No. 667,850. Patented Feb. 12, 1901.

J. & C. McNEIL.

METHOD OF SUGAR BOILING.

(Application filed July 7, 1900.)

(No Model.)

Fig. 1.

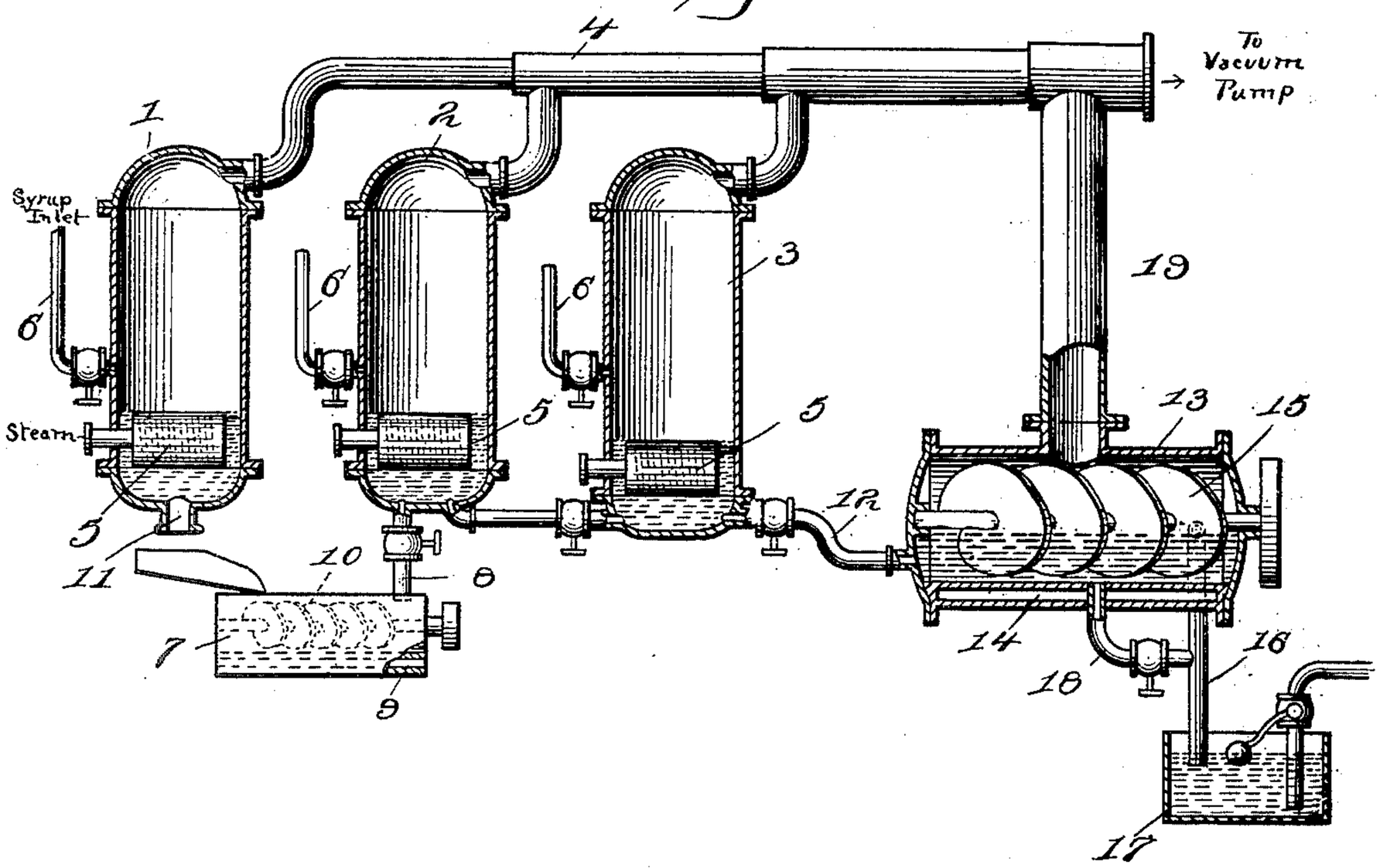
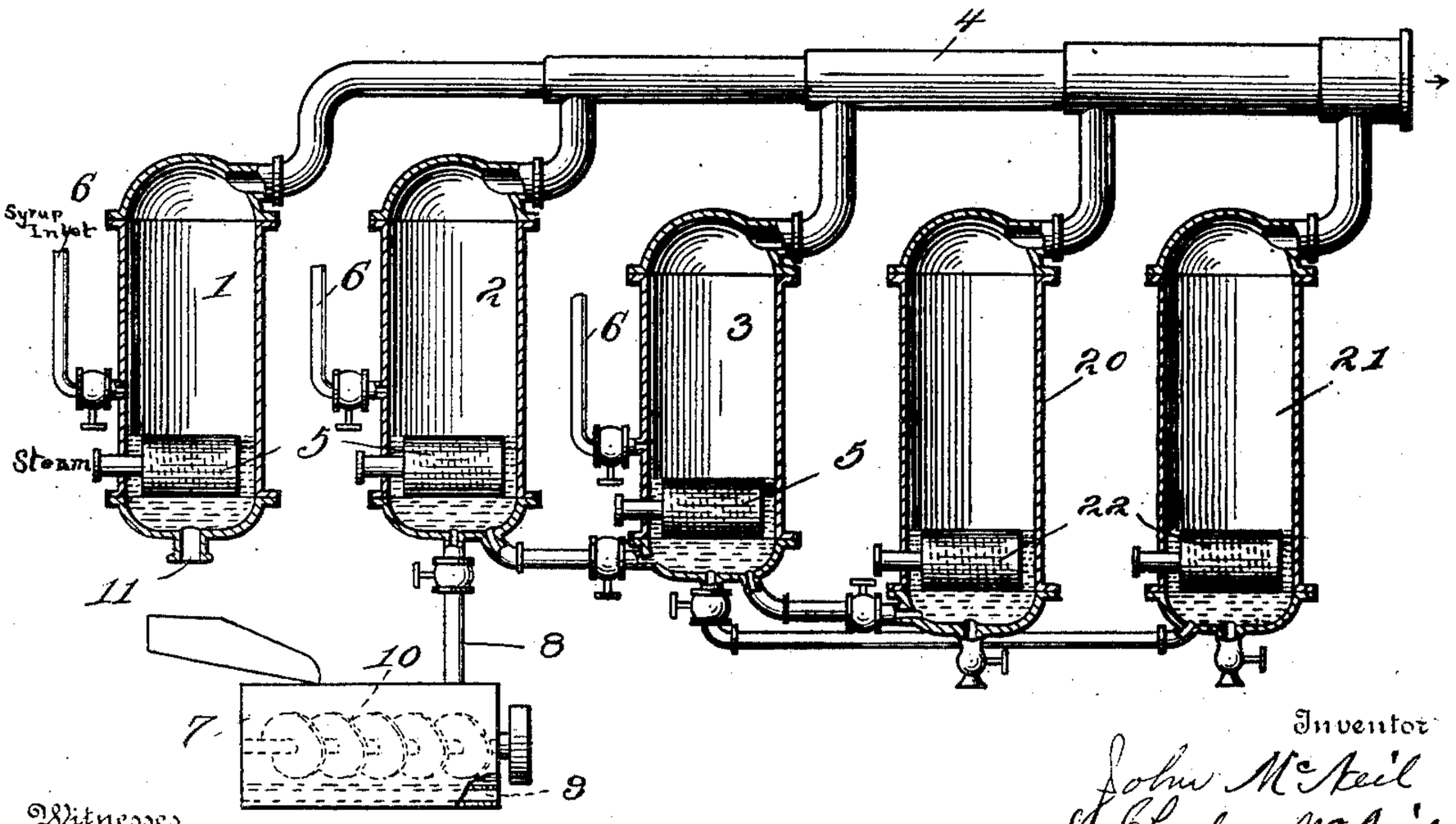


