

No. 741,689.

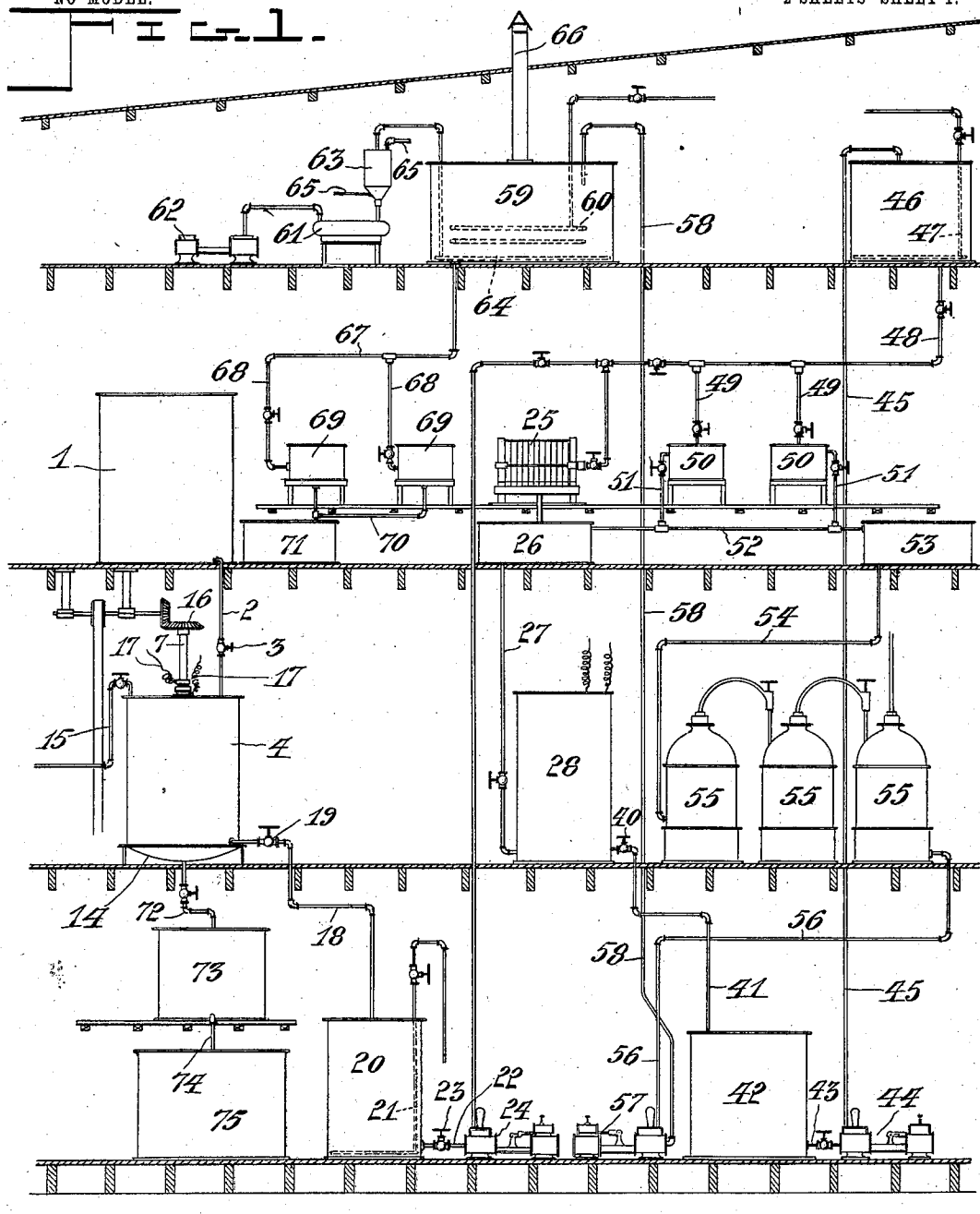
PATENTED OCT. 20, 1903.

