Aug. 9, 1955 R. E. GARDINER 2,714,993

RANGE WITH AUTOMATIC CHECK DAMPER UNIT

Filed Aug. 23, 1951

Fig. 1.

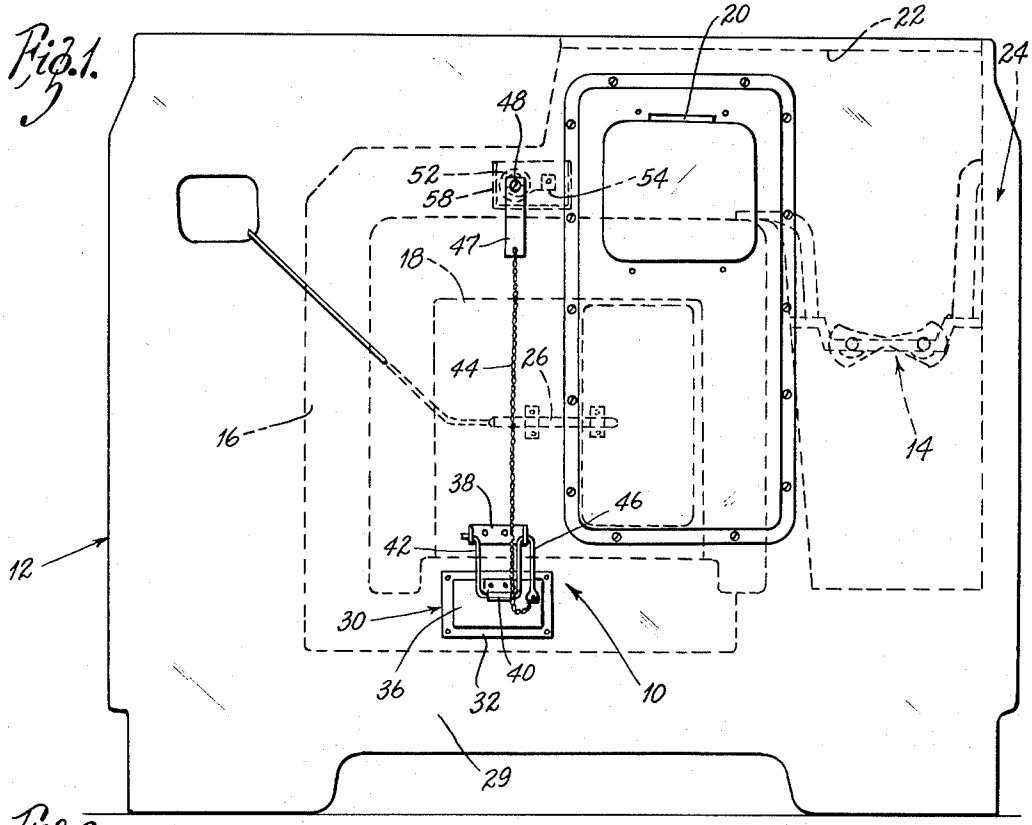


Fig. 2.

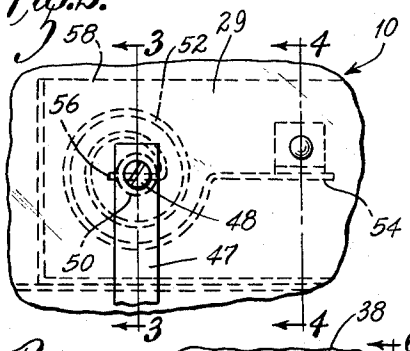


Fig. 3.

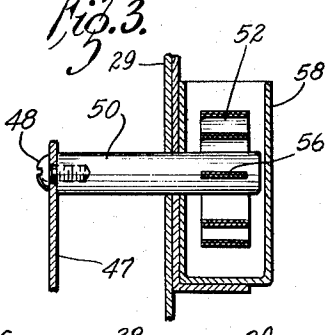


Fig. 4.

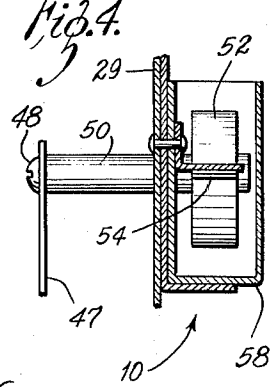


Fig. 5.

