

(No Model.)

2 Sheets—Sheet 1.

W. SWINDELL.  
REGENERATING FURNACE FOR BOILERS.

No. 413,691.

Patented Oct. 29, 1889.

FIG. 1.

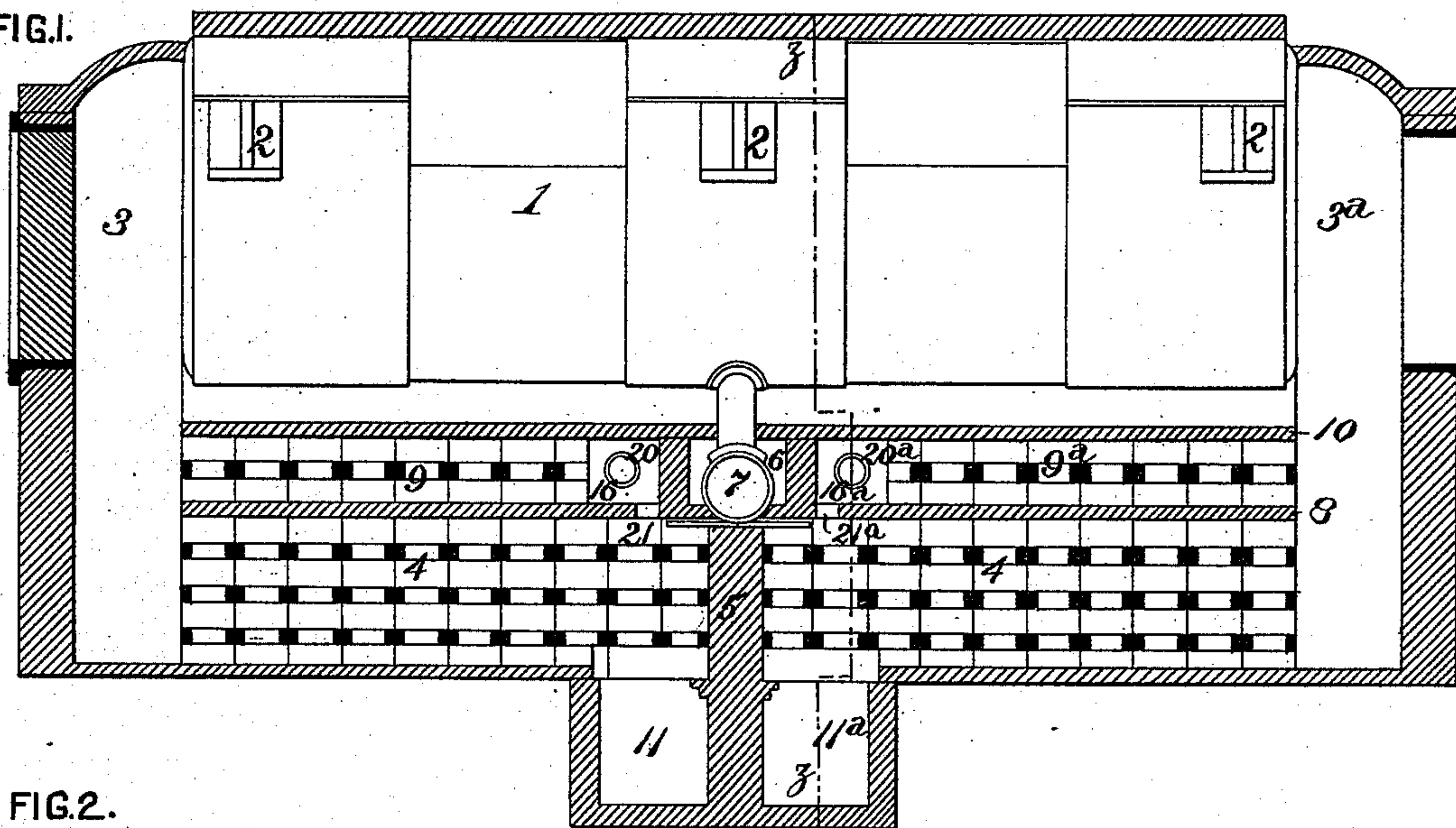
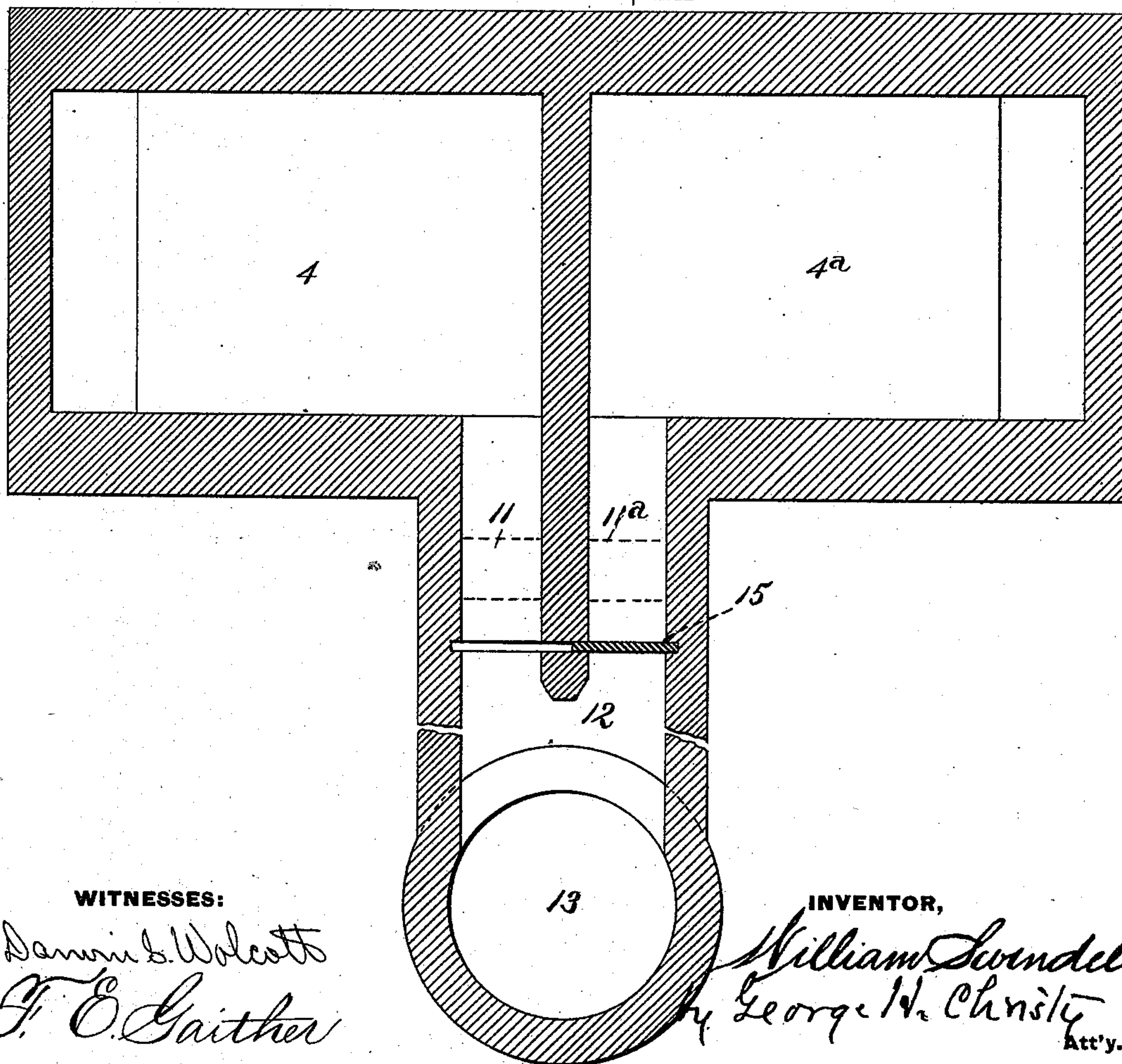


FIG. 2.



