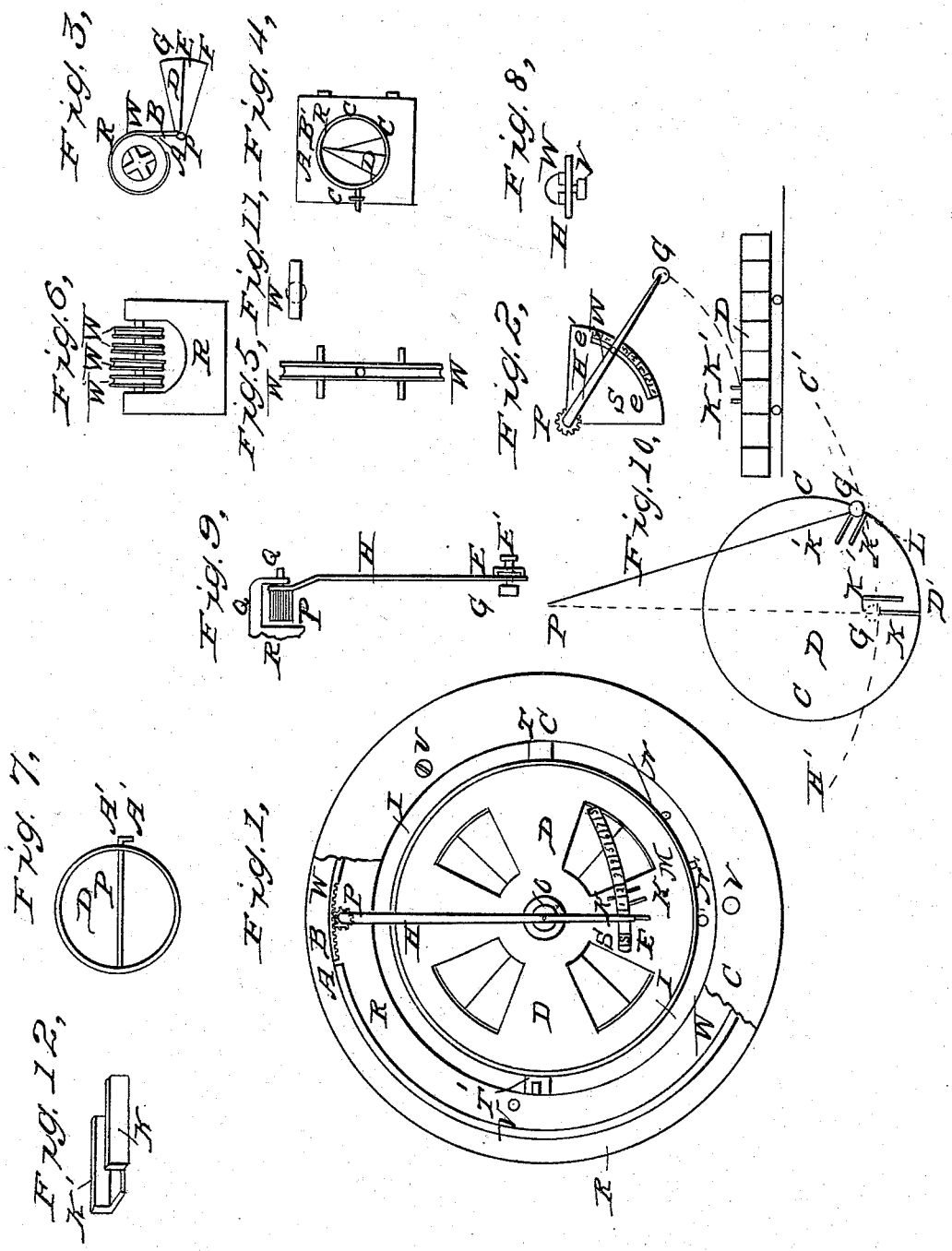
S. D. TILLMAN.

Heat Regulator.

No. 3,545. Patented April 17, 1844.



UNITED STATES PATENT OFFICE.

SAMUEL D. TILLMAN, OF SENECA FALLS, NEW YORK.

APPARATUS FOR REGULATING THE HEAT OF STOVES.

Specification of Letters Patent No. 3,545, dated April 17, 1844.

To all whom it may concern:

Be it known that I, SAMUEL D. TILLMAN, of Seneca Falls, in the county of Seneca and State of New York, have invented a new and useful machine and several modes of applying it for indicating and regulating changes of temperature, which machine when used for the purpose of regulating the action of caloric I call the "thermostat."

The nature of my invention consists in the construction of a machine which is moved by the expansion and contraction of a metallic ring upon the application of caloric and by means of an index indicates the degree of the caloric by which it is effected, also in the several modes of applying it to dampers so as to regulate the radiation of caloric from any stove, dumb stove, pipe or other structure in which caloric is generated or contained, also of applying it to ventilators and registers for the regulation of temperature of a room.

To enable others skilled in art to make and use my invention I will proceed to describe its construction and operation.

