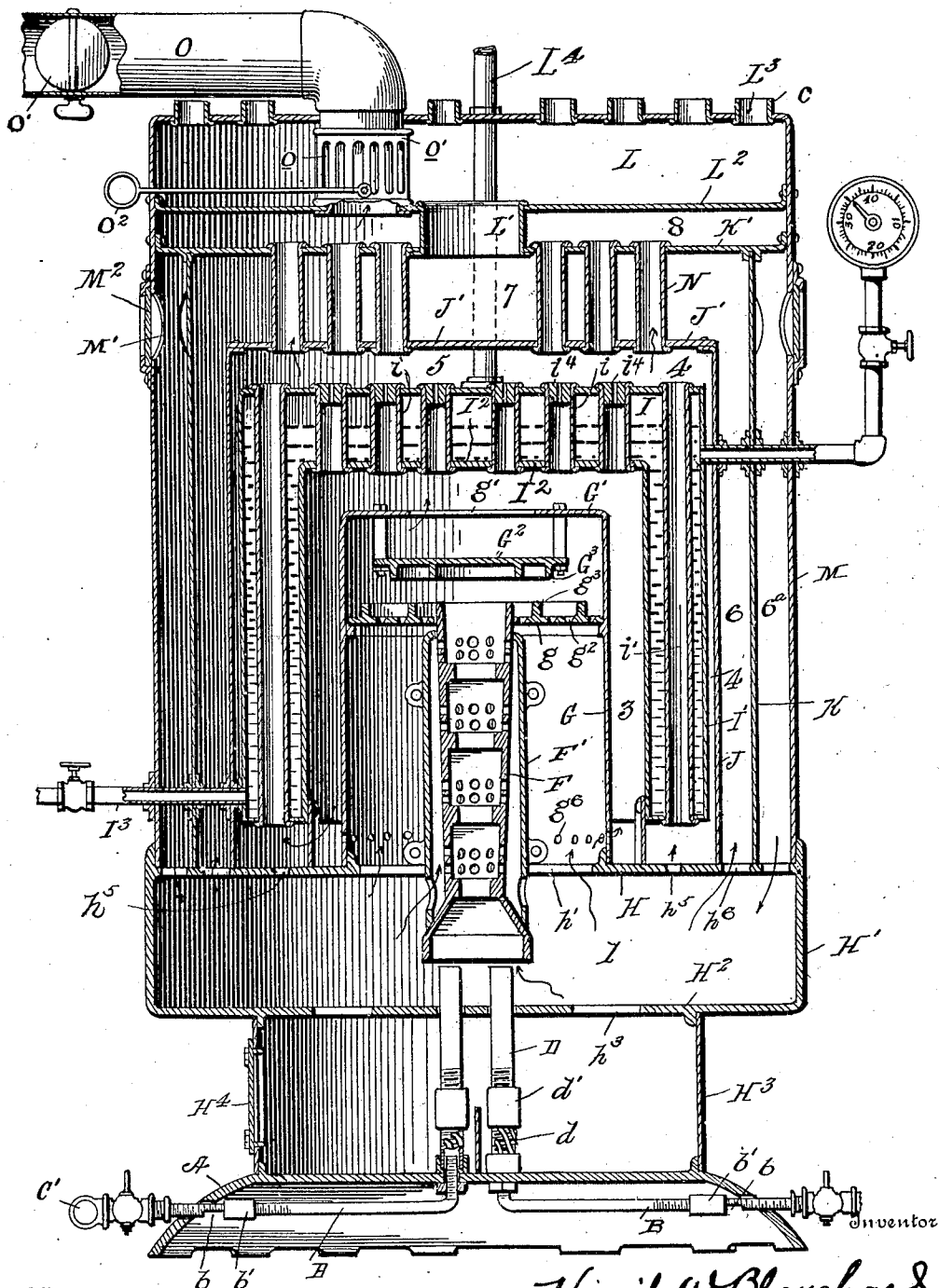


No. 849,314.

PATENTED APR. 2, 1907.

V. W. BLANCHARD.  
HEATING APPARATUS.  
APPLICATION FILED JAN. 22, 1906.



**Witnesses**

Chas. K. Davies.

Chas. H. Davis.  
James G. Brownell

Virgil W. Blanchard

डे.यु.

Alexander & Fowell Attorneys

Attorneys

# UNITED STATES PATENT OFFICE.

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

## HEATING APPARATUS.

No. 849,314.

