Feb. 12, 1929. 1,701,500

G. KEITH

GAS BURNER INSTALLATION

Filed Jan. 27, 1927 3 Sheets-Sheet 1

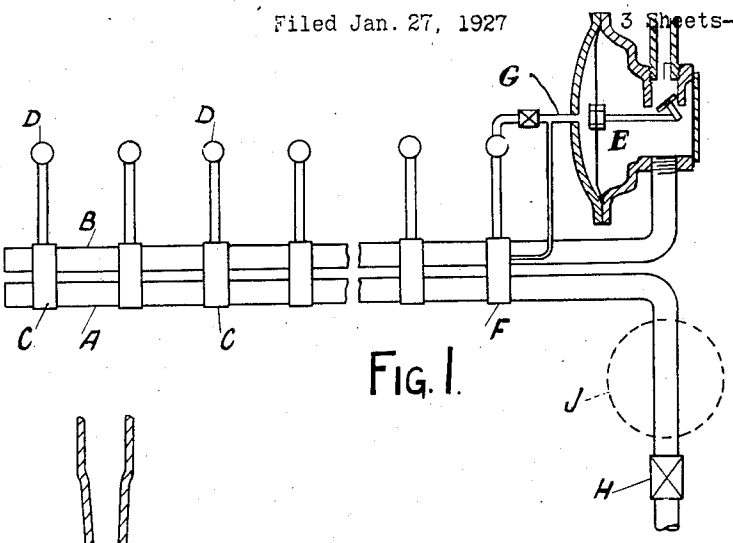


FIG. 1.

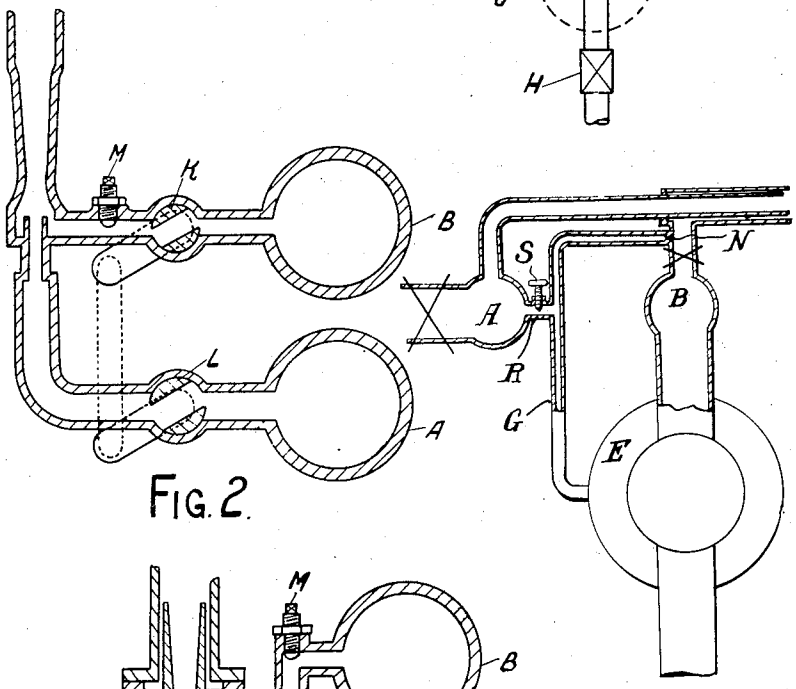


FIG. 2.

FIG. 6.

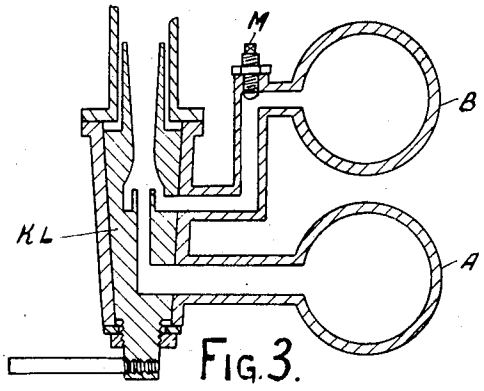


FIG. 3.

