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Patented Nov. 13, 1900.

H. E. SCHILD.
GAS REVERSING VALVE.

(Application filed Apr. 4, 1900.)

(No Model.)

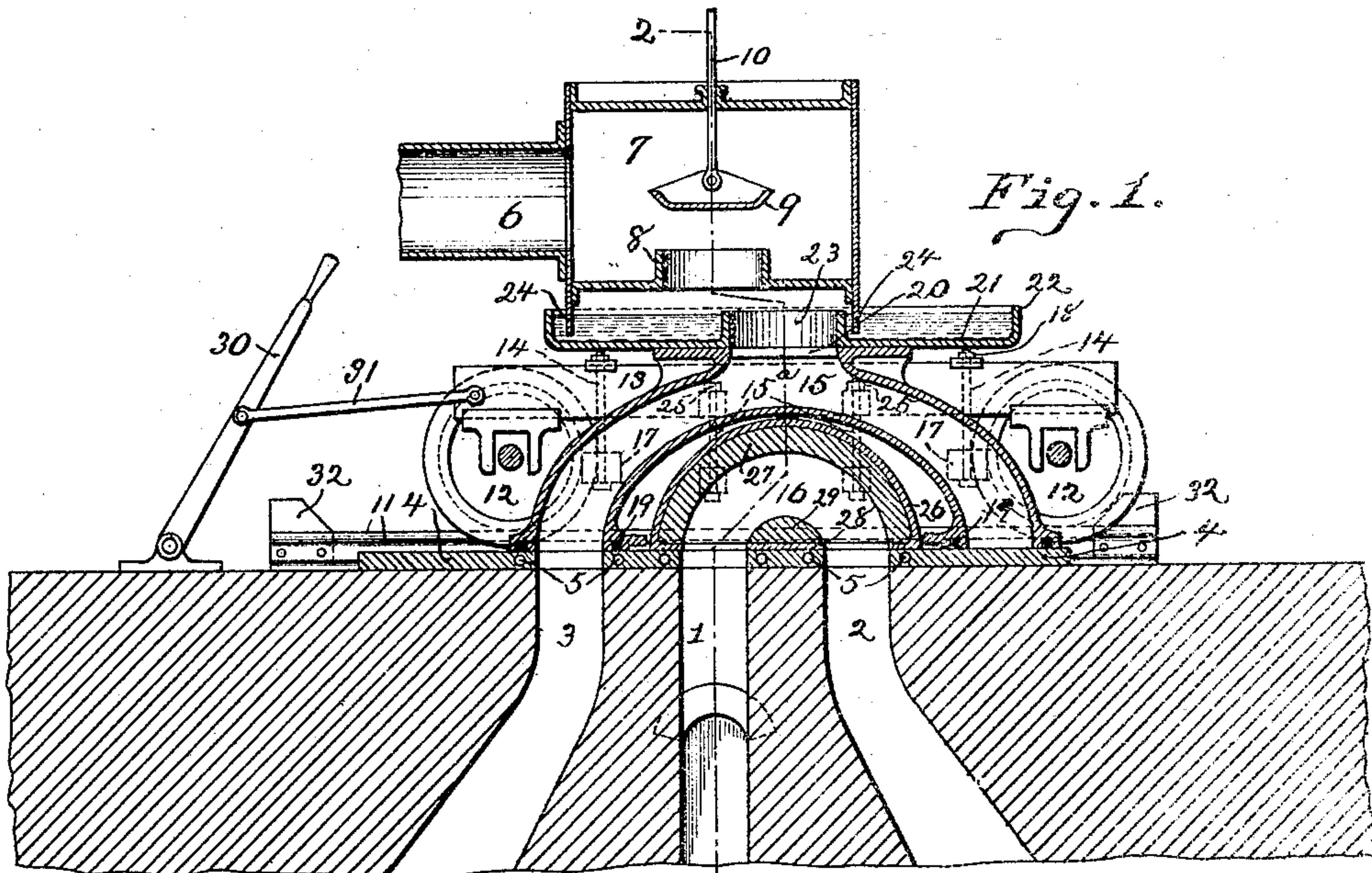
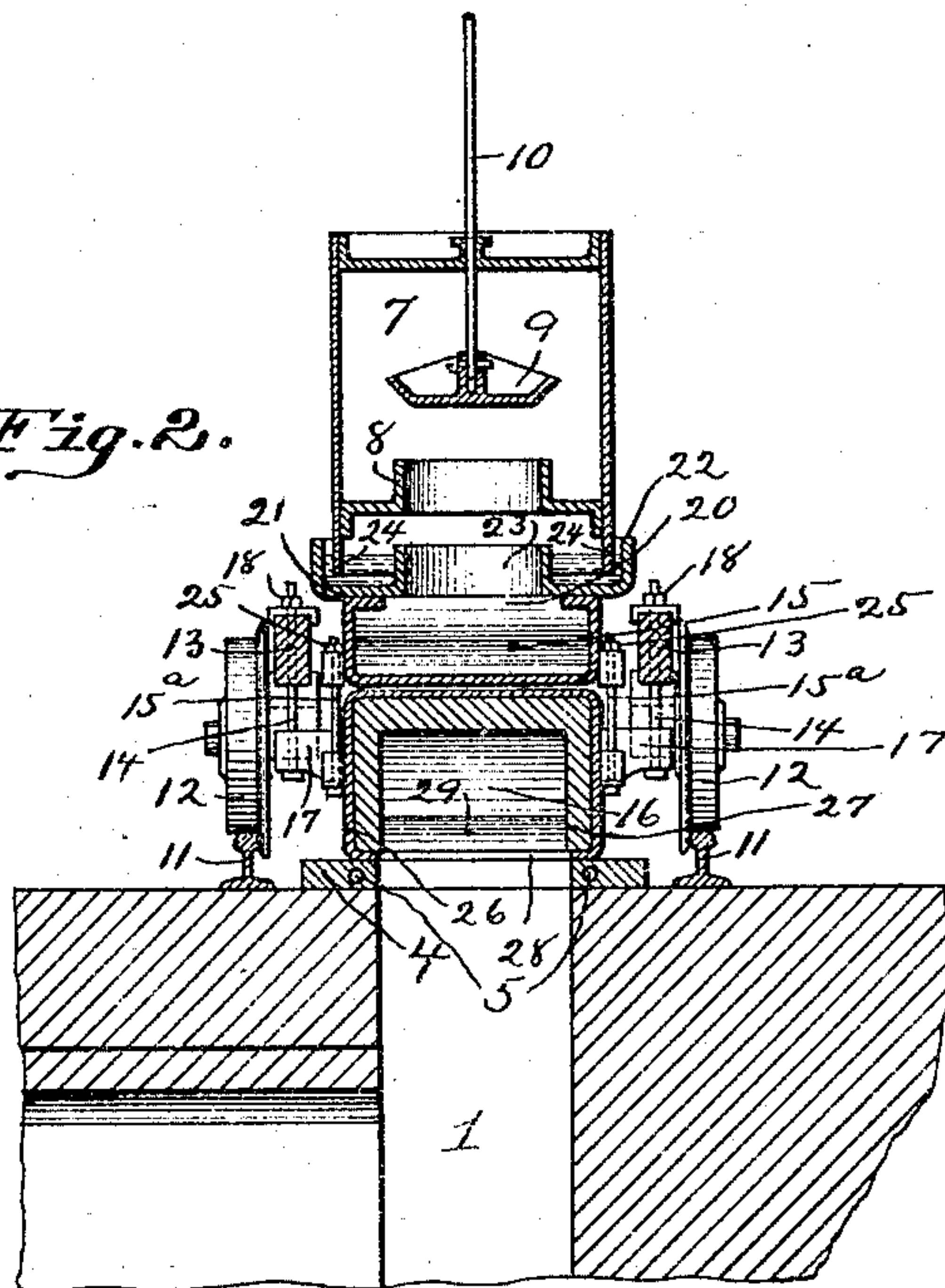


