No. 636,712. Patented Nov. 7, 1899.

V. W. BLANCHARD.

HEATING STOVE.

(Application filed May 3, 1898. Renewed Aug. 21, 1899.)

(No Model.)

Fig. 1.

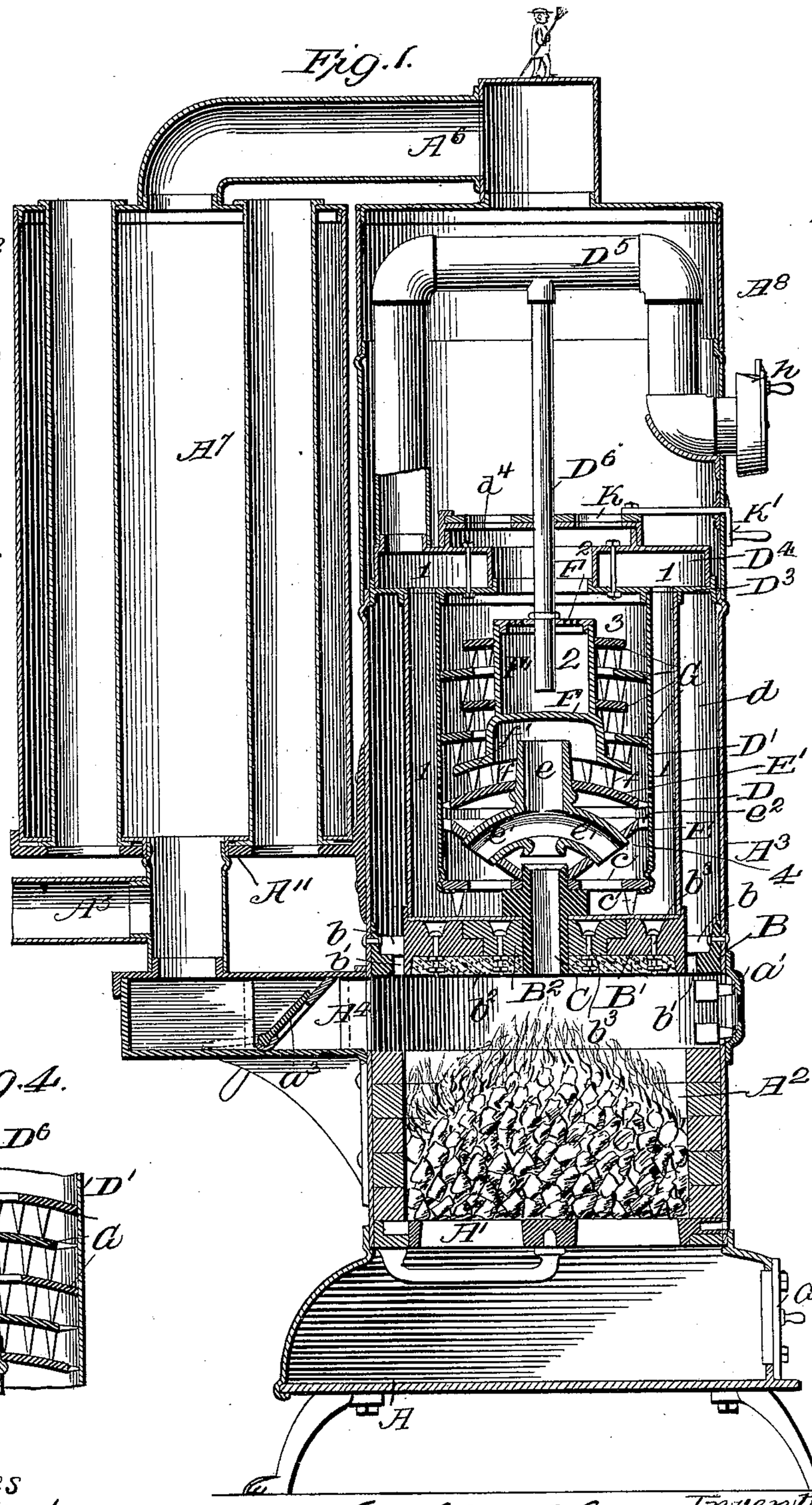


Fig. 2.

