

Dec. 24, 1940.

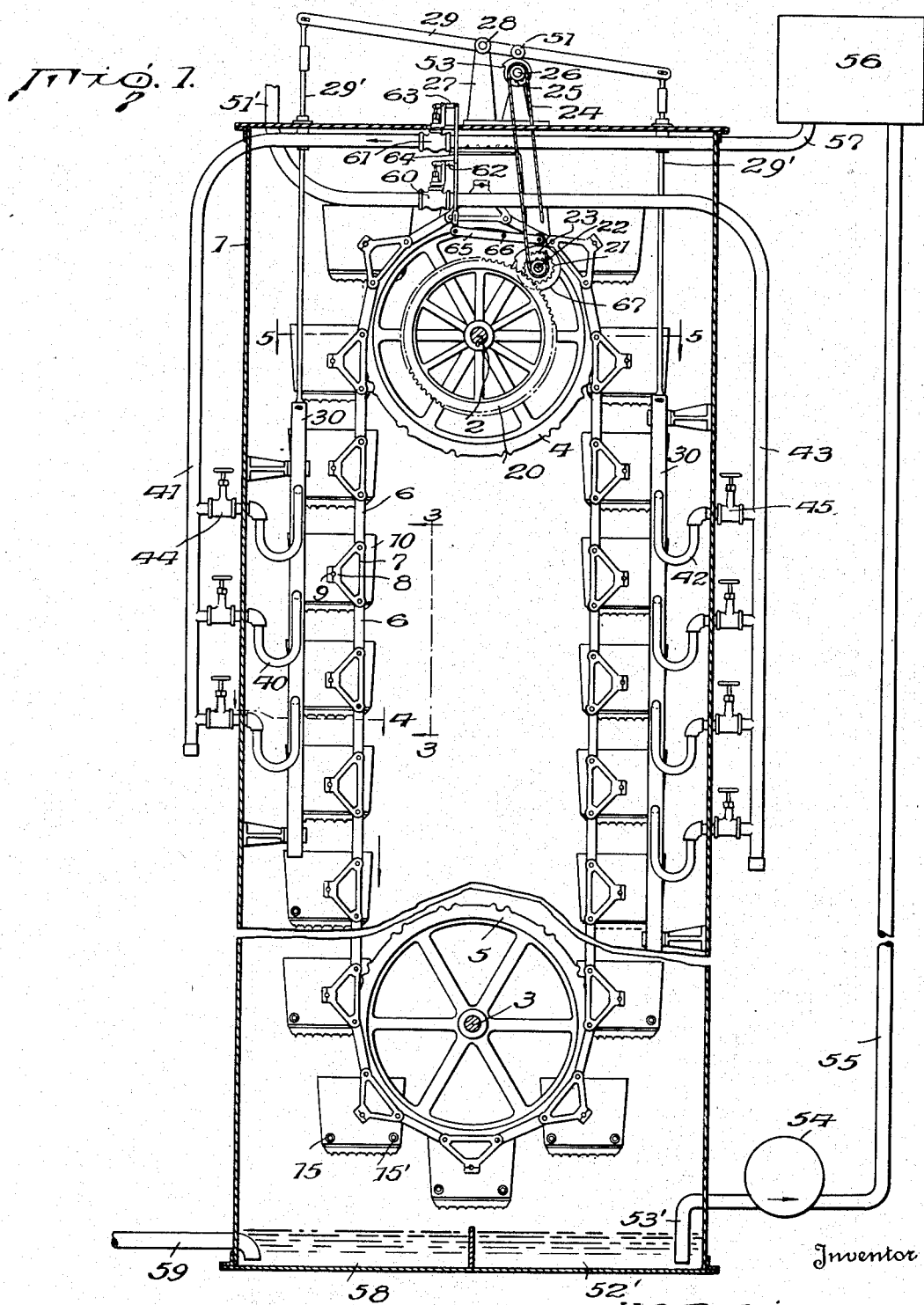
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2,225,799