Fig. 2.



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GAS-REVERSING VALVE.

SPECIFICATION forming part of Letters Patent No. 661,670, dated November 13, 1900

Application filed April 4, 1900. Serial No. 11,483. (No model.)

To all whom it may concern:

Be it known that I, HERMANN E. SCHILD, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Gas-Reversing Valves; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to gas-reversing valves for regenerating-furnaces of the Siemens open-hearth and reheating types; and its object is to provide a gas-reversing valve which will prevent the waste of gas due to leakage of the valve, and especially that which occurs during the reversing operation.

As is well known, regenerating-furnaces are provided with four regenerators or heating-chambers for the air and gas, two being provided for the air and two for the gas. Each of these chambers is filled with fire-brick or other refractory material known as "checker-work," which upon becoming heated serves as the means for heating the air or gas passing through the same. The air and gas are each conducted through a regenerator, where they become heated, and thence to the combustion-chamber, the waste products of combustion passing through the two remaining regenerators, heating the checker-work in the same, thereby themselves becoming cooled, and thence out at the chimney-flue. The first set of regenerators gradually cool off, and after a certain time it becomes necessary to reverse the course of the air and gas through the furnace, the same then passing through the newly-heated regenerators into the combustion-chamber and the waste products of combustion passing through the regenerators first used, reheating the same, and thence out through the chimney-flue. The course of the air and gas through the furnace has heretofore been reversed by means of ordinary butterfly-valves, which resemble an ordinary damper placed in the air and gas flues. Such valves are fairly effective for the air-flues, but are open to serious objections in the gas-flues. Owing to the intense heat to which they are subjected they soon become warped and burned, so that they no longer fit closely upon the seats provided for them, allowing a considerable amount of gas to continually escape into the chimney-flue,

thereby unnecessarily wasting the same. Furthermore, in reversing the valve there is a short interval during which the gas-inlet is opened directly to the chimney-flue, allowing a further waste. At the same time the gas comes in contact and mixes with the waste products of combustion, and if the gas is not pure more or less serious explosions are liable to occur. To overcome the leakage caused by the warping and burning of the butterfly-valve, it has been proposed to use a dome-shaped valve fitting over refractory projections on the base, over which said valve had to be lifted in the reversing operation. This overcomes the defect aimed at, but is still open to the objection of opening the gas-inlet directly to the chimney-flue during the reversing operation, thereby wasting gas, and is also open to the objection that it is entirely inclosed in a chamber, so that it cannot be readily inspected to detect defects therein. Various other forms of valves have been used, but all are open to the same objections as the dome-shaped valve.

The object of my invention is to overcome these defects and provide a valve which will not become warped or burned and allow leakage of gas to the chimney-flue, which will not during the reversing operation open the gas-inlet directly to the chimney-flue, and which has all its parts exposed, so that the same may be inspected at any time and defects therein corrected.

To this end it consists of a gas-reversing valve comprising a slide-valve so arranged and constructed that the gas-inlet is never open to the chimney-flue nor to the flue carrying the waste products of combustion.

It further consists of a slide-valve of this character in which there is little liability of its burning out and which embodies means to effect a close seating of the valve upon the face-plate surrounding the ports leading to the regenerator and chimney-flue, respectively.

It further consists in certain details of construction whereby the valve or its parts are readily removable for the purpose of repairing the same or substituting new parts in place thereof.

To enable others skilled in the art to which my invention relates to make and use the

same, I will now describe it more fully, referring to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of my reversing-valve with the necessary adjacent parts; and Fig. 2 is a transverse vertical section of the same on the line 2 2, Fig. 1.

The reference-numeral 1 indicates the flue leading to the chimney, while 2 and 3 represent the flues leading to two of the regenerators, it being understood that only one set of regenerators and the reversing-valve therefor are involved in this application. It is obvious that a valve similar to that shown may be used for the regenerators for heating the air, although I have not found it necessary, the ordinary butterfly-valve being effective in that relation for the reason that it is of no consequence whether or not air escapes into the chimney-flue. The flues 1, 2, and 3 are located in ordinary masonry, as disclosed, on the top of which is placed the plate 4, having suitable openings registering with the flues and cored out, as shown at 5 5, to allow for the circulation of water to cool the same.

The gas comes from the gas-generator through the pipe 6 into the gas-box 7, the latter being a rectangular box provided with a flanged opening 8 in its bottom, upon which rests the gas-regulating valve 9, controlled by means of the stem 10, passing through the top of said chamber, as will be readily understood by those versed in this art.

Upon each side of the plate 4 are rails 11, upon which moves a carriage provided with ordinary wheels 12 and side beams 13, the remaining details of construction of the carriage being immaterial and may be of any suitable form to suit the convenience of the maker or user. Suspended from the side beams of the carriage by means of the rods 14 14 is my improved gas-reversing slide-valve, which comprises two members or parts 15 and 16. The part 15 consists of an arch-shaped hollow member provided with laterally-extending lugs 17, through which are passed the lower headed ends of the rods 14, the upper ends of said rods being screw-threaded to receive the nuts 18, by means of which the said member 15 can be adjusted vertically to provide for the proper seating of the same upon the plate 4. Said member 15 on its lower face is provided with the recesses 19 for receiving asbestos or other suitable packing to insure a close fit of the same on the plate 4. The member 15 has an opening 20 in its top, surrounding which is a pan 21, said pan being suitably secured to the member 15 in such manner that it may be readily removed therefrom—as, for instance, by having suitable projections fitting into corresponding recesses. The pan 21 has its periphery turned upward to form the flanges 22, and about the central opening in the same is a similar upwardly-projecting annular flange 23. The lower edges 24 of the side walls of the gas-box 7 project down into the pan in close proxim-

ity to the bottom of the latter, and when water or a similar liquid is placed in said pan an effective seal is provided which will prevent gas from escaping into the atmosphere. The pan 21 is made of suitable length to allow the valve to be moved on the track 11 to bring it into either of its operative positions.

