

(No Model.)

4 Sheets—Sheet 1.

G. F. METZGER.
APPARATUS FOR EXTRACTING OIL.

No. 566,406.

Patented Aug. 25, 1896.

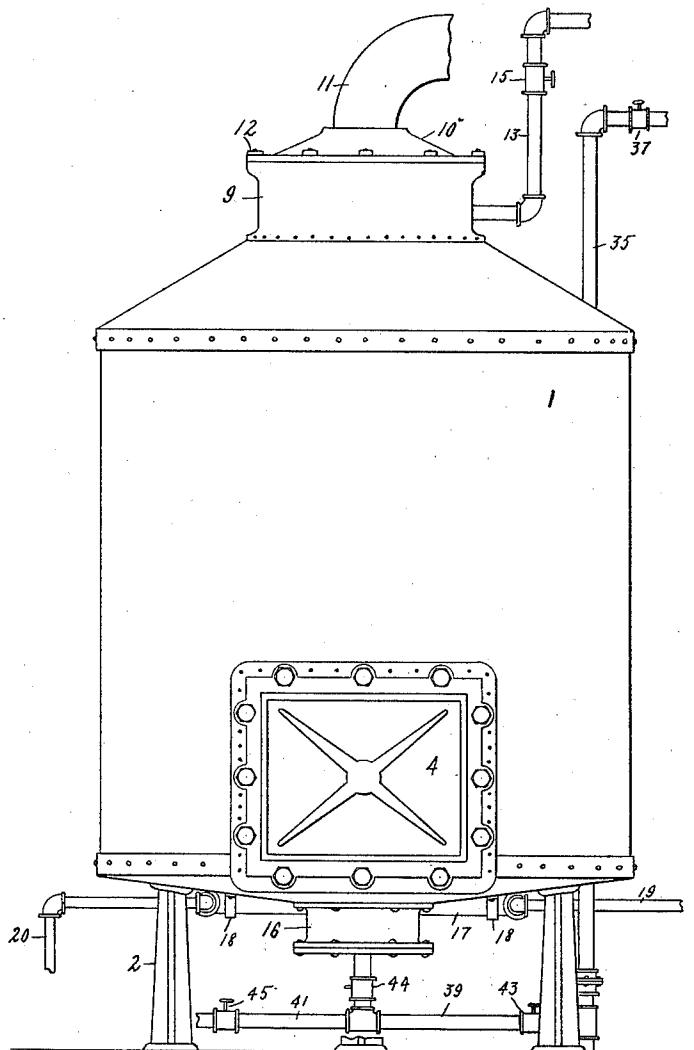


Fig. 1

Witnesses

H. Griswold
Helen M. Hutchison

Inventor

Gottlieb F. Metzger
By *E. L. Thurston*
his attorney

(No Model.)

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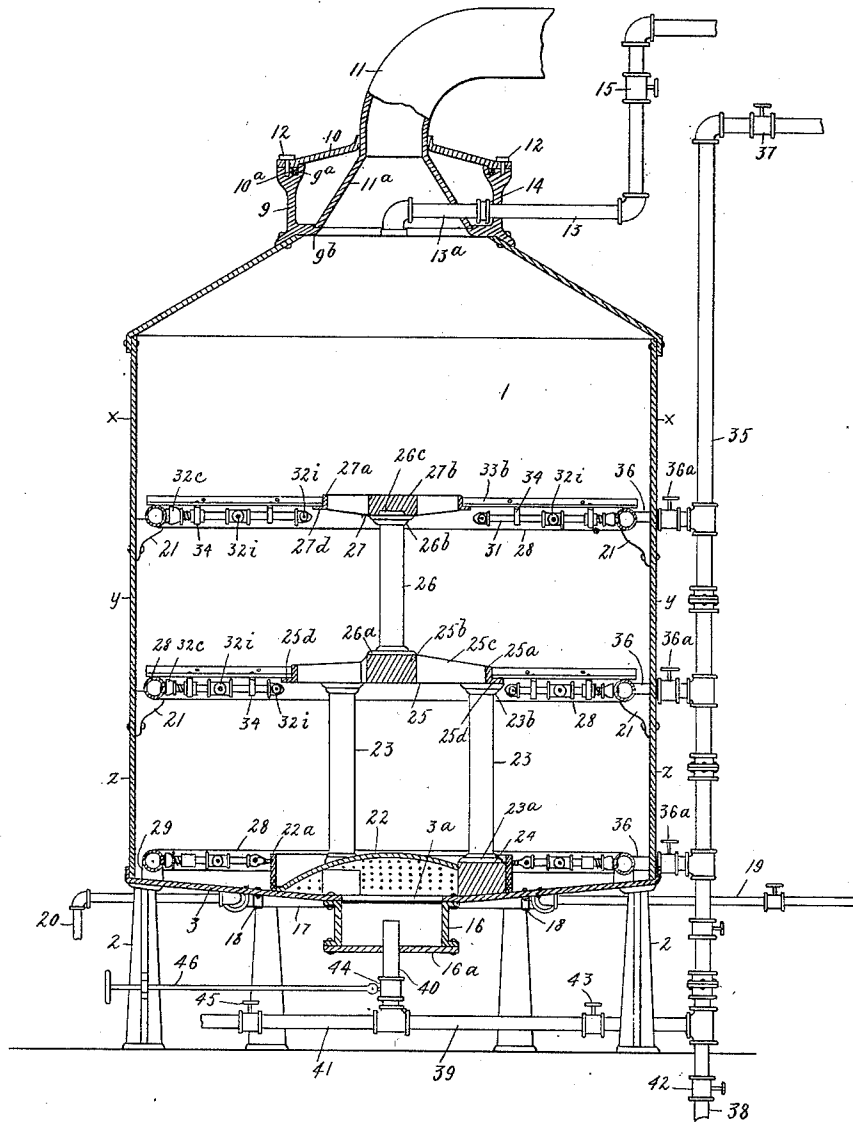


