

Dec. 13, 1932.

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1,890,816

GAS HEATING SYSTEM

Filed June 25, 1931

4 Sheets-Sheet 1

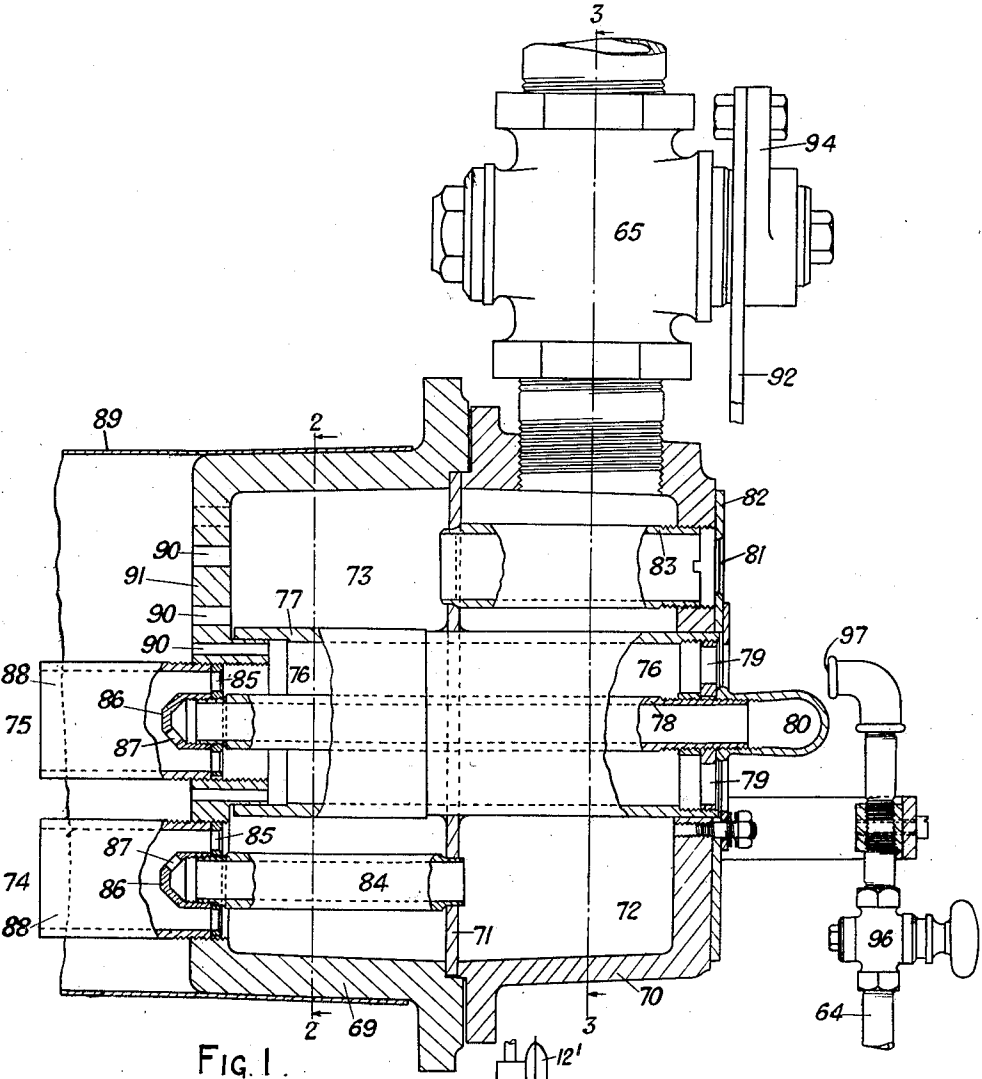


FIG. 1.

