Sept. 16, 1947. O. J. KUENHOLD, SR 2,427,531

HUMIDIFICATION SYSTEM WITH AIR SEAL MEANS

Filed Nov. 13, 1941 5 Sheets-Sheet 1

FIG. 1.

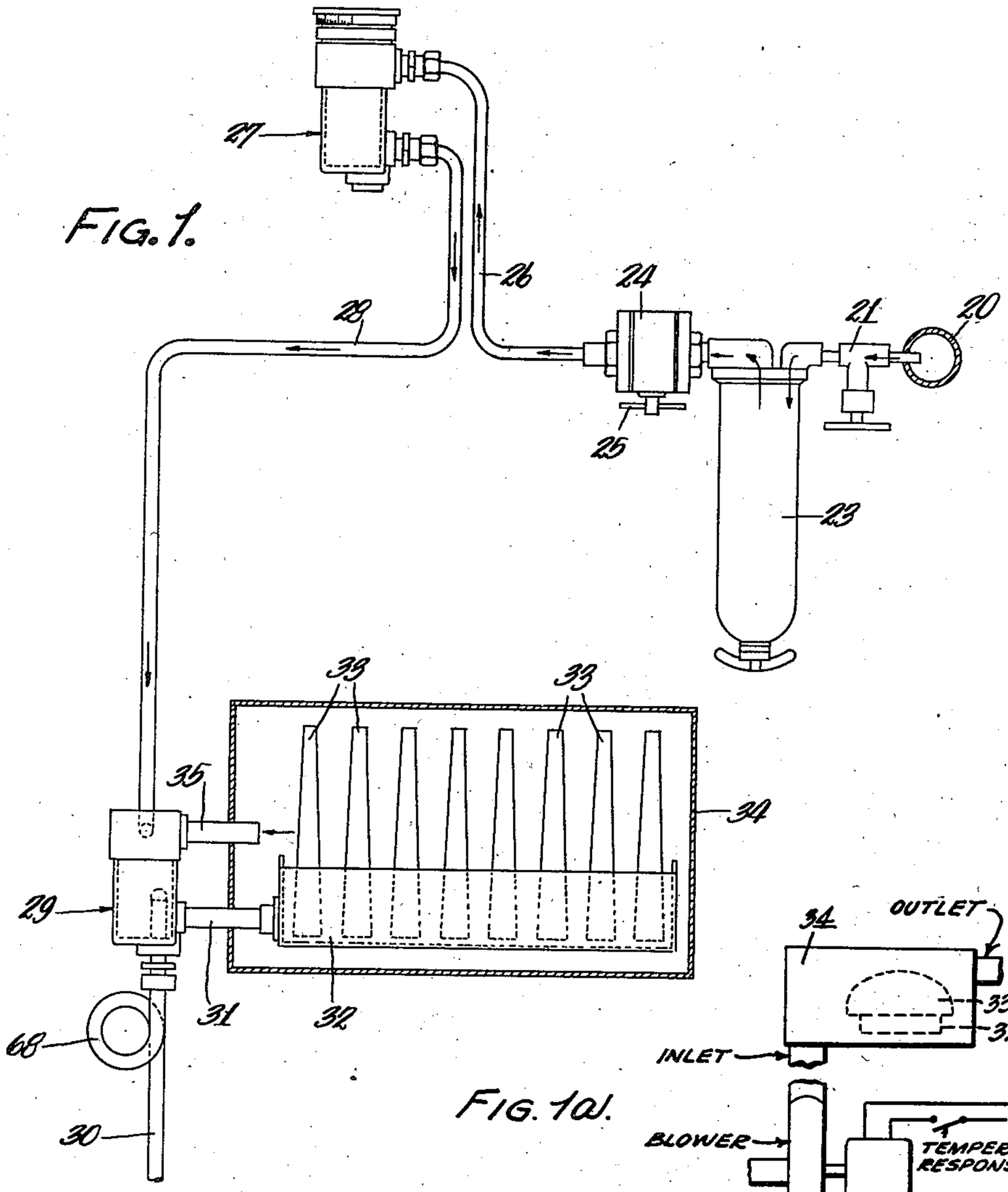

FIG. 1a.

OTTO J. KUENHOLD, SR.
INVENTOR
BY Freeman Stowell and Albrecht
ATTORNEYS

Sept. 16, 1947. O. J. KUENHOLD, SR 2,427,531

HUMIDIFICATION SYSTEM WITH AIR SEAL MEANS

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FIG. 2.

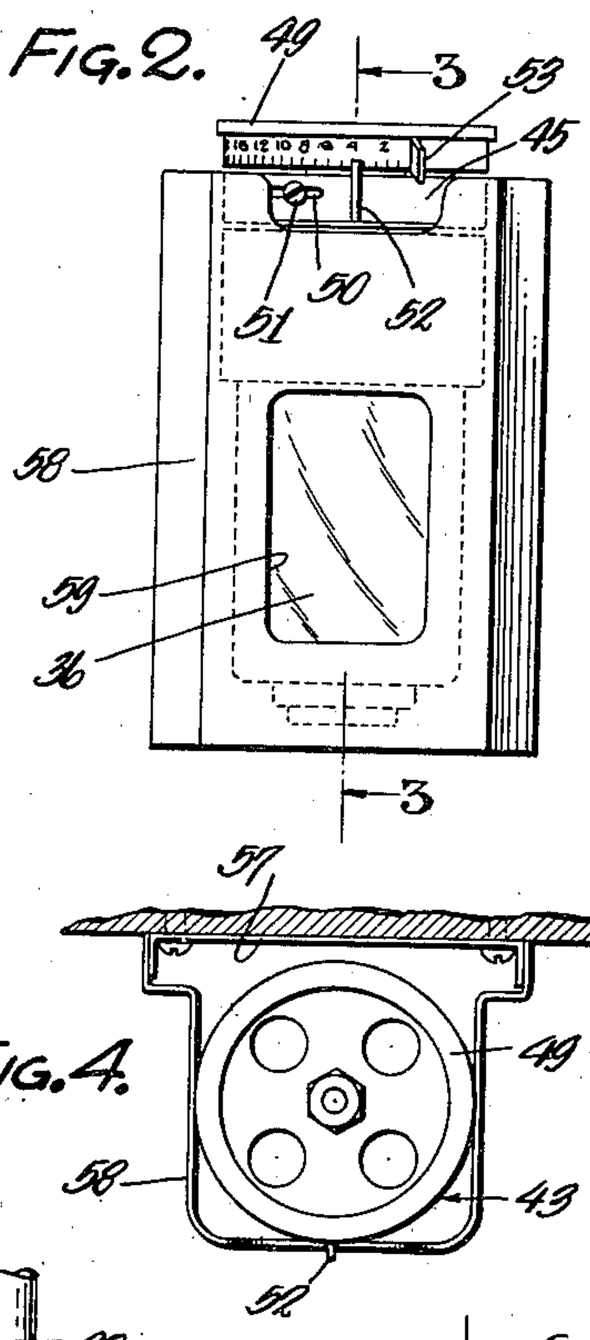


FIG. 3.

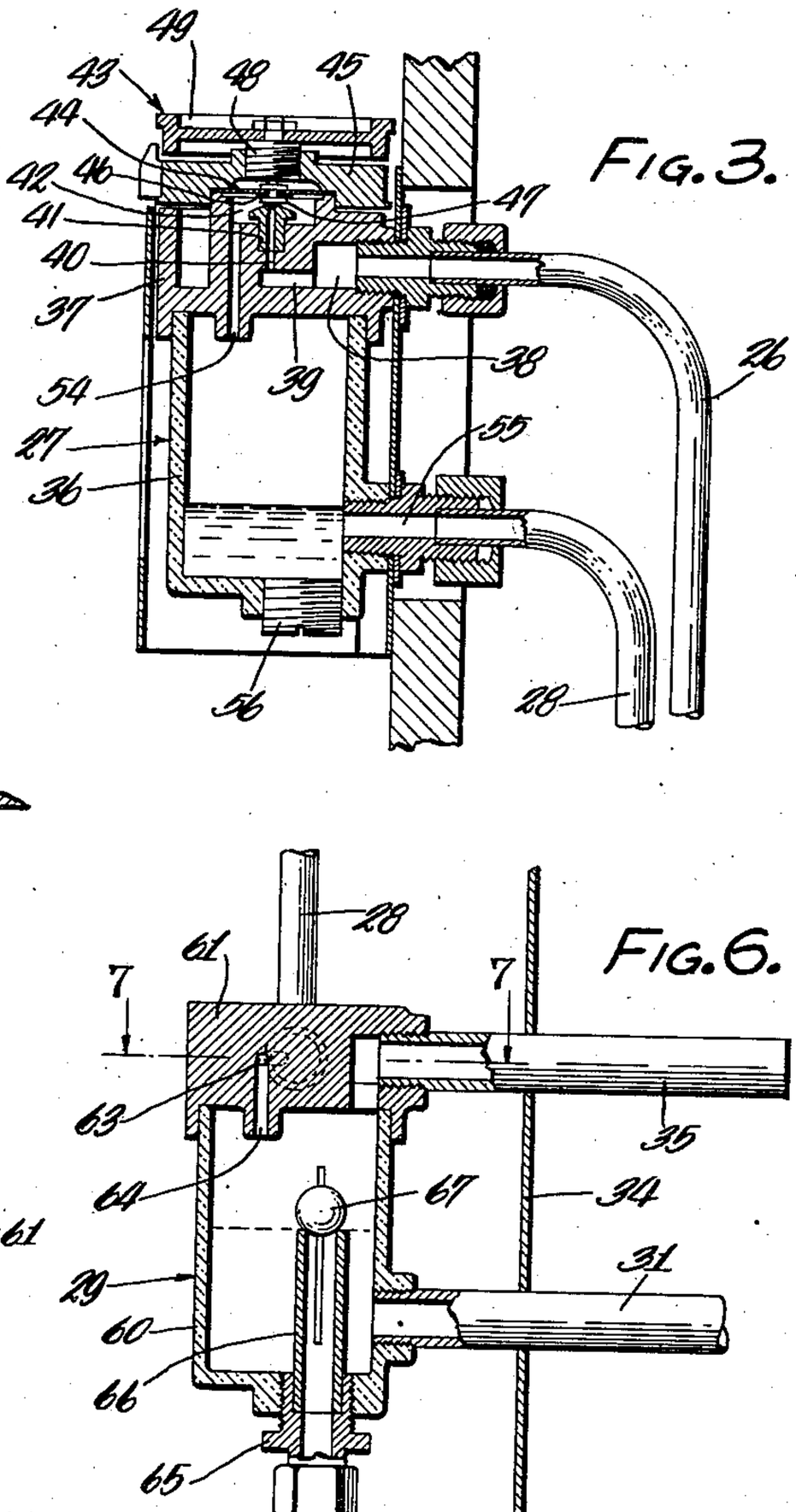


FIG. 4.

