

(No Model.)

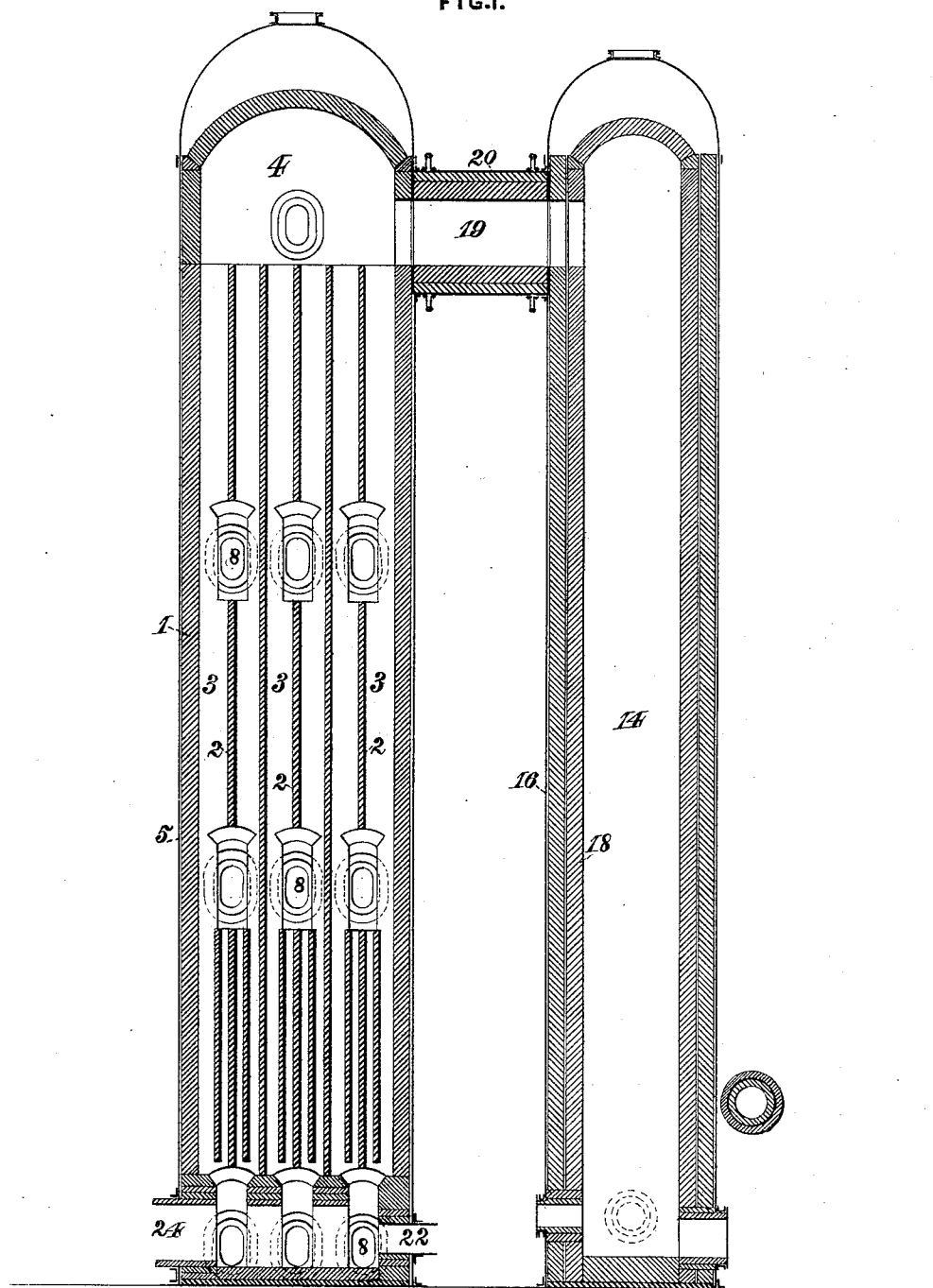
2 Sheets—Sheet 1.

H. A. LAUGHLIN.
REGENERATIVE HOT BLAST STOVE.

No. 379,707.

Patented Mar. 20, 1888.

FIG. 1.



WITNESSES:

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J. E. Gaither

INVENTOR,

Henry A. Laughlin
by J. Snowden Bell
Att'y.

