(No Model.)

J. PEDDER.

CRUCIBLE FOR MELTING METALS.

No. 243,788. Patented July 5, 1881.

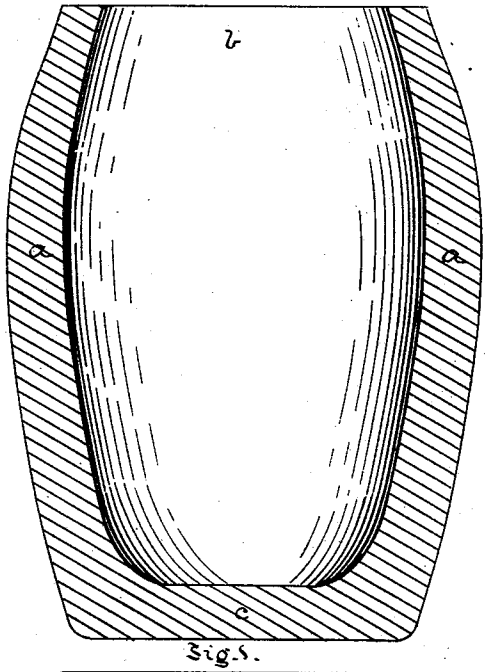


Fig. 1.

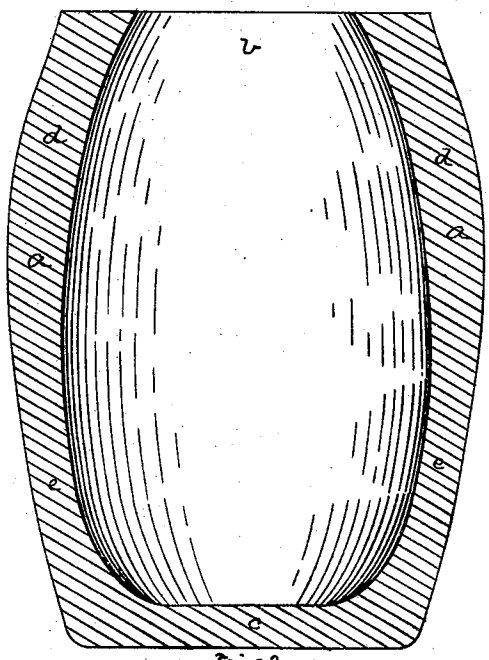


Fig. 2.

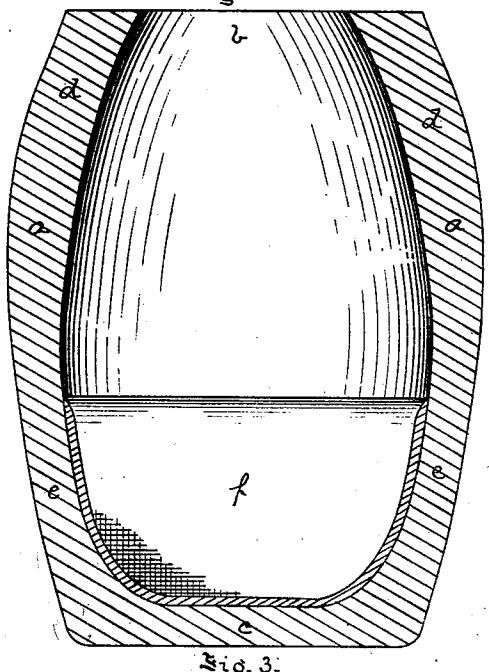


Fig. 3.

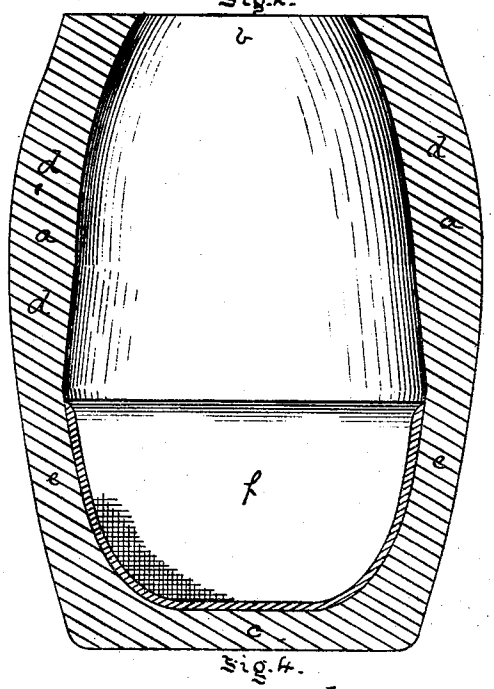


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN PEDDER, OF PITTSBURG, PENNSYLVANIA.

