No. 862,796. PATENTED AUG. 6, 1907.

V. W. BLANCHARD.

GAS BURNER.

APPLICATION FILED JAN. 22, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

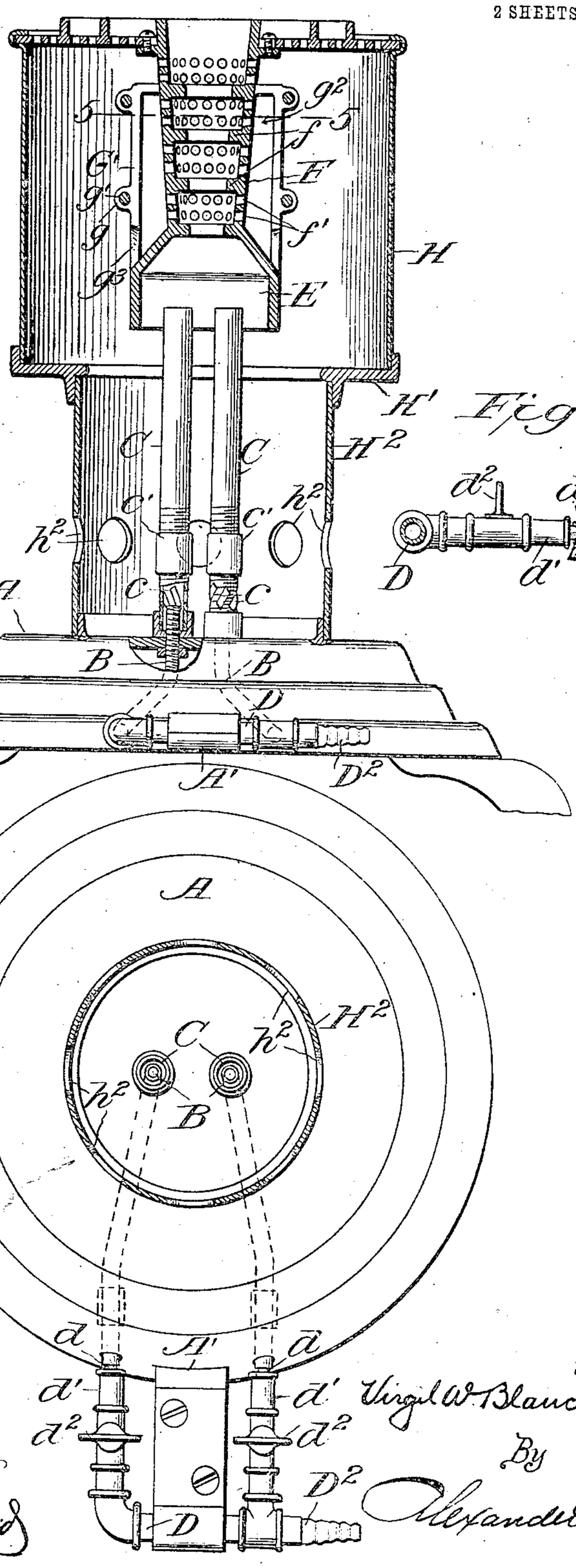

Fig. 3.

Fig. 2.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 4.