Fig. 2

Witnesses.

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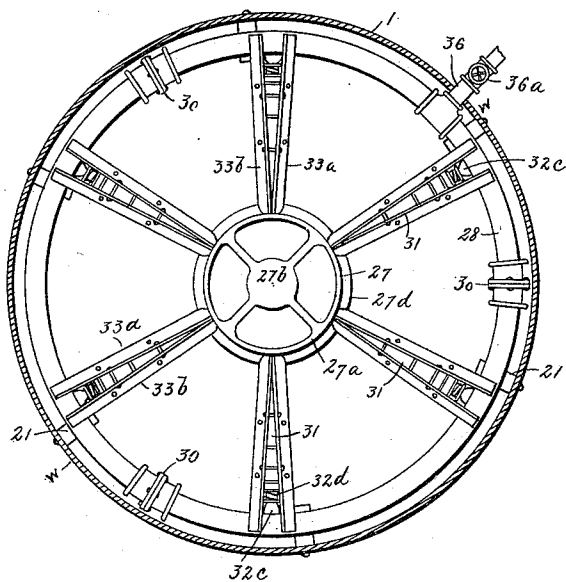


Fig. 3

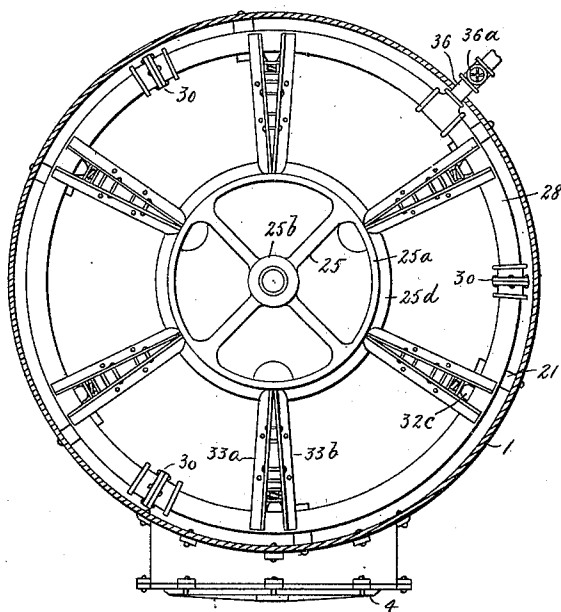


Fig. 4

Witnesses.

