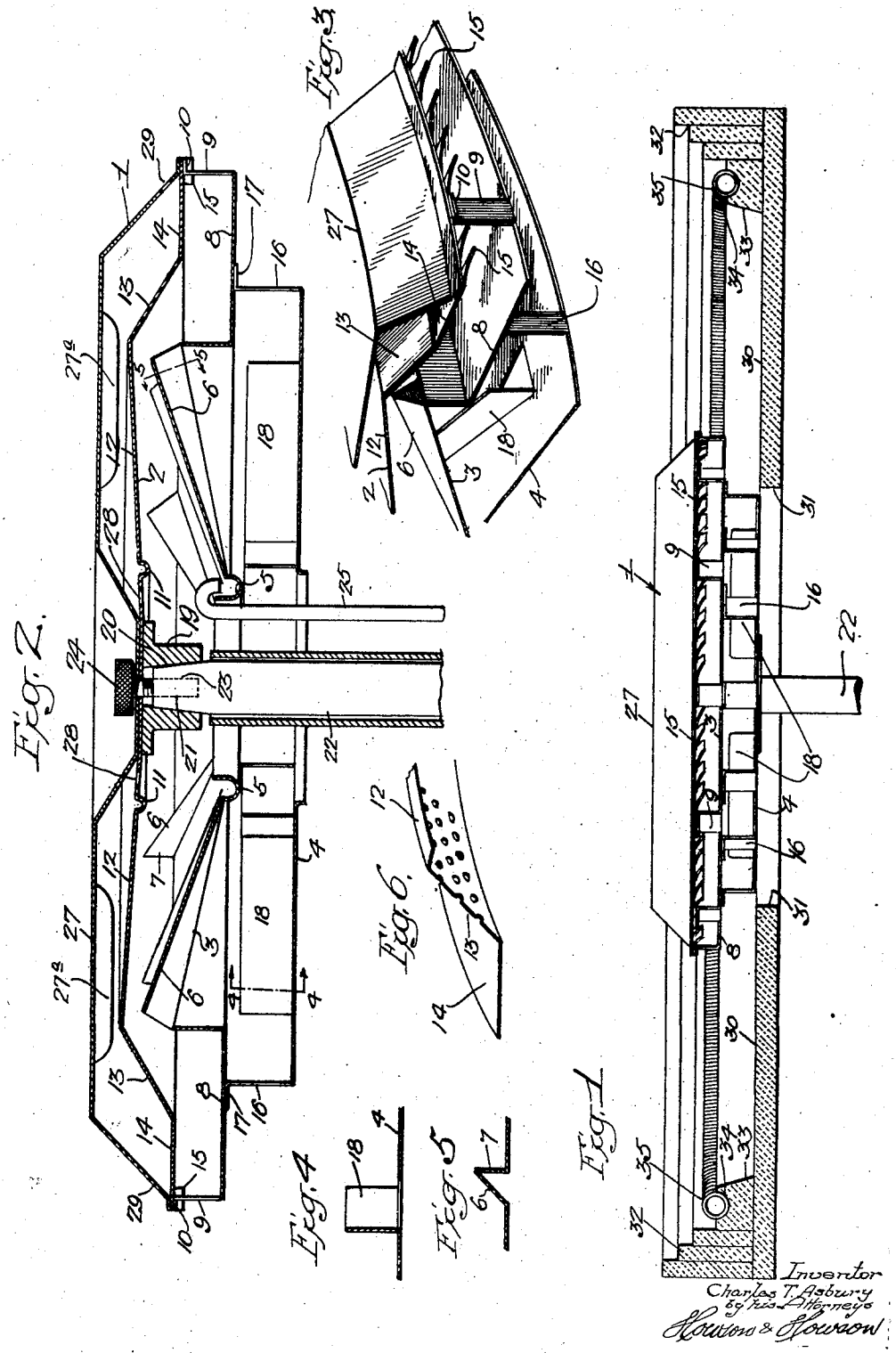
June 28, 1938. C. T. ASBURY 2,122,333

LIQUID VAPORIZING DEVICE

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Fig. 8.

