Oct. 28, 1941. H. O. PETERSON 2,260,865

APPARATUS FOR THE EXTRACTION OF JUICES

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Fig. 1

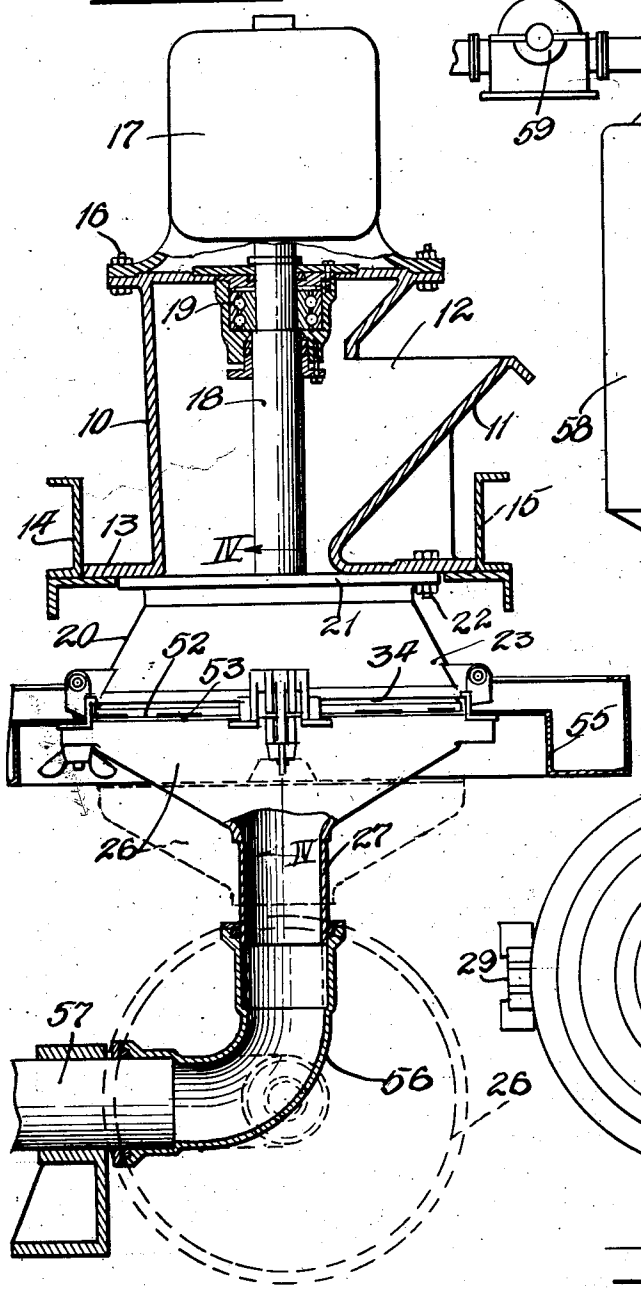


Fig. 3

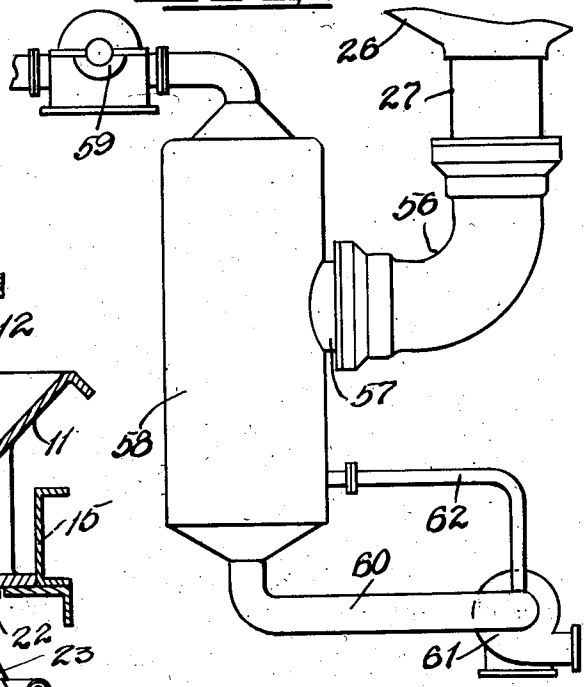
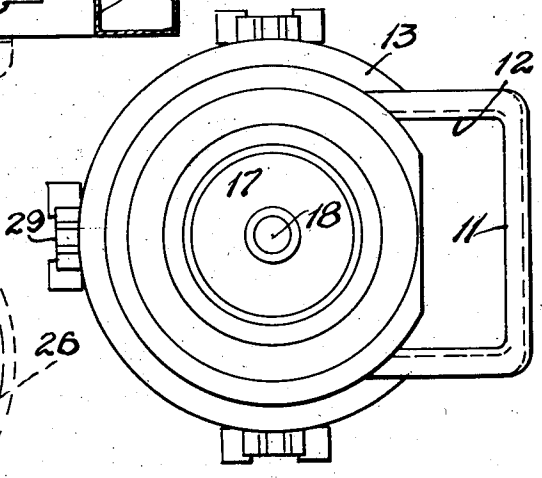