CRUCIBLE FOR MELTING METALS.

SPECIFICATION forming part of Letters Patent No. 243,788, dated July 5, 1881.

Application filed June 8, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN PEDDER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Crucibles for Melting Metals; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a sectional view of crucibles as usually made. Fig. 2 is a vertical section illustrating my improved crucible. Fig. 3 is a like view of the crucible in which a case or lining has been formed. Fig. 4 is a like view illustrating another form of my improved crucible.

Like letters of reference indicate like parts in each.

My invention relates to certain improvements in the construction of the plumbago crucibles for melting steel and other metals.

The crucibles in common use in the manufacture of cast-steel, brass, or other metals have been generally formed of plumbago and German clay, with a slight portion of silica, being known in the trade as "plumbago crucibles." They are usually contracted at the mouth, forming a bulge a short distance below the mouth to strengthen them and increase their capacity, and are made of different sizes, to hold from fifty to one hundred pounds of metal. These crucibles are subject to wear both on the exterior and interior surfaces during the process of melting the steel or other metals. The intense heat, flame, and air-draft of the furnaces burn away and wear off the outer surface very rapidly, the draft or blast of gas-furnaces being from the side and affecting the upper part of the crucible most, and the draft or blast of the coke or coal furnaces being from below and affecting the lower half of the crucible most. The interior of the crucible is also eaten off by the molten metal, which absorbs a portion of the carbon of the crucible, and by the spiegeleisen, manganese, and other fluxes, which cut into the inner surface, the metal and fluxes sometimes eating off as much as the flame affects the exterior. The greater portion of the interior wear comes on the lower part of the crucible from the molten-metal line to the bottom, and as it is subject to wear on both sides and has to sustain the weight of the molten metal, the lower walls have consequently been thickened to compensate for the double wear, the lower crucible-walls, from the molten-metal line down, being about one-third thicker than the upper walls. One difficulty in this construction, however, has been found in the cracking or weakening of the upper walls of the crucible, as they were not strong enough to withstand any jar or strains, and would consequently crack and render the crucible useless, or become so thinned and weakened in the upper portion as to render their use dangerous when the lower part was thick enough to stand one or more heats. This difficulty has become more apparent since I have discovered that by forming a lining or case in the interior of the crucible the interior is protected from cutting or other wear, so that the wear is all on the outer surface, and consequently the crucible will stand several more heats; and it frequently happens that where this lining or case is formed in the lower part of the crucible this lower part is sufficiently strong to stand several more heats when the upper part is cracked or too thin for safe use. As the cost of each heat obtained from a pot or crucible is calculated at from twenty-five to thirty-five cents, it is evident that any further heats obtained therefrom would be an important saving to the manufacturer.

The object of my invention is to so construct a crucible as to prevent its cracking or weakening at the top, and thus enable the upper part to wear as long as the lower part will when protected from inside wear.

It consists, first, in thickening the upper portion of the crucible from below the molten-metal line to the mouth, so as to form the upper walls thicker than the lower walls, by this means bracing the upper part of the crucible, so as to prevent its cracking during handling, and furnishing more material at the principal point of wear, so that the upper walls will stand several more heats before becoming too thin for safe use; second, in combining with the crucible having the upper walls formed relatively thicker from the molten-metal line to the mouth than the lower walls an inner case or lining of plumbago and silica, or simi-

lar material, formed in the lower part of the crucible to protect the lower walls.

To enable others skilled in the art to make and use my invention, I will describe its construction and operation.

