

(No Model.)

2 Sheets—Sheet 1.

J. F. WANGLER.
DOWNDRAFT FURNACE FOR STEAM BOILERS.

No. 487,896.

Patented Dec. 13, 1892.

Fig. 1.

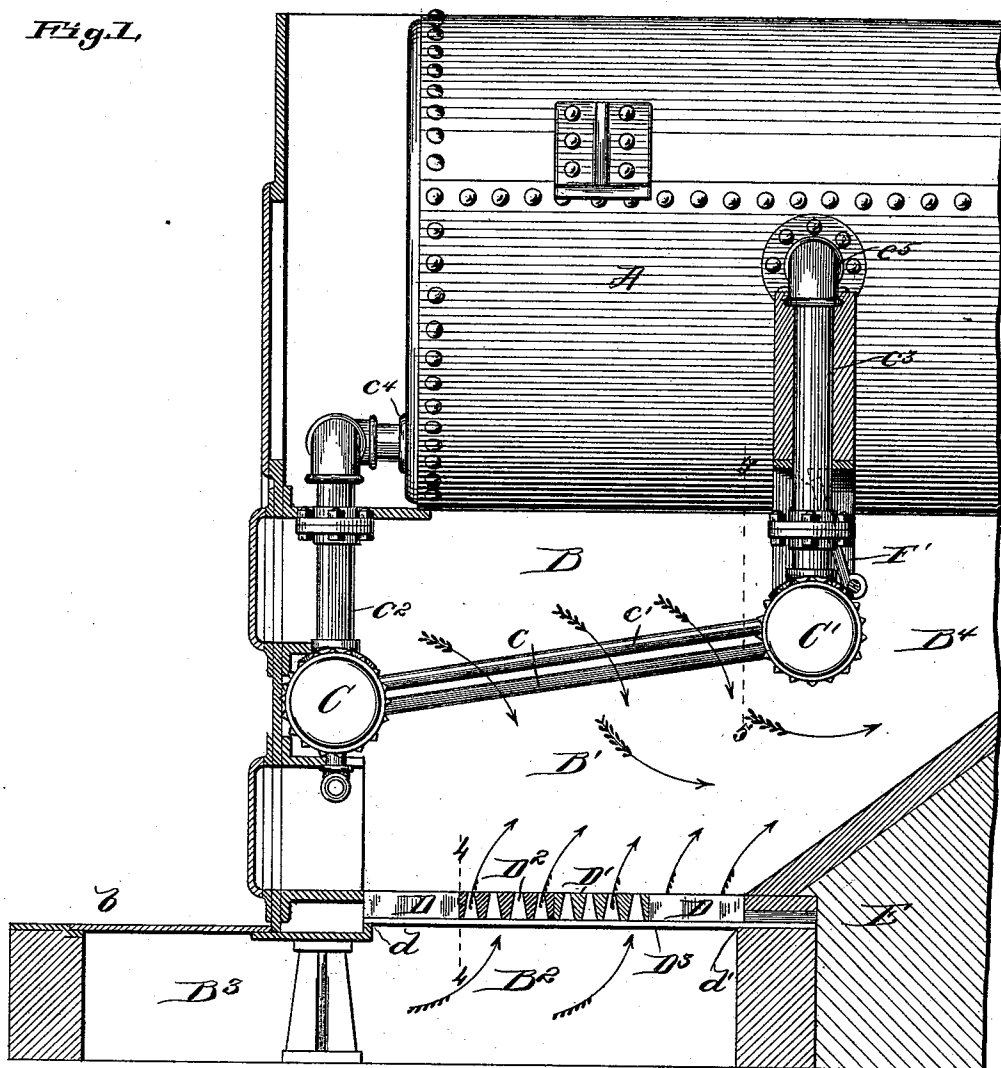
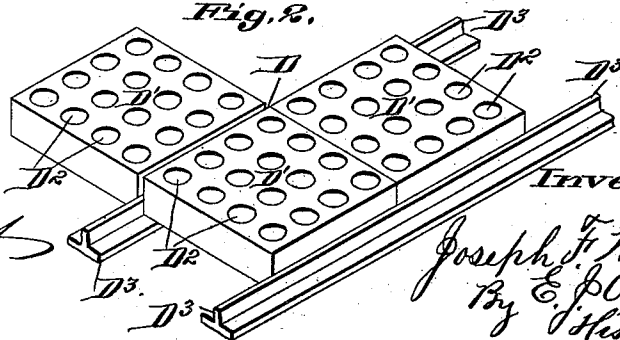


Fig. 2.



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Fig. 3.

