No. 701,687. Patented June 3, 1902.

G. DESAULLES.

APPARATUS FOR PURGING SUGAR, &c.

(Application filed May 18, 1901.)

(No Model.) 3 Sheets—Sheet 1.

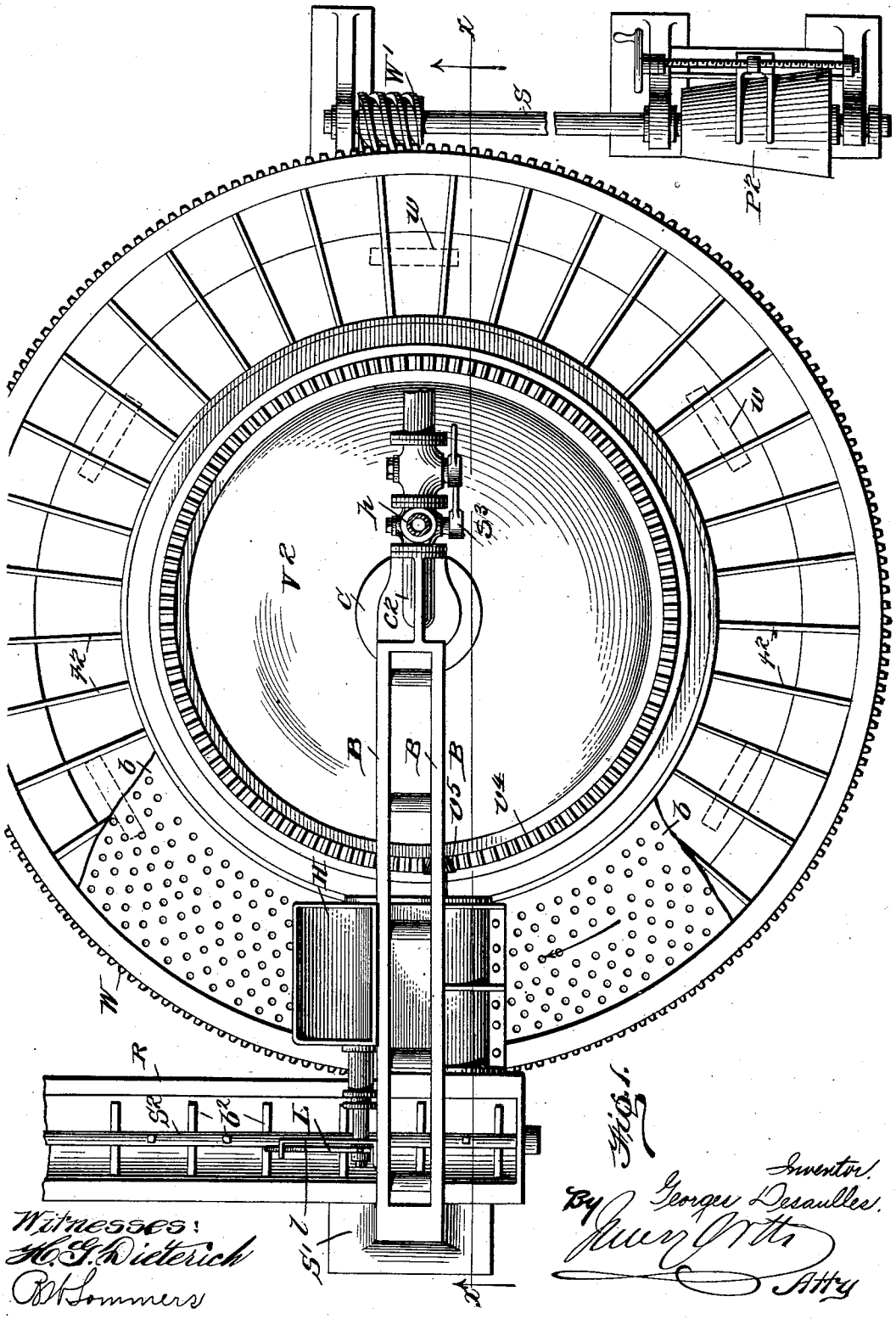


Fig. 1.

