June 26, 1928. 1,675,302.

J. ROEMER

HYGROSTAT

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Fig. 1

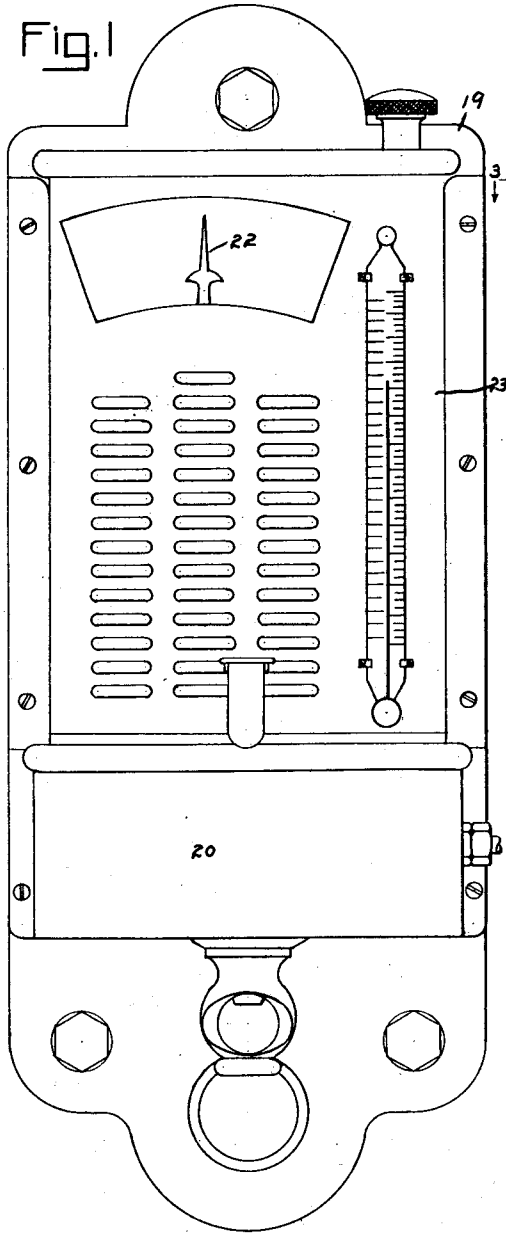


Fig. 2

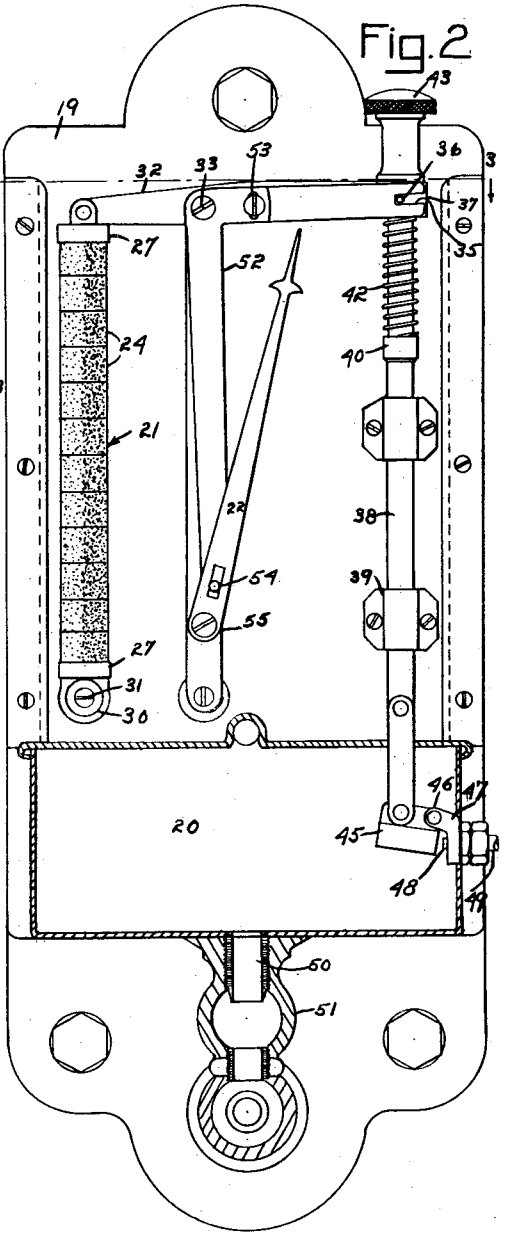
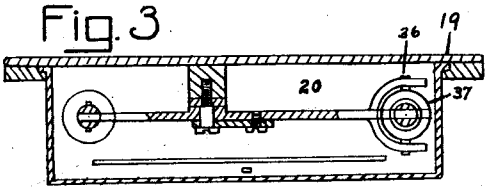


