April 21, 1931. E. D. NORTON 1,801,565

HUMIDIFIER

Filed Feb. 23, 1929

Fig. 1.

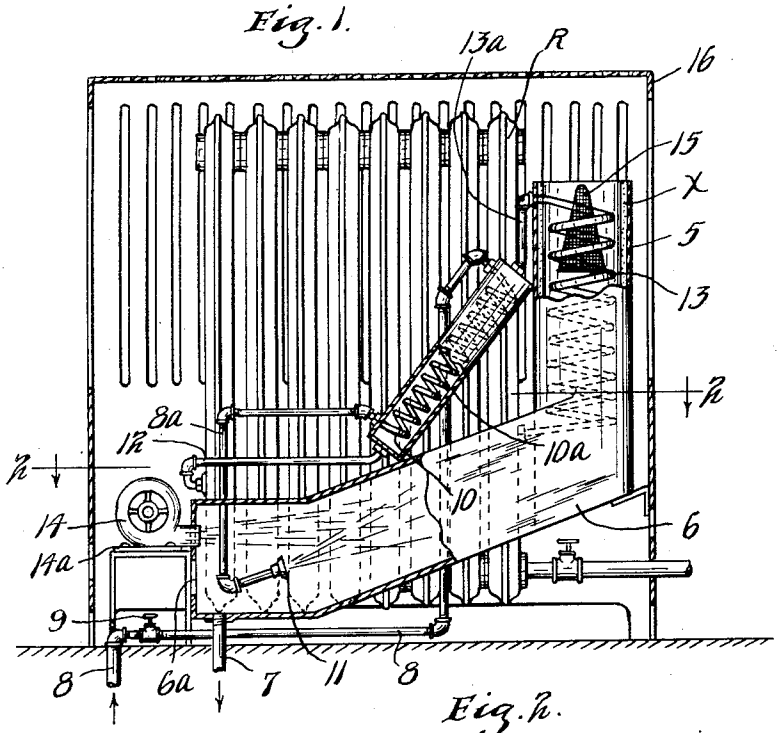


Fig. 2.

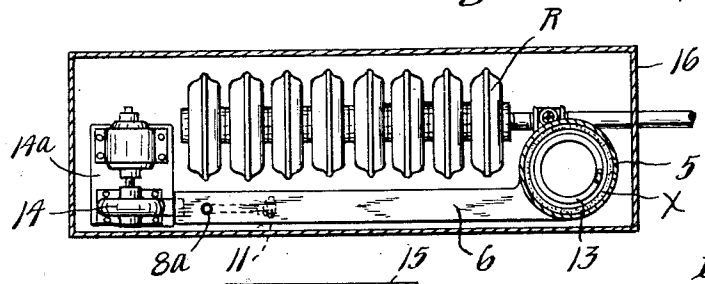


Fig. 3.

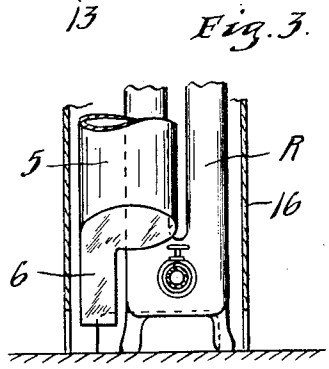
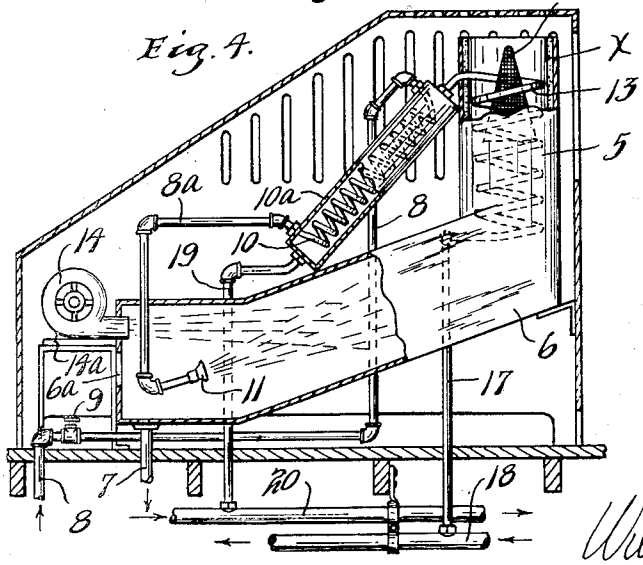


Fig. 4.



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UNITED STATES PATENT OFFICE

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HUMIDIFIER

Application filed February 23, 1929. Serial No. 342,088.

My invention relates to humidifying devices and especially to himidifiers adapted for use in connection with heating systems for humidifying the air in a room or building. This application is a continuation in part of my application entitled "Humidifier" S. N. 262,531, filed March 17th, 1928, for all subject matter common to both applications. In addition to the combinations and structure set forth in my said pending application, my present invention comprises several new improvements which increase the efficiency of the device.

It is an object of my invention to provide a comparatively simple but highly efficient humidifier adapted to be used in connection with a heating system and having a high evaporative capacity and adapted to be installed above the floor of a room or building.

