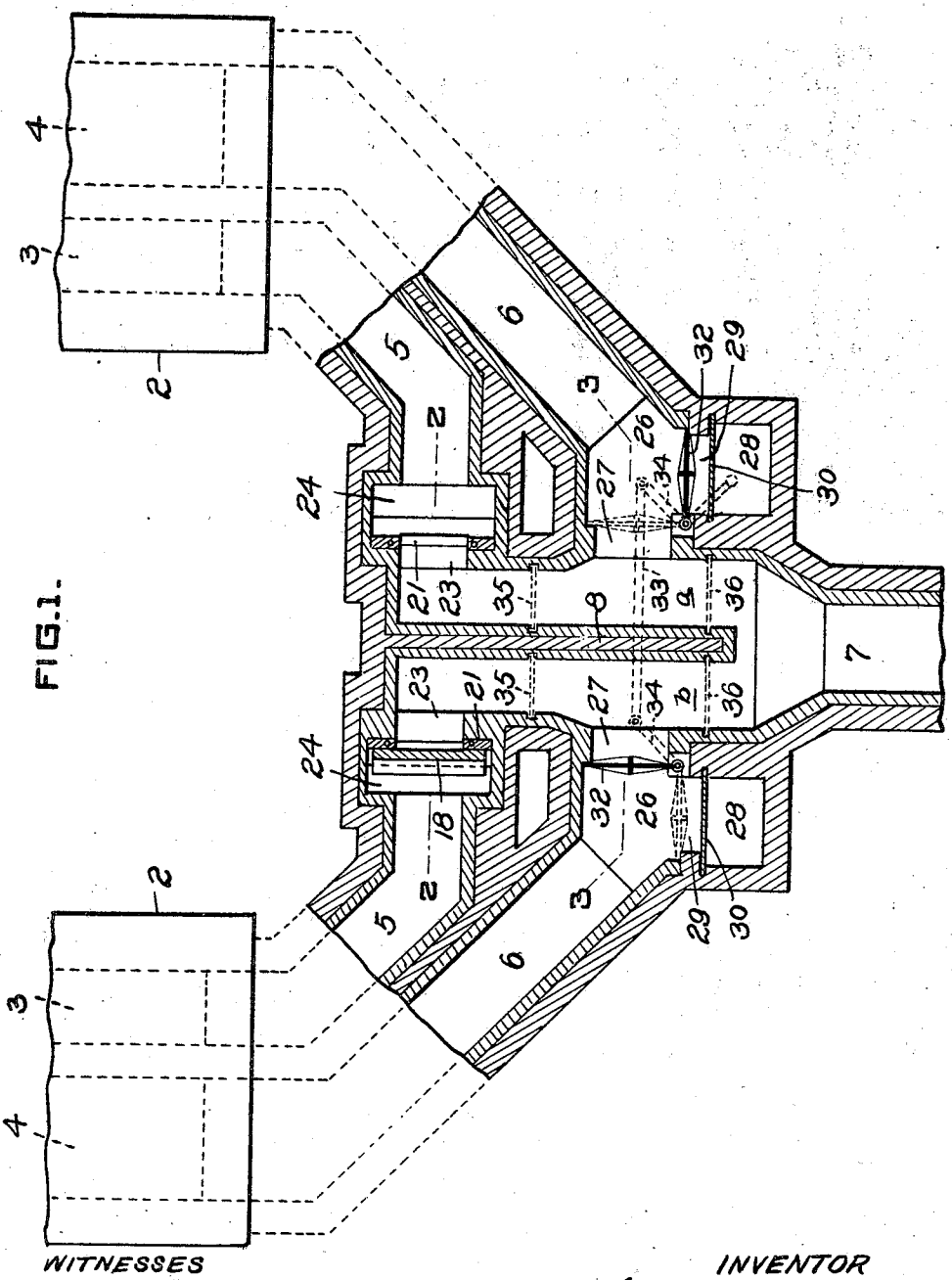
Aug. 5, 1924. 1,503,464

W. O. AMSLER

REGENERATIVE FURNACE CONSTRUCTION

Filed May 21, 1920 2 Sheets-Sheet 1



WITNESSES

J. Hebel Bradley.

Lois Wiseman.