M. H. MILLER.
SUGAR MAKING.

APPLICATION FILED NOV. 24, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:

John F. Deufferwald
J. S. Ammen

Martin H. Miller, Inventor,

By

Marion Marion

Attorneys

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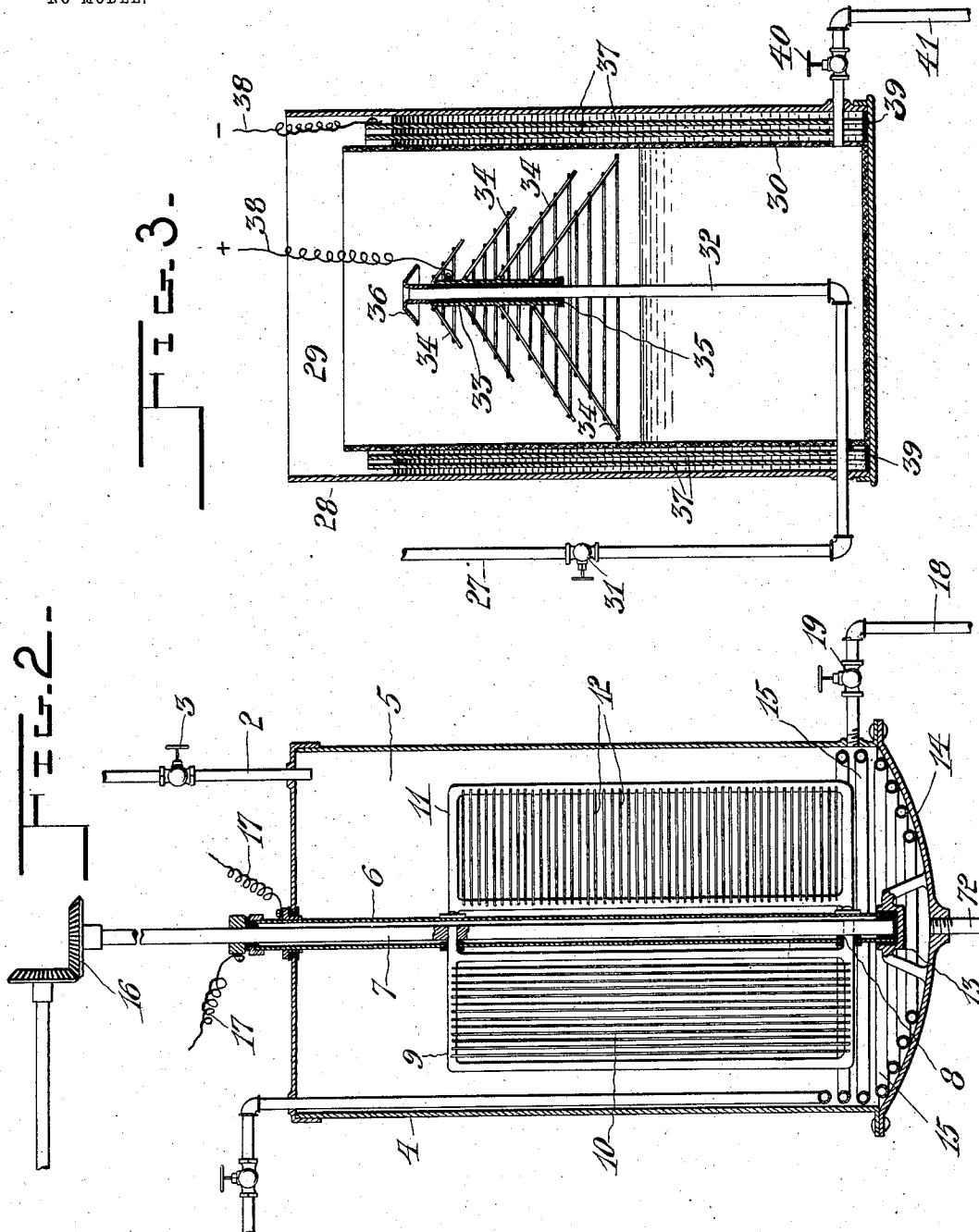
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UNITED STATES PATENT OFFICE.

MARTIN HOCKER MILLER, OF WIARTON, CANADA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF FOUR-FIFTHS TO DAVID HUETHER, ARTHUR HAMILTON HOUGH, ALEXANDER McNEILL, AND RICHARD M. FISHER, OF WIARTON, CANADA.

SUGAR-MAKING.

SPECIFICATION forming part of Letters Patent No. 741,689, dated October 20, 1903.

Application filed November 24, 1902. Serial No. 132,523. (No model.)

To all whom it may concern:

Be it known that I, MARTIN HOCKER MILLER, a subject of the King of Great Britain, residing at Wiarton, county of Bruce, Province of Ontario, Canada, have invented certain new and useful Improvements in Sugar-Making; and I do hereby declare that the following is 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.

My invention relates to sugar-making, and is especially applicable to the manufacture of sugar from beet-juice. It is also applicable in the manufacture of sugar from sugarcane juice and from molasses. Its object is to produce a most efficient means for purifying the juices preparatory to the crystallization of the sugar. These means include improved electrical apparatus by which the juice is treated with an electric current in order to separate albuminous matter, foreign and coloring matter. While the apparatus is intended primarily to be used in the treatment of the ordinary raw juice, its efficiency is so high that it enables what is known in the art as "molasses" (a residual by-product hitherto useless for sugar-making) to be treated to economical advantage.

