

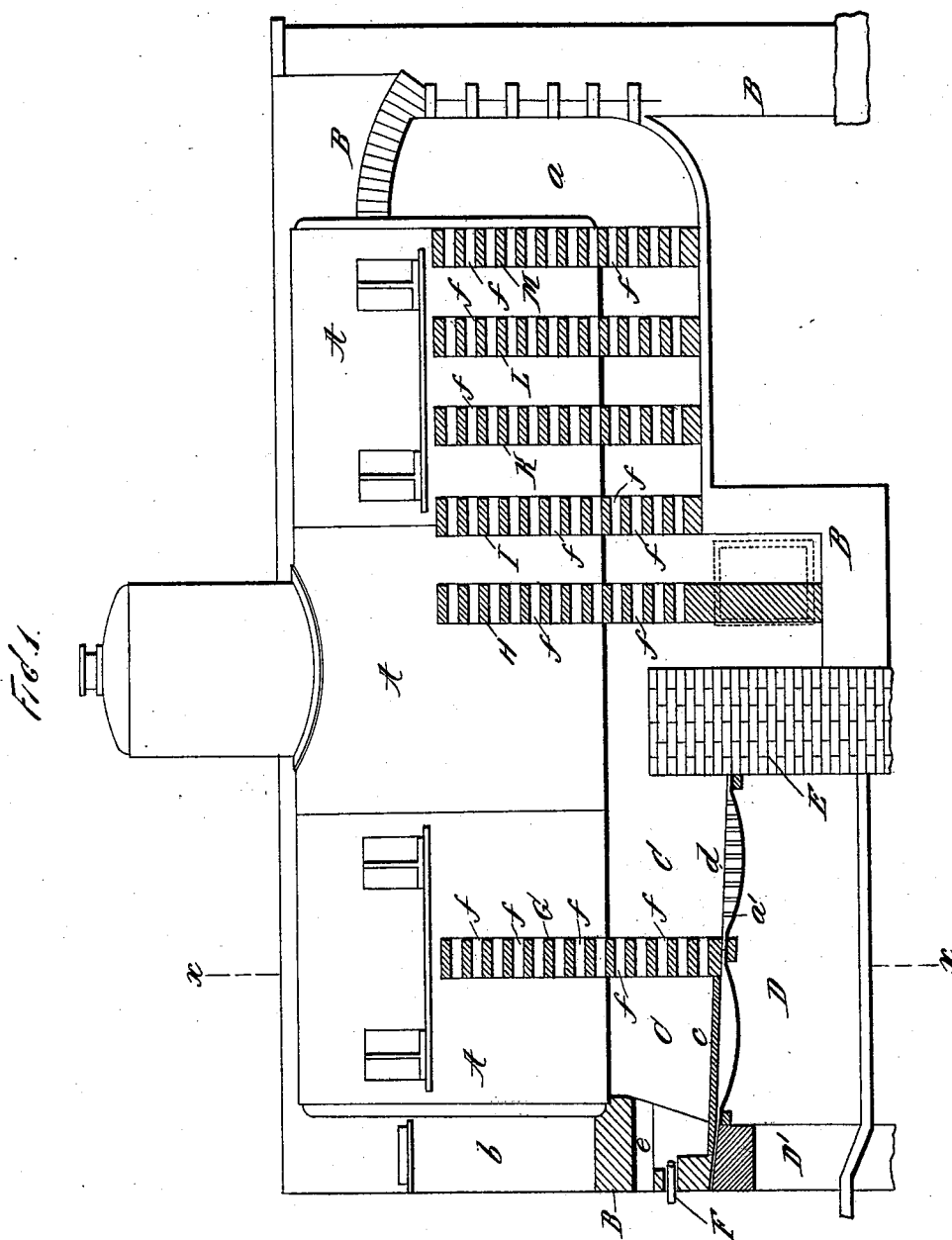
(No Model.)

2 Sheets—Sheet 1.

C. E. STOCKFORD.
FURNACE FOR STEAM GENERATORS.

No. 507,692.

Patented Oct. 31, 1893.



Witnesses:
John Buckler,
Frank J. Linahan.

