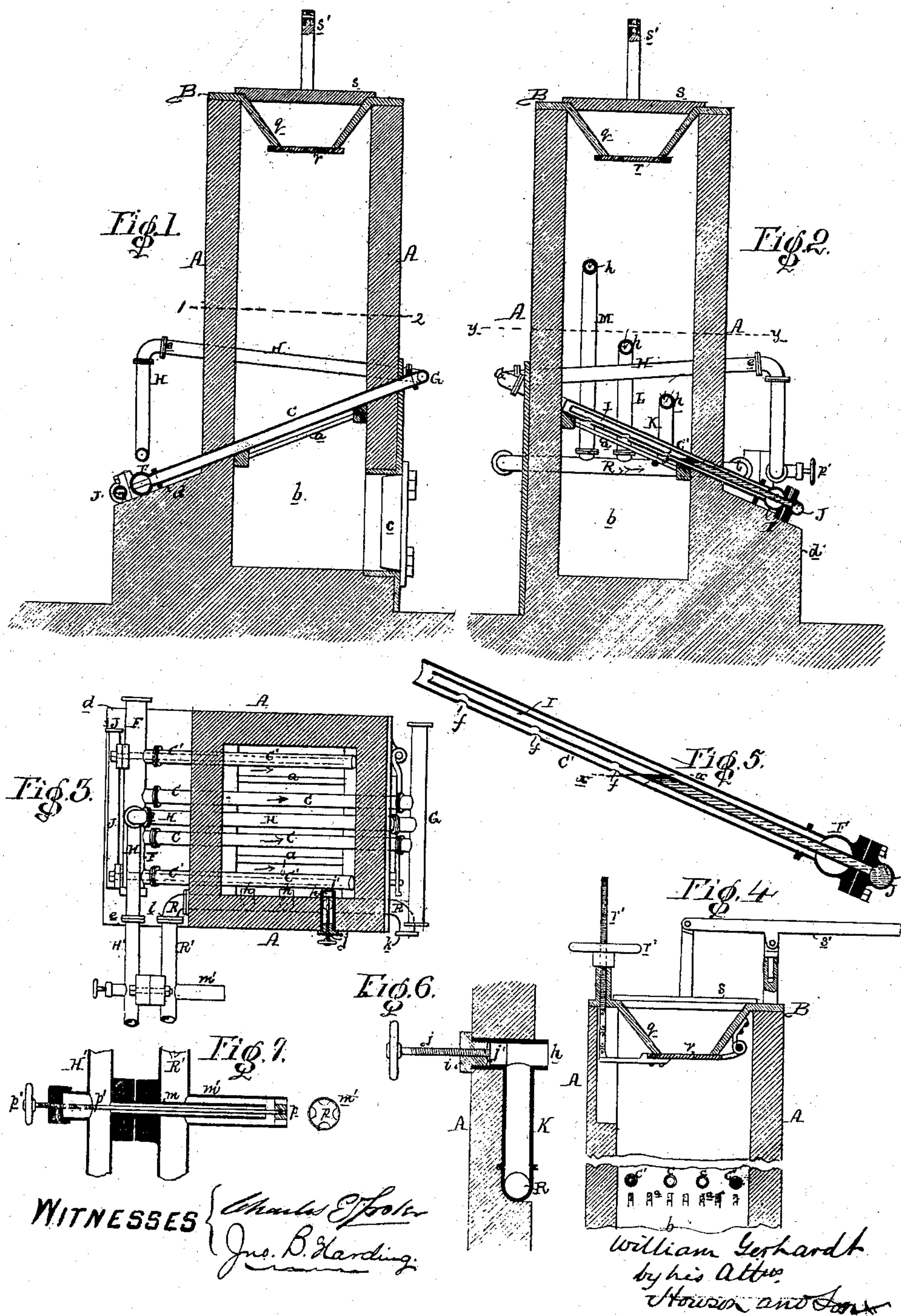


W. GERHARDT.
GAS PRODUCING FURNACE.

No. 99,554,

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Letters Patent No. 99,554, dated February 8, 1870.

IMPROVEMENT IN GAS-PRODUCING FURNACES.

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

I, WILLIAM GERHARDT, of New York, county of New York, State of New York, have invented certain Improvements in Gas-Producing Furnaces, of which the following is a specification.

Nature and Object of the Invention.

