

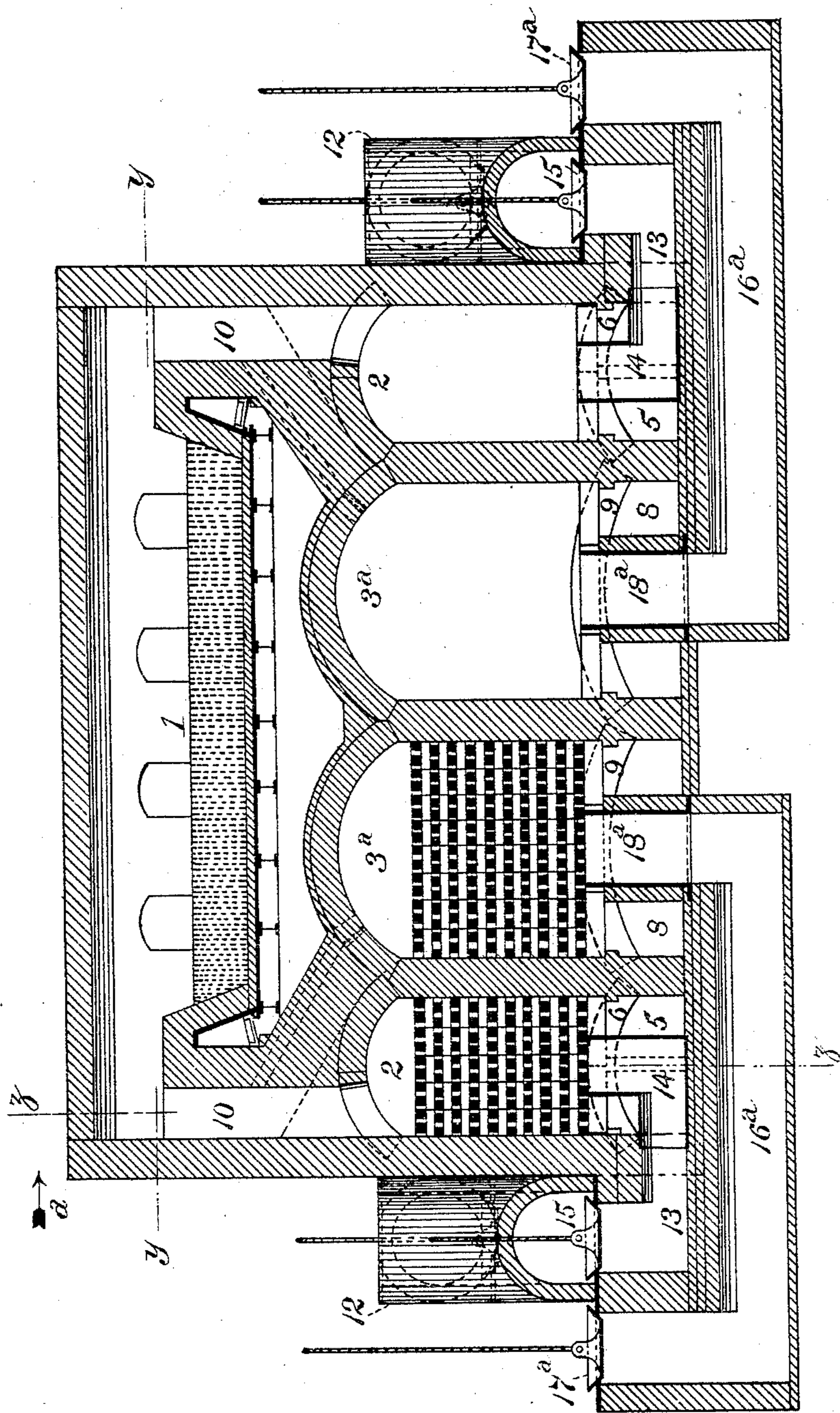
(No Model.)