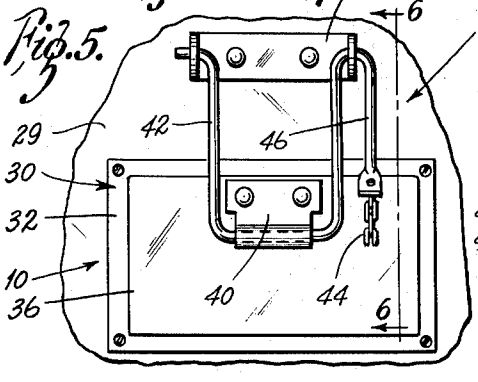
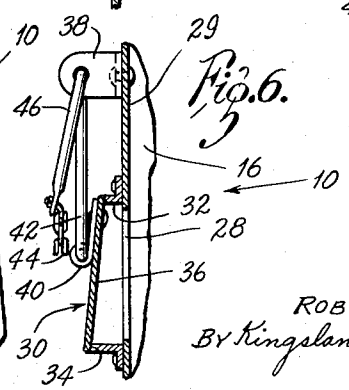


Fig. 6.



INVENTOR:
ROBERT E. GARDINER,
By Kingsland, Rogers & Ezell
ATTORNEYS

United States Patent Office 2,714,993 Patented Aug. 9, 1955

2,714,993

RANGE WITH AUTOMATIC CHECK DAMPER UNIT

Robert E. Gardiner, Affton, Mo., assignor, by mesne assignments, to Universal Match Corporation, St. Louis, Mo., a corporation of Delaware

Application August 23, 1951, Serial No. 243,329

8 Claims. (Cl. 236—15)

The present invention relates generally to the combustion control art, and more particularly to an automatic check damper unit for control of the maximum flue passage temperature in a coal or wood burning range.

Briefly, the invention comprises a check damper opening communicating with the flue passage of a coal or wood burning range between the fire and the stack and a closure for the opening, which closure is connected by means of a flexible chain to a thermostatic bimetallic element located in a flue passage above the oven adapted to open and close the check damper opening in accordance with predetermined temperatures existing in the oven, which temperatures are primarily governed by temperatures existing in the flue passage.

It is an object of the present invention to provide a novel automatic check damper unit adapted to increase the efficiency of a range by cutting down on stack loss.

It is another object of the invention to provide a novel automatic check damper unit which insures more uniform heating of a wood or coal burning range.

It is another object of the invention to provide an automatic check damper unit to provide protection against overheating in a wood or coal burning range.

It is another object of the invention to provide a novel automatic check damper unit which functions only when oven temperatures are in excess of normal cooking temperatures in the range.

It is another object of the invention to provide a novel automatic check damper unit to prevent damage to temperature sensitive elements in a range.

The foregoing and additional objects and advantages will be apparent from the following description taken with the accompanying drawing, in which:

Fig. 1 is a rear elevational view of a wood or coal burning range incorporating the automatic check damper unit of the present invention;

Fig. 2 is an enlarged fragmentary view of a portion of Fig. 1 showing a bimetallic element adapted to control the operation of the check damper unit of Fig. 1;

Fig. 3 is a sectional elevation taken substantially along the line 3—3 of Fig. 2;

Fig. 4 is a sectional elevation taken substantially along the line 4—4 of Fig. 2;

Fig. 5 is an enlarged fragmentary view of a portion of Fig. 1 showing a check damper in closed position; and

Fig. 6 is a sectional elevation taken substantially along the line 6—6 of Fig. 5.

Referring to the drawing more specifically by means of reference numerals, **10** indicates generally an automatic check damper unit constructed in accordance with the teachings of the present invention. The automatic check damper unit **10** is shown incorporated in a combination range **12** provided with a conventional wood or coal burning grate assembly **14**. The range **12** further includes alternative surface heating means (not shown), such as electric, oil, gas, or the like. Such combination ranges are well known, and customarily include provision for space heating, surface cooking, and oven cooking.

The combination range **12** may be coal or wood fired, in either case the fuel being placed upon the grate assembly **14** and oxidized by means of air drawn therethrough by conventional chimney effect. The combustion air enters the range **12** through a front damper (not shown) and the products of combustion of the fuel are caused to flow by chimney draft through a flue passage **16** which extends across the top, down the side remote from the grate **14**, under the bottom and up the rear of an oven **18**, the products of combustion eventually leaving the range **12** through a flue outlet **20** at the rear of the oven **18**. This arrangement, which is well known in the art, clearly provides for heating not only of the oven **18**, but also of a cooking top **22** and of the space occupied by the range **12** by heat passing across the area shown generally as **24**.