SOLVENT EXTRACTION APPARATUS

Filed March 27, 1939

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

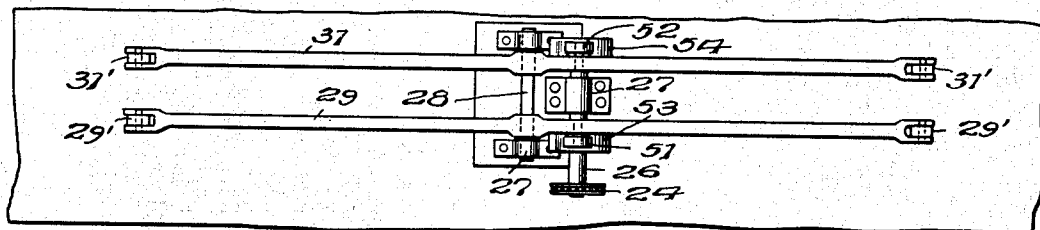


FIG. 2

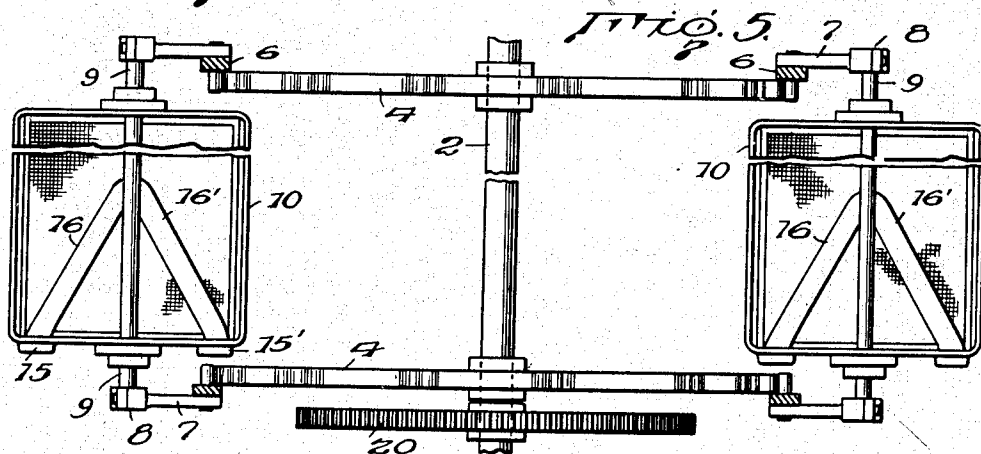


FIG. 5

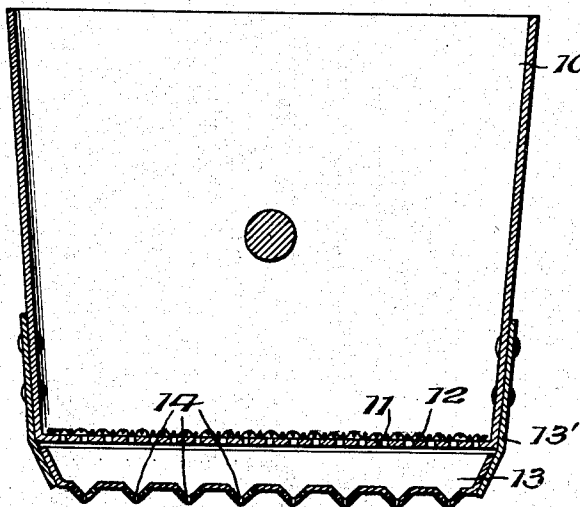


FIG. 6

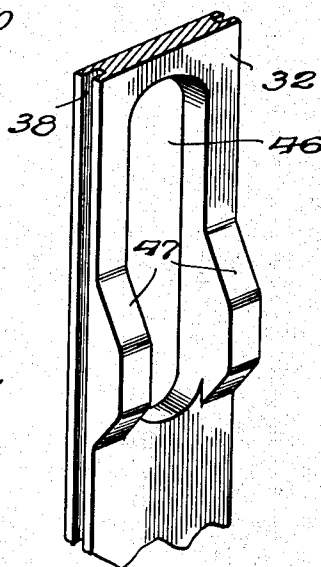


FIG. 8

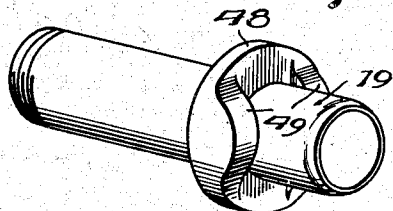


FIG. 7

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3 Sheets-Sheet 3

Fig. 3

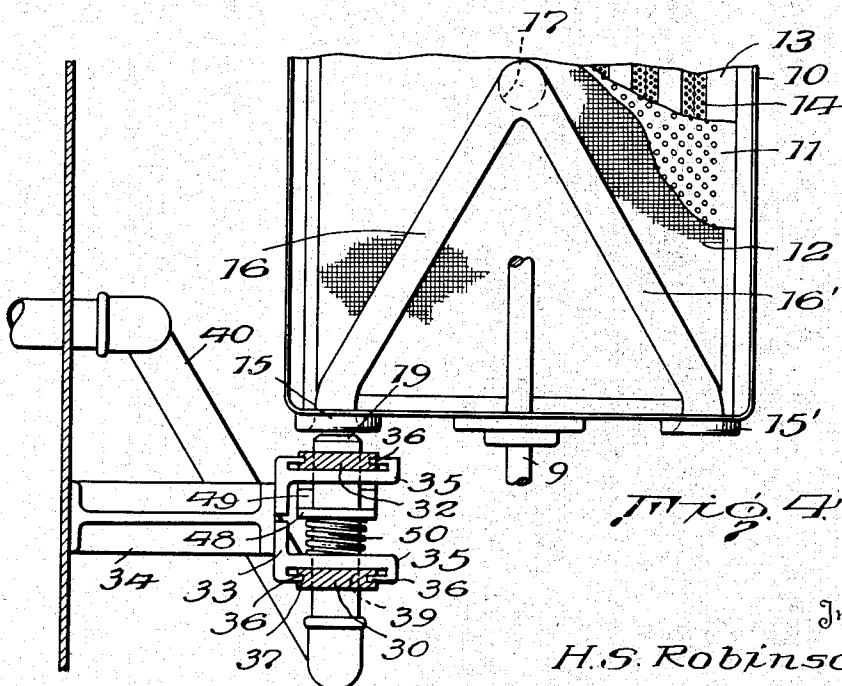
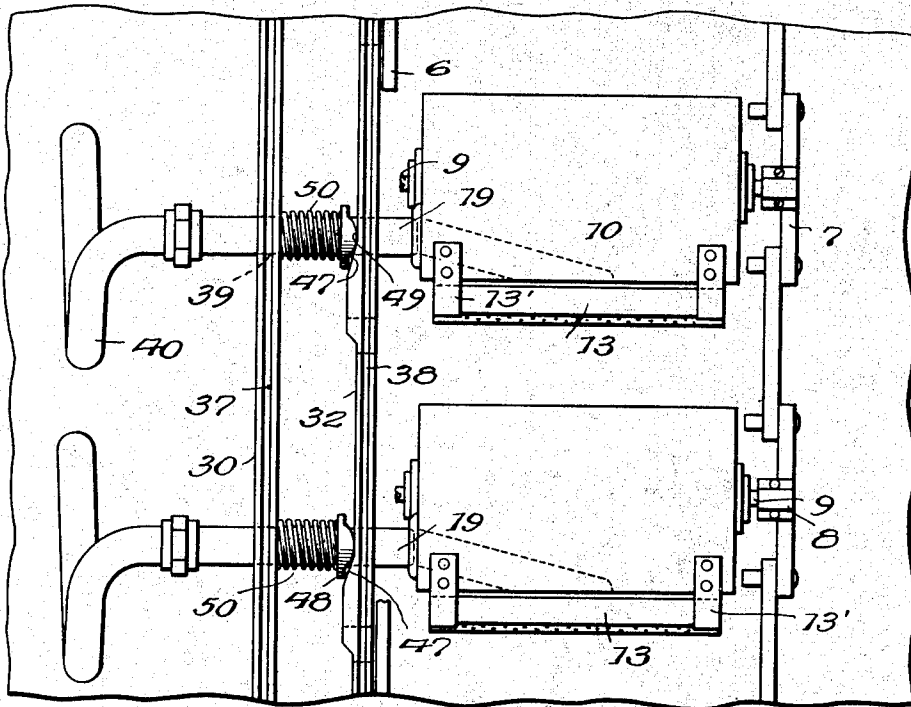


Fig. 4

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2,225,799

SOLVENT EXTRACTION APPARATUS

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Application March 27, 1939, Serial No. 264,505

22 Claims. (Cl. 23—270)

This invention relates to an apparatus for the extraction of soluble substances from materials of various kinds, and particularly to an apparatus for more satisfactorily extracting oils and fats from vegetable seeds and other oleaginous or fat-containing materials.

Various types of apparatus have been proposed for the solvent extraction of materials. In the paternoster type of apparatus the extraction takes place continuously while the material is conveyed in containers carried by a continuously moving chain; suitable means being provided for filling the containers during their cycle of movement with material to be extracted, passing solvent through the material while in the containers, and discharging the extracted material from the containers and removing it from the extraction chamber.

In the paternoster type of apparatus, as referred to above, it is known to position the sprockets over which the container-carrying chains pass so that the containers travel, mainly, in a vertical direction. Such an arrangement has the advantage over the type of apparatus in which the containers travel in a horizontal direction in that the solvent used to extract the oils or fats, or other extractable substances, from the material may be introduced into the containers at the upper ends of their flights and, as the containers are perforated, caused to pass downwardly by gravity through the several containers of the flights.

