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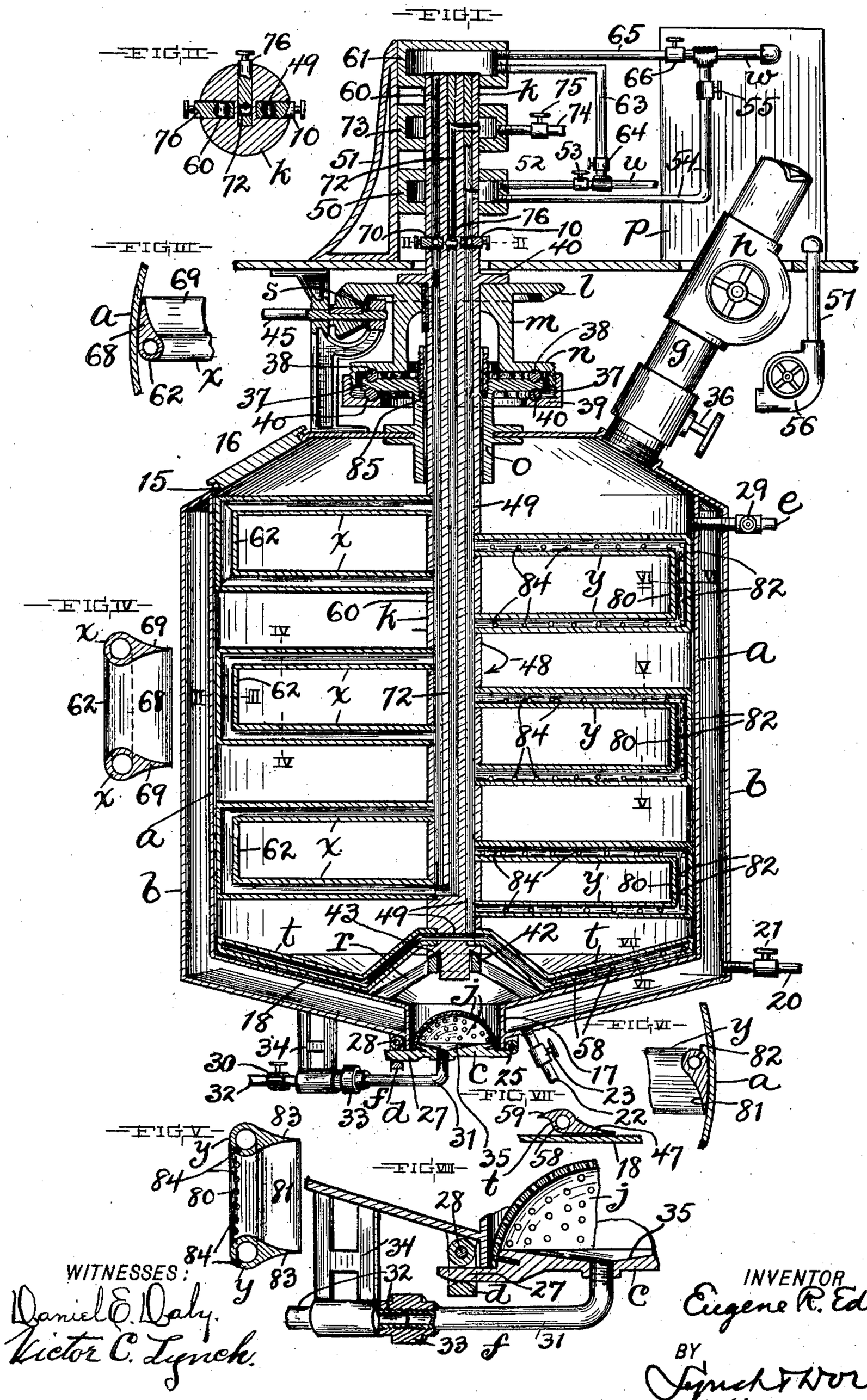
E. R. EDSON.

RENDERING APPARATUS.

(Application filed Oct. 19, 1901.)

(No Model.)



UNITED STATES PATENT OFFICE.

EUGENE R. EDSON, OF CLEVELAND, OHIO.

RENDERING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 707,565, dated August 26, 1902.

Application filed October 19, 1901. Serial No. 79,200. (No model.)

To all whom it may concern:

Be it known that I, EUGENE R. EDSON, a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Reducing or Rendering Apparatus; 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 pertains to make and use the same.