Witnesses:
H. G. Dieterich
R. H. Sommers

Inventor.
By Georges Desaulles.
Atty

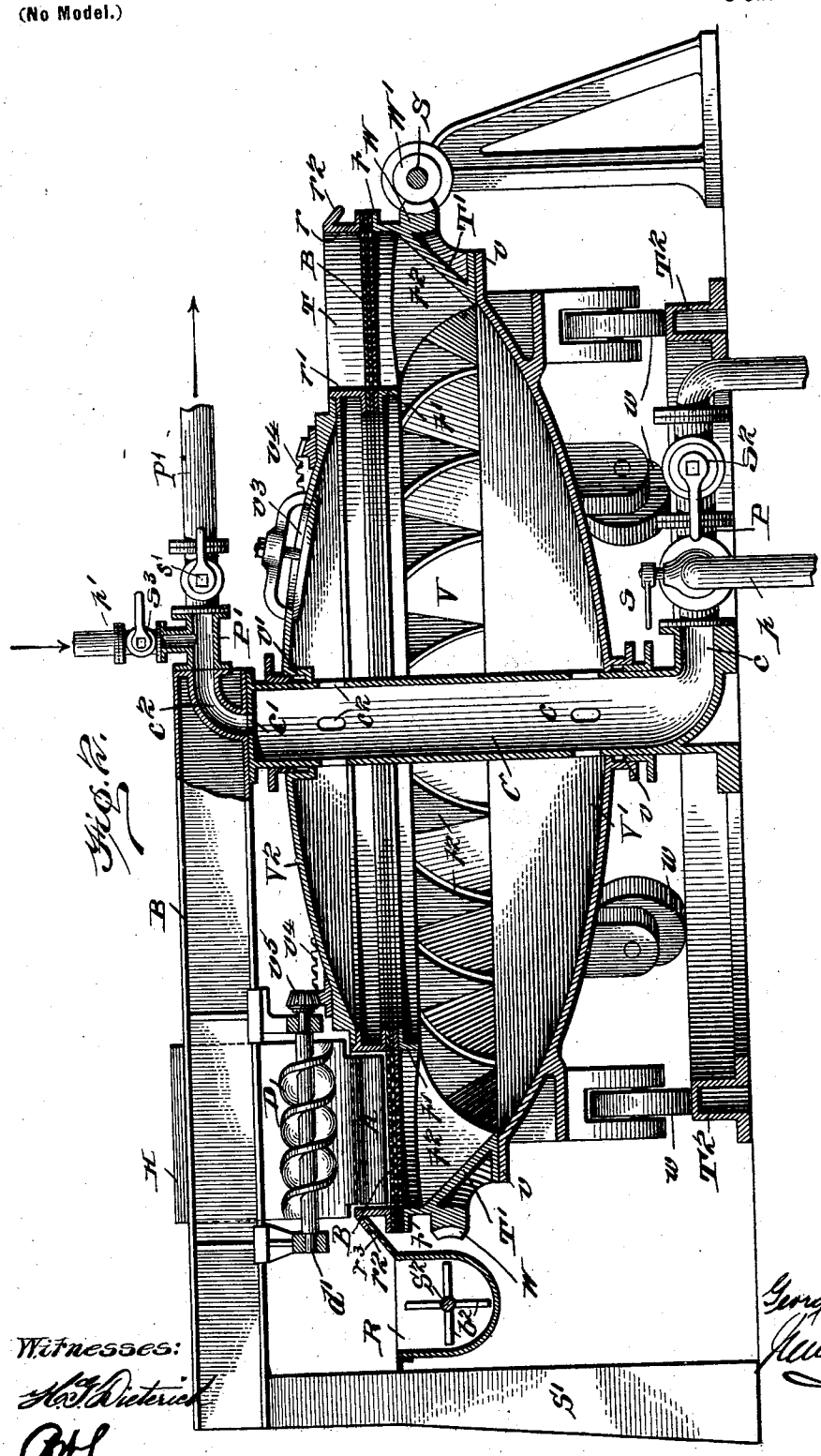
No. 701,687. Patented June 3, 1902.

