This invention relates to mixer apparatus for use at sugar centrifugal stations, in refineries and raw cane and beet sugar factories, to hold masscucute and magmas in proper condition for centrifugal treatment. More particularly, the invention deals with improvements in mixer installations of the types disclosed in United States Patents Nos. 2,086,961, Re. 20,555, 2,128,873 and 2,206,237, which embody means for heating and stirring the mixture of sugar crystals and syrup held in the mixer tank, awaiting or en route for delivery to adjacent centrifugal machines, so as to pre-determine and keep approximately uniform the viscosity and purging qualities of the many centrifugal charges drawn successively from the mixer during the period of hours usually needed to process an entire run or vacuum pan strike.

In the use of such mixer installations made with conventional forms of mixer tanks there has continued to be some trouble due to centrifugal charges of irregular consistency sometimes being delivered from the mixer. For example, the sugar crystals sometimes are not uniformly distributed in their suspending syrup, and when such a charge is admitted into a slowly rotating centrifugal basket, the crystals tend to lodge in the bottom of the basket and form an uneven or conical sugar wall that cannot be centrifuged efficiently, instead of walling up evenly under centrifugal force. Such trouble is particularly evident in the treatment of higher purity or white sugar masscucutes—the so-called “free-purging” masscucutes.

The object of my present invention, therefore, is to provide improved mixer apparatus of the type described which comprises heating and stirring means for controlling the condition of masscucute or magma to be delivered from the mixer, together with means to keep all of the masscucute that is ready for centrifugal treatment in circulation and subject substantially uniformly to the action of the heating and stirring means. More particularly, the mixer is constructed to keep all masscucute awaiting treatment in motion and under the influence of the heating and stirring means by maintaining a forced circulation of the masscucute substantially to the inside faces of the loading gates. My apparatus thus prevents heated masscucute from resting in a relatively dormant condition and distributes such cooling and settling effects as occur through all of the mass being conditioned for centrifugal treatment. This enables cooling and settling effects to be avoided, or overcome automatically, through the control and operation of the heating and stirring means.

Other features, objects and advantages hereof are set forth particularly in the appended claims and will become apparent from the following detailed description of preferred embodiments of my invention, when considered in connection with the accompanying drawing wherein,

Figure 1 is a diagrammatic front elevation, with some parts broken away to reveal inside structure, illustrating one form of the improved mixer apparatus;

Figure 2 is an end view, partly in section, taken substantially along line 2—2 of Figure 1;

Figure 3 is a fragmentary front elevation showing another form of the improved apparatus;

Figure 4 is an end view, partly in section, taken substantially along line 4—4 of Figure 3; and
Figure 5 is an inclined horizontal section along line 5—5 of Figure 4.

Figures 1 and 2 illustrate a mixer installation useful for the handling and treatment of white or other free-purging massescue that is to be dropped directly from a vacuum pan (not shown) into a mixer A and held by the mixer in a substantially uniform condition while awaiting treatment, charge by charge, in sugar centrifugal B.

The mixer structure includes an elongated tank body 2, which is usually U-shaped in cross-section, together with a plurality of loading gates 4 and means including conduits 6, 8 and 10 connecting the loading gates with the bottom of the tank so as to maintain a circulation of heated massescue or magma between suitable heating and stirring means 12 inside the tank and the inside faces of the loading gates. The gates 4 may be of any suitable construction, and are usually operable by means such as the levers 5 to open and close charging ports, which they normally cover, and thus deliver charges periodically from the mixer to the respective centrifugal B.

The heating and stirring means 12 extend lengthwise in the base or lower portion of tank 2, and coacting rotary stirring means 16 are provided which extend substantially the full length of the tank in its upper portion. The means 12, as shown, comprise spiral coils 14 mounted for rotation on a shaft 13, and these coils both heat and stir the massescue in contact therewith just before delivery of the massescue to the centrifugal B. Other forms of moving coils, however, may be used, as well as suitable combinations of relatively stationary heating coils with rotary stirring means. Water or other suitable heating fluid at a regulated temperature is circulated through the coils by any suitable means (not shown), for example, as disclosed in United States Patent Reseue No. 20,556.

