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METHOD AND MEANS FOR REMOVING OILS AND OTHER EXTRACTS
Filed Feb. 11, 1939

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2 Sheets-Sheet 1

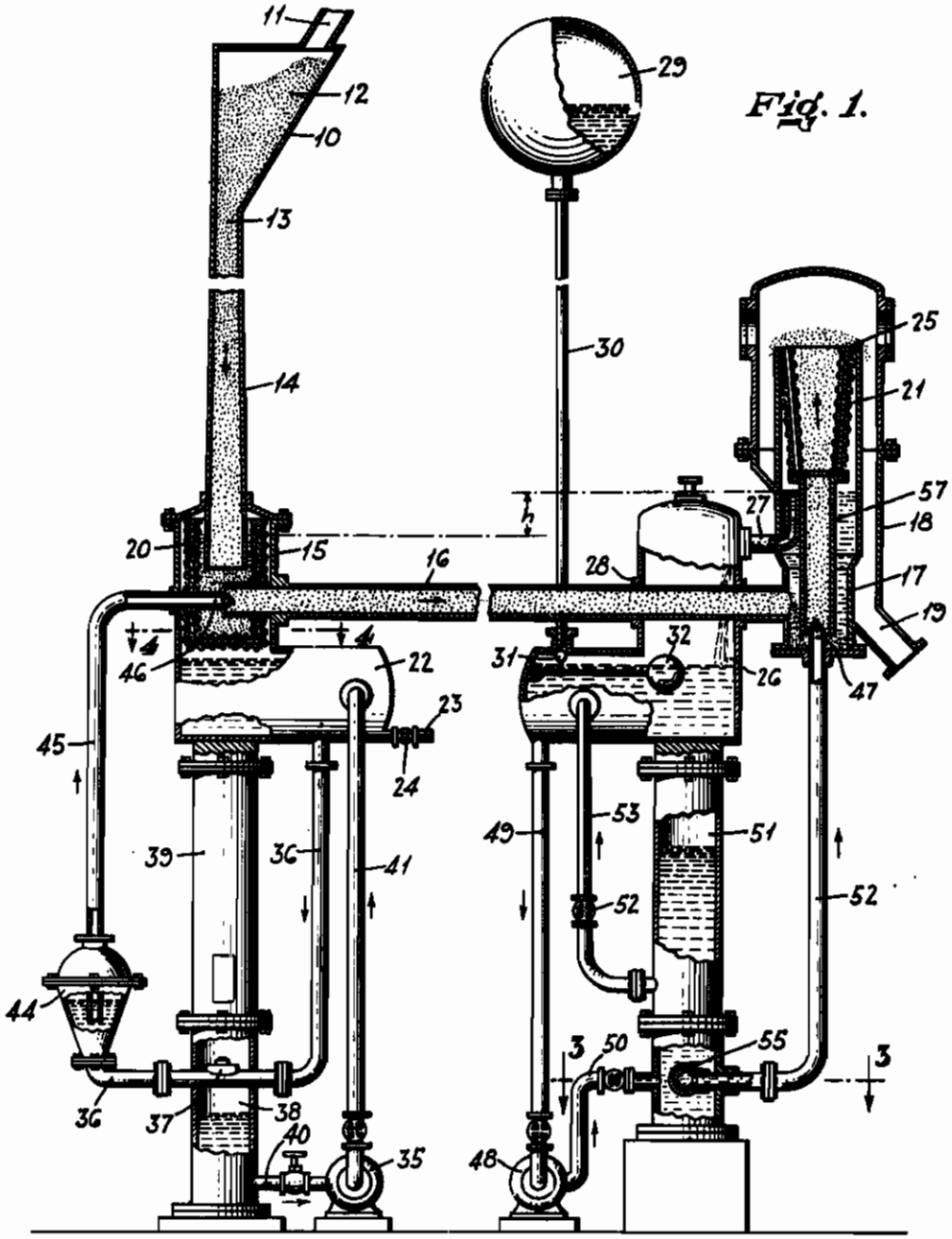

Fig. 1.

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Fig. 2.

