

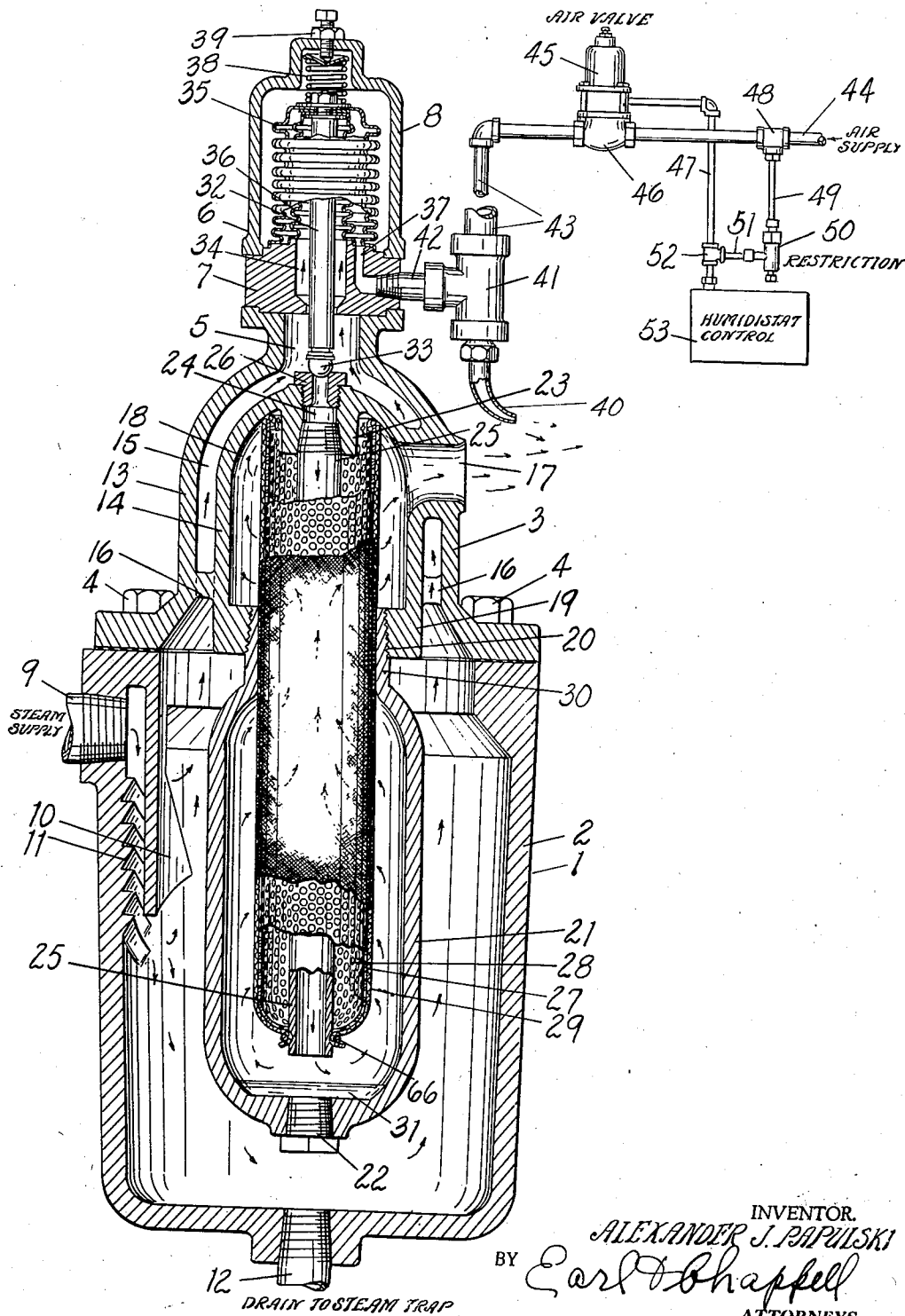
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HUMIDIFYING SYSTEM

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HUMIDIFYING SYSTEM

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This invention relates to improvements in humidifying system.

The main objects of this invention are:

First, to provide a humidifier system employing steam as the humidifying agent which is highly efficient in maintaining the humidity of an enclosed space at any desired value.

Second, to provide a humidifier of the foregoing type which is quiet in operation and accurately regulates the amount of steam discharged for the purpose of predeterminedly humidifying the atmosphere.

Third, to provide a humidifying system including a steam muffling and discharge housing having associated therewith a steam control valve and a humidostat controlled regulating arrangement for the latter, adapting the system to function with great accuracy and reliability.

Further objects relating to details and economies of the invention will appear from the description to follow. The invention is defined in the claims.

A structure embodying the features of the invention is illustrated in the accompanying drawing, wherein the single figure represents the humidifier system of the present invention, the structure of the humidifier per se constituting part of this system being partially broken away and in vertical section to illustrate its details, and the remainder of the system being diagrammatically illustrated.

