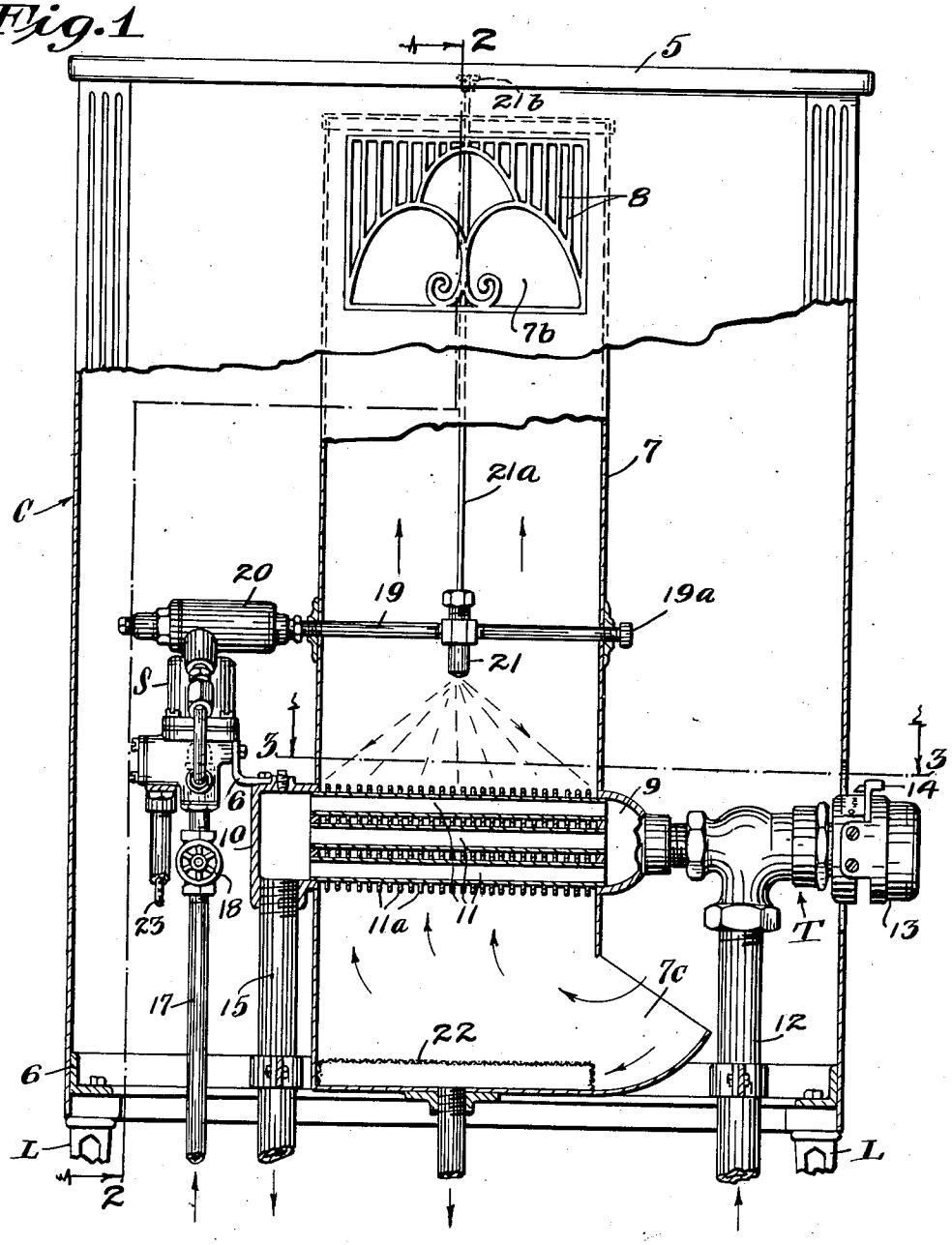
June 19, 1934. C. E. LEWIS 1,963,412

HUMIDIFIER

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Fig. 1



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Fig. 4

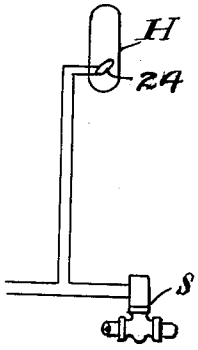


Fig. 2

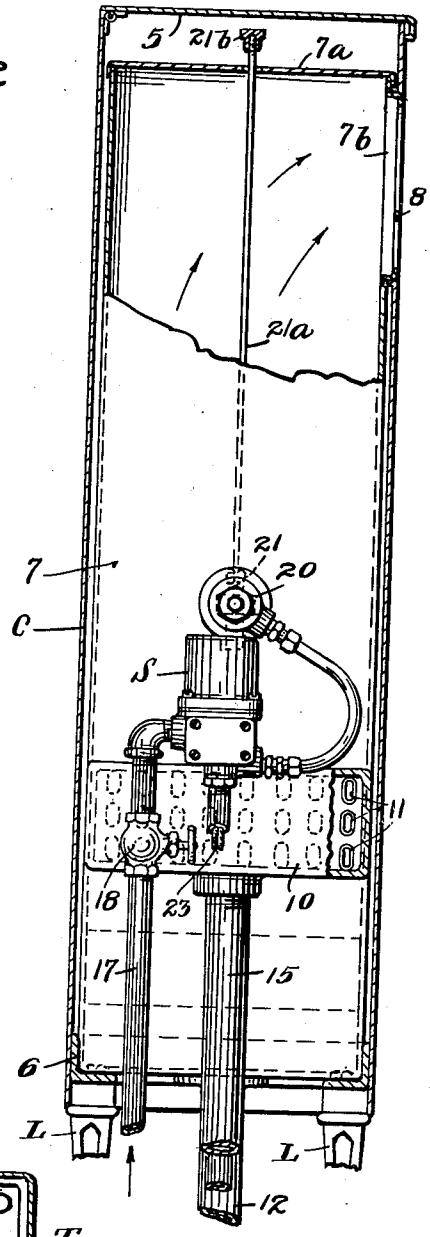
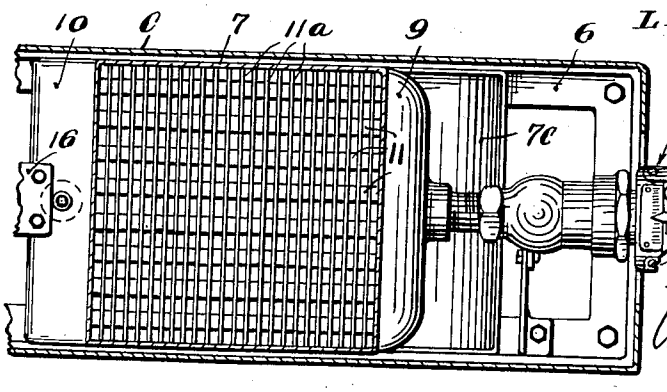


Fig. 3



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Patented June 19, 1934 1,963,412

UNITED STATES PATENT OFFICE

1,963,412

HUMIDIFIER

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Application November 28, 1930, Serial No. 498,769

5 Claims. (Cl. 261—15)

This invention relates to humidifiers and air conditioning apparatus and particularly to a compact unit especially adapted for installation in dwellings, offices and buildings in association with hot fluid heating systems.

It is an object of my present invention to provide an extremely simple and efficient humidifier and air conditioner adapted to be associated with a hot fluid heating system to facilitate the evaporation of moisture and further operative to effect the circulation of humidified air by gravity rather than through the medium of a fan or impeller.

A further object is to provide an efficient humidifier which may be manufactured at very low cost, which will have a high evaporative capacity and which will deliver only completely evaporated moisture into the room or building served.

Another object is to provide a humidifier of the class described utilizing a heating unit or radiator for raising the evaporative capacity of the air and for quickly evaporating particles of moisture which are discharged thereagainst and further to so construct said radiator and the evaporating and radiation surfaces thereof that they will not accumulate incrustations or scale from the chemical ingredients and organic matter present in the water supply associated with the device.

Still another object is to provide a unit device of the class described especially adapted for installation and connection with a circulating fluid heating system and having associated therewith individual controls which cooperate to regulate the amount of moisture circulated in the surrounding air, one control regulating the supply of moisture discharged and the other control regulating the supply of hot circulating fluid to the radiator of the unit and thereby cooperating to regulate the relative humidity of the air discharged.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings, in which like reference characters refer to similar parts throughout the several views, and in which:—

Fig. 1 is a front view of an embodiment of my invention partly in elevation and partly in vertical section;

Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 is a cross section taken on the line 3—3 of Fig. 1, and

Fig. 4 is an electrical diagram showing the circuit for operating the solenoid valve for controlling the moisture discharge.

In the embodiment of the invention illustrated my entire apparatus with the exception of the humidity actuated control and a portion of the temperature actuated control is conveniently housed in an ornamental rectangular casing C having front, rear and side walls, an open bottom and a top or cover 5 which is preferably hinged to the rear wall of the casing at the upper longitudinal edge thereof. The casing is preferably supported in spaced relation to the floor by means of legs L. Legs L also support an open rectangular frame 6 on which most of the remaining parts of my apparatus are mounted.

