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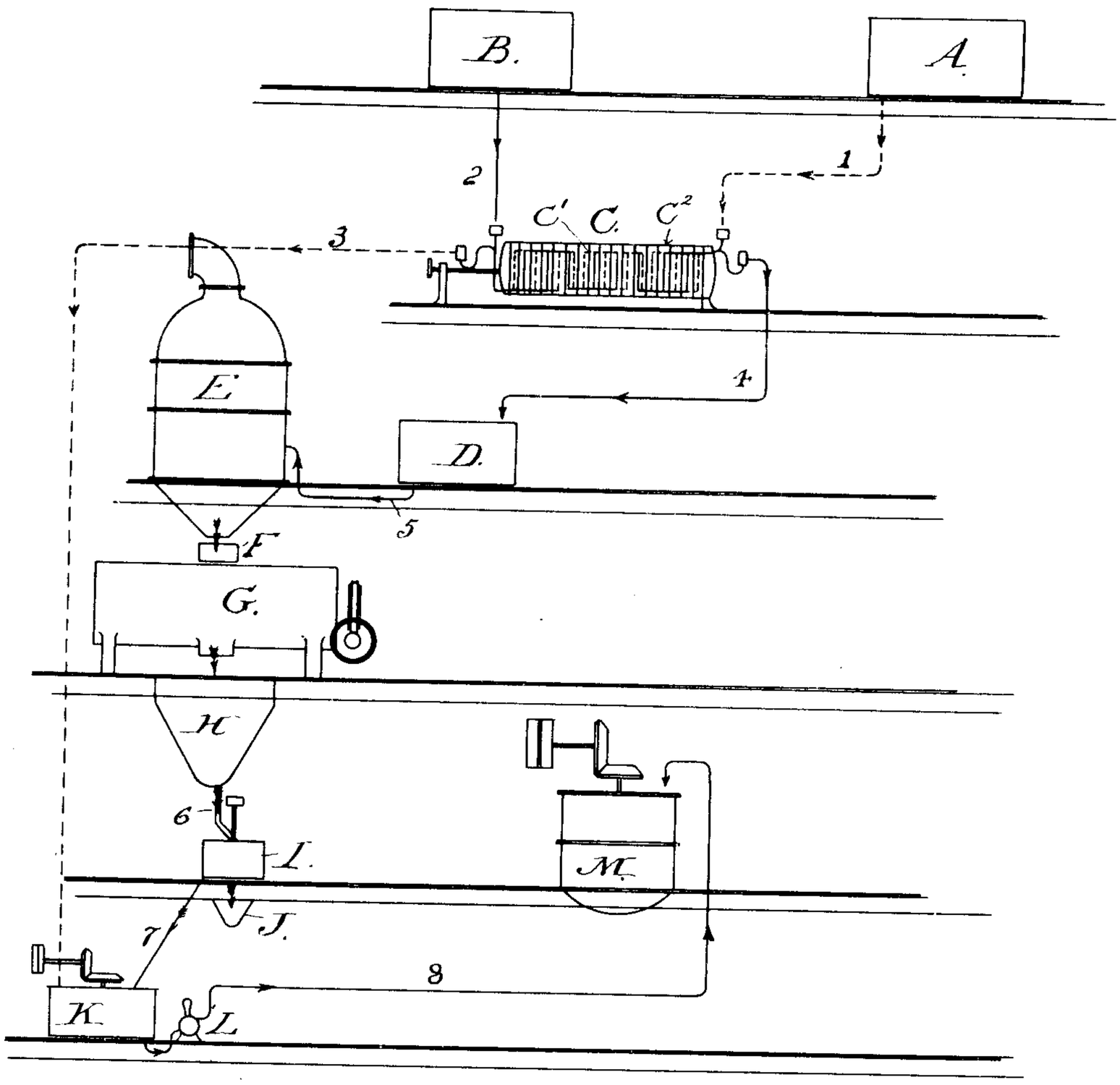
J. G. OXNARD & W. BAUR.

PROCESS OF EXTRACTING SUGAR FROM MOLASSES.

