G. S. FABER.

AUTOMATICALLY CONTROLLED HUMIDIFYING APPARATUS.

APPLICATION FILED MAR. 6, 1917.

1,294,073.

Patented Feb. 11, 1919.

5 SHEETS—SHEET 1.

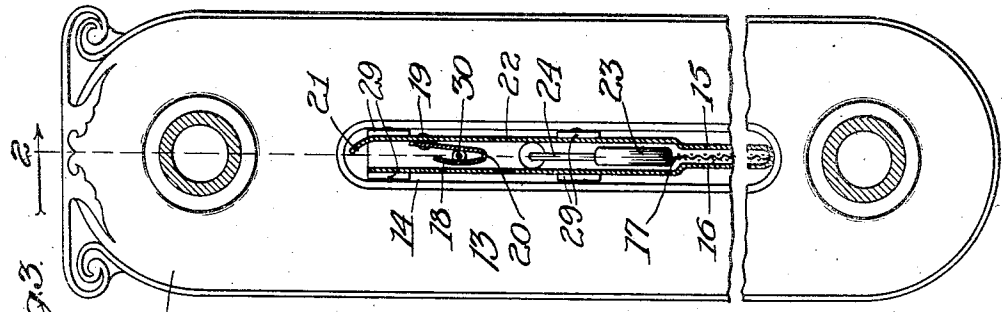


Fig. 3.

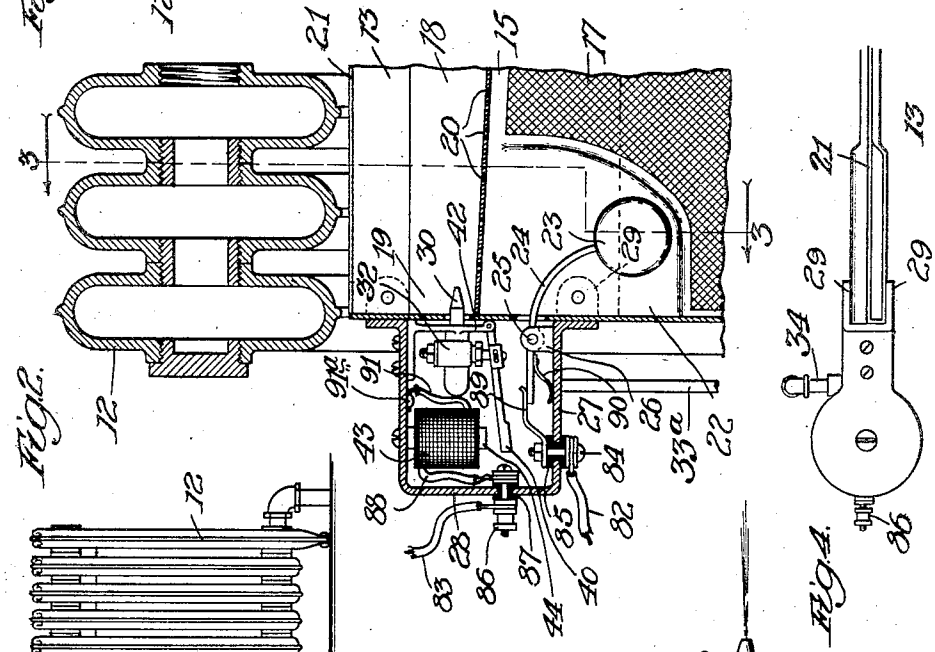


Fig. 2.

Fig. 4.

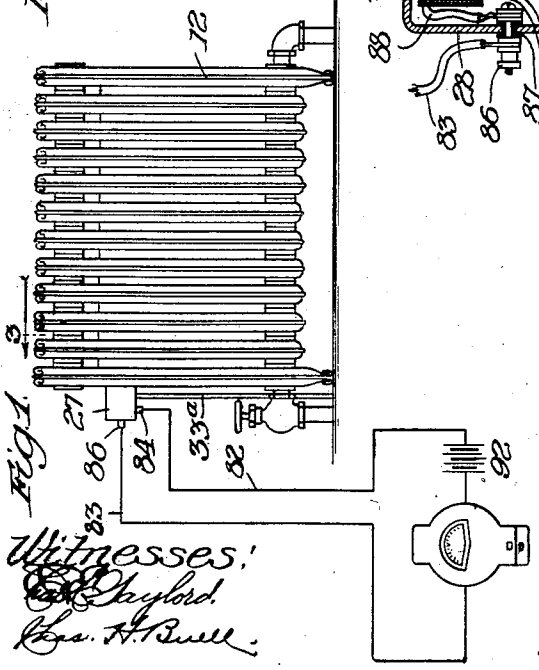


Fig. 1.

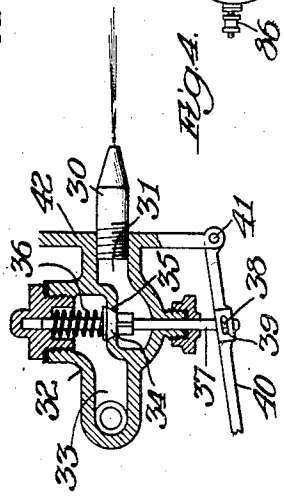


Fig. 5.

Witnesses:
Chas. H. Gaylord.
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Fig. 6.

