

REGENERATIVE REVERSING FURNACE.

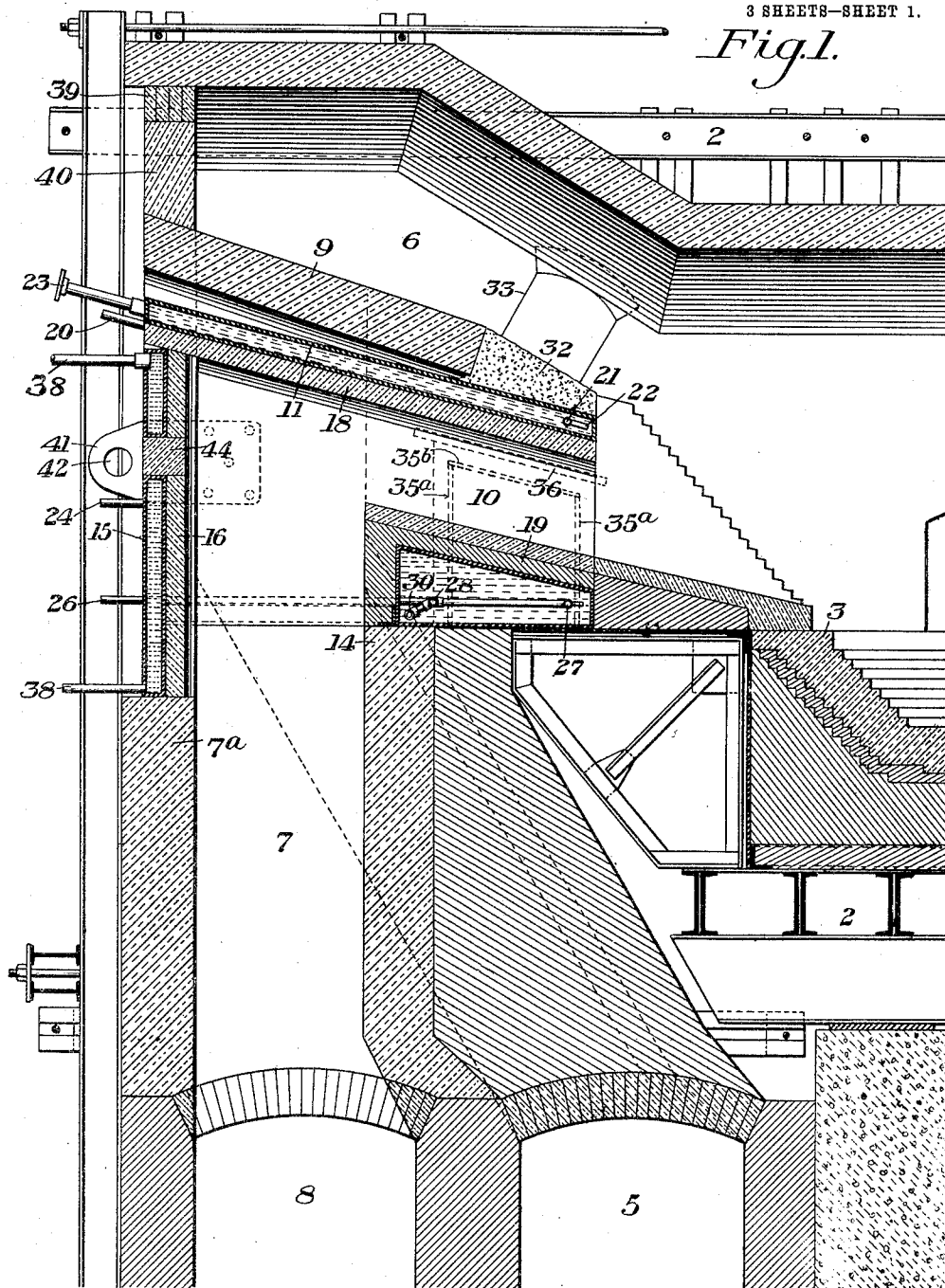
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3 SHEETS—SHEET 1.

Fig.1.



