W. S. JOHNSON.

HYGROMETRIC VALVE CONTROLLING DEVICE.

APPLICATION FILED MAY 10, 1905.

924,235.

Patented June 8, 1909.

2 SHEETS—SHEET 1.

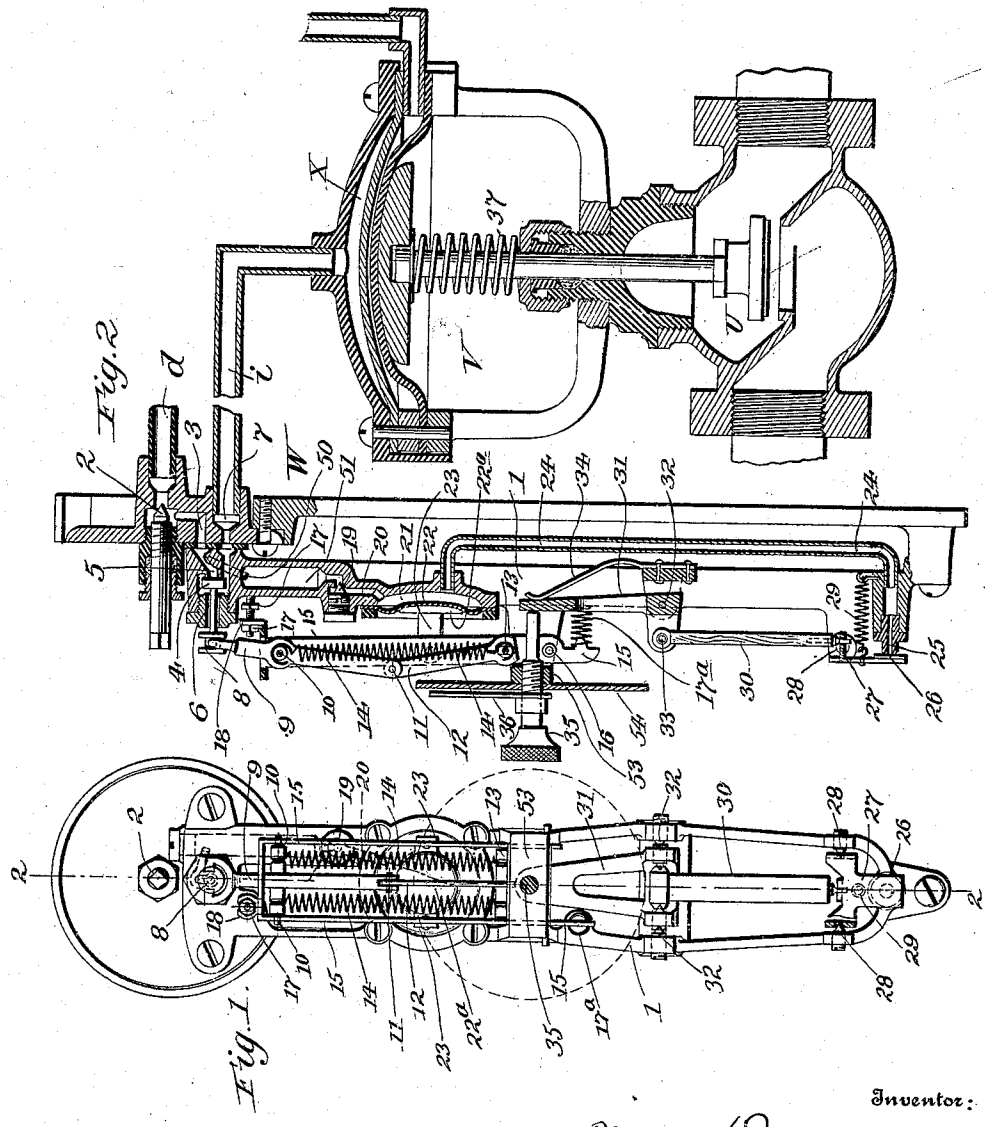


Fig. 2.

Fig. 1.