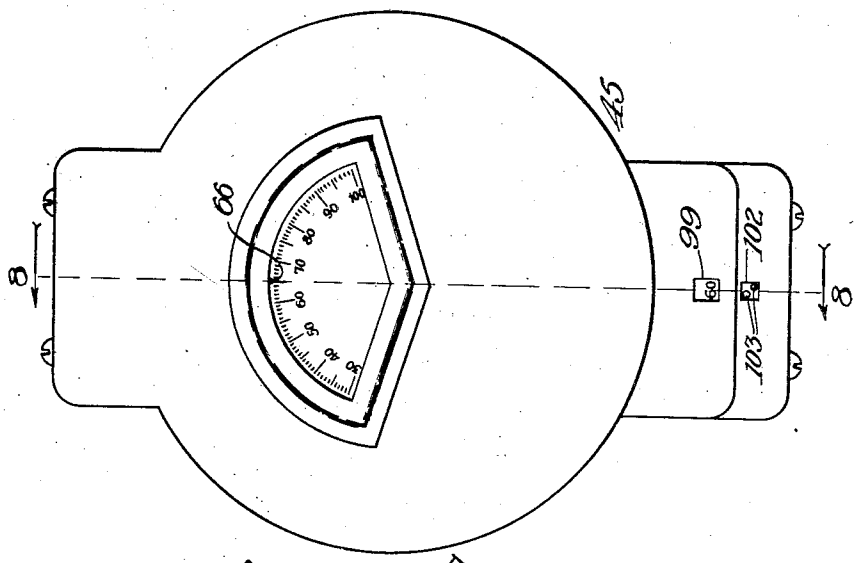
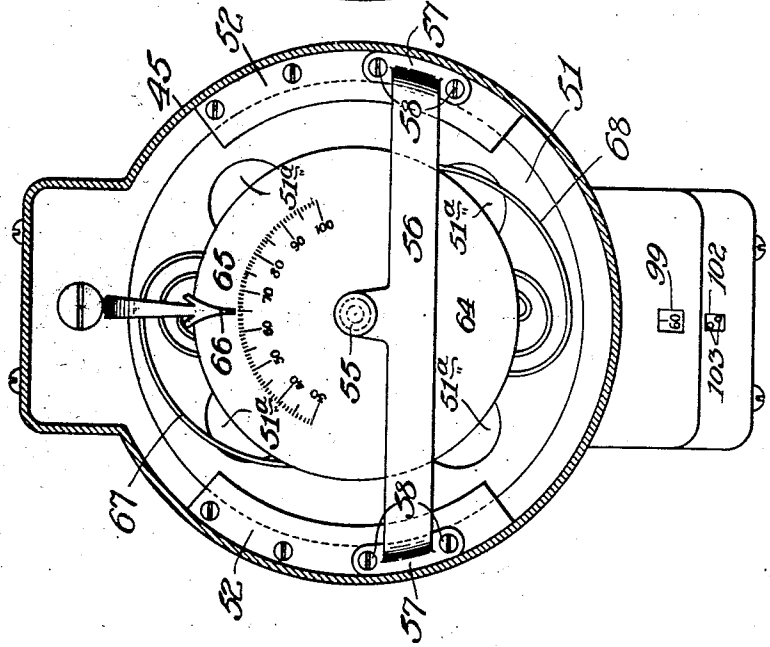


Fig. 7.



Witnesses:
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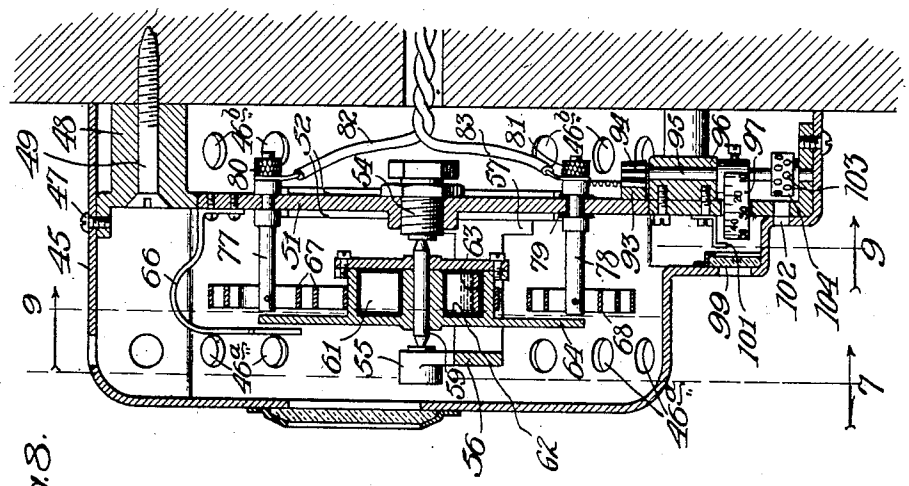


Fig. 8.