4 Sheets—Sheet 1.

S. R. SMYTHE.  
REGENERATIVE FURNACE.

No. 433,603.

Patented Aug. 5, 1890.



WITNESSES  
Darius S. Wolcott  
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Inventor  
Samuel R. Sawyer  
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(No Model.)

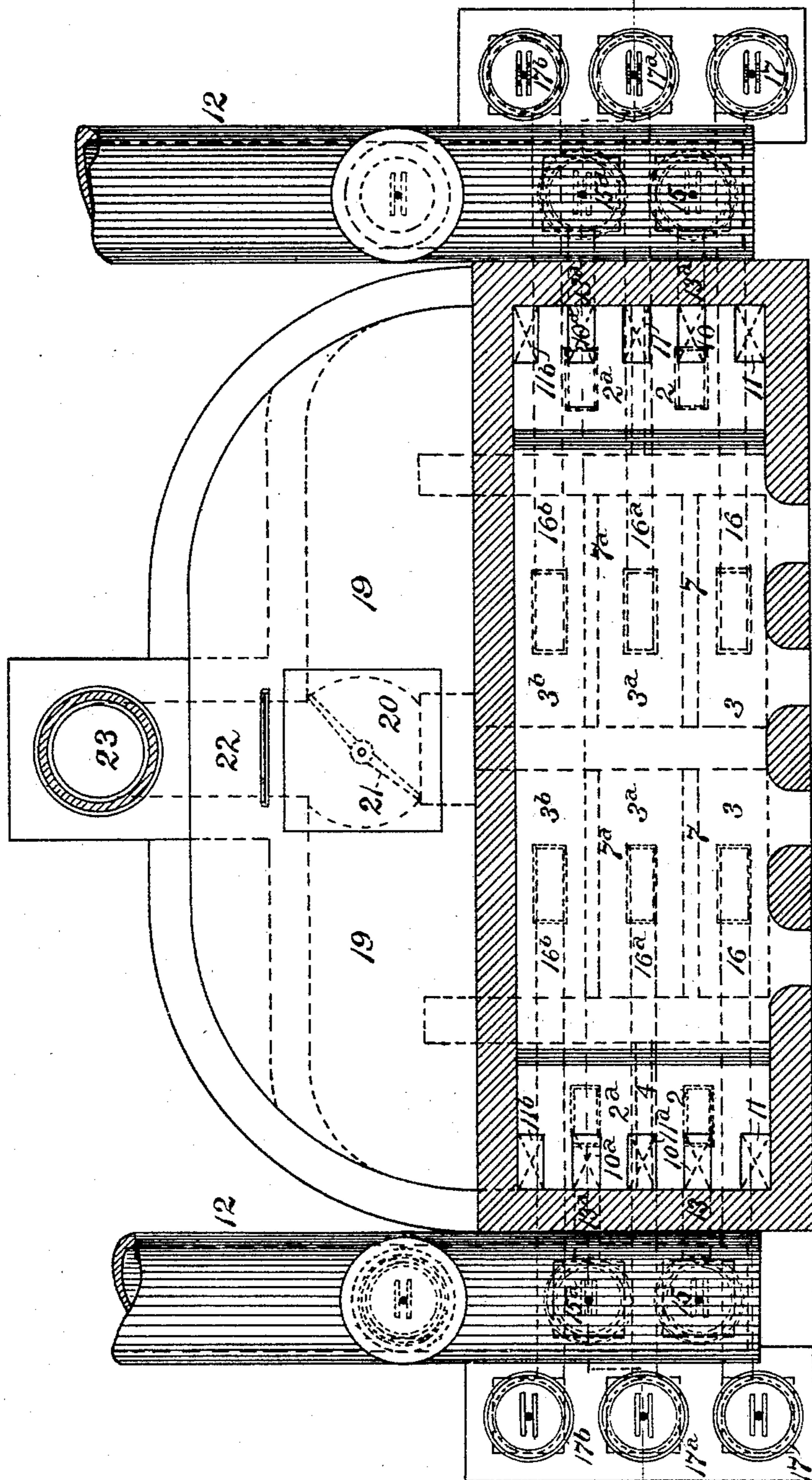
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FIG. 2.



