Sept. 20, 1960 A. F. DE LA CALLE 2,953,485

CONTINUOUS CANE DIFFUSER

Filed April 28, 1959 2 Sheets-Sheet 1

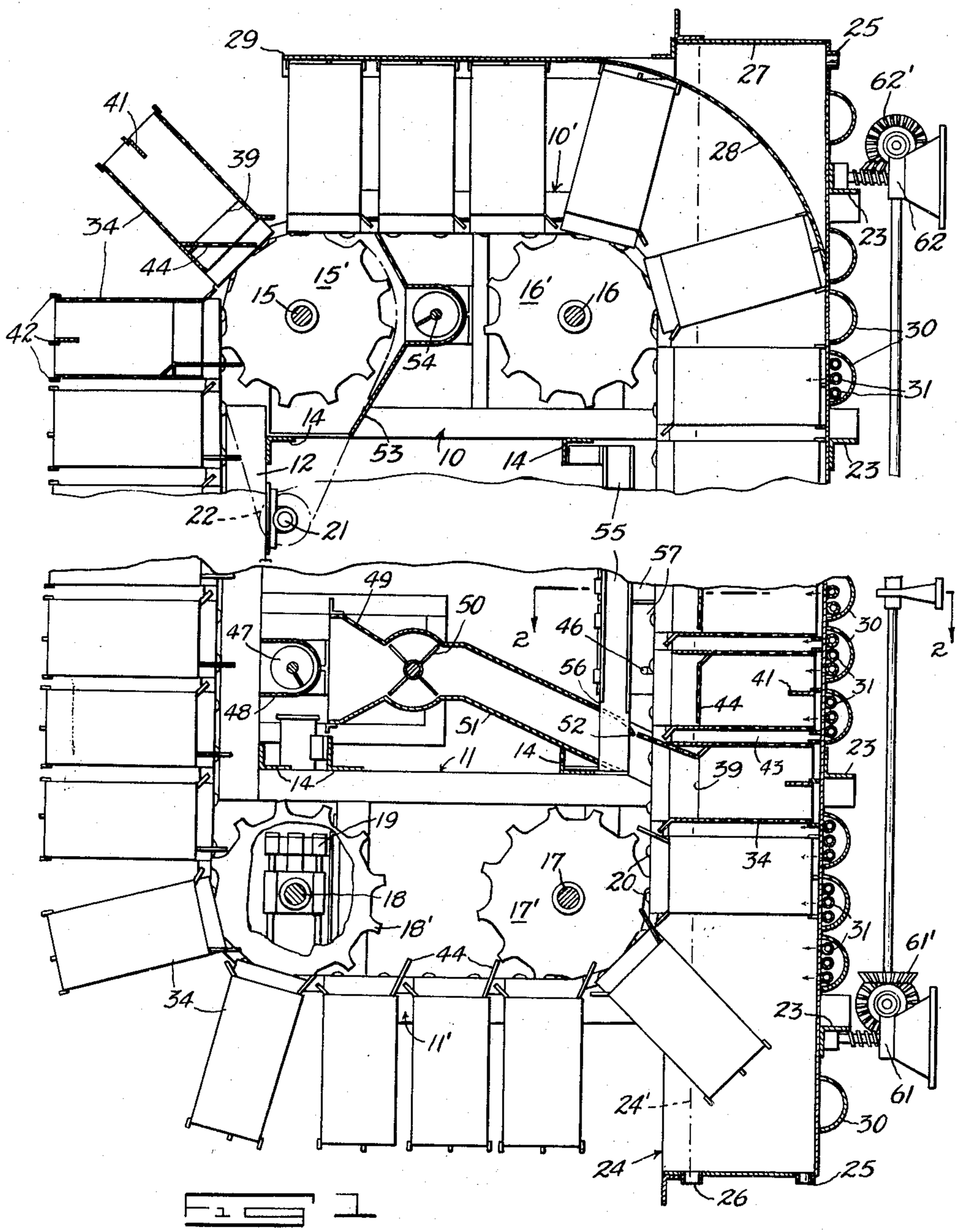

FIG. 1

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FIG 2