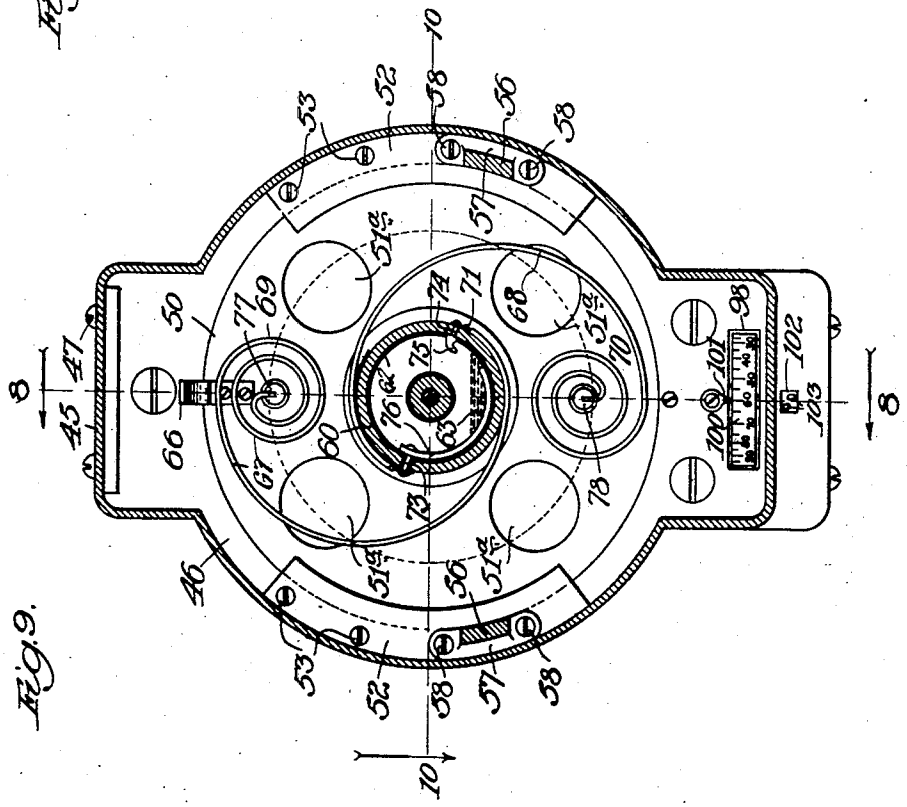


Fig. 9.

Witnesses:
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5 SHEETS—SHEET 4.

Fig. 11.

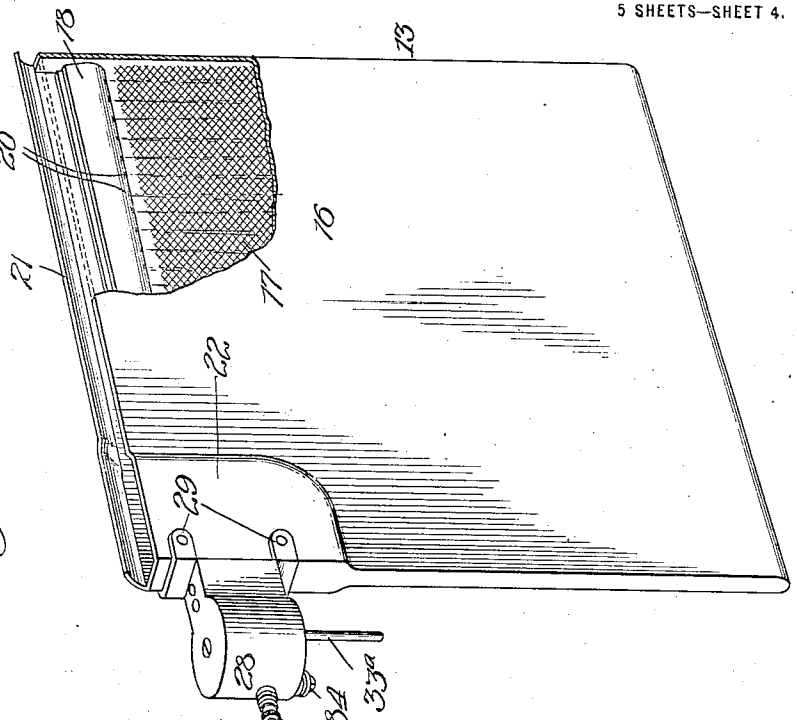
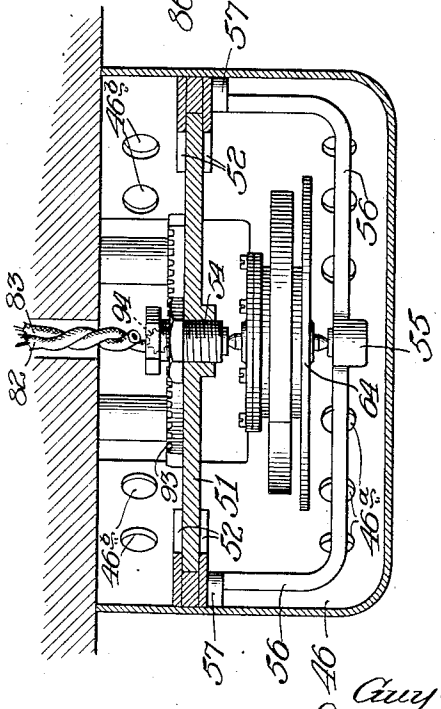


Fig. 10.



