

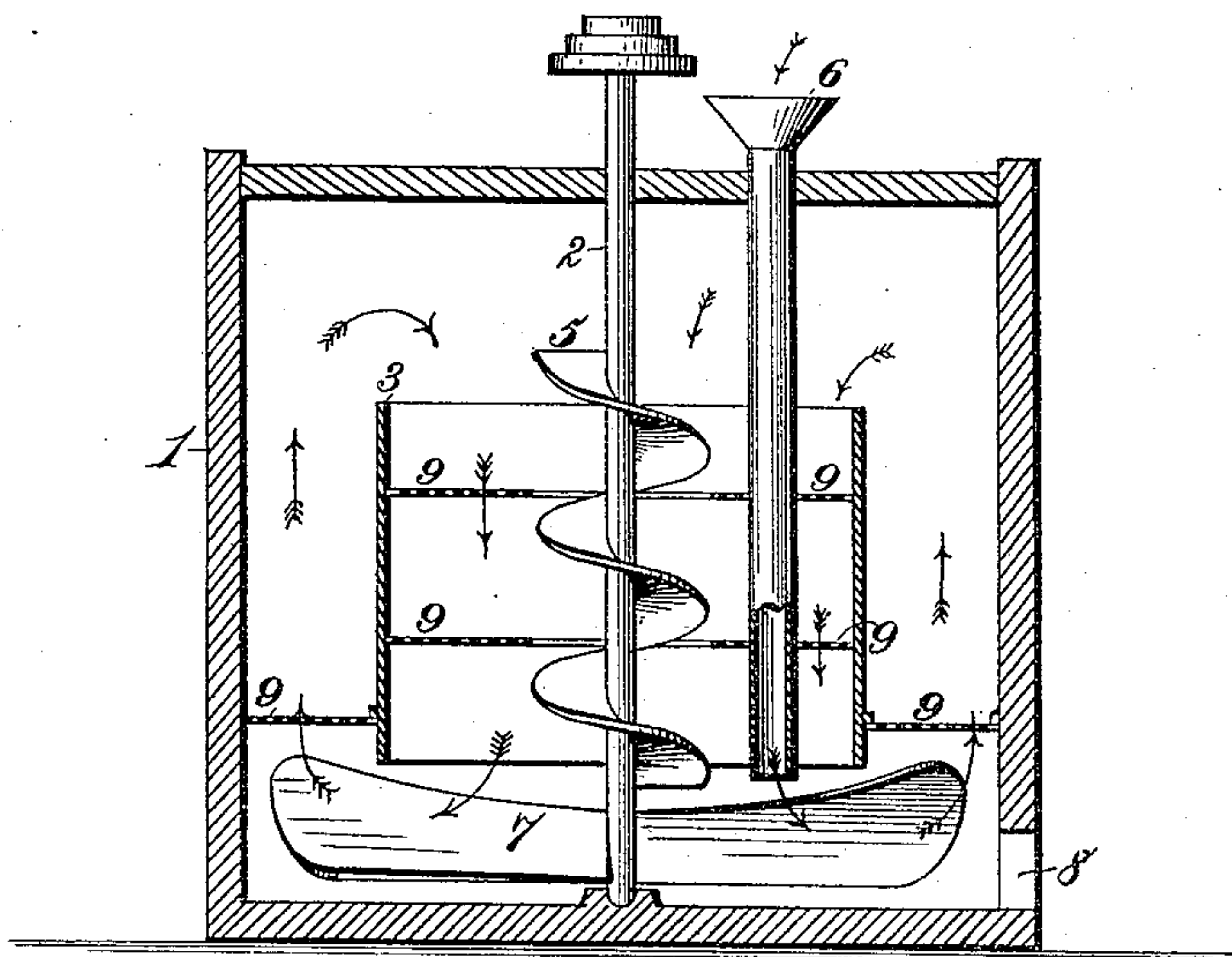
(No Model.)

C. HORNOSTEL.

MIXING, DIFFUSING, LEACHING, AND CONCENTRATING APPARATUS.

No. 328,585.

Patented Oct. 20, 1885.



Witnesses.

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MIXING, DIFFUSING, LEACHING, AND CONCENTRATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 328,585, dated October 20, 1885.

Application filed December 29, 1884. Serial No. 151,518. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HORNBOSTEL, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Mixing, Diffusing, Leaching, and Concentrating Apparatus, of which the following is a specification.

