

Specification of James Yates : furnaces and fire-places.

Contributors

Yates, James.

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A.D. 1839 N° 8244.

S P E C I F I C A T I O N

OF

JAMES YATES.

FURNACES AND FIRE-PLACES.

L O N D O N :

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
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1854.





A.D. 1839 N° 8244.

Furnaces and Fire-places.

YATES'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JAMES YATES, of the Effingham Works, Rotherham, in the County of York, Iron-founder and Earthenware Manufacturer, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her
5 Royal Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Nineteenth day of October, in the third year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said James Yates, Her especial licence, full power, sole privilege and authority, that I, the said James Yates, my executors, administrators, and assigns, and such others
10 as I, the said James Yates, my executors, administrators, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein mentioned, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick upon Tweed, my Invention of "**CERTAIN IMPROVEMENTS IN THE CONSTRUCTION OF**
15 **FURNACES;**" in which said Letters Patent is contained a proviso obliging me, the said James Yates, by an instrument in writing under my hand and seal, particularly to describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, and to cause the same to be inrolled in Her Majesty's High Court of Chancery within six calendar months
20 next and immediately after the date of the said in part recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

Yates's Improvements in the Construction of Furnaces.

NOW KNOW YE, that in compliance with the said proviso, I, the said James Yates, do hereby declare that the nature of my said Invention, and the manner in which the same is to be performed, is particularly described and ascertained in and by the following description thereof, reference being had to the Drawings hereunto annexed, and to the letters and figures marked 5 thereon, (that is to say):—

My improvement in furnaces, as applicable to the cupola furnace for melting metals, consists, first, in constructing that part of the interior where the fuel and material is placed in such a manner as to arrest as much as possible the escape or progress of the caloric, unconsumed air, gases, spark, dust, or other matter, 10 which in the ordinary cupola furnace is allowed to pass freely away, these furnaces having an open chimney and open feed hole. I accomplish this in the following way:—I place an impinging or arresting arch, dome, or ceiling over the hearth and boshes, or a partial arch, dome, or ceiling over the hearth and boshes, at a short distance above where the fuel and material is placed. 15 I close up the feed hole by a door or otherwise, and leaving only a small aperture in the ceiling, or in one or more of the sides sufficiently large only to allow such gases, &c. to escape as cannot be consumed in the furnace. My improvement consists, secondly, in introducing a series of impinging arches, ceilings, or shelves, for the more effectually arresting the escape or progress of 20 the gases, spark, dust, &c.; and, thirdly, in introducing a valve or damper at the top or other part of the chimney, for the purpose of regulating the escape of the gases, &c. The advantages I gain over the ordinary cupola furnace, which has an open chimney and open feed hole, are, first, the retaining and making use of a large portion of heat, which in the old cupola would pass away, 25 by the application of which heat, together with the exclusion of cold atmospheric air, the material to be melted is forwarded very much in the process of melting, requiring much less fuel, and by being melted much quicker; and the melting taking place considerably higher, or at a greater distance from the admission of the blast, much time is saved; and there is considerably less 30 waste of metal by oxidation than in the old cupola, where the melting takes place near the blast, and being longer exposed to its action; secondly, there is also considerable saving of fuel during the intervals of melting when the hearth has to be filled with fuel to keep up the heat, at which times in the old furnace a large portion is consumed in consequence of its exposure to 35 the action of the atmosphere, whereas in the improved furnace, all is closed up, excepting a small portion of the damper hole, and by which means the heat is kept up and little or no fuel is consumed; thirdly, the spark, dust, &c. (which from the ordinary cupola issues forth to the great annoyance of all

