

(No Model.)

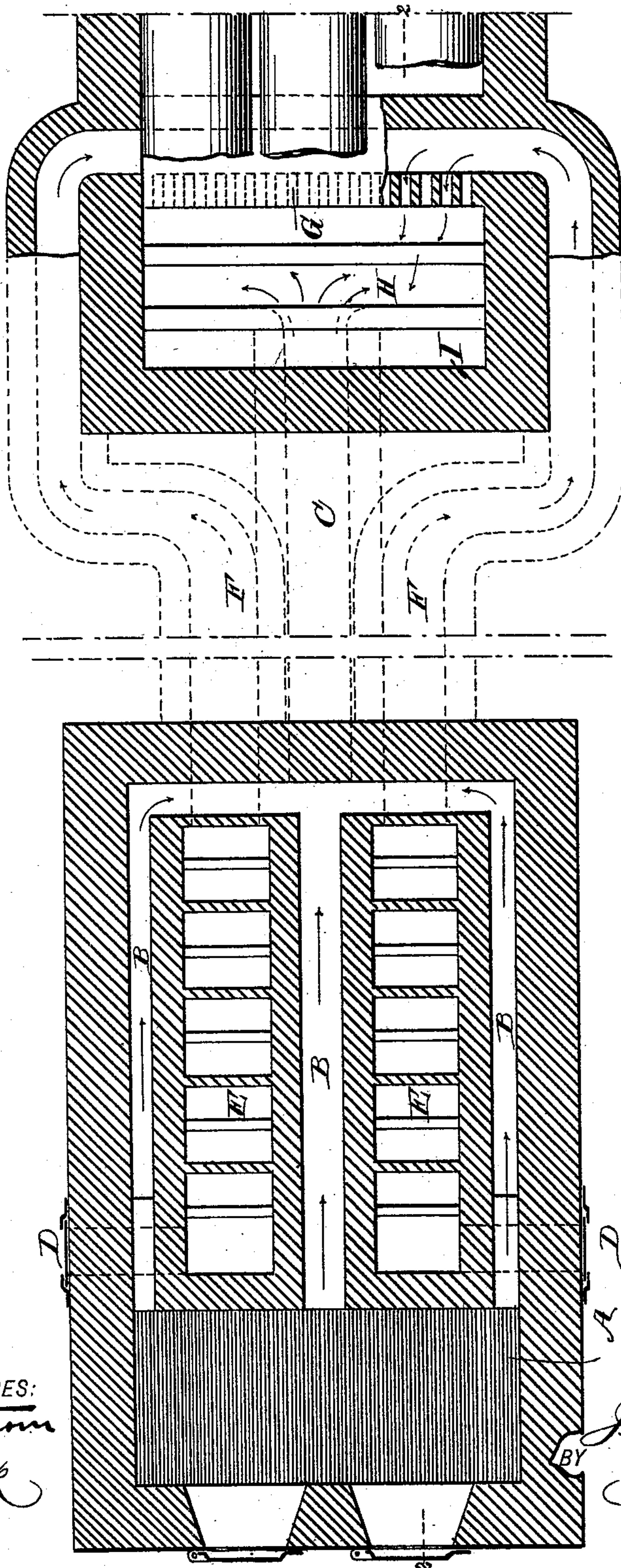
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J. W. McGRANAHAN.  
BOILER AND METALLURGICAL FURNACE.

No. 532,690.

Patented Jan. 15, 1895.

Fig. 1



WITNESSES:

*John Bergstrom*  
*C. Sedgwick*

INVENTOR

*J. W. McGranahan*

BY

*Munn & Co*

ATTORNEYS.