This invention relates to improvements in apparatus suitable for use in the production of oil and fertilizer from fish, fish waste, and other oil-yieldable material, and pertains more particularly to apparatus not only suitable for extracting oil from the said material by the treatment of the material with a volatile solvent—such, for instance, as naphtha—but especially well adapted for eliminating from the mass all traces of naphtha, gases, noxious odors, and moisture after draining or removing the extracted oil and the solvent mixed with the said oil from the mass, so as to render the residue suitable for use as a desirable fertilizer.

The primary object of this invention is to provide apparatus capable of more efficiently and more speedily reducing material of the character indicated.

With this general object in view and to realize other advantages hereinafter appearing the invention consists in certain features of construction and combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure I is a side elevation, largely in central vertical section, of apparatus embodying my invention. Fig. II is a horizontal section in detail on line II II, Fig. I. Fig. III is a horizontal section in detail on line III III, Fig. I. Fig. IV is a vertical section in detail on line IV IV, Fig. I, looking outwardly. Fig. V is a vertical section in detail on line V V, Fig. I, looking outwardly. Fig. VI is a horizontal section in detail on line VI VI, Fig. I. Fig. VII is a section in detail on line VII VII, Fig. I. Fig. VIII is a vertical section in detail hereinafter described. The detail illustrations are on a somewhat larger scale than Fig. I.

Referring to the drawings, *a* designates a normally closed tank or receptacle which is cylindrical and provided at the top and one side with a charging-aperture 15, at which the material which is to be treated within the said receptacle is introduced into the receptacle. The aperture 15 is normally closed by a suitably-applied cover 16. The receptacle *a* is provided at the bottom and centrally with a downwardly-extending tube or duct 17, arranged to discharge downwardly, and the bottom 18 of the chamber of the receptacle declines toward the outlet-forming duct, so as to facilitate the flow of oil extracted from material treated within the receptacle to the said outlet and to equally facilitate the discharge of the residue.

The receptacle *a* is externally provided with a heating-jacket *b*, which extends in under the said receptacle and around the duct 17. A valved pipe 20 is arranged to supply steam or other heating fluid to the chamber of the jacket *b* and has its valve 21 normally closed. A valved drain-pipe 22 extends from the lower end of the jacket and has its valve 23 normally closed. The duct 17 is normally closed at its lower and discharging end by a door *c*, which is hinged at one side of the said duct, as at 25, to any stationary object—such, for instance, as the casing of the jacket *b*. The door *c* at the opposite side of the duct 17 has an arm 27, which in the closed and normal position of the said door has its under side snugly overlapped by a tiltable latch *d*, which is pivoted, as at 28, to any stationary object—such, for instance, as the casing of the jacket *b*. Obviously, therefore, a tilting or swinging of the latch *d* in the direction and to the extent required to disengage it from the door-arm 27 will render the door *c* free to be swung open.

A pipe *e* for supplying the naphtha or solvent to the chamber of the receptacle *a* is arranged to discharge into the said chamber and has a valve 29, which is normally closed. A drain-pipe *f* is arranged to conduct oil which has been extracted within the receptacle *a* from the said receptacle. The pipe *f* is provided with a valve 30, which is normally closed. The pipe *f* comprises a short inner pipe-section 31, an outer pipe-section 32, and a union 33, connecting the pipe-sections 31 and 32 together, and the outer pipe-section 32

carries the valve 30. The said pipe *f* and its component parts are shown very clearly in Fig. VIII. The outer pipe-section 32 is supported from a bracket 34, which is rigid with and depends from the casing of the jacket *b*. The inner pipe-section 31 has its inner end secured in any approved manner to the door *c* and is in open relation with the chamber of the receptacle *a* through the medium of the duct 17. The oil which is extracted from the material treated within the receptacle *a* gravitates to the bottom of the said receptacle and flows adown the latter into the duct 17 and thence to the drain-pipe *f*, and the door *c* is dished upon its inner side, as at 35, to facilitate the flow of oil to the said pipe *f*. It is obvious, of course, that the union 33 should be manipulated as required to disconnect the pipe-sections 31 and 32 of the drain-pipe *f* before the door *c* is unlatched and opened. The receptacle *a* is provided at its upper end with a vapor-conducting pipe or flue *g*, which has a suitably-operated pump or device *h*, adapted when operating to create suction, and thereby establish a vacuum or partial vacuum in the vapor-outlet *g*, and consequently in the chamber of the receptacle *a*, upon opening the normally closed valve 36, with which the flue *g* is provided, between the said receptacle and the receiving end of the suction-creating device. A concavo-convex screen or strainer *j* is secured to the inner side of the door *c* and bulges upwardly, so that its capacity is considerable.

