May 18, 1926. 1,585,536

G. W. D'ARCY

HUMIDIFYING APPARATUS

Filed April 6, 1921 2 Sheets-Sheet 1

Fig. 1.

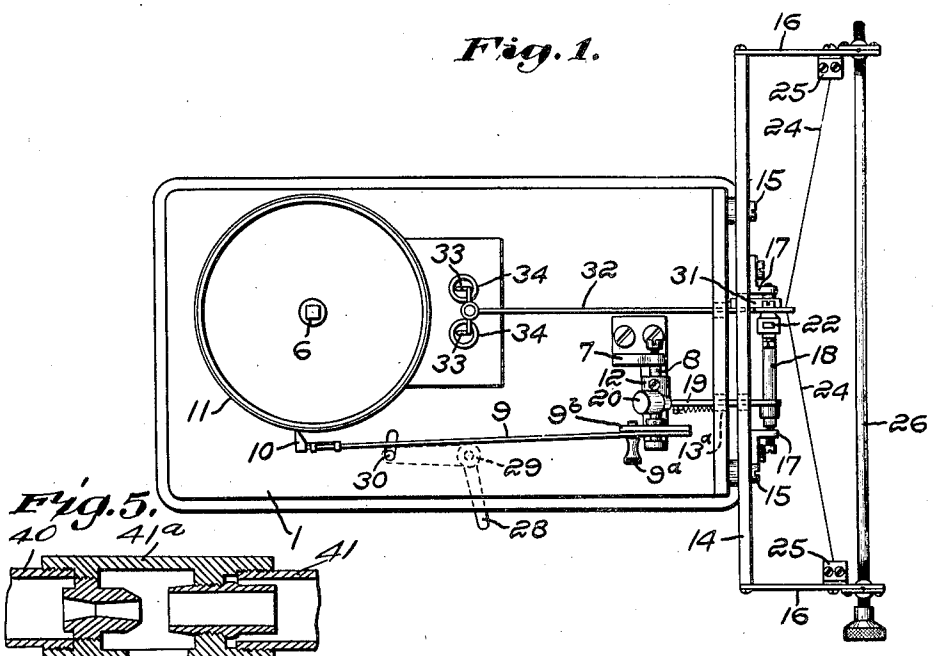


Fig. 5.

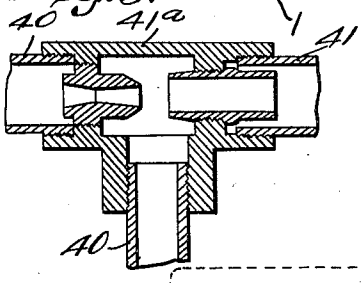
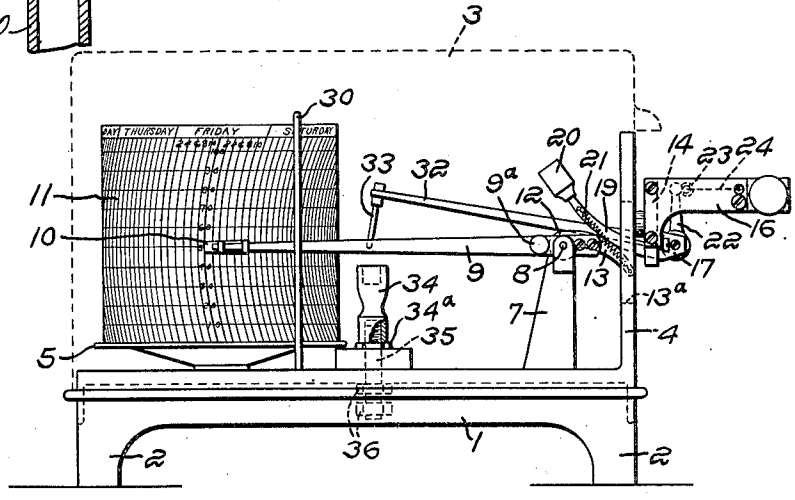


Fig. 2.



Inventor:
George W. D'Arcy,
by Emery, Booth, Jamieson & Thurston
Attys.

May 18, 1926. 1,585,536

G. W. D'ARCY

HUMIDIFYING APPARATUS

Filed April 6, 1921 2 Sheets-Sheet 2

Fig. 3.