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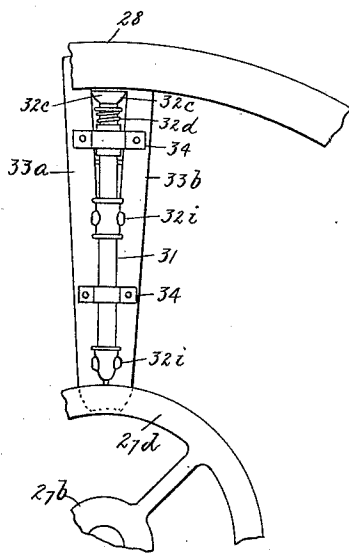
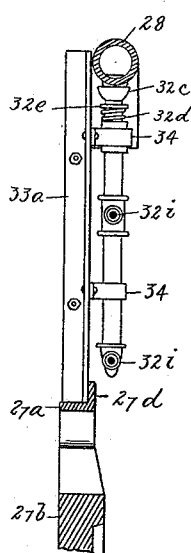
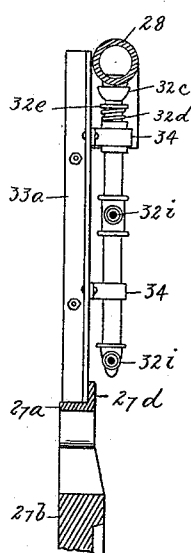
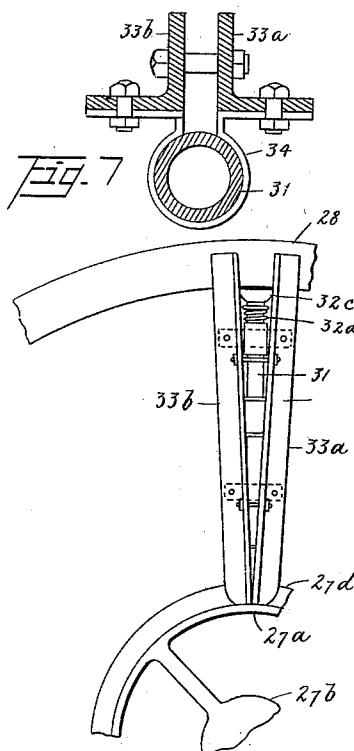
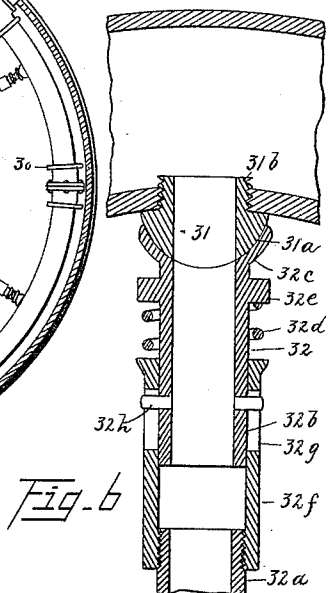
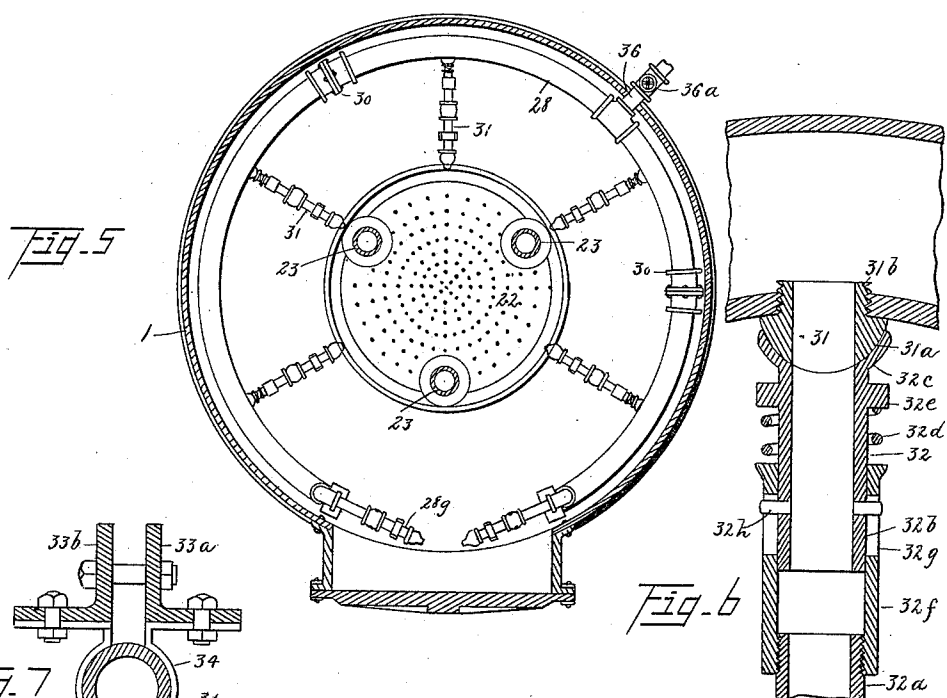
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Witnesses:
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John M. Hutchison

Inventor:
Gottlieb F. Metzger
By *E. L. Thurston*
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UNITED STATES PATENT OFFICE.

GOTTLEIB F. METZGER, OF ELYRIA, OHIO.

APPARATUS FOR EXTRACTING OIL.

SPECIFICATION forming part of Letters Patent No. 566,406, dated August 25, 1896.

Application filed January 22, 1896. Serial No. 576,466. (No model.)

To all whom it may concern:

Be it known that I, GOTTLEIB F. METZGER, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Percolators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain improvements in the class of percolators which are adapted for use in extracting the oil from flaxseed meal, cotton-seed meal, and other oleaginous meals by the so-called "naphtha" process.

One object of the invention is to cheapen and simplify the construction of such percolators.