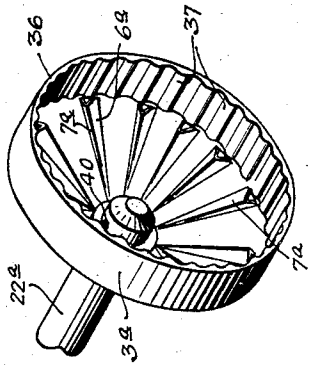
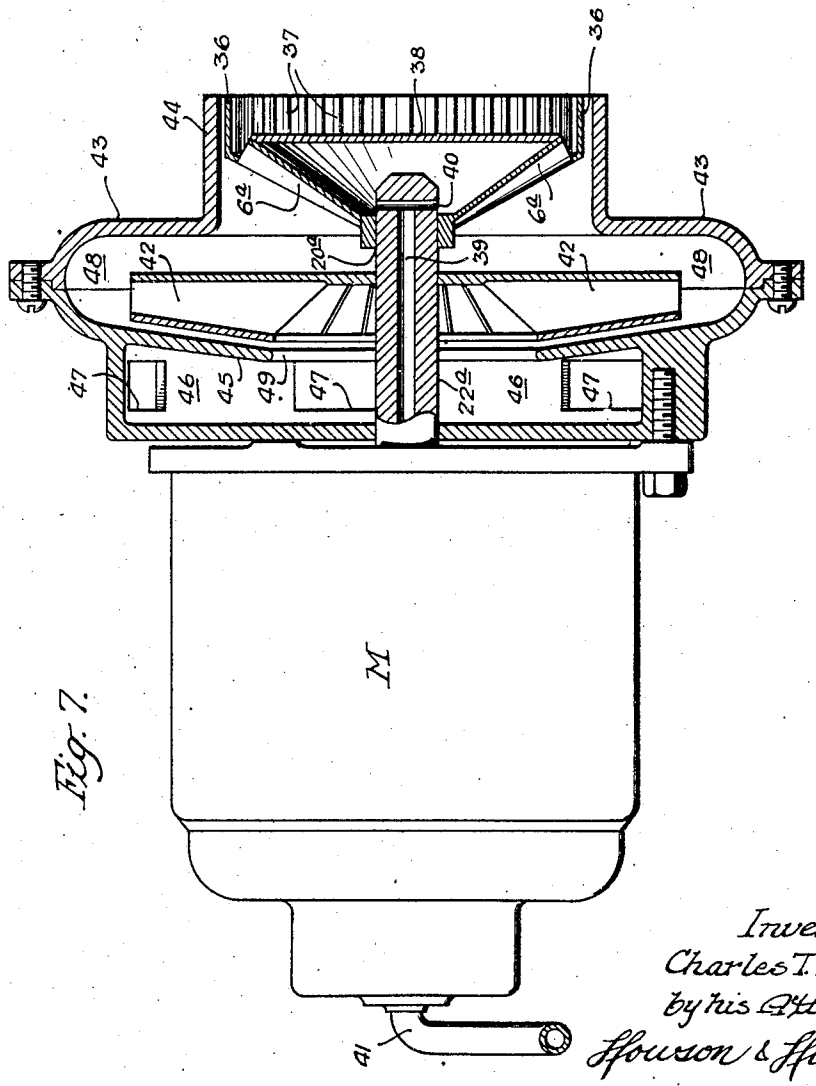


Fig. 7.



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LIQUID VAPORIZING DEVICE

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Application April 2, 1936, Serial No. 72,438

8 Claims. (Cl. 261—83)

This invention relates to new and useful improvements in liquid atomizing devices.

The principal object of the present invention is to provide a device of the character set forth constructed and arranged to produce maximum atomization of a liquid.

Another object of the invention is to provide a device of the stated character the parts of which may be readily and easily installed and removed for purposes of cleaning and repair.

A further object of the invention is to provide a device of the type described which is relatively small and compact and of simplified, inexpensive construction.

These and other objects of the invention and the features and details of construction thereof are set forth hereinafter and shown in the accompanying drawings, in which:

Fig. 1 is a view in elevation showing the invention in association with the hearth of a liquid fuel burner.