This invention relates generally to a humidifying system or apparatus which employs steam at comparatively low pressure as the humidifying agent, having provision for automatically effecting a predetermined discharge of steam to the atmosphere when conditions require it. The system incorporates means for muffling the steam in its passage through and discharge from the humidifier whereby the discharge of steam to the atmosphere is effected without appreciable noise, and likewise embodies improved provisions for utilizing all the moisture content of the steam in the form of means for flashing condensate back into steam, which is thereafter discharged to the atmosphere to be humidified. The system likewise has associated therewith an air controlled steam valving arrangement including one or more valves of the type shown and described in my copending application Serial No. 415,787, filed concurrently herewith, these valves being associated with a still further humidostat controlled valve and a source of air or other fluid under pressure in a manner to

control the supply of steam to the humidifier with great accuracy and dependability.

Referring to the drawing, the reference numeral 1 in general designates the humidifier of the present system which is in the form of an open top steam casing 2, having a dome-like head 3 secured over the open top thereof by bolts 4. The head 3 is provided with a valve chamber 5 at and opening to the top thereof and over this open top is disposed an automatic fluid pressure controlled valve, generally designated 6, which is of the type shown and described in my copending application, Serial No. 415,787 identified above. As described in that application, the valve 6 includes a block-like base 7 and an inverted bellows enclosing dome 8 secured thereon. Valve 6 serves to control the supply of steam passing through the humidifier casing 2 and parts associated therewith and will therefore be considered as a part of the humidifier. Structural details of this valve will be hereinafter described.

The structure of the humidifier per se will first be referred to, following which there will be described the related parts of the humidifier system which render the latter entirely automatic in operation to control the supply of humidifier agent, i. e., steam, to an atmosphere to be humidified. Casing 2 is bored and tapped on the side wall thereof to receive a steam supply pipe 9 and immediately adjacent this pipe internally of the casing wall the same is provided with an integral depending baffle 10, which is impinged by the steam entering the casing and deflects the steam downwardly. Baffle 10 is flared outwardly adjacent the lower portion thereof so as to effectively baffle the steam as the same passes downwardly behind the baffle. Immediately beneath steam supply pipe 9, the wall of the casing is provided with a plurality of vertically spaced parallel ribs or corrugations 11 which serve to receive and separate condensate from the steam, the condensate flowing off these corrugations and down to the bottom of the steam casing. It will be observed that the ribs or corrugations 11 are closely adjacent baffle 10 so that a substantial restricting effect is present to enhance the condensate separating action. At its bottom the casing 2 has a drain pipe 12 communicating therewith and leading to a steam trap (not shown) by which the condensate is separated from the steam and discharged.

The casing head 3 is cored out to provide spaced external and internal dome walls 13, 14 respectively defining the internal space 15 which

communicates at its top with the valve chamber 5 in the head and at its bottom with the interior of the casing 2, the latter communication being through passages 16. The dome-like head is provided with a laterally opening steam discharge mouth 17 of substantial capacity which communicates with a steam discharge chamber 18 interiorly of the inner wall 14 of head 3. Space 15 serves as a steam jacket for this chamber. Said inner wall 14 is provided at its lower edge with an inwardly extending annular portion 19 internally threaded at 20 to receive a hollow steam muffling separator chamber 21. Said chamber depends downwardly internally concentric with casing 2 and is in the form of an enlarged hollow capsule closed at its lower end by a threaded plug 22. It will be noted that the interior of chamber 21 is sealed at all points from communication with the interior of casing 2.

At its upper end the inner wall 14 of dome-like head 3 has a downwardly projecting boss 23 which is provided with a vertical passage 24 threaded at its upper and lower extremities. A downwardly depending steam delivery pipe 25 is threaded in the lower extremity of passage 24 and a tubular valve 26 is threaded in the upper extremity thereof, thereby providing a steam delivery port. This port will be hereinafter referred to. Steam pipe 25 extends downwardly a substantial distance internally concentric of the chamber 21, terminating adjacent the bottom thereof. Surrounding pipe 25 and appropriately secured thereto by a clamping ring 66, there is provided a sleeve-like muffler, generally designated 27, which consists of a perforated or foraminated metal screen 28 turned inwardly at its lower end into embracing engagement with the pipe and an asbestos cloth covering 29 snugly encasing this screen. Muffler 27 surrounds steam pipe 25 throughout practically the entire length thereof and has a tight internal fit with the restricted throat 30 of the chamber 21 at which the latter opens to steam discharge chamber 18, whereby steam travelling axially of the muffler 27, after being discharged from pipe 25 externally thereof, is prevented from passing between the muffler and the wall of chamber 21 and is forced to inwardly penetrate the asbestos sleeve and the screen of the former in order to traverse said throat.

