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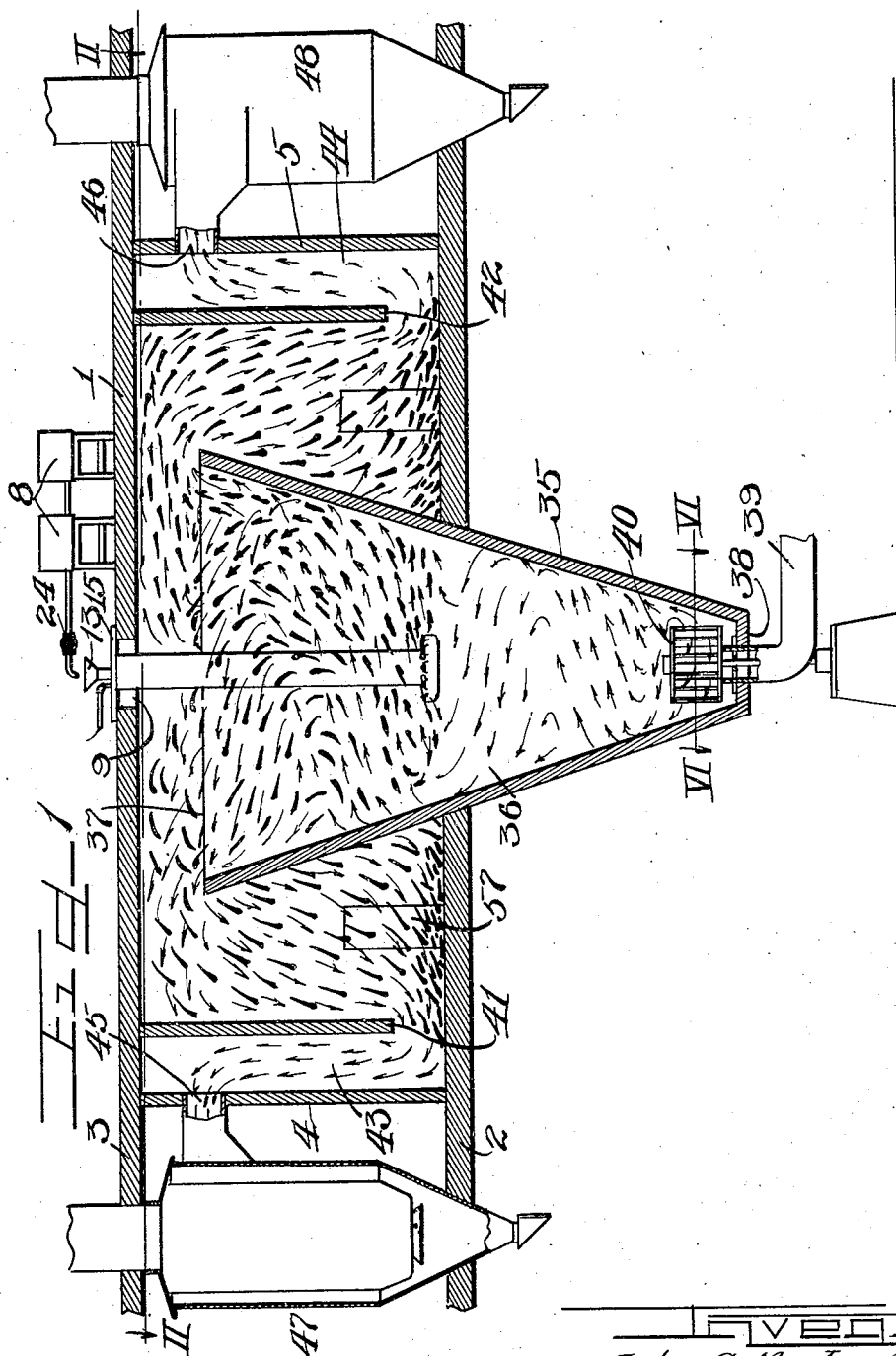
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PROCESS AND APPARATUS FOR DEHYDRATING LIQUID MATERIAL

