Sept. 27, 1932. M. W. STOUT 1,879,582

FLUID MIXING DEVICE

Filed June 27, 1930

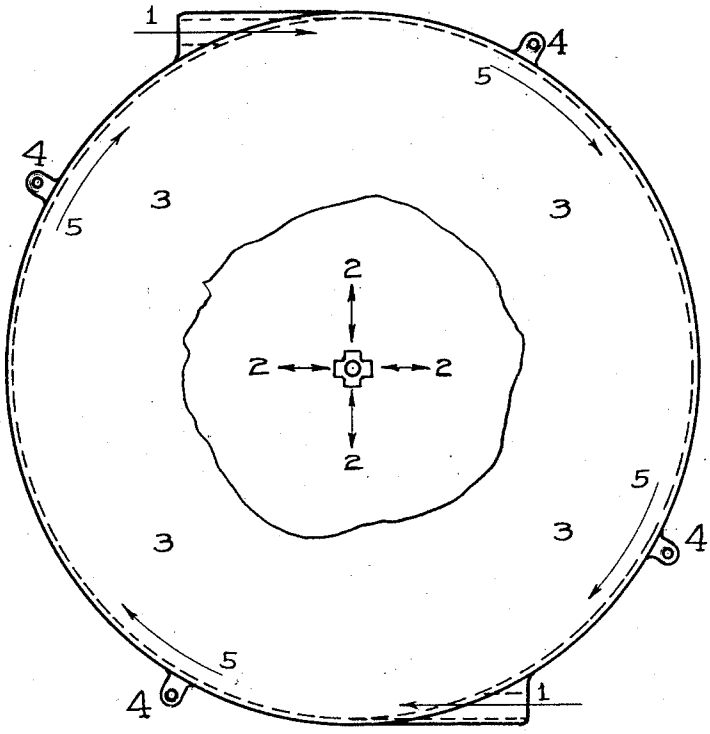


FIG. 1.

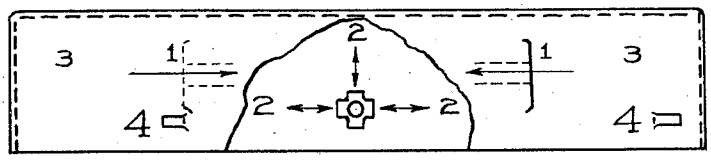


FIG. 2.

INVENTOR.

Milton W. Stout

Patented Sept. 27, 1932 1,879,582

UNITED STATES PATENT OFFICE

MINOR W. STOUT, OF KANSAS CITY, MISSOURI

FLUID MIXING DEVICE

Application filed June 27, 1930. Serial No. 464,384.

This invention relates to fluid mixing devices, and particularly to apparatus for effecting contact between two or more fluids, any of which may be either a liquid, a gas or a vapor. The apparatus of the present description is designed especially for mixing steam with water for heating purposes, but is capable of general application and use in any situation where any two or more fluids are to be mixed with each other.

It is known in the art to utilize steam for the heating of water by injecting the steam directly into a body of water to be heated. This method is noisy, may build up an objectionable back-pressure, and requires small inlet openings for a suitable regulation of flow, which openings in practice become easily obstructed. I propose, according to the present invention, to distribute one of the fluids into a whirling stream or body of the other fluid; the whirling action of the second fluid being automatically obtained by admitting such fluid into a cylindrically shaped container, tangentially to the curved walls of such container. This container is by preference, and according to the particular example of the present disclosure, in the nature of a dome having a bottom opening.

An object of the invention, as suggested by the preceding paragraph, may be stated as the attainment of a device for the purpose noted, which is practically noiseless in operation.

A further object is attained in an improved arrangement of parts of a fluid mixer, such as a steam-water heater, which tends to generate a vacuum or reduced pressure, instead of a back-pressure.

A still further object is to arrange the openings for both fluids, with respect to the container, so as to permit the use of relatively large inlet openings throughout.

An additional object is attained in a more thorough mixing or heating action on account of the directed velocity of one fluid with respect to one or several other fluids.

Other objects and advantages of the invention will be apparent to persons skilled in the art, as the description proceeds and reference is made to the accompanying drawing, in which:

Fig. 1 is a plan view of a device constructed according to the present invention, showing a central portion broken away to reveal the arrangement of openings for admitting one of the fluids, and Fig. 2 is a side elevation of the device appearing in Fig. 1, with a lateral portion cut away to show the arrangement of passages for the second fluid, and their position inside the container.

Referring now by reference characters to the drawing, the entrance ports or passages 1, are employed to admit what may for convenience be termed the first fluid, preferably at an appreciable velocity, into the container 3 which, according to the present showing, assumes the form of a cylindrically- or dome-shaped member, the top of which is closed, the sides of which are continuous and uniformly curved and the bottom of which is preferably left open, the top being closed or covered. It will, of course, be understood that I do not restrict myself to the use of a container in which one or the bottom side of the container is left entirely open, as in certain circumstances according to the use of the device, it is practical to provide a bottom wall portion with a suitable outlet drainage aperture (not shown). As will best appear from Fig. 1, the entrance passages 1 are by preference of a trend parallel to each other and so disposed as to be intersected by the walls of the dome shaped container 3, and by further preference so located with respect to the container, that the inlet openings are diametrically opposite each other. Any desired number of such passages may be employed, for the same or different fluids.