Witnesses

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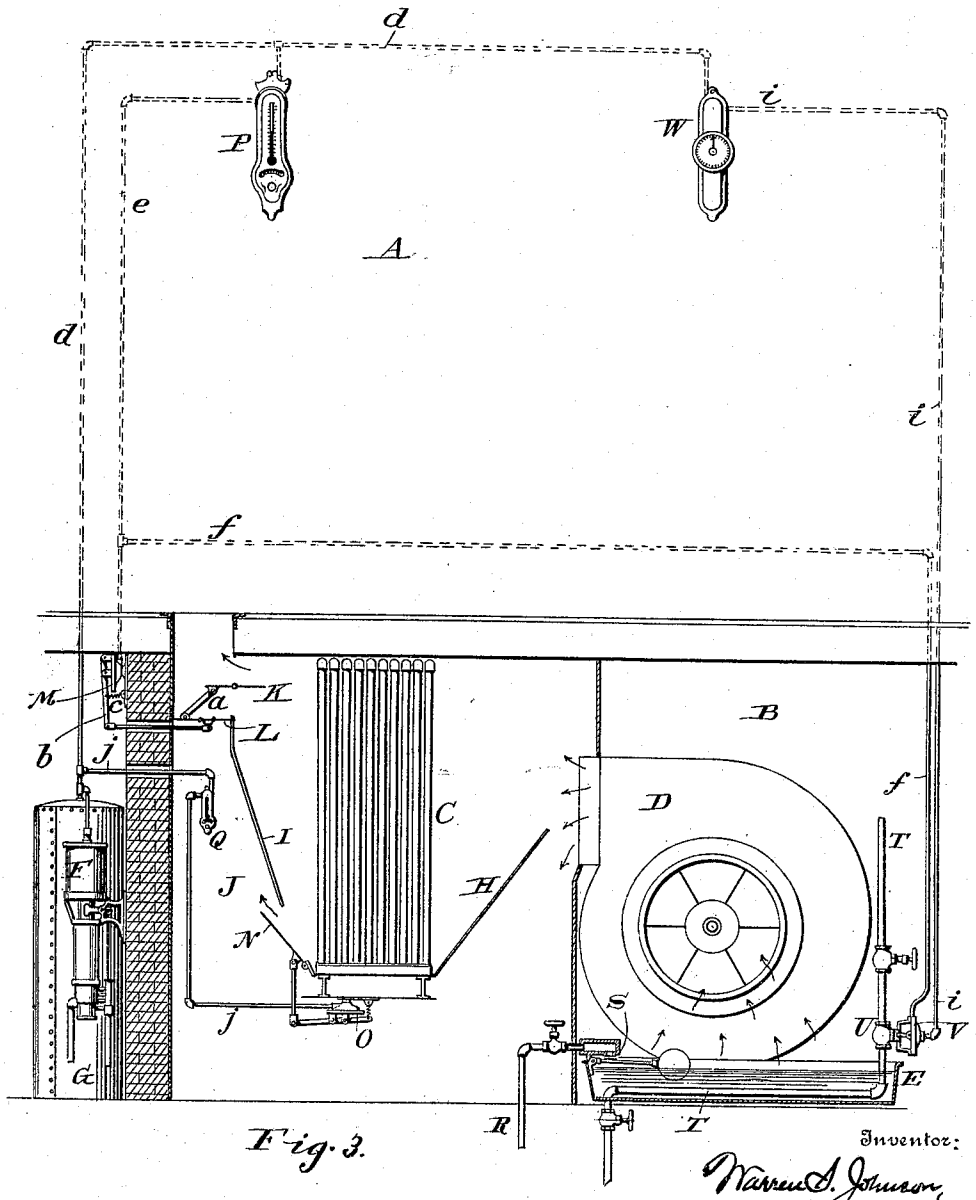


Fig. 3.

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UNITED STATES PATENT OFFICE.

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HYGROMETRIC VALVE-CONTROLLING DEVICE.

No. 924,235. Specification of Letters Patent. Patented June 8, 1909.

Application filed May 10, 1905. Serial No. 259,778.

To all whom it may concern:

Be it known that I, WARREN S. JOHNSON, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Hygrometric Valve-Controlling Devices, of which the following is a specification.

This invention pertains to a device for measuring or ascertaining the percentage of moisture in the surrounding air or medium, and controlling or throwing out of action, according to variations in such percentage, a device for supplying or adding moisture to the air or surrounding medium.

The present invention is primarily designed for use in or as a part of a complete system including heating apparatus, temperature-regulating apparatus, and a humidifier or apparatus for supplying moisture, as well as the device for measuring or ascertaining the percentage of moisture.

In the accompanying drawings, Figure 1 is a front elevation of the device for measuring or ascertaining the percentage of moisture, with the dial, indicator and thumb-button removed, and the dial indicated in dotted outline; and Fig. 2 is a vertical sectional view of the device for measuring or ascertaining the percentage of moisture, taken on the line 2—2 of Fig. 1, and through a valve motor and valve controlled thereby. Fig. 3, a diagrammatic view illustrating the device of Figs. 1 and 2 as embodied or incorporated in a complete heating and ventilating system.