WITNESSES

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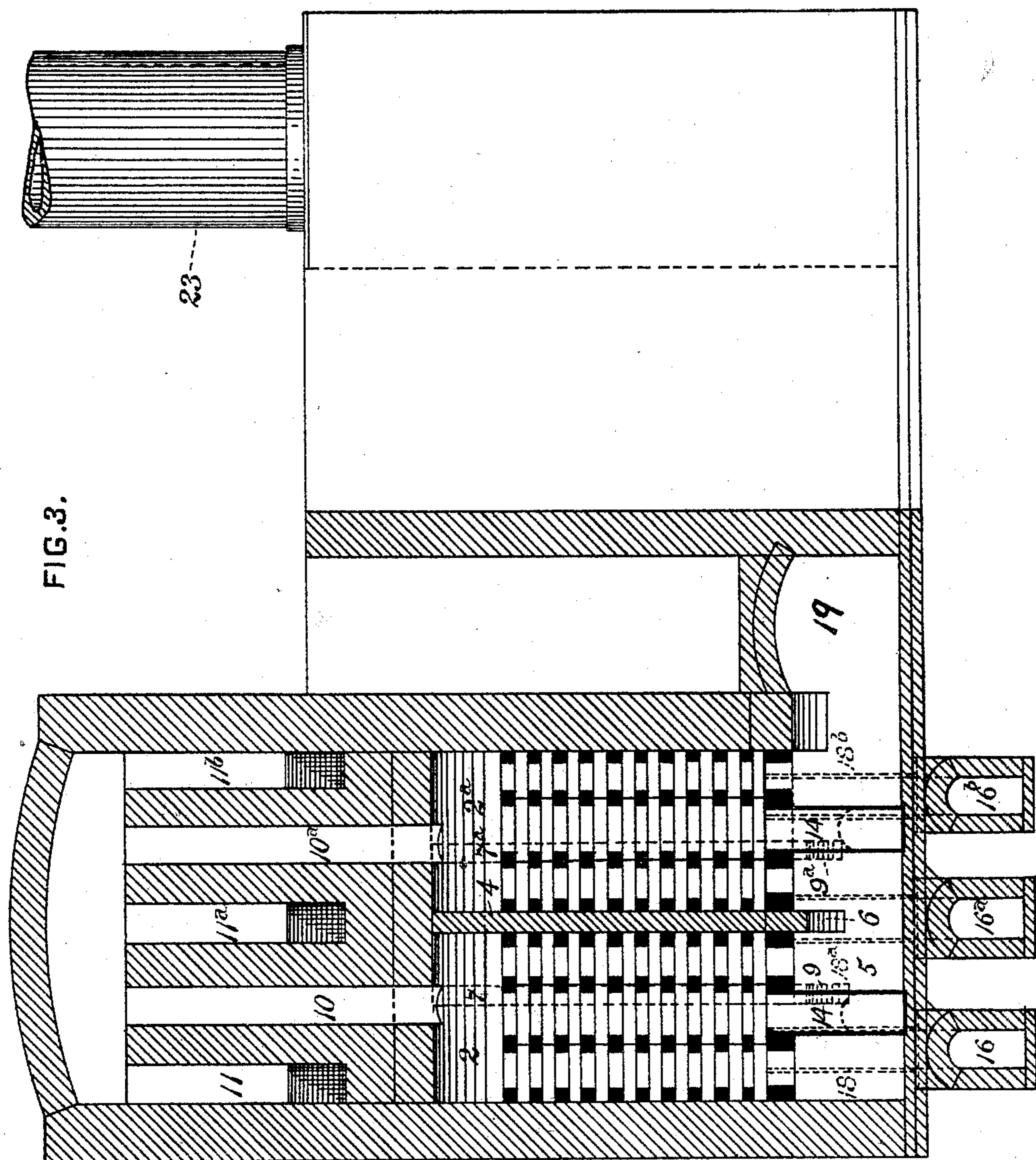
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FIG. 5.

