

(No Model.)

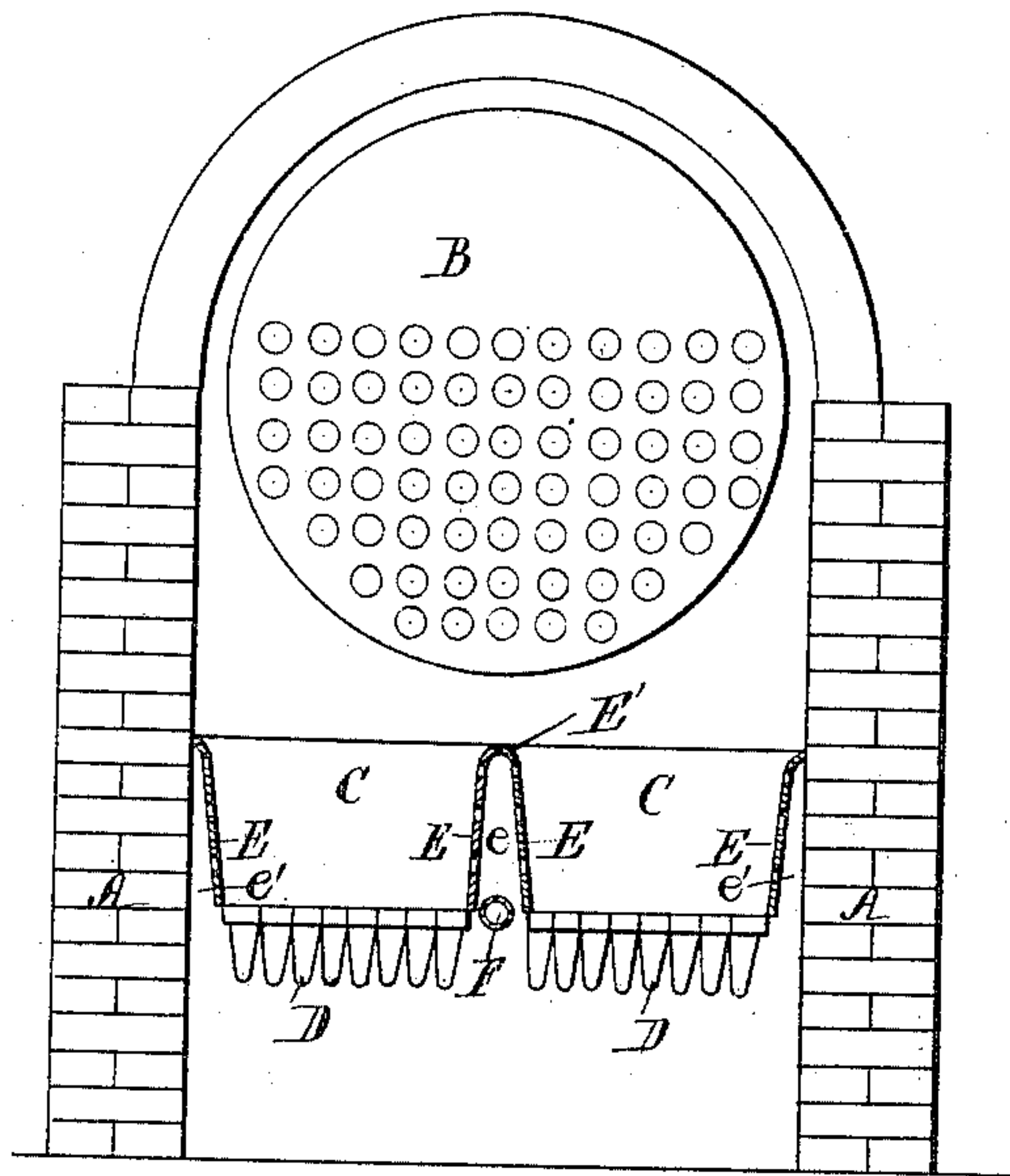
E. H. REES.

STEAM BOILER OR OTHER FURNACE.

