June 25, 1946. D. W. KAUFMANN 2,402,636

DISSOLVING APPARATUS

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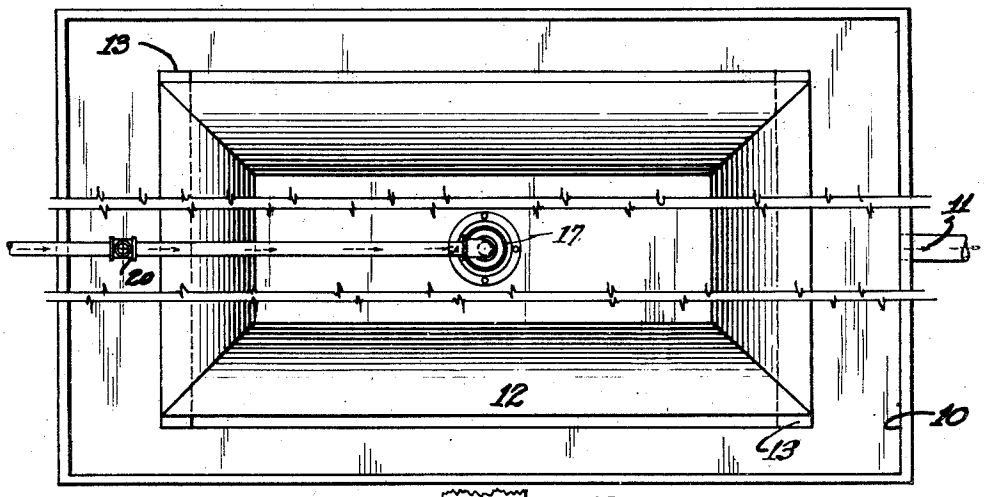