INVENTOR

Walter O. Amsler

by W. J. Dooliade

Attorney.

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FIG. 2.

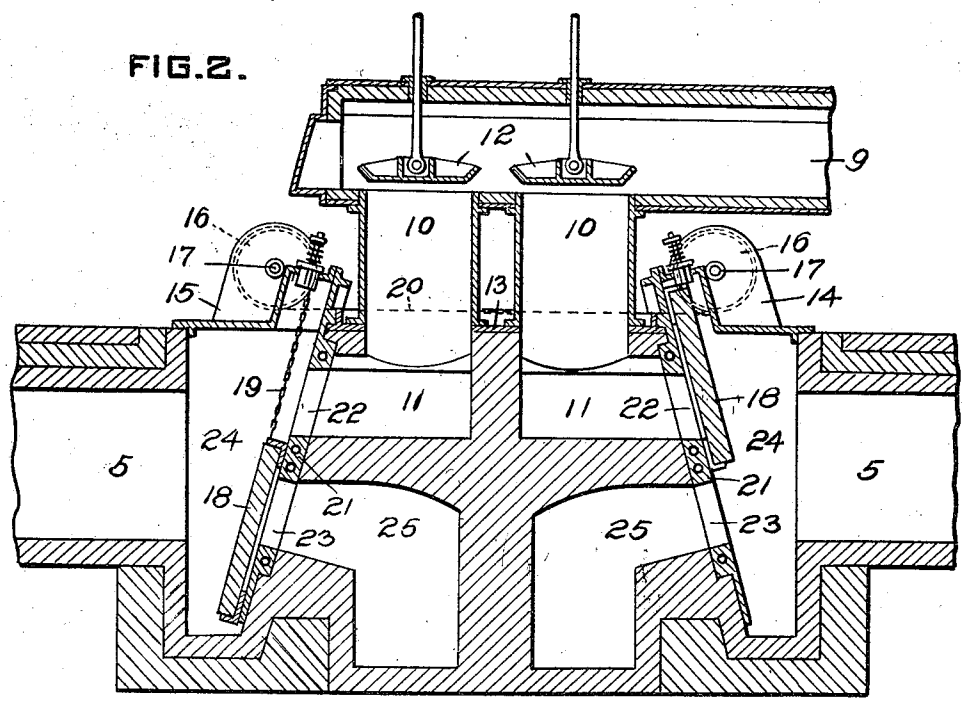
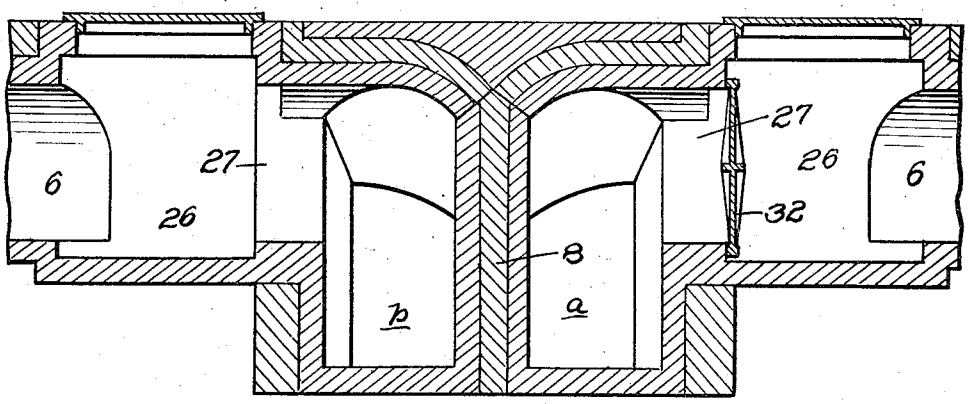


FIG. 3.



WITNESSES

J. Herbert Bradley

Lois Wineman

INVENTOR

Walter O. Amsler

by W. F. Doolittle

Attorney

Patented Aug. 5, 1924. 1,503,464

UNITED STATES PATENT OFFICE.

WALTER O. AMSLER, OF PITTSBURGH, PENNSYLVANIA.