Fig. 3



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Fig. 4.

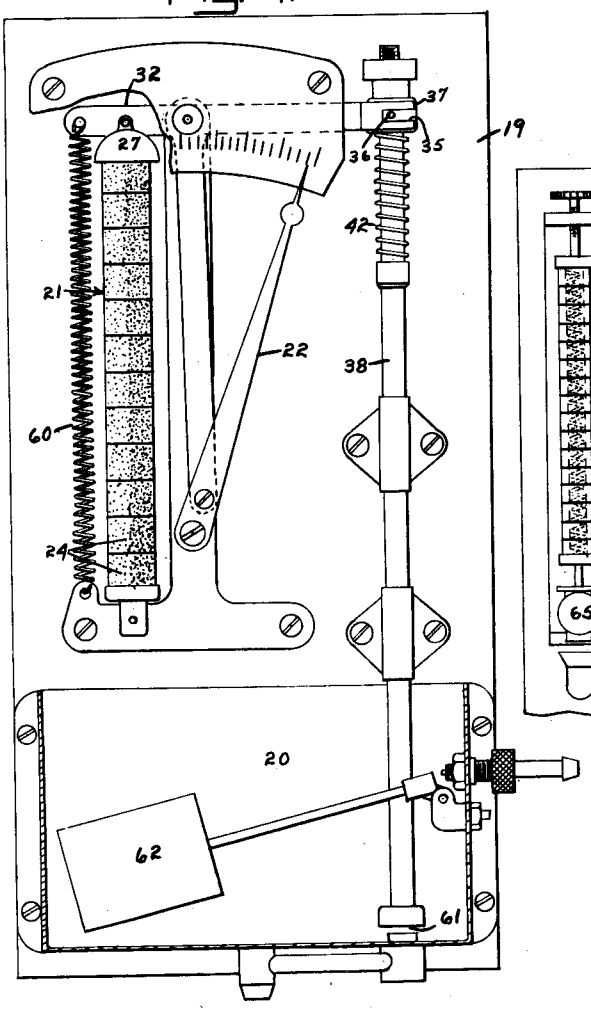


Fig. 5

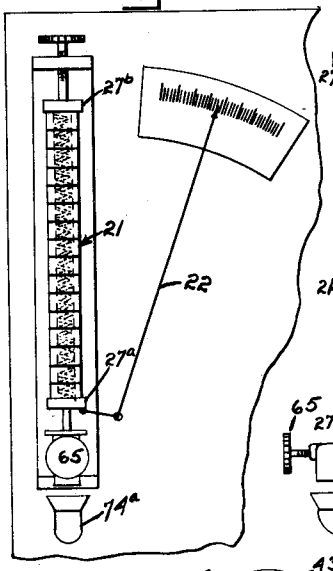
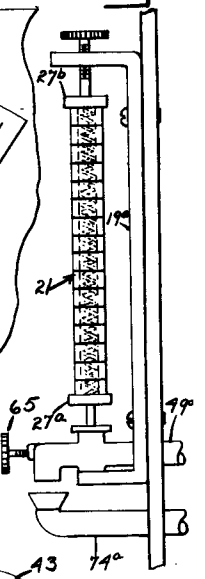


Fig. 6



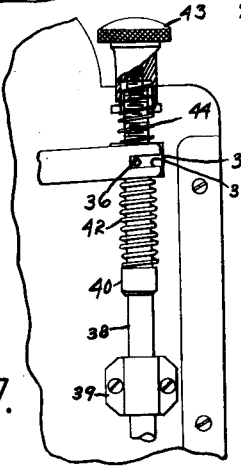


Fig. 7.

