H. McDONALD.
Re-heating-Furnace.

No. 203,634. Patented May 14, 1878.

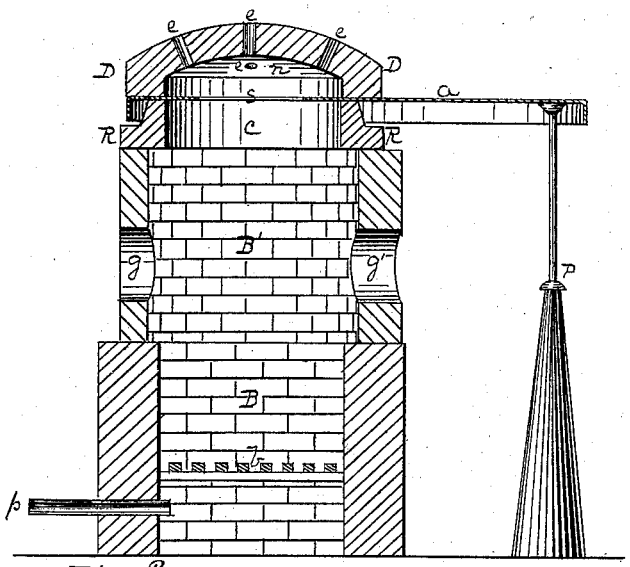

Fig. 2.

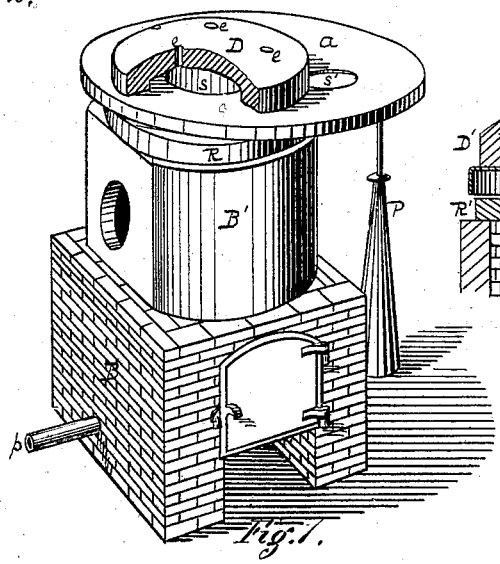

Fig. 1.

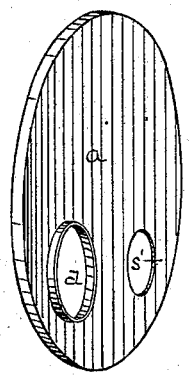

Fig. 4.

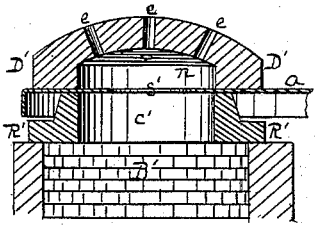

Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

HUGH McDONALD, OF ALLEGHENY, PENNSYLVANIA.

IMPROVEMENT IN REHEATING-FURNACES.

Specification forming part of Letters Patent No. **203,634**, dated May 14, 1878; application filed April 6, 1878.

To all whom it may concern:

Be it known that I, HUGH McDONALD, of Allegheny city, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Reheating-Furnace; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawing, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is an exterior view in perspective, with reverberatory arch or cap, partly in section, of my improved furnace, and illustrative of the manner of its use. Fig. 2 is a vertical sectional view of the same. Fig 3 is a like view of the upper part of Fig. 2, and illustrative of the manner of using the improvement for heating smaller-sized flue-holes; and Fig. 4 is a perspective view of a plate to be operated on.

My improved furnace is particularly designed for the heating of the flue-holes of boiler-heads, tube-sheets, &c., preparatory to the nozzling of the same, or to the bending of a flange around such holes. Heretofore such work has commonly been done by the use of an ordinary blacksmith's fire on an open or plain forge-hearth; but with such a fire, where the part to be heated has to be kept covered by or in contact with the fuel, it has been found difficult to heat the metal uniformly at all points around the hole, and the undue heating or overheating of one part is apt to so injure the plate as to spoil it for practical use.

The furnace B and flue B′ are built of any suitable material, preferably fire-brick, in any of the ways known to the art. The furnace has an ordinary fire-chamber over an ordinary grating, *b*; but, as any suitable fuel may be used, the construction of the parts for securing combustion may be varied at pleasure, according to the fuel employed. If a blast is used, it may be introduced through any suitable pipe, *p*. Above the combustion-chamber is the flue B′, which may, however, be simply an upward prolongation of the combustion-chamber to a sufficient height above the fire below, such that no solid fuel shall come in contact with the plate *a* or flue-hole *s*, which is to be heated.

The amount of plate which it is necessary to heat will vary with the size of the flue-hole and the depth of flange to be turned thereon, and an economical use of fuel and expenditure of heat require that little or no more of the plate should be heated than is necessary as a preparatory step to bending; and while it is obvious that the flue B′ may at its upper end be contracted to or made of such size as to heat the proper area of plate where the holes vary but little, if at all, in size, I have found it better to provide removable and interchangeable throat pieces or rings, which may be placed on top of the flue, so as thereby to contract or enlarge at pleasure the size of the opening or throat. While not limiting myself to any exact proportions, I deem it best to provide, in this way, a throat or flue opening the diameter of which will be, say, from two to six inches (more or less) greater than the outside diameter of the flange to be formed; but these dimensions are not material, provided only the furnace have the capacity of giving a good bending heat to the plate through so much and such part of it as is to be subject to the nozzling effect.