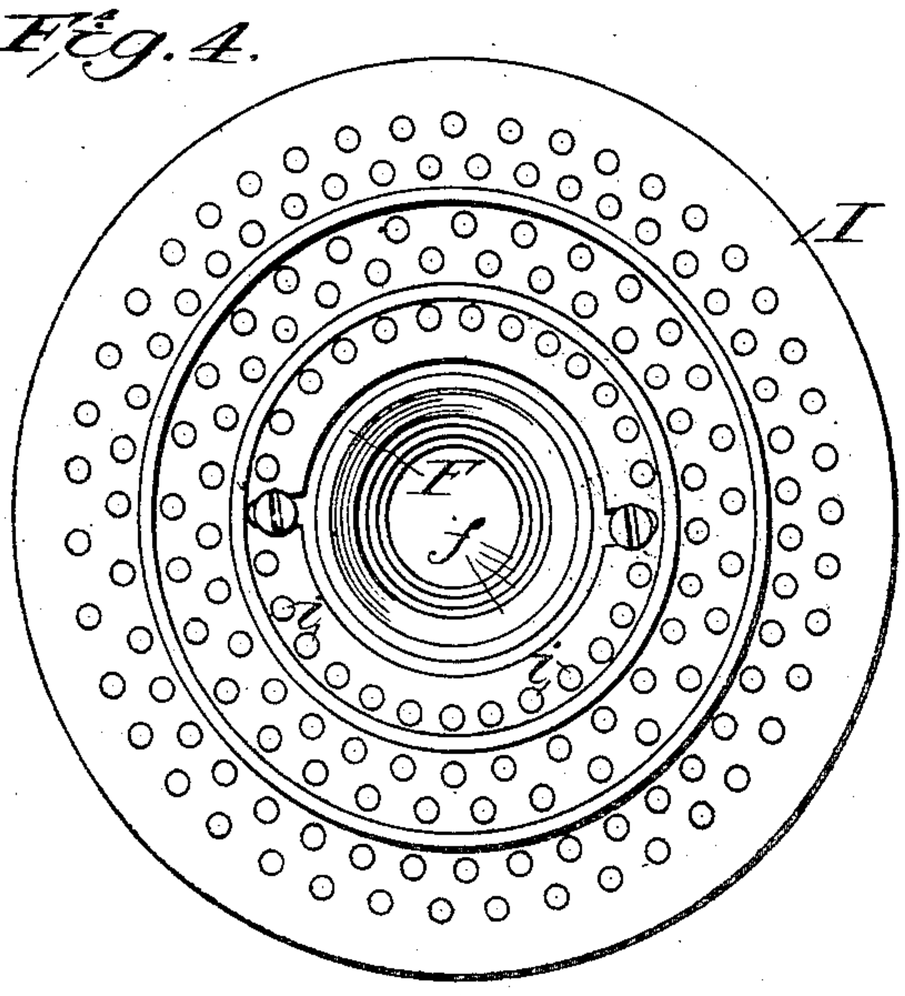


Fig. 5.

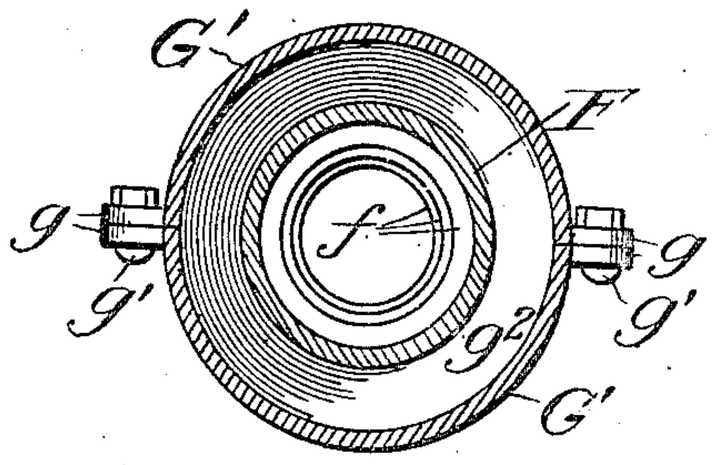


Fig. 6.

