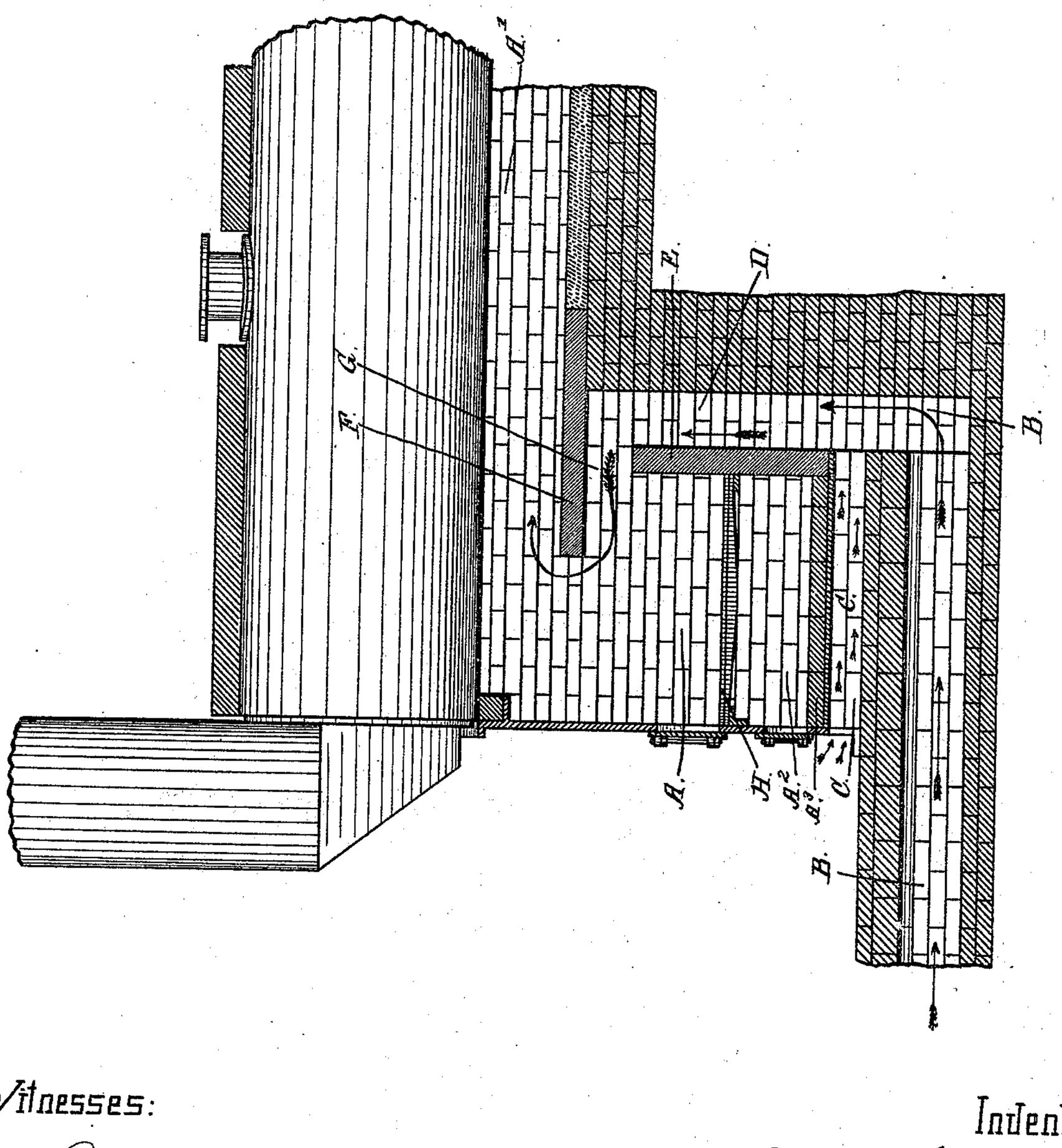
(No Model.)

G. E. BELMOR.

GAS BURNING FURNACE FOR STEAM BOILERS.

No. 519,373. Patented May 8, 1894.



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GAS-BURNING FURNACE FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 519,373, dated May 8, 1894.

Application filed September 12, 1892. Serial No. 445,590. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. BELMOR, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Gas-Burning Furnaces for Steam-Boilers, of which the following is a specification, reference being had to the drawing accompanying and forming a part of the same.

My invention relates to improvements in the construction of furnaces for burning gaseous fuel in steam generators, and consists in a certain construction and combination of gas and air passages and combining chamber, with an ordinary furnace in which solid fuel may be burned.

The objects of my invention are:—first, to provide improved means for burning gas in ordinary boiler furnaces, thereby preventing smoke and saving fuel, without compelling the removal or disuse of the existing devices for burning solid fuel; second, to provide improved means for getting up steam quickly in boilers supplied with gas from producers, and for continuing the operation of gas-fired boilers in case of failure of the gas supply; third, to provide improved means for introducing the gas and air to the furnace, so as to obtain complete combustion and the most perfect utilization of the radiant heat of the flame. The nature of the means used to accomplish these objects is illustrated by the accompanying drawing in which the figure represents, in vertical longitudinal section, the furnace end of a horizontal steam boiler, with the combustion chamber and passages for air and gas arranged in accordance with my invention.