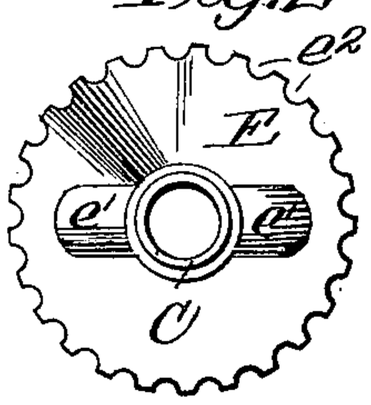


Fig. 3.

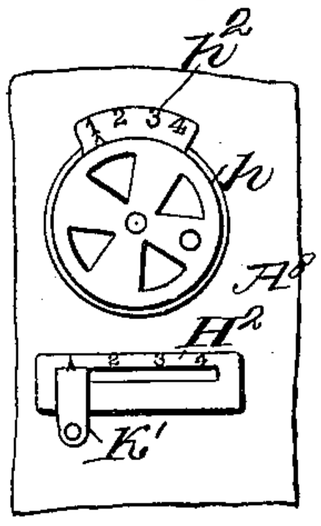
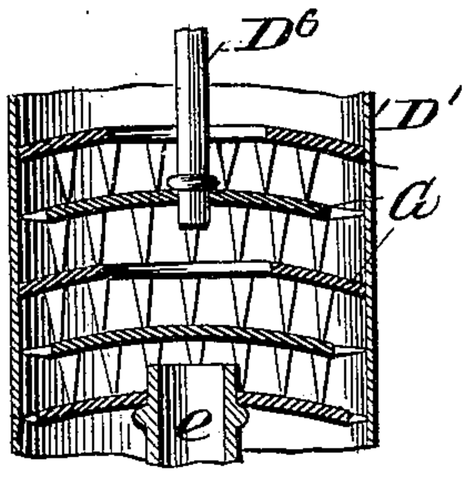


Fig. 4.



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UNITED STATES PATENT OFFICE.

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

HEATING-STOVE.

SPECIFICATION forming part of Letters Patent No. 636,712, dated November 7, 1899.

Application filed May 3, 1898. Renewed August 21, 1899. Serial No. 727,981. (No model.)

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-Stoves; 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 improvement in stoves; and its object is to provide an improved house-heating stove or furnace adapted for the perfect combustion of all forms of fuel, more especially wood, bituminous and hard coal, and all forms of hard fuel containing a large percentage of the carbon elements.

The particular object of the invention is to economize fuel by practically gasifying the same and then burning the gases by commingling them with a large proportion of heated air, so that practically no hydrocarbon or heavy combustible gases will escape unconsumed.

The device is simple in construction, durable, and well adapted for the accomplishment of the aforementioned objects.

The accompanying drawings illustrate a practical form of the apparatus and are hereinafter described in detail; but I do not consider my invention limited to the specific construction shown, and the essential features of the invention are summarized in the claims following the description of the drawings, in which—

Figure 1 represents a vertical section of the complete apparatus. Figs. 2 and 3 are details of parts thereof, and Fig. 4 is a detail illustrating a slightly-modified construction of the mixing and combustion chambers.

The base portion of the stove has an ash-pit A, a grate A′, and a fire-chamber A^2, which are substantially of ordinary construction, the ash-pit being provided with a door a, which can be tightly closed, and the fire-chamber being provided with a door a', which can also be tightly closed. The outer shell A^3 of the furnace extends above the fire-chamber for a purpose hereinafter explained, and attached thereto just above the fire-chamber is an interior annular casting B, upon which is supported another annular casting B′, which is provided with lugs b, by which it is kept centered in, but slightly separated from, shell A^3, leaving a passage b' therebetween for a purpose hereinafter explained.