Fig. 2

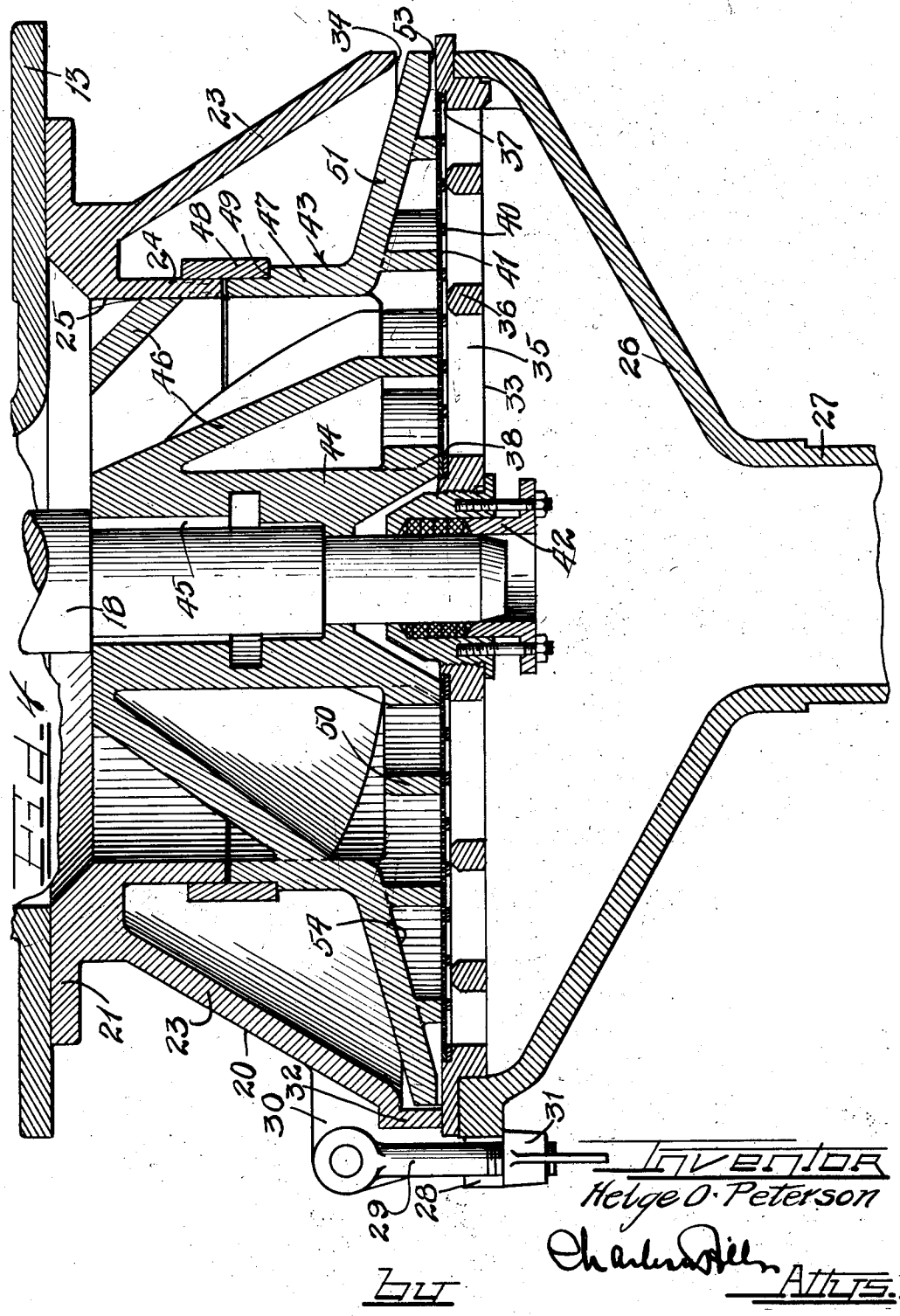


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APPARATUS FOR THE EXTRACTION OF JUICES