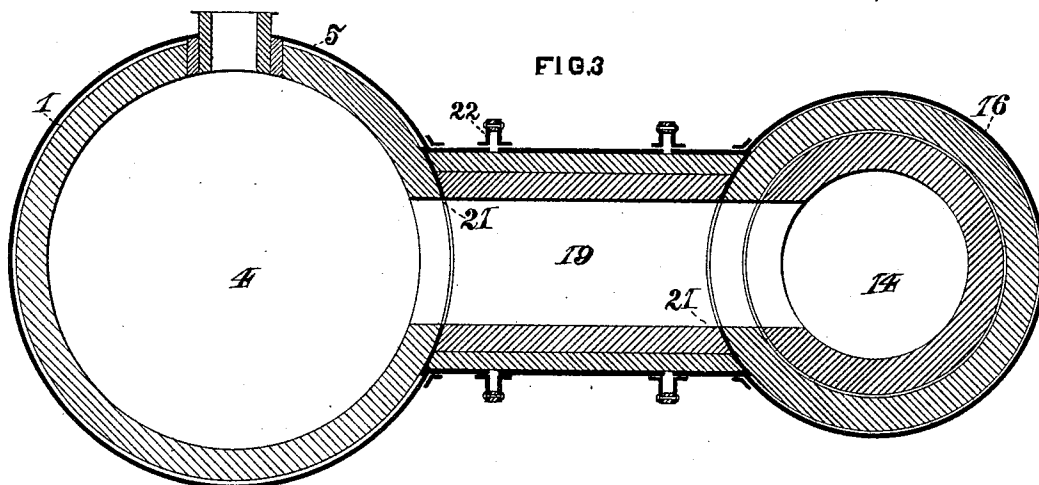
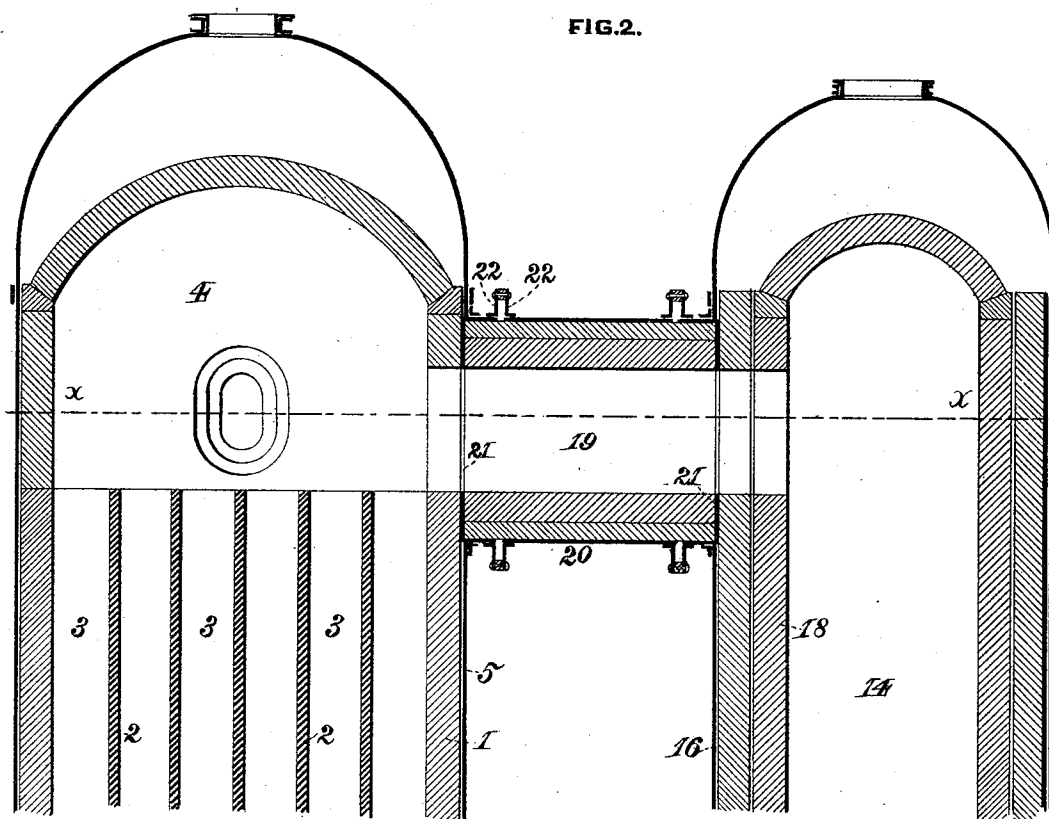
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UNITED STATES PATENT OFFICE.