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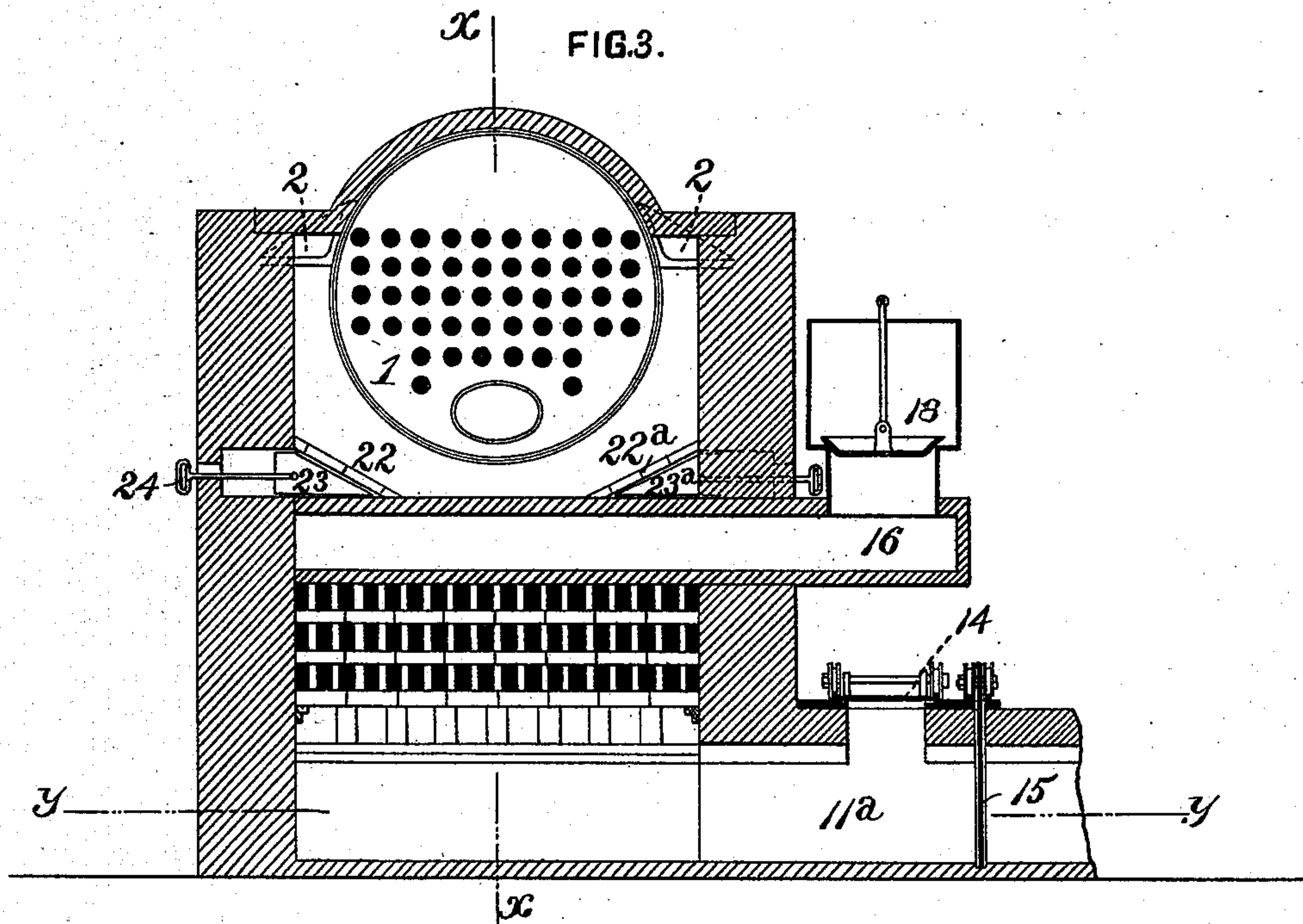
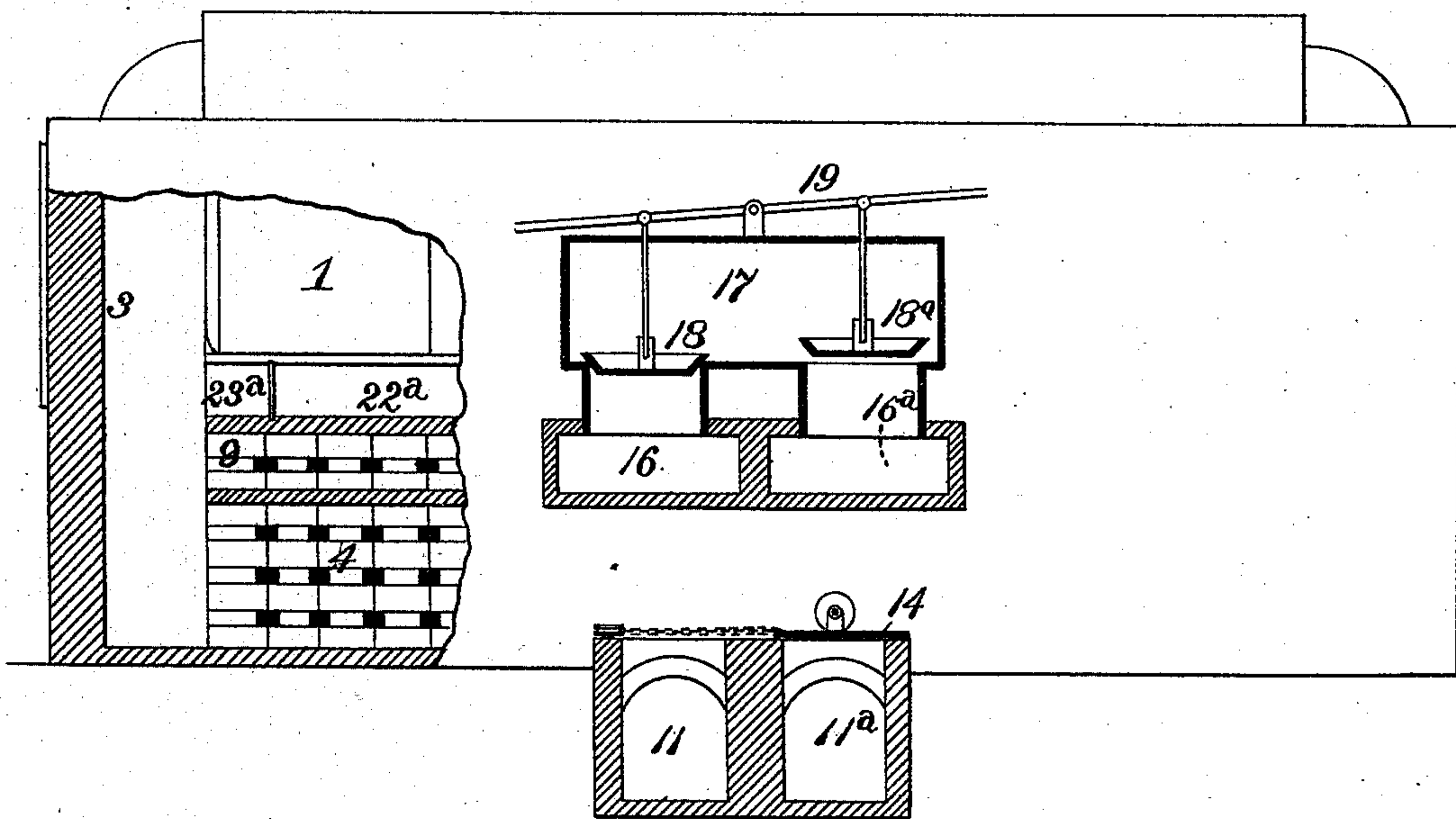