In an apparatus of the kind referred to, the solvent heretofore has been supplied from a stationary nozzle directed to introduce the solvent, serially, into the several containers just as they begin their downward movement. When it is also desired to have the solvent pass through the containers in a counter-current direction on the upwardly moving side of the cycle nozzles are positioned to introduce solvent into the several containers as they approach the upper end of their upward movement. As the open top of the containers are opposite the stationary nozzles for only a very limited period of time it has been necessary to introduce a relatively large amount of the solvent into the containers in a very short period of time, with resultant packing of material in the baskets due to the pressure exerted on the material in the containers by the solvent. Also, it has been difficult, to introduce the solvent into the moving container without considerable spillage.

It is an object of the present invention to provide an apparatus of the paternoster type for the

extraction of oleaginous and like material in which the solvent is introduced into the several containers in a manner which will prevent spillage of the liquid solvent, and in a manner which will give a longer period in which to introduce the desired amount of solvent into each container, thereby avoiding packing of the material in the containers, as occurs when the supply of solvent is added at one point in the limited time possible with a stationary nozzle.

More particularly, my invention comprises an extraction apparatus of the paternoster type in which the nozzles for supplying the solvent to the container are adapted to engage suitable sockets or openings in the containers, move with the containers while the solvent is being supplied through the nozzles, and thereafter to move away from the containers and return to their initial position, ready to engage other containers or buckets of the series.

