

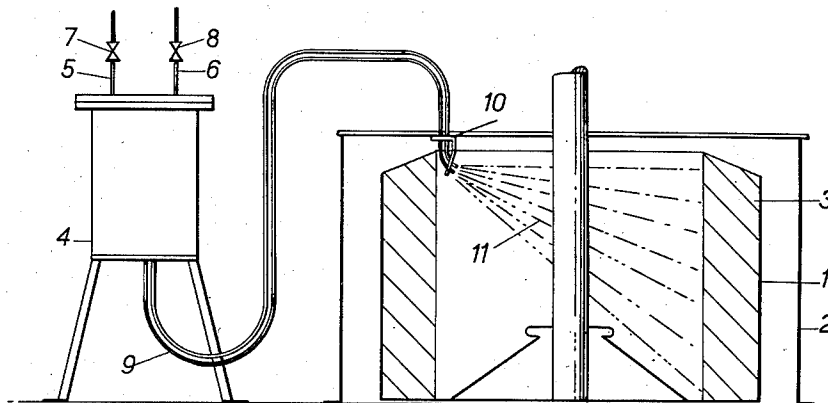
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W. HAWKSLEY

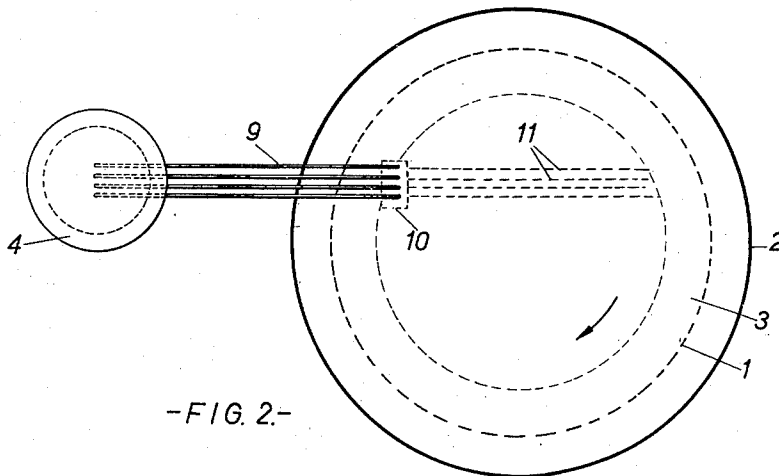
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REFINING OF SUGAR

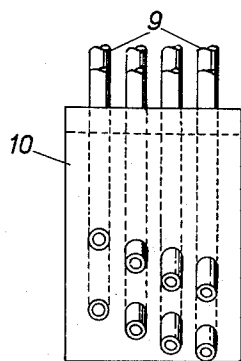
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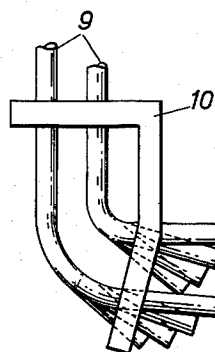
-FIG. 1-



-FIG. 2-



-FIG. 3-



-FIG. 4-

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REFINING OF SUGAR

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The present invention relates to the production of sugar.

In the process of producing or refining sugar a wet mass containing sugar crystals generally known either as a magma or a massecuite (and commonly hereinafter referred to as a massecuite) is centrifuged to throw off most of the syrup which contains impurities such as invert sugar and mineral ash. To assist in purging the syrup and impurities from the sugar crystals, it is customary to apply water in the form of a fine spray on to the inner surface of the rotating annular sugar charge at an appropriate stage or stages in the centrifuging operation when the main bulk of the syrup has been discharged therefrom. The quantity of water so sprayed and the time occupied in so doing varies with the nature of the massecuite and the size of the charge but in a typical case of a charge containing about 900 lbs. dry sugar between 3 and 5 gallons of water would be sprayed towards the inner surface of the rotating charge over a relatively extended period of about 20 to 30 seconds. Because the water is projected towards the rotating charge in the form of a fairly fine spray and because the charge and thus the atmosphere therein are rotating at fairly high speed it is doubtful whether the water is caused forcibly to impinge on the charge or whether, on the other hand, it is merely entrained by the charge. At all events, there is certainly no vigorous impingement of the water on to the charge.

According to the present invention the water is projected towards the rotating charge much more rapidly than in the past namely at a rate not less than 1.0 gallon per second and preferably at a rate not less than 1.5 gallons per second and not greater than 2.5 gallons per second.

