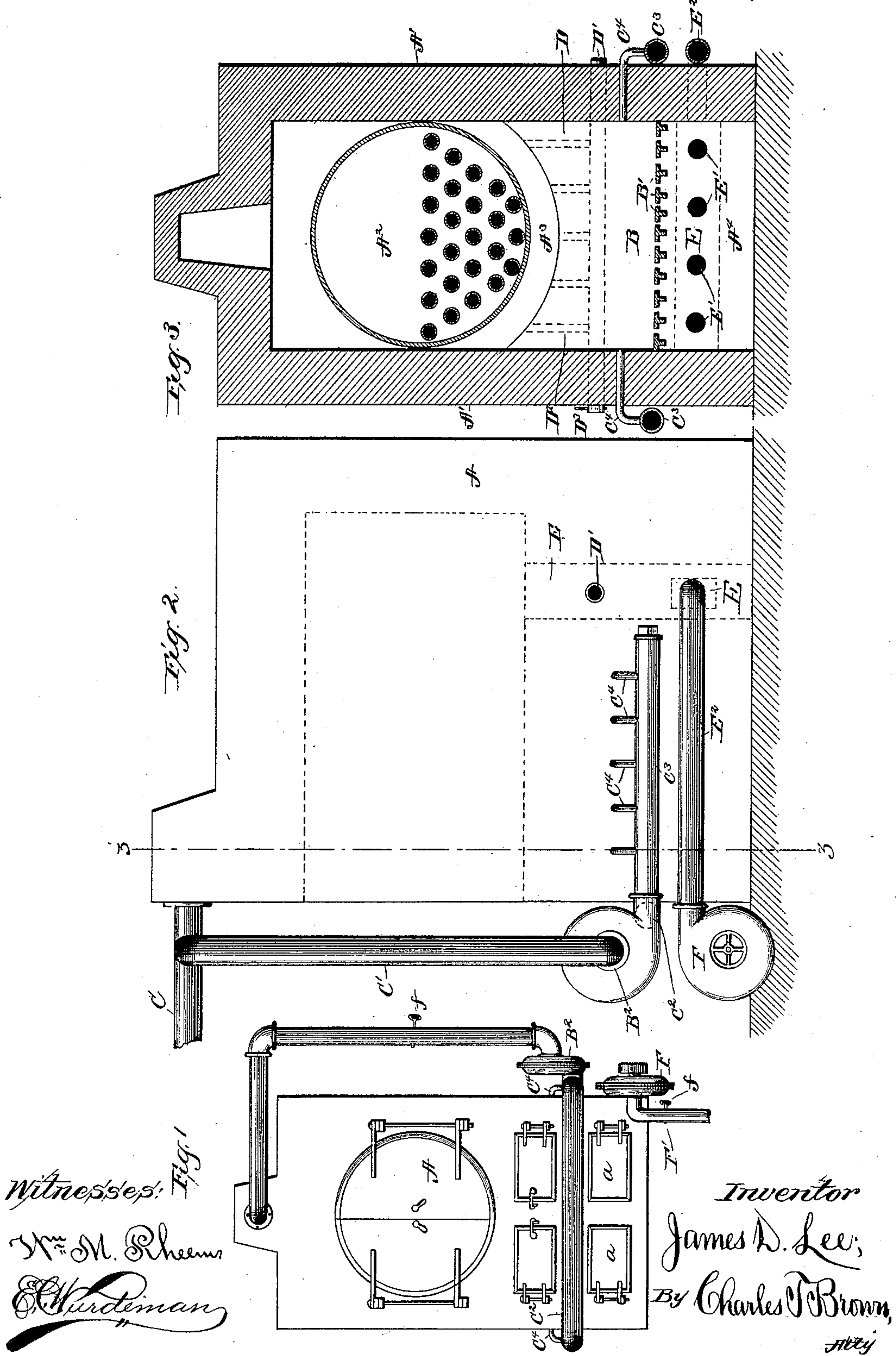


(No Model.)

J. D. LEE.
SMOKE CONSUMING FURNACE.

No. 464,506.

Patented Dec. 8, 1891.



UNITED STATES PATENT OFFICE.

JAMES D. LEE, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE LEE SMOKE BURNER
AND FUEL SAVING FURNACE COMPANY, OF SAME PLACE.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 464,506, dated December 8, 1891.

Application filed September 8, 1890. Serial No. 364,257. (No model.)

To all whom it may concern:

Be it known that I, JAMES D. LEE, of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in a Smoke-Consuming Furnace, of which the following is a full and complete description, when taken in connection with the drawings accompanying and forming a part hereof.

This invention is an improvement of the invention set out, described, and claimed in Patent No. 383,310, granted to me for a smoke-consuming furnace on the 22d day of May, 1888; and the object of this invention is to obtain a device which can be attached to an ordinary boiler-furnace in combination with the device or an essential part thereof contained in the above-named patent, and wherein the completed furnace thereby attained will perform the same work under conditions where the draft is defective or poor as is performed under the ordinary conditions of using a smoke-consuming furnace by the device described in my said patent.

In order to accomplish the results sought by me, as aforesaid, in the device obtained by the combination of the invention herein described with the invention described in the above-referred-to patent and the devices in common use in boiler-furnaces, I find it necessary to provide an arrangement for taking the contents of the smoke-stack or smoke-passage of the furnace and return such material or materials to the furnace above the grate-bars of the combustion-chamber; to provide means for introducing air through the bridge-wall of the furnace to the products of combustion or partial combustion passing thereover from the combustion-chamber, such air so passing through the bridge-wall to be forced through the passage or way provided therefor by a fan, or to be drawn through by the "natural draft," as I choose to term it, of the furnace, although such natural draft may be produced when the dampers in the smoke-stack and the front door of the fire-pot are closed by the fan drawing the contents of the smoke-passage therefrom and returning them to the combustion-chamber over the grate-bars thereof, as preferred, and, further, to introduce a current of air under pressure to

the ash-pit of the furnace, thereby creating, when the doors of the ash-pit are closed, a greater pressure of air in the ash-pit than in the combustion-chamber or in the room surrounding the furnace.