Chamber 21 may accumulate a certain amount of condensate 31 during the operation of the humidifier system, this condensate separating and collecting at the bottom of the chamber as illustrated in the figure and flashing or vaporizing into steam during said operation, as steam is discharged from pipe 25 and immediately expands.

In the operation of the humidifier the steam passes from pipe 9 upwardly through casing 2 and the hollow space 15 in head 3, thence downwardly through port 26 when the latter is open. Valve 6 is employed to control the flow of steam past said port.

As described in my copending application identified above, the valve 6 has a vertically disposed elongated stem 32 on the lower end of which a ball valve member 33 is carried for coaction with valve port 26. It will be noted that valve block 7 has a counterbored vertical opening 34 therein through which stem 32 extends, and this opening is in communication at its lower end with valve chamber 5. Disposed concentrically of the said opening 34 and internally of the valve dome

8 are a pair of flexible, corrugated, metallic bellows members 35, 36, one arranged concentrically within the other. These bellows members are open at one end only and are secured at the other end to the block 7. The internal bellows is positioned in direct communication with the aforesaid space 34, being subject to the steam pressure on the upstream side of the steam inlet valve, while the external bellows 35 is communicated with an air supply passage 37 in the block 7, said passage opening to the interior of the external bellows externally of the internal bellows.

The valve stem 32 is secured to the upper closed end of the bellows 35, 36, and is urged toward closing position by a coil spring 38 which abuts a thrust member on the bellows at one end and at the other end is adjustably sustained by a threaded set screw 39.

As described in my copending application referred to above, the pressure of the steam supplied to casing 2 is at all times effective on the interior of the internal bellows 36, serving to urge the same in a direction to lift the valve 33 from its seat or to open the valve and thus enable the steam to pass into pipe 25. However, the pressure of the steam is normally relatively low and insufficient to overcome the force of spring 38, hence when only steam pressure is effective on the bellows 36, valve 33 remains closed. However, under conditions to be hereinafter referred to, when further moisture is desired in the atmosphere to be controlled by the humidifier system, air is admitted under pressure to passage 37 so as to act internally on external bellows 35, thereby assisting the bellows 35 in opening the valve 33. The combined action of the two gases is sufficient to unseat valve member 33 with the result that the steam enters the port 26 and pipe 25 from casing 2.

In operation, assuming that valve 33 has been opened in the manner described in response to a requirement for further humidity, steam flows downwardly through the valve and pipe 25 and is discharged at the lower end thereof in the manner indicated by the arrows. This steam tends to flash some of the condensate 31 collected in chamber 21 into steam, and the steam travels upwardly around and inwardly through the muffler 27, thence upwardly internally of the muffler through restricted throat or neck 30. After passing this restriction, the steam passes outwardly through the muffler into the discharge chamber 18 in the head 3, thence outwardly through the relatively large, laterally opening discharge mouth 17 into the atmosphere. So discharged, it is disseminated by the blast of air emanating from a jet 40 disposed immediately adjacent and over the mouth 17, this jet being supplied with air from the same source as that utilized for the control of valve 6. The operation of the structure and operation of the control parts of the assembly whereby operation of the humidifier in the foregoing manner is accomplished, will now be described. In addition to serving as a muffler, the muffler structure serves as a separator to trap condensate drops of water carried by the steam.

The reference numeral 41 designates a T-fitting having a short pipe 42 connected to the central leg thereof and threaded in the above described air supply passage 37. The restricted jet 40 communicates with one lateral branch of this fitting and the other branch thereof has an air supply pipe threaded therein, pipe 43 being of substan-

tially greater capacity than the discharge capacity of jet 40, so that the latter creates a definite back pressure effective interiorly of outer bellows 35 when air is supplied through pipe 43 to fitting 41. The reference numeral 44 designates an air supply line having disposed therein an automatic air controlled valve 45 in advance of the fitting 41. Valve 45 is similar in all details to the valve 6 in that it has a valve chamber (not shown) in the base 46 thereof, generally similar to valve chamber 5 and an adjacent valve port or seat (not shown) generally similar to valve seat 26, through which air is adapted to pass from the supply line to pipe 43 when the port is exposed by the valve member of valve 45. It will be understood that the valve chamber of valve 45 communicates internally with the inner, flexible, metallic bellows of the valve in exactly the same manner as in the case of valve 6. Air pressure augmenting the normal air pressure thus effective on the internal bellows is admitted internally of the external bellows of valve 45 through an air supply tube 47. It has not been deemed necessary to repeat the illustration of internal details of the above valve structure, since it is believed that those skilled in the art will readily understand the structure and operation of the same from the foregoing description in connection with valve 6, and from the description contained in the above identified application Serial No. 415,787. The only difference between valves 6 and 45 is that the fluid controlled by the former is steam, by the latter air.

