

June 18, 1946.

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 APPARATUS FOR MELTING FINELY DIVIDED ALUMINUM
 AND ALLOYS AND OTHER METALS
 Filed May 25, 1943

2,402,498

2 Sheets-Sheet 1

FIG. 1.

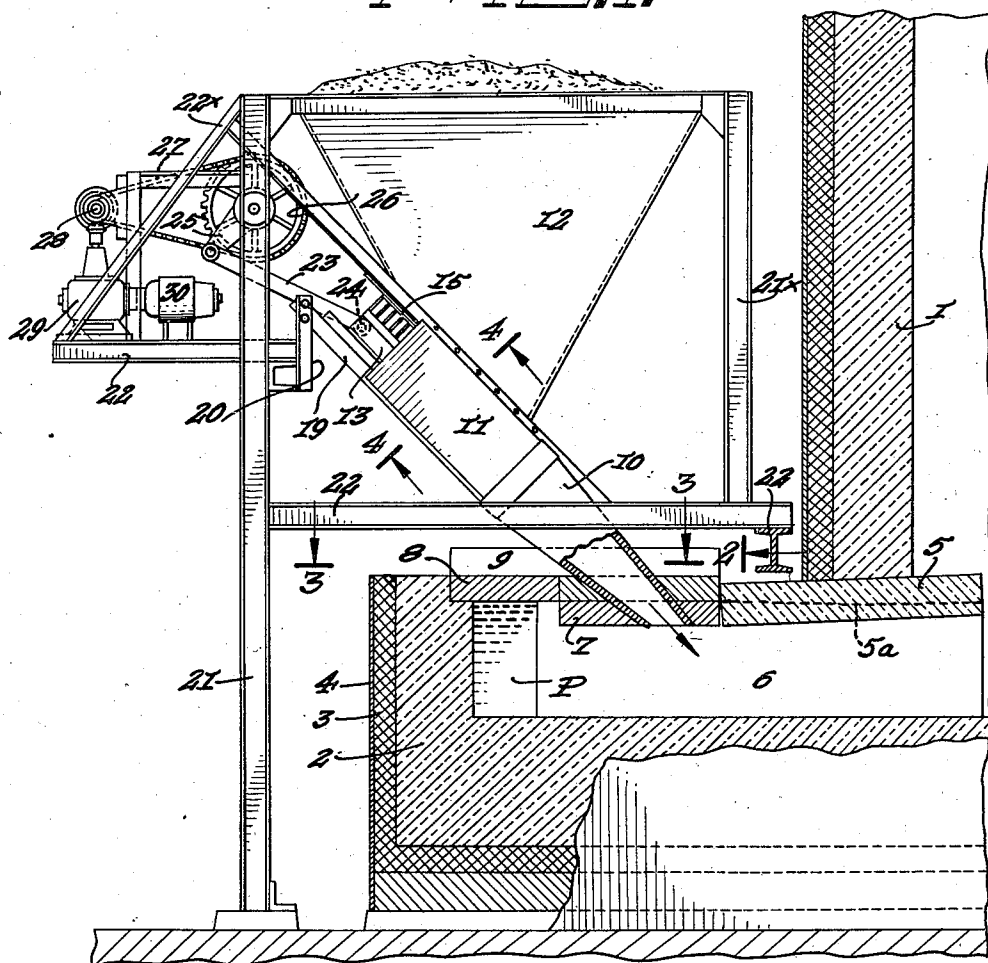
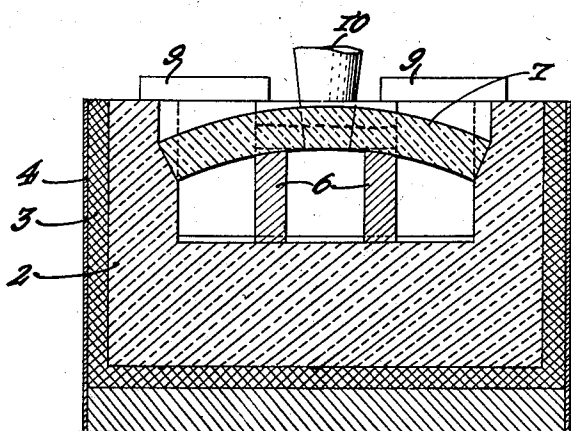


FIG. 2.

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FIG. 3.