Filed March 30, 1938 4 Sheets-Sheet 2



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APPARATUS FOR THE EXTRACTION OF JUICES

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Fig. 5

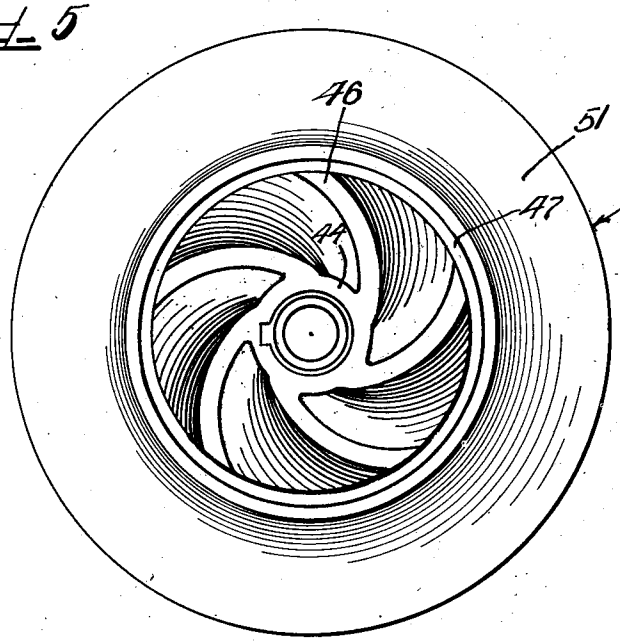
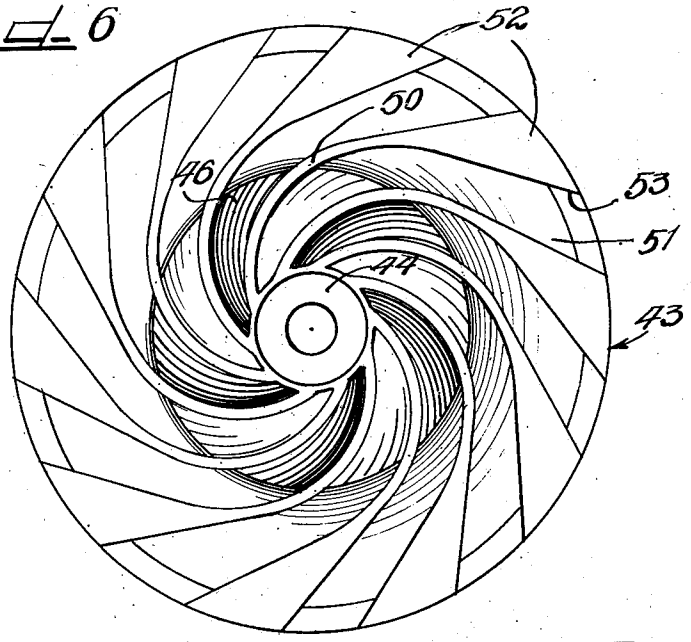


Fig. 6



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APPARATUS FOR THE EXTRACTION OF JUICES

