B. E. MEACHAM.

HEAT AND DAMPER REGULATOR FOR GAS OVENS.

APPLICATION FILED FEB. 16, 1918.

1,300,990.

Patented Apr. 15, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

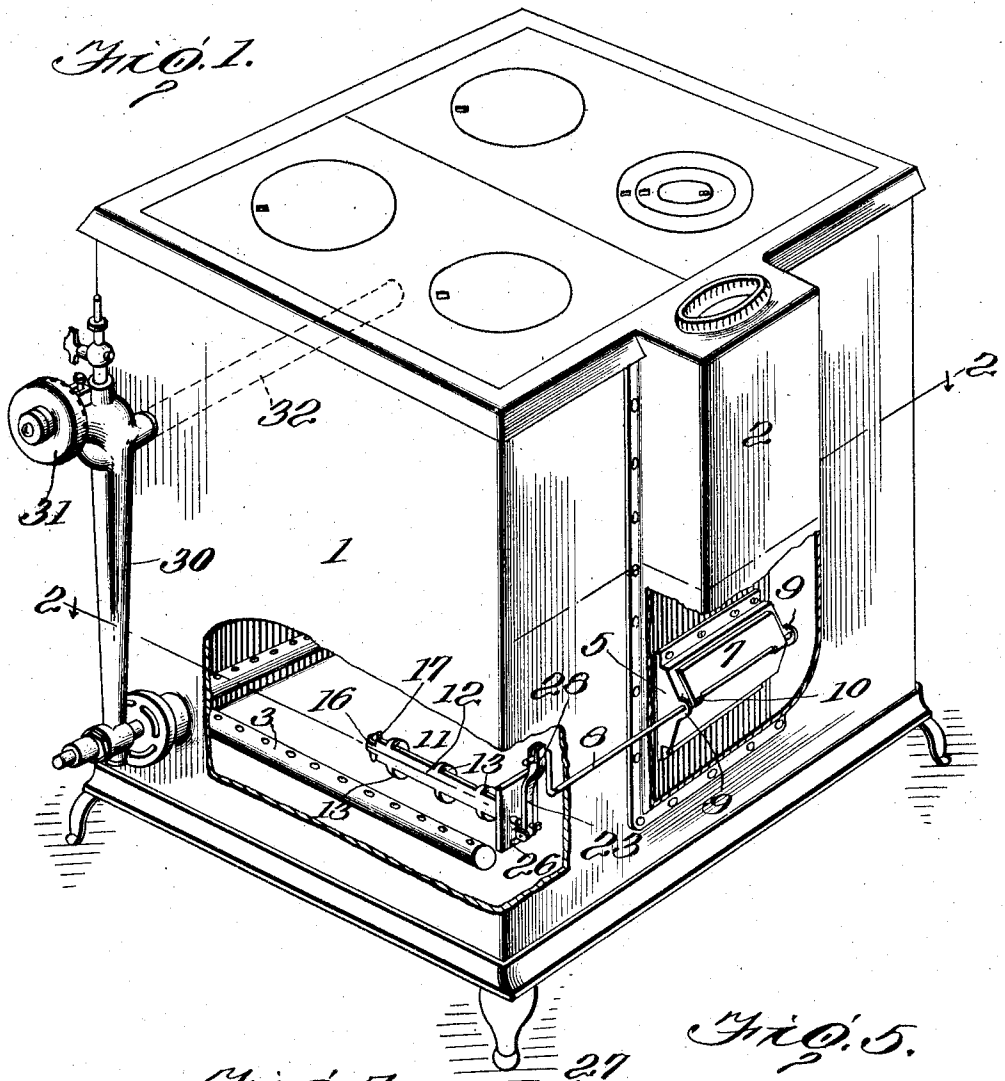


Fig. 4.