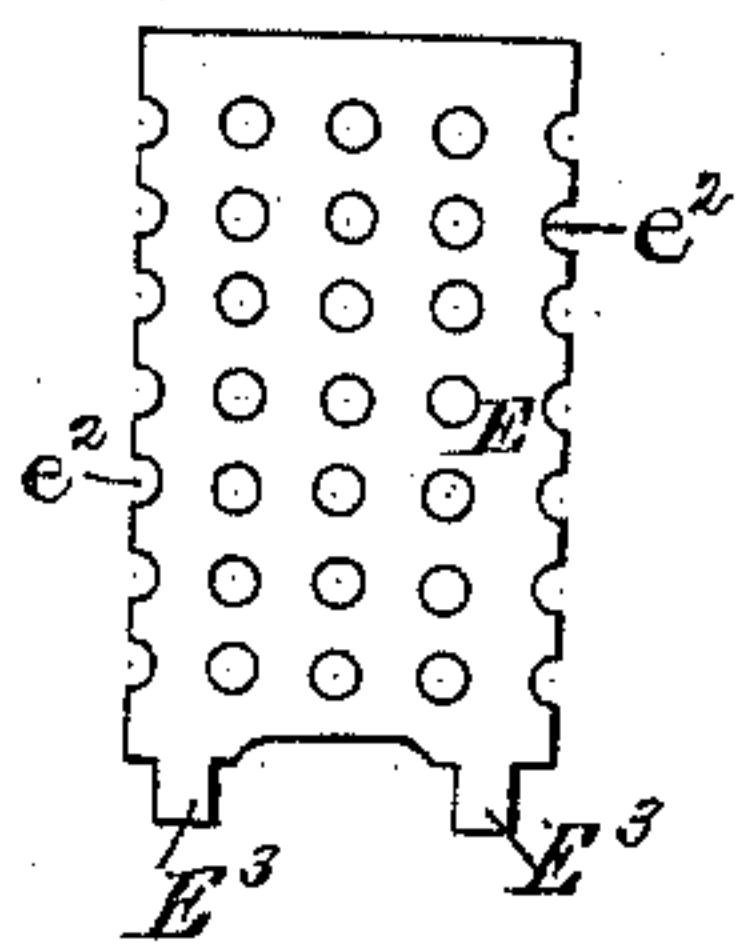
No. 302,940.

Patented Aug. 5, 1884.

