

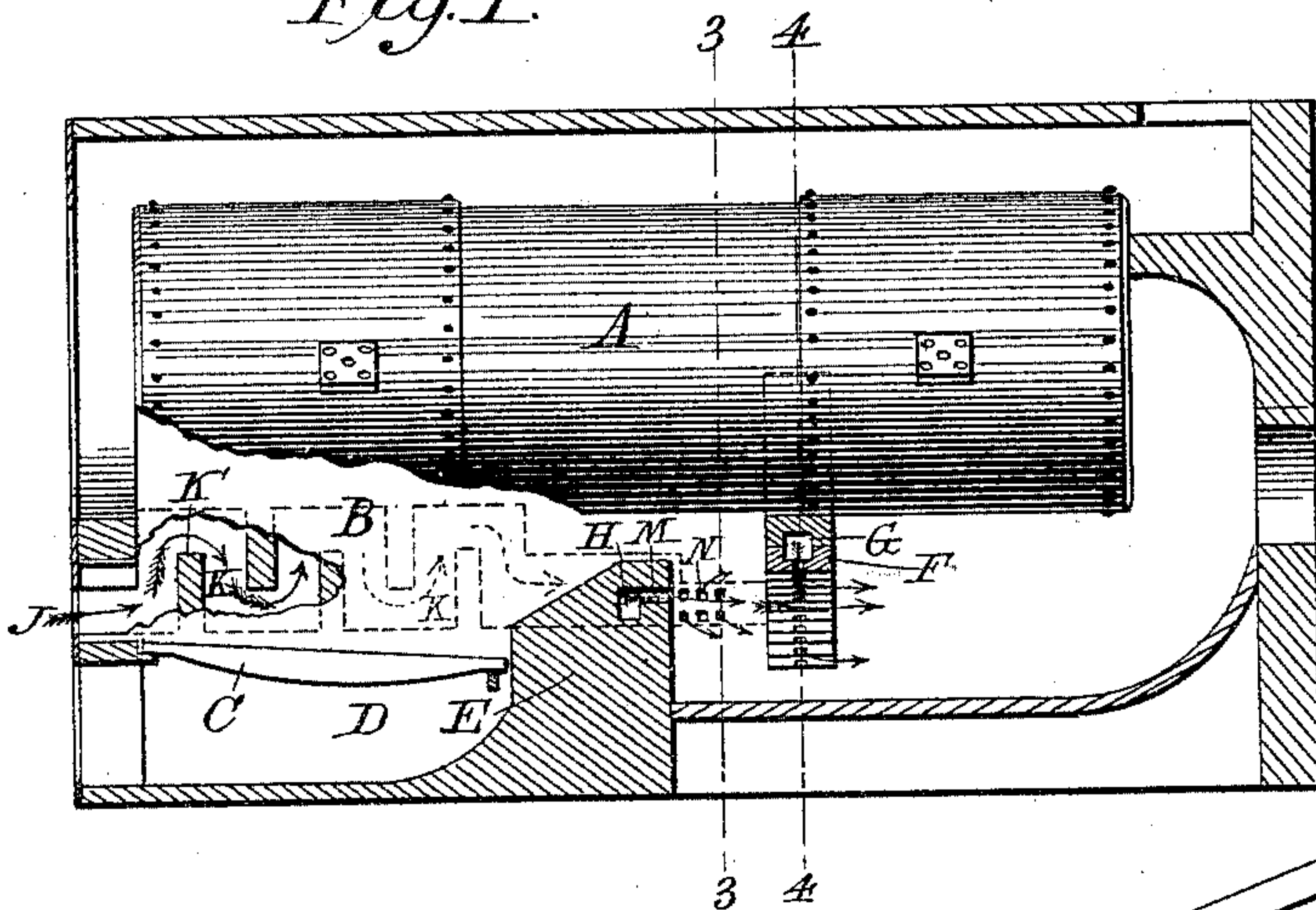
(No Model.)