It is a further object to provide a humidifier for buildings wherein a flue is provided having therein a heating element and having an offset leg wherein a nozzle is mounted directing a fine spray of liquid toward the main portion of said flue to assist in setting up a swift current of air through said flue, said offset leg being connected with said main portion in such a manner as to cause said current of air to rotate or swirl rapidly as it passes through the main portion of said flue.

Another object is to provide in a device of the class described, means for heating the air and moisture as it passes through said flue and for also heating the water or liquid before it is discharged from said nozzle.

Still a further object is to provide a device of the class described, wherein a fan is provided for operating the device at greatest efficiency, but wherein the device may have a considerable evaporative capacity when the fan is not in use.

These and other objects and advantages of the invention will be apparent from the following description made in connection with the accompanying drawings, wherein like reference characters refer to similar parts throughout the several views and in which,

Fig. 1 is a vertical section taken longitudinally through an embodiment of my invention, installed in connection with a radiator;

Fig. 2 is a cross section taken on the line 2—2 of Fig. 1, showing the radiator in plan;

Fig. 3 is a fragmentary rear elevation of the radiator and lower portion of my flue, some portions of the ornamental casing being broken away; and

Fig. 4 is a vertical section taken longitudinally through an embodiment of my invention connected with the lead and return pipes of a circulating heating system.

As shown in Figs. 1 to 3 of the drawings, an embodiment of my device is applied to a radiator R of the usual type which may be connected with either a hot water, vapor or steam heating system.

A vertical flue 5 of circular cross section is suitably supported at one end of the radiator R and communicates at its lower end with an offset or angularly disposed leg 6. Leg 6 is of oblong cross section, and as shown has a horizontal lower portion and an elongated inclined upper portion communicating eccentrically or substantially tangentially with the lower end of flue 5. The width of leg 6 is comparatively small relatively to its height. An air intake passage 6*a* is provided in the lower end of leg 6, disposed a short distance above the bottom thereof, said bottom with the rear wall wherein said intake passage is formed, constituting a drain chamber which is provided with a drain pipe 7.

A relatively small conduit 8, connected with the household water supply or a suitable source of liquid under pressure, is provided, having therein a regulating valve 9, said pipe, as shown, extending upwardly and connecting with the upper end of a small helical heating coil 10. Coil 10 for compactness in the structure, may be conveniently disposed in inclined position above the upper portion of leg 6, and has its lower end connected with a conduit 8*a*, which extends into the lower extremity of leg 6 and terminates in a nozzle 11 positioned substantially centrally of the inclined portion of leg 6 and adapted to discharge a finely divided spray of liquid toward the opening in the cylindrical flue 5. A cylindrical heater casing

10*a* of somewhat greater diameter than helical coil 10, surrounds said heating coil and the lower end of said casing is connected by a conduit 12 to one end of the radiator R.

A helical heating coil 13 is mounted within and concentric with cylindrical flue 5 and the upper end of said heating coil is connected by a short conduit 13*a* to the upper end of heater casing 10*a*. The lower end of heating coil 13 is connected to the opposite and hotter end of radiator R.

A force fan 14 of suitable type is mounted on a support 14*a*, at the end of the radiator opposite from flue 5 and has its discharge end communicating with the lower end of leg 6, preferably at a point slightly above the air intake passage 6*a*. Fan 14 is connected in conventional manner (not shown) to a source of electricity.

As shown, flue 5 is lined with some absorbent material having capillary attraction, said lining extending substantially throughout the entire length thereof. An inverted conical screen 15 is concentrically mounted within heating coil 13 at the upper end thereof.

An ornamental rectangular casing 16 houses the radiator and the several parts of my device previously described, said casing as shown being supported upon the floor and having reticulated side and front portions and a reticulated top.

A form of the invention is illustrated in Fig. 4 substantially similar to the form illustrated in Figs. 1 to 3, with the exception that the lower end of the heating coil 13, disposed within cylindrical flue 5, is connected to the lead pipe 18 of a hot water, steam or vapor heating system, while the lower end of heater casing 10*a* is connected by a conduit 19 with the return pipe 20 of said heating system. As shown in Figs. 4, the ornamental casing covering my device has an inclined top portion.

The operation of my humidifier may be briefly summarized as follows:—

A circulation of a hot heating fluid is set up through the heating coil 13 and through heater casing 10*a*, returning in the device shown in Figs. 1 to 3, to the colder side of the radiator, and in the device shown in Fig. 4, to the return pipe 20 of the heating system. Water regulating valve 9 is opened to cause a fine conical spray of water to be directed toward the lower end of flue 5, said spray substantially filling the narrow leg 6. The force of said spray is sufficient of itself to set up or induce a strong circulation of air through intake passage 6*a* and through leg 6 and flue 5. The circulation may, of course, be accelerated by the use of fan 14. The entering air commingles with the finely divided spray from nozzle 11 and the air and moisture move upwardly through flue 5 with a rapid swirling motion. This rapid swirling motion throws the larger and unevaporated particles of moisture against the sides of the flue 5 and against the hot helical coil 13 thereby preventing an excess of unevaporated moisture from being delivered from the upper end of the flue. Said swirling movement moreover slows up the passage of the air and moisture sufficiently to cause an efficient humidification at a relatively high temperature. The hot helical coil 13 raises the temperature of the air and moisture, thereby greatly increasing the evaporative capacity of said air. The inverted conical screen 15 which is heated to a relatively high temperature by coil 13 assists in catching particles of water and prevents excess of unevaporated water from being expelled outwardly through the delivery end of flue 5. This screen also holds a considerable amount of moisture and the air passing therethrough causes much of this moisture to be evaporated in the delivery of air through the upper portion of the enclosed space within ornamental casing 16. Casing 16 is so reticulated at its top, end and front, that the moist air delivered therein is placed under pressure, causing a substantially even delivery of the air from said casing.