In order that the liquid solvent may be more evenly distributed over the material in the containers, each container is provided at its bottom with a depending perforated pan or tray, and the solvent from the nozzles is introduced into those pans rather than into that part of the container which carries the material. The solvent after being introduced into the pan or tray carried by any particular container passes through the perforations therein in small streams into that part of the next lower container which carries the material to be extracted. Thus, the only force exerted by the solvent on the material in any container, is the slight gravitational force of the solvent in dripping from the depending perforated pan or tray of one container to the next lower container, which is insufficient to cause appreciable packing or channeling of the material.

The invention will be further described in connection with the accompanying drawings but it is to be understood that such further illustration and description is by way of exemplification and the invention is not limited thereto except as may be set forth in the appended claims.

In the drawings:

Fig. 1 is a vertical sectional view of an extraction apparatus embodying the present invention.

Fig. 2 is a plan view of the actuating mechanism for the guide bars and cam bars which control the movement of the solvent supplying nozzles.

Fig. 3 is a view on line 3—3 of Fig. 1 showing the nozzles engaged with the sockets of the

material-conveying containers, with the carrier chain at one side being broken away to better show certain features of the structure.

Fig. 4 is a horizontal sectional view on line 4-4 of Fig. 1.

Fig. 5 is a horizontal sectional view on line 5-5 of Fig. 1.

Fig. 6 is a vertical sectional view through one of the material-conveying containers and the distributing pan secured thereto.

Fig. 7 is a perspective view of one of the solvent supplying nozzles, and

Fig. 8 is a perspective view of a portion of the cam bar for withdrawing the nozzles from engagement with the sockets of the material-conveying containers.

Referring now to the drawings, the extraction apparatus comprises a vapor tight tank 1 having a main driving shaft 2 driven in any suitable manner rotatably mounted in the upper end thereof. A shaft 3 is mounted for rotation in suitable bearings adjacent the lower end of the tank 1 and in vertical alignment with the driving shaft 2. A pair of spaced sprockets 4 and a pair of spaced sprockets 5 are rigidly secured to and rotate with the shafts 2 and 3 respectively. The sprockets 4 function as driving means for a pair of carrier chains 6, the alternate links of which are formed as brackets 7 having bearings 8 in their outer ends for receiving trunnions 9 secured to and extending from opposite sides of material-conveying containers 10 positioned between the chains.

As shown in the drawings, the sprockets 4 and 5 are rotated in a counter-clockwise direction and cause the containers 10 carried by the chains 6 to move in a cycle in which they pass downwardly on the left hand side and upwardly on the right hand side of the apparatus, as viewed in Fig. 1. Suitable means (not shown) such as commonly is used in extraction apparatus of the type disclosed is provided for introducing the material to be extracted into the containers as they begin their downward movement for rotating the containers about the trunnions 9 to invert them after they have passed substantially through their cycle of movement and when they have reached the top, to discharge the extracted material. After the material has been discharged from the inverted containers they assume their normal position ready to receive a fresh charge of the material to be extracted as they again begin their downward movement. The material discharged from the containers may be conveyed from the tank and treated in any suitable manner for the recovery of any solvent remaining therein.

Each container 10 has a perforated bottom 11 over which is secured foraminous material 12 which will permit free passage of solvent and extracted oil from the material but will retain thereon the material undergoing extraction. A distributing pan or tray 13 is suspended beneath each container 10 by means of straps or the like 13'. The bottom of each pan 13 is provided with a plurality of longitudinally-extending V-shaped or corrugated troughs 14 which are perforated to permit the passage of solvent and extracted oil therethrough. Each container 10 also is provided at one side with a pair of sockets 15 and 15' which communicate with conduits 16 and 16', respectively, which converge inwardly and downwardly and terminate in a common outlet 17 which passes through the perforated bottom 11 of the container so that solvent from nozzles

19, located in the upper portion of the apparatus at each side thereof, may be introduced directly through either socket and conduit into the distributing pans secured to the bottom of the containers through either socket and the conduit extending therefrom, in the manner to be hereinafter set forth.

A driving gear 20 is rotatably secured to the main driving shaft 2 at one side of the tank 1 and meshes with and drives a pinion 21 rotatable upon a stub shaft 22, secured to one of the side walls of the tank. A sprocket 23 rotatable with the pinion 22 drives a chain 24 which passes around and drives a sprocket 25 rigidly secured to and rotatable with a shaft 26 mounted in a pair of brackets 27 secured to the top of the tank 1. A shaft 28 mounted in the upper end of the brackets 27 pivotally supports an oscillatable lever 29, having arms extending from each side of the shaft 28 and pivotally secured to the upper ends of adjustable connecting links 29'. The lower ends of the connecting links 29' are pivotally secured to the upper ends of a pair of vertically reciprocable guide bars 30 positioned at opposite sides of the tank. An oscillatable lever 31 is also pivotally mounted on the shaft 28 and, like the lever 29, has arms extending from opposite sides of the shaft 28. Adjustable connecting links 31' are pivotally secured to the outer ends of the arms of the lever 31 and have their lower ends pivotally secured to the upper ends of a pair of vertically reciprocable cam bars 32, also positioned at opposite sides of the tank and adjacent the guide bars 30.