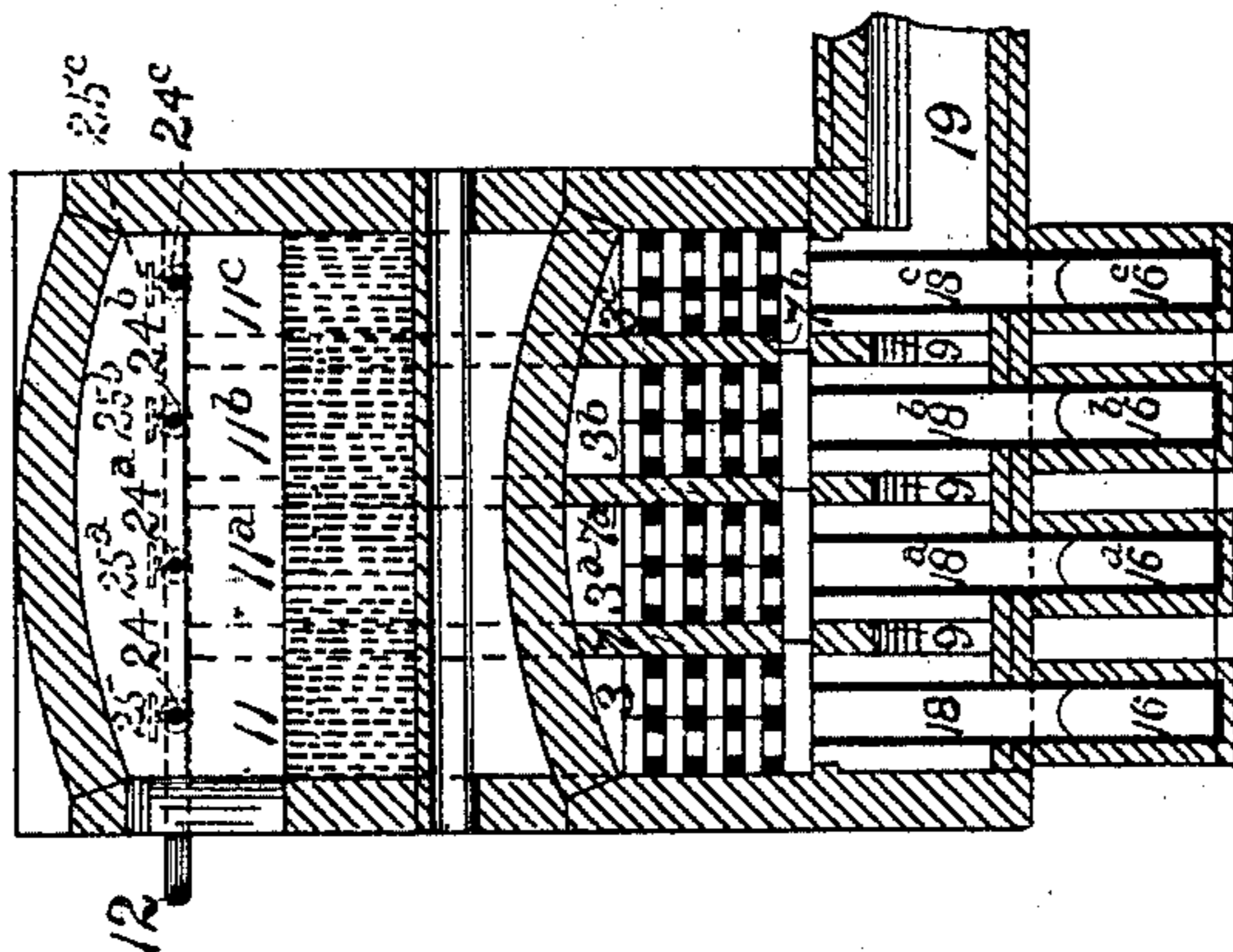
