J. JENKINS.

FURNACE.

No. 191,005. Patented May 22, 1877.

Fig. 1.

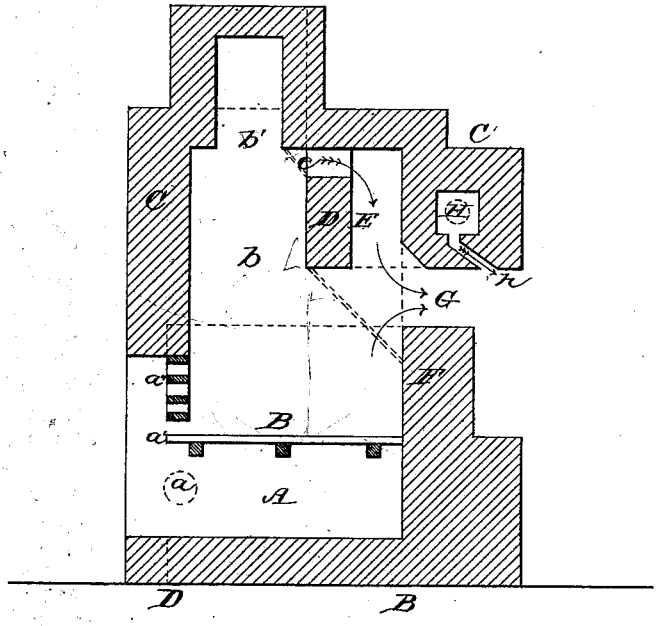


Fig. 2.

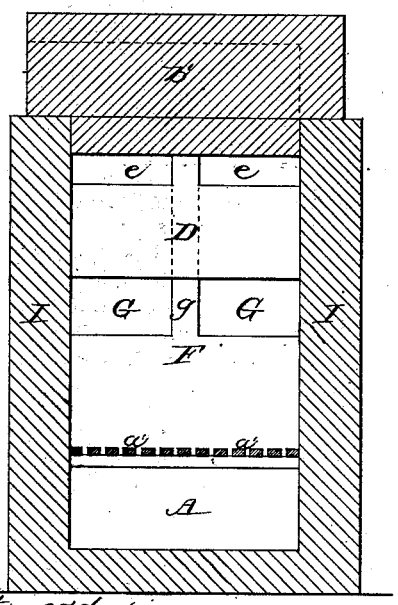
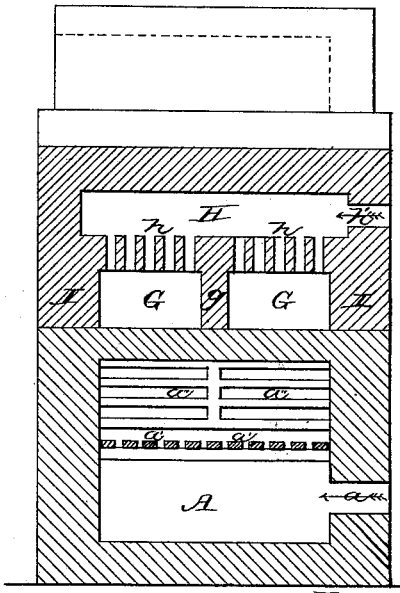


Fig. 3.



Witnesses:

W. F. Wheeler

Henry A. Ebenstein

Inventor.

James Jenkins.

UNITED STATES PATENT OFFICE

JAMES JENKINS, OF BUFFALO, NEW YORK.

IMPROVEMENT IN FURNACES.

Specification forming part of Letters Patent No. **191,005**, dated May 22, 1877; application filed October 16, 1876.

To all whom it may concern:

Be it known that I, JAMES JENKINS, of the city of Buffalo, in the county of Erie and State of New York, have invented an Improvement in Furnaces for the Combustion of Fuel, of which the following is the specification:

The drawings represent only the brick-work of a furnace, working by natural draft; but when compressed air is used, the air-chamber is closed with a door. In practice this brick-work is cased with iron plates, as is the general custom.

Figure 1 of the drawings is a longitudinal vertical section through the center; Fig. 2, a vertical cross-section through the line A B; Fig. 3, a vertical cross-section through the line C D.

Like letters denote like parts wherever used.

The furnace is illustrated as applicable to purposes of metallurgy.

In Fig. 1, A is the lower air-chamber; *a*, the inlet to same when compressed air is used; *a'*, the fire-bars; *a''*, a grating across the furnace, extending from the fire-bars to the under edge of the back wall; B, section of chamber from fire-bars to top of bridge-wall flues; *b*, section to under side of roof; *b'*, the feed-way section; C, the back wall; D, the front wall of section *b;* E, a conduit, leading from section *b; e*, inlet to conduit E; F, bridge-wall; G, bridge-wall flue; H, the upper air-chamber; *h*, outlet from same, placed at an angle in line of direction beyond the bridge-wall.

