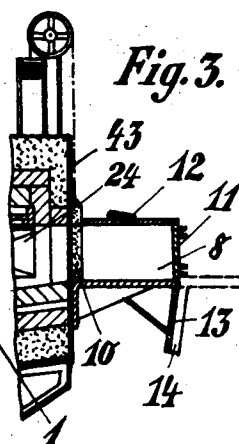
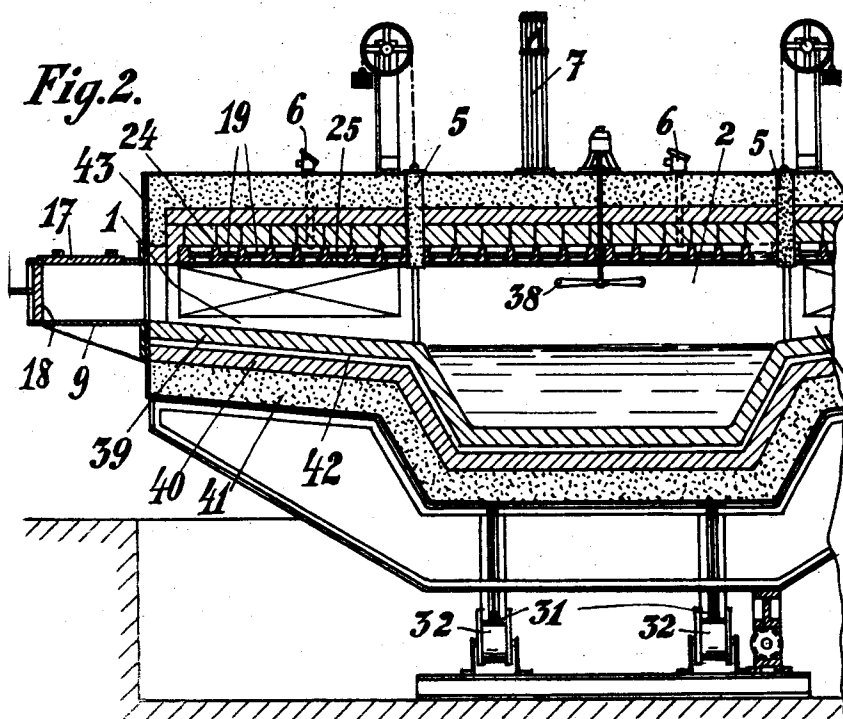
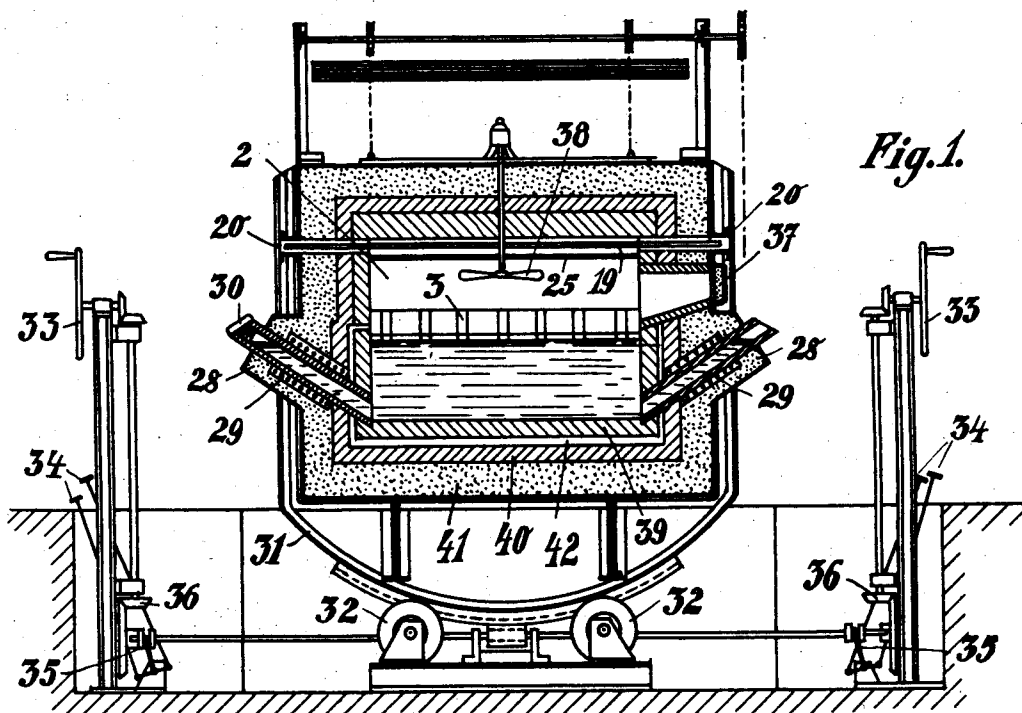


ALUMINIUM MELTING FURNACE

Filed June 18, 1932

2 Sheets-Sheet 1



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March 26, 1935.