In advance of, i. e., on the upstream side of the automatic valve 45, the air supply line 44 is communicated through a T-fitting 43 with a tube 49 in which is disposed a flow restrictor 50, restricting the passage of air through this tube. On the downstream side of this restriction an air tube 51 communicates the same with a T-fitting 52, the branches of which are connected respectively to the automatic valve air supply tube 47 and to a humidostat control 53 which is illustrated conventionally in the drawing. This last named device is governed by a suitable humidostat disposed in the space to be humidified, which humidostat functions to open an air relief valve (incorporated in the device but not shown) to atmosphere when the humidity requirements of the space to be humidified are satisfied. The restriction 50 is characterized by the fact that when the said air relief valve is open the latter bleeds air to the atmosphere surrounding the valve at a faster rate than air can pass through the restriction to the aforesaid relief valve. Hence as a result the air pressure in supply pipe 47 for valve 45 will be practically zero and incapable of sufficiently augmenting the bellows action of valve 45 to open the same to pipe 43. However, when the air relief valve of the humidostat control is closed, then the full air supply pressure of line 44 is effective through pipe 47 on air valve 45, with the result that the latter opens and air is supplied through pipe 43 and fitting 41 to the external bellows 35 to the humidifier, thereby adding its effect to that of the steam-filled inner bellows and unseating valve 33. Thus steam is enabled to flow into and through the muffler in the manner described above. Simultaneously a blast of air is discharged through jet 40 to disseminate the steam issuing from humidifier mouth 17. When the humidity requirements of the space are satisfied, the relief valve of humidostat control 53 opens, draining air from the pressure augmenting bel-

lows of air valve 45, which consequently shuts off. The result is that the air which has been effective on external bellows 35 bleeds outwardly through passage 37, fitting 41 and jet 40, enabling compression spring 36 to overcome the force of the steam pressure on the internal bellows 36 and urge valve 33 against its port 26, thus terminating the flow of steam in the humidifier.

The foregoing system is very simple in its parts and very effective and silent in its operation. The valves 6, 45 may be nicely adjusted by manipulation of the bellows sustaining set screws thereof, and after desired setting the system operates without attention. In actual practice the air in supply line 44 is at 15 lbs. gauge pressure and the steam in supply pipe 9 at from 1 lb. to 15 lbs. gauge. It has been found that for maximum humidifier capacity the steam should be preferably from 5 lbs. to 7 lbs. or from 12 lbs. to 15 lbs. The air requirement at the above pressure is approximately 1.6 cubic feet per minute.

An embodiment of the invention which incorporates the principles of the invention in a highly desirable manner has been illustrated and described, though I am aware that other embodiments within the intent of the invention will suggest themselves to those skilled in the art. It should be understood that the foregoing terminology is used only descriptively rather than in a limiting sense, and with full intention to include equivalents of the features shown and described, within the scope of the following claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a humidifier, the combination of a casing having an inlet chamber, a discharge chamber positioned above said inlet chamber and having a laterally directed discharge, said inlet chamber having a steam jacket portion at the top thereof surrounding said discharge chamber, a combined muffler and separator chamber depending centrally within said inlet chamber, said muffler and discharge chambers having a restricted connecting neck portion, a delivery pipe depending centrally of said muffler chamber, a delivery valve at the top of said steam jacket portion of said inlet chamber controlling the delivery of steam to said pipe, a fluid permeable muffler surrounding said pipe and externally fitting said restricted neck portion, said muffler being enclosed at its upper and lower ends so that steam delivered through said pipe is discharged at the bottom of said muffler chamber at the outside of said muffler and passes inwardly through the wall of said muffler and upwardly therein through said restricted neck portion and outwardly through the wall of the muffler into said discharge chamber, a control means for said valve comprising a pair of bellows members, one of which is subject to the pressure of steam in said inlet chamber in advance of said valve, the other being sealed therefrom and subject to a source of humidostat controlled fluid, and a simultaneously controlled air jet disposed to discharge a blast of air across the path of the steam as discharged from said discharge chamber.

2. In a humidifier, the combination of a casing having an inlet chamber, a discharge chamber positioned above said inlet chamber and having a laterally directed discharge, said inlet chamber having a steam jacket portion at the top thereof surrounding said discharge chamber, a combined muffler and separator chamber depending centrally within said inlet chamber, said muffler and

discharge chambers having a restricted connecting neck portion, a delivery pipe depending centrally of said muffler chamber, a delivery valve at the top of said steam jacket portion of said inlet chamber controlling the delivery of steam to said pipe, a fluid permeable muffler surrounding said pipe and externally fitting said restricted neck portion, said muffler being enclosed at its upper and lower ends so that steam delivered through said pipe is discharged at the bottom of said muffler chamber at the outside of said muffler and passes inwardly through the wall of said muffler and upwardly therein through said restricted neck portion and outwardly through the wall of the muffler into said discharge chamber, and a control means for said valve comprising a pair of bellows members, one of which is subject to the pressure of steam in said inlet chamber in advance of said valve, the other being sealed therefrom and subject to a source of humidostat controlled fluid.