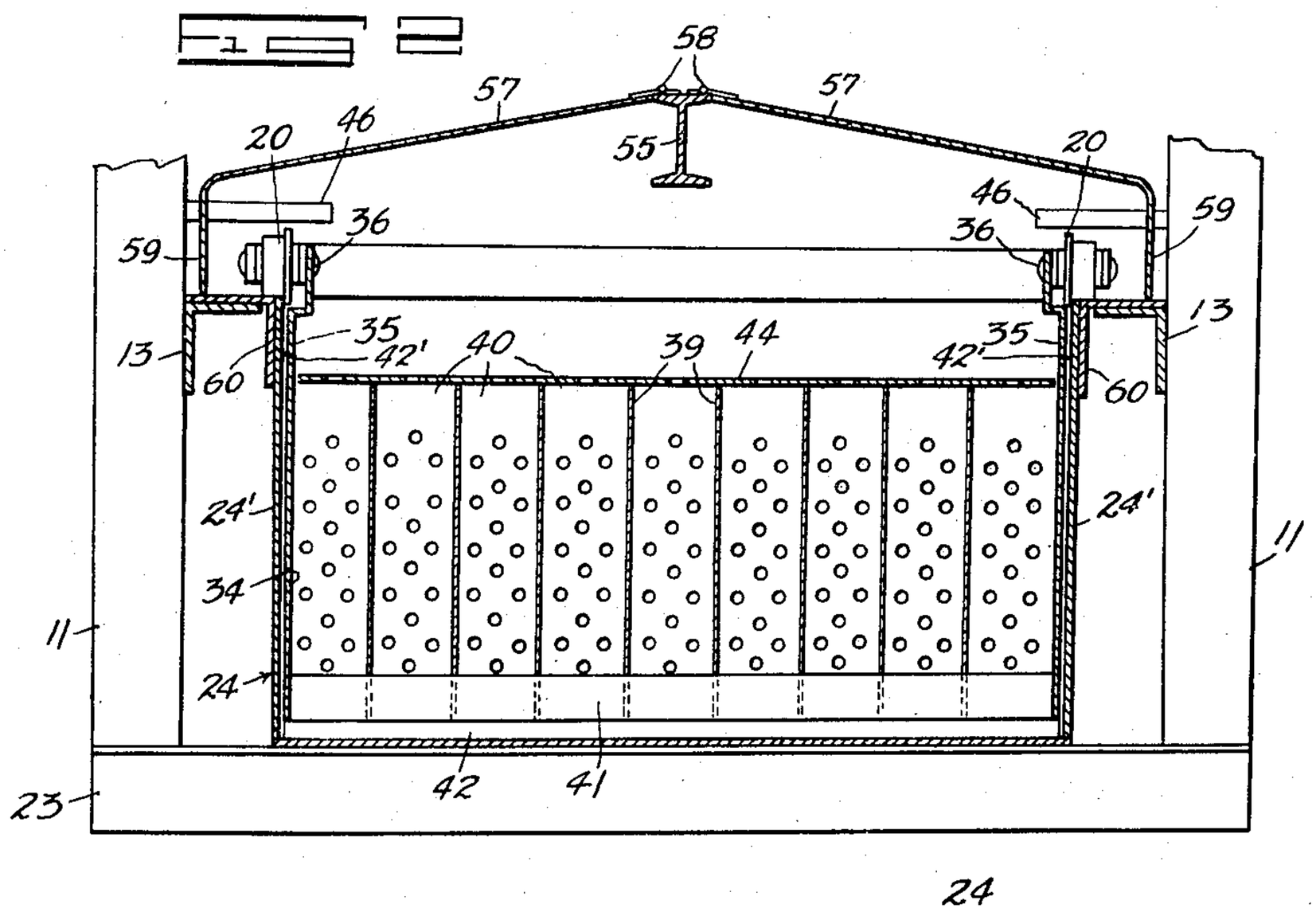


FIG 4

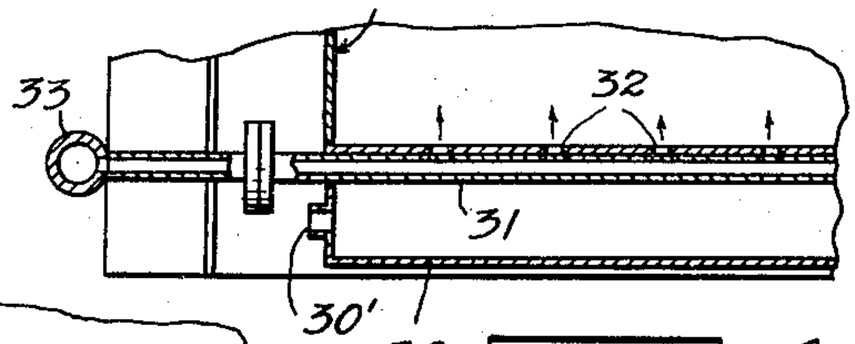
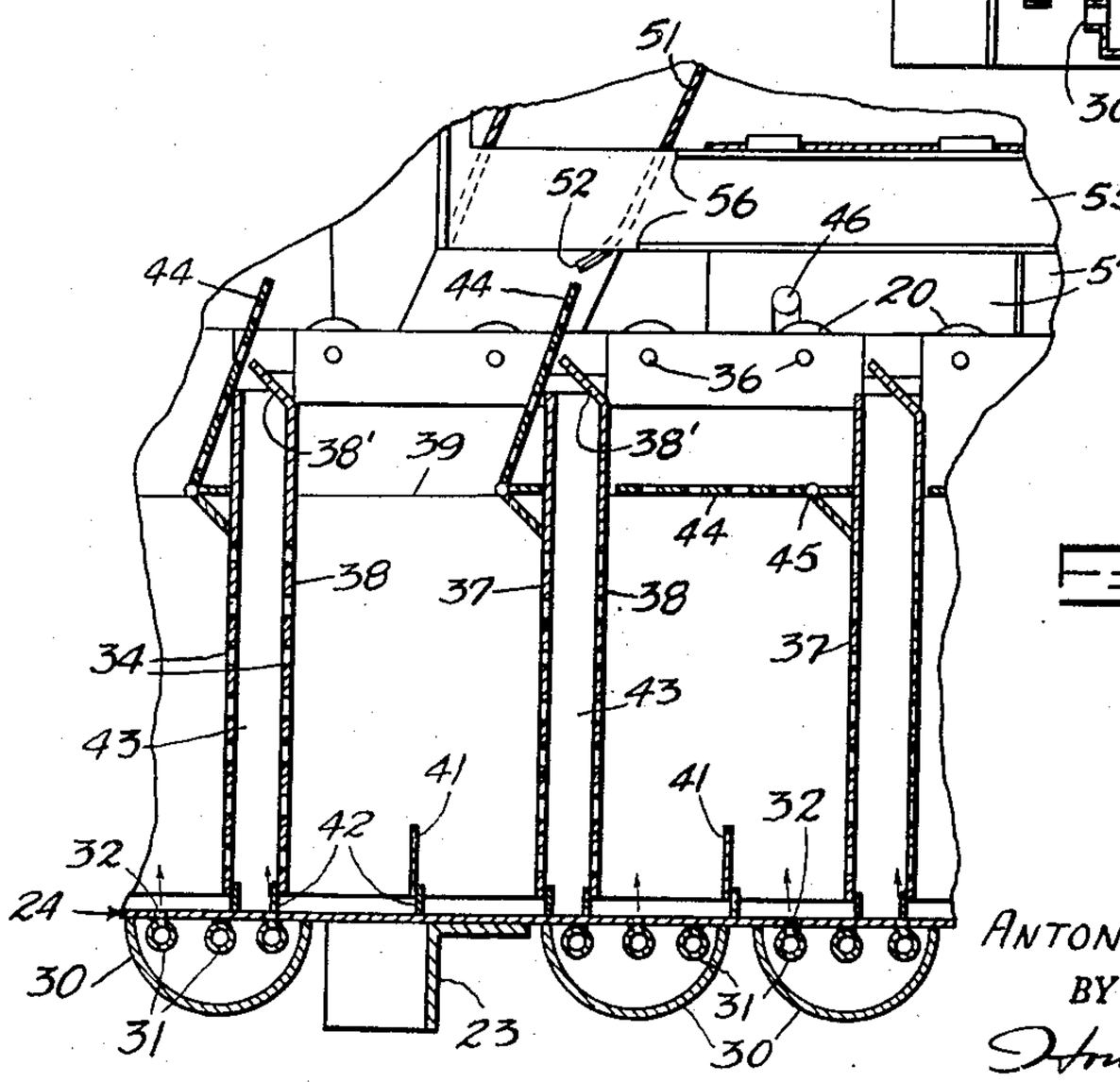