REGENERATIVE-FURNACE CONSTRUCTION.

Application filed May 21, 1920. Serial No. 383,254.

To all whom it may concern:

Be it known that I, WALTER O. AMSLER, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Regenerative-Furnace Construction, of which the following is a specification.

This invention relates to improvements in regenerative and reversing furnaces, and particularly to furnaces of this type embodying two gas regenerators, two air regenerators, and gas and air reversing valves.

Among the objects of the present invention are, to provide a simple and efficient construction including separate and independent means for regulating the admission of gas and air to the respective sides of the furnace, whereby an independent adjustment of each side of the furnace may be effected; to effect a great reduction of chimney draft losses; to eliminate the abrupt bends and friction creating gas and air passages, ports or flues now so generally employed in connection with the gas and air reversing valves; to do away with all liquid seals; and to provide a construction that may be built and operated at considerably less cost than heretofore.

In the accompanying drawings which illustrate an application of my invention,

Fig. 1 is a part horizontal sectional view and a part plan of a furnace structure embodying my invention;

Fig. 2, a vertical sectional view taken on line 2—2 of Fig. 1; and

Fig. 3, a view similar to Fig. 2 taken on line 3—3 of Fig. 1.

Referring to the drawings, 2 designates the brickwork or masonry of a portion of a reversible regenerative furnace in which the gas flues, air flues, and chimney flues are located. 3—3 and 4—4 respectively designate gas and air regenerators for heating gas and air, as is usual in furnaces of this class.

As illustrated, 5—5 designate gas regenerator flues, 6—6 air regenerator flues, and 7 a chimney flue. The chimney flue as shown is divided into two passages *a* and *b* by a partition wall 8. It will be noted that the gas flues 5 are disposed oppositely to each other, and that the air flues 6 are similarly disposed, and that the partition wall 8 extends between the respective gas and air flues.

In the embodiment of my invention as shown, and as preferred, gas is conveyed to the furnace through a gas conduit 9, said conduit being in communication with two independent gas boxes 10—10 through which gas is introduced to horizontally extending chambers 11—11. The passage of gas from the conduit to the gas boxes 10—10, and from thence to the respective sides of the furnace through the respective chambers 11, is controlled by independently operable vertically movable valves 12.

The boxes are mounted on a cover plate 13, and 14 and 15 respectively represent housings designed to receive chain sheaves or wheels 16. Sheaves 16 are arranged in pairs, and are respectively mounted on shafts 17 extending through and supported by the housings 14 and 15.

The gas valve structure shown corresponds substantially to and constitutes the subject matter of a companion application Serial No. 383,255, filed May 21, 1920, and, as illustrated herein, includes two vertically movable slide valves 18 adapted to be conjointly operated and moved in alternate directions. The valves are moved into open and closed positions by means of chains 19 and 20, said valves being mounted on vertically extending inclined and water cooled metallic seats 21. The valve seats are each formed with openings 22 and 23, the openings 22 registering with chambers 11 and valve chambers 24, and the openings 23 with ports 25 formed in the brick-work and leading to the divided chimney flue 7, and communicating with the valve chambers 24. The valve seats extend upwardly through the cover plate 13 and are connected thereto and also with the respective housings.

Each of the air regenerator flues at its end adjacent the chimney flue is enlarged to form a chamber 26, and each chamber 26 communicates with the chimney flue through a port 27 and with an air admission flue 28 through a port 29. The quantity of air admitted to the chambers 26 is regulated by dampers 30.

The air reversing valves 32, like the gas reversing valves, are located within the brick-work of the furnace, and, as shown, function to control the passage of air through the ports 29 leading to the air flues 6 and the passage of fluids from the chambers 26 to the chimney flues. Valves 32 are connected to each other by a connecting bar

33 and arms 34, and are designed to be moved to alternately open and close the ports 27 and 29. Valves 32 are preferably of the form of a hinged or swinging door structure and control the passage of fluids from the air admission flue to chamber 26 and from chamber 26 to the chimney flue.

Dampers 35 and 36 located in the chimney flue or the passages *a* and *b* thereof are provided for the purpose of regulating the passage of fluids from the regenerators to the chimney flue, dampers 56 being particularly designed to permit more waste gases to pass through flues 6 than through flues 5, and dampers 36 for regulating the chimney draft.

