15, and the walls at the lower ends of said elongated opening 13. The fluid passageways 14 are formed in the portion of each turnplate which includes the downwardly extended portion 15, and the walls at the lower ends of the passageways, which are open at the bottom face of said downwardly extended portion, are provided with screw threads as indicated at 16 in Figure 7. The top face of the turnplate 11 of each trash bar is recessed, as indicated at 17, in Figures 4 and 7, and a perforated plate 18 is set into this recess. The recess is so arranged that the perforated plate covers the elongated opening 13 at its top, the perforations 19 thereof being in communication with said elongated openings so that fluid which is forced into said elongated opening will be forcibly discharged from said perforations. It will be noted from a consideration of Figure 7, that the orifices 19 are of a tapered formation, the apices of which are presented toward the top rolls, generally indicated at T, and by this construction it will be apparent that the perforations produce a jet-effect of fluid discharged into the bagasse during its passage over the turnplate 11.

It is important that the channel 13 should have a definite spaced relation to the toe portion 12 of the turnplate in order to provide a proper clearance between top roll T and the concave face of the turnplate, to permit expansion of the bagasse, thereby avoiding the stoppage of the apertures 19. In actual practice, there is a distance of approximately seven inches between the tip of the toe to the medial portion of the channel 13. In any event, the channel 13 should occupy the lowest point in the concave face 20.

Attention is now particularly invited to Figure 1 of the drawings, wherein it will be noted that the turnplates 11 as associated with the top rolls of the mills C, D, and E are spaced progressively closer to the rolls, and that the upper concave faces 20 of the turnplate 11 define respective pockets beneath each roll thereby permitting ready expansion of the bagasse with resultant thorough absorption of macerating fluid discharged from the jets or orifices 19.

Each trash bar 1 has associated with it at its lower end a fluid header 21 which is elongated and extends longitudinally thereof, as shown in Figure 3. The header 21 of each trash bar has connected thereto for communication therewith a plurality of fluid conductors 22, the opposite or upper end portions of said fluid conductors being screwed into the lower screw-threaded end portions of the fluid passageways 14 of the associated turnplate 11.

Arranged beneath each of the mills C, D, and E is a pair of juice trays 23 and 24, the tray 23 being located beneath the feed roll F of the mill and the tray 24 being located beneath the bagasse roll R of the mill. These trays receive the juice expressed from bagasse which is passed through the various mills, a juice deflector 25 being associated with the trash bar of each mill in such manner that juice from the bagasse roll is directed into the associated tray 24.

Connected to the header 21 of the trash bar of the final mill E of the juice expressing apparatus illustrated in Figures 1 and 2 is a conductor 26, which leads from a source of water or other macerating fluid. This conductor has associated with it a suitable pump which serves to force fluid therethrough under pressure, this fluid passing from said header 21 through the conductors 22 associated therewith, and through the passage-ways 14 into the elongated opening 13, from which opening said fluid is forcibly discharged through the orifice 19 in the perforated plate 18. In like manner, the headers associated with the trash bars of the second mill D and the first mill C are connected in communication with pipes which conduct liquid to said headers. The pipe 27 leading to the trash bar of the second mill D communicates with the interior of the tray 23 of the final mill E, as shown most clearly at 28 in Figure 2, and a pump 29 is associated with said pipe in a manner to cause liquid to be withdrawn from the tray 23 of the final mill and forced through the pipe 27 to the header 21 of the second mill D, whence said liquid is forced upwardly through the conductors 22, passageways 14, and elongated opening 13, where it is discharged through the apertures 19 of the perforated plate 18. The pipe 30 leading to the trash bar of the first mill C is arranged in communication with the tray 23 of the second mill D. This pipe has associated therewith a pump 31 which serves to withdraw liquid from the tray 23 of the second mill D and force said liquid through the pipe 30 to the second mill 21 of the trash bar of the first mill, whence said liquid is forced through the conductors 22 associated with the said header and through associated passageways 14 and elongated opening 13 to the discharge orifices of the associated perforated plate 18.