The shaft *k* is arranged vertically and centrally of the receptacle *a* and extends from above and near the screen *j* upwardly and through and a suitable distance above the top of the receptacle *a*. A bevel-gear *l* is operatively mounted upon the shaft *k* a suitable distance above the top of the receptacle *a*. The gear *l* is rigid with the upper end of an upright frame or stand *m*, formed upon a turn-table *n*, which is mounted upon the upper end of a vertically-arranged tubular guide and shaft-steadying piece *o*, which is rigid with the top of the receptacle *a* and loosely embraces the shaft *k*. The shaft-steadying piece *o* is provided at its upper end with an external annular table-forming flange 37, which bears the turn-table *n*. Antifriction-balls 38 are interposed between the tables *n* and 37 and arranged within annular recesses formed in the opposing sides of the said tables. The table *n* is provided with an annular rim or member 39, which extends in under the table 37, and antifriction-balls 40 are interposed between the rim 39 and the table 37 and arranged within annular recesses formed in the opposing sides of the said members 37 and 39. The turn-table *n* is obviously, therefore, adequately supported. Vertical displacement of the said table is rendered impossible, and the balls 38 and 40 also afford lateral bearing to the table. The stand or frame *m* forms the central portion of the turn-table, which is operatively connected with the shaft *k*, and the gear *l* is formed upon the central frame or stand *m* of the turn-table. The shaft *k*, next above the stand or frame *m* and the gear *l*, is provided with a collar 41, which rests upon the said frame or stand. It will be observed, therefore, that the shaft *k* is suspended from the turn-table, and by the construction hereinbefore described displacement of the shaft is prevented without wear upon the shaft, and twisting or wabbling of the shaft is reduced to a minimum. A shaft-steadying frame *r*, mounted upon and secured to the bottom of the receptacle *a* around the upper end of the duct 17, is provided centrally with an annular member 42, which loosely embraces and is adapted to steady the shaft *k*. The shaft *k* has its said lower end considerably reduced in diameter where it extends into the shaft-steadying piece *r* to reduce any friction between the said member *r* and the shaft to a minimum. The shaft *k* at the upper end of the central member 42 of the shaft-steadying frame *r* is provided with a downwardly-flaring external annular shoulder 43, which overlaps but does not bear upon the correspondingly-shaped upper edge of the said member 42. It will be observed that the shaft *k* is suspended or supported from the elevated table 37 through the medium of the turn-table *n* and that the frame *r* does not bear the load of the shaft, but merely participates in steadying the shaft, except that the said frame *r* forms also a guard for the protection of the screen *j*, preventing the crushing of the said screen by the weight of the body of material undergoing treatment within the receptacle *a*.

The gear *l* meshes with the bevel-pinion *s*, operatively mounted upon a shaft 45, to which power is suitably applied. The said shaft 45 is supported in any approved manner. Obviously, therefore, power is transmitted to the turn-table *n* and shaft *k* from the shaft 45 through the medium of the intergearing *l* and *s*.

The shaft *k* is provided at its lower end, preferably next above its downwardly-flaring shoulder 43, with two laterally-projecting and radial arms *t* and *t*, which are arranged, preferably, diametrically opposite each other and extend from the shaft downwardly to the bottom 18 of the chamber of the receptacle *a*, near the inner end of the duct 17, and thence extend outwardly and over in close proximity to the said bottom. The outer portion of an arm *t* and the adjacent portion of the bottom 18 are shown in cross-section in Fig. VII. The said outer portion of each arm *t* is provided with a scraper 47, arranged to clear the bottom of the chamber of the receptacle *a*. The scrapers 47 of the arms *t* point in the direction in which the shaft *k* rotates when operated, which direction is also indicated by the arrow 48 in Fig. I. Obviously, therefore, the arms *t* are not only instrumental in stirring the lower end of the mass of material being treated, but are instrumental also in facilitating the dis-