Witnesses:
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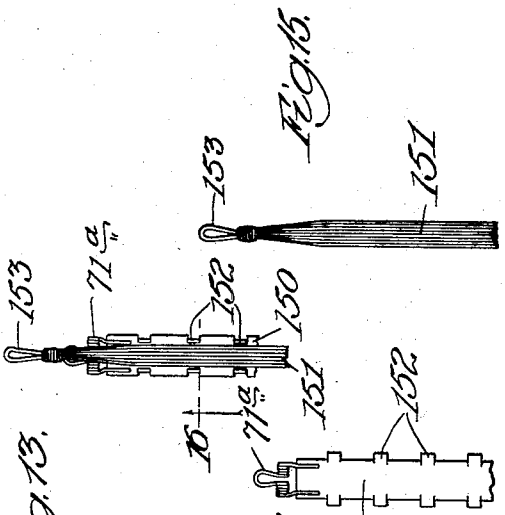


Fig. 13.

Fig. 14.

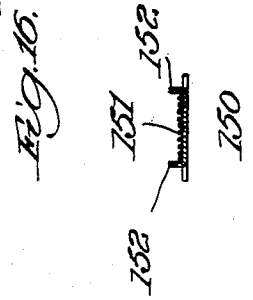


Fig. 16.

Fig. 15.

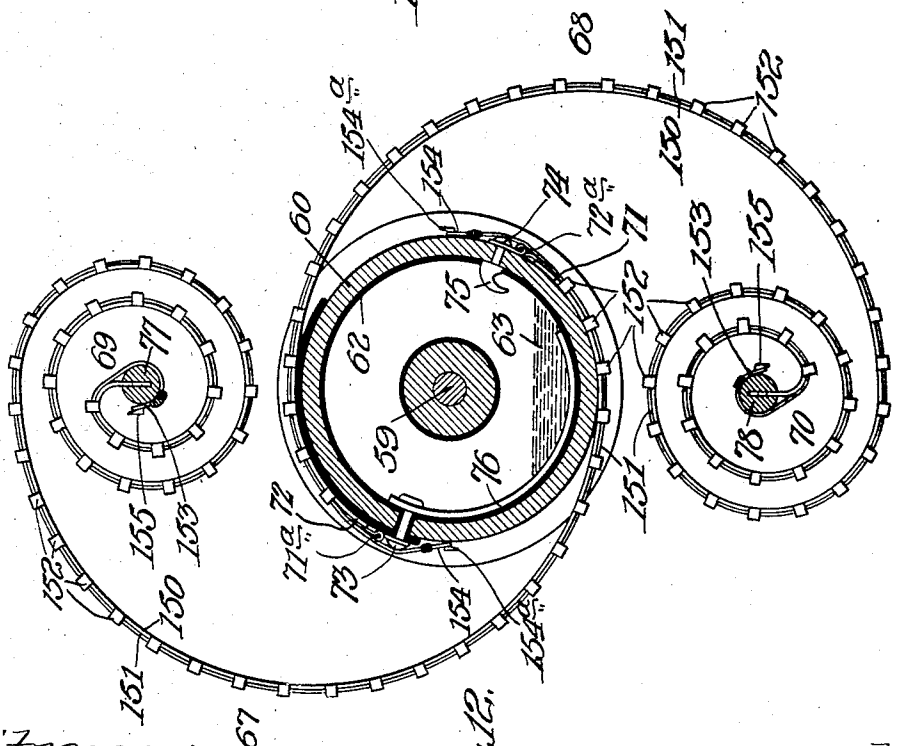


Fig. 12.

Witnesses:
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UNITED STATES PATENT OFFICE.

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AUTOMATICALLY-CONTROLLED HUMIDIFYING APPARATUS.

1,294,073. Specification of Letters Patent. Patented Feb. 11, 1919.

Application filed March 6, 1917. Serial No. 152,851.

To all whom it may concern:

Be it known that I, GUY S. FABER, a citizen of the United States, residing at Springfield, in the county of Sangamon and State of Illinois, have invented a new and useful Improvement in Automatically-Controlled Humidifying Apparatus, of which the following is a specification.

My invention relates more particularly, to automatically controlled apparatus for use more particularly in connection with steam or hot water radiators, for maintaining a desirable amount of moisture in the room, or rooms, heated by the radiator.

My primary objects are to provide novel, simple and positively operating apparatus of the character above stated, and which shall be sanitary, and other objects as will be manifest from the following description.

Referring to the accompanying drawings:

Figure 1 is a view in elevation of a steam radiator equipped with my improved apparatus, shown more or less diagrammatically, partly to illustrate the general electrical circuit connections.

Fig. 2 is a broken section taken longitudinally through the upper left hand corner of the structure shown in Fig. 1, the section being taken at the line 2 on Fig. 3 and viewed in the direction of the arrow.

Fig. 3 is a section taken at the line 3 on Fig. 1 and the irregular line 3 on Fig. 2 and viewed in the direction of the arrows, these views showing a portion of the radiator in section and a portion of the vaporizing mechanism forming a part of my improvement.

Fig. 4 is a plan view of the structure shown in Fig. 2 as located within the central space extending lengthwise through the radiator.

Fig. 5 is a view in vertical sectional elevation of the valve mechanism controlling the supply of water to the vaporizing pan shown in Fig. 2.

Fig. 6 is a face view of an electrical contact-making-and-breaking device operable under changes in the moisture-content of the air surrounding the instrument.

Fig. 7 is a similar view showing the casing of the instrument in section, the section being taken at the line 7 on Fig. 8 and viewed in the direction of the arrow.

Fig. 8 is a section taken at the lines 8 on Figs. 6 and 9 and viewed in the directions of the arrows.

Fig. 9 is a section taken at the irregular line 9 on Fig. 8 and viewed in the direction of the arrow.