G. DESAULLES.

APPARATUS FOR PURGING SUGAR, &c.

(Application filed May 18, 1901.)

(No Model.) 3 Sheets—Sheet 2.



Witnesses:
Max. F. Dieterich
A. H. Sommers

Inventor.
Georges Desaulles.
By Munn & Co
Attys

No. 701,687. Patented June 3, 1902.

G. DESAULLES.

APPARATUS FOR PURGING SUGAR, &c.

(Application filed May 18, 1901.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 3.

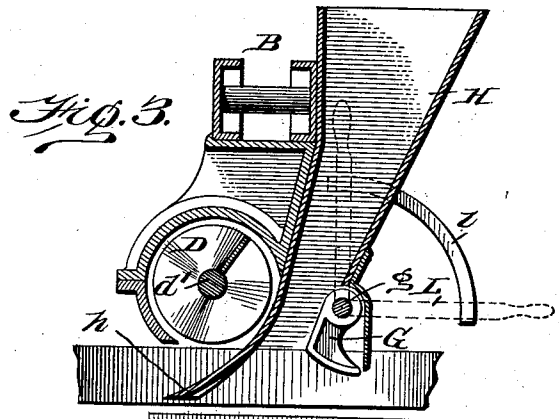


Fig. 4.

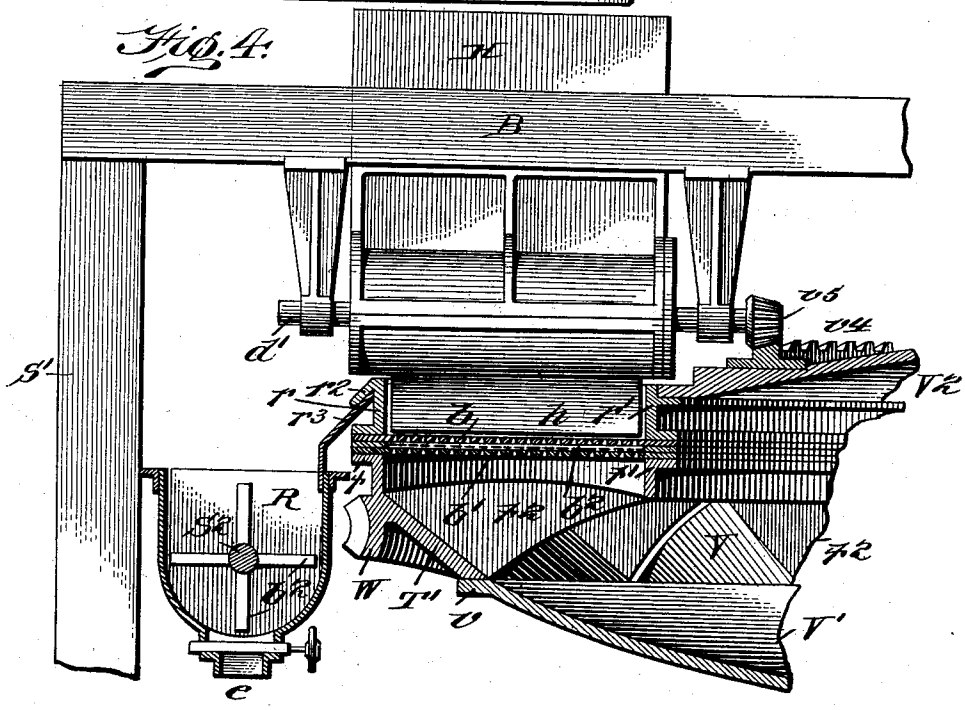
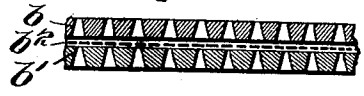


Fig. 5.



