

J. L. SMITH.

CONSTRUCTION OF PUDDLING OR OTHER FURNACES.

No. 519,620.

Patented May 8, 1894.

Fig-2-

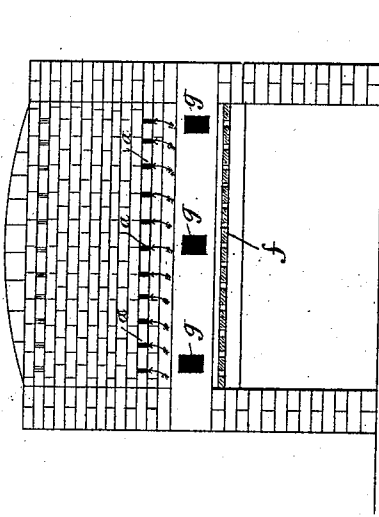


Fig-7-

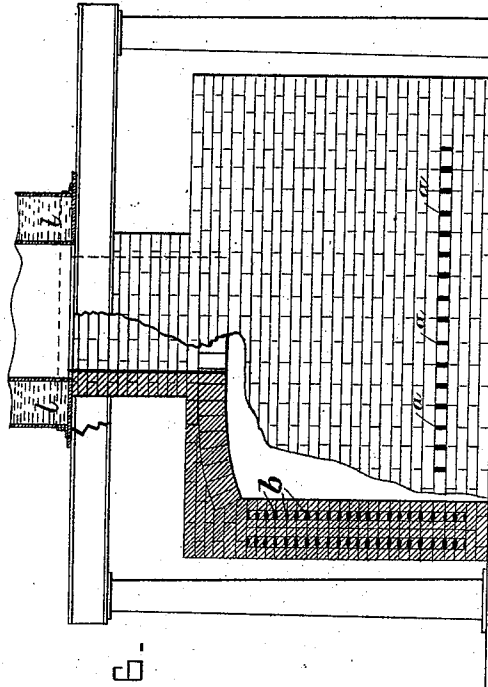


Fig-1-

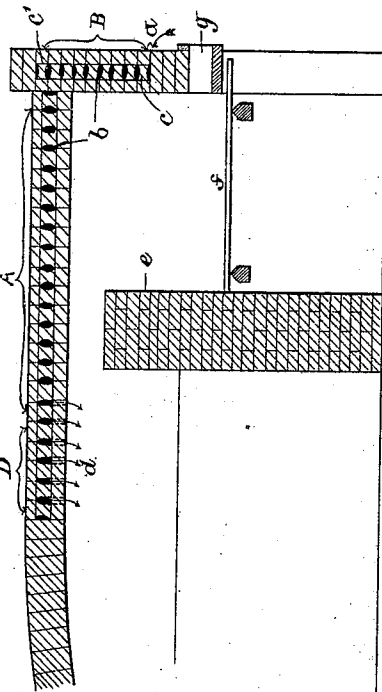
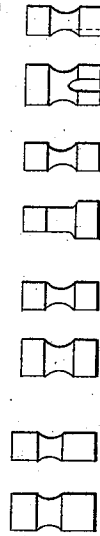


Fig-3-Fig-4-Fig-5-Fig-6-



Witnesses:

Louis P. Keller.
John E. Wilson.

Inventor:

John Law Smith,
by Whitman & Wilkinson
Attorneys.

(No Model.)