3. In a humidifier, the combination of a casing having an inlet chamber, a discharge chamber positioned above said inlet chamber and having a laterally directed discharge, said inlet chamber having a steam jacket portion at the top thereof surrounding said discharge chamber, a combined muffler and separator chamber depending centrally within said inlet chamber, said muffler and discharge chambers having a restricted connecting neck portion, a delivery pipe depending centrally of said muffler chamber, a delivery valve at the top of said steam jacket portion of said inlet chamber controlling the delivery of steam to said pipe, a fluid permeable muffler surrounding said pipe and externally fitting said restricted neck portion, said muffler being enclosed at its upper and lower ends so that steam delivery through said pipe is discharged at the bottom of said muffler chamber at the outside of said muffler and passes inwardly through the wall of said muffler and upwardly therein through said restricted neck portion and outwardly through the wall of the muffler into said discharge chamber, and a control means for said valve.

4. In a humidifier, the combination of a casing having an inlet chamber, a discharge chamber positioned above said inlet chamber and having a laterally directed discharge, a combined muffler and separator chamber depending centrally within said inlet chamber, said muffler and discharge chambers having a restricted connecting neck portion, a delivery pipe depending centrally of said muffler chamber, a delivery valve between said pipe and inlet chamber controlling the delivery of steam to said pipe, a muffler surrounding said pipe and externally fitting said restricted neck portion, said muffler being closed at its lower end and steam delivered through said pipe being discharged at the outside of said muffler and passes inwardly through the wall of said muffler and upwardly therein through said restricted neck portion into said discharge chamber, a control means for said valve and a simultaneously controlled air jet disposed to discharge a blast of air across the path of the steam as discharged from said discharge chamber.

5. In a humidifier, the combination of a casing having an inlet chamber, a discharge chamber positioned above said inlet chamber and having a laterally directed discharge, said inlet chamber having a steam jacket portion at the top thereof surrounding said discharge chamber, a combined muffler and separator chamber depending centrally within said inlet chamber and in com-

munication with said discharge chamber, a delivery pipe depending centrally of said muffler chamber, a delivery valve at the top of said steam jacket portion of said inlet chamber controlling the delivery of steam to said pipe, a fluid permeable muffler associated with said pipe, said pipe discharging steam in said muffler chamber at the outside of said muffler and the steam passing from the muffler chamber through the muffler and into said discharge chamber, a control means for said valve comprising a pair of bellows members, one of which is subject to the pressure of steam in said inlet chamber in advance of said valve, the other being sealed therefrom and subject to a source of humidostat controlled fluid, and a simultaneously controlled air jet disposed to discharge a blast of air across the path of the steam as discharged from said discharge chamber.

6. In a humidifier, the combination of a casing having an inlet chamber, a discharge chamber positioned above said inlet chamber and having a laterally directed discharge, a combined muffler and separator chamber depending centrally within said inlet chamber and in communication with said discharge chamber, a delivery pipe depending centrally of said muffler chamber, a delivery valve between said pipe and inlet chamber controlling the delivery of steam to said pipe, a fluid permeable muffler associated with said pipe, said pipe discharging steam in said muffler chamber at the outside of said muffler and the steam passing from the muffler chamber through the muffler and into said discharge chamber, a control means for said valve, and a simultaneously controlled air jet disposed to discharge a blast of air across the path of the steam as discharged from said discharge chamber.

7. A humidifier system of the type described comprising a casing provided with a steam supply connection thereto and a discharge chamber discharging through the wall of the casing, a delivery pipe extending through said discharge chamber and supplied with steam at one end through a port in communication with the interior of the casing, a valve controlling said port, a muffling chamber depending in said casing closed at one end and in communication at the other through a restricted throat with said discharge chamber, an elongated, hollow, fluid permeable, sleeve-like muffler surrounding said pipe and extending into said discharge and muffling chambers through said restricted throat, said muffler being in external engagement with said throat to prevent passage of steam through the throat externally of the muffler, said delivery pipe discharging at the end thereof opposite said port into said muffling chamber externally of said muffler whereby steam passes from said muffling chamber to the discharge chamber only by penetrating said muffler in traversing said throat, means for actuating said valve to control the flow of steam through said pipe, muffling chamber, muffler and discharge chamber, and means for disseminating in the atmosphere steam discharged from said last named chamber.