As shown, ring B supports another ring B^2, which has a central perforation in which is fitted a gas-outlet tube C. The rings B′ B^2 might be made integral, if desired, and their lower surfaces are protected by a layer of fire-brick b^2, secured thereto by bolts b^3, as shown.

Chamber A^2 has a direct-draft smoke-outlet A^4, in which is pivoted a weighted valve a^3, which may be thrown to the position shown in dotted lines, Fig. 1, when the fire is being kindled, but is closed after the stove is fully heated. The outlet A^4 communicates with the uptake by a pipe A^5, as shown.

Supported upon plate B′ within the shell A^3 is a cylinder D, and within this cylinder is a second cylinder D′, both cylinders being connected at their upper ends to an annular plate D^3, which practically closes the annular space between the cylinders and shell, and on plate D^3 is an annular drum D^4, which communicates with the space between the cylinders D D′ and forms therewith an air-heating chamber 1. The space between the cylinder D and casing A^3 forms an annular dead air or gas chamber d, which the gases rising from fire-chamber A^2 can enter through the passages b' and circulate therein, and thus surround the air-chamber 1 with warm gases. The interior of cylinder D′ forms the gas and air mixing chamber or secondary combustion-chamber 3, and tube C is arranged to direct gases escaping from chamber A^2 upward centrally into said chamber. At the lower end of said chamber and surrounding tube C is an annular perforated disk c, provided with depending legs c', which support it upon the plates B′ and B^2, and the edges of said disk are fitted in the lower edges of cylinder D′, which terminates slightly above the plates B′ B^2, so that the air from chamber 1 can pass under the said plates.

Supported on the tube C and plate c within the cylinder D′ is an inverted hollow cone E, and in said cone is a tube e, arranged vertically above tube C and provided with lateral downwardly-curved branches e', which open through the sides of cone E, as shown. Fitted over tube e and substantially closing the cone E is a plate E′, upon which is supported a

dome F, having lugs *f* on its bottom, by which it is upheld slightly above the surface of plate E′. This dome is of much less diameter than the cylinder D′, and above the dome is an air-chamber 2, supplied with air through a pipe D^6 from the main air-inlet pipe D^5, which conducts air from the front of the stove to chamber 1, as indicated in the drawings. The walls of chamber 2 are formed of an annular upstanding flange F′ on dome F, and its top is a perforated plate F^2, as shown. Supported on the laterally-projecting flange *f′* at the bottom of dome F are a series of superimposed studded rings G, which are provided on their under sides with depending lugs, as shown, and together constitute an efficient device for thoroughly commingling the air and gases ascending in the cylinder D′ exterior to the dome. The alternate rings are of different diameters, so that not only will the gas and air be broken up in passing by the studs, but will be deflected first outward and then inward, and thus thoroughly commingled. The space between the cone E, cylinder D′, and plate *c* constitutes another air-heating chamber 4.

The air-pipe D^5 is inclosed within a drum A^8 at the upper end of the shell, into which the products of combustion from chamber 3 pass through central openings d^4 in head D^4, which are regulated by an adjustable rotary valve K, that can be adjusted from the outside by means of an arm K′. The position of this valve can be determined by a graduated scale H^2, as indicated in Fig. 3. The inlet of pipe D^5 is also provided with a register-valve *h*, the position of which can be determined by a graduated scale h^2. The scales H^2 h^2 are marked alike, so that the two valves may be properly adjusted in relation to each other at all times in the practical operation of the device.

From the drum A^8 the waste gases of combustion escape through a pipe A^6 into a radiator-drum A^7, which communicates with pipe A^5, as indicated in the drawings. This drum is supported on a bracket A^{11}, attached to the cylinder A^3.

