

(No Model.)

2 Sheets—Sheet 1.

R. L. SHORT.
AUTOMATIC REGULATOR FOR FURNACES.

No. 569,944.

Patented Oct. 20, 1896.

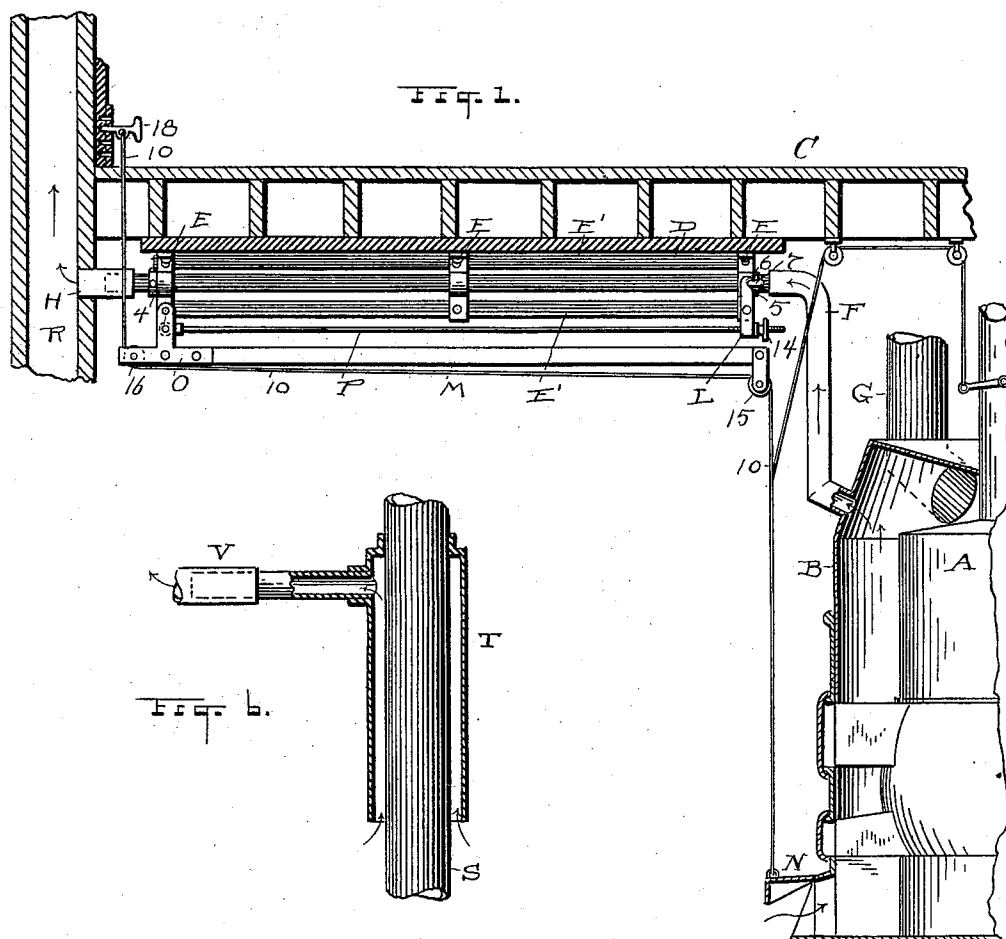
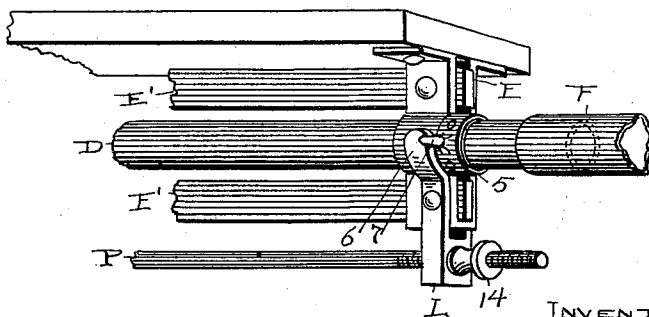


FIG. 2.



ATTEST
R. B. Moxer.
H. E. Moxer.

INVENTOR
Robert L. Short.

