

April 12, 1927.

1,624,847

C. L. RILEY

METHOD AND APPARATUS FOR ATOMIZATION OF FLUIDS

Filed Feb. 3, 1925

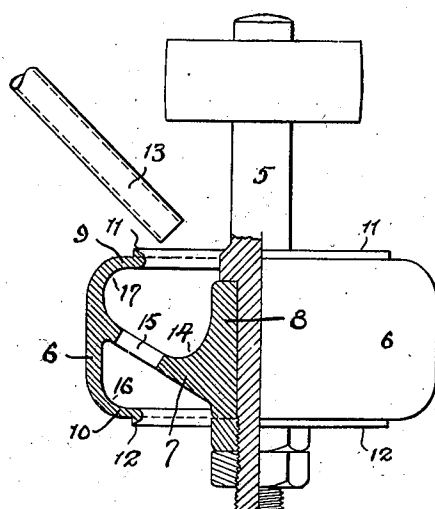


FIG. 1.

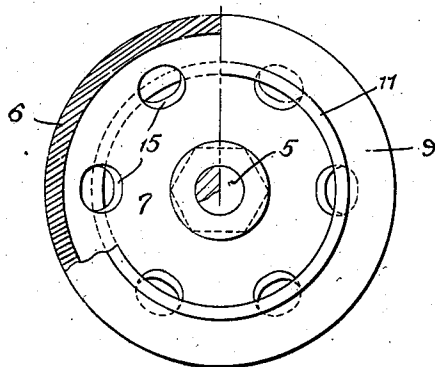


FIG. 2.

CHAMPLAIN L. RILEY

INVENTOR.

BY

Horner and Horner

ATTORNEYS.

UNITED STATES PATENT OFFICE.

CHAMPLAIN L. RILEY, OF NORTH PLAINFIELD, NEW JERSEY, ASSIGNOR TO INDUSTRIAL ASSOCIATES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

METHOD AND APPARATUS FOR ATOMIZATION OF FLUIDS.

Application filed February 3, 1925. Serial No. 6,642.

My invention relates to the art of atomization of fluids, and particularly to that branch of the art in which the atomization is accomplished by centrifugal force.

My invention provides not only new apparatus for the purpose, but also a new method, by the use of which a surprising increase in efficiency is obtained.

The thought which underlies my invention is to hold the liquid on the centrifugal until it has attained an angular speed more closely approaching the angular speed of the peripheral area of the centrifuge, after which it is centrifugally discharged. The dispersed liquid consequently impinges against the surrounding air or gas, not only at the speed of the centrifugal off-throw, but also at the peripheral speed of the rotor at the discharge lip. Inasmuch as the liquid acquires a speed approximating the high angular speed of the periphery of the centrifugal, its velocity, upon escape from the latter, is the resultant of such angular speed, plus the radial velocity of centrifugal off-throw. This resultant is greater than either of its components, and of the two components the angular velocity is far greater, than the radial or centrifugal off-throw velocity. The resultant velocity of the liquid as it leaves the high speed centrifugal is far more effective in causing nebulization of the liquid than the usual relatively low velocity due primarily to centrifugal off-throw. The resulting atomization of the liquid is far greater than has heretofore been accomplished, and the fluid, even a relatively heavy, or thick, fluid, is dispersed as a nebula.

Again, inasmuch as the liquid while detained by the centrifuge and coming to speed, forms an annulus held in position by centrifugal force, it is possible to discharge from both margins thereof simultaneously. The capacity of the apparatus may thus be doubled—although if for any reason desired, the invention may be embodied in apparatus having but a single discharge lip.

Obviously the underlying thought of my invention may be embodied in apparatus of different types, and is only illustratively shown in the unit illustrated in the accompanying drawings, in which—

Fig. 1 is a broken side elevation of a cen-

trifuge built according to my principles; and

Fig. 2 is a broken plan thereof.

Upon the high speed shaft 5 is secured in any suitable fashion, a centrifuge, here shown as comprising an annulus 6 connected by a downwardly inclined web 7 with its hub 8. At the upper and lower margins of the annulus 6 are inwardly extending rim flanges 9 and 10 respectively, each provided at its margin with an outwardly projecting, sharp-edged throw-off lip constituting throw-off rings 11 and 12. Liquid may be fed to the centrifuge in any desired fashion—for example, through the feed pipe 13.