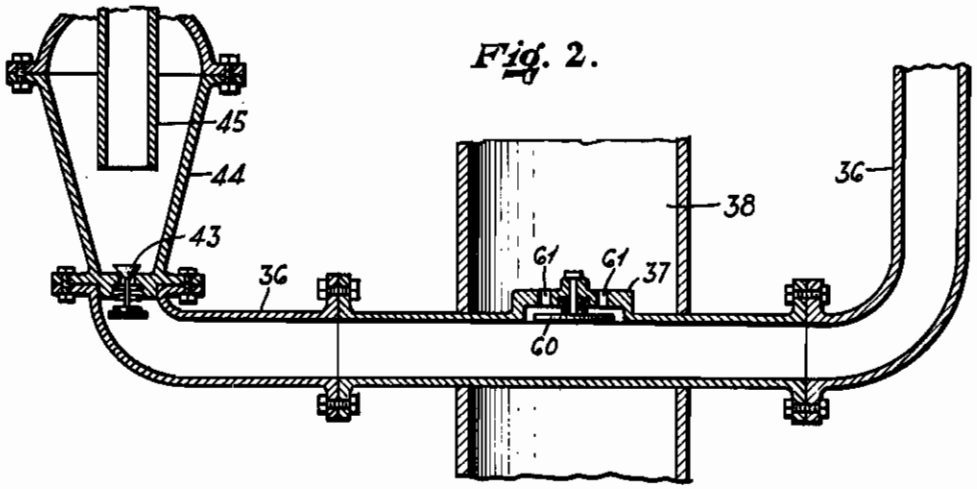


Fig. 3.

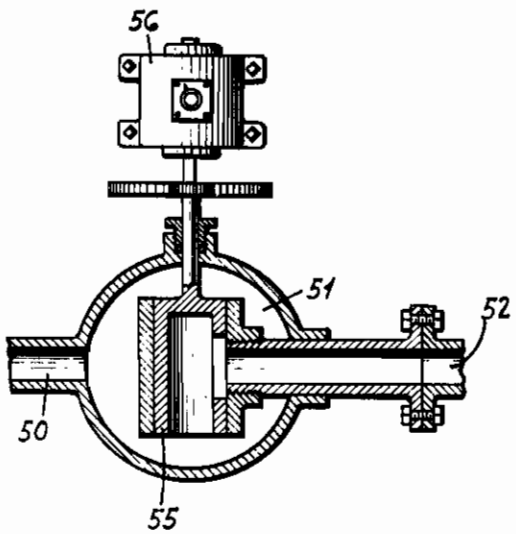
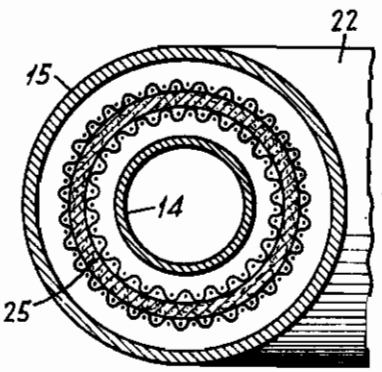


Fig. 4.



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ALIEN PROPERTY CUSTODIAN

METHOD AND MEANS FOR REMOVING OILS AND OTHER EXTRACTS

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This invention relates to a method and means for continually extracting oils and other substances.

In the course of a continuous lixiviation or extraction of various materials, such as oils, fats and other soluble extracts, it is very difficult to provide a transportation of the material subjected to extraction which would be uniform, and free from interruptions or other disturbances. It is necessary, however, that the material be transported through the extraction solution over a comparatively long path, the extraction solution usually flowing counter current to the direction of movement of the material.

In prior art extractors, reciprocatory pistons or pipes were used for the purpose of moving the material step by step, and these pistons or pipes transmitted their pressure either directly upon the material subjected to extraction or employed frictional forces to cause it to move along with them.

An object of the present invention is to eliminate the inconveniences and disadvantages of these prior art methods and to provide a simple and easily operable method and means for continuously extracting oils, fats and other substances.

Another object of the present invention is the provision of a device for continually extracting oils and other substances wherein the extraction process is carried out in a simple hollow pipe which does not contain any transporting screws, pressure pistons or other transporting devices.

Other objects will be apparent during the course of the following specification.

It was found that small amounts of liquid projected with a comparatively great force and having the effect of short, powerful blows to which the extraction solution is subjected at suitable places, have the effect of readily transporting, step by step, the material situated within the extraction solution from its place of entry to the outlet. This effect takes place even when the extraction solution flows counter current to the material.

The objects of the present invention may be realized, therefore, through the use of a purely hydraulic pressure operating intermittently in the form of short powerful thrust-like blows upon the extraction solution and transmitted to the material through that extraction solution and not through the use of any auxiliary mechanical means.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings showing by way of example, a preferred embodiment of the inventive idea.

In the drawings:

Figure 1 is a diagrammatic view, partly in section of an extraction device constructed in accordance with the principles of the present invention.

Figure 2 shows a portion of the device for producing hydraulic blows, upon an enlarged scale.

Figure 3 is a section along the line 3—3 of Figure 1, on a larger scale; and

Figure 4 is a section along the line 4—4 of Figure 1, on a larger scale.

The device illustrated in the drawings comprises a hopper 10 having an upper opening 11 into which the material 12 to be subjected to extraction is introduced.