The invention consists in the construction and combination of parts to be more fully described hereinafter and definitely set forth in the claims.

In the drawings, Figure 1 represents, largely diagrammatically, my apparatus in side elevation, the said apparatus being distributed over several floors of a building, as will appear. Fig. 2 represents one of the electrical separators of my invention, the same being shown in vertical central section. Fig. 3 is a similar view representing a second electrical separator.

Throughout the specification the same numerals of reference denote like parts.

Referring to the parts more particularly, 1 represents a tank intended to receive the raw juice which has been extracted from the beets by any of the well-known processes. From this tank a pipe 2, provided with a suit-

able valve 3, leads to my electrical separator 50 4. The construction of this separator is most clearly shown in Fig. 2, where it should appear that it consists, substantially, of a cylindrical tank 5, provided with a central vertical hollow shaft 6, within which is mounted 55 an insulated inner shaft 7. The hollow shaft 6 is provided with insulated openings 8, in which are attached the arms of a vertical frame 9, which frame is provided with a plurality of vertical strips or wires 10, as indicated. A substantially similar frame 11 is 60 carried by the hollow shaft 6 and preferably diametrically opposite to the aforesaid frame 9. This frame is provided with a plurality of wires 12; but these are substantially horizontal, as shown, instead of vertical. The 65 two shafts 6 and 7 are suitably carried in a step-bearing 13, and they are insulated at this point, as shown. The bottom 14 of this separator is preferably dish-shaped, as shown, 70 and there is provided a steam-coil 15, arranged just above the same, as indicated. The upper extremity of the shaft 7 may be driven continuously through suitable gearing 16, which imparts a rotary motion to said 75 frames 9 and 11, and the terminal wires 17 of an electric circuit connect, respectively, with the inner and outer shafts, as shown, wherefore the juice which is being treated within the tank 5 is subjected to the action 80 of the electric current passing between the frames. The purpose of this peculiar construction is to insure that the molecules of the juice will be brought into most intimate contact with the surface of the frames, and 85 it should be understood that during the process the shaft 7 is driven so that it brings this result about. Passing an electric current through the raw juice in this manner has the effect of separating out the albuminous and 90 other foreign matter, which thereupon is precipitated to the bottom of the tank, as will be readily understood, the steam-coil operating to maintain the fluid at a high temperature during this process. 95

From the tank 4 a pipe 18, which is suitably supplied with a valve 19, conducts the juice to a tank 20, which tank is provided

with a steam-coil 21. In this tank the temperature of the juices may be raised from one hundred to two hundred degrees. A pipe 22, provided with a suitable valve 23, leads from this point to a pump 24, by means of which the juice is conducted to a filter-press 25, of common construction. After passing through this press the juices are led to the tank 26, thence through a pipe 27 to the second separator 28. The construction of this second separator is best illustrated in Fig. 3, where it should appear that it comprises a substantially cylindrical tank 29, in which is placed an immense porous cup 30. The juice from the pipe 27, after passing through a suitable valve 31, is delivered within this porous cup 30, through the upright extension 32. This extension 32 carries a sleeve 33, upon which are mounted a plurality of pyramidal frames 34, which are preferably constructed of lead or aluminium, their construction being such as to augment their superficial surface. It should appear that this sleeve 33 is suitably insulated from the pipe-section 32, as indicated at 35. This sleeve, with its frames 34, may be moved down and up by hand or otherwise, so they may be submerged in the juice more or less or removed therefrom, at the discretion of the operator. The extremity of the pipe-section 32 is provided with a conically-formed nozzle 36, over which the juice is adapted to flow so that it will be shed in drops or small streams down the frames 34 lying below it. While this is taking place, an electric current is passed through the liquid. To this end outside of the cup there are provided a plurality of electrodes, preferably consisting of sheet-iron members 37, immersed in water, as indicated. The terminal wires 38 of an electric circuit are attached, respectively, to the sleeve 33 and the electrodes 37, the current passing in such a direction that the frames 34 constitute anodes therefor. The sheet-iron members may be suitably insulated, as indicated at 39. From the tank 29 the juice passes through a suitable valve 40 and thence by the pipe 41 to a tank 42. Leaving this tank by the pipe connection 43 it is raised by the pump 44 through a pipe 45 and delivered into a tank 46, which tank contains a steam-coil 47. Here the juices are again heated, thence passing through the pipe connection 48 to the branches 49, which lead to the mechanical filters 50. From these filters 50 the juice passes through suitable branch pipe connections 51, connecting with a main 52, which conducts the juice to a tank 53. From the tank 53 the juice passes by a pipe connection 54 to the evaporators 55, through which it passes successively. The juice is treated in these evaporators until it is raised to a semisyrup or to about 30° Baumé. From the evaporators the juice passes by the pipe 56 to a pump 57, by means of which it is raised through a pipe 58 and delivered into a tank 59, containing a steam-coil 60. In this tank 59 the juices are treated