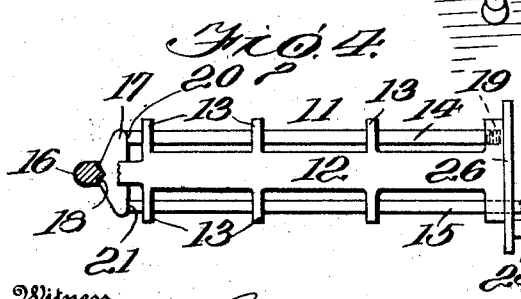
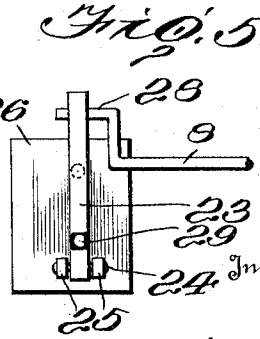


Fig. 5.



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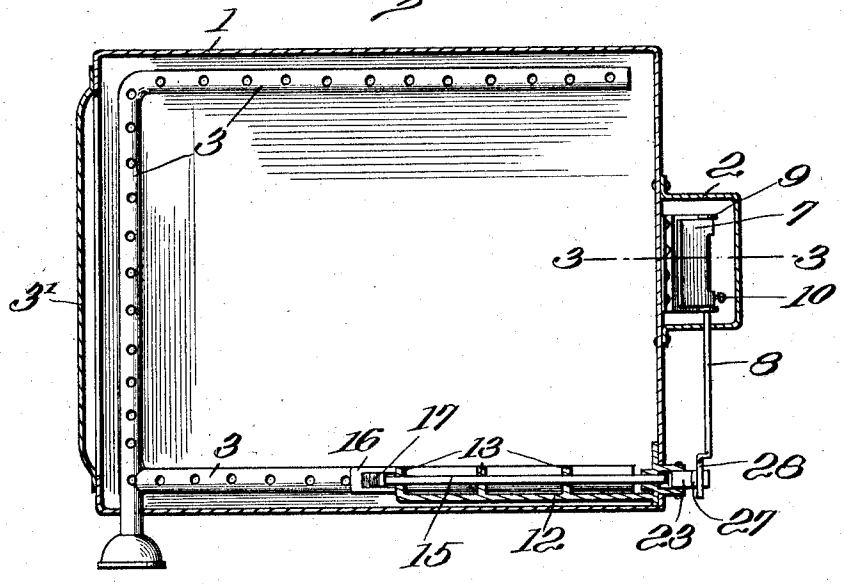
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2 SHEETS—SHEET 2.

Fig. 2.



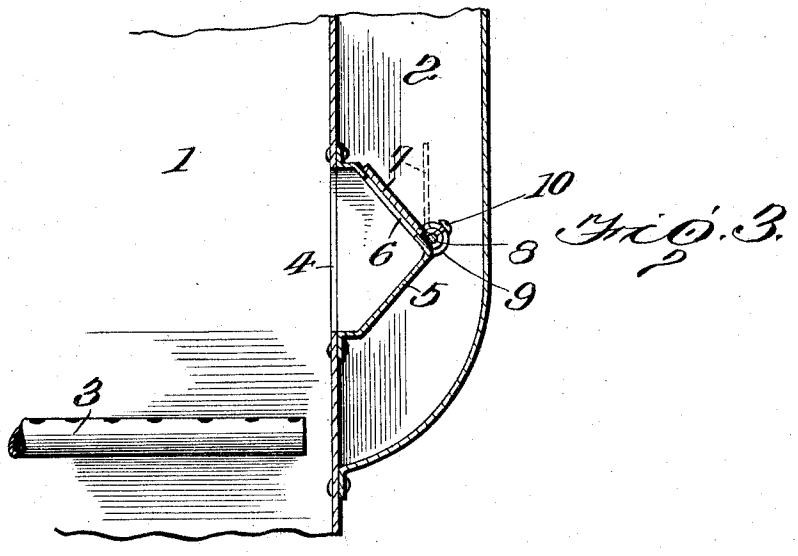


Fig. 3.

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UNITED STATES PATENT OFFICE.

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HEAT AND DAMPER REGULATOR FOR GAS-OVENS.

1,300,990. Specification of Letters Patent. Patented Apr. 15, 1919.

Application filed February 16, 1918. Serial No. 217,506.