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Fig. 8

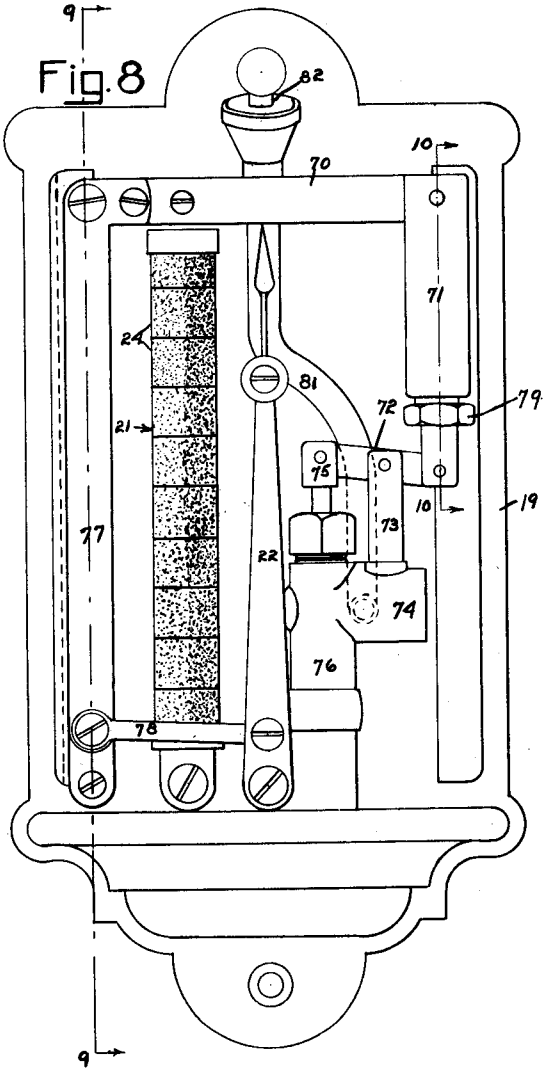
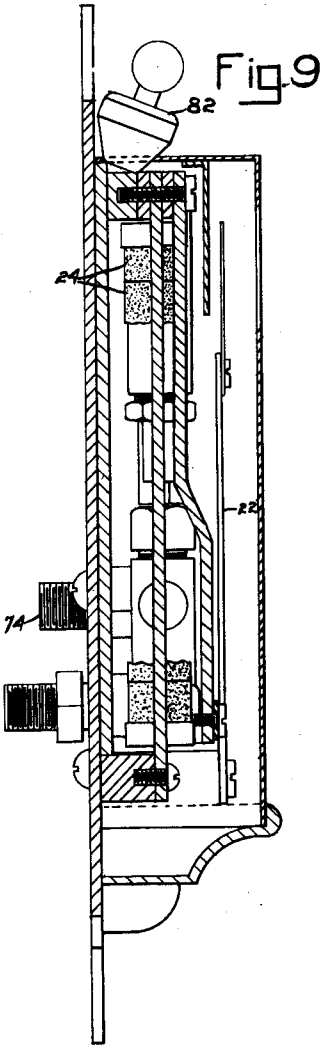


Fig. 9



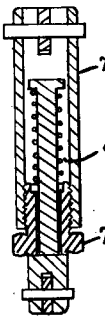


Fig. 10

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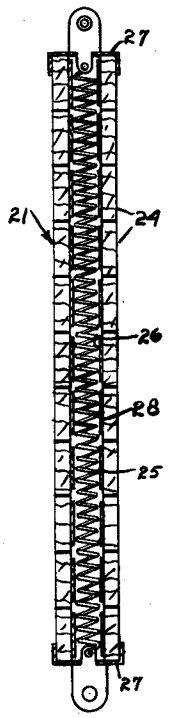