L. LAWTON.  
STEAM BOILER FURNACE.

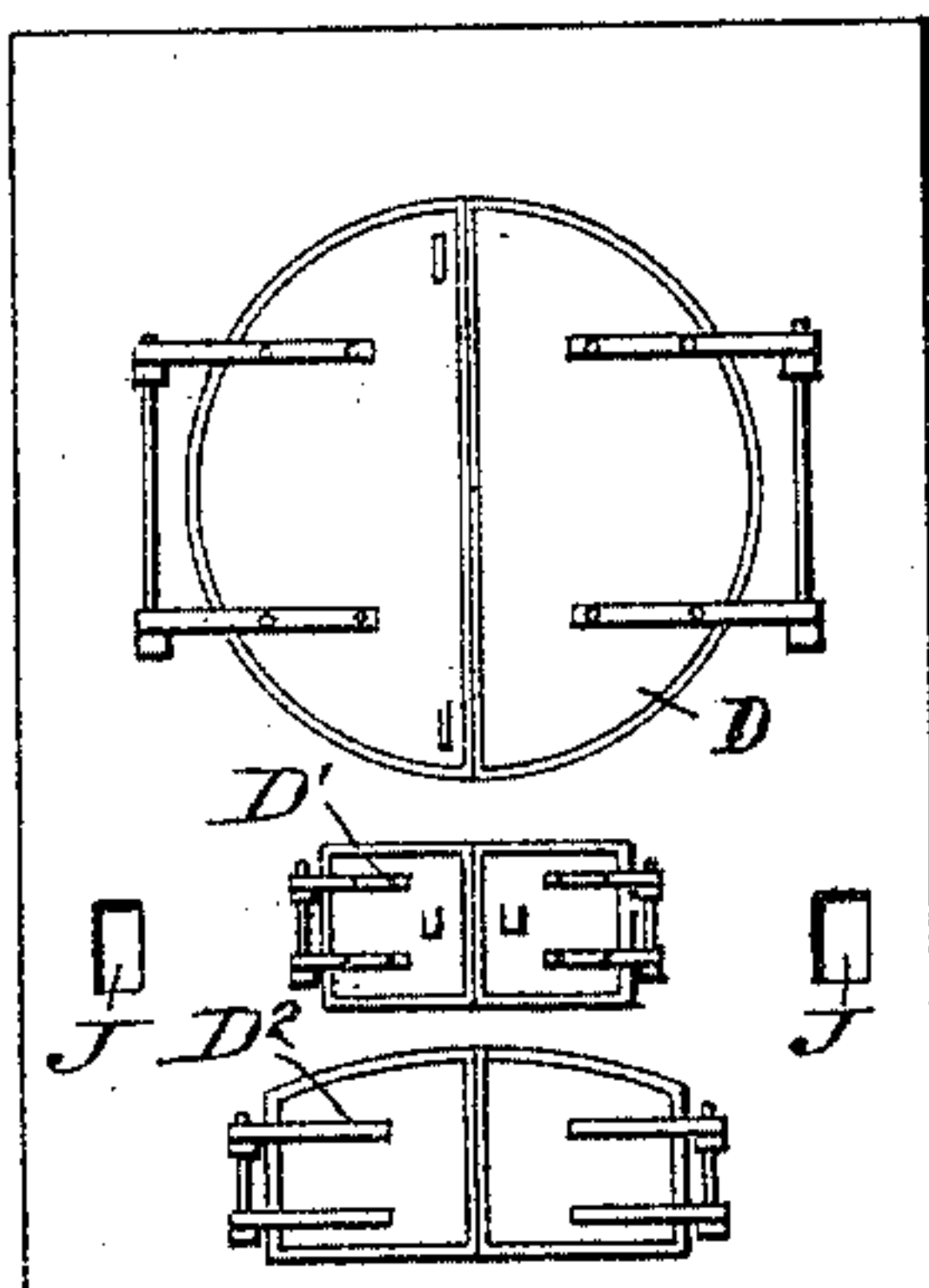
No. 491,570.

Patented Feb. 14, 1893.