Located within the arch of the member 15 is the member 16, which is suspended from the member 15 by means of the rods 15^a 15^a, passing through laterally-projecting lugs on the two members and provided with suitable nuts 25 for adjusting the member 16 vertically with reference to the member 15. The member 16 consists of an arch-shaped metallic shell 26, lined with fire-brick or other suitable refractory material 27, as clearly indicated, and bridged by a plate 28, covered with similar refractory material 29. It will be observed that the side beams 13 of the carriage are placed at such a height that the lower edge thereof is above the top of the member 16, and as the member 15 is opened at both sides the member 16 can be removed by merely sliding it out sidewise under the beams 13 of the carriage. It will be further observed that the lower face of the member 16 is not provided with packing, it not being necessary to have an absolutely tight joint for the reason that the outside of said member is in direct contact with the air and no harm will result if air should leak in, as it would merely pass out at the chimney-flue. By providing an open space between the members 15 and 16 a free circulation of air is permitted, thereby keeping the member 15 cool.

The valve may be reversed by any suitable mechanism—as, for instance, by means of the lever 30, pivoted in any suitable manner and connected to the carriage by the link 31; but it is obvious that other mechanism may be used—such, for instance, as a hydraulic cylinder. To each end of the rails 11 are removably secured, as by means of bolts, inclined blocks 32, which serve as stops to limit the movement of the valve in either direction, but at the same time allow of its ready removal by merely unbolting said blocks.

In the position of the valve shown the gas coming from the generator passes through the pipe 6 into the gas-box 7, thence through the opening 8 in the bottom thereof, the amount depending upon the position of the valve 9, thence through the opening 20 in the top of the member 15, through the passage in the latter to the flue 3, leading to one of the regenerators, where it becomes heated. Thence passing to the furnace-chamber it mixes with the air coming from another regenerator, the waste products of combustion passing through the other two regenerators and return through the flue 2, and thence through the passage in the member 16 into the chimney-flue 1. When the valve is reversed or moved to the left in Fig. 1, the course of the gas and waste products of combustion is just the reverse of that described—that is to say, from the gas-box

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through the passage in the member 15 into the flue 2 to the newly-heated regenerator, where it becomes heated, thence to the combustion-chamber, as before, the waste products of combustion returning through the other regenerator, the flue 3, and the passage in the member 16 into the chimney-flue 1, as before.

The arrangement of the passages in the members 15 and 16, respectively, is such that at no time in reversing the valve is the gas-box open to the chimney-flue 1, preventing all loss of gas in the reversing of the valve. The member 15, furthermore, is not in contact with any part that receives the heat from the waste products of combustion, for the reason that the latter pass through the member 16, the air-gap between the member 16 and the member 15 keeping the latter perfectly cool. It is therefore possible at all times to have the member 15 seated closely upon the base-plate 4, thereby obviating any loss of gas from imperfect joints in these parts.

The member 16 may be readily removed by merely removing the rods 15^a 15^b, when the said member can be slid out sidewise underneath the beams 13 of the carriage. In order to remove the carriage and all the parts of the valve, it is merely necessary to unbolt the stop-blocks 32 at one end of the track and raise the pan 21 from the top of member 15, when the carriage and all the valve parts can be moved out from under the same.

It is obvious that the members 15 and 16 might be formed integral, or at least the passages in the same might be cored out in a single integral cast block. This would provide a valve that would reverse the gas in exactly the same manner as the construction described; but it would be open to the defect of heating, inasmuch as no circulation of air between the members would be provided. While I prefer to form the valve of two separate members, I wish to have it clearly understood that I consider it within the scope of my invention to use a single integral valve provided with two passages having the same relation to each other as the passages in the members 15 and 16.

Having described my invention, what I claim as new, and desire to cover by Letters Patent, is—

1. In a gas-reversing valve, the combination with the gas-box and chimney and regenerator-flues, of a reversing-valve comprising two members constructed and designed to operate together, each of said members being provided with a passage, and an air-space between said members, said members being so arranged that as the valve is reversed one of said passages connects the gas-box alternately with the regenerator-flues while the other passage connects the chimney-flue alternately with the regenerator-flues but in the reverse order in which the same are connected with the gas-box.