Fig. 11

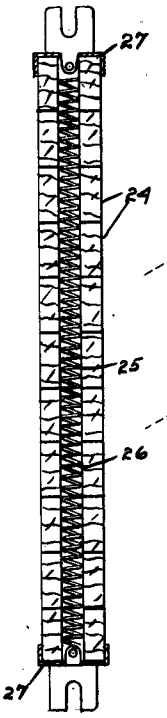


Fig. 12

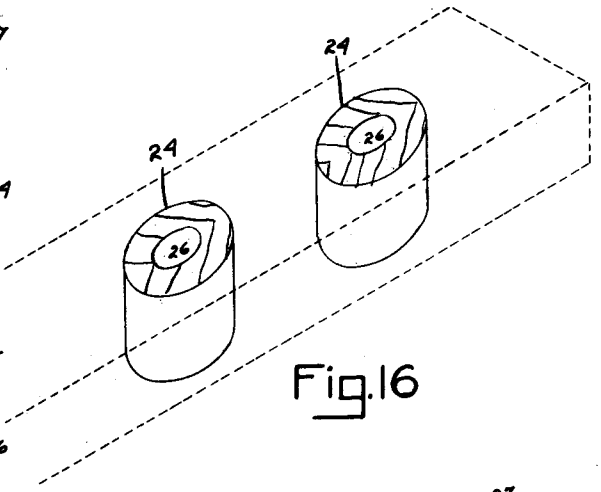


Fig. 16

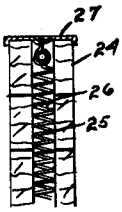


Fig. 13

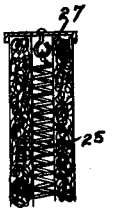


Fig. 14

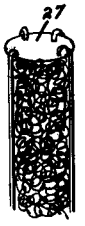


Fig. 15

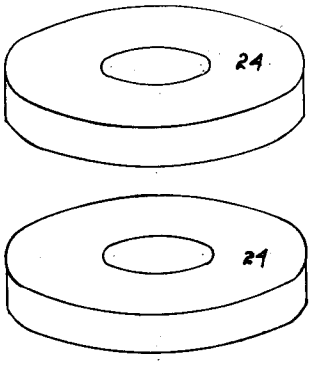


Fig. 17

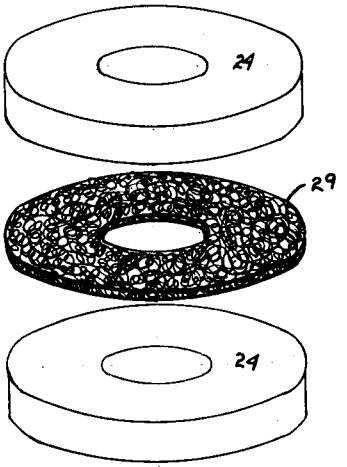


Fig. 18

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Patented June 26, 1928. 1,675,302

UNITED STATES PATENT OFFICE.

JULIUS ROEMER, OF LAKEWOOD, OHIO.

HYGROSTAT.

Application filed April 13, 1927. Serial No. 183,445.

This invention relates to humidity apparatus, and has for its object the provision of an improved operating element for use in humidity indicating and controlling apparatus; the provision of an improved construction of humidoscope and humidostat; the provision of a humidity controlling device which can be readily adjusted for desired variations in humidity and which shall not be injured by accidental variations from the desired condition; while further objects and advantages of the invention will become apparent as the description proceeds.

In the drawings accompanying this specification and forming a part of this application I have illustrated several physical forms in which my inventive idea can be embodied.