Witnesses:
H. G. Dieterich
A. Sommers

Inventor:
Georges Desaulles
By Henry Orth
Atty

UNITED STATES PATENT OFFICE.

GEORGES DESAULLES, OF BOURBON, FRANCE.

APPARATUS FOR PURGING SUGAR, &c.

SPECIFICATION forming part of Letters Patent No. 701,687, dated June 3, 1902.

Application filed May 18, 1901. Serial No. 60,886. (No model.)

To all whom it may concern:

Be it known that I, GEORGES DESAULLES, engineer, a citizen of the Republic of France, residing at Bourbon, Puy-de-Dôme, France, have invented certain new and useful Improvements in Apparatus for Purging Sugar, &c.; 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention has relation to the extraction or separation of liquids from solids—as, for instance, the mother-liquor from crystalline substances—the invention being more particularly designed for the extraction of molasses from raw sugar in the manufacture of such or syrup from masse-cuite in the manufacture of white or table sugar, though I do not desire to limit my said invention to the treatment of sugar, as it can be used with equally good results in the extraction or separation of liquids from other crystalline or non-crystalline substances.

The object of this invention, broadly stated, lies, first, in exposing a layer of a material such as stated to atmospheric pressure on one side and to the action of a vacuum on the opposite side; second, in imparting to the layer a progressive movement and in progressively removing material freed from moisture, and, third, in progressively re-forming the layer of fresh material in such a manner as not to relieve or materially relieve the vacuum on one side thereof.

That my invention may be fully understood I will describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a top plan view of an apparatus embodying my invention. Fig. 2 is a section thereof on line $x\,x$ of Fig. 1 looking in the direction of arrow. Fig. 3 is a sectional detail view of the feed-hopper and screw conveyer. Fig. 4 is an elevation of the parts shown in Fig. 3 and showing also the receiver for the material removed by the conveyer and part of the vacuum-pan in cross-section, and Fig. 5 shows the preferred construction of foraminous support for the material treated interposed between the vacuum-chamber in the pan and the atmosphere.

In Figs. 1 and 2, C indicates a hollow column provided with a suitable foot-flange securable to a suitable support, said column having at its lower end a branch pipe c, to which is secured a pipe P, having a branch pipe p, provided with a stop-cock s, and beyond said branch p the said pipe P is provided with a stop-cock s^2. At its upper end the column C has a port c', in register with an elbow-joint c^2, preferably cast with a plate c^3 of or secured to one end of a cross-beam B, and to said joint c^3 is secured a pipe P', having a branch pipe p', provided with a stop-cock s^3, and beyond said stop-cock said pipe P' is provided with a stop-cock s'.

On column C is mounted to revolve fluid-tight a vacuum-pan V, comprising the body V' and cover V^2. The body V' of the pan has a rim-flange v, to which is bolted a circular support T' for the foraminous bottom B of a like channel or trough T, hereinafter referred to as the "trough," said support being composed of concentric rings t and t', connected together at suitable intervals by webs t^2, on which is laid the aforementioned foraminous bottom B, which latter is preferably composed of two perforated metal plates $b\,b'$ and a wire fabric b^2, interposed between them, Fig. 5, the perforations in plate b' being preferably of greater area than those in plate b and may be circular or polygonal openings, preferably having their walls diverging downwardly. Although this construction of foraminous bottom is preferred, I do not desire to limit myself to its use, as other constructions may be resorted to, according to the material to be treated. This foraminous bottom B is held in place by its edges being clamped between the flanges $t\,t'$ of support T' and between those of two rings r and r', that form the upper part or the trough proper.

The foraminous bottom B is held against displacement by being clamped between the foot-flanges of the inner and outer concentric walls or rings r and r' of trough T, which walls are bolted to the head-flanges of the

support T', the head-flange of the inner ring r' of said trough being of sufficient width to admit of the bolting thereto of the rim-flange of the cover V^2 for the vacuum-pan V, said cover having formed therein a manhole normally closed by a cover v^3. Both cover V^2 and body V' of pan V are provided with suitable stuffing-box bearings v and v' for the column C, so that the pan will revolve fluid-tight thereon.