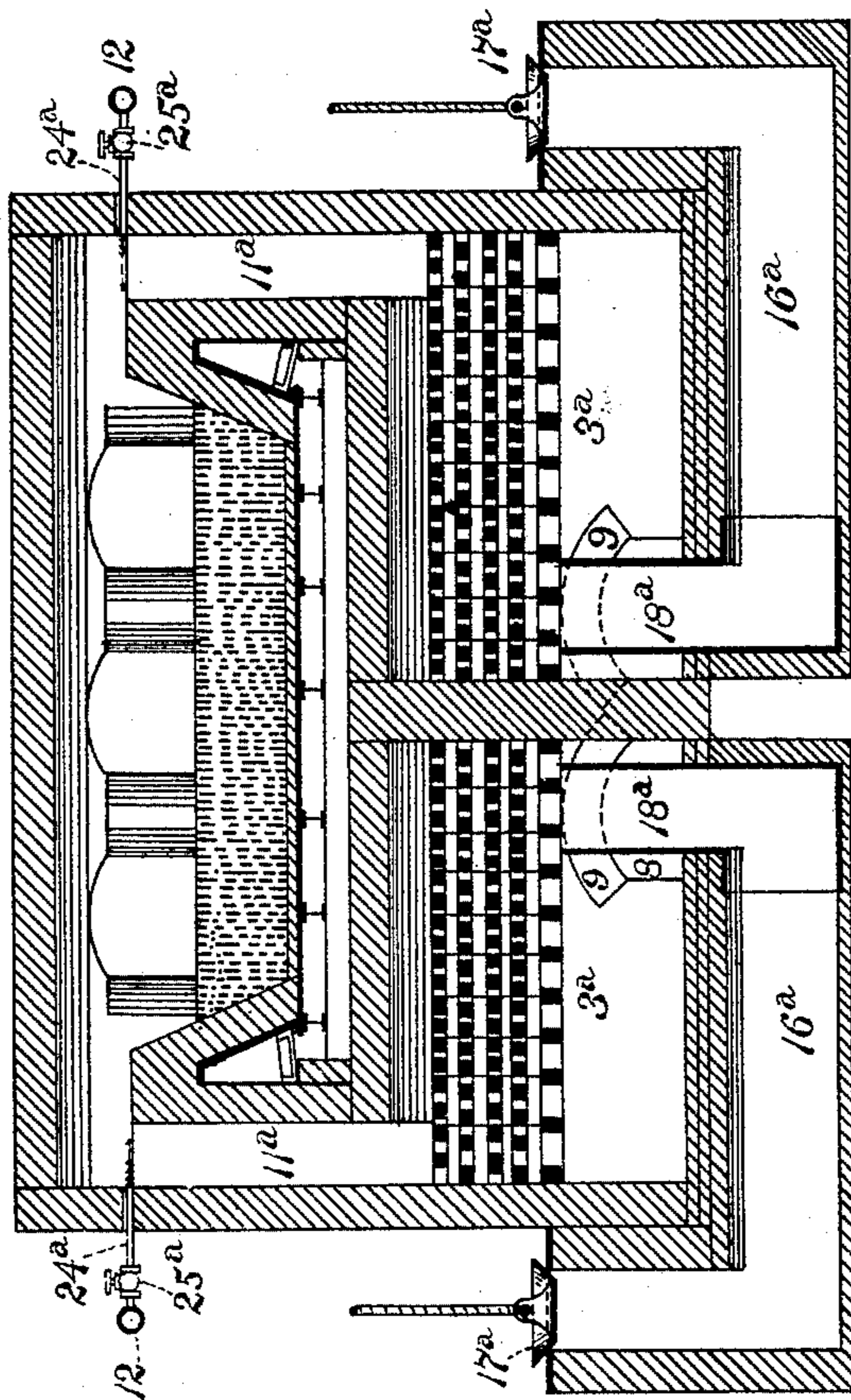


