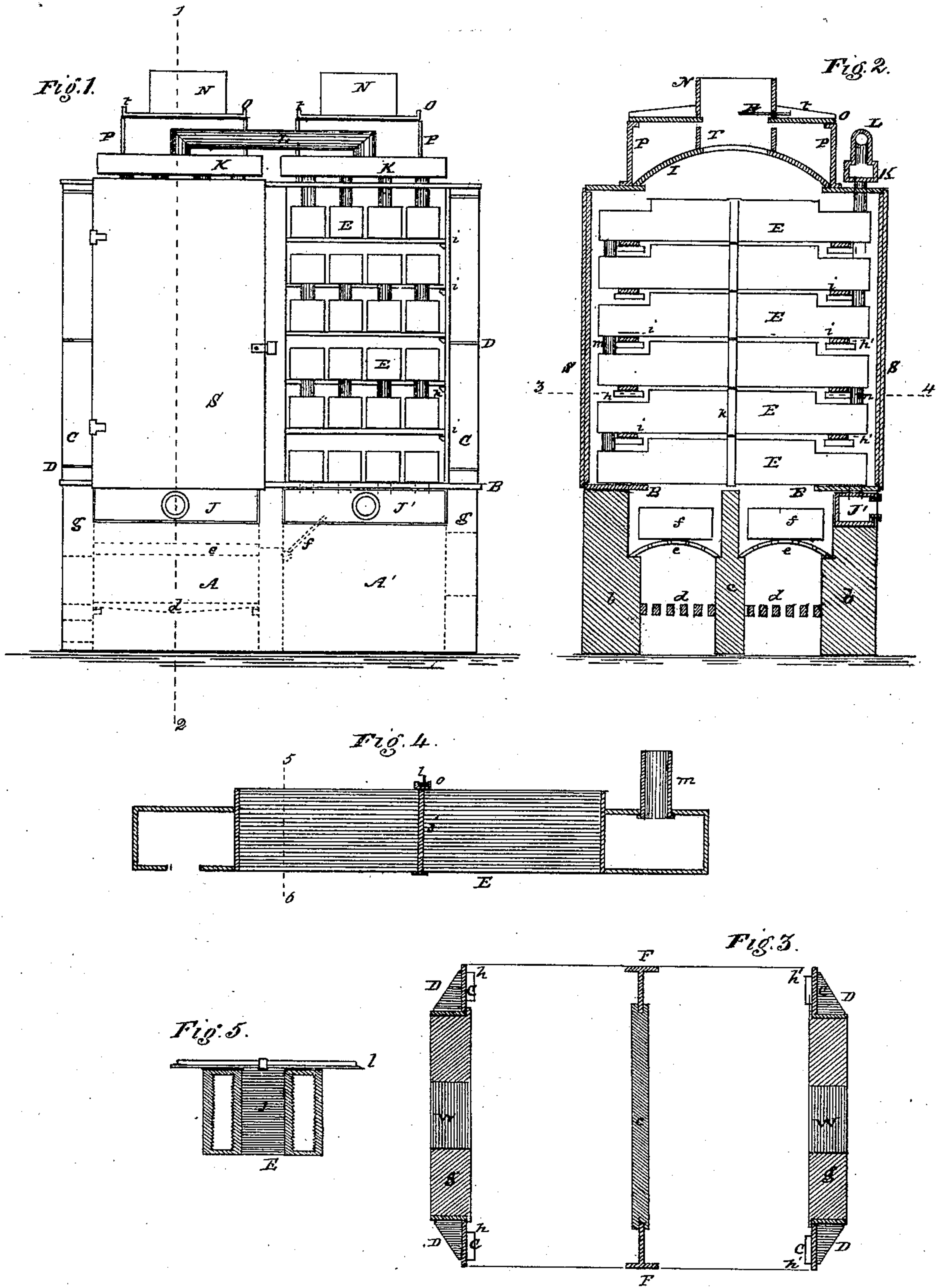


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Improvement in Hot-Blast Ovens.

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IMPROVEMENT IN HOT-BLAST OVENS.

Specification forming part of Letters Patent No. 131,143 dated September 3, 1871.

To all whom it may concern:

Be it known that I, JESSE YOUNG, of Portsmouth, in the county of Scioto and State of Ohio, have invented a new and Improved Hot-Blast Oven; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawing forming a part of this specification and to the letters of reference marked thereon.

