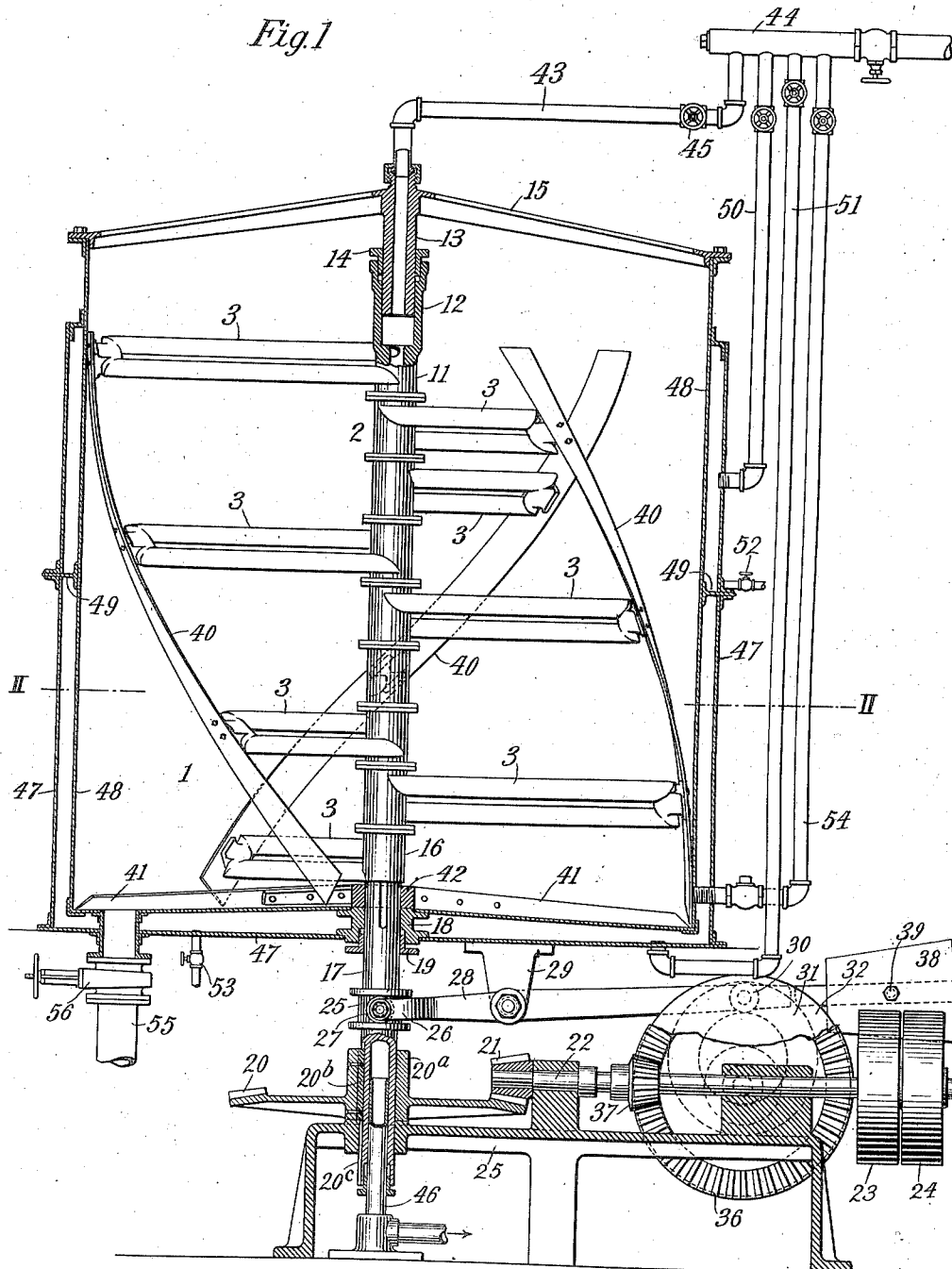


No. 811,145.

PATENTED JAN. 30, 1906.