Fig. 2 is an enlarged view in section vertically through the rotary distributing head.

Fig. 3 is a fragmentary view in perspective of a portion of the periphery of the distributor head.

Fig. 4 is a view in section on line 4—4, Fig. 2.

Fig. 5 is a view in section on line 5—5, Fig. 2.

Fig. 6 is a fragmentary view in perspective showing a modified form of one feature of the invention.

Fig. 7 is a view in elevation partially in section showing another form of the invention and

Fig. 8 is a view in perspective of an atomizing disk or member embodying the present invention.

Referring now particularly to the drawings, reference numeral 1 designates generally one form of liquid atomizer head made in accordance with the present invention and comprising upper, intermediate and lower plate or disk-like members 2, 3 and 4 respectively. As shown, the intermediate member 3 is of annular form and provided with a downwardly offset channel 5 at the inner periphery thereof outwardly from which extend a plurality of upwardly projecting radially disposed ribs or vanes 6 pressed, stamped or otherwise formed in said member 3 at predetermined substantially equally spaced intervals circumferentially thereof. The radial ribs or vanes 6 gradually increase in height and width outwardly from the channel 5 of the member 3, and are otherwise constructed and arranged so that the side or wall thereof which faces in the direction of rotation of the atomizer 1 is substantially vertical as indicated at 7 in Fig. 7 of the drawings.

In addition to the foregoing, the intermediate plate or disk-like member 3 is provided with a radially projecting substantially horizontal flange or the like 8 which is offset downwardly below the plane of the radial extremities of the vanes 6. A plurality of relatively narrow legs or like elements 9 project vertically upward from the periphery of the flange 8 of the member 3 at equally spaced intervals circumferentially thereof in approximate alignment with the upstanding vanes 6 of said member and have their upper end portions bent or turned outwardly at right angles to said elements and to form a plurality of supporting surfaces 10, the purpose for which will be described more in detail hereinafter.

The upper member 2 of the atomizer head 1 previously mentioned is provided with an annular depending bead 11, the diameter of which is preferably slightly in excess of the diameter of the channel 5 in the intermediate member 3, and the adjacent portion 12 of said member 2 preferably inclines at a slight angle outwardly to the side or wall portions 13 thereof which diverge downwardly and terminate at their lower edge in a relatively narrow peripheral flange 14, the outer circumference of which is substantially equal to that of the outer end edges of the supporting surfaces 10 of the legs 9 of the intermediate member 3. The top portion 12 of the upper member 2 of the head 1 is inclined outwardly from the bead 11 at a slight angle with respect to the horizontal so that when rotation of the distributor head 1 ceases, liquid remaining on the inner surface thereof will flow inwardly and be intercepted by the bead 11 which causes said liquid to drop back into the lower member 3 and the oil channel 5 therein, and further for the purpose of facilitating atomization of certain liquids, it may be found desirable to provide the side or wall portions 13 of the top member 2 of the head 1 with a substantially roughened or uneven inner surface in the manner shown in Fig. 6 of the drawings.

The upper and intermediate members 2 and 3 of the head 1 are preferably permanently secured together by welding or other suitable means at the several points circumferentially of each of said members where the peripheral flange 14 of said top member 2 rests upon the supporting surface portions 10 of the vertical legs 9 of said intermediate member 3, and a plurality of substantially radially extending angularly disposed blades or vanes 15 are formed in any suitable

manner in those portions of said peripheral flange 14 of the top member 2 that reside intermediate said vertical legs 9 of the intermediate member 3.

The previously mentioned lower disk like member 4 is of annular form and the inner diameter thereof is preferably slightly in excess of the diameter of the channel 5 of the intermediate member 3 while its outer diameter is somewhat less than the outer diameter of the flange 8 of said intermediate member 3. As shown the member 4 is substantially horizontal and provided with a plurality of upstanding vertical legs or the like 16 located at substantially equally spaced intervals circumferentially thereof, the upper end portions of said legs 16 being bent or turned outwardly at right angles to the legs 16 to form toes or surfaces 17 by means of which the lower member 4 is preferably permanently secured in any suitable manner such as welding to the underside of the flange 8 of the intermediate member 3 and made a component part of the head 1. In addition to the foregoing the lower member 4 is provided with a plurality of angularly disposed upstanding vertical blades or vanes 18 formed intermediate the inner and outer circumferential edges of said member by stamping or pressing out portions thereof in the usual manner, although such blades or vanes 18 may be independently provided and permanently secured to the upper surface of the member 4 if desired.