The lower opening 13 of the hopper 10 is connected with a long vertical pipe 14, the lower end of which is situated within a cylindrical casing 15.

The casing 15 also carries one end of an elongated horizontal pipe 16, the opposite end of which is connected with a casing 17. The casing 15 encloses a filter 20 which is a standard wash-filter and consists of a filter mass which is enclosed between two sieve surfaces while a thin layer of the filtered material which covers the surfaces of the sieves operates as the final filtering medium. This filter operates as a solvent remover.

A pipe 45 has one end provided with a nozzle 46 which is carried by the casing 15 and the filter 20 and which projects into the inflow opening of the pipe 16.

The casing 15 is carried by a container 22 which is supported by a column 39. The interior of the container 22 is in communication with the pipes 23, 36 and 41. The outflow pipe 23 carries a valve 24. The pipe 36 carries a drop valve 37 and is connected through a valve 43 (Fig. 2) with the interior of a container 44 enclosing an end of the pipe 45.

The valve 37 connects the interior of the pipe 36 with a chamber 38 situated below the column 39 and connected by a pipe 40 with a pump 35 which is also connected with the pipe 41.

The column 39 which is situated between the container 22 and the valve 37, is used merely as a support for the container 22 and does not provide a communication between the chamber 38 and the container 22.

The pipe 16 constitutes the actual extraction chamber. It has smooth inner walls and does

not contain any transporting devices or the like.

The pipe 16 should be of such length that the material 12 moving through the pipe with a predetermined speed should be subjected to extraction for the required period of time.

While the pipe 16 is shown as being straight in the drawings, it may be curved or bent in any suitable manner or may have the form of a sinuous curve. Care must be taken, however, that all of the parts of the pipe 16 should lie in the same horizontal plane.

However, in order to be able to overcome frictional forces better, it is advisable to incline the pipe 16 to a small extent in the direction toward the container 17. Whenever specifically light extraction means, such as benzene, benzol, or ether are used, the pipe 16 should be inclined downwardly in the direction toward the container 17, while in the case of specifically heavy solvents such as tri-, tetra-, etc. the pipe 16 should be directed upwardly.

Due to the simplified method of transporting the material 12, the process of the present invention, is particularly suitable for specifically light solvents, for instance, solvents which are lighter than the material 12.

The casing 17 which supports the opposite end of the extraction pipe 16, is enclosed by another casing 18 which is provided with an out-flow pipe 19. A filter 21 provided with upper edges 25, is substantially similar to the filter 20 and is situated within the casing 17. The filter 21 is used to remove the solvent still adhering to the material 12 and cause a return of that solvent, into circulation.

The pipe 16 is supported by bearings 28 of a container 26 which is carried by a pipe 51.

An upper container 29 is connected with the container 26 by a vertical pipe 30 and a valve 31 having a float 32. A pipe 49 connects the container 26 with a pump 48 which is connected by the pipe 50 with the pipe 51.

A steering cock or valve 55 situated within the pipe 51 is driven by the motor 56 (Fig. 3) and is connected with a pipe 52 having a nozzle 47 projecting into a vertical pipe or casing 57 situated below the filter 21 within the casing 17.

A short-circuit pipe 53 carrying a valve 52 connects the container 26 with the container 51.

In operation, the material 12 to be extracted is introduced through the opening 11 into the hopper 12, and drops through the vertical pipe 14 into the interior of the filter 20.

As will be described in greater detail hereinafter, the blows of the liquid ejected through the nozzle 46 cause the material 12 to move step by step through the extraction pipe 16. The pressure of the liquid ejected through the nozzle 47 causes the treated material to rise vertically in the pipe 57 and the filter 21 and to drop over the edges 25 of the filter 21 into the outflow pipe 19.

A concentrated oil or extract solution known as "Miscella" flows through the filter 20 into the container 22, and may be removed therefrom for further use either intermittently or continually through the pipe 23 carrying the valve 24.

The residue liquid remaining in the material 12 after the latter has passed through the extraction pipe 16, is removed in the filter 21 before the residue is caused to drop over the edges 25 of the filter 21 into the space between the containers 17 and 18, and is removed from that space through the outflow pipe 19.

The solvent removed in the filter 21 is returned to a container 26 by an angular pipe 27 which connects the filter 21 with the container 26.

The container 26, which also serves as a support for the long extraction pipe 16, receives continually a fresh supply of solvent from the container 29, the supply being regulated by the valve 31 having the float 32.

The amount of solvent flowing through the valve 31 into the container 26 corresponds to the amount of liquid removed through the pipe 23.

There is a difference in level between the liquid situated in the filter 21 and the liquid situated in the filter 20, this difference being represented by the letter *h* in Figure 1.