FIG. 4.



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# UNITED STATES PATENT OFFICE.

SAMUEL R. SMYTHE, OF ALLEGHENY, PENNSYLVANIA.

## REGENERATIVE FURNACE.

SPECIFICATION forming part of Letters Patent No. 433,603, dated August 5, 1890.

Application filed November 29, 1889. Serial No. 332,063. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL R. SMYTHE, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Regenerative Furnaces, of which improvement the following is a specification.

The invention described herein relates to certain improvements in regenerative furnaces in which as heretofore constructed the gas and air flowed freely in practically equal volume to all parts of the heating-chamber, the only attempt at regulation being by the reduction of the size of some of the flues or ports. In consequence of such free and uniform flow of the gas and air some parts of the heating or melting chamber are more highly heated than others—as, for example, the cold air entering a furnace through the charging-doors will reduce the temperature on that side of the furnace. A prevention of this chilling action has been attempted by enlarging the flues and ports adjacent to the charging-doors; but such enlargement of the flues or ports is more in the nature of a preventative of chilling rather than a regulation of the temperature.

The object of the invention described herein is to provide for a complete control of the flow of gas and air to any part of the heating-chamber, and a consequent regulation of the heat therein.

In general terms, the invention consists in the construction and arrangement of mechanical devices or elements, all as more fully hereinafter described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a sectional elevation of my improved furnace, the plane of section being indicated by the line *x x*, Fig. 2. Fig. 2 is a horizontal section, the plane of section being indicated by the line *y y*, Fig. 1. Fig. 3 is a sectional elevation on the line *z z*, Fig. 1, looking in the direction of the arrow *a*. Figs. 4 and 5 are views similar to Figs. 1 and 3, showing my improvement as applied to furnaces employing gases which do not require preheating.

The hearth 1 is of the usual or of any suitable construction, and below the hearth are arranged the gas and air regenerative cham-

bers. In lieu, however, of one gas and one air regenerative chamber for each end of the furnace, I provide two gas-chambers 2 2<sup>a</sup> and three air-chambers 3, 3<sup>a</sup>, and 3<sup>b</sup>, the former, by dividing the usual gas-chamber by a curtain-wall 4, as shown in Fig. 3, extending from the top of the chamber down to the conduit 5, leading to the stack, the curtain being supported by an arch 6 across the conduit 5, as shown in Figs. 1 and 3. The air regenerative chambers are similarly formed by two curtain-walls 7 and 7<sup>a</sup>, (shown in dotted lines in Figs. 2 and 3,) extending from the arch forming the top of each of the chambers down to the conduit 8, leading to the stack, the lower ends of said curtains being supported by arches 9 9<sup>a</sup> across the conduit 8. These several chambers are provided with checker-work, as is usual, although such checker-work is shown only at one end of the furnace, and similar chambers are provided at each end of the furnace. The gas-chambers 2 2<sup>a</sup> are connected by flues 10 10<sup>a</sup> with the hearth or heating-chamber 1, and the air-chambers are similarly connected to the hearth by flues 11, 11<sup>a</sup>, and 11<sup>b</sup>, as indicated by dotted lines in Figs. 1 and 2. Along each end of the furnace is arranged a gas-conduit 12, extending from any suitable source of supply, and connected to the gas regenerative chambers 2 2<sup>a</sup> by passages 13 13<sup>a</sup>, whose inner ends are preferably formed by angular cast-iron pipes 14 14<sup>a</sup>. These pipes are so constructed and arranged that their discharge ends extend above the lower end of the curtain 4 into the chambers, so that the gas flowing through each pipe may flow only into its own chamber. The flow of gas from the conduits into the passages 13 13<sup>a</sup> is regulated by valves 15 15<sup>a</sup>, preferably located at the point of junction of the passages and conduits, as shown in Figs. 1 and 2. Each of the air-chambers 3, 3<sup>a</sup>, and 3<sup>b</sup> is connected by a passage 16, 16<sup>a</sup>, and 16<sup>b</sup> with the open air, and at the outer end of each passage is arranged a valve 17 17<sup>a</sup> 17<sup>b</sup>, controlling the flow of air therethrough. The inner or discharge end of each passage, preferably formed of a section of pipe 18 18<sup>a</sup> 18<sup>b</sup>, is arranged above the lower ends of the curtains 7 7<sup>a</sup>, so that the air from each passage may flow only into its respective chamber.

