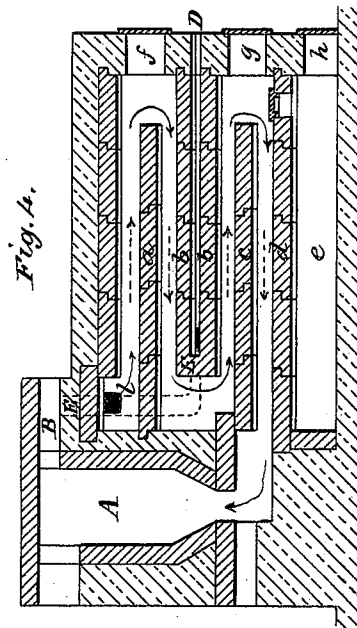
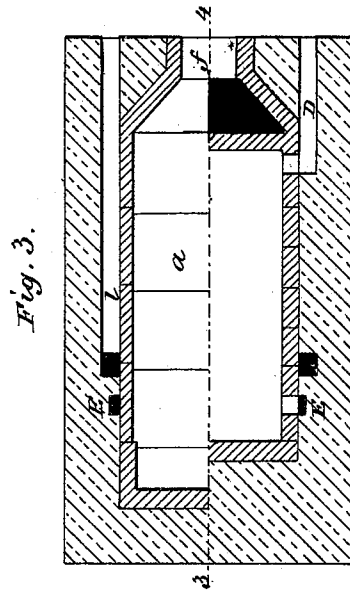
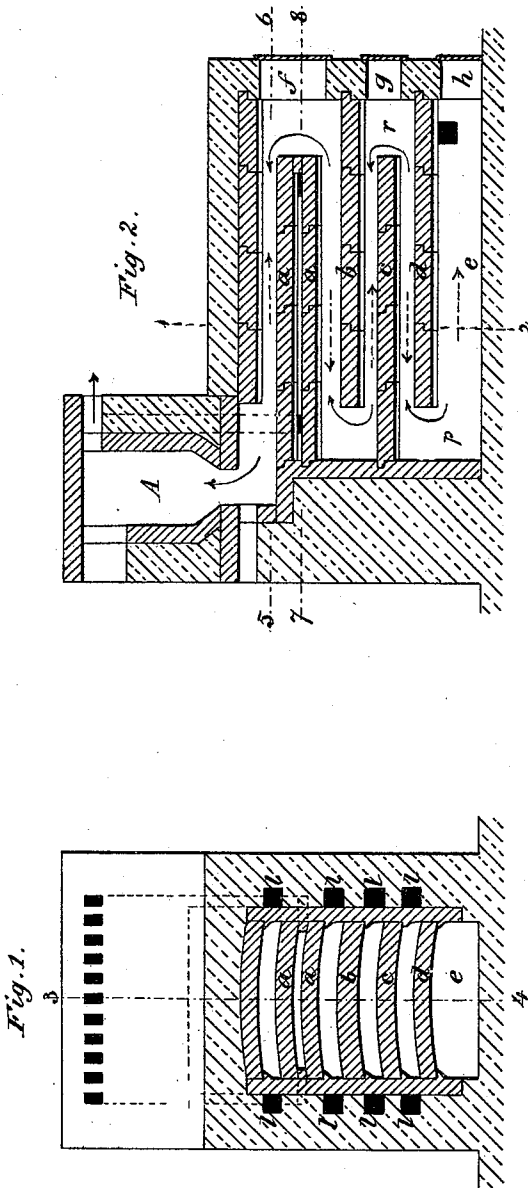


M. PERRET.

FURNACE FOR BURNING PULVERULENT FUEL.

No. 175,493.

Patented March 28, 1876.



Witnesses:
Edw. A. Dick
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UNITED STATES PATENT OFFICE.

MICHEL PERRET, OF PARIS, FRANCE.

IMPROVEMENT IN FURNACES FOR BURNING PULVERULENT FUEL.

Specification forming part of Letters Patent No. 175,493, dated March 28, 1876; application filed February 19, 1876.

To all whom it may concern:

Be it known that I, MICHEL PERRET, of Paris, France, have invented certain new and useful Improvements in Furnaces for Burning Pulverulent and Poor Fuel, of which the following is a specification:

Most kinds of fuel offer the greatest obstacle to combustion when in a pulverulent condition. Natural agglutination, when exposed to fire, is the property of but few kinds of fuel, and artificial agglutination is a costly process, which cannot practically be applied to poor combustibles.

To remedy these difficulties I have devised a furnace in several stories or floors, (*foyer à étages*), which fulfills the double purpose of burning pulverulent or poor fuel without any previous preparation of the same, even though it be extremely poor and thin.

The nature of my invention, and the manner in which the same is or may be carried into effect, will be understood by reference to the accompanying drawing, in which I have represented two forms of storied and gas-generating furnace embodying my invention, the first constructed to operate upwardly or *per ascensum*, and the second downwardly or *per decensum*.

The first is adapted principally for the combustion of non-flamant fuel. The second is for use in case of the reduction of oxides, or the employment of flamant fuel, with a view of obtaining combustion of smoke.

Figure 1 is a transverse section on the line 1 2, Fig. 2. Fig. 2 is a longitudinal section on the lines 3 4, Figs. 1 and 3. Fig. 3 represents horizontal sections on the lines 5 6 and 7 8, Fig. 2.