Another object is to provide a construction which may be operated at a very reduced cost.

Another object is to reduce to a minimum the liability of leaks occurring which will permit the escape of the naphtha either in liquid or vaporous form, both of which are dangerous as well as disagreeable.

Another object is to facilitate the rapid vaporization and removal of the naphtha which remains in the meal after the oil has been extracted.

Another object is to prevent the condensation of steam within the percolator, whereby the meal which remains therein after the naphtha has been expelled is dry and sweet and of an even light-gray color. The meal which is taken from the percolators heretofore in common use is almost invariably damp and soggy, and some of it is so wet that it is properly called "slush," and nearly all of it is discolored almost to blackness.

Another object is to facilitate the removal of the meal and the breaking down, removal, cleaning, and replacing in proper relative positions of the mechanism contained within the percolator-tank.

All of these objects are in a greater or less degree obtained as the direct and immediate result of the construction constituting my invention, as hereinafter described, and as pointed out definitely in the claims.

In the drawings, Figure 1 is a front eleva-

tion of my percolator-tank, showing it raised a desirable distance from the floor. Fig. 2 is a vertical central sectional elevation of my tank on lines *ww*, Figs. 3, 4, and 5. Fig. 3 is a cross-section of the tank on lines *xx*, Fig. 2. Fig. 4 is a cross-section on lines *yy*, Fig. 2. Fig. 5 is a cross-section on lines *zz*, Fig. 2. Fig. 6 is an enlarged central sectional view of the outer end of one of the steam-discharging pipes and a portion of one of the annular pipes, showing the separable bearing-surfaces. Fig. 7 is a cross-section of one of said steam-discharging pipes and the guard-arm to which it is connected on lines *aa*, Fig. 9. Fig. 8 is a plan view of one of the guard-arms and its associated steam-discharging pipes, said arm resting on a section of the annular supply-pipe and one of the carriers. Fig. 9 is an edge view of the parts shown in Fig. 8, and Fig. 10 is a bottom view thereof.

Similar figures of reference designate like parts in the drawings and specification.

1 represents a tank, which is shown here as resting upon the posts 2; but any suitable support therefor may be used. This tank is made, preferably, of sheet-iron and of a size corresponding to the work it is required to do. It has the slightly concave bottom 3, converging to the center thereof, a door 4 in the side, which opens to the bottom 3, and a substantially convex top 5, surmounted by the dome 9, which is riveted or bolted to the upper part of the top 5. The dome-cover 10 has a central opening through which the pipe 11 passes and is provided with a tongue 10^a, which enters the groove 9^a in the top of the dome 9, the joint formed thereby being rendered tight by means of a gasket when the screw-bolts 12 are turned down. The pipe 11 is provided with an inverted-funnel-shaped extremity 11^a, which is inclosed with the dome and rests upon a shoulder 9^b, which projects inward from the lower part of the dome-wall. This vapor-exit pipe 11 runs to a "condenser." (Not shown or described, since it is a separate apparatus.) The naphtha-inlet pipe extends from a reservoir (not shown) through the dome 9 and funnel-shaped end of pipe 11 and opens over the center of the interior of the tank 1. The section 13^a is attached to the pipe 13 by the

coupling 14, inside of the dome 9, in order to allow said section to be detached from said pipe when it is desired to remove the pipe 11 and cover 10 from said dome. The pipe 13 is provided with the valve 15.

In the center of the floor 3 is the opening 3^a, and the receiving-pot 16 is bolted to said floor directly beneath said opening. The pot is open at the top and closed at the bottom by the floor or plate 16^a. The semicircular heating-pipe 17 is attached to the bottom of the tank by the straps 18 and is covered with asbestos or other suitable non-heat-conducting material. Hot water or exhaust-steam, or even live steam, if desired, is admitted into this pipe 17 from the pipe 19, and this water is discharged through pipe 20. As a matter of economy the pipe 19 may be connected with the exhaust end of some steam-using apparatus, (not shown,) whereby exhaust-steam, or the hot water which results therefrom, is delivered from such apparatus into the pipe 17. The strainer 22 is placed on the floor 3 and covers the opening 3^a.

The three several columns 23 rest upon the pedestals 24, which preferably are cast in one piece with the strainer 22, equidistant from each other and from the center of the floor 3, and one of said columns should be directly back of the door 4, so as to be easily reached when the door is opened for the purpose of pulling down the whole inside structure. The carrier 25 is composed of a ring 25^a, which is supported upon the columns 23, a central hub 25^b, and arms 25^c, which connect the hub and ring. An external annular flange 25^d projects from the bottom of the ring and serves to support the inner ends of the guard-arms, while the ring itself takes the end thrust from said arms. The single column 26 stands upon the hub 25^b of the carrier and supports the carrier 27, which is shaped like the carrier 25, and has a similar ring 27^a, hub 27^b, and external flange 27^d. The columns 23 are provided with the bases 23^a and the caps 23^b. The column 26 is provided with the base 26^a and the cap 26^b, but said column projects below said base and above said cap, as shown at 26^c in Fig. 2, the projection being received into tapering recesses in the carrier-hubs 25^b 27^b for the purpose of centering the parts.