Inventor
George Keith
By Pennie, Davis, Marvin & Edmonds
Attorneys

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G. KEITH

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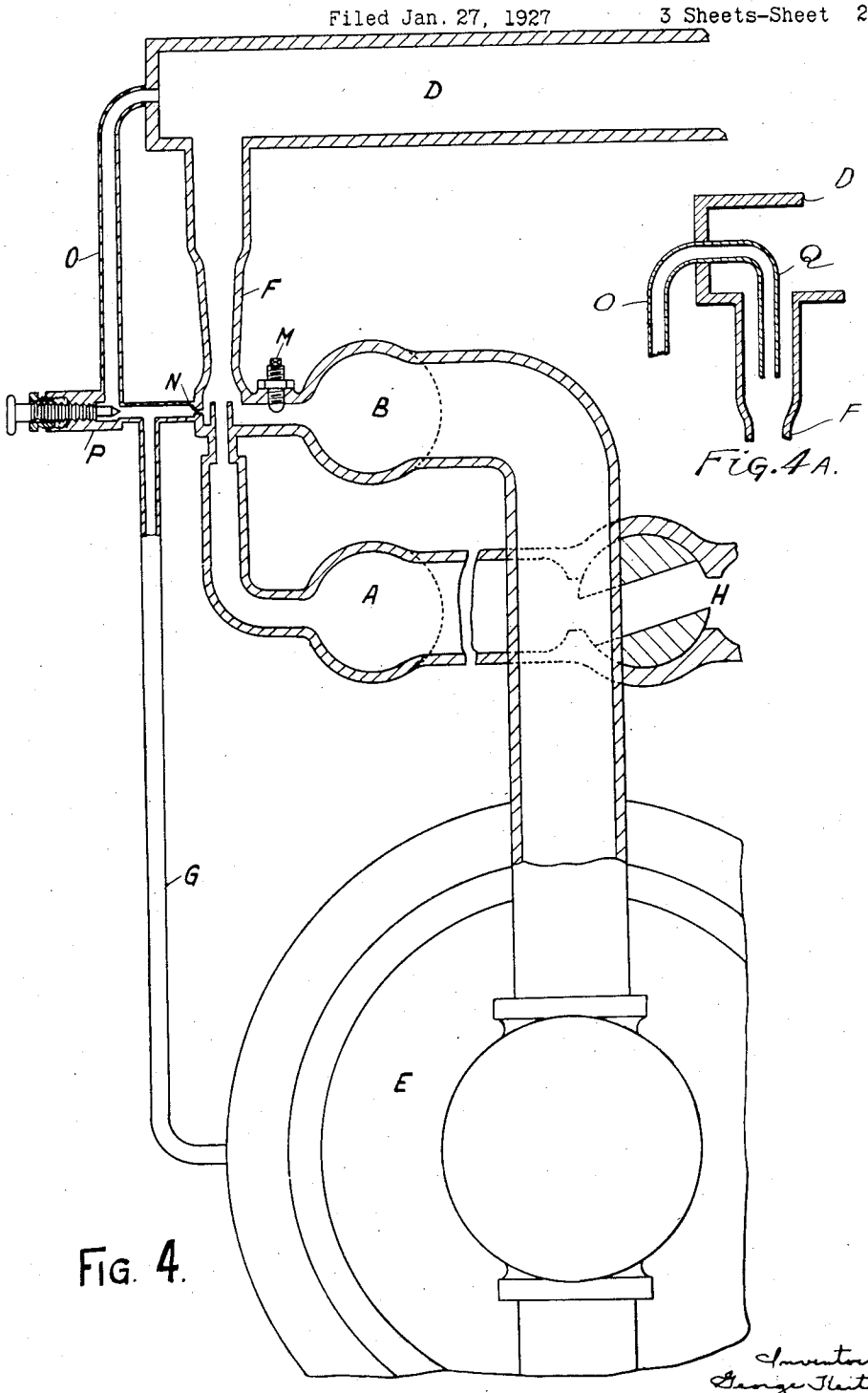


FIG. 4.

