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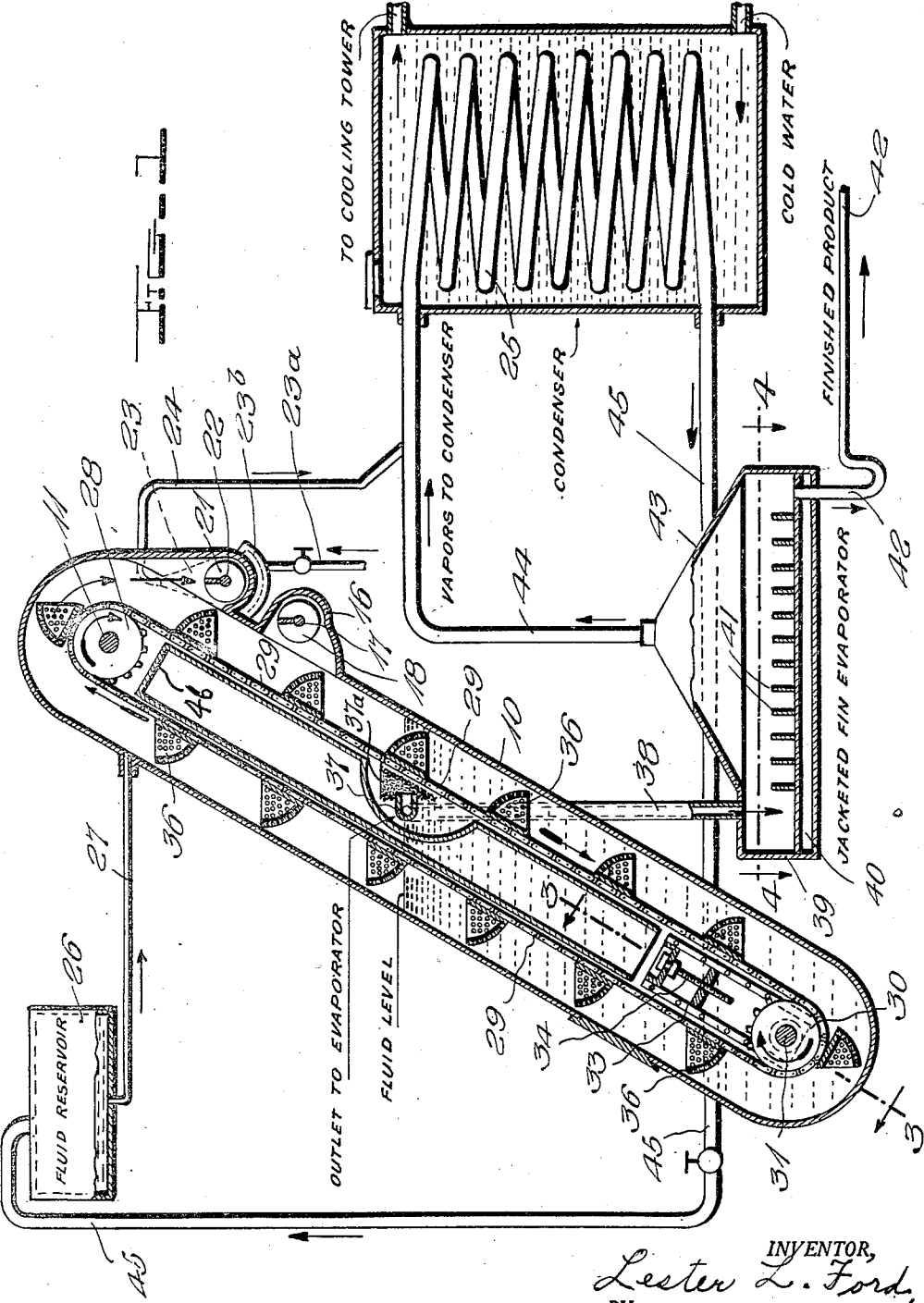
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2,451,081