(Application filed June 26, 1901.)

(No Model.)



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JAMES G. OXNARD AND WILHELM BAUR, OF NEW YORK, N. Y.

PROCESS OF EXTRACTING SUGAR FROM MOLASSES.

SPECIFICATION forming part of Letters Patent No. 682,737, dated September 17, 1901.

Application filed June 26, 1901. Serial No. 66,127. (No specimens.)

To all whom it may concern:

Be it known that we, JAMES G. OXNARD, a citizen of the United States, and WILHELM BAUR, a subject of the Emperor of Germany, both residing at New York, in the borough of Manhattan and State of New York, have invented new and useful Improvements in the Process of Extracting Sugar from Molasses, of which the following is a specification.

This invention relates to a certain new and useful process for extracting from final molasses which has been obtained from saccharine juices of plants, especially sugar-beets, and from other more or less pure saccharine solutions the crystallizable sugar which they may contain.

The essential objects of the invention are to increase the yield of the sugar and reduce the quantity of final molasses and to reduce the cost of working the molasses plant.

The figure represents an apparatus suitable for carrying out our invention.

A general description of this apparatus is as follows and will be sufficient for those skilled in the art to carry out this process.

A is a tank containing pure water to be used to "osmose" the molasses.

B is a tank containing molasses which is to be osmosed.

C is the osmose apparatus of the well-known type.

D is a storage-tank for molasses after osmosing.

E is a vacuum-pan for boiling down the osmosed molasses.

F is a gutter for conveying the masse-cuite to crystallizers.

G is a crystallizer of any well-known form.

H is a mixer in which the masse-cuite after leaving crystallizer is stored before going to the centrifugals.

I is a centrifugal in which the masse-cuite is separated—molasses from masse-cuite.

J is a conveying apparatus for conveying the sugar after leaving the centrifugal to any desired point.

K is a tank for storing the molasses spun from the centrifugal I.

L is a pump for pumping the molasses from the tank K to the separating apparatus, of which M is one type.

1 is a pipe-line which conveys the water for osmosing to the osmose apparatus.

2 is a pipe-line for the molasses to be osmosed to the osmose apparatus.

3 is the pipe-line conveying the waste water from the osmose apparatus to the storage-tank K.

4 is the pipe-line conveying the osmosed molasses to the storage-tank D.

5 is the pipe-line connecting the storage-tank D to the vacuum-pan E.

6 is the spout, connecting the mixer H with the centrifugal I for passing the masse-cuite from the mixer into the centrifugal.

7 is a pipe-line for molasses from the centrifugal I to the storage-tank K.

8 is a pipe-line from the storage-tank K to the separating apparatus M.

In our former patent, No. 626,292, dated June 6, 1899, we describe and claim a process of manufacturing granulated sugar from beets and from the final molasses which results from the treatment of the beet-juice, and in said patent we describe a process for extracting from the final molasses, either by a hot or cold process, the sugar as a tri-sucrate. In the present case the molasses, which is obtained by the working of the juices of sugar-beets into granulated sugar—as, for instance, by the process disclosed in said former patent—is collected into an appropriate tank or receptacle B and from thence is subjected to what is known as the "osmose" process, which requires generally an apparatus C, comprising osmosing-frames C′ of appropriate construction contained within a frame or casing C^2 and separated from each other in, say, two series of frames, each alternate frame containing molasses received from the aforesaid collecting-tank, and the intermediate frames containing water supplied from a pure-water tank A. The frames are thus alternately disposed, and each of the frames is separated from the other by walls of porous material or fabric, as parchment paper. Both the molasses and the water are permitted to slowly circulate through the respective frames—say in reverse directions—and as the salts in the molasses have a tendency to diffuse more quickly through the parchment walls which separate the molasses-passages