As shown in Figs. 2 and 4, the outer wall r of trough T has an outwardly-inclined undercut peripheral flange r^2 for purposes presently explained, and the cover V^2 has a circular toothed track v^4 for purposes presently explained, while the body V' of the pan has a circular worm-gear W meshing with a worm W' on a driving-shaft S, carrying a cone-pulley P^2 for varying the speed of rotation of the pan, suitable belt-shifting appliances being provided for the purpose, the pan being mounted on wheels w, traveling on a circular track T^2.

The column C has ports c in line with the bottom of the pan V and ports c^2 below the cover V^2.

The cross-beam B, one end of which, as above stated, is supported by column C, has its opposite end supported by a suitable standard S'. To the rear face of the beam B—that is to say, to that face of the beam facing the direction of rotation of the pan V—is secured a feed-hopper H, whose front wall is extended forwardly into the trough T close to the bottom B thereof, the extension h being concavo-convex or having its front face facing in a direction opposite to the direction of rotation of the pan V, inclined upwardly, and of gradually-increasing cross-section to its lower end to form a somewhat broad under face above bottom B of trough T, Fig. 3, said extension performing the function of intercepter, intercepting the material on said bottom and causing it to bank upwardly thereon to bring it into reach of a screw conveyer D, which in practice is rotating in a casing open at bottom, by means of which the material is removed to a receiver R on the side of the pan and guided into the same by a directing-chute r^3, secured to the receiver and projecting into the undercut of the rim-flange r^2 on the outer wall r of trough T, hereinabove referred to.

The intercepter or scraper h need, of course, not form an extension of the front wall of the hopper H, as it may form a separate part and be secured thereto.

The shaft d' of conveyer D is extended beyond its bearing over the cover V^2 of vacuum-pan V and carries a bevel-pinion v^5 in gear with the circular toothed rack v^4 on said cover V^2, hereinbefore referred to, and whereby said conveyer is rotated.

To the rear wall of the feed-hopper H, at the delivery end thereof, is pivoted a feed-regulating gate G, the spindle g whereof carries a hand-lever L, adjustable along a sector l for the purpose of regulating the feed of the material to the trough T in a well-known manner.

The receiver R, which has a bottom of concavo-convex form in cross-section, may be constructed in the form of a trough of suitable length and provided with a discharge-pipe controlled by a suitable gate or valve, and in said receiver is mounted a stirrer-shaft S^2, having stirrer-blades b^2 when the apparatus is employed in the manufacture of white sugar, for instance, so that after the masse-cuite has been freed from syrup it may be mixed with purging or clearing liquor and sent to the centrifugal. If, however, the apparatus is used for the mere extraction of molasses from crude sugar or of another mother-liquor from other substances which are not to be immediately mixed with a liquid or with another substance, a screw conveyer may be substituted for the stirrer-shaft and the receiver left open at one end for the discharge of the material, as will be readily understood.

Before describing the operation of the apparatus it may be stated that the branch p of pipe P has its discharge either sealed by a liquid, as that extracted or separated from a substance, or said pipe extends fluid-tight into a closed vessel, so that the vacuum in pan V may be established and maintained, as presently explained, that said pipe P also serves as a purge-pipe, that the pipe P' is connected to a vacuum-pump or other suitable air-exhausting apparatus, and that the branch p' of said pipe P' is connected to a source of supply of steam, preferably of low pressure or saturated.