By H. J. Fisher ATTORNEY

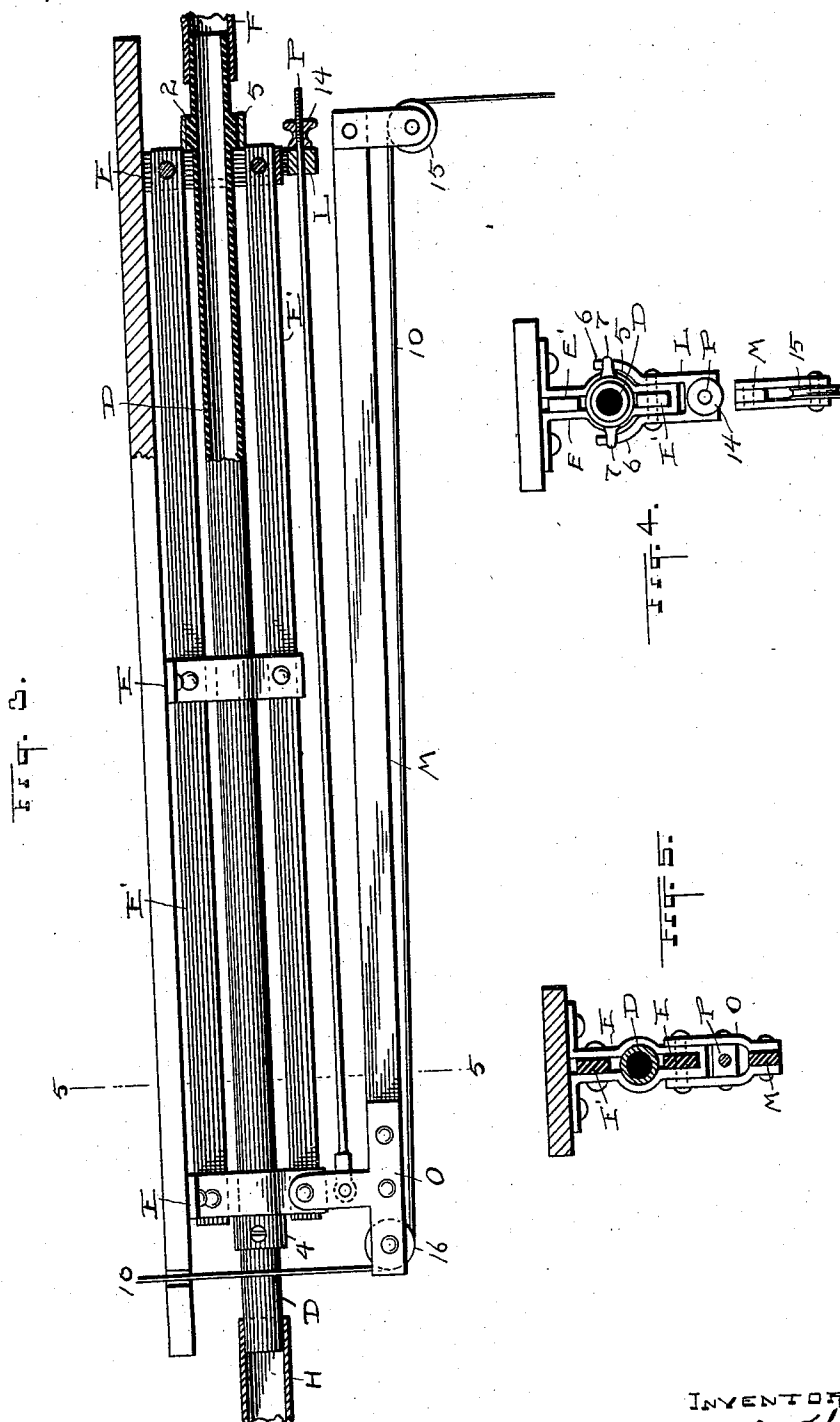
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ATTEST

S. B. Moser
H. C. Medra

INVENTOR

Robert L. Short.

BY *H. J. Fisher* ATTORNEY

UNITED STATES PATENT OFFICE.

ROBERT L. SHORT, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-HALF TO
CHARLES SMITH, OF SAME PLACE.

AUTOMATIC REGULATOR FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 569,944, dated October 20, 1896.

Application filed May 11, 1896. Serial No. 590,971. (No model.)

To all whom it may concern:

Be it known that I, ROBERT L. SHORT, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Automatic Regulators for Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to means for automatically regulating the heat of furnaces; and the object of the invention is to provide means whereby furnaces used in heating houses, stores, churches, school-houses, and other buildings by means of hot air, steam, or hot water may be placed under positive and definite control both as to uniformity and quantity or volume of heat developed in the furnace. I am of course aware that many devices of different kinds having this object in view have been made and patented, and that heat, water, air, electricity, and possibly other agencies have been utilized in this behalf; but I am also aware that notwithstanding the great desirability of a perfect device of this kind and the many attempts of inventors to supply the evident need it still remains true that, with possibly one or two exceptions, the public demand remains unsatisfied, and in these exceptional instances the devices are imperfect and unsatisfactory in material respects, and at best are so high-priced and require such intelligent care in operation that they are practically beyond reach and usefulness. The present invention therefore has in view a device which is simple and reliable in operation, and which is cheap enough to come within the reach of people in common circumstances, and which requires no more care or intelligence to operate than an ordinary furnace with the usual dampers and chains.