FIG. 5.

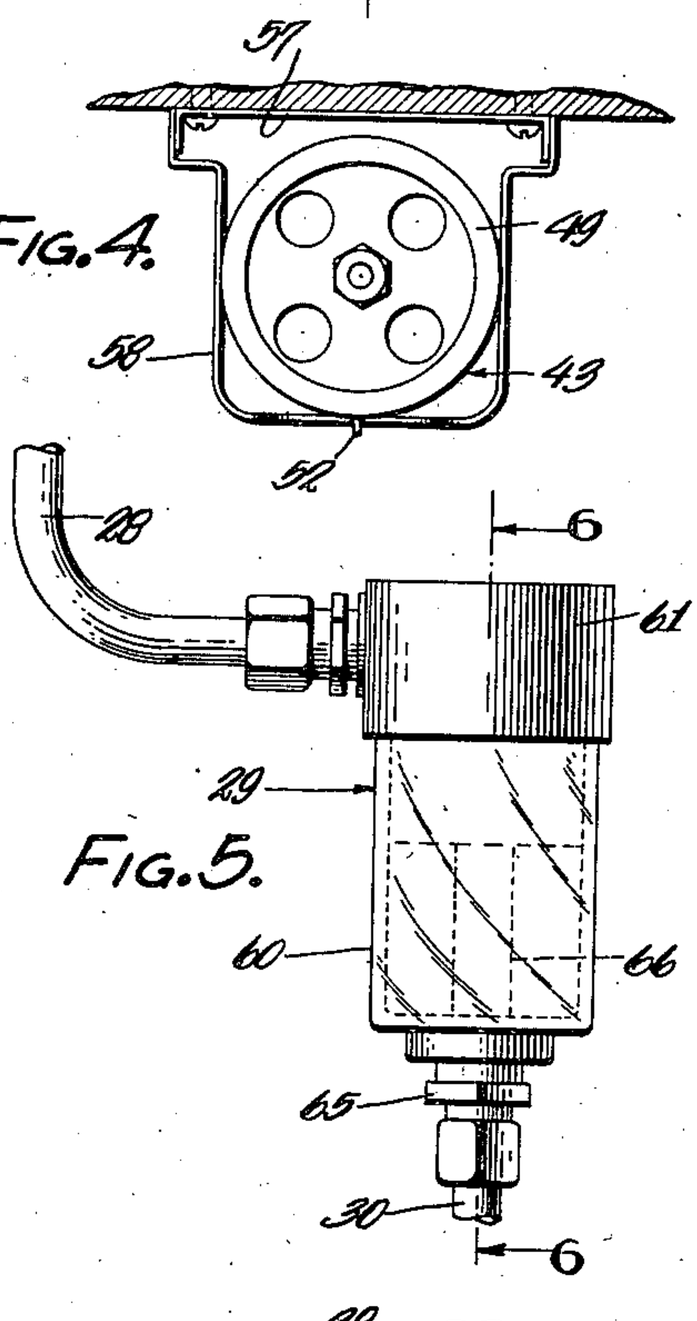
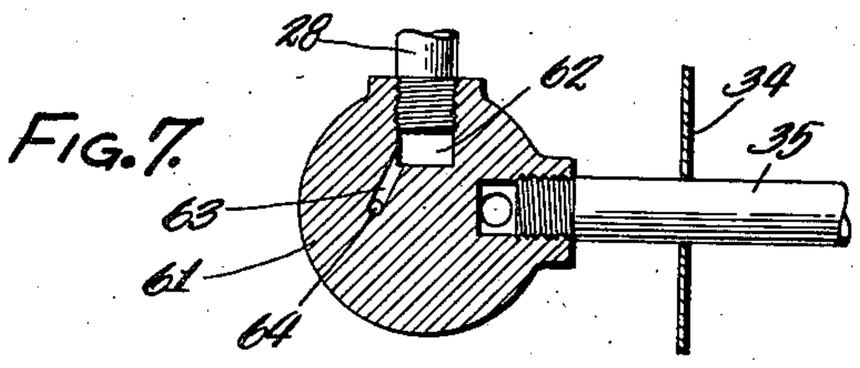


FIG. 6.

FIG. 7.



OTTO J. KUENHOLD, SR.
INVENTOR
BY Freeman Swart and Albrecht
ATTORNEYS

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HUMIDIFICATION SYSTEM WITH AIR SEAL MEANS

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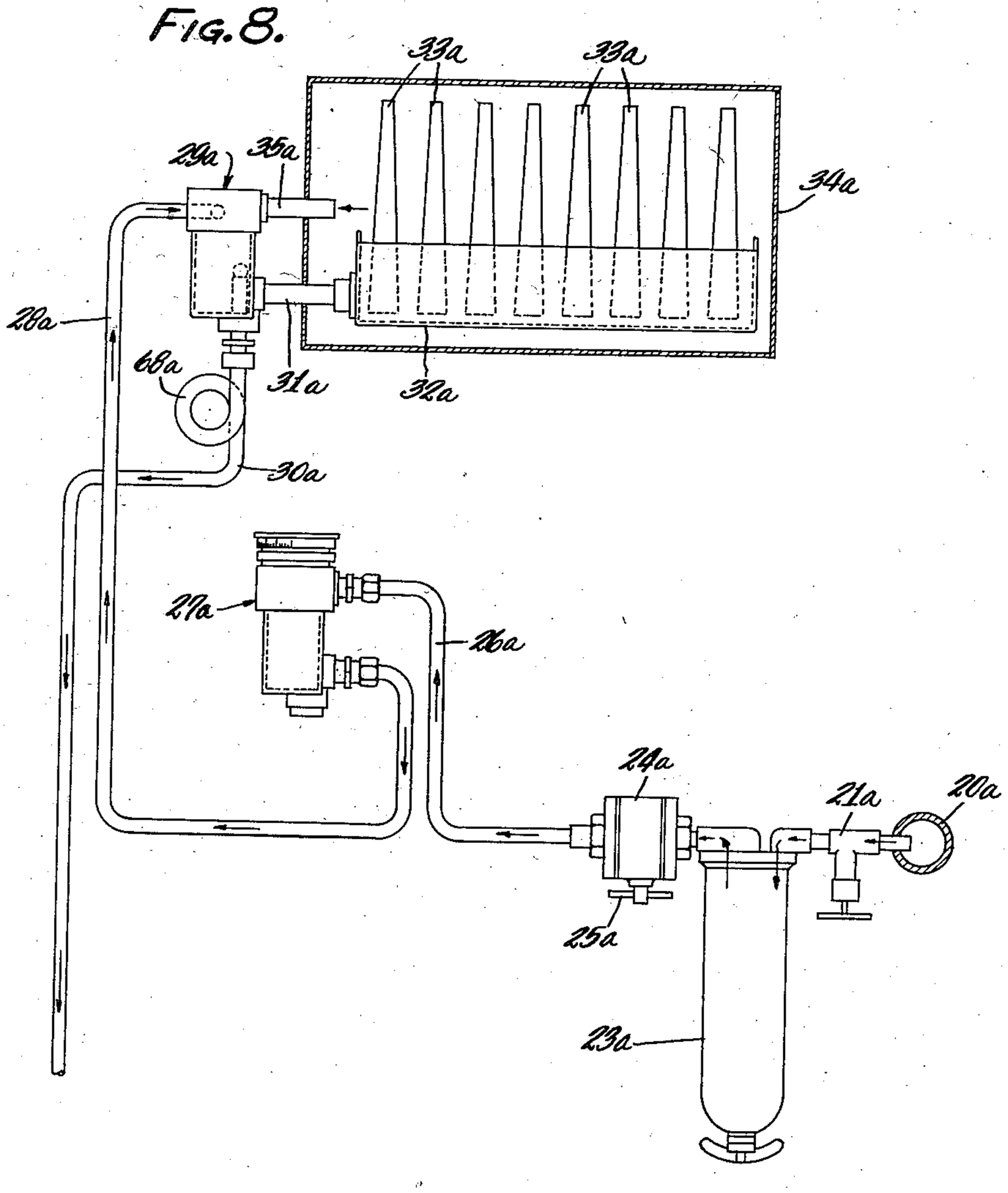
FIG. 8.



