No. 688,716. Patented Dec. 10, 1901.

J. W. CALDER.

HOT BLAST STOVE.

(Application filed May 24, 1901.)

(No Model.) 4 Sheets—Sheet 1.

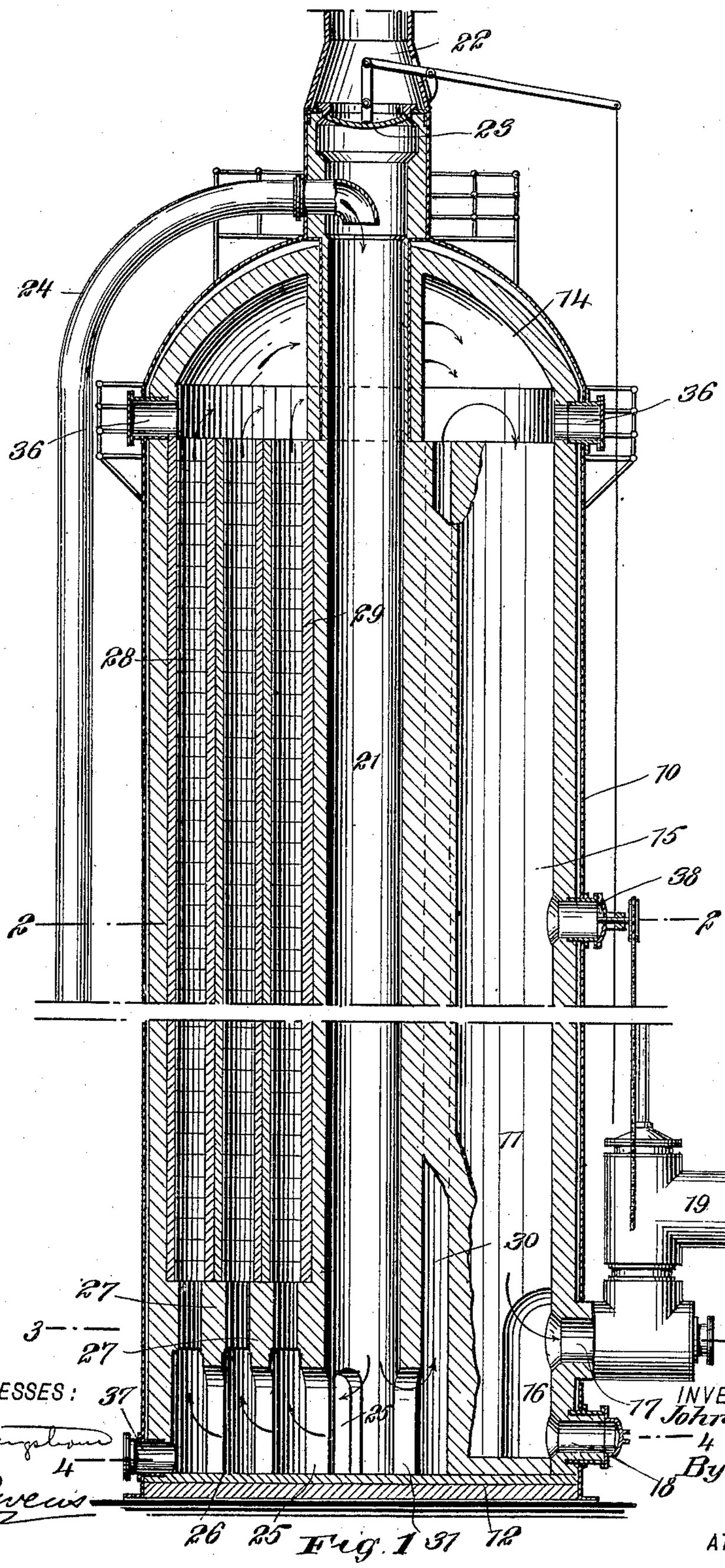

Fig. 1

WITNESSES:

John A. Engelhard

H. B. Owens

INVENTOR

John W. Calder

By Munn & Co

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HOT BLAST STOVE.

(Application filed May 24, 1901.)

(No Model.) 4 Sheets—Sheet 2.