Filed Oct. 25, 1928

3 Sheets-Sheet 1



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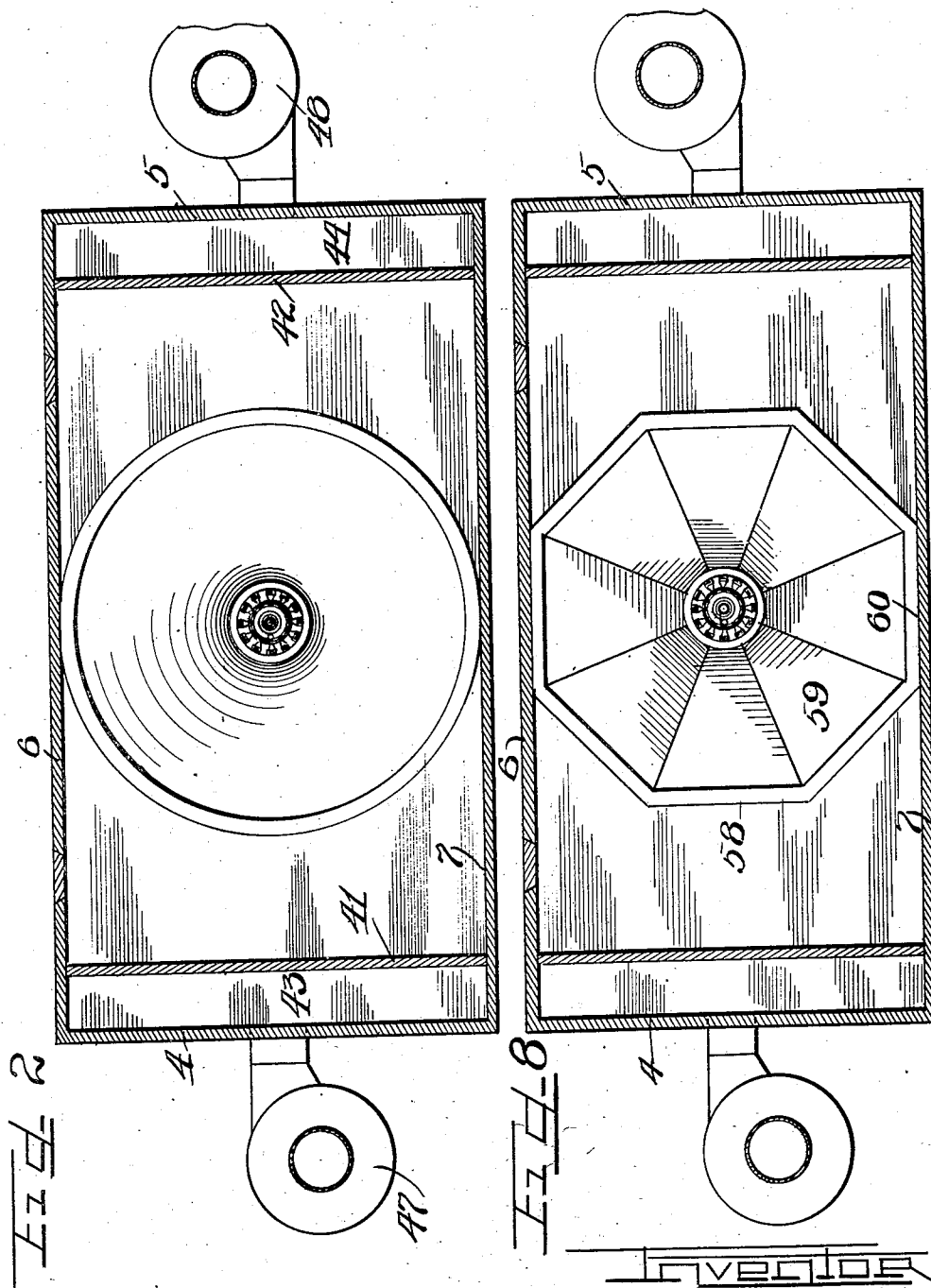
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3 Sheets-Sheet 2