Specification of Letters Patent.

Patented April 2, 1907.

Application filed January 22, 1906. Serial No. 297,247.

*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 Heating Apparatus; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing, which forms part of this specification.

This invention is an improved heating apparatus specially designed for burning gaseous fuel and to heat air in large quantities for the purpose of ventilation, and also to heat water, so that the apparatus can be used for heating buildings with either hot water or steam or hot air and both hot water or steam and hot air, all supplied from the same apparatus under the best sanitary conditions, and, furthermore, if desired, the gaseous products of combustion in this apparatus are rendered non-poisonous and oxygenated, so that they can, if desired, be commingled with the hot air and supplied to the hot-air registers in the building, so that in this manner every heat unit is conserved and utilized for heating purposes.

The invention therefore consists in the novel construction of the apparatus hereinafter described and claimed, and the accompanying drawing illustrates a vertical section through a complete gas-burning, air-heating, steam-generating, or water-heating furnace embodying the invention.

I preferably use the gas-burning devices shown in my application for patent, Serial No. 297,240, filed January 22, 1906, although the invention is not restricted to any particular form of gas-burner.

In the drawing under the base A of any suitable construction are located two primary mixing-tubes B, to which gas is supplied from pipe C, connected with a gas-supply in any suitable manner, air being admitted to these pipes B at the points *b*, the amount of air admitted being regulated by sleeves *b'*.

The mixtures of gas and air are discharged from the inner ends of tubes B into the lower ends of upright tubes D, which are provided with air-inlet slots *d*, regulable by sleeves *d'*. These secondary mixing-tubes D discharge into the lower end of the burner F, preferably constructed as described in my application

aforesaid and suspended from a perforated plate *g* within a cylinder G, which surrounds the burner, which cylinder is supported upon an annular plate H, which is supported upon a cylinder H', resting upon a second horizontal plate H<sup>2</sup>, which is supported upon a short cylinder H<sup>3</sup>, resting upon the base A and surrounding the tubes D. The space between the plates H and H<sup>2</sup> forms an air-distributing chamber 1, hereinafter referred to.

The heater F may be surrounded by a jacket F'. On the upper end of the cylinder G is an annular plate G', having an annular opening *g'* for the products of combustion. Suspended below this opening *g'* is a plate G<sup>2</sup>, which is preferably provided on its under side with annular ribs G<sup>3</sup>, while the plate *g'* is perforated at *g*<sup>2</sup> for the admission of air to the space between said plates. The products of combustion are discharged from the burner F against plate G<sup>2</sup> and are deflected outwardly thereby between the ribs G<sup>3</sup> *g*<sup>3</sup> and eventually pass up and out through the opening *g'* into a secondary combustion-chamber 3, which is formed within an inverted-cup-shaped boiler I or water-heater, which is preferably constructed as shown and described in my application for steam-boiler, Serial No. 297,248, filed January 22, 1906. This boiler has an annular depending leg I', surrounding the cylinder G, the space between the wall of this leg and the cylinder G forming a descending flue 3 for the products of combustion. The boiler may be supported upon the plate H, as shown, and the products of combustion can pass under the lug of the boiler and into an ascending flue 4, formed between the outer cylindrical wall of the boiler, and an inclosing cylinder J, also resting upon plate H, extending above the top of the boiler and at its upper end closed by a plate J', a hot-air space or flue 5 being left between the top of the boiler and plate J'.

The boiler is preferably provided with short fire-tubes *i*, which connect the chambers 3 and 5, and with long fire-tubes *i'*, which extend through the annular leg of the boiler, as shown, so that by this construction the boiler is entirely surrounded by heated gases and in addition has currents of hot gases circulating therethrough in the tubes *i* *i'*.

Water can be supplied to the boiler through a pipe I<sup>3</sup>, and hot water or steam can be

taken therefrom through pipe I<sup>4</sup>, connected to the upper end thereof. The boiler should be provided with proper gages and valves (not shown) to regulate the supply of water and the pressure therein.

The cylinder J is inclosed by a cylinder K, resting on plate H and having its upper end closed by the plate K' above plate J'. The space between the cylinders J K forms an ascending air-heating flue 6, which communicates at top with an air-heating space 7, between the plates J' K', from which the hot air rises into a distributing-chamber L, located on top of the furnace, chambers L and 7 being connected by a short pipe L', which passes through an outer chamber 8 for the products of combustion between the plate K' and the bottom plate L<sup>2</sup> of chamber L. The sides of chamber 8 and of the distributing-chamber L are conveniently formed by the outer walls or casing M of the furnace, which casing incloses the cylinder K and is supported upon the plate H or cylinder H', as indicated in the drawing.