Figure 1 is a front elevation of a face view of a wall humidostat embodying my improvements;

Figure 2 is a similar view of the same device, the removable casing being omitted, and the tank shown in section;

Figure 3 is a sectional view on the line 3—3 of Figure 2;

Figure 4 is a view similar to Figure 2 showing a modified form of operating mechanism;

Figures 5 and 6 are front and side elevations respectively of another embodiment of my invention;

Figure 7 is a sectional view through a part of the adjustable cap shown in Figures 1 and 2;

Figure 8 is a view similar to Figure 1 of a modified form of my invention;

Figure 9 is a section on the line 9—9 of Figure 8;

Figure 10 is a section on the line 10—10 of Figure 8;

Figure 11 is a section through the humidity responsive element;

Figure 12 is a view similar to Figure 11 of a variant form;

Figures 13, 14, and 15 are fragmentary views showing simplified forms of caps;

Figure 16 illustrates the method of producing the sections of my improved operating device, while

Figures 17 and 18 show methods of assembling the sections.

The embodiment of my invention herein disclosed comprises a base plate 19 adapted to be attached to a wall of a room and carrying a liquid receiving tank 20, a hygrometric element 21, a humidity indicator 22, control mechanism for controlling the flow of water from the tank 20, and a casing 23 for protecting the mechanism of the device.

My improved operating member or hygrometric element 21 consists of a series of small cylindrical wooden blocks 24 located axially in line and supported so as to be free to expand and contract in the direction of such line and preferably held together by means of a contractile spring 25, shown in Figures 11 and 12, passing through aligned longitudinal bores 26 in the different blocks, the ends of the contractile spring being secured to suitable caps 27. These blocks are cut cross wise of the grain of the wood as illustrated in Figure 16, and the wood from which the blocks are cut is chemically treated to render it more susceptible to the aqueous vapor content of the surrounding atmosphere in order to accurately maintain the predetermined degree of humidity. I also contemplate the use of compressed fiber such as wood pulp or cotton wool for constructing the hygrometric element 21, as illustrated in Figures 14 and 15. It is permissible to line the interiors of the blocks if desired with short sections 28 of metal tubing, as shown in Figure 11, but this, if employed, should terminate short of the end faces of the blocks. The blocks also may be assembled with layers of felt 29 between adjacent faces, as shown in Figure 18.

The blocks are preferably assembled at random since it is desirable that the grain should be in different directions in the different blocks owing to the fact that atmospheric moisture is absorbed more readily at the end of the grain than at the side thereof. Such an assemblage of blocks is very quickly and delicately responsive to the hygrometric condition of the surrounding atmosphere and expands with very substantial force while remaining substantially straight, its elongation being permitted by the spring which also holds the assemblage together during shipment and handling. The spring can also be used to assist in the operation of the instrument or it can be supplanted or supplemented by other external springs or weights.

As shown in Figure 2 one of the end caps 27 of the hygrometric element 21 is secured to a lug 30 on the base plate 19 by a screw 31, and the other end cap 27 is secured to one end of a lever 32 pivoted at 33 to the base plate 19. The other end of the pivoted lever

32 is yoked at 34 and slotted at 35 to engage trunnions 36 carried by a collar 37 slidable on the vertical rod 38 which is itself slidable in guides 39 carried by the base plate 19. The rod 38 carries a flange 40 below the collar 37, and between the flange 40 and the collar 37 is interposed a compression spring 42, and threaded upon the top end of the rod 38 is an adjustable cap 43 having a spring 44, shown in Figure 7, interposed between the cap 43 and the collar 37 to hold the cap 43 against accidental turning.

The rod 38 is pivotally connected to a block 45 which in turn is pivoted at 46 to a lug 47 on the inner wall of the tank 20 for operating a valve 48 which controls admission of water from the pipe 49 into the tank 20.

The bottom of the tank 20 is provided with an outlet 50 having connection with a water pipe 51 through which liquid is introduced into an evaporator (not shown).