Two such throat-pieces are shown at R R′. They are made preferably of fire-brick banded together. They are made, as shown in the drawing, sufficiently large to rest upon the top of the flue B′; but the openings through them are reduced in diameter or area, so that at the upper side or end such opening has an area corresponding closely or approximately to the area of the plate which it is desired to heat, and the amount of such reduction varies in the different throat-pieces. Thus the throat-piece R has an opening, *c*, which adapts it for use in heating the metal of the plate *a* to the desired radial extent around the flue-hole *s*, preparatory to the nozzling of the same, as shown at *d*, Fig. 4, while the throat-piece R′ has an opening, *c′*, which adapts it for like use as regards a smaller flue-hole, *s′*. In this way I make provision for the heating on one side of the desired area or depth of plate immediately around flue-holes of different sizes.

In order to secure the like action of the heat on the upper side of the plate, and to about the same depth or over the same area of surface, I employ a reverberatory arch or cap, D

or D′, the different caps differing as to sizes in accordance with the described differences of the throat-pieces. These caps are also made of fire-brick banded together, or of other suitable material, and in any suitable way. They are made somewhat of the form of the cap or cover of a pepper-box, each with a chamber, *n*, on the under side, preferably dome-shaped, or approximately so, and the area of such chamber in horizontal section is such that the desired area of plate shall on its upper face be exposed to the action of the flame and heat, which, passing up through the flue-hole in the plate, is reverberated or deflected downward onto the exposed area of the plate, or is so confined as to act thereon; but to keep up the flow of flame and heat, escape-holes, *e*, in any desired number or order of arrangement, are made in the cap.

In operation the proper throat-piece is put onto the top of the flue B′, the plate is placed thereon, with the flue-hole of the plate over about the center of the flue, and the cap of the proper size is placed on the plate over the flue-hole, substantially as shown in the drawings. When the flue-hole is near the edge of the plate the opposite edge may be supported by a post, P, or in other convenient way. After the proper bending heat has been secured in the plate immediately around the flue-hole, the nozzling is done in the usual or any known or desired way.

It is comparatively immaterial at what point or place in or part of the furnace the heat is applied to the plate, provided only that it be away from the fuel. Hence the plates, instead of being placed on top of the flue B′, may be placed and supported in any convenient way opposite a lateral opening, *g* or *g′*, in the side of the flue, the top, in such case, being closed.

In such mode of working or using the invention the throat-piece may be used or not, as before; but the best results require the use of reverberatory caps or arches outside the plates, in order to secure the proper heating of the exterior. When *g* or *g′* is used, the top of the flue B′ should be closed, and vice versa, the important feature in this respect being that the direct line for passage of heat and flame should be through the opening or throat thus utilized for heating purposes.

This apparatus I have found much more convenient for the purpose than any other now known to me, while it provides for heating uniformly and to the desired degree so much and only so much of the plate as needs to be heated, thus involving convenience and rapidity of manipulation, economy of fuel, and freedom from the loss which attends the use of fuel over and on the parts to be heated.

In so far as relates to the use of an open-topped or open-sided flue, I do not include herein any flue the opening or discharge-throat of which is not easily accessible to the workman in putting the plate or other article to be heated thereon or applying it thereto; and herein lies the distinction between the flue which I employ and an ordinary chimney, and for this purpose I designate my flue as a "low flue." Also, while I prefer to make the caps removable, or at least adjustable for convenience in manipulating the plates, they may also be fixed in position, and a horizontal slit be left for the insertion and removal of the plates, particularly if the plates are not previously flanged; and by the term "plates," as used herein, I mean plates having flue-holes made therein preliminary to nozzling; but in such case the slit or opening must extend outside of or beyond the furnace-flue opening, so as to make provision for the heating of the plate to only the desired extent around the flue-hole cut therein, the rest of the plate being protected as against heat by the horizontal faces of the slit above and below.

I claim herein as my invention—

1. The combination of a combustion-chamber, a low flue, a reverberatory cap or arch, and a space between the top of the flue and the cap or arch for the insertion of a plate, whereby, while a portion of the plate around the flue-hole cut therein shall be exposed to the action of the heat above and below, the rest of the plate will lie outside of the heating-spaces, substantially as set forth.

2. The combination of a combustion-chamber, a low flue, and a removable reverberatory cap or arch, substantially as set forth.

3. Removable and interchangeable throat-pieces R R′ and caps or arches D D′, as appendages to a heating-furnace, substantially as and for the purposes set forth.

4. The combination of combustion-chamber, low flue, throat-piece, and cap or arch, substantially as set forth.

In testimony whereof I have hereunto set my hand.

HUGH McDONALD.

Witnesses:
J. J. McCORMICK,
CLAUDIUS L. PARKER.