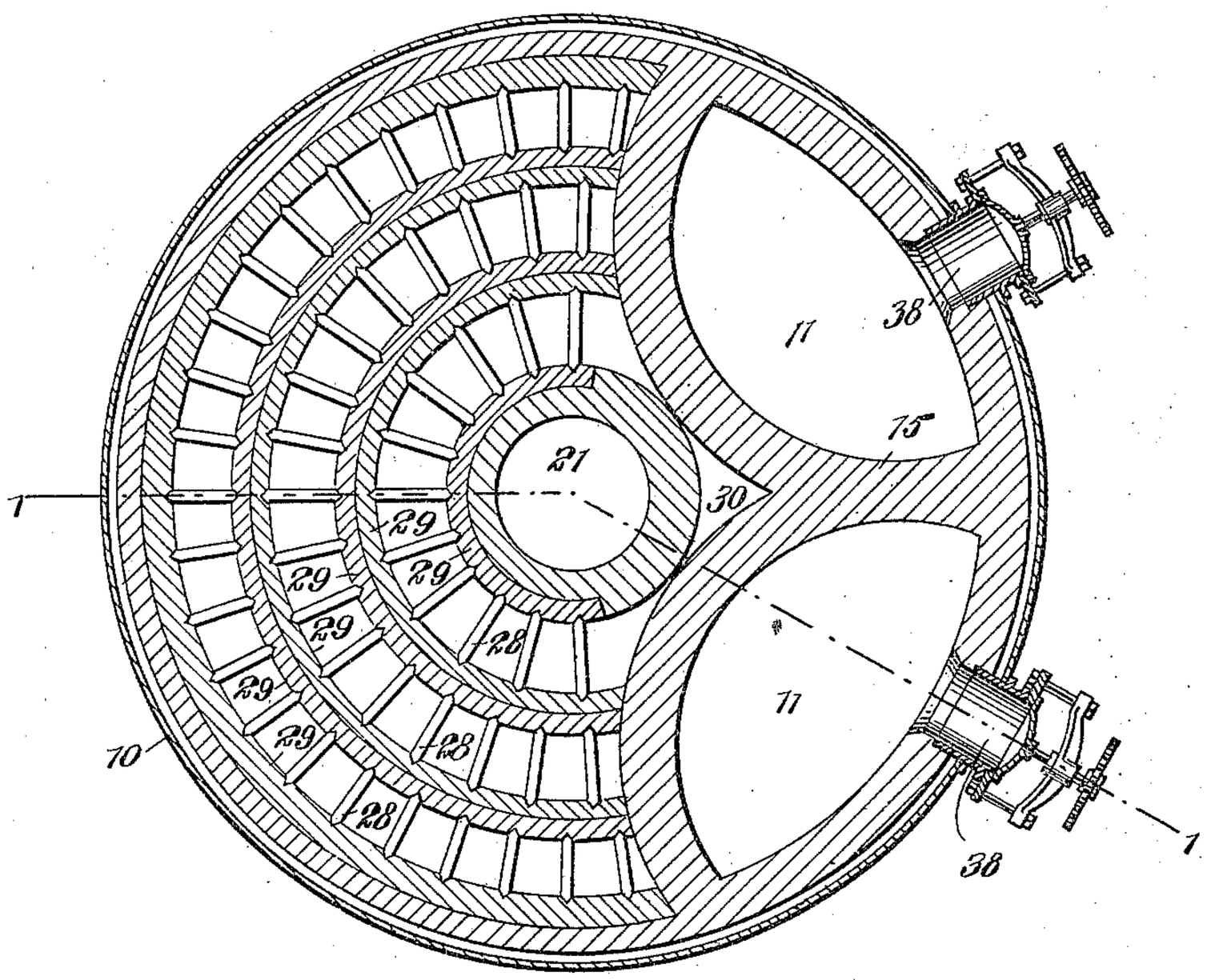

Fig. 2

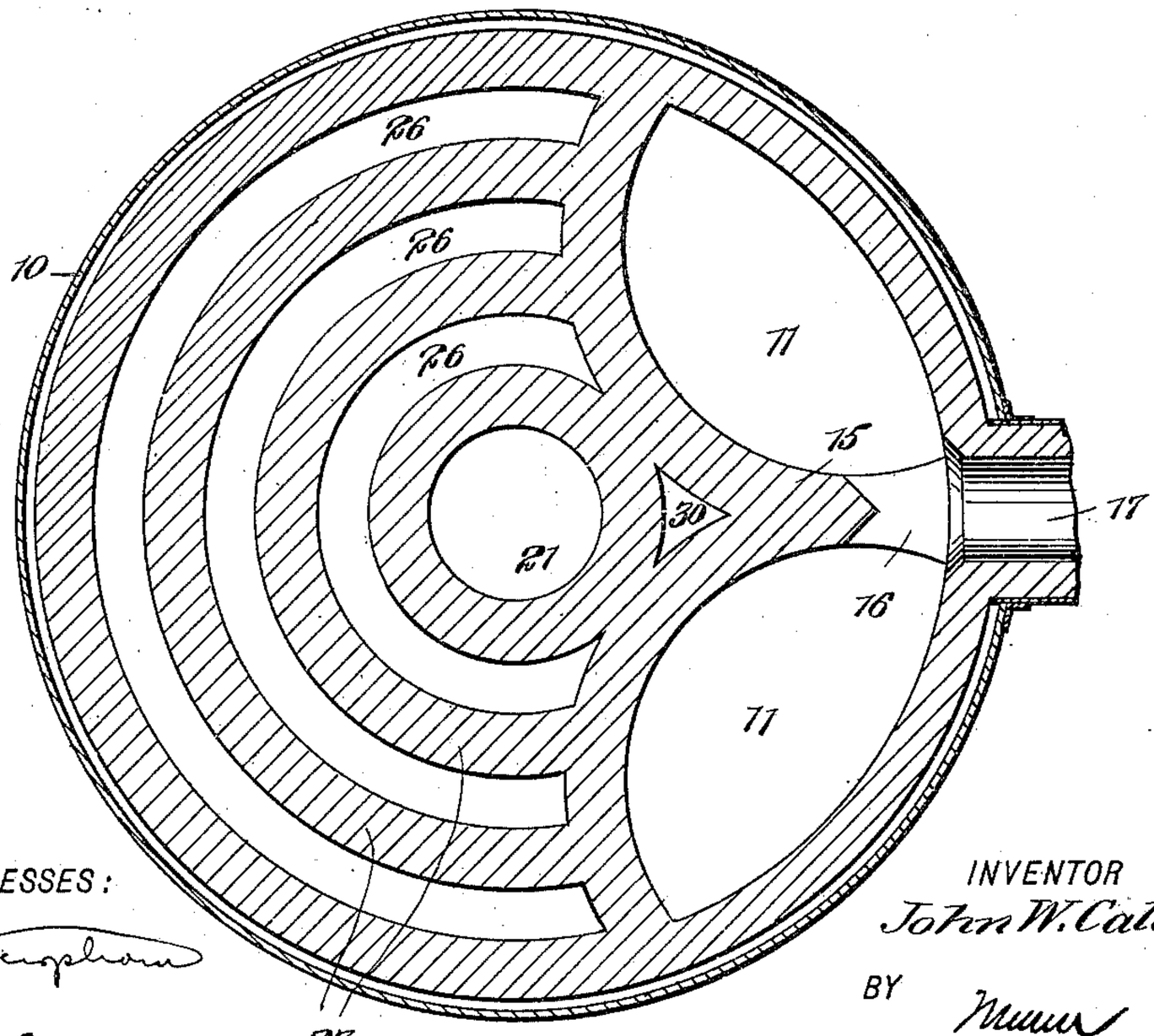

Fig. 3

WITNESSES:

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E. W. Owens.

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No. 688,716. Patented Dec. 10, 1901.

J. W. CALDER.

HOT BLAST STOVE.

(Application filed May 24, 1901.)

(No Model.) 4 Sheets—Sheet 3.