Operation: The fire is first kindled in the chamber A^2 in the usual manner, the valve a^3 being opened to admit the direct draft to the uptake. Part of the heated products will naturally circulate into the space *d*, so as to heat the air in chamber 1, and a small part of the products may find their way through the secondary combustion-chamber 3 and upper part of the apparatus and warm the same. When a good bed of coals is formed in chamber A^2, the valve a^3 is closed, and all the gases then have to take their course through the secondary combustion-chamber or gas-burning portion of the apparatus. The gases rise through tube C, and part of them enter the chamber within cone E; but the greater part of the gases ascend directly into the dome F, where they are deflected downward and diverted under the mixing-rings G. As the gases rise through tube *e* they draw in a quantity of hot air from chamber 4 through the tubes *e′*, which is commingled therewith in the hood and still further commingled therewith as it passes through the rings in chamber 3. The gases which enter the cone E escape therefrom around the edges of plate E′ and in so doing are commingled with jets of fresh air rising at the points e^2 around the edge of cone E, as indicated in the drawings. The commingled air and gas continue to ascend through the mixing-chamber, producing intense heat therein, and as the gases pass from chamber 3 they are brought over the air-chamber 2 and subjected to the action of the jets of hot air rising therefrom, and thus practically perfect consumption of all combustible elements of the gases is realized.

The air supplied to the gases receives its initial heat while passing through pipe D^5 in chamber A^8. It is heated still more as it descends into chamber 1 and reaches its highest temperature at the points e^2 and *e′*, where it is first commingled with the gases. The air descending through pipe D^6 in chamber 2 becomes intensely heated by direct contact with the top of chamber F. By this construction an ample supply of highly-heated air is provided which is commingled with the gases ascending through the cylinder D′ in the most efficient manner, so that practically no unconsumed fuel elements are carried off to the uptake.

It will be observed that practically the fuel is distilled and that all the gases evolved therefrom are consumed instead of escaping to the uptake, as they do in ordinary stoves. Thus obviously a large amount of heat is derived from a given amount of fuel with a corresponding economy thereof.

When operating on bituminous fuel or fuel where a large amount of gases may be suddenly evolved, the valve a^3 is very useful, as any sudden explosion of gases in the chamber 2 can throw the valve a^3 wholly or partially open, and thus allow the escape of sufficient gas to reduce the pressure, this valve thus acting as a safety-valve to prevent injury to the apparatus.

As shown in Fig. 4, the dome F is modified in form and air-chamber 2 practically dispensed with, the air being admitted through pipe D^6 into the lower end of chamber 3, a short distance above the inlet *e*.

From the foregoing description the principles of my invention will be readily comprehended, as well as the fact that it is not restricted to the particular embodiment shown in the drawings.

By my invention I obtain all the heat derived from the fuel in an ordinary stove and in addition the heat of a gas-stove produced by burning the gases in the upper portion of the apparatus; but gases consumed in the gas-stove portion of the apparatus are derived from what are usually waste gases in the ordinary stove. Therefore I practically realize

a far greater amount of heat and much greater economy of fuel than is possible with the ordinary fuel-burning stove as heretofore constructed, and even if liquid fuel, such as coal-oil, were burned in the chamber A^2 a great saving would be still effected by the use of my apparatus, as I would still utilize the heavy dense gases which are evolved in the combustion of liquid fuel that would go to waste in ordinary apparatus.

From the foregoing it is apparent that I employ a very large proportion of the heat units resulting from the combustion of the fuel in the fuel-chamber and from the combustion of the fuel-gases derived from said chamber for heating air for the combustion of said fuel-gases and by means of which said air is raised to a temperature approximately as great as the fuel-gases themselves into which they are injected. As a result of this the fresh heated air is rendered so identical in specific gravity with the fuel-gases into which they are discharged that the process of their mixture is rendered complete and certain by the elements described.

