A. BRANDRIFF & S. SIMMERMAN.

Thermostatic Device for Controlling Dampers, Heat and Fire Alarms, &c.

No. 198,185. **Patented Dec. 18, 1877**

Fig. 1.

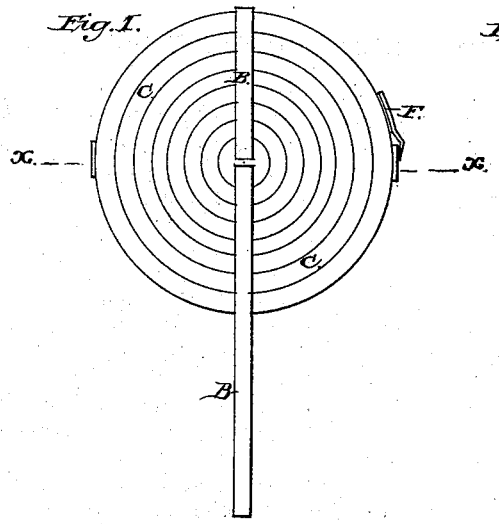

Fig. 2.

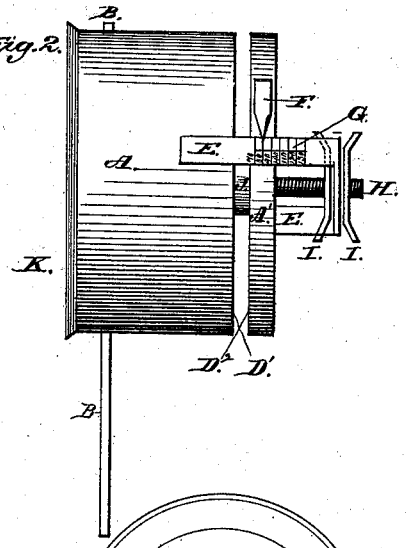

Fig. 3.

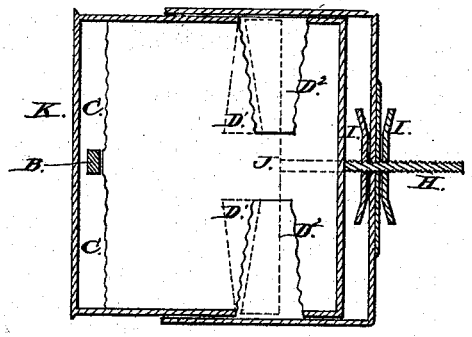

Fig. 4.

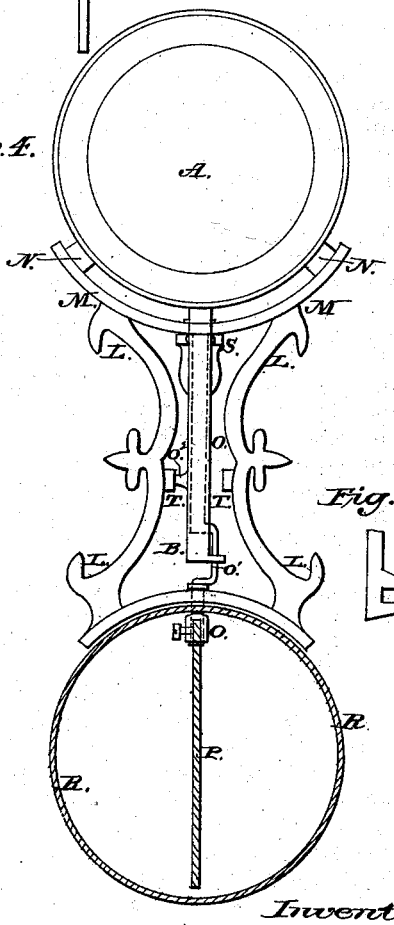

Fig. 5.

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UNITED STATES PATENT OFFICE.

ALFRED BRANDRIFF AND JACOB S. SIMMERMAN, OF MILLVILLE, N. J.

IMPROVEMENT IN THERMOSTATIC DEVICES FOR CONTROLLING DAMPERS, HEAT AND FIRE ALARMS, &c.