Fig. 1

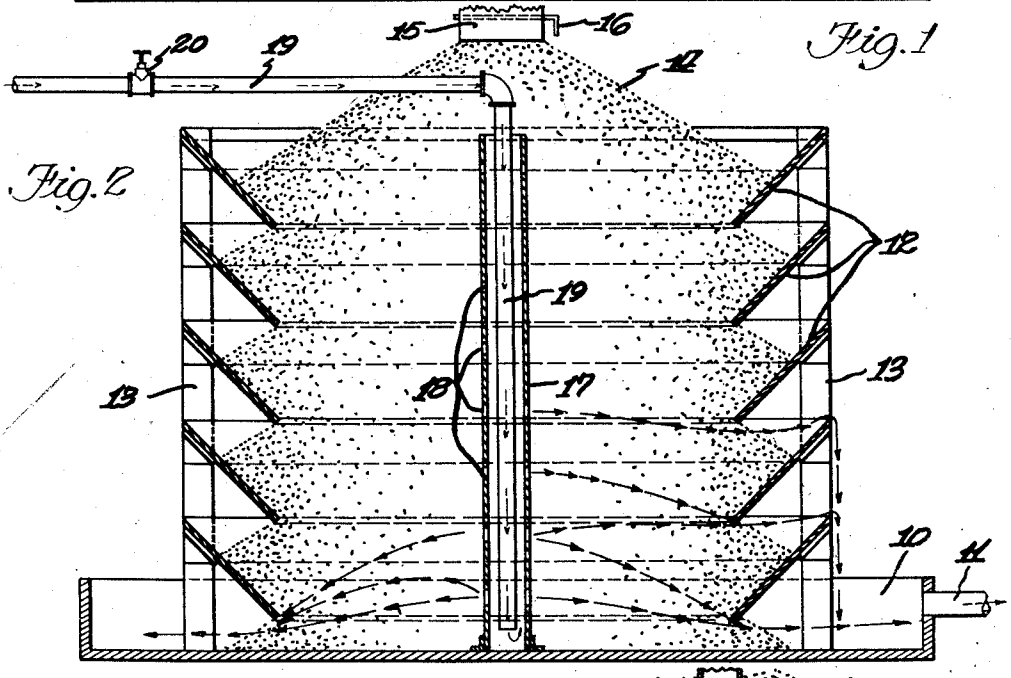


Fig. 2

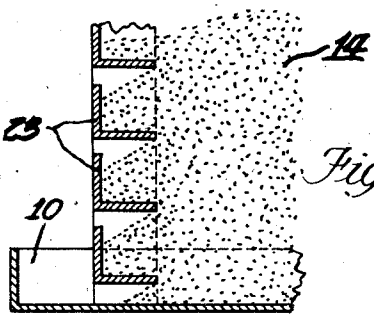


Fig. 4

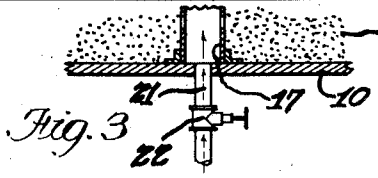


Fig. 3

Inventor:
Dale W. Kaufmann
By: Brayton G. Richards
Attorney.