— Fig. 1. —



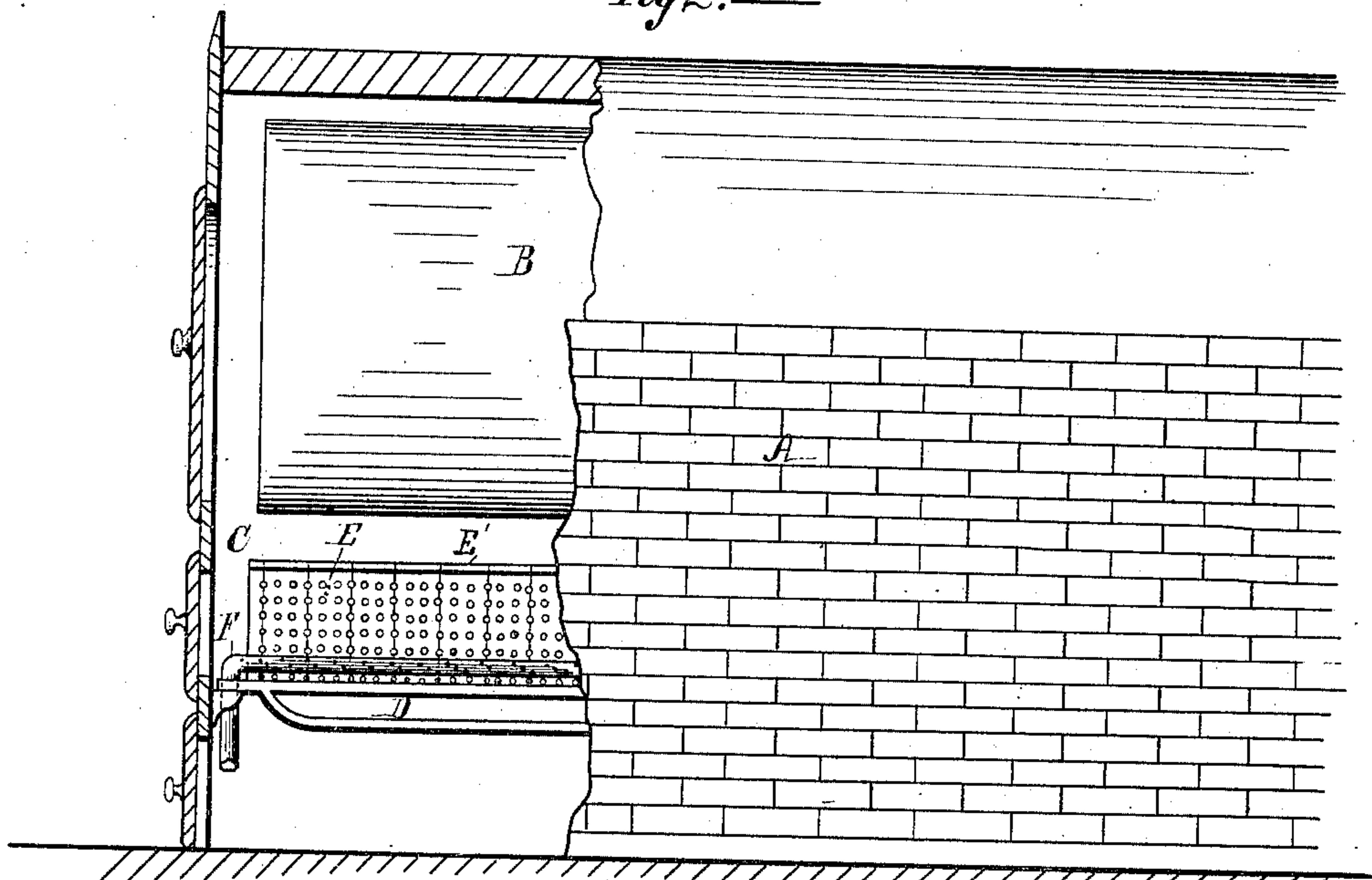
— Fig. 3. —



— Fig. 4. —



— Fig. 2. —



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# UNITED STATES PATENT OFFICE.

EDWARD H. REES, OF DETROIT, MICHIGAN.

## STEAM-BOILER OR OTHER FURNACE.

SPECIFICATION forming part of Letters Patent No. 302,940, dated August 5, 1884.

Application filed May 26, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD H. REES, of Detroit, county of Wayne, State of Michigan, have invented a new and useful Improvement in Steam Boiler and other Furnaces; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

My invention consists in the combinations of devices and appliances hereinafter specified, and more particularly pointed out in the claims.

In the drawings, Figure 1 is a vertical section of an apparatus embodying my invention. Fig. 2 is a longitudinal vertical section at right angles to Fig. 1. Fig. 3 is a separate view of one of the sections of the perforated grate. Fig. 4 is a separate view of the steam-pipe.

The object of my invention is to provide improved means whereby more perfect and thorough combustion may be secured in steam-boiler and other furnaces, which shall prevent the escape of smoke and soot, economize fuel, and which may be economically applied to any ordinary furnace.

In the drawings, A represents the walls of the furnace.

B is the boiler.

C is the fire-box in the combustion-chamber.

D represents ordinary fire-bars.

E represents my improved perforated grates located at the sides and in the center of the fire-box in proximity with the products of combustion.

E' is a longitudinal bridge dividing the fire-box, said bridge constructed of perforated grates similar to those located at the sides of the fire-box. These perforated grates, forming the sides of the fire-box, and the longitudinal bridge, are preferably constructed in sections, as shown in Fig. 3, and may be located in any desired position, either vertically or inclined at a suitable angle with the fire-bars. These grates are also preferably constructed with an upper flange, the construction being such that when two grates are placed in suitable position they will form a conical-shaped