Referring to the accompanying drawings, Figure 1 shows an elevation in section of a furnace and a cross-section of a floor and an elevation of my improved regulating device connected therewith as appears in practical operation. Fig. 2 is an enlarged perspective

elevation of what is here shown as the furnace end of the regulating device and showing especially the mechanism for transmitting action from the sensitive tube to the strictly mechanical parts of the device. Fig. 3 is an enlarged side elevation of the device, and Fig. 4 is a front end elevation thereof. Fig. 5 is a cross-section on line 5 5, Fig. 3; and Fig. 6 is a modification.

As already stated, I may employ this device with any ordinary furnace, whether in hot-air, steam, hot-water, or other heating systems, but in this instance have shown the invention as connected up with a hot-air furnace, comprising the furnace proper, A, and the hot-air jacket or casing B. Over the furnace is a floor C, and my improved regulating device is preferably secured to this floor, although it may of course have a separate means of support, if desired.

In the construction and operation of this device I rely, primarily, on a sensitive tube or pipe D, which is preferably of brass, but may be of any other equally sensitive metal or material or composition thereof. Brass is preferred because it responds promptly and uniformly to differences of temperature and will at once show by expansion or contraction the exact temperature of the air to which it is exposed. In this instance I have arranged the said tube in suitable hangers or supports E between parallel frame-bars E', built into said hangers, and usually the said tube is about three feet in length, but might be longer or shorter and serve the purpose. In cross-section the said tube does not ordinarily exceed an inch, and any ordinary one-inch brass tubing found in the market may be used. This tube is wholly apart from the furnace, as shown, and has no direct exposure whatever thereto nor connection therewith, except by a correspondingly small connecting-tube F, which is tapped into the hot-air jacket B and arranged to receive air from the chamber within the same as the hot-air pipes G, which distribute the air to the various parts of the building. The opposite end of tube D has a pipe connection H, which discharges, preferably, into the chimney or smokestack, so as to have a perfectly free and

healthy draft. Thus it will be seen that tube D becomes an air-conveying or circulating pipe, and being in open communication with the hot-air chamber of the furnace, the same as the heating-pipes that go to the rooms, it must necessarily show approximately the same temperature in itself as the furnace from which it receives its heat. This being true, and the tube D being manifestly sensitive to changes of temperature, it follows that said tube can be made to impart such changes through mechanical appliances for the purposes herein described. To this end the said tube is provided with collars 2 and 4 just outside the respective hangers E, the collar 4 being shown here as adjustable. Then, in order to take off the changes in the tube by reason of contraction or expansion in the same lengthwise, I fix a sleeve 5 over the collar 2 and pivot a yoke L at about its center on the front support E in such position that the arms 6 of the said yoke shall be in touch with the lateral projections 7 on the sleeve 5. Now, in order to utilize any movement imparted to yoke L through the sleeve 5 from tube D and to make such movement sufficient to operate the draft-damper N on the furnace, it is necessary that the movement thus obtained be greatly multiplied. I have therefore provided means for this purpose, comprising the long lifting lever or arm M, which carries the damper-operating chain 10, as hereinafter more fully described, the short elbow O, pivoted on the bottom of the rear hanger E, and the rod P, which connects the lower end of yoke L centrally with the elbow O.

It will be understood that lever-bar M is a perfectly rigid bar and that this bar and the elbow O, as well as connecting-rod P, are so constructed that there will be no lost motion in them. The rod P has a nut 14 to fix the connections closely between the hanger L and pivot-elbow O. The damper chain or cable 10 passes over sheave 15 at the front free end of lever M and sheave 16 at the rear end of said lever, and hence whatever vibrations or movements are imparted to said lever will be communicated to said chain and to the damper N.

The chain 10 is adapted to be raised and lowered independently of lever-arm and can be fixed in any desired position by fastening-pin 18, to which it is attached, or by any other sufficient means, the ordinary hooks being equally well adapted to this purpose. When the chain is set to a given place, it may remain there indefinitely day and night, according to the weather or other conditions and according to whether the same temperature is wanted continuously. Suppose, for example, the parts be as seen in Fig. 1, where we may assume that the fire is down and the furnace is cold. It is desirable now to open the draft-damper N, so as to bring up the fire, and hence the pin 18 may be set into

one of the series of holes made for that purpose about as shown. Then as the furnace gets heated the tube D will heat in like degree and of course expand. As this occurs it will permit the yoke L to swing rearward or to the left at its lower end, where connecting-rod P is attached, and thus allow the free end of lever M to drop and as it drops gradually close the damper N. Possibly it may be desirable not to close damper N entirely, and this will of course be governed by the chain 10 and pin 18 independently of the other mechanism. Different positions of the damper may be wanted day and night, and it will be adjusted accordingly. When adjusted, the other parts will be operated just the same as before, but the degrees of heat given off by the furnace will vary according to the position of the damper. In any case it will be seen that the attendant of the furnace has the whole matter under his own control primarily, and having set the device where he wants it the device then comes into action and does the rest and keeps the heat at the predetermined point. So accurately is this done that there need not be any marked variance in twenty-four hours.