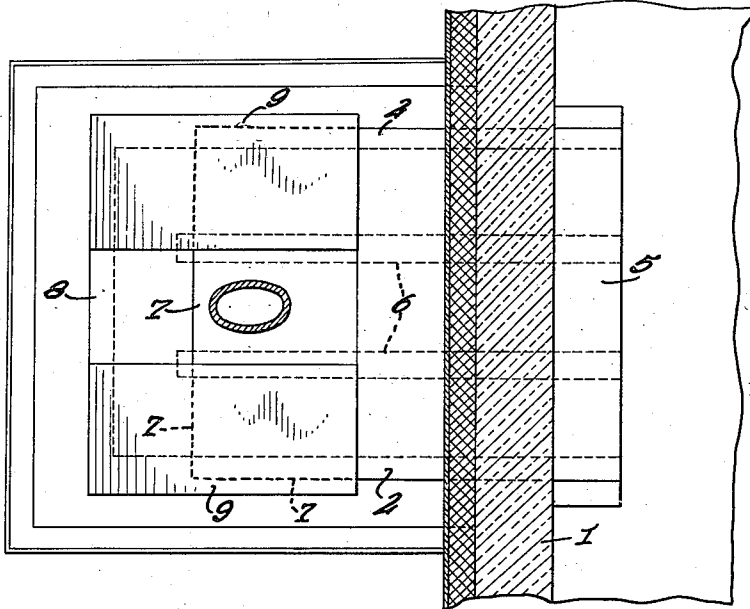
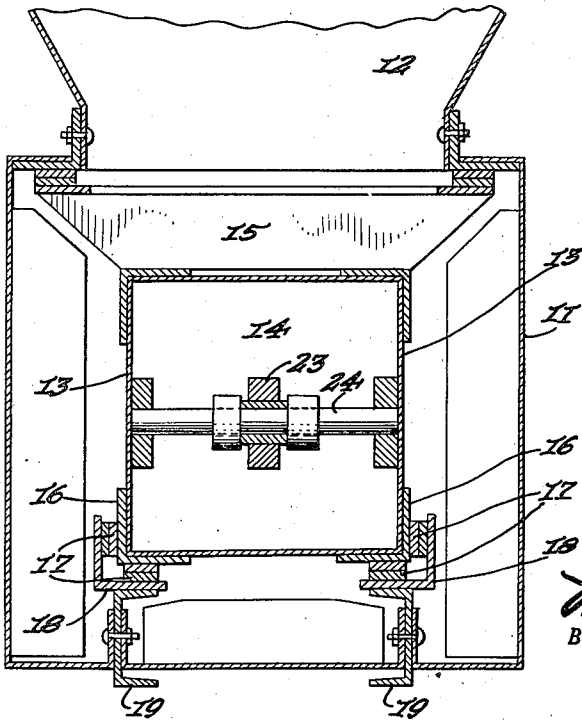


FIG. 4.



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APPARATUS FOR MELTING FINELY DIVIDED
ALUMINUM AND ALLOYS AND OTHER
METALSNorman Kohlhepp, Louisville, Ky., assignor to
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Application May 25, 1943, Serial No. 488,354

3 Claims. (Cl. 266—33)

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The object of this invention is to provide a method for the re-melting of finely divided particles of metal, particularly aluminum and alloys thereof including scrap, sheets, lathe cuttings and borings, in such manner as to largely overcome the problem of oxidation which is appurtenant to the re-melting of such finely divided portions of the aluminum and aluminum alloys, the apparatus being automatic and of such nature that the customary manual or machine puddling is dispensed with, turbulent movements of the molten metal into which the material for re-melting is injected being formed by gaseous generation, which gaseous generation is so controlled as to have a physical effect upon the molten metal and said re-melt material fed thereto.

The invention will be described with reference to the accompanying drawings, in which:

Figure 1 is a view in elevation and fragmentary in part, showing the lower portion of the front wall of a furnace, the forwardly projected scrap-melting unit at the base of the furnace and the scrap-feeding mechanism.

Figure 2 is a vertical section on the line 2—2, Figure 3.

Figure 3 is a plan view, partly in section, taken on the line 3—3, Figure 1.

Figure 4 is a transverse section on the line 4—4, Figure 1, drawn to a larger scale.

Referring to the drawings, I have indicated at 1 the lower portion of the front wall of a furnace for containing a bath of molten aluminum or aluminum alloy into which the scrap or finely divided aluminum will be fed as raw stock or in molten condition. Toward its base the front wall will be formed with an aperture for communication with a charging and agitation section.

The charging and agitation section of the furnace shown in the present embodiment consists of a trough-like body member 2 of refractory material and which may have an inner casing 3 and an outermost casing 4, if desired. Lying immediately under the furnace wall 1 is a flat wall 5, the lower face of which is inclined downwardly toward the front of member 2. Wall 5 may be supported directly upon the side walls of trough member 2 and upon spaced intermediate and longitudinally extending division walls 6.

Immediately at the rear of wall 5 is an arch cap 7, which may be unitary or sectional in construction, the latter construction being indicated, and forwardly of the arch cap 7 is a flat top wall section 8. In addition, I have shown the placement of two tile top members 9, these members being faced so as to lie over the outermost of the three

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chambers of the charging and agitation section of the furnace.

