

## **Specification of John Henry Johnson : furnaces for the prevention of smoke.**

### **Contributors**

Johnson, John Henry.

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A.D. 1860, 17th FEBRUARY. N° 431.

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

OF

JOHN HENRY JOHNSON.

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FURNACES FOR THE PREVENTION OF  
SMOKE.

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A.D. 1860, 17th FEBRUARY. N<sup>o</sup> 431.

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**Furnaces for the Prevention of Smoke.**

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**LETTERS PATENT** to John Henry Johnson, of 47, Lincoln's Inn Fields, in the County of Middlesex, and of 166, Buchanan Street, in the City of Glasgow, North Britain, Gentleman, for the Invention of "**IMPROVEMENTS IN FURNACES FOR THE PREVENTION OF SMOKE.**"—A communication from abroad by Jules Poivret, of Paris, in the Empire of France, Manufacturer.

Sealed the 8th June 1860, and dated the 17th February 1860.

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**PROVISIONAL SPECIFICATION** left by the said John Henry Johnson at the Office of the Commissioners of Patents, with his Petition, on the 17th February 1860.

I, JOHN HENRY JOHNSON, of 47, Lincoln's Inn Fields, in the County of Middlesex, and of 166, Buchanan Street, in the City of Glasgow, North Britain, Gentleman, do hereby declare the nature of the said Invention for "**IMPROVEMENTS IN FURNACES FOR THE PREVENTION OF SMOKE,**" a communication from abroad by Jules Poivret, of Paris, in the Empire of France, Manufacturer, to be as follows:—

- 10 This Invention relates to a peculiar construction and arrangement of furnace, whether for stationary, locomotive, or marine boilers, or for other purposes, whereby a perfect combustion of the gases is obtained and the prevention of smoke effected. According to this Invention it is proposed to so construct the furnace that the fuel will form one continuous mass from the



*Johnson's Improvements in Furnaces for the Prevention of Smoke.*

front to the back end of the furnace, the continuity being maintained as the fuel burns away by mechanical means, as, for example, by vertically rotating fire-grates carried on horizontal axes, by endless chains of fire-bars placed at an inclination, or by ordinary fire-bars at such an inclination that the fresh fuel will descend by its own gravity and take up the place of the burnt fuel, a supply of fresh fuel being maintained in a feeding hopper above or at the upper end of the grate. In front of the moveable grate in land furnaces there may be a second or fixed grate composed of short fire-bars, which serve to support the fuel as it is driven down by the occasional rotation or traversing of the moveable grate. A hanging bridge is also placed in front of the main grate, 10 which bridge may be either hollow or solid, and supplied or not with a current of feed water or cool air. In locomotive engines the shaking of the engine will generally effect the gradual and steady descent of the fuel, but an arrangement should be provided for vibrating the grate when the engine is standing. 15

By the system and contrivances above described the gases from the green or fresh fuel will pass direct through the incandescent fuel of the mass, and will be thereby effectually consumed.

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**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said John Henry Johnson in the Great Seal Patent Office on 20 the 17th August 1860.

**TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOHN HENRY JOHNSON**, of 47, Lincoln's Inn Fields, in the County of Middlesex, and of 166, Buchanan Street, in the City of Glasgow, North Britain, Gentleman, send greeting. 25

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Seventeenth day of February, in the year of our Lord One thousand eight hundred and sixty, in the twenty-third year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said John Henry Johnson, Her special license that I, the said 30 John Henry Johnson, my executors, administrators, and assigns, or such others as I, the said John Henry Johnson, my executors, administrators, or assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of 35 Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention



*Johnson's Improvements in Furnaces for the Prevention of Smoke.*

for "IMPROVEMENTS IN FURNACES FOR THE PREVENTION OF SMOKE," a communication from abroad by Jules Poivret, of Paris, in the Empire of France, Manufacturer, upon the condition (amongst others) that I, the said John Henry Johnson, by an instrument in writing under my hand and seal, should particularly  
5 describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said John Henry Johnson, do hereby  
10 declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, reference being had to the accompanying Drawings, and to the letters and figures marked thereon, that is to say :—