The guide bars 30 and the cam bars 32 are guided in brackets 33 secured by other brackets 34 to a side wall of the tank. The brackets 33 have generally C-shaped extensions 35 including inwardly directed guide flanges 36 which engage in slots 37 and 38 formed in the opposite sides of the guide bars 30 and in the cam bars 32, respectively, as clearly shown in Fig. 4.

The nozzles on the descending side are connected by flexible connections 40 to a solvent header 41 and the nozzles on the ascending side are connected by like flexible connections 42 to a solvent header 43. Valves 44 and 45 are interposed between the flexible connections 40 and 42 and the headers 41 and 43, respectively.

The guide bars 30 have a plurality of vertically spaced circular openings 39 of a diameter approximately equal to the external diameter of the nozzles 19, through which the nozzles extend. The cam bars 32 are positioned opposite the guide bars 30 and are provided with plurality of vertically spaced, vertically-extending elongated openings or slots 46 through which the nozzles 19 also extend. Cams 47 are formed on each of the cam bars 32 at opposite sides of and adjacent the lower ends of the elongated openings or slots 46, and each nozzle is formed intermediate its length with a flange 48 having cams 49 at opposite sides thereof which are adapted to engage and ride upon the cams 47 as the cam bars are reciprocated. Springs 50 are interposed between the guide bars 30 and the flanges 48 of the nozzles to constantly urge the nozzles 19 inwardly towards the path of the traveling containers 10.

The oscillatable levers 29 and 31 carry rollers 51 and 52 respectively at one side of the shaft 28 which ride upon adjustable cams 53 and 54 rigidly secured in their adjusted position to the shaft 28 so that rotation of the shaft and the cams 51 and 52 will cause the levers 29 and 31

to be oscillated and the guide bars 30 and the bars 32 to be reciprocated vertically. The vertical reciprocation of the guide bars 30 cause the nozzles to be raised and lowered due to the fact that the nozzles pass through and snugly fit within the openings 39 of the guide bars. The flexible connections 40 and 42 permit the raising and lowering of the nozzles without interfering with the flow of solvent therethrough. The reciprocation of the cam bars 32 cause the cams 47 to be brought into and out of engagement with the cams 49 carried by the flanges 48 of the nozzles 19. Thus, when the cam bars 32 are raised the cams 47 are caused to move opposite the cams 49 and to compress the springs 50 and to move the nozzles 19 in a direction away from the path of travel of the containers 10. When the cam bars 32 are lowered the cams 47 move from a position opposite the cams 48 and the springs 50 act to again force the nozzles in a direction towards the path of travel of the containers 10, and to the position shown in Fig. 3 with their ends engaging the sockets 15 and 15' of the containers 10.

The chains carrying the containers 10 and the actuating mechanism for the guide bars 30 and cam bars 32 are all driven from the main driving shaft 2 and their movements are so synchronized that the nozzles are permitted to move towards the path of travel of the containers 10 only at such times that the sockets 15 and 15' are opposite the nozzles 19 so that the nozzles will be received within and make connection with the sockets. Also, the reciprocation of the guide bars 30 and cam bars 32 is such that after the nozzles have engaged the sockets 15 and 15' of the containers 10 the nozzles will move downwardly with the containers for a limited period of time, after which the cam bars 32 are raised to cause the cams 47 to engage the cams 49 on the nozzles and to cause the nozzles to be forced backwardly away from the sockets in the containers 10. After the nozzles have thus been withdrawn from the sockets in the containers the guide bars 30 are raised to restore the nozzles to their upper position, ready for movement again towards the containers when the cam bars 32 again are lowered. Thus the nozzles have a parallelogram movement imparted to them during which they move towards the moving containers 10, engage the sockets 15 and 15', move with the containers for a limited distance, are withdrawn from engagement with the sockets and then are moved upwardly to their original position.

As is clearly shown in Fig. 4, each container 10 is provided with a pair of sockets 15 and 15' and a pair of conduits 16 and 16' which terminate in the common outlet 17. Thus, on the descending side of the apparatus the sockets 15 will come opposite and receive the nozzles on that side; while on the ascending side the sockets 15' will come opposite and receive the nozzles on that side of the apparatus. The downward inclination of the conduits 16 and 16' is sufficient to prevent solvent being introduced through one socket and conduit from flowing through the other conduit and out of the other socket.

Pure solvent is supplied from any source through a supply line 51 to the solvent header 43 on the ascending side of the apparatus and, when the nozzles 19 on that side are in engagement with the sockets 15' pure solvent will flow from the header 43 through the nozzles on that side and conduits 16' to the distributing pans

13 of those containers with which the nozzles engage. The solvent will spread out in the distributing pans and pass through the perforations in the V-shaped troughs 14 in a myriad of fine streams, much like rain, into the portion of the next lower container containing the material to be extracted. Thus, the force of the flow of the solvent into the containers is broken and the kinetic energy of the solvent introduced is insufficient to cause packing or channeling of the material undergoing extraction with the result that extraction is more readily and thoroughly accomplished.