FIG. 4A.

Inventor
George Keith
By
Penning, Dann, Marvin & Edmonds
Attorneys

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G. KEITH

GAS BURNER INSTALLATION

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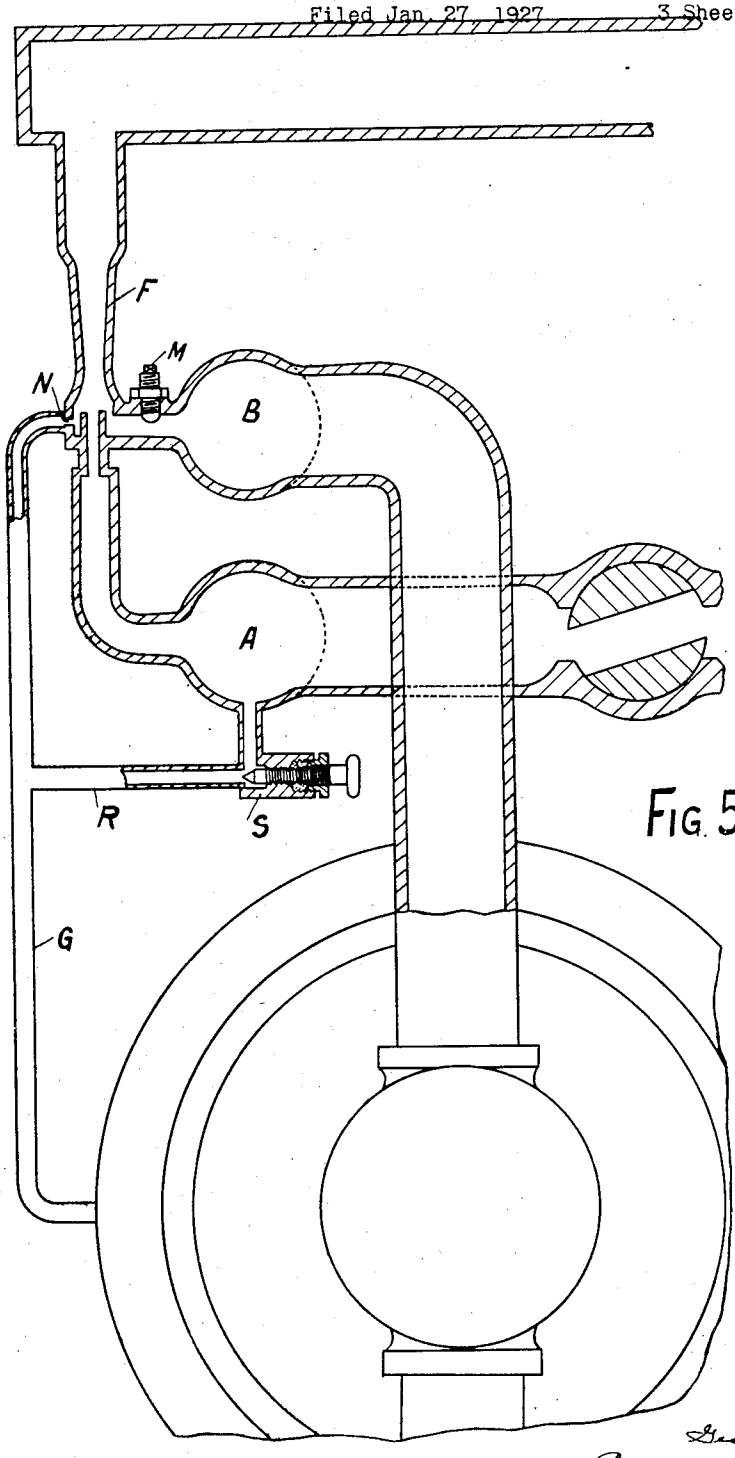


FIG. 5

Inventor
George Keith
By
Parmele, Dennison & Edmonds
Attorneys

Patented Feb. 12, 1929. 1,701,500

UNITED STATES PATENT OFFICE.

