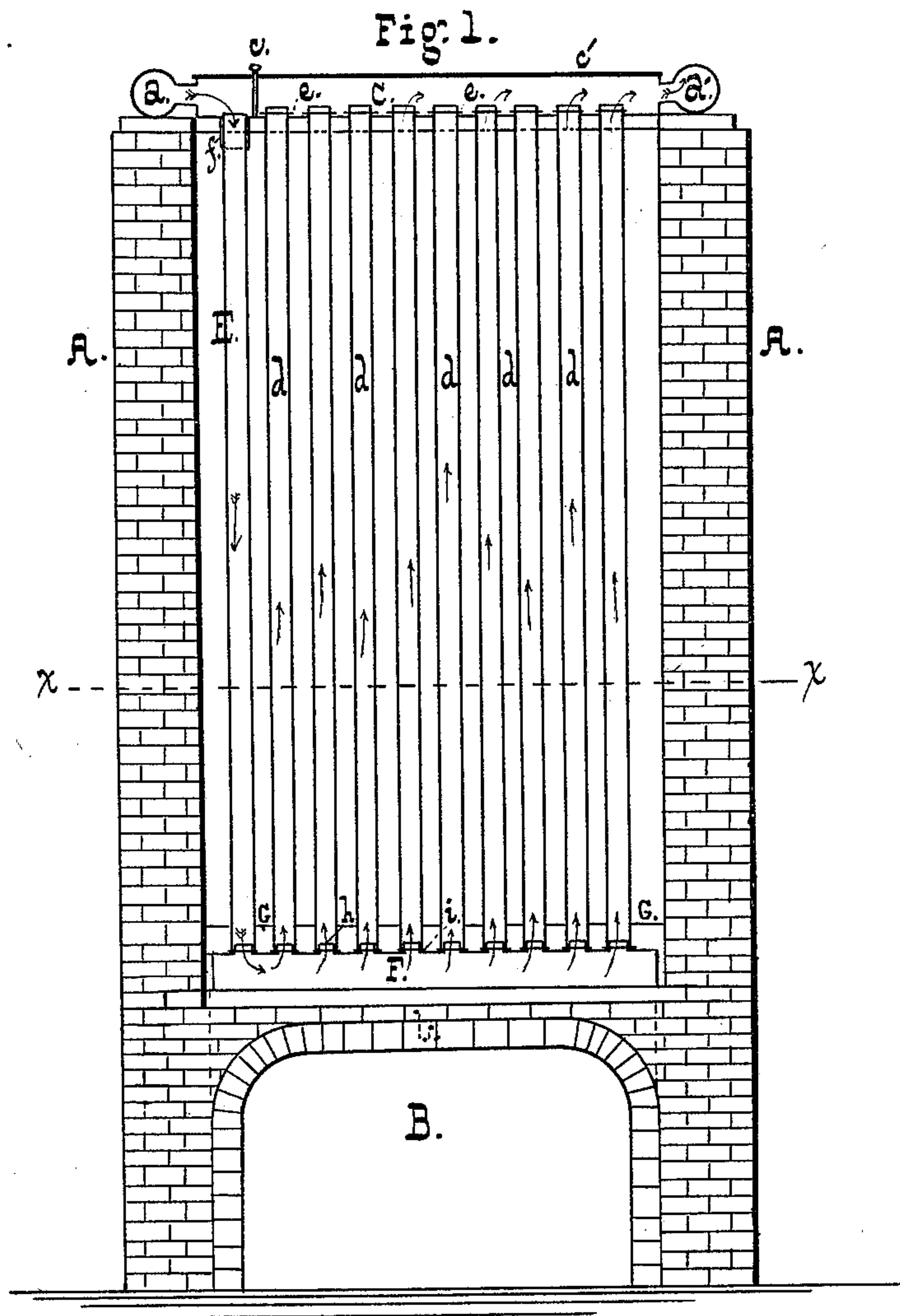


H. L. BROOKE.
Hot Blast Oven.

No. 231,265.

Patented Aug. 17, 1880.



