

No. 618,751.

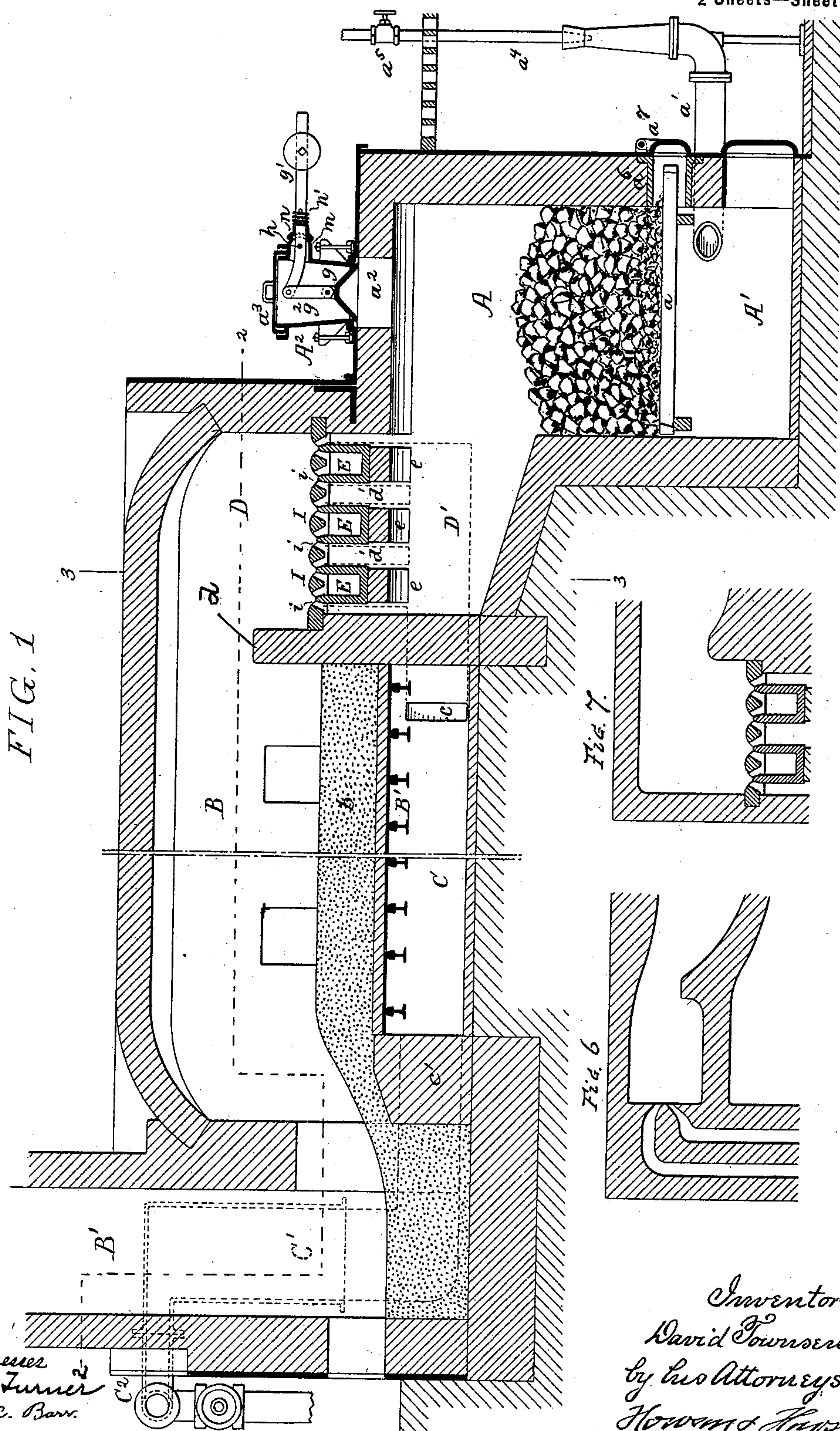
Patented Jan. 31, 1899.