The three several annular steam-pipes 28 are arranged at intervals about the inside of the tank 1, between the top and bottom, the two upper pipes being supported in position by the brackets 21, which are bolted to said tank. The lower annular pipe is elevated a little above the floor 3 by the blocks 29. The three pipes 28 are of the same diameter and are placed a short distance from the walls of the tank 1. They are preferably made up of segmental sections, rather than in one piece, said sections being connected by flange-unions 30. The object of the flange-unions 30 is to permit of the taking apart of the several pipes 28, when necessary, for the purpose of more thoroughly cleansing the interior of the

same. Each of these pipes is provided with a plurality of inwardly-directed discharge-openings 31, which openings are surrounded by suitable bearing-surfaces 31^a for the outer ends of the steam-discharging pipes 32. The said ends of said pipes are shaped to fit tightly against said bearing-surfaces and to severally embrace the discharge-openings 31, wherefore, when said pipes 32 are supported, and the said outer ends thereof are pressed against said bearing-surfaces, there is open communication between said pipes 32 and said annular pipes 28 through said discharge-openings, and the escape of steam at the temporary joint, thus formed is substantially prevented.

The specific construction of the several parts above referred to, as shown in the drawings, is the following: Plugs 31^b, having the opening 31 and the ball-shaped outer ends, which form the bearing-surfaces 31^a, are inserted at suitable intervals in the inner peripheries of the annular pipes. The steam-discharging pipes 32 are each composed of two telescoping sections 32^a 32^b. This section 32^b is provided on its end with a socket 32^c, which fits the ball-shaped end of a plug 31^b. A spring 32^d surrounds the section 32^b and thrusts endwise against a flange 32^e on said section and the outer end of the section 32^a, wherefore said spring exerts a constant force, tending to relatively move said sections longitudinally and lengthen the said pipe 32. It is preferred to make the section 32^a of two parts, of which the end part 32^f is of larger diameter and is screwed onto the other part. The section 32^b fits and slides in the part 32^f. Slots 32^g are formed in the part 32^f, and pins 32^h, which project outward from the section 32^b, lie and are movable in said slots. These pins and slots prevent the relative revolution of the two telescoping sections and limit their relative longitudinal movement and prevent them from being separated. In the section 32^a are formed a plurality of lateral discharge-openings 32ⁱ, from which the steam escapes.

The pipe-sections 32^a are secured rigidly to the under side of the guard-arms 33 by straps 34 or other suitable means. These guard-arms, as shown, consist each of two pieces 33^a 33^b, of angle-iron, bolted together at their inner ends and spaced and connected at their inner ends by the straps 34 or other means. The inner ends of these guard-arms, in the two upper series, rest upon the flanges 25^d 27^d of the carriers 25 27, respectively, and their outer ends rest upon one of the annular pipes 28. The sockets 32^c embrace the ball-shaped ends of the plugs 31^b, and the springs force the sockets close against the ball-shaped bearing-surfaces, which surround the discharge-openings 31, the carriers 25 27 receiving the end thrust from said guard-arms. Besides supporting the steam-discharge pipes 32 these guard-arms 33 also support the meal and prevent it from packing or settling down in a compact

mass toward the bottom of the tank, and thus they facilitate the extraction of the oil from the naphtha.

The lower series of steam-discharge pipes 32 are not connected with guard-arms. Their inner ends are tapering and enter sockets in a ring 22^a, which incircles the strainer and rests upon the floor of the tank.

The lower annular pipe 28 does not extend across the door-opening of the tank, as will be seen in Fig. 5; but the steam-distributing pipes 28^g, which are connected with the ends of said annular pipe, extend into the door-opening and discharge steam from their ends and from lateral discharge-openings into whatever meal may be lodged in said door-openings.

The main steam-supply pipe 35 extends vertically outside the tank and is connected with the three annular pipes 28 by three short straight pipes 36, which pass through the wall of the tank. Each of these pipes 36 is provided with a valve 36^a. Steam is admitted to the pipe 35 past the valve 37 therein. The lower end of the pipe 35 is connected with the exhaust or waste pipe 38 and with a pipe 39, which passes beneath the tank, and is joined by the drain-pipe 40, which enters the bottom of the pot 16. The horizontal pipe 39 is extended beyond the drain-pipe 40, forming the delivery-pipe 41, through which the oil and naphtha are conducted to a receiving-tank. A valve 42 is placed in waste-pipe 38, another valve 43 is placed in the pipe 39, another valve 44 is placed in the drain-pipe 40, and another valve 45 is placed in the pipe 41. The valve 44 may be operated by the long valve-rod 46.