GEORGE KEITH, OF LONDON, ENGLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE SURFACE COMBUSTION COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

GAS-BURNER INSTALLATION.

Application filed January 27, 1927, Serial No. 163,943, and in Great Britain February 5, 1926.

This invention relates to an improved system of controlling a group of gas burners, e. g., an installation of burners for firing a bread or biscuit oven or a section of such an oven.

The invention contemplates an arrangement in which the quality of the mixture delivered by a number of injectors or the like is controlled by the pressure conditions set up in one of the injectors or the like serving as a master-unit and co-operating with a governor.

In practice separate air supply and gas supply lines are installed along the oven, at desired points of each section of which are located separate injectors fed with air and gas from the respective lines by way of branches distributed in any suitable arrangement. A single governor is installed to control the pressure of medium in one of the two lines, say the gas supply line, for each section of the oven. Manually operable means or thermostatically controlled means is provided for controlling the pressure in the other line, say the air supply line, such control being depended on to increase or diminish the total quantity of mixture delivered by the group of injectors.

Preferably, the injector and burner units are substantially similar, provision being made for compensating for minor differences so as to equalize the effects obtained from the several units.

For example, one injector might be more efficient than its fellows, so that under the same conditions of air supply and gas supply it would tend to induce more gas (or air) than the others. To counteract this tendency, local adjustment or variable extra resistance may be provided in the gas supply or air supply for each injector. While manufacturing conditions may render it desirable that the injector and burner units be all of the same capacity, sameness of capacity is not essential.

To provide for turning off and on the individual units or sets of units as required whereby to control the distribution of the heating effects, coupled or uncoupled cocks may be fitted to the air and gas lines, or in lieu thereof there may be used a double-ported plug cock in which the injector element may be embodied in an interchangeable fitting.

To avoid the necessity for adjustment of each injector separately, say on the occasion of a change in the quality of gas, provision is made for variably loading the governor, in such wise as practically to exclude the possibility of overloading.

Suitably a small orifice is formed in the suction chamber of the master injector from which is led a pipe having a branch taken to the body of the burner and a branch to the back of the governor. In the first branch is fitted a cock or obturator. Depending on the position of the obturator the load on the back of the governor will vary between that due to the pressure in the suction chamber and that in the burner. It will thus be seen that if the obturator is adjusted while the flame issuing from the burner is observed the governor may be set to ensure the supply of the proper quality of mixture to all the burners.

For the event that it may be necessary to provide for greater difference in the loading of the governor than is realizable with the provision above set forth, the connection to the burner may be extended into the diffusion tube of the master injector so that when the obturator is open there will be communicated through the connection to the governor the pressure requisite to ensure the proper self-setting of the governor.

Again, when, as in working with producer gas, it is found impracticable in certain circumstances to obtain sufficient loading pressure by extending the loading pipe into the diffusion tube of the master injector without interfering with the functioning of such injector, a connection may be taken directly from the air supply line.

The system above described offers important advantages over systems previously practised.

Thus, it permits of convenient control of the total number of burners in use and the

quantity of mixture consumed by these burners collectively or individually.

Further, the quality of the mixture delivered at the burners may be maintained constant however many or few burners are in use, and whether the pressure in the air line is high or low, variation in the quality of the gas constituent being compensated for by adjustment of the obturator.

The system described offers the advantage over systems in which the burners are fed with a preformed mixture that in the event of a burner lighting back only that burner is affected.