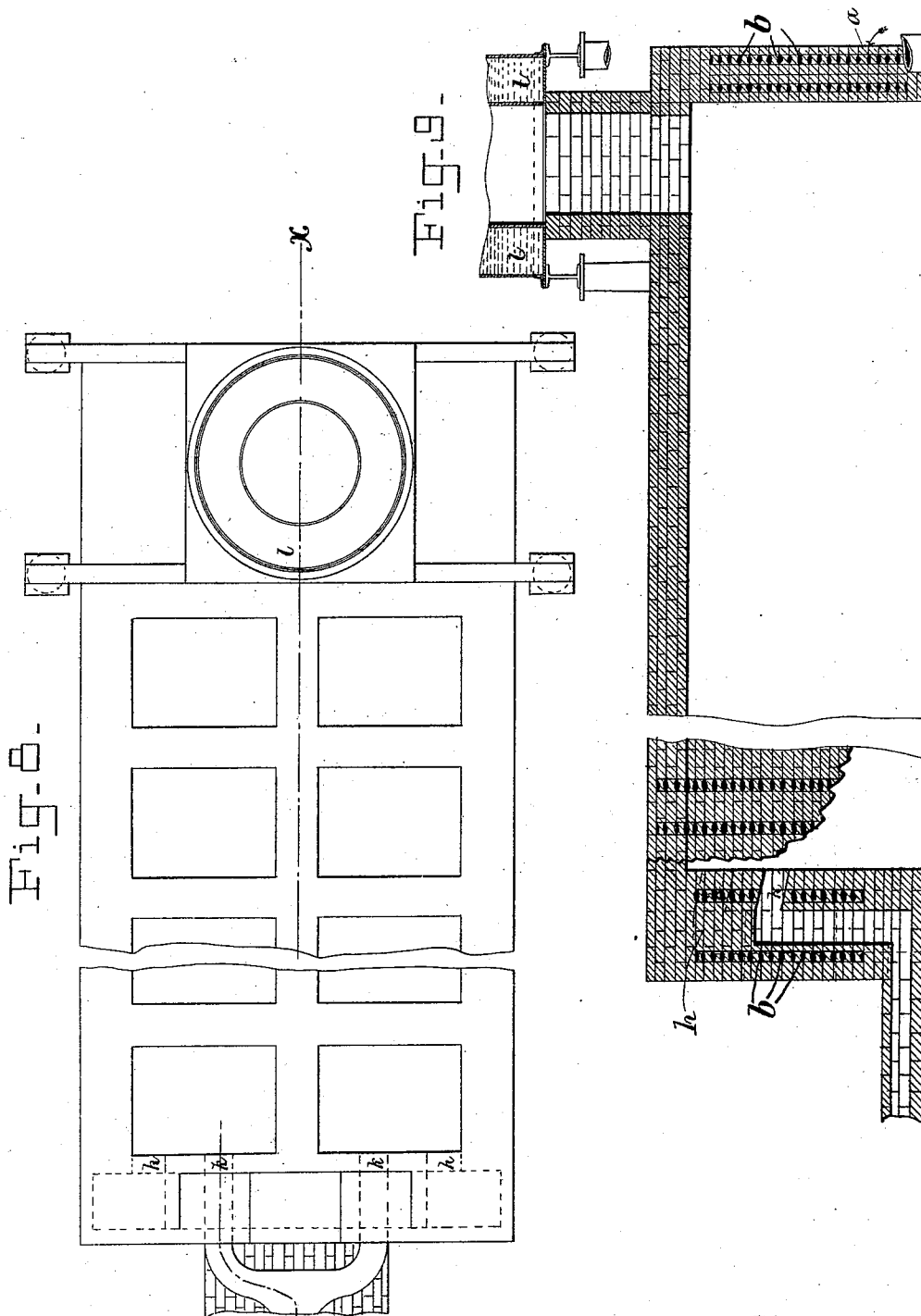
3 Sheets—Sheet 2.