APPARATUS FOR EXTRACTING VEGETABLE OIL

Filed Aug. 24, 1943

2 Sheets-Sheet 1



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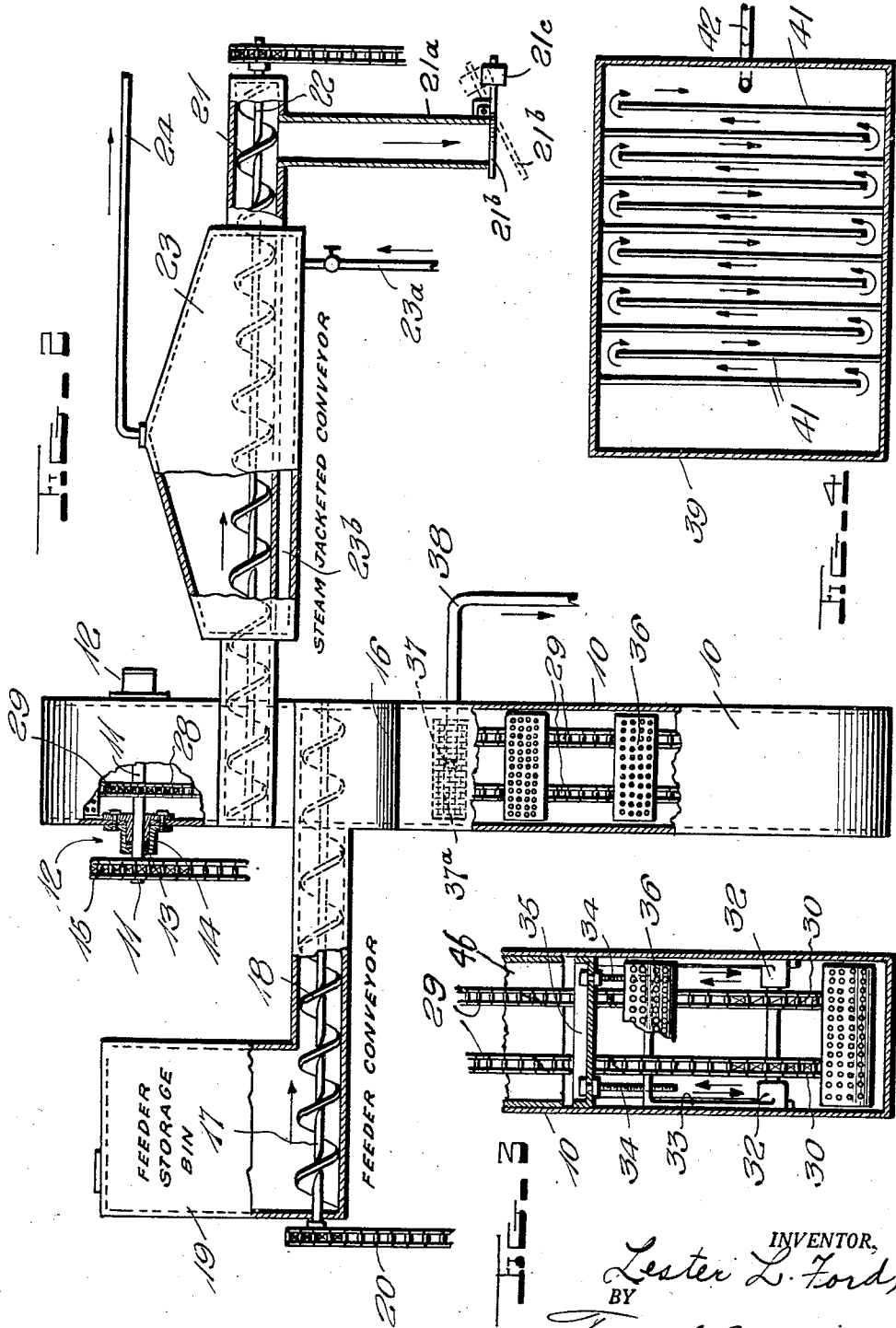
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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

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APPARATUS FOR EXTRACTING  
VEGETABLE OIL

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2 Claims. (Cl. 23—267)

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This invention relates to an apparatus for extracting vegetable oil, and provides for subjecting the material to a solvent circulated in a machine, wherein provision is made for sealing the contents of the machine and parts thereof so that vapors will not escape except through channels provided for their circulation. For extracting vegetable oil a number of elements may be employed as solvents, and fluid such as the hexane group, including benzene, aviation gasoline and petroleum ether, has been successfully used, so long as it has a boiling point under 170 degrees F. and leaves no objectionable residue, so that in the further description, the term "solvent" will be employed to include suitable fluid that is used for the purpose and having the above characteristics.