In each container on the ascending side the solvent passes downwardly through the material 15 and through the foraminous material 12 and perforated bottom 11 into the distributing pan 13 secured thereto from which it, together with any solvent which may be introduced directly into the distributing pan from the nozzles 19 when the containers are at the upper end of the ascending column, drips into the container next below until the solvent, now partially enriched with dissolved oil by passing through the oil-bearing material, drips into the accumulator compartment 52 at the bottom of the tank.

The partially enriched solvent, termed "half miscella," is withdrawn through a pipe 53 and pumped by a pump 54 through a pipe line 55 to an upper reservoir 56, from which it flows through a supply line 57 to the header 41 at the left hand side of the apparatus. The "half miscella" from the header 41 is supplied through the nozzles 19 at the left hand side to the fresh oil-bearing material in the upper containers of the descending column, the fresh material having been introduced into the containers as they began their descent. The passage of the "half miscella" through the containers in the descending column is the same as the passage of the pure solvent through the containers of the ascending column. As the containers in the descending column approach the lower end of the tank the further enriched solvent, or "miscella" drips into the accumulator compartment 58, from which it may be discharged through a pipe 59 for treatment to recover the extracted oil. The solvent also is recovered and returned through the supply line 51 as pure solvent.

The supply of pure solvent through the supply line 51, header 43 and the nozzles at the right hand side of the apparatus is controlled by a normally closed valve 60 in the supply line 51. Likewise, the supply of "half miscella" from the reservoir 56 to the header 41 and the nozzles at the left hand side of the apparatus is controlled by a similar valve 61 in the supply line 57. The valve stems of the valve 60 and 61 are pivotally connected to levers 62 and 63, which have their other ends pivotally connected to a common, adjustable actuating link 64. The lower end of the adjustable actuating link 64 is pivotally connected to one end of a lever 65 oscillatably mounted on a stub shaft 66 secured to one side of the tank. The other end of the lever 65 carries a roller which bears upon an adjustable cam 67, which, like the sprocket 23 is rotatable with the pinion 21.

The valve-actuating cam 67 being rotatable with the pinion 21 and sprocket 23, the opening and closing of the valves 60 and 61 is synchronized with the movement of the cam bars 32, the guide bars 30 and the nozzles 19 carried thereby, and the cam 67 is so formed and adjusted that the valves 60 and 61 are opened only while

the nozzles 19 are in their inward position and engage within the sockets 15 and 15' of the containers. As soon as the nozzles 19 are moved away from the sockets of the containers by the
 5 cams 47 of the cam bars 32, the valves 60 and 61 are closed to prevent leakage or dripping of the solvent from the nozzles.

The cams 53, 54 and 67 may be made adjustable in any manner, but preferably are secured
 10 in the desired position to cam driving rings, in a manner well known. The adjustability of the guide bars 30 and cam bars 32 which control the parallelogram movement of the nozzles 19, during which they move into and out of engagement
 15 with the sockets of the containers, coupled with the adjustable means for controlling the opening and closing of the valves 60 and 61 which control the flow of the pure solvent and "half miscella" to the headers 41 and 43, and
 20 consequently to the nozzles 19, provide flexibility of adjustment for the time of flow of the solvent to the containers and the length of the reciprocal travel of the nozzles while in engagement with the sockets of the containers. The provision of
 25 the valves 44 and 45 between the headers 41 and 43 and the flexible tubes 40 and 42 which lead to the nozzles enable the amount of solvent supplied from the headers to the flexible connections and the nozzles connected thereto to be
 30 controlled.

From the foregoing description it will be apparent that the present invention provides means for positively controlling the supply of solvent
 35 to the material to be extracted. Furthermore, the efficiency of the extraction is increased by the use of the present apparatus in that the solvent is so introduced into the containers containing the material to be extracted, that packing and channeling of the material does not occur;
 40 thereby enabling the solvent to pass through the material in an even flow; the flow being controlled by time and amount of solvent applied. The downward travel of solvent is more even and thereby more efficient in its action on soluble
 45 material, and is less influenced by, the insoluble material. Also, as the present invention provides for the control of the time during which given amounts of solvent may be introduced into the containers, the speed of the extraction may be
 50 controlled.

In addition to the advantages of the present apparatus set forth above, it also enables the solvent to be supplied to the containers while
 55 they are passing through their cycle of movement without appreciable loss of solvent, and enables the solvent passing through the material in the upper containers in each column to be collected in the distributing pans secured beneath those containers and there to be redistributed
 60 and mixed with the solvent introduced directly into the distributing pans by the traveling nozzles and to pass through the perforations in the bottom of those pans with a minimum of force and thereby be evenly distributed over the material
 65 in the containers directly beneath. In the lower containers of each flight the solvent passes through the material undergoing extraction and into the distributing pans carried by the containers until the solvent and the constituents extracted from the material drop into the accumulator compartments 52 or 58 in the manner above
 70 described.

Various changes may be made in the details of the apparatus disclosed without departing
 75 from the invention or sacrificing any of the ad-

vantages thereof. For example, the openings 15 and 15' may be placed in one of the vertical sides of the containers 10 instead of one of the ends, as shown in the drawings, and the nozzles 19 and the carriers therefor placed at such sides of the
 5 containers.