FIG 3



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2,953,485

Patented Sept. 20, 1960

2,953,485

CONTINUOUS CANE DIFFUSER

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Filed Apr. 28, 1959, Ser. No. 809,446

20 Claims. (Cl. 127—5)

This invention relates to apparatus for passing finely cut cane chips disposed in a plurality of baskets or pockets in a multiplicity of cane chip conveyor elements moved through an elongated tank in a direction opposed to the flow of liquid through the tank and in providing means for mixing and agitating the chips in said baskets or pockets in effecting the maximum extraction of sucrose, thereby obtaining the highest efficiency in production of the end sugar product.

More particularly, the invention deals with an apparatus of the character described, wherein means is provided for maintaining the chips submerged in the fluid in passage through the tank, said means being movably mounted, so as to admit chips into the baskets or pockets of the elements, as well as discharge of the treated chips from the apparatus.

Still more particularly, the invention deals in an apparatus of the character described employing jack supports, by means of which level and/or pitch of the tank can be controlled.

The novel features of the invention will be best understood from the following description, when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed and, in which, the separate parts are designated by suitable reference characters in each of the views and, in which:

Fig. 1 is a diagrammatic sectional view of end portions of an apparatus made according to my invention, with parts of the construction shown in elevation and broken away.

Fig. 2 is a diagrammatic enlarged sectional view substantially on the line **2—2** of Fig. 1 and omitting parts of the structure shown in Fig. 1.

Fig. 3 is a view similar to Fig. 1 on an enlarged scale and showing only a part of the construction; and

Fig. 4 is a detail sectional view through one corner portion of the tank, diagrammatically illustrating the admissions to the steam chamber and one of the compressed air tubes.

In order to maintain the reading of the drawings with the vertical arrangement of the sheet, Fig. 1 illustrates the actual base of the apparatus to the right of the drawing, this being done in compliance with this procedure and to avoid the necessity of turning the sheet sideways in order to read the same. It will also be apparent that the illustrations in the drawing are, for the most part, diagrammatic in order to simplify the illustration and, further, only one side portion of the apparatus is illustrated, the opposed side being duplicated, as will be apparent, this particularly with respect to the drive of the conveyor.

Considering Fig. 1 of the drawing, **10**, **10′** and **11**, **11′** represent generally end frames, the frame **10**, **10′** being the righthand frame and the frame **11**, **11′** being the lefthand frame, as the apparatus is generally viewed. These frames are joined by horizontal upper and lower frames, indicated, in part, at **12** in Fig. 1 and **13** in Fig. **2** and, further, crossframe members are employed and

these are indicated, in part, at **14** in Fig. 1 of the drawing.

Suitably supported in the frames **10**, **10′**; **11**, **11′** are a driven shaft **15** and three idlers **16**, **17** and **18**, the latter having an adjustable support, as diagrammatically indicated at **19**, to maintain tension in endless conveyor chains, diagrammatically seen at **20** in Fig. 2 of the drawing. On end portions of the shafts **15—18** are fixed sprockets **15′**, **16′**, **17′** and **18′**, respectively, for support and drive of the chains **20**. The shaft **15** is driven from a suitable motor or other drive, as diagrammatically indicated by the drive shaft **21** in Fig. 1 of the drawing and in dot-dash lines **22** is indicated the drive chain from the shaft **21** for drive of the shaft **15**.