The space between the cylinders K and casing M form a descending air-flue 6, which communicates at bottom with the air-distributing chamber 1, which chamber communicates with the flue 6 through apertures h<sup>6</sup> in plate H. This air-chamber 1 also communicates with the burner, as shown, and with the lower part of the cylinder G through apertures h' and with the interior of cylinder H<sup>3</sup> through openings h<sup>3</sup> in plate H<sup>2</sup>.

The chambers 5 and 8 are connected through chamber 7 by means of pipes N, attached to plates J' K', as shown, through which the heated products of combustion pass from chamber 5 into chamber 8, imparting heat to the surrounding air in chamber 7. From chamber 8 the products of combustion can escape to the chimney through a pipe O, provided with a valve O' outside the distributing-chamber and with an annular series of slots o within the distributing-chamber L, which slots are closable by the valve o', which can be operated by a pull-rod o<sup>2</sup>, extending outside of the distributing-chamber. When this valve o is closed, all the products of combustion are shut out of the distributing-chamber.

The cylinder H<sup>3</sup> is preferably closed tightly during the operation of the apparatus, but is provided with a door H<sup>4</sup>, by which access can be had to the valves d' on tubes D. Air may be admitted into the casing in any convenient manner, but preferably it is admitted thereto through openings M' in its upper ends which are closable or regulable by an annular valve M<sup>2</sup>.

The hot air in chamber L can be distributed to the several registers of the building by ordinary hot-air pipes (not shown) connected to collars L<sup>3</sup>, surrounding openings in the up-

per part of chamber L. The cylinder G may be provided with apertures g<sup>6</sup> at its lower end, through which air can be admitted into the products of combustion as they pass from flue 3 into flue 4.

Operation: Suitably-regulated mixtures of gas and air are admitted to the burners F, and the heated products of combustion pass into the chamber 3 and impinge against the crown-sheet I<sup>2</sup> of the boiler, which forms the roof of the chamber 3. Some of the products of combustion pass up through the fire-tubes i into the chamber 5; but I preferably choke the upper ends of tube i by means of plugs i<sup>4</sup>, provided with small apertures, so that the flow of hot gases upward therethrough is retarded and the major portion of the products of combustion are compelled to descend through flue 3 to the lower end of the annular leg I' of the boiler, under which they pass to the flue 4 and ascend into chamber 5. Additional air may be supplied to these products of combustion through the jets g<sup>6</sup> and through apertures h<sup>5</sup> in the plate H, as indicated in the drawing, to not only insure thorough oxidation of the combustible elements in the products of combustion, but also to measurably reoxygenate such products and render them capable of use for heating purposes, as described in my application for furnace, Serial No. 297,245, filed January 22, 1906. Part of the gases also rise through the flues i' into chamber 5, and the water in the boiler I is highly heated, and the hot water or steam can be utilized for heating the building by connecting the boiler in the usual manner with the hot-water or steam heating-pipes in the building. The heated gases pass from chamber 5 through tubes N into chamber 8 and thence, if desired, through pipe O to the outlet. The hot gases passing through the apparatus heat the air in the flue 6 and in the chamber 7, this heated air escaping eventually into chamber L and may be supplied to the hot-air registers in the building through the usual hot-air pipes connected to collars L<sup>3</sup>. It will be seen that the heated gases are circulated in and around and through the cold-air chambers and passages in a most advantageous manner, and as the partitions and cylinders are preferably made of sheet metal a great amount of heating-surface is presented for contact with the hot air.

If desired, the products of combustion, which by the use of my improved gas-burner are completely oxidized and contain only carbonic-acid gas and are not as deleterious to health as the products of ordinary gas-heating stoves commonly used in living-rooms and which are rendered practically innocuous by a large admixture of fresh air supplied thereto after the oxidation is completed, may be admitted into the distributing-

chamber by opening valve *o'* and partly or wholly closing valve *O'*, and thus mixed with the fresh air and delivered into the living-rooms through the hot-air pipes.

5 In the apparatus described the heat generated in the burner is entirely utilized to heat water and air in large volumes, and the terminal gases may be commingled with the heated air and discharged therewith. For  
10 heating very large rooms the hot air may be discharged directly into the room through the openings in the distributing-chamber.

