

(No Model.)

T. H. LUCAS.
FURNACE.

No. 554,705.

Patented Feb. 18, 1896.

Fig 1

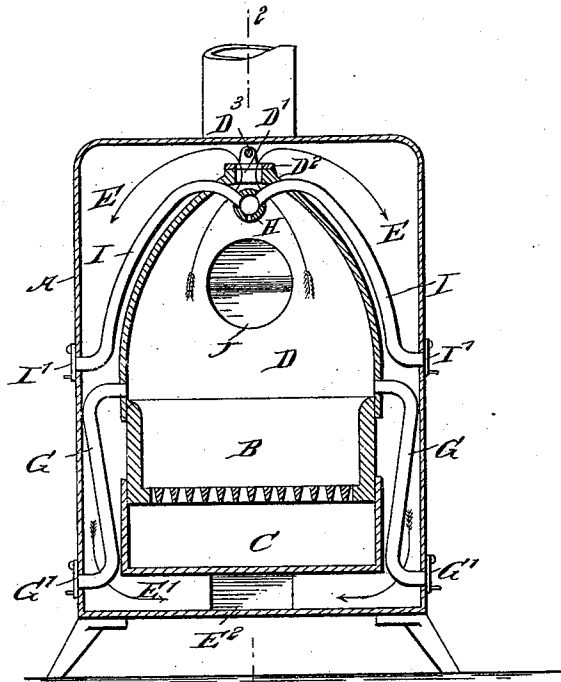
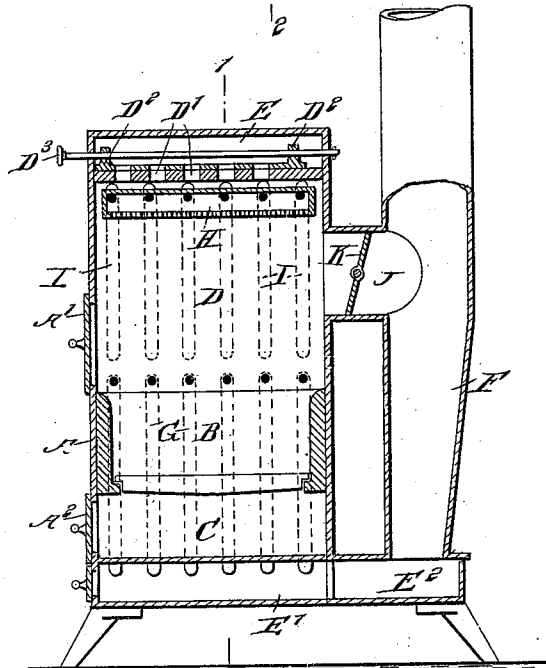


Fig 2



WITNESSES:

R. Walker

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BY

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THOMAS H. LUCAS, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF
TO HENRY BOOTH MARTIN, OF SAME PLACE.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 554,705, dated February 18, 1896.

Application filed January 23, 1895. Serial No. 535,858. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. LUCAS, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented a new and
5 Improved Furnace, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved furnace for use on boilers or for cooking, heating or other purposes, the
10 furnace being simple and durable in construction, arranged to insure complete combustion and to utilize the fuel to the fullest advantage.

The invention consists of a primary combustion-chamber communicating with the
15 fire-pot and having a contracted outlet at its top, said chamber being provided with means for supplying air thereto, and a secondary combustion-chamber surrounding the primary combustion-chamber and communicating
20 therewith through its contracted outlet.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

25 Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in both the figures.

30 Figure 1 is a sectional front elevation of the improvement on the line 1 1 of Fig. 2, and Fig. 2 is a sectional side elevation of the same on the line 2 2 of Fig. 1.

The improved furnace is provided with an exterior shell A, supporting a fire-box B, below which is arranged an ash-pit C, and above which is arranged the primary combustion-chamber D, preferably arched, as indicated in Fig. 1, and of a sufficient size to permit a thorough mixing of the air with the products
40 of combustion before they escape therefrom for a purpose hereinafter described. A suitable door A' at the front of the shell A opens into the lower part of the combustion-chamber, to permit of placing fuel in the fire-box B, and a door A² is arranged in the lower part
45 of the shell A, to give access to the ash-pit C to remove ashes therefrom whenever necessary.

50 The ash-pit C, fire-box B and primary combustion-chamber D are ordinarily closed, and

in the apex or top of the said combustion-chamber D are formed openings D' adapted to be closed by a damper D², fitted to slide, and secured on a rod D³ extending to the outside of the shell A to be under the control of
55 the operator. The openings D', when the damper D² is open, lead into a secondary combustion-chamber E surrounding the sides of the combustion-chamber D, the fire-box B and the ash-pit C, the said secondary combustion-chamber also extending under the ash-pit C,
60 as at E', and from the rear end of this chamber extension E' leads a short pipe E² connected with a chimney or draft-flue F. The necessary air for combustion is supplied to the
65 fire-box D through the pipes G extending in the lower part of the chamber E and connected at their lower ends through the sides of the shell A with the outer air, while the inner upper ends discharge into the primary
70 combustion-chamber at opposite sides thereof or at the front or back or around the said combustion-chamber as adaptation to use and form of construction may require.

Suitable valves G' are arranged over the
75 inlet-openings of the pipes G, to control the amount of air passing from the outside through the pipes G into the primary combustion-chamber.