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Fig. 7

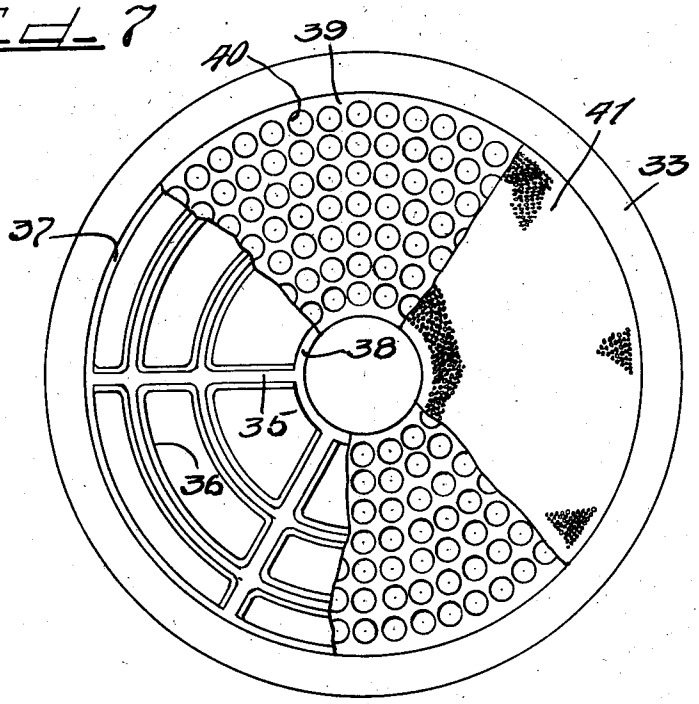
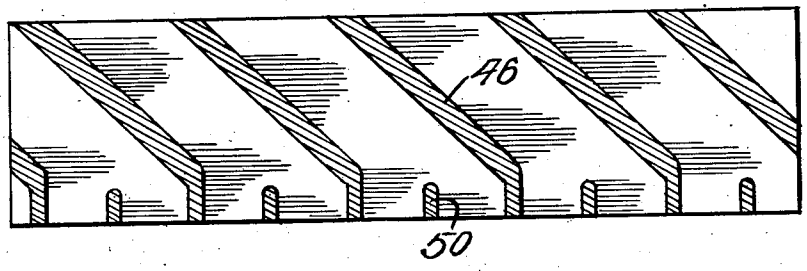


Fig. 8



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UNITED STATES PATENT OFFICE

2,260,865

APPARATUS FOR THE EXTRACTION OF JUICES

Helge O. Peterson, Chicago, Ill.

Application March 30, 1938, Serial No. 198,878

14 Claims. (Cl. 100—48)

The present invention relates in general to an improved apparatus for extracting liquid from a liquid containing material and is particularly concerned with the extraction of juices from a fruit pulp of such fruits as pineapples and the like.

It is a primary object of the herein described invention to provide in a juice extracting apparatus improved means for compressing the fruit pulp to liberate the juices therefrom.

A further object of the invention is to provide improved means for ejecting or discharging the pulp from the apparatus after the juice has been extracted from the pulp.

A further object is to provide an apparatus for the extraction of fruit juices which utilize a screen, improved means for enabling the screen to be removed or changed without having to disassemble the compressing mechanism or having to unload or clear the apparatus of the fruit pulp which is being compressed therein.

It is also an object of the invention to provide improved apparatus for the extraction of fruit juices, which may be operated continuously and does not have to be shut down and charged between compressing operations.

Still another object is to provide improved means for drawing off the extracted juices after the compressing operation.

In accordance with the general features of the invention, it is proposed to provide a power driven rotor which is provided with a first set of inclined vanes which are adapted to feed the juice containing pulp towards a perforated baffle and compress the pulp against this baffle to remove the juices therefrom. This rotor is additionally provided with a second set of vanes which are arranged to move the compressed pulp in a direction laterally of the direction in which the pulp is moved during the compressing operation. The rotor is provided with an inclined end portion at the end adjacent the baffle, so that as the pulp is moved outwardly it must pass through a passage of gradually decreasing cross section. As the pulp passes through this passage, it is additionally squeezed to further remove the juices therefrom and is finally ejected at the periphery of the baffle.

The juices which are liberated pass through the perforations of the baffle into a collecting system including a separating tank. The uppermost end of this tank is connected to a vacuum or suction pump which acts to remove air, gases, and light foam from the juices. The lower end of this tank is connected to a pump by means of which the juices are withdrawn from the tank, and there is additionally provided a return connection whereby foam which collects at the pump may automatically be returned to the separating tank.

A further feature of the invention resides in the connection of the juice collecting system at the baffle. For this purpose I provide a funnel-shaped construction which is removably connected to the housing of the device and which cooperates to hold the baffle in operative position. This funnel-shaped member is provided at its throat with a slip joint which permits raising and lowering movements thereof when disconnected from the housing of the device. Also, there is a sealed swing joint connection which enables swinging movement of the funnel-shaped member so as to enable access to the baffle and permit its removal for cleaning or being replaced by a baffle having different sized perforations or screens therein. With such an arrangement it will be evident that it is not necessary to disassemble the apparatus proper nor is it necessary to have to clear the apparatus of any pulp which may be passing therethrough.

