A. W. SPRAGUE & J. M. OSGOOD.

Automatic Heat-Regulators for Houses.

No. 150,200. Patented April 28, 1874.

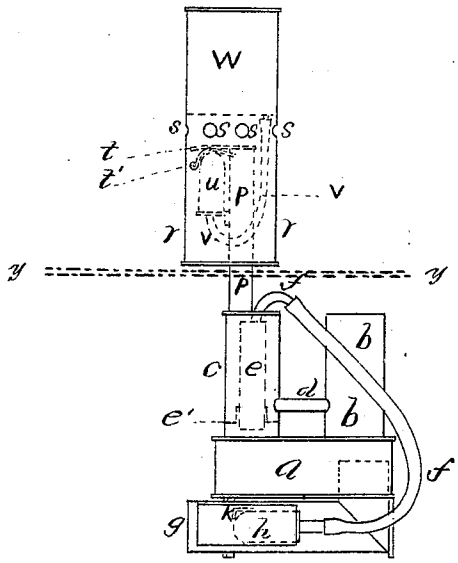

Fig. 1

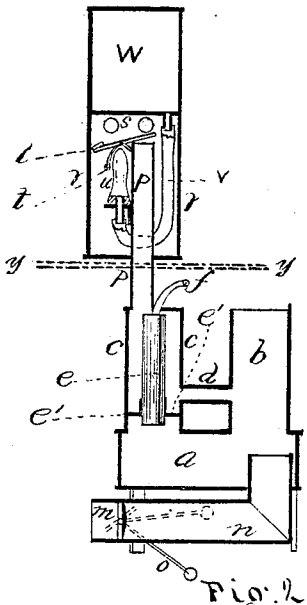

Fig. 2

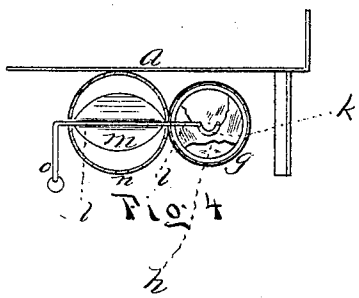

Fig. 4

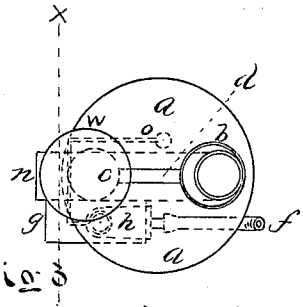

Fig. 3

Witnesses

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UNITED STATES PATENT OFFICE.

ALFRED W. SPRAGUE, OF QUINCY, AND JAMES M. OSGOOD, OF SOMERVILLE, MASSACHUSETTS; SAID OSGOOD ASSIGNOR TO SAID SPRAGUE.

IMPROVEMENT IN AUTOMATIC HEAT-REGULATORS FOR HOUSES.

Specification forming part of Letters Patent No. **150,200**, dated April 28, 1874; application filed August 11, 1873.

To all whom it may concern:

Be it known that we, ALFRED W. SPRAGUE, of Quincy, in the county of Norfolk and State of Massachusetts, and JAMES M. OSGOOD, of Somerville, in the county of Middlesex, in the State of Massachusetts, have invented a new and Improved Automatic Heat-Governor; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification.

This invention is intended to regulate automatically the temperature of any room, as, for example, in dwelling-houses, schools, ice-houses, &c., and indeed of any inclosed or partially-inclosed space. This is effected by means of the expansive power of air when heated, and the reverse when cooled.

The nature of the invention in detail is described below.

In the accompanying drawings, Figure 1 is an elevation of a device embodying our invention. Fig. 2 is a vertical section of the same. Fig. 3 is a plan of the same. Fig. 4 is a transverse vertical section of the damper and adjacent parts, cut through the line *x x*.

Similar letters of reference indicate corresponding parts.