My invention relates to improvements in the inner arrangements in vessels which have for an object the diffusing of liquids, air, or gas through solids, and the intermingling, diffusing, dissolving, disintegrating, concentrating, and leaching of masses generally.

This object has been attained heretofore by various devices. Some consist in agitating the mass to be treated by apparatus imparting a rotary motion, and for this purpose propeller-wheels and rakes and stirring-arms of various construction, attached to a rotating shaft, have been used. By certain mechanical arrangements in some apparatus the solid components of a mass are lifted and become moved about while being rotated, in a manner similar to being shoveled from the bottom upward, for affording an opportunity of diffusing the liquid through the solid components of a mass. One system commonly in use consists in allowing a liquid to percolate through solids for dissolving or extracting, either mechanically or by chemical combination, the soluble components.

The methods heretofore applied in mixing, diffusing, concentrating, and leaching apparatus have failed in bringing the components of a mass uniformly, effectively, quickly, and readily into intimate contact.

The object of my invention is to perfect the methods of treating with air at any desired temperature, or with gas, and of intermingling, diffusing, dissolving, disintegrating, concentrating, and leaching masses, first, by substituting for a rotary motion a vertical motion, by means of which the masses to be treated are caused to move and flow from the bottom upward and then down again in one inner and one outer compartment, connecting on top and bottom of the mixing-vessel, in the manner hereinafter described; second, by affording facilities for introducing the materials to be treated into the said mixing-vessel from the bottom upward, for intermingling the com-

ponents of a mass at once effectively and uniformly; also, by affording facilities for aerating masses during treatment, either for lowering or raising the temperature, and for separating the components of a mass during operation, in the manner hereinafter described.

In carrying out my invention and for attaining the said objects I make use of vessels of any desired construction, which may be the same as or similar to those now in use for the same or similar purposes. In the center of said vessels I place in an upright position a shaft, around which I arrange a spiral, and which said shaft at its upper end is provided with proper attachments for being revolved by pulleys, cog-wheels, or otherwise, while the lower end of said shaft runs on a step on the bottom of said vessel. Close to and spreading over the bottom of said vessel I attach to said shaft a propeller-wheel. Now, on rotating the said shaft and wheel, it operates more or less in the same manner and for the same purpose as an ordinary revolving stirring apparatus. However, the function and purpose of said propeller-wheel becomes entirely changed by the following combination with said propeller-wheel and shaft. I now place in a vertical position in the center of said vessel, and over the center of said propeller-wheel and surrounding said spiral shaft, a tubular frame open on top and bottom, in such a manner that on being properly fastened to said vessel the lower end of said tubular frame reaches close onto the upper edges of the blades of said propeller-wheel without touching these, while the upper end of said tubular frame reaches to a height at which it will be immersed under the contents of said vessel during operation. On now rotating said propeller-wheel and shaft with the tubular frame in the described position the masses in the said vessel will be drawn downward through said tubular frame, the rotating propeller-wheel creating a vacuum at and throwing the masses continually out from under the base of said tubular frame and into the space between the outer walls of said tubular frame and the walls of said vessel, where the masses are forced upward to the top and over the tubular frame to be drawn into and down through said tubular frame again and again until the operation is finished. When in the course of said opera-

tion a separation or disintegration of the components of a mass takes place, which has as a consequence a difference in the specific gravity of said components, or when said difference exists originally among said components, then, instead of the whole mass passing upward to the top and down through said tubular frame without intermission, the lighter components of a mass will only take said course, while the heavier components will not rise to a sufficient height in said outer compartment for passing over and into said tubular frame, but will be washed and agitated by the continuous passage of the lighter and fluid components through said heavier components confined by reason of their specific gravity near the bottom of said vessel and between the outer walls of said tubular frame and the sides of said vessel. By a proper adjustment of the height of said vessel and of said tubular frame, any desired effect from diffusing liquids through solids for whatever purpose may be had in the manner described.

Referring to the annexed drawing, the figure is a central vertical section of an apparatus by which my invention may be practiced.