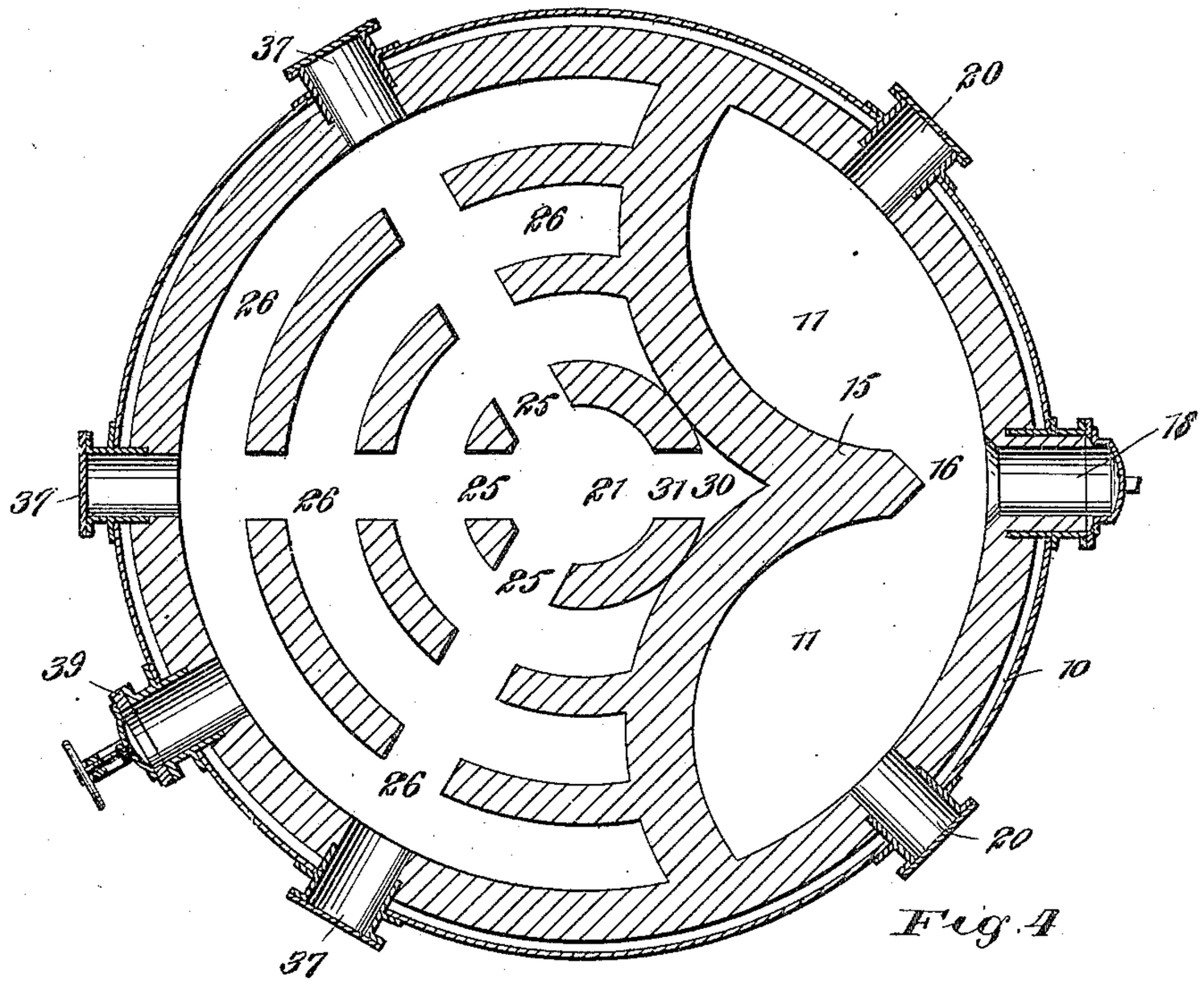

Fig. 4

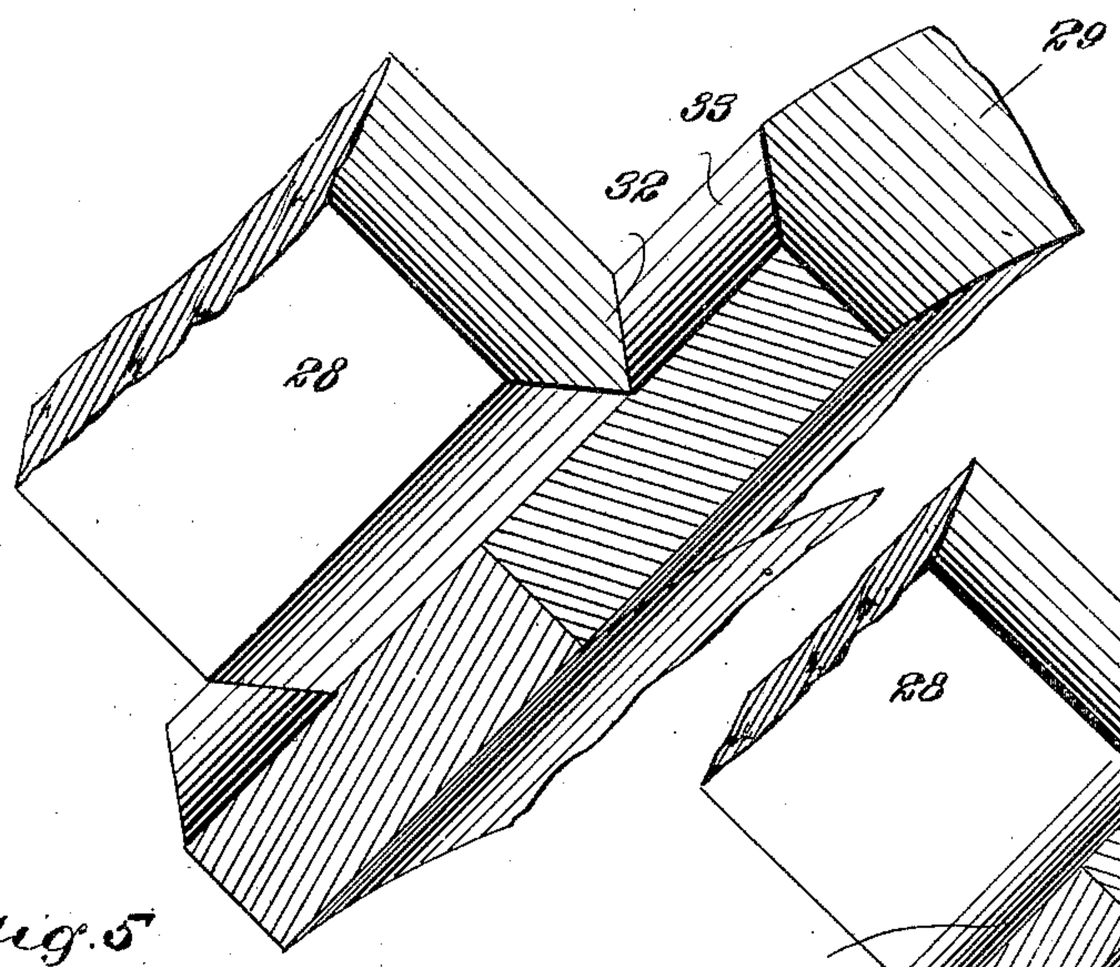

Fig. 5

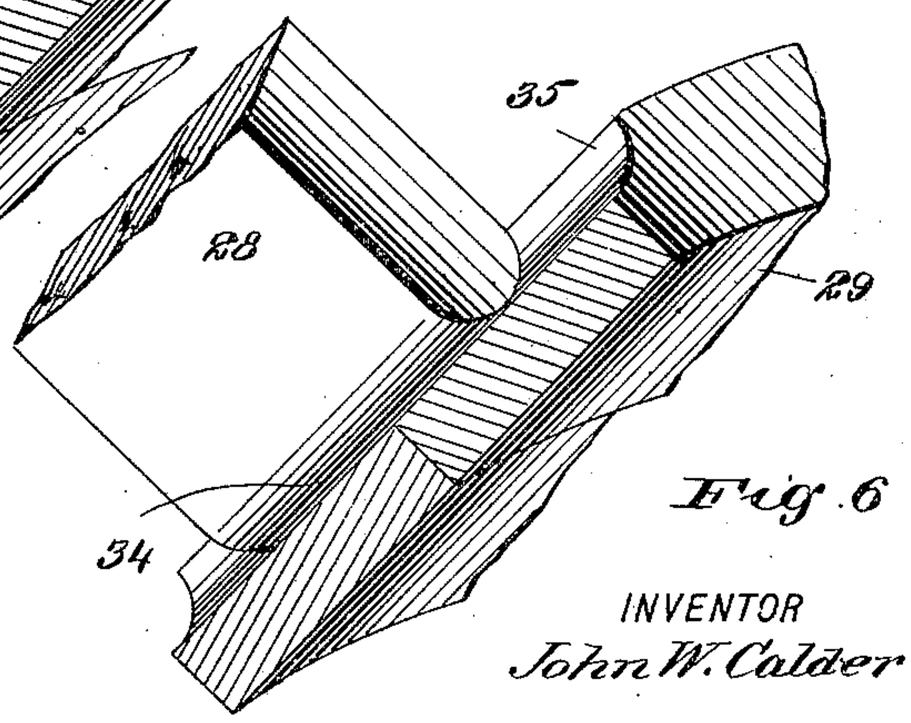

Fig. 6

WITNESSES:

John A. Brophy

F. B. Queen.

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ATTORNEYS

No. 688,716. Patented Dec. 10, 1901.

J. W. CALDER.

HOT BLAST STOVE.

(Application filed May 24, 1901.)

(No Model.) 4 Sheets—Sheet 4.