a represents a stove, furnace, range, or any other heating apparatus. We will suppose it in this instance to be a furnace in a dwelling-house. *b* is the smoke-pipe. *c* is an automatic cooler attached to the furnace in the cellar. *d* is a pipe leading from the cooler *c* to the smoke-pipe *b*. *e* is an expansion-chamber setting into the partition *e'* across the cooler *c*. A small portion only of the expansion-chamber *e* is exposed to the direct heat from the fire in the furnace, the rest being separated by the partition *e'*. *f* is a tube leading from the expansion-chamber *e*, through the top of the cooler *c*, into a rubber bag, *h*, (see Fig. 1,) which lies in the chamber *g*. *k* is a lever extending from and, in reality, a part of the shaft *l*, to which is fixed the damper or valve *m*. This lever *k* is bent at right angles to the shaft *l* and lies upon the top of the rubber bag *h*. *n* is the pipe, through which air enters the furnace and passes to the fire from under the grate. *o* is a weighted lever, bent at right angles to the shaft *l* and tending to keep the lever *k* down upon the bag *h*. *p* is a pipe extending from the cooler *c* in the cellar to and into a chamber, *r*, in the room to be heated. In the chamber *r* are perforations or openings *s* admitting the air of the room. *t* is a valve opening and closing the pipe *p* and having an arm or weight, *t'*, which rests upon a rubber bag, *u*. *v* is a tube connecting the rubber bag *u* with the tight expansion chamber *w*. The broken lines *y y* show the position of the floor between the cellar and the apartment to be heated.

In practical operation, our regulator operates as follows: We will suppose the draft or damper *m* to be open. When a fire is built in the furnace *a* the heat gradually acts upon the lower portion of the expansion-chamber *e*, and the air therein expands and presses through the tube *f*, swells up and fills the collapsed bag *h*, lifts the levers *l* and *o*, and shuts the damper *m*. The fire is then checked, no air being admitted, and the heat in the furnace is checked, and the temperature of the room grows lower. As the heat of the room grows less and the temperature falls, the air in the chamber *w* condenses and contracts. The air in the rubber bag *u* rushes through the tube *v* to supply the lack in the chamber *w*, and the arm or weight *t'* falls and pulls open the valve *t*. The air in the chamber *v*, having been admitted through the openings *s*, passes down the tube *p*, over the expansion-chamber *e*, and, being cooler than the air in said chamber *e*, causes it to condense. As soon as the air in the chamber *e* commences to condense, more air enters through the tube *f* from the bag *h*, which, of course, collapses (see Fig. 4) and the weighted lever *o* pulls down the lever *k* upon the bag *h*, and the damper opens again. The air passing down the tube *p* has, meanwhile, passed through the tube *d* and out through the smoke-pipe *b*. The damper being open, the heat increases, and thus the regulation is perfectly automatic. When the heat is sufficient, the air in chamber *e* expands, as above stated, and the damper *m* closes. When the room is too cool the air in chamber *w* condenses, and in a few seconds the air in chamber *e* condenses also,

and the damper *m* opens. The air in chamber *e* is, of course, at the same temperature as the air in the room. The air in chamber *w* is placed at the proper temperature before it is sealed up.

It will be noticed that the expansion-chamber *e* is exposed only at its lower extremity to the heat. There is a great advantage in this partial exposure to the heat.

Other devices for opening and closing drafts by means of heated air have allowed the expansion-chamber to lie wholly within the hot air, where it has been on all sides exposed to a heat of, say, 300° or 400°. As the heat of the furnace falls off upon the close of the draft-damper, the expelled air attempts to return to the expansion-chamber, but, owing to the high temperature, is again at once rarefied and expelled. Thus, an oscillation of the air between the outer receptacle and the heated expansion-chamber goes on for some time before it cools—say 15° to 30°—sufficiently to produce a power equal to overcoming the friction of the damper, causing it to open. Meanwhile, the furnace has cooled off 30° to 100°, with a corresponding variation in the temperature of the room to be warmed.

By means of my automatic cooler *c* the expansion-chamber *e* is kept at a moderate temperature, so that a slight change at once acts upon the draft-damper *m*, the automatic arrangement in the chamber *r* in the room admitting just the right quantity of air necessary to produce condensation in the chamber *e*.

By actual test, a variation of $1\frac{1}{2}$° to 2° will open or close the damper.

In case the automatic valve *t t'* in the chamber *r* is not desired, a damper or valve may be set by hand, so as to control the amount of air passing into it and through the cooler *c*.

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

1. An expansion-chamber, constructed substantially as represented by *e*, Fig. 2, and acted upon either by hot air from the furnace or stove with which it is connected or by cooler air from the apartment to be heated or other source of supply, or by both hot and cold air simultaneously.

2. The arrangement, with the cooler *c*, of the pipe *p* and pipe *d*, for the purpose of creating a current of air.

3. The arrangement, with the pipe *p*, of the valve *t t'*, bag *u*, and pipe *v*, substantially as and for the purposes specified.

4. The arrangement, with the pipe *p*, valve *u*, and tube *v*, of the chambers *w* and *r*, substantially as and for the purpose above shown.

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