OTTO J. KUENHOLD, SR.
INVENTOR
BY Fremon Smart and Albrecht
ATTORNEYS

Sept. 16, 1947. O. J. KUENHOLD, SR 2,427,531

HUMIDIFICATION SYSTEM WITH AIR SEAL MEANS

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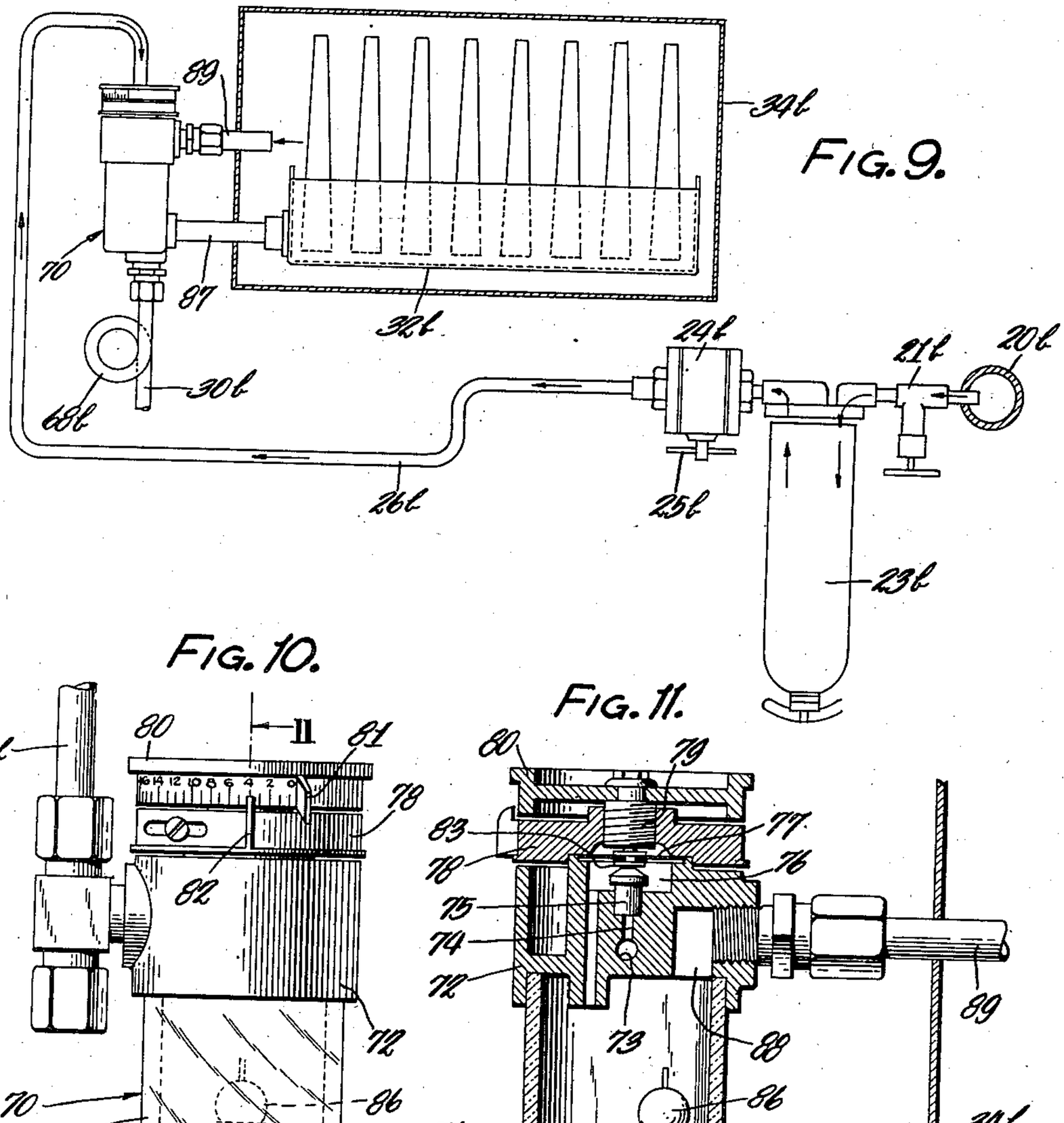

FIG. 9.

FIG. 10.

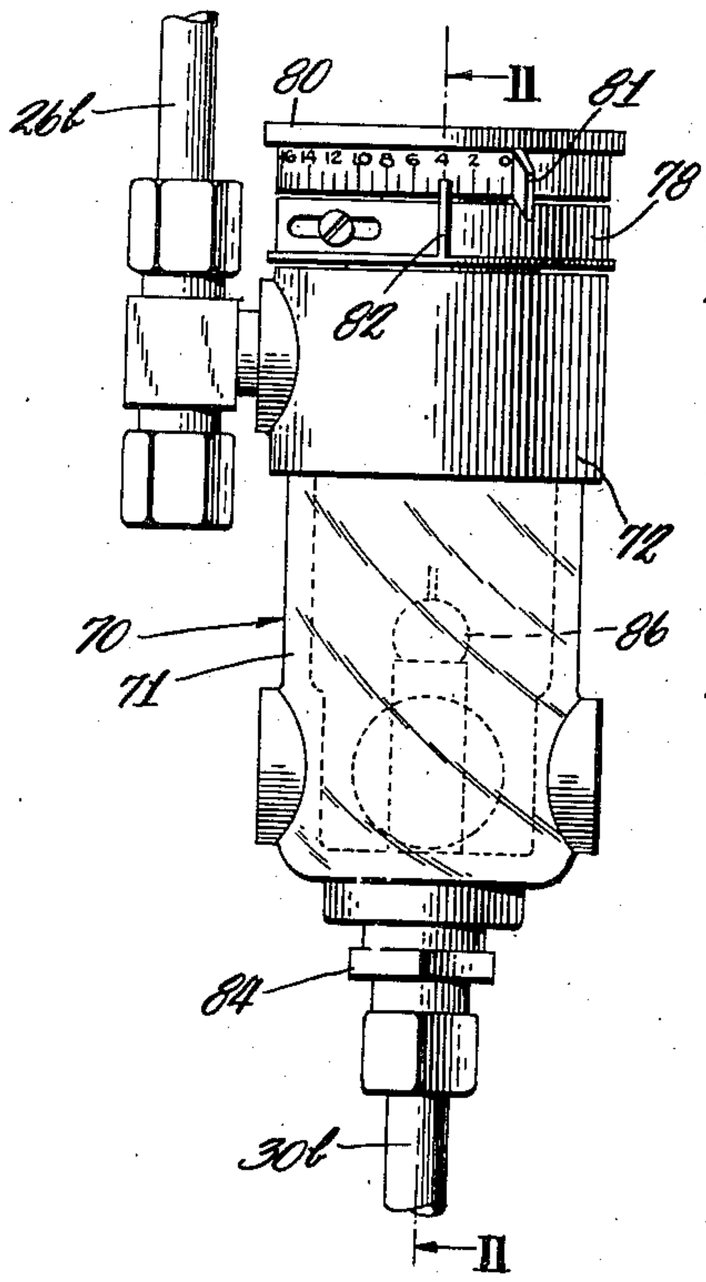

FIG. 11.

OTTO J. KUENHOLD, SR.
INVENTOR

BY Freeman Sweet and Albrecht
ATTORNEYS

Sept. 16, 1947. O. J. KUENHOLD, SR 2,427,531

HUMIDIFICATION SYSTEM WITH AIR SEAL MEANS

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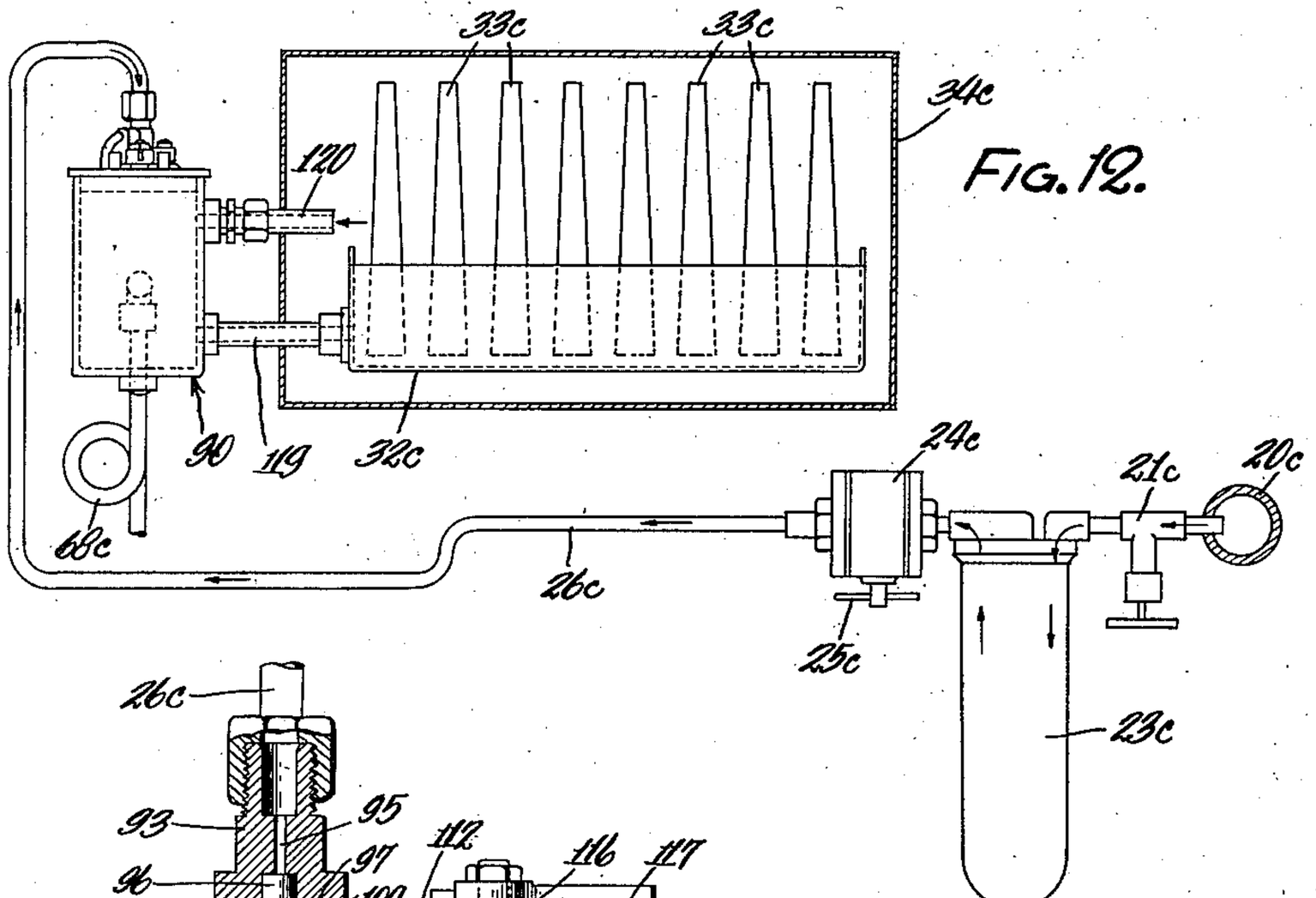

FIG. 12.