In the said drawing, the reference-numeral 1 denotes the vessel having a central vertical shaft, 2, and surrounding this shaft is a tubular frame, 3, having suitable support. The shaft 2 carries a propeller-wheel, 7, mounted on its lower end and rotating between the bottom of the vessel 1 and the base of the tubular frame 3, the currents produced by such rotation being shown by arrows in the drawing. I arrange a spiral, 5, around said shaft 2, for assisting in conducting and intermingling the components of dense masses more uniformly and effectively in their downward passage through said tubular frame 3. However, if the masses to be treated are very fluid and uniform in composition, the spiral on said shaft may be modified or dispensed with, and the purpose, shape, and size of said spiral depend in a great measure on the nature of the components of the mass to be intermingled.

For introducing the materials to be treated, and for affording facilities for allowing air or gas of any temperature to enter into said vessel from the bottom upward, and thus to intermingle with the contents of such vessel, I extend feed-tubes 6 through the top of said vessel and in the inside of said tubular frame 3 to within the same distance from the bottom of said vessel and from the upper edges of the propeller-wheel 7. On charging the feed-tubes from above by means of a hopper, and of any proper arrangements for forcing in air or gas with the materials to be treated, and with air or gas, these will be displaced from below the base of said feed-tubes and become intermingled very effectively and uniformly by the action of the revolving propeller-wheel 7.

For separating the components of a mass, when their disintegration has been effected during the operation, or when it may exist originally—as, for instance, for separating the

gluten from the starchy components in the manufacture of starch and for other purposes—I interpose in the spaces of said vessel filters and plates 9, for retaining and separating such components the fluidity of which has become lessened, or which will adhere to and be taken up by the interposed hinderances. I interpose perforated partitions in the spaces of said vessel when materials are treated for the purpose of diffusing liquid through solids without displacing the said solids during operation. In concentrating and leaching or in washing out of a mass its lighter and soluble components, I provide in said vessels separate tap-holes and openings 8, for allowing the liquid parts to pass out during operation and for removing the solid parts separately.

The construction of the tubular frame 3 and propeller-wheel 7, their dimensions, shape, &c., depend in a great measure on the nature, fluidity, density, specific gravity, and chemical relations, &c., of the components of the masses treated, and all of which have to be taken into consideration. The purposes for which masses are mixed and intermingled are so manifold and the constitution of said masses is so varied that I do not limit myself to any special size, shape, or style of tubular frame, propeller-wheel, spiral filters, plates, and partitions, but adopt that form and those proportions which may be most suitable in any given case for attaining the object of my invention by the means specified heretofore.

What I claim is—

1. In a mixing apparatus, the combination of a case or vessel, a cylinder supported therein by one or more perforated partitions extending from the walls of the case to the cylinder, and a screw-mixer attached to a shaft and located within the cylinder, substantially as described.

2. In a mixing apparatus, the combination of a case or vessel, a cylinder supported therein by one or more perforated or reticulated partitions and having one or more perforated partitions transversely within it, and a screw-mixer located within the cylinder and working in apertures in such transverse partitions, substantially as described.

3. In a mixing apparatus, the combination of a case or vessel, a cylinder supported above the bottom thereof, and a propeller or mixing wheel extending beyond the limits of the bottom of the cylinder, substantially as described.

4. In a mixing apparatus, the combination of a case or vessel, a cylinder supported above the bottom thereof, a propeller or mixing wheel extending beyond the limits of the bottom of the cylinder, and an inlet-pipe terminating just above the blades of such wheel, substantially as described.

5. In a mixing apparatus, the combination of a vessel or case, a cylinder secured therein, as described, and of much larger diameter than the mixing-screw, one or more perforated partitions extending transversely across the cylinder and cut out at their centers to per-

mit the operation of the mixing-wheel, and a mixing-wheel arranged to operate therein, substantially as described.

6. In a mixing apparatus, the combination
5 of a vessel or case, a cylinder secured therein, as described, and having one or more perforated transverse partitions, a mixing-screw arranged within the cylinder, and a propeller-wheel whose blades extend beyond the limits
10 of the bottom of the cylinder, substantially as described.

7. In a mixing apparatus, the combination of a case or vessel, a cylinder secured therein, as described, and having one or more perfo-

rated transverse partitions, a screw-mixer ar- 15
ranged to operate within the cylinder, a propeller-wheel upon the bottom of the screw-mixer shaft, and having its blades extended beyond the limits of the cylinders, and an inlet-pipe having its delivery-mouth situated just 20
above the line of the propeller-blades, substantially as described.

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

CHARLES HORBOSTEL.

Witnesses:

MATTHEW WHITE,
GEO. VAN VLIET.