charge of the residue or fertilizer. The arms *t* are hollow interiorly—that is, each arm *t* is provided with an internal passage-way extending longitudinally of the arm and in open relation at its inner end with a passage-way 49, which is formed in and extends longitudinally of the shaft *k* and has its upper end communicating with the chamber of a chest 50, which surrounds the shaft *k* a suitable distance above the gear *l* and is rigid with a suitably-applied standard 51. A pipe *u* for supplying steam, hot air, or other heating agent has a valved branch 52 communicating with the chamber of the chest 50, with its valve 53 normally closed. An air-supply pipe *w* for supplying air under pressure at the ordinary atmospheric temperature has a valved branch 54 communicating with the chamber of the chest 50, with its valve 55 normally closed. The pipe *w* has its receiving end communicating with a tank or reservoir *p*, wherein air under pressure is stored, and the discharging end of a suitably-operated pump 56 is connected with the said reservoir by a pipe 57. Obviously, therefore, a heating agent or ordinary air under pressure is supplied to the passage-way 49, according as the heating agent upon opening the valve 53 or air under pressure upon opening the valve 55 are supplied to the chest 50. The surrounding wall of the passage-way in each arm *t* is provided with a series of orifices 58, arranged at suitable intervals longitudinally of the arm and slanting, preferably, downwardly and rearwardly, as shown in Fig. VII, so as to discharge the fluid received thereby against the bottom 18. Each arm *t* is provided with a guard-forming flange 59, projecting rearwardly from the arm above and near the orifices 58 of the arm and adapted to prevent the weight of the material being treated within the receptacle *a* from forcing solid matter into the said orifices, and thereby avoid clogging of the said orifices and the connected passage-way.

The shaft *k* is preferably provided with a valve 10 for controlling continuity in the passage-way 49, which valve 10 is of course opened preparatory to supplying steam or air to the chest 50. The shaft *k* is provided also within the receptacle *a* with two series of laterally-projecting and radially-arranged arms, with the arms *x* of one of the said series alternating, preferably, with the arms *y* of the other series. The arms *x* are hollow interiorly, but imperforate—that is, each arm *x* is provided internally with a passage-way extending longitudinally of the arm and in open relation at the inner end of the arm with a passage-way 60, formed in and extending longitudinally of the shaft *k*, and the said last-mentioned passage-way communicates at its upper end with the chamber of a chest 61, which surrounds the extreme upper end of the shaft a suitable distance above the chest 50 and is rigid with the standard 51. The arms *x* are arranged a suitable distance apart vertically and in pairs, and the arms of each pair of arms are connected together at their outer ends by a hollow web 62, which establishes open relation between the passage-ways extending through the said arms. Obviously, therefore, each pair of arms *x* and the web 62, connecting the said arms together, form a coil whose opposite ends are the inner ends of the said arms and are in open relation with the passage-way 60 in the shaft, so that steam or hot air or other fluid supplied to the said passage-way will circulate through the said coil. The heating-agent-supply pipe *u* has another valved branch 63, which communicates with the chamber of the chest 61 and has its valve 64 normally closed. The air-supply pipe *w* has a valved branch 65, which communicates with the chamber of the chest 61 and has its valve 66 normally closed. Obviously, therefore, steam or heating agent upon opening the valve 64 or air under pressure upon opening the valve 66 is supplied to the passage-way 60, and obviously if the reservoir *p* were supplied with hot air the heating agent could be transmitted to the arms *x* from the said reservoir. Each web 62 is provided with a scraper 68, as shown in Figs. III and IV, which scraper is instrumental in clearing the surrounding wall of the chamber of the receptacle *a* and points, therefore, in the direction in which the arms *x* revolve during the operation of the shaft *k*. Each arm *x* has a blade 69, which extends longitudinally of the said arm at the side which faces in the direction in which the arm revolves during the operation of the shaft *k*, and the said blade 69 is arranged as required to render it instrumental in facilitating the passage of the arm through the mass of material undergoing treatment within the receptacle *a* and in avoiding undue strain upon the said arm. The shaft *k* is preferably provided with a valve 70, arranged to control continuity in the passage-way 60, which valve 70 is of course opened preparatory to the supply of fluid to the passage-way 60. The shaft *k* is provided interiorly with another passage-way 72, which extends longitudinally of the shaft and is in open relation at its lower end with the lower end of the passage-way 60 and has its upper end connecting with the chamber of an exhaust-chest 73, which is arranged between the chests 50 and 61 and rigid with the standard 51. A valved exhaust-pipe 74 extends from the chamber of the chest 73 and is provided with a valve 75. The shaft *k* is provided with a valve 76, arranged to control continuity in the exhaust passage-way 72. Obviously when the valves 75 and 76 are open or partially open any heating fluid supplied to the heating-coils *x* circulates through the said coils; but the passage-way 72 more especially accommodates the forcing from the coils *x* of any liquid resulting from condensation in said coils. The arms *x* form, therefore, heaters as well as stirring devices.