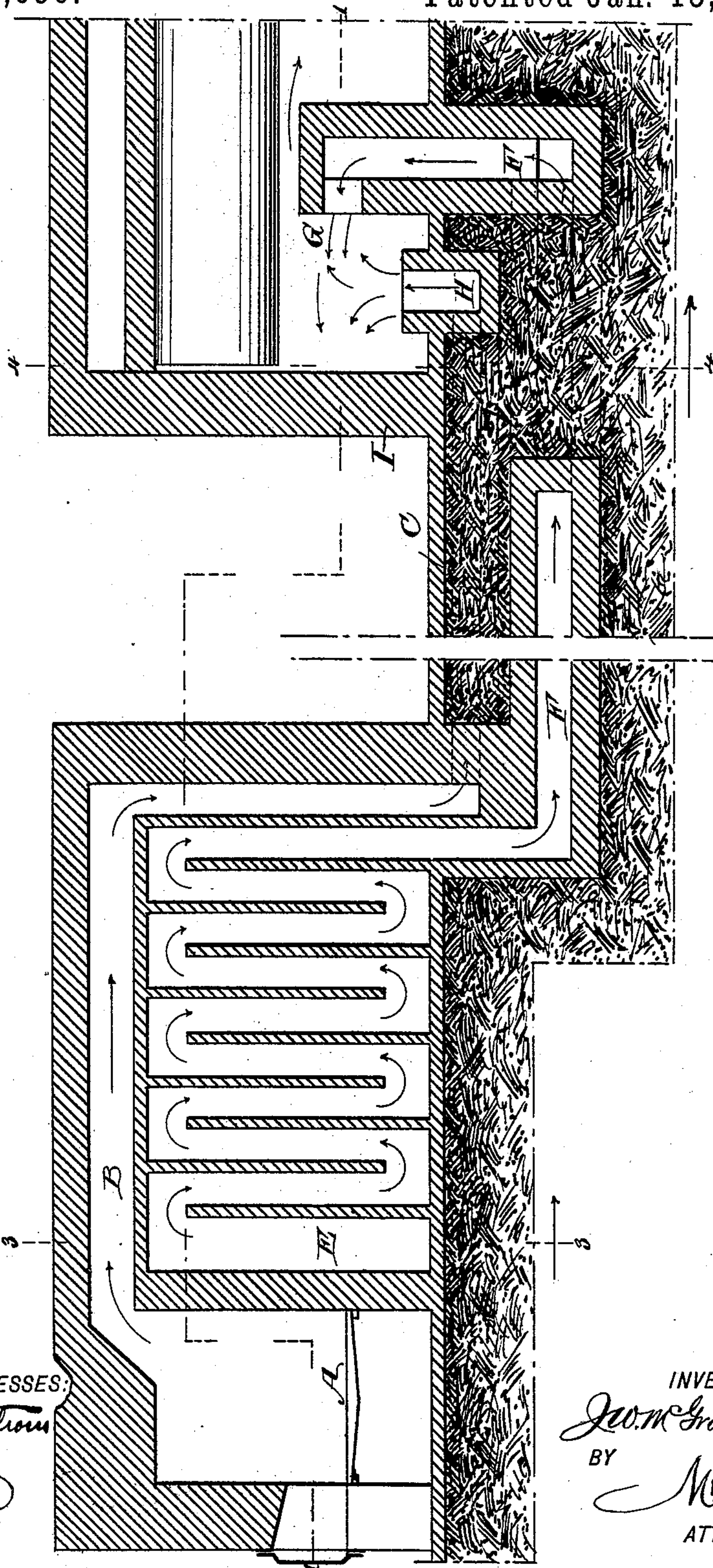
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No. 532,690.

Patented Jan. 15, 1895.



WITNESSES:

Johna Bergstrom  
C. Sedgwick

***INVENTOR***

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(No Model.)