I claim:

1. An extraction apparatus comprising a series of moving containers for material to be extracted, solvent-supplying means, and means for
 10 moving said solvent-supplying means to engage and move with said containers and supply solvent to them while they are in motion.

2. An extraction apparatus comprising a series of containers movable through a cycle, means
 15 for driving said containers through said cycle, a solvent supplying nozzle, means for moving said nozzle into engagement with a moving container and for supplying solvent thereto while the container is in motion.

3. An extraction apparatus comprising a series of containers movable through a cycle, means
 20 for moving said containers through said cycle, a solvent supplying nozzle, means for causing said nozzle to successively engage and move with
 25 different containers of said series and to supply solvent to the containers while they are in motion.

4. An extraction apparatus comprising an endless conveyor, means for driving said endless conveyor,
 30 a series of containers for material to be extracted carried by said endless conveyor, a solvent supplying nozzle, means for causing said nozzle to move into engagement with said containers, to move with said containers for a limited distance and then return to its initial position, and means for supplying solvent through
 35 said nozzle while it is in engagement with said containers.

5. An extraction apparatus comprising an
 40 endless conveyor, means for driving said endless conveyor, a series of containers for material to be extracted carried by said endless conveyor, a solvent supplying nozzle, means for causing said nozzle to have a parallelogram movement during which it moves into engagement with one
 45 of the containers of said series, moves with said container for a limited distance, moves out of engagement with said container and returns to its initial position, and means for supplying solvent
 50 through said nozzle only while it is in engagement with a container.

6. An extraction apparatus comprising an
 55 endless conveyor, means for driving said endless conveyor, a series of containers for material to be extracted carried by said endless conveyor, a solvent supplying nozzle, means for reciprocating said nozzle, means for moving said nozzle toward and from the path of movement of said
 60 containers, and means for introducing solvent into the containers when the nozzle is moved to its forward position towards the path of travel of the containers.

7. An extraction apparatus comprising an
 65 endless conveyor, means for driving said endless conveyor, a series of containers for material to be extracted carried by said endless conveyor, a solvent supplying nozzle, means for reciprocating said nozzle, means normally urging said
 70 nozzle toward the path of movement of said containers, a reciprocatory cam member for controlling the movement of said nozzle toward and from the path of movement of said containers, and means for introducing solvent from said
 75 nozzle into the containers when said nozzle is in

its forward position towards the path of travel of said containers.

8. An extraction apparatus comprising an endless conveyor, means for driving said endless conveyor, a series of containers for material to be extracted carried by said endless conveyor, a solvent supplying nozzle, means for reciprocating said nozzle and causing it to move into engagement successively with different containers of said series, cam means controlling the movement of said nozzle into and out of engagement with said containers, and means for supplying solvent through said nozzle while it is in engagement with said containers.

9. An extraction apparatus of the paternoster type comprising an endless conveyor, means for driving said endless conveyor, a series of containers for material to be extracted carried by said endless conveyor, said endless conveyor and the containers carried thereby moving through a cycle in which the containers pass through descending and ascending columns of substantial length, a solvent supplying nozzle, a vertical reciprocable guide bar for raising and lowering said nozzles, means for causing said nozzles to move into engagement with said containers, a vertically reciprocable cam bar for controlling the movement of said nozzle toward and from the containers as they pass said nozzle, means for controlling the reciprocation of said guide bar and said cam bar whereby the nozzle has a parallelogram movement imparted to it during which it moves into engagement with one of the containers of said series, moves with said container for a limited distance, moves out of engagement with said container and returns to its initial position, and means for supplying solvent through said nozzle only when it is in engagement with a container of said series.

10. In an extraction apparatus, a container for material to be extracted comprising a compartment for said material having a perforated bottom, and a distributing pan having an open top secured to said container and extending beneath the entire perforated portion of the bottom thereof and having perforations in its bottom through which liquid may pass, and means for introducing a solvent for material to be extracted directly into the distributing pan.

11. In an extraction apparatus, a container for material to be extracted comprising a compartment for said material having a perforated bottom, and a distributing pan having an open top secured to said container and extending beneath the entire perforated portion of the bottom thereof and having perforations in its bottom through which liquid may pass, a solvent supplying nozzle, and means for introducing solvent for the material to be extracted from said nozzle into said distributing pan.

12. In an extraction apparatus, a container for material to be extracted comprising a compartment for said material having a perforated bottom, and a distributing pan having an open top secured to said container and extending beneath the entire perforated portion of the bottom thereof and having perforations in its bottom through which liquid may pass, a solvent supplying nozzle, and means for introducing solvent for the material to be extracted from said nozzle directly into said distributing pan.

13. In an extraction apparatus, a container for material to be extracted comprising a compartment for said material having a perforated bottom, and a distributing pan secured to said con-

tainer beneath the perforated bottom and having perforations in its bottom through which liquid may pass, an imperforate conduit passing through said container and communicating with an opening in the bottom thereof, and means for passing solvent for the material to be extracted through said conduit into said distributing pan.