Due to this level difference, the extracting solvents are driven through the material 12 situated in the pipe 16 in counter current to the direction of movement of this material.

As already stated, the nozzles 46 and 47 are used to transport the material 12 through the device by ejecting intermittently out of their pipes 45 or 52 small amounts of liquid with the greatest possible original velocity, i. e. with a great kinetic energy, into the current of the comparatively slowly flowing extraction means. Each of the nozzles 46 and 47 has the form of a shower head provided with many openings. The nozzle 46 extends horizontally at the inflow end of the horizontal pipe 16 and is used for the horizontal transportation of the material 12, while the nozzle 47 is situated beyond the outflow end of the extraction pipe 16 and extends vertically, since its purpose is to transport the material 12 upwardly through the pipe 57 and the filter 21.

The intermittent blows exerted by the liquid ejected through the nozzles 46 and 47 shift the material 12 rhythmically through the device until it falls by gravity over the edges 25 of the filter 21 into the outflow pipe 19.

Many suitable devices may be used for the purpose of ejecting small amounts of liquid with high initial energy through the nozzles 46 and 47.

In the device illustrated in the drawings, a hydraulic ram is used for the purpose of ejecting liquid through the nozzle 49, while a steered shut-off valve is used to eject the liquid through the nozzle 47.

In actual practice, however, it may be advantageous to use similar devices for operating the two nozzles.

The hydraulic ram operates as follows:

The liquid situated in the container 22 is driven by the pump 35 through the pipe 36 and toward the drop valve 37 which is normally open (Fig. 2). The liquid flows through the valve 37 into the container 38 and thence through the conduit 40 into the casing of the pump 35, and is transported through a pipe 41 back into the container 22.

As soon as the liquid flowing through the pipe 36 has reached a certain predetermined speed, it presses the body 60 (Fig. 2) of the valve 37 upwardly until the valve body 60 closes the openings 61 and thus interrupts the communication between the pipe 36 and the chamber 38.

Then the liquid column remaining in movement in the pipe 36 strikes against the valve body 62 of the valve 43 situated between one end of the pipe 36 and a container 44, and opens the valve 43. Then a comparatively small amount of liquid will flow rapidly upwards through the container 44 and the pipe 45 into the nozzle 46, and will be ejected out of the nozzle 46 into the

extraction pipe 16, the effect of this liquid being that of a sharp swift blow.

As soon as the kinetic energy of this amount of liquid has been used up, the valve body 60 of the valve 37 drops downwardly again and the valve 37 is opened, thus permitting the pump 35 to cause a circulation of liquid through the valve 37, the chamber 38 and the pipes 40 and 41. When the circulating liquid reaches a predetermined speed, the valve 37 is again closed and the same operation is repeated.

Thus the hydraulic ram operates periodically and automatically, without the assistance of any steering devices, the effect of the ram being that of periodically repeated blows, exerted by a liquid of comparatively small volume but high initial energy. Due to the great kinetic energy of the liquid a good blow-like effect is attained.

The hydraulic blows transmitted by the nozzle 47 are produced by means of a steered shut-off valve. The pump 46 transmits the solvent situated in the container 26 through the pipes 49 and 50 into the container 51. The valve or cock 55 situated in the container 51, is rotated by the motor 56 (Fig. 3), so that periodically and intermittently a communication is established between the container 51 and the pipe 52 carrying the nozzle 47.

The safety valve 52 carried by a pipe 53 is normally closed. When the pressure of the solvent is too high, the valve 52 opens automatically and causes a portion of the solvent to flow upwardly from the container 51 through the pipe 53 and into the container 26.

Due to the rotation of the valve 55, small amounts of liquid having a high kinetic energy penetrate the pipe 52 and are ejected upwardly through the nozzle 47, thereby moving the material 12 upwardly within the filter 21 and causing it to fall off the edges 25 of the filter 21 and into the outflow pipe 19.

Thus the material 12 is transmitted through the extraction pipe 16 by hydraulic pressure devices situated at both ends of the pipe 16. The nozzle 47 in addition to pressing the material 12 upwardly also creates suction at the outflow end of the pipe 16.

It is apparent that the specific illustration shown above has been given by way of illustration and not by way of limitation and that the structures above described are subject to wide variation and modification without departing from the scope or intent of the invention. For example, many other suitable hydraulic pressure devices may be substituted for the ones described and in addition to those shown, further hydraulic pressure devices may be provided within or alongside the pipe 16. The material removed through the outflow pipe 19 may be reintroduced into the same device in order to further the extraction operation. It is also possible to connect in series several of the devices of the type illustrated in the drawings. All of the above and other variations and modifications are to be included in the scope of the present invention.

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