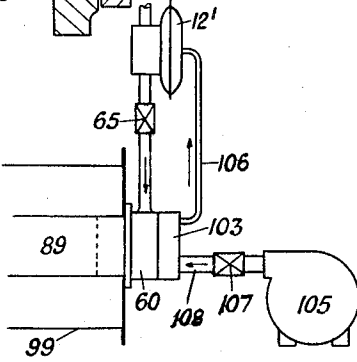


FIG. 5a

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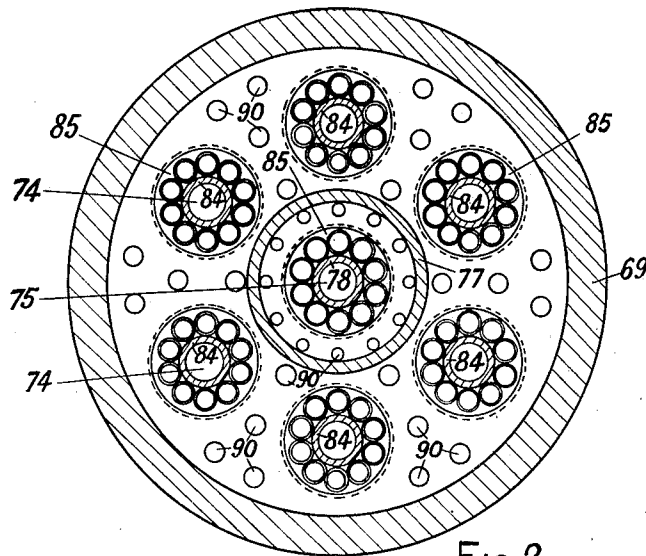


FIG. 2.

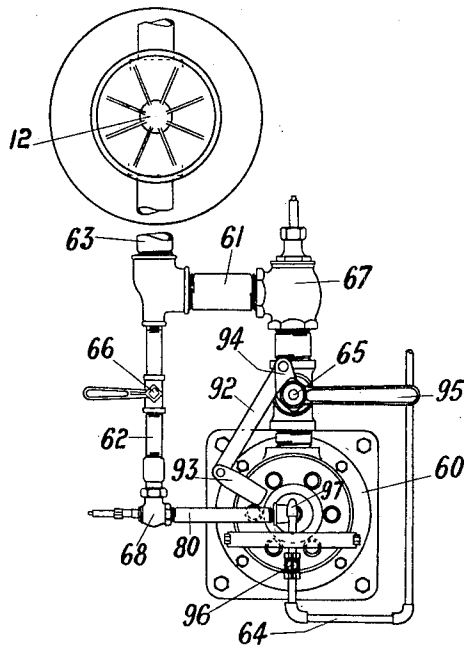


FIG. 4.