In said figure A indicates a room or an apartment which receives air at proper temperature from a preparing or moistening chamber B, which air is forced over heating coils C by a fan D, being first charged with moisture or vapor arising from an evaporating pan E. A compressed air reservoir or holder G is provided into which air is forced by a pump F to give the necessary pressure for the operation of the temperature and moisture-regulating devices. The temperature-regulating mechanism constitutes no part of the present invention, hence need not be further described, but a thermostat P, controlling the same, is indicated in Fig. 1.

The device for measuring or ascertaining the percentage of moisture is indicated by W, and the pipe by which air is conveyed from the reservoir G to said device W is indicated by the letter *d*. The pipe connecting the said device with the valve which controls the supply of steam to the evaporating coil T within the evaporating pan E, is shown at *i*. It will be understood, however, that the valve U may either control the supply of steam for effecting evaporation or may directly control the supply of water, which may be delivered in a spray or other suitable form.

Referring to Fig. 2, W represents, as a whole, the device for measuring or ascertaining the percentage of moisture. 1 is the base on which the device is built, which also serves to attach it to a wall or other support; *d* is the pipe conveying compressed air from a reservoir, accumulator or other source, to the device W; and *i* is the pipe leading from the said device to the humidifier or its steam pipe valve motor. 2 is a pin-valve for shutting off the supply of air by hand when not wanted. When the device W is operative, the valve 2 must be open. 3 is a passage leading from the pipe *d* to a valve 4, which is made to play between two seats or ports. In the position shown in Fig. 2, the valve 4 closes the port 5. In reversing, the valve closes the port 6. Port 6 leads to the open air, but when it is closed the compressed air system will be sealed at that point. With the valve in such position, however, there will be a free passage of the compressed air from the pipe *d* through port 5 and passage 7 to the connecting pipe *i*, leading to a valve motor V, controlling a humidifier. Motor V is for convenience of description termed the primary motor. Should the valve 4 return to the position shown in Fig. 2, port 5 will be closed and port 6 opened, so that any air under pressure in primary motor V and pipe *i* will escape to the open air. The valve 4 is in effect a supply-and-waste valve and is sometimes called a three-way valve. It is supplied with a stem, having a grooved head 8 clutched by the forked lever 9, Figs. 1 and 2, fulcrumed at 10 and linked at 11 with a companion lever 12, fulcrumed at 13. The fulcrum 13, however, is a sliding one, while fulcrum 10 is fixed. When the companion levers 9 and 12 are flexed at 11, the shortening is allowed by the sliding fulcrum 13. The axes 10 and 13 forming the fulcrums are connected by the light retractile springs 14—14, which tend to "knuckle" the joint 11 when left free to do so. The fulcrums 10 and 13 are not set in the base of the device W

but are set in the light frame 15, which is itself fulcrumed at 16 in the base 1. The opposite end swings freely between stop nuts 17, 17, which limit the swing of the lug 18. As before stated, the lever 9 has a fork which fits into the groove of the valve-head 8. Supposing valve 4 be seated on port 5, as shown in Fig. 2, and that pressure be brought to bear on frame 15 to push its free end to the right, it will be seen that the grooved valve head 6 becomes the fulcrum of the lever 9 and as 15 moves, the toggle 9—12 will gradually straighten until the joint 11 will pass a line drawn through the points 10 and 13, and become flexed in the opposite direction by the tension of the springs 14, 14. At the moment when the change takes place, the pressure of the fork on the valve head will be reversed and applied in the opposite direction, and the valve 4 will be seated on port 6. The pressure to cause this action is normally produced by the spring 17^a pushing outward on the opposite end of the frame 15 beyond the fulcrum 16.

