L. STEVENS.

Combined Matting and Smelting Furnace.

No. 221,429. Patented Nov. 11, 1879.

Fig. 1.

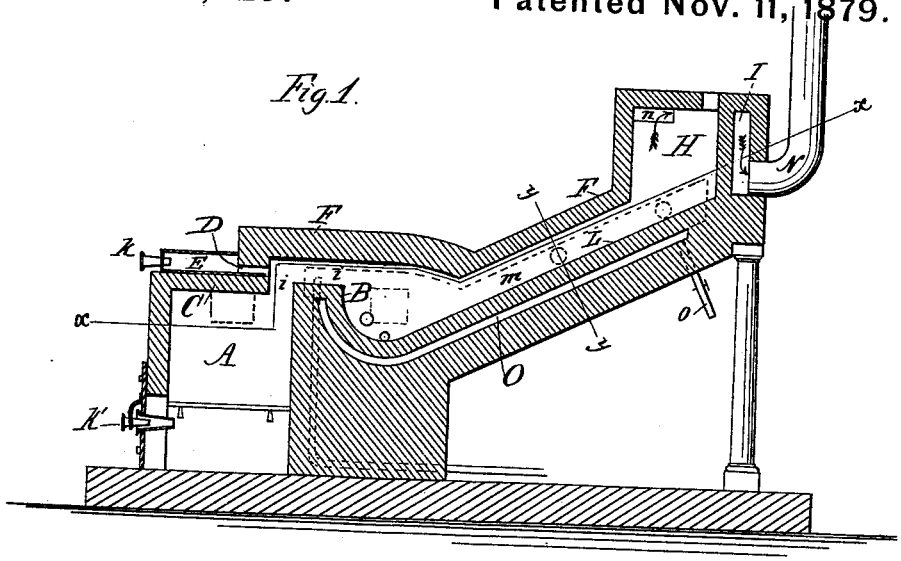


Fig. 2.

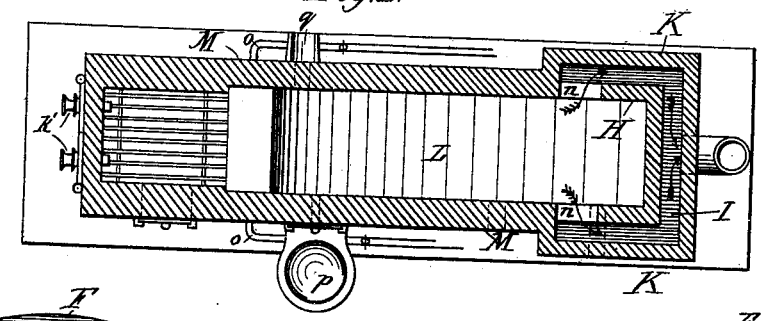


Fig. 5.

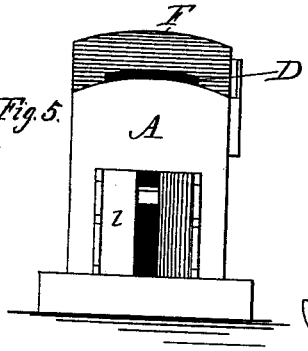


Fig. 3.

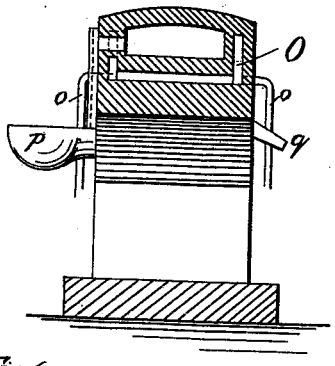


Fig. 4.

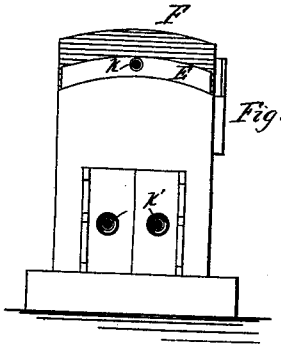
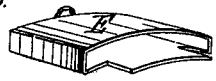


Fig. 6.



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UNITED STATES PATENT OFFICE.

LEVI STEVENS, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN COMBINED MATTING AND SMELTING FURNACE.

Specification forming part of Letters Patent No. **221,429**, dated November 11, 1879; application filed September 15, 1879.

To all whom it may concern:

Be it known that I, LEVI STEVENS, of Washington, in the District of Columbia, have invented a new and Improved Combined Matting and Smelting Furnace; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, of which—

Figure 1 is a vertical and longitudinal central section of my furnace; Fig. 2, a section on the line *x x*, Fig. 1; Fig. 3, a section on the line *y y*, Fig. 1; Fig. 4, an end view; Fig. 5, an end view, showing a modification; and Fig. 6, a detail view.

My invention relates to a furnace adapted for the consumption of coal, and duplex in its character, whereby it performs the twofold office of matting and smelting the ore in one continuous operation; and it consists in the several and joint construction of the parts, whereby, first, the requisite degree of combustion is attained; and, secondly, the products of combustion, after performing their function of smelting the ore, operate further to mat the same preparatory to smelting, all as hereinafter more fully set forth.