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4 Sheets-Sheet 3

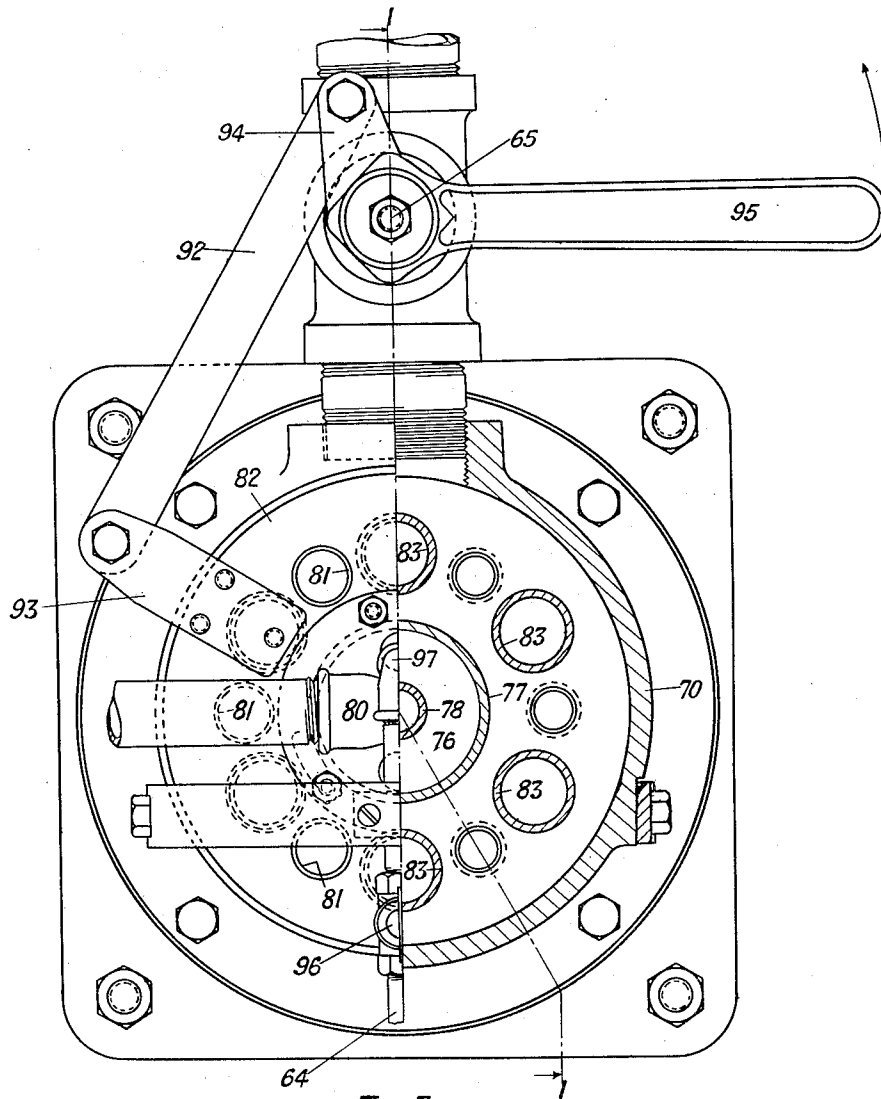


FIG. 3.

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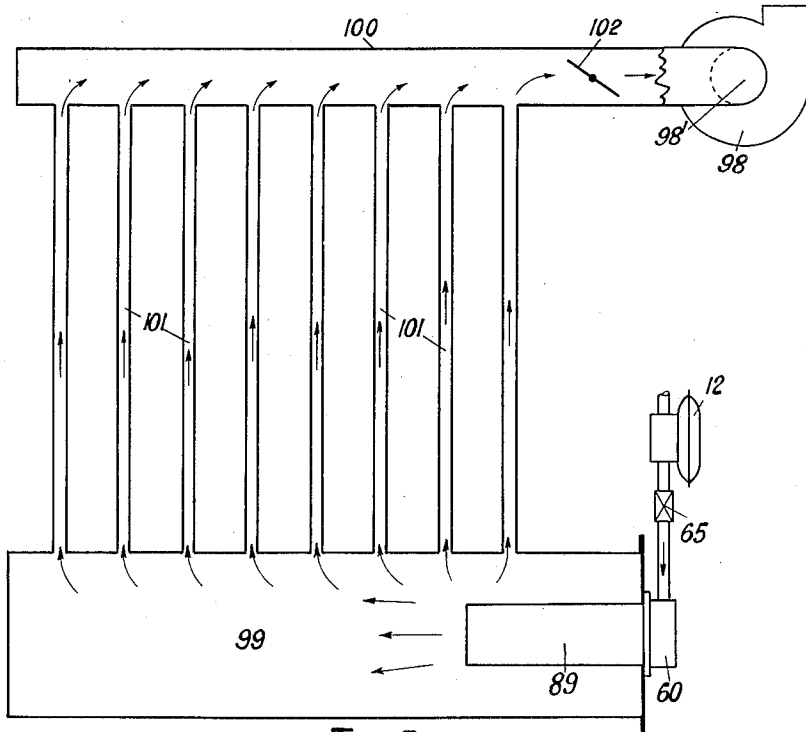


FIG. 5.