An elongated substantially vertical flue 7 which may conveniently be of rectangular cross sectional shape is rigidly secured to frame 6 at its lower end and extends from adjacent the bottom of casing C to a point spaced a short distance below the cover 5. The upper extremity of said flue may be closed by a removable cover 7*a* and, as shown, the front wall of said flue has a lateral discharge opening 7*b* therethrough which communicates with an opening in the front of the casing. If desired said casing opening may be provided with an ornamental grating 8. At the lower end of the casing a segmental shaped air intake passage 7*c* is provided, the air being directed by said passage as indicated by the arrows in Fig. 1. It will be noted that the air is not drawn from below the flue but is admitted at a point somewhat thereabove.

Within flue 7 an efficient type of radiator is mounted disposed a short distance above the air intake passage 7*c*, the core of said radiator extending horizontally and traversing the entire cross sectional area of the flue. The form of radiator illustrated comprises headers 9 and 10 respectively, disposed outside of flue 7 and at opposite sides thereof. Said headers are connected by a series of small tubes or cells 11 which carry radiating elements or fins 11*a*, said fins extending substantially vertically. Both the tubes 11 and the fins 11*a* are spaced apart to allow the upwardly moving column of air to pass therebetween.

Header 9 is connected with the lead conduit 12 of a hot fluid heating system which may be steam, hot water or vapor. A thermostatically controlled valve mechanism T is interposed in the lead conduit 12 adjacent header 9, and in the form of mechanism disclosed, the thermostat elements are encased in a housing 13 which projects through one of the end walls of the large orna-

mental casing C and is subjected to the temperature of the air in the room or rooms served by my apparatus. Mechanism T is preferably provided with an adjustment arm or lever 14 disposed exteriorly of casing C, whereby the operation of the valve may be set for any predetermined temperature within the range provided. Valve mechanism T is preferably of variable capacity type.

Header 10 of the radiator is connected with a return conduit 15 of the heating system and as shown, both the conduits 12 and 15 extend vertically and are suitably clamped to the rectangular supporting frame 6 of my device and with the cooperation of the vertical flue 7, support the radiator. An electro-magnetically controlled water supply valve, or solenoid valve S, is mounted adjacent header 10, as shown by means of an angle bracket 16, the base of which is secured to said header. A water supply pipe is numbered 17 and is connected with the valve casing of solenoid valve S, and a hand valve 18 may be interposed in said conduit if desired. A water discharge pipe 19 traverses horizontally the flue 7 and is supported thereby, the outer end thereof being closed by a removable plug 19*a*. A suitable strainer or filter 20 is interposed between the discharge of the solenoid valve and the conduit 19.

A discharge nozzle 21 communicates with a medial portion of discharge conduit 19 and is directed downwardly longitudinally of and centrally of the flue 7. This discharge nozzle is preferably adapted to discharge a finely atomized spray of moisture in conical form against the top of the radiator core. The form of nozzle disclosed in my co-pending application for U. S. Letters Patent, Serial Number 460,876, filed June 13, 1930, which has since matured into Patent No. 1,910,025, dated May 23, 1933, may be successfully applied, although of course any satisfactory type of nozzle may be utilized. My said type of nozzle, which is illustrated, includes elongated flushing and cleaning rod 21*a* which may extend through the cover 7*a* of the flue terminating in a handle 21*b* which is accessible when the cover 5 of casing C is raised.

Within the bottom of flue 7 a deadening mat or screen 22 may be provided, having its upper surface spaced from the bottom of the flue and upon which unevaporated particles of liquid may fall, eliminating noise which would be present if said particles struck directly against the bottom of a sheet metal flue.

The service wires 23 for the solenoid valve S are connected in circuit with the switch 24 of a suitable humidostat or humidity regulator 8, which controls the operation of the water supply valve.

In operation the temperature of the radiator will be maintained, by the variable capacity valve mechanism T, in accordance with the desired room temperature, thereby effecting a uniform heating of the column of air which passes upwardly through flue 7. The evaporator capacity of this air is directly determined by the temperature of said radiator and may be regulated by means of the arm or lever 14 on mechanism T.

When the relative humidity of the room served by my device has fallen below a predetermined point, the humidostat H will effect the operation of the solenoid valve S and finely divided moisture will be discharged downwardly in a conical spray against the fins 11*a* and tubes 11 of the radiator, said spray filling the cross sectional area of the flue, and thoroughly washing and purifying the column of air which passes upwardly in the opposite direction.

The distribution of the finely divided particles of moisture against the radiating elements effects the rapid and complete evaporation of the moisture and no unevaporated particles pass upwardly through flue 7 and into the room. The evaporative capacity of the upwardly moving column of air is maintained by the thermostatically controlled valve mechanism T at the proper value and in accordance with the desired room temperature.

If the nozzle becomes clogged, the same may be flushed or cleaned by projecting rod 21*a* downwardly from the open top of casing C.