It is a further object of this invention to provide novel means for circulating the material and the solvent, for delivering the material to an extraction chamber, wherein the extraction chamber is inclined to retard the too rapid descent of the material in the solvent and including a means by which material is removed from the chamber and conveyed through a heated zone where vapors from the material are exhausted and from which the spent material is discharged. The invention also may include means for collecting vapors of the solvent, condensing such vapors, and returning them to the fluid reservoir, from which they may again enter the extraction chamber.

An object furthermore is to provide means for sealing the vapors inside the machine and so long as the feeder hopper remains loaded, the screw forms a seal.

A further object of the invention is to produce in combination a plurality of elements coacting in sequence or time, which results in a complete automatic operation.

With the foregoing and other objects in view, the invention consists in the details of construction, and in the arrangement and combination of parts to be hereinafter more fully set forth and claimed.

In describing the invention in detail, reference will be had to the accompanying drawings forming part of this application, wherein like characters denote corresponding parts in the several views, and in which:

Figure 1 illustrates a view in elevation, partly in section, showing one side of the apparatus;

Figure 2 illustrates a similar view of the apparatus at right angles to that shown in Figure 1;

Figure 3 illustrates a sectional view of a part of the apparatus on the line 3—3 of Fig. 1; and

Figure 4 illustrates a sectional view of the evaporator on the line 4—4 of Figure 1.

In these drawings 10 denotes an elongated inclined extraction chamber which may be re-

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garded as an elevator shaft or housing, in which the elevator buckets are moved for lifting the material from a zone near the bottom of the shaft and delivering it to a discharging conveyor.

In the present embodiment of the invention, a driven shaft 11 is journaled in bearings 12 that are vapor-proof and each includes a packing ring 13 and a gland 14. The shaft is provided with suitable power transmitting means 15, such as a sprocket wheel and chain. The extraction chamber has a laterally extending pocket 16 in one side wall of which a conveyor shaft 17 is journaled, the said shaft having a screw 18 thereon, and it is shown that the conveyor screw operates in the bottom of a feed storage bin 19 and that the shaft 17 projects through the wall of the storage bin and is journaled therein. The outer end of the shaft is provided with power transmitting means 20, such as a sprocket wheel and chain.

A screw conveyor 21 has a shaft 22 which extends laterally through the extraction chamber above the end of the pocket 16 of said extraction chamber and it is open at the top for the purpose of receiving the treated material which is elevated in the extraction chamber, as will presently appear. The screw conveyor 21 extends through a steam jacket 23, the heat from which causes the vapor in the material to rise and escape through the pipe 24 from whence it discharges into a condensing coil 25, the condensation being returned to the fluid reservoir 26, and the fluid from the reservoir enters the extraction chamber through the pipe 27 and of course commingles with the material delivered to it from the feed storage bin. The steam jacket is provided with steam through the pipe 23a which enters the chamber 23b of the steam jacket.

It is seen that the extraction chamber 10 is elongated and set on an incline and material delivered to it is retarded in its descent by reason of the engagement of the material with the inclined side of the chamber. The shaft 11 has sprocket wheels such as 28 mounted on it and these are engaged by sprocket chains such as 29, which sprocket chains operate over similar sprocket wheels such as 30 near the bottom of the extraction chamber. The shaft 31 on which the sprocket wheels 30 are mounted is journaled in bearings 32 carried by a yoke 33 which is adjustable to regulate the tension of the chains through the medium of screws 34 rotatably mounted in a cross bar 35 extending from one side wall to the other of the extraction chamber and secured thereto in any appropriate way.