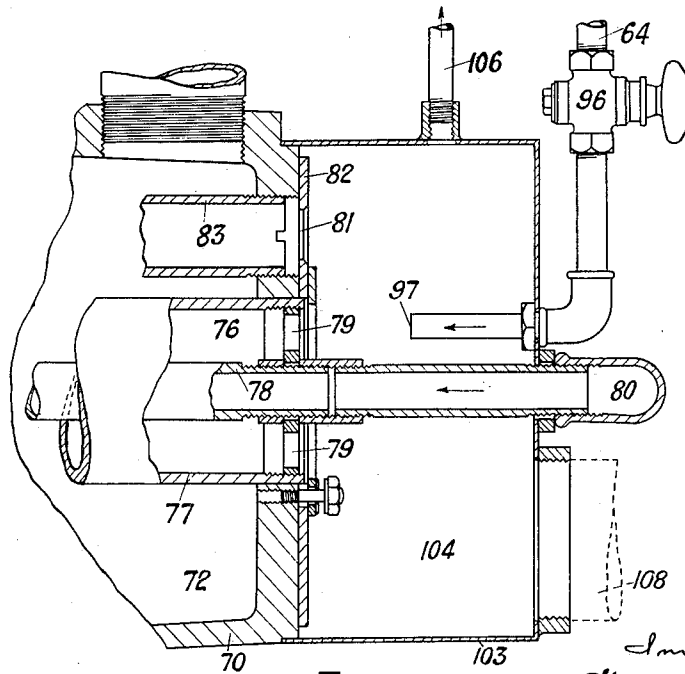


FIG. 6.

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UNITED STATES PATENT OFFICE

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GAS HEATING SYSTEM

Application filed June 25, 1931, Serial No. 546,905, and in Great Britain July 31, 1930.

This invention relates to gas heating systems for gas-fired bread and biscuit ovens and like apparatus.

The invention provides an improved arrangement enabling large quantities of gas to be burned in a combustion chamber without necessity to spread the combustion over a distance in small units of flames, being designed for heating by circulation of hot products of combustion.

A gas heating system according to the invention comprises a plurality of sets of burners surrounded by a tube extending within a combustion chamber, connections for supplying separately combustible and combustion-supporting media to said sets of burners, means for metering separately the supply of said media, a governor for controlling the supply of combustible medium through separate branches to said burners, draught means for withdrawing or expelling the products of combustion from said chamber, and means for varying the draught.

In practice the combustible medium may be gas or a non-explosive mixture of gas and air.

Although for all practical purposes it is sufficient to load the governor to atmospheric pressure only, it may be loaded to a variable sub-atmospheric pressure by the method described in Patent No. 1,701,500, issued February 12, 1929, or the governor may be loaded to super-atmospheric pressure, the two factors which determine the loading of the governor being the pressure existing at the air inlet side of the burner proper and the pressure existing in the combustion chamber.

In the foregoing I have referred to the air and gas being metered by holes and obturators, respectively; it will be understood however that these metering means constitute only the chief portion of the total resistance in each case, the rest of the resistance being introduced by the friction of the passages, bends, etc.

The invention is illustrated in the accompanying drawings in which Figs. 1-3 show the gas burner unit in detail, Fig. 1 being a longitudinal section on the line 1-1 of Fig. 3, Fig. 2 a cross section on the line 2-2 of

Fig. 1 and Fig. 3 a half front elevation half section on the line 3-3 of Fig. 1. Fig. 4 is a front elevation drawn to a smaller scale showing the arrangement of the burner and governor. Fig. 5 is a diagrammatic sectional view showing the general arrangement of the heating system. Fig. 5^a is a fragmentary view showing a modification. Fig. 6 is a fragmentary detail view.

Referring to Figs. 1-5 the gas heating system shown comprises a burner body indicated generally at 60 with two branches 61, 62 (Fig. 4) for supply of gas, connected with the outlet 63 of the governor 12, a third ungoverned supply 64 of gas being provided for a pilot light. Stop cocks 65, 66 are provided on the gas supplies 61, 62, respectively. Control of the gas supply is effected by two obturators 67, 68.

The burner body consists of two castings 69, 70 (Figs. 1-3) bolted together in such wise as to clamp between them a diaphragm plate 71, thus providing a chamber partitioned into two compartments, namely a gas compartment 72 and an air compartment 73. These two compartments 72, 73 supply the constituents for an outer group of burners indicated generally by 74 (Figs. 1 and 2) grouped in a circular row. A central burner 75 is arranged to work separately from the burners 74 for convenience in lighting up and operating, the air compartment for the central burner 75 being formed by the annular space 76 between an outer tube 77 and an inner central tube 78 forming the gas compartment.

