

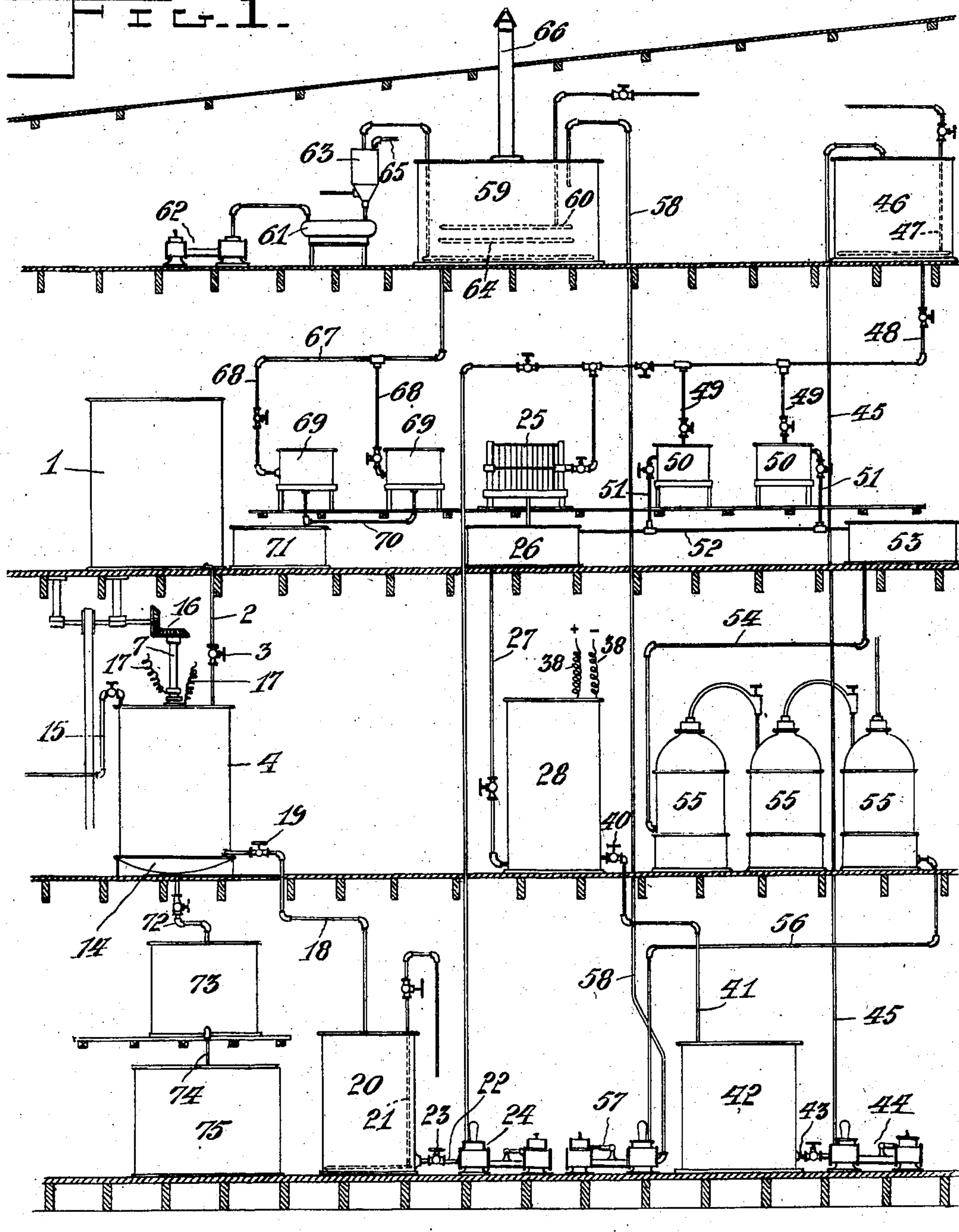
No. 742,127.

PATENTED OCT. 20, 1903.

M. H. MILLER.  
PROCESS OF SUGAR MAKING.  
APPLICATION FILED JUNE 3, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:

*John T. Deufferwiel*  
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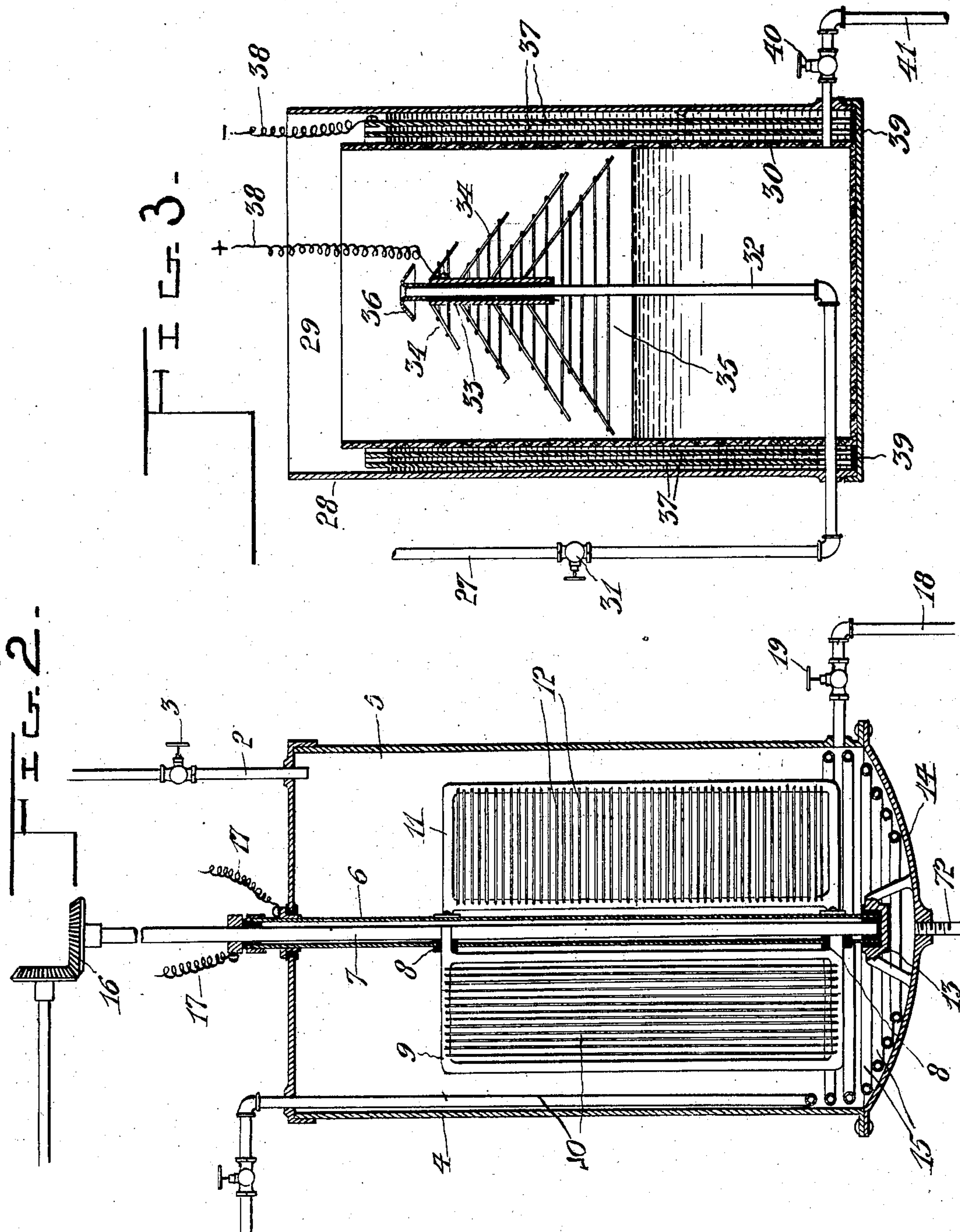
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# UNITED STATES PATENT OFFICE.

MARTIN HOCKER MILLER, OF WIARTON, CANADA.

## PROCESS OF SUGAR-MAKING.

SPECIFICATION forming part of Letters Patent No. 742,127, dated October 20, 1903.

Application filed June 3, 1903. Serial No. 159,914. (No specimens.)

*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 Processes of 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 concerns itself especially with a process for treating and purifying the juices preparatory to the crystallization of the sugar. The process is especially applicable in the manufacture of sugar from beet-juice.

The object of the invention is to produce a process for the purposes mentioned which is efficient and economical in separating out from the raw juice albuminous matter and other impurities.

In practice the high efficiency of the process enables molasses to be treated economically, so that sugar may be made from it as well as from the raw juice. Heretofore this molasses has been usually discarded by the sugar-makers, and as it constitutes a by-product of the sugar process, being formed in considerable quantities, discarding it in this manner entails a loss in the output of sugar. During the process the juice is treated with an electric current, which is passed through the juice between frames which are agitated within the body of the juice, and at another stage of the process the juice is allowed to drip or trickle over a metallic frame, which frame constitutes a terminal of an electric circuit.

The invention consists in the process to be more fully described hereinafter, and definitely set forth in the claims.