Other objects and features of the invention will more fully appear from the following detailed description, taken in connection with the accompanying drawings which illustrate a preferred embodiment thereof, and in which:

Figure 1 is an elevational view of apparatus embodying the features of the present invention, portions being in section to illustrate the detailed and cooperative relationship of certain of its parts;

Figure 2 is a plan view of the same;

Figure 3 schematically illustrates the juice collecting system;

Figure 4 is an enlarged sectional view through the housing for pulp compressing instrumentalities, taken substantially on line IV—IV of Figure 1;

Figure 5 is a detailed plan view of the rotor element of the compressing mechanism;

Figure 6 is a similar view looking at the bottom of the rotor element;

Figure 7 is an enlarged plan view of the baffle, portions being cut away to show the details of its construction; and

Figure 8 is a development view of the rotor element showing the relative positions of the vanes for moving the pulp against the baffle and the vanes for moving the pulp to position of discharge.

As shown on the drawings:

Referring to Figure 1, the apparatus of the present invention comprises a generally tubular housing 10, which is preferably of cast steel construction and is provided at one side with an outwardly and upwardly inclined lip portion 11. This lip cooperates with the body of the housing to define a hopper opening 12 for receiving fruit pulp or the like from which the juices are to be extracted.

This casing 10 at its lowermost end is provided with a peripherally extending flange 13 by means of which the casing may be supported on spaced rail structures 14 and 15 which may constitute a part of any suitable supporting framework for the apparatus.

The upper end of the casing 10 is closed and has supported thereon as by bolts 16 suitable power means such as an electric motor 17.

This motor is disposed with its driving shaft 18 extending vertically through the casing 10 and journalled in suitable bearings 19, these bearings preferably being of anti-friction type, which are supported in the top of the casing.

The compressing elements of the apparatus are contained within a housing structure, generally indicated at 20, which is provided at its uppermost end with an annular flange 21 which is secured to the flange 13 of the casing 10 by means of suitable flange bolts as indicated at 22.

The housing 20 is of double-walled construction, the outer wall as shown at 23 being downwardly and outwardly flared from the annular flange 21. Also extending axially of the outer wall is an inner wall 24 of substantially uniform diameter but of shorter length than the outer wall, the inner wall likewise depending from the upper end of the housing. The uppermost end of the inner wall defines an entrance opening 25 into which materials placed in the casing 10 may move downwardly into contact with the compressing elements.

The housing 20 is made of any suitable material, but it is preferred that this housing should be constructed of a metal such as brass. The lowermost end of the housing 20 has supported therefrom a funnel member 26 having an outlet throat 27. The funnel rim is provided with circumferentially spaced slotted lugs 28, which are adapted to receive the swing bolts 29 which are hinged on suitable lugs 30 associated with the outer wall 23 of the casing 20 at its lowermost edge.

By means of the bolts 29 and suitable thumb nuts 31, the funnel member may be drawn against spacer feet 32 which cooperate to engage the peripheral margin of a screen supporting frame 33 disposed between the upper end of the funnel and the lowermost ends of the feet 32. With this arrangement, it will be apparent that circumferentially extending openings 34 are thus provided at the lower edge of wall 23 on the housing 20.

As more clearly shown in Figure 7, the screen supporting frame is of grid construction having radially extending ribs 35 interconnected with spaced circumferentially extending ribs 36.

The screen frame adjacent its periphery is provided with a circumferential groove 37 having its bottom lying substantially in the same plane as the upper surfaces of the ribs 35 and 36. This groove, together with a similar groove 38 near the center of the screen frame, provides a seat for one or more screens, in this case two. The lowermost of these screens, which I have termed the drainage screen, is shown at 39 in Figure 7 and may comprise a ring-shaped plate having a plurality of relatively large perforations 40 therein. The drainage screen is placed next to the ribs of the screen frame and may be utilized as a support for grading screen 41 of much finer mesh.

Referring again to Figure 4, it will be noted that the driving shaft 18 of the motor extends axially through the tubular portion of the housing defined by the inner wall 24 and has its lowermost end journalled in a suitable bearing 42 supported at the center of the screen frame.