In the present instance the lower disk member 4 has been shown and described as being permanently secured to the under side of the flange 8 of the intermediate disk member 3. However, in installations of larger size it may be desirable to secure said disk member 4 to the under side of the disk member 3 in such manner that the former may be readily removed and re-attached to the under side of the disk 3 in inverted position with the vanes 18 thereof extending downwardly from the under side, in which position said blades or vanes have been found to provide a greater quantity of air for discharge into contact with the fully atomized liquid.

A boss or the like 19 is secured centrally at the under side of the top member 2 of the head 1, and provided with a tapered bore 20 arranged to receive the similarly tapered upper end 21 of the shaft 22 of a motor or other source of rotative power (not shown), the upper end of said shaft 22 being tapped as indicated at 23 to receive a screw or the like 24 for securing the distributor head 1 to the shaft 22 for rotation therewith. A supply pipe 25 extends vertically upward through the central openings in the head members 3 and 4 and has its upper end directed inwardly of the annular channel 5 in said member 3 as indicated by reference numeral 26.

Under certain conditions of operation of a liquid fuel burner having a rotary distributor head of the present type, it may be found desirable to mount one or more hoods or the like 27 thereon for the purpose of protecting and insulating said member 2 from the excessive temperatures of the surrounding combustion chamber and reducing carbonization of the fuel and the formation of soot on the under side thereof to a minimum, and if desired apertures may be provided inwardly adjacent the head 1 of the top member 2 and the periphery of such hood members 27 as indicated at 28 and 29 respectively to provide openings for the circulation of air within the space therebetween. It may also be advisable under various operating conditions to provide fins or blades 27a at the under side of the hood 27 for the purpose of augmenting the circulation of air between the latter and the upper head member 2 by drawing air inwardly of the openings 28 and discharging the same outwardly through the openings 29 therein.

As shown in Fig. 1 of the drawings hereof, a hearth 30 of refractory material extends laterally of the burner head 1 and is provided with a central air inlet opening 31 therein through which air flows upwardly through said head 1 for mixture with the atomized liquid fuel in the manner set forth hereinafter. A refractory structure 32 which is preferably stepped as shown is positioned on the upper face of the hearth 30 substantially at the periphery thereof and a ring 33 likewise of refractory material and having a groove or channel 34 in the upper face thereof circumvents said hearth 30 inwardly adjacent the previously mentioned refractory structure 32, said groove being arranged to receive a coil of wire 35 or other relatively open heat impervious structure such as screening or the like, the convolutions or strands of which are relatively spaced for the purpose of further distributing and breaking down the vaporized fuel and greatly decreasing the time required for the ignition of said fuel as it is discharged from the head 1.

To operate the device, the distributor head 1 comprising the members 2, 3, and 4 is rotatably driver by the shaft 22 in a counter-clockwise direction with respect to the drawings hereof and liquid deposited in the channel 5 of the member 3 from the pipe 25 is forced radially outward over the upper surface of said member 3 between the upstanding ribs or vanes 6 thereof, the centrifugal force created by rotation of the head 1 causing the greater portion of said liquid to impinge against the substantially vertical forward or leading face 7 of the ribs or vanes 6 and be partially atomized and vaporized during its outward movement, said partial vaporization being effected by contact of the liquid with air which during operation of the distributor head aspirates upwardly through the opening surrounded by the channel 5 of the intermediate disk 3 and outwardly over the latter intermediate the upstanding vanes 6 thereon. When the partially atomized and vaporized liquid reaches the radial extremities of the ribs or vanes 6 it is discharged or flung against the inner surface of the outwardly spaced side or wall portions 13 of the upper member 2 with sufficient impact to effect substantially complete atomization and vaporization of said liquid which is aided or enhanced by reason of the differential between the respective peripheral velocities of the radial extremities of the vanes 6 of the intermediate member 3 and the outwardly spaced inner surface of the side or wall portions 13 of the top member 2.