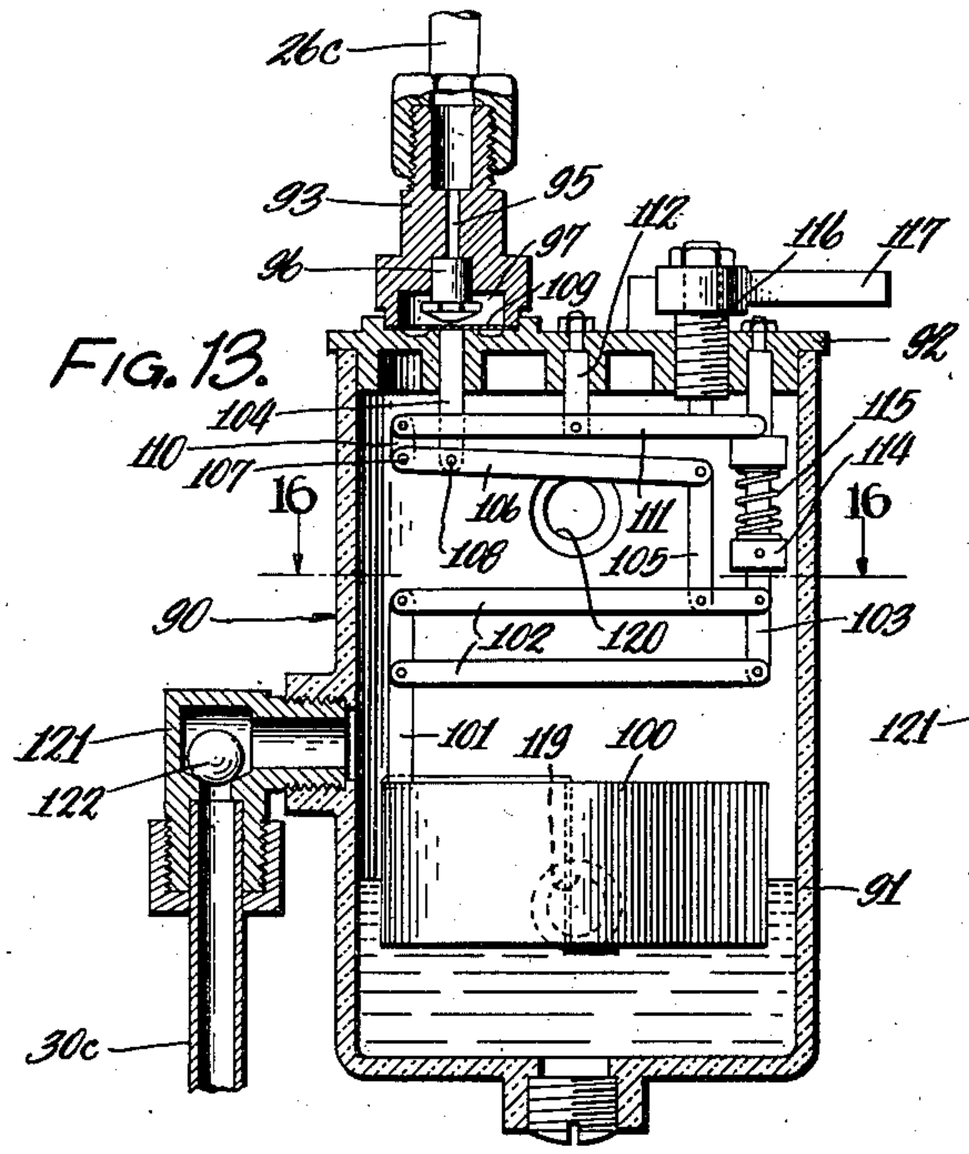

FIG. 13.

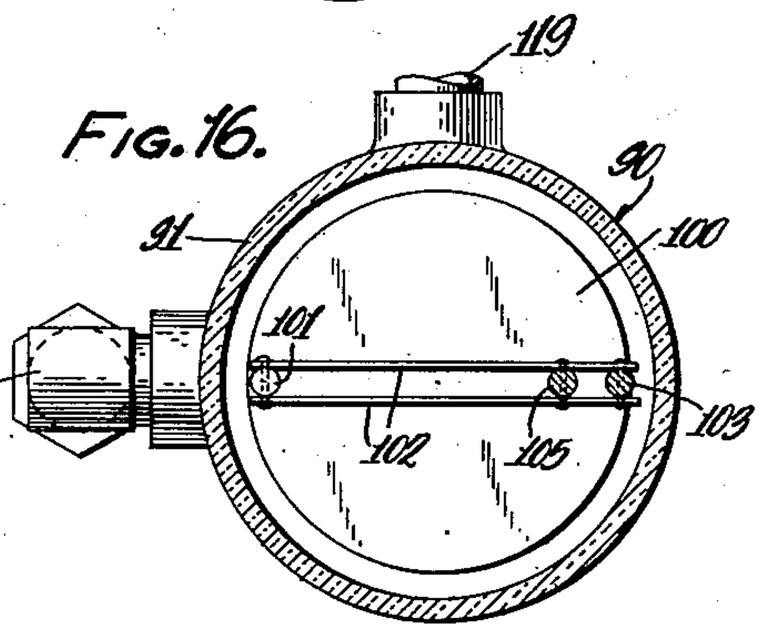

FIG. 16.

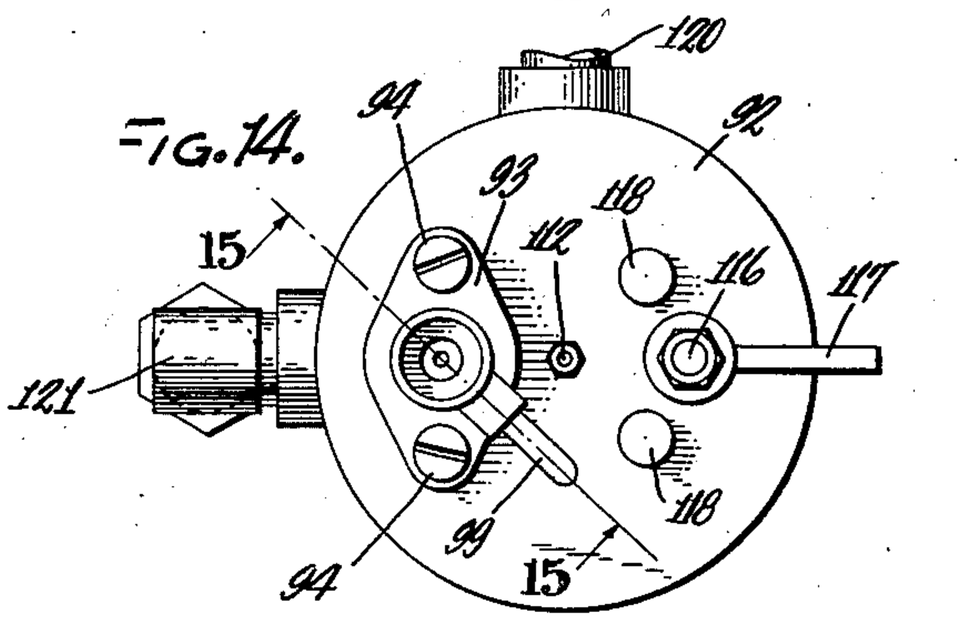

FIG. 14.

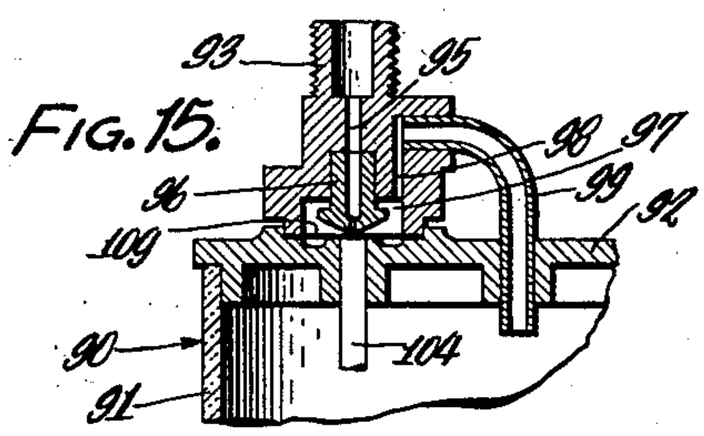

FIG. 15.

OTTO J. KUENHOLD, SR.
INVENTOR
BY Freeman Sweet and Albert
ATTORNEYS

Patented Sept. 16, 1947

2,427,531

UNITED STATES PATENT OFFICE

2,427,531

HUMIDIFICATION SYSTEM WITH AIR SEAL MEANS

Otto J. Kuenhold, Sr., Shaker Heights, Ohio, assignor to Monmouth Products Company, Cleveland, Ohio, a corporation of Ohio

Application November 13, 1941, Serial No. 418,926

18 Claims. (Cl. 126—113)

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My invention relates to humidification, particularly to humidification systems and apparatus for use with furnaces, especially hot air furnaces, and the principal object of my invention is to provide new and improved humidification systems and apparatus.