With the low pressure demanded for the loading and output of the governor it is possible to fire the oven with low-pressure gas, the air only being under pressure and that pressure within the limits attainable by resort to a fan, it being always understood, however, that, if so desired, the gas may be supplied under pressure and the air supplied at or slightly above atmospheric pressure.

In the accompanying drawings Fig. 1 is a diagram illustrating the general arrangement of the system. Figs. 2 and 3 represent diagrammatically the arrangement of the connections between the two headers and an injector. Fig. 4 shows diagrammatically an arrangement for variably loading the governor with pressure variations in the master injector and the burner system it serves. Fig. 4^a is a detail view of a modification. Fig. 5 shows a modified loading arrangement. Fig. 6 is a diagram illustrating a variant in which the governor is loaded by a function of the variable pressures of the constituents prior to the admixture thereof.

An air header A and a gas header B are arranged parallel to each other. A number of injectors C are clamped to these headers whereby to establish air and gas connections. In the example illustrated each injector is arranged to deliver mixture to an individual burner D, D, it being understood, however, that one injector may be contrived to serve more than one burner. A governor E comprising a diaphragm E′ operatively connected to a valve E^2 controlling the gas inlet serves to control the pressure in the gas header. The governor E is variably loaded by a function of the pressure in a master injector F, between which and the governor a connection is effected by a pipe G. Regulation of the pressure in the air header A is effected by manual adjustment of a valve H.

Fig. 2 shows an arrangement including cocks K and L serving to cut off the air and gas supplies to the injector when the unit in question is out of operation.

The cocks K, L are connected by a link, shown in dotted lines, whereby they may be operated simultaneously, or the cocks may be independently operable. In certain cases, it is sufficient in practice to provide a cock in the gas line and to leave the air blowing. Any other form of cut-off device may be provided.

Fig. 3 shows a double ported cock K L equivalent to the two cocks K and L and contrived to cut off the supplies of gas and air simultaneously.

M denotes a local resistance by adjustment of which the proportions of the mixture injected in each injector may be regulated whereby to counteract any irregularity in performance of the injector due to local peculiarities of form or friction; alternately, this resistance may be introduced in the branch supplying the injecting medium.

It is to be understood that in the arrangements described and shown it is immaterial which of the two headers is an air header and which a gas header.

Formed in the suction chamber of the master injector, shown in Fig. 4, is a small orifice N from which is led a connection comprising a pipe O taken to the body of the burner and a pipe G taken to the back of the governor. P denotes a cock, or obturator, by adjustment of which the pressure in the pipe G may be set to be between that in the burner D and that in the suction chamber of the injector. Should it be necessary to provide for a greater difference in the loading of the governor than is realizable with this provision, a tube Q, shown dotted, may be extended into the diffusion tube of the master injector so that advantage may be taken of the velocity head of the mixture issuing from the injector.

Fig. 5 shows a modified loading arrangement which is useful where the proportion of gas to air is larger than usually obtains in the employment of coal gas, as, for instance, when the producer gas is employed, and when it is desirable to have a greater pressure of gas in the header B than is possible to obtain in the loading system shown in Fig. 4. In this case, the pipe O leading to the burner is dispensed with and a branch R connected to the air header A is substituted. This branch R is controlled by an obturator S. In these circumstances, the pressure for loading the governor is intermediate the pressure in the header A and the pressure in the suction chamber of the injector.

For the sake of clearness no stop cocks are shown on the air or gas branches in Figs. 4 or 5.

As will be understood, in the constructions shown in Figs. 4 and 5 the positions of the orifices N and the obturators S and P may be transposed.

Fig. 6 illustrates diagrammatically a variant in which the governor is variably loaded automatically by a function of the variable pressures of the constituents prior to

the admixture thereof, such arrangement being useful in operation with gases such as blue water gas, mixtures of which are difficult to work with due to the high rate of combustion and consequently difficulty in preventing lighting back. As shown in Fig. 6, the pipe G has a branch R connected to the air header A, said branch being controlled by an obturator S.