During continued rotation of the head 1 the liquid passes downwardly along the inner surface of the side or wall portions 13 of the top member 2 and along the under side of the peripheral flange 14 to the edge of the latter from which it is discharged into contact with air from the blades or vanes 18 of the lower member 4 of the head 1 and further discharged at a substantial velocity radially, outward through the smaller relatively closely spaced blades or vanes 16 which function to increase still further the atomization and vaporization of the liquid which is then discharged outwardly from the head 1 and uni-

formly distributed throughout the combustion chamber of the burner in the form of a fine mist or fog which, prior to ignition, falls upon the relatively open coil or screening 35 located at the periphery of the hearth structure where it is quickly ignited and the flame rapidly distributed uniformly around said hearth causing the liquid thereafter discharged from the head 1 to burn more or less in suspension above the hearth, whereby carbonization and the formation of soot within the burner chamber and distributor head 1 is substantially eliminated. In addition to the foregoing, the relatively open coil or screening 35 functions to retain the hot gases of combustion adjacent the peripheral area of the combustion chamber so that said gases may pass off upwardly along the side wall area of said chamber whereby a more uniform distribution of the products of combustion throughout the chamber is effected and the efficiency of the burner materially increased.

While the embodiment of the present invention previously described has been restricted more or less to the so-called vertical rotary distributor head type of liquid atomizers the principle of the invention may be effectively employed in liquid atomizers of the form shown in Figs. 7 and 8 of the drawings hereof wherein reference numeral 3a designates generally an atomizing plate or disk member of more or less conical configuration provided with radially disposed ribs or vanes 6a pressed, stamped or otherwise formed in said member 3a at substantially predetermined equally spaced intervals circumferentially thereof, said radial ribs or vanes 6a being of gradually increasing height and width outwardly of the member 3a and otherwise constructed and arranged so that the side or wall thereof which faces in the direction of rotation of said member is substantially vertical as indicated at 7a in Fig. 8 of the drawings.

In addition to the foregoing, the plate or disk member 3a is provided with a peripheral flange 36 which extends parallel to the axis of said member to a point beyond the ends of the radial ribs or vanes 6a in outwardly spaced relation with respect to the radial extremities thereof, and has its inner surface corrugated or ribbed as at 37. A plate or like guard member 38 may be secured in any suitable manner such as by welding to the outer end portions of each of the radially extending ribs or vanes 6a to overlie the latter and eliminate as far as possible the formation of soot or carbon on the surfaces of said ribs 6a as a result of the intense heat of combustion when said atomizing device is employed in liquid fuel burners and the like.

In the present instance, the plate or disk member 3a is provided with a central bore or opening 20a to receive the end of a shaft 22a of a motor or other source of rotative power M, said member 3a being fixedly secured on said shaft 22a for rotation therewith. As shown, the shaft 22a of the motor M is provided with an axial bore 39 connecting at one end with a transverse bore 40 which opens on to the central portion of the ribbed or vaned face or surface of the member 3a for the purpose of discharging liquid on to said face or surface from the bore 39 which is supplied from a pipe 41 connected to a suitable source of supply.

A fan or the like 42 is mounted for rotation with the shaft 22a of the motor M and is located intermediate the latter and the plate or disk member 3a. A casing, housing or like structure designated generally as 43 substantially encloses the fan 41 and is provided with a flange 44 which extends parallel to the shaft 22a and the flange 36 of disk 3a in outwardly spaced relation with respect to said flange to a point substantially in register with the outer peripheral edge of the latter. A partition member 45 sub-divides said housing or casing 43 into an air chamber 46, having a plurality of circumferentially spaced air inlet openings 47 thereto, and a fan chamber 48, said partition member 45 having an opening 49 centrally therein for the ingress of air to the fan 42 from said air chamber 46.