FIG. 4.



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# UNITED STATES PATENT OFFICE.

WILLIAM SWINDELL, OF ALLEGHENY, PENNSYLVANIA.

## REGENERATING-FURNACE FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 413,691, dated October 29, 1889.

Application filed June 24, 1889. Serial No. 315,355. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM SWINDELL, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Regenerative Furnaces for Boilers, of which improvements the following is a specification.

It has heretofore been the practice, in applying the regenerative principle to the furnaces of boilers, to locate all regenerative chambers and the combustion-chamber under one end of the boiler, so that the products of combustion always pass in one direction through and around the boiler. This practice I considered ineffective, as maintaining the highest degree of heat always at one end of the boiler, thus preventing to a great extent the necessary circulation of the water within the boiler.

The object of the invention described herein is to provide by such a relative arrangement of the boilers and regenerative furnaces for a reversal not only of the regenerative chambers, but also in the traverse of the products of combustion through and along the boiler.

In general terms the invention consists in the construction and combination of devices and 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 a boiler and its furnace constructed in accordance with my invention, the plane of section being indicated by the line *xx*, Fig. 3. Fig. 2 is a sectional plan view, the plane of section being indicated by the line *yy*, Fig. 3. Fig. 3 is a sectional elevation, the plane of section being indicated by the line *zz*, Fig. 1; and Fig. 4 is a view in side elevation, the gas and air flues being shown in section, a portion of the side wall of the furnace being broken away, so as to show the flues or passages employed as auxiliary heaters for the regenerative furnaces.

In the practice of my invention the boiler 1 is supported by flanges 2, resting on the side walls of the furnace, as is the usual practice. The furnace is made sufficiently long to form chambers 3 at each end of and extending along the boiler, which is constructed

either with tubes or flues, in accordance with the class of boiler employed, said flues or tubes communicating at their ends with the chambers 3 and 3<sup>a</sup>, respectively. Below the boiler I arrange the regenerative chambers 4 and 4<sup>a</sup>, separated from each other by a vertical partition 5, upon which are supported the walls of a chamber 6, in which is located the mud-drum 7 of the boiler. The top of the regenerative chambers 4 and 4<sup>a</sup> is formed by a layer of closely-laid fire-brick 8, or tile, upon which is arranged the checker-work for the gas-regenerative chambers 9 and 9<sup>a</sup>, whose top is formed by a layer of closely-laid brick or tile, said layer forming the bottom of a combustion-chamber passing under and along the sides of the boiler. The air and gas regenerative chambers connect freely at their outer ends with the combustion-chambers 3 and 3<sup>a</sup>, and the air-regenerative chambers connect at their inner ends with the flues 11 and 11<sup>a</sup>, which converge to a common flue 12, leading to the stack 13. In the top of the flues 11 and 11<sup>a</sup> are formed openings which are alternately, in the operation of the furnace, covered by a sliding valve-plate 14, and transverse to both flues is formed a guide groove or slot for the valve-plate 15, which serves to cut off communication alternately between the flues 11 and 11<sup>a</sup> and the flue 12 leading to the stack. As described in Letters Patent No. 389,671, the valves 14 and 15 are connected by a chain or other suitable means, whereby the movement of one valve will effect the corresponding movement of the other—as, for example, when the valve 15 is shifted to the position shown in Fig. 2 to cut off communication between the flues 11<sup>a</sup> and 12, the valve 14 will be shifted to cover the opening into the flue 11 and uncover the opening of the flue 11<sup>a</sup>, thereby permitting air to enter into the flue 11<sup>a</sup> and thence into and through the regenerative chamber 4<sup>a</sup>. The gas-regenerative chambers 9 and 9<sup>a</sup> are connected by flues 16 and 16<sup>a</sup> with the gas-chamber 17, which in turn is connected by a suitable pipe or conduit with a producer or other suitable source of gas-supply. Communication between the flues 16 and 16<sup>a</sup> and the chamber 17 is controlled by valves 18 and 18<sup>a</sup>, operated by a



lever 19 or other suitable means whereby said valves may be reversely operated. If desired, burners 20 and 20<sup>a</sup> may be arranged in the flues 16 and 16<sup>a</sup>, connected by pipes to a suitable gas-supply when other gas than producer-gas is employed in heating the furnace.