This application is a continuation in part of my copending application Serial Number 263,265, filed March 21, 1939, and a continuation in part of my copending application Serial Number 263,266, filed March 21, 1939.

In the drawings accompanying this specification and forming a part of this application, there are shown, for purposes of illustration, various embodiments which my invention may assume, and in these drawings:

Figure 1 is a generally schematic view showing a humidification system embodying my invention,

Figure 1*a* is a schematic view of a detail.

Figure 2 is an enlarged elevational view of a device used in the system shown in Figure 1,

Figure 3 is a vertical sectional view corresponding generally to the line 3—3 of Figure 2,

Figure 4 is a top plan view of the device shown in Figure 2,

Figure 5 is an enlarged elevational view of another device used in the system shown in Figure 1,

Figure 6 is a vertical sectional view corresponding generally to the line 6—6 of Figure 5,

Figure 7 is a transverse sectional view corresponding generally to the line 7—7 of Figure 6,

Figures 8 and 9 are generally schematic views showing other humidification systems embodying my invention,

Figure 10 is an enlarged elevational view of a device used in the system shown in Figure 9,

Figure 11 is a vertical sectional view corresponding generally to the line 11—11 of Figure 10,

Figure 12 is a generally schematic view showing another humidification system embodying my invention,

Figure 13 is an enlarged vertical sectional view of a device used in the system shown in Figure 12,

Figure 14 is a top plan view of the device shown in Figure 13,

Figure 15 is a fragmentary vertical sectional view corresponding generally to the line 15—15 of Figure 14, and

Figure 16 is a transverse sectional view corresponding generally to the line 16—16 of Figure 13.

Referring particularly to Figure 1, the system therein shown is connected to a source of liquid. The liquid ordinarily used in humidification sys-

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tems is largely water, and for purposes of this description, the source of liquid may be a water supply pipe 20, leading from a city water supply, or from a well or the like. From the pipe 20, the water passes through a shut-off valve 21, and then through a water filter 23, of any suitable construction, the filter being for the purpose of filtering out impurities suspended in the water. The filtered water then passes through a pressure regulator 24, of any suitable construction, but preferably of the construction shown in my patent, Number 2,249,010. As disclosed in such patent, the pressure regulator 24 is provided with a manually operable purge lever 25, which when twisted in either direction, fully opens the valve regulating the water pressure, so that water under full pressure is admitted to the system, for a purpose to be hereinafter pointed out. Under normal operating conditions, it is preferable that the pressure regulator is so set that it delivers water to the humidification system at a greatly reduced constant pressure.

A conduit 26 leads from the outlet port of the pressure regulator 24, and extends to the inlet of a water-feed control device 27. A conduit 28 leads from the outlet of the water-feed control device 27 to the inlet of a water-feed device 29, and the latter device has a drain conduit 30 leading to a suitable drain.

The water feed device has a conduit 31 providing liquid communication between it and an evaporator means, here shown in the form of an elongated evaporator pan 32 having evaporator plates 33 extending upwardly out of the water in the evaporator pan 32. The evaporator pan 32 and the evaporator plates 33 are disposed within a chamber 34 through which air may move. The chamber 34 may comprise part of a heating system, and in this instance is adapted for the passage of heated air to a place in a dwelling to be heated. Since the air in the chamber 34 at times is of different temperatures, the air pressure in the chamber 34 will vary, at least partly because of expansion and contraction of the air.

The humidification system shown in Figure 1 is particularly designed for cooperation with a hot air furnace of the type employing an air blower operable to force air past the heating portion of the furnace and up into the bonnet chamber, from whence it is distributed by risers to the rooms to be heated. Of course, the air blower, in a properly designed and installed furnace, operates intermittently and forces air past the heating portion of the furnace and to the bonnet

chamber only when heat is called for. Therefore, intermittent operation of the air blower causes sharp fluctuations in air pressure in the bonnet chamber, due at least partly to the inertia of the air in such chamber, and to the resistance to air flow in the risers. In hot air furnaces, the chamber **34** is preferably the bonnet chamber. In accordance with my invention, the system includes a pressure-equalizing means **35** extending between the water feed device **29** and the chamber **34**, for a purpose hereinafter explained.

Blower means operable when heat is called for, and arranged to force air into and through the chamber **34**, is shown schematically in Figure 1*a*. It will be understood that the illustration in Figure 1*a* is merely one of numerous possible embodiments.

Referring particularly to Figures 2 through 4, the water-feed control device **27** comprises a cup **36**, formed of a transparent material, such as glass or a suitable plastic, the open end of the cup **36** being closed by a cover **37**, preferably formed of a suitable plastic material, and the cup and cover are fitted and cemented together to seal against admission of air at their connection.

The cover **37** provides a water inlet chamber **38** which is in communication with the conduit **26** leading from the pressure regulator **24**, and passages **39** and **40** extend respectively laterally and upwardly. The upper portion of the passage **40** is enlarged, and receives an orifice nozzle **41** having its free end extending into a valve chamber **42**. Valve means **43** is provided to control flow of water outwardly from the orifice provided by the orifice nozzle **41**, and as here shown, the valve means **43** comprises a flexible diaphragm **44** extending across and closing the upper end of the valve chamber **42**. The diaphragm **44** is tightly clamped, at its periphery, to the cover **37** by a valve cover **45** which is held down by screws, not shown. A flat flexible spring **46** underlies the diaphragm **44** and normally flexes the diaphragm upwardly and away from the adjacent terminal end of the orifice nozzle **41**, and a central flat-headed rivet **47** is passed through the flat spring, the diaphragm, and a washer above the diaphragm, the upper extremity of the rivet stem being peened over to form a central button head. A valve screw **48**, having a low pitch screw thread is screwed through a threaded aperture in the valve cover **45**. The valve screw **48** is perfectly flat and smooth at its bottom terminal surface, and such surface engages the central button head of the rivet **47**. When the valve screw **48** is turned down far enough it flexes the diaphragm downwardly so that the flat head of the rivet **47** accurately engages the orifice opening into the orifice nozzle **41**, and closes passage therethrough.

On the upper end of the valve screw **48** a graduated dialed wheel **49** is secured, as shown. Rotation of this wheel opens or closes the valve, dependent upon the direction of rotation, approximately .00012 inch per graduation, and such increase, in the construction herein shown, corresponds to a change of approximately one gallon per day in the rate of water flow through the valve. Preferably, the dial graduations, seen in Figure 2, are numbered to indicate the rate of water flow in gallons per day.

A movable indicator having a slot **50** is anchored in position on the valve cover **45** by means of a screw **51**. The indicator comprises a projection **52** positioned in the path of a stop lug **53** formed on the dial wheel **49** to limit the farthest open position of the dial wheel, and also to limit the tightness of valve closure. Without this limitation, the comparatively large diameter of the dial wheel **49** and very fine pitch of the thread of the valve screw **48** would permit the valve to be closed with considerable force, with the result that predetermined contact between the flat head of the rivet **47** and the adjacent part of the orifice nozzle **41** may be destroyed, and this would change the distance of the valve opening, and consequently change the rate of water flow so that it would no longer correspond with the water flow rate indicated by the dial.

The diaphragm **44** itself must be flexible and rather soft, but by providing a relatively hard unyielding diaphragm center in the form of the flat head of the rivet **47**, it is possible to have a flexible soft diaphragm with a center that will not expand, contract, or readily wear. With the valve screw **48** so adjusted that the flat rivet head is out of closing contact with respect to the adjacent terminal end of the orifice nozzle **41**, water may flow from the valve chamber **42** and downwardly into the cup through an upright passage **54** formed in the cover **37**.

The outlet of the water-feed control device **27** is positioned above the bottom of the cup **36**, as indicated at **55**, to provide a level of water in the bottom of the cup, and the conduit **28** is connected to the outlet **55**. A screw-threaded aperture provided in the bottom of the cup **36** for purposes of draining the cup is normally closed by a screw plug **56**.

The water-feed control device **27** is preferably mounted upon the wall of a room in the residence to be heated and humidified, and as here shown, the device **27** is enclosed in a housing which comprises a base **57** held to the wall by means of screws or the like, and a sheet-metal case **58** is constructed and arranged to be snapped in position on the base **57**. The case **58** is provided with a cut-out **59** to permit view of the water dripping, or flowing, from the passage **54** in the cover **37** to the cup **36**, and also to permit view of the level of the water in the cup. In this manner, a user may actually see whether or not water is being delivered to the cup **36**, and in what quantities. This provides a means of checking whether or not the system is operating up to this point, as well as providing a means for showing the amount of water delivered to a subsequent part of the system.

Referring particularly to Figures 5 through 7, the water-feed device **29** comprises a cup **60**, formed of transparent material, such as glass or a suitable plastic, the open end of the cup being closed by a cover **61**, the connection being closely fitted and cemented to seal against air entering at this point. The water supply conduit **28** communicates with a chamber **62**, formed in the cover **61**, and a passage **63** leads transversely from the chamber **62** to an upright drip or flow passage **64**, the lower end of which delivers water to the cup **60**.