In operation of the device, the fan 42 and the plate or disk atomizer 3a are rotatably driven by the shaft 22a and motor M and liquid fed through the bore 39 of said shaft from pipe 41 discharges through the transverse bore 40 on to the ribbed or vaned face or surface of said member 3a and is forced radially outward over the upper surface thereof between the upstanding ribs or vanes 6a, the centrifugal force caused by rotation of said member causing the greater portion of said liquid to impinge against the substantially vertical forward or leading face 7a of said ribs or vanes where it is partially atomized during such radially outward movement. When the partially atomized liquid reaches the radial extremities of the ribs or vanes 6a it is discharged or flung against the inner corrugated or ribbed surface 37 of the outwardly spaced flange 36 of the member 3a with sufficient impact to effect substantially complete atomization of said liquid due to the differential existing between the respective peripheral velocities of the radial extremities of the vanes 6a and the inner surface of the outwardly spaced flange 36 as well as said corrugated or ribbed inner surface formation of the latter.

During continued rotation of the member 3a the atomized liquid passes along the inner corrugated or ribbed surface of the flange 36 to the outer peripheral edge thereof from which it is discharged into contact with the blast of air from the fan or the like 42 emerging through the space between said flange 36 of said member 3a and the flange portion 44 of the housing or casing 43.

As an alternate construction of the present form of the invention, the flange 36 which extends parallel to the axis of rotation of the disk 3a may be entirely eliminated and the liquid discharged from the extremities of the radial ribs 6a by centrifugal force allowed to impact directly against the inner surface of the outer portion of the flange 44 of the stationary fan casing 43, where it is thoroughly atomized and immediately vaporized by the blast of air discharging outwardly between said flange 44 and the periphery of the disk 3a from the fan 42.

Although the description of the present invention has been set forth more particularly with respect to liquid fuel burners and the like, such devices can be employed effectively to atomize and vaporize any other liquid or liquids as for example in apparatus to effectively atomize cooling or washing liquids such as water and the like, and while a specific embodiment of such a device has been set forth for purposes of description it is not intended that the invention shall be precisely limited thereto but that changes and modifications may be incorporated where within the scope of the annexed claims.

I claim:

1. In a device of the character described, a centrally apertured rotatable disk imperforate between its inner and outer peripheries and hav-

ing ribs on its imperforate portion disposed at substantially equally spaced intervals circumferentially thereof, means for feeding a liquid onto said disk, means for rotating the disk to cause the liquid to be discharged outwardly thereof by centrifugal force, impacting means rotatable with the disk arranged in outwardly spaced relation with respect to the ribs for atomizing the liquid discharged therefrom, and means operatively associated with said impacting means to still further atomize said liquid after the same contacts the impacting means.

2. In a device of the character described, a centrally apertured rotatable disk imperforate between its inner and outer peripheries and having ribs on its imperforate portion disposed at substantially equally spaced intervals circumferentially thereof, means for feeding a liquid onto said disk, means for rotating the disk to cause the liquid to be discharged outwardly thereof by centrifugal force, impacting means rotatable with the disk arranged in outwardly spaced relation with respect to the ribs for atomizing the liquid discharged therefrom, means operatively associated with said impacting means to still further atomize said liquid after the same contacts the impacting means, and means operable to direct air into contact with said atomized liquid to thoroughly vaporize the same.

3. In a device of the character described, a centrally apertured rotatable disk imperforate between its inner and outer peripheries and having ribs on its imperforate portion disposed at substantially equally spaced intervals circumferentially thereof, means for feeding a liquid onto said disk, means for rotating the disk to cause the liquid to be discharged outwardly thereof by centrifugal force, impacting means rotatable with the disk arranged in outwardly spaced relation with respect to the ribs for atomizing the liquid discharged therefrom, means operatively associated with said impacting means to still further atomize said liquid after the same contacts the impacting means, a fan rotatable with the disk, and a casing having air inlet openings substantially enclosing said fan, said casing being constructed and arranged to direct air from said fan into contact with the atomized liquid discharged from said impacting means to vaporize the same.