bridge, as shown in Fig. 1, leaving a free air-space, *e*, between said plates, and also when located against the walls of the furnace, a free air-space will be left between the grate and the wall, as shown at *e'*. These perforated grates may be constructed of any suitable length and width and thickness, and be of any suitable shape to admit air freely through the perforations. I design to construct these grates of metal. Each grate may be constructed of one piece of casting, although it is my intention to construct them in sections, as shown in Fig. 3, the sides of each section being preferably provided with notches *e''*, and also with dowels *E''*, for securing the grate upon the fire-bars. I do not, however, limit myself to this precise construction of the sections, as they may be constructed in any suitable manner to be secured in place, and to be held properly together. As thus made in section, there will be much less liability to crack and become impaired, as the spaces between the sections would allow expansion and contraction without injury, and should any section become injured it could readily be replaced by another section. I propose to make these sections in duplicate, the same pattern forming the perforated grates for the sides of the combustion-chamber, and also the adjacent grates of the longitudinal bridge, although the pattern might be varied, if desired.

F is a steam-pipe located between the two portions of the bridge-wall E', and preferably at the base of the free air-spaces between them, said steam-pipe constructed to emit jets of steam. As shown in Fig. 4, the steam-pipe is provided with a series of nipples, *f*, through which the steam may be emitted.

In operation, it is evident that currents of air will be drawn through the perforations of the grates, both at the sides of the combustion-chamber and of the longitudinal bridge-wall. These grates, being intensely heated, will of necessity heat the air thoroughly before it comes in contact with the products of combustion, and prevent any cooling of the fire, as would be the case were cold currents of air introduced into the fire-box. In this manner the oxygen is plentifully supplied to said fire-box both below the surface of the burning fuel, and also imme-



diately above the fuel in connection with the gases generated, for, as illustrated in the drawings, the perforated grates are extended to a suitable distance above the surface of the fuel, so that the currents of air will be admitted to the products of combustion from the base of the fuel upon the fire-bars upward to the desired distance, to effectually accomplish a perfect combustion, and in addition to these currents of air so freely introduced into the fire-box through the perforated plates the steam emitted from the pipe D in jets also mingles with the currents passing through the perforations of the grates to facilitate the combustion. The admission of a spray of steam against the hot cones or grates, which are heated to 800° of heat, or more, is for the purpose of facilitating the production of hydrogen gas, and to increase the supply of oxygen through the perforations in the grates, thereby producing immediate mixture of the gases at a point in the combustion-chamber hot enough to ignite the mixture and thereby produce thorough combustion of the same. By ejecting jets of steam against the hot grates, as described, it is important to observe that the gases are formed therefrom before being admitted into the combustion-chamber.

The perforated plates described may be employed with any ordinary grate-bars, and may be located in any ordinary combustion-chamber without any structural change either of the combustion-chamber or of the grate-bars. By dispensing with any reconstruction of the combustion-chamber or grate-bars, these plates and the steam-pipe may be added thereto quickly and economically, or may be removed therefrom without impairing the construction in the least.

What I claim is—

1. In a furnace, a fire-box having one or more of its walls formed of plates provided with a series of apertures, and arranged so as to leave

an air-space between the walls of the chamber in which the fire-box is formed and the said plates, said air-spaces communicating with the ash-pit, and in combination therewith one or more steam-pipes for admitting steam into said air-space upon the back of said plates, substantially as described.

2. In a furnace, a fire-box having one or more of its walls formed of plates flanged at their upper ends, and provided with a series of apertures, and arranged so as to leave an air-space between the walls of the chamber in which the fire-box is formed and said plates, and communicating with the ash-pit, the base of said plates resting upon the fire-bars, and in combination therewith one or more steam-pipes for admitting steam into said air-spaces upon the back of said plates, substantially as described.

3. In a furnace, a fire-box having one or more of its walls formed of perforated plates, said plates constructed and arranged to form air-chambers, a vertical central air-chamber formed of said plates, and in combination therewith one or more steam-pipes for admitting steam into one or more of said air-chambers, substantially as described.

4. The combination, with any ordinary combustion-chamber provided with any ordinary grate-bars, of perforated plates located upon one or more of the walls of the combustion-chamber, and arranged to leave air-spaces between the said walls and plates communicating with the ash-pit, and in combination therewith a steam-pipe to introduce steam into said spaces and against the rear of said plates, substantially as described.

In testimony whereof I sign this specification in presence of two witnesses.

EDWARD H. REES.

Witnesses:

N. S. WRIGHT,  
WILLIAM F. FORD.