Inventor:
Charles E. Stockford
By
James A. Whitney
His Attorney.

(No Model.)

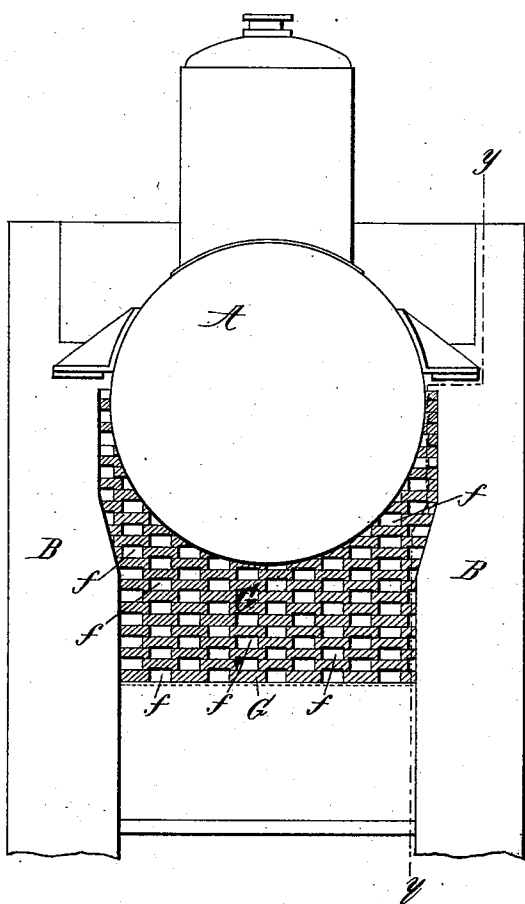
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Fig. 2.



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UNITED STATES PATENT OFFICE.

CHARLES E. STOCKFORD, OF BROOKLYN, NEW YORK.

FURNACE FOR STEAM-GENERATORS.

SPECIFICATION forming part of Letters Patent No. 507,692, dated October 31, 1893.

Application filed March 3, 1893. Serial No. 464,577. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. STOCKFORD, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Furnaces for Steam-Generators; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a longitudinal view taken in the line *y, y*, of Fig. 2, of a furnace and generator made according to my invention, and Fig. 2 is a vertical transverse sectional view of the same taken in the line *x, x*, of Fig. 1.

This invention belongs to that class of furnaces designed for burning liquid and gaseous fuels for the generation of steam in steam boilers. It comprises a novel combination and arrangement of parts whereby I secure in such a furnace a substantially perfect combustion of the fluid fuel, a material economy of fuel, a largely increased steam generating capacity in the boiler, an increased volume of gases and products of combustion maintained at a high and approximately uniform temperature in contact with the heating surface of the boiler, a substantially uniform steam pressure in the boiler due to the uniform temperature of said gases and products of combustion, and by reason of the more perfect combination of the fuel with the oxygen of the air, a practical immunity from the noisome and objectionable production of smoke.

A is a steam boiler or generator of any suitable type. That shown in the drawings is a return flue boiler, of which the return passage at the rear end is shown at, *a*, and the uptake at the front at, *b*. As the construction of such boilers and their immediate or necessary adjuncts is well understood in the art, no specific or detailed description thereof is herein necessary. The boiler A is surrounded with the usual brick work indicated at, B, surrounding and inclosing its lower and rear parts with the usual spaces between the boiler and said brick-work. As such brick-work is familiar to the art and may be varied within due limits of mere mechanical judgment, no specific description thereof is herein necessary.