The conduits 5 and 8, extending under and having a free connection with all the gas and air chambers respectively, are connected by a conduit 19 with the chamber 20, in which is placed the reversing-valve 21, the chamber 20 being connected by a conduit 22 to the stack 23, as shown in Fig. 3.

It will be observed that while the gas-chambers have an independent connection with the gas-supply and also with the hearth, they have a common connection with the stack, and that the same is true of the air-chambers. By reason of these independent connections with their valves the flow of gas and air to the different parts of the hearth or heating-chamber can be regulated at will without in any way interfering with the out-flow of the products of combustion, which have free uninterrupted passage to the stack.

The number of gas and air chambers, with their independent connections to the air and gas supply and to the hearth and with common connections to the stack, may be varied as circumstances may require, and the arrangement of the regenerative chambers relative to each other and to the hearth may be changed as may be desired.

When employing gases which do not require preheating—*e. g.*, natural or water gas—the gas-regenerating chambers are omitted, as shown in Fig. 4, the air-regenerating chambers 3 3<sup>a</sup> 3<sup>b</sup>, &c., only being retained. The gas is introduced at a right angle, or approximately so, to the upward-flowing currents of air by means of a series of pipe-sections or burners 24 24<sup>a</sup>, passing through the walls of the furnace on a line, or approximately so, with the upper ends of the flues 11 11<sup>a</sup> 11<sup>b</sup>, &c., connecting the air-regenerating chambers with the heating-chamber. These burners are connected at their outer ends to a gas-supply pipe or main 12, and each is provided with a regulating-valve 25 25<sup>a</sup>, whereby the flow of gas to any part of the heating-chamber may be regulated as desired.

While the invention is shown as applied to a heating-furnace, it is equally applicable to any furnace operating on the regenerative principle.

I claim herein as my invention—

1. In a regenerative furnace, the combination of a hearth, a series of two or more valved connections at each end or side of the hearth for supplying gas to the furnace, two or more air-regenerating chambers at each side or end of the hearth, having independent connections to the air-supply and to the hearth, valves arranged in the connections between the air-supply and the regenerating-chambers, and a conduit for conducting the products of combustion to the stack, substantially as set forth.

2. In a furnace, the combination of a hearth, two or more gas-regenerating chambers at each end or side of the hearth, having independent connections to the hearth and to the gas-supply and a common connection to the stack, and two or more air-regenerating chambers at each end or side of the hearth, having independent connections to the air-supply and to the hearth, valves arranged in the connections of the gas and air regenerating chambers with the gas and air supplies, and a common connection to the stack, and valves arranged in the connections of the gas and air regenerating chambers with the gas and air supplies, substantially as set forth.

3. In a furnace, the combination of a hearth, two or more gas-regenerating chambers at each side or end of the hearth, flues connecting the chambers to the hearth, independent passages provided with valves connecting the chambers with the gas-supply, a conduit connecting both chambers with the stack, two or more air-regenerating chambers at each side or end of the hearth, flues connecting them with the hearth, independent passages provided with valves connecting the air-chambers with the air-supply, and a conduit connecting both air-chambers with the stack, substantially as set forth.

In testimony whereof I have hereunto set my hand.

SAMUEL R. SMYTHE.

Witnesses:

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R. H. WHITTLESEY.