It will be apparent that the screen frame in effect forms a baffle which separates the interior of the funnel 26 from the interior of the housing 20.

Material from the casing 10 is forced downwardly through the tubular portion defined by the wall 24 in a direction towards the baffle or, in other words, the screens 40 and 41. This is accomplished by means of a rotor structure 43 having a hub 44 which is secured as by a key 45 to the shaft 18 for rotation therewith. Extending outwardly from the hub at its uppermost end are a plurality of spirally inclined vanes or wings 46 which are so arranged as to form a screw which feeds the pulp material toward the screens and acts to compress this material thereagainst.

The outermost ends of the wings 46 terminate in a peripherally extending tubular rim 47, which in effect forms an extension of the tubular portion defined by wall 24.

It is preferred that the joint between the lower end of this tubular portion and the upper end of the rim 47 be closed by means of an annular sleeve 48 which may be supported in a peripheral groove 49 at the upper end of the rim and extend over the lower end of the tubular portion defined by wall 24.

Compression of the pulp material against the screens 40 and 41 will cause a liberation of a portion of the juices contained in the pulp. After this initial compression and removal of a portion of the juices, the pulp is moved outwardly over the screens toward the openings 34 by means of a plurality of spiraled ribs or vanes 50 which emanate from the lowermost end of the hub 44 and are secured adjacent their outermost ends to an angularly disposed rim portion 51 forming an extension of the rim 47 at its lowermost end.

As will be noted in Figure 6, the ribs or wings 50 at their outer ends are expanded to provide a series of spaced bearing surfaces 52 which are interspersed by openings 53 communicating with the spaces between the respective ribs.

The inclined rim portion 51 cooperates with the upper surface of the screens in the screen frame to provide a passageway at the periphery of the rotor at its lowermost end which is of decreasing cross section, this passageway being indicated at 54.

As the rotor is revolved in a clockwise direction, when looking at its top, the pulp which is being pressed against the screens will naturally tend to lag behind the movement of the rotor. This relative movement between the material and the rotor, coupled with the centrifugal action due to the rotation of the rotor will cause a movement of the initially compressed pulp in a radial or outward direction along the top of the screen. During this movement, the passage of the material through the peripheral passageway 54 of decreasing cross section will cause further compressing of the material and final extraction of juice therefrom. The compressed material will be discharged at the periphery of

the rotor and pass through the openings 34 at the bottom of the outer wall 23 of the housing 20, where it is caught in a ring-shaped trough 55. The pulp having the juice extracted therefrom may be removed from this trough at the convenience of the operator.

As shown in Figures 1 and 3, the tubular throat 27 of the funnel is sealed for axial movements in one end of a right-angled L fitting 56, the other end of this fitting being sealed on an end of a horizontally disposed tubular member 57 which may form a part of a juice collecting system.

This arrangement or mounting for the funnel 26 is particularly advantageous, since there are times when the baffle screens 40 and 41 may become clogged, or it may be desirable to substitute for a screen frame another screen frame having screens of different size mesh thereon depending upon the characteristics of the pulp from which the juice is being extracted.

It will be apparent that it is a very easy matter to change the screen frames or clean a screen frame. All that is necessary is to loosen the swing bolts 29 and lower the funnel 26 from its elevated position as shown in Figure 1 to the dotted line position. Having lowered the funnel as just described, the funnel and fitting 56 may be rotated about the horizontal pipe 57 as a pivot, to bring the top of the funnel to a position, as shown in dotted lines, wherein the funnel top will be displaced substantially 90° from its usual operative position. In the rotated position of the funnel, the screen frame is readily accessible either for cleaning or for substituting a different screen.

It will be apparent that it is not necessary when cleaning or changing screens to clear the compressing part of the apparatus of any pulp which may be therein, nor does it become necessary to disassemble the main parts of the apparatus.

The juice collecting system as disclosed in Figure 3 preferably comprises a separating tank 58 which may have the conductor 57 formed as a connection thereto. This separating tank receives the juices traveling through the throat of the funnel, the fitting 56, and conductor 57.

As the juices pass into this tank, there will naturally be some foam formed, and gases will be collected above the liquid in the tank. For removing these gases, a vacuum or suction pump 59 is connected to the top of the tank. These gases, foam, etc., may be piped to any convenient point from the pump 59.