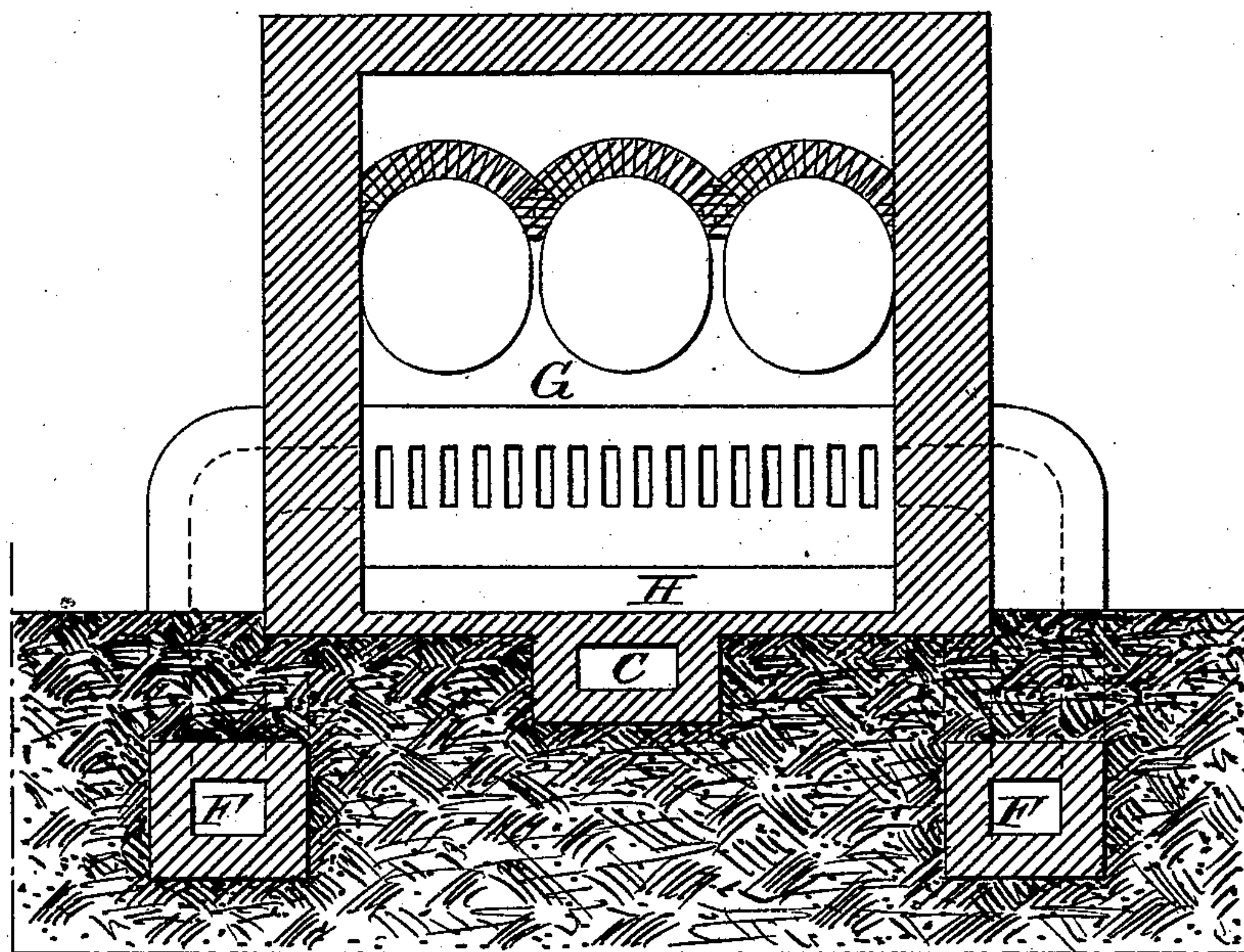
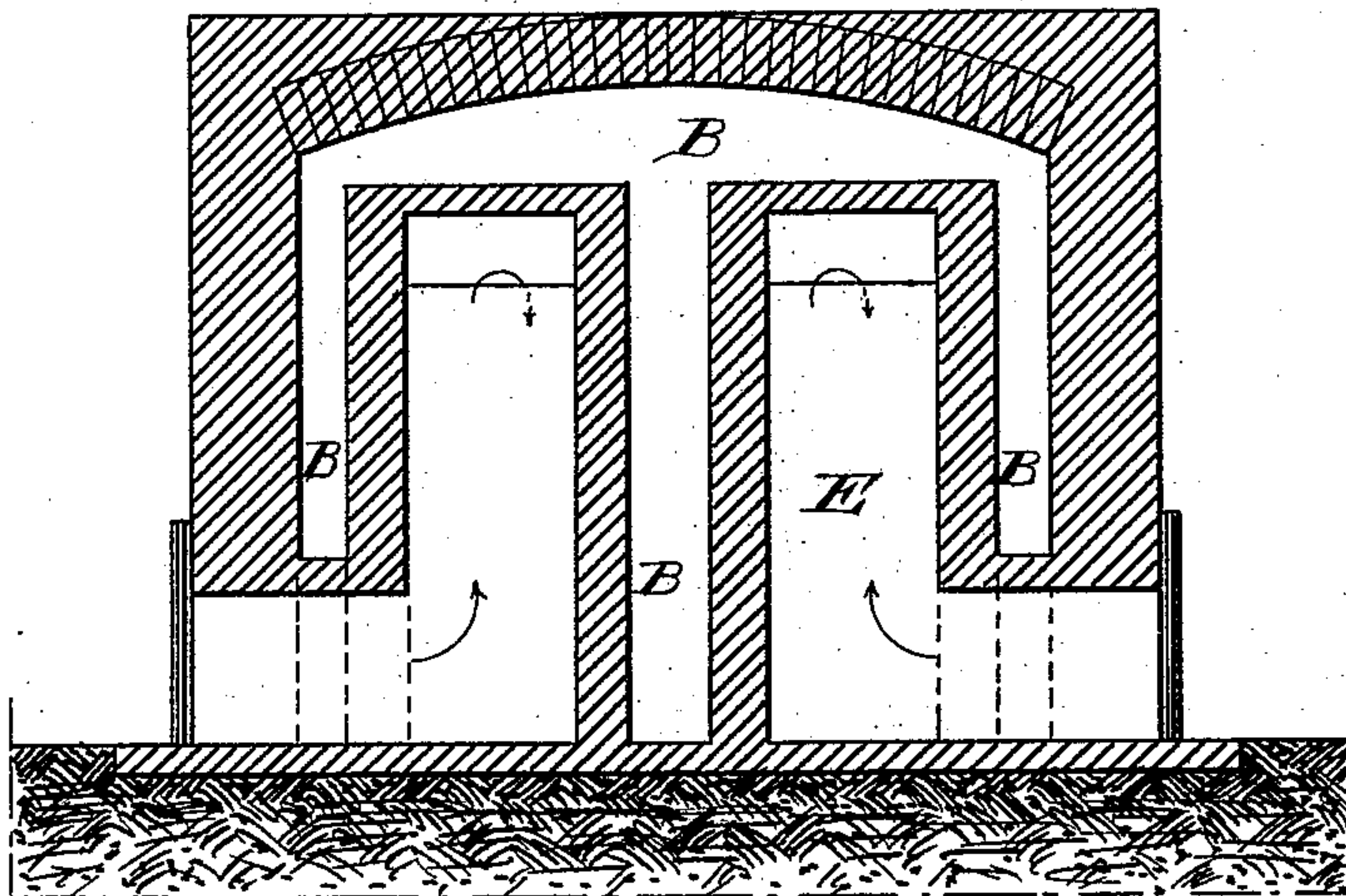
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*Fig. 3*