HENRY A. LAUGHLIN, OF PITTSBURG, PENNSYLVANIA.

REGENERATIVE HOT-BLAST STOVE.

SPECIFICATION forming part of Letters Patent No. 379,707, dated March 20, 1888.

Application filed March 16, 1887. Serial No. 231,108. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. LAUGHLIN, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered a certain new and useful Improvement in Regenerative Hot-Blast Stoves, of which improvement the following is a specification.

My invention relates to regenerative hot-blast stoves having a vertical-uptake combustion-chamber wholly exterior to the body of the stove and communicating therewith at or near its top, an instance of which is illustrated in Letters Patent of the United States No. 355,181, granted and issued to me under date of December 28, 1886. In hot-blast stoves of such construction the objection obtains that by reason of the fact that the temperature within the combustion-chamber greatly exceeds that exerted upon the interior of the stove the former tends correspondingly to expand and contract to a greater extent than the latter under the influence of such difference of temperature, the result of such unequal expansion and contraction being to induce distortion and fracture of the connection between the combustion-chamber and the body of the stove.

The object of my invention is to render the advantageous features of hot-blast stoves of the construction above specified usefully available in practice by obviating, as far as practicable, the detrimental action referred to, to which end my invention, generally stated, consists in the combination of a shell or main body provided with a series of regenerative flues, an exterior vertical combustion-chamber formed of fire-brick of greater thickness than the shell of the stove and inclosed in an iron casing, and a throat or passage-way connecting the shell and combustion-chamber at or near their upper ends; also, in the combination of a main shell or body provided with a series of regenerative flues, an exterior vertical combustion-chamber, and an upper throat or passage-way connecting the shell and combustion-chamber, and having a body separate from said shell and combustion-chamber and a casing secured to the casings thereof.

The improvement claimed is hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is

a vertical central section through a hot-blast stove embodying my invention; Fig. 2, a similar section, on an enlarged scale, through the upper portion of the same; and Fig. 3, a horizontal section at the line *x x* of Fig. 2.

In the practice of my invention I provide a hot-blast stove having a main body or shell, 1, of fire-brick or other refractory material, which is built up into a vertical cylinder of desired height and diameter and inclosed in a tight casing, 5, of iron plates, in the ordinary manner. The shell 1 is divided by vertical walls or partitions 2 into a series of vertical regenerative flues, 3, extending from an arch sprung at the bottom of the stove to a dome or chamber, 4, which covers it at top and communicates with the entire series of flues 3. Passages 22 and 24, governed by proper valves, lead from the base of the shell to a cold-blast pipe and to the chimney, respectively, and two or more series of transverse cleaning-passages, 8, may be formed in the partitions separating the regenerative flues, as set forth in my Letters Patent No. 355,181 aforesaid.

The combustion of the furnace-gases by which the stove is heated is, as in Letters Patent No. 355,181, effected in a vertical-uptake combustion-chamber, 14, which is wholly exterior to the shell or body 1 of the stove, and extends from a suitable foundation at or near the level of the base of the latter to or near its top. It is preferably closed at its upper end by an arched cap or cover. The combustion-chamber 14 is formed of fire-brick, and is, similarly to the shell 1, inclosed in a tight casing, 16, of iron plates. As before stated, the temperature within the combustion-chamber is greatly in excess of that in the regenerative flues of the main body of the stove, and the range of its expansion and contraction under the variations of temperature to which it is subjected is hence greater in a corresponding degree. In order to protect the casing 16 from the heat of the chamber and equalize, as far as may be, the action of the heat upon the casing 16 with that exerted upon the casing 5 of the shell 1, I increase the thickness of the wall of the combustion-chamber 14 relatively to that of the shell 1 by providing the combustion-chamber with a fire-brick lining, 18, which may be, as shown, as thick as the outer wall proper of the chamber. The durability

of the casing is thus promoted, and its tendency to expansion and contraction so far reduced as to accord, practically, with that induced upon the casing of the shell 1.