D. TOWNSEND.  
METALLURGICAL FURNACE.

(Application filed July 8, 1897.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses  
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by his Attorneys  
Howard & Howard



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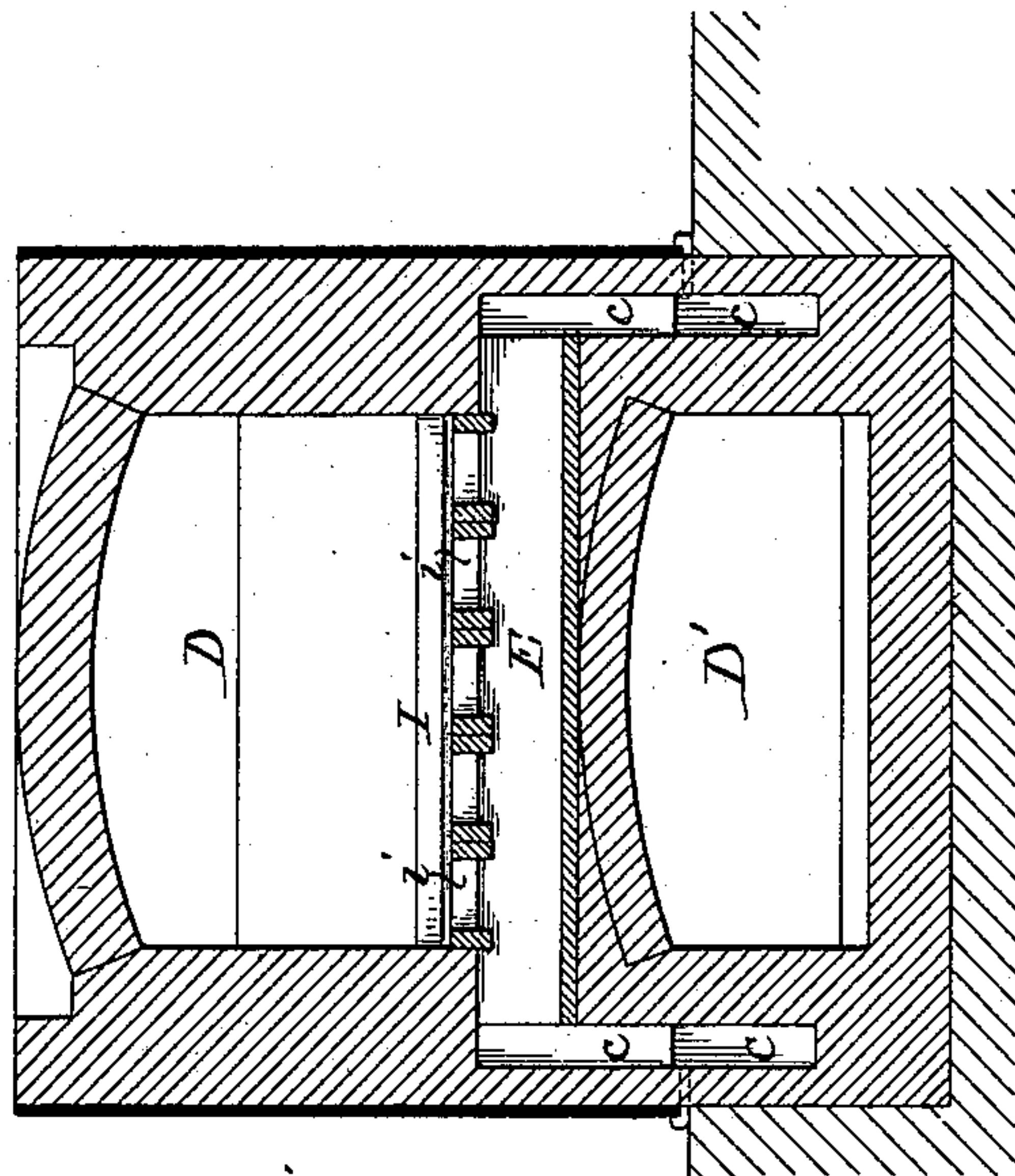
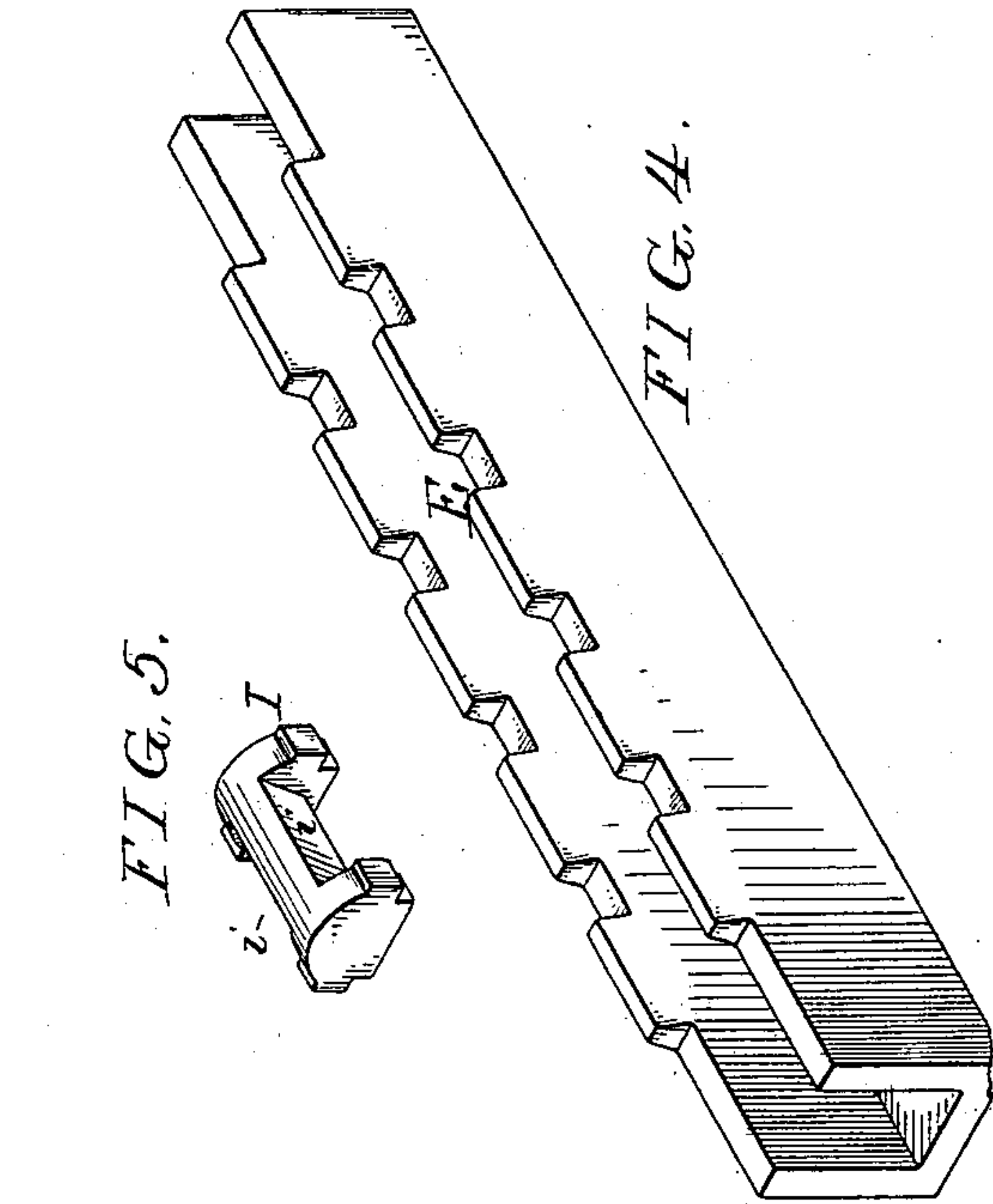
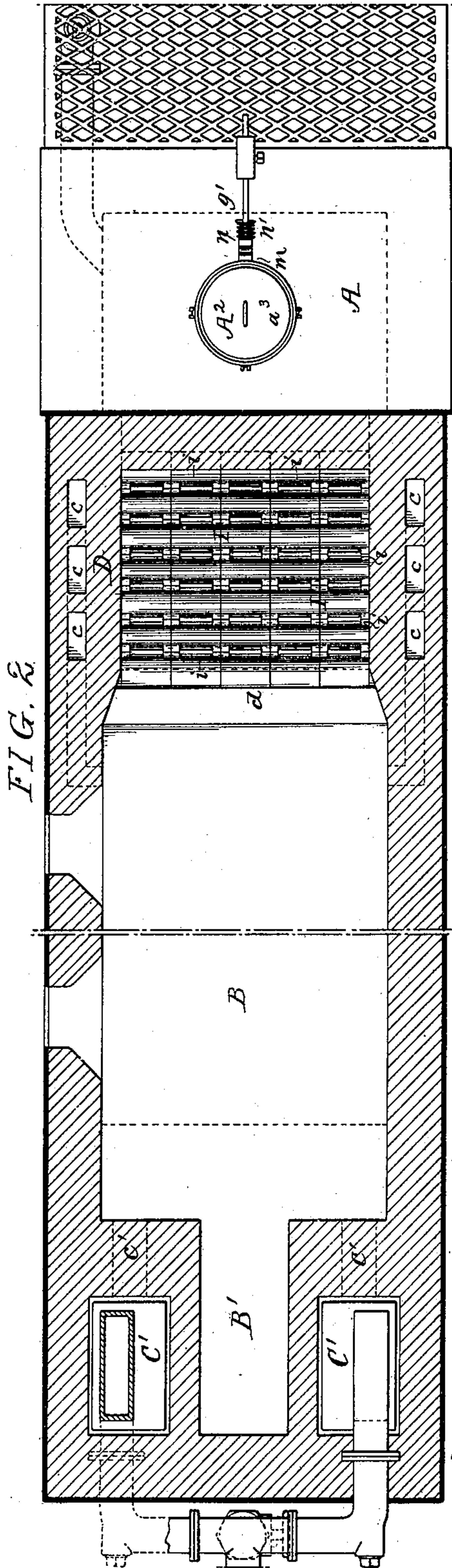
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# UNITED STATES PATENT OFFICE.

