

## **Specification of Frank Clarke Hills : furnaces.**

### **Contributors**

Hills, Frank Clarke.

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A.D. 1854 . . . . . N° 1005.

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

OF

FRANK CLARKE HILLS.

—  
FURNACES.  
—

LONDON:

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,

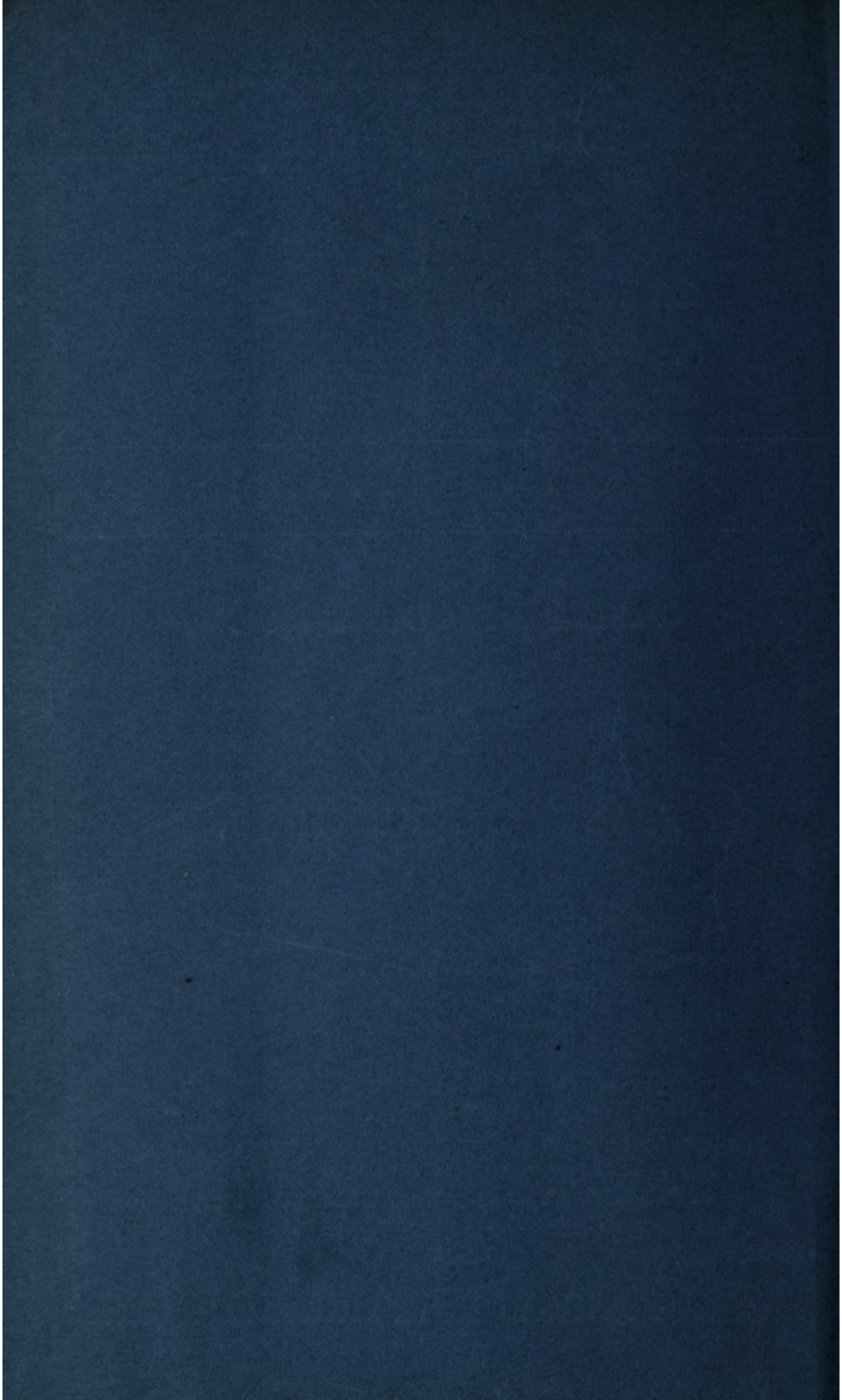
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A.D. 1854 . . . . . N<sup>o</sup> 1005.

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**Furnaces.**

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**LETTERS PATENT** to Frank Clarke Hills, of Deptford, in the County of Kent, Manufacturing Chemist, for the Invention of "**IMPROVEMENTS IN THE MEANS OF PREVENTING OR CONSUMING SMOKE IN FURNACES.**"

Sealed the 27th June 1854, and dated the 5th May 1854.

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**PROVISIONAL SPECIFICATION** left by the said Frank Clarke Hills at the Office of the Commissioners of Patents, with his Petition, on the 5th May 1854.