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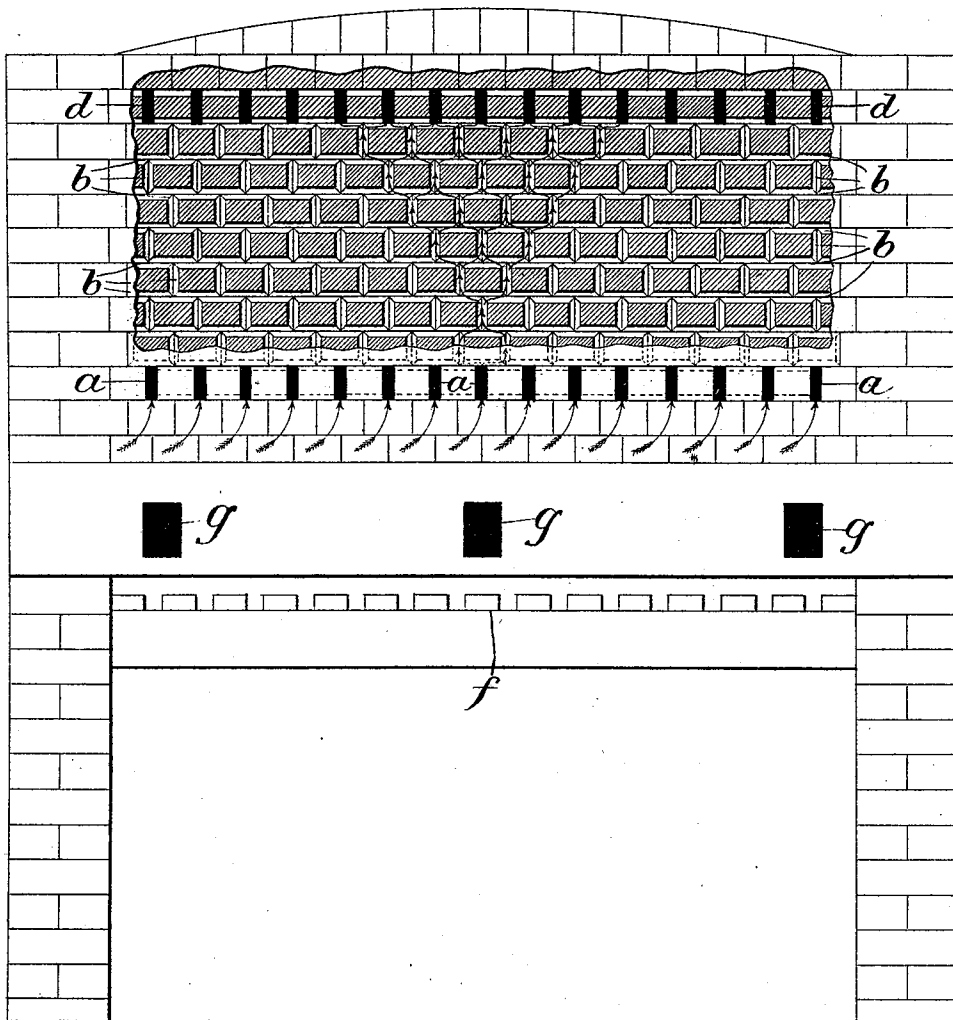
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FIG. 10.



Witnesses:

John E. Wilson.
Percy C. Bowen.

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UNITED STATES PATENT OFFICE.

JOHN LAW SMITH, OF WEST HARTLEPOOL, ENGLAND.

CONSTRUCTION OF PUDDLING OR OTHER FURNACES.

SPECIFICATION forming part of Letters Patent No. 519,620, dated May 8, 1894.

Application filed March 16, 1893. Serial No. 466,303. (No model.) Patented in England March 2, 1892, No. 4,106; in France February 2, 1893, No. 227,609, and in Belgium February 20, 1893, No. 103,510.

To all whom it may concern:

Be it known that I, JOHN LAW SMITH, a subject of the Queen of Great Britain, residing at West Hartlepool, in the county of Durham, England, have invented certain new and useful Improvements in the Construction of Puddling or other Furnaces, (for which I have obtained patents in Great Britain, No. 4,106, dated March 2, 1892; in France, No. 227,609, dated February 2, 1893, and in Belgium, No. 103,510, dated February 20, 1893;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the class of furnaces known as puddling, mill, reheating, and forge furnaces, or the like structures such as gas furnaces and soaking pits into which air can be advantageously admitted in the manner hereinafter described.

In describing my invention I will in the first place refer to its application to puddling and reheating furnaces of the usual design. Puddling and reheating furnaces are constructed with walls and roof of solid brickwork, the whole of the air required for the combustion of the fuel being admitted through the furnace grate. It is found in practice that although the heat generated within the furnace in this manner is sufficient to effect its intended purpose, a waste of fuel results owing to a proportion of the elements of combustion passing out of the furnace unconsumed and to the waste of the heat in the upper region of the furnace which impinges upon and is absorbed into the brickwork of the roof and adjoining parts which in consequence require frequent renewal.