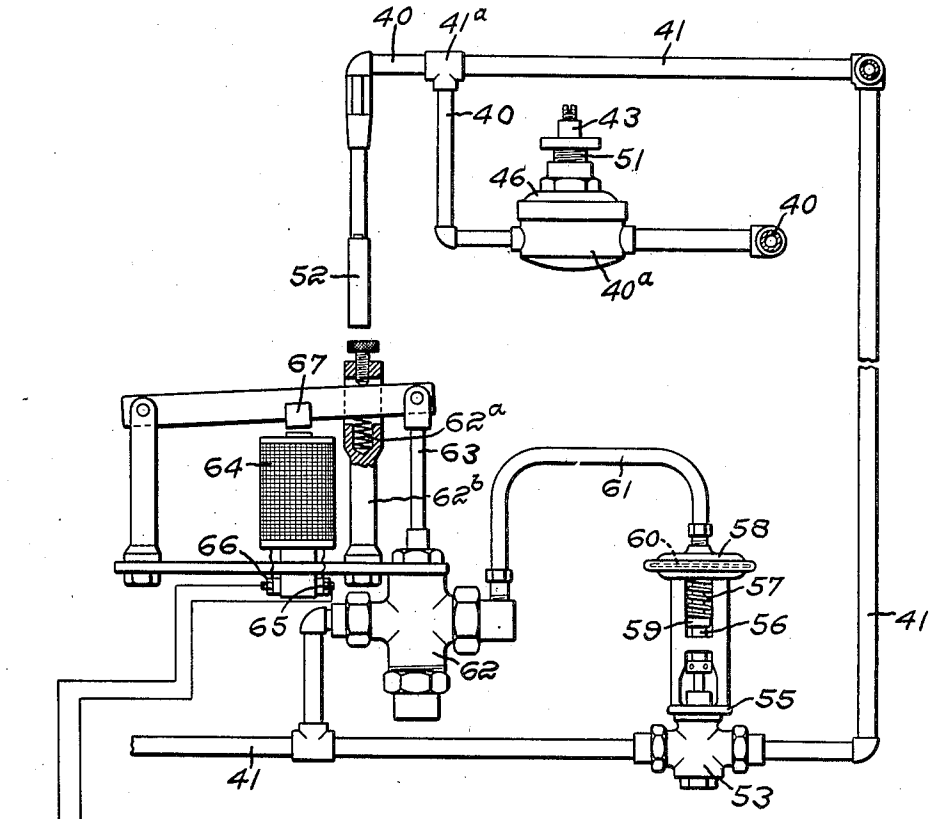
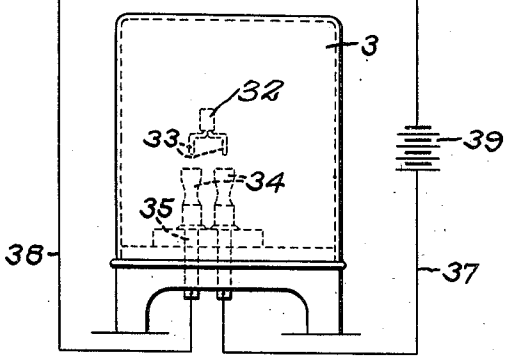
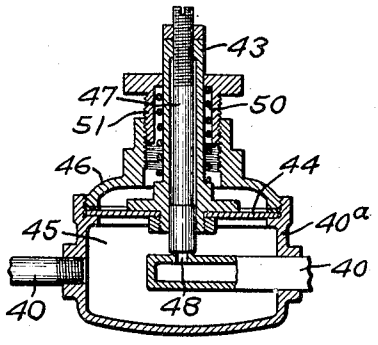


Fig. 4.





Inventor:
George W. D'Arcy,
by Cammy Porth, Jammy & Vammy
Attys.

Patented May 18, 1926. 1,585,536

UNITED STATES PATENT OFFICE.

GEORGE W. D'ARCY, OF BOSTON, MASSACHUSETTS.

HUMIDIFYING APPARATUS.

Application filed April 6, 1921. Serial No. 459,178.

This invention relates to humidifying apparatus and is particularly adapted for use in textile and other mills where it is important to maintain a predetermined degree of humidity with substantial regularity, and provide a permanent record of the variations in the degree of humidity throughout a given period.