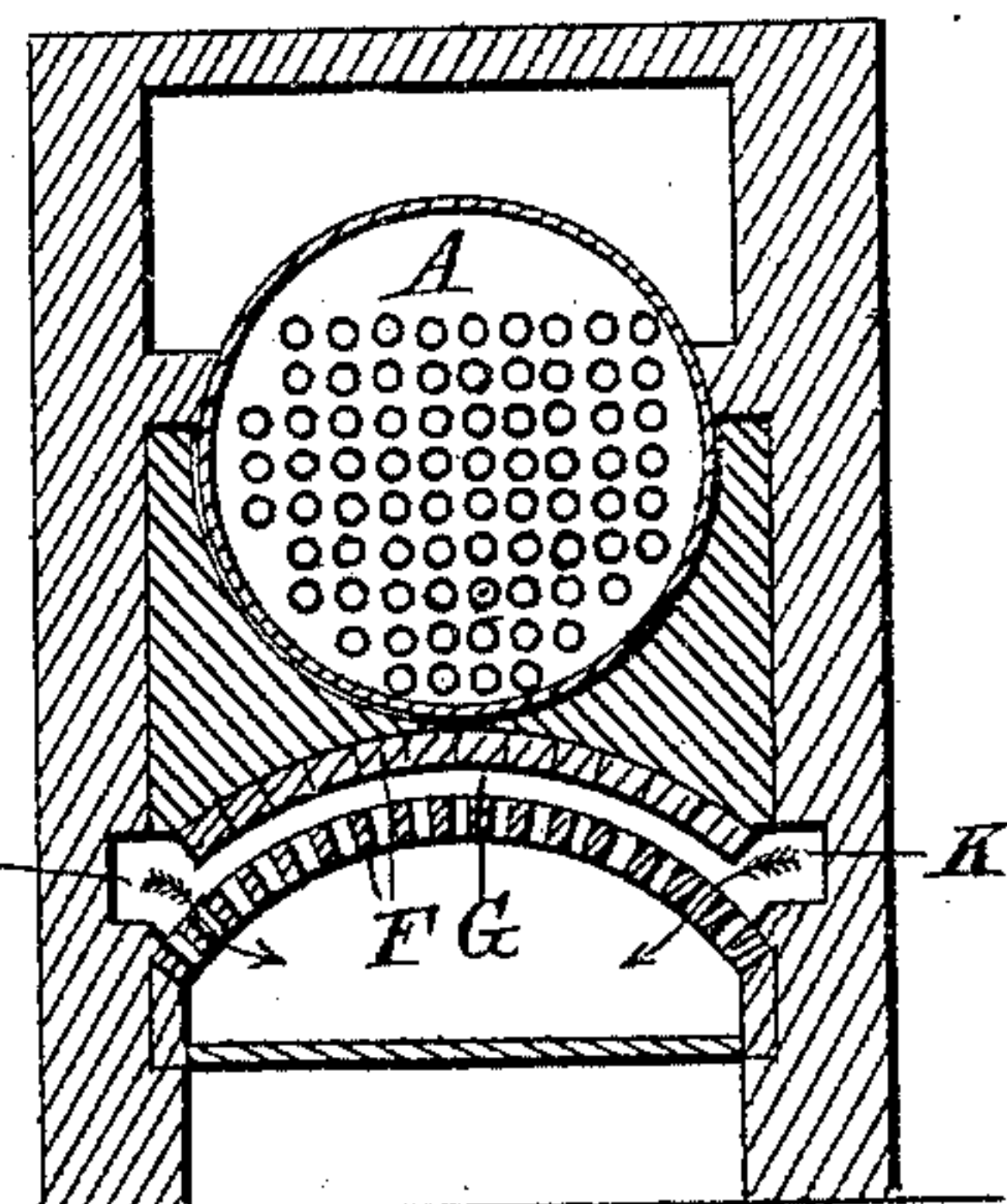
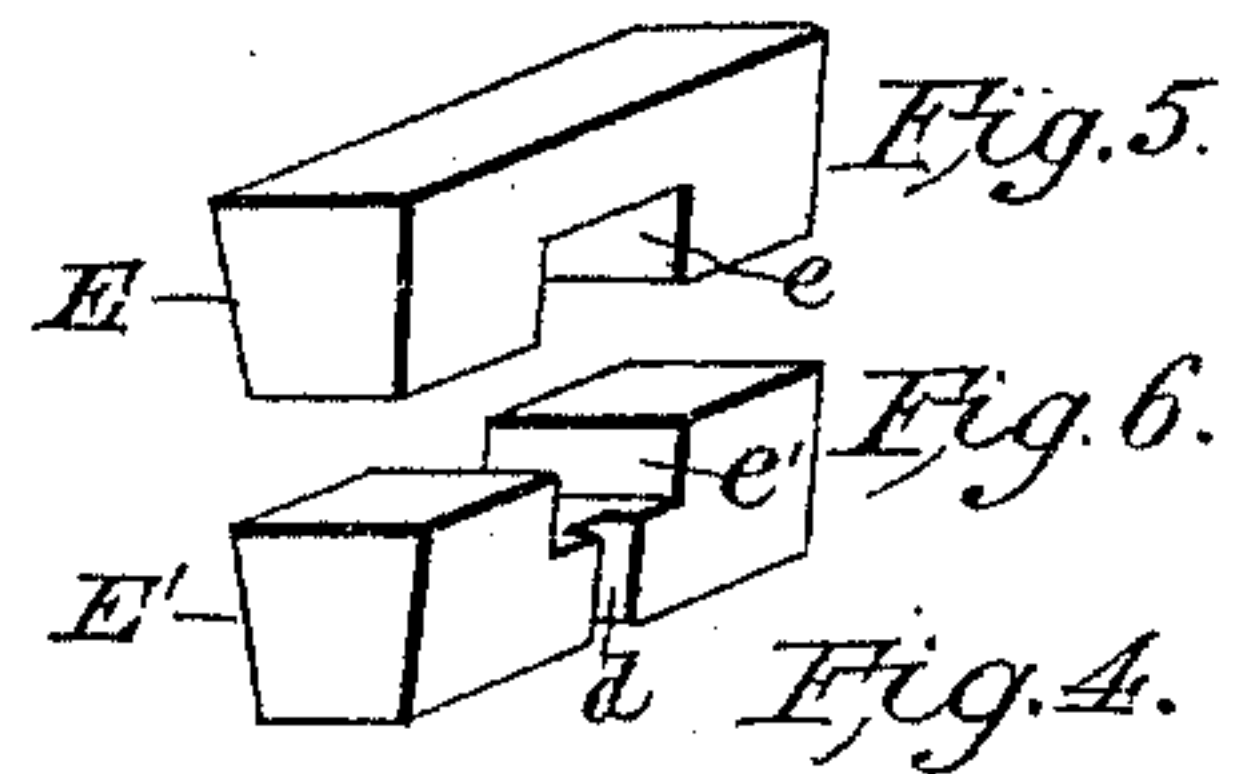