Fig. 10 is a section taken at the line 10 on Fig. 9 and viewed in the direction of the arrow.

Fig. 11 is a perspective view of the vaporizing pan employed and shown in position in Fig. 2, together with the mechanism carried thereby, a portion of the pan being broken away.

Fig. 12 is an enlarged detail view of the central portion of the structure shown in Fig. 9 to bring out certain of the details of this portion of the structure.

Fig. 13 is a face view of an end of one of the similar spiral hygroscopic members employed.

Fig. 14 is a similar view of one of the elements of the member shown in Fig. 13.

Fig. 15 is a similar view of the other element thereof; and

Fig. 16, a section taken at the line 16 on Fig. 13 and viewed in the direction of the arrow.

As a preface to a detailed description of the construction shown, it may be stated that the general idea of the apparatus involves the provision of an instrument which is adapted to control an electrical circuit to control the supplying of water to a vaporizing surface located preferably adjacent the heating apparatus in the room, the moisture-content in the air of which is to be maintained at a certain degree. In the drawings a radiator, either steam or hot water, is illustrated at 12, the radiator being equipped with a water-vaporizing pan 13 which extends into the opening 14 provided through the central portion of the radiator as is common with radiators, the pan being secured in position in this opening, in any suitable manner (not shown). By preference the pan is provided of general rectangular form as shown in Fig. 11, its opposite side-walls 15 and 16 being spaced apart a relatively slight distance only, preferably about one-eighth of an inch, this pan being closed at its bottom, sides and ends as illustrated, and preferably containing a sheet of wire fabric, represented at 17, which extends upwardly in

the pan closely adjacent the bottom of a trough-member 18 extending across the upper end of the pan as represented, this trough-member being riveted, or otherwise secured, as indicated at 19, to the inner surface of the wall 15 of the pan, and having its bottom inclining downwardly from the left-hand side of the device in Fig. 2 toward its opposite end, the bottom of this trough containing perforations 20 arranged at intervals along its length, and the side of the trough 18 adjacent the side 16 being spaced therefrom. The side 15 of the pan preferably extends above the upper edge of the side 16 and is curved forwardly as represented at 21 in Figs. 3 to 11, for deflecting forwardly the vapor discharged from the pan as hereinafter described. The upper left-hand corner of the pan 13 is preferably widened, as represented at 22, to receive a float 23 fulcrumed at its arm 24, as indicated at 25, on a lug 26 rising from the bottom 27 of a casing 28 secured to the upper left-hand corner of an end-wall of the pan 13, as through the medium of the strap devices 29.

Water is supplied to the trough 18 for discharge therethrough into the pan 13, upon the fabric 17 in the particular construction illustrated, for subjection to the heat of the radiator to vaporize it, through a nozzle 30 which screws into the outlet 31 of a valve-casing 32 and projects through the adjacent end-wall of the pan 13 and into the trough 18, as represented in Fig. 2. The inlet 33 of the valve would, in practice, connect, as through the pipe 33ª, with any suitable source of water supply under pressure. The valve of the valve-casing 32 is represented at 34 and is normally held against its seat 35 by a coiled spring 36, the stem of the valve, represented at 37, being rigid with the valve and engaging at a pin 38 on its lower end, with the walls of an elongated slot 39 provided in a lever 40 fulcrumed at 41 on a depending bracket 42 in the casing 28 and with which the valve-casing 32 is connected, the lever 40 operating when raised, to open the valve 34 and permit water to be introduced into the trough 18 preferably in the form of a relatively fine stream. The opening and closing of the valve 34 is controlled through the medium of the electric means hereinbefore referred to, these means in the particular embodiment shown, comprising an electromagnet 43 mounted in the casing 28 with its core 44 arranged above the lever 40 which would be of magnetic material and forms an armature, and operating, when energized, to swing the lever 40 upwardly and open the valve 34, and hold the latter in open condition until the current through the magnet is broken, whereupon the spring 36 closes the valve 34 and shuts off the water supply to the trough 18.

The electromagnet 43 coöperates with the electric contact making-and-breaking instrument hereinbefore referred to and represented particularly in Figs. 6 to 10 inclusive, the following being a description of this instrument. 45 is a casing containing intermediate its ends a plate section 46 secured to the walls of the casing 45 as by the screws 47, this plate being provided with rearwardly extending lugs 48 at which the casing is adapted to rest against a wall or other support, and through which attaching screws 49 extend. The plate 46 contains a circular opening 50 in which a circular plate 51 is rotatably confined by means of arc-shaped plates 52 secured to the opposite faces of the plate 46, as by the screws 53, and overlapping the marginal edges of the plate 51, permitting this last-referred-to plate to be rotated in the casing 45 for the purpose of adjustment hereinafter described. The plate 51 is provided at its center with a bearing-member 54, which latter, with a bearing-member 55 in alinement therewith and provided on a yoke-shaped bar 56 secured at its enlarged ends 57 to the outer plates 52 as by means of the screws 58, form bearings for a shaft 59 arranged concentric with the disk-plate 51. The shaft 59 has rigidly secured thereto a receptacle 60 affording an annular chamber 61 which, when the receptacle 60 is of current conducting material, would be lined with insulating material as indicated at 62, this chamber being provided for housing a current-conducting material such as mercury, represented at 63, which only partially fills this chamber. The shaft 59 also, by preference, is provided on its forward end, with a disk 64 having the scale 65 adapted to coöperate with a pointer 66 secured to the front face of the plate 51, the shaft 59 together with its bearings and the parts carried by this shaft, being so constructed and arranged that the shaft will turn on its bearings upon applying thereto a relatively light force. The receptacle 60 is adapted to be rotated first in one direction, and then in the other, to make and break an electric circuit through the mercury 63, as hereinafter described, responsive to changes in the degree of moisture in the atmosphere surrounding the instrument. To this end the receptacle 60 is connected with, preferably a pair of members the form of which changes under variations in the moisture-content of the air, and in so changing rocks the receptacle 60, these members being so arranged that they will supplement each other in exerting force for turning the receptacle 60. In the particular arrangement illustrated these members,