4. In a device of the character described, a centrally apertured rotatable disk imperforate between its inner and outer peripheries and having ribs on its imperforate portion disposed at substantially equally spaced intervals circumferentially thereof, means for feeding a liquid onto said disk, means for rotating the disk to cause the liquid to be discharged outwardly thereof by centrifugal force, impacting means rotatable with the disk arranged in outwardly spaced relation with respect to the ribs for atomizing the liquid discharged therefrom, means operatively associated with said impacting means to still further atomize said liquid after the same contacts the impacting means, means operable to direct air into contact with said atomized liquid to thoroughly vaporize the same, a fan rotatable with the disk, and a casing having air inlet openings substantially enclosing said fan, said casing having a portion surrounding said impacting means in spaced relation with respect thereto whereby air from said fan is directed into contact with the atomized liquid discharged from the impacting means to thoroughly vaporize the same.

5. In a device of the character described, a liquid fuel distributor including a centrally apertured disk having a liquid receiving channel outwardly adjacent said aperture and upstanding vanes extending radially outward from said channel at predetermined spaced intervals circumferentially of said disk, means for feeding a liquid into the channel, means for rotating the disk to cause said liquid to collect adjacent one face of the vanes by centrifugal force, a second disk having a portion arranged in outwardly spaced relation with respect to the vanes of the first disk and in the path of discharge of the liquid therefrom so that said liquid will impact against said portion and atomize, means projecting outwardly from the impacting portion of said second disk operable to still further atomize the liquid after the same contacts said impacting portion, and a third disk rotatable with said first and second disk, said third disk having means constructed and arranged to direct an air current into contact with said atomized fuel to vaporize and discharge the same outwardly of the distributor substantially in the form of a fog.

6. In a device of the character described, a centrally apertured disk imperforate between its inner and outer peripheries and having substantially radial ribs on its imperforate portion at equally spaced intervals circumferentially thereof, means for feeding a liquid onto the ribbed surface of the disk, means for rotating said disk to cause the liquid to move outwardly thereof between the ribs and be discharged from the disk by centrifugal force, a flange on said disk extending in outwardly spaced relation with respect to the extremities of said ribs and arranged for engagement by the liquid discharged from the disk with sufficient impact to thoroughly atomize the same prior to discharge from said flange, a fan rotatable with said disk, and a casing having air inlet openings thereto substantially enclosing said fan, said casing having an open ended flange portion surrounding the first mentioned flange in spaced relation with respect to the latter whereby air from the fan is directed into contact with the atomized liquid discharged from said first flange to thoroughly vaporize the said liquid.

7. In a device of the character described, a centrally apertured disk imperforate between its inner and outer peripheries and having substantially radial ribs on its imperforate portion at equally spaced intervals circumferentially thereof, said ribs being of gradually increasing height and width outwardly of said disk, means for feeding a liquid onto the ribbed surface of the disk, means for rotating said disk to cause the liquid to move outwardly thereof between the ribs and be discharged from the disk by centrifugal force, a flange on said disk extending in outwardly spaced relation with respect to the extremities of said ribs and arranged for engagement by the liquid discharged from the disk with sufficient impact to thoroughly atomize the same prior to discharge from said flange, a fan rotatable with said disk, and a casing having air inlet openings thereto substantially enclosing said fan, said casing having an open ended flange portion surrounding the first mentioned flange in spaced relation with respect to the latter whereby air from the fan is directed into contact with the atomized liquid discharged from said first flange to thoroughly vaporize the said liquid.

8. In a device of the character described, a centrally apertured disk of substantially frusto-conical form imperforate between its inner and

outer peripheries and having substantially radial ribs on its imperforate portion at equally spaced intervals circumferentially thereof, said ribs being of gradually increasing height and width outwardly of said disk, means for feeding a liquid onto the ribbed surface of the disk, means for rotating said disk to cause the liquid to move outwardly thereof between the ribs and be discharged from the disk by centrifugal force, a flange on said disk extending in outwardly spaced relation with respect to the extremities of said ribs and arranged for engagement by the liquid discharged from the disk with sufficient impact to thoroughly atomize the same prior to discharge from said flange, a fan rotatable with said disk, and a casing having air inlet openings thereto substantially enclosing said fan, said casing having an open ended flange portion surrounding the first mentioned flange in spaced relation with respect to the latter whereby air from the fan is directed into contact with the atomized liquid discharged from said first flange to thoroughly vaporize the said liquid.

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