For the purpose of preparing the apparatus for continuous operation it is of course necessary to "prime" the same, if I may so express myself, during which operation the stop-cock s' in exhaust-pipe P' is closed, stop-cock s in branch p of pipe P being open, while stop-cock s^2 in said pipe P and stop-cock s^3 in branch p' of pipe P' are closed during the operation of the apparatus and are opened only when the apparatus is being cleansed. This being premised, the feed-gate G of feed-hopper H being properly adjusted and the said hopper supplied with material—say, for instance, masse-cuite as it comes from the vacuum-pan—the apparatus is rotated at such a rate as to supply the bottom B of trough T with a layer of masse-cuite of the desired or required thickness until the pan has made a complete rotation, or substantially so—that is, until the beginning of the layer reaches the intercepter h. The feed of material is now stopped, the stop-cock s' in pipe P' opened, and the air exhausted from the pan V. This is continued until the mother-liquor is extracted from the sugar-crystals. The pan may now be said to be primed and is again put in motion, the feed-gate being also opened again, and as the pan rotates the layer of sugar-crystals free or substantially free from mother-liquor is taken up by the

intercepter or scraper h, banked up, and taken by the screw conveyer D and conveyed to the receiver R. The speed at which the pan is rotated is of course so regulated that the mother-liquor in the layer of masse-cuite is extracted at each complete revolution of the pan, during which time the layer progressively deposited in the trough T is subjected to the action of the vacuum, so that the operation of the apparatus is a continuous one, as will be readily understood. In view of the fact that the layer of material on bottom of trough T is re-formed as fast as the material is removed therefrom, and inasmuch as the material is delivered to the trough along the rear face and immediately in rear of the intertepter h, the bottom of trough T is during the operation of the apparatus always covered with material, so that the vacuum in the pan V is at no time relieved to a degree below that which is necessary to extract the liquor.

I have hereinbefore stated that the described apparatus is of particular advantage in sugar-factories, as by its use I am enabled to dispense with the large number of centrifugals, also with redissolving and reboiling of the sugar.

For some years past manufacturers of sugar have resorted to the return process—that is to say, they begin with the concentration of the syrup and end with the syrups from the centrifugals more or less rich in sugar, according as the manufacturer separates these more or less rich syrups. It is, however, admitted that all attempts at separation or grading of these syrups in the centrifugal have proven failures. The excess of syrups not returned into the masse-cuite are returned into the boilers and concentrated according to special processes, and the resulting masse-cuite is then transferred to coolers and after a considerable period of time finally treated in the centrifugal. The resultant sugar is, for the purpose of obtaining a first-class final product, redissolved, reboiled, and worked over again in the centrifugal, the resulting molasses being more or less rich in sugar, and its composition shows clearly the imperfection of this process, and if the factory produces white sugar principally a large quantity of masse-cuite is obtained because of the return into the cycle of operations of the syrups resulting from this redissolving of the masse-cuite and from the syrups from the centrifugals. This repeated concentration has a deleterious action on the sugar, which is more or less dissolved and of inferior quality. It does not keep well in storage, while the crystals are not hard. All these difficulties are avoided by the use of apparatus such as hereinabove described, and the manufacture of sugar becomes more rational, the reconcentrations being avoided, and the operations yield either white sugar or a very rich raw sugar and a molasses the organic and saline coefficients of which are very low. In the latter case the trough T contains a screw conveyer for discharging the raw sugar from the open end of the trough, while in the case of white sugar said trough T is closed at both ends and provided with a stirrer-shaft, so that the masse-cuite can therein be mixed with clairce discharged through branch T^2 and then sent to the centrifugal.

When it becomes necessary to cleanse the vacuum-pan, the bottom B of the trough T is covered with an impermeable sheet, the pan is cut off from the exhauster, the stop-cock s in branch p of pipe P closed, and the stop-cock s^2 in said pipe opened and low-pressure or saturated steam admitted through branch pipe p' of pipe P', the products of condensation of the steam, together with the sugar dissolved thereby, being discharged through pipe P into a suitable receiver and used in the manufacture of sugar.

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

1. Apparatus such as described, comprising a vacuum-pan having a channel open to said pan and to the atmosphere throughout its length, a foraminous partition in said channel to form a trough and means for educting liquid from the pan; in combination with a stationary feed device for feeding material to the trough and means for moving the pan progressively along said feed device, for the purpose set forth.