WITNESSES

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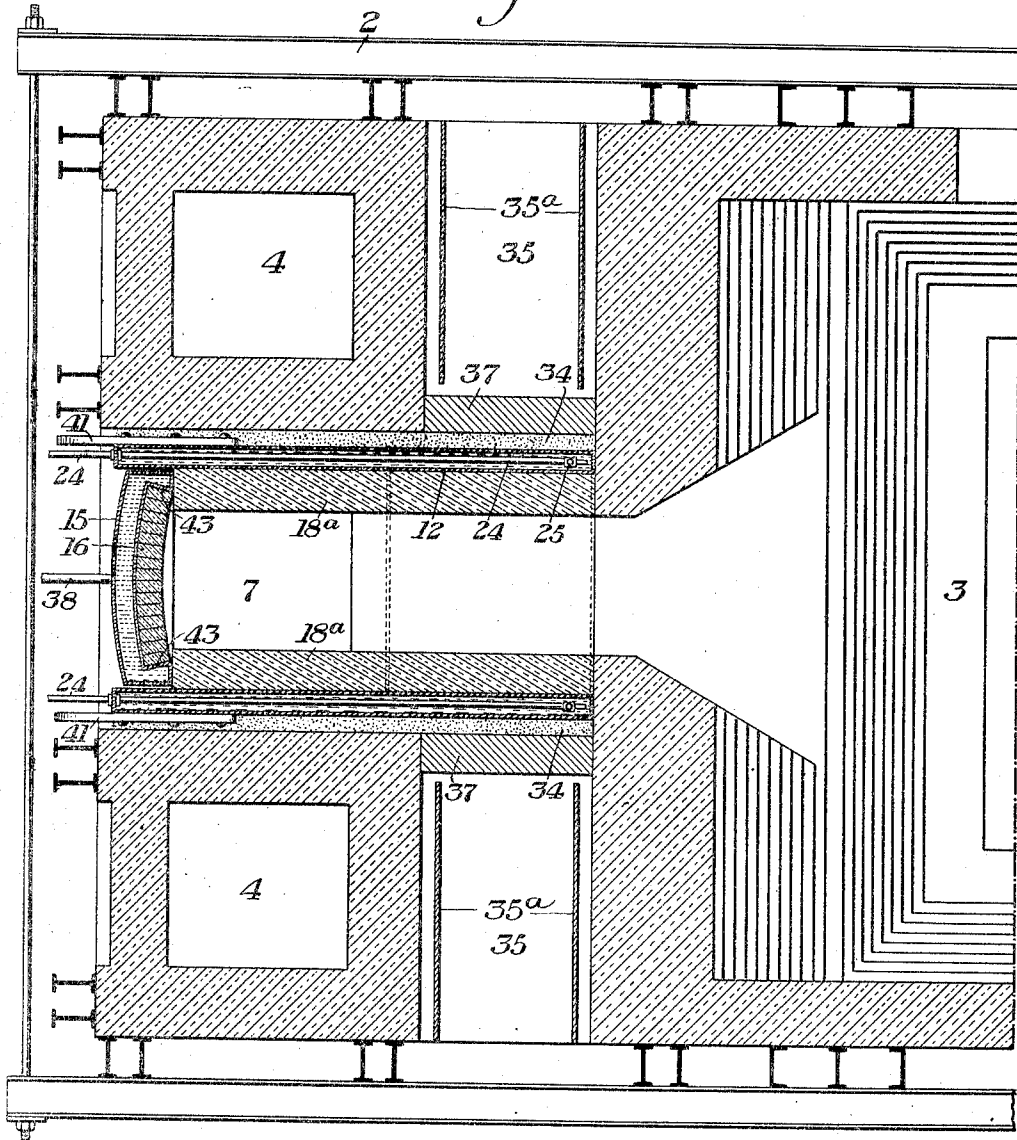
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3 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

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REGENERATIVE REVERSING FURNACE.

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To all whom it may concern:

Be it known that I, LUTHER L. KNOX, of Avalon, Allegheny county, Pennsylvania, have invented a new and useful Improvement in Regenerative Reversing Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

10 Figure 1 is a longitudinal vertical section of one end portion of a furnace embodying my invention; Fig. 2 is a horizontal section of the same taken through the gas port; Fig. 3 is a perspective view, partly broken
15 away, of the removable port cooler; Fig. 4 is a horizontal section through the lower portion of the port cooler; Fig. 5 is a vertical longitudinal section of a modified form of the port cooler; and Fig. 6 is a section on the line VI—VI of Fig. 5.