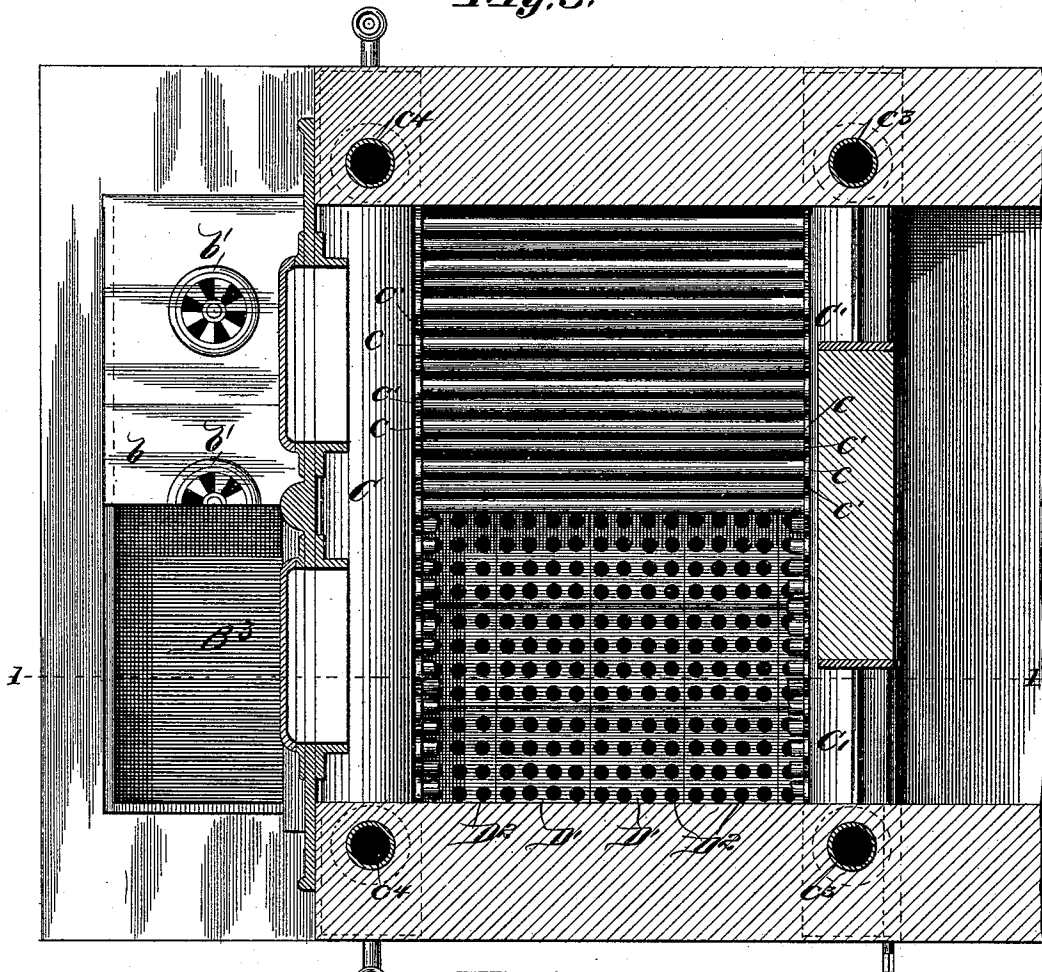


Fig. 4.

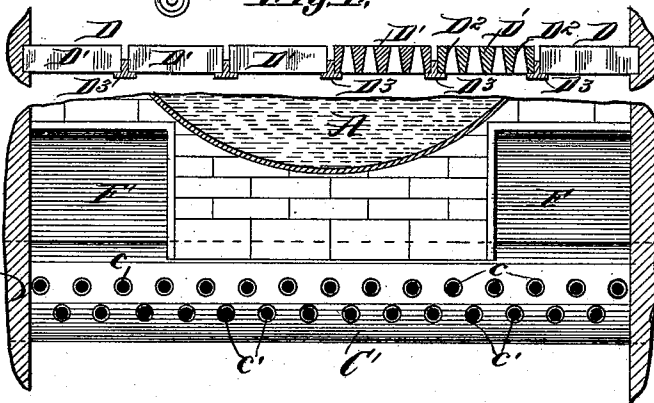


Fig. 5.

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UNITED STATES PATENT OFFICE.

JOSEPH F. WANGLER, OF ST. LOUIS, MISSOURI.

DOWNDRAFT-FURNACE FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 487,896, dated December 13, 1892.

Application filed April 27, 1892. Serial No. 430,887. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH F. WANGLER, a citizen of the United States, residing at the city of St. Louis, Missouri, have made a new and useful Improvement in Downdraft-Furnaces for Steam-Boilers, of which the following is a specification.