From the foregoing it will be understood that, with the adoption of the arrangements described, a burner or group of burners may be cut in or cut out at will without interference with the automatic regulation of the proportions. Characteristic of the present invention is the feature that the adjustment of the quality of the mixture fed to the burners is obtained by varying the loading of the governor manually instead of by shifting manually the obturator at the outlet of the governor, as heretofore.

I claim:—

1. In combination with a group of gas burners to be controlled, separate conduits for supply of the constituents to said burners, a governor device for controlling the pressure in one of said conduits, said governor device including a diaphragm one side of which is acted on by the resultant of two forces automatically variable with variations in the pressures of the constituents, a valve connected to said diaphragm and interposed in one of said conduits and manually controlled means for effecting variation of one of said forces in order to vary the proportions to be maintained of said constituents.

2. In combination with a group of gas burners, injectors for delivery of a mixture of constituents to said burners, one of said injectors serving as a master injector, separate conduits for supply of said constituents to said injectors, a governor device, including a diaphragm and a valve for controlling the pressure in one of said conduits, means for variably loading said diaphragm automatically by the resultant of two forces automatically varying with the variable pressures of said constituents and acting on one side of said diaphragm, one at least of which forces varies with the variable pressure in said master injector, and manually controlled means for effecting variation of one of said forces.

3. In combination with a group of gas burners to be controlled, separate conduits for supply of the constitutents to said burners, a governor device, including a diaphragm and a valve for controlling the pressure of the constituent flowing through one of said conduits, means for controlling the supply of the constituent flowing through the other of said conduits, means for variably loading said diaphragm by the resultant of two forces automatically varying with the variable pressures of the constituents and acting on one side of said diaphragm whereby to maintain desired proportions of the supplies of the constituents to the burners, and manually controlled means for effecting variation of one of said forces in order to vary the proportions to be maintained of such constituents.

4. In combination with a group of gas burners to be controlled, separate conduits for supply of the constituents to the burners, a governor device for controlling the pressure in one of said conduits, said governor device including a diaphragm and a valve, means for variably loading said diaphragm by two forces automatically varying with the variable pressures of the constituents and acting on one side of said diaphragm whereby to maintain desired proportions of the supplies of the constituents to the burners, manually controlled means for effecting variation of one of said forces in order to vary the proportions to be maintained of such constituents, and manually operable means for intercalating variable resistance to the flow of said constitutents to individual burners.

5. In combination with a group of gas burners, injectors for delivery of a mixture of constituents to said burners, one of said injectors serving as a master injector, separate conduits for supply of said constituents to said injectors, a governor device, including a diaphragm and a valve for controlling the pressure in one of said conduits, means for variably loading said diaphragm by two forces automatically varying with the variable pressures of said constituents and acting on one side of said diaphragm, one at least of which forces varies with the variable pressure in said master injector, manually controlled means for effecting variation of one of said forces, and means including at least one valve for cutting in and out the supply to each injector.

6. In combination with a group of gas burners, injectors for delivery of a mixture of constituents to said burners, one of said injectors serving as a master injector and including a suction chamber, separate conduits for supply of said constituents to said injectors, a governor device, including a diaphragm and a valve, for controlling the pressure of the constituent flowing through one of said conduits, a connection between a point of said suction chamber and one side of said diaphragm, a connection between said point and a point subject to pressure variable with the pressure of the other constituent, and a manually adjustable obturator in one of said connections.

7. In combination with a group of gas burners, injectors for delivery of a mixture of constituents to said burners, one of said injectors serving as a master injector and

including a suction chamber, separate conduits for supply of said constituents to said injectors, a governor device, including a diaphragm and a valve, for controlling the pressure of the constituent flowing through one of said conduits, a connection between a point of said suction chamber and one side of said diaphragm, a connection between said point and a point of the conduit traversed by the other constituent, and a manually adjustable obturator in one of said connections.

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

GEORGE KEITH.