DAVID TOWNSEND, OF PHILADELPHIA, PENNSYLVANIA.

## METALLURGICAL FURNACE.

SPECIFICATION forming part of Letters Patent No. 618,751, dated January 31, 1899.

Application filed July 8, 1897. Serial No. 643,880. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID TOWNSEND, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain  
5 Improvements in Metallurgical Furnaces, of which the following is a specification.

My invention relates to certain improvements in metallurgical furnaces in which producer-gas or products of combustion from an  
10 ordinary fire-chamber may be used.

The object of my invention is to so construct the furnace that the gases after passing from the producer or fire-chamber will be mixed with a certain amount of hot air, and combustion will immediately take place in a chamber  
15 especially provided for the purpose adjacent to and communicating with the heating-chamber of the furnace.

In the accompanying drawings, Figure 1 is  
20 a longitudinal sectional view of my improved furnace, the furnace shown being what is known as a "metallurgical" heating-furnace. Fig. 2 is a sectional plan view on the line 2 2, Fig. 1. Fig. 3 is a section on the line 3 3,  
25 Fig. 1. Fig. 4 is a perspective view of one of the air-ducts detached. Fig. 5 is a perspective view of one of the bricks forming the inclined passages, and Figs. 6 and 7 are views of the invention applied to the ordinary steel  
30 melting-furnace.

A is the producer-chamber, having a grate *a* for supporting the coal and ash, and under the grate is the ash-pit A', with which communicates the air-blast pipe *a'*, having a  
35 steam-pipe *a''*, provided with a regulating-valve *a'''*.

*a''* is the feed-opening for the coal, provided with a hopper A<sup>2</sup>, the details of which will be described hereinafter.

40 B is the heating-chamber, having the usual bed *b*, supported on a suitable framework B', and under this framework is a space C, which I utilize as a preheating-chamber for the air used in producing the proper combustion.

45 D is the combustion-chamber, separated from the chamber B preferably by a bridge-wall *d* of any suitable height.

D' is a passage for the gas from the producing-chamber A, which communicates with the  
50 combustion-chamber D through the transverse passages *d'*, formed by air-ducts E, which rest on suitable arches *e*.

The air-ducts E communicate with side passages *c* in the side walls of the furnace, and these passages connect in turn with the pre-  
55 heating-chamber C under the bed of the furnace. This space receives air from the two heating-chambers C' on each side of the flue B' at the rear of the furnace through two passages *c'*, and air is supplied to the chambers  
60 through the pipes C<sup>2</sup>, having a suitable regulating-valve *c''*. The chambers C' protect the brickwork of the stack from the intense heat of the furnace.

The air that passes through the pipe, heating-chambers, and passages to the ducts E is heated, so that it will readily mingle with the  
65 gases as they pass through the passages *d'*.

Forming a partition between the combustion-chamber D and the air and gas passages  
70 is a series of notched or perforated bricks I, (clearly shown in Fig. 5,) which when assembled form passages *i*, and these passages are arranged in pairs and are inclined at such an  
75 angle to a vertical line between them that one passage of the pair will communicate with the air-ducts and the other with the gas-passages, and as the air and gas pass through  
80 the openings *i* each in a thin sheet they will cross each other and become thoroughly mixed, and the combustion will take place at once in the chamber D. The combustion will  
85 be completed in the chamber D, and the heated products will pass into the heating-chamber B in the best possible condition for heating  
or melting the metals contained therein.

In some instances when it is desired to use the ordinary grate-fire I may either build the furnace especially for this purpose or may  
90 keep a fire on the grate, raking it in the same manner as an ordinary furnace-fire, and the products of combustion from the coal will pass up through the passage D' and passages *d'* and mix with the air in the combustion-chamber D, so that thorough combustion will take  
95 place in the chamber D.

The partition I instead of being formed of a series of small sectional bricks may be made by uniting a series of long sections or may be  
100 made from a single slab; but I prefer the construction shown in the drawings.

It will be understood that the main features of my invention may be embodied in the ordinary steel melting-furnace, as shown in Fig.