Supported upon a plurality of transverse base frame members **23** is an elongated tank **24**, having suitable drains, as at **25**, with a discharge **26** at one end, suitable means, not shown, being employed to introduce water into the tank for circulation from the end **27** to the discharge end **26**. The end portion **27** of the tank includes a curved, apertured false bottom wall **28** which extends upwardly above said end of the tank, as seen at **29**. Welded or otherwise secured to the bottom wall of the tank **24**, at longitudinally spaced intervals, are transverse semi-circular steam chambers **30** and in part of these chambers are also welded compressed air discharge pipes **31**, the latter communicating with a staggered arrangement of apertures in the bottom wall of the tank, as indicated at **32** in Fig. 3 of the drawing. Considering Fig. 4 of the drawing, it will appear that each of the chambers **30** have a steam admission passage **30′** and each of the compressed air tubes **31** communicate with a compressed air supply pipe **33**. Suitable means, not shown, are employed to control the supply of compressed air in the use of the apparatus.

Coupled with the chains and transversely spacing the chains **20** are a multiplicity of cells or cane chip conveying elements **34**, a few of which are shown in enlarged detail in Fig. 3 of the drawing, and a cross-section through one of these elements is indicated in Fig. 2 of the drawing.

Each element has side walls **35** fixed to links of the chains, as indicated diagrammatically at **36**. Welded to the side walls of each element are forward and rear apertured walls **37** and **38**, thus producing what might be termed cell-like elements which are open at the top and bottom, as will clearly appear from a consideration of Fig. 3 of the drawing. Welded to the walls **37** and **38**, at transversely spaced intervals, are partitions **39**, note Fig. 2 of the drawing, these partitions dividing each cell or element into a plurality of baskets or pockets **40**, into which the cane chips are adapted to pass.

Secured to the side walls **35**, adjacent the bottom of each element, as noted in Figs. 2 and 3, is a transverse baffle strip **41**, the purpose of which is to induce an upward movement of the chips in each of the pockets **40** in movement of the elements **34** from the discharge end of the tank to the intake end **27** thereof or, in other words, against the flow of water through said tank.

Fixed to and projecting beyond the lower edges of the walls **37** and **38** and the strip **41** are flexible packing or wiper strips **42**, which prevent the chips from displacement from the pockets **40** or into the spaces or gaps **43** between adjacent elements **34**.

At **44** I have shown a pivoted apertured lid or cover in each of the elements **34** pivoted, as seen at **45**, adjacent the forward wall **37**. The several positions of the covers **44** are diagrammatically illustrated in Fig. 1 of the drawing as they would assume in properly viewing Fig. 1 with the righthand side of the sheet downward as the apparatus is normally installed.

It will, thus, be noted that, as the elements **34** enter the tank **24**, the covers **44** are directed upwardly in an

inclined direction and supported upon upper edges of the walls **37** and, after passing the filling station, later described, the covers **44** strike inwardly extending pins **46**, note Figs. 1 and 2, which will automatically move the covers into their lowest position resting upon the upper edges of the partitions **39**, thus confining and retaining the chips within the pockets **40** at a position slightly below the level of water in the tank **24**, which level is diagrammatically illustrated by the dot-dash line **24'** in Fig. 1 of the drawing.

It will appear, from a consideration of Fig. 2 of the drawing, that the upper edge of the wall **38** of each element **34** has an extended angularly offset flange **38'** to guard against passage of the chips into the gaps or spaces **43**.

The delivery or filling station is generally identified by a delivery or feed screw, diagrammatically seen at **47** in Fig. 1 of the drawing, arranged in an apertured housing **48**, into which the chips are deposited from an elevator or other source of supply for delivery into a hopper **49**, the lower portion of the hopper having a rotatable paddle feeder **50** controlling the discharge of the chips into a chute **51** for directing the chips into successive elements **34** as they are slowly fed through the tank **24**. It will be noted that one wall of the chute **51** is curved or offset at its lower end, as indicated at **52**, to insure direction of the chips at all times into the successive elements, while the cover **44** is in its raised position and, after passing the chute, the cover is then deflected by striking the pins **46** and moved into its closed position.

At the right side of the apparatus is what can be termed the discharge station, from which the processed chips are discharged from the apparatus to a suitable dryer, not shown. This station includes a hopper **53**, into which the used cane is automatically discharged as the elements move into the raised position around the spocket **15'**, it being understood that the action of gravity plus the weight of the chips will move the cover **44** into open position and this cover will remain open in passage over the full top part of the apparatus, as diagrammatically seen in Fig. 1.