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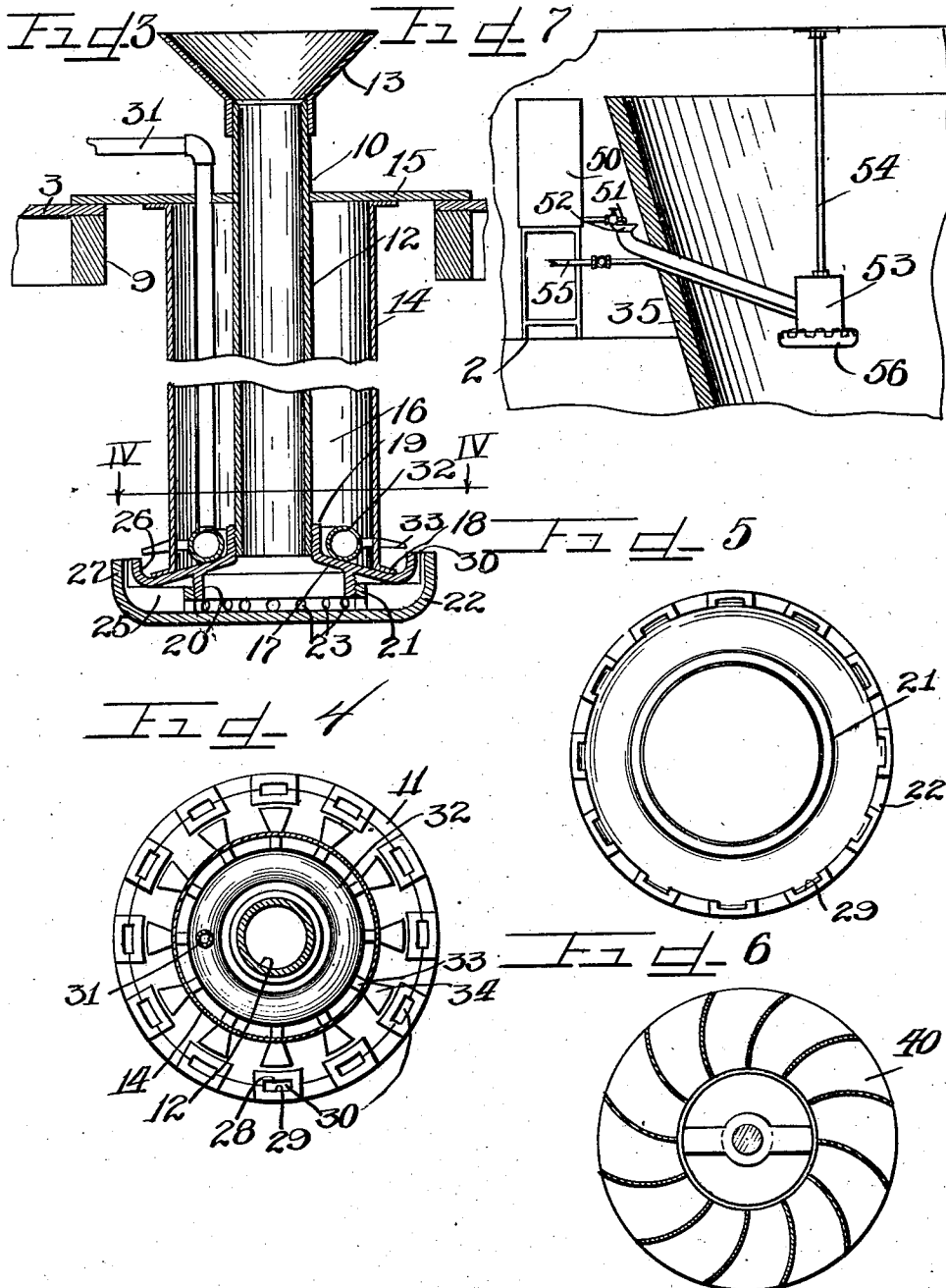
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PROCESS AND APPARATUS FOR DEHYDRATING LIQUID MATERIAL

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

JOHN C. MACLACHLAN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
ALBERT P. HUNT, OF CHICAGO, ILLINOIS

PROCESS AND APPARATUS FOR DEHYDRATING LIQUID MATERIAL

Application filed October 25, 1928. Serial No. 315,091.

This invention relates to a process and apparatus for dehydrating liquid material containing solids, and more particularly to a process and apparatus for drying rubber latex and similar material in the form of small comminuted particles.

It is an object of this invention to provide an improved process and apparatus for effecting the dehydration of rubber latex or similar material.