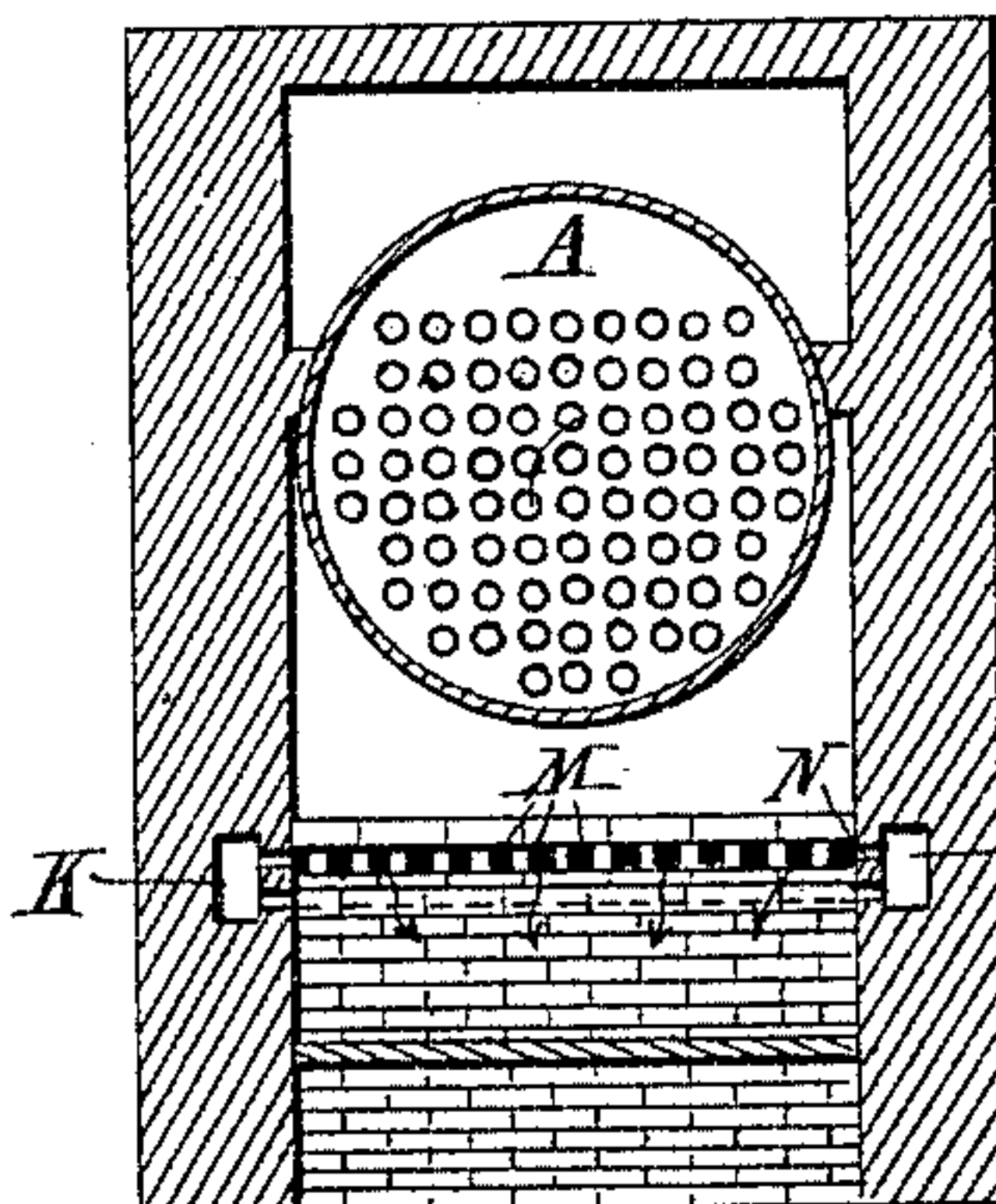
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