The bottom of the cup **60** is formed with a screw-threaded aperture which receives a threaded fitting **65**, connected to the drain conduit **30**, and the fitting carries an overflow tube **66** extending upwardly inside of the cup **60**. The overflow level in the cup may be varied by threading the fitting **65** in a proper direction to extend the upper terminal end of the tube a greater or lesser amount into the cup. A ball float valve **67** may

be seated on the terminal end of the overflow tube 66, to seal the overflow tube against admission of air to the cup 60, a rise in water level to a point above the terminal end of the overflow tube 66 unseating the ball float valve 67 and permitting a drainage of water through the tube 66 and the communicating drain conduit 30. In some cases, it is preferable to use an air trap formed in the drain conduit 30, such as an S-trap, or the modified form of such trap as by bending the drain conduit 30 upon itself in the form of a circle, as shown at 68 in Figures 1 and 6. It will be appreciated that either or both the ball float valve 67 or the trap 68 may be used.

The conduit 31 communicates with the interior of the cup 60 at a point spaced above the bottom of the cup but below the upper terminal edge of the overflow tube 66, as best seen in Figure 6. The water feed device 29 is preferably disposed exteriorly of the chamber 34, and the conduit 31 extends from the device 29, through a wall in the chamber 34 and communicates with the interior of the evaporator pan 32. When the humidifying system is used with a hot air furnace, the water-feed device 29 is disposed exteriorly of the furnace casing, and the conduit extends through such casing and to the evaporator pan 32 located in the bonnet chamber.

The water-feed device 29 and the evaporator pan 32 are relatively so positioned that a common water level may be established therein. Accordingly, the level of water in the cup 60 will indicate the level of water in the evaporator pan 32. The level of water in the cup, and the drip or flow of water from the passage 64 are visible by reason of the transparency of the cup 60. Thus, means are provided to check at this point, which may be at the furnace, whether or not that part of the system preceding the water feed device 29 is working, and further, a check is possible to determine whether vaporization of the water in the evaporator pan 32 is taking place, as well as to determine whether or not water is flowing through the conduit 31.

Since the overflow drain is connected to the water-feed device 29, instead of to the evaporator pan 32, in the event the feed rate is too great compared with the evaporation rate, the excess water will not be delivered to the evaporator pan, but will be drained before it reaches the evaporator pan. Thus, the overflowing water will not carry away heat from the chamber 34, and likewise, the incoming relatively cold water will not reach the evaporator pan to reduce the temperature of the water therein.

Since most water contains certain substances, such as lime or the like, constant vaporization of the water from the evaporator pan 32, in at least certain instances, increases the concentration of such substances in the water in the evaporator pan, and in some cases this concentration approaches a sludgy state. Therefore, it is highly desirable that the water, and other substances carried by it, in the evaporator pan, does not return to the cup 60.

For this purpose, the equalizing conduit 35 is provided. As best seen in Figure 6, the conduit 35 is carried by the cover 61, and establishes communication between the inside of the cup 60 and the inside of the chamber 34, so that the air pressure in the cup 60 is always equal to the air pressure in the chamber 34. Otherwise, if the pressure in the chamber 34 increased, as for instance when the air blower started operation, such pressure would act on the relatively large

surface of water exposed by the evaporator pan, and would force the water in the evaporator pan back through the conduit 31 and into the cup 60. This is undesirable, not only because the substances accompanying such water tends to clog the conduit 31, dirty the transparent cup 60, and stop up passages in the water-feed device 29, but also because the common water level in the cup 60 and evaporator pan 32 will be unbalanced so that the water level in the cup 60 will not indicate the true level of the water in the evaporator pan. In some instances, the common water level is unbalanced to such extent that the water level rises above the overflow tube 66 and flows through the drain conduit 30. Additionally, sludge flowing through the drain conduit would eventually interfere with proper operation of the float valve 67 or the air trap 68.

From the foregoing, it will be appreciated that the humidifying system and apparatus so far described provides means for inspecting operation of the system at spaced points, because of the transparency of the cups 36 and 60. Also, a user may accurately set the flow rate in a living room of the house, and positively know that water is flowing, since he can see the flow and also the level of the water in the cup 36. Further, the system is closed and sealed against admission of air pressure except that pressure entering through the conduit 35. Since the cup 60 is formed with air trap means, preventing flow of air through the cup, practically no air will enter the cup through the equalizer conduit 35, since an increase in air pressure in the chamber 34 will merely cause slight shifting of the air in the conduit 35, in the manner of a piston, to compress the air in the cup 60 to a pressure equal to that in the chamber 34. Therefore, the air in the cups 36 and 60 is always fully saturated with moisture, preventing the drying of lime or other substance on the walls of the cups, and thereby insuring that the visibility of the level and flow of water in the cups will not be obscured.

In some instances, certain foreign matter may pass the filter 23 and tend to obstruct passage of water through the system; for example, alum is used in some water purification plants to precipitate impurities in the water, and such substance, in certain cases, tends to form a jell-like deposit which may obstruct water flow through small passages in the system. In such case, the purge lever 25 of the pressure regulator 24 is turned to admit water under full pressure, and such surge of water effectively cleans all passages in the system of obstructions. Referring to Figure 1, it will be noted that the device 27 is above the device 29, and normally this is true since the device 27 is usually mounted on the wall of a living room of a house, whereas the device 29 is mounted preferably close to the chamber 34, which in the case of a furnace, is close to or on the furnace casing.

However, the relative position of the devices may be changed, without departing from the invention and without sacrificing any advantages of the humidifying system. For example, Figure 8 illustrates a system comprising the parts used in the system shown in Figure 1, similar parts bearing the same reference numeral with the numerals in Figure 8 bearing the suffix *a*.

Referring to Figure 8, the system therein disclosed illustrates a case where conditions require that the chamber 34*a* and the water-feed device 29*a* are positioned above the water-feed control device 27*a*.

Figures 9 through 11 disclose a different embodiment of the invention, wherein a device delivering water to the evaporator pan is provided with means for controlling the water feed. Referring particularly to Figure 9, the humidification system comprises the circuit from the supply conduit 20*b*, through the shut-off valve 21*b*, the water filter 23*b*, the pressure regulator 24*b*, the conduit 26*b*, to a device 70 which controls the flow of water and also feeds such water to the evaporator pan 32*b* located in the chamber 34*b*.

The device 70, referring particularly to Figures 10 and 11, comprises a cup 71, formed of transparent material, such as glass or a suitable plastic, the upper open end of which is closed by a cover 72 provided with a transverse bore 73 connected to the conduit 26*b*. The bore 73 communicates with an upright passage 74, formed in the cover 72, the upper end of which is enlarged to receive an orifice nozzle 75 which has its upper part extending into a valve chamber 76. A diaphragm valve 77 closes the chamber 76, and it is held in place by a valve cover 78, the latter having connection with the cover 72 by means of screws (not shown). Threaded in a screw-threaded aperture in the valve cover 78 is an adjustment screw 79 connected to a dial wheel 80. The dial wheel has a lug 81 cooperating with an adjustable stop 82, the construction being similar to the construction shown in Figures 2 and 3. As before, the screw 79 bears against the peened end of a rivet 83, rotation of the screw providing for adjustment of the diaphragm valve 77 relative to the orifice outlet of the orifice nozzle 75.

The bottom of the cup 71 is formed with a screw-threaded opening into which fits a fitting 84 which carries an overflow tube 85. The inner terminal end of the tube 85 is normally closed by a ball check valve 86 adapted to be unseated by the water when the level reaches above the inner terminal end of the tube 85, to permit draining of water through the drain conduit 30*b*, but sealing the tube 85 against entrance of air. If desired, the drain conduit 30*b* may be bent to form an air trap 68*b*, and either or both the ball check valve 86 or the trap 68*b* may be used.

The cup 71 has a conduit 87, spaced upwardly from its bottom a slight distance, and extending through the wall of the chamber 34*b*, to the evaporator pan 32*b*, the cup 71 and evaporator pan 32*b* being relatively so disposed that a common water level may be established therein. The cover 72 has a passage 88 communicating with the interior of the cup 71, and an equalizer conduit 89 establishes air pressure communication between the interior of the cup 71 and the chamber 34*b*. The humidification system and apparatus shown in Figures 9 through 11 operates in the manner, and has the advantages heretofore pointed out, this system differing only in that the device 70 not only feeds water to the evaporator pan, but also has means to regulate the amount of water entering the cup 71.

The humidification system shown in Figure 12 is similar to the system shown in Figure 9, with the exception that a control device 90 is substituted for the control device 70. Accordingly, like parts of the system will be given like reference numerals, with the exception that the suffix *c* will be inserted in place of the suffix *b*.

As seen in Figures 12 and 13, the conduit 26*c* leads to the inlet of the device 90, which in this instance embodies a float controlled valve for regulating flow of liquid. The device 90, shown in detail in Figures 13 through 16, comprises a cup

91, formed of transparent material, such as glass or a suitable plastic. The upper open end of the cup 91 is closed by a cover 92 which is fitted and sealed tightly at the joint, to seal against entrance of air at this point. The conduit 26*c* is threaded to an inlet fitting 93, secured to the cover by screws 94, and water from the conduit 26*c* passes downwardly through a passage 95, formed in the fitting 93, and through a passage in the orifice nozzle 96, the lower end of which forms a valve seat. From the orifice nozzle, the water passes into an annular space 97, formed by the fitting 93 and the cover 92, and then upwardly through a passage 98 which leads to a tube 99, the terminal end of which extends through the cover 92 and terminates inwardly of the cup 91, so that the water dripping or flowing from such terminal end is visible from the exterior of the cup.

Within the sealed chamber formed by the cup 91 and the cover 92, is a float 100, having an upright post 101, at one side, to which one end of parallel levers 102 are pivoted, the opposite ends being pivoted in a post 103 which is rigidly secured to the cover 92, as best shown in Figure 13. The movement of the float 100 is conveyed to a plunger 104, which slides in an aperture formed in the cover 92, by means of a link 105 and lever 106. The lever 106 is fulcrumed at 107, and has a pivotal connection with the plunger 104, as best seen at 108 in Figure 13.