The arms *y* of the shaft *k* are tubular, having passage-ways formed therein and extending

longitudinally thereof, which passage-ways connect at the inner ends of the arms with the passage-way 49 in the shaft. The arms *y* are arranged a suitable distance apart vertically and in pairs, and the arms of each pair of arms *y* have their outer ends connected together by a hollow web 80, which establishes open relation between the passage-ways formed in the said arms. Obviously, therefore, each pair of arms *y* and the web 80, connecting said arms together, form a coil whose opposite ends are the inner ends of the said arms and connect with the passage-way 49 of the shaft. The web or central portion 80 of each coil is provided with a scraper 81, instrumental in preventing caking of the material upon the surrounding wall of the chamber of the receptacle *a*, and the scraper 81 consequently points in the direction in which the said coil revolves during the operation of the shaft, and each web 80 has lateral orifices 82, arranged to discharge against the said wall. Each arm *y* is provided with a blade 83, which extends longitudinally of the arm at the side which faces in the direction in which the said arm revolves during the operation of the shaft *k*, and the said blade 83 is arranged as required to render it instrumental in facilitating the passage of the arm through the mass of material being treated and in avoiding undue strain upon the arm. Each arm *y* is provided in the rear wall of the passage-way extending therethrough with a series of orifices 84, arranged to discharge somewhat downwardly. Obviously, therefore, when air under pressure is supplied to the arms *t* air under pressure is also supplied to the arms *y* and by the latter during their revolution distributed throughout the mass of material.

It is evident, of course, that all joints where leakage might occur in the absence of proper packing must be suitably packed—as, for instance, a stuffing-box 85 is provided around the shaft *k* at the upper end of the shaft-steadying member *o*; but the application of stuffing-boxes and the packing of joints are too well known to require description or further illustration in this application.

In operating the apparatus the oil-yieldable material which is to be treated is supplied to the chamber of the receptacle *a*, and the valve 29 of the solvent-supply pipe *e* is opened to run the desired quantity of solvent into the said receptacle. The valve 29 is of course closed as soon as the receptacle *a* has been supplied with the desired quantity of solvent. The oil-yielding material is treated with the solvent at the ordinary atmospheric temperature, and during the said treatment the shaft *k* is rotated, so as to cause its arms *x* and *y* to stir and disintegrate the mass, and thereby facilitate the extraction of the oil. When the oil has been extracted, the valve 30 of the drain-pipe *f* is opened to permit the extracted oil to run from within the receptacle *a*, through the duct 17, and off by the said pipe *f*. The shaft *k* is operated to revolve its arms *x* and *y* during the draining period, so as to stir or disintegrate the mass within the receptacle *a* and facilitate the flow of oil to the outlet of the receptacle, and especially is the clearing of the bottom and surrounding wall of the chamber of the receptacle by the scrapers 47, 68, and 81 instrumental in facilitating the flow of oil down the said wall and bottom. When the extracted oil and solvent mixed therewith have been drained from the material, the valve 30 is closed and the valve 21 of the pipe 20 is opened to permit the flow of heating agent into the chamber of the jacket *b*, so as to heat the receptacle *a*. The residue remaining after the draining of oil is heated, preferably, to from 100° to 150° Fahrenheit and dried. Traces of naphtha or volatile solvent remaining within the receptacle vaporize and escape at the top of the receptacle through the flue *g* upon opening the valve 36, and the pump or suction-creating device *h* is operated to create a vacuum or partial vacuum within the upper portion of the receptacle *a*, and thereby draw or pull the vaporized solvent and gases and moisture from the mass through the said flue, and the shaft *k* is operated during the vaporizing period to stir the mass of material undergoing treatment and facilitate an equal distribution of the heat throughout the mass and facilitate the elimination of the vapors, gases, and moisture from the mass. Heat is also transmitted to the mass interiorly of the receptacle by the heating-coils formed by the shaft-arms *x*, which coils are supplied with a heating agent upon opening the valves 70 and 64, and the said arms *x* revolve through the mass during the operation of the shaft and not only stir or disintegrate the material, but directly heat the material being dried and distribute heat throughout the mass of material. While the mass being dried is being heated and operated upon by the arms *x* heating agent is supplied to the shaft-arms *t* upon opening the valves 10 and 53 and also to the coils formed by the shaft-arms *y* and discharged directly into the mass. Any heating agent thus discharged into the mass by the shaft-arms *t* and *y* is of course distributed throughout the mass during the operation of the shaft and in its passage to the vapor-outlet of the receptacle absorbs vapors, gases, and odors and carries them off. Then the valve 53 is closed, and while the suction-creating device is being operated air under pressure is supplied to the mass upon opening the valve 55 and distributed throughout the mass by revolving the shaft-arms *t* and *y*, and all traces of moisture, gases, and odors remaining in or with the mass are effectually eliminated. The air under pressure supplied and distributed throughout the mass during the drying and vaporizing period is not only instrumental in disintegrating the mass, but in absorbing moisture and in facilitating the elimination of gases and odors. The air under pressure discharged against the bottom