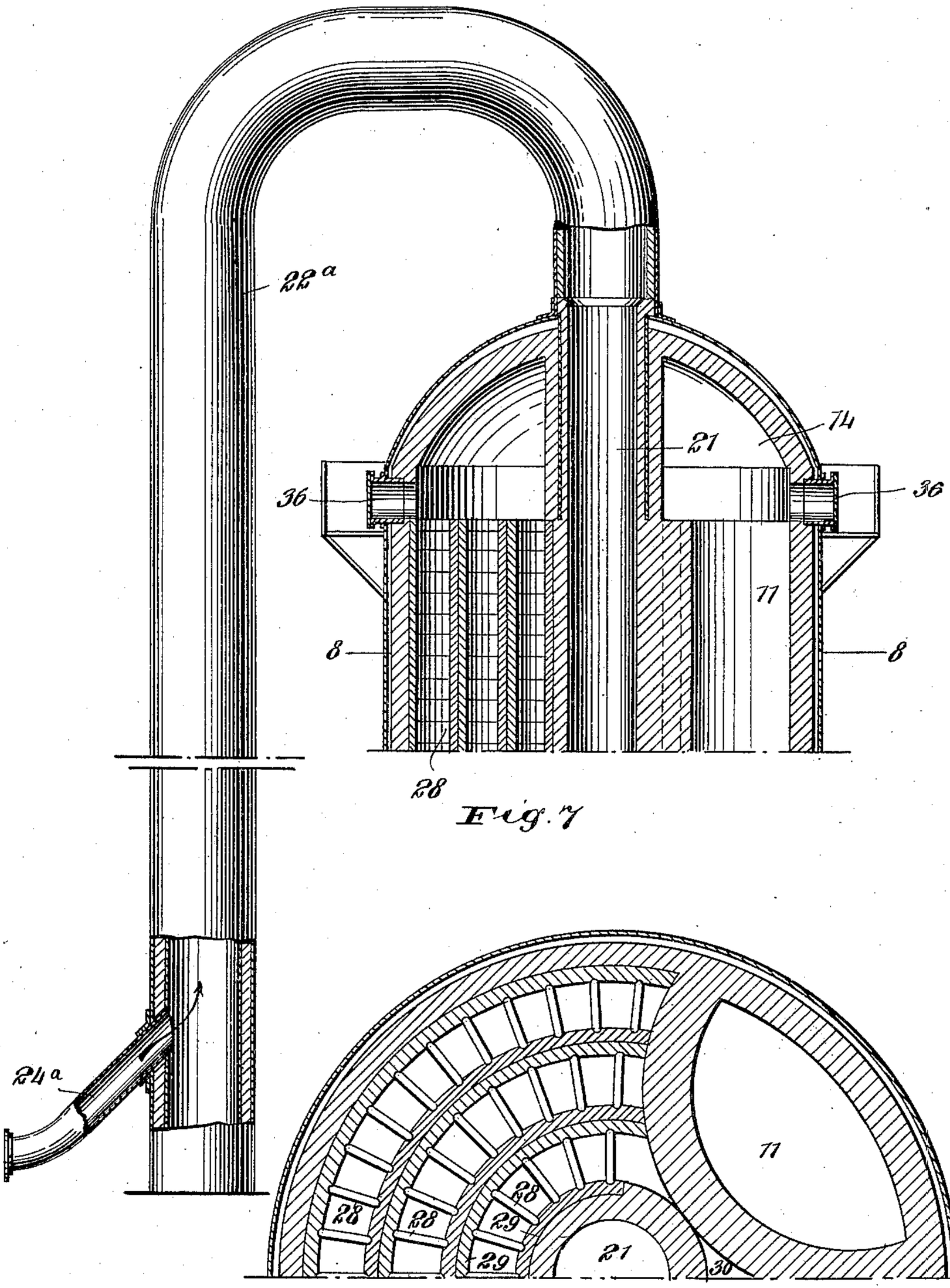

Fig. 7

Fig. 8

WITNESSES:

John A. Bugbee

E. B. Owens.

INVENTOR

John W. Calder

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ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN WORRALL CALDER, OF PITTSBURG, PENNSYLVANIA.

HOT-BLAST STOVE.

SPECIFICATION forming part of Letters Patent No. 688,716, dated December 10, 1901.

Application filed May 24, 1901. Serial No. 61,736. (No model.)

To all whom it may concern:

Be it known that I, JOHN WORRALL CALDER, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and Improved Hot-Blast Stove, of which the following is a full, clear, and exact description.

This invention relates to an apparatus for producing a hot blast for use in connection with blast-furnaces; and the object is to so construct the stove that every part thereof will be uniformly and highly heated.

This specification is a specific description of several forms of the invention, while the claims are definitions of the actual scope thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a vertical section of the invention on the line 1 1 of Fig. 2, with the line of section broken back at the right-hand side fully to show the hot-blast pipe. Fig. 2 is a cross-section on the line 2 2 of Fig. 1. Fig. 3 is a cross-section on the line 3 3 of Fig. 1. Fig. 4 is a cross-section on the line 4 4 of Fig. 1. Fig. 5 is a detail view showing the manner of forming checker-work; and Fig. 6 is a view of a slight modification of the checker-work. Fig. 7 is a fragmentary sectional view showing a slight modification in the form of the stove, and Fig. 8 is a section on the line 8 8 of Fig. 7.