Leading from the juice tray 24 of each of the mills is a pipe through which juice is forced to a remote point where said juice is discharged on the mat of bagasse passing through the apparatus. Thus a pipe 32 leads from the juice tray 24 of the first mill C to a discharge point 33 immediately adjacent the discharge side of the preliminary crusher B. This pipe 32 has a pump 34 associated therewith which acts to withdraw juice from the tray 24 of the first mill and discharge said juice from a suitable discharge head 35 onto the mat of bagasse passing between the preliminary crusher B and the first mill C. The pipe 36 which leads from the juice tray 24 of the second mill D has a pump 37 associated therewith, and said pipe extends to a discharge point 38 immediately above the bagasse discharge roll R of the first mill C, where said pipe is provided with a suitable discharge head 39. In like manner the pipe 40, which has a pump 41 associated therewith, leads from the juice tray 24 to the

final mill E to a discharge point 42 immediately above the bagasse discharge roll R of the second mill D, where said pipe is provided with a discharge head 43. The pumps 37 and 41 associated with the pipes 36 and 40 draw juice from the juice trays 24 of the second and final mills and discharge said juice from the discharge heads onto the mat of bagasse passing over the bagasse discharge rolls of the first and second mills. Valves 43 are associated with the various pipes through which macerating liquid is passed so that the flow of liquid through said pipes may be regulated. Also it is obvious that the apparatus A would include means for conducting juice away from the trays 23 and 24 of the various mills to points remote from the apparatus for subsequent treatment, but as such means are quite common same have not been shown in the drawings. However, I have shown the pipe H leading from the juice tray 23 under the first mill C to a point remote from the apparatus where the juice is subjected to further treatment well understood in the art.

In the operation of a juice-expressing apparatus constructed in accordance with this invention, macerating liquid is discharged into the mat of bagasse from the perforated plates of the turnplates 11 and from the discharge heads of the pipes 32, 36, and 40 to very completely macerate said bagasse. In this connection it has been found in actual practice that when the macerating liquid is discharged into the bagasse under from 40 to 60 pounds pressure, such pressure is sufficient to allow the mat of bagasse to absorb the macerating liquid up to 35 percent. Due to the application of the macerating liquid by jet action to the mat of bagasse while the same is passing over the turnplates in a more or less expanded state, the extraction of juice by the top rolls T of the various mills is much higher than with the old system of single maceration on each mill.

An important feature of this invention is that there is no limit as to the temperature of the macerating liquid. On a mill equipped with the old method of single maceration—that is, applying the macerating liquid in front of the feed and top rolls of the mill, the highest temperature that could be maintained without causing the mill to slip and choke was 140 degrees. By applying the macerating liquid through the turnplates as contemplated by this invention, a temperature of 200 degrees has been maintained without any indication of mill slippage, but this high temperature has a tendency to extract the gums. However, it has been found in actual practice that the temperature of the macerating liquid may be carried as high as 180 degrees without encountering any difficulties in connection with the defecation of juices.

If desired, each header 21 may be provided with means 44 (Fig. 3) for coupling a steam pipe to said header. By this arrangement steam may be passed through the fluid passageways associated with the trash bars so as to clean out said passage-ways and thus prevent juice from lodging therein and becoming contaminated.

It is important to note that a particular advantage of the invention is that the improved results which follow the use of the invention are obtained without modifying the structure of the cane mills as heretofore employed except that the structure of the turnplate is changed. Also, the improved turnplate employed in carrying out the invention is made narrower than heretofore, which allows for free lifting of the top rolls of the mills, owing to the decreased angles between the top rolls and the feed and bagasse discharge rolls.

Instead of providing the plates 18 of the turnplates with tapered circular apertures as shown in Figure 7 of the drawings, I may employ plates 45 (Fig. 6) having elongated, slot-like apertures as indicated at 46, these elongated apertures being cut at a taper angle of 45 degrees in the direction of travel of the mat of bagasse, so as to overcome possibility of choking by bagacillo when same passes over the plate.

It is essential in my apparatus to have the two separate juice trays 23 and 24, as the sugar juices expressed from the bagasse must be kept in continuous progression toward the point remote from the apparatus where said sugar juices are subjected to treatment for recovering the sugar therefrom, and such progression must not be subject to such delay as will permit fermentation to set in. The juice trays 23 and 24 are of sufficient capacity to have the juice caught therein promptly removed therefrom by the pump associated with each juice tray.

I claim:—

In a juice-expressing apparatus, the combination of a plurality of mills arranged in tandem, means for passing a mat of bagasse successively through each mill, each mill being composed of a top roll, a feed roll and a discharge roll, means for supplying a macerating fluid to the mat of bagasse passing through the last of said series of mills at a point between the feed and discharge rolls, and means associated with each mill for separately recovering the fluid expressed from the bagasse by the top and feed rolls and by the top and discharge rolls, respectively, and applying said separate bodies of fluid to the bagasse passing through the next preceding mill at points in advance of and beyond, respectively, the discharge roll of the said preceding mill, one of said separate juice-removing means of the first of the series of said mills being adapted to transfer juices received therein to points remote from the apparatus.

WILLIAM D. HYMERS.