The invention thus includes the range of water feed rate of from 1.0 up to 2.5 gallons per second and the more preferable range of from 1.5 up to 2.5 gallons per second.

Another feature of the invention resides in projecting the water towards the rotating mass in substantially solid and undispersed water streams instead of as a spray or sprays. Preferably the water charge is abruptly introduced into the centrifuge as a plurality of substantially solid and undispersed streams or jets directed towards different levels in the centrifuge.

Another feature of the invention resides in projecting the water towards the rotating sugar mass as water streams which impact upon the rotating mass.

Yet a further feature of the invention resides in subjecting the rotating sugar mass to a deluge of washing water abruptly projected into the centrifuge as a plurality of substantially solid and undispersed streams or jets.

One advantage of the present invention is that the time required for each centrifuging operation can be shortened.

Tests have shown that the syrup and impurities can be more effectively purged from the sugar mass by feeding the water thereto more quickly as substantially solid and

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undispersed streams with the result that for a given quantity of wash water fed to a given charge the invert and ash content of the sugar mass at the end of the centrifuging operation are lower. It is thought that the syrup film which tends to cling to each sugar crystal despite the centrifuging operation is to a greater extent removed by feeding the water to the rotating sugar mass in accordance with the present invention. It is believed probable that the water, being supplied at a rapid rate to the rotating sugar mass after the main bulk of the syrup has been removed more nearly floods all the interstices between the sugar crystals with water and syrup than when applied in the customary slow way when most of the wash water perhaps passes by a limited number of paths through the rotating sugar mass.

To enable the water to be fed substantially uniformly to the rotating mass over its whole depth, the water charge is projected in a number of streams directed to different parts of the depth of the rotating mass so that adjacent annular bands of the sugar are purged by adjacent streams of water. The water streams are preferably directed at different angles from a more or less common locality.

According to a further feature of the invention, the water charge to be supplied to a rotating sugar mass is fed to a closed tank with a discharge at the bottom and a compressed air feed at the top and the water is abruptly discharged from the tank to the rotating sugar mass by compressed air. The invention thus includes a sugar centrifuge provided with a closed water tank having a valve-controlled water feed connection, a valve-controlled compressed air connection and a plurality of water discharge pipes leading from the bottom of the tank to the centrifuge and directed at their open ends towards different levels in the centrifuge. Said discharge pipes preferably extend downwardly from the tank, then upwardly and then downwardly into the centrifuge so as to preclude the possibility of dripping from the tank into the centrifuge after the water feed has been completed.

The invention will be described further, by way of example, with reference to the accompanying generally diagrammatic drawings, in which:

Fig. 1 is a front elevation of one sugar centrifuging apparatus constructed in accordance with the invention.

Fig. 2 is a plan view thereof;

Fig. 3 is a detail in front elevation showing a water pipe terminating block; and

Fig. 4 is a side elevational detail corresponding to Fig. 3.

In the apparatus shown in the drawings, a flowable mass of damp or wet sugar crystals such as massecuite is delivered to a centrifuge comprising a rotatable, perforate basket 1 largely enclosed within a so-called monitor casing 2. The basket 1 is caused to spin, and the sugar mass is consequently urged towards the periphery of the basket, where it builds up to form a wall 3 of sugar crystals. As the rotational speed of the basket 1 is increased towards a desired maximum, the action of centrifugal force purges by far the greater part of the adhering moisture, in the form of a syrup, from the crystals, and this syrup passes out through the perforations in the basket.

For the purpose of removing as much as possible of the residual quantity of syrup remaining on the sugar crystals, the invention provides means for projecting a number of substantially solid streams or jets of washing water towards the sugar wall 3. Referring firstly to Fig. 1 of the drawings, there is provided a totally enclosed container or water pot 4 having a connection 5 to a water supply, and a connection 6 to a supply of compressed air. The water connection 5 and air connection 6 are controlled by valves 7 and 8 respectively. From an opposed region of the water pot 4 there are taken a num-

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ber of relatively large bore pipes 9, typically of an internal diameter of the order of $\frac{5}{8}$ ", and the pipes 9 will be seen firstly to depend downwardly from the pot 4, then to extend upwardly to a level above the monitor casing 2, and finally to describe a downward path whereby they are caused to enter the centrifuge to terminate just within the top of the basket 1 and adjacent the periphery thereof. These pipes 9 may conveniently be secured to the monitor casing 2 by means of a bracket or block 10. Fig. 3 shows the manner in which the pipe ends are mutually spaced laterally across and longitudinally of the bracket 10, and Fig. 4 illustrates how the pipe ends are angularly spaced relative to one another in order to cause the water streams projected from the pipes 9 to be directed towards different levels of the sugar wall 3, whereby to describe different annular bands around the sugar wall as the basket 1 rotates.