Mounted upon the pivot pin 33 is a bellcrank 52 having at one end a slot 53 for adjustably connecting such end to the pivoted lever 32, and has the other end slidably connected by a slot and pin connection 54 to the humidity indicator needle 22 which is pivoted at 55 to the base plate 19.

In the construction just described a decrease of humidity in the air in the room in which the device is located causes a shrinking of the wooden blocks of which the hygrometric element 21 is composed resulting in a shortening of the length of such element under the influence of the spring 25, with a consequent shifting of the lever 32 on its pivot 33 and a raising of the rod 38 through its connection with the collar 37 thereby opening the valve 48 thus permitting an outflow of water to the evaporator, and such flow continues until a swelling of the hygrometric element 21 under the influence of the humidity of the atmosphere shifts the lever 32 in the opposite direction thus closing the valve controlling the opening to the pipe 49. At the same time the position of the indicator needle is shifted owing to its connections with the lever 32. The spring 42 is provided to prevent injury to the device in cases where the swelling of the hygrometric element 21 continues after the valve controlling the passageway to the pipe 49 is completely closed.

In the embodiment of my invention shown in Figure 4 the end of the lever 32 is extended beyond the connection with the cap 27 of the hygrometric element 21 and is connected by a contractile spring 60 to a fixed point on the base plate 19 which tends to maintain the rod 38 in a raised position for keeping open the outlet port 61 in the bottom of the tank 20. Float means 62 is provided in the tank 20 for controlling the flow of liquid into the tank. In this form a swelling of the hygrometric element results in a raising of the end of the lever 32 against the action of the spring 60 with a consequent depression of the rod 38 and a closing of the outlet port 61 thereby shutting off the flow of liquid from the tank until such time as a decrease of humidity in the atmosphere permits a shrinking of the hygrometric element 21.

The form shown in Figures 5 and 6 comprises a base plate 19^a fixedly attached to a wall of a room and having projecting therethrough and supported thereby an end of a supply pipe 49^a. The hygrometric element 21 is supported between an end cap 27^a carried by a valve interposed in the passage through the pipe 49^a and an end cap 27^b adjustable on the plate 19^a. After adjustment of the end cap 27^b has been made to obtain the desired degree of humidity any shrinking of the hygrometric element induced by the moisture content falling below a predetermined amount allows a raising of the end cap 27^a through action of the spring 25 and a consequent opening of the valve carried thereby to permit an increase in the amount of liquid delivered by the pipe 49^a to the evaporator feed pipe 74^a. The end of the pipe 49^a is also provided with a manually operated valve 65 for further regulating the flow of liquid. This form also may be provided with an indicator needle 22 as shown diagrammatically in Figure 5.

In the variation shown in Figure 8 the hygrometric element 21 is connected to a lever 70 pivoted at one end to the base plate 19 and has a rod 71 pivoted to the other end thereof and extending at a right angle thereto and pivotally connected to a short evaporator feed pipe 74. The other end of the lever 72 is pivotally connected to the stem 75 of a cutoff valve disposed in a water supply pipe 76 whereby fluctuations in the length of the hygrometric element 21 are transmitted to the valve controlling the flow of liquid to the evaporator feed pipe 74 from a source of water supply. In this form the indicator needle is actuated by a bellcrank 77 having one end adjustably connected to the lever 70 and the other end connected by a link 78 to the indicator needle 22. The rod 72 has an adjusting nut 79 and nut locking spring 80, shown in Figure 10.

The form disclosed in Figure 8 is provided with a tube 81 closed at its top end by a stopper 82 and connected with the pipe 74 leading to the evaporator and adapted to contain any suitable aromatic substance which volatilizes under the influence of heat.

From the above disclosure it will be obvious to those skilled in the art that I have provided a new and improved hygrometric element responsive to the humidity of a

room in which it may be located and effectively controlling the flow of liquid to an evaporating device.

It will therefore be apparent to those skilled in the art that the embodiment of my invention herein shown and described accomplishes at least the principal object of my invention.