In the drawings of the embodiment of my invention illustrated and described herein,

Fig. 1, is a plan of my novel hygrometer which responds to and registers the changes in humidity and controls the action of the humidifying apparatus;

Fig. 2, a side elevation of the same;

Fig. 3, a diagrammatic illustration of one arrangement of the same in connection with the sprinkling head, vaporizer and controlling valves;

Fig. 4, a detail on an enlarged scale of the water valve; and

Fig. 5 is a vertical section of the vaporizer showing the water and fluid pressure pipe and spraying nozzle connections thereto on an enlarged scale.

Referring first to Figs. 1, 2, the hygrometer which is the automatically acting controlling element of my humidifying apparatus, comprises a base 1, with legs 2, and a cover 3, in dotted lines, hinged to the end 4 on the base, to permit access to the interior of the case when desired.

Within the case there is mounted on the base a revolving drum 5 which may be rotated by any suitable and conventional spring or clock mechanism and which, as to details, forms no part of my invention and is therefore not shown in detail. A spring carrying shaft 6, Fig. 1, extends upwardly within the drum to receive a key for winding the actuating mechanism.

Upon the base 1, Figs. 1, 2, there is a post 7 on which is mounted a shaft 8 carrying a long arm 9 with a suitable pointer 10 on its outer end, adapted to register the degree of humidity on a chart 11 on the rotating drum 5. The pointer is preferably a recording one, as a pencil or pen of any conventional form, and obviously the chart, preferably in the form of a removable sheet or strip, may be made to cover any period of time, as a week, within the capacity of the drum and its rotating mechanism, and may have such scales or indicating characters as is most suitable and convenient. The shaft 8, Fig. 1, also carries a hub 12 with a downwardly curved arm 13, Fig. 2, extended rearwardly therefrom.

On the end member 4 is a bar 14 suitably secured as by screws 15, and carrying at each end an arm 16. By means of brackets 17 on the bar 14 there is mounted a short shaft 18 carrying also a forwardly and upwardly curved arm 19 resting upon and for actuating the arm 13, the former arm being suitably weighted at 20 to retain it in contact with the latter. Both arms 13, 19, extend through an opening 13^a in the end 4. To secure still further close adjustment, cooperation and action between the two arms 13, 19, they are connected by a spring 21, one end of the same being secured to the upper end of the arm 19 while the opposite end is secured to the lower end of the arm 13.

On the shaft 18, Figs. 1, 2, there is also an upright arm 22 carrying, adjustably thereon, an eye 23 which receives a hair, plurality of hairs, or other moisture responsive elements 24, the opposite ends of which are securely fastened between clamping plates 25 on the brackets 16. The hairs may be kept at the proper degree of tension by a rod 26 having threaded connection with the arms 16 and a thumb screw for adjusting the rod, whereby the arms may be sprung toward each other or apart. The hairs of course are very sensitive to the presence of moisture and alternately expand and contract according to the presence of the same in varying degree in the atmosphere.

As the hairs expand and retract they move the arm 22 outwardly or release it so that the weight 20 on arm 19 can swing it backwardly, and thus cause the arm to travel up and down and move the pointer across the record sheet 11 and leave thereon its record of movement during the period provided

therefor. The recording point 10 is, in general, kept in contact with the record sheet by means of a hand lever 28, shown in dotted lines Fig. 1, pivoted at 29 to the base 1, the opposite lever arm carrying an upright post 30 which presses with sufficient force against the arm 9 to cause the pointer 10 to remain in contact with the record sheet. Still further and more accurate adjustment may be had by means of the set screw 9^a on the arm 9, extended through the same and threaded into the arm base 9^b, by means of which the arm 9, normally slightly sprung away from the base 9^b may be adjusted near to or away from such arm.

The foregoing construction is a well known one for a recording hygrometer and no novelty is claimed therein per se, to the extent described.

For the purpose of enabling the same mechanism that operates the recording pointer 10 to actuate the necessary valves and control the supply of air and water or other humidifying agents as required, I have provided the following novel construction.