These three figures relate to the principal arrangement, which I have denominated "*per ascensum*," for reasons which will hereafter appear.

Fig. 4 represents a longitudinal vertical section of a furnace operating downwardly, or *per decensum*.

These two arrangements differ from each other only in the direction of movement of the air-current or draft. The arrows in full lines indicate the course of the air, and those in dotted lines the course of the fuel.

Each furnace is composed of four super-

posed floors or hearths, *a b c d*, of refractory earth, and an ash-pit, *e*. Three doors, *f g h*, permit of access to the interior of the furnace.

To put in operation a furnace of this kind, all the floors must first be brought to a red heat by means of wood or charcoal. The furnace is then charged on all its floors or hearths with the fuel which it is proposed to burn. When combustion is well established, the fire is managed as follows: The ashes on the hearth *d* are, by means of a rabble, which is introduced through the door *g*, worked down into ash-pit *e*, through the passage *p*. With the same tool, introduced through door *g*, the fuel on hearth *c* is worked down onto hearth *d*, through the passage *r*. The same operation is gone through with for the two upper floors through the door *f*. Then a fresh supply of fuel is charged on the hearth or floor *a*, and is spread in a thin layer of uniform thickness. The air to support combustion is introduced by channels *l*, where it becomes heated in descending the length of the furnace-walls. The combustion is thus maintained by heated air. The gases of combustion pass into the gas-generator *A*, through the mass of fragmentary fuel contained therein, and pass out therefrom through the burner-flues *B*. The hearth *a* in Fig. 2 is formed of two layers or thicknesses, between which is a space into which air enters through lateral channels *D*. This air becomes heated, and is conducted through channels *E* to the burner-flues *B*, where it serves to inflame the products of combustion of the gas-generator. This double hearth possesses, moreover, the advantage of preventing the fusion of the hearth-slabs placed at the point where the temperature is most elevated.

The above description refers to the furnace operating *per ascensum*.

In the one operating *per decensum* all the members of the furnace are the same, and the only difference is in their respective positions and in the direction of movement of the air, which, like the fuel, descends through the several stories of the furnace. This will be seen by reference to Fig. 4 of the drawing, and it will also be noted that the floor *b* is the one which, in this instance, is formed of two layers or thicknesses between which the air is heated, and thence passes to the burning-flues *B*.

The air to support combustion passes up through channels *l*, enters the furnace above the floor or hearth *a*, and redescends, following the path of the fuel.

In either kind of furnace, the number of stories or floors can be increased or decreased at pleasure, according to the kind of fuel used, and the nature of the use for which the furnace is intended.

In the furnace represented, the fuel is worked over immovable hearths by the aid of rabblers operated either by the hand or mechanically. The same result, however, can be arrived at by the employment of movable hearths or surfaces, operating to automatically displace the fuel.

The fuel can be renewed whenever necessary, and the interval of time between each charge may be varied at will, and may extend even to twelve hours by suitably regulating the draft. Owing to the wide-spread surfaces of the several hearths, the most finely-powdered fuel can be burned. By bringing the surfaces of the hearths comparatively close together, the temperature is elevated, and effects the combustion of the densest and poorest substances. By heating the air that supports combustion, incineration is pushed to the extreme limit. In this way I can burn to a condition completely pulverulent anthracite, poor bituminous coal, coke, peat, saw-dust, and even the residuum of other furnaces—which expresses the limit of poverty that can be attained. This facility in burning inferior combustibles, admits of economically bringing to high temperatures every kind of substance by mixing with such substance a suitable proportion of combustible matter; and in case the substances are oxides reducible by coal, the apparatus can operate as a reducing-furnace. In this case the draft should be downwardly, or as in Fig. 4. The air is introduced from above, in order that the gases in accompanying the charge through the several stories may become more and more reducing in character.

My furnace, therefore, according to the way in which it is worked, can be made to produce carbonic acid and oxide of carbon in varied proportions, with a greater or less mixture of atmospheric air.

With a view of obtaining much heat and of producing gasification of all kinds of combustible matter, I combine, as shown, my apparatus for consuming pulverulent fuel with a gas-generator for containing fuel in fragmentary form. The gases produced by the first pass through the fragmentary mass contained in the gas-generator, in order to absorb the excess of air to decompose the carbonic-acid gas, and to thus produce oxide of carbon, the ulterior combustion of which produces the maximum useful effect. In some cases, particularly where a comparatively low but constant temperature is required, as in heaters of all kinds, the gas-generator may be dispensed with, using only the furnace with its several stories, operating either *per ascensum* or *per descensum*, or, if necessary, having the two modes combined in one furnace, which would permit of its use in either way at pleasure.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A furnace or apparatus for burning poor or pulverulent fuel, provided with a series of superposed communicating hearths, and with draft-flues arranged and operating to maintain an air-current upward or downward through the furnace, substantially as set forth.

2. The combination of a furnace or apparatus for burning poor or pulverulent fuel on a series of superposed communicating hearths, as described, with a gas-generator for burning fragmentary fuel, substantially as set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

MICHEL PERRET.

Witnesses:

ALBERT ROBIN,
ALFRED COINY.