Fig. 2.



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METHOD OF SUGAR-BOILING.

SPECIFICATION forming part of Letters Patent No. 667,850, dated February 12, 1901.

Application filed July 7, 1900. Serial No. 22,806. (No specimens.)

To all whom it may concern:

Be it known that we, JOHN McNEIL and CHARLES McNEIL, subjects of Her Majesty the Queen of Great Britain, residing at Glasgow, Scotland, (and whose post-office address is Helen street, Govan,) have invented a new and useful Improvement in Processes of Concentrating and Crystallizing Liquids, (for which we have received provisional protection in Great Britain under Patent No. 23,598, dated December 7, 1899,) of which the following is a specification.

Our invention relates to a process of concentrating and crystallizing liquids; and it has for its object to carry out in a practically continuous manner the concentration, crystallization, and discharge of a granulated mass of saccharine or other crystallizable liquids.

The process of crystallization is dependent on the bringing up of the density of the solution to the saturated state corresponding to the temperature existing in the vessel, the supersaturation of this solution in order to start crystallization or the formation of grain, the addition of the required amount of syrup or thick juice or liquor to increase the size of the minute newly-formed crystals, and the application of heat to evaporate the water set free by the formation of crystals, and thus keep the solution saturated. This series of operations is usually accomplished in a single vacuum-pan; but as its action is intermittent, and at times the greater part of the heating surface is out of action, it follows that a very large amount of surface is required to do the work. To overcome this difficulty and to carry on the above series of operations in a practically continuous manner, the vacuum-pan has been, according to this invention, subdivided into a series or battery of vessels, all of which are to work under vacuum, the number of which vessels is determined by the quantity and kind of liquor to be treated and the density at which the finished mass is to be discharged. Each of the vessels is provided with a suitable heating-surface, intended to utilize exhaust or low-pressure steam, and may be provided with a mechanical screwing or mixing arrangement to assist in the concentration and discharge of the material.