The central burner 75 operates as follows: When a depression is produced at the burner outlet by means of a fan 98 (Fig. 5) air is drawn in through holes 79 (Fig. 1) which may be assumed to act as metering orifices for the quantity of air induced for a given depression. The gas supplied through the connection 80 from the branch 62 to the tube 78 is metered by the obturator 68. If the governor 12 is loaded to atmosphere, the difference of pressure across these two metering points must be always the same, whence it follows that the proportion of gas to air will remain constant no matter how the depression on the burner outlet is varied.

The proportions of gas and air supplied to the outer burners 74 is maintained in similar manner, the air being metered by a set of holes 81 in a cover plate 82 and the gas being metered by the obturator 67; the air passing through the holes 81 is fed by tubes 83 into the air compartment 73 while the gas fed to the gas compartment 72 passes through to the burner head by way of tubes 84. The tubes 84 and the tube 78 are centralized in the burner head by perforated plates 85, their inner ends being provided with caps 86 having obliquely drilled holes 87 to form gas outlets which discharge into tubular nozzle pieces 88. The caps 86 are not essential; without them, the resultant flame is, with coal gas, luminous, and large; with them, a partial mixture of the constituents is formed early within the nozzles 88, so that a shorter blue flame is produced.

All the burner nozzles 88 discharge into a main outer tube 89, which may be of any convenient length. The flame produced by this burner is not so intense as to cause destruction of the parts forming the burner outlet, as would be the case where a complete self-burning mixture is used. This is accounted for by the delayed combustion which occurs, the effect being enhanced by reason that part only of the air for combustion is passed through the perforated plates 85 and that a supplementary supply of air is provided by way of holes 90 formed in the back wall 91 of the air compartment 73, the additional air drawn through the holes 90 meeting the partial mixture issuing from the nozzles 88 and meeting the flame along the length of the main outer tube 89.

As it is desired to be able to cut off the burners 74 whilst the burner 75 is still burning, it is necessary to have control over the air supplied to the burners 74 as well as the gas supply; otherwise, if the gas were merely cut off, excess of air would be pulled in through the air holes 81 in the cover plate 82. In order to cut off the air simultaneously with the shutting off of the gas cock 65, the cover plate 82 is arranged to revolve partially so as to eclipse the holes 81 by means of a link 92 connecting an arm 93 on the plate 82 to an arm 94 on the lever 95 of the gas cock 65.

The operation of lighting the burner is as follows: Suction is set up in the combustion chamber 99 (Fig. 5) without any gas being admitted to the burner. A cock 96 on the pilot supply 64 is then opened and a light applied to the outlet 97; the flame from the outlet 97 is sucked through one of the air inlet holes 79 of the burner 75 and is long enough to reach the central burner nozzle 88. When the control cock 66 is turned on, the burner 75 lights up quietly. The pilot cock 96 is then turned off. Subsequently the burners 74 are lit by opening the cock 65.

As shown in Fig. 5 the suction branch 98

of the fan 98 is connected to one end of a header 100 connected to the combustion chamber 99 by way of a bank of heat-radiating tubes 101, there being fitted within the header 100 a valve 102 operable to permit variable throttling of the induced draught.

As is understood, the parts 99, 100 and 101 are located within the oven or the like to be heated.

In the arrangement shown in Figs. 4 and 5 the governor 12 is loaded to atmospheric pressure, i. e., the pressure existing at the air inlet to the burner.

In the modification shown in Figs. 5^a and 6 there is fitted to the front of the burner body a shell 103 defining with the front of said body an air inlet chamber 104 into which is forced at superatmospheric pressure by a fan 105 the air supply to the burners, the gas governor 12' being loaded by way of a pipe 106 so as to govern the pressure of gas to equal the pressure within the chamber 104. 107 denotes an air pressure control valve interposed in the conduit 108 connecting the delivery of the fan 105 with the chamber 104. As shown in Fig. 6, the pilot gas supply outlet 97 is located within the chamber 104. As will readily be understood, in operation, by boosting the air supply to the burner, the draught is supplemented.