At the lower portion of the hopper **53** is another feed screw **54** for discharge of the processed cane from the apparatus for conveyance to the drying means, as mentioned above.

Extending longitudinally of the apparatus between the frames **10**, **10'**; **11**, **11'** and, at a point raised with respect to the supports **13** and the chains **20**, is an eyebeam **55**, note Fig. 2 of the drawing. Also considering Fig. 1 of the drawing, it will appear that this eyebeam has its flanges cut away adjacent the chute **51**, as noted at **56**, in order to provide free passage of the cane chips into the respective pockets **40**.

Starting adjacent the chute **51**, the upper portion of the tank includes a series of side hoods or covers, as clearly noted at **57** in Fig. 2 of the drawing, these covers being hinged, as indicated at **58**, to the eyebeam **55** and include depending outer extremities **59** adapted to rest upon rails **60** welded or otherwise secured to the side walls **24'** of the tank **24** and resting upon the frames **13**, as clearly noted in Fig. 2 of the drawing. The rails **60** form supports and guides for the chains **20** in movement of the elements **34** through the tank **24**.

From the foregoing, it will be apparent that, by providing the apertured forward and rear walls **37** and **38** in each of the elements **34** with all other walls of these elements solid and unperforated, a continuous flow of water is possible through each of the pockets of the respective elements and, by providing the spaces or gaps **43** between each element **34**, the full capacity of the water or prevailing liquid is free to enter into and be discharged from the pockets. As the elements **34** are moved through the tank **24**, the intermittent blasts of air under pressure into the tank and the pockets of the respective elements operates to constantly churn the liquid and break-up and agitate the chips to insure a substantially one hundred percent extraction of the sucrose, thereby attaining the highest efficiency possible in producing the resulting end product. It will also be understood that the temperature of the liquid can be definitely controlled by temperatures in the respective steam chambers longitudinally of the tank to again produce the high degree of efficiency desired in use of the apparatus.

I also preferably employ at least four jacks, two at each end of the apparatus to control horizontal position or angularity of the tank. Two, only, of these jacks are diagrammatically illustrated in Fig. 1 of the drawing, the jacks **61** representing one of the pair of jacks at the left end of the apparatus and at **62** one of the jacks in the pair at the right end, it being understood that other means of support of the tank can be provided intermediate these end jacks. The end jacks **61**, **62** are simultaneously operated through bevelled gearing, as diagrammatically illustrated at **61'**, **62'** so that, in the operation of one of these gearings, the other will be actuated so that, if one end of the tank is raised, the other end of the tank will be automatically lowered. It will appear, from a consideration of Fig. 1 of the drawing, that the jacks directly operate in conjunction with two of the transverse rails or frames **23**.

It will be understood that, by controlling the operation of the delivery station and regulating the speed of drive of the conveyor, including the elements **34** movable therewith, the deposit of the cane chips into the respective pockets **40** of each of the elements **34** can be regulated to prevent overpacking of the pockets and, thus, provide the free and efficient exposure of all of the chips with the solution in promoting a faster and highly efficient osmose of the sugar in all of the cells or elements. It will also appear that, by upward movement of the elements **34** when discharged from the end **27** of the tank, sufficient drainage will be provided, so that the treated chips will be substantially free of liquid when deposited into the hopper **53** for transmission to the drying means by action of the feed screw **54**.

In order to simplify the showing, wipers which are used at side corner portions of each of the elements are not shown in Figs. 1 and 2 of the drawing. However, these wipers will extend to a position above the level of water or to the points **42'**, noted in Fig. 2 of the drawing, so that the elements are substantially sealed in their passage through the tank, without having the end walls **35** of the elements actually contacting the tank, thereby eliminating unnecessary friction or possible jamming.

It is also to be kept in mind that, by utilizing the two pairs of jacks **61**, **62**, the jacks **62** can be raised when it is desired to increase the flow of liquid through the tank to the discharge, as at **26**. The greater the rise of said end of the tank, the faster the flow. By virtue of the interconnection between the jacks, it will be understood that, as one end of the apparatus is raised the other is correspondingly lowered.