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around, and detriment to the work going on,) is by these improvements totally consumed or caught upon the shelves. My improvement as applicable to blast furnaces for melting or smelting ores consists, first, in placing the impinging arch, dome, or ceiling, or the partial arch, dome, or ceiling, over the
5 hearth and boshes, and near to the same, for the purpose of confining the heat as much as possible, as before described; secondly, in forming one or more shelves on the top or above the said arch, dome, or ceiling, for the purpose of placing the ore upon and exposing it with or without a very small portion of fuel to the action of the heat that would otherwise pass
10 away uselessly. The ore having been thus exposed to the heat for a sufficient length of time is brought into a state of preparation for smelting, which smelting is more actively going on within the boshes, and into which place it is removed by stokers, or any other more convenient means, the whole or the greater part of the fuel being introduced directly into the boshes without
15 being exposed to the action of the heat, or being exposed but a short time; thirdly, in introducing a damper or dampers at the top or any other situation for the purpose of regulating the escape of the gases, &c. &c. The advantages I gain over the ordinary blast furnace which has the high shaft without inter-ceptions in the interior, and with open top, are, first, the saving a large portion
20 of fuel when the furnace is first set to work, as it needs only to be filled to or near to the impinging arch. Secondly, the saving of the whole or nearly the whole of the fuel that is consumed in its passage from the top of the ordinary furnace to the boshes. Thirdly, in the small expences and short time required in blowing out the furnace for repairs or other purposes, and starting again.
25 Fourthly, in the small power required for blowing, the blast being required soft or of low pressure, not having so heavy a mass to force its way through. My improvement as applicable to the furnaces and chimneys of locomotive and steam packet engines, and other furnaces and chimneys, is in introducing the impinging or arresting partitions or shelves into the interior of such
30 chimney, furnace, or flue, by which means spark, dust, or other substances are consumed or caught upon the shelves, or in receptacles prepared for that purpose, and by which means also, when the steam is turned into the chimney, the water from the condensed steam is prevented escaping from the top of the chimney, and is conveyed by the channels upon the shelves to the receptacle
35 prepared for them. And for the better securing drafts, and preventing gusts of wind from blowing down the chimney, I use my balance hood; when the steam is allowed to escape through a separate pipe, not through the chimney, the impinging or arresting shelves may be made as if to prevent the water escaping from the top, in the same way as within the chimney. The

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advantages of the above improvement are obvious from this description. My improvement as applicable to the furnaces of stoves for giving out heat, is in introducing the impinging or arresting partition or shelves, which partition or shelves for this purpose I make hollow, leaving an opening through each, so that a current of air may pass through, by which means I expose a large 5 heated surface to the surrounding atmosphere, which carries off the heat that would otherwise pass up the chimney. My improvement in furnaces extends to the mode of manufacturing bricks to make them withstand the action of the intense heat to which they are exposed, which I accomplish in the following manner:—I take the clay usually used for fire bricks, and temper it in the 10 usual manner. I then form it into thin sheets or cylinders, or other shapes, so as to leave sufficient room when piled in the kiln for the heat to get freely round them. I bake these sheets, or other shaped pieces of thin clay, in a very high degree, and when this is done, I have them crushed down into pieces, the size of peas or small beans, which pieces I put into strong moulds made to the 15 form required, and amongst which I pour a thin “slip” or mixture made of a small portion of the best fire clay mixed up with rice water. I make the rice water by soaking or creeing the rice for a considerable time, and then boiling it up well; when the pieces of baked clay and the “slip” are thus put in the moulds, I compress them in the mould by a powerful press or stamper, and 20 then bake them in the kiln to a very high temperature.

Having now described my Invention, I proceed to describe the Drawings or Figures as follows:—Fig. 1 represents the exterior or front of the cupola for melting metals on the side where it is fed; *f, f*, cast iron columns; there are four of these, as shewn in plan; *d, d*, the barrel, made of wrought or cast iron; 25 I prefer wrought iron; *e*, a plate of cast iron, resting on the top of the columns, with a raised moulding, forming a rabbet to hold the lower part of the corner plates *g, g*, which are further secured by screw bolts, as shewn; *a*, the door, of cast iron, closing up the feed hole; this door is either hung on hinges to open sideways, or on arched levers balanced, so that it may be easily raised perpen- 30 dicularly; the interior of this door is lined with fire brick; *b*, a second feed door, to be used whilst the cupola is at work; *c, c, c*, are smaller doors, so situated that a “cole” or rake may be introduced through them to clear away the dust, &c. from the shelves; *h*, the regulating damper or valve, with balance lever, made with one, two, or more doors; I prefer four; by those levers pre- 35 senting inclined planes causes the wind to glide off from every quarter, thereby preventing it blowing down or pressing upon the interior of the chimney; the round plates and bolts shewn are to hold the masonry together. Fig. 2 represents the interior or section of Fig. 1; *n*, the tapping hole from whence the