It will be observed by reference to the drawings that the chambers 2 and 5 and flues  
15 3 and 4 practically form one large combustion-chamber, which, however, is divided by the inverted-cup-shaped boiler into the upper and lower chambers 2 and 5 and into ascending and descending gas-flues 4 and 3. In  
20 some cases it might not be desired to use the boiler, and in such a case a very efficient air-heating apparatus would be produced and, in fact, with the parts constructed as shown and described; but with the boiler disused I would  
25 still have a very efficient gas-burning air-heating furnace.

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

30 1. The combination of a burner, an inverted-cup-shaped boiler above and surrounding the burner, annular flues for the products of combustion exterior to the boiler, an air-heating chamber above the boiler, gas-  
35 flues passing through said chamber, an outlet for the gases above said chamber, and an air-distributing chamber.

2. The combination of a burner, means for supplying gas and air thereto, an inverted-  
40 cup-shaped boiler above and surrounding the burner, annular flues for the products of combustion exterior to the boiler, an annular air-heating flue inclosing the gas-flues, an air-heating chamber above the boiler, gas-flues  
45 passing through said chamber, an outlet for the gases above said chamber, and an air-distributing chamber above the air-heating chamber.

3. The combination of a burner, an inverted-  
50 cup-shaped boiler above and surrounding the burner, annular flues for the products of combustion exterior to the boiler, an air-heating chamber above the boiler, gas-flues passing through said chamber, an outlet for the gases above said  
55 chamber, and an air-distributing chamber; with a casing surrounding the flues, an air-chamber in the casing below the burner and flues, and air-passages connecting said air-chamber with said flues.

4. The combination of a burner, means for supplying gas and air thereto, an inverted-  
cup-shaped boiler above and surrounding the burner, annular flues for the products of

combustion exterior to the boiler, an annular  
65 air-heating flue inclosing the gas-flues, an air-heating chamber above the boiler, gas-flues passing through said chamber, an outlet for the gases above said chamber, and an air-  
70 distributing chamber above the air-heating chamber; with a casing surrounding the air-heating flues, an air-chamber in said casing below the burner and flues, and air-passages connecting said air-chamber with said flues.

5. In a gas-heating apparatus, the combi-  
75 nation of a gas-burner, a combustion-chamber above the burner, descending flues surrounding the burner, an air-heating chamber above the combustion-chamber, an out-  
80 let-chamber for the gases above the air-heating chamber, pipes passing through the air-heating chamber and connecting the combustion-chamber with the outlet-chamber, a hot-air-distributing chamber above the out-  
85 let-chamber, and a connection between the air-heating and air-distributing chamber.

6. In a gas-heating apparatus, the combi-  
nation of a gas-burner, a combustion-chamber above the burner, descending flues surrounding the burner, an air-heating chamber  
90 above the combustion-chamber, an outlet-chamber for the gases above the air-heating chamber, a hot-air-distributing chamber above the outlet-chamber, pipes connecting the combustion-chamber with the outlet-  
95 chamber, and a pipe connecting the air-heating and air-distributing chamber; with an inverted-cup-shaped boiler in the combustion-chamber and surrounding the burner, adapted to cause the products of combustion  
100 to first descend and then ascend in their passage to the outlet-chamber.

7. In combination, a burner, a combustion-chamber surrounding the same into  
which the heated products of combustion are  
105 discharged, an air-heating chamber inclosing the combustion-chamber, an air-distributing chamber, pipe connections between such chambers, an outlet-chamber between the air-heating and air-distributing cham-  
110 bers, and heating-pipes connecting the combustion and outlet chambers and passing through the upper portion of the air-heating chamber.

8. In combination, a burner, a combustion-  
115 chamber surrounding the same, into which the heated products of combustion are discharged, an air-heating chamber inclosing the combustion-chamber, an outlet-chamber above the air-heating chamber, heating-pipes  
120 connecting the combustion and outlet chambers and passing through the upper portion of the air-heating chamber, an air-distributing chamber above the outlet-chamber, connections between the air-heating and air-dis-  
125 tributing chambers; with an inverted-cup-shaped boiler in the combustion-chamber forming interior descending and exterior as-

ceding gas flues or passages therein, and fire-tubes extending through said boiler for the passage of the products of combustion.