I am aware that in order to protect the brickwork and utilize the heat which impinges upon it, flues or unobstructed passages have been formed taking a vertical direction in the end wall and then running along the roof through which the outside air is drawn into the furnace whereby the heat of the upper region of the furnace which has hitherto expended itself in overheating the brickwork

is made to serve the useful purpose of heating the incoming air, while the air so admitted serves the useful purpose of keeping the brickwork cool and of promoting a more perfect combustion within the furnace. The object of my invention is to effect improvements in attaining the same results namely, to utilize the heat which is absorbed into the roof and upper brickwork of the furnace by heating air which is drawn through the said brickwork into the furnace by which the brickwork is kept cooler, and heated air is delivered into the upper region of the furnace to assist in promoting the more perfect combustion of gaseous products which otherwise escape in the form of smoke. And in order that my invention may be fully understood and readily carried into effect, I will now proceed to describe the same with reference to the accompanying drawings, in which—

Figures 1 and 2 illustrate my invention as applied to a puddling or reheating furnace of the ordinary design. Figs. 3, 4, 5, and 6 show different forms of brick used in the construction of the furnace or soaking pit. Figs. 7, 8 and 9 illustrate my invention as applied to a soaking pit, Fig. 9 being a longitudinal sectional view on the line $x x$ of Fig. 8, with part of the side wall broken away to show the interstices therein. Fig. 10 is an enlarged front elevation partly in section, showing the interstice as formed in the wall.

In applying my invention to a puddling or reheating furnace from which its application to furnaces generally will be readily understood I construct the roof and upper brickwork wholly or in part of bricks specially molded or constructed for the purposes of my invention and substantially in the form of which the modifications required in constructing the furnace shown in Figs. 1 and 2 are illustrated in Figs. 3 to 6 inclusive, that is to say, that brickwork so constructed includes numerous interstices forming tortuous and intersecting passages or ramifications through which outside air is drawn into the interior of the furnace on the well known principle of checker work and with a view of bringing the incoming air into intimate

contact with as large an area of heated brick surface as possible.

Referring to Figs. 1 and 2 in which the puddling furnace is of the ordinary design and the precise form indicated by the drawings is given for the purposes of illustration only, *a a a* are holes in the breast of the furnace into which the outside air is first admitted. The air then becomes diffused among the passages and interstices *b* until it reaches the bricks *D* in which openings *d* are provided through which the air is discharged into the interior of the furnace just beyond the furnace bridge *e*. As it is essential that the above described interstices and passages be provided without resorting to brickwork of unusual thickness it will be understood that specially constructed bricks must be used; these special bricks as adapted for the purpose of my invention, take the form shown in Figs. 3 to 6 inclusive, that is to say, the central part of each brick is hollowed out while the ends present the usual faces for surface contact subject to such modification as the general construction of the furnace may require, as for instance, Fig. 3 is the form of brick used at A, Fig. 4, being the form of brick used at B, Fig. 5 at C to provide for the holes *a*, communicating with the outside air and at C' for communicating endwise with the roof; and Fig. 6 at D to provide for the holes *d* communicating with the interior of the furnace. Any desired number of pores or openings communicating with the internal interstices are provided as required to admit outside air both on the outer surface and on the inner surface to deliver the air so admitted into the interior of the furnace. In furnaces constructed with my improved porous roofs or upper walls the usual grate is provided below or at the end of the furnace to support the combustion of the fuel as in puddling and reheating furnaces of the ordinary construction. *f* is the usual fire grate which draws in air through the bars in the usual manner to excite the combustion of the

fuel for generating gas, and *g g g* are stoke holes for stoking the fire.

Referring to Figs. 7, 8 and 9 which illustrate my invention as applied to a soaking pit it will be observed that the interstices and passages are formed in the side and end walls of the furnace, the air entering in at the openings *a* and threading its way along to the air ports *h* where it combines with the gases from the gas ports *K* in the manner required for combustion. *l* is an annular boiler constructed and erected to serve as the uptake for the products of combustion, the waste heat of which is thereby intercepted and utilized for generating steam.

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

1. In a furnace, the combination with a fire chamber; of walls having horizontal air passages therein and vertical openings connecting the said horizontal air passages in pairs, the said vertical openings in each course breaking joint with those of the next course, and openings connecting the lower horizontal air passages with the air outside of the furnace wall, and openings from the upper horizontal air passage into the fire chamber, substantially as and for the purposes described.

2. A furnace having the roof and walls thereof constructed of recessed bricks forming horizontal and vertical air passages therein, the said air passages breaking joints with each other, forming tortuous passages for the air, the lower courses of openings communicating with the external air, and the upper courses of openings communicating with the interior of the furnace, substantially as and for the purposes described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN LAW SMITH.

Witnesses:

GEORGE JAMES CLARKSON,
EDWARD THOMAS ELCOAT.