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metal is drawn out; *i*, the hearth; *k*, the "boshes" or oven, where the metal and fuel are placed; *l*, the first impinging arch, roof, or ceiling; *m*, *m*, *m*, other impinging arches, arresters, or shelves. Fig. 3 represents another exterior or side view of the same, letters referring to the same parts as in Figs. 1 and 2; *d*, the barrel; *m*, the tapping hole; *f*, *f*, the columns; *e*, the plate on which the masonry rests; *g*, *g*, the corner or bracing plates. Fig. 4 represents another section in the line *c*, *d*, in Fig. 6, the same letters referring to the same parts as Figs. 1, 2, and 3; *i*, the hearth; *k*, the boshes or oven; *l*, the first impinging arch, roof, or ceiling; *m*, *m*, *m*, *m*, *m*, *m*, other impinging arches, arresters, or shelves; *a*, the door closing up the first or larger feed hole; *b*, the door closing up the second or smaller feed hole; *c*, *c*, *c*, the doors closing up the openings through which the shelves are cleaned; *i**, *i**, twyers through which the air is admitted to the furnace. Fig. 5 represents the interior differently arranged to Fig. 4, the impinging arch being reversed, and the smaller feed hole so situated that material may be placed upon the top of it, so as to receive heat passing away, and thus become better prepared to enter the oven or boshes. Fig. 6 is a horizontal section across *x*, *x*, Fig. 1; *f*, *f*, *f*, *f*, the column; *d*, the barrel; *i*, the hearth; *n*, the tapping hole. Fig. 7 is another horizontal section taken at *y*, *y*, Fig. 1; *i*, the hearth; *k*, the oven or boshes; *a*, the door; *e*, *e*, the plate resting on columns and upon which the masonry stands. Fig. 8 represents another arrangement of the interior; *i*, the hearth; *k*, the oven or boshes, without door; *l*, *l*, the impinging arch with a small opening in the centre through which the material is passed after having been exposed to the heat in the upper oven *p*. Fig. 9 another arrangement with upper ovens. Fig. 10 represents only one impinging arch, dome, or ceiling, or partial arch, dome, or ceiling, having a small opening through the centre, and *r*, a narrow shaft or chimney; this may be used without any other impinging arches, arresters, or shelves, being a cheaper furnace to fix than any of the others, but it is inferior to any of them. Fig. 11 represents the furnace with one impinging arch and with horizontal flue *s*, shewn by the dotted lines, or with a descending flue *t*; either of these flues may be carried to any shaft at a distance. Fig. 12 represents the interior of a furnace of larger dimensions adapted more particularly for the smelting of ores, the shelf over the impinging arch or dome *b* being the place where the principal portion of the fuel is introduced, and the upper shelf *m*, or as great a number of them as may be required, are for the purpose of holding the ore to be exposed to the action of the heat that is passing away. *z* is an opening through which the stoker passes. This furnace has the regulating damper. Fig. 13 represents another view of the interior of a furnace adapted for the smelting of ores, having a large