6 or Fig. 7, by forming narrow elongated slots arranged at an angle, one or more slots being connected with the gas-chamber and the other slot or slots connected with the air-chamber, so that the gas and air as they pass from their chambers into a combustion-chamber will cross each other in thin films and be thoroughly mixed and ignited in the combustion-chamber before entering the melting-chamber.

The hopper  $A^2$  is supplied with a valve  $g$ , connected with a weighted lever  $g'$  by a link  $g^2$ . The lever  $g'$  is pivoted at  $h$  to the casing of a hopper and has a rounded projection against which fits a sliding cover-plate  $n$ , having a socket adapted to receive the projection of the casing, and in order to confine this socket to the casing I provide a spring  $n'$ , which tends to keep the socket tightly against the casing and prevent leakage of gas at the joint. The weight of the lever  $g'$  can be adjusted so that the valve will dump automatically as soon as a certain amount of coal is placed within the hopper, and as soon as the coal is dumped the valve will return to its seat. The hopper is provided with a suitable cover  $a^2$ , which is sealed to prevent leakage of gas.

Opposite the grate  $a$  is an opening  $a^6$ , provided with a suitable door  $a^7$ , so that a slicer-bar can be inserted above the grate to either cut the ash when the chamber  $A$  is used as a gas-producer or to prepare the bed of coal when the chamber is used as a fire-chamber.

By adjusting the steam-valve  $a^5$  and the air-valve  $c^4$  the flame in the furnace can be so regulated as to give the best possible result. On checking the steam an excess of air is obtained and the product is an oxidizing-flame, whereas on the other hand a reducing-flame is obtained by checking the air.

It will therefore be seen that I can use either the gas from a producer or the partly-consumed products of combustion from an ordinary furnace and can so thoroughly mix the gas or products of combustion with a given quantity of hot air and can burn the same in a chamber before they enter the heating-chamber of the metallurgical furnace.

I claim as my invention—

1. The combination in a furnace of a series of notched air-ducts located adjacent to the combustion-chamber with notched bricks having sections adapted to the notches in the air-ducts, one series of bricks extending across the ducts, and the other series of bricks extending across the spaces between the ducts and forming air and gas passages, substantially as described.

2. The combination of a metallurgical furnace, the gas-producing chamber  $A$  having the grate  $a$ , a blast-pipe communicating with the space under the grate, a hopper in the upper portion of the producer, a passage  $D'$  for the gases generated, transverse air-ducts spaced to form passages  $d'$  communicating with the passage  $D'$ , a perforated partition

above the air ducts and passages, some of the perforations communicating with the ducts while others communicate with the passages, a combustion-chamber  $D$  above the partition, a heating-chamber  $B$  beyond the combustion-chamber and with which the said combustion-chamber communicates, a stack, air-passages in the stack and under the bed of the heating-chamber, said air-passages communicating with the ducts, substantially as described.

3. The combination of the gas producer or furnace, a hopper, a valve therein, a weighted lever connected to the valve and pivoted on the casing, the casing having a rounded projection, a lever having a cap resting against the rounded projection and longitudinally movable on the lever with a spring tending to keep the cap on the projection, substantially as described.

4. The combination in a furnace, of a gas-producing chamber, a grate therefor, an air-blast pipe communicating with the space under the grate, a combustion-chamber, a series of air-ducts having spaces between them and located between the gas-producing chamber and combustion-chamber, perforated bricks above the ducts and spaces, some of the perforations communicating with the ducts and some with the spaces, so that a mixture of air and gas is introduced into the combustion-chamber, with means for heating the air prior to its entering the transverse air-ducts, substantially as described.

5. The combination in a furnace, of a gas-producing chamber, a combustion-chamber, a series of arches having spaces between them and located between the gas-producing chamber and combustion-chamber, an air-duct carried by each arch, an air-passage at the sides of the furnace communicating with the ducts and a perforated partition carried by the air-ducts, some of the perforations communicating with the air-ducts and others with the gas-chamber, substantially as described.

6. The combination in a furnace, of a gas-producing chamber, a combustion-chamber, a heating-chamber communicating with the combustion-chamber and with the stack, an air-preheating chamber under the bed of the heating-chamber, air-passages in the side walls of the furnace communicating with the preheating-chamber, a series of arches having spaces between them and located between the gas-producing chamber and the combustion-chamber, and air-ducts on the arches suitably spaced for the passage of gas to the combustion-chamber and communicating with the air-passages in the side walls of the furnace, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DAVID TOWNSEND.

Witnesses:

WILL. A. BARR,  
JOS. H. KLEIN.