At the same time it also will be obvious to those skilled in the art that the embodiment of my invention herein shown and described may be variously changed and modified without departing from the spirit of my invention or sacrificing the advantages thereof, and it therefore will be understood that the disclosure herein is illustrative only, and that my invention is not limited thereto.

I claim:

1. For use in an air humidifying system: a humidity responsive element comprising: a pair of end caps, a series of axially aligned cylindrical sections of moisture sensitive material interposed between said caps, and longitudinally yielding means for holding said sections substantially in line and said caps in alignment.

2. For use in an air humidifying system: a humidity responsive element comprising: a pair of end members, a series of aligned cross-grained wooden sections interposed between said caps, said sections being mounted with the grain extending in random directions.

3. For use in an air humidifying system: a humidity responsive element comprising: a pair of end caps, a series of axially aligned cylindrical sections of moisture sensitive material having central bores interposed between said caps, and a contractile spring disposed in said bores and connected to said end caps for holding said caps in alignment.

4. A humidity responsive element comprising: a pair of end caps, a series of axially aligned cylindrical wooden blocks cut across the grain of the wood interposed between said caps, said blocks being axially bored, and a contractile spring transversing said bores and secured to said caps.

5. In a humidity controlling device, in combination, a humidity responsive element comprising a series of aligned sections of moisture-sensitive material, abutment elements against which the end sections of said series abut, a movement-multiplying arm operatively connected to one of said abutment elements, a moisture-controlling valve having its movable member operatively connected to said arm, a graduated scale, an indicator needle mounted for movement over said scale and operating means for said needle adjustably connected to said lever.

6. In a humidity controlling device, in combination, a humidity responsive element comprising a series of aligned sections of moisture-sensitive material, a pair of abutment members between which said sections are located, one of said members being fixed and the other movable, a movement-multiplying lever operatively connected to said movable member, a moisture valve having a movable member, and operative connections between said lever and valve, said connections adapted to open said valve upon approaching movements of said elements and to close said valve upon a departing movement thereof, said connections including a spring and lost motion connection permitting relative departing movement of said members after said valve has become fully closed.

7. In a humidity controlling device, in combination, a humidity-responsive element comprising a series of aligned sections of moisture-sensitive material, abutment elements against which the end sections of said series abut, a movement-multiplying arm operatively connected to one of said abutments, a moisture controlling valve, operative connections between said arm and the movable member of said valve, said connections including adjustment provisions, a graduated scale, an indicator needle mounted for movement over said scale, and operating means for said needle connected to said lever, said last connections also including an adjusting element to compensate for said first adjustment provisions.

8. In a humidity controlling device, in combination, a base adapted to be secured to a wall, an abutment member carried by said base, a movement-multiplying lever pivoted to said base, an abutment member carried by said lever and spaced from said first abutment, a series of aligned sections of moisture sensitive material interposed between said abutment members, a valve casing carried by said base and having a seat, a movable valve member adapted to open and close said seat, a perforated casing carried by said base and surrounding the working parts, and an operative connection between said lever and valve member, said connection including relatively slidable members and a spring adapted to permit relative movement of said lever and valve members after the latter has become seated.

9. In a humidostat, a humidity responsive element comprising in combination a pair of end members, a series of cross-grained wooden sections interposed between said end members, said sections being recessed, and longitudinally yielding means located in the recesses of said sections and operatively connecting said end members whereby said sections are held substantially in alignment with each other and with said end members.

10. In a humidity controlling device, in combination a longitudinally expansible humidity responsive element, abutment elements between which said expansible element

is confined, one of said abutment elements being movable, a movement multiplying arm operatively connected to said movable abutment member, a moisture controlling valve, and operative connections between said arm and the movable member of said valve adapted to open said valve upon approaching movements of said abutment elements and to close said valve upon a departing movement of said abutment elements, said connections including adjustment provisions and also including a spring and lost motion connection permitting relative departing movement of said members after said valve has become fully closed.

In testimony whereof I hereunto affix my signature.

JULIUS ROEMER.