A. is the fire chamber, in which the mixed gas and air are ignited, and A′. is the combustion chamber, extending rearwardly under the boiler.

B. is the gas-conducting passage, C. the air supply passage, and D. a passage or chamber common to the two passages, in which the gas and air are brought together, and which I call the "combining chamber."

E. is a wall constructed of tile or some like material that will become incandescent under the heat of the burning gas to which it is exposed, to form a heating surface with which the mixed gas and air come in contact to raise the temperature before entering the fire chamber.

F. is an apron or ledge, also of tile, overhanging and projecting beyond the front face of the bridge wall.

G. is a narrow outlet passage formed of one or more openings between the apron and the top of the bridge wall, either straight or arched in form, and extending from side to side of the chamber.

H. is a grate-furnace set in the fire chamber A. for burning ordinary fuel in the furnace and A^2. is an ash-pit below the grate, furnace and ash-pit doors being situated as usual.

The air during its passage to the combining chamber is heated by downward radiation from the furnace, or, when the gas and air passages are in juxtaposition, may receive heat from the inflowing gas, or from both of these sources conjointly, as in the construction shown in the figure. Such preheating of the air I have found to improve the working of the furnace, by causing more rapid and perfect combustion of the gas.

In the figure, the air-conductor C. is carried from the outside, under the bottom of A^3. of the ash-pit, and the passage for the gas is carried (from a producer or other source of gas-supply) below the air passage, to the combining chamber. This is one of the special ways in which I arrange the elementary parts or devices combined in my invention; but I do not limit its application to the particular relative positions of the inlet passages which are here shown. It is not always convenient to have the gas-producer, or source of supply, in front of the boiler; and whenever it is more convenient to do so, the gas and air passages may be led into the combining chamber from the rear of the boiler; or they may be brought in from different directions, and either or both of the passages may be carried back and forth, traversing the furnace a number of times, before being finally led into the combining chamber. While such variations of details may be made without interfering with the successful working of the apparatus, or affecting the nature of the com-

bination herein claimed, I have found it essential, in order to obtain perfect combustion, and the most economical application of the heat of the flame, that the gas and air should be conducted by independent passages or pipes under or through the furnace to a point sufficiently near the outlet G. to prevent any extensive development of flame in the combining chamber, or passage D. By thus making the combining passage short in comparison to the length of the inducting passages, the inflowing air is permitted to absorb a greater or less amount of heat before uniting with the gas, and the flame is made to attain its full development in the fire chamber A. and the combustion chamber A′. where the heat can be imparted by direct radiation to the boiler. The heating surface of the latter is thus made more effective, and a more complete transfer of the heat of combustion to the water is possible than would be the case were the flame inclosed for a considerable distance in a more extensive combining chamber.

The front face of the bridge wall may be left flush, but I prefer generally to employ an overhanging ledge of tile F. by means of which the flame is projected farther toward the front of the furnace. To prevent the rear ends of the grate bars becoming overheated by this flame, they may be protected if necessary with a covering of tile.

In order that the downward radiated heat may be taken up in the most perfect manner by the inflowing air, I prefer to make the partition between the air passages and the furnace wholly or partly of iron; but the use of this material is not absolutely essential, and brick or tile may be substituted without seriously affecting the performance.

The grate bars may be removed from the furnace, if desired, to permit a more unobstructed radiation of heat to the air passage under the ash-pit, being replaced whenever it may be desired to burn solid fuel. This reason for the removal of the grate bars does not exist of course when the air passage is carried to the combining chamber under the rear part of the furnace; and generally I prefer to keep the grate bars in position. The ability to burn solid fuel in the ordinary way in the furnace is an advantage in case of failure of the gas supply, and when a gas producer is used, a small fire can be built on the grate for the purpose of getting up steam quickly in starting, this fire also serving as a safe means of igniting the gas, as soon as it issues from the outlets G.

It will be seen that the construction that I have herein set forth as my invention may be readily applied to existing boiler furnaces, without disturbing the grate and other appliances for burning ordinary fuel; and I intend so to apply it, as well as to new boilers, both in connection with gas-producers, or other artificial sources of gas-supply, and for burning natural gas where the latter is available.

From what has preceded it is evident that the positions and arrangement of the gas and air passages leading to the combining chamber D. may be varied to suit the convenient location of the gas-producer, or other circumstances, without departing from the principles of construction herein shown and described.

Without limiting my claims, therefore, to the precise arrangement exhibited in the drawing, what I claim as my invention, and desire to secure by Letters Patent, is—

In a gas burning furnace for steam boilers of the character described the combination of a fire-box for solid fuel; with an air and gas mixing chamber behind said fire-box and separated therefrom by the rear wall of the said fire-box, channels or passages connecting said mixing chamber with a gas holder, channels or passages connecting said mixing chamber with the atmosphere, openings connecting said mixing chamber with the said fire-box, and a deflecting plate over the top of said chamber and extending forward into the fire-box, all constructed and arranged substantially in the manner and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal.

GEORGE E. BELMOR. [L. S.]

Witnesses:
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