The liquid or juices in the tank are removed through a bottom connection 60 which is connected to a suitable pump 61.

Foam which might accumulate at the inlet side of the pump is returned through a return connection 62 to the tank.

From the foregoing description, it will be apparent that the present invention provides an improved apparatus for extracting juices from pulp materials, such as fruit pulp and the like; which apparatus embodies improved means for compressing the pulp from which the juices are to be removed; which includes a novel construction for enabling the screens to be removed or changed without having to disassemble the compressing mechanism or having to unload or clear the apparatus of material in the process of being compressed; which includes improved means for ejecting the compressed pulp after the juice has been extracted; which may be continuously operated and does not have to be shut down or charged between compressing operations; and which embodies an improved arrangement for drawing off or collecting the extracted juices.

It is, of course, to be understood that although I have described in detail a single embodiment of my invention, the invention is not to be thus limited, but only insofar as defined by the scope and spirit of the appended claims.

I claim as my invention:

1. As an article of manufacture, a rotor element comprising a tubular shell structure defining a tubular body portion of substantially uniform diameter, a flared tubular portion at one end of the body portion, vanes in the body portion adapted to move a material disposed therein in an axial direction through the tubular body portion towards the flared tubular portion, and vanes in the flared portion forming continuations of said first vanes and adapted to move the material delivered thereto outwardly away from the axis of the flared portion.

2. Apparatus for extracting juices from pulp material comprising a rotatable tubular shell of substantially uniform diameter at one end and flared at its other end, a flat perforate baffle extending over said flared end, a plurality of spaced spiralled ribs rotatable with the shell in close proximity to the adjacent surface of said baffle, said ribs having their outer end portions extending between the flared end of the shell and the baffle for moving material outwardly and compressing it therebetween, and means adjacent the uniform diameter end of the shell for moving material through the shell and between said ribs into compressing engagement with said baffle.

3. Apparatus for extracting juices from pulp material comprising a rotatable tubular shell of substantially uniform diameter at one end and flared at its other end, a flat perforate baffle extending over said flared end, a rotatable shaft centrally disposed of said shell and connected thereto, vanes carried by said shaft for moving material in an axial direction through the shell into pressure engagement with said baffle, and a plurality of ribs carried by said shaft spirally extending over the adjacent surface of said baffle in close proximity thereto for forcing material radially away from the shaft into the space between the flared end of the shell and the baffle.

4. Apparatus for extracting juices from pulp material comprising a rotatable tubular shell flared at one end, a perforate baffle extending across the flared end of said shell, a plurality of spiralled ribs mounted for sweeping movement over the adjacent surface of said baffle for moving material outwardly over said surface to a position of discharge adjacent the periphery of the baffle, and extensions on certain of said ribs for moving material in an axial direction through the shell and between said ribs into pressure engagement with said baffle.

5. In apparatus for extracting juices from pulp material, a tubular material receiving shell flared at one end, a central hub, a plurality of spiralled spaced apart ribs having their inner ends secured to the hub and their outer end portions extending over and secured to the flared portion of the shell, a stationary perforate baffle extending over the flared end of the shell and said ribs, the surfaces of the ribs facing said baffle lying in the same plane, and wing extensions on certain of said ribs extending into the non-flared portion of said shell, said wings acting to move material through the shell in an axial direction

into pressure engagement with the baffle and the spiralled ribs acting to move material outwardly between the flared end of the shell and the baffle, when the hub, ribs and shell are rotated as a unit.

6. In apparatus for extracting juices from pulp material, a rotatably mounted tubular shell having one end flared, a plurality of spaced spiralled ribs at said end of the shell, said ribs having a common connection adjacent the center line of the shell and their outermost end portions secured to the flared portion of the shell, a perforated baffle extending over said flared end of the shell and arranged to have its inner surface swept by said ribs, said flared portion of the shell, the associated portions of the ribs and the baffle coacting to form spiralled passageways of decreasing cross-section adjacent the periphery of said baffle, and means for moving material in an axial direction through the shell into engagement with said baffle.