In Fig. 2, A, air-chamber, (lower;) *a' a' a'*, fire-bars; F, bridge-wall; G G, bridge-wall flues; D, front wall of section *b; e e*, inlets to conduit E; *b'*, the feedway section, through the open end of which the feed is charged; I I, the side walls of furnace.

In Fig. 3, A, lower air-chamber; *a*, inlet when compressed air is used; *a' a' a'*, fire-bars; *a'' a''*, grating under back wall; G G, bridge-wall flues; H, upper air-chamber; *h*, inlet to same; *h' h'*, outlets; I I, side walls of furnace.

The furnace, as illustrated, is for the combustion of bituminous coal, peat, or other fuel in which hydrogen is a constituent element, and is also available for the use of anthracite coal, as will be hereinafter explained.

In bituminous coal in its natural state, the hydrogen and carbon are united and solid. Their respective characters and mode of entering into combustion are, however, essentially different. The first leading distinction is, that the bituminous portion is convertible to the purposes of heat in the gaseous state alone, while the carbonaceous portion, on the contrary, is combustible only in the solid state, and, what is essential to be borne in mind, neither can be consumed while they remain united.

The operation is as follows: The furnace being kept fully charged with fuel, the door to the charging-hole closed, the walls of the chamber become highly heated. The process of distillation takes place in the upper sections *b* and *b'*. These products, in a gaseous state at high temperature, find vent through inlets *e e* to the conduits E E, by which they are conducted to the bridge-wall flues G G. As the combustion on the fire-bars *a' a' a'* proceeds, the charge of fuel settles, and in its descent, having parted with its volatile elements, the carbonaceous portion is acted upon by the air from chamber A entering through the fire-bars *a' a' a'* and the grating *a'' a''*, the gaseous products being drawn, or, if compressed air is used, forced into and through the bridge-wall flues. The gaseous products, drawn or forced from below, travel in direct line to the bridge-wall flues G G, while the furnace being kept closed at its top, and owing to the nature of its construction above that line, these currents from below cannot ascend higher, and even should they contain free oxygen, the gases of distillation do not inflame. Hence the products of distillation from above, in a gaseous state, conducted by conduits E E, and the products of combustion from below, partly inflamed and partly gaseous, meet and intermingle in the bridge-wall flues, to which they are drawn or forced, and are there met by jets of air under pressure from chamber H, through the outlets *h h*, producing perfect combustion and the maximum of heat.

The air heated, or at the atmospheric temperature, is supplied to chamber H under pressure through a pipe in which is a slide-valve to regulate the quantity, and when the furnace is worked by compressed air, the supply for the combustion of the carbonaceous portion enters chamber A through opening *a*,

being, in its arrangement and details, identical with what is in the usual practice.

Thus from the construction and operation of the furnace, it performs at the same time the two important functions, neither interfering with the other—to wit, first, in the upper part the gaseous products of distillation, at high temperature, are produced by the direct action of the heated walls; and, second, in the lower part the gases of the carbonaceous portion are produced by the direct action of the air.

The same construction is available for the use of anthracite fuel, although it contains no volatile element.

As at present used, this coal when charged in, fractures by the heat, and small particles are carried over the bridge-wall, wasting the fuel, and doing great injury to the metal in a working-chamber; or, if used for steam purposes, resulting in great waste, while each charge of fresh coal lowers the temperature to the extent that, for a period, the regular working of the furnace or the production of steam is paralyzed. With the furnace as described no such experience can be had, since being fed from the top, the fuel, of whatever variety, becomes gradually heated in its descent, and on reaching the lower part is in an incandescent state, and, therefore, in the proper condition for the rapid production of the gases of combustion.

The management of the furnace: The care to be observed is to properly regulate the admission of the air, to keep it charged full of fuel, and to have it settle regularly, the furnace being so accessible at the top through the charging-door, and from below through the grating *a'' a''*, that perfect means are afforded to insure this; also through the grating *a'' a''* the fire can be readily worked and kept clean and solid on the bars.

The capacity of the furnace for the distilling process can be increased by giving additional height to section *b*, and by continuing the front wall D of section *b* down to the line of the top of the bridge-wall F, or lower, in which case the fire-bars *a' a' a'* must be placed lower down, and the air-chamber A also made deeper. These changes will be found desirable when the fuel to be used contains a high percentage of bituminous matter, since the capacity of section *b* being thereby increased, its contents are exposed for a longer time to the distilling action of the heated walls. They may also be made for the purpose of increasing the power of the furnace, or without reference to the characteristics of the fuel to be used.

What I do claim as new, and desire to secure by Letters Patent, is—

The combination of the gas-generating chamber *b b'*, division D, provided with conduits *e* and passages E and G, with air-chamber H leading into said passage G, where the gases meet and intermingle with gases and flame from the main combustion-chamber, in the manner and for the purpose substantially as herein described.

JAMES JENKINS.

Witnesses:
W. F. WHEELER,
HENRY A. OBEVIST.