My invention consists of certain improvements, fully described hereafter, in gas-producing furnaces, the improvements being such that both gases and heated air, which are produced at the same time within the furnace, can be conducted, under pressure, to any required point or points, and can be combined in such proportions as to produce, when ignited, a broad and powerful jet of flame, which may be utilized for melting and smelting-furnaces, heating steam-boilers, or for any of the purposes for which ordinary furnaces are employed.

Description of the Accompanying Drawing.

Figure 1 is a vertical sectional view of my improved furnace;

Figure 2, also a vertical section, viewed from a side opposite to that shown in fig. 1;

Figure 3, a sectional plan on the line 1-2, fig. 1;

Figure 4, a sectional view of the upper portion of the furnace; and

Figures 5, 6, and 7, detached views drawn to an enlarged scale, and illustrating portions of my invention.

General Description.

The body A of the furnace is, in the present instance, square, although it may be cylindrical or of other convenient form, and it is covered at the top by a plate, B, the peculiar construction of which will be fully described hereafter.

The furnace is provided with a double-inclined grate, consisting of pipes *c c* and *c' c'* above, and of an ordinary grate beneath, the bars *a* of the latter being placed close together in order to retain particles of fuel small enough to pass between the said pipes; and beneath this double grate is a chamber or ash-pit, *b*, with which communicates a door, *c*, in the front of the furnace.

All of the pipes *c c* and *c' c'* are supplied with air under pressure by a pipe, *F*, which rests upon a ledge, *d*, outside the furnace, it being proposed to connect this latter pipe with a fan, or with a reservoir containing compressed air.

The projecting ends of the central pipes *c c* of the grate are also connected, at the opposite side of the furnace, with a horizontal pipe, *G*, which communicates with a third pipe, *H*, the latter, which is slightly inclined upward, extending across the furnace above the grate, and terminating, finally, outside the furnace in a flange, *e*, by means of which it is connected to a pipe, *H'*, referred to hereafter. (See figs. 1, 2, and 3.)

The pipes *c' c'* of the grate extend across, but do not

project through the furnace, and are open at their inner ends, they being perforated, on their under sides, with a number of holes *f*, and each containing a tube, *I*, of small diameter, which is likewise open at its inner end, and perforated at points opposite the holes *f* of the outer pipe.

These tubes *I* communicate with a water-pipe, *J*, which is fed from an adjoining reservoir in which the water is maintained at such a height that it shall not rise in the tubes *I* to a point above the lowermost of the openings *f*; in other words, to a greater height than is represented by the line *x x*, fig. 5.

K, *L*, and *M*, are three gas-flues, arranged within the furnace, against one of the walls of the same, as best observed in figs. 2 and 6, and projecting downward to a point beneath or on line with the grate, where they all communicate with a horizontal pipe, *R*, the upper ends of these flues, which extend to different heights in the furnace, each terminating in a short branch, *h*, which extends through the wall of the furnace, and is closed, at its outer end, by a plug, *i*, a rod, *j*, to which is attached a valve, *j'*, being arranged to slide through this plug and branch, for the purpose of closing the flue, as will be hereafter described.

The pipe *R*, with which all the gas-flues communicate, extends through both sides of the furnace, and terminates at one end in a flange, *k*, and, at its opposite end, in a flange, *l*, at a point adjacent to the flange *e* of the hot-air pipe *H*.

To this flange *l*, of the pipe *R*, is connected a pipe, *R'*, which is continued in a direction parallel with the pipe *H'*, to the point where the hot air and gases are to be combined and ignited.

To effect this combination of the hot air and gases, the pipe *H'* is furnished with a branch, *m*, which projects into and extends part way through a branch, *m'*, of the pipe *R'*. (See fig. 7.)

A valve, *p*, operated by a rod, *p'*, is arranged within the branch *m'*, so that it may be closed against the end of the branch *m*, for the purpose of regulating the supply of hot air from the latter.

The top plate *B* of the furnace, before referred to, is formed with a hopper, *q*, which has a hinged bottom, *r*, operated through the medium of a screw-rod, *r'*, and hand-wheel, *r''*, and a top or cover-plate, *s*, which can be raised or lowered by means of a lever, *s'*. (See fig. 4.)

Fuel having been piled upon the double grate of the furnace, to about the height represented by the line *y*, fig. 2, and ignited, water is admitted into the tubes *I*, as before described, and currents of air are forced through the pipes *c c* and *c' c'* of the grate, and into and through the pipes *G*, *H*, and *H'*.