A diaphragm 109, clamped between the fitting 93 and the cover 92, is movable within the annular space 97, and is cooperable with the valve seat formed by the orifice nozzle 96 to control flow of water through such nozzle. Upward movement of the plunger 104 flexes the central portion of the diaphragm 109 in a direction to contact the valve seat and close passage through the orifice nozzle. It will be appreciated that the lever mechanism greatly increases the lifting force of the float, so that sufficient force is provided to lift the diaphragm 109 to closed position against any usual water pressure.

To provide for adjustment of the valve-closing action of the float 100, the fulcrum 107 of the lever 106 is in the form of a short lever 110, in turn pivotally connected to one end of an arm 111 which is pivoted intermediate its ends to a stud 112 extending downwardly from the cover 92. The opposite end of the arm 111 is formed to straddle the post 103. The post 103 carries a fixed collar 114 which serves as a base for a compression spring 115. The spring 115 is arranged to urge the adjacent end of the arm 111 upwardly against the bottom of a regulating screw 116 which is threaded in a threaded aperture formed in the cover 92. The upper end of the screw 116 extends outwardly of the cover 92 and has secured thereto a lever 117 by means of which the screw 116 may be rotated. Movement of the lever 117 causes rotation of the screw 116, causing the bottom end of the screw to move the arm 111 about its fulcrum point on the stud 112. Rotation of the screw 116 will move the lever 111 and cause a shifting of the short lever, thus changing the pivot point 107 of the lever 106, and consequently changing the closing point of the diaphragm valve 109. The exterior surface of the cover 92 is provided with spaced-apart lugs 118, which limit movement of the lever 117, the construction herein disclosed being such that rotation of the screw 116 between the limits defined by the lugs 118 is sufficient to provide for practical adjustment of the closing point of the diaphragm valve 109.

Water is conducted from the cup 91 to the evaporator pan 32c by means of the conduit 119, leading from a point spaced upwardly of the lower end of the cup 91. As best seen in Figure 12, the device 90 and the evaporator pan 32c are relatively so disposed that a common liquid level may be established therein. An equalizer conduit 120 leads from the upper end of the cup 91 to the chamber 34c, so that the pressure in the cup 91 is at all times equal to the pressure in the chamber 34c, thus providing that the common liquid level is not unbalanced.

Extending from the cup 91, at a predetermined level, is an overflow fitting 121, containing a ball check valve 122. Normally, the ball check valve 122 engages a seat formed in the fitting 121, but if the water level rises to a point where water flows through the fitting 121, the ball will float and rise from its seat, permitting drainage of water through the drain tube 30c. The drain tube 30c may be bent in the form of an air trap 68c, and either or both the ball check valve 122 and trap 68c may be used to prevent admission of air to the interior of the cup 91.

In the embodiment shown in Figures 12 through 16, the level in the evaporator pan 32c and the like level in the cup 91 is maintained by the float 100, adjustment of float settings being possible by manipulation of the lever 117. In all other respects, the system therein disclosed provides the advantages hereinbefore pointed out. As before, the cup 91 is sealed against air flow therethrough, and accordingly the air in the cup 91 is always in fully saturated condition. This is very desirable in the construction shown in Figures 12 through 16, since lime and like substances cannot dry within the cup 91 to form a crust interfering with proper operation of the valve mechanism.

From the foregoing it will be apparent to those skilled in the art that I have accomplished at least the principal object of my invention, and it also will be apparent to those skilled in the art that the embodiments herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that my invention is not limited thereto.

I claim:

1. In combination: a chamber through which air is adapted to move; an evaporator pan, disposed within said chamber, for adding moisture to the air in said chamber; a receptacle disposed exteriorly of said chamber and having liquid inlet means; liquid supply means, from a source of liquid, having atmospherically sealed connection with said liquid inlet means; said receptacle and said evaporator pan being relatively so disposed that a common liquid level may be established therein leaving a space above the liquid level in said receptacle; means, having atmospherically sealed connection with said receptacle, for establishing liquid communication between said receptacle and said evaporator pan and for establishing air communication between said space and said chamber to equalize air pressure on the liquid in said receptacle and the liquid in said pan to prevent unbalancing of the common liquid level in said receptacle and said chamber; and said receptacle having liquid overflow outlet means for limiting the maximum height of said common liquid level, the entrance to said overflow outlet means from said receptacle being at a place in said receptacle which can be exposed to the air in said space by predetermined reduction of the height of said common liquid level; and said overflow outlet means including air seal means constructed and arranged to permit flow of liquid from said receptacle into said entrance and through said overflow outlet means to atmosphere but effectively to seal the inside of said receptacle and atmosphere against relative air communication through said overflow outlet means.

2. In combination: a chamber through which air is adapted to move; an evaporator pan, disposed within said chamber, for adding moisture to the air in said chamber; a receptacle disposed exteriorly of said chamber and having liquid inlet means; liquid supply means, from a source of liquid having atmospherically sealed connection with said liquid inlet means; said receptacle and said evaporator pan being relatively so disposed that a common liquid level may be established therein leaving a space above the liquid level in said receptacle; float controlled valve means constructed and arranged to control the flow of liquid from the source to said receptacle, dependent upon the level of the liquid in said receptacle; means, having atmospherically sealed connection with said receptacle, for establishing liquid communication between said receptacle and said evaporator pan and for establishing air communication between said space and said chamber to equalize air pressure on the liquid in said receptacle and the liquid in said pan to prevent unbalancing of the common liquid level in said receptacle and said chamber; and said receptacle having liquid overflow outlet means for limiting the maximum height of said common liquid level, the entrance to said overflow outlet means from said receptacle being at a place in said receptacle which can be exposed to the air in said space by predetermined reduction of the height of said common liquid level; and said overflow outlet means including air seal means constructed and arranged to permit flow of liquid from said receptacle into said entrance and through said overflow outlet means to atmosphere but effectively to seal the inside of said receptacle and atmosphere against relative air communication through said overflow outlet means.

3. In combination: a chamber through which air is adapted to move; an evaporator pan, disposed within said chamber, for adding moisture to the air in said chamber; a receptacle disposed exteriorly of said chamber and having liquid inlet means; liquid supply means, from a source of liquid, having atmospherically sealed connection with said liquid inlet means; said receptacle and said evaporator pan being relatively so disposed that a common liquid level may be established therein leaving a space above the liquid level in said receptacle; said liquid supply means including manually adjustable valve means for adjusting the flow of liquid from the source to the receptacle; means, having atmospherically sealed connection with said receptacle, for establishing liquid communication between said receptacle and said evaporator pan and for establishing air communication between said space and said chamber to equalize air pressure on the liquid in said receptacle and the liquid in said pan to prevent unbalancing of the common liquid level in said receptacle and said chamber; and said receptacle having liquid overflow outlet means for limiting the maximum height of said

common liquid level, the entrance to said overflow outlet means from said receptacle being at a place in said receptacle which can be exposed to the air in said space by predetermined reduction of the height of said common liquid level; and said overflow outlet means including air seal means constructed and arranged to permit flow of liquid from said receptacle into said entrance and through said overflow outlet means to atmosphere but effectively to seal the inside of said receptacle and atmosphere against relative air communication through said overflow outlet means.

4. In combination: a chamber through which air is adapted to move; an evaporator pan, disposed within said chamber, for adding moisture to the air in said chamber; a receptacle disposed exteriorly of said chamber and having liquid inlet means, said receptacle being so constructed and arranged that the level of the liquid therein is visible; liquid supply means, from a source of liquid, having atmospherically sealed connection with said liquid inlet means; said receptacle and said evaporator pan being relatively so disposed that a common liquid level may be established therein leaving a space above the liquid level in said receptacle; said liquid supply system including valve means and means rendering visible the liquid allowed to flow through said valve means; means, having atmospherically sealed connection with said receptacle, for establishing liquid communication between said receptacle and said evaporator pan and for establishing air communication between said space and said chamber to equalize air pressure on the liquid in said receptacle and the liquid in said pan to prevent unbalancing of the common liquid level in said receptacle and said chamber; and said receptacle having liquid overflow outlet means for limiting the maximum height of said common liquid level, the entrance to said overflow outlet means from said receptacle being at a place in said receptacle which can be exposed to the air in said space by predetermined reduction of the height of said common liquid level; and said overflow outlet means including air seal means constructed and arranged to permit flow of liquid from said receptacle into said entrance and through said overflow outlet means to atmosphere but effectively to seal the inside of said receptacle and atmosphere against relative air communication through said overflow outlet means.

5. In combination: a chamber through which air is adapted to move; an evaporator pan disposed within said chamber, for adding moisture to the air in said chamber; a receptacle disposed exteriorly of said chamber and having liquid inlet means; liquid supply means, from a source of liquid, having atmospherically sealed connection with said liquid inlet means; said receptacle and said evaporator pan being relatively so disposed that a common liquid level may be established therein leaving a space above the liquid level in said receptacle; said receptacle having liquid feed outlet means; conduit means having atmospherically sealed connection with said liquid feed outlet means and constructed and arranged to establish liquid communication between said receptacle and said evaporator pan; conduit means connected to said space and to said chamber, constructed and arranged to equalize air pressure on the liquid in said receptacle and the liquid in said evaporator pan, to prevent unbalancing of the common liquid level in said receptacle and said pan; said receptacle having liquid

overflow outlet means for limiting the maximum height of said common liquid level, the entrance to said overflow outlet means from said receptacle being at a place in said receptacle above said liquid feed outlet means; and said liquid overflow outlet means including air seal means constructed and arranged to permit flow of liquid from said receptacle into said entrance and through said overflow outlet means to atmosphere but effectively to seal the inside of said receptacle and atmosphere against relative air communication through said overflow outlet means.