It is, of course, obvious that the rate of combustion of the fuel on the grate assembly **14** may be controlled by manipulation of the front damper (not shown), but it is equally apparent that, in the event this front damper is left unattended, the rate of combustion may increase to a point where, not only is it inefficient, but it may cause damage to various parts of the range **12** through overheating. Temperatures around 800° F. may be reached in the flue passage **16**. Many combination ranges, for example, are provided with a capillary tube, such as **26** shown in Fig. 1, filled with a temperature sensitive liquid for control of oven temperatures when electrical or gas heating means are used for the oven **18**. Although the liquids commonly employed in such tubes are capable of withstanding all normal oven cooking temperatures, they may be quickly deteriorated through the overheat which is readily obtainable by an excessive rate of combustion of fuel on the grate assembly **14**. As previously indicated, it is a primary function of the automatic check damper unit **10** to provide protection for such heat sensitive elements in the range **12**.

Inasmuch as the rate of combustion of the fuel on the grate **14** is a function of the draft created by chimney effect, it is obvious that control of the draft may be exercised by admitting air into the flue passage **16** between the grate assembly **14** and the chimney itself. Thus, there is provided an opening **28** in a rear wall **29** forming a portion of the flue passage **16**. As shown in Figs. 1, 5, and 6, the opening **28** is provided with a damper door assembly **30** comprising a frame **32** preferably having an inclined external face **34** adapted to be closed by a door plate **36**. A preferred means for mounting the door plate **36** so as to be movable away from the face **34** of the frame **32** is clearly shown in Figs. 1, 5, and 6 of the drawing to include a bracket **38** and a hinge **40**, respectively, secured to the rear wall **29** and the door plate **36** and connected by a stirrup **42**. Thus mounted, the door plate **36** tends at all times to close by its own weight against the face **34** of the door frame **32**.

A chain **44**, appropriately secured to an extension **46** of the stirrup **42**, is provided for opening the door plate **36** and has an upper end secured to an arm **47** adapted to be rotated in a vertical plane through its attachment by means of a screw **48** to a horizontal shaft **50** mounted to the center of a spirally formed bimetal element **52**. The bimetal spiral **52** is a conventional heat sensitive device which, having its outer extended end **54** securely anchored to the rear wall **29**, as clearly shown in Figs. 2–4 of the drawing, is adapted to rotate its inner flattened end **56** in accordance with temperature changes in the element **52** itself. Thus, for the purpose of the present invention, the element **52** is disposed within the flue passage **16** above the oven **18** so as to subject it to the temperatures prevailing therein. A receptacle **58** may be provided to protect the element **52** from becoming clogged with soot and fly ash.

As best shown in Fig. 1, the chain **44** is preferably of a length to provide sufficient slack to permit the arm **46** to rotate through a substantial arc before becoming effective to lift the door plate **36**. Thus, the door plate **36** may remain closed as long as normal or subnormal operating temperatures prevail in the flue passage **16**. When, however, excessive temperatures obtain in the passage **16**, further movement of the arm **46** causes the door plate **36** to be lifted and the effective draft through the grate assembly **14** to be reduced by dilution of the chimney effect. Temperatures in the back portion of the flue passage **16** may drop 300°–400° F. in ten to fifteen seconds. As soon as the result of reduction in the rate of combustion thus enforced permits the temperatures in the passage **16** to be reduced to a normal operating level, the element **52** will reverse its direction of movement and the door plate **36** will automatically close.

Clearly, there has been disclosed an automatic check damper which fulfills the objects and advantages sought therefor.

It is to be understood that the foregoing description and the accompanying drawing have been given only by way of illustration and example. It is also to be understood that changes in form of the several parts, substitution of equivalent elements, and rearrangement of parts, which will be readily apparent to one skilled in the art, are contemplated as within the scope of the present invention, which is limited only by the claims which follow.

What is claimed is:

1. In a range, grate means for supporting a quantity of combustible material, a smoke passage for conducting products of combustion of said combustible material within said range, a flue outlet in said smoke passage for emitting said products of combustion from said smoke passage, a check damper assembly in said smoke passage for selectively admitting outside air thereunto at a point substantially ahead of said flue outlet, said check damper assembly comprising a frame having an inclined external face, a movable door plate adapted to close said face, and a pivotally mounted stirrup pivotally connected to said door and adapted to withdraw the same bodily from said inclined face, and temperature responsive means disposed within said smoke passage and connected to said check damper assembly for operating the latter in predetermined accordance with the temperatures obtaining in said smoke passage.

2. In a range, grate means for supporting a quantity of combustible material, a smoke passage for conducting products of combustion of said combustible material within said range, a flue outlet in said smoke passage for emitting said products of combustion from said smoke passage, a check damper assembly in said smoke passage for selectively admitting outside air thereinto at a point substantially ahead of said flue outlet, said check damper assembly comprising a frame having an inclined external face, a movable door plate adapted to close said face, and a pivotally mounted stirrup pivotally connected to said door and adapted to withdraw the same bodily from said inclined face, said stirrup having an extension thereto disposed angularly to the plane of the main portion thereof, and temperature responsive means disposed within said smoke passage and connected to said stirrup extension for operating the check damper assembly in predetermined accordance with the temperatures obtaining in said smoke passage.