The stove is constructed of brick built up in the usual manner and may, if desired, be covered with a metallic sheathing, (indicated at 10 in the drawings.) The stove is preferably cylindrical in exterior contour, and it comprises two combustion-chambers 11, which are arranged at one side of the stove and which pass upward side by side from the bottom or base 12 to the dome 14 of the stove. These combustion-chambers 11 are separated from each other by a wall 15, and this wall is formed with an orifice 16 in its lower end, through which the chambers communicate with each other at their bottoms. The upper ends of the chambers open into the dome 14. Passing out from the interior of the stove and arranged directly opposite the orifice 16 in the wall 15 are two openings, (designated 17 and 18, respectively.) The opening 17 communicates with a pipe 19, which constitutes the hot-blast pipe. The orifice 18 is adapted to admit gas or atmospheric air into the lower portions of the combustion-chambers, according to the manner of operating the furnace and will be fully described. Communicating with the lower end of each combustion-chamber (see Fig. 4) is an orifice 20 in the walls of the stove. These orifices are adapted to supply air or gas, according to the manner in which the stove is operated.

21 indicates a centrally-disposed flue which passes longitudinally throughout the stove and above the dome 14, where it communicates with a stack 22, commanded by a suitable valve 23, this stack opening into the atmosphere. The flue 21 passes through the dome 14 without communication therewith and receives at its upper end the cold-blast pipe 24, which is provided with a suitable valve, (not shown,) by which it may be commanded. At its lower end the flue 21 communicates by orifices 25 with a number of quadrantal chambers 26, formed in the base of the stove, the walls of which chambers support arc-shaped piers 27. These walls and the piers 27 are separated from each other, so that gases may pass into and through the chambers 26 and through the spaces between the piers 27. These piers 27 support the checker-work or the regenerative flues of the stoves. This checker-work is made up of a number of radially-disposed partitions 28. (See Figs. 2 and 5.) The partitions 28 are engaged with and held by arc-shaped liners 29, supported on the piers 27 and against the interior walls of the stove and the exterior walls of the flue 21, as shown in Fig. 2. The checker-work or regenerative flues thus formed occupy, with the combustion-chambers 11, the entire cross-sectional area of the stove. The interior walls of the combustion-chambers 11 are curved, as shown, and this shape of the walls leaves between them and the flue 21 a vertically-extending flue 30. This flue serves also as a regenerative flue and is in communication with the flue 21 at its base by means of an orifice 31. (See Figs. 1 and 4.) The flue 30 passes upward and opens into the dome 14. The radial partitions 28 of the checker-work, as shown in Figs. 1 and 2, are provided with

double beveled edges 32, which are engaged in corresponding grooves 33, formed in the liners 29, (see Fig. 5,) thus holding the partitions without cement and making a strong and durable structure capable of resisting the intense heat to which it is necessarily subjected. If desired, the partitions may have rounded edges, as indicated at 34 in Fig. 6, and these edges may engage correspondingly shaped or rounded grooves in the liners 29. The checker-work thus constructed will allow expansion and contraction and being formed of brickwork will effectively retain the heat.

The stove is provided at its top with a number of cleaning-doors 36, and similar doors 37 are provided at the base of the stove. (See Fig. 4.) The upper doors 36 communicate with the dome 14, and the lower doors 37 communicate with the spaces 26, which are formed below the checker-work. By means of these doors the interior of the stove may be readily cleaned. A relief-valve 39 (see Fig. 4) may be provided in the position shown, and relief-valves may be placed in other positions, if desired.

38 indicates valves which are used to supply air to the combustion-chambers at points approximately at the middles of said chambers, thus to reënliven the combustion at these points.

In such cases where it is desired that the stack lead down to an underground flue the parts may be arranged as in Fig. 7, in which the stack 22^a is turned downward to communicate with the flue, which may be at any point desired, and into the stack at its lower portion leads the cold-blast pipe 24^a. The furnace thus arranged furnishes four passages through which the cold blast is led and in which said blast is heated. In other respects the structure of the furnace is the same, as may be seen by reference to Figs. 7 and 8.

The stove may be operated with two burners or with one, as desired. When two burners are employed, they will be introduced at the orifices 20 and air will be supplied at the orifice 18. When one burner is used, it will be introduced at the orifice 18 and air will be supplied through the orifices 20.