9. In a gas-heating apparatus, the combination of a gas-burner, a combustion-chamber above the burner, descending flues surrounding the burner, an air-heating chamber above the combustion-chamber, an outlet for the gases above the air-heating chamber, and pipes passing through the air-heating chamber, and connecting the combustion-chamber with the outlet-chamber, an air-supply chamber below the burner and flues and communicating therewith, and a hot-air-distributing chamber above the gas-outlet chamber and communicating with the air-heating chamber.

10. In combination a gas-burner, a combustion-chamber surrounding the same into which the heated products of combustion are discharged, an air-heating chamber inclosing the combustion-chamber, a gas-outlet chamber above the air-heating chamber, and heating-pipes connecting the combustion and outlet chambers and passing through the upper portion of the air-heating chamber; with a cold-air-supply chamber below the burner and flues and communicating therewith, and a hot-air-distributing chamber above the gas-outlet chamber communicating with the air-heating chamber.

11. The combination of a burner, an inverted-cup-shaped boiler surrounding said burner, and gas-flues for the products of combustion exterior to said boiler and surrounding the same; with a cold-air-supply chamber below the burner and flues and communicating therewith, and a hot-air-distributing chamber above the boiler communicating with the air-heating flues.

12. In combination, a burner, an inverted-cup-shaped boiler surrounding said burner, gas-flues for the products of combustion exterior to said boiler, and air-heating flues surrounding the boiler and gas-flues; with a cold-air-supply chamber below the burner and flues and communicating therewith, and a hot-air-distributing chamber above the boiler and communicating with the air-heating flues.

13. The herein-described heating apparatus having an air-distributing chamber at its lower end a cylinder above said chamber, a gas-burner in said cylinder, a combustion-chamber surrounding the said cylinder, ascending air-heating flues around said combustion-chamber, an air-heating chamber above said combustion-chamber, a gas-outlet chamber above the air-heating chamber, heating-pipes connecting the combustion-chamber and outlet-chamber, a distributing-chamber above the outlet-chamber communicating with said air-heating chamber, a casing inclosing the air-heating cham-

ber and flues, the space between said casing and flues communicating with the air-distributing chamber.

14. The herein-described heating apparatus having an air-distributing chamber at its lower end, a cylinder above said chamber, a gas-burner in said cylinder, a combustion-chamber surrounding the said cylinder, ascending air-heating flues around said combustion-chamber, an air-heating chamber above said combustion-chamber, a gas-outlet chamber above the air-heating chamber, and heating-pipes connecting the combustion-chamber and outlet-chamber, and passing through the air-heating chamber; with means for supplying air to said air-distributing chamber, means for supplying mixtures of air and gas to said burner, and a valve on the outlet-pipe for the products of combustion for establishing communication between said outlet-pipe and the air-distributing chamber.

15. The herein-described heating apparatus having an air-distributing chamber at its lower end, a cylinder above said chamber, a gas-burner in said cylinder, a combustion-chamber surrounding the said cylinder, ascending air-heating flues around said combustion-chamber, an air-heating chamber above said combustion-chamber, a gas-outlet chamber above the air-heating chamber, heating-pipes connecting the combustion-chamber and outlet-chamber, a distributing-chamber above the outlet-chamber communicating with the air-heating chamber, a casing inclosing the air-heating chamber and flues, the space between said casing and flues communicating with the air-distributing chamber; with an inverted-cup-shaped boiler located in the combustion-chamber and surrounding the burner and forming descending and ascending flues for the products of combustion and provided with vertically-disposed hot-air pipes for the products of combustion.

16. The herein-described heating apparatus having an air-distributing chamber at its lower end, a cylinder above said chamber, a gas-burner in said cylinder, a combustion-chamber surrounding the said cylinder, ascending air-heating flues around said combustion-chamber, an air-heating chamber above said combustion-chamber, a gas-outlet chamber above the air-heating chamber, heating-pipes connecting the combustion-chamber and outlet-chamber, and passing through air-heating chamber, and a distributing-chamber above the outlet-chamber communicating with the air-heating chamber, a casing inclosing the air-heating chamber and flues; with an inverted-cup-shaped boiler located in the combustion-chamber and surrounding the burner and forming descending and ascending flues for the prod-

ucts of combustion and provided with vertically-disposed hot-air pipes for the products of combustion, means for supplying gas to the burner, and a valve in the gas-outlet  
5 whereby terminal gases may be discharged into the air-distributing chamber.

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.