The object of my invention is to construct an oven or stove for heating the air supplied to a blast-furnace, in such a manner that the air, in its passage through the same, shall be exposed to a relatively larger heating-surface than in any other hot-blast oven hitherto known or used; also to make provision for the escape of carbonic-acid gas or other gases which do not support combustion, so that the temperature within the oven may be raised to any desirable degree by the use of stone-coal or other similar fuel; and to construct the heating-pipes and other portions of the oven with a comparatively small weight of metal, and in such a manner as to provide against lateral and vertical deflection under a high degree of heat. The nature of my invention consists in making the heating-pipes in a novel and peculiar manner, which will hereinafter be more fully described, so that a very large heating-surface is obtained with a comparatively small weight of metal, and so that the pipes are not liable to lateral or vertical deflection when exposed to a high degree of heat; and in the use of a T-shaped bar, in combination with the said pipes, for the purpose of further preventing the tendency to or possibility of vertical deflection. It also consists in constructing the lower portion of the oven in two separate compartments, and providing damper-doors in the partition-wall between the same, for the purpose of allowing the escape of carbonic-acid gas and other gases which will not support combustion, so that stone-coal and other similar fuel may be used with advantage for heating the pipes; and it further consists in supporting the cross-plate upon which the chimney rests upon iron columns above the crown of the oven.

To enable others skilled in the art to make and use my invention I will proceed more particularly to describe its construction and operation.

Figure 1 represents a side elevation of my improved hot-blast oven. Fig. 2 is a transverse vertical section of the same taken through the line 1 2 in Fig. 1. Fig. 3 is a detached horizontal transverse section taken through the line 3 4 in Fig. 2. Fig. 4 is a longitudinal sectional elevation of one of the heating-pipes. Fig. 5 is a transverse section of the same taken through the line 5 6 in Fig. 4.

Letters of like name and kind indicate like parts in each of the figures.

A and A' represent the base of my improved oven, which is divided into two chambers by means of a partition-wall, *a*, which runs transversely through the center, connecting with the side walls *b b'*. In the chamber A, which is divided into two compartments by means of a partition-wall, *c*, running lengthwise through the center, and extending upward to the under sides of the first tier of heating-pipes, are the fire-grates *d d* and ash-pits, neither of which require particular description; and immediately over the grates *d d*, and at a convenient distance therefrom, is an arch, *e*, of suitable material, provided with perforations sufficient in number and diameter to allow the free passage of flames and heat into the upper chamber of the oven. In the partition-wall *a* are two openings, each located immediately in front of one of the fire-grates *d*, and a little above the same, for each of which openings is provided a damper or door, *f*, hinged in any suitable manner to the wall *a*, and which are opened and closed by means of levers extending outside of the front side wall *b*. By means of this construction and arrangement of the base of the oven, when an undue proportion of carbonic-acid gas or other similar gas prevails in the chamber A it may be thrown into the chamber A'. B B' are the lower frame-plates, the former of which, B, rests upon the top of the side walls *b b'*, and the latter, *b'*, rest in like manner within the end walls *g g*. These plates are made of cast metal of suitable thickness and width, and extend the entire length of the side and end walls. The two plates which rest upon the side walls are made in two sections, being spliced at the middle, where the inner ends of the two sections meet, by means of wrought-iron plates placed underneath their ends. C C C are the corner columns, which rest upon the ends of the frame-plates just men-

tioned, which latter are cleated for the purpose of receiving the base of the columns, and keeping them in position. Each of these columns is formed of two rectangular cast-iron plates, of suitable width and thickness, and corresponding in length to the height of the upper chambers of the oven, in which the heating-pipes are placed. These plates are placed in a vertical position at the corners of the structure, with their lower ends resting upon the frame-plates at right angles with each other, so as to form a square column, the angle of which stands toward the inner side of the oven, as seen in Fig. 3, while they form a triangular recess outside, and are braced by means of triangular brace-plates D, cast to the plates. The four plates, which are placed at right angles with the line of the side walls, are wider than the others, and are provided on their inner face with cleats *h h h*, upon which rest the ends of bars *i i i* which support the heating-pipes E. Midway between these corner columns, on the sides, and corresponding in height or length with the said columns, are T-shaped columns F F, which are also formed of two cast-iron plates. On the inner faces of these columns, which stand at right angles to the line of the side walls *b b*, are provided cleats *h' h' h'*, corresponding with the cleats *h h h*, already mentioned, which receive the other ends of the bearing or supporting bars *i i i*. These bars *i i i*, which are for the purpose of supporting the heating-pipes, are made of cast-iron plates, about one inch thick, and having a rib cast on each edge for the purpose of imparting additional strength. As before mentioned, the ends of these bars rest upon the cleats *h h* and *h' h'*. Upon the upper ends of the columns C C C C and F F rest the upper frame-plates G G G', which correspond with the lower frame-plates B B and B' B'. E are the heating-pipes, which are rectangular in form, and are divided vertically into two narrow branches, except for a short distance at their ends, where the two branches connect, as seen in Figs. 4 and 5. A vertical bar or stay, *j*, is provided at or near the middle of the pipe, between the two branches, for the purpose of keeping the same firmly in position and preventing lateral flexure; and upon the outer side of each are cleats *k k*, which, when the pipes are in position in the oven, fit closely against the corresponding cleats on the pipes immediately adjoining, and are for the purpose of imparting lateral support. On the upper side of the pipe, immediately over the vertical bar *j*, is a cleat, *o*, placed transversely across the pipes, which is provided with a flange on each edge, by which means a groove or recess is formed which runs across the top of each tier of pipes when placed in position upon the bars *i* in the oven; and when so placed in position a bar, *l*, made in the form of a T-rail, and of sufficient length to reach across the tier of pipes, is shoved in along this groove, so that its upper edge comes in contact with the lower sides of the next tier of pipes