My invention has relation to regenerative reversing furnaces, and is designed to provide means of novel character for cooling the gas ports of the furnace.

25 To this end the invention consists in a port cooler of the novel character herein-after described.

Referring to the accompanying drawings, in which I have shown the preferred embodiment of my invention, the numeral 2
30 designates the supporting frame of a furnace of the open hearth type; 3 designates a portion of the hearth, 4 the air uptakes leading upwardly from the regenerator connections 5 in an inclined direction, and communicating at their upper ends with the air
35 port 6.

7 is the gas uptake leading upwardly from a regenerator connection 8, intermediate the
40 air uptakes 4.

9 designates a wall or arch of refractory material separating the air ports 6 from the gas port 10, this wall or arch being a part of the permanent construction of the fur-
45 nace.

The gas port 10 is formed in a port cooler, which consists of a hollow metal shell having an arched top portion 11, depending parallel side portions or legs 12,
50 and a bottom portion 13. This bottom portion 13 extends only a portion of the length of the shell, and constitutes the bottom of the gas port, while the rear portion of the cooler back of the bottom 13 constitutes the
55 upper portion of the gas uptake 7, being

removably seated on the walls 14 of said uptake. The gas port 10 discharges at its forward end directly into the furnace. The rear end of the cooler is closed by a removable end portion, which consists of a hollow water-cooled plate 15 and an inner refractory lining 16.

The top portion 11 of the cooler is formed with the skew-backs 17, which support the refractory lining 18 for said top portion.
65 The side legs 12 of the cooler are provided with a refractory lining 18^a; and the bottom portion 13 has the refractory covering 19. The several portions of the cooler may be supplied with water by any suitable system of circulating connections.

In the drawing I have shown the top portion as having the two inlet pipes 20 extending longitudinally therein to a point near its forward end, and connected to a transverse
75 spray pipe 21, having a plurality of spraying nozzles 22. 23 designates the outlet connection for said top portion. The side portions of the cooler are shown as supplied by means of pipes 24, extending longitudinally
80 therein and connected at their inner ends to the vertically extending spray pipes 25. The bottom portion 13 is shown as supplied by the two longitudinally extending pipes 26 extending through the side legs
85 and having their inner portions connected by the two transverse pipes 27 and 28. The pipe 27 has a plurality of spray nozzles 29 arranged to discharge against the front end of the cooling chamber, while the pipe 28
90 has a discharge T 30.

31 designates clean-out openings at the lower rear portion of the side legs, and at the lowest points of the structure. The side, end and bottom portions of the cooler preferably form a continuous chamber, and the pipe 23 constitutes the common discharge for said chamber.

The wall or arch 9 terminates some distance short of the inner end of the cooler,
100 and the inner top portion of the cooler is preferably covered by a layer 32 of sand, or other similar material, which may be thrown thereon after the cooler is put in place. To permit access to the inner portion of the cooler the side walls of the air
105 port 6 are preferably provided with the doors 33, one of which is shown in Fig. 1, and which are normally closed by false brickwork which can be readily removed. 110

A space is left at each side of the cooler for the reception of a filling 34 of sand, or other similar material, as shown in Fig. 2. These side spaces extend clear to the end of the furnace, so that the sand can be readily tamped or packed therein.

35 are dead air spaces behind the air uptakes 4, which are closed at the top by plates 36 (one of which is indicated in dotted lines in Fig. 1), and which have the false walls 37 adjacent to the port cooler.

38 designates the circulating connections for the cooling plate 15 of the bulk head.

The front end of the air port 6 is preferably formed by an arch 39 with a filling 40 of removable brick so that access to the port may be readily obtained.

The entire port cooling structure may be readily removed from underneath the wall or arch 9, and to facilitate this removal it is provided with the side plates 41 having the perforations 42 for engagement with a withdrawing means.