The downwardly inclined web 7 forms with the hub 8 a central receiving channel 14 to which the pipe 13 discharges. From this channel the liquid is thrown outward by centrifugal force over the web 7, and passes, in part, through the holes 15 in the web 7 to the lower channel 16 formed between the web and the lower flange 10 of the annulus 6, and in part, over the web 7 to the upper channel 17 formed between the web and the upper flange 9 of the annulus. If the feed to the upper channel 17 exceeds that to the lower channel 16 or vice versa, the holes 15 in the web form equalizer passages through which the liquid passes from one channel to the other, eventually forming a ring of liquid of a depth corresponding to the depth of the confining flanges 9 and 10. The ring of liquid thus confined, picks up speed from the rotor, due not only to the frictional drag of the liquid in engagement with the inner surfaces of the annulus and the upper and lower surfaces of the web, but also to the positive propulsion of the liquid at circumferentially spaced points by the equalizing apertures 15 in the web through which the liquid is forced to pass. As the feed continues the flanges 9 and 10 are overflowed and the liquid escapes to the throw-off rings or lips 11 and 12, from which it is dispersed centrifugally in an exceedingly fine spray or nebula.

This exceedingly fine atomization of the liquid is of the greatest possible advantage for spray drying, since the exposed surface area of the dispersed particles is enormously increased. For gas washers, the great surface area of the dispersed washing fluid is

equally valuable. For conditioning air, that is to say, for moistening air, the nebula is ideal. In whatever connection used, and it is of course understood that the uses above suggested are only illustrative, the invention is of great value by reason of the fact that the unit has twice the capacity of usual centrifugal units of like size. For spray drying, the unit has the additional advantages
 10 that (1) the flow of liquid over both upper and lower surfaces of the centrifuge washes both clear and thus prevents accumulation of deposits thereon, (2) the exposed un-
 15 wetted surfaces are smooth and may be readily freed of deposits by a scraper without interruption of operations.

The centrifuge illustrated is simple to manufacture, and rugged and durable in service. It will of course be obvious that it
 20 may be operated on a horizontal instead of a vertical axis, wherever the general layout of the associated apparatus makes such an arrangement desirable.

With the understanding therefore that
 25 what I claim as my invention may be embodied in other constructions than that shown and described, but operating on the same underlying principle, I claim—

1. The method of atomizing liquid which
 30 comprises converting a stream of liquid by centrifugal force into a whirling liquid sheet having both angular and radial velocity, gathering the liquid at the periphery of said sheet into a high speed annulus having
 35 increased angular but no radial velocity, and discharging the liquid by centrifugal force from a margin of said high speed annulus at the resultant velocity of its combined angular and radial off-throw speeds.

40 2. The method of atomizing liquid which comprises converting a stream of liquid by centrifugal force into a whirling liquid sheet having both angular and radial velocity,
 45 gathering the liquid at the periphery of said sheet into a high speed annulus having increased angular but no radial velocity, and discharging liquid by centrifugal force from both margins of said high speed annulus
 50 at the resultant velocity of its combined angular and radial off-throw speeds.

3. The method of atomizing liquid which

comprises discharging a stream of liquid, converting said discharged stream of liquid by centrifugal force into a whirling annulus of substantial radial depth and high velocity, from a margin of which annulus liquid is centrifugally dispersed to form a nebula.

4. The method of atomizing liquid which comprises distributing and converting a
 60 stream of liquid by centrifugal force into a whirling sheet of liquid having both angular and radial velocity, subjecting at least a portion of the liquid at circumferentially spaced points in its peripheral area to positive propulsion at increased angular velocity, and centrifugally discharging the liquid at the resultant velocity of angular and radial off-throw speeds.

5. The method of atomizing liquid which
 70 comprises distributing and converting a stream of liquid by centrifugal force into a whirling sheet of liquid having both angular and radial velocity, subjecting at least a portion of the liquid at circumferentially
 75 spaced points in its peripheral area to positive propulsion at increased angular velocity, and centrifugally discharging the liquid in different planes at the resultant velocity of angular and radial off-throw speeds.

6. In a centrifugal atomizer, a rotor comprising an annulus with inturned upper and lower flanges forming an interior channel therebetween, a hub, and means connecting the hub and annulus while affording passage for fluid to both flanges for centrifugal dispersion therefrom.

7. A rotor comprising upper and lower throw-off flanges, a hub and a web between the hub and flanges, said web being apertured to permit flow therethrough of fluid to the lower throw-off flange.

8. A rotor comprising upper and lower throw-off flanges, a hub and an upwardly inclined web between the hub and flanges, said web being apertured to permit flow therethrough of fluid to the lower throw-off flange.

In testimony whereof I have signed my name to this specification.

CHAMPLAIN L. RILEY.