C, is the fire-box, and, D, a pit which corresponds in position with the ordinary ash-pit of a steam boiler furnace. These are placed in their usual, or in any suitable position in the front of the apparatus below the forward end of the boiler. The forward part of this fire-box is provided with grate-bars, *c*, covered with brick. The back part is provided with grate-bars, *d*, which are vertically perforated, as shown at *d'*, to provide for the passage of a finely divided stream of air upward into the fire-box. This air enters, in the first instance, the pit D, through a suitably large opening, D', in the front of the latter. E is the bridge wall behind the perforated grate-bar, *d*. At the front of the fire-box is an opening, *e*, for the admission of air, and in due juxtaposition with this is the nozzle, F, of an injector, which may comprise, or consist in, any suitable or usual apparatus for injecting a stream or streams of the fuel, whether the same be liquid or gaseous. Placed transversely within the fire-box is a vertical partition, G, composed of brick of suitable character arranged in staggered fashion as more clearly shown in Fig. 2, to provide openings or passages, *f*. Similar partitions, H, I, R, L, M, are placed across the space between the brick-work and the boiler as represented in Fig. 1, behind the bridge wall and between the latter and the rear end of the boiler at which latter is provided the return passage, as above explained. The bricks are staggered to provide the openings, *f*, in each, and it is preferred that the bricks or solid portions of each partition shall be opposite the openings, *f*, in the partitions next adjacent. It is of course to be understood that the number of partitions, their distance apart, and the relative proportions of the parts of the apparatus may be varied within due limits, but as I have obtained very superior results with the use of certain proportions I prefer, when convenient, that such proportions be substantially maintained. Thus, for example, the drawings are intended to represent a boiler eighteen feet long and six feet six inches in diameter; the forward partition, G, about three feet six inches from its center to front of fire-box; the length of combustion space behind the bridge wall about nine feet, six inches; the spaces between the partitions

H, I, K, L, M, about one foot each. the distance of the bottom of the boiler from the top of the bridge wall about ten inches; and the remaining proportions substantially such as
5 are shown by the relative sizes and distances as represented in the drawings.

For the operation of the furnace the boiler is of course preliminarily supplied with water, and the jet or stream or streams of fluid fuel,
10 liquid or gaseous, as the case may be, is turned on and passes into the front portion of the fire-box, mingling on its way with more or less of atmospheric air admitted through the passage. The fuel being ignited in this part
15 of the fire-box is impetuously carried against the partition, G, and by contact therewith is finely broken up and more intimately mingled and asseverated with the air which is carried along therewith, with a resultantly increased
20 combustion. The volume of burning fuel in an atomized, vaporous or gaseous condition mingled with atmospheric air is then carried through the openings, *f*, of said partitions and an additional supply of air passes up through
25 the perforated grate-bars, *d*, and in finely divided streams mingles with the volume of flaming fuel passed into and through the space over said grate-bars. This volume of burning fuel, with its increased supply of air
30 dashes against the solid portions of the next adjacent partition, H, with the result of further comminuting or atomizing the fuel and bringing it into still more intimate asseveration with the air, the flaming constituents
35 subsequently passing through the openings, *f*, to the next partition, and so on, impinging against the solid portions of each of said partitions comprised in the series, and passing through the openings, *f*, of each, until the return passage, *a*, is reached. Each partition
40 doing its work, by the impact of the fuel upon

it as described, to further bring the fuel into the finely divided or atomized condition in which, when intimately in contact with the air, it is capable of the most complete combination with the oxygen to afford as nearly as
45 may be a practically perfect combustion. By the means described, the combustion of the fuel is caused to begin in the forward part of the fire-box, is continued throughout the entire length, width and height of the space
50 between the boiler and its surrounding brick-work and the hot products of combustion passed into the return passage, comprise substantially nothing but perfectly combined
55 products of combustion and free nitrogen from the air, thereby avoiding smoke from the uptake. This continuous combustion throughout the whole extent of the space between the boiler and the surrounding brick-
60 work being substantially uniform insures a corresponding uniformity in the heating of the entire heating surface of the boiler.

What I claim as my invention is—

The combination with a steam boiler and
65 its surrounding brick-work of the fire-box having an air inlet, *e*, grate bars, *c*, and perforated grate-bars, *d*, an injecting apparatus for injecting fluid fuel into said fire-box, a pit, D, and bridge-wall, E, of the staggered
70 partition, G, having openings, *f*, and placed across the fire-box, and a system of like staggered partitions having like openings *f*, and placed between the bridge-wall and the rear end of the boiler, the whole constructed and arranged
75 for joint use and operation, substantially as and for the purpose herein set forth.

CHARLES E. STOCKFORD.

Witnesses:

JNO. C. MCQUHAE,
FRANK J. LINEHAN.