Recent investigations and experiments have demonstrated the fact that, from some inherent cause not yet scientifically explained, the greater portion of the western coals are incapable of reduction to coke without such enormous labor and expense as to render the employment of coke for smelting purposes in the mining regions wholly impracticable. Hence it becomes necessary to resort to coal in these regions for smelting purposes. In order, however, to derive sufficient heat from coal to smelt ores, a furnace is required which shall produce almost perfect combustion of the fuel, and such a furnace I have succeeded in devising.

The smelting portion of my furnace, it will be observed, is of the usual reverberatory pattern, and the peculiarity lies in the situation and form in which I introduce the air-blast and the manner in which I concentrate the products of combustion and the said air-blast within narrow confines.

In the drawings, A is a deep fire-box in the usual position before the bridge-wall B. The interior of the top C of this fire-box is lower than the top of the bridge-wall, and this dropping, so to speak, of the top C below the upper level of the bridge-wall gives to the passage *i* the form of a right angle, as shown, causing the products of combustion to assume first a vertical and then a horizontal course on their way to the furnace.

D is an opening through the front wall of the furnace, just over the top C of the fire-box, and leading into the passage *i* at or nearly in line with the center of the horizontal portion of the said passage. This opening is in the form of a narrow slot extending entirely across the interior of the furnace, and its purpose is to cause the air to enter in the form of a thin sheet and commingle with the ascending products of combustion in front of and immediately over the bridge-wall.

It is not the mere lowering of the top of the fire-box and introducing an additional blast above the same which gives novelty to this part of my invention. Furnaces have heretofore been made in which this occurs; but in no instance, so far as I am aware, has the top been dropped below the upper level of the bridge-wall, giving to the passage *i* the particular form described.

The drawings show two constructions as to the fire-box and the means for introducing air through the opening D, the one by means of a blast, and the other (shown in Fig. 5) by means of the natural draft.

To direct the blast through the opening D, an auxiliary chamber, E, is set upon the top C of the fire-box against the front of the arch F. The blast-pipes *k* enter this chamber at the end opposite the opening D. In this way the air is raised to a high temperature before passing into the interior of the furnace, owing to the situation of the chamber E immediately over the fire-box.

The blast through the fire-box is produced in the usual way by means of the pipes *k'* entering below the grate-bars. In the other form, Fig. 5, the auxiliary chamber E is dispensed with, and the draft through the fire-box is caused and regulated wholly by the doors *l*. The upper current of air still acquires considerable heat before entering the furnace,

owing to the narrowness and large area of the opening D.

It is, perhaps, needless to suggest that, if desirable, the two constructions may each be adopted in part, the blast being used above with the natural draft below or the blast below with the natural draft above.

The matting-furnace comprises the interior chamber, H, surrounded on three sides by a space, I, intervening between the wall of said chamber and the exterior wall, K. From the chamber H the bed L of the furnace inclines to the smelting-chamber below, the top F running parallel with it, and thus, with the side walls M, forming the passage *m*. Openings *n* in the upper forward part of the chamber H lead into the space I, and the chimney N connects with the rear of the said space at its base.

The bed of the entire furnace is surrounded on three sides by a water-jacket, O, as shown, the water entering through a pipe, *o*, at the lower end, and escaping through a pipe, *o'*, at the upper.

The novelty of this part of my invention lies in the relative construction of the chambers H and I and the openings connecting the two, whereby the products of combustion pass through the outer and envelop the inner chamber on their way to the chimney. All that relates to the inclined passage for conveying the ore down to the smelting-chamber is of the usual form.

The operation is as follows: The products of combustion from the fire-box pass first vertically into the passage *i*, and at their turning-point encounter the inrushing current of air from the opening D. The form of this opening and that of the passage *i*, together with the relative situation of the two, cause an intimate commingling of the products of combustion with atmospheric air within narrow confines, resulting in almost perfect combustion of the inflammable gases, and the consequent development of heat of very great intensity. The resulting incandescent gases, after being deflected to the bed of the reverberatory portion of the furnace, pass through the passage *m* into the chamber H; thence through the ports *n* into the surrounding space I, whence they finally escape through the chimney N. The ore is charged from above into the chamber H, but not in sufficient quantity to obstruct the passage of the products of combustion to the chimney. Thus the said products of combustion impinge against the ore in the said chamber, and also all the way up the inclined bed L, thereby matting it preparatory to smelting in the reverberatory portion below.

The heating of the walls of the chamber H by the passage of the hot products of combustion through the surrounding space I obviously contributes materially toward the operation of matting.

The molten metal runs into a receptacle, *p*, and the slag is removed through a trough, *q*, all in the usual manner.

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

1. In combination with the bridge and arch of a reverberatory furnace, the top C of the fire-box, extending lower than the top of the said bridge, and the opening D, of the form and in the situation shown and described, for the purpose specified.

2. In combination with a smelting-furnace, the matting-furnace, comprising the interior chamber, H, communicating through ports *n* with the space I between the walls of said chamber and the exterior wall, K, said space I communicating at the base of its rear side with the chimney N, and the passage *m*, forming a continuation of the chamber H, and leading to the smelting-furnace, being formed by the inclined bed L, inclined top F', and the side walls M, substantially as described, and for the purpose set forth.

LEVI STEVENS.

In presence of—

P. C. DYRENFORTH,

E. D. WINSLOW.