In a typical centrifuging and washing operation, a predetermined charge of massecuite, from which a weight of dry sugar of some 900 lbs. is to be obtained, is fed into the basket 1 as the latter is rotating relatively slowly. The rotational speed of the basket is increased, and purging of the syrup from the sugar crystals takes place centrifugally as already mentioned. In the meanwhile, the valve 7 is opened to admit a predetermined charge of washing water into the pot 4, and in the typical instance quoted, this water charge is of the order of 3 to 5 gallons. The valve 7 is now closed, and as the basket 1 approaches its maximum rotational speed, and at an instant when a desired degree of centrifugal purging of the syrup has taken place, the valve 8 is opened to admit compressed air at some 90-100 p.s.i. The water charge in the pot 4 is thus forced under substantial pressure into the pipes 9, whence it is abruptly projected into the basket 1 in a plurality of solid streams or jets 11, each stream or jet being directed to a selected region of the sugar wall 3. Under the conditions described, the water charge in the pot 4 is displaced from the pot and forced into the basket 1 in a period of some 2-3 seconds.

The water impinging on the sugar wall 3 is rapidly urged under centrifugal force through the whole thickness of the wall, and due to the rate at which the water is supplied it is probable that a substantial proportion thereof passes through the radially inner surface regions of the wall 3 without becoming saturated with sugar with the result that the middle and outer radial regions of the wall 3 are effectively purged by relatively fresh water, and at the same time, the volume of water passing through the wall 3 appears to mechanically scour the syrup film from individual sugar crystals.

It will be appreciated that the provision of the pot 4 enables accurate metering of the washing water charge to be observed, whilst the arrangement shown of the pipes 9 mitigates against the possibility of water dripping therefrom at undesired times, for example into a washed charge of sugar.

I claim:

1. In the centrifuging of a wet sugar mass to throw off syrup and impurities therefrom, projecting water as substantially solid and undispersed streams towards the inner surface of the rotating annular sugar mass at a rate not less than one gallon per second.

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2. In the centrifuging of a wet sugar mass to throw off syrup and impurities therefrom, projecting water as substantially solid and undispersed streams towards the inner surface of the rotating annular sugar mass at a rate not less than 1.5 gallons per second.

3. In the centrifuging of a wet sugar mass to throw off syrup and impurities therefrom, projecting water as substantially solid and undispersed streams towards the inner surface of the rotating annular sugar mass at a rate not less than 1.0 gallon per second and not greater than 2.5 gallons per second inclusive.

4. In the centrifuging of a wet sugar mass to throw off syrup and impurities therefrom, projecting water as substantially solid and undispersed streams towards the inner surface of the rotating annular sugar mass at a rate not less than 1.5 gallons per second and not greater than 2.5 gallons per second.

5. In the centrifuging of a wet sugar mass to throw off syrup and impurities therefrom, projecting water towards the inner surface of the rotating annular sugar mass at a rate not less than one gallon per second as substantially solid and undispersed water streams instead of as dispersed sprays.

6. In the centrifuging of a wet sugar mass to throw off syrup and impurities therefrom, projecting the water charge towards the inner surface of the rotating annular sugar mass at a rate not less than one gallon per second as substantially solid and undispersed water streams which impact upon the rotating mass at different levels thereof.

7. In the centrifuging of a wet sugar mass to throw off syrup and impurities therefrom, projecting the water charge abruptly at a rate not less than 1 gallon per second as substantially solid and undispersed water stream directed towards the inner surface of the rotating annular sugar mass at different levels thereof.

8. In the centrifuging of a wet sugar mass to throw off syrup and impurities therefrom, subjecting the rotating annular sugar mass to a deluge of washing water abruptly projected into the centrifuge at a rate not less than 1 gallon per second as a plurality of substantially solid and undispersed streams of water directed towards different levels thereof.

9. A method of projecting a water charge into a rotating annular wet sugar mass in a centrifuge in which the water charge is fed into a closed tank and is abruptly discharged therefrom by compressed air as a plurality of substantially solid and undispersed water streams and at a rate not less than 1 gallon per second.

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