In operating the described percolator the several columns and carriers are erected in the manners shown and described. The guard-arms 33 rest upon the annular pipes 28 and upon the flanges 25^b 27^b of the carriers 25 27, and the socketed ends of the steam-discharging pipes 32 are placed over the inwardly-directed openings 31 in the annular pipes 28 and in engagement with the surrounding bearing-surfaces 31^a. The door is tightly closed and fastened by bolts 4^a or other means, and the tank is then filled through the top with the meal, which has been thoroughly dried. The cover and vapor-exit pipe 11 are secured in place and raw naphtha is admitted through the pipe 13 until the meal is thoroughly saturated. Exhaust-steam or hot water is admitted to the pipe 17 through the pipe 19, and it escapes through the pipe 20. This warms the contents of the tank and facilitates the extraction of the oil. The naphtha dissolves out the oil and is drawn off through pipes 40 41. Fresh naphtha is admitted from time to time until substantially all of the oil in the meal has been extracted. The liquid contents of the tank are then drained off as completely as practical; but there will remain mixed with the meal a considerable quantity of naphtha, which must be evaporated and removed from the tank before the meal can be removed with

safety and before the meal will be fit to be used for feed. This result is effected by discharging live steam into the meal from the steam-discharging pipes 32. Before beginning this steaming-out operation the valve 42 in pipe 38 should be opened and steam admitted to pipe 35. This will blow out through the pipe 38 any condensation of steam in said main supply-pipe. This is important, because it is necessary, in order to secure the best results, that little or no water or moisture be mixed with the meal. Indeed, the entire arrangement of the steam-pipes, as shown, has been devised with special reference to preventing any condensation of steam in the tank, or in the pipes from which it will be blown into the tank. The main supply-pipe 35 and the short connecting-pipes 36 are alone outside of the tank, where they will be subjected to the cooling influence of the surrounding atmosphere. The annular steam-distributing pipes 28 are inside the tank and close to the walls thereof. A twofold advantage is gained by so placing them. The temperature surrounding the pipes is approximately the same as the temperature of the steam in them, wherefore they do not lose heat rapidly, and, moreover, the heat radiated from them assists in evaporating the naphtha and in maintaining the desired temperature within the tank. These pipes especially act to prevent the condensation of steam in the tank near the walls thereof. The steam is most liable to condense in this part of the tank, and in all percolators of this class heretofore used, for example, in the Evans percolator, which is well known in this art, a greater or less condensation always does occur here, with the result of forming a greater or less quantity of so-called "slush." This condensation of steam, and a further condensation, which almost invariably occurs in prior percolators in the top of the tank, render the entire mass of meal damp and soggy and discolors it almost to blackness. In my percolator hereinbefore described there is substantially no condensation of steam at any point in the tank, and the meal when removed is almost completely dry and of an even light-gray color. The liability of the steam to condense in the pipes is also lessened by so constructing and connecting the various pipes, substantially as described, that the steam is diverted only a few times from a straight path. In prior percolators it is compelled to make numerous turns through various approximately right-angled joints, which always induced condensation.

Another practical advantage arises from the described construction—viz., a very much less quantity of steam is necessary to effect the desired result. For example, all of the naphtha in a three-hundred-and-fifty-bushel percolator, constructed as herein described, may be evaporated and drawn off in four hours, more or less, by steam from a fifty-horse-power boiler, while in prior percolators

of like size a boiler having at least one-hundred-and-fifty-horse power is invariably and necessarily used, and a longer time is necessary to effect the result. This immense saving in operating the percolator is effected because the construction is such that substantially all of the heat is utilized and very little is lost.

Another practical advantage of the described construction is that only three openings in the side walls of the tank are necessary to properly distribute the steam. In prior percolators, where the distributing-pipes are outside of the tank, a large number of such openings are necessarily made, and every additional opening increases the liability of leakage. Moreover, by my construction less pipe and fewer valves and fittings are required to construct the device.

When the water of condensation has been blown out of the main supply-pipe, the valve 42 is closed and steam is admitted to the upper annular pipe 28. This steam passes from said annular pipe into the discharging-pipes 32, which are in communication with it, and out into the tank through the discharge-openings 32¹ therein. This causes the evaporation of the naphtha in the adjacent meal, and this vapor, together with the steam, rises to the highest point in the tank, at which point the broad funnel-shaped mouth of the vapor-exit pipe is placed. The vapor and steam consequently enter this pipe and are conducted away. When the vapor-exit pipe is not placed at the highest point in the tank, some of the steam will rise above it and consequently will be condensed. The condensed steam will fall on top of the meal, will dampen it, and make it soggy, which will not only injure it, as before stated, but will retard the subsequent evaporation of the naphtha and escape of the vapor and steam.