As the heat absorbed by the fresh heated air in the air-heating channel is returned without loss to the fuel-gases into which they are injected, no loss is occasioned in my invention in heating the air to a temperature approximating the heat of said fuel-gases themselves, by means of which the perfect oxidation of their oxidizable elements is realized.

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

1. In a stove, the combination of a fire-chamber, an air and gas mixing chamber above the same in which the gases of combustion are consumed and a gas mixing-tube in the bottom of said chamber, a series of mixing-rings in said chamber above said tube and an air-heating chamber surrounding said mixing-chamber and supplying air to said mixing-chamber at the bottom, and an air-supply pipe extending into said mixing-chamber and supplying air to the same above the tube.

2. The combination of a mixing-chamber, an inverted cone therein, a gas and air mixing jet-pipe supported on said cone and having branch pipes on its lower end passing through the wall of the cone, a plate above said cone, and the mixing-rings above said plate, substantially as described.

3. The combination of a mixing-chamber, an inverted cone therein, a gas and air mixing jet-pipe supported on said cone, a plate above said cone, a dome thereon above the jet-pipe, and the mixing-rings supported on said dome, substantially as described.

4. The combination of a mixing-chamber, a gas and air mixing jet-pipe therein, a dome thereon above the jet, an air-chamber above the dome, an annular air-chamber surrounding the mixing-chamber and communicating therewith below the cone, and means for conducting air to the air-chamber above the jet-pipe, substantially as described.

5. The combination of a mixing-chamber, an inverted cone therein, a gas and air mixing jet-pipe supported on said cone and opening therethrough, a plate above said cone, a dome thereon above the jet, the mixing-rings supported on said dome, and an air-chamber above the dome, an annular air-chamber surrounding the mixing-chamber and communicating therewith below the cone and means for conducting air to the air-chamber above the jet-pipe, substantially as described.

6. In a stove, the combination of the fire-chamber, the gas-outlet in the top thereof, and the gas and air mixing chamber above said outlet, the air-heating chamber surrounding said mixing-chamber and communicating with the air-supply pipe, and a hot-gas space surrounding the air-heating chamber and commuinating with the fire-chamber, substantially as described.

7. In a stove, the combination of the fire-chamber, the gas-outlet in the top thereof, the mixing-chamber above said outlet, the gas and air mixing jet in the lower end of said chamber, the dome supported above said jet and the superimposed mixing-rings around and above said dome, with the air-heating chamber surrounding said mixing-chamber and communicating with the air-supply pipe, and a hot-gas space surrounding the air-heating chamber and communicating with the fire-chamber, substantially as described.

8. In a stove, the combination of the fire-chamber, the gas-outlet thereof, the mixing-chamber above said outlet, the air-heating chamber surrounding said mixing-chamber and communicating with the air-supply pipe; with the heating-drum above said mixing-chamber, the valve for regulating the escape of burned gases from said mixing-chamber into said drum and devices for conducting air from said drums to said air-heating chamber, substantially as described.

9. In a stove, the combination of the fire-chamber, the gas-outlet thereof, the mixing-chamber above said outlet, the air-heating chamber within said mixing-chamber, the air-heating chamber surrounding said mixing-chamber, and the hot-gas space surrounding the air-heating chamber and communicating with the fire-chamber; with the heating-drum above said mixing-chamber the valve for regulating the escape of burned gases from said mixing-chamber into said drum, and pipes for conducting air through said drum to said air-heating chambers, substantially as described.

10. The combination in the fire-chamber, of a furnace, of the top consisting of metal plates B′, B^2, and having fire-bricks b^2 fastened to their lower sides, substantially as described.

11. The combination with a fire-chamber having metal top plates B′, B^2, with fire-bricks b^2 fastened to their lower sides; with a gas

and air mixing chamber supported on said plates and an air-chamber surrounding said mixing-chamber and also supported on said plates, substantially as described.