To all whom it may concern:

Be it known that I, BENJAMIN E. MEACHAM, a citizen of the United States, residing at Lorain, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Heat and Damper Regulators for Gas-Ovens, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in heat and damper regulators for gas ovens, and the primary object is to automatically control the outlet or vent opening for the products of combustion of the oven burner by a damper, according to the amount of fuel or flame that is being used.

A further object of the present invention is to combine an automatic damper control for the outlet of the products of combustion, with an automatic fuel control for the oven, the fuel control operated by the oven zone temperature and the damper control by the burner flame zone temperature, but both controls being operated by the heat from the oven burner, whereby the two operate in unison to control the heat within the oven through the combined action of the fuel control, and the damper control.

A further object of the present invention is to provide an automatic damper control for the outlet opening of the products of combustion from the oven burner according to the heat or flame of the oven burner, whether the oven burner be controlled automatically, or by hand.

In the accompanying drawings,

Figure 1 is a perspective view of a gas oven showing my invention applied thereto.

Fig. 2 is a horizontal sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view on the line 3—3 of Fig. 2 looking in the direction indicated by arrow.

Fig. 4 is a detached elevation of the automatic damper control.

Fig. 5 is an end view of Fig. 4.

Referring now to the drawings in which like parts are designated by the same reference characters, 1 is an oven, and 2 a vent flue for the products of combustion from the oven burner 3. This burner is preferably made in substantially U-shape in plan view and extends around the front sides of the oven as shown. The back of the oven is provided with a vent opening 4, through which the products of combustion from the burner 3 pass into the vent flue 2. A triangular hood 5, is arranged at the outer side of the vent opening 4, and the top side of this hood 5 is provided with an opening 6. A damper 7 is arranged to close or open this opening 6, and the damper 7 is connected to a combined pivotal and operating rod 8, which is journaled in ears 9, projecting from the ends of the hood 5. The damper 7 is adjustably connected to the rod 8 by means of a suitable clamping screw 10.

An automatic thermostatic control is provided for oscillating the rod 8, and thus operating the damper 7, to open it or permit it to close. This automatic device consists of a suitable thermostat 11 which comprises a frame 12, preferably of cast iron, and this frame is provided with a plurality of projecting perforated ears 13 through which two thermostatic rods 14 and 15 loosely pass. The inner end of the frame 12 has an arm or hook 16, and arranged within this hook is a rocker arm 17, the rocker arm and hook 16 having a knife-edge bearing 18, whereby the rocker arm 17, is adapted to rock on the said knife-edge bearing under the expansion of the rods 14 and 15. The rod 14 has its end 19 made fast to one end of the frame 12, and its opposite end 20 rests on one end of the rocker arm 17. The rod 15 has one end 21 resting on the other end of the rocker arm 17, and the opposite or outer end 22 of the rod 15 is elongated and passes through the outer end of the frame 12, and is adapted to engage and operate the lever 23. The lower end of this lever 23 is pivoted at the point 24 to the ears 25 which extend out from the end 26 of the frame 12. The free end of the lever 23 is bifurcated to form a slot 27, into which the crank end 28 of the rod 8 extends. The lost motion between the end 22 of the rod 15 and the lever 23, may be regulated, by a suitable adjusting screw 29, which passes through the lever 23, and is located in a line with the end of the rod 15.

The damper 7 closes by gravity and is normally in its closed position when the burner 3 is not in operation, or in other words, when the oven is cold. When the

burner 3 is lighted, the thermostat 11 is heated by the flame of the burner quickly, because it is located directly in the zone of the flame, and the expansion rods 14 and 15 serve to move the lever 23 and rock the rod 8 and swing the damper 7 to open position. With full fuel on, the thermostat 11 reaches its maximum heat, and therefore maximum expansion, and as a consequence the damper 7 is opened to its maximum extent, as at this time the damper must be well open in order to provide proper ventilation for the burner 3 to properly operate. When the flame of the burner 3 is reduced, the temperature of the burner zone in which the thermostat 11 is located, is correspondingly reduced, and the damper 7 is correspondingly closed. From this it will be observed, that the damper 7 is automatically opened and closed from maximum to minimum, as the flame of the burner 3 is regulated from maximum to minimum. The damper 7 is adjusted to its minimum open position while in its adjusted position by the screw 10.

