

(No Model.)

E. DE STRENS.
STEAM BOILER OR OTHER FURNACE.

No. 462,515.

Patented Nov. 3, 1891.

Fig. 1.

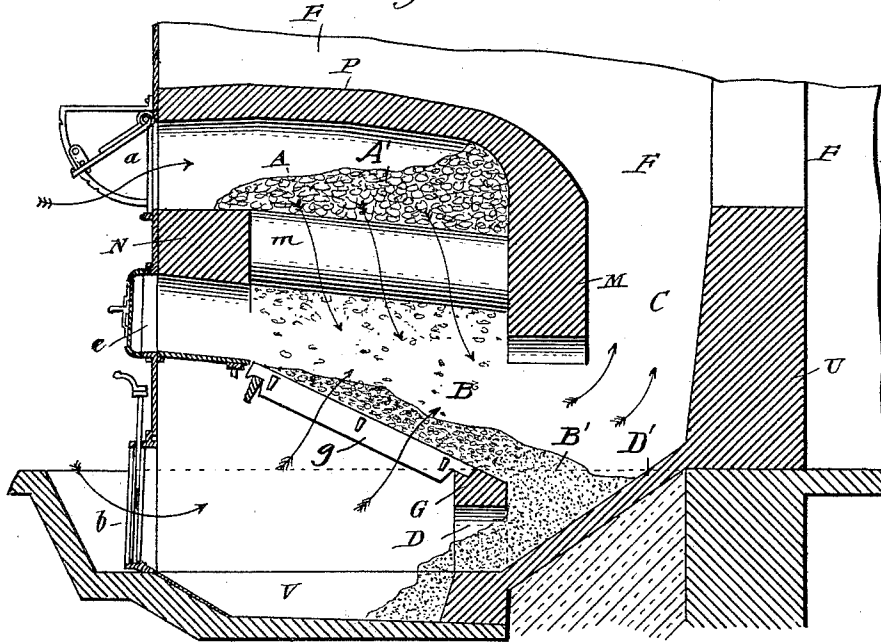
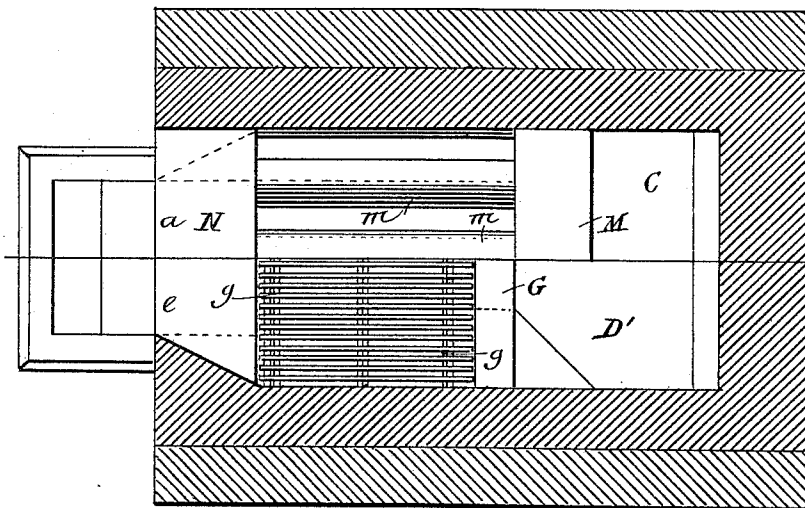


Fig. 2.



WITNESSES:

J. Clark.
C. Sedgwick

INVENTOR:

E. de Strens
BY *Munn*
ATTORNEYS

UNITED STATES PATENT OFFICE.

EMILIO DE STRENS, OF ROME, ITALY.

STEAM-BOILER OR OTHER FURNACE.

SPECIFICATION forming part of Letters Patent No. 462,515, dated November 3, 1891.

Application filed February 12, 1891. Serial No. 381,179. (No model.) Patented in Italy June 2, 1890, No. 27,261.