The container or dome may be fabricated of any suitable or convenient material, so selected as not to be subject to excessive corrosion by either of the fluids employed. It will, of course, appear that in case the present device is employed as part of other apparatus or in case the dome-shaped portion 3 may not consist of a separate element, the accompanying portions of the structure need not be limited to cylindrical form.

Means for introducing a second fluid, to

the interior of the container 3, are shown in the present example at 2 and consist of one or more fittings. The one fitting illustrated is cross-shaped in section, the extremities of the legs of the cross providing inlet openings of substantial size. This inlet fitting is preferably so disposed in the container, as suggested by Fig. 1, that two of the openings thereof serve to inject the second fluid radially of the container and at a right angle to the trend of the stream of the first fluid at its point of entrance. At least one other, say the uppermost projection or leg of the fitting, is preferably utilized to project a stream of the second fluid in a direction vertically of the container 3. This latter stream impinges against the inner surface of the cover of the container, and is deflected downwardly into the path of the first fluid entering through passages 1.

The device may, of course, be employed alone or in connection with other containers or apparatus, and in either event, to the end of providing mounting or supporting means, I have indicated at 4 suitable external perforated lugs.

The action of the fluids when the device is in use, resulting in a mixture of the two fluids and, for example, the heating of one fluid by the other, are thought to be obvious from the foregoing detailed description of parts, but may be briefly reviewed, for sake of completeness, as follows: The first fluid entering at a substantial velocity through the passages 1, is immediately given a whirling action resulting not only in rotation about the center or axis of the container, but also in an appreciable turbulence, the general trend of whirling or rotative movement of the first fluid being indicated by arrows 5. The second fluid, projected radially and preferably at an appreciable velocity along paths corresponding to the lead lines 2, will be brought rapidly and intimately into mixing contact with the first fluid. The heating effect obtained, where steam and water constitute the fluids introduced to the container, will be obvious; and the heated fluid or fluids will, of course, fall by gravity from the open side of the container, or may be delivered through a suitable drain opening in cases where the lower side of the container may be partly closed.

It will appear that, by the tangential arrangement of fluid inlet ports, these openings are of relatively large sectional area, as are those for the other, or any additional fluids introduced to the container. It will further appear that the quantities of each fluid intended to be handled in a unit time, may be varied through wide limits, without seriously affecting the efficiency of the mixing action, on account of the intimacy of contact of particles of each fluid with the other. Such variation in unit quantities of either fluid handled, may, within wide limits, be made independently of the quantity of any other fluid handled. Provisions for varying the flow of the several fluids are, of course, well known in the art and may consist of suitable valves (not shown), disposed in the lines behind ports 1 and 2.

It is believed that the foregoing description will clearly indicate certain novel and structural features, practical economies of construction and maintenance, as well as other advantages of the invention, to persons who are skilled in the art. Manifestly the specific description of structural details is to be considered only in an illustrative, and not in a limiting sense, since certain of these details are not necessarily of the essence of the present subject matter but may be variously modified without departing from the spirit and full intendment of the invention, as defined by the appended claims.

I claim as my invention:

1. In a fluid heating device of mixing type, a container having a substantially cylindrical portion and a bottom opening, means for injecting a fluid substantially at a tangent to, and on opposite sides of said cylindrical portion, a fitting forming passages for another fluid within the container, said passages being located near a transverse plane intersecting the injection means for said first named fluid and directed across the path of said first named fluid in both a lateral, and a transverse direction.

2. In a fluid heating device of mixing type, a container having a substantially cylindrical portion provided with a bottom outlet opening, means forming an inlet port for one fluid and adapted to direct the stream of such fluid substantially tangentially to the sides of said cylindrical portion, and a fitting forming inlet passages within the container for a second fluid, and adapted to direct one stream of said second fluid, substantially along a radius of said cylindrical portion, and another stream substantially along the axis of said cylindrical portion.

3. In a fluid heating device of mixing type, a container having a portion of substantially circular section, means forming an inlet passage for one fluid, arranged to project such fluid substantially at a tangent to, and peripherally of, said portion of the container, and a fitting in the container for injecting streams of a second fluid into said container at an angle to each other, with each of said streams directed substantially transversely to the initial path of said first named fluid.

4. In a device of a type adapted to heat one fluid by admixture with another fluid, a cylindrical container having an open bottom and closed top; inlet passages for one fluid, disposed at substantially diametrically opposite locations, terminating within the curved sides of the container and of a trend

substantially tangent thereto; and an inlet fitting for a second fluid, disposed substantially centrally of the container, said fitting being of angulate section and provided with a pair of radial extensions having outlet openings arranged to direct streams of said second fluid in opposite directions and into impingement with fluid issuing from said first named inlet passages, said fitting being further provided with a vertical extension having an outlet opening adapted to direct a stream of fluid substantially along the vertical axis of said container and at substantially a right angle to the plane of projection of streams of said first named fluid.

MINOR W. STOUT.