C. S. HIGGINS.
MIXING APPARATUS.
APPLICATION FILED FEB. 23, 1905.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

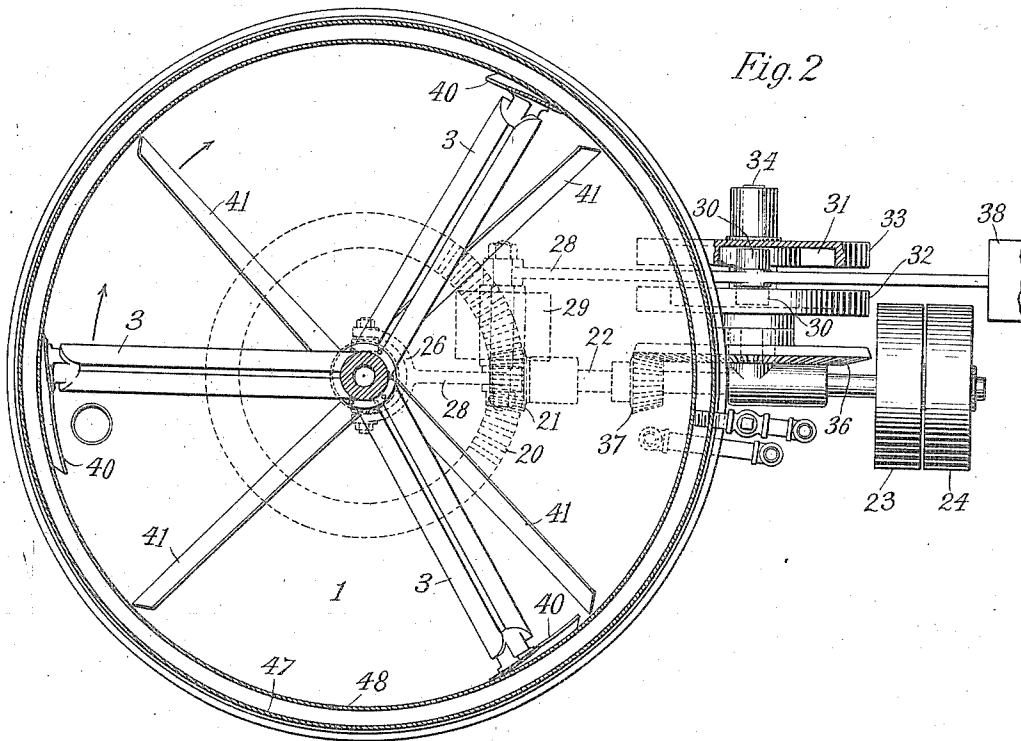


Fig. 4

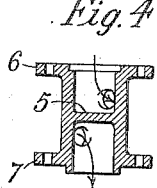


Fig. 3

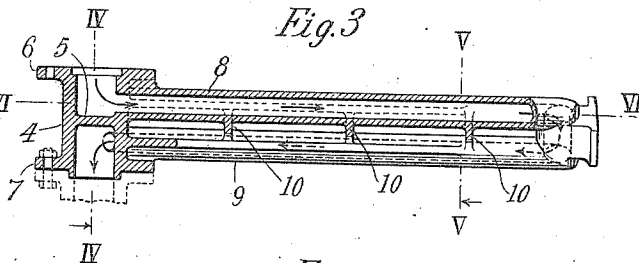


Fig. 5

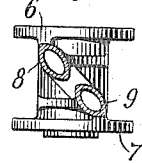
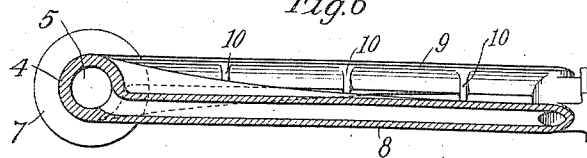


Fig. 6



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MIXING APPARATUS.

No. 811,145.

Specification of Letters Patent.

Patented Jan. 30, 1906.

Application filed February 23, 1905. Serial No. 246,853.

To all whom it may concern:

Be it known that I, CHARLES S. HIGGINS, a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Mixing Apparatus, of which the following is a specification, reference being had to the drawings accompanying and forming part of the same.

My invention relates to apparatus for mixing or stirring materials of various kinds, the present embodiment being designed more particularly for use in the manufacture of soaps.

One of the chief objects of the invention is to provide a machine for stirring or mixing the material and at the same time heating it which shall perform the desired functions in a most thorough and rapid manner, utilizing effectively the power supplied to it for actuating its moving parts and the heat of the medium supplied to it for heating purposes.

Another object is to provide a machine of the kind mentioned which shall be simple, strong, and compact and withal inexpensive to construct, operate, and maintain.

In carrying out my invention in its preferred form I employ a mixing vessel or vat of cylindrical shape and within the same a rotary stirrer having radial arms provided with suitable scrapers which bear upon the wall of the vat and serve to dislodge any material that may adhere thereto. The mixer-arms are mounted on a hollow shaft and are themselves hollow and so connected with the shaft that a heating medium—as steam, hot water, &c.—will flow radially outward from the shaft through the arms to the ends of the same, then back radially inward to the shaft, and finally escape from the apparatus as exhaust. In this way not only is the material in the vat thoroughly agitated and commingled, but also has heat applied to it through all parts thereof, and since these operations go on at the same time it will be evident that the material is very quickly brought to the desired condition of temperature and intermixture. I may also provide means for reciprocating the shaft simultaneously with its rotation, so that the mixing arms or blades will not only revolve, but will also have a motion at right angles to the plane of their revolution. I may further provide means for heating the mixing vat or

receptacle itself, so that the material under treatment will receive heat from the vessel as well as from the agitator.