Figure 1 (reference being had to the annexed drawing) represents the thermostat attached to a stove damper which governs the admission of air into the chamber where caloric is generated. A ring or section of a cylinder (R) is constructed of some highly expansive metal. Zinc being the most expansive of solid metals and less fusible than lead bismuth or tin is to be preferred except when the ring (R) is liable to be exposed to heat above 700° Fahrenheit in which case brass should be used. One side of this ring is made perfectly smooth which is the side partly exposed to view in Fig. 1 and into it about equidistant from the inner and outer edge of the ring is turned or cut a groove of such width and depth as to admit a wire (W) which must be fitted closely so that it cannot bend out of its circular form. This wire should be of metal the least expensive; steel wire is to be preferred to any other which can be easily obtained. One end of this wire is fastened tightly at the point (A) to the ring (R) by means of a wedge; the other end of the wire (B) is unfastened and lies in the groove as near the end A as the ring when most contracted by cold will permit. Near the end (B) several notches are made into the wire so as to fit exactly into the leaves of the revolving pinion (P) as it turns upon its axis. The lower pivot of the pinion P is set into the ring R or into a harder metal sunk into the ring R and the upper pivot into a plate Q of hard metal fastened to the outside of the ring R and bent so to be over and perpendicular to pinion P as represented in Fig. 9, Q being the metal in which the upper pivot plays.

The cap (C) represented in Fig. 1 as partly covering the ring R may approach close to either side of the bent plate Q Fig. 9 or it may entirely cover the ring R and be fastened to it by means of screws (V V V) in which case the upper pivot of the pinion P is held by the cap as by the plate at Q^1 in Fig. 9 and passing through the cap the pivot projects far enough to allow the hand H to be attached to it above the cap C. The hand H in Fig. 1 and Fig. 9 is a lever fastened to the pinion P by means of the upper pivot Q^1 in Fig. 9 and is bent up so as to pass over the cap C. Near the end of the hand (H) is a slot E see Fig. 9 in which slides a scale (S) see Fig. 1 whose sides are curved so as to turn within circles described by the sides of the slot E revolving around the center of the pinion P.

Over the slot E is a screw E^1 (Fig. 9) which enters the slot and bears upon the scale S so as to hold it to any position in which it may be placed.

To the under side of the scale is attached a roller G by means of a pivot around which it turns. The roller G describes the curve marked H, C, in Fig. 10 which figure represents the manner in which the roller G moves the damper D.

Upon the damper are cast or riveted two elevations or flanges acting as catches (Fig. 12) running parallel to each other and of the same length but so placed (one being nearer to the outside of the damper than the other) that the roller G in passing from the point C^1 toward the point H would pass the end of the elevation or catch K^1 and strike the catch K thereby effecting the damper D; as the damper moves the roller G passes between the catches K and K^1 and as the damper upon its outer edge describes the curve C D^1 and the roller G the curve H^1 C^1 it follows that when the catch K has arrived at D^1 the roller G will have passed between the catches K^1 K and owing to the position of the catch K will move freely out and leaving the damper will pass on

toward the point H^1 as long as the ring continues to expand; when the ring R begins to contract from want of caloric the roller G begins to move in the opposite direction toward the point C^1 and passing the end of the catch K strikes K^1 and rolls between the catches K K^1 and by its pressure upon K^1 the damper is moved until the roller G passes from the catches K K^1 at the point L Fig. 10. The damper is so placed that when the roller G is at the point L Fig. 10 the pin M projecting from the edge of the damper D (see Fig. 1) is pressing against a knob N projecting from and fastened to the plate in which are the holes for the admission of air; in this position the damper is fully open and is prevented from moving farther in one direction by the contact of the pin M with the knob N. As the roller G moved by the effect of the increasing heat presses against the latch K and turns the damper the pin M (Fig. 1) moves toward the knob N^1 and strikes it when the damper is entirely closed or in other words when the damper covers all the apertures for the admission of air.

In applying the thermostat to the regulation of the heat of a stove it must be fixed upon the outside of the stove that it may be effected only as the stove throws off more or less caloric. It may be placed around a draft-damper which is best in the circular form made so as to cover every aperture made into the stove for the admission of air or to leave every such aperture uncovered by turning it upon its center O, as in Fig. 1. The metallic ring R is fastened firmly to the lower plate H by means of the pins T T^1 which fill holes made to receive them in the ring the number of pins may be increased care being taken to make allowance for the expansion of the ring.

When the thermostat is attached to a stove the radiation and conduction of caloric therefrom to the metallic ring causes it to expand and the wire (W Fig. 1) not expanding with the ring R does not fill the groove through its entire length but the wire being fastened at the end A the end B must recede from the end A. The greatest difference of motion between the wire and the ring must be at the end B. To this end the pinion P is attached as before described which must turn as the notches or leaves in the wire recede from the end A. The hand H being firmly attached to the pinion P, as before described forms a pinion-lever whose velocity and power are proportionate to the amount of caloric passing from the stove into the metallic ring.

