UNITED STATES PATENT OFFICE.

CARL SCHEIBLER, OF BERLIN, GERMANY.

PROCESS OF OBTAINING SUGAR FROM MOLASSES AND SIRUPS.

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To all whom it may concern:

Be it known that I, CARL SCHEIBLER, doctor of philosophy, a subject of the King of Prussia, residing at Berlin, Prussia, German Empire, have invented certain new and useful Improvements in the Process of Obtaining Sugar out of Molasses and Sirups; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In order to separate sugar from molasses or other saccharine solutions by means of caustic strontium or hydroxide of strontium in an insoluble form, the molasses or saccharine solution must in the first instance be suitably diluted with water. The degree of this dilution depends upon the combination of and percentage of sugar in the solutions, as also especially upon the required quantity of the caustic strontium to be supplied. I prefer to employ a surplus quantity of the latter—that is, one atom of sugar to three atoms of oxide of strontium. A surplus of oxide of strontium, even though it be not strictly necessary, is to be recommended, because it increases the insolubility and close-grained condition of the saccharate. Nor is this surplus lost; but it can be regained as hydroxide of strontium, as will be explained farther on. As to the degree of dilution of the molasses or sugar solution, the rule will in general hold good that there should be such a quantity of fluid that the required quantity of the not easily soluble hydroxide of strontium may be dissolved therein at a temperature below boiling-point—or, say, about 158° to 167° Fahrenheit, or 70° to 75° centigrade. The strontium saccharate will not separate under boiling-point, and hence the state of dilution of the whole solution is made so that it produces a saturated solution of the strontium hydroxide below the boiling-point. From the latter solution a large crystallization will take place on cooling. It would be unsuitable to employ a larger quantity of water, as a needlessly diluted solution would have to be treated and the proceeds would be decreased, because the strontium saccharate is not quite insoluble in water, but only difficult to dissolve therein.

When the most suitable degree of dilution and of heat has been once ascertained for any given molasses or sugar solution, then it is not necessary to apply the raw caustic strontium according to weight and percentage of actual strontium hydroxide, but it has only to be used in surplus quantity, and to let as much of it dissolve as can be dissolved at the temperature decided upon and while stirring it.

Obviously the required quantity of caustic strontium may, if desired, be first separately dissolved in boiling water, and the molasses or sugar solution then be added thereto. In that case, however, the resulting solution would be thinner, as the caustic strontium is harder to dissolve in water alone than in a sugary fluid.

For production on a large scale, I find it suitable to place a surplus quantity of caustic strontium in a sheet-iron vessel, which can be closed, and is surrounded by a steam-jacket and fitted with stirring-gear, thermometer, draw-off cock, and other usual appendages, and to run the molasses solution (diluted by hot water) into it. I then heat it to the required temperature while constantly stirring it until the solution has become saturated. If the operation is done quickly, no separation of the strontium saccharate will yet take place. The saturation of the solution being accomplished, it may, if desired, be forced through a filter-press in order to free it from mechanical impurities and some other matters. Otherwise the solution may be run off from the surplus of the strontian by a tap situated a little above the bottom and run directly into one of the vessels in which the separation of the strontium saccharate is to be effected. These vessels are similarly arranged—that is, fitted with a stirring apparatus. At the bottom they have a large outlet-pipe which can be closed by a valve, and which is connected with filtering apparatus. In these vessels the solution is heated to boiling-point, whereby the strontium saccharate soon becomes separated. This separation may, however, be accelerated and increased by employing steam

under pressure, so that the solution while being stirred is heated more or less beyond 212° Fahrenheit, (100° centigrade.) The strontium saccharate hereby separates itself in the form of a heavy sandy powder, which, unlike the corresponding gelatinous and voluminous calcium saccharate, is close, deposits quickly from the solution, and is easily filtered. These excellent qualities distinguish it advantageously from the lime saccharate, which, besides, can only be partially obtained from impure sugar solutions.