of the chamber of the receptacle *a* is not only instrumental in clearing the said bottom, but ascends through the entire body of material being dried on its way to the vapor-outlet of the receptacle, and is consequently very effective in facilitating the drying of the material. When the material is dry, the door *c* is opened, as hereinbefore described, and the dried residue discharged through the duct 17, and the shaft *k* is operated during the discharging period to cause its arms to revolve through the mass and facilitate the said discharge.

The drying or reducing process disclosed in this application forms the subject-matter of a contemporaneous application of even date.

What I claim is—

1. Apparatus of the character indicated, comprising a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet, a pump having its inlet in open relation with the said vapor-outlet; means for heating the receptacle; a shaft extending into the receptacle and provided, within the receptacle, with laterally-projecting arms having passage-ways formed therein and extending longitudinally thereof, which arms have orifices discharging into the receptacle; means for supporting the shaft; means for operating the shaft; and means for supplying the aforesaid passage-ways with a gaseous or aeriform fluid.

2. Apparatus of the character indicated, comprising a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet, which receptacle has its lower end provided with a suitably-closed outlet; a pump having its inlet in open relation with the said vapor-outlet; means for heating the receptacle; an upright shaft extending into the receptacle and provided, within the receptacle, with laterally-projecting and radially or approximately radially arranged arms which have passage-ways formed therein and extending longitudinally thereof, means for supporting the shaft; means for operating the shaft; and means for supplying the aforesaid passage-ways with a gaseous or aeriform fluid.

3. Apparatus of the character indicated, comprising a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet; means for heating the receptacle; a shaft extending into the receptacle and provided, within the receptacle, with laterally-projecting perforated arms having passage-ways formed therein and extending longitudinally thereof, which arms have orifices discharging into the receptacle; means for supporting the shaft; means for operating the shaft, and means for supplying the aforesaid passage-ways with a gaseous or aeriform fluid.

4. Apparatus of the character indicated, comprising a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet, which receptacle has its lower end provided with a suitably-closed outlet; a pump having its inlet in open relation with the said vapor-outlet; means for heating the receptacle; a vertically-arranged shaft extending into and centrally of the receptacle and provided, within the receptacle, with laterally-projecting radially or approximately radially arranged perforated arms having passage-ways formed therein and extending longitudinally thereof; means for supporting the shaft; means for operating the shaft, and means for supplying the aforesaid passage-ways with a gaseous or aeriform fluid.

5. Apparatus of the character indicated, comprising the following: a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet, a shaft extending into the receptacle and provided, within the receptacle, with laterally-projecting arms having passage-ways formed therein and extending longitudinally thereof, which arms have discharge-orifices; means for supporting the shaft; means for operating the shaft, and means for supplying air under pressure to the said passage-ways, substantially as and for the purpose set forth.

6. Apparatus of the character indicated comprising the following: a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet, which receptacle has its lower end provided with a suitably-closed outlet; a suction-creating device adapted, when operating, to create suction within the vapor-outlet; an upright shaft extending into the receptacle and provided, within the receptacle, with laterally-projecting arms having passage-ways formed therein and extending longitudinally thereof, which arms have orifices discharging into the receptacle; means for supporting the shaft; means for operating the shaft, and means for supplying air under pressure to the said passage-ways, substantially as and for the purpose set forth.