The upper stirring means 16 comprise horizontal paddles or blades 17 mounted on radial arms 18 for rotation with a shaft 15. The general arrangement of means 12 and 16 is similar to that disclosed in my United States Patent No. 2,328,673. A common external drive transmission of any suitable type, parts of which are diagrammed at 20, may be used for driving the means 12 and 16.

The elongated conduit 8, which is spaced below tank 2, as seen in Figures 1 and 2, extends parallel to the tank and to the adjacent centrifugal B, and serves as a header which is connected with the tank bottom near its opposite ends through the vertical conduits 6 and 16. The loading gates 4 are secured directly to the front face of header 8 so as to deliver massescue therefrom directly to the corresponding centrifugal machines.

Inside of header 8 I provide a screw propeller 30, or equivalent means, which is connected at one end with suitable driving means such as a chain 32 driven from the same source 23 as the means 12 and 16.

In some mixer installations the coils 14 may not extend quite to the end walls of the tank 2, so that pockets of massescue might stay relatively dormant in one or more of the tank corners. Where this condition is likely to occur, such as in the left-hand corner of the tank shown in Figure 1, I preferably provide a fillet 40 to present a curved or streamlined surface 41 causing a freer circulation of massescue relative to the heating coils. Conduit 10 opens into the tank approximately at the right hand end wall thereof, so that a similar fillet is not needed at that point in the form shown.

In the use of this apparatus, the heating and stirring means 12 and 16 and the screw propulsion means 30 inside header 8 are all maintained in continuous rotation at suitable predetermined rates. The means 12 and 16 keep the main body of massescue in the tank substantially uniform, since the massescue is continuously agitated and circulated in and between the respective upper and lower paths of rotation of the two devices, and enough heat may be furnished, by the circulation of hot water through the heating coils and the relative motion of massescue in contact with these coils, to establish the desired temperature conditions for purging and counteract heat losses from the mass held in the tank. In the treatment of white massescue or the like, the desired temperature may be approximately the final temperature existing in the vacuum pan when the strike is dropped into the mixer.

The coils 14 of means 12 tend to move the heated massescue in a path leading to one end of the tank bottom. The screw means 30 continuously draw massescue from that end and circulate it through the conduits 6, 8 and 10 back to the heating coil, thereby keeping the massescue being heated in motion at all times, substantially to the inside faces of the loading gates 4. In this way the mixer keeps all of the massescue awaiting centrifugal treatment in a substantially uniform condition of heat and crystal distribution; eliminates dormant massescue which heretofore have contributed to false grain formation, settling of crystals and irregularity of centrifugal work; and enables temperature and viscosity conditions to be selected and maintained more perfectly than heretofore, in many mixer installations.

The embodiment of Figures 1 and 2 is applicable to conventional mixer installations without necessitating major changes in the form or mounting of the mixer tank. The embodiment of Figures 3, 4 and 5 similarly is applicable for the conversion of conventional mixer apparatus to the improved construction herein disclosed. It will be understood that various other forms may be utilized in adapting the invention to existing installations or in providing entirely new facing installations according to the requirements, whereby all of the many successive charges delivered for centrifugal treatment during the processing of a strike or run of sugar may be kept at a desired uniform condition by maintaining the whole mass in the lower portion of the mixer in motion relative to the heating means, not only in the tank proper but also substantially to the inside faces of the loading gates.

The form of apparatus shown in Figures 3, 4 and 5 functions in substantially the same way as the embodiment of Figures 1 and 2, but it differs structurally from the latter in some respects. The lower portion only of the mixer tank 102 is shown. This has loading gates 104 at the bottom connected with the tank proper through vertically extending conduits or loading chutes or spouts 106, one conduit for each gate. The heating and stirring means 112, as shown, again comprise spiral columns 114 mounted for rotation on a shaft 113 in the lower portion of the tank 102.