5 The combustion-chamber 14 is connected at or near its top with the dome 4 of the shell 1 by a transverse throat or passage-way, 19, formed of fire-brick inclosed in an iron casing, 20, and which preferably extends horizon- 10 tally from an opening in the side of the dome to a corresponding opening in the adjacent side of the combustion-chamber, but may, if preferred, extend over and communicate with the latter at its top. To prevent rupture or 15 displacement of the wall of the throat by the increased expansion and contraction of the combustion-chamber relatively to the shell, I form a slip or expansion joint at the end of the throat next the combustion-chamber, so 20 that vertical movement of the wall and lining of the latter shall not exert a disturbing action to any substantial or injurious extent upon the throat. For this purpose, instead of bonding or connecting the brick-work of the throat 25 with that of the combustion-chamber, a narrow space is left between the end of the throat and the periphery of the chamber, surrounding the opening in each, which space may be filled with a fire-clay packing or facing, 21, so 30 that the wall of the combustion-chamber may move vertically with practical freedom in expanding and contracting without tending to break or displace the throat. A corresponding joint may, if desired, be formed at the 35 end of the throat adjoining the dome.

To further adapt the throat to accommodate itself to movement of the wall and casing of the combustion-chamber and its casing, one or more expansion-joints may likewise be formed 40 in the casing 20 of the throat. A suitable form of said joint is shown more particularly in Figs. 2 and 3, the same consisting of a pair of annular plates or flanges, 22, which are secured together at their peripheries, and at 45 their inner ends are secured independently to adjoining and separate sections of the casing 20. The flexibility of the plates 22 admits of a limited degree of deflection of the casing 20 from normal horizontal position, in accordance with vertical movement of the casing of 50 the combustion-chamber.

The combustion-chamber is provided with passages in its lower end, governed by proper valves, and leading, respectively, to a gas-supply pipe and a hot-blast-delivery pipe, and 55 with a passage and valve for admitting air to support combustion. In operation waste gas from a blast-furnace is admitted to and ignited in the combustion-chamber and dome, the products of combustion passing through and 60 highly heating the regenerative flues of the

shell, after which, by proper manipulation of the air and gas valves, an air-blast is passed upwardly through the regenerative flues and downwardly through the combustion-chamber, 65 and is thereby heated to a high degree prior to being delivered to the tuyeres of the furnace.

I disclaim, broadly, a hot-blast stove having a vertical uptake or combustion-chamber 70 exterior to its shell. Neither do I broadly claim such a stove in which the wall of the combustion-chamber is of greater thickness than that of the regenerative chamber.

I claim as my invention and desire to secure 75 by Letters Patent—

1. In a regenerative hot-blast stove, the combination of a shell or body having a series of vertical regenerative flues and an upper dome or chamber, an independent fire-brick combustion-chamber located exterior to the shell and 80 having its wall lined, so as to exceed in thickness that of the shell or body, an iron casing inclosing the combustion-chamber, and a throat or passage-way connecting the combustion- 85 chamber with the dome of the shell or body, substantially as set forth.

2. In a regenerative hot-blast stove, the combination of a shell or body having a series of vertical regenerative flues and an upper dome, 90 an iron casing inclosing said shell, an independent vertical fire-brick combustion-chamber located exterior to the shell, an iron casing inclosing said combustion-chamber, a throat or passage-way of fire-brick connecting open- 95 ings in the combustion-chamber and dome and separated at either or both of its ends therefrom, and an iron casing inclosing the throat and secured at its ends to the casings of the combustion-chamber and shell, substantially 100 as set forth.

3. In a regenerative hot-blast stove, the combination of a shell or body having a series of vertical regenerative flues and an upper dome, 105 an independent fire-brick combustion-chamber located exterior to the shell, a fire-brick throat or passage-way connecting an opening in the dome with an opening in the combustion-chamber, a separate packing or facing of fire-clay interposed between the end of the 110 throat and the combustion-chamber, and an iron casing inclosing the throat and secured at its ends to similar casings inclosing the shell and combustion-chamber, substantially as set 115 forth.

In testimony whereof I have hereunto set my hand.

HENRY A. LAUGHLIN.

Witnesses:

J. SNOWDEN BELL,
R. H. WHITTLESEY.