A substantial saving of gas is effected by this automatic damper control, by reason of the fact that any excess escape of heat through the vent opening is prevented, and the amount of ventilation and the escape of heat, is automatically regulated to suit the requirements of the size of flame, thereby preventing any excessive escape of heat when the burner is turned down. The saving in fuel by this automatic device is most pronounced when the oven is required to be operated at medium or low temperature, as then, there is only a small amount of burnt products to be carried through the flue, and the vent opening should then be nearly closed off, without impairing the combustion of the burner. Where there is no means provided for controlling the vent opening according to the flame of the burner, there must be a vent opening sufficiently large for ample ventilation when the burner is on full. When the burner is turned down and the flame reduced without at the same time reducing the size of the vent opening or passage there is an excess ventilation and a rapid escape of heat, the oven soon cools off. On the other hand with the vent passage automatically controlled according to the size of the flame of the burner, to reduce or increase the vent opening then there is no excess escape of heat, but just enough ventilation for the greatest efficiency of the burner in all of its various flame adjustments.

Thus far I have described the automatic vent control acting according to the flame of the burner, whether that flame be controlled by hand, or automatically. A further improvement here disclosed, is combining an automatic damper control with an automatic means for controlling the flame of the oven burner, to maintain a predetermined heat in the oven. The automatic burner control here shown, is that illustrated in my Patent, 1,236,335 dated Aug. 7, 1917 and it needs no detail description herein, further than to say, that 30 is the housing which contains the automatic mechanism of my said patent, and 31 is the adjustable device to be operated as described in the said patent, for setting the device to maintain the desired temperature.

The coöperation of my automatic damper control and the patented burner control whereby one conjointly operates with the other, is this:—The device 31 is set as described in my said patent for maintaining the heat within the oven at the desired predetermined temperature. When the burner is lighted the fuel is full on, and with flame the damper controlling thermostat 11 opens the damper 7 wide to provide the proper and necessary ventilation for the burner 3 at full flame. When the oven has reached the predetermined heat to which the device 31 is set, the thermostatic member 32 has cut down the fuel supply to the oven burner 3 as described in my said patent, and as the fuel supply is cut down, the flame of the burner 3 is reduced, and the heat zone of the thermostat 11 correspondingly reduced, and the damper 7 correspondingly closed to regulate the vent opening according to the size of flame, fixed by the automatic fuel control of my said patent: Therefore as the flame of the burner 3 automatically increases and decreases to maintain the predetermined temperature in the oven, the vent opening is correspondingly and automatically opened and closed to meet the proper conditions of the varied size flame, and to prevent an excess escape of heat through the vent opening, and thereby the two devices coöperate one with the other to maintain the predetermined heat within the oven, and the two combined accomplish this result in an economical manner, which is not possible with the fuel control of my patent alone, for the reason that the vent opening must be sufficiently large to provide for ventilation of the full flame of the burner, and when the oven heats up and the flame is automatically reduced, there will be an excess escape of heat through the large uncontrolled vent opening. Because of this excess escape of heat a larger flame is required to maintain the oven at the predetermined temperature than is necessary where there is a control for the vent opening which is operated by the size of the flame, which in turn is controlled by the automatic fuel control.

While it is true that the control for the damper will operate whether the fuel of the burner 3 is controlled automatically or by hand, it is equally true that a predeter-

mined temperature cannot be maintained with the hand control for the burner 3, and right here my automatic damper control steps in and coöperates with the automatic fuel control of my said patent, whereby the two together maintain a predetermined temperature within the oven by reason of the fact that the operation of the damper control depends upon the automatic action of the fuel control in my patent.

Particular attention is called to the construction of the thermostat 11, whereby a short frame 12 may be used, and at the same time the combined expansion effect of the two rods 14 and 15 be obtained, which is equivalent to the expansion effect of a rod twice the length of the thermostat frame. Cast iron is used for the frame preferably, because of its durability and its small coefficient of expansion. The short frame 12 also reduces the extent of its expansion approximately one half what it would be if it were twice its length, and therefore the expansion of the frame is reduced one half, while the expansion of the two rods 14 and 15 is doubled as compared with the expansion of the frame 12.