8. A humidifier system of the type described comprising a casing provided with a steam supply connection thereto and a discharge chamber discharging through the wall of the casing, a delivery pipe supplied with steam at one end through a port in communication with the interior of the casing, a valve controlling said port, a muffling chamber in said casing closed at one end and in communication at the other through a restricted throat with said discharge chamber, a fluid per-

meable muffler extending into said discharge and muffling chambers through said restricted throat, said muffler being in external engagement with said throat to prevent passage of steam through the throat externally of the muffler, said delivery pipe discharging at the end thereof opposite said port into said muffling chamber externally of said muffler whereby steam passes from said muffling chamber to the discharge chamber only by penetrating said muffler in traversing said throat, means for actuating said valve to control the flow of steam through said pipe, muffling chamber, muffler and discharge chamber, and means for disseminating in the atmosphere steam discharged from said last named chamber.

9. A humidifier system of the type described comprising a casing provided with a steam supply connection thereto and a discharge chamber discharging through the wall of the casing, a delivery pipe supplied with steam at one end through a port in communication with the interior of the casing, a valve controlling said port, a muffling chamber in said casing closed at one end and in communication at the other through a restricted throat with said discharge chamber, a fluid permeable muffler extending into said discharge and muffling chambers through said restricted throat, said muffler being in external engagement with said throat to prevent passage of steam through the throat externally of the muffler, said delivery pipe discharging at the end thereof opposite said port into said muffling chamber externally of said muffler whereby steam passes from said muffling chamber to the discharge chamber only by penetrating said muffler in traversing said throat, and means for actuating said valve to control the flow of steam through said pipe, muffling chamber, muffler and discharge chamber.

10. A humidifier of the type described comprising a hollow steam-receiving casing having a steam supply connection thereto, said casing having a combined steam muffling and discharge chamber therein including a discharge zone opening through the casing, a restricted portion, and a closed hollow muffling extension on the opposite side portion from said zone, a valve controlled port communicating with the interior of said casing externally of said chamber, a delivery pipe communicating with said port, and a fluid permeable muffler extending into said discharge zone and muffling extension in external engagement with the restricted portion of said chamber, said muffler being substantially closed at its end in the muffling extension and the pipe discharging into said muffling extension externally of said muffler, whereby steam discharged through said pipe into the muffling extension passes through said muffler in one direction radially thereof in axially traversing said restricted chamber portion, the muffler being substantially closed at its end in the discharge zone whereby the steam again passes through the muffler in the opposite radial direction in order to pass to said discharge zone and externally of the casing.

11. A humidifier of the type described comprising a hollow steam-receiving casing having a steam supply connection thereto, said casing having a combined steam muffling and discharge chamber therein including a discharge zone opening through the casing, a restricted portion, and a closed hollow muffling extension on the opposite side portion from said zone, a valve controlled port communicating with the interior of said casing externally of said chamber, a delivery pipe communicating with said port, and a fluid

permeable muffler extending into said discharge zone and muffling extension in external engagement with the restricted portion of said chamber, said muffler being substantially closed at its end in the muffling extension and the pipe discharging into said muffling extension externally of said muffler, whereby steam discharged through said pipe into the muffling extension passes through said muffler in one direction radially thereof in axially traversing said restricted chamber portion to said discharge zone and externally of the casing.

12. A humidifier system of the type described comprising a casing including a steam discharge chamber having a discharge mouth opening laterally thereof to the atmosphere to be humidified, a steam inlet connection for said casing, an elongated combined muffling and separator chamber closed at one end and in communication at the other end through a restricted portion with said discharge chamber, a sleeve-like fluid permeable muffler in said muffling and separator chamber extending through said restricted portion in external engagement therewith, a steam delivery pipe, a valve communicating one end of said pipe with the casing externally of said chambers, said pipe discharging at the other end into said muffling and separator chamber externally of said muffler, automatic means for actuating said valve to regulate the flow of steam through said pipe, comprising a pressure sensitive element connected to the valve and a humidostat controlled source of air pressure effective on said element to control the latter, and an air jet connected to and supplied by said source and disposed adjacent said steam discharge mouth to supply a blast of air to disseminate steam discharged therefrom in the atmosphere.

13. A humidifying system comprising a casing provided with a steam supply connection and having a discharge chamber discharging to the atmosphere to be humidified, a steam delivery control valve, a pressure responsive member operably connected to said valve subject to steam pressure in advance of said valve and tending to open said valve, a further pressure responsive member operably connected to the valve and acting to augment the first named pressure responsive member in shifting the valve, spring means resisting the action of said pressure responsive members, an air supply pipe communicating with said further pressure responsive member to actuate the same under certain conditions whereby to actuate said valve in opposition to said spring means, an air jet in communication with said last named pipe and disposed adjacent said steam discharge mouth to supply a blast of air for disseminating the steam in the atmosphere to be humidified, a source of air supply having an air controlled valve connecting the same with said air pipe and jet, and an air connection from said supply to said last named air controlled valve for actuating the same under certain conditions of said atmosphere to be humidified, including a restriction in said connection and a humidostat controlled air relief valve to atmosphere on the downstream side of said restriction adapted to be opened when the humidity requirements of the atmosphere to be humidified are satisfied and thereby bleed air from said connection, and to be closed when further humidity is required, whereby said air controlled valve is actuated through said connection to communicate said air supply pipe and jet with said air supply.