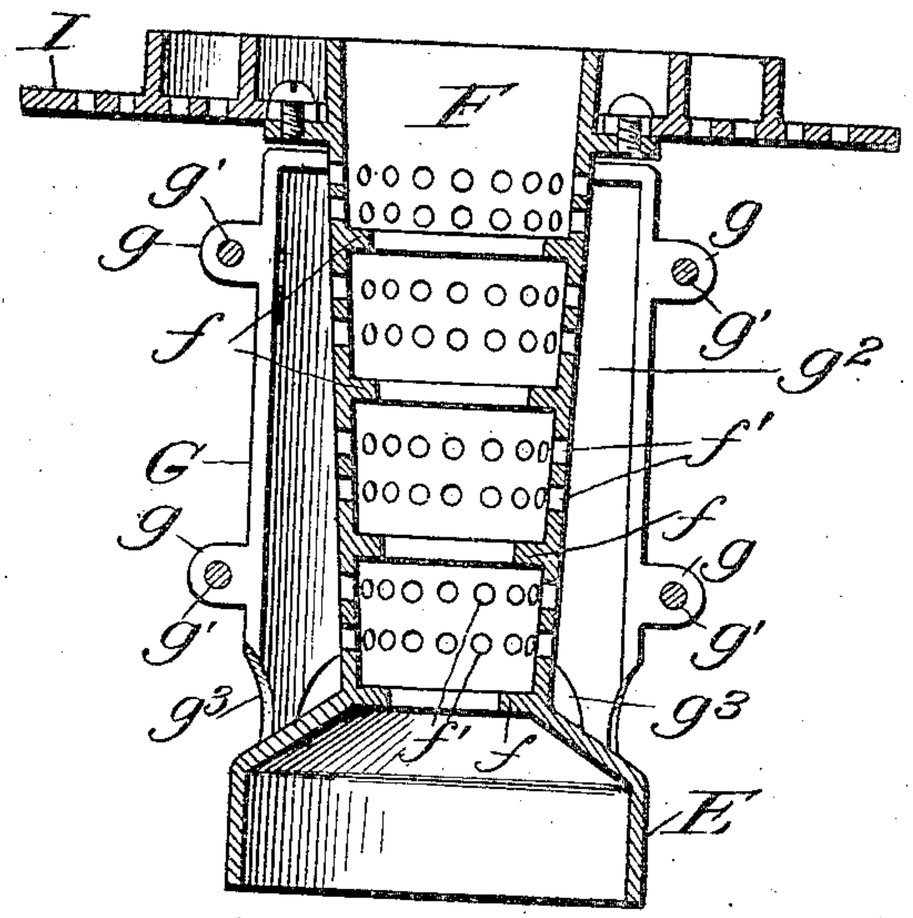
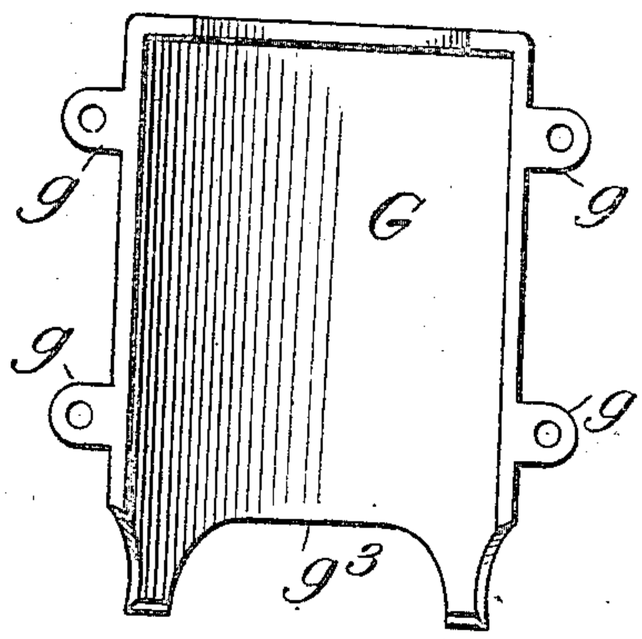


Fig. 7.



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UNITED STATES PATENT OFFICE.

VIRGIL W. BLANCHARD, OF NEW YORK, N. Y.

GAS-BURNER.

No. 862,796. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed January 22, 1906. Serial No. 297,240.

To all whom it may concern:

Be it known that I, VIRGIL W. BLANCHARD, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Gas-Burners; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improved gas burner designed for the total combustion of gaseous fuel and adapted for use in a great variety of the useful arts, especially for house heating and culinary purposes. Its object is to produce perfect total combustion of the gaseous fuel. This is accomplished substantially by the following means: first the admixture of a proper volume of cold air with the gases previous to the firing thereof and a thorough commingling and admixture of the resultant compound; second, by introducing highly heated air into the resulting combustible compound and thoroughly mixing and commingling the same therewith; and finally, introducing into the burning gases such a quantity of heated air as will insure the complete oxidation of all the gaseous elements and the production of a practically colorless invisible heat jet of great heat and without light.

In practice I prefer to first add such a volume of cold air to the gaseous current, by means hereinafter set forth, that the admixture closely approximates a non-combustible condition before firing the same, and following this, to add such a large volume of highly heated air to the combustible gases by means of numerous small jets and mixing and commingling them until the resultant gas or heat jet is invisible to the naked eye in sunlight or artificial light, thus realizing the total combustion of all of the fuel elements contained in the original gaseous current undergoing the process of combustion and obtaining a greatly enhanced volume of heat units by oxidizing a large quantity of the light combustible element (hydrogen) contained in the water diffused in the air itself.

In the accompanying drawings I have illustrated an apparatus which is especially designed and practically adapted for the production of heat without color or light from gaseous fuel, and which will enable those skilled in the art to fully understand the invention and to use the same.

While the drawings illustrate a practical gas-burning apparatus, the invention is not restricted to the particular form or dimensions of parts shown therein; and I refer to the claims following the detailed description of the said apparatus for summaries of the essential features and parts of the invention for which protection is desired.

In said drawings—Figure 1 is a vertical section, partly broken, of the complete gas-burning apparatus. Fig. 2 is a plan view thereof partly broken. Fig. 3 is a detailed section showing the gas-supplying jets. Fig. 4 is a top plan view. Fig. 5 is a transverse section on line 5—5, Fig. 1, enlarged. Fig. 6 is an enlarged vertical section through the burner, and Fig. 7 is a detail view of one of the sections of the burner jacket.