In the drawings which fully illustrate my invention, 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 suitable valve 3, leads to my electrical separator 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 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. These wires may be of platinum, aluminium, or of other metals or combinations of metals or materials best suited for the purpose. A substantially similar frame 11 is 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 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, 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, 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 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 frame, and 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 other foreign matter, which thereupon is precipitated to the bottom of the tank, as will be readily un-



derstood, the steam-coil operating to maintain the fluid at a proper high temperature during this process. This result is brought about by reason of the peculiar construction  
 5 of the electrodes and the rotation of the same, which causes the products of electrolysis at the surfaces of said electrodes to be brought into intimate contact with the liquid throughout its mass, and thereby permits  
 10 chemical reactions having the effect of separating out the impurities.

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  
 15 with a steam-coil 21. In this tank the temperature of the juices may be raised from 100° to 200°. 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  
 20 a filter-press 25 of common construction. After passing through this press the juices are led to a tank 26 and thence through a pipe 27 to the second separator 28. The construction of this second separator is best illustrated in  
 25 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 with-  
 30 in 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 platinum, aluminium, or of  
 35 other metals or combinations of metals or materials best suited for the purpose. The construction of these frames is such as to augment their superficial surface. It should appear that this sleeve 33 is suitably insulated  
 40 from the pipe-section 32, as indicated at 35. 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  
 45 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  
 50 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 said frames 34 are so constructed that they may be submerged in  
 55 the juice at the discretion of the operator. The current passes in such a direction that the frames 34 constitute anodes therefor. The sheet-iron members may be suitably insulated, as indicated at 39.

60 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  
 65 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  
 70 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 suc-  
 75 cessively. 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  
 80 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  
 85 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. 90  
 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 con-  
 95 ducting 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 crystalliza- 100  
 tion 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  
 105 subjected subsequently to my process with advantage. To this end the lowest point of the dished bottom 14 aforesaid is provided with an outlet-pipe 72, leading these residual  
 110 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 process is applicable to the treatment of "molasses." This substance is a low-grade juice or by-product of  
 115 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  
 120 10° or less, then heated to 180° Fahrenheit, and filtered before introduction into the raw-juice tank.

It will thus be seen by successively electrolyzing the juices, filtering, and treating with  
 125 SO<sub>2</sub> or its equivalent I cause practically each small portion of the liquid to be subjected to the purifying agencies, so that a thorough separation of impurities results.

While I have described above the exact  
 130 steps by which my process is preferably carried out, still it will be understood by those skilled in the art that these are merely given by way of example and that certain modifi-



cations and variations may be resorted to and the non-essential steps of the process omitted so far as lies within the scope of the following claims.

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

10 1. The method of purifying juice, which consists in rotating metallic electrodes provided with means for finely subdividing said juice, beneath the surface of the same, passing an electric current between said electrodes while they are in motion, then discharging said juice over a metallic frame-  
15 work to again finely subdivide the same and passing an electric current therethrough.

20 2. The method of purifying juice, which consists in rotating beneath the surface of the same metallic electrodes provided with means for finely subdividing said juice, passing an electric current between said electrodes while they are in motion, then discharging said juice and filtering the same, and then passing said juice over a metallic framework to  
25 again finely subdivide the same and passing an electric current therethrough.

30 3. The method of purifying juice, which consists in rotating beneath the surface of the juice metallic electrodes having means for finely subdividing the juice, passing an electric current between said electrodes while they are in motion, discharging the juice over a metallic framework to again finely subdivide the same, passing an electric current  
35 therethrough, and passing sulfurous vapors through said juice.

40 4. The method of purifying juice, which consists in rotating beneath the surface of the juice metallic electrodes having means for finely subdividing the juice, passing an electric current between said electrodes while they are in motion, filtering said juice, dis-

charging the same over a metallic framework to again finely subdivide the same, passing an electric current therethrough, and after-  
45 ward passing sulfurous vapors through said juice.

5. The method of purifying juice, which consists in rotating metallic electrodes provided with wires, or their equivalents, sub-  
50 stantially at right angles to each other, beneath the surface of the juice, passing an electric current through said juice while it is in motion, filtering said juice thereafter, and passing sulfurous vapors therethrough. 55

6. The method of purifying raw sugar juice, which consists in rotating metallic electrodes provided with wires, or their equivalents, sub-  
60 stantially at right angles to each other, beneath the surface of the juice, passing an electric current through said juice while the same is in motion, maintaining the juice at a high temperature meanwhile, filtering said juice, passing sulfurous vapors through said juice, and maintaining said juice at a high tempera-  
65 ture while said vapors are passing therethrough.

7. The method of purifying molasses, which consists in diluting the same to sub-  
70 stantially 10° Baumé, rotating beneath the surface of such molasses metallic electrodes having means for finely subdividing the same, passing an electric current between said electrodes while they are in motion, filtering the molasses, discharging the same over a metal-  
75 lic framework connected in electric circuit to again finely subdivide the molasses and then passing sulfurous vapors therethrough.

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

MARTIN HOCKER MILLER.

Witnesses:

H. J. KLINGE,

W. J. FERGUSON.