Instead of circulating the massescue along the heating coils from one end to the other of the tank and then through a header conduit supporting the loading gates, a horizontal conduit or header 108 is disposed below the tank in back of
the gates and is connected with the chutes at points near the gates through respective branch conduits 108; and this header 108 is also connected to the tank bottom through an additional vertical conduit 110.

A screw propeller mechanism 130 inside of header 108 maintains a forced circulation of massecuite from the heating means 112 through the several conduits substantially to the inside faces of the loading gates. As shown in Figure 5, the propelling means are formed with opposed pitched spiral screw sections 131 and 131a, respectively, which cause massecuite to be drawn downwardly from tank 102 through conduit 110 and then to be divided and forced in different paths through the plural sets of connected conduits 109 and 105. Baffles 120 (Figure 4) may be provided at the joints between conduits 109 and 105, to extend toward the loading gates 114 and insure complete circulation of massecuite up to the faces of the gates. A shaft 132 carries the screw means which enforce this circulation.

I realize that various other forms of mixer apparatus may be made according to my invention, and I intend to define the invention by the appended claims without restriction to non-essential details of the illustrated embodiments.

I claim:

1. A mixer to hold a mixture of sugar crystals and syrups awaiting centrifugal treatment comprising a tank body, gate means to deliver charges of the mixture to adjacent centrifugal machines, means inside the tank body for heating and stirring the mixture therewithin, and connecting means between the tank body and said gate means and having propulsion means therein to maintain a forced circulation of said mixture from said heating means substantially to the face of said gate means.

2. A mixer to hold sugar massecuite awaiting centrifugal treatment comprising an elongated substantially U-shaped tank having massecuite heating and stirring means disposed lengthwise in the lower portion thereof, an elongated header in spaced relation to the bottom of the tank, conduits connecting the end portions of the header with the tank, means to circulate massecuite from the tank through the header, and a plurality of loading gates mounted on the header to deliver charges of massecuite thereto from adjacent centrifugal machines.

3. A mixer to hold sugar massecuite awaiting centrifugal treatment comprising an elongated tank having massecuite heating and stirring means extending substantially the full length thereof adjacent the tank bottom, an elongated header spaced below the tank bottom, a plurality of loading gates to deliver charges of massecuite to adjacent centrifugal machines, vertically extending conduits respectively connecting the loading gates with the tank bottom, other conduits respectively connecting the header with the aforesaid conduits close to the loading gates, additional conduit means directly connecting the header with the tank bottom, and screw propulsion means in the header operative to draw massecuite from the tank and circulate the massecuite to the gates and through said conduits.

4. A mixer to hold sugar massecuite quite uniform while awaiting centrifugal treatment comprising a tank body having massecuite heating and stirring means therewithin, a plurality of loading spouts having loading gates therein at the bottom of the mixer to deliver charges of the massecuite therefrom to adjacent centrifugal machines, a substantially horizontal header below the tank body connected with the same and with the respective loading spouts adjacent said loading gates, and massecuite propulsion means in said header to maintain a circulation of massecuite therethrough and through said spouts between the gates and the heating means.

5. A mixer to receive a pan strike of sugar massecuite and hold the same ready for centrifugal treatment, comprising a tank body having massecuite heating and stirring means therewithin, gate means to deliver charges of the massecuite to adjacent centrifugal machines, conduit means connecting the bottom of the tank body with said gate means, and screw propulsion means to maintain a forced circulation of massecuite through said conduit means.

6. A mixer to hold sugar massecuite awaiting centrifugal treatment comprising an elongated substantially U-shaped tank having lower rotary heating and stirring means disposed lengthwise in the base thereof and upper rotary stirring means disposed lengthwise above and in coating relation to said lower means, a plurality of loading gates to deliver charges of the massecuite to adjacent centrifugal machines, conduit means connecting the gates with the tank bottom, said tank having its inside walls approaching the paths of rotation of said lower and upper means and curved insides at corners thereof to prevent massecuite lying dormant in the corners, and means to maintain a forced circulation of massecuite between said lower means and the inside faces of said loading gates through said conduit means.

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