The said Invention relates to a peculiar construction and arrangement of  
15 furnace, whether for stationery, locomotive, or marine boilers, or for other purposes, whereby a perfect combustion of the gases is obtained, and the prevention of smoke effected. According to this Invention it is proposed to construct the furnace in such a manner that the fuel will form one continuous mass from the front to the back end of the furnace, the continuity being main-  
20 tained as the fuel burns away by mechanical means, as, for example, by vertically rotatory fire-grates carried on horizontal axes, by endless chains of fire-bars placed at an inclination, or by ordinary fire-bars at such an inclination that the fresh fuel will descend by its own gravity, and take up the place of the burnt fuel, a supply of fresh fuel being maintained from a feeding hopper above or  
25 at the upper end of the grate. In front of the moveable grate in land furnaces there may be a second or fixed grate composed of short fire-bars, which serve to support the fuel as it is drawn down by the occasional rotation or traversing of the moveable grate. A hanging bridge is also placed in front of the main grate, which bridge may be either hollow or solid, and supplied or not with a  
30 current of feed water or cool air. In locomotive engines the shaking of the engine will generally effect the gradual and steady descent of the fuel, but an arrangement should be provided for vibrating the grate when the engine is standing.

By the system and contrivances above described the gases from the green or  
35 fresh fuel will pass directly through the incandescent fuel of the mass, and will be thereby effectually consumed.

And in order that the said Invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose I shall refer to the several Figures on the Sheet of Drawings hereunto annexed, the



*Johnson's Improvements in Furnaces for the Prevention of Smoke.*

same letters of reference indicating corresponding parts throughout all the corresponding Figures.

Figures 1 and 2 of the accompanying Sheet of Drawings represent respectively a longitudinal vertical section and end elevation of a stationary boiler furnace, constructed according to this Invention. Figures 3 and 4 represent similar 5 views of a furnace suitable for dye works, constructed on the same principle. Figure 5 represents the application of this principle also to a locomotive boiler furnace. The rest of the Figures are details which I shall herein-after fully describe and refer to. The fire-place in Figures 1 and 2 is provided with a front circular moveable grate E, and a lower grate C mounted on hinges, 10 and capable of being let down into the position indicated by blue lines for facilitating the emptying of the furnace when desired. The grate E, mounted on a central axis, is actuated by a lever handle *f*, provided with a pall, which takes into the teeth of a ratchet wheel keyed on to the axis of the grate, so that the rotatory movement of the grate, and consequently the descent of the fuel 15 contained in the hopper, depend upon the use of this lever. The hinged grate C is connected with a system of jointed levers provided with handles, as shewn at H, convenient to the hand of the attendant. A tube or hollow bridge F, forming the bottom of the front wall of the furnace A, is kept constantly filled with water, whereby this part of the furnace is protected from the 20 destructive action of the fire, whilst at the same time it serves to heat the water of the generator or boiler B. The air entering the grates C and E, as shewn by the arrows, produce at this central point of the furnace or continuous current or draught, which draws to and maintains at that part all the gases developed by the heat, and assists their combustion in such a manner that they 25 are entirely consumed by the time they arrive at the boiler. The coal or other combustible contained in the hopper, and subjected to the feeding and steady subsidence produced by the occasional turning of the grate E, may be equally acted upon by the modified form of grate illustrated at Figure 6. This grate consists of endless chains E<sup>1</sup>, passed round polygonal rollers M, and 30 carrying the bars which form the fuel-bearing surface. The other Figures on the Sheet of Drawings represent examples of various modifications, both as regards the grate C (Figure 1), which forms the bottom of the furnace, and the front grate E of the same Figure, which supplies the fuel to the furnace. I may here observe that these modifications are equally applicable to furnaces 35 of all kinds.