Communicating with the interior of the central chamber of the charging and agitation section of the furnace between walls 6 is a conduit 10. This conduit passes through an aperture formed in the arch 7 and at its top communicates with a box 11 at the lower end of a hopper 12, the latter communicating with the interior of the box.

Mounted for reciprocation within the box is a charging ram of any suitable construction and adapted, when moved upwardly, to clear the intercommunicating space between the hopper 12 and box 11 so that the charging material will descend into the box and, also adapted on downward movement, to press the charging material from the box and into the conduit 10. In the present embodiment, the ram consists of a hollow rectangular member having side walls 13 and a bottom wall 14, and at its top it carries spaced shearing blades 15. At its lower corners the box-like ram carries angle irons 16, to take up wear and to bear against suitable abutments 17 carried by the angular guides 18, the latter being supported on frame members 19 supported at their upper ends by brackets 20. The brackets 20 are carried by the main frame which consists of the vertical standards 21, 21x and the horizontal standards 22 and sub-frame members 22x.

The ram is reciprocated by a crank arm 25 and connecting rod 23, one rod being shown. The rod is pivotally mounted on a pin 24 carried by the ram, and is also pivotally mounted by a pin to crank 25 carried by a sprocket wheel 26 driven by chain 27 led over a sprocket wheel on a shaft 28 having suitable gear connections with a change-speed device 29 (diagrammatically shown in Figure 1) driven by motor 30.

It will be understood that the shearing blades 15 may be fixed so that the upper end edge of the ram may act as a co-shear, or be adapted for such action by the application of a separate shear blade.

In the operation of my apparatus and method the hopper 12 is filled with the charging material, and it may be maintained filled by suitable conveying instrumentalities from a source of supply. The furnace will be provided with a bath of molten aluminum or aluminum alloy and the metal line in the furnace will be maintained above that in the charging and agitating section, a suitable metal line being indicated in Figure 1 as 5a.

Reciprocation of the ram will cause a constant or intermittent feed of the charging material into

the central chamber of the charging and agitating section, said chamber being bounded by the wall 6, the base of the trough 2, the arch 7 and the wall 5, and also partially by the wall 3 as shown in Figure 2. The rate of feed may be regulated by the change-speed device 29 or by intermittently operating the feed ram, as desired.

The charging material will be fed under the level of the molten metal in the furnace as may be seen in Figure 2. Due in part to the usual presence of impurities such as oil and grease with which the charging stock is coated, gases are generated in the charging and agitating section with each stroke of the ram, the primary generation being in the central section laterally bounded by the wall 6. The pool of metal at the area P, Figure 1, is, of course, of less volume than that in the furnace and the generated gases constantly seek a passageway and hence develop greater turbulence in the pool P and in the central chamber of the charging and agitating section. By such means very substantial movement of the molten metal and the charging stock undergoing melting is effected, enabling my method to wholly dispense with the customary mechanical puddling, and also to greatly reduce oxidation of the charging stock and to reduce heat losses.

It will be understood that the invention will be found useful in connection with metals in addition to aluminum and alloys thereof. For example, the invention is applicable to the melting of finely divided magnesium metal and its alloys under a mixture of fused chloride salts, which will greatly reduce the losses in the recovery of finely divided magnesium under present methods. In such case the surface of the fused chloride salt becomes the equivalent of the metal line within the furnace as specified for aluminum. In other words, the aluminum metal line within the furnace then becomes a fused salt line, in which case the sub-surface metal line within the furnace could be at the same level as the metal line within the charging and agitating section.

The claims are to be interpreted as applicable not only to aluminum and alloys but to metals generally.

Having described my invention, what I claim and desire to secure by Letters Patent is as follows:

1. In apparatus for melting finely divided aluminum and alloys, a furnace adapted to maintain a mass of molten aluminum and having a lateral passageway at its base, a charging and agitating furnace section projecting at the base area of the furnace and communicating with said passageway, said furnace section having top closure means for confining molten metal with the level thereof below the mass of molten aluminum within the furnace back of its said lateral passageway, and means above said top closure means for feeding said finely divided material into the molten metal within the charging and agitating furnace section and through said top closure means.

2. In apparatus for melting finely divided aluminum and alloys, a furnace adapted to maintain a mass of molten aluminum and having a lateral passageway at its base, a charging and agitating furnace section projecting at the base area of the furnace and divided by walls into a central pool area and lateral pool area, said pool areas communicating at one end, said furnace section having top closure means for confining molten metal with the level thereof below a mass of molten aluminum within the furnace back of its said lateral passageway, and means above said top closure means for feeding said finely divided material into one of said pools of the charging and agitating furnace section.

3. Apparatus for melting finely divided aluminum alloys constructed in accordance with claim 1, in which the top closure means for the charging and agitating furnace section comprises an arch wall having an aperture therethrough for said feeding means, the arch extending transversely of said furnace section whereby the depth of the molten metal therein is major at the center of said furnace section and minor at the sides thereof.

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