Under the base A, of any suitable construction, are arranged two primary mixing-tubes B, which are provided at their receiving ends with air inlets *b*, the openings of which can be regulated by means of sleeve *b'* on the tubes. The discharge ends of said tubes project upwardly through the base, about the center thereof, and into the lower ends of secondary mixing-tubes C, which are preferably constructed as described in my application for gas burners filed January 22, 1906, Serial No. 297,238, being provided at their lower ends with overlapping air inlet slots *c*, the area of which is controllable by sleeve *c'* on the lower ends of the secondary mixing-chambers C as shown.

The gas is admitted into the receiving ends of the primary mixing-tubes B from jet-heads *d*, removably attached to branches *d'* of a pipe D, which is removably attached to bracket A' on the base as indicated in the drawings, and the branches *d'* may be provided with valves d^2 so as to close or open the gas supply. The pipe D may be connected with a gas supply in any desired manner, and as shown it is provided with a hose connection D^2 at one end, by which it may be connected by a flexible gas-pipe to any ordinary gas-fixture of a building.

The secondary mixing-chambers C discharge into an overhanging dome or hood E, which is arranged thereover, and has a contracted or conical upper portion whose outlet is less in diameter than the width between the axes of the tubes C—C, so that the gases flowing from said tubes strike the inclined roof of the hood E and are deflected thereby so as to produce a violent upward suction of air into the hood from the surrounding air space; the hood in fact becoming a tertiary mixing-chamber for the gases, substantially as described in my application for patent for gas burners, Serial No. 297,238. Above this hood is arranged a burner F, which is small at its lower end and enlarges as it rises, so as to afford a gradually enlarging chamber or space for the burning gases. This burner is provided at intervals with a series of inwardly projecting shallow annular flanges or throat-contractions *f*, which constrict the gas passage and cause an alternate contraction and expansion of the gases as they pass upward through the burner. The burner is also provided with lateral perforations *f'* above each throat-contraction or flange *f*, for the purpose of repeatedly admitting air into the upwardly flowing gases as they rise in the gradually expanded tube above, as hereinafter explained.

The burner is preferably surrounded by a metallic jacket which constitutes an efficient air heater and which is preferably made in sections G', G', secured

together by means of lugs g and bolts or rivets g' at their meeting edges; as shown, said jacket being larger than the exterior of the burner, so as to form an air passage g^2 between the walls of the burner and jacket into which air can enter through notches g^3 in the lower edges of the jacket, and flow upwardly therethrough, as shown.

The burner and hood are further inclosed in a casing H, resting at bottom upon an annular plate H′ supported upon a cylinder H^2 surrounding the secondary mixing-chamber C and resting upon the base A, the cylinder H^2 being provided with apertures h^2 for the admission of fresh air into the casing, as shown. The hood may be suspended from the burner, and the burner in turn suspended from a cap-plate I, supported on the cylinder H, inclosing the casing, and provided with apertures i near the mouth of the burner for the escape of heated air.

In the operation of the device the hood E, burner F and jacket G become highly heated and a great deal of heat is radiated therefrom and the air admitted to the gas at the hood and through the perforations f' will be highly heated and consequently greatly facilitates and augments the intensity of the combustion.

The operation is as follows: Gas is admitted into the primary mixing-tubes D and is mixed therein with air admitted through the apertures b as it flows onward. The mixture escapes into the tubes C, where it receives a further admixture of warmer air admitted through the slots c in such manner and such quantity that approximately the gaseous mixture escaping from the tubes C is almost non-combustible. The gases flowing upward in the hood impinge against the inclined top thereof and are thereby further intimately mixed and then flow upward into the burner through the contracted outlet e at the upper end of the hood and are fired as they pass upward through the burner. The jets of gas issuing from the secondary mixing-chambers C create a suction in the hood and draw air upwardly thereinto which mixes with the gaseous mixture entering the burner. As the mixture burns it rises with increased velocity and force in the burner, and in so doing receives additional modicums of hot air admitted through the lateral apertures f' in the walls of the burner. The flow of the burning gases is slightly checked at each constriction of flange f passing which it slightly expands and is again supplied with fresh jets of hot air coming through perforations f'; the mixture is again slightly compressed in passing through the next constriction formed by the overlying flange, and again is mixed with hot air; and thus in passing through the burner the mixture is repeatedly alternately expanded and contracted and at each point of expansion receives a fresh supply of hot air, so that the resultant flame issuing from the burner is colorless and invisible to the eye and of most intense heat.

It will be observed that the air admitted into the gas at the several points noted becomes hotter and hotter, being of the highest temperature at the upper end of the burner, where the final admixture of air and gas occurs.