14. In an extraction apparatus, a container for material to be extracted comprising a compartment for said material having a perforated bottom, and a distributing pan secured to said container beneath the perforated bottom and having perforations in its bottom through which liquid may pass, a conduit extending through said container and communicating with an opening in the bottom thereof, a solvent supplying nozzle, and means for causing said nozzle to be temporarily engaged with said conduit, whereby solvent for material to be extracted may be introduced directly from said nozzle into said distributing pan.

15. In an extraction apparatus, a container for material to be extracted comprising a compartment for said material having a perforated bottom, and a distributing pan secured to said container beneath the perforated bottom and having perforations in its bottom through which liquid may pass, a conduit extending through said container and terminating at one end in an outlet in the bottom of said container, the other end of said conduit terminating in a socket at one side of the container, a solvent supplying nozzle, and means for causing said solvent supplying nozzle to intermittently engage in said socket, and means for passing solvent through said nozzle when it is in engagement with said socket, whereby solvent may be introduced directly from said nozzle into said distributing pan.

16. In an extraction apparatus, a container for material to be extracted comprising a compartment for said material having a perforated bottom, and a distributing pan secured to said container beneath the perforated bottom and having perforations in its bottom through which liquid may pass, a plurality of conduits extending through said container, each terminating at one end in an outlet communicating with the bottom of said container, the other end of each of said conduits terminating in a socket in one side of the container, a solvent supplying nozzle, and means for intermittently moving said nozzle into engagement with the socket at the end of one of said conduits, and means for supplying solvent through said nozzle when it is in engagement with one of said sockets, whereby solvent may be supplied directly from said nozzle to said distributing pan.

17. In an extraction apparatus, a container for material to be extracted comprising a compartment for said material having a perforated bottom, and a distributing pan secured to said container beneath the perforated bottom and having perforations in its bottom through which liquid may pass, a plurality of inwardly and downwardly converging conduits, each terminating at one end in a common outlet in the bottom of said container, the other end of each of said conduits terminating in a socket at one side of the container, a solvent supplying nozzle, and means for intermittently moving said nozzle into engagement with the socket carried at the end of one of said conduits, and means for supplying solvent through said nozzle when it is in engagement with said socket, whereby solvent may be

supplied directly from said nozzle to said distributing pan.

18. Extraction apparatus of the paternoster type comprising an endless conveyor for material to be extracted, containers having perforated bottoms carried by said conveyor, said conveyor and containers moving through a cycle in which the containers pass through descending and ascending columns of substantial length, a distributing pan having a perforated bottom secured beneath the perforated bottom of each of said containers, each of said containers having a plurality of conduits extending therethrough, each terminating at one end in an outlet in the bottom of said container, the other end of each of said conduits terminating in a socket at one side of the container, at least one solvent supplying nozzle located adjacent both the ascending column and descending column of containers, means for intermittently moving the nozzle adjacent the descending column successively into engagement with the socket of one of the conduits carried by the containers of said series, and means for intermittently moving the nozzle adjacent the ascending column successively into engagement with the socket of the other conduit carried by said containers, and means for causing solvent to pass through said nozzles when they are in engagement with said sockets, whereby solvent may be supplied from the nozzles adjacent either column directly into the distributing pans carried by said containers.

19. In an extraction apparatus, a container for material to be extracted comprising a compartment for said material having a perforated bottom, a distributing pan having an open top secured to said container and extending beneath the entire perforated portion of the bottom thereof, the bottom of said distributing pan having trough-like portions, said trough-like portions having perforations through which liquid may pass, and means for introducing a solvent for material to be extracted directly into said distributing pan.

20. An extraction apparatus comprising an end-

less conveyor, means for driving said conveyor through a cycle including a least one substantially vertical path, a series of containers for material to be extracted carried by said endless conveyor, means for introducing solvent into said containers during their cycle of movement, each of said containers having a perforated bottom whereby solvent from one container may pass to the subjacent container, and means below the perforated bottom of each container for redistributing solvent passing therethrough over substantially the entire surface of material in the subjacent container.

21. An extraction apparatus comprising an endless conveyor, means for driving said conveyor through a cycle including at least one substantially vertical path, a series of containers for material to be extracted carried by said endless conveyor, means for introducing solvent into said containers during their cycle of movement, each of said containers having a perforated bottom whereby solvent from one container may pass to the subjacent container, and means secured to the bottom of each container for receiving and redistributing solvent, whereby solvent draining through the material in a container will be caught by said solvent receiving and redistributing means and redistributed before it passes to the subjacent container.

22. An extraction apparatus comprising an endless conveyor, means for driving said conveyor through a cycle including at least one substantially vertical path, a series of containers for material to be extracted carried by said endless conveyor, means for introducing solvent into said containers during their cycle of movement, each of said containers having a perforated bottom whereby solvent from one container may pass to the subjacent container, and a pan having a perforated bottom secured beneath the perforated bottom of each container, whereby solvent draining through the material in a container will be caught by the attached pan and redistributed before it passes to the subjacent container.

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