WITNESSES:  
*John A. Bergstrom*  
*C. Sedgwick*

*Fig. 4*

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# UNITED STATES PATENT OFFICE.

JAMES W. McGRANAHAN, OF HARRISON, NEW JERSEY.

## BOILER AND METALLURGICAL FURNACE.

SPECIFICATION forming part of Letters Patent No. 532,690, dated January 15, 1895.

Application filed January 5, 1894. Serial No. 495,838. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES W. McGRANAHAN, of Harrison, in the county of Hudson and State of New Jersey, have invented a new and Improved Boiler and Metallurgical Furnace, of which the following is a full, clear, and exact description.

My invention relates to furnaces for heating boilers, reverberatory and open hearth furnaces and similar structures. By my invention the fire is burned on a grate situated at some distance from where the heat is to be applied. Such grate may be of the ordinary type of step grate or of the kind used in Siemens' furnaces, the object being to produce a quantity of incompletely burned and therefore combustible gases. The stream of gas produced in the grate is led through flues to the fire box of the boilers, or to the bed of the furnace or other place where the heat is desired to be generated. Thus, beneath the boilers or in the furnace I maintain a clear gas fire, all ashes and dirt of every description being far removed therefrom. If now, air were supplied directly to the fire chamber from the outside there would be a great waste of heat owing to the inevitable cooling of the gases from the fire on their way through the flues to the fire chamber. To avoid such loss of heat I conduct the air required for the combustion of the gases through flues or heaters contiguous to the smoke or gas flues, the walls of which air flues or heaters become highly heated by the gas. This heats the air, and supplies for the combustion of the gas in the fire chamber, a stream of highly heated air.

My invention consists of certain features of construction, and combinations of parts that will be hereinafter described and claimed.

Reference is to be had to the drawings accompanying this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a horizontal partly sectional view of my improved furnace. Fig. 2 is a vertical and longitudinal, partly sectional view of the same. Fig. 3 is a vertical cross section showing the arrangement of air and gas flues in what I term the reheating portion of my device; and Fig. 4 is a cross section showing the perforated bridge wall. The section of Fig. 1 follows the dotted lines 1—1 of Fig. 2. The

section of Fig. 2 follows the dotted line 2—2 of Fig. 1. The section of Fig. 3 follows the dotted line 3—3 of Fig. 2. The section of Fig. 4 follows the dotted line 4—4 of Fig. 2.

A, is the grate or fire place fed with coal through the fire doors by regular process. From the grate the combustible gases go through the flues B, B, following the course of the arrows and reaching the furnace by the centrally disposed flue C in which the several gas flues unite. The air enters by flue openings D, D, and in the reheaters E, E, follows as forced to by the diaphragms and walls, a sinuous course up and down through the heaters and finally by the flues F, F, reaches the perforated bridge wall G, where it is admitted to the fire chamber.

The gases to be delivered to the fire chamber enter it by a flue or upcast H, reaching up through its floor. The air for the combustion of the gases reaches the fire chamber through a similar flue perforated to permit the outflow of the air, and so arranged as to constitute a bridge wall. The openings in the bridge wall are adapted to discharge the heated air toward the end wall I of the fire chamber, and the gas flue H is arranged between the said wall and the air flue G. As the hot gases rush into the chamber through the up-cast H they are met by a stream of air from the flue or perforated bridge wall F. Combustion takes place, its intensity being greatly increased by the heating of the air. The result is a very pure flame absolutely void of all ashes and solid matter.

The draft of air may be accelerated if desired, by the use of a blower, or a chimney of the ordinary construction may be used to maintain the necessary current through the heater and connecting flues.

The ordinary devices may be used to admit of extra or cold air to the fire chamber of the boiler by adjustable ports or dampers on its front or sides, the use of such, however, forming no part of this invention.

I do not confine myself to the exact construction shown in the drawings, but it will be obvious that additions and minor changes may be made, or equivalents substituted for some of the parts, without departing from the nature of the invention as defined in the appended claims.



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

1. The combination with the fire-place, of  
5 a plurality of parallel gas flues arranged in the rear of the fire-place, and separate air chambers extending longitudinally of the gas flues and arranged between each two gas flues, said chambers being provided with vertical  
10 alternately overlapping diaphragms to produce sinuous channels for the air to compel it to travel alternately up and down while it proceeds from one end of each chamber to the other end thereof, substantially as described.
- 15 2. The combination, with the fire-place, of

a plurality of gas flues arranged in the rear of the fire-place, air chambers extending longitudinally between the said gas flues and provided with diaphragms to produce sinuous channels for the air, a gas flue into which dis- 20 charge the aforesaid gas flues, a combustion chamber into which discharges the said gas flue, a perforated bridge wall located in the said combustion chamber, and air flues connecting the air chambers with the said bridge 25 wall, substantially as described.

JAMES W. McGRANAHAN.

Witnesses:

C. SEDGWICK,

F. W. HANAFORD.