The separation of the deposited strontium sugar from the solutions must be effected while the solutions are still boiling hot. It is best done by means of filter-presses, into which the hot material is forced under steam-pressure. The filtration is done quickly and easily, and when the filter-compartments are full of the deposit the residuum of the inherent lye may be forced out by steam. If desired, the cakes may be slightly rinsed with hot saturated strontian solution or with water. The separation of the lye from the saccharate may also be effected by means of a centrifugal exhauster having a double (instead of a single) sieve with a filtering material between, or by centrifugal exhausters having other or even closed filtering-partition; or the separation of the lye from the deposit may be effected by suction of a vacuum, or by simple filtration, or by hot rinsing through systematic decanting in closed vessels, as the close-grained saccharate deposits easily. The strontium saccharate freed from the non-sugary lye may now be separated by carbonic acid in water, and best and most quickly under pressure, whereby insoluble carbonate of strontian is produced and the sugar is liberated. Both are then again separated by the filter-press or otherwise, and the sugar solution is then crystallized in the usual manner. I have, however, found that a part of the strontium in the form of crystallized strontium hydroxide may be first separated from the strontium saccharate and obtained separately, leaving the rest to be separated by means of carbonic acid. The over basic strontium saccharate is a material which only subsists at boiling-point, but which, when in contact with water and at a lowering temperature, gradually changes into a less basic saccharate and liberated strontium hydroxide. (This explains why the filtration of the saccharate from the non-sugary lye must be done by boiling-heat.) If the over basic saccharate thus obtained is put into warm water and allowed to cool gradually, a sensible quantity of strontium hydroxide will crystallize on the walls of the vessel, and the lye may be let off herefrom for further treatment. The strontium hydroxide separated in this manner, or by cold lye abstraction, may of course be used directly for a following operation. This remarkable feature of the strontium saccharate causes a considerable simplification in the working, as not all the strontian is to be translated into the form of carbonate of strontian, but only a part, which involves a considerable saving in various ways.

The refuse lyes in the above-described method of obtaining the strontium saccharate, which contain nearly all the non-sugary substances in the molasses or sugar solution treated, will, when the caustic strontian has been applied in a surplus quantity by the cooling under exclusion of the carbonic acid of the air, cause the crystillization of the said surplus as strontium hydroxide, which then can be applied directly in a thereupon-following operation. (If required, this lye might be concentrated first by boiling down in order to further the crystallizing.) It is at last likewise saturated with carbonic acid in order to gain the still dissolved strontian. The non-sugary lye separated from the latter then constitutes an excellent manure; but it may also be made into salts of potash and other products. The carbonate of strontian, separated as well from the strontium saccharate as the lye by means of carbonic acid, is transformed into caustic strontian again by means of red heat, as is well known, and may then be applied afresh.

The gain of sugar from molasses treated in the way here described is very considerable. Out of one hundred parts of sugar existing in the material I obtain ninety-five to ninety-six parts, according to circumstances, and in the form of a very pure substance.

The strontium saccharate may very successfully be used for the separation of the beet-root juice, and this doubtless will take place as soon as strontia can be obtained at a reasonable price, or as soon as strontium hydroxide can be recovered in a simple manner from the slime of separation, which, I believe, is only a question of time.

Having now described my invention, what I claim is—

1. The method herein described for obtaining strontium saccharates, which consists in treating saccharine solutions with caustic strontium or hydroxide of strontium, and separating the strontium saccharate by boiling, substantially as described.

2. The method herein described for obtaining sugar from saccharine solutions, which consists in treating the solution with a caustic strontium or hydroxide of strontium in excess, separating the strontium saccharate from the non-sugary lye, and finally separating the sugar from the strontium by means of carbonic acid, substantially as described.

3. In the treatment of saccharine solutions by means of caustic strontium or hydroxide of strontium in excess, the method herein described for removing in part the strontium, which consists in treating the over basic saccharate with water at low temperature to crystallize a portion of the strontium, substantially as and for the purpose specified.

4. The method herein described of obtaining sugar from saccharine solutions, which consists in treating such solutions with caustic stron-

tium or hydroxide of strontium in excess, to obtain a strontium saccharate, then eliminating a part of the strontium from the over basic saccharate by treating with water at low temperatures, and finally removing the strontium from the basic saccharate by means of carbonic acid, substantially as herein described, and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

CARL SCHEIBLER.

Witnesses:
G. LOUBIER,
B. ROI.