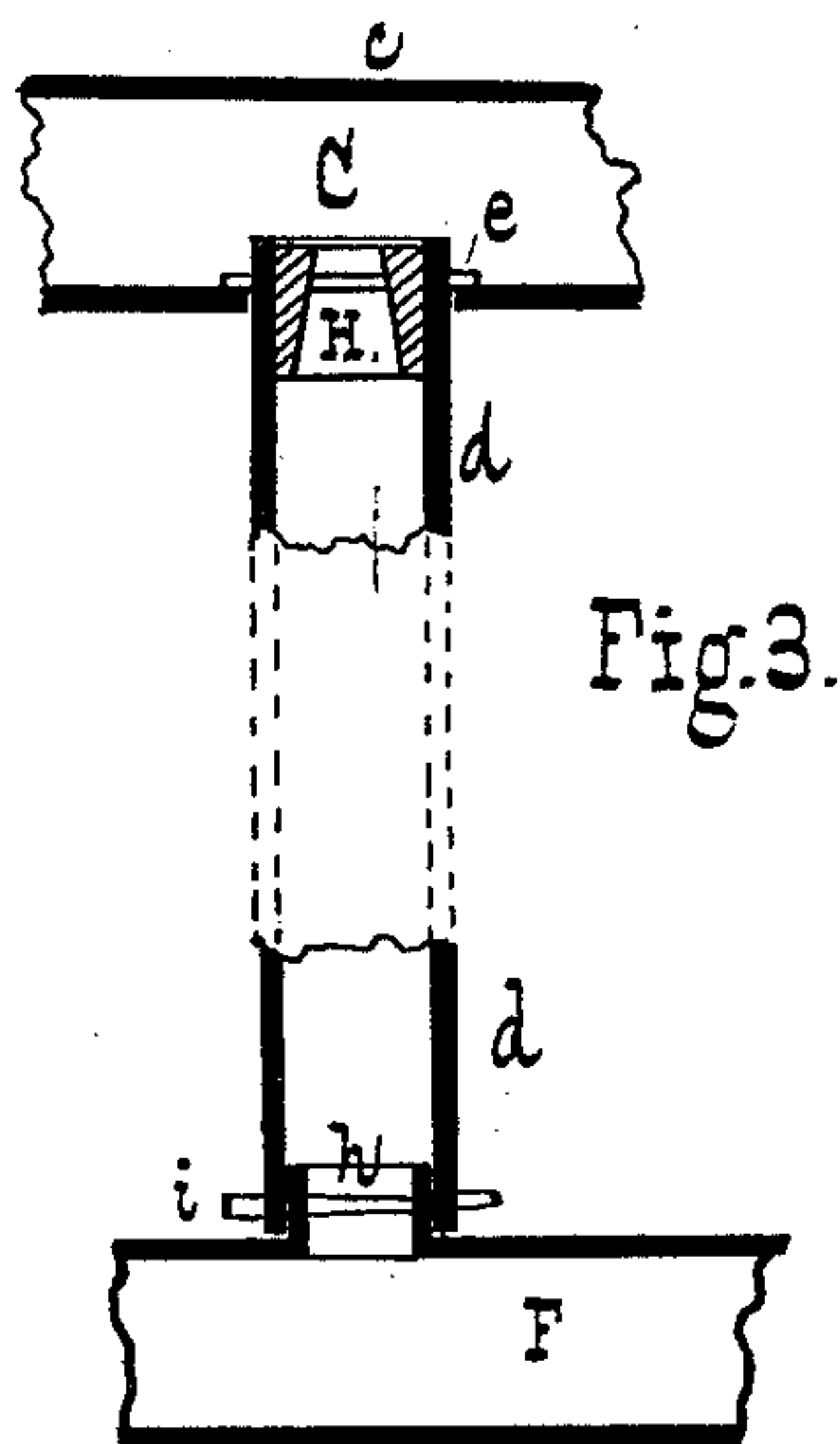
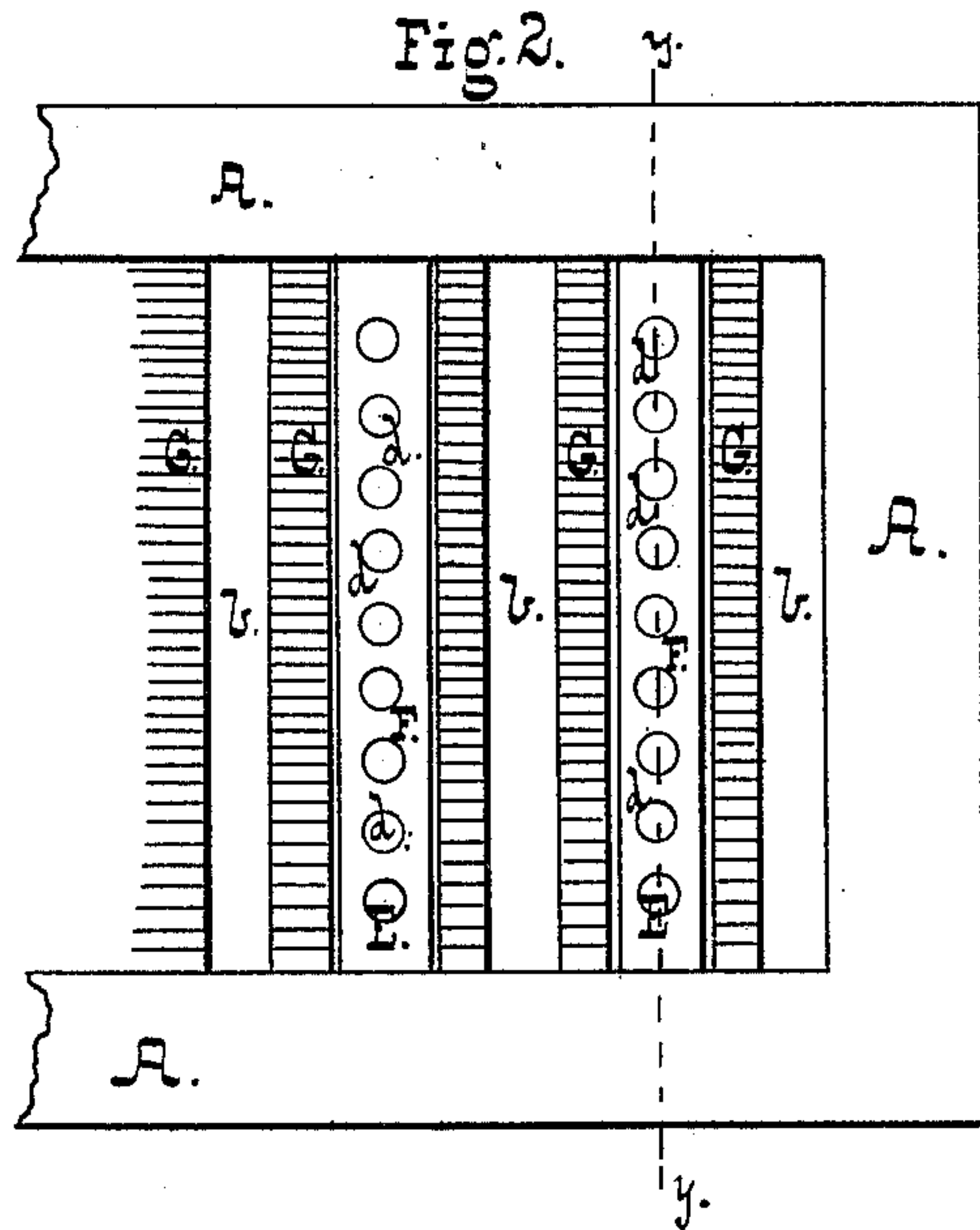
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UNITED STATES PATENT OFFICE.