from the water-passages formed by the separation of the frames than the sugar held in solution in the molasses, as is found by actual tests, the result is that the water in the passages between alternate molasses-passages is absorbing much of the salts and organic impurities in the molasses and to this extent is relieving the molasses of much of its impurity. It will be apparent, therefore, that the molasses finally leaves the frames in a purified condition, since it has given to the water, besides some sugar in solution, a larger proportion of its salts. Consequently the molasses has become of higher purity—so much higher, indeed, that a "strike" of sugar can be boiled of it in a vacuum-pan by the methods usually adopted for the purpose or by the method set forth in our aforesaid former patent. Thus as products of the foregoing osmose treatment there are obtained the purified molasses and the osmose-water, the two being collected in separate tanks D and K, and the said water containing some crystallizable sugar and much of the salts extracted from the molasses. This portion of the process may be and is frequently repeated, but is not as effective in its operation and results when worked more than once on the same product, as most of the quick-diffusing salts are eliminated in the first treatment.

Previous to our invention the waste water of the osmose process, substantially as above described, and which contains in addition to the salts and organic impurities extracted from the molasses a considerable per cent. of the sugar originally in the molasses, was allowed to run to waste or the salt contents of the same were utilized as a fertilizer. The sugar contents of this osmose-water—namely, the sugar held in solution after extraction from the molasses—has never been recovered, as far as we know, previous to our invention and represents an entire loss of a valuable part of the sugar in the original juice, and it is to the recovery of this valuable and heretofore-wasted product that our invention particularly relates.

Referring again to the purified molasses which has been collected in the tank D, this molasses is concentrated by the method usually adopted in making sugar and is sent to the vacuum-pan E, where it is boiled to a masse-cuite. The masse-cuite is then sent to a crystallizer G, and from thence it is dropped or delivered into a mixer H, from whence it goes into a centrifugal I, and the centrifugal action of this machine spins off or purges the masse-cuite of the molasses with which it is saturated, the sugar remaining in the centrifugal until delivered to a conveyer J of ordinary character, and the separated molasses, which we will hereinafter refer to as a "secondary" molasses, being collected in the tank or vessel K, placed to receive it. If found desirable, this latter molasses may be osmosed again, as before described; but usually it is impracticable to do so, as the original molasses from which the aforesaid masse-cuite has been obtained has already been treated and relieved of almost all readily-osmosing salts. Being, therefore, heretofore considered as of little value for making sugar, this secondary molasses product of the osmose process has been either run to waste or worked by other processes to save its salt constituents, the sugar contents, however, being thus destroyed and representing an entire loss of saccharine-sugar-producing matter.

In our process we avoid the greater part of the sugar losses of the waste water of the osmose process and also avoid the loss to a great extent of the secondary molasses, and to arrive at these valuable results we combine or mix the heretofore-mentioned osmose-water and the aforesaid secondary molasses, and we obtain the sugar of this combined solution by precipitating the same with either lime, barium, strontium, lead, &c., substantially in the manner described in our said former patent, No. 626,292, wherein lime is described as the precipitating agent to gain the sugar of the sucrates as granulated sugar. Thus, in brief, it may be stated that the molasses product is first treated by the osmose process, producing, say, two products—namely, a purified molasses and an osmose-water. This purified molasses is boiled to a masse-cuite and treated in the centrifugal to produce two products—namely, a sugar and a separated secondary molasses—and this latter molasses and the water of the first osmosing are mixed together, and the combined mixture is treated by an extracting process of the character described in our former patent, before alluded to. It is essential to note that the mixture obtained by combining the osmose-water and the osmosed molasses in spite of its lower purity than the original molasses from beets will be in no way injurious to any one of the separating processes.