It will be noted that the supply of air to flue 7 is taken from an area some distance above the floor and consequently the minimum amount of dust and dirt will be introduced. This is quickly eliminated by the washing action of the downwardly directed spray.

The height of the vertical flue 7 and arrangement of its intake and discharge passages cause a steady and adequately fast upward passage of air through the flue. This air is raised to a predetermined evaporative capacity by the radiator and will evaporate and absorb a predetermined amount of moisture from the spray, in its passage to the device. It will be seen, therefore, that two factors or mechanisms control the moisture evaporated. One is the thermostatically controlled radiator and the other is the humidostat, which may be set for a desired predetermined relative humidity within an extensive range.

Special attention is called to the structure and form of my radiator core. The tubes or cells 11 and the fins 11*a* are constructed from suitable metal which will take a high polish and which will have a relatively high coefficient of expansion. The said elements are buffed or polished and will resist the accumulation of scale or incrustation due to the presence of chemical substances and organic matter in the water supply. Small accumulations of scale will be quickly sloughed off by the contraction and expansion of the metal constituting the fins and tubes. I have found that copper or brass are satisfactory for the construction of said radiating elements but it will, of course, be understood that other metals or materials having high coefficients of expansion and properly polished are also suitable.

Most humidifiers known to me at this time have encountered much difficulty due to the accumulation of said scale or incrustation, upon the evaporating surfaces, heating coils or other heat exchangers. Said accumulations restrict the free passage of air and insulate the heating elements greatly reducing efficiency. My said structure obviates the said undesirable feature.

From the foregoing description it will be seen that I have provided an extremely simple and highly efficient humidifier and air conditioner adapted to be manufactured at low cost, having a high evaporative capacity and delivering only completely evaporative moisture into the room or building served. It will further be seen that the moisture evaporated and consequently the relative humidity of the room may be accurately controlled by the combination of my radiator or heat exchanger, thermostatic valve mechanism T and humidostat H.

It will, of course, be apparent that various changes may be made in the details, proportions and arrangements of parts all within the scope of

my invention, which, generally stated, consists in a device or apparatus capable of carrying out the objects herein set forth and in the novel parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:—

1. A humidifier comprising an upwardly extending flue having an air intake passage in the lower end thereof and an air discharge passage in the upper end thereof, a radiator having a core traversing and substantially filling the cross sectional area of said flue intermediate of said passages, said core having a multiplicity of vertically disposed passages therethrough producing a stack action of air upwardly and distributing moisture and effecting a downward flow thereof through said core, said radiator having headers disposed without said flue and being adapted for connection with a circulating fluid heating system and a nozzle adapted to be connected with a source of humidifying medium, said nozzle being mounted centrally of said flue above the core of said radiator and directed downwardly longitudinally of said flue to discharge moisture directly against said core.

2. A humidifier comprising a flue having an air intake passage at one end thereof and an air discharge passage adjacent the opposite end thereof, a radiator having a core which traverses said flue intermediate of said passages, said core comprising tubes or cells and fins associated therewith which extend in planes longitudinal of said flue, a nozzle adapted to discharge a finely divided spray of moisture against said core and said core and fins being constructed from a highly polished metal having a high coefficient of expansion for sloughing off accumulations of scale during temperature changes of said radiator.

3. A humidifier including a radiator having a core, connections between said core and a source of heat-carrying fluid, and a spray nozzle to distribute water over the exterior surfaces of said core, said core being constructed of highly polished metal having a high coefficient of expansion for sloughing off accumulations of scale during temperature changes of said radiator.

4. In air conditioning apparatus, an upwardly extending flue having an air intake passage adjacent the lower end thereof and an air discharge passage adjacent the upper end thereof, moisture supply means mounted in said flue and constructed and directed to distribute a finely divided spray of moisture downwardly, a heat exchanger traversing said flue and disposed below said moisture supply means in position to receive said spray, said heat exchanger having a multiplicity of relatively small passages extending longitudinally of said flue adapted to entrain particles of said sprayed moisture as well as air.

5. A humidifier comprising an upwardly extending flue having an air intake passage in the lower end thereof and an air discharge passage in the upper end thereof, a radiator having a core traversing and substantially filling the cross-sectional area of said flue intermediate of said passages, said core having a multiplicity of vertically disposed passages therethrough producing a stack action of air upwardly and distributing moisture and effecting a downward flow thereof through said core, said radiator having headers at opposite sides of said flue and being adapted for connection with a circulating fluid heating system, and a nozzle adapted to be connected with a source of humidifying medium, said nozzle being mounted centrally of said flue above the core of said radiator and directed downwardly longitudinally of said flue to discharge moisture directly against said core.

CARROLL E. LEWIS.