In operation, assuming that the gas-supply and the air-supply are closed and that the furnace has been heated by the gases previously burned therein, the valve 23 should be closed and the pipes 19 and 24 opened. The cold blast then passes in through the pipe 24 and down the flue 21. It then takes the course indicated by the arrows in Fig. 1—that is to say, it passes through the openings 25 into the chambers 26 and up out of said chambers through the checker-work and into the dome 14, and finally down through the combustion-chambers 11 and out by way of the pipe 19. When the furnace is being heated preparatory to producing the hot blast, the pipes 19 and 24 are closed and the valve 23 is opened. Gas is admitted through the openings 18 or 20, as the case may be, and atmospheric air through the openings 18 or 20, which are not used for gas. Combustion begins in the bottoms of the chambers 11, and the burning gases pass up through the same. When the valves 38 are reached, additional oxygen is supplied and the burning gases pass onward into the dome 14 and down through the checker-work and thence into and through the flue 21.

By means of the construction shown and described when the stove is "on gas"—that is to say, when it is being heated—every part is subjected uniformly to the action of the burning gases and every part is placed at a uniform and high temperature, so that the entire volume of the fuel is consumed and merely the waste gases pass out through the stack. The double combustion-chamber facilitates the combustion of the gas and the heat from the burned gases passing from the dome through the checker-work or regenerative flues imparts to all of the surfaces of the stove a vigorous degree of heat.

Various changes in the form, proportions, and minor details of my invention may be resorted to without departing from the spirit and scope of my invention. Hence I consider myself entitled to all such variations as may lie within the scope of my claims.

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

1. A hot-blast stove, having two combustion-chambers located side by side and passing up one side of the stove, a dome at the top of the stove in communication with the combustion-chambers, a vertically-disposed flue passing through the dome and opening beyond the top of the stove, said flue lying against the inner walls of the combustion-chambers, a checker-work forming regenerative flues, said checker-work extending around the central flue from one combustion-chamber to the other and communicating at its top with the dome and at its bottom with the central flue, means at the base of the combustion-chambers for supplying the fuel, means at the upper part of the central flue for supplying the blast and means constituting a hot-blast outlet at the base of the combustion-chambers.

2. A hot-blast stove, having two combustion-chambers arranged side by side and extending vertically through it at one side of the stove, walls erected at the base of the stove at the other side thereof and forming arc-shaped chambers, piers sustained on said walls, checker-work forming regenerative flues sustained on the piers and communicating at its lower end with the said arc-shaped chambers, a centrally-disposed flue passing between the combustion-chambers and the checker-work, a dome at the top of the stove with which the combustion-chambers and the checker-work communicate, the said central flue extending through the dome and being open beyond the same, the lower end of the

central flue communicating with the said arc-shaped chambers in the base of the stove, means at the base of the combustion-chambers for supplying the fuel, means at the upper part of the central flue for supplying the blast and means constituting a hot-blast outlet at the base of the combustion-chambers.

3. A hot-blast stove having a centrally-disposed flue extending continuously through it and open at its upper end, a combustion-chamber arranged at one side of the flue, regenerative flues arranged at the other side of the central flue and extending continuously from proximity to one side of the combustion-chamber to the other, the combustion-chamber communicating at its top with the regenerative flues and the regenerative flues communicating with the central flue at the bottom, said regenerative flues being formed of a checker-work having radially-disposed partitions, the edges of which are engaged in grooves formed in the surface of arc-shaped liners forming the side walls of the checker-work and means for controlling the admission of the fuel and blast.

4. A hot-blast stove having a centrally-disposed flue extending continuously through it and open at its upper end, a combustion-chamber arranged at one side of the flue, regenerative flues arranged at the other side of the central flue and extending continuously from proximity to one side of the combustion-chamber to the other, the combustion-chamber communicating at its top with the regenerative flues and the regenerative flues communicating with the central flue at the bottom, said regenerative flues being formed of a checker-work having radially-disposed partitions, the edges of which are engaged in grooves formed in the surface of arc-shaped liners forming the side walls of the checker-work and the said partitions having their edges rounded and the grooves of the liners being correspondingly formed, for the purpose specified and means for controlling the admission of the fuel and blast.

5. A hot-blast stove, having a centrally-disposed flue extending continuously through it and open at its upper end, two combustion-chambers arranged at one side of the flue and extending alongside of each other longitudinally through the stove, regenerative flues arranged at the other side of the central flue and extending from one side of the combustion-chambers to the other, the combustion-chambers communicating at their tops with the regenerative flues, and the regenerative flues communicating with the central flue at the bottom, said regenerative flues being formed of a checker-work having radially-disposed partitions, the edges of which are each engaged in grooves formed in the surface of arc-shaped liners forming the side walls of the checker-work, and means for controlling the admission of the fuel and blast.

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

JOHN WORRALL CALDER.

Witnesses:
I. B. OWENS,
JNO. M. RITTER.