By providing the valves, dampers, and the arrangement of flues and ports as described, it will be seen that each side of the furnace is under independent control and that it is not necessary to frequently adjust the gas and air admission valves and the chimney dampers due to varying working conditions so often encountered on opposite sides of the furnace.

Attention is particularly called to the fact that I dispense with abrupt bends and curved passageways adjacent the gas and air reversing valves, and substitute therefor straight passageways. Thus, the chambers 11 and openings 22 in the gas valve structure are in line with the inner ends of gas flues 5 and arranged in the same horizontal plane. This is also true in regard to ports 27 and 29, that is, they are disposed in the same horizontal plane as the air flues 6, and are arranged to cause a direct flow of fluids to and from said flues 6.

By providing the partition wall in the chimney flue or by forming two separate chimney flues extending between the oppositely located gas and air regenerative flues and between the gas and air valves, a simple and efficient construction for preventing the hot gases attacking the respective gas and air regenerative valves is provided.

What I claim is:

1. In a reversible regenerative furnace, the combination with gas and air reversing valves, of horizontally disposed fluid passageways disposed adjacent said valves, the communicating fluid passages adjacent the gas valve being so arranged in line with one another and in the same horizontal planes, that the flow of gas through the passages is not deflected from its path of flow in proximity to the valve, and the communicating fluid passages adjacent the air valve being arranged in line with one another and in the same horizontal plane.

2. In a reversible regenerative furnace having a brickwork structure, the combination with gas and air reversing valves, of horizontally disposed fluid passageways disposed adjacent said valves, the communicating fluid passages adjacent the gas valve at each side thereof being arranged in line with one another and in the same horizontal plane, and the communicating fluid passages adjacent the air valve at each side thereof being arranged in line with one another and in the same horizontal plane, said reversing valves and passageways being located within the brick-work of the furnace structure.

3. In a reversible regenerative furnace, the combination with horizontal gas and air regenerative flues, horizontal gas supply passages, horizontal ports establishing communication between the gas supply passage and gas regenerator flues, valves for said ports, horizontal chimney flues, horizontal ports establishing communication between the gas regenerator flues and chimney flues, said valve acting to close said second-named ports when the first named ports are open and vice versa, horizontal ports establishing communication between said air regenerator flues and the chimney flues, valves for opening and closing said ports, and means for supplying air to said air regenerator flues when said valves are closed.

4. In a reversible regenerative furnace, the combination with horizontal gas and air regenerator flues, horizontal gas supply passages, horizontal ports establishing communication between the gas supply passage and gas regenerator flues, valves for said ports, horizontal chimney flues, horizontal ports establishing communication between the gas regenerator flues and chimney flues, said valves acting to close said second-named ports when the first named ports are open and vice versa, horizontal ports establishing communication between said air regenerator flues and the chimney flues, valves for opening and closing said ports, horizontally disposed air passages opening into the air regenerator flues for supplying air thereto, and valves in said passages for controlling the flow of air into the air regenerator flues.

5. In a reversible regenerative furnace, independent means on each side of the furnace for independently controlling the admission of gas and air used on each side of the furnace, jointly operable valves for admitting gas to one side when the gases from the other side are passing to a chimney, jointly operable valves for closing the escape of air from one side of the furnace when air is being admitted to that side and when the other side is open to a chimney, and independently operable chimney control valves for the two sides.

6. In a reversible furnace, a chimney flue, a gas regenerator flue opening into said chimney flue at each side thereof through a port, an air regenerator flue opening into said chimney at each side thereof through a port, gas supply passages communicating

with the gas regenerator flues, a valve on one side of the chimney flue adapted to close either the port to the chimney flue or to the gas passage, a similar valve on the other side of the flue, means for operating said valves jointly to open the gas supply passage on one side when closing the port to the chimney flue on the other side, valves for closing the ports from the air regenerator flues to the chimney flues, operating means for opening one valve while closing the other, and valves for admitting air to the air regenerator flues.