On the shaft 18 Figs. 1, 2, is a hub 31 carrying an arm 32 forwardly extended through the end 4 and which carries at its outer end a pair of wire contacts 33, both of which extend downwardly, and when the arm is in its lower position, into a pair of mercury cups 34 on the base 1. The lower ends of the posts 35, supporting the cups, are extended through the base 1 and insulated therefrom and are supplied with nuts 36 to form terminals for an electric circuit. One of the cups 34 is more nearly full of mercury than the other, so that the contact 33 therein is always in contact with the mercury and thus prevents vibration of the contacts, while the other cup is raised or lowered by a threaded connection with its post 35 and the lock nut 34^a to obtain the necessary and most accurate adjustment thereof to close at the proper time its contact with the mercury in the cup. The action of the arms 9 and 32 is of course, controlled by the action of the atmosphere on the hairs 24 and the consequent movement of the arm 32 and shaft 18. Referring now to Fig. 3, the two mercury cups are shown as part of an electrical circuit comprising the wires 37, 38, and battery 39.

I will now proceed to describe the arrangement of valves, sprinkler head and vaporizer and their connections, which are controlled by the hygrometer. The embodiment illustrated comprises a water supply pipe 40 and air supply pipe 41, both leading from any suitable and convenient source of supply not shown.

In the water line 40 is a vaporizer 41^a, which is preferably of the construction shown in my issued Patent No. 1,302,515 dated May 6, 1919, and an automatic water valve body 40^a for controlling the flow of water or other liquid, and this valve is, in turn, controlled by the air fed to the same by the pipes 41 through the vaporizer 41^a.

This valve 40^a, Figs. 3, 4, comprises a hollow stem 43 carrying at its lower end a flexible diaphragm 44 held in position in the water pressure 45 by a cover 46 screw threaded to the base 40^a. In the stem 43 is a plunger 47 adjustable vertically in the stem by means of a nut on its upper end whereby it is possible to obtain the exact adjustment necessary. The lower end of the plunger seats over the port 48 in the water pipe 40, to open and close the same.

Under normal conditions the plunger is held seated on the port 48 by the spring 50 in the bushing 51 adjustably carried by the cover 46, with pressure sufficient to overcome the pressure in the water line, the air line being closed.

When the water port 48 is to be opened to operate the humidifier, Fig. 3, air is admitted to the chamber 45 from the pipe 41 through the vaporizer 41^a, and pipe 40, the air pressure thus admitted being sufficient to overcome the resistance of the spring 50. Thereupon, water flows into chamber 45 and through pipe 40 to the vaporizer 41^a in the air line, and thus water and air are supplied to the nozzle 52 in the proper proportions, and the vapor is discharged from the nozzle in a fine cloud. After the port 48 is once opened, water will continue to flow until the air pressure is discontinued. Apparently while there is sufficient air pressure in the water pressure chamber 45 to retain the diaphragm 44 in raised position, there is still a movement of air toward the sprinkler head, created by the action of the vaporizer, which carries with it a sufficient quantity of water to humidify the air in the room.

For controlling the action of the valve 40^a, Fig. 3, from the hydrograph, I have conceived the following novel construction. In the air line 41 I locate a diaphragm valve 53 comprising a base 55, a stem 56 normally retained in raised or open position by a spring 57 seated against the top of the housing 58 and a head 59 on the stem.

The top of the stem carries a diaphragm 60, dotted lines Fig. 3, in the top of the housing. Air is admitted to act on the diaphragm to depress the stem and close the valve by means of a pipe 61 connected to a magnetic cock 62, having a stem 63, the valve being normally closed while the system is in operation.

This cock 62 is operated by the hygrometer through the medium of a pair of magnets 64, to the terminals 65, 66, of which the wires 37, 38, are connected. When the apparatus is in use the finger 10 is set opposite the figure on the scale 11 repre-

senting the degree of humidity it is desired to maintain, for instance 50°. One mercury cup is filled to the point where the wire 33 for instance, will always extend into it.

The other cup 34 is then adjusted to the position where the other wire contact 33 will always drop and contact with the mercury when the humidity rises one degree above the point to be maintained, causing the arm 32 to drop the contact 33 into the mercury. In use the pointer 10 is set at the point representing the degree of humidity desired, the valve 62 being closed and the valve 53 open.