Witnesses:  
J. H. Goodenough  
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Inventor:  
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By H. B. Luntz, jr.  
his Atty.



# UNITED STATES PATENT OFFICE.

LEWIS LAWTON, OF TRENTON, NEW JERSEY.

## STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 491,570, dated February 14, 1893.

Application filed June 9, 1890. Renewed November 3, 1892. Serial No. 450,822. (No model.)

*To all whom it may concern:*

Be it known that I, LEWIS LAWTON, a citizen of the United States, residing at Trenton, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to an improved construction of furnace, designed especially for use in connection with steam boilers, though some of its features are adapted for other furnaces.

It has for its object to obtain a maximum degree of heat from a minimum amount of fuel; and to this end it consists in the novel construction hereinafter described and claimed, whereby the products of combustion, after leaving the fire-pot and passing over the bridge-wall, are fed with air taken in through peculiarly arranged flues and delivered thereto in a highly heated condition, the products being then deflected under an arch some distance beyond the bridge-wall, at or about which point a further supply of air is introduced, whereby the escape of the products is retarded and a thorough commingling of the air supply therewith is insured; from which results a more complete combustion and consumption of the gaseous products, greater economy in the use of fuel, a more intense heat with less smoke, and, generally, an increased efficiency in the furnace.

In the accompanying drawings forming a part of this specification, Figure 1, is a longitudinal vertical section; Fig. 2, is a front elevation; Figs. 3 and 4, are vertical transverse sections on the lines 3—3 and 4—4, respectively, Fig. 1; and Figs. 5 and 6, are detailed views of the bricks or slabs with which the arch is formed.

Like letters denote the same parts in the several views.

A is a steamboiler of any preferred form or structure, that shown being of the common, cylindrical, tubular type.

B is the fire-box, underlying as usual the front end of the boiler.

C denotes the usual grate-bars, and D the ash-pit beneath.

D, D', D<sup>2</sup>, are the doors ordinarily provided, and E is the bridge-wall, located at the rear end of the fire-box, as usual, extending considerably above the grate-bars, and reaching to near the under side of the boiler, the construction and arrangement of parts thus far described not being unlike that in common use in this type of boiler furnaces.

Formed in the brick-work inclosing the boiler, on either side of the fire-box, are the air-supply flues K, opening at their front ends at J, on either side of the door D', at about the level of the front ends of the grate-bars, and extending at their rear to and beyond the bridge-wall. These flues are provided with partitions K', arranged alternately as shown, those from the top of the flues extending to near the bottom thereof, and those rising from the bottom extending to near the top.