2. Apparatus such as described, comprising a vacuum-pan having a circular channel open to the pan and to the atmosphere throughout its length, a foraminous partition in said channel to form a trough and means for educting liquid from the pan; in combination with a stationary feed-hopper above the aforesaid trough and means for rotating the pan, for the purpose set forth.

3. Apparatus such as described, comprising a vacuum-pan having a circular channel open to the pan and to the atmosphere throughout its length, a foraminous partition in said channel to form a trough, means for educting liquid from the pan and means for rotating the latter; in combination with means for continuously removing material from the trough and means for simultaneously and continuously feeding material to said trough so as not to relieve or materially relieve the vacuum in the pan, for the purpose set forth.

4. Apparatus such as described, comprising a vacuum-pan having a channel open to the atmosphere and to the pan throughout its length, a foraminous partition in said channel to form a trough, means for educting liquid from the pan and means for rotating the latter; in combination with a stationary intercepter arranged to remove material from the trough and means for taking up and conveying away said material, substantially as set forth.

5. Apparatus such as described, comprising a vacuum-pan having a circular channel open

to the pan and to the atmosphere throughout its length, a foraminous partition in said channel to form a trough, means for educting liquid from the pan and means for rotating the latter; in combination with a receiver, appliances automatically removing material from the trough into the receiver as the pan rotates, and means for simultaneously feeding fresh material to the trough at or substantially at the point of removal, for the purpose set forth.

6. Apparatus such as described, comprising a vacuum-pan having a circular channel open to the pan and to the atmosphere throughout its length, a foraminous partition in said channel to form a trough, means for educting liquid from the pan and means for rotating the latter; in combination with a stationary intercepter constructed to intercept the material in the trough and direct it upwardly out of the same, a receiver, and a conveyer arranged to take the material banked up by the intercepter and convey it to said receiver, for the purpose set forth.

7. Apparatus such as described, comprising a vacuum-pan having a circular channel open to the pan and to the atmosphere throughout its length, a foraminous partition in said channel to form a trough, means for educting liquid from the pan and means for rotating the latter; in combination with a stationary intercepter constructed to intercept the material in the trough and direct it upwardly out of the same, a receiver provided with stirring appliances, and a conveyer arranged to take the material banked up by the intercepter and convey it to said receiver, for the purpose set forth.

8. Apparatus such as described, comprising a stationary hollow column, a vacuum-pan mounted to revolve fluid-tight thereon, ports in said column near the bottom and top of the pan, a drain-pipe connected to the lower end of the column, an exhaust-pipe connected to the upper end of said column, said pan having a circular channel open to the pan and to the atmosphere throughout its length, a foraminous partition in said channel to form a trough and means for rotating the pan; in combination with appliances for simultaneously removing material from and feeding material to said trough as the pan rotates and so as not to relieve or materially relieve the vacuum therein, for the purpose set forth.

9. In apparatus such as described, the combination with a rotatable vacuum-pan having a circular channel open to the pan and to the atmosphere throughout its length, a foraminous partition in said channel open to the pan and to the atmosphere throughout its length, means for educting liquid from the pan, and means for rotating the latter; in combination with a stationary feed-hopper arranged to discharge into said trough and means for regulating the feed of material to the hopper, for the purpose of set forth.

10. In apparatus such as described, the combination with a rotatable vacuum-pan having a circular channel open to the pan and to the atmosphere throughout its length, a foraminous partition in said channel open to the pan and to the atmosphere throughout its length, means for educting liquid from the pan and means for rotating the latter; in combination with a stationary feed-hopper arranged to discharge into said trough, means for regulating the feed of material to the trough, a scraper therein, in front of the hopper-outlet, arranged to remove material from said trough as the pan rotates, and means for conveying away the material so removed, for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

GEORGES DESAULLES.

Witnesses:
NICOLAS DEVILLO,
JOANNIS FREYSSINET.