If we suppose the quantity and quality of the fuel from which caloric is generated to be equal or uniform and the stove as near air tight as may be the amount of heat generated would be in proportion to the amount of air admitted through the apertures controlled by the damper D. The object of the thermostat is to control the radiation of caloric from the stove by controlling the aforesaid damper. The roller G standing at the point C^1 Fig. 10 when the end B is nearest the end A or in other words when the stove is cold by the application of heat from the stove moves toward the damper and in the manner before described the quantity of air admitted decreases as the radiation of caloric increases until the apertures are closed and again the quantity increases as the radiation decreases until the apertures are fully opened.

There is one degree of radiation at which the hand H is stationary since it is moved both ways by varying the degree of radiation. This stationary or uniform radiation may be kept at a higher or lower degree by altering the distance between the roller G and the catches K, K^1 by means of the sliding scale S moving in the slot E. If a low degree of heat is wanted the roller G should soon touch the damper and shut off the draft. If a high degree the roller G should by means of the sliding scale be removed farther from the catches K K^1 so that the dampers would not begin to close until the degree of radiation required had been produced.

The distance between the roller G and the catches K K^1 is better controlled by the mode illustrated by Fig. 2. The scale S is of quadrant shape and fastened firmly to the pinion P as in the hand H in Fig. 9. Through this quadrant scale the upper pinion of the pivot P projects as at the point Q^1 in Fig. 9 and upon it turns freely the hand H at the end of which is attached the roller G see Fig. 2; at $l\ l'$ is a slot in which moves a screw V see Fig. 8 which passes through this hand H and into another screw W which on being turned will connect or disconnect the hand H and the scale S. In Fig. 2 is also represented a horizontal damper which may be moved by means of catches K K^1 already described.

A more simple and cheap construction of the thermostat is to connect the hand H see Fig. 1 directly with the wire W at the end B by means of a pivot and to allow the hand H to play upon a pivot as does the pinion P, in Fig. 9 and by turning the smooth side of the ring R in which the groove is made, to and directly against the stove thereby dispensing with the cap C in Fig. 1 .

If Q Q^1 in Fig. 9 represent a side view of a portion of the ring thus placed, the pivot attached to the wire will project through the ring at Q^1 to which must be fastened the hand H. The pivot being allowed to play or move in the ring with the wire to which it is attached by means of a short slot at Q^1. There are two modes of applying the ex-

panding and contracting power of the metallic ring for the purposes mentioned which vary slightly from the one described. The first is illustrated by Fig. 3. Around the ring R is closely drawn a wire or main spring (W) which is fastened to the ring at the end A and to the damper D at the point B—the fulcrum being the pivot P on which the damper turns. The expansion of this ring R raises the damper from its position P E F′ and closes the draft aperture P E G. As the ring R contracts the damper falls by its own weight or if in a position on the stove when its weight cannot effect it, it may be pressed to its place by a screw.

The second mode is when the metallic ring is connected with the stove itself as the metal of least contraction; it may lie in a groove around the stove if circular in form or as in Fig. 4 may be held within a circular groove or rim C C C. And it is attached at A to the stove door and at B to the damper which may operate as that illutrated in Fig. 3.

The thermostat may be applied to the regulation of the heat radiated from a dumbstove or pipe by placing the metallic ring around the pipe through which caloric is conducted. Within the pipe the common flue damper is placed revolving on a pin running through the pipe and projecting as A A^1 in Fig. 7 the end A is connected to the end of the wire B see Fig. 1, by a pin.

The thermostat when made larger than the size which is described above is effected by the heat of a room and by means thereof may regulate the admission of cold or hot air into a room by being attached to a ventilator or a register. When attached to a ventilator D D (see Fig. 1) that part may be made of wood and so as to turn easily in a horizontal direction around a shoulder on the pivot O.

The thermostat when attached to a circular register which governs the admission of warm air should be placed so far from the register as to be effected by the general temperature of the room rather than by the hot air proceeding from the register; the only alteration necessary to accomplish this being the lengthening of the hand H, G in Fig. 2.

When the metallic ring to be effected by a low degree of heat cannot be made as large as desirable the wire may be lengthened in the ring by deepening the groove and using antifriction wheels as in Fig. 5 placed in the ring on either side of the wire or placed in the wire as in Fig. 11 and where wire or main spring is applied around the ring R by winding such wire or main spring on anti friction wheels W W W see Fig. 6 placed into the end of the ring R.

What I claim as new is—

1. The modes herein described of regulating and indicating changes of temperature by means of a metallic ring also by means of a ring of zinc inclosing a broken ring of iron or steel; said ring of steel being attached by one of its ends to the zinc ring and free to move throughout its length, its free end operating upon an index by means of a rack and pinion or other similar device.

2. I also claim the combination of the above arrangement which I denominate a thermostat with a register plate or valve for regulating the heat of a stove or for similar purposes such as the ventilation of rooms &c. as above described.

I may use for the above purpose other metals whose expansive properties are well known.

For the above described invention I desire Letters Patent.

SAMUEL D. TILLMAN.

Witnesses:
W. R. MACKEY,
LAFAYETTE CALDWELL.