The sprocket chains are provided with perforated buckets 36 which collect material in the bottom of the extraction chamber and carry it upward and over the top of the shaft 11, from whence it is deposited in the conveyor 21 and transferred by the screw through the steam jack-

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et and discharge chute 21a, the vapors being meanwhile collected, as heretofore described, through the use of the pipe 24 and its connections.

The discharge chute 21a is guarded at its end by a gate 21b which closes by gravity through the operation of a weight 21c after the chute has become evacuated. The gate maintains the air sealed condition of the system.

Within the extraction chamber there is an outlet 37 with a pipe 38 communicating with an evaporator 39 provided with a steam jacket 40. The evaporator has fins 41 on its floor alternately terminating at the sides of the chamber so that the fluid circulates back and forth along the fins, and the finished, reclaimed oil escapes through the pipe 42 to a suitable reservoir or receptacle. A filter 37a protects the outlet from receiving anything but fluid reaching the pipe 38. The extraction chamber is thus divided into a vapor space above the said outlet, whereas that part of the extraction chamber below the said outlet is a liquid space. The extraction chamber has a longitudinally disposed partition 46 dividing the extraction chamber so that the buckets travel downwardly between the partition and the wall of the extraction chamber and upwardly on the other side of the partition in a space between said partition and the opposite wall of the extraction chamber. These separate spaces are formed for the down traveling course of the buckets and for the up traveling course of the buckets. These compartments, separated as they are between the ends of the extraction chamber, connect with that part of the extraction chamber at the bottom or "boot" above the sprocket yoke and connect with the top part below the upper sprocket wheels.

It is seen that the evaporator has a hood 43 for the collection of vapors arising from the evaporator, and the said vapors escape through the pipe 44 to condenser 25 and the condensate thereof also reaches the fluid reservoir 23 through the connections 45 heretofore described as leading to the fluid reservoir.

I claim:

1. An extraction apparatus combination comprising an elongated inclined extraction chamber having shafts positioned at its upper and lower end, an endless conveyor operated by said shafts, perforated buckets on said conveyor arranged to

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travel with small clearance with the walls of said chamber and in upward flight to raise material from the bottom section of said chamber for drainage through said perforated baskets and in its downward flight to force material downwardly into said bottom section, a central partition in said chamber dividing said flights so that liquid admitted thereto in the upflight compartment flows downwardly and under the partition for drainage in the downflight compartment, an inlet for extraction liquid in the upper portion of said upflight compartment, an overflow outlet for the micella, a first screw conveyor extending into the upper portion of said downflight compartment of the chamber, and a second screw conveyor extending into said downflight compartment above said first conveyor and arranged to receive material discharged from said baskets on commencement of said downward flight.

2. Apparatus as defined in claim 1 in combination with an evaporator to which the micella is delivered from the overflow outlet, a condenser to which vapors of the extraction liquid are delivered from the evaporator, a vapor pipe leading from the top of the extraction chamber to the condenser, and an outlet for the finished product leading from the evaporator.

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#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

| Number    | Name      | Date          |
|-----------|-----------|---------------|
| 357,528   | Herreshof | Feb. 8, 1887  |
| 550,035   | Wheeler   | Nov. 19, 1895 |
| 615,968   | Craney    | Dec. 13, 1898 |
| 720,789   | Delattre  | Feb. 17, 1903 |
| 913,751   | Mills     | Mar. 2, 1909  |
| 1,694,361 | Sterling  | Dec. 4, 1928  |
| 2,088,190 | Du Pont   | July 27, 1937 |
| 2,187,208 | McDonald  | Jan. 16, 1940 |
| 2,264,390 | Levine    | Dec. 2, 1941  |
| 2,273,557 | Bonotto   | Feb. 17, 1942 |

#### FOREIGN PATENTS

| Number  | Country       | Date        |
|---------|---------------|-------------|
| 215,113 | Great Britain | May 6, 1924 |