HORACE L. BROOKE, OF BALTIMORE, MARYLAND.

HOT-BLAST OVEN.

SPECIFICATION forming part of Letters Patent No. 231,265, dated August 17, 1880.

Application filed December 29, 1879.

To all whom it may concern:

Be it known that I, HORACE L. BROOKE, of Baltimore city, State of Maryland, have invented certain new and useful Improvements in Hot-Blast Ovens; and I hereby declare the same to be fully, clearly, and exactly described as follows, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical sectional view of the device on line *y y* of Fig. 2; Fig. 2, a horizontal section on line *x x* of Fig. 1, and Fig. 3 is a vertical sectional view enlarged, showing the construction of the pipe ends.

My invention relates to that class of apparatus in use for heating a current of air for the blast of a furnace, charcoal-kiln, converter, or other apparatus in which a hot-blast is used; and it has for its object to furnish a hot-blast oven in which facility is afforded for renewing worn-out parts, and by means of which a maximum temperature of blast is secured with minimum expenditure of fuel.

My invention consists in a hot-blast oven having a series of independently-expandible pipes uniting its inlet and outlet mains, and in certain details of construction of the pipe-connections and of the mains, as hereinafter set forth and claimed.

In the accompanying drawings, A A are the walls of the oven, constructed of suitable masonry with fire-brick lining, and B is the combustion-chamber. Through the arched roof of the latter are a series of openings, *b*, (see Fig. 2,) and on each side of each opening *b* is a bridge-wall, G, extending some distance above the inner floor of the oven.

On one side of the oven, at the top, is the inlet-main *a*, from which lead a series of short pipes that communicate with the transverse upper mains, C, which are provided with removable covers *c'*, and are square or rectangular in cross-section.

Dampers *c* in the mains C direct the incoming blast into the downtake-pipes E, which latter communicate with the lower transverse mains, F.

Between the mains C and F extend the pipes *d d*, which constitute the heating-pipes proper. All the vertical pipes (indeed, by preference, all the pipes) are of wrought-iron instead of cast-iron, the material heretofore universally used for this purpose—a feature

which will be hereinafter more particularly referred to.

The lower mains, F, lie between the bridge-walls G, and are slightly shorter than the internal diameter of the oven, so as to allow for expansion as they are heated. These mains are provided with nipples *h*, over which the lower ends of the pipes *d* and E fit, (see Fig. 3,) and are secured by transverse pins *i* or by other suitable means, whereby the mains are sustained by the pipes *d*.

By preference longitudinal flanges are formed upon the mains F, inclosing the nipples *h*, and a packing of asbestos, iron turnings mixed with an oxidizing agent, or equivalent material is rammed into the intervening space, making the joints air-tight.

Instead of forming the flanges integral with the mains F, iron plates projecting above the mains and suitably bolted to them may be used.

At their upper ends the pipes *d d* project through holes in the mains C, being retained by means of pins *e* or by flanges or collars integral with or screwed upon the ends of the pipes.

The top *c'* of the main C being removable, ready access is afforded for calking the joints between the pipes *d* and the main C.

The cold-air or downtake pipes E are attached to the mains F in a manner similar to the attachment of the pipes *d*, but at their upper ends they telescope on nipples *f* depending from the mains C, forming an expansion joint.

The object of this construction is to admit of the expansion of the pipes *d*, which are practically uniformly heated and expand to about the same extent, while the pipes E, that conduct the incoming cold air, remain at a much lower temperature, and are consequently elongated to a less extent.

In operation a number of thimbles, H, are inserted in the ends of the pipes *d*, and are of such internal diameter that their gross area for the efflux of the heated air is equal to the internal area of the pipes E. By these means the flow of air in the pipes *d* is equalized and their temperature remains practically uniform.

The operation of the device is as follows: A blast of air being induced by any suitable form of blower, the current is led into the main

a, whence it descends through the pipes *E* into the lower mains, *F*, and rises therefrom uniformly through the pipes *d* into the mains *C*, finally finding egress through the main *a'* and delivery-pipe. The flames and heat from the combustion-chamber *B* rise through the openings *b* and sweep over the system of pipes and heat the air-currents passing therethrough.