3. In a range, grate means for supporting a quantity of combustible material, a smoke passage for conducting products of combustion of said combustible material within said range, a flue outlet in said smoke passage for emitting said products of combustion from said smoke passage, a check damper assembly in said smoke passage for selectively admitting outside air thereinto at a point substantially ahead of said flue outlet, and temperature responsive means disposed within said smoke passage for operating the check damper assembly in predetermined accordance with the temperatures obtaining in said smoke passage, said temperature responsive means comprising a spirally formed bimetal element having an outer extended end firmly anchored to said range and an inner end freely rotatable under the influence of temperature changes in said smoke passage, a shaft secured to said inner end for rotation therewith, and an arm secured to said shaft, said arm being connected to said damper assembly.

4. In a range, grate means for supporting a quantity of combustible material, a smoke passage for conducting products of combustion of said combustible material within said range, a flue outlet in said smoke passage for emitting said products of combustion from said smoke passage, a check damper assembly in said smoke passage for selectively admitting outside air thereinto at a point substantially ahead of said flue outlet, and temperature responsive means disposed within said smoke passage for operating the check damper assembly in predetermined accordance with the temperatures obtaining in said smoke passage, said temperature responsive means being connected to said damper assembly by means restricting operative response of the latter to a predetermined limited portion of temperature induced movement of the former.

5. In a range, grate means for supporting a quantity of combustible material, a smoke passage for conducting products of combustion of said combustible material within said range, a flue outlet in said smoke passage for emitting said products of combustion from said smoke passage, a check damper assembly in said smoke passage for selectively admitting outside air thereinto at a point substantially ahead of said flue outlet, and temperature responsive means disposed within said smoke passage for operating the check damper assembly in predetermined accordance with the temperatures obtaining in said smoke passage, said temperature responsive means being connected to said damper assembly by means restricting operative response of the latter to a predetermined limited portion of temperature induced movement of the former, said connecting means comprising a chain of a length sufficient to accommodate a predetermined temperature induced movement of said temperature responsive means without resulting operative movement of said damper assembly.

6. In a range, grate means for supporting a quantity of combustible material, a smoke passage for conducting products of combustion of said combustible material within said range, a flue outlet in said smoke passage for emitting said products of combustion from said smoke passage, a check damper assembly in said smoke passage for selectively admitting outside air thereinto at a point substantially ahead of said flue outlet, said check damper assembly comprising a door frame, a door plate adapted to close said door frame, mounting means disposed above said door frame, and means suspending said door plate from said mounting means for gravity induced closure of said door frame by said door plate, temperature responsive means disposed above said check damper assembly and within said smoke passage for operating the check damper assembly in predetermined accordance with the temperatures obtaining in said smoke passage, said temperature responsive means comprising a temperature responsive bimetal element, a horizontally disposed shaft secured to said element for temperature induced rotation thereby, and an arm secured to said shaft for rotation therewith in a vertical plane, and a chain interconnecting said check damper assembly and said temperature responsive means, said chain having one end connected to said suspending means in the check damper assembly and the other end connected to said arm in the temperature responsive means, said chain being of a length to permit rotation of said arm through a predetermined first arc of movement without operative effect upon said door plate, said chain being effective to lift said door

plate upon rotation of said arm through a predetermined second arc of movement.

7. In a range having an oven, grate means for supporting a quantity of combustible material, a smoke passage extending from said grate means past at least two sides of said oven for conducting hot gases therepast, a flue outlet for discharging the gases from the smoke passage, a selectively operable cold air inlet for admitting cold air to the smoke pasasge at a point intermediate its first and last extensions past the oven, and temperature responsive actuating means for operating the cold air inlet for simultaneously checking the effective draft through the grate means and introducing cold air for flow through at least the last extension of the smoke passage past the oven.

8. The combination of claim 7 in association with a combination range, the latter being provided with automatically controllable auxiliary means for heating the oven, said means including a control element containing a temperature sensitive fluid disposed within the oven, the cold air inlet being disposed at a point in the smoke passage which insures passage of cold air past enough of the oven to prevent temperature rise therein above a predetermined level.

References Cited in the file of this patent

UNITED STATES PATENTS

135,611	Willoughby	Feb. 4, 1873
364,888	Barton	June 14, 1887
377,136	Beauchamp	Jan. 31, 1888
2,360,167	Schumann	Oct. 10, 1944
2,454,044	Eggert	Nov. 16, 1948