above. By this means a firm support is provided for each tier of pipes, and the possibility of vertical deflection is entirely obviated. The inner surfaces of the heating-pipes are corrugated by providing two convex cones, each half an inch high and half an inch wide at the base, upon each square inch of surface, as seen in Fig. 5, by which means the area of heating surface is nearly doubled, and at the same time the lateral strength of the pipes is increased. These cones are placed in such a position relatively with each other that the air will move through the cavities at a slight angle with the line of the pipe. At the upper side of one end of the pipe, and secured by a suitable joint within a perforation provided in the same, is a connecting-tube, *m*, the end of which passes through a perforation provided on the under side of the end of the heating-pipe next immediately above; and on the under side of the other end is a perforation for receiving the connecting-tube *m* at the end of the heating-pipe next immediately underneath the same. The upper portion of the oven, in which are the heating-pipes, is divided into two chambers by the partition-wall *a*, which is extended up to the crown-arch I. J J' are oblong cast-iron chests or box-shaped pipes, secured in a horizontal position underneath the frame-plate B, and resting upon or within the side wall *b* in front of the chambers A and A'. These pipes are closed at their ends, and are each provided with a perforation or opening of suitable dimensions on their front side, at the center, the perforation in J' being for the purpose of admitting the air which forms the blast into the oven, and that in J for discharging the same when heated. The blast is admitted into the pipe J, from whence it passes through perforations provided on its upper side and in the frame-plate B, which receive the connecting-pipes *m* into the heating-pipes E in the upper chamber A. After traveling through the heating-pipes in the chamber A', it is conducted to those in the other chamber, A, by means of the pipes or chests K K, which rest upon the upper frame-plate G, and are similar in construction to the pipes J J', except that they have no perforation to admit the outer air, and are connected by means of a connecting-pipe, L. By means of these pipes K K' and L L' the blast is admitted into the heating-pipes in the upper chamber A, and after passing through the same is received into the pipe or chests J', from whence it passes in a heated condition to the tuyere. I I' represent the crown of the oven, which is formed of two arches spanning the chambers A A', and rests upon the inner edges of the upper frame-plates. These arches may be formed of fire-brick or other suitable material, with an opening in the center of each for allowing the passage of the smoke from the oven to the chimneys N N. O O' are cross-plates which support the chimneys, and which are cast-iron plates of suitable thickness and proper dimensions. Side ribs *t t* are cast upon each edge of these plates for the pur-

pose of strengthening the same. P P P P are the columns which support the chimney-plates just mentioned. These columns are formed of flat metal plates supported in a vertical position upon the upper frame-plates, and correspond in width to the width of the end of the chimney-plate which rests thereon. T-shaped plates, which form the base and cap of each column, are cast upon its upper and lower edges. R R are dampers for regulating the draft. These may be made of any suitable form and material, and operated in any convenient and well-known manner. S S are the doors which close the sides of the upper chambers of the oven, and which are hung upon the corner columns with wrought-iron hinges, and close against the columns F F. They may be made in any suitable manner and lined with fire-clay. V are port-holes for allowing access to the interior. T is a short connecting-flue built between the crown I and chimney-plates, which does not require particular description.

The advantages of my invention are obvious, and may be briefly stated as follows: In the first place, by means of the novel and peculiar form of the heating-pipes, I am enabled to obtain a very large heating-surface with comparatively a very small amount of metal used in their construction; and they are so constructed as to be almost entirely free from liability to vertical deflection. They are also provided with such lateral and vertical support that there is no danger of their becoming displaced. It will also be seen that the air in its passage through the pipes is spread out into thin sheets, and is thus brought more perfectly into contact with the heating-surfaces. Again,

by means of my improved method of arranging the lower chambers of the oven, when an undue proportion of carbonic acid or other similar gases which do not support combustion are accumulated, the same may be thrown off, so that stone-coal, and other similar fuel may be used for heating my improved oven with the best results; and I may also state that the dust and soot may be removed, when necessary, by means of the ports W in the end walls, which are on a level with the spaces between the tiers of heating-pipes.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The heating-pipes E, constructed substantially as described, for the purposes set forth.

2. The heating-pipes E, constructed substantially as described, in combination with the T-shaped bar l, for the purpose specified.

3. The relative arrangement of the chambers A A', partition-wall c, and dampers f, substantially as herein shown and described, and for the purposes set forth.

4. I also claim the heating-pipes E, constructed substantially as described, provided with conical corrugations on their inner surfaces, as herein shown and described, for the purposes specified.

5. I claim supporting the chimney N over the crown I of a hot-blast oven, upon iron columns P, substantially in the manner described, and for the purposes set forth.

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Witnesses:

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THEO. BURKHART.