It is a further object of this invention to provide a process and apparatus capable of drying large quantities of latex or similar material in an economical manner with a more efficient use of the apparatus to its full capacity.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

This invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is an elevational sectional view of an apparatus embodying the principles of this invention, with parts in elevation;

Figure 2 is a sectional view taken substantially on line II—II of Figure 1;

Figure 3 is an enlarged broken longitudinal sectional view of the feed device and spray head;

Figure 4 is a sectional view taken substantially on line IV—IV of Figure 3;

Figure 5 is a top plan view of Figure 4 with parts removed;

Figure 6 is an enlarged sectional view taken substantially on line VI—VI of Figure 1;

Figure 7 is an enlarged fragmentary view of a modified form of feed device; and

Figure 8 is a longitudinal sectional view of a modified form of drying cabinet.

The reference numeral 1 indicates a cabinet, which may suitably be formed using as bottom and top walls, the floors 2 and 3 respectively of a building in which the drying apparatus is to be housed.

The drying cabinet 1 is here shown as substantially rectangular in form with end walls

4 and 5 and side walls 6 and 7, but it may be circular in form or any other desired shape. Preferably, the walls and top and bottom of said drying cabinet 1 are formed of cement, brick or tile, or other similar relatively non-heat-conducting material.

One or more reservoirs 8 for containing the rubber latex or similar material is positioned above the drying cabinet 1 on the flooring 3. This flooring 3 is provided with an opening 9 for the insertion of a feed device, indicated as a whole by the reference numeral 10, carrying at its lower end a spray head 11. Said feed device 10, as best shown in Figure 3, comprises an inner pipe or cylinder 12, provided with a funnel 13 at its upper end, and an outer concentric flanged cylinder 14. An upper plate 15 serves both as a cover for said opening 9 and as a closure for the annular chamber 16 formed between the two cylinders 12 and 14. The bottom of said annular chamber 16 is closed by an annular plate 17, secured as at 18 to the lower flanged end of the cylinder 14 and provided with an internally threaded central flange 19 for receiving the lower threaded end of the cylinder 12. Said plate 17 is also provided with an annular flange 20 on its under side that is threaded externally for attachment to an upstanding annular flange 21 on a lower plate 22. The annular flange 21 is provided with a plurality of apertures 23, to permit the passage of the liquid material introduced into the cylinder 12 from the reservoir 8 by means of a pipe 24 to fill the space 25 between said plates 17 and 22. The edges of the plates 17 and 22 respectively are turned upwardly as at 26 and 27 respectively and are recessed as at 28 and 29 respectively to provide discharge ports 30.

A pipe 31 for carrying superheated steam under pressure extends through the plate 15 parallel to the cylinder 12 and connects at its lower end with an annular pipe 32 resting upon the plate 17 and provided with a plurality of discharge nozzles 33 having flat orifices 34. Each nozzle 33, as best shown in Figures 3 and 4, terminates slightly above and just behind a discharge port 30, so that the steam under pressure may serve to atomize

the liquid rising out of said discharge port 30. The steam, which is highly superheated, sprays the liquid, such as rubber latex, in a generally horizontal plane and simultaneously effects the substantial dehydration of the liquid. The liquid may also be sprayed in a slightly downward or upward direction as shown in my application, Serial No. 243,318, filed December 29, 1927.

10 A funnel-shaped member 35 surrounds the spray head 11 (Figs. 1 and 2) in such a manner as to form a spraying chamber 36 opening, as at 37, into the interior of said drying cabinet 1 and closed at its lower end by a wall 38. The upwardly flared walls of said funnel-shaped member 35 extend to within a short distance from the top 3 of said drying cabinet 1, and extend through the bottom wall 2 for a considerable distance.

20 A conduit 39 leads into the bottom of said funnel-shaped member 35 for delivering a current of a heated gaseous drying medium such as air to said spraying chamber 36. A stationary deflector 40 mounted above the open end of said conduit 39 and supported from the plate 38 serves to give the air currents a whirling or swirling movement, as indicated by the arrows in Figure 1, during their ascent through the spraying chamber 36.