In the drawings, Figure 1 is a front elevation of the boiler-furnace having my inventions attached thereto; Fig. 2, a side elevation thereof, and Fig. 3 a cross-section on line 3 3 of Fig. 2.

Like letters refer to the same part throughout the several views thereof.

A is the boiler-front; A', the inclosing walls of the boiler; A², the boiler; A³, the line of the bridge-wall; A⁴, the ash-pit; a a, the ash-pit doors; B, the combustion-chamber; B', the grate-bars, and B² a fan. The fan B² is connected to and with the smoke-stack C by pipe C'.

C² is a discharge-pipe extending from the fan to both sides of the boiler-furnace, and C³ C³ are branch pipes which extend along the side walls of the boiler-furnace.

C⁴ C⁴ are pipes extending from branch pipes C³ C³ to and into the combustion-chamber B.

It will be observed that I have illustrated the pipe C² as extending across and in front of the boiler-front A, and the branch pipes C³ C³ as extending along the side walls of the furnace, outside thereof; but it is evident that the pipe C² may extend across the ash-pit above or below the doors and inside thereof, or may be placed underneath the ash-pit, and the pipes C³ C³ may, in like manner, be embedded or built into the side walls A' A', if desired.

When the fan B² is in operation, the heated products from the combustion-chamber passing into the smoke stack or smoke passage C, and withdrawn therefrom by the fan, are forced into the combustion-chamber above the grate-bars thereof in precisely the same manner as in the Patent No. 383,310, hereinbefore referred to, and constitutes the essential part of the invention secured by such patent. The several inventions made by me and combined with these essential elements of my former invention, and whereby I obtain the invention claimed herein are composed of the following elements: pipe D', embedded in the bridge-wall D, and pipes D² D², extending from

pipe D' to the inner face of the bridge-wall and valves D³ in pipe D'; and, further, space E in the bridge-wall D, openings E' E', extending from space E to the face of the bridge-wall in the ash-pit A⁴, and pipe E², extending from space E to fan F and forming the discharge-pipe of such fan.

F' is a pipe which may extend from the fan F to any part of the chamber wherein the furnace is located or to the outer air, as preferred. Unless it is desired to extend the pipe F' to the outer air or to the top part of the furnace chamber or room, I do not consider the pipe F' necessary, and in no case do I consider it an essential part of my invention.

When the ash-pit doors *a a* are closed and the fan F is in operation, air is forced through the pipe E², space E, and openings E' E' into the ash-pit A⁴ and a greater pressure of air thereby produced in such ash-pit than obtains in the combustion-chamber B, and an artificial blast of air is thereby forced through the grate-bars into the combustion-chamber. While air is contained under pressure, as stated, in the ash-pit it is heated to a considerably higher temperature than the air surrounding the furnace, and as it is forced into the combustion-chamber such portion of said air as is not required to enter into the combustion of the contents of the combustion-chamber below the line of the openings of pipes C⁴ C⁴ is well adapted to combine with and assist in the combustion of the contents of the pipes C⁴ C⁴, as such contents are delivered into the combustion-chamber.

When I desire to force or apply pressure to the air passing through pipes D' and D², and from thence entering the furnace, I connect the pipe D' with one of the branch pipes C³; but I have found such results can be attained by simply leaving the ends of the pipe D' open, thereby securing what I term a "natural draft" through these pipes D' D²; but I prefer, ordinarily, not to connect this pipe D' to pipe C³.

It will be seen that in the device obtained by the combination of the several hereinbefore-described elements the contents of the smoke-stack or smoke-passage withdrawn therefrom by the fan are returned and forced into the combustion-chamber of the furnace in the same manner as in the device which forms the subject-matter of the patent hereinbefore referred to; but in the present de-

vice I do not return or force any of such contents into the ash-pit, as is done in one of the forms of construction described in such patent, or through pipes embedded in the bridge-wall of the furnace, as in another of the forms of construction therein described; but in place thereof I force air obtained either from within or without the building wherein the furnace is placed into the ash-pit and from there through the grate-bars into the combustion-chamber, and I also in the present device supply air, either under pressure or not under pressure, as preferred, obtained from within or from without such building through openings in the bridge-wall to intermingle with the smoke, gases, or other products of partial combustion passing over such bridge-wall from the combustion-chamber and into the smoke-stack or smoke-passage.

The amount of air forced into the ash-pit is regulated by the size and speed of the fan and by the dampers *f f*, and the amount of smoke, gases, or other products of partial combustion supplied to the combustion-chamber from the smoke-stack or smoke-passage is also determined in the same way.

Having thus described my invention and its method of operation, what I claim, and desire to secure by Letters Patent of the United States, is—

In a smoke-consuming furnace, the combination of a fan, a pipe extending from the smoke-passage of the furnace to the fan, a pipe extending from the fan to the combustion-chamber of the furnace, a pipe open at the end embedded in the bridge-wall of the furnace and having branch pipes extending therefrom to the inner face of the bridge-wall, a second fan and a pipe extending therefrom into the ash-pit, whereby the contents of the smoke-passage withdrawn therefrom by the first-named fan are returned to the combustion-chamber of the furnace, air is supplied to the heated matter, leaving the combustion-chamber and passing over the bridge-wall to the smoke-passage, and air is forced into the ash-pit and from there to the combustion-chamber between the grate-bars thereof, substantially as described.

JAMES D. LEE.

Witnesses:

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