In describing the operation of my improved furnace it will be supposed that the valves 14 and 15 are so adjusted as to permit the products of combustion to pass through the regenerative chambers 4 and 9, and thence by the flue 11 to the stack, while the air will enter by the opening in the top of the flue 11<sup>a</sup> and pass thence through the regenerative chamber 4<sup>a</sup> into the combustion-chamber 3<sup>a</sup>, where it will mingle with the gas which is admitted into the flue 16<sup>a</sup>, the valve 18<sup>a</sup> being raised, and passes thence through the regenerative chamber 9<sup>a</sup> into the chamber 3<sup>a</sup>, where, mingling with the air, combustion occurs, the flames and products of combustion passing along the boiler and through the flues or tubes thereof to the chamber 3 at the opposite end of the boiler, and thence through the regenerative chambers 4 and 9 to the stack 13. By a reversal of the valves 14 and 15 and also the valves 18 and 18<sup>a</sup> the flames and products of combustion will flow in the opposite direction.

In order that the flames and products of combustion may be caused to traverse the regenerative chambers 9 and 9<sup>a</sup>, said chambers are connected at their inner ends by ports 21 and 21<sup>a</sup> with the inner ends of the regenerative chambers 4 and 4<sup>a</sup>, respectively.

It may sometimes occur that the flames and the products of combustion may part with so much of their heat during their traverse of the boiler that the regenerative chambers through which the products of combustion pass to the stack will not be sufficiently heated. In order to overcome this objection, I provide flues 22 and 22<sup>a</sup> along the side walls of the furnace, said flues communicating at their ends with the chambers 3 and 3<sup>a</sup>, so that the heat and products of combustion will pass from the chamber 3 or 3<sup>a</sup>, in which the gas is for the time being ignited, directly to the opposite combustion-chamber, and thence through the regenerative chambers which are being heated. As these flues 22 and 22<sup>a</sup> are

inclosed in brick-work, which becomes highly heated in the operation of the furnace, the flame and products of combustion passing therethrough will lose a very small amount of their heating-power, and hence will be effective in heating the regenerative chambers. The flow of flame and products of combustion through the flues 22 and 22<sup>a</sup> is controlled by valves 23 and 23<sup>a</sup>, arranged transversely of said flues at any suitable point therealong and operated by handles 24 and 24<sup>a</sup>, projecting out through the side walls of the furnace.

The invention herein is not limited to any special arrangement of the gas and air regenerative chambers with reference to each other, as any suitable arrangement may be employed; but I prefer the arrangement shown—*i. e.*, with the gas-chambers superposed on the air-regenerative chambers.

I claim herein as my invention—

1. The combination of a boiler, a combustion-chamber at each end of the boiler and extending along the boiler, and gas and air regenerative chambers located under each end of the boiler and connected to the combustion-chambers, substantially as set forth.

2. The combination of a boiler, a combustion-chamber at each end of the boiler and extending along the boiler, and gas and air regenerative chambers located under each end of the boiler and connected at their outer ends to the combustion-chambers, the gas-regenerative chambers being superposed on the air-regenerative chambers, substantially as set forth.

3. The combination of a boiler, a combustion-chamber at each end of the boiler and extending along the boiler, gas and air regenerative chambers located under each end of the boiler and connected to the combustion-chambers, and a flue provided with the valve for connecting the combustion-chambers, substantially as set forth.

In testimony whereof I have hereunto set my hand.

WILLIAM SWINDELL.

Witnesses:

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F. X. BARR.