R. D. PIKE.

TREATING MOLASSES.

APPLICATION FILED OCT. 2, 1907.

900,584.

Patented Oct. 6, 1908.

FIG. 1

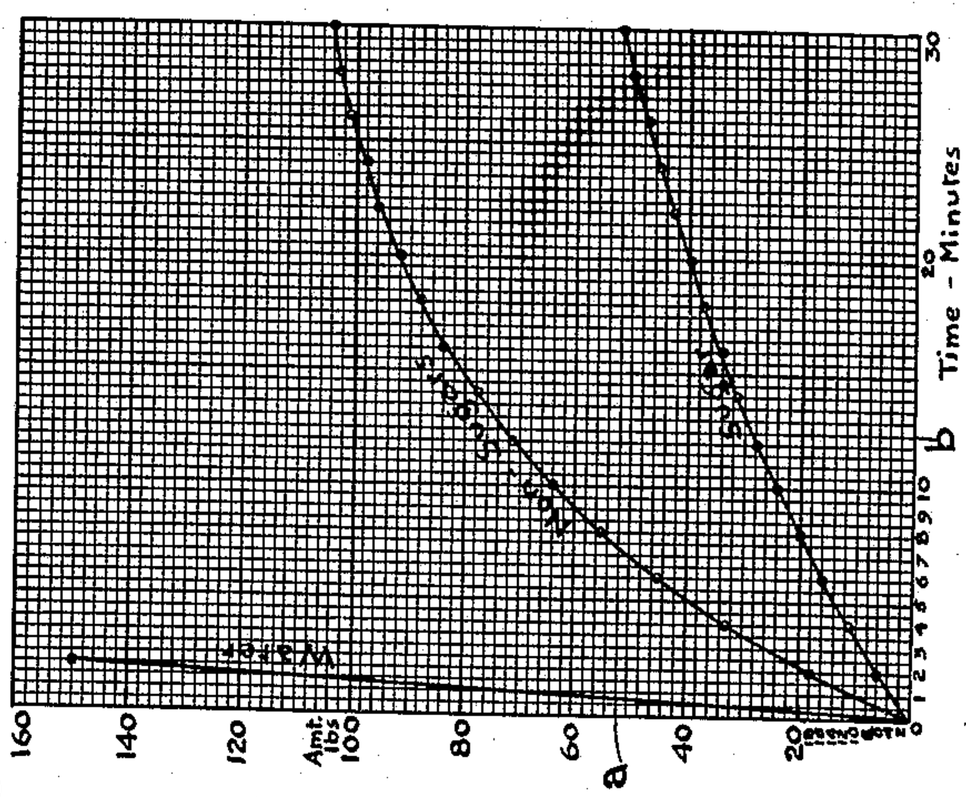
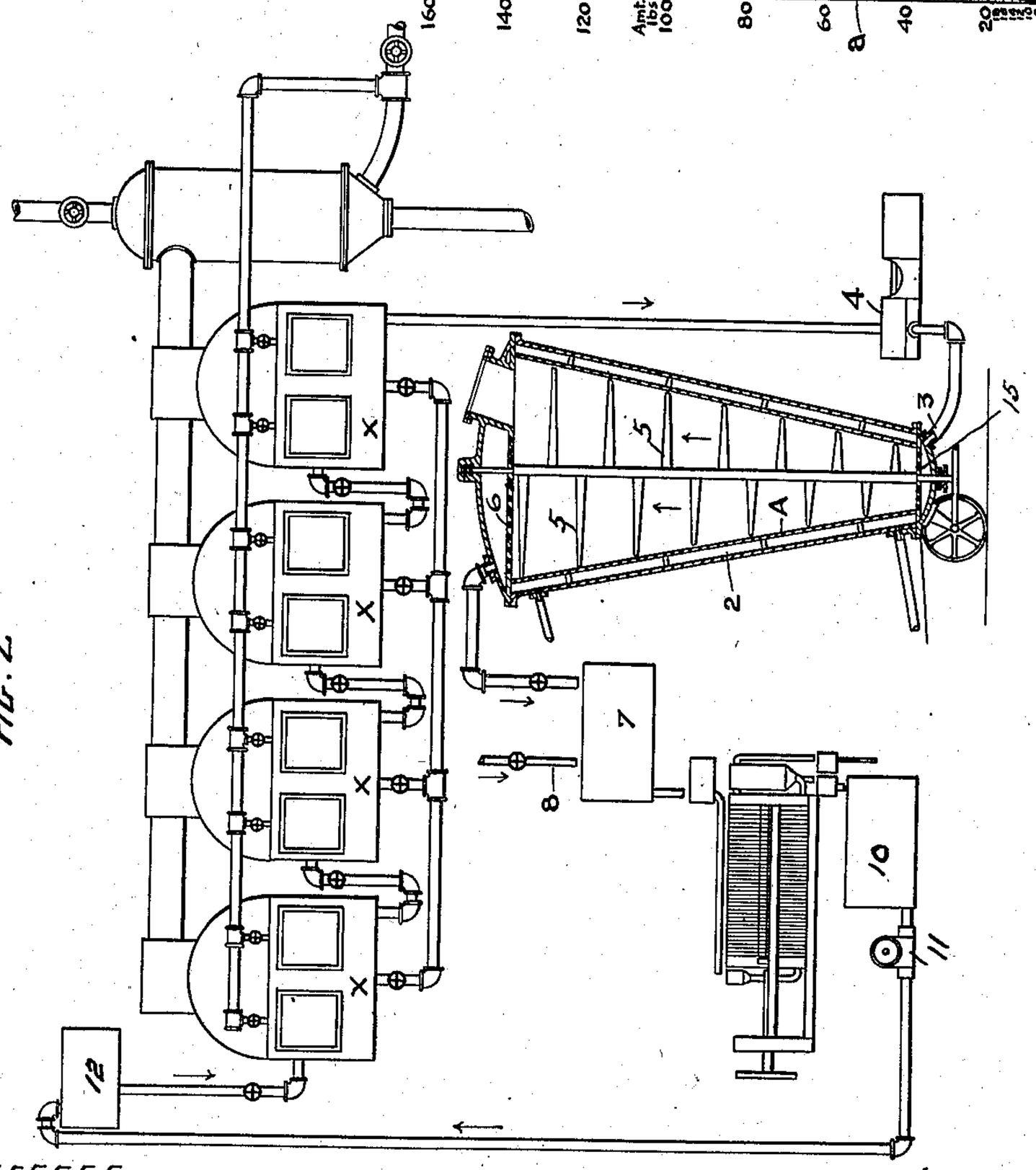