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Fig. 5

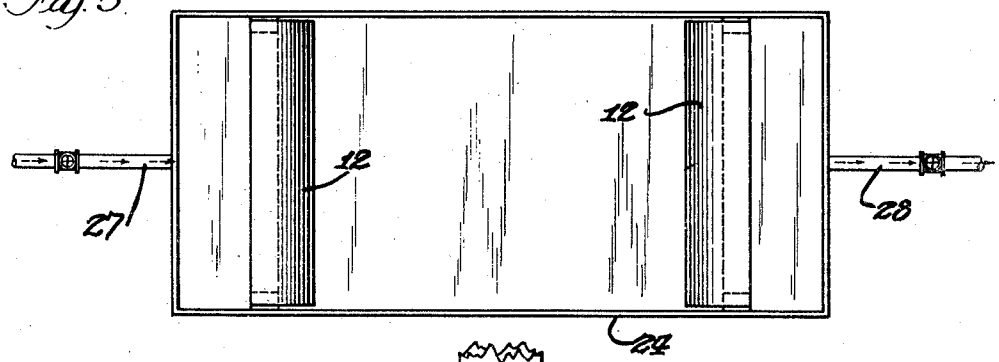


Fig. 6

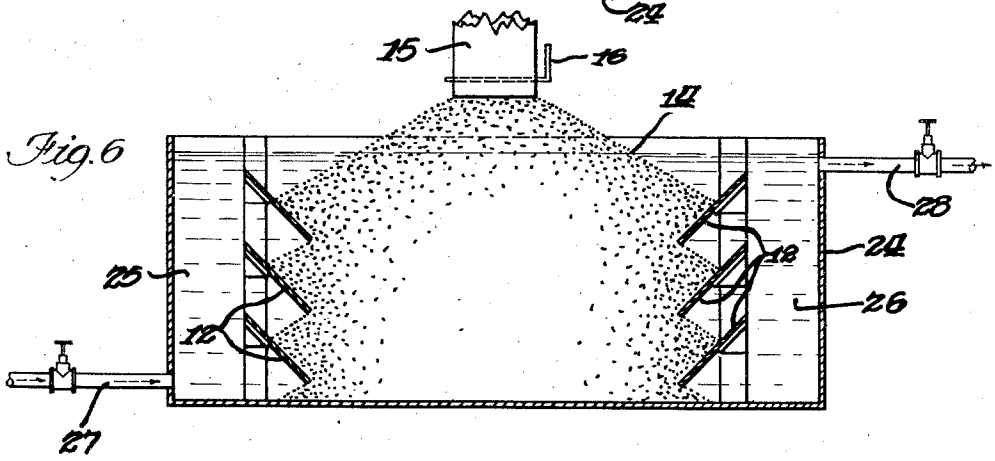


Fig. 7

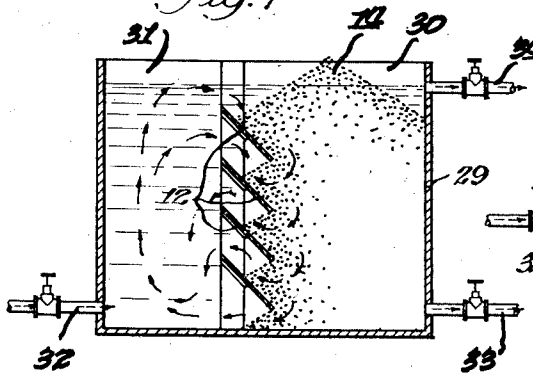
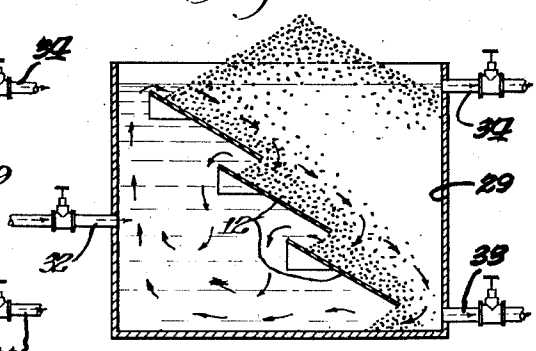


Fig. 8



Inventor:
Dale W. Kaufmann
By: Brayton & Richards
Attorney.

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UNITED STATES PATENT OFFICE

2,402,636

DISSOLVING APPARATUS

Dale W. Kaufmann, Dearborn, Mich., assignor to International Salt Company, Incorporated, Scranton, Pa., a corporation of New York

Application May 30, 1942, Serial No. 445,411

1 Claim. (Cl. 23—272)

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The invention relates to improvements in dissolving apparatus especially adapted for the formation of salt or similar solutions, and has for its primary object the provision of a simple and efficient construction of the character indicated.

Another object of the invention is the provision of an improved construction of the character indicated which operates automatically to filter the solution as it is being formed.

Other objects will appear hereinafter.

The invention consists of the combinations and arrangements of parts hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings forming a part of this specification and in which:

Fig. 1 is a partial plan view of dissolving apparatus embodying the invention;

Fig. 2 a vertical longitudinal medial section thereof;

Fig. 3 a detail sectional view illustrating a slightly modified form of arrangement for introducing the solvent into the apparatus;

Fig. 4 a detail view illustrating a slightly different form of louver boards which may be employed in the apparatus;

Fig. 5 is a top plan view of a modified form of apparatus;

Fig. 6 a vertical longitudinal medial section of the form of apparatus illustrated in Fig. 5;

Fig. 7 a vertical medial section illustrating another modified form of apparatus; and

Fig. 8 a similar section illustrating still another modified form of apparatus.

The embodiment of the invention illustrated in Figs. 1 and 2 comprises a base 10 in the form of a shallow pan having a pipe 11 arranged at one end thereof for the purpose of withdrawing the finished solution from the apparatus. A container is formed centrally in the pan 10 out of louver boards 12 arranged in vertical overlapping relation as shown around the four sides of said container to constitute the four vertical walls thereof, said louver boards being supported as shown on four corner posts 13, and whereby a container is provided centrally in the pan 10 having all of its walls provided with louver openings. A constant supply of solute, such as salt 14 is maintained in the container thus provided by means of a supply pipe 15 having a valve 16 as indicated. As will be noted, the louver boards 12 are so arranged as to prevent the outward flow of the solute through the louver openings, said louver boards being sufficiently overlapped so that the angle of repose of the solute will prevent any outward flow of the solute as such and will compel the upward flow of the solvent from the exposed surfaces of the solute as will be readily understood from an examination of Fig. 2.

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A stand pipe 17 is arranged as shown centrally in the body of the solute and a liquid supply pipe 19 is extended into said stand pipe to discharge the solvent into the bottom thereof. The stand pipe 17 is provided with escape openings 18 at different levels and the supply pipe 19 is supplied with valve 20 by means of which the flow of solvent to the apparatus may be controlled as desired.