This invention is particularly adapted for ovens which have a covering of asbestos or similar insulation which form an oven that is well known to those skilled in this art and need not be illustrated or described, as it is well known that they are of the type frequently referred to as fireless cookers, in that they are heated by gas, and radiation of the heat prevented by an insulating covering. In some of these forms of ovens the gas is completely cut off when it has been heated up to a certain temperature, while in others the gas is maintained at a low flame after the oven is heated to the desired temperature, and it is with this latter form of stove that the automatic fuel control of my said Patent, 1,236,335 is particularly well adapted to operate.

In a device of the character here shown it must be operated by the temperature of the burner zone, and this temperature is governed by the volume of fuel and gas consumed. The temperature of this zone is so much higher than the oven temperature, that the oven temperature has practically no effect upon it. In fact in this device the damper control is not effected at all by the oven temperature, on the contrary it is controlled solely by the burner zone temperature.

The term "burner flame zone" in the specification and claims as applied to the thermostat 11, means that the thermostat is sufficiently close to the burner 3 to be directly affected by the increase and decrease of the size of the flame. In practice the thermostat 11 is placed in a horizontal plane two or three inches above the horizontal plane of the burner 3, whereby the thermostat is quickly affected by the increase and decrease of the size or volume of the flame and the amount of fuel being consumed. The term "burner flame zone" may also be defined as that location of the thermostat 11 in respect to the burner 3, which causes the thermostat to quickly respond to the size of the burner flame independently of the degree of heat throughout the oven, whereas the term "oven zone" as applied to the thermostat 32, means the zone which represents substantially the degree of heat throughout the oven. That is to say, the thermostat 11 controls the damper 7 by the direct action of the flame from the burner and, therefore, may be said to be within the burner flame zone, whereas the thermostat 32 is located in the oven zone and is affected by the degree of heat which is substantially uniform throughout the oven. By reason of the thermostat 11 being in the burner flame zone, when the burner is first lighted and the full flow of gas is on, the thermostat quickly responds to the heat from the flame of the burner 3, and causes the damper 7 to open wide, while the heat of the oven zone is not sufficient to materially affect the thermostat 32 for cutting off the fuel or reducing the flame.

I am aware of controlling the fuel to the burner by the oven temperature, and of controlling the damper on vent opening also by the oven temperature as shown for instance in my Patent 1,162,297 of Nov. 30, 1915, but my present improvement operates upon a different principle. It has the principle of two thermostats or controls, one controlled by the oven zone temperature which controls the burner flame, and the other controlled by a burner flame itself, or burner temperature zone. One depends on the oven temperature alone and the other depends upon the burner temperature zone.

So far as the broad invention here illustrated is concerned the type or construction of the thermostat 11 is not essential to the carrying out of the invention, and it may vary from that here shown so long as it is adapted to be located in the burner zone, and adapted to open and close the vent opening of the oven by the temperature of the burner zone as the flame of the oven burner is increased and decreased. Therefore so far as my generic invention is concerned, the construction of the thermostat 11, or its type, may be entirely different from that here shown, when adapted to operate as here shown and described.

Having thus described this invention, what I claim and desire to secure by Letters Patent is:—

1. The combination with a gas oven, having a vent opening therefor, a burner for the oven, controlling means for the vent

opening, a thermostat device located in the burner flame zone, and an operative means between the thermostat and the said vent controlling means, whereby the thermostat operates the vent controlling means according to the variations of the heat from the burner.

2. The combination with a gas oven, having a vent opening, a burner for the oven, a damper controlling the vent opening, a thermostatic device located in the burner flame zone and connected with the damper to open it with full flame and close it corresponding to the decrease in the flame for the purpose described.

3. The combination with a gas oven, of a burner therefor, means for controlling the fuel to the burner, a thermostat located in the burner flame zone, the oven having a vent opening, a damper for controlling the vent opening, and means connecting the damper and the thermostat whereby the damper is opened as the fuel is turned on and closed as the fuel is turned off, for the purpose described.