The number of primary and secondary mixing chambers employed can be varied to suit the size of the burner, and the amount of heat it is desired to generate; by providing a plurality of such devices, and suitable valves, as shown, one or more sets of primary and secondary mixing-chambers can be cut out of operation when it is desired to produce a less intense heat, or a less amount of heat, thereby correspondingly reducing the amount of gas consumed.

Having thus described my invention what I therefore claim as new and desire to secure by Letters Patent thereon is:

1. The combination of a primary mixing tube, a secondary mixing tube, a burner having numerous rows of perforations in its walls to successively admit air to the burning gases ascending therethrough, and provided with constrictions intermediate the rows of perforations for causing alternate expansion and contraction of the burning gases passing therethrough, and a flaring hood on the lower end of the burner into which hood the secondary mixing tube discharges so that the gases impinge against the walls of the hood before entering the burner.

2. The combination of a mixing tube, a tapered tubular burner above said tube into which the gases from the mixing tube are discharged; said burner being provided with a series of integral internal annular flanges for causing alternate expansion and contraction of gaseous current flowing therethrough, and with apertures in its walls intermediate the flanges for the admission of air into the current of burning gases passing therethrough.

3. The combination of a mixing-tube, a hood into which the mixing-tube discharges, a tapered tubular burner above said hood into which the hood discharges, said burner being provided with a series of internal annular flanges for causing alternate expansion and contraction of the burning gases flowing therethrough, and with apertures in its sides intermediate the flanges for the admission of air into the current of gases at the expanding points; and a jacket surrounding the burner above the hood, and forming an air-chamber to heat the air supplied to the apertures in the burner.

4. In a gas burner, the combination of means for mixing air and gas, a tapered tubular burner provided with a series of internal annular flanges in the gas passage, for causing alternate contraction and expansion of the burning gases passing therethrough and with perforations in its walls for the admission of air intermediate said flanges, and a flaring hood on the lower end of the burner into which hood the gaseous mixture is delivered and impinged against the walls of the hood before reaching the burner.

5. In a gas burner, the combination of means for mixing air and gas, a conical open bottomed hood into which this mixture is discharged, a tubular burner above and formed integrally with the hood and gradually increasing in diameter from its inlet to its outlet, and provided with a series of internal annular flanges forming constrictions of the gas passage and with series of air inlet perforations in its walls intermediate said flanges.

6. In a gas burner, the combination of means for mixing air and gas, an open bottomed conical hood into which this mixture is discharged, a tubular burner above the hood and formed integral therewith and provided with a series of internal integral annular flanges forming constrictions adapted to cause alternate contraction and expansion of the burning gases passing therethrough, and with air inlet perforations in its walls intermediate said constrictions, and a metallic jacket surrounding said burner above the hood, forming an air-heating chamber exterior thereto.

7. The combination of a tapered tubular burner having an internal central gas passage, a series of internal annular flanges in said passage adapted to cause alternate contraction and expansion of the burning gases passing therethrough, and a series of air inlet perforations in the walls of the burner intermediate the flanges, a mixing tube adapted to supply air and gas to the burner, and a metallic jacket surrounding the burner, the space between the burner and jacket forming an air heating chamber.

8. The combination of a primary mixing tube, a secondary mixing tube connected with the discharge end of the primary tube, an open conical hood above and partly inclosing the discharge end of said secondary mixing tube, a tubular burner connected to the upper end of said hood,

said burner having a series of internal annular constrictions and series of lateral air jet openings in its walls intermediate the constrictions, an air heating chamber surrounding said burner, and communicating with the jet openings therein, and a casing inclosing said air-chamber, burner and secondary mixing tubes.

9. In a gas heating stove, the combination of a cylinder, a perforated top-plate thereon, a tapered tubular burner suspended in said cylinder, and provided with a series of internal annular flanges and series of perforations in its walls intermediate the flanges, a hood connected to the lower end of said burner, and means for admitting combustible mixtures of gas and air into said hood.

10. In a gas heating stove, the combination of a cylinder having a perforated top-plate, a tapered tubular burner suspended in said cylinder, and provided with a series of internal flanges, and series of perforations in its walls intermediate the flanges, and a conical hood formed on the lower end of said burner; with a primary mixing tube, means for admitting air and gas into said tube, a secondary mixing tube receiving gaseous mixtures from the primary tube and discharging same into the hood, and means for admitting air to said secondary mixing tube.

In testimony that I claim the foregoing as my own, I affix my signature in presence of two witnesses.

VIRGIL W. BLANCHARD.

In presence of—
JAMES R. MANSFIELD,
L. E. WITHAM.