In the bridge-wall, near its upper edge, is formed the air-chamber or passage H, extending from end to end of the wall and communicating at each end with the flues K near the rear ends thereof. This passage is provided along its length with outlet openings M arranged horizontally and opening into the smoke-flue in rear of the bridge-wall. At some little distance in rear of the bridge-wall is the partition F, its lower end being arched as shown, and extending slightly below the upper edge of the bridge-wall. The arch of this partition is made up of the bricks or slabs E and E', the upper ones E being cut away on their under sides at the center, as at e, and the lower ones E' being cut out on their upper sides, as shown at e', for a purpose to be presently described. As before stated, the air-flues at the side extend beyond the bridge-wall and terminate at a point opposite the ends of the arched partition F. Between the bridge-wall and this partition these side flues communicate with the smoke-flue by small openings N. The arch F is provided with an air-chamber or passage G, extending throughout its length and communicating with the air-flues K at the sides of the furnace at their rear ends. This air-passage is conveniently formed by the cut away portions e and e' in



the bricks composing the arch, the cut away portions registering with each other when the bricks are placed in position one upon the other, and forming the passage G. In one  
 5 side of each of the lower bricks E' is cut the vertical channel *d*, which, when the bricks are in position and the arch completed, form outlet openings from the passage, similar to the openings leading from the passage in the  
 10 bridge-wall.

The construction being as above described, the products of combustion passing over the upper edge of the bridge-wall impinge against, and are deflected downward, and broken up  
 15 by the arch F. As they pass the bridge-wall they are supplied from the under side with fresh air, drawn in through the flues K at the side of the fire-box and discharged through the openings M in the air-passage H. The  
 20 small openings N in the sides of the flues K afford an additional supply of fresh air at the sides. Passing on under the arch F the gaseous products are again supplied with air from above through the openings *d* leading  
 25 from the passage G in the arch. The flues K, being located in the side walls of the furnace contiguous to the fire-box and extending along the smoke-flue, cause the air-supply passing therethrough to be delivered in  
 30 a highly heated condition. The mouths J of these flues may of course be provided with suitable draft regulators to increase or diminish the amount of fresh air admitted. The partitions K' arranged in these flues, as heretofore described and shown, form a circuitous  
 35 passage for the air, practically lengthening the flues and affording extended heating surfaces against which the air impinges.

To effect the best results, I have found that  
 40 the air should be delivered at the points described from the side flues, heated to about 800° Fahrenheit, and this construction is well adapted to produce this result. The air carried through these side flues and being heated  
 45 to approximately this degree, then commingled with the gases in the combustion cham-

ber causes them to be thoroughly consumed and producing a white flame. The air thus highly heated is delivered at different points as described in finely divided currents, there-  
 50 by causing an active combustion of the unconsumed products, and insuring an intense heat with little or no loss from smoke &c.

What I claim and desire to secure by Letters Patent is;—

1. In a furnace, the combination of the fire-box, the bridge-wall reaching above the grate bars, the arch in rear of the wall extending below its upper edge, the air flues in the side walls of the furnace, the air-chambers in the  
 60 bridge-wall and the arch, communicating with the side flues and opening into the smoke flue, and the openings N, leading from the side flues into the rear of the combustion chamber between the bridge-wall and the  
 65 arch, substantially as described.

2. In a steam-boiler furnace, the combination of the fire-box, the bridge-wall, the arch in rear of the latter, the air-flues in the side walls of the furnace having the partitions K',  
 70 the air-passages in the bridge-wall and the arch, communicating at their ends with the air flues and opening into the smoke flue, and the openings N, whereby the air-flues communicate with the smoke flue between the bridge-  
 75 wall and the arch, substantially as described.

3. In a steam boiler furnace, the combination of the fire-box, the bridge-wall, the air-flues in the side walls of the furnace, and the arch in rear of the bridge-wall, said arch being formed of the bricks E and E' cut away  
 80 on their adjacent faces as at *e*, and *e'*, to form the air-passage G communicating with the air-flues and opening into the smoke-flue, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

LEWIS LAWTON.

Witnesses:

JOS. L. WATSON,  
 L. SCHOONOVER.