In Figures 3 and 4, A is the brickwork of the furnace; B, a portion of the boiler; C, a portion of a reservoir; D, the grate mounted on the carriage D<sup>1</sup>; and E, the moveable grate serving to break up the coal in the hopper, and



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*Johnson's Improvements in Furnaces for the Prevention of Smoke.*

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supply it to the furnace. The bars of this grate are fixed in a moveable frame F mounted on a shaft, which is secured to two cheeks, the upper part of the frame forming a plate. The cheeks G, which are of cast iron, are fixed to the front of the furnace, one on each side of the frame F. They are  
5 united by a plate H, which descends to the level of the opening, through which the fuel is pushed into the furnace. The arms J are fixed to the sides of the frame F, and are connected by a cross bar, which serves as a handle for actuating the grate E. In order to supply fuel to the furnace, it is simply requisite to impart a to-and-fro motion to the arms J, whereupon  
10 the grate E will oscillate to and fro, and force in the fuel as fast as it descends from the fuel space above; K is the water heater supplied by the pipe L from the reservoir C; N is a door through which combustibles are introduced into the furnace M, when lighting the fire; O are slots made in the cheeks G, in which the ends of the supporting shaft or spindle of the grate E  
15 rest, so that facility is afforded for raising the grate when the carriage D<sup>1</sup> and grate D are required to be run out for the purpose of emptying the furnace. The frame F, the grate E, the cheeks G, and the plate H combined as shewn in Figure 3, form a hopper, into which the fresh fuel is supplied. The bars of the frame F may be replaced by a plate, the draught of air being  
20 regulated by a damper. In erecting large furnaces on this principle, two or more frames may be contained between the same pair of cheeks, disposed one above another. The pipe K is supplied with water or air for the purpose of preventing the coal in the hopper above the entrance to the furnace from becoming coked too soon, and producing gas which would escape at the front  
25 of the furnace in place of being drawn therein and burnt. It is highly desirable that the coal in the hopper and the incandescent fuel in the furnace should form one uninterrupted mass, which may be readily effected by imparting occasionally a gentle vibratory motion to the arms J, J. If not worked by machinery, this frame should be actuated by the stoker as often as he would  
30 require to supply fresh fuel to an ordinary furnace, and by attending to this simple duty the entire prevention of smoke will be effected. The bottom layer of fuel in the hopper becomes heated and coked immediately in front of the mouth or entrance to the furnace and beneath the water or air tube K. The gases emitted during this coking of the coal are drawn inwards by the  
35 entering air, and are entirely consumed by being carried over the surface of the incandescent fuel in the bottom of the furnace. As the grate D contains nothing but incandescent fuel, it is easily kept clean, and the draught maintained free and unimpeded. In the locomotive boiler furnace, Figure 5, A represents the fire box; B, a portion of the boiler; C, a part of the tender;



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*Johnson's Improvements in Furnaces for the Prevention of Smoke.*

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D, the bottom grate or fire bars; F, the moveable frame supported by a transverse shaft or spindle resting in the side cheeks G, and containing the grate bars E at its lower end; J are the arms for vibrating the frame, so as to force the fuel beneath the water chamber or tube into the body of the furnace L; H is the front of the boiler, which with the cheeks G and frame F constitutes 5 the fuel hopper. The water space K is supplied by a pipe opening into the side of the boiler, or into the tender. Figures 7 and 8 represent respectively a detail side elevation and transverse section of a fire-bar, specially adapted to this system of furnace, as by reason of its inclined surface the incandescent fuel thereon will always have a tendency to bear against the front part K of 10 the furnace.

Having now described and particularly ascertained the nature of the said Invention, and the manner in which the same is or may be used or carried into effect, I would observe in conclusion that what I consider to be novel and original, and therefore claim as the Invention secured to me by the herein- 15 before in part recited Letters Patent, is,—

First, the general constructions and arrangements of furnaces or fire-places for effecting the perfect combustion of the fuel and preventing the formation of smoke, as herein-before described.