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upper oven immediately over the first impinging arch *l, l*, to heat and prepare the ore before it is passed into the first oven or boshes *k*. *v, v*, are apertures in the upper roof or arch through which the material is conveyed from the shelves; these apertures are provided with covers to prevent the heat escaping, and may be increased in number as may be most convenient. *w* is an 5 aperture over the centre or hearth, through which the fuel or the principal portion of the fuel is conveyed directly within the first oven or boshes *k*. *u, u*, are openings through which the stokers pass; these stokers sliding through balls, which balls work in sockets, as shewn at *u^x*. *r, r*, are chimneys which have regulating dampers attached to them for the purpose of regulating the escape of 10 gases, &c.; these chimneys may be increased in number. Fig. 17 represents the lower part of a furnace for melting or smelting metal or ore, or for other purposes, with a series of vertical apertures at or near the bottom, sloping downwards towards the interior; through these apertures the air is forced by the pressure of the external atmosphere, instead of a forced blast by machinery, 15 the quantity admitted being regulated by the damper; the apertures or twyers here described, as well as those for the other furnaces, I form in strong moulds in the manner before described for the bricks. I do not confine myself to the particular forms here represented for my furnaces, but to the principles hereafter described. Fig. 14 is a section of chimney and balanced circular hood 20 for locomotive or steam packet engines, or any other chimney in which my impinging or arresting shelves *b, b, b, b, b, b, b, b*, are placed for the purpose of arresting and consuming or catching spark, dust, or other substance, as well as condensed steam, and thereby preventing its escape from the top of the chimney. On the top is placed a hood *f*, resting upon a rounded collar *h*, and 25 being balanced by the ball *g*, a very small pressure of wind will press the side next the wind close to the chimney; the other side becoming open prevents the wind blowing down the chimney. Fig. 15 is a section of chimney, shewing the impinging or arresting shelves so arranged that the dust or water may glide off and be deposited in the receptacle *d*. Fig. 16 is a section of a furnace or 30 stove with my impinging shelves made hollow; *e*, the furnace or fire-place; *b, b, b, b*, the impinging shelves; *c*, the escape pipe. I claim as my Invention as applied cupola furnaces for melting metals, first, the impinging arch, dome, or ceiling, or partial arch, dome, or ceiling. N.B.—This may be used alone without any other of my improvements. Secondly, the closing up of the feed hole or 35 feed holes by a door or otherwise. N.B.—This may be used alone without any other of my improvements. Thirdly, the feeding over the arch, dome, or roof. Fourthly, the series of refracting or arresting arches or shelves. Fifthly, the regulating damper, in any form or situation, and more particularly with two or

FIG. 1.

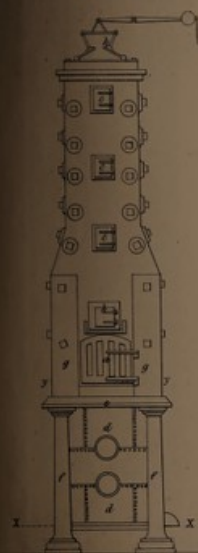


FIG. 2.



FIG. 3.

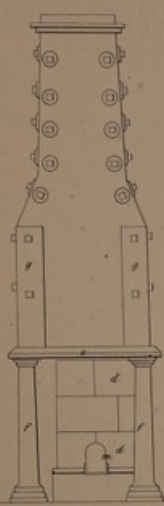


FIG. 4.



FIG. 5.

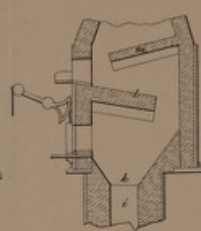


FIG. 6.

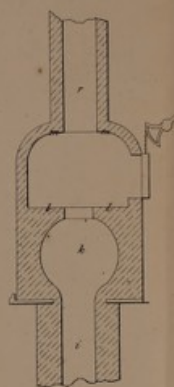


FIG. 14.



FIG. 15.



FIG. 6.



FIG. 7.



FIG. 12.

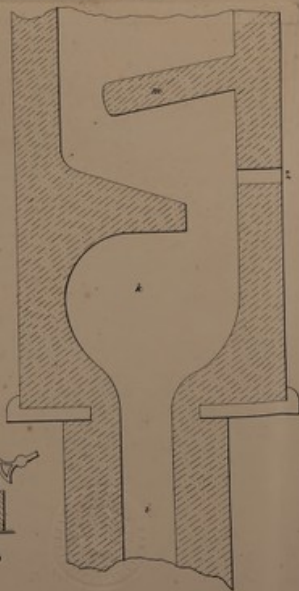


FIG. 13.

