W. A. SWEET.

Furnace for Melting Metals.

No. 48,739. Patented July 11, 1865.

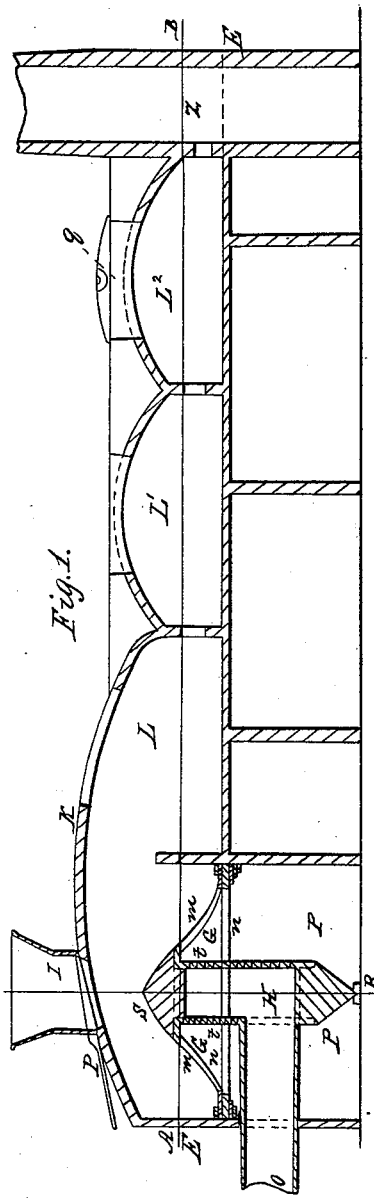

Fig. 1.

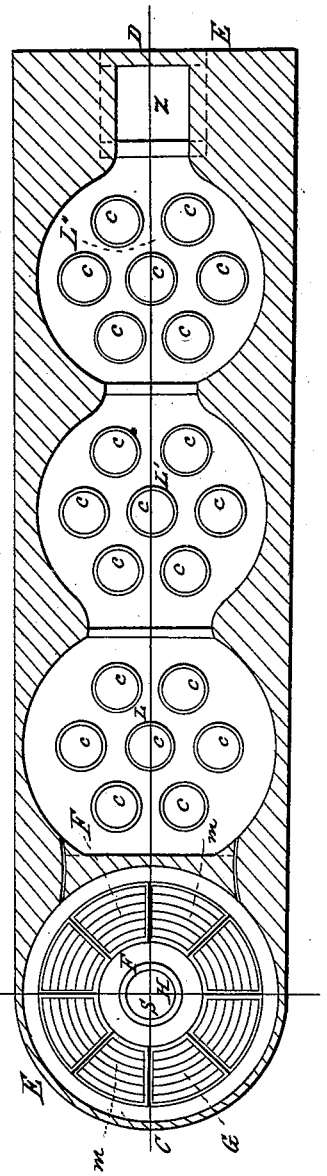

Fig. 2.

Witnesses:

E. R. Slosson

S. H. Slosson

Inventor:

Wm. A. Sweet

UNITED STATES PATENT OFFICE.

WM. A. SWEET, OF SYRACUSE, NEW YORK.

IMPROVED FURNACE FOR MELTING METALS.

Specification forming part of Letters Patent No. **48,739**, dated July 11, 1865.

To all whom it may concern:

Be it known that I, WM. A. SWEET, of the city of Syracuse, county of Onondaga, and State of New York, have invented a new Method of Melting Metals; and I do hereby declare the following to be an exact description of the same, reference being made to the accompanying drawings, which form a part of my specification.

The leading object of my invention is to make the process of melting steel and other refractory metals as nearly continuous as possible when carbon crucibles are used, and at the same time to save the now very expensive destruction of crucibles, caused chiefly by their being embedded in the coal and furnace by which they are heated.

To any one familiar with the process of melting steel it is well known that when the crucibles are placed in immediate contact with the coal oftentimes the blast from the fan or blower will be so guided or directed that a deep groove will be cut or, as it were, plowed almost instantly out of the side of the crucible, thereby rendering it useless for another charge, if it should not even lose its charge at the time. Embedding the crucibles in the coal also necessitates the delay of letting the furnaces cool down, so that they may be properly recharged, which also of necessity lets the crucibles chill, causing many of them to break, thus producing both delay and wastage—two very important objections which my method is intended to and does actually obviate. From these two causes—viz., the unequal distribution of the blast and the chilling before recharging—there is a wastage of crucibles in some large steel works which amounts to from one hundred to three hundred dollars per day; but to prevent this, and to save time by making the process a continuous one, I have been compelled to plan such combinations of heating-chambers and fuel apparatus as will give the necessary temperature with regularity, and capable also of being managed by the most ordinary workmen.

Having noted thus briefly some of the leading features, I will now proceed to explain more fully my methods, which I know are very valuable.