represented at 67 and 68, are preferably formed of thin strips 150 of copper, say of approximately two-thousandths of an inch in thickness, and hygroscopic elements hereinafter described, these strips being formed at one end into the spirals indicated at 69 and 70 at which they are supported on posts 77 and 78, respectively, secured in the disk 51 at diametrically opposed points thereon, and of general spiral form at their opposite ends as indicated at 71 and 72 respectively, at which latter portions these strips overlie the circumferential wall of the receptacle 60, as represented especially in Fig. 12. The extremities of the portions 71 and 72 are preferably connected with the ends of spiral springs 71ª and 72ª, the other ends of these springs being connected with studs 73 and 74, respectively, fastened in the wall of the receptacle 60, the stud 74 terminating at its inner end in a contact-point 75 which extends inwardly through the insulating material 62, and the stud 73 being electrically connected with a contact-plate 76 which is positioned against the inner peripheral wall of the chamber 60, as represented in Figs. 9 and 12. The hygroscopic elements above referred to may be of any suitable material which lengthens and shortens under variations in the moisture-content of the air to which they are subjected. A desirable material for these elements is human hair from which the oil has been removed, this material lengthening upon increase of the moisture in the air, and shortening as the air becomes drier. In the particular construction illustrated the strips 150 are normally under tension tending to coil them and when the moisture in the air decreases, the hygroscopic elements operate, by shrinking, to uncoil the spring elements 150 and thus turn the receptacle 60 in clockwise direction in Figs. 9 and 12, and when the moisture increases, the hygroscopic elements expand and permit the elements 150 to move to more closely coiled condition, thus turning the receptacle 60 in the opposite direction. The strands of hair referred to are represented at 151, and extend lengthwise along the outer surface of the strips 150, being held thereon against lateral displacement, as by the lugs 152, bent up from the sides of the strips, the ends of the strands 151 being preferably secured to rings 153 and 154, the rings 153 being secured to the posts 77 and 78 as by the studs 155, and the rings 154 to studs 154ª. In the manufacture of the instrument the strips 150 would preferably be first coiled to form and applied to the position shown in the drawings, and the elements 151, in wet condition, then applied to position on the elements 150, the posts 77 and 78 preferably being rotatably adjustable to adjust the tension of the hygroscopic members 67 and 68.

The contacts 75 and 76 are so arranged relative to each other, and the mercury 63 is provided of such quantity that when the receptacle 60 is in a certain position, the contacts 75 and 76 will extend into the mercury and thus electrically connect together the copper strips 150; and the dial-scale 65, is so disposed on the plate 50 that it will, in coöperating with the pointer 66, indicate the degree of moisture in the atmosphere to which the instrument is subjected. In the particular arrangement as shown in the drawings the dial 65 registers with the pointer 66 at 65° humidity, in which position the contact 75 is out of contact with the mercury 63, but when the moisture-content of the air drops to approximately 50°, the shortening of the hygroscopic elements 151 causes the receptacle 60 to rotate to a position in which the contact 75 is immersed in the mercury 63, thus electrically connecting together the strips 150, for the purpose hereinafter explained.

The strips 150 serve not only to perform the function hereinbefore explained, but also serve as electric-current-conductors and to this end are electrically connected with the posts 77 and 78, the latter being insulated from the plate 51 as by the insulating material indicated at 79. The posts 77 and 78 are provided with electric-wire-clamping devices 80 and 81, respectively, connected with wires 82 and 83, respectively, the wire 82 being connected with a binding post 84 secured in the bottom of the casing 28 and insulated therefrom as indicated at 85, and the wire 83 being connected with a binding post 86 positioned in the wall of the casing 28 and insulated therefrom as at 87, this post connecting with the terminal 88 of the magnet 43. The post 84 is provided at its upper end with a contact arm 89 which, in the normal position of the float 23 is engaged by the inner end of the lever 24 which is provided with a leaf spring 90 which serves to augment the float 23 in forcing the lever 24 into close engagement with the arm 89, the parts just described being of such material that the wall of the casing 28 is in electrical connection with the arm 89 when the parts are in the position shown in Fig. 2. The other terminal 91 of the magnet 43, is grounded, as indicated at 91ª, to be in electrical contact with the casing 28. It will be understood from the foregoing that the circuit through the magnet 43 will be closed only when the wires 82 and 83 are electrically connected together through the medium of the contact making-and-breaking device of Figs. 7 to 10 in-

clusive, and the stem of the float engages the arm 89.