4. The combination with a gas oven, having a vent opening, a gas burner for the oven, means for controlling the fuel to the burner to increase or decrease the flame thereof, a damper for the vent opening, a thermostat located above and within the burner flame zone and an operative connection between the damper and thermostat to cause the damper to be opened and closed as the fuel of the oven burner is increased and decreased.

5. The combination with a gas oven, having a burner chamber, a vent opening communicating with the burner chamber, a gas burner within said chamber, a damper for said vent opening, a thermostat located in the chamber and within the burner flame zone, means for increasing and decreasing the fuel of the oven burner, and an operative connection between the thermostat and the damper, whereby the damper is opened and closed as the fuel is increased or decreased for the purpose described.

6. The combination with a gas oven, having a burner chamber, a gas burner extending along the side of the chamber, the chamber having a vent passage, a damper controlling the vent passage, a thermostat located in the burner chamber and over a part of the said burner flame and within the burner zone, means for controlling the fuel to the burner, and an operative connection between the damper and the thermostat for opening and closing the damper as the fuel to the burner is increased and decreased.

7. The combination with a gas oven having a burner chamber, a gas burner located therein, the chamber having a vent passage, a damper controlling said passage, a thermostat located in the burner chamber just above and close to the burner, means for controlling the fuel to the burner, and an operative connection between the thermostat and the damper whereby the damper is opened and closed as the fuel to the burner is increased and decreased.

8. The combination with a gas oven, of a gas burner, a thermostat actuated by the heat in the oven and controlling the fuel to the burner, a vent opening for the oven, a thermostat located within the burner flame zone and affected by the flame thereof, a damper for the vent passage, and an operative connection between the damper and the thermostat for opening and closing the damper as the fuel to the burner is increased and decreased.

9. The combination with a gas oven of means for maintaining a predetermined temperature within an oven, said means comprising a gas burner, a thermostat affected by the temperature of the oven and controlling the fuel supply to the burner, the oven having a vent passage, a damper controlling the said passage, a thermostat located within the burner flame zone and directly affected by the flame of the burner, and an operative means between the damper and the thermostat for opening and closing the damper as the fuel to the burner is increased and decreased for the purpose described.

10. The combination with a gas oven having a vent passage, a gas burner, a fuel supply therefor, and a thermostat in the oven zone and affected by the heat of the oven and controlling the fuel supply, of a damper for the vent passage, a thermostat located within the burner flame zone and directly affected by the heat therefrom, and an operative connection between the thermostat and the damper for opening and closing the damper as the flame of the burner is increased and decreased, whereby a predetermined temperature in the oven is maintained.

11. The combination with a gas oven having a vent passage, a gas burner for the oven, means for regulating fuel to the burner, a damper for the vent passage, a thermostat located within the burner flame zone and affected directly thereby, and an operative connection between the damper and the thermostat for opening and closing the damper as the fuel to the burner is increased and decreased.

12. The combination with a gas oven having a vent passage, of a gas burner therefor, means for regulating the flow of fuel to the burner, a damper for the vent passage, a thermostat located in the burner flame zone, said thermostat including a frame, parallel thermostatic rods supported by the frame, a damper for said vent passage, said thermostatic rods operatively connected with the damper to obtain the expansion effect of

both rods upon the damper for causing it to open and close as the fuel to the burner is increased and decreased.

13. The combination with a gas oven having a vent passage, a damper therefor, a gas burner and a thermostat, a lever operatively connected with the damper and actuated by the thermostat, said thermostat located within the burner flame zone, whereby the damper is opened and closed as the fuel to the burner is increased and decreased.

14. The combination of a gas oven having a vent passage, a damper therefor, a gas burner, a fuel control for the gas burner, a thermostat located in the burner flame zone, said thermostat comprising a castiron frame having at one end a rocking arm, parallel thermostatic rods having a greater coefficient of expansion than the frame, a lever connected with the damper, said thermostatic rods arranged to deliver their combined expansion to said lever and open the damper as the fuel is increased, and close the damper as the fuel to the burner is decreased.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

BENJAMIN E. MEACHAM.

Witnesses:
A. C. CALHOON,
L. H. HOLCOMB.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."