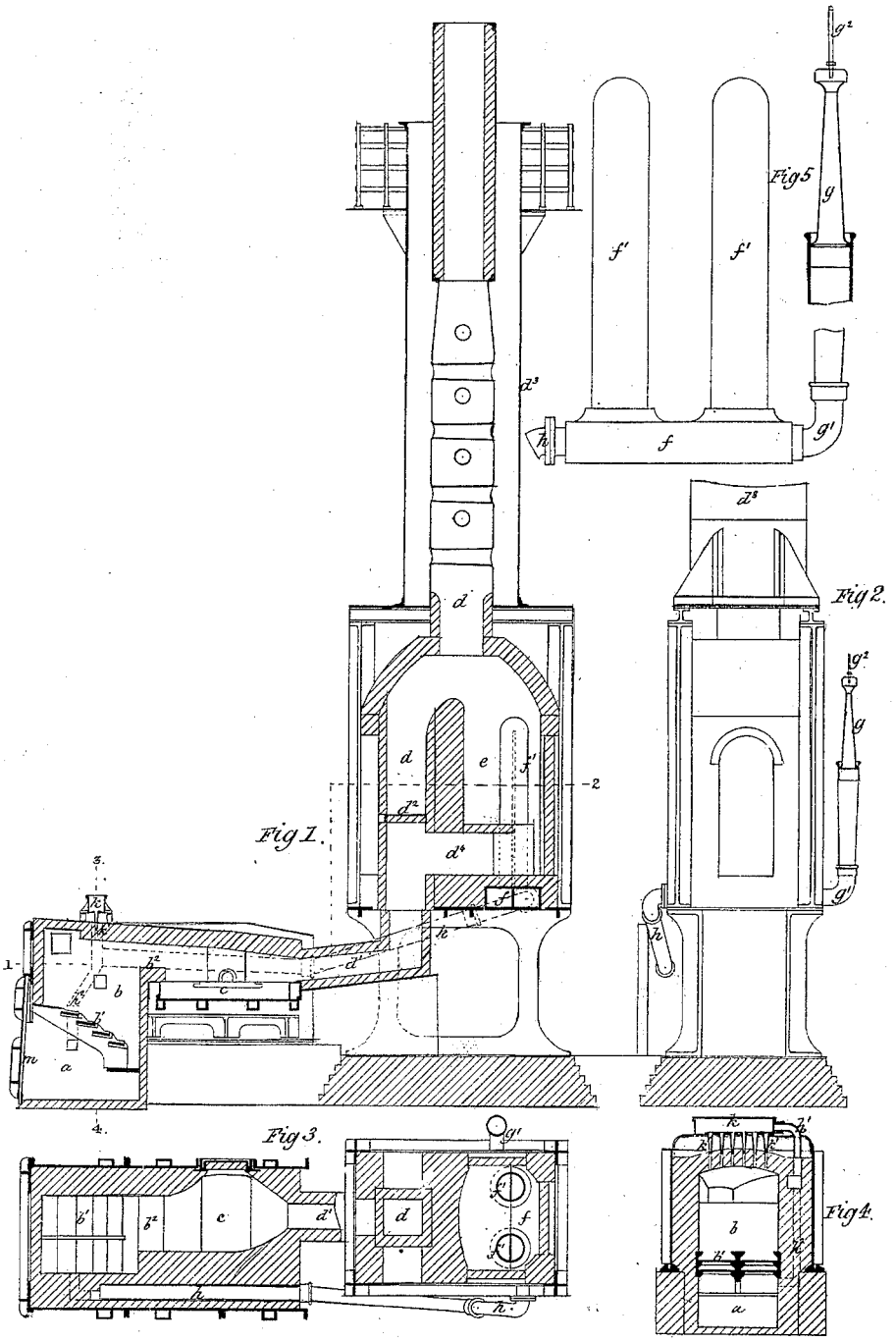
J. A. JONES, R. HOWSON & J. GJERS.

PUDDLING AND OTHER FURNACES.

114,151. Patented Apr. 25, 1871.



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Letters Patent No. 114,151, dated April 25, 1871.

IMPROVEMENT IN PUDDLING AND OTHER FURNACES.

The Schedule referred to in these Letters Patent and making part of the same.

We, JOHN ALLCOCK JONES, RICHARD HOWSON, and JOHN GJERS, all of Middlesborough-on-Tees, in the county of York, England, engineers, have invented "Improvements in Puddling and other Furnaces employed for melting, boiling, or heating iron," of which the following is a specification.

This invention consists in a mode of utilizing the waste heat of puddling and other similar furnaces by causing it to heat a mixture of air and steam, and in some cases where desired to generate steam, which mixture of air and steam so heated is employed for the combustion of fuel, thereby economizing the consumption thereof and preventing smoke.