The operation of the apparatus is as follows: Assuming the parts of the apparatus to be in the positions shown in the drawings, which would represent a condition in which the moisture-content of the atmosphere surrounding the make-and-break device, is greater than the minimum degree desired, as soon as the moisture-content of the atmosphere becomes reduced to about 50°, considering the parts of the make-and-break device as adjusted to the positions illustrated, the members 67 and 68 will have straightened out to such an extent as to have rotated the receptacle 60 in a clockwise direction in Fig. 9 sufficiently far to cause the contact 75 to engage the mercury 63 thus closing the circuit through the magnet 43, and which is supplied with current as from a battery 92 interposed in the wire 82 (Fig. 1), thus energizing the magnet 43 which swings the lever 40 upwardly and opens the valve 34. This allows water to flow into the pipe 33ª through the valve casing 32 and out through the nozzle 30 into the trough 18, from which it discharges downwardly through the small holes 20 upon the screen 17 in the pan 13. The heat of the radiator 12 heats the walls of the pan 13 and the air contained therein to such a degree that the water discharging through the trough as stated, quickly vaporizes and does not accumulate in the device, the water thus vaporized discharging upwardly between the side of the trough and the adjacent wall of the pan and out through the top of the latter, where it mixes with the atmosphere and circulates throughout the room by reason of the heat thrown out by the radiator. The apparatus continues to supply water to the trough 18, until the moisture-content of the air surrounding the make-and-break device of Figs. 7 to 10 inclusive, increases sufficiently to cause the members 67 and 68 in moving to coiled condition to rotate the receptacle 60 in anticlockwise direction in Fig. 9 to a point where the contact 75 is withdrawn from the mercury 63, whereupon the magnet 43 becomes deënergized and the spring 36 closes the valve 34.

The float mechanism 23 is provided for the purpose of preventing the overflow of the pan 13 in the event that the heat of the radiator is not sufficient to vaporize the water supplied to the pan 13, as for example should the moisture-content of the atmosphere be less than that at which the instrument is set to operate, and the radiator is shut off. Should the water rise in the pan 13 to a point adjacent its top, it will lift the float 23, thereby swinging lever 24 in a counter-clockwise direction in Fig. 2 disengaging this lever from the arm 89 and thereby breaking the circuit through the magnet 43, whereupon the spring 36 closes the valve 34 and the supply of water to the trough is arrested.

In order that the air in which the instrument is located may freely circulate therethrough for obtaining the most effective results, I preferably perforate the disk 51 as represented at 51ª, and the side-wall of the casing 45 at opposite sides of the member 46, as indicated at 46ª and 46ᵇ.

The moisture-controlled make-and-break device, is shown in the drawings as of such form as to permit of it being set to maintain in the atmosphere any given moisture-content within a certain range, this being effected through the means of the rotatable plate 51 to set the posts 77 and 78 at different positions about the axis of the shaft 59. The lower rear edge of the plate 51 is provided with a curved rack 93 which meshes with a bevel-pinion 94 mounted on the upper end of a shaft 95 journaled in a bearing 96 secured to the rear side of the plate 46, this shaft carrying an arc-shaped plate 97 which extends through an opening 98 in the member 46 and is exposed to view through an opening 99 in the front wall of the casing 45. The surface of the plate 97 exposed through the opening 99 carries a scale 100 the graduations of which coöperate with a pointer 101 on the plate 46, these graduations being so calibrated that when the plate 51 is rotatably adjusted to shift the posts 77 and 78, the marking on the scale 100 which is thereby brought into registration with the pointer 101 will indicate the degree to which the moisture-content of the atmosphere must fall before the contact 75 will contact with the mercury 63. Thus by setting the plate 51 through the medium of the shaft 95 which may be operated in any suitable manner, as by means of a pin (not shown) which the operator inserts through the opening 102 in the front wall of the casing 45 and into the exposed one of the holes 103 in the periphery of a disk 104 rigid on the shaft 95, and by which this disk may be turned, the user of the device may cause any desired degree of moisture-content, to be substantially uniformly maintained in the atmosphere.

While I have illustrated a particular form of apparatus in which my invention is embodied, I do not wish to be understood as intending to limit it thereto, as the same may be variously modified and altered without departing from the spirit of my invention, it being my intention to claim my invention as fully and completely as the prior state of the art will permit.

What I claim as new and desire to secure by Letters Patent is:

1. A moisture-controlled electric make-and-break device comprising a receptacle mounted to be rocked, spaced contacts in said receptacle, means in said receptacle of a character to gravitate to the bottom of

the latter regardless of the position of the receptacle and operating, when the receptacle is tilted to one position, to electrically connect said contacts together and render said contacts out of electrical communication with each other when the receptacle is in another position, and means constructed and arranged to be affected by changes in the moisture-content of the atmosphere to which they are subjected and operating, when the moisture-content increases, to rotate said receptacle in one direction, and when the moisture-content decreases to rotate said receptacle in the opposite direction, said last-named means constituting a portion of the circuit in which said contacts are interposed.

2. A moisture-controlled electric make-and-break device comprising a receptacle mounted to be rocked, spaced contacts in said receptacle, means in said receptacle of a character to gravitate to the bottom of the latter regardless of the position of the receptacle, and operating when the receptacle is tilted to one position, to electrically connect said contacts together and render said contacts out of electrical communication with each other when the receptacle is in another position, and means constructed and arranged to be affected by changes in the moisture-content of the atmosphere to which they are subjected, and operating when the moisture-content increases to rotate said rotatable means in one direction, and when the moisture-content decreases to rotate said rotatable means in the opposite direction, said last named means involving separate members electrically connected with said contacts, respectively.