Figure 1 is a vertical section of the furnace as seen through the line A B, or longitudinally, and through the line C D of Fig. 2. Fig. 2 is a partial section and plan of Fig. 1 through A B.

Like letters refer to like parts in the drawings.

E E is the exterior wall of the furnace, built of the usual materials, and of sufficient strength to insure durability. In form it somewhat resembles the well-known reverberatory furnaces.

F is the fuel or combustion chamber, containing the conical grate G, whose base is a circle. The bottom of said chamber I prefer to make to correspond as nearly as possible to the base of the grate, so that the fuel will be held upon the grate-bars alike all round the combustion-chamber. The sides are built up perpendicularly, or nearly so, as high as the cone of the grate, whatever that may be; and here I may remark that the height of the cone must bear such a proportion to its base and the shape of the upper surface of the grate-bars that when the coal is let fall from the hopper I upon the apex of the cone it will distribute itself as evenly as possible over the entire grate. If any difference is given, I believe the greatest economy will be found in making the mass of coal deepest at the middle of the grate-bars, or at the points *m m*. The walls being raised to the height already named, or about that, a space is then left in the side next to the first heating-chamber nearly as wide as the diameter of the grate, and the rest of the wall is built up to some distance above the grate-cone, as represented in the drawings, Fig. 1. Upon the wall so built an oval arch is sprung, having its longest radius more than twice the diameter of the grate, so as to cover over both the grate-space and one heating-chamber, as at L, Fig. 1. The portion of the wall not raised to the height of the arch serves as a bridge-wall between the grate and the first heating-chamber, L, and causes a reverberation of the heat upon the crucibles placed therein, and arranged as shown at *c c c c*, Fig. 2. Other heating-chambers, as at L′ and L″, of a circular form, are connected together with the first chamber, as it is connected with the fire-space, and so also others might be added to utilize nearly all the heat before reaching the smoke-stack Z. I believe, however, that the three heating-chambers will generally be found sufficient, unless a very strong draft is readily attainable in the stack.

The blast is introduced from the fan or blower through the pipe O to the central and vertical pipe, H, within the air-chamber P P. The pipe H is pierced with a sufficient number of holes, as at *tttt*, Fig. 1, to permit the blast to escape all around and underneath the grate-bars, as well as into the air-chamber P P, and such an arrangement has the effect to equalize and give a steady blast. The pipe or tube H also serves as a support to the grate, having arms radiating from it, so as to receive the lower edge of the grate-segments G G, Fig. 2, while their upper arcs rest against the flange at F, Fig. 2, which is fastened upon the upper end of the tube. The upper end of the tube H is closed with a conical fire-tile, S, Fig. 1, and thus mounted the entire grate and air-tubes O and H rest upon the step R at the bottom of the air-chamber, and may be revolved back and forth within the surrounding wall by means of the pipe or tube O, which serves as a lever for that purpose.

The coal is charged in the hopper I immediately over the cone of the grate, and a slide *p* controls the aperture through the arch K. Through said aperture the coal is let fall in just such quantities as may be desired, and immediately over the cone, and will thereby be evenly distributed over and around the grate, and thus avoid the great wastage in the common furnaces—that of drifting the slack-coal through the grates by the stirrers. This fact is readily seen in comparing the ashes from my grate, which fall easily, when combustion is completed, through the grate-bars by a gentle jar of the pipe O, and those of the common furnace, where stirring with large iron pokers is resorted to. After the fire is lighted and the crucibles charged they are first placed in one of the cooler chambers, or that next to the stack, being introduced through the openings in the crown of the arches, which openings are closed by clay-lined covers, as at *q*, Fig. 1. The heat in L″, or the third chamber from the grate, being less than in the first, gradually increases the temperature of the crucibles from their cold state, without at all injuring them, and when they have attained as great a temperature, or nearly so, as can be given them there they are lifted by tongs properly formed for that purpose from that chamber and placed in the next one nearer the grate, and so on until the proper degree of heat is obtained, which may require their being transferred to the chamber L, which is within the furnace-arch K and in close proximity to the grate. So, also, to make a continuous process, or nearly so, whenever a crucible is lifted from the last heating-chamber and poured it is immediately recharged and introduced into the cooler chambers, whence crucibles have been taken to supply the hotter ones.

It will thus readily be observed that there is no necessity of allowing the furnace to cool down so as to properly embed the crucibles in the fuel. Neither are the crucibles permitted to become chilled after being once heated, or exposed to an intense heat when first charged.

Having thus briefly described my improvements, what I claim, and desire to secure by Letters Patent, is—

1. So constructing a melting-furnace that the temperature of the crucibles can be increased from a minimum to a maximum degree by transferring them from the cooler to the hotter chambers, substantially as described, and for the purposes set forth.

2. The combination and arrangement of the conical grate and feeding-aperature, substantially as described, and for the purposes set forth.

WM. A. SWEET.

Witnesses:
JAS. H. MASON,
BOYD ELLIOTT.