Having thus described the treatment of the molasses mixture from the osmose process and shown in what manner the heretofore-wasted sugar of that molasses is recovered, we will now indicate some of the benefits flowing from this present process, and especially from the mixing of the waste water of the first osmosing with the molasses purged from a masse-cuite obtained from the purified molasses of the said first osmosing. By our improved process of mixing the waste water of the osmose process with the secondary molasses the expenses of the separation process and the unavoidable losses of the same are proportionately lowered, and the final yield of sugar obtained as granulated from the ordinary sugar in the beet-molasses is raised considerably and at less cost than when working the extraction process alone. To illustrate, we will use the following approximate figures: The average yield so far obtained from

the working of the ordinary osmose process has been thirty-threeper cent. in granulated from sugar in original beet-molasses. By employing our former extracting process, as set forth in our aforesaid former patent, sixty-seven per cent. of granulated has been produced, and with our present improved process seventy-eight per cent. of granulated is obtained. The only sugar losses in the present process are in the final waste waters obtained from the separation process, and these contain, besides the small amount of sugar, all the fertilizing properties of the original beet-molasses. To illustrate further, we will state that we eliminate from the original beet-molasses by the osmose process about thirty-three per cent. of the sugar contained in said molasses and do this by a process which is capable of being worked comparatively cheap, but the main objection to which is the large loss in the amount of sugar extracted. The osmose water and the heretofore waste molasses we then combine and treat as a separate process or step to eliminate about forty-five per cent. more of the sugar contents in the original beet-molasses, thereby making a total of about seventy-eight per cent. of the original sugar contents of the beet-molasses that we obtain by the present improved process. The new process is therefore important in that it takes care of all the waste products of the osmose process containing a large amount of the original sugar and extracting the same to a large extent and losing only a comparatively small proportion of the original sugar in the final waste waters of the extraction process, and which latter process, while extracting a much larger per cent. of the sugar in the original molasses, is more expensive to operate than the osmose process. The present improved process is also an important advance over the extraction processes alone, because it has been shown that a higher yield of the original sugar in the beet-molasses as granulated sugar can be obtained. It is also shown that about thirty-three per cent. of this original sugar can be extracted in the comparatively cheap osmose process, thereby leaving so much less sugar to be extracted by the more expensive extraction process. In other words, actual experiment shows that this present improved process gives a higher yield of final granulated sugar from the sugar contained in the original beet-molasses at a greatly-reduced cost than can be obtained by any other process, as far as we know. As stated, we extract part of the sugar—say one-third—by the economic osmose process and then combine the secondary molasses with the waste water of the osmose process and produce a mixture which is in about the same chemical condition as the original molasses, except for the loss of part of its sugar, and is therefore in as good condition to be treated by any extraction process, as Steffen's or the one described in our former patent, as was the original molasses. Part of the sugar—say one-third—having been extracted by the osmose process, there remains in the mixture of osmose-water and final molasses only two-thirds of the original sugar in the molasses, and it follows from this that the expense and inevitable losses of sugar in manipulation occur only on two-thirds of the original sugar in the molasses. There is consequently as a result of our improved process less loss of sugar of the original molasses and also less cost of obtaining the available sugar.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The process herein described of obtaining sugar from molasses which consists, essentially, in flowing the molasses in contact with the pervious walls of adjacent water-channels whereby a part of the salts and organic impurities contained in the molasses are absorbed and the purity of the molasses is raised; then concentrating the purified molasses and boiling the same to a masse-cuite; then purging the masse-cuite of its molasses; then combining the osmose-water of the original molasses and the said purged molasses, and finally extracting the sugar contained in the combined mixture.

2. The process herein described of extracting sugar from the molasses obtained from working original juice consisting in purifying the molasses by osmosing and boiling the purified molasses to form a masse-cuite; then purging this masse-cuite; then combining the molasses purged therefrom and the solution of the absorbed salts and impurities of the original molasses; and, finally, precipitating the sugar remaining in the combined solution to form sucrates and treating the precipitated sucrates to gain the sugar thereof.

3. The process herein described of extracting sugar from the molasses obtained from working original beet-juice, consisting, essentially, in purifying the molasses by osmosing; then boiling the purified molasses to form a masse-cuite; then purging the masse-cuite of its molasses constituent; then combining the purged molasses and the osmose-water used in purifying the original molasses; and, finally, precipitating the sugar remaining in the combined solution as sucrates and then treating the sucrates to gain the sugar thereof as granulated sugar.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

JAMES G. OXNARD.
WILHELM BAUR.

Witnesses:
E. A. CLAUS,
E. C. EPPLE.