My improved crucible is illustrated by sectional views, the crucibles having the usual bulge, *a*, a short distance below the mouth, and the usual contracted mouth, *b*. The crucibles, as heretofore constructed, have been made with the lower walls below the molten-metal line about one-fourth or more thicker than the upper walls, as shown in Fig. 1, and the lower walls were further braced by the bottom *c*, which supported the walls against side strain, the lower walls being made thicker to compensate for the double wear, as above referred to.

My improved crucible is generally formed with the upper walls, *d*, from one-third to one-fourth thicker than the lower walls, *e*, this thickening of the walls generally commencing about half-way up the metal space, and at least extending from below the line which the molten metal reaches, known as the "molten-metal line," to the mouth of the crucible. The molten-metal line is generally about in the center of the crucible-bulge, but varies slightly according to the weight of metal, as well known to the skilled workman. The walls may either gradually increase in thickness toward the top, forming a gradual curve or arch, as shown in Fig. 2, or they may be formed of the same thickness throughout the thickened portion, as shown in Fig. 4, either construction serving to impart to the upper walls a strong bracing, so that, though they have no connecting support, as the bottom affords to the lower walls, they are equally strong, and will withstand any ordinary shocks or jars consequent to the handling and use. The thickened upper walls also give much more material to withstand the action of the flame and enable the upper portion to stand several heats longer. The thickening of the upper walls naturally reduces the capacity of the pot, as the increase in thickness is generally on the inner surface, as shown, and the increased thickness adds several pounds of material to the crucible, thus considerably increasing its cost. To remedy both these objections I reduce the thickness of the lower walls, so as to provide material for thickening the upper walls, the relative thicknesses of my improved crucible being substantially the reverse of the common crucible, and the lower walls being about two-thirds or three-fourths the thickness of the upper walls. The consequent enlargement of the lower metal space fully compensates for the reduction in capacity by the thickened upper walls, and the material so displaced provides the necessary material for the upper walls, so that my improved pot can be made with as great capacity and at as low cost as the usual pot.

The crucible can be formed in the usual pottery-machines for that purpose, the only change necessary being in the forming-tool.

As the thinned lower walls of my improved crucible would burn out and give away very soon, I form in it my improved case or lining *f*, the lining being formed in the lower part of the crucible, so as to protect the thinned walls and prevent the fluxes or metal from cutting into them. This lining or case is composed, generally, of ground-up pots or plumbago, silica, salt, and water in which a small portion of German kaolin or similar clay has been dissolved, this clay-water acting as a bond to the other ingredients of the lining. The proportions of the materials are generally about twenty parts of plumbago, ten of silica, one of salt, and sufficient water to form a mortar that will "run," a portion of this mortar being placed in the bottom of the pot, which is then slightly tilted and gradually revolved, so as to cause the mortar to run around and cover the sides of the pot to a sufficient height. It is then thoroughly dried in an oven or above the melting-furnaces. Similar ingredients suitable for the purpose may also be employed for this lining, and it may be molded in by hand or tools or placed in dry. After the lining so formed has been once brought to the high heat of the melting-furnace it is united with the crucible, and has a hard glazed surface, which will resist the metal and fluxes and prevent any further wear on the crucible interior. If the lining becomes punctured by the metal scrap, it can be renewed.

The crucible so protected is found to wear several heats longer than the ordinary crucible, the upper thickened walls standing eight or ten heats before cracking or wearing too thin for use, and the thinned lower walls, when protected by the lining, being only affected by the outside wear, and lasting as long as the upper part of the pot, so that I am enabled to obtain about one-third more metal from this pot than from the ordinary crucible, which makes a large saving in the manufacture of steel or other metals with which it is employed.

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

1. A plumbago crucible for melting steel or other metals formed with the upper portion thickened from below the molten-metal line to the mouth, so as to form the upper walls relatively thicker than the lower walls, substantially as and for the purposes set forth.

2. A plumbago crucible with the upper walls thickened from below the molten-metal line to the mouth, so as to form the upper walls relatively thicker than the lower walls, in combination with an inner lining or case of plumbago and silica or similar material formed in the lower part of the crucible, substantially as and for the purposes set forth.

In testimony whereof I, the said JOHN PEDDER, have hereunto set my hand.

JOHN PEDDER.

Witnesses:
JAMES I. KAY,
F. G. KAY.