To all whom it may concern:

Be it known that I, EMILIO DE STRENS, a subject of the King of Belgium, and a resident of 11 Santa Sabina, Rome, in the Kingdom of Italy, chief engineer of the Central Electric Station, have invented certain new and useful Improvements in Steam-Boiler or other Furnaces, (for which I have obtained Letters Patent in Italy, No. 27,261, dated June 2, 1890,) of which the following is a specification.

My invention relates to steam-boiler and other furnaces; and its object is to provide a furnace wherein a high temperature may be obtained by the use of solid fuel of any kind, especially that having a low-heating capacity and containing a large proportion of slag, and also wherein the action is not interfered with by the feed of fuel or in cleaning and the products of combustion are completely burned and exhausted.

The invention consists in the construction, arrangement, and combination of parts, as hereinafter described and claimed.

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 views.

Figure 1 is a longitudinal vertical section of a furnace constructed in accordance with my invention, and Fig. 2 is a horizontal sectional view of the same, taken for convenience on two different planes and showing the relative arrangement of the two combustion-chambers.

The furnace is constructed with two fire or combustion chambers A and B, located the one above the other and aligning one with the other.

The upper fire-chamber A has an opening *a* at its front for the introduction of the fuel and is ordinarily open to admit air. Said opening is shown as provided with an adjustable swinging door; but any other preferred closure may be adopted for the purpose. Said chamber has front and rear transverse walls N and M and a top wall P, which latter may be constructed of metal or of refractory brick, as shown. The front and rear

walls of said chamber are of fire-clay, as shown, and arched to serve as the supports for a grate composed of a series of rearwardly-inclined bars *m* of refractory material, the faces of said bars being preferably laterally inclined, thus producing downwardly-converging openings leading to the lower fire-chamber.

The lower fire-chamber B is provided with any ordinary form of grate *g*, resting at one end upon suitable lugs in said chamber and extending rearward at a somewhat sharp downward inclination and resting at its lower end upon a wall G, located some distance in front of the bridge-wall U of the furnace, which wall G is constructed of refractory material and provided with an opening D, leading to the ash-pit V, if the fuel used contains a large proportion of slag and such slag is to be removed by fusion. If otherwise, said wall is substituted by a metallic grate pivoted in proper bearings, so that it may be tilted or swung to discharge its burden into the ash-pit.

At the front of the chamber B is an opening *e* to permit of lighting the fire in the chamber A, and through which any suitable implement may be passed for pushing the fuel in the chamber B to the rear. This opening may be located at either side of the furnace and may have any preferred form of door.

An inclined wall D' extends from the bridge-wall U of the furnace to meet the wall G below its aperture, thereby forming a cavity in front of said opening.

The ash-pit V is provided with an opening *b*, which may be closed by the form of door shown or by any other that may be preferred.

In operation the fuel A' is supplied to the chamber A and ignited through the opening in the chamber B, the draft being from the feed-orifice *a* downward through the fuel and through the chamber B to the mixing-chamber C, intervening the rear of the chamber A and the bridge-wall U, as indicated by the upper arrows in Fig. 1. After the solid parts of the fuel have become well ignited and nearly all the volatile parts of the same have been liberated the former fall upon the grate in

the chamber B, as shown at B', and there complete their combustion, the draft in this case being from the orifice *b* upward through the fuel to the mixing-chamber C, as indicated by the lower arrows in Fig. 1. As the fuel in the chamber B is consumed the refuse for the most part falls down along the grate *g* and over the wall G to and upon the inclined wall D', intervening the bridge-wall and the ash-pit, and is directed thereby through the opening D into the ash-pit.