When the humidity rises one degree above normal as shown by pointer 10 and causes the contact 33 to drop and close the circuit, the magnet is energized, drawing the armature 67 down, and with it the valve stem 63, opening the valve, and admitting steam or air from the pipe 41 to the pipe 61, which in turn forces down the valve stem 56 and closes the valve 53, shutting off the supply of air from valve 40^a which in turn permits the plunger 47 in valve 40^a to be depressed by the spring 50 to shut off the water supply through pipe 40.

The valves will remain in these positions until the hydrograph registers a drop of one degree in the humidity below the normal point when the dropping of the arm 9 will rotate the shaft 18, raise the arm 32 and one wire contact 33 from the mercury and open the circuit 37, 38, deenergizing the magnet and permitting a spring 62^a in the post 62^b to raise the stem 63 and close the valve 62, shutting off the air pressure in valve 53 and permitting the spring 57 to open the valve 55 and allow air to again circulate through pipe 41 to operate the valve 40^a.

This action will continue alternately opening and closing the valves as may be necessary at each variance of one degree above or below normal in humidity of the air of the chamber.

The hydrograph registers each variation of humidity during the night or any period, so that it is possible to have a complete record of the humidity during any period.

Obviously my invention is not restricted to the construction shown, and I claim:

1. Humidifying apparatus comprising a water supply pipe with a vaporizer and a spray nozzle thereon, a fluid supply pipe leading to the water pipe, a fluid pressure controlled valve in the water line, and means for controlling the action of the fluid pressure comprising a diaphragm valve, and a magnet valve, and a hydrograph for controlling the magnet valve.

2. Humidifying apparatus comprising a water supply pipe with a vaporizer and a spray nozzle thereon, a fluid pressure supply pipe leading to the water pipe, a fluid pressure controlled valve in the water line comprising a pressure chamber, a spring controlled valve stem normally closing the water inlet opening thereto and adapted to open the inlet under combined water and air pressure, and means for controlling the action of this fluid pressure comprising a diaphragm valve, and a magnet valve, and a hydrograph in circuit with the magnet valve for controlling the magnet.

3. Humidifying apparatus comprising a water supply pipe with a vaporizer and a spray nozzle thereon, a fluid pressure supply pipe, a fluid pressure controlled valve in the water line, the fluid pressure pipe connected with the water pipe between the vaporizer and fluid pressure valve, the fluid pressure valve comprising a pressure chamber, a spring controlled valve stem normally closing the water inlet opening thereto and adapted to open the inlet under combined water and air pressure and means for controlling the admission of fluid pressure to the valve comprising a diaphragm valve, a magnet valve, and a hydrograph in circuit with the magnet valve for controlling the magnet.

4. Humidifying apparatus comprising a water supply pipe with a vaporizer and a spray nozzle thereon, a fluid supply pipe leading to the water pipe, a fluid pressure controlled valve in the water line, and means for controlling the action of same comprising a diaphragm valve and magnet valve in the fluid pressure line, and a hydrograph comprising an atmospheric responsive member and a circuit breaking member actuated by the atmospheric responsive member in circuit with the magnet.

5. Humidifying apparatus comprising a water supply pipe with a vaporizer and spray nozzle thereon, a fluid supply pipe leading to the water supply pipe, a fluid pressure controlled valve in the water line with connections for admitting water and air thereto, and means for controlling the same comprising a diaphragm valve and electromagnetic valve in the fluid pressure line, and a hydrograph for controlling the action of the electromagnetic valve.

6. Humidifying apparatus comprising a water supply pipe with a vaporizer and spray nozzle thereon, a fluid supply pipe leading to the water supply pipe, a fluid pressure controlled valve in the water line with connections for admitting fluid and water pressure to a common chamber therein, and means for controlling the fluid pressure controlled valve comprising a diaphragm valve and an electromagnetic valve in the fluid pressure line, and a hydrograph for controlling the action of said magnetic valve.

7. Humidifying apparatus comprising in combination with a fluid pressure pipe having a magnet valve therein, a water supply

pipe and a spray nozzle, a water regulating valve in the water supply pipe having a water pressure chamber in communication also with the fluid pressure pipe, pressure responsive means associated with said pressure chamber for opening said water regulating valve upon admission of fluid pressure to said pressure chamber, and a hydrograph to control the action of the fluid pressure.