For a full explanation of the invention reference may now be made to the annexed drawings, showing a convenient embodiment.

Figure 1 is a vertical section through the mixing-vat, showing the rotary agitator, with its side and bottom scrapers, and the mechanism for actuating the same, together with the arrangement of parts for supplying a heating medium thereto. Fig. 2 is a horizontal section on line II II of Fig. 1. Fig. 3 is a detail view, partly in vertical section, of one of the mixing arms or blades, showing the passages therein. Figs. 4 and 5 are sections on lines IV IV and V V, respectively, in Fig. 3. Fig. 6 is a plan view, partly in horizontal section, of one of the mixing-arms.

The vessel in which the soap or other material is to be treated is indicated by 1, preferably cylindrical in form and arranged with its axis vertical. Within the same is a combined mixer and heater, which I prefer to construct and operate in the following manner: The mixer is composed of a central hollow shaft 2, with outstanding hollow blades 3 in communication therewith in such manner that, as before stated, the heating medium will traverse the entire length of each arm twice before passing out as exhaust. I prefer also to connect the parts so that the heating medium will pass through the arms or blades in succession, entering through the upper blade and leaving from the lower. The central shaft is made in sections, one of which is shown in Figs. 3, 4, 5, and 6. As shown, the section consists of a hollow member 4 of cylindrical form separated into two divisions by a transverse partition or septum 5 and having upper and lower flanges 6 7 for attachment with the adjoining sections, as by means of bolts, as shown. The transverse partition 5 divides the hollow member 4 into two chambers between which there can be no communication except through the two tubular arms 8 and 9, which extend laterally from the hollow member 4, as hereinafter described. (See Figs. 3, 4, and 5.) By this construction the steam or other heating medium is prevented from rushing suddenly through the hollow shaft 2 to the lower part of the vat and thereby causing overheating of a portion of the contents of the vat, which would be

detrimental to the mixing process; but, on the contrary, the heating medium is forced to pass through the hollow mixing-arms successively, thus gradually heating the entire mass of the material under treatment and imparting to the contents of the vat a uniform degree of heat in the shortest time, thereby securing the best results. The tubular arms 8 and 9 communicate with and extend laterally from the upper and lower chambers, respectively, of the member 4. The two tubular arms 8 and 9 communicate with each other at their outer ends and together form the mixing-blade 3. (See Figs. 1 and 3.) Instead of arranging the tubular parts 8 9 in line one directly above the other I prefer to locate them out of alinement, so that the blade formed by the two will be inclined to the axis of the shaft. I also prefer to make each tubular member slightly flattened or elliptical in cross-section, so that the two will form an approximately flat blade. If desired, they may be connected by webs, as 10, to give the structure additional strength and further subdivide the material in which the blade works. The agitator or mixer is built up by securing the shaft-sections together end to end by means of their flanges, as before explained, the sections being preferably arranged so that the blades 3 will be located in a helical line on the hollow shaft 2, as clearly shown in Fig. 1. The top section (indicated by 11 in the figure just mentioned) has an extension 12 fitting over a hollow spindle 13 loosely enough to rotate freely thereon. A stuffing-box 14 is provided on the extension or bearing 12 to prevent leakage of the liquid or gaseous medium delivered by the spindle 13. The latter member is supported centrally at the top of the vat 1 in any suitable manner, as by means of a spider 15. The bottom section 16 is rigidly secured to a hollow shaft 17, extending through a bearing 18 in the bottom of the vat or vessel 1, provided with a stuffing-box 19. From the foregoing it will be clear that steam or other fluid entering the mixer through the spindle 13 will pass through the arms or blades 3 in succession before leaving the apparatus through the hollow shaft 17.

For the purpose of rotating the agitator I provide the following mechanism: Keyed to the lower part of the hollow shaft 17 is a bevel-gear 20, meshing with a gear 21 on a shaft 22, driven by a pulley 23. The shaft 22 may also carry the usual idle pulley, as 24. The bearings for the various shafts in the actuating mechanism are supported by a suitable frame 25, as shown. As before stated, the mixer may also be given a reciprocating movement, the devices for effecting the same being preferably the following: Immediately above the gear 20 on the shaft 17 is a flanged collar 25, engaged by a yoke or fork 26, bearing anti-friction-rollers 27. The yoke 26 is carried