In the top of the arched primary combustion-chamber D is arranged, when an extra
80 supply of superheated air is necessary to insure more perfect combustion, a longitudinally-extending pipe H, into which discharge the upper ends of the pipes I, extending
85 through the upper part of the secondary combustion-chamber E, to then pass at their lower ends through the sides of the shell A to connect with the outer air, the inlet of the air to the said pipes I being controlled by
90 suitable valves I', similar to the valves G'.

The rear end of the primary combustion-chamber D is connected by a short flue J with the chimney F, and in this short flue J is arranged a damper K, which when open gives a
95 direct draft from the said combustion-chamber to the chimney. Normally, however, this damper K is closed.

Now when the furnace is in operation the air necessary for combustion is supplied to 100

the burning fuel by the pipes G and I, and the air in its passage from the outside to the primary combustion-chamber by the said pipes G and I is heated, as the pipes extend through the hot-air chamber E. When the valve or damper D² is open, then the products of combustion in the primary combustion-chamber D pass through the openings D' into the upper end of the secondary combustion-chamber E, to then travel downward to the sides of the primary combustion-chamber D, fire-box B, and ash-pit C, around the bottom thereof, to finally pass to the extension E² into the chimney F. Now the products of combustion traveling through the secondary combustion-chamber E heat the pipes I and G to a considerable extent, so that the air passing through the said pipes from the outside is brought to a comparatively high temperature of heat at the time the air reaches the primary combustion-chamber. By having the perforated pipe H the air passing through the pipe I is equally distributed in the upper part of the primary combustion-chamber, so that a uniform burning of the fuel is insured.

A fire being started in the furnace, the destructive distillation of the fuel in the fire-pot and the evolution of the combustible gases first take place. Then, the said gases being mixed with a quantity of heated air, a portion of the said gases will be burned and the remainder heated to such temperature that the carbon therein will have its chemical affinity for oxygen awakened, and then the thus-heated and partially-consumed gases being subjected to a further supply of heated air the gases and air will be gradually mixed and maintained at a temperature high enough to support combustion, so that the unburned gases will all be consumed.

It will thus be seen that by the arrangement described the fuel burning in the fire-box is utilized to the greatest advantage, as a complete combustion of the fuel takes place owing to the proper supply of air directly above the fire-box B and by a second supply in the top of the primary combustion-chamber when coming in contact with the heated-air supply by the pipe H. For the purpose of burning some fuels and for some uses it may be necessary only to use one set of pipes for supplying hot air, and the construction may be varied accordingly.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with a fire-pot, of a primary combustion-chamber having means for supplying air thereto and communicating with the fire-pot so as to receive the gases therefrom, a secondary combustion-chamber covering or surrounding the primary combustion-chamber and having communication therewith at the top of the latter through a restricted opening, and means for supplying

air to the primary combustion-chamber at said restricted opening, substantially as described.

2. The combination with a fire-pot, of a primary combustion-chamber above the fire-pot and having means for supplying heated air thereto at the lower part, a secondary combustion-chamber surrounding the fire-pot and primary combustion-chamber, and having communication with the primary combustion-chamber at the top of the latter through a restricted opening, and means for supplying heated air to the primary combustion-chamber at the said restricted opening, substantially as described.

3. The combination with a fire-pot, of an arched primary combustion-chamber above the fire-pot and having a valve-controlled opening in its top, a casing surrounding the fire-pot and primary combustion-chamber and forming a secondary combustion-chamber communicating with the primary combustion-chamber through said valved opening, and pipes leading from the outer air through the secondary combustion-chamber to the upper and lower portions of the primary combustion-chamber, substantially as described.

4. A furnace, comprising a shell, a primary combustion-chamber, fire-pot, and ash-pit arranged and spaced from the shell to form a secondary combustion-chamber surrounding the several parts, pipes leading from the lower part of the primary combustion-chamber through the secondary combustion-chamber and through the lower part of the shell, and a chimney connected with the upper part of the primary combustion-chamber by a valved flue, and having its lower end connected with the secondary combustion-chamber, substantially as described.

5. A furnace comprising a shell, a primary combustion-chamber, fire-box, and ash-pit arranged in the shell and spaced therefrom to form a secondary combustion-chamber, the top of the primary combustion-chamber being provided with an opening, a valve for closing said opening, pipes leading from the outer air through the secondary combustion-chamber and discharging into the upper and lower portions of the primary combustion-chamber, and a chimney connected with the primary combustion-chamber by a valved flue, and having its lower end connected with the secondary combustion-chamber, substantially as described.

6. A furnace, comprising a shell, a primary combustion-chamber, fire-box, and ash-pit arranged in the shell and spaced therefrom to form a secondary combustion-chamber, the primary combustion-chamber being arched and provided with an opening in its top, a valve for closing said opening, a perforated pipe arranged longitudinally in the top of the primary combustion-chamber, valved pipes leading from the outer air through the sec-

ondary combustion-chamber and primary
combustion-chamber and connected with said
perforated pipe, valved pipes leading from
the outer air through the secondary combus-
5 tion-chamber and into the lower part of the
primary combustion-chamber, and a chim-
ney connected with the primary combustion-
chamber by a valved flue and having its lower
end connected with the secondary combus-
tion-chamber under the ash-pit, substantially 10
as herein shown and described.

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Witnesses:

SUMNER LADD,
W. H. ADAMS.