30 The swirling currents of upwardly ascending air meet the sprayed particles and carry them, together with the entrained steam, or water vapor, out through the upper flared opening 37 of said funnel-shaped member 35 into the interior of said drying cabinet 1. Baffles 41 and 42, positioned at each side of said funnel-shaped member 35 and extending transversely of said drying cabinet 1 from the top wall 3 thereof, cause the currents of heated air carrying the now dried particles of sprayed material to be deflected downwardly. The dried sprayed particles are thereby caused to be deposited upon the floor 2 of said drying cabinet, while the waste gases pass upwardly through the passages 43 and 44 formed between the baffles 41 and 42 and the ends 4 and 5 of said cabinet respectively and out through discharge openings 45 and 46 formed in said end walls 4 and 5 respectively. Centrifugal type separators 47 and 48, which may be of any standard type, are connected to the discharge ports 45 and 46 respectively. In these separators 47 and 48, any particles of dried material that may be carried over are separated out and collected in receptacles, (not shown), placed at the bottom of said separators.

50 In the modification shown in Figure 7, of the feeding device, the liquid to be sprayed is run from a storage tank 50 positioned on the floor 2 through a valve or faucet 51, into a spout 52 that extends through the wall of the funnel-shaped member 35 to a spraying device 53. The spraying device 53 is similar in operation to that already described, but

is merely suspended from the top wall of the drying cabinet by means of a rod 54. A steam pipe 55 also passes through the side wall of the funnel-shaped member 35 along-side of the spout 52, for connection with the spraying head 56.

This modified construction permits control of the feed device from the floor 2, and since admittance to the drying chamber through doors 57 in the side wall 6 of the drying cabinet is also gained from the floor 2, this arrangement is somewhat more convenient for the operator.

In Figure 8, there is shown a funnel-shaped member 58, which instead of being conical shaped as in Fig. 1, is provided with plane faces 59 to form a truncated prism. It should be noted that irrespective of the shape of the funnel-shaped member, its upper portion lies tangential as at 60 to the side walls 6 and 7 of the drying chamber.

The operation of the apparatus is substantially as follows:

Rubber latex, or similar material, is run from the tank or tanks 8 through the pipe 24 into the open funnel 13, from which it passes down through the cylinder 12 into the spray head 11. The cylinder 12 serves as a reservoir for the latex so that it may be introduced into the spray head under any desired head. The latex passes through the opening 23 into the annular chamber 25 and up through the discharge ports 30.

As the latex emerges from the ports 30, it is met by blasts of superheated steam, which impact the latex with great force, instantly atomizing and drying the latex and scattering it in dry particles into a rapidly upwardly revolving body of warm air introduced through the bottom conduit 39. The air serves primarily as a carrying medium and need not be sufficiently hot to act as the sole drying medium. The required temperature of the air will vary in accordance with the volume used, as well as the volume of latex to be dehydrated, the volume of superheated steam and its degree of superheat. It is sufficient if the air is hot enough to absorb the moisture that the superheated steam extracts from the latex in the drying process, and also hot enough to absorb the water vapor formed by the cooling of the superheated steam. The upwardly swirling current of heated air carries with it the dried particles of latex out of the open top of the funnel-shaped member 35 and into the interior of the cabinet 1. The effect of the baffles 41 and 42 is to cause a downward deflection of the air current carrying the dried particles of latex with a resultant deposition of the dried particles upon the flooring 2. The air, freed from its load of dried particles, but still retaining the moisture absorbed from the latex and steam, passes again upwardly through the end chambers 130

43 and 44 and out through the discharge openings 45 and 46 into the centrifugal separators 47 and 48 respectively. In these separators, any dust particles that have been carried over are separated out and collected at the bottom.