Second, the contrivances herein-before described for causing the uncon- 20 sumed gases generated in the furnace to pass into a mass of incandescent fuel, or over the surface of the same, with a view to their perfect combustion.

Third, the peculiar construction and arrangement of moveable grates, for the purposes herein-before described.

Fourth, the application and use at or near the central part of the furnace of 25 a tube or chamber supplied with water or air, or a mixture of both, for the purposes herein-before described.

In witness whereof, I, the said John Henry Johnson, have hereunto set my hand and seal, this Seventeenth day of August, One thousand eight hundred and sixty. 30

J. HENRY JOHNSON. (L.S.)

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Printers to the Queen's most Excellent Majesty. 1860.



FIG. 5.

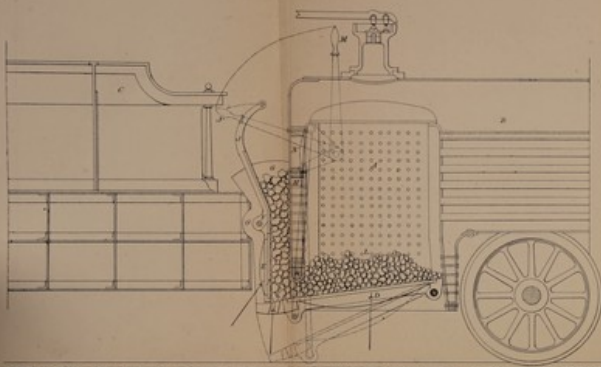


FIG. 1.

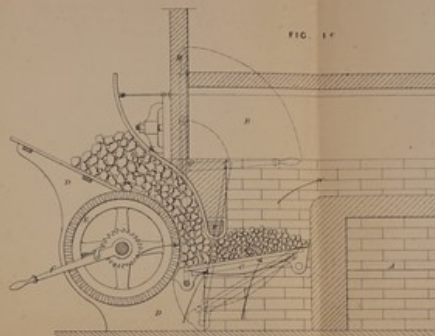


FIG. 2.

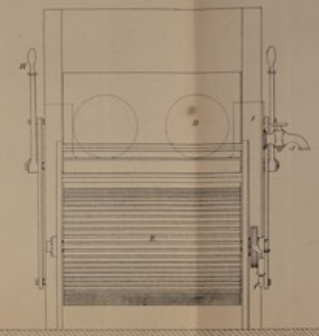


FIG. 3.

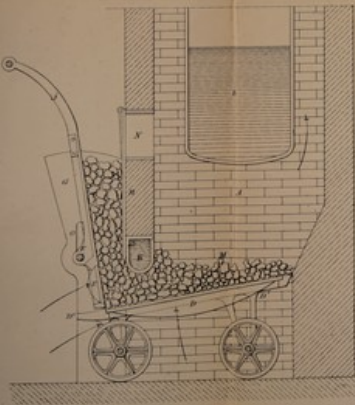


FIG. 4.

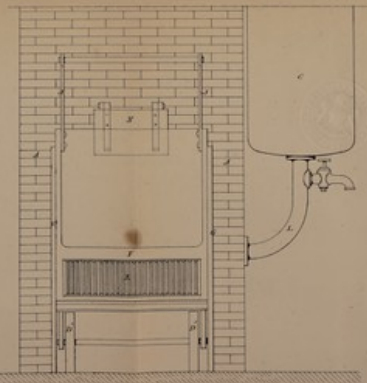


FIG. 6.

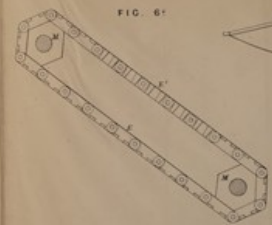


FIG. 7.



FIG. 8.