The air for the support of combustion is discharged from the open ends of the pipes *c'*, and from the orifices *f* of the same, it becoming, in its passage through

these pipes, which are contained in the midst of the burning fuel, so highly heated as to heat the water within the tubes I I, and to convert a portion of the same into steam.

The steam escapes through the ends and orifices of the tubes into the outer pipes *c'*, where it is combined with the heated air, and escapes with the same, in the manner above described. The combined air and steam are forced, in jets, through the orifices *f*, to points beneath the grate, and are diffused through the chamber *b*, afterward passing upward, through the grate, to support the combustion of the fuel.

It will thus be seen that by this peculiar arrangement of pipes, the hot air and steam for the support of combustion can be produced within the furnace above the grate, to be fed to the fuel at the most advantageous point, namely, beneath the grate.

The combined steam and air, after passing upward through the grate, become decomposed by the burning fuel, and unite with the products of combustion, the gases thus produced, owing to the draught within the furnace, entering the flues K, L, and M, and passing downward through the same into the pipe R, by which they are conducted to the pipe R', and thence to the points where they are to be utilized.

The pipes C C of the grate serve merely to heat the air which is forced through them, this air being again conducted through the furnace by the pipe H, and thus becoming more highly heated, it finally entering the pipe H', by which it is conducted to the points at which it is to be combined with the gases.

The air and gases, both under strong pressure, are forced through the branches *m* and *m'*, and are ignited at the point of union, the result being a broad and powerful jet of flame, which can be utilized for melting and smelting-furnaces, heating steam-boilers, or for any of the purposes for which ordinary furnaces are employed. The valve *p*, within the branch *m'*, enables the supply of heated air to be properly proportioned in respect to the supply of gases, so as to produce a flame of the most intense heat.

It will be understood that the pipes H' and R' can be provided with as many of these branches *m* and *m'* as there are required jets of flame.

If desired, two other pipes, similar to the pipes H' and R', can be connected to the pipe G, and to the flange *k* of the pipe R.

In charging the furnace with fresh fuel, it is important that none of the gases should escape from the same, and it is for this purpose that the charging-hopper *q* is closed at both top and bottom, the top plate *s* being raised by means of its lever *s'*, in order to fill the hopper with fuel, and being again closed before the bottom *r* of the hopper is lowered, to permit the passage of the fuel into the furnace.

It is also important, in charging the furnace, that particles of fuel, &c., should not be permitted to en-

ter and choke the gas-flues K, L, and M, for which reason the latter are furnished with the valves *j'*, which can be operated from outside the furnace in such a manner as to close the entrances to said flues.

The valves *j'* also enable one or more of the flues to be closed while the others remain open; for instance, the lower flue K receives carbonic-oxide gas from the midst of the burning fuel, while carburetted hydrogen, produced above the fuel, is conducted off through the upper flue M, from which it will be evident that where a mixture of the gases is not required, one or other of the flues must be closed.

Claims.

1. In a gas-producing furnace, a double-inclined grate, consisting of pipes *c* and *c'*, and of bars *a*, arranged substantially in the manner described.

2. The bars *c'* of the furnace, open at their inner ends, perforated beneath with a number of holes *f*, and furnished with air, under pressure by a pipe, F, all substantially as herein set forth.

3. The combination of the said pipes *c'* with water-tubes I, when the latter are contained within the former, and are likewise open at their inner ends, and perforated beneath with a number of small holes, all substantially as herein described.

4. The perforations of the water or steam-tubes I, so arranged, in respect to the openings *f* of the air-pipes *c'*, that jets of combined steam and air may be projected downward from the latter openings into the space beneath the grate.

5. The combination and arrangement, substantially as herein described, of the air-pipes F, C, G, H, and H'.

6. The gas-flues K, L, and M, arranged within the furnace at different heights above the grate, and communicating with pipes R and R', substantially as herein set forth.

7. The valves *j'* in the said gas-flues, for the purpose specified.

8. The combination, substantially as herein described, of the branches *m* and *m'* of the pipes H' and R', for the purpose specified.

9. The valve *p*, arranged within the branch *m*, for the purpose of regulating the passage of air from the branch *m*.

10. The charging-hopper *q*, furnished with a hinged bottom, and with a cover-plate arranged to be operated independently of each other, substantially as herein set forth.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIAM GERHARDT.

Witnesses:

JOHN WHITE,
WM. A. STEEL.