It will be appreciated that my apparatus provides in compact form, a means for drying liquids containing solids and is especially adapted to the dehydration of rubber latex or other similar material. By other similar material it is meant to include other lactiferous juices of rubber trees such as balata and gutta-percha. It should be particularly noted that the funnel-shaped member 35 provides an upwardly continuously expanding spraying chamber wherein the sprayed particles of latex may be maintained in a suspended condition in the swirling current of heated gaseous drying medium for any desired period of time. Obviously, by varying the velocity of the air currents issuing from the conduit 39, the time during which the latex particles are suspended in the spraying chamber 36 may be correspondingly varied. It is further apparent that the larger sized globules of rubber latex will be suspended for a longer period of time than the smaller particles due to their greater mass and for this reason the larger globules which are slower drying, will remain in contact with the superheated steam for a sufficient length of time to complete the dehydration. In effect, then, the upwardly expanding spraying chamber 36 functions much the same as an air separator for fine dust particles in suspension, and this function is extremely important from the standpoint of thorough dehydration of the latex.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. Apparatus for dehydrating liquids containing solids, which comprises a drying cabinet, means within said cabinet for spraying a liquid in a substantially horizontal plane, means positioned below said first mentioned means for directing a swirling current of a gaseous drying medium against said sprayed liquid and means forming an upwardly expanding chamber including said two first mentioned means and opening at its top into the interior of said cabinet.

2. Apparatus for dehydrating liquids, comprising a drying cabinet, a spray device secured to but spaced downwardly from the top of said cabinet, a funnel-shaped member opening at its top into the interior of said cabinet and enclosing said spray device and means positioned adjacent the tapered bot-

tom of said funnel-shaped member for directing upwardly ascending currents of a gaseous drying medium to carry the sprayed material into the interior of said cabinet.

3. Apparatus for dehydrating liquids containing solids, comprising a drying cabinet, spraying means within said cabinet secured to but spaced from the top thereof, a hollow member closed at the bottom and opening at the top into the interior of said cabinet enclosing said spraying means and means positioned adjacent the bottom of said hollow member for creating upwardly swirling currents of a heated gaseous medium adapted to carry the sprayed material out of the top of said hollow member into the interior of said cabinet.

4. Apparatus for dehydrating liquids containing solids, comprising a drying cabinet, spraying means within said cabinet secured to but spaced from the top thereof, a funnel-shaped member closed at the bottom and opening at the top into the interior of said cabinet enclosing said spraying means and means positioned adjacent the tapered bottom of said funnel-shaped member for creating upwardly swirling currents of a heated gaseous medium adapted to carry the sprayed material out of the top of said funnel-shaped member into the interior of said cabinet.

5. Apparatus for dehydrating liquids containing solids, which comprises a drying cabinet having an opening in the bottom thereof, a funnel shaped member extending upwardly through said opening to within a short distance from the top wall of said cabinet, a spraying device positioned axially within said funnel-shaped member and means positioned adjacent the bottom of said member for directing upwardly ascending swirling currents of a gaseous dehydrating medium.

6. Apparatus for dehydrating liquids containing solids, which comprises a drying cabinet having an opening in the bottom thereof, a funnel shaped member extending upwardly through said opening to within a short distance from the top wall of said cabinet, a spraying device positioned axially within said funnel-shaped member approximately equidistant from its top and bottom, and means positioned adjacent the bottom of said member for directing upwardly ascending swirling currents of a gaseous dehydrating medium.

7. Apparatus for dehydrating liquids containing solids, which comprises a drying cabinet having an opening in the bottom thereof, a funnel shaped member extending upwardly through said opening to within a short distance from the top wall of said cabinet, a spraying device positioned axially within said funnel-shaped member, means positioned adjacent the bottom of said member for directing upwardly ascending swirling currents of a gaseous dehydrating medium, and baffles

on each side of said funnel shaped member extending from the top wall of said cabinet, a space between the bottom edge of said baffle and the floor of said cabinet and also between the outside surface of said baffle and the inside surface of the adjacent side wall of said cabinet, thereby causing said current of gaseous dehydrating medium to be first deflected downwardly by said baffle and then to be deflected upwardly on the opposite side of said baffle by the floor and said adjacent side wall of the cabinet for effecting a deposition of the dried sprayed material upon the floor of said cabinet.

8. Apparatus for dehydrating liquids containing solids, comprising a drying cabinet having an opening in the bottom thereof, an upwardly flared funnel-shaped member extending through said opening to within a relatively short distance from the top wall of said cabinet, liquid conducting means extending downwardly through the top wall of said cabinet into said funnel-shaped member, a spray device positioned on the lower end of said conducting means and means at the bottom of said funnel-shaped member for directing an ascending current of a heated gas against the sprayed liquid to aid in dehydrating the liquid and carry the dried sprayed particles out of the top of said funnel-shaped member into the interior of said drying cabinet.