By this arrangement a simple and effective dissolving apparatus is provided in which the head of the solvent in the stand-pipe 17 will automatically balance itself against the flow resistance through the solute or through the accumulated mixture of solute and insoluble impurities out side of the stand-pipe. Thus in dissolving a solute, such as rock salt, which contains certain amounts of insoluble or slowly difficultly soluble material, the salt flows into the container through spout 15 and whereby a constant level of solute will be maintained in said container. Water is introduced through pipe 19 and the rate of flow controlled through valve 20. At the beginning of operations the water will flow outwardly through the lowest openings 18 in the standpipe 17 and proceed thence radially to the outward lowest louver openings and thence into the pan 10 and out through discharge pipe 11 as indicated by the lower arrows in Fig. 2. Obviously the newly entering water, close to the standpipe, contains the least salt, and successively more salt at points radially further out, until the water is fully saturated. The size of the container is such that the water will become fully saturated before it emerges from the louver openings so that the saturated solution must traverse additional salt before escaping from the container. The portion of the salt thus traversed by the fully saturated brine will thus constitute a filter to remove suspended dirt or any insoluble matter from the brine. Or, if desired, the size of the container and the rate of flow of the solvent may be regulated so that any desired degree of saturation may be obtained in the solvent as will be readily understood. As soon as the salt starts to dissolve around the openings 18 in the stand-pipe 17 more salt will flow down from above and the comparatively rapid dissolution at this point will result in the accumulation of foreign matter which is either insoluble or slowly and difficultly soluble. This residue of foreign material will

cause resistance to the flow and then the water will escape from the standpipe through the higher level of openings 18. Increasing resistance due to accumulating residue will cause decreased flow from said higher level of openings and the above process will be repeated. Thus the flow will be from successively higher openings 18 and over successively higher paths through the solute. In this way, until the entire mass of solute becomes clogged with foreign matter, the solvent will automatically seek the shortest possible path to the outside of the container and thus the solvent will have a minimum of exposure to the difficultly soluble impurities which always contaminate the brine made from rock salt. As will be noted, the outflow of saturated brine is always upward from the body of solute so that none of the solute will be carried along by the current.

In the modification illustrated in Fig. 3 a supply pipe 21 having a valve 22 is arranged to introduce the water or other solvent into the bottom of the stand-pipe 17, obviously with the same effects as described above.

In the modification illustrated in Fig. 4, I have illustrated a modified form of louver boards 23 which may be employed to form walls of the solute container.

In the modification illustrated in Figs. 5 and 6 a tank 24 is provided with transverse louver boards 24 extending across opposite ends thereof so as to provide liquid spaces 25 and 26. A valved supply pipe 27 leads into the space 25 and a valved discharge pipe leads from the space 28. Obviously the pipes 27 and 28 may be connected with the spaces 25 and 26 at any desired levels. By this arrangement the solvent flows from pipe 27 into space 25 thence through the container and the body of the solute 14 and out through the space 26 and 28 with substantially the same results as that already described. If the solvent is arranged to enter the space 25 at a low level and the withdrawal pipe 28 is also arranged at a low level, the flow through the mass of solute will be at increasingly higher levels, as insolubles accumulate, with a correspondingly increased height of solvent in chamber 25.

In the modification illustrated in Fig. 7 a tank

29 is divided centrally by transverse louver boards 12 into a solute chamber 30 and solvent chamber 31. The solvent is introduced through a valved supply pipe 32 and withdrawn through either of the discharge pipes 33 or 34. In operation the solvent enters chamber 31 until the tank is full whereupon further flow of solvent may be stopped if desired. The solvent comes in contact with the solute through the louver openings and dissolves the same. Such dissolution increases the specific gravity of the solution which causes it to flow downwardly both inside and outside of the louver wall, and upwardly in a path near the end of the dissolution tank. The net result is a circulation of the solvent as indicated by arrows until the same is fully saturated when it may be drawn off through pipe 34. Pipe 33 is used for cleaning out and draining purposes.

In the modification illustrated in Fig. 8 a slightly different arrangement of louver boards 12 is indicated. Otherwise the construction and operation thereof is the same as that of the apparatus illustrated in Fig. 7.

While I have illustrated and described the preferred forms of construction for carrying the invention into effect, these are capable of variation and modification without departing from the spirit of the invention. I therefore do not wish to be limited to the precise details disclosed, but desire to avail myself of such modifications and variations as fall within the scope of the appended claim.

I claim:

Dissolving apparatus comprising a tank, a container for solid material positioned within said tank, said container having walls composed of upwardly and outwardly sloping louver boards arranged in vertically spaced overlapping relation to retain said solid, means located above said container for supplying solid material thereto, means for introducing liquid into the tank at a point adjacent the bottom thereof located and directed so as to cause passage of said liquid transversely through said container, and means for withdrawing solution from said tank from a point outside said louvered walls.

DALE W. KAUFMANN.