What I claim is:—

1. A gas heating system, comprising at least one set of burners, a tube surrounding said burners, said tube being open at the discharge end, a combustion chamber into which said tube extends, connections for supplying separately combustible and combustion-supporting media to said burners, means permitting passage of a secondary supply of combustion-supporting medium to the opposite end of said tube, means for controlling separately the supplies of said media to said burners, said last mentioned means including a governor loaded to a pressure equal to that of the supply of combustion-supporting medium entering said burners, said governor serving to maintain a constant proportion between the combustible medium and the combustion-supporting medium supplied to said burners, draught means for removing the products of combustion from said chamber, and means for varying the draught to regulate the flow of said media to said burners.

2. A gas heating system, comprising a plurality of sets of burners, a tube surrounding said burners, said tube being open at the discharge end, a combustion chamber into which said tube extends, connections for supplying separately combustible and combustion-supporting media to said burners, means permitting passage of a secondary supply of combustion-supporting medium to the opposite end of said tube, means for controlling separately the supplies of combustion-supporting medium to said sets of burners, a governor

loaded to a pressure equal to that of the supply of combustion-supporting medium entering said burners, said governor having two outlets, one branched to each set of burners, said governor serving to control the supply of combustible medium to said burners while maintaining a constant proportion between the combustible medium and the combustion-supporting medium supplied, draught means for removing the products of combustion from said chamber, and means for varying the draught to regulate the flow of said media to said burners.

3. A gas heating system, comprising a central burner and a surrounding set of burners, a tube surrounding said burners, said tube being open at the discharge end, a combustion chamber into which said tube extends, connections for supplying separately combustible and combustion-supporting media to said burners, means permitting passage of a secondary supply of combustion-supporting medium to the opposite end of said tube, means for controlling separately the supply of combustion-supporting medium to said central burner and said surrounding set of burners, a governor loaded to a pressure equal to that of the supply of combustion-supporting medium entering said burners, said governor having two outlets, one serving said central burner and the other serving said surrounding set of burners, said governor serving to control the supply of combustible medium to said burners while maintaining a constant proportion between the combustible medium and the combustion-supporting medium, a stop cock and an obturator for each governor outlet, draught means for removing the products of combustion from said chamber, and means for varying the draught to regulate the flow of said media to said burners.

4. A gas heating system, comprising a burner body partitioned into two compartments, one serving to receive combustible medium and the other to receive combustion-supporting medium, a group of burners receiving supplies of said media from said compartments, a tube surrounding said burners, said tube being open at the discharge end, a combustion chamber into which said tube extends, a connection for supplying combustible medium to one of said compartments, means for admitting a controlled supply of combustion-supporting medium to the other compartment, means permitting passage of a secondary supply of combustion-supporting medium to the opposite end of said tube, a governor loaded to a pressure equal to that of the supply of combustion-supporting medium entering said burners, said governor serving to control the supply of combustible medium to said first mentioned compartment while maintaining a constant proportion between the combustible medium and the com-

bustion-supporting medium passing to said group of burners, draught means for removing the products of combustion from said chamber, and means for varying the draught to regulate the flow of said media to said burners.

5. A gas heating system, comprising a central burner and a surrounding set of burners, a tube surrounding said burners, said tube being open at the discharge end, a combustion chamber into which said tube extends, a tubular connection for supplying combustible medium to said central burner, a tube defining with said tubular connection an annular space for passage of combustion-supporting medium to said central burner, means controlling admission of combustion-supporting medium to said annular space, a governor loaded to a pressure equal to that of the supply of combustion-supporting medium entering said burners, said governor serving to control the supply of combustible medium to said central burner while maintaining a constant proportion between the combustible medium and the combustion-supporting medium, draught means for removing the products of combustion from said chamber, and means for varying the draught to regulate the flow of said media to said burners.

In testimony whereof I have signed my name to this specification.

GEORGE KEITH.