9. Apparatus for dehydrating liquids containing solids, comprising a drying cabinet having an opening in the bottom thereof, an upwardly flared funnel-shaped member extending through said opening to within a relatively short distance from the top wall of said cabinet, liquid conducting means extending downwardly through the top wall of said cabinet into said funnel-shaped member, a spray device positioned on the lower end of said conducting means, means at the bottom of said funnel-shaped member for directing an ascending current of a heated gas against the sprayed liquid to aid in dehydrating the liquid and carry the dried sprayed particles out of the top of said funnel-shaped member into the interior of said drying cabinet, and transverse baffles extending from the top wall of said cabinet on each side of said funnel-shaped member, a space between the bottom edge of said baffles and the floor of said cabinet and also between the outside surface of said baffles and the inside surface of the adjacent side walls of said cabinet, thereby causing said current of gaseous dehydrating medium to be first deflected downwardly by said baffles and then to be deflected upwardly on the opposite sides of said baffles by the floor and said adjacent side walls of the cabinet for effecting a deposition of the dried particles upon the floor of said drying cabinet.

10. Apparatus for dehydrating liquids containing solids, comprising a drying cabi-

net having an opening in the bottom thereof and discharge openings at the ends thereof near the top, an upwardly flared funnel-shaped member extending through said opening to within a relatively short distance from the top wall of said cabinet, liquid conducting means extending downwardly through the top wall of said cabinet into said funnel-shaped member, a spray device positioned on the lower end of said conducting means, means at the bottom of said funnel-shaped member for directing an ascending current of a heated gas against the sprayed liquid to aid in dehydrating the liquid and carry the dried sprayed particles out of the top of said funnel-shaped member into the interior of said drying cabinet, and transverse baffles extending from the top wall of said cabinet on each side of said funnel-shaped member for effecting a deposition of the dried particles upon the floor of said drying cabinet prior to the discharge of the heated gas through the openings in the end walls of said cabinet.

11. Apparatus for dehydrating liquids containing solids, which comprises a cabinet, a spraying device positioned within said cabinet and secured to the top wall thereof at a considerable distance from the same, means for separately conducting liquids and steam under pressure to said spraying device, means positioned below said spraying device for directing upwardly swirling currents of heated air and walls enclosing said spraying device and current directing means to form an upwardly expanding spraying chamber opening at its top into the interior of said cabinet.

12. Apparatus for dehydrating liquids containing solids, which comprises a cabinet, a spraying device positioned within said cabinet at a considerable distance from the top wall thereof, means for separately conducting liquids and steam under pressure to said spraying device, means positioned below said spraying device for directing upwardly swirling currents of heated air, walls enclosing said spraying device and current directing means to form an upwardly expanding spraying chamber opening at its top into the interior of said cabinet, and baffles extending from the top wall of said cabinet transversely thereof on each side of said spraying chamber to effect a deposition of the dried sprayed material upon the floor of said cabinet.

13. Apparatus for dehydrating liquids containing solids, which comprises a cabinet, a spraying device positioned within said cabinet at a considerable distance from the top wall thereof, for spraying liquids in a generally horizontal direction, means for separately conducting liquids and steam under pressure to said spraying device, means positioned below said spraying device for

directing upwardly swirling currents of heated air against the sprayed material and walls enclosing said spraying device and current directing means to form an upwardly expanding spraying chamber opening at its top into the interior of said cabinet.

14. The method of dehydrating liquid materials containing solids, which comprises spraying said liquid materials into an upwardly swirling current of a heated gaseous medium, effecting a continuous expansion of the ascending gaseous medium and causing the deposition of the dried sprayed particles at a level below the uppermost points of travel of said gaseous medium and laterally with respect to said upwardly swirling current.

15. The method of dehydrating liquid materials containing solids, which comprises spraying said liquid materials in a generally horizontal plane, directing an upwardly swirling column of heated air against said sprayed materials, effecting a continuous expansion of the ascending column of air and causing the deposition of the dried sprayed particles at points lying outside of said column of heated air.

In testimony whereof I have hereunto subscribed my name at Chicago, Cook County, Illinois.

JOHN C. MacLACHLAN.

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