7. In a reversible regenerative furnace, the combination with gas reversing valves and air reversing valves, a divided chimney, independent gas and air admission valves for admitting gas and air to one side of the furnace, and independent air and gas admission valves for admitting air and gas to the opposite side of the furnace whereby an independent control for each side of the furnace is effected, the gas reversing valves for opposite sides of the furnace being jointly operable and the air reversing valves at opposite sides of the furnace being jointly operable, said divided chimney protecting valves on one side from contact with escaping gases from the other side when the reversing valves on the other side are open to the chimney.

8. In a reversible furnace, a chimney flue, a gas regenerator flue opening into said chimney flue at each side thereof through a port, an air regenerator flue opening into said chimney at each side thereof through a port, gas supply passages communicating with the gas regenerator flues, independent, separable operable valves for controlling the supply of gas to said passages, a valve on one side of the chimney flue adapted to close either the port to the chimney flue or to the gas passage, a similar valve on the other side of the flue, means for operating said valves jointly to open the gas supply passage on one side when closing the port to the chimney flue on the other side, valves for closing the ports from the air regenerator flues to the chimney flues, operating means for opening one valve while closing the other, and valves for admitting air to the air regenerator flues.

9. In a reversible regenerative furnace, oppositely disposed valve controlled gas regenerator flues, a chimney flue having a partition wall therein disposed between said gas regenerator flues, and oppositely disposed valve controlled air regenerator flues in communication with the chimney flue, said partition wall being also disposed between said air flues.

10. In a reversible regenerative furnace, a gas supply chamber, a chimney flue disposed below the said chamber, a partition wall in the chimney flue, oppositely disposed gas regenerator flues, oppositely disposed air regenerator flues, said partition wall being disposed between the gas flues and the air flues.

11. In a reversible furnace, a gas supply conduit, opposed gas regenerator flues with which said conduit connects through ports, a chimney flue between said opposed gas regenerator flues and in communication therewith through ports below said first ports, a pair of valves, one for each of the opposed gas regenerator flues movable across its respective gas and chimney flue ports, opposed air regenerator flues besides the gas regenerator flues opening into the chimney flue through opposed ports, separate air supply passages for each air regenerator flue opening into said flues through air inlet ports adjacent their respective chimney ports, and a valve in each regenerator flue movable to position to close either the port to the chimney or the air inlet port.

12. In a flue and valve construction for reversible regenerative furnaces, the combination with air and gas regenerators, a chimney flue between and extending parallel with the regenerators, air and gas regenerator flues having their ends adjacent the chimney flue arranged within the masonry of the furnace, and air and gas valves disposed and operable within the said masonry.

13. In a reversible furnace, a chimney flue, a pair of gas regenerator flues opening into said chimney flue through horizontal ports, one gas regenerator flue being disposed opposite the other, a similarly arranged pair of air regenerator flues opening into said chimney flues through horizontal ports, gas supply passages above the chimney flue opening into the gas regenerator flues through horizontal ports, valves for opening and closing all of said ports, and valves in the air regenerator flues for controlling the admission of air thereto.

14. In a reversible furnace, a chimney flue, a pair of gas regenerator flues opening into said chimney flue through horizontal ports, one gas regenerator flue being disposed opposite the other, a similarly arranged pair of air regenerator flues opening into said chimney flues through horizontal ports, gas supply passages above the chimney flue opening into the gas regenerator flues through horizontal ports, valves for opening and closing all of said ports, and valves in the air regenerator flues for controlling the admission of air thereto, all of said valves being so arranged as to be out of direct path of a flow of gas when they are open.

15. In a reversible furnace, a chimney flue, a pair of gas regenerator flues opening into said chimney flue through horizontal ports, one gas regenerator flue being disposed opposite the other, a similarly ar-

ranged pair of air regenerator flues opening into said chimney flues through horizontal ports, gas supply passages above the chimney flue opening into the gas regenerator flues through horizontal ports, a single valve in each of the gas regenerator flues for opening one of the ports and closing the other, and valves in the air regenerator flues for controlling the admission of air thereto.

In testimony whereof I affix my signature in presence of two witnesses.

WALTER O. AMSLER.

Witnesses:
J. M. GEOGHEGAN,
LOIS WINEMAN.