After discharging steam through the upper series of pipes 32 the steam is shut off and admitted into the next lower annular pipe and thence discharged through the discharging-pipes 32 in communication therewith. Finally, the steam is shut off from these pipes and admitted to the lower annular pipe 28, being discharged into the lower part of the tank through the discharging-pipes which are in communication therewith. When the steam is being discharged through this lower series of pipes, steam may also be blown through the drain-pipe into the center of the tank. In about four hours, more or less, the naphtha is all evaporated and drawn off through the exit-pipe and the meal is ready to be removed. The cover 10 is generally first removed and then the door 4 is opened. The meal is shoveled out until one of the columns 23 may be reached. This column is pulled out and this permits the entire superstructure to fall with the meal. The discharging-pipes 32 fall away from their connections with the annular pipes 28, and all of the movable pieces inside the tank fall to the bottom with the

meal and may be removed, and they and the tank may be cleaned. They may then be replaced, as described, within the tank and the entire operation repeated.

Obviously many of the parts shown and described herein may be more or less varied and modified in construction without departing from the spirit of the invention, and I do not, therefore, intend to limit the invention to the form of the several parts, except as distinctly set forth in the claims.

Having described my invention, I claim—

1. In a percolator, in combination, a tank, an upright main steam-supply pipe outside of said tank, a waste-pipe connected therewith, a series of annular distributing-pipes supported within said tank and near the walls thereof, an equal number of valved connecting-pipes which pass through the tank-wall and severally connect said annular pipe with the main steam-pipe, and inwardly-extending steam-discharging pipes in the tank in open communication with said annular pipes, substantially as and for the purpose specified.

2. In a percolator, in combination, a tank, one or more annular pipes supported within the tank and having each a plurality of inwardly-directed discharge-openings and suitable bearing-surfaces surrounding said openings, steam-discharging pipes having their outer ends fitted to said bearing-surfaces, and mechanisms sustaining said pipes and holding said ends thereof over the discharge-openings in the annular pipes and in close contact with said surrounding bearing-surfaces, and means for admitting steam to said annular pipes, substantially as and for the purpose specified.

3. In a percolator, in combination, a tank, one or more annular pipes supported within said tank, each having a series of inwardly-directed discharge-openings and suitable bearing-surfaces surrounding said openings, steam-discharging pipes each consisting of two telescoping sections, the outer end of each outer section being fitted to the said bearing-surfaces on the annular pipe, a device for supporting and taking the end thrust from the inner sections, and means for moving the outer sections longitudinally and forcing their outer ends over said discharge-openings and into contact with said bearing-surfaces, substantially as and for the purpose specified.

4. In a percolator, in combination, a tank, one or more annular pipes supported within said tank and having a plurality of inwardly-directed discharge-openings and suitable bearing-surfaces surrounding said openings, steam-discharging pipes each consisting of two relatively movable sections of which the outer end of the outer section is fitted to said bearing-surfaces on said annular pipe, and a spring for moving and holding said outer section in engagement with said bearing-surfaces, substantially as and for the purpose specified.

5. The combination, in a percolator, of a tank, annular pipes bracketed inside of said tank, an outside main steam-supply pipe connected with said annular pipes through the tank-walls by pipes, a waste-pipe connected with said main steam-supply pipe, knockdown columns centrally located in said tank, carriers on said columns, and steam-discharging pipes, attached to arms supported by said carriers and annular pipes, in open communication with the latter, substantially as and for the purpose specified.

6. The combination, in a percolator, of a tank, a series of annular pipes bracketed inside of said tank having semispherical perforated bearings, a main steam-supply pipe outside of said tank connected with said annular pipes through the wall of said tank by pipes, a waste-pipe connected with said main supply-pipe, and a series of orificed steam-discharging pipes provided with sockets and spring-actuated sections arranged to normally hold said sockets in engagement with the said semispherical bearings, whereby said discharging-pipes are in open communication with said annular pipes, and means for supporting said steam-discharging pipes, substantially as and for the purpose specified.

7. The combination, in a percolator, of a tank, annular pipes bracketed inside of said tank having semispherical perforated bearings, orificed steam-discharging pipes provided with sockets and spring-actuated sections arranged to normally hold said sockets in engagement with said bearings, whereby said discharging-pipes are in open communication with said annular pipes, and means for supporting said steam-discharging pipes, substantially as and for the purpose specified.