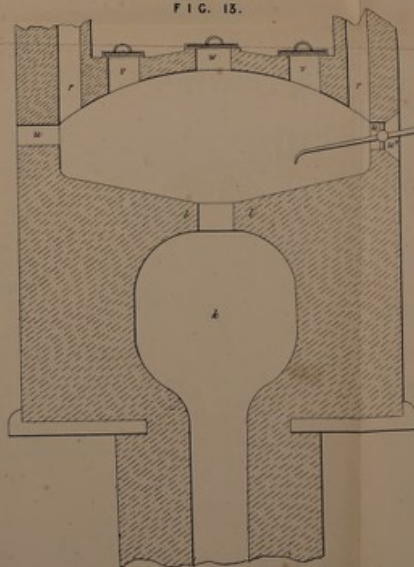


FIG. 17.

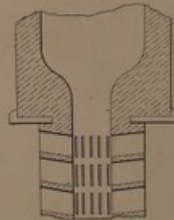


FIG. 16.



FIG. 9.

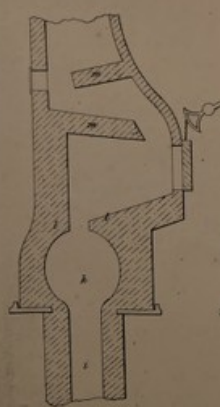


FIG. 10.

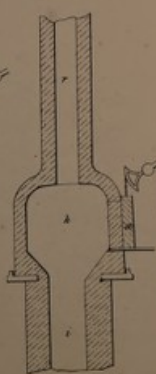
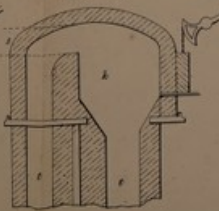


FIG. 11.



The enrolled drawing is colored.



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four doors. I claim as my Invention, as applied to cupola or blast furnaces for smelting ores, first, the impinging arch, dome, or ceiling immediately over or at a short distance above the boshes; secondly, the shelf or shelves on the top, or on a level, or above the said impinging arch, as also the series of impinging
5 arches or shelves. I claim as my Invention, as applicable to the furnace chimneys of locomotive, steam packet, or other engines, or chimnies of other furnaces, or fire-places, the impinging or arresting shelves, with or without ledges, to arrest and convey away the water arising from the condensed steam, and for the purpose of arresting the progress or escape of spark, dust, or other
10 substance, and also the balance hood as applied thereto. I claim as my Invention, as applicable to furnaces or stoves for giving out heat, the impinging shelf or shelves made hollow. I claim as my Invention the series of vertical slits or apertures or twyers near the bottom of furnaces opening into the hearth, with a direction downwards. I claim as my Invention the application and
15 use of bricks or twyers made or manufactured as above described in the construction of furnaces.

In witness whereof, I, the said James Yates, have hereunto set my hand and seal, this Sixteenth day of April, in the year of our Lord One thousand eight hundred and forty.

20

JA^s (L.S.) YATES.

AND BE IT REMEMBERED, that on the Sixteenth day of April, in the third year of the reign of Her Majesty Queen Victoria, the said James Yates came before our said Lady the Queen in Her Chancery, and acknowledged the instrument aforesaid, and all and everything therein contained and specified,
25 in form above written. And also the instrument aforesaid was stamped according to the tenor of the Statute made in the fifty-fifth year of the reign of His Majesty King George the Third.

Inrolled the Nineteenth day of April, One thousand eight hundred and forty.

LONDON :

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1854.

I have the honor to acknowledge the receipt of your letter of the 10th inst. in relation to the purchase of land for the purpose of erecting a school house in the town of ... I have the honor to inform you that the land has been purchased and the school house is now under construction. I have the honor to inform you that the land has been purchased and the school house is now under construction. I have the honor to inform you that the land has been purchased and the school house is now under construction.

I am, Sir, very respectfully,
Your obedient servant,
J. H. ...

Very respectfully,
J. H. ...

Witness my hand and seal this 10th day of ... 1830.