I, **FRANK CLARKE HILLS**, of Deptford, in the County of Kent, Manufacturing Chemist, do hereby declare the nature of the said Invention for "**IMPROVEMENTS IN THE MEANS OF PREVENTING OR CONSUMING SMOKE IN FURNACES**" to be as follows:—

My Invention consists in the following methods or arrangements for admitting air to the fuel in furnaces, for the purpose of consuming or preventing  
10 smoke. Firstly, by admitting air at the back part of the furnace, and causing it to pass under an arch projecting from the bridge and extending a short distance over the fire bars. Secondly, by admitting air to the fuel at the back of the furnace through a perforated plate or grating or bars rising from the ordinary fire bars to the bridge, or the fire bars themselves may be formed with their ends turned up to the bridge. Thirdly, by admitting air to the back part of furnaces through perforated plates or gratings placed below the fire bars,

*Hills' Improvements in Preventing or Consuming Smoke in Furnaces.*

and leaving a space behind for the passage of the air to the bridge; the plates or gratings may form the back bearing bar for the fire bars. Fourthly, by placing an arch or shield between the under part of the boiler and the bridge of the furnace, in order to cause the air admitted into the furnace the better to combine with the combustible gases. Lastly, by admitting air to fur- 5  
naces for a regulated time after each feeding of fuel by means of a valve, the closing of which is regulated by the running out of water or other liquid, or of sand, from a vessel connected with the valve.

**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said Frank Clarke Hills in the Great Seal Patent Office on the 10  
3rd November 1854.

**TO ALL TO WHOM THESE PRESENTS SHALL COME, I, FRANK CLARKE HILLS**, of Deptford, in the County of Kent, Manufacturing Chemist, send greeting.

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters 15  
Patent, bearing date the Fifth day of May, in the year of our Lord One thousand eight hundred and fifty-four, in the seventeenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Frank Clarke Hills, Her special licence that I, the said Frank Clarke Hills, my executors, administrators, and assigns, or such others as I, the 20  
said Frank Clarke Hills, my executors, administrators, and 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 Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "**IM- 25  
PROVEMENTS IN THE MEANS OF PREVENTING OR CONSUMING SMOKE IN FURNACES,**" upon the condition (amongst others) that I, the said Frank Clarke Hills, by an instrument in writing under my hand and seal, should particularly 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 30  
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 Frank Clarke Hills, do hereby 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 35  
following statement thereof (that is to say):—

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*Hills' Improvements in Preventing or Consuming Smoke in Furnaces.*

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My Invention consists in certain methods or arrangements for admitting air to the fuel in furnaces, for the purpose of consuming or preventing smoke.

The first of these methods or arrangements is as follows:—At the back  
5 of the fire bars I place a partition (formed of fire lumps, bricks, tiles, or  
a plate of iron,) extending the whole breadth of the furnace, and about ten  
inches high, and which I call the “heating plate,” and between this plate and  
the ordinary bridge of the furnace I leave a space of two or three inches, for  
the air to pass up between the heater and the bridge; this passage I cover  
10 with fire tiles or plates, resting upon the bridge and projecting into the furnace  
a few inches over the back end of the fire bars, and leaving a space of about  
an inch between the top of the heating plate and the under side of the covering  
tiles; the air thus ascends through the space between the heating plate and the  
bridge, and then passes through the slot or space between the heating plate  
15 and the covering tiles into the furnace. The admission of the air may be  
regulated by valves, and, preferably, in the manner herein-after described.

A second arrangement for the admission of air is as follows:—Above the  
bridge I construct an arch of fire brick, in contact, or nearly so, with the boiler,  
and extending back into the flue about two or three feet; and in the space  
20 between this arch and the bridge I place a fire lump, having numerous aper-  
tures or perforations; or I fill in the space with fire bricks or tiles, so placed as  
to form a series of apertures and solid parts, ranged chequerwise, like the  
squares of a draught-board. The area of these spaces or apertures should be  
in the aggregate rather more than is required for the draught of the furnace.  
25 The air admitted into the furnace in passing through these holes will become  
so heated and intermixed with carbonaceous particles and gases evolved from  
the fuel as to cause their more perfect combustion.

Lastly, I sometimes admit the air to the furnace for a regulated time after  
each feeding, by means of a valve, which at the expiration of the time closes  
30 of itself. The arrangement which I employ to effect this is as follows:—To  
a lever attached to the valve or door by which the air is admitted is hung a  
vessel containing water (or other liquid, or sand,) which by its weight causes  
the valve to open, and thus admit the air. A small hole in the bottom of the  
vessel furnished with a stop-cock allows the water to escape, and as the pot  
35 becomes lighter by the escape of the water, the valve descends by its own  
weight and closes at the desired time. At the introduction of each charge of  
fuel the water vessel is filled with water by any convenient means, so as by  
its weight to open the valve, which, obtaining a preponderance by the escape  
of the water, descends by its weight and closes the aperture, as described. The

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*Hills' Improvements in Preventing or Consuming Smoke in Furnaces.*

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escape of the water is regulated by means of the stop-cock, so as to allow the valve to close at any desired time.

Having thus described the nature of my Invention, and the manner of carrying the same into effect, I claim in respect thereof,—

First, introducing air into the back part of furnaces through the ash pit 5 and between a heating plate and the bridge of the furnace, and then under a covering which projects inwards from the bridge of the furnace over the back ends of the fire bars.

Second, the employment of a perforated wall or grating placed between the bridge of the furnace and an arch below the boiler, to effect the better 10 combustion of the smoke gases with the air admitted into the furnace by any means.

Third, regulating the admission of air into furnaces, by means of a valve governed by the escape of water or other fluid, or sand, as described under the last head of my Invention. 15

In witness whereof, I, the said Frank Clarke Hills, have hereunto set my hand and seal, this Third day of November, in the year of our Lord One thousand eight hundred and fifty-four.

F. C. HILLS. (L.S.) 20

Witness,

JAMES MURDOCH.

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LONDON :

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Printers to the Queen's most Excellent Majesty. 1854.