12. The combination with the fire-chamber A^2 having metal top plate; with a gas and air mixing chamber supported on said plates, an air-chamber surrounding said mixing-chamber also supported on said plates, and a dead-gas space surrounding said air-chamber and communicating with the fire-chamber around the edges of said top plate, substantially as described.

13. In a stove, the combination of the fire-chamber, the outlet-flue provided with a gravity-valve a^3, the gas and air mixing chamber and air-heating chamber above the fire-chamber, the tube for conducting gas from the fire-chamber into said mixing-chamber, the heating-drum above the mixing-chamber, a regulating-valve for controlling the escape of gas from said mixing-chamber into said drum, the pipes for conducting air through said drum to said air-heating chamber, provided with a regulating-valve, and a pipe for conducting the burned gases from said drum, substantially as described.

14. The combination in a gas and air mixing chamber, of an inverted cone E its top plate E′ and its gas and air mixing jet *e* having radial branches by which it is supported in said cone and opening therethrough, the dome above said jet and the mixing-rings G supported on and extending above said dome, for the purpose and substantially as described.

15. The combination in a stove, of a gas and air mixing chamber, an inverted cone E therein, its top plate E′, a gas and air mixing jet *e* supported in said cone and opening therethrough, the dome above said jet, and the mixing-rings supported on and extending above said chamber; with an air-heating chamber above said dome within the mixing-chamber, and an air-heating chamber surrounding said mixing-chamber and communicating with the lower end thereof, for the purpose and substantially as described.

16. In a stove, the combination of the ash-pit and the fire-chamber, their doors, and the direct outlet-flue, the casing or shell A extending above the fire-chamber, the cylinder D forming a dead-gas space between itself and the shell, the cylinder D′ depending in the cylinder D and forming therewith an annular chamber 1, with the gas and air mixing devices in cylinder D′, the drum A^8 above the cylinders, the valve for regulating the escape of gases from the cylinder D′ into the drum and the air-pipe for conducting air to the chamber 1, for the purpose and substantially as described.

17. In a stove, the combination of the ash-pit and fire-chamber and their doors, and the direct outlet-flue, the casing or shell extending above the fire-chamber, the cylinder D interposed forming a dead-gas space between itself and the shell, the cylinder D′ depending in the cylinder D and forming therewith an annular air-chamber 1, with the gas and air mixing devices in cylinder D′, the air-chamber 2 therein; with a heating-drum A^8 above the cylinders, the valve for regulating the escape of gases from cylinder D′ into the drum and the air-pipes for conducting air through drum A^8 to the chambers 1 and 2, for the purpose and substantially as described.

18. In a stove, the combination of the fire-chamber, the gas-outlet thereof, the mixing-chamber above said outlet, the cone in the lower end of said outlet, the gas and air mixing jet supported on said cone and opening therethrough, the plate supported on said jet above the cone, the dome supported on said plate and the superimposed mixing-rings supported on said dome; with the air-heating chambers surrounding said mixing-chamber and communicating therewith, the heating-drum above said mixing-chamber, the valve for regulating the escape of burned gases from said mixing-chamber into said drum, and devices for conducting air from said drums to said air-heating chamber, substantially as described.

19. In a stove, the combination of the fire-chamber, the gas-outlet in the top thereof, the mixing-chamber above said outlet, the cone in the lower end of said outlet, the gas and air mixing jet supported on said cone and opening therethrough, the plate supported on said jet above the cone, the dome supported on said plate and the superimposed mixing-rings supported on said dome, and the air-heating chamber within said mixing-chamber above the dome; with the air-heating chamber surrounding said mixing-chamber and communicating therewith, the hot-gas space surrounding the air-heating chamber and communicating with the fire-chamber, the heating-drum above said mixing-chamber, the valve for regulating the escape of burned gases from said mixing-chamber into said drum, and pipes for conducting air through said drums to said air-heating chambers, for the purpose and substantially as described.

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,
B. T. WEBSTER.