In structures of this class a great obstacle has heretofore been encountered in the warping, bending, and cracking of the cast-iron pipes, arising probably from unequal density of opposite sides of the pipes and unequal expansion, as one side is heated more than the other. I obviate this evil, and at the same time secure important advantages, by making the pipes of wrought-iron. From the superior strength of the material the wrought-iron pipes may be made much thinner than the cast ones, and, being better conductors of heat, a higher temperature of blast is secured. Moreover, the wrought-iron pipes may be made so thin as to expand in practically right lines, even if unequally heated on opposite sides, and—a most important point—all the pipes expand about equally, the material being homogeneous. With cast-iron pipes this is not the case. The material is not homogeneous, and, besides warping, bending, and cracking, the pipes expand unequally lineally, straining and bending the junction-mains.

To secure sufficient strength, cast-iron pipes require to be so thick and heavy that a length of about fifteen to eighteen feet is the extreme limit, whereas the wrought-iron pipes may be made thirty to thirty-five feet in length, or even upward, and the oven is given a vastly-increased draft, securing a more perfect combustion of fuel and a higher temperature of blast.

Any possible inequality of expansion is guarded against in the described oven by the means of fitting the pipes in the mains *C*, as any pipe expanding more than the average of its fellows simply slides its upper end through the aperture in the main *C* to that extent.

The baffle-walls *G* prevent a direct play of the flames on the mains *F* and the junction therewith of the pipes *d*. Each main *F* fits snugly between the walls *G*, space being left to allow for expansion, so that by no possibility can the pipes in bending bring the mains over the openings *b*, as so frequently occurs in hot-blast ovens of the usual construction.

Facility is afforded by the described construction for renewing worn-out pipes without necessarily interrupting the operation of the oven. The short junction-pipes with the mains *a a'* being uncoupled from the main *C*, from which the defective pipe or pipes depend, the openings in the mains *a a'* are closed by screw-caps, and the entire system *C E d d F* is lifted out, repaired, and replaced.

While I have described the mains *C* and *F* as straight, it is obvious that they may be curved without departing from the spirit of my invention; and, instead of a single row of

pipes connecting the mains *C* and *F*, a number of rows may be used with compound or partition mains.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a hot-blast oven, of inlet and outlet mains and a series of pipes uniting the same and having slip-joints with one of the mains, whereby the pipes are rendered independently expansible, as set forth.

2. In a hot-blast oven, and in combination with a transverse main, a series of wrought-iron pipes depending therefrom and supporting a common lower main, the said pipes having slip-joints with the upper main, whereby they are made independently expansible.

3. In a hot-blast oven, a double series of transverse upper and lower mains, *C F*, in combination with and united by heating-pipes and by pipes for the cold incoming air, which latter pipes are provided with sliding joints, as set forth.

4. The combination, in a hot-blast oven, of the cold-air downtake having telescopic joint, the upper transverse main and lower main, *F*, the latter being suspended by means of the pipes *d*, having slip-joints with the upper main, as described.

5. The combination, in a hot-blast oven, of a cold-air downtake and a main provided with a series of throttled uptakes, whereby the capacity of each uptake is diminished and the entire series has but the capacity of the downtake, as set forth.

6. In a hot-blast oven, a series of hot-air pipes depending from a transverse upper main and supporting a lower one, whereby the latter is free to descend as the pipes expand, as set forth.

7. In a hot-blast oven, an upper transverse main provided with a series of depending pipes having slip-joints therewith, in combination with a removable cover, as and for the purpose set forth.

8. In combination with the mains *a*, *C*, *F*, and *a'*, the pipes *E* and *d*, having expansion-joints, as described.

9. In combination with the pipes *d*, the main *C*, having damper *c'* and removable top *c*, as set forth.

10. In combination with the upper mains, the heating-pipes *d*, passing freely through apertures in the lower side of the mains, as set forth.

11. In combination with the pipes *d*, the throttling-thimbles *H*, as set forth.

12. In combination with the mains *F*, having nipples *h*, the pipes *d* and pins *i*, as described.

13. In combination with the mains *C* and *F*, the pipes *d*, sustaining the lower mains, *F*, and free to expand independently of each other, as set forth.

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