This invention relates to the class of boiler-furnaces known as "slow-combustion" or "smokeless" furnaces which employ water-tube grate-bars, and wherein the air to support combustion is admitted above the grate and is thence conducted downward through the grate; and the objects of my improvement are, first, to provide below the downdraft-grate a perforated intermediate table or platform composed of fire-brick, tile, or other suitable refractory matter of sufficient surface and constructed so as to receive and give back into the furnace the heat imparted to it by induction from the mass of incandescent coals that drop from the upper grate, as well as to retain the same for consumption; second, to afford means for supplying heated atmospheric air to and for the purpose of maintaining the combustion of the incandescent coal dropped from the downdraft-grate upon the perforated table, thereby greatly contributing to the keeping of the combustion-chamber at the high temperature which is necessary to obtain the greatest efficiency for drawing oxygen through the upper furnace-grate, especially when the same is freshly charged with fuel; third, to guard against the cooling of the combustion-chamber occasioned by an influx of cold air from below, particularly at the early stages of firing; fourth, to provide means for effectually consuming the particles of coal dropped from the dependent grate, and, fifth, providing a retort and secondary furnace combined capable of highly heating the combustible gases and finely-divided carbon given or falling off from the burning fuel upon the upper bars or water-tubes, and thus insure their complete combustion, whereby a practically-smokeless furnace will result. I attain these objects by the means illustrated in the accompanying drawings, in which—

Figure I is a side elevation of the forward portion of a steam-boiler, to which is appended a downdraft-furnace provided with my improvement. Fig. II is a sectional view

of my improved lower retort-hearth or perforated combustion-platform. Fig. III is a top or plan view of a downdraft water-bar furnace with one-half portion of the tube-bars removed, thus showing the position and arrangement of the perforated retort-hearth. Fig. IV is a longitudinal cross-sectional view of the perforated retort hearth or table, as shown on line 4 4, Fig. I; and Fig. V, a sectional view showing the rear manifold and updraft-dampers on line 5 5, Fig. I.

Similar letters have reference to similar parts throughout the several views.

In the drawings, A represents an ordinary steam-boiler having its furnace internally constricted and provided with a water circulation connected with the boiler by means of depending water-space manifolds and water-pipe grate-bars.

C C' are respectively the front and rear manifold dependent water-spaces connected together by the staggered water-pipe grate-bars c c'.

c² c³ are respectively the leading pipes, extending upward to the boiler from the front and rear manifolds, and c⁴ c⁵ their connections with the boiler.

F F' represent the updraft-dampers.

B represents the fire-box; B', a combustion-chamber; B², the space above the ash-pit, and B³ an air-box below the platform.

D³ D³ D³ represent a gang or series of metal T-bars supported in front by a suitable chair or ledge formed on the front wall of the furnace at d and in the rear in a similar manner at the base of the fire-bridge at d'.

D represents the perforated retort table or platform, which I prefer to make up in the sections D' for convenience. These sections may be composed of any suitable refractory matter, fire-brick, or tiles, the most desirable form being fire-brick, as shown in the drawings. These are made in sections or squares having a thickness of from two and one-half to four inches by twelve inches square and provided with apertures or perforations D² D² D², the perforations shown being conical in cross-section or having the opening at the bottom larger than at the top, so as to impart a good heating-surface for contact of the heated refractory table with the air passing upward through it from the air-box B³ be-

low the platform, whereby the air becomes heated before passing to the bed of live coals; but I do not confine myself to the shape of the openings through the platform, it being manifest that the idea and principle involved are not controlled by the shape thereof. Neither do I in like manner limit my construction of the retort-platform D in sections of any particular area or shape, as it is evident that it may be constructed in one piece or otherwise, as desired.

b is the top or covering for the air-space *B*³ below the platform, and *b'* *b'* are register-openings whereby the supply of air to the table D is regulated.

*B*⁴ represents the draft and heating space below the boiler.

The advantages derived from the herein-described furnace over the forms and methods heretofore used in steam-boiler furnaces having a downdraft are set forth in the objects thereof heretofore stated herein. The importance of close study and attention to detail in order to obtain satisfactory results from the use of furnaces of this class is well known, and to those who are familiar with the subject the benefits of my construction herein will be apparent.

I am aware that a secondary iron grate placed under a water-tube grate in a downdraft furnace for steam-boilers has been used and that the same is not new but such devices do not absorb and give forth the heat and coact with the upper fire so as to achieve

the results or perform the work which I obtain herein.

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

1. In a downdraft and water-tube grate-furnace of a steam-boiler, the combination of the depending front and rear water-spaces, having pipe connection with each other and the boiler, and a perforated intermediate table between the ash-pit and the combustion-chamber composed of refractory matter, such as fire brick or tiles, and supported in the furnace, substantially in the manner shown and described, and for the purpose specified.

2. In a downdraft and water-tube grate-furnace of a steam-boiler, the platform D, composed of refractory matter, such as fire brick or tiles, and having holes or openings *D*² *D*² formed larger at the bottom than at the top, substantially in the manner shown and described, and for the purposes specified.

3. In a downdraft and water-tube grate-furnace of a steam-boiler, the combination of the dampers *F* *F'*, air-box *B*³, cover *b*, registers *b'* *b'*, air-space *B*³, and perforated refractory table D, composed of refractory matter, such as fire-brick or tiles, and supported on the bars *D*³, all substantially as shown and described, and for the purpose specified.

JOSEPH F. WANGLER.

Witnesses:

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