by a lever 28, fulcrumed on a hanger 29, depending from the bottom of the vat 1. For the purpose of oscillating the lever 28, and so reciprocating the mixer, I provide the former with studs or rollers 30, extending laterally into eccentric grooves 31, formed in the adjacent surfaces of a pair of disks or face-cams 32 33. The cams are rigidly mounted on a short shaft 34, bearing a gear 36, which is in mesh with a pinion 37 on the main driving-shaft 22, so that rotation of the latter will not only cause the mixer to be revolved, but also to be reciprocated. It will be noted that the spindle 13 and bearing extension 12 and the bearing 18 and shaft 17 are constructed so as to permit such up-and-down movement, while hub 20^a of the gear 20 is provided with a feather 20^b, sliding in a groove 20^c in the shaft 17. The lever 28 may, if desired, be provided with a counterweight, as 38, to balance the agitator. The counterweight may be adjustably mounted on the lever and may be secured in any adjusted position by means of a set-screw 39.

In order to detach any material which may adhere to the sides of the vat, I provide scrapers 40, secured to the ends of the mixer-arms 3, the latter being flattened for that purpose, as shown in Figs. 3 and 6, and inclined slightly relative to the wall of the vat, so that the scrapers will present their edges to the wall, as shown in Fig. 2. The scrapers may be made of spring metal, so as to bear firmly but yieldingly on the wall, and hence without undue friction. To remove adhering material from the bottom of the vat, I provide inclined scraping-knives 41, secured to a collar 42, which is keyed on the shaft 17. The said scraping-knives 41 bear against and scrape the bottom of the vat in the same manner as the scrapers 40 scrape the sides of the vat. These side and bottom scrapers perform an important function. Although they act to some slight extent as mixers, yet they are not employed for that purpose, but are designed and used to prevent the material under treatment from adhering to the sides and bottom of the interior of the vat. In the manufacture of soap, for example, it is essential that every part of the material to be treated should be thoroughly mixed and heated to a uniform temperature to produce the best results; but some of the ingredients of the mixture are inclined to adhere to the sides and bottom of the vat, where they become hardened without being properly mixed or heated and then drop off into the mixture, spoiling the entire contents of the vat. By the use of the scrapers this is prevented.

The steam or other heating medium is delivered to the hollow spindle 13 by a pipe 43, extending from a pipe 44 and provided with a valve 45 for controlling the supply. The exhaust-steam escapes through a tubular

stem 46, fitting inside the shaft 17, as shown in Fig. 1.

Any suitable means may be employed for heating the vat itself, if such additional heat is desired; but I prefer to use steam taken from the common supply-main 44. For this purpose the vat is provided with an outer wall or jacket 47, leaving a space between the same and the inner wall 48, into which steam may be admitted from the main 44. This space may be divided into two non-intercommunicating parts by a central flange or partition 49, the upper division being connected with the steam-main by a valved pipe 50 and the lower division by a valved pipe 51. In this way all or only part of the vat may be heated, thereby affording a closer regulation of the heat to which the material in the vessel is subjected. Moisture condensed in the steam-chambers may be drawn off by means of waste-cocks 52 53. Steam may also be delivered directly into the lower part of the vat by a valved pipe 54, extending from the main 44. The vat is also provided with a discharge-pipe 55, controlled by a suitable gate-valve 56.

From the foregoing description it will be seen that my invention provides an apparatus for agitating and heating the material under treatment in a most efficient and rapid manner. At the same time it will be noted that the apparatus, considering the functions which it performs, has relatively few operative parts and that these are in no sense delicate or liable to get out of order.

The invention has a wide range of utility and may be employed wherever material of practically any kind is to be agitated or stirred, or stirred and at the same time heated.

It is also clear that the apparatus may be used for cooling as well as for heating purposes, in which case a refrigerant—such as, for example, ammonia, compressed air, water, &c.—may be circulated through such parts of the apparatus as may be necessary.

It will be understood, of course, that the form herein specifically shown and described is merely the preferred embodiment of the invention, which may be embodied in a great variety of widely-differing forms.

Having now fully described my invention, what I claim is—

1. In an apparatus of the kind described, the combination of a suitable mixing-vat, a mixer therein comprising a hollow shaft having a plurality of arms or blades, a tubular spindle supported at the top of the vat and extending into the shaft, a bearing in the bottom of the vat through which the shaft extends, a flanged collar on the shaft below the vat, a lever having a fork engaging the collar, and a cam engaging the lever to oscillate the same, as set forth.

2. In an apparatus of the kind described, in combination a mixing-vat; means for heating part or all of the same at will; a mixer in the vat, comprising a hollow shaft and a plurality of hollow arms or blades in communication therewith; means for delivering a fluid heating medium to the hollow shaft; means for rotating the mixer; and means for simultaneously reciprocating the same, as set forth.

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