Specification forming part of Letters Patent No. **198,185**, dated December 18, 1877; application filed June 29, 1877.

To all whom it may concern:

Be it known that we, ALFRED BRANDRIFF and JACOB S. SIMMERMAN, of Millville, in the county of Cumberland and State of New Jersey, have invented a new and useful Improvement in Automatic Devices for Operating Heat-Regulating Devices, Heat and Fire Alarms, and for other Purposes, of which the following is a specification:

Figure 1 is a front view of our device with the lid K removed. Fig. 2 is a side view. Fig. 3 is a longitudinal section of the same, taken through the line *x x*, Fig. 1. Fig. 4 is a front view, showing the application of our device in operating a stove-damper. Fig. 5 is a view of the notch at the end of the lever in Fig. 4, which engages the crank of the damper-stem.

Similar letters of reference indicate corresponding parts.

Our invention has for its object to furnish an improved device for obtaining power and motion, at different degrees of temperature, sufficient to operate heat-regulating devices, heat and fire alarms, flood buildings in case of fire, and to accomplish other purposes.

The invention consists in providing an air-tight box with a head for obtaining motion, one or more heads for regulating purposes, and a lever for increasing the motion when required, which shall be operated by the expansion of a suitable amount of air contained therein.

A in the drawings is an air-tight box, of any suitable size and shape, made of metal or other material that will answer the purpose. To the back end of the box A is added a small compartment, A′, and connected with A by the hollow tube J, for the purpose of accommodating the head D^2. (See Figs. 2 and 3.)

In the front end of A is placed a corrugated head, C, Figs. 1 and 3, by which motion is obtained from the expansion of air within. The heads may be plain or corrugated. We prefer to corrugate them, on account of the greater amount of regularity, ease, and motion obtained.

In the back end of A and front of A′ are placed the heads D^1 D^2, Figs. 2 and 3, by means of which the box A may be regulated or set to act at different temperatures. By drawing out the heads D^1 D^2, which is accomplished by the screw H and nuts I I, the amount of vacuum will be increased, and, by pushing them in, the vacuum will be decreased. The greater the amount of vacuum in A, the greater will be the heat required to operate it, and vice versa.

A scale may be arranged by marking the two extreme points at which the box will operate, and dividing the intermediate space accordingly, (see Fig. 2, in which G is the scale, and F the pointer, which is made to move with the action of the screw H.)

One or more heads, D^1 D^2, may be used, the number depending upon the range of temperature required. In most cases one head, D^1, will be sufficient.

In the present size of the box A a range of temperature of about 30° Fahrenheit per head D may be obtained.

The lever B is placed across the head C, and secured to the center of C by a piece of wire fastened to the head, and passing around the lever. The short end from center of C passes through a hole in the side of the box A, serving the purpose of a hinge. (See Figs. 1, 2.) The object of the lever B is to increase the motion obtained by the head C. The short end being confined, the movement will be at the long end. When the head C moves, the long end will move an increased distance. The distance required for the lever to move at its longer end may be regulated by changing the length of either end from the center of C. The outer or longer end may be of such shape as its various applications may require.

In cases where enough motion may be had with the head C, the lever B may be dispensed with—for instance, in its application to a fire-alarm, where it is used for the purpose of breaking or connecting the electric circuit.

The required amount of air may be introduced into the box A by sealing it at a temperature sufficiently below that at which it is required to move the head C, or air may be forced in at the temperature required for it to act until the head C moves with sufficient force, and sealed at that point. By the last process a considerable amount of power may be obtained.

Fig. 4 is a front view of our device as applied to the operating of a stove-damper.

A is the air-tight box; B, the lever; O, the damper-stem; O^1, the crank; O^2, a projection on the damper-stem; P, the damper; R, a section of stove-pipe. L L are two arms or supports. They are secured to the pipe R at one end, and at the other end is a guard, M, to which the box A is secured by the screw and nut S. The box A is protected from reflected heat from the pipe by the guard M, and from conducted heat by the pieces of wood against which the box A rests at N N. The lever B has at its outer or movable end a projection corresponding with that in the drawing, Fig. 5, which engages the crank of the damper-stem at O^1. The damper is prevented from turning more than a quarter of a circle by the projection O^2 on the damper-stem coming in contact with the projections T T on the arms L L.