FIG. 2



WITNESSES:

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TREATING MOLASSES.

No. 900,584. Specification of Letters Patent. Patented Oct. 6, 1908.

Application filed October 2, 1907. Serial No. 395,570.

To all whom it may concern:

Be it known that I, ROBERT D. PIKE, citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented new and useful Improvements in Treating Molasses, of which the following is a specification.

This invention has for its object the extraction of sugar from the end molasses occurring as a by-product of the beet sugar industry.

It consists in a novel and useful combination of the osmose process and the process of crystallization in motion, whereby the percentage of sugar recovered from molasses is greater than that recovered by the combination of these processes at present in use.

In the drawings Figure 1 represents the curves showing the velocities of diffusion of the sugar, non sugars, and water, when the molasses is placed on one side of a parchment paper and water on the other. The abscissa, *b*, represents the time consumed in the diffusion in the ordinary osmose process and the ordinates, *a*, amounts diffused. At the beginning of the operation the velocity of diffusion of the non-sugars is very much greater than that of the sugar, while at the end the velocities of the sugar and non-sugars are nearly equal. In other words, at the beginning of the process, the ratio of sugar to non-sugars in the osmose water is much less than toward the end, and as the sole object is to separate the non-sugars and leave the sugar behind in the molasses, the osmose process can be said to work most efficiently at the start, and to gradually decrease in efficiency as the diffusion proceeds. By the combination of osmose and crystallization in this invention, the entire osmosing of the molasses is carried on with an efficiency approximating that obtained at the start of the ordinary osmose process.

Fig. 2 shows a form of apparatus with which my invention can be put into practice. In Fig. 2, 9, is an osmose apparatus of any desired form. 10 is a tank into which the osmose syrup falls. 11 is a pump delivering this syrup to the evaporator supply tank, 12, from which the syrup is taken through the evaporators, X, in which it is concentrated, and is then forced by the pump, 4, up through the sugar crystals, in the closed receptacle, A. This closed receptacle, A, is essentially what is known as a rotary crystallizer. It is a hollow frustum vertically placed, smaller end downward. It is surrounded with a jacket, 2, in which steam is circulated, and with a perforated false bottom, 15, and a perforated false top, 6, the perforations in the top, 6, and the bottom, 15, respectively being too small to admit the passage of sugar crystals of the usual size. A stirrer, 5, whose axis of rotation coincides with the axis of the frustum, is adapted to gently agitate the mixture of molasses and crystals in which it rotates. 7 is a tank into which the pump, 4, delivers the molasses which has been forced to percolate through the crystals in A, and 8 is a pipe adding fresh molasses to the molasses off the crystallizer. The mixture in the tank, 7, again goes through the osmose apparatus, 9.