7. Apparatus of the character indicated, comprising the following: a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet, which receptacle is provided, at its lower end, with a suitably-closed outlet; an upright shaft extending into the receptacle and provided, within the receptacle, with arms *t* projecting laterally of the shaft at or near the lower end of the shaft, which arms extend over and in close proximity to the bottom of the chamber of the receptacle, and are provided, respectively, with a scraper arranged to operate in close proximity to the said bottom; means for supporting the shaft, and means for rotating the shaft.

8. Apparatus of the character indicated, comprising the following: a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet, which receptacle is provided, at its lower end, with a suitably-closed outlet; an upright shaft extending into the receptacle and provided, within the receptacle, with perforated hollow arms *t* projecting

laterally of the shaft at or near the lower end of the shaft, which arms have discharge-orifices arranged to discharge downwardly against the bottom of the chamber of the receptacle; means for supplying fluid under pressure to the said arms; means for supporting the shaft, and means for rotating the shaft.

9. Apparatus of the character indicated, comprising the following: a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet, which receptacle is provided, at its lower end, with a suitably-closed outlet; an upright shaft extending into the receptacle and provided, within the receptacle, with perforated hollow arms *t* projecting laterally of the shaft at or near the lower end of the shaft, which arms have discharge-orifices arranged to discharge downwardly against the bottom of the chamber of the receptacle; means for supplying fluid under pressure to the said arms; guards upon the arms and overhanging the discharge-orifices of the said arms; means for supporting the shaft, and means for rotating the shaft.

10. Apparatus of the character indicated, comprising the following: a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet; a shaft extending into the receptacle and provided with a fluid-conducting passage-way formed in and extending longitudinally of the shaft, which shaft has radially or approximately radially arranged hollow arms at suitable intervals longitudinally of the shaft, with each of the said arms in direct communication, at its inner end, with the aforesaid passage-way; means for supplying the fluid to the said passage-way; means for supporting the shaft, and means for rotating the shaft.

11. Apparatus of the character indicated, comprising the following: a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet, a shaft extending into the receptacle and provided with a fluid-conducting passage-way formed in and extending longitudinally of the shaft, which shaft has hollow perforated arms in open relation, interiorly, with the said passage-way; means for supplying air under pressure to the said passage-way; means for supporting the shaft, and means for operating the shaft.

12. Apparatus of the character indicated, comprising the following: a closed receptacle provided, at its upper end, with a suitably-closed charging-aperture and a vapor-outlet, which receptacle is provided, at its lower end, with a suitably-closed outlet; a suction-creating device adapted, when operating, to create suction in the vapor-outlet; an upright shaft arranged centrally of the receptacle and provided with a fluid-conducting passage-way formed in and extending longitudinally of the shaft, which shaft has hollow perforated arms in open relation interiorly with the said passage-way; means for supplying air under pressure to the said passage-way; means for supporting the shaft, and means for operating the shaft.

13. Apparatus of the character indicated, comprising a closed receptacle, a shaft extending into the receptacle and provided with a fluid-conducting passage-way formed in and extending longitudinally of the shaft, which shaft has hollow perforated arms projecting laterally of the shaft and in open relation interiorly with the aforesaid passage-way; a chest surrounding the shaft and having its chamber in open relation with the aforesaid passage-way; a valved pipe arranged to control the supply of fluid to the said chest; means for supporting the shaft, and means for rotating the shaft.

14. Apparatus of the character indicated comprising the following: a closed receptacle provided, at its upper end, with a suitably-closed charging-aperture and a vapor-outlet, which receptacle is provided, at its lower end, with a suitably-closed outlet; an upright shaft extending into the receptacle and provided with a fluid-conducting passage-way formed in and extending longitudinally of the shaft, which shaft has hollow perforated arms projecting laterally of the shaft and in open relation interiorly with the aforesaid passage-way; a chest surrounding the shaft outside of the receptacle and having its chamber in open relation with the aforesaid passage-way; a valved pipe arranged to control the supply of fluid to the said chest; means for supporting the shaft, and means for rotating the shaft.