The mode of carrying out our invention is as follows:

We place the heating-pipe or pipes in the up-take of the chimney, or in a chamber, or in flues having communication with the chimney, and we apply a jet or jets of steam at the point where the air enters such pipe or pipes. By this means the air is forced in under a certain degree of pressure and mixed with steam, and the whole is heated ready for introduction into the furnace. For this purpose the pipes are caused to branch in such a way that one portion of the mixture of air and steam may pass into the space below the fire-bars and the other portion into the space above the fuel.

In order to prevent the entrance of cold air into the space under the fire-bars the ash-pit is fitted with doors, and a slight excess of pressure of air is maintained therein.

Figure 1 of the drawing is a longitudinal vertical section of a puddling-furnace with the improved arrangements for heating and distributing the mixture of air and steam attached thereto, and showing, also, the application of a vertical boiler heated by the waste heat for the purpose of generating steam;

Figure 2 is an external end elevation of the furnace, the upper part of the steam-generator being broken away;

Figure 3 is a sectional plan view of the same furnace taken along the line 1 2 in fig. 1, showing the heating arrangement for the mixture of air and steam;

Figure 4 is a transverse vertical section taken along the line 3 4, fig. 1; and

Figure 5 is an enlarged sectional view of the steam-jet apparatus.

The same letters of reference are used for the same and corresponding parts in each figure of the drawing.

a is the ash-pit.

b^1, the fire-bars of a stepped grate.

b, the fire-place.

b^2, the fire-bridge.

c, the hearth of the furnace.

d^1, the flue leading to the chimney.

d, the chimney, which may be either an ordinary stack or may form the central flue of a vertical boiler, d^3, if preferred.

We will first describe the arrangements which may be employed for mixing and heating the air and steam, and then the manner of using such mixture.

A damper, d^2, is arranged in the chimney d, by which the whole or part of the heated products of combustion may be diverted and made to pass through the opening d^4 in the side of the chimney into a heating-chamber, e, communicating at the upper end with the chimney again above the damper d^2.

In the lower part of the heating-chamber e an iron box, f, divided into two parts, is fixed, and upon this box two pipes, f', are secured, each of which is also divided by a partition that terminates short of the upper closed end of each pipe.

One side of the pipes f' is open to one division of the box f, and the other sides of the pipes to the other division of the box.

A mouth-piece, g, is fitted to a pipe, g^1, attached to one division of the box, (see fig. 2,) and a jet of steam is brought by a pipe, g^2, provided with a stop-cock, opposite the mouth-piece, (see fig. 5,) thus causing a current of mixed air and steam to enter the first division of the box. It then ascends one side of the pipes f' and descends the other side into the second division of the box, and is thus heated; and from the box f it is conveyed away by a pipe, h, to be distributed as hereinafter described.

This pipe h is partly built in the wall of the furnace, (see fig. 3,) and communicates with an ascending and descending passage formed within the brickwork.

The ascending passage communicates by a pipe, h^1, fig. 4, with a box, k, passing across the top of the furnace, and by means of a number of nozzles, k', in the box at intervals across the furnace, or a continuous slit, a portion of the mixture is discharged so as to meet the unburned gases as they pass over the bridge. The remainder of the mixed air and steam is conveyed by the descending passage h^2 into the ash-pit, the front of which is closed by doors m.

Valves may be placed in the pipe h to regulate the supply of mixed air and steam at any convenient place.

The pipe h may be made to branch in two directions, one to supply the nozzle-box k and the other the ash-pit a, and in this case a valve may be placed in each branch, so that the supply to the nozzle-box k and to the ash-pit a may be adjusted separately;

but in ordinary cases no valves are required, and none, therefore, are shown.

It will thus be seen that the otherwise waste heat may be caused not only to heat a mixture of air and steam for supporting combustion, but may also in some cases, when found desirable, be further economized for generating steam.

When building a new furnace without the boiler it is preferred to erect a plain chimney or stack in the crown of the heating-chamber *e;* but where the improvements are to be adapted to an existing furnace and stack it is simply necessary to build a heating-chamber at the side of the stack and to provide openings at the top and bottom of such chamber leading into the chimney above and below the damper d^2.

We have hitherto described our invention as applied to a puddling-furnace, but it is equally applicable to all heating or reverberatory furnaces used in the manufacture of iron and steel.

Having now described and particularly ascertained the nature of our said invention, and the manner in which the same is or may be used or carried into effect, we would observe, in conclusion, that what we consider to be novel and original, and therefore claim as our invention, is—

The combination, with a puddling-furnace, of appliances substantially as described, whereby air and steam may be combined, the mixture heated without decomposing either gas by the waste heat of the furnace, and then introduced into the furnace to support combustion, as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

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RICHARD HOWSON.
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