3. A moisture-controlled electric make-and-break device comprising a rotatably mounted receptacle adapted to contain a liquid which is a conductor of electricity, spaced electric contacts extending on the interior of said receptacle and adapted when the latter is rocked to one position, to contact with said liquid, and when the receptacle is rocked to another position to break the contact, hygroscopic elements secured to said contacts respectively, and relatively fixed at their other ends, and constructed and arranged to rotate said receptacle in opposite directions when the moisture-content of the atmosphere surrounding the device increases and decreases respectively, to alternately make and break electric connection between said contacts.

4. A moisture-controlled electric make-and-break device comprising a shiftable member operating when in one position to close an electric circuit and when shifted to another position to break the circuit, a hygroscopic member connected with said shiftable member and adapted to actuate the latter, and formed of an element of springy current-conducting material in the said circuit and an element of hygroscopic material, said last-named element coöperating with said first-referred-to element to shift said first-named member in one direction under a change in the moisture-content of the atmosphere and said last-referred-to element serving, by its spring-tension, to actuate said first-named member in the opposite direction under a different change in the moisture-content.

5. A moisture-controlled electric make-and-break device comprising rotatable means operating when in one position to close an electric circuit and when rotated to another position to break the circuit, and means constructed and arranged to be affected by changes in the moisture-content of the atmosphere to which they are subjected, and operating when the moisture-content increases to rotate said rotatable means in one direction, and when the moisture-content decreases to rotate said rotatable means in the opposite direction, said last-named means comprising hygroscopic elements in the form of coils arranged at opposite sides of said rotatable means, each of said coils being connected at one end to said rotatable means, these coils exerting pressure in the same direction against said rotatable means to turn the latter.

6. A moisture-controlled electric make-and-break device comprising a rotatably mounted receptacle adapted to contain a liquid which is a conductor of electricity, spaced electric contacts extending on the interior of said receptacle and adapted when the latter is rocked to one position, to contact with said liquid, and when the receptacle is rocked to another position to break the contact, hygroscopic elements in the form of coils arranged at opposite sides of said receptacle, said hygroscopic elements being secured to said contacts respectively, and relatively fixed at their other ends, and constructed and arranged to rotate said receptacle in opposite directions when the moisture-content of the atmosphere surrounding the device increases and decreases respectively, to alternately make-and-break electric connection between said contacts.

7. A moisture-controlled electric make-and-break device comprising a receptacle mounted to be rocked, spaced contacts in said receptacle, means in said receptacle of a character to gravitate to the bottom of the latter regardless of the position of the receptacle and operating when the receptacle is tilted to one position to electrically connect said contacts together and render said contacts out of electrical communication with each other when the receptacle is in another position, and means constructed and arranged to be affected by changes in the moisture-content of the atmosphere to which

they are subjected and operating when the moisture-content increases to rotate said receptacle in one direction and when the moisture-content decreases to rotate said receptacle in the opposite direction, parts of the construction being adjustable about the axis of rotation of said receptacle to set the device to operate under different degrees of humidity.

8. A moisture-controlled electric make-and-break device comprising a receptacle mounted to be rocked, spaced contacts in said receptacle, means in said receptacle of a character to gravitate to the bottom of the latter regardless of the position of the receptacle, and operating when the receptacle is tilted to one position to electrically connect said contacts together and render said contacts out of electrical communication with each other when the receptacle is in another position, and means constructed and arranged to be affected by changes in the moisture-content of the atmosphere to which they are subjected, and operating when the moisture-content increases to rotate said receptacle in one direction and when the moisture-content decreases to rotate said receptacle in the opposite direction, said receptacle and said last-named means being bodily adjustable about the axis on which said receptacle rocks, to set the device for operation under different degrees of humidity.

9. A moisture-controlled electric make-and-break device comprising a receptacle mounted to be rocked, spaced contacts in said receptacle, means in said receptacle of a character to gravitate to the bottom of the latter regardless of the position of the receptacle, and operating when the receptacle is tilted to one position to electrically connect said contacts together and render said contacts out of electrical communication with each other when the receptacle is in another position, and means constructed and arranged to be affected by changes in the moisture-content of the atmosphere to which they are subjected, and operating when the moisture-content increases to rotate said receptacle in one direction and when the moisture-content decreases to rotate said receptacle in the opposite direction, and a plate adapted to be rotatably adjusted, said plate carrying said receptacle and said last-named means, for the purpose set forth.

10. A moisture controlled electric make-and-break device comprising a supporting member, a plate axially adjustable on said supporting member, a receptacle journaled upon said plate to permit it to be rocked, spaced contacts in said receptacle, means in said receptacle of a character to gravitate to the bottom of the latter regardless of the position of the receptacle, and operating when the receptacle is tilted to one position, to electrically connect said contacts together and render said contacts out of electrical communication with each other when the receptacle is in another position, hygroscopic elements in the form of coils, each relatively fixed at one end to said plate and engaging at their other ends said contacts, respectively, said hygroscopic elements operating to rotate said receptacle in one direction when the moisture-content of the atmosphere surrounding the device increases and rotates said receptacle in the opposite direction and the moisture-content decreases for alternately making and breaking electrical connection between said contacts.

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