8. The combination, in a percolator, of a tank, annular pipes bracketed inside of said tank having semispherical perforated bearings, orificed steam-discharging pipes provided with sockets and spring-actuated sections arranged to normally hold said sockets in engagement with said bearings, whereby said pipes are in open communication with said annular pipes, and disconnecting guard-arms supporting said steam-discharging pipes, substantially as and for the purpose specified.

9. The combination, in a percolator, of a tank, annular pipes bracketed inside of said tank having semispherical perforated bearings, orificed steam-discharging pipes provided with sockets and spring-actuated sections arranged to normally retain said pipes in open communication with said annular pipes, disconnecting guard-arms attached to said steam-discharging pipes, and carriers normally supporting the inner ends of said arms while said annular pipes support the outer ends, substantially as and for the purpose specified.

10. In a percolator, in combination, a tank, steam-distributing pipes having discharge

openings supported within said tank, flanged carriers, and knockdown supports therefor, guard-arms supported at their ends on said pipes and carriers, and steam-discharging pipes fixed to said guard-arms, and having spring-actuated sections whereby said discharging-pipes are normally held in open communication with said distributing-pipes, substantially as and for the purpose specified.

11. The combination, in a percolator, of a tank having an opening in its floor, a strainer over said opening having pedestals, a series of annular pipes one above the other bracketed inside of said tank and connected with a main steam-supply pipe, three knockdown columns on said pedestals, a flanged carrier supported by said columns, a central column resting upon said carrier, a flanged carrier supported by said central column, and detachable guard-arms extending from said annular pipes to said carriers, and steam-discharging pipes secured to said guard-arms and in open communication with said annular pipes, substantially as and for the purpose specified.

12. In combination, with a percolator-tank, a steam-distributing pipe about the inside of said tank on or near the floor, a central ring on said floor, and a series of steam-discharging pipes provided with spring-actuated sections arranged to retain said pipes in operative connection with said distributing-pipe when said discharging-pipes are supported on said ring and distributing-pipe, substantially as and for the purpose specified.

13. The combination, in a percolator, of a tank having a door-opening, a steam-distributing pipe about the inside of said tank, except across the opening, on or near the floor, having semispherical perforated bearings, a central ring, perforated steam-discharging pipes supported by said ring and bearings, and provided with sockets and spring-actuated sections arranged to normally retain said pipes in open communication with said distributing-pipe, and perforated steam-discharging pipes projecting into the doorway from the ends of said distributing-pipe, substantially as and for the purpose specified.

14. In a percolator, in combination, a tank having a concave top surmounted by a dome, a removable cover for said dome, a vapor-exit pipe extending through said cover and having an inverted-funnel-shaped extremity, and steam-discharging pipes in said tank, substantially as and for the purpose specified.

15. In a percolator, in combination, a tank having a concave top surmounted by a dome having an internal flange, a removable cover for said dome, a vapor-exit pipe which passes through said cover and has an inverted-funnel-shaped extremity which rests upon said flange, a naphtha-inlet pipe which passes through said dome, a detachable section at the end of said inlet-pipe which passes through one wall of the vapor-exit pipe, substantially as and for the purpose specified.

16. In a percolator for extracting oil, a tank having a perforated floor, a conical top surmounted by a dome, a detachable cover on said dome, a central removable vapor-exit pipe
5 having a flaring mouth extending through said cover, and a naphtha-inlet pipe provided with a detachable section extending through said dome, in combination with a series of annular pipes attached on the inside of said
10 tank, a strainer over the perforation in said floor, supporting-columns which in turn sustain two carriers with a central column between, guard-arms extending from said annular pipes to said carriers, and horizontal
15 steam-discharging pipes supported from said arms in open communication with said annular pipes, substantially as and for the purpose specified.

17. In a percolator for extracting oil, a tank
20 having a door in its side extending to the bottom and a concave floor open at its center, a strainer over said opening and three columns supported by said strainer and in turn sustaining two carriers with a central column
25 between, in combination with a series of annular pipes within said tank and attached to sides and floor thereof, said pipes being con-

nected with the main steam-pipe, arms supported on said annular pipes at one end and resting on said carriers at the opposite end, 30 steam-discharging pipes supported by said arms in open communication with said annular pipes, said columns and carriers arranged to be precipitated to the floor by removing one of the lower columns, substantially as and for the purpose specified. 35

18. In a percolator for extracting oil, a tank having a conical top surmounted by a dome, a side door at its bottom and a concave floor with a central opening therein, a strainer 40 over said opening and a pot attached below the same, a vapor-exit pipe and a naphtha-inlet pipe opening through said dome into said tank, a series of annular pipes inside of said tank attached to the walls and floor of the same, and steam-discharging pipes in operative connection with said annular pipes, 45 substantially as and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

GOTTLEIB F. METZGER.

Witnesses:

E. L. THURSTON,

L. F. GRISWOLD.