It will be seen that the rod P works on a very short fulcrum in or through the elbow O, and though the movement at this point is not considerable it still is abundant when the movement is communicated to bar M in the manner shown. If greater movement were wanted in elbow O, it could be obtained by extending the yoke L below its pivot or in any one of a number of other ways that might be devised. I desire it to be understood, therefore, that the mechanism here shown for taking off the power from tube D may be considerably modified and still be within the spirit of the invention, the invention being and involving, broadly, a sensitive tube tapped into the hot-air chamber or equivalent portion of a heater and means connected therewith for regulating a furnace-damper whether at the rear or front of a furnace, and, secondly, a damper-controlling chain or cable built into or operated by the heat-controlling mechanism.

It will be noticed that relatively the tubular passage or air-outlet, including tube D, is very small, so that the loss of heat on that account will be immaterial, and yet it is large enough to maintain a free flow of air and thus communicate to tube D practically the same temperature all the time that is found in the furnace itself. Of course to maintain movement or flow of air in said passage there must be a continuous supply of air to the furnace-chamber, and if the pipe F were tapped into one of the pipes G near its base it would be practically the same thing and is understood to be covered in the claims.

I have referred to part D as a "tube," and so it preferably is, but any other shape which will give the same result may obviously be

adopted, if preferred, and the use of the word "tube" herein is understood to cover such modification of part D.

It will be understood that in order to obtain the desired results from this device the passage comprising the expansion-tube D must be a draft-passage in which there is such suction, for example, as a smoke-pipe or chimney affords. Otherwise the movement of the air through the small tube D and its connections will be too sluggish to be either reliable or useful. The idea of the invention is to have air of approximately the same temperature in tube D as is found in the air-chamber, so that it may be said that the said tube is constantly "sampling" the air in the air-chamber and reporting through the regulating mechanism which it operates. To get this effect, a healthy draft through said tube is essentially necessary.

In Fig. 1 the draft-passage pipe H, which is connected with tube D, is shown as discharging into a chimney R, but any other draft connection may be made.

Fig. 6 shows a modification of the invention, in which pipe S may be a steam or hot-water pipe and the drum or jacket T adapted to form a hot-air chamber or space about said pipe. The sensitive regulating-tube V is connected with this hot-air chamber in the draft-passage therefrom and to a chimney or other source of draft, as in Fig. 1. The hot-air chamber in this case is the same in effect as the hot-air chamber of the furnace.

The term "chain" as used in the claims is to be understood as referring to the chain, wire, cord, or cable 10, which goes to the damper N, and as covering any such flexible connection as may be used for this purpose, whether it actually be a chain or its equivalent.

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

1. In a regulator, the combination of a furnace having a hot-air chamber with an outlet-opening, a duct communicating with the chamber through said opening, means for causing a draft through the duct, an expansion member subject to the heat of the medium passing through the duct, and means

for controlling the furnace through variations in the length of the expansion member, substantially as set forth.

2. In a heat-regulator, a furnace and a hot-air chamber having an outlet-opening, a duct from said opening and means for causing a draft through said duct, in combination with a tubular expansion member forming a part of said duct and means for controlling the furnace through variations in the length of the said expansion member, substantially as described.

3. In a heat-regulator for furnaces, a hot-air chamber having an outlet-opening, a draft-flue and a duct from said opening to said flue, an expansion member forming a part of said duct and means for controlling the furnace through variations in the length of said expansion member comprising a pivoted arm and a flexible damper connection supported by said arm, substantially as set forth.

4. In a regulator for a furnace, a hot-air chamber having an opening, a duct communicating with the chamber through said opening, an expansion-tube forming a part of said duct, and means to stimulate a draft through said duct, in combination with a pivoted yoke actuated by said expansion member, a pivoted arm and an actuating-rod connecting the yoke with the said arm, substantially as set forth.

5. The heat-regulator comprising a damper-chain, a pivoted arm having the chain passing over its free end, an operating-rod connected with the pivot end of the said arm, and a pivoted yoke connected with said rod, in combination with a hot-air chamber and a draft-flue, a duct connecting said chamber and flue and a tubular expansion member in said duct and subject to the heat of the air passing through the same and having a projection to engage and actuate said yoke, substantially as set forth.

Witness my hand to the foregoing specification this 2d day of May, 1896.

ROBERT L. SHORT.

Witnesses:

H. T. FISHER,
R. B. MOSES.