8. Humidifying apparatus comprising in combination with a fluid pressure pipe having a magnetic valve therein, a water supply pipe and a spray nozzle, a water regulating valve in the water supply pipe having a water pressure chamber in communication also with said fluid pressure pipe, a spring for closing said valve against the water pressure, means for adjusting the pressure of said spring, and pressure responsive means associated with said pressure chamber for opening said water regulating valve upon admission of fluid pressure to said pressure chamber from said fluid pressure pipe, and a hydrograph for controlling the action of the fluid pressure.

9. Humidifying apparatus comprising in combination with a fluid pressure pipe having a magnetic valve therein, a water supply pipe and a spray nozzle, a spring-closed water regulating valve in the water supply pipe having a water pressure chamber in communication with said fluid pressure pipe, and a diaphragm closing an opening from said pressure chamber, and connections between said diaphragm and valve for opening said water regulating valve upon admission of fluid pressure to said pressure chamber, and a hydrograph to control the fluid pressure.

10. Humidifying apparatus comprising in combination with a fluid pressure pipe having a diaphragm valve therein, a water supply pipe and a spray nozzle, a water regulating valve in the water supply pipe having a water pressure chamber in communication with said fluid pressure pipe, said valve having an adjustable plunger for regulating the amount of opening thereof, and pressure responsive means associated with said pressure chamber for opening said water regulating valve upon admission of fluid pressure to said pressure chamber, and a hydrograph and magnet valve to control the fluid pressure action.

11. Humidifying apparatus comprising in combination with a fluid pressure pipe having a diaphragm valve therein, a water supply pipe and a spray nozzle, a water regulating valve in the water supply pipe having a water pressure chamber in communication with said fluid pressure pipe, said valve having an adjustable plunger for regulating the amount of opening thereof, a spring for closing said valve against the water pressure, means for adjusting the pressure of said spring, and pressure responsive means associated with said pressure chamber for opening said water regulating valve upon admission of fluid pressure to said pressure chamber, and a hydrograph for controlling the fluid pressure.

12. A fluid pressure control means for humidifying systems comprising vaporizers connected to a fluid pressure pipe and a water supply pipe, said control means comprising a common fluid and liquid pressure chamber and operating upon a change in pressure in the fluid pressure pipe to shut off the water supply at each vaporizer, a magnet valve and a diaphragm valve in the fluid pressure pipe and a hydrograph controlling the same.

13. Humidifying apparatus comprising in combination with a fluid pressure pipe having a magnet valve and a diaphragm valve therein, a water supply pipe and a spray nozzle, a vaporizer having a mixing chamber communicating with said spray nozzle and with the fluid pressure pipe, a water regulating valve in the water supply pipe having a water pressure chamber in communication with said mixing chamber, and pressure responsive means associated with said pressure chamber for opening said water regulating valve upon an increase of fluid pressure in said fluid pressure pipe, and a hydrograph to control the fluid pressure.

14. Humidifying apparatus comprising, in combination, a water pipe, a fluid pressure pipe with a hydrograph and valve for controlling the same, a spraying nozzle communicating with the fluid pressure pipe, and a water regulating valve in the water line having a water pressure chamber and connections thereto for admitting both air and water, and a valve therein normally closed against either water or air pressure but responsive to open under the combined water and air pressure.

15. Humidifying apparatus comprising, in combination, a water pipe, a fluid pressure pipe in which the pressure is less than the pressure in the water pipe, a hydrograph and valve to control the same, a spraying nozzle communicating with the fluid pressure pipe, a water regulating valve with a water pressure chamber in the water line and a connection from the fluid pressure line thereto, said water regulating valve normally closed against either water or fluid pressure but responsive to the combined water and fluid pressure to open and permit continued flow of water therethrough.

16. Humidifying apparatus comprising, in combination, a water pipe, a fluid pressure pipe, a fluid pressure valve in the water line comprising a valve body, a pressure actuated valve stem therein, constructed and arranged to operate under combined liquid and fluid

pressure, and a hydrograph for controlling the same.

17. Humidifying apparatus comprising, in combination, a water pipe, a fluid pressure pipe, a fluid pressure controlled valve in the water line constructed and arranged to operate under combined liquid and fluid pressure, a by-pass in the fluid pressure line, a diaphragm and a magnet valve in said by-pass and a hydrograph controlling all the valves.

In testimony whereof, I have signed my name to this specification.

GEORGE W. D'ARCY.