With these objects in view our invention consists in the improved construction and novel arrangements of the apparatus and in the improved process of concentration and crystallization of liquids, as will be hereinafter more fully set forth.

In the accompanying drawings, in which the same reference-numerals indicate corresponding parts of the apparatus in each of the views in which they occur, Figure 1 is a plan view of so much of a plant as is necessary to practice our invention, the pans being shown in vertical section. Fig. 2 is a similar view of a modification of the same.

Referring more particularly to the drawings, 1, 2, and 3 indicate vessels which are connected with a suitable exhaust-pipe 4 and each provided with the usual steam coil or heater 5 and an inlet or feed pipe 6. A vessel or tank 7, which we shall call a "seed-receiver," is placed under the vessels 1 and 2 and connected with the latter by means of a pipe 8. It is provided with a steam-jacket, as indicated at 9, and with a screw or stirrer, (indicated by dotted lines 10.) A spout or trough communicates with one end of the vessel 7 and extends under the lower end of vessel 1, so as to receive the material therefrom as it is discharged through the outlet 11 and conduct it into the vessel 7.

Adjacent to the vessel 3 and connected therewith by a pipe 12 is a vessel 13, which is provided with a steam-jacket 14 and a screw 15, which extends from end to end, by means of which the mass is thickened and a continuous discharge may be secured, if desired. A torricellian discharge-tube 16 is connected with the end of the vessel 13 farthest from its inlet and with a tank 17, from which a valved pipe 18 extends to the point where it is desired to have the mass of material from the vessels deposited. The top of the vessel 13 is connected with the exhaust-pipe 4 by means of a pipe 19 in the same manner as the vessels 1, 2, and 3.

Instead of providing the apparatus with a continuous discharge, as above described, the vessel 13 and tank 17 may be replaced with two vessels 20 and 21, each of which is connected with the exhaust-pipe 4 and provided with the steam-coil 22, as shown in Fig. 2.

In this construction the two vessels work intermittently, the one thickening up with molasses while the other one is being charged.

In operation the first vessel 1 of either series works intermittently by drawing in charge after charge of the syrup or liquid to be treated, bringing each charge up to the hot saturated state, and then forming the grain, technically termed "seed," in the usual way and dropping the same into the vessel 7, placed underneath it. The seed-receiver is kept at a constant and uniform temperature by the steam-jacket around it, and its charge is kept in motion by the stirrer 10 to reduce the risk of false grain being formed. The seed is drawn up continuously from the receiver 7 into the second vessel 2 of the series. At the same time a continuous supply of syrup or thick juice is introduced, by which the seed or grain is nourished and increased in size. The mass then passes continuously into the third vessel 3. The third vessel is also fed continuously with a regulated supply of syrup to still further nourish and increase the size of the seed or grain on its way to the last vessel. In the last vessel no syrup need be added, as it is intended merely for finishing the thickening of the mass up to a density, in the case of saccharin liquids, of about 93° Brix. The discharge from this vessel is also continuous and is effected by a mechanical arrangement, as the screw 15, which propels the charge entering from the preceding vessel toward the outlet, where it escapes by a suitable orifice in the side of the vessel and the tube 16. From the tank 17 the material is emptied by means of the regulating-valve and pump or by any other suitable means. In this way the seed originally formed in cell or vessel No. 1 is continually passed through all the other cells or vessels of the battery, being gradually increased in size in each cell by the addition of thick juice or nourishing liquor till it is crystallized up to the required degree and discharged continuously from the last vessel. The function of the first vessel is to prepare the seed for use in the battery and keep the seed-receiver filled. The function of the vessels in the battery following the seed-receiving vessel is to increase the size of the crystals and concentrate the mass up to the required density.

If it be desired to add molasses or syrup of a lower purity, this can be done in the case of large apparatus by increasing the number of the vessels and discharging continuously, or in the case of small apparatus the continuous discharge might be dispensed with and the vessel preceding the last allowed to fill up while the last is thickening up with molasses.

Having described our invention, we claim—

1. The herein-described process of treating a saccharin liquid consisting in forming seed-crystals therein, then continuously passing said liquid through a series of heated vessels and increasing the size of the crystals in each vessel by continuously adding thereto nourishing liquid in each vessel until it is crystallized up to the required degree, and then discharging the same.

2. The herein-described process of treating a saccharin liquid consisting in placing the same in a vessel and evaporating the same in a vacuum and forming seed-crystals therein, then passing the same continuously through a series of vessels and adding nourishing liquid thereto in each vessel and evaporating the same in a vacuum and finally discharging the same.

3. The herein-described process of treating a saccharin liquid consisting in intermittently bringing a certain portion of the same up to the hot saturated state and then forming seed-crystals therein, then discharging the same into a vessel and subjecting it to constant agitation, then continuously passing the same through a series of heated vessels and adding nourishing liquid thereto in each vessel and evaporating the same.

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