The cooling plate 15 of the end wall or bulk head of the gas port is supported on the outer wall 7^a of the gas uptake. It is preferably provided with the skew-backs 43, to support the inner refractory lining 16. It is also preferably provided with an opening, which is normally closed by a removable block 44 of refractory material.

In Figs. 5 and 6 I have shown a modified form of the port-cooling structure, which, instead of being of generally rectangular form in cross-section, as is the first form described, is of circular form in cross-section with a continuous hollow cooling shell 45 having water-circulating connections 46. 47 is the inner refractory lining, and 48 is a downwardly extending leg which is supported on the upper end of the walls of the gas uptake. The outer end of this structure is closed by the removable end wall or bulk head, consisting of a hollow cooling plate 49 and an inner refractory lining 50.

I preferably provide the air spaces 35 with baffle plates or walls therein arranged to induce an air circulation which will assist in cooling the adjacent structure. These baffles may be variously arranged. In the drawings I have shown lateral baffles 35^a and a top baffle 35^b.

My invention provides a port cooling construction, which can be readily applied to and removed from a furnace, and which in itself constitutes those portions of the gas port which are subject to most rapid destruction in service. This port structure can be readily removed and replaced when necessary.

I do not limit myself to the particular construction and arrangement of the parts which I have herein shown and described, since it is obvious that various changes may be made in the details of the structure and

arrangement without departing from the spirit and scope of my invention as defined in the appended claims.

It will be understood that while I have shown the invention as applied to but one end of the furnace, that in practice both ends will be preferably of similar construction.

What I claim is:—

1. A regenerative reversing furnace having a wall or arch separating the air and gas ports, and a removable gas port forming and cooling structure forming the roof and side walls of said port and inserted underneath said wall or arch, and having a separately formed removable outer end wall or bulk head; substantially as described.

2. A port forming and cooling structure for furnaces, consisting of a hollow metal shell provided with water-circulating connections, said shell having top, bottom and depending side portions, and a separately formed removable outer end portion; substantially as described.

3. A regenerative furnace having gas and air ports, and a refractory wall or arch separating said ports, the gas port being formed by a metal shell inserted endwise underneath the said wall or arch, and having hollow, top, bottom, and side portions surrounding the gas port; substantially as described.

4. A regenerative furnace having gas and air ports, and a refractory wall or arch separating said ports, the gas port being formed by a metal shell inserted endwise underneath the said wall or arch, and having hollow, top, bottom, and side portions surrounding the gas port; the rear portion of said structure being open at the bottom to constitute the upper portion of a gas uptake; substantially as described.

5. A gas port forming and cooling structure for furnaces, comprising a hollow metal shell extending from the mouth of the port to the rear wall of the gas uptake, and composed of top, bottom and side portions surrounding the gas port and having a rear part open at the bottom to constitute the upper portion of a gas uptake, together with a removable end wall or bulk head for closing the outer end portion of the structure; substantially as described.

6. A gas port forming and cooling structure for furnaces, comprising a metal shell having a top portion, depending side portions, and a bottom portion shorter than the side and top portions and connecting the side portions, all of said portions being hollow, and spray pipes extending and discharging therein at a plurality of different points; substantially as described.

7. In a regenerative reversing furnace having gas and air ports, an arch or wall separating the gas and air ports, and a re-

movable gas port forming and cooling structure inserted underneath said wall or arch, said structure having depending side portions forming the sides of the gas port, the
5 wall or arch terminating short of the inner end of the said structure; substantially as described.

8. In a regenerative reversing furnace having gas and air ports, an arch or wall separating the gas and air ports, a removable gas port forming and cooling structure inserted underneath said wall or arch, the wall or arch terminating short of the inner end of the said structure, and a layer of
10 relatively loose refractory material covering the inner portion of said structure beyond the end of the wall or arch; substantially as described.

9. A regenerative reversing furnace, hav-

ing laterally arranged air uptakes and a centrally arranged gas uptake, the furnace having laterally open air spaces between the air uptakes, and means for inducing an air circulation in said spaces; substantially
20 as described.

10. A regenerative reversing furnace having an air uptake and a gas uptake, with a laterally open space at the rear of the air uptake, and means for inducing an air circulation in said space; substantially as de-
25 scribed.

In testimony whereof, I have hereunto set my hand.

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Witnesses:

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