6. In combination: a chamber through which air is adapted to move; intermittently operable blower means, for intermittently forcing air through said chamber; an evaporator pan, disposed within said chamber, for adding moisture to the air in said chamber; a receptacle disposed exteriorly of said chamber and having liquid inlet means; liquid supply means, from a source of liquid, having atmospherically sealed connection with said liquid inlet means; said receptacle and said evaporator pan being relatively so disposed that a common liquid level may be established therein leaving a space above the liquid level in said receptacle; means, having atmospherically sealed connection with said receptacle, for establishing liquid communication between said receptacle and said evaporator pan and for establishing air communication between said space and said chamber to equalize air pressure on the liquid in said receptacle and the liquid in said pan to prevent unbalancing of the common liquid level in said receptacle and said chamber when said blower means is operating; said receptacle having liquid overflow outlet means for limiting the maximum height of common liquid level in said receptacle, the entrance to said overflow outlet means from said receptacle being at a place in said receptacle which can be exposed to the air in said space by predetermined reduction of the height of said common liquid level; and said overflow outlet means including air seal means constructed and arranged to permit flow of liquid from said receptacle into said entrance and through said overflow outlet means to seal the inside of said receptacle to prevent escape of air from said receptacle through said overflow outlet means when said blower means is operating.

7. In combination: a chamber through which air is adapted to move; intermittently operable blower means, for intermittently forcing air through said chamber; an evaporator pan disposed within said chamber, for adding moisture to the air in said chamber; a receptacle disposed exteriorly of said chamber and having liquid inlet means; liquid supply means, from a source of liquid, having atmospherically sealed connection with said liquid inlet means; said receptacle and said evaporator pan being relatively so disposed that a common liquid level may be established therein leaving a space above the liquid level in said receptacle; said receptacle having liquid feed outlet means; conduit means having atmospherically sealed connection with said liquid feed outlet means and constructed and arranged to establish liquid communication between said receptacle and said evaporator pan; conduit means connected to said space and to said chamber, constructed and arranged to equalize air pressure on the liquid in said receptacle and the liquid in said evaporator pan, to prevent unbalancing of the common liquid level in said receptacle and said pan when said blower means is op-

erating; said receptacle having liquid overflow outlet means for limiting the maximum height of said common liquid level, the entrance to said overflow outlet means from said receptacle being at a place in said receptacle above said liquid feed outlet means; and said liquid overflow outlet means including air seal means constructed and arranged to permit flow of liquid from said receptacle into said entrance and through said overflow outlet means but effectively to seal the inside of said receptacle to prevent escape of air from said receptacle through said overflow outlet means when said blower means is operating.

8. In combination: a chamber, through which air is adapted to move; an evaporator pan, disposed within said chamber, for adding moisture to the air in said chamber; and a liquid supply system, for supplying liquid to said evaporator pan, comprising a closed housing, and liquid supply means, from a source of liquid, having atmospherically sealed connection with said housing, and conduit means establishing liquid communication between the interior of said housing and said evaporator pan, said housing and said evaporator pan being so constructed and arranged that a single, common liquid level may be established therein, and liquid overflow means having atmospherically sealed connection with said housing and constructed and arranged to prevent said single, common liquid level to rise beyond a predetermined level short of overflowing said evaporator pan and also short of completely filling the interior of said housing; and means providing air pressure communication between the interior of said housing, above said single liquid level, and said chamber only, equalizing the air pressure on the liquid within said housing and said evaporator pan, and preventing unbalancing of said common liquid level.

9. In combination: evaporating means, including a pan for containing liquid, constructed and arranged for adding moisture to air in an air circulation chamber; conduit means, extending from said pan to a source of liquid supply; and first and second closed housings, each forming a liquid chamber, interposed in said conduit means in spaced-apart relation; said first housing having means for establishing a liquid level below the top and above the bottom of its chamber and below the top and above the bottom of said pan; and said second housing being nearer the source of liquid than said first housing and having means for establishing a liquid level below the top and above the bottom of the chamber of said second housing.

10. In combination: evaporating means, including a pan for containing liquid, constructed and arranged for adding moisture to air in an air circulation chamber; conduit means, extending from said pan to a source of liquid supply; and first and second closed housings, each forming a liquid chamber, interposed in said conduit means in spaced-apart relation; said first housing having means for establishing a liquid level below the top and above the bottom of its chamber and below the top and above the bottom of said pan; and said second housing being nearer the source of liquid than said first housing and having means for establishing a liquid level below the top and above the bottom of the chamber of said second housing; each of said housings having a liquid inlet above the liquid level in the respective chamber and constructed and arranged so that liquid falls through space above the respective liquid level; and each housing having

means constructed and arranged to permit view of the liquid falling within the respective chamber and also the level of liquid in the respective chamber.

11. A device for feeding water to an evaporating reservoir comprising the combination of a transparent, atmospherically sealed housing, a vertically disposed inlet passage in the top of said housing, an outlet conduit leading from the bottom portion of said housing to said reservoir, a second conduit leading from the upper portion of said housing to the atmosphere surrounding said reservoir, and an overflow outlet leading from the interior of said housing at a point above said outlet conduit.

12. A device for feeding liquid to evaporator means the air surrounding which may be at a pressure different from atmospheric pressure, comprising: a receptacle providing a chamber, said chamber having in an upper portion thereof liquid inlet means constructed and arranged for atmospherically sealed connection to a source of liquid, and having in a lower portion thereof liquid discharge outlet means constructed and arranged for atmospherically sealed connection to feed liquid to said evaporator means, and having liquid overflow outlet means communicating with said chamber at a level above said discharge outlet, and having atmospherically sealed inlet means communicating with the space in said chamber above said level and constructed and arranged for connection to communicate with the air surrounding said evaporator means.

13. A device for feeding liquid to evaporator means the air surrounding which may be at a pressure different from atmospheric pressure, comprising: a receptacle providing a chamber, said chamber having in an upper portion thereof liquid inlet means constructed and arranged for atmospherically sealed connection to a source of liquid, and having in a lower portion thereof liquid discharge outlet means constructed and arranged for atmospherically sealed connection to feed liquid to said evaporator means, and having liquid overflow outlet means communicating with said chamber at a level above said discharge outlet, and having atmospherically sealed inlet means communicating with the space in said chamber above said level and constructed and arranged for connection to communicate with the air surrounding said evaporator means; and air seal means constructed and arranged to permit flow of liquid from said chamber through said outlet means to atmosphere but effectively to seal the inside of said chamber and atmosphere against relative air communication through said outlet means.

14. A device for feeding liquid to evaporator means the air surrounding which may be at a pressure higher than atmospheric pressure, comprising: a receptacle providing a chamber, said chamber having in an upper portion thereof liquid inlet means constructed and arranged for atmospherically sealed connection to a source of liquid, and having in a lower portion thereof discharge outlet means constructed and arranged for atmospherically sealed connection to feed liquid to said evaporator means, and having liquid overflow means communicating with said chamber at a level above said discharge outlet, and having atmospherically sealed inlet means communicating with the space in said chamber above said level and constructed and arranged for connection to communicate with the air surrounding said evaporator means; and air seal means con-

structed and arranged to permit flow of liquid from said chamber through said outlet means to atmosphere but effectively to seal the inside of said chamber against escape of air therefrom through said outlet means.

15. A liquid feed device, comprising: a closed housing, adapted to receive liquid, having a liquid inlet adjacent its top and a liquid outlet adjacent its bottom, and having a drain outlet disposed intermediate said liquid inlet and said liquid outlet, said drain outlet being constructed and arranged to limit the liquid in said housing to a predetermined level short of said liquid inlet but above said liquid outlet so that liquid from said liquid inlet falls through space to the liquid in said housing; conduit means, providing communication of said space with an air space external to said housing; means, preventing flow of air through said drain outlet to said space in said housing; and said conduit means and said liquid outlet being adapted for subjection to like air pressure from said air space external to said housing, so that if the liquid level in said housing falls below said liquid outlet, flow of air through said housing is precluded.

16. A liquid feed device, comprising: a housing, for receiving liquid, having a liquid inlet adjacent its top and having a liquid delivery opening and liquid overflow outlet means, limiting the liquid in said housing to a predetermined level above said liquid delivery opening and short of the top of said housing, providing an air space between said top and the level of the liquid; said housing having means providing for communication of said air space with an air space external to said housing but being closed to communication with air at all other places including at said liquid overflow outlet means so that air flow through said housing is precluded.

17. In combination: a chamber, through which air moves; an evaporator pan, disposed within said chamber, for adding moisture to the air in said chamber; a receptacle, connectable to a source of liquid, and disposed exteriorly of said chamber; conduit means, establishing liquid communication between said receptacle and said evaporator pan, said receptacle and said evaporator pan being relatively so disposed that a common liquid level may be established therein; said receptacle having liquid overflow outlet means for limiting the liquid level therein to a predetermined level; means precluding the flow of air through said overflow outlet means; and means, constructed and arranged to equalize air pressure on the liquid in said receptacle and the liquid in said evaporator pan, preventing unbalancing of said common liquid level.

18. In combination: a chamber, through which air moves and in which the air pressure may be above atmospheric pressure; an evaporator receptacle, disposed within said chamber, and adapted to contain liquid open to the air in said chamber for adding moisture to such air; a

liquid feed receptacle, connectable to a source of liquid, and disposed exteriorly of said chamber; conduit means, establishing liquid communication between said liquid feed receptacle and said evaporator receptacle, said liquid feed receptacle and said evaporator receptacle being relatively so disposed that a common liquid level may be established therein; said feed receptacle having liquid overflow outlet means for limiting the liquid level therein to a predetermined level; means precluding the flow of air through said overflow outlet means; and means, constructed and arranged to equalize the air pressure on the liquid in said liquid feed receptacle and said evaporator receptacle, preventing a backing up of liquid from said evaporating receptacle to said liquid feed receptacle when said air pressure is above atmospheric pressure.

OTTO J. KUENHOLD, Sr.

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