with fumes of sulfur, the apparatus for this purpose comprising a stove 61, in which flour of sulfur is burned, a pump 62 being provided for forcing the fumes therefrom through a cooler 63, whence the fumes are led to a perforated coil 64, lying, preferably, near the bottom of the tank 59. The cooler 63 is provided with suitable water-circulating connections 65. The sulfur fumes find exit through a suitable chimney 66, as shown. From the tank 59 the juices are led through a suitable pipe-main 67, the branches 68 conducting the juices to mechanical filters 69. From these filters the juices pass by the pipe connections 70 to the delivery-tank 71. Upon their arrival at this point the juices will have been thoroughly purified and will then be ready for treatment by any of the crystallization processes, such as boiling in vacuum-pans, &c.

The albuminous and foreign precipitates thrown down in the separator 4, described in connection with the foregoing, may be also subjected subsequently to treatment by the apparatus in the same manner as the raw juice. To this end the lowest point of the dish bottom 17 aforesaid is provided with an outlet-pipe 72, leading these residual juices to a sack-filter 73, from which they find their way by the pipe 74 to the tank 75. They may now be treated with my process.

As stated above, my apparatus is applicable to the treatment of molasses. This substance is a low-grade juice or by-product of the crystallization processes and hitherto has been discarded for purposes of sugar-making and used principally for making alcohol. This molasses, however, should be first diluted substantially to a Baumé reading of ten degrees or less, then heated to 180° Fahrenheit, and filtered before introduction into the raw-juice tank.

While I have shown in the accompanying drawings the preferred form of my invention, it will be understood that I do not limit myself to the precise form shown, for many of the details may be changed in form or position without affecting the operativeness or utility of my invention, and I therefore reserve the right to make all such modifications as are included within the scope of the following claims or of mechanical equivalents to the structures set forth.

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

1. In apparatus of the class described, the combination of a receptacle for the juice, rotatable metallic electrodes therein adapted by their rotation to minutely subdivide the juice, electrical connections, a receptacle connected with the first-named receptacle, a metallic framework therein by which the juice is again finely subdivided, and electrical connections with said receptacle and framework.

2. In apparatus of the class described, the

combination of a receptacle for the juice, rotatable metallic electrodes therein adapted by their rotation to minutely subdivide the juice, electrical connections, a receptacle connected with the first-named receptacle, a metallic framework therein by which the juice is again finely subdivided, electrical connections with said receptacle and framework, and means for heating the juice while in the first-named receptacle.

3. In apparatus of the class described, the combination of a receptacle for the juice, rotatable metallic electrodes therein adapted by their rotation to minutely subdivide the juice, electrical connections, a receptacle connected with the first-named receptacle, a metallic framework therein by which the juice is again finely subdivided, electrical connections with said receptacle and framework, and a filter interposed between said receptacles.

4. In apparatus of the class described, the combination of a receptacle for the juice, rotatable metallic electrodes therein adapted by their rotation to minutely subdivide the juice, electrical connections, a receptacle connected with the first-named receptacle, a metallic framework therein by which the juice is again finely subdivided, a filter interposed between said receptacles, and electrical connections with the second receptacle and its framework.

5. In apparatus of the class described, the

combination of a receptacle for the juice, rotatable metallic electrodes therein adapted by their rotation to minutely subdivide the juice, a receptacle connected with the first-named receptacle, a metallic framework therein by which the juice is again finely subdivided, a filter interposed between said receptacles, electrical connections with the first-named receptacle, electrical connections with the second receptacle and its framework, means for passing sulfurous vapors through said juice, and means for maintaining said juice at a high temperature while said vapors are passing therethrough.

6. In apparatus of the class described, in combination, a receptacle for the juice, a hollow shaft mounted therein, an inner shaft carried thereby, oppositely-projecting frames carried respectively by said hollow shaft and said inner shaft, means for rotating said frames, means for insulating said frames from each other, a plurality of substantially vertical wires carried by one of said frames, a plurality of substantially horizontal wires carried by the other of said frames, said wires constituting terminals for an electric circuit.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

MARTIN HOCKER MILLER.

Witnesses:

JOHN A. PATERSON,
ALEX MCKENZIE.