The damper P is shown standing open in the pipe R, and the air in the box A contracted. When the required amount of heat is applied the lever B will carry the damper one-quarter way round, and at right angles with the pipe R.

Having a suitably-constructed box, A, we next proceed to secure therein the requisite amount of air or gas. We prefer air on account of the greater ease of management. First make a small hole in the side of the box A, push the heads D^1 D^2 as far in as they will go by turning the nuts I I, and place the box in any suitable medium whereby the temperature of the same may be ascertained. We usually use water. Place the box in such position that the water will not run in the hole in the side. Bring the temperature of the water to about 35° Fahrenheit below that at which it is desired for the box to operate, at the lowest point of the scale, and seal air-tight. Then raise the temperature to the desired point for the box to operate, and note whether the head C moves with sufficient force; if so, mark accordingly on the scale opposite the pointer F; if not, note at what temperature it does move. The difference above or below will be the number of degrees to add to or take from the temperature at which the box was sealed. Then proceed as at first, having the requisite amount of air secured therein, and the lowest point of the scale marked. Next take the box out and draw the heads D^1 D^2 as far out as they will go by turning the nuts I I. Place the box back in the water and raise the temperature until the head C moves with sufficient force; note the temperature, and mark on the scale opposite the pointer F. Having the temperature at which it moves at the two extreme points of the scale, the intermediate space may be divided accordingly. The number of degrees at which the box is sealed will vary with different sizes and thicknesses of boxes.

The same results may be obtained for the lowest point of the scale, without the use of water, by drawing the heads D^1 D^2 out about 35° Fahrenheit. The box may be sealed temporarily with bees-wax. The heads may then be pushed in, and it may be noted whether the head C moves with sufficient force; if so, seal at that point; if not, remove bees-wax and draw the heads again more or less, as is indicated by the first trial. Having ascertained the lowest point of the scale, proceed to ascertain the highest point of the scale, as in the first mode, by raising the temperature of the water.

In the second mode it will be necessary to mark the points each time to which the heads are drawn out, and to make calculation for the difference in temperature between that of the room and that which is required for the box to operate.

If the amount of power required to operate the device be considerable, the air may be forced into the box, at the temperature required for it to operate, until the head C moves with sufficient force. This mode will apply where it would be inconvenient to reduce the temperature sufficiently low for the sealing-point.

The amount of power required to operate the different devices, if considerable, may be ascertained, and applied to the lever B at the time of sealing the box by the use of a spring with graduated scale. Apply the scale to the device to be operated, note the power required to move it; next attach it to the lever B, and cause it to raise the same amount at the temperature required for the box to operate at the two extreme points of the scale.

The mode of applying our device consists, in its different applications, in securing the box A in a suitable and convenient position to operate the device in question, and by making a connection of the lever B thereto. The differences in shape and construction of the various devices to which our device applies are so many that it would be impossible for us at this time to describe each in detail. We think it will be seen from the foregoing that when the lever B is properly attached to dampers, slides, doors, registers, and such other device as may be used to regulate the heating apparatus, the expansion of air within the box will cause the lever B to move, and carry with it the device to which it is attached, and when the temperature is lowered the air in the box will contract, and the lever B carry the device back again.

In making the different applications for the regulation of the heat of apartments, the box A may be placed in any convenient part of the room where the device could be connected with the lever B to advantage. If the box A is placed near the heating apparatus, it should be protected from both reflected and conducted heat.

In the different applications to heat and fire alarms that are operated by machinery,

and with spring or other motive power, the lever B would be connected with whatever device was used for setting the machinery in motion. For an alarm that would give one stroke of the hammer against a bell, the lever B could be so connected with the hammer that when it moved, the hammer would be raised and let fall against the bell. For an electric alarm the motion of the head C would serve the purpose of breaking and connecting the electric circuit. For this purpose, if desirable, the lever B might be dispensed with, as enough motion may be had with the head C.