15. Apparatus of the character indicated, comprising the following: a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet; an upright shaft arranged within the receptacle and having a passage-way formed in and extending longitudinally of the shaft, which shaft is provided, within the receptacle, with laterally-projecting hollow imperforate arms arranged radially or approximately radially at intervals longitudinally of the shaft and in direct communication, at their inner ends, with the said passage-way; means for supplying a heating fluid to the said passage-way; means for supporting the shaft, and means for rotating the shaft.

16. Apparatus of the character indicated, comprising a receptacle; a shaft extending into the receptacle, and provided, within the receptacle, with laterally-projecting arms arranged a suitable distance apart and in pairs, with a web connecting together the outer ends of the arms of each pair of arms and provided with a scraper arranged to travel in close proximity to the surrounding wall of the chamber of the receptacle during the operation of the shaft.

17. In apparatus of the character indicated, a closed receptacle having a suitably-closed charging-aperture, and a vapor-outlet; a shaft extending into the receptacle, and having a fluid-supply passage-way formed therein and extending longitudinally thereof, which shaft

is provided, within the receptacle, with laterally-projecting hollow imperforate arms in open relation interiorly with the said passage-way; means for supplying the heating fluid to the said passage-way, and a valved exhaust passage-way formed in and extending longitudinally of the shaft and connected with the first-mentioned passage-way.

18. In apparatus of the character indicated, a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet; a shaft extending into the receptacle and provided, within the receptacle, with laterally-projecting hollow perforated arms; a compressed-air reservoir; a valved pipe leading from the said reservoir, and means for conducting air from the said pipe to the interior of the aforesaid arms.

19. In apparatus of the character indicated, a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet; a shaft extending into the receptacle and having a fluid-conducting passage-way 49 formed therein and extending longitudinally thereof, which shaft is provided, within the receptacle, with laterally-projecting hollow perforated arms in open relation interiorly with the said passage-way; a chest surrounding the shaft and having its chamber in open relation with said passage-way; a compressed-air reservoir, and a valved pipe leading from the said reservoir to and in open relation with the said chamber.

20. In apparatus of the character indicated, a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet; a shaft extending into the receptacle, and provided, within the receptacle, with laterally-projecting perforated arms arranged in pairs, with a web connecting together the outer ends of the arms of each pair of arms, and means for supplying fluid to the said arms.

21. In apparatus of the character indicated, a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet; a shaft extending into the receptacle, and provided, within the receptacle, with laterally-projecting perforated arms arranged in pairs, with a hollow web connecting together the outer ends of and establishing open relation between the arms of each pair of arms and having orifices arranged to discharge against the surrounding wall of the chamber of the receptacle, and means for supplying fluid to the said arms.

22. In apparatus of the character indicated, a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet; a shaft extending into the receptacle and having a series of laterally-projecting hollow imperforate arms x and another series of laterally-projecting hollow perforated arms y; means for supplying a heating agent to the imperforate arms, and means for supplying air under pressure to the perforated arms.

23. In apparatus of the character indicated, a closed receptacle having a suitably-closed charging-aperture and a vapor-outlet; a suction-creating device adapted, when operating, to create suction in the vapor-outlet; means for draining the receptacle; a shaft extending into the receptacle and having a series of laterally-projecting hollow imperforate arms and another series of laterally-projecting hollow perforated arms, and means for supplying fluid to the said arms.

24. In apparatus of the character indicated, a receptacle provided, at its lower end, with a downwardly-discharging duct 17; a door normally closing the said duct from below; means for holding the door in its closed position, and a drain-pipe f comprising a pipe-section 31 attached to the door and in open relation with the aforesaid duct, another pipe-section 32 and a union 33 for coupling the said pipe-sections together.

25. In apparatus of the character indicated, a receptacle provided, at its lower end, with a downwardly-discharging duct 17; a door normally closing the said duct from below; means for holding the door in its closed position; a strainer or screen at the inner side of the door and bulging upwardly, and a guard-forming frame extending over the said screen or strainer.

26. In apparatus of the character indicated, a closed receptacle having a downwardly-discharging duct 17; a door normally closing the said duct from below; means for holding the door in its closed position; a drain-pipe comprising a pipe-section attached to the door and in open relation with the aforesaid duct; a concavo-convex strainer or screen at the inner side of the door and bulging upwardly, and a guard-forming frame r extending over the said screen or strainer.

Signed by me at Cleveland, Ohio, this 14th of September, 1901.

EUGENE R. EDSON.

Witnesses:
C. H. DORER,
V. C. LYNCH.