In carrying out the process of beet sugar manufacture, what is known as second strikes are obtained. A second strike is a mixture of sugar crystals and mother liquor whose purity co-efficient is 75–80, and whose mother liquor has a purity co-efficient of approximately 68–72. By the ordinary process of rotary crystallization the purity co-efficient of the mother liquor is reduced to 61. It is this mother liquor of 61 purity, called end molasses, which is treated in this process in the following manner. If the crystallizer, A, will hold fifteen tons of fill-mass (a mixture of sugar crystals and mother liquor) place in it one ton of raw sugar crystals, and into the steam jacket, 2, introduce steam of a temperature of 80 degrees to 90 degrees C. Now subject about five tons of the end molasses to a rapid osmose treatment in the osmogene, 9, so as to raise its purity co-efficient from 61 to about 62, and then pump it through the evaporators, X, so that it will leave them at such a concentration as to have a co-efficient of supersaturation of about 1.2 at the temperature of the steam in the jacket, 2, of the crystallizer, A. As the concentrated syrup comes through the last evaporator, the pump, 4, draws it out and pumps it through the perforated false bottom, 15, and thence up through the sugar crystals which are being agitated by the stirrer, 5. Owing to its supersaturation at the temperature in the crystallizer, A, the syrup deposits syrup on the exciting crystals contained therein, and its passage is so timed that when it passes through the perforated false top, 6, it has had its purity co-efficient lowered from 62 to the original purity co-efficient of the end

molasses, namely 61. It now passes into the tank, 7, where enough of the original end molasses is added to it to make up for the loss of solid material incurred in the osmose and crystallizer, or, in other words, to restore the molasses in the process to its original weight of five tons and the mixture, as fast as it comes in, is passed on again through the osmose, raising its purity about one degree as before, and so on through the same cycle of operations.

It is thus seen that a continuous stream of molasses is passing through the cycle of operations, namely, osmosis, concentration, crystallization, addition of new molasses, once the process is started. The osmose action will continue to be effective until about ten additional tons of original end molasses have been added to the five tons started with when this point has been reached, at the end of about 125 hours, the process is completed. The crystallizer, A, is now emptied in any suitable manner and the contents centrifugaled. The molasses obtained is the real final molasses of a factory using this process, and is only about one-third of the end molasses ordinarily obtained, while, at the same time, fifty percent. and over of the sugar existing in the original end molasses has been recovered. This high recovery is possible because the molasses is passed rapidly through the osmogene thus causing the action of diffusion to take place near the origin of the curves in Fig. 1, or, as was pointed out above, in the region of highest efficiency or lowest purity of the osmose water.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. The method herein described of treating molasses which consists, essentially, in rapidly osmosing and then concentrating the osmose syrup to supersaturation; then crystallizing this syrup until the purity coefficient of the resulting moleasses is approximately that of the molasses previously osmosed; then adding fresh molasses to the osmosed molasses; and then reosmosing the combined molasses.

2. The method herein described of treating molasses which consists, essentially, in rapidly osmosing the molasses and then concentrating the osmose syrup to supersaturation; then crystallizing the syrup while the same is flowing or in motion, and until the purity coefficient of the resulting molasses is approximately that of the molasses previously osmosed; then adding fresh molasses to the osmosed molasses; and then reosmosing the molasses of the crystallizer.

3. The method herein described of treating molasses which consists, essentially, in rapidly osmosing the molasses and then concentrating the osmose syrup to supersaturation; then crystallizing the syrup in a closed chamber on exciting crystals, and simultaneously flowing the syrup therethrough with a velocity which is greater in the inlet portion of the crystallizer than in the outlet portion thereof; then adding fresh molasses to this osmosed molasses; and then reosmosing the combined molasses.

4. The method herein described of treating molasses which consists, essentially, in rapidly osmosing the molasses and then concentrating the osmose syrup to supersaturation; then crystallizing the syrup in a closed chamber on exciting crystals, and simultaneously flowing the syrup therethrough with a velocity which is greater in the inlet portion of the crystallizer than in the outlet portion thereof; while subjecting the crystallizer to a temperature sufficient to maintain the supersaturation of the syrup; adding fresh molasses to the osmosed molasses, and then reosmosing the molasses of the crystallizer.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ROBERT D. PIKE.

Witnesses:
CHARLES A. PENFIELD,
S. H. NOURSE.