2. In a gas-reversing valve, the combina-

tion with a gas-box and chimney and regenerator-flues, of a reversing-valve comprising two independent members, each of which is provided with a passage, and means for connecting said members out of contact with each other, said members being so arranged that as the valve is reversed one of said passages connects the gas-box alternately with the regenerator-flues while the other passage connects the chimney-flue alternately with the regenerator-flues but in the reverse order in which the same are connected with the gas-box.

3. In a gas-reversing valve, the combination with a gas-box and chimney and regenerator-flues, of a reversing-valve comprising two independent members, each of which is provided with a passage, and means for connecting said members out of contact with each other, said means permitting said members to be adjusted relatively to each other, said members being so arranged that as the valve is reversed one of said passages connects the gas-box alternately with the regenerator-flues while the other passage connects the chimney-flue alternately with the regenerator-flues but in the reverse order in which the same are connected with the gas-box.

4. In a gas-reversing valve, the combination with the gas-box and chimney and regenerator-flues, of a slide-valve intermediate said gas-box and flues, and a water seal between said slide-valve and the gas-box.

5. In a gas-reversing valve, the combination with the gas-box and chimney and regenerator-flues, of a slide-valve intermediate said gas-box and flues, and a pan removably placed on the top of the valve and adapted to receive water to form a seal between said slide-valve and the gas-box.

6. In a gas-reversing valve, the combination with a slide-valve, of the carriage on which said valve is mounted, and means constructed to adjust the valve vertically on said carriage and secure it in any of its adjusted positions.

7. In a gas-reversing valve, the combination with the track, of the carriage moving thereon, a slide-valve mounted on the carriage, and removable stops secured to the track.

8. In a gas-reversing valve, the combination with the track, of the carriage moving thereon, removable stops secured to the track, a slide-valve mounted on the carriage, and a pan removably placed on the top of the valve.

9. In a gas-reversing valve, the combination with a carriage having side beams, of the slide-valve comprising two separate members removably mounted on said carriage, one of said members having its top normally lying below the lower edge of the side beams of the carriage.

10. A gas-reversing valve comprising the arched member and the member located within the arch of the first-named member but out of contact therewith, and means for connect-

ing said members to cause them to move together.

11. In a gas-reversing valve, the combination with the carriage, of the arched sliding member mounted thereon, and the sliding member located in the arch of the first-named member but out of contact therewith.

12. In a gas-reversing valve, the combination with the carriage having side beams, of the arched sliding member mounted thereon, and the sliding member located in the arch of the first-named member with its top below the lower edge of the side beams of the carriage.

13. In a gas-reversing valve, the combination with the carriage, of the arched sliding member mounted thereon, the sliding member located in the arch of the first-named member and means for vertically adjusting said members on the carriage.

14. In a gas-reversing valve, the combination with the carriage having side beams, of the arched sliding member mounted thereon, the pan removably placed on the top thereof, and the sliding member located in the arch of the first-named member with its top below the lower edge of the side beams of the carriage.

15. In a gas-reversing valve, the combination with the gas-box and chimney and regenerator-flues, of the arched sliding member having an opening in its top communicating with the gas-box and an opening in each lower end adapted to register alternately with the regenerator-flues, and a second sliding member located in the arch of the first-named mem-

ber and out of contact therewith, and having a passage registering with the chimney-flue and alternately with the regenerator-flues.

16. In a gas-reversing valve, the combination with a gas-box and chimney and regenerator-flues, of the arched sliding member intermediate said gas-box and flues and having an opening in its top communicating with the gas-box and an opening in each lower end adapted to register alternately with the regenerator-flues, a pan removably placed on the top thereof and adapted to receive water to form a seal between said slide-valve and gas-box, and a second sliding member located in the arch of the first-named member and having a passage registering with the chimney-flue and alternately with the regenerator-flues.

17. In a gas-reversing valve, the combination with the gas-box and chimney and regenerator-flues, of the carriage having side beams, the arched sliding member mounted thereon and having an opening in the top communicating with the gas-box and an opening in each lower end adapted to register alternately with the regenerator-flues, and a second sliding member adjustably secured to the arched member and located in the arch thereof with its top below the side beams of the carriage and having a passage registering with the chimney-flue and alternately with the regenerator-flues.

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