14. A humidifying system comprising a casing

provided with a steam supply connection and a discharge opening, a steam delivery control valve, a pressure responsive member operably connected to said valve subject to steam pressure in advance of said valve and tending to open said valve, a further pressure responsive member operably connected to the valve and acting to augment the first named pressure responsive member in shifting the valve, spring means resisting the action of said pressure responsive members, a source of fluid pressure communicating with said further pressure responsive member to actuate the same whereby to sufficiently augment said first named member to actuate said valve in opposition to said spring means, and means for controlling the fluid from said source acting on said further member.

15. A humidifying system comprising a casing provided with a steam supply connection and a discharge opening, a valve controlling the delivery of steam from said casing to said discharge opening, a pressure responsive member operably connected to said valve and subject to the pressure in advance of said valve, spring means resisting the action of said pressure responsive member, an air supply pipe communicating with said pressure responsive member to actuate the same under certain conditions whereby to actuate said valve in opposition to said spring means, an air jet in communication with said last named pipe and disposed adjacent said steam discharge opening to supply a blast of air for disseminating the steam in the atmosphere to be humidified, a source of air supply having an air controlled valve connecting the same with said air pipe and jet, and an air connection from said supply to said last named air controlled valve for actuating the same under certain conditions of said atmosphere to be humidified, including a restriction in said connection and a humidostat controlled air relief valve to atmosphere on the downstream side of said restriction adapted to be opened when the humidity requirements of the atmosphere to be humidified are satisfied and thereby bleed air from said connection, and to be closed when further humidity is required, whereby said air controlled valve is actuated through said connection to communicate said air supply pipe and jet with said air supply.

16. A humidifying system comprising a casing provided with a steam supply connection and a discharge opening, a valve controlling the delivery of steam from said casing to said delivery chamber, a pressure responsive member operably connected to said valve and subject to the pressure in advance of said valve, and means for actuating said pressure responsive member to control said valve, comprising an air supply pipe communicating with said pressure responsive member to actuate the same under certain conditions whereby to actuate said valve in opposition to said means, an air jet in communication with said last named pipe disposed adjacent said discharge opening to supply a blast of air for disseminating steam from said opening in the atmosphere to be humidified a source of air supply having an air controlled valve connecting the same with said air pipe and jet, and means between said supply and said last named air controlled valve for actuating the same under certain conditions of the atmosphere to be humidified to communicate said air supply pipe and jet with said air supply.

17. A humidifying system of the type described including a humidifier having a discharge for humidifying agent, a valve to be controlled for regulating the flow of said agent through the humidifier to said discharge, a valve chamber ad-

jacent said valve, a flexible corrugated metallic bellows connected at one end to said valve and in communication at the other end with said valve chamber whereby to be subject to the pressure therein, a further flexible corrugated metallic bellows likewise secured at one end to the valve, the other end thereof being in communication with an air supply pipe, an air jet in fluid communication with said supply pipe and disposed adjacent said discharge whereby to furnish a blast of air for dissemination of agent discharged there-through, an air supply source connected to said pipe and jet through an air controlled valve, a connection from said source to said last named valve including a controlling air tube to the air controlled valve, the latter having means subject to the air in said tube to actuate said air controlled valve, a restriction restricting the flow of air in said connections to said tube, and a humidostat controlled air relief valve between said restriction and tube, said air relief valve when opened bleeding air from the connection at a rate exceeding the rate at which the air passes said restriction, whereby to prevent the rise of sufficient pressure in said tube to actuate the air controlled valve, and when closed building up pressure in said tube to actuate the air controlled valve, whereby said air supply pipe and jet are communicated with said source, pressure in said pipe causing said further bellows to augment the force of the first named bellows and actuate said first named valve.

18. A humidifying system of the type described including a humidifier having a discharge for humidifying agent, a valve to be controlled for regulating the flow of said agent through the humidifier to said discharge, a flexible corrugated metallic bellows secured to the valve and in communication with an air supply pipe, an air jet in fluid communication with said supply pipe and disposed adjacent said discharge whereby to furnish a blast of air for dissemination of agent discharged therethrough, an air supply source connected to said pipe and jet through an air controlled valve, a connection from said source to said last named valve including a controlling air tube to the air controlled valve, the latter having means subject to the air in said tube to actuate said air controlled valve, a restriction restricting the flow of air in said connections to said tube, and a humidostat controlled air relief valve between said restriction and tube, said relief valve when opened bleeding air from the connection at a rate exceeding the rate at which the air passes said restriction, whereby to prevent the rise of sufficient pressure in said tube to actuate the air controlled valve, and when closed building up pressure in said tube to actuate the air controlled valve, whereby said air supply pipe and jet are communicated with said source, pressure in said pipe causing said bellows to actuate said first named valve.