In its application to flooding buildings, the lever B would be connected to the device used for opening or shutting off egress to the water.

The temperature at which the boxes will operate must be set to suit the various locations and circumstances; also, it will be necessary to vary the size and shape of the box A, and the positions of the heads C and $D^1 D^2$, in making the different applications, for the purpose of obtaining more or less power and motion, and for convenience in applying and operating the same.

The small compartment A′, with its head D^2, is only used when a greater range of temperature is required than can be obtained by the head D^1.

The range of temperature obtained by the head D^1 may be increased by enlarging the head D^1 and its end of the box A accordingly, without changing the size of the head C.

By the term "operate at a given temperature," we mean that the work assigned the box A shall be accomplished at that temperature.

When it is required to set the box A to operate at one given temperature only, it is not necessary to observe as much care as to the exact number of degrees below at which the box A is sealed, as corrections may be made with the head D^1. If within the limits of its range, having sealed the box A, and on applying the required amount of heat, it is found that the head C moves too soon, there is too much air for the box at that degree of heat, and may be remedied by drawing out the head D^1 sufficiently to make the correction required; and if the head C does not move soon enough the opposite is the case, and the correction is made by pushing the head D^1 in the proper distance. If the corrections to be made are not within the limits of the range of the head D^1, it will be necessary to seal the box again, making the calculation in accordance with the difference between the temperature we have and that which is required. Having obtained the required temperature for the box A, the head D^1 may be securely held in that position by any suitable means. No scale in this case is required.

The head C does not move all at once; but several degrees of heat are required to carry it from its starting-point to the extent of its movement, the number of degrees depending upon the distance the head C moves and the depth of the box A; decreasing its depth increases the number of degrees.

It will be seen from the foregoing that in cases where the distance required for the head C to move is small, as in the case of opening or closing the electric circuit, either with or without the lever B, in one whole movement of the head C, a range of temperature may be obtained; and also, in cases where greater distance of movement of the head C is required and the power required not too great, the same thing may be accomplished by the use of the lever B, by shortening one end or lengthening the other, or both, from the center of the head C. Probably a range of temperature of 30° may be obtained in this way. By taking advantage of the points herein mentioned affecting the same, it will be seen that if 30° of heat are required to carry the head C from its starting-point to the extent of its movement, a range of temperature of that length is obtained. A scale may be arranged in accordance therewith, if desired.

In speaking of the lever B, we have stated that it passes through a hole in the side of the box A, serving the purpose of a hinge. We do not wish to confine ourselves to the use of a hinge for this purpose, as, in place of the hinge, one end of the lever B may be rigidly secured to the box A, and sufficient spring given it to allow its outer or movable end to move the distance required. In some cases this mode would be preferred.

We are aware that similar results in setting the box A at a given temperature, or of procuring a range of temperature, may be obtained with the head C, and without the motion of the head D^1, by compressing the air in the box sufficiently to allow of the movement of the head C at the proper temperature. This may be accomplished by a spring or weight or other suitable device, whereby the requisite pressure may be brought to bear upon the head C, and the tension of the same regulated as desired. In this mode the box A may be sealed a little higher, so as to insure that the head C will move a little before the temperature required is attained. The pressure may then be brought to bear upon the head C sufficient to hold it at the temperature required, and, by increasing the pressure upon the head C, more heat will be required, and thus a range of temperature is obtained.

Having first experimented upon this principle, we found that in order to get a range of temperature it was necessary to compress the air in the box to such an extent that the head C was likely to be strained out of position, and correct and uniform results not obtained.

In the mode we have herein adopted the size of the box A is made to conform to the amount of expanded air contained therein, and no additional strain is put upon the head C in consequence of its being made to operate

at a higher temperature, thereby securing uniformity of operation and correct results.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination, in an air-tight box, of the head C with one or more heads, D^1 D^2.

2. The combination of the lever B with an air-tight box having its head C and one or more heads, D^1 D^2, all substantially as shown and described.

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JACOB S. SIMMERMAN.

Witnesses:
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J. D. BRANDRIFF.