7. In apparatus for extracting juices from pulp material, a rotatably mounted tubular shell having one end flared, a plurality of transversely disposed ribs across the open flared end of the shell, said ribs being spaced apart and spiralled outwardly from adjacent the center line of the shell, the outermost end portions of the ribs being secured to the flared portion of the shell, a flat perforated baffle extending across the flared end of the shell and said ribs with the adjacent faces of the ribs disposed in a common plane and arranged to sweep the surface of the baffle, the ribs coacting with the flared portion of the shell and the baffle to form movable passageways of decreasing cross-section as the end edge of the flared end of the shell is approached, and means for moving material in an axial direction through the shell into engagement with said baffle.

8. Apparatus for extracting juices from pulp material comprising a rotatably mounted tubular shell defining an inlet end and an outlet end, the shell adjacent its inlet end being of substantially uniform diameter and adjacent its outlet end being flared, a plurality of edge notches at said latter end, means for supplying pulp material to the inlet end of said shell, a flat perforate baffle extending across said outlet end and cooperating with the flared portion of the shell to define a passageway of decreasing height, vanes adjacent the inlet end for moving material through the shell in an axial direction and initially compressing the material against said baffle, and other vanes extending between the flared end of the shell and said baffle for moving the initially compressed material outwardly over said baffle through said passageway to said edge notches, the movement of the material through said passageway effecting further compression of the material.

9. As an article of manufacture, a rotor element for a pulp press comprising a central hub portion, a first set of vanes on said hub arranged to move a material axially of the hub, a tubular rim surrounding said vanes and having a portion of uniform diameter secured to the outer end margins of said vanes, said rim portion terminating at one end in a flared portion, and a second set of vanes spiralled outwardly from the hub with their outer end margins underlying the flared portion of the rim and secured thereto, said latter vanes being arranged to move material delivered by the first vanes in a direction generally outwardly away from the hub and along the flared portion of the rim.

10. As an article of manufacture, a rotor element for a pulp press comprising a central hub, a first set of vanes on said hub arranged to move a material axially of the hub, a tubular rim surrounding said vanes and having a portion of uniform diameter secured to the outer end margins of said vanes, said rim portion terminating at one end in a flared portion, and a second set of vanes forming a continuation of the first set of vanes, said second set of vanes being spiralled outwardly from the hub with their outer end margins engaging and underlying the inner surface of the flared portion of the rim, said latter vanes being arranged to move material delivered by the first vanes in a direction generally outwardly away from the hub and along the flared portion of the rim.

11. As an article of manufacture, a rotor element for a pulp press comprising a central hub, a first set of vanes on said hub arranged to move a material axially of the hub, a tubular rim having a portion of uniform diameter surrounding said first set of vanes and terminating at one end in a flared portion, and a second set of vanes spiralled outwardly from the hub with their outermost end margins extending under the inner surface of the flared portion of the rim, said hub, vanes and rim being integrally formed to provide a rotor element of one piece construction.

12. As an article of manufacture, a rotor element for a pulp press comprising a central hub portion, a first set of vanes on said hub arranged to move a material axially of the hub, a tubular rim surrounding said vanes and having a portion of uniform diameter secured to the outer end margins of said vanes, said rim portion terminating at one end in a flared portion, and a plurality of other vanes spirally extending outwardly from the hub with their outer end margins underlying the inner surface of the rim flared portion, said latter vanes having one set of their corresponding edges disposed towards the first vanes and their other set of corresponding edges disposed away from the first set of vanes and lying in a common plane.

13. In a device of the character described, a stationary housing having an inner tubular portion, a perforated baffle in said housing and spaced from said tubular portion, and a rotor element in said housing and having a tubular portion and a flared portion, said rotor tubular portion defining a rotatable extension of the stationary housing tubular portion and said rotor flared portion terminating adjacent the baffle, and continuous vanes rotatable with and extending lengthwise of said rotor and seating on said baffle.

14. In a device of the character described, a stationary flared housing having an inner tubular portion at one end thereof, a perforated baffle at the other end of said housing, peripheral openings through said flared housing communicating with the upper surface of said baffle, a rotatable shaft extending axially through said housing, and a rotor element carried by said shaft and having a tubular portion, a flared portion and continuous vanes extending lengthwise of said tubular and flared portions, said rotor tubular portion defining a rotatable extension of the stationary housing tubular portion and said rotor flared portion terminating in spaced relation from said baffle, and said vanes seating across the upper surface of said baffle.

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