It will be further seen that the water discharged from nozzle 11 is heated by its passage through the restricted heating coil 10 disposed in heater casing 10*a* and will, therefore, atomize efficiently when discharged. This discharge of warm water serves to warm the air to some extent before passage of air and moisture over the heating coil 13, thereby greatly increasing the evaporative capacity and efficiency of my device. I have found that cold water cannot be satisfactorily atomized by a nozzle and will otherwise greatly lessen the humidification, since the evaporative capacity of air increases progressively with the temperature.

The absorbent lining X within flue 5 acts as a wick maintaining a supply of moisture throughout the entire length of flue 5, and the swirling motion of the air over said wick causes additional moisture to be evaporated and commingled with the air. The device has a high efficiency when used without the fan 14, but the circulation of air in the room, as well as the humidification is accelerated by operating said fan. In hot weather, when, of course, the heating system is not in operation, my device has a high efficiency for cooling a room or building, if the fan is operated. The forced circulation of air through the spray from the nozzle evaporates a considerable amount of water, thereby absorbing heat and producing a fast circulation of cool air in the building.

It will be obvious that my device cleans and purifies the air as well as materially increases the circulation of air in the room. The swirling motion of the air and moisture

caused by the leg 6 communicating substantially tangentially with the flue is responsible for a high evaporative and humidifying capacity and the addition of the means connected to heating coil for preheating the water discharged is also another important factor in the efficiency of my device.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of applicant's invention.

What is claimed is:

1. In a humidifier, a flue provided with an offset leg communicating substantially tangentially with said flue, a source of water supply within said leg, and means for setting up a circulation of air through said flue, whereby said tangential communication of said leg with said flue will produce a swirling motion on said air in its passage through said flue.

2. In a humidifier, a cylindrical flue having an offset leg communicating with one end thereof, said leg having a substantially tangential connection with said flue, an air intake passage in the outer end of said leg, and a nozzle connected with a source of liquid supply under pressure adapted to direct a fine spray in the direction of said flue.

3. The structure set forth in claim 2, and a heating element in said flue.

4. In a humidifier comprising an upwardly extending flue having a laterally extending leg communicating with the lower portion thereof, a water supply pipe extending into said leg, and terminating in a nozzle, said nozzle being adapted to direct a fine spray of water toward the juncture of said leg and flue, an air intake passage at the rear end of said leg, the force of said spray setting up an induced circulation of air through said spray and said flue, a heating coil connected with a circulating heating system and disposed in said flue above said juncture and a fine meshed filter constructed of heat conductive material disposed in the upper portion of said flue adapted to disintegrate small particles of water and to prevent delivery of larger particles.

5. A humidifier comprising an upwardly extending flue having an inclined leg communicating with the lower portion thereof, a water supply pipe having a nozzle adapted to direct a fine spray of water through said leg in the direction of the juncture of said leg with said flue, a drain chamber at the lower end of said leg, a heating unit mounted in said flue above said juncture and connected with a radiator, an intake opening in the lower end of said leg, whereby said spray will set up an induced circulation of air through said leg and said flue and an inverted funnel-shaped screen in the upper portion of said flue.

6. A humidifier comprising an upwardly extending flue having an offset leg communicating with the lower portion thereof, a water supply pipe having a nozzle disposed within the outer end of said leg, said nozzle being adapted to direct a fine spray of water through said leg in the direction of its juncture with said flue, said flue having an absorbent lining constituting a wick, a heating unit mounted in said flue above said juncture, and an air intake opening in the lower end of said leg, whereby said spray from said nozzle will set up an induced circulation of air through said leg and flue, said air circulation passing through said heating unit and over the surface of said wick.

7. In a humidifier, a flue provided with an offset leg communicating substantially tangentially with said flue, means for providing a finely divided spray of water to said leg and means for setting up a circulation of air through said leg and said flue whereby said tangential communication of said leg will produce a swirling motion on said air in its passage through said flue.

8. In a humidifier, a flue provided with an offset leg communicating substantially tagentially with said flue, a source of moisture in said leg, means for setting up a circulation of air through said leg and said flue and a spiral heating coil disposed longitudinally in said flue and adapted to cooperate with the tangential connection of said leg and flue to produce a swirling motion on said air in its passage through said flue.

In testimony whereof I affix my signature.

EDWARD D. NORTON.