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

1. An apparatus for diffusing sugar cane, comprising an endless conveyor having a multiplicity of closely spaced chip conveyor elements, an elongated tank, means for guiding said elements through the tank in a direction opposed to the flow of water therethrough, each element comprising forward and rear apertured walls transversing the tank, means dividing each element into a plurality of transversely spaced pockets, means for delivering cane chips directly into the pockets of said elements at one end portion of the apparatus, means for discharging the processed chips from the elements at the other end portion of the apparatus at a position above and in spaced relation to said tank, means spaced longitudinally of the tank for heating the liquid contents of the tank,

and means spaced longitudinally of the tank for introducing a multiplicity of compressed air discharges into the tank and said elements in passage of said elements through the tank.

2. An apparatus as defined in claim 1, wherein means is provided for maintaining a predetermined level of water circulated through said tank, each of said elements including a pivoted cover supported in raised position in passage of the elements beneath said delivery means, and means adjacent the delivery means for automatically moving the cover into closed position substantially at the line of level of the water in said tank.

3. An apparatus as defined in claim 1, wherein each element includes, at its lower central portion, a raised transverse baffle.

4. An apparatus as defined in claim 3, wherein the walls of each element and said baffle include wiper strips operatively engaging the tank.

5. An apparatus as defined in claim 4, wherein the second named end of the tank includes a raised curved apertured wall, over which the wipers of said elements pass.

6. An apparatus as defined in claim 1, wherein said delivery means comprises a screw for feeding chips into a hopper, a feeder for delivering the chips to a chute, opening into the tank for delivery of the chips into the pockets of said elements.

7. An apparatus as defined in claim 1, wherein the conveyor includes a pair of chains disposed at sides of the apparatus, said chains operatively engaging four pairs of sprockets, two pairs being disposed at each end portion of the apparatus, and means for directly driving one pair of sprockets.

8. An apparatus as defined in claim 7, wherein means is provided for adjusting the axis of another pair of sprockets in maintaining the conveyor in taut position.

9. An apparatus as defined in claim 1, wherein the discharge means comprises a hopper arranged over the second named end portion of the tank, and a feed screw for discharging the treated chips from said hopper.

10. An apparatus as defined in claim 1, wherein pairs of jacks are disposed at end portions of said apparatus for adjustably controlling support of the apparatus.

11. An apparatus as defined in claim 1, wherein a plurality of transverse pairs of hoods are spaced longitudinally of and above the tank intermediate the delivery means and said discharge means.

12. An apparatus as defined in claim 1, wherein the heating means comprises a plurality of transverse steam chambers spaced longitudinally of the bottom of said tank.

13. An apparatus as defined in claim 1, wherein said compressed air discharge means comprises a plurality of apertured tubes arranged in predetermined chambers intermediate the first and second named ends of said tank and the bottom wall of the tank having apertures registering with the apertures of said tubes.

14. In a diffusing apparatus of the character described, an elongated tank, through which a liquid is adapted to be circulated in one direction and maintained at predetermined level in said tank, a plurality of product receiving elements arranged in close spaced relationship to each other on a feeding means, means for driving said feeding means to move said elements through said tank in a direction opposed to the flow of liquid through the tank, each of said elements comprising spaced apertured walls transversing said tank, said walls being joined by side walls, means spaced transversely of each element for partitioning each element into a plurality of pockets, a movable cover at the upper portion of each element, said cover being supported in open position in passage of each element beneath a product delivery station for delivering products to the pockets of each element, and means to lower said cover immediately upon the passage of each element past said delivery station.

15. An apparatus as defined in claim 14, wherein each pocket includes, at its lower portion, a transverse raised baffle wall.

16. An apparatus as defined in claim 15, wherein each element includes a plurality of wipers operatively engaging the walls of the tank.

17. An apparatus as defined in claim 14, wherein means is provided for heating the liquid in said tank.

18. An apparatus as defined in claim 17, wherein means is provided for charging the tank at longitudinal and transversely spaced intervals with compressed air.

19. An apparatus as defined in claim 14, wherein said delivery station is disposed at one end portion of said tank, a discharge station above the other end portion of the tank, and means comprising transverse pairs of longitudinally spaced hoods forming closures for the tank intermediate said stations.

20. An apparatus as defined in claim 14, wherein means is provided at end portions of said tank for controlling position of the tank.

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