It will be seen that the products of combustion from one fire-chamber do not traverse the fuel in the other fire-chamber, but pass in parallel and concordant lines at a high temperature into the chamber C, where they mingle, and thence pass to the space F of the apparatus, where their caloric is utilized. It will also be seen that by reason of the grate of the upper fire-chamber having downwardly-converging openings the products of combustion from said chamber, which ordinarily require to be at a high degree of temperature to insure a perfect combustion, are raised to the required degree, not only by the heat radiated from the lower fire-chamber, but also because of their being laminated or flattened in their passage between the bars of the upper grate. It will further be seen that by reason of the formation of a cavity at the lower end of the lower grate for the accumulation of the cinders and residuum and the provision of a passage therefrom to the ash-pit I secure a draft of air through the ashes, which air will become highly heated by radiation of heat from the ashes without correspondingly depleting such air of its oxygen, which air, owing to its great oxidizing effect, will when thus heated act more efficiently when it reaches the mingling-chamber, to which all the gaseous products pass. The mingling-chamber is thereby rapidly raised to and steadily maintained at a very high temperature, which is the initial temperature for utilizing the caloric produced. Thus I secure a perfect combustion of the fuel, so that no smoke will be produced even when the richest coal is burned.

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

1. In a combined downward and upward draft furnace, the combination of an upper downward-burning grate formed of a series of lumps, blocks, or bars of fire-clay supported at their ends by two transverse fire-clay arches independent of the boiler, with a lower upward-burning grate formed of metallic bars, the said lumps, blocks, or bars of fire-clay being so molded and placed at such a suitable distance from each other as to form a kind of an always-open hopper for the feeding of the furnace and allow the lower grate to be supplied with the burning fuel falling from through the openings between the said

lumps, blocks, or bars of fire-clay, and the escape-flue common to both grates and leading from a point of the fire-clay walls intermediate between the said grates and in such a manner as to form a mingle-chamber for the flue of both grates, substantially as shown and described.

2. In a combined upward and downward draft furnace, the combination of an upper downward-burning grate formed of a series of lumps, blocks, or bars of fire-clay supported at their ends by two transverse fire-clay arches, with a lower upward-burning grate formed of metallic bars, the said lumps, blocks, or bars of fire-clay being so molded and placed at such a suitable distance from each other as to form a kind of an always-open hopper for the feeding of the furnace and allow the lower grate to be supplied with the burning fuel falling from through the openings between the said lumps, blocks, or bars of fire-clay, and the lower grate being provided at its rear end with a cavity within fire-clay walls in immediate communication with the ash-pit and the escape-flue common to both grates and leading from such a point of the fire-clay walls intermediate between the said grates and in such a manner as to form a mingle-chamber for the flue of both grates, situated directly above the said cavity, and the openings between the ash-pit and the said cavity being of such a convenient size as to allow the clearing from the furnace of the slag accumulated therein, substantially as shown and described.

3. In a steam-boiler or other furnace, the combination, with an upper fire-chamber having a downward draft and provided with an inclined grate of refractory material, between the openings of which the products of combustion from the upper fire pass, of a lower fire-chamber aligning the upper chamber, having an upward draft, and provided with an inclined metallic grate which is substantially supplied with fuel falling in an incandescent state from the upper fire, and an apertured transverse vertical wall surrounding the lower end of said metallic grate, and a mixing-chamber common to both fire-chambers and in communication through the aperture in said wall with the ash-pit of the furnace, substantially as shown and described.

4. In a steam-boiler or other furnace, the combination, with an upper fire-chamber having a downward draft and provided with an inclined grate of refractory material, between the openings of which the products of combustion from the upper fire pass, of a lower fire-chamber aligning the upper chamber, having an upward draft, and provided with an inclined metallic grate which is substantially supplied with fuel falling in an incandescent state from the upper fire, and an apertured transverse vertical wall supporting

the lower end of said metallic grate, and an inclined wall opposite the apertured wall, forming a cavity thereat, and a mixing-chamber common to both fire-chambers and in communication through the aperture in the said vertical wall with the ash-pit of the furnace, substantially as shown and described.

In testimony that I claim the foregoing as

my invention I have signed my name, in presence of two witnesses, this 21st day of January, 1891.

EMILIO DE STRENS.

Witnesses:

G. B. ZANARDO,

G. B. BORTOLMIZ.