19. A humidifying system of the type described including a humidifier having a discharge for humidifying agent, a valve to be controlled for regulating the flow of said agent through the humidifier to said discharge, a fluid pressure responsive member secured to the valve and in communication with an air supply pipe, an air jet in fluid communication with said supply pipe and disposed adjacent said discharge whereby to furnish a blast of air for dissemination of agent discharged therethrough, an air supply source connected to said pipe and jet through an air controlled valve, a connection from said source to said

last named valve including a controlling air tube to the air controlled valve, the latter having means subject to the air in said tube to actuate said air controlled valve, a restriction restricting the flow of air in said connections to said tube, and a humidostat controlled air relief valve between said restriction and tube, said relief valve when opened bleeding air from the connection at a rate exceeding the rate at which the air passes said restriction, whereby to prevent the rise of sufficient pressure in said tube to actuate the air controlled valve, and when closed building up pressure in said tube to actuate the air controlled valve, whereby said air supply pipe and jet are communicated with said source, pressure in said pipe causing said pressure responsive member to actuate said first named valve.

20. A humidifying system of the type described including a humidifier having a discharge for humidifying agent, a valve to be controlled for regulating the flow of said agent through the humidifier to said discharge, a fluid pressure responsive member secured to the valve and in communication with an air supply pipe, an air supply source connected to said pipe through an air controlled valve, a connection from said source to said last named valve including an automatically controlled air bleeder valve, said bleeder valve when opened bleeding air from the connection to prevent the rise of sufficient pressure to actuate the air controlled valve, and when closed building up pressure to actuate the air controlled valve, whereby said air supply pipe is communicated with said source, pressure in said pipe causing said pressure responsive member to actuate said first named valve, and jet means adjacent said discharge and in communication with said pipe to provide an air blast to disseminate the humidifying agent issuing from said discharge.

21. A humidifier system of the type described comprising a humidifier having a supply connection supplying humidifying agent thereto and a discharge mouth for said agent, a control valve controlling the flow of said agent to and through said mouth, fluid pressure responsive means controlling said valve, a source of air supply effective in said means through an air controlled valve, an operating fluid connection from said source to said last named valve including a restriction between said source and the last named valve and an automatically controlled air relief valve in the connection on the downstream side of said restriction adapted when open to bleed air from said connection at a rate exceeding the rate at which it passes from said source through said restriction, said connection supplying air under pressure to said air controlled valve when the relief valve is closed, so as to actuate and open the air controlled valve and supply air under pressure from said source to said pressure responsive means, and means for bleeding air from said pressure responsive means when said air controlled valve is closed, comprising an open jet discharging air into the humidifying agent issuing from said humidifier to disseminate the latter in the atmosphere to be humidified.

22. A humidifier system of the type described comprising a humidifier having a supply connection supplying humidifying agent thereto, a control valve therefor, fluid pressure responsive means controlling said valve, a source of air supply effective on said means through an air controlled valve, an operating fluid connection from said source to said last named valve including a restriction between said source and the last named valve and an automatically controlled air relief valve in the connection on the downstream side of said restriction adapted when open to bleed air from said connection at a rate exceeding the rate at which it passes from said source through said restriction, said connection supplying air under pressure to said air controlled valve when the relief valve is closed, so as to actuate and open the air controlled valve and supply air under pressure from said source to said pressure responsive means, and means for bleeding air from said pressure responsive means when said air controlled valve is closed, comprising a normally open, restricted jet positioned adjacent said discharge mouth and delivering a blast of air to the humidifying agent discharged therethrough.

23. A humidifier system of the type described comprising a humidifier having a supply connection supplying humidifying agent thereto, a control valve therefor, fluid pressure responsive means controlling said valve, a source of air supply effective on said means through an air controlled valve, an operating fluid connection from said source to said last named valve including a restriction between said source and the last named valve and an automatically controlled air relief valve in the connection on the downstream side of said restriction adapted when open to bleed air from said connection at a rate exceeding the rate at which it passes from said source through said restriction, said connection supplying air under pressure to said air controlled valve when the relief valve is closed, so as to actuate and open the air controlled valve and supply air under pressure from said source to said pressure responsive means, and means for bleeding air from said pressure responsive means when said air controlled valve is closed, comprising an open jet discharging air into the humidifying agent issuing from said humidifier to disseminate the latter in the atmosphere to be humidified.

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