From the passage 3, a secondary or branch passage 50 leads into the chamber 51 and to the pin-valve 19, thence through passage 20 to chamber 21 fitted with a flexible diaphragm 22, the chamber and diaphragm constituting a fluid-pressure motor, which I term the secondary motor. A button 22^a presses against the diaphragm 22, and through standard 23 is fastened to the frame 15 and becomes an integral part of it. From chamber 21 a passage 24 leads to the port 25. The port 25 is closed by a valve 26 of metal or other suitable substance, the valve 26 being sustained by the bell-crank lever 27 fulcrumed at 28. The valve 26 is normally held against the port 25 by the retractile spring 29. A thin strip of suitable wood 30, cut crosswise of the grain, is swung at one end in trunnions and the other end pushes against the short horizontal arm of the bell-crank lever 27. It is a well known fact that wood expands or contracts under changes of moisture in a direction crosswise of the grain of the wood. Another bell-crank lever 31 is fulcrumed at 32 in the base 1. The lower arm of the lever 31 supports the trunnions 33 of wooden strip 30, and the upright arm is pressed upon on one side by the spring 34 and upon the other side by the rounded end of the thumb-screw 35. This thumb-screw passes through a bridge 53 on the base 1, to which bridge is fastened rigidly an index plate 54. To the thumb-screw 35 is fastened the pointer or index 36. The turning of the thumb-screw lengthens or shortens the distance between 33 and the horizontal arm of lever 27, and thus causes strip 30 to press more or less on said arm and thus to swing the bell-crank lever 27. The compressed air is supplied to the chamber through the pin-valve 19 and released from chamber 21 through the vent port 25. The pin-valve 19 is so set that when vent port 25 is sufficiently open by the removal of valve 26, the egress of air will be greater than the inflow at valve 19; there will then be no pressure in chamber 21. On the other hand, if 25 is closed, the pressure will accumulate through the opening controlled by pin-valve 19. As shown in Fig. 2, the ports are in the position above indicated. The vent port 25 is closed, pressure is in 21, the button 22^a and standard 23 have pushed the frame 15 to the left or outward, in which position of said parts port 5 is closed, port 6 is open, and there being no pressure in pipe *i* and motor chamber X, of primary motor V, valve U is open. Assuming now that the humidity of the air surrounding the device W increase, the strip of wood or other suitable material will lengthen by absorption of moisture and the upper end being fixed, the horizontal arm of the bell-crank 27 fulcrumed at 28, will be pushed upon and eventually will be moved against pull of spring 29, so as to raise the valve 26 from the vent port 25. Port 25 being larger than inlet 19, the pressure in 21 will be relieved and spring 17^a will be free to move frame 15 inward. This movement will reverse the position of valve 4; then port 5 will be open and port 6 closed. This will then furnish a passage for compressed air from pipe *d* to pipe *i* and motor chamber X. This pressure will overcome spring 37 and close valve U, thus shutting off the further supply of moisture which said valve controls, mediately or immediately. As the air or surrounding medium parts with its moisture, the strip 30 (Fig. 2) will give up some of its moisture, will shorten, and the spring 29 being relieved, will again close vent port 25, when all parts of the device will assume the positions shown in Figs. 1 and 2. The humidity of the surrounding medium having reached the desired percentage, the device W will shift the valves on the slightest change in such percentage, and thus a substantially fixed percentage will be maintained. When used with proper heating and temperature regulating devices, the device W will maintain such uniform percentage of moisture, and all conditions of the atmosphere or surrounding medium will continue practically constant.

The lever 31, screw 35, and spring 34, are for the purpose of adjusting manually the fulcrum 33, so as to cause the wood strip 30 to be effective at certain required percentages of humidity.

It will of course be understood that while the strip 30 is here shown and described as of wood, cut crosswise of the grain, this is merely one of many bodies capable of being affected by varying degrees of percentages of moisture.

Having thus described my invention, what I claim is:

1. In combination with a source of fluid pressure and with a primary fluid-pressure motor, a pipe or passage connecting the two; a vent port for said pipe; a valve controlling said port; a secondary motor or actuating device for moving said valve; and a hygrometric body combined with and serving to throw into action said secondary motor or valve-actuating device, substantially as described.

2. In combination with a fluid-pressure motor having a movable wall or member adapted to be forced in one direction by pressure within the member, and provided with a vent-port to relieve or destroy said pressure; a valve controlling said port; and a hygrometric body mechanically connected with said valve and serving to effect or control movement of said valve and consequent opening and closing of the vent-port in accordance with variations in humidity of the surrounding medium.

3. In combination with a fluid-pressure motor 21, 22, having a vent port 25; a valve 26 for controlling said port; a lever 27 carrying said valve; and a hygrometric body 30, fixed at one point and arranged to bear at another upon the lever 27 and thereby to move the lever and valve in accordance with changes in percentage of humidity of the surrounding medium.

4. In combination with a fluid-pressure motor 21, 22, provided with a vent port 25; a valve 26 for controlling said port; a hygrometric body 30 adapted to effect movement of said valve; and means for adjusting the position of the hygrometric body and thereby determining the degree or percentage of humidity of the surrounding medium at which it shall act upon and move the valve.

5. In combination with a fluid-pressure motor 21, 22, having a vent port 25 and a port-controlling valve 26; a hygrometric body 30 adapted and arranged to effect a movement of said valve relatively to its port; a lever 31 carrying said body; and means for determining the adjustment of lever 31 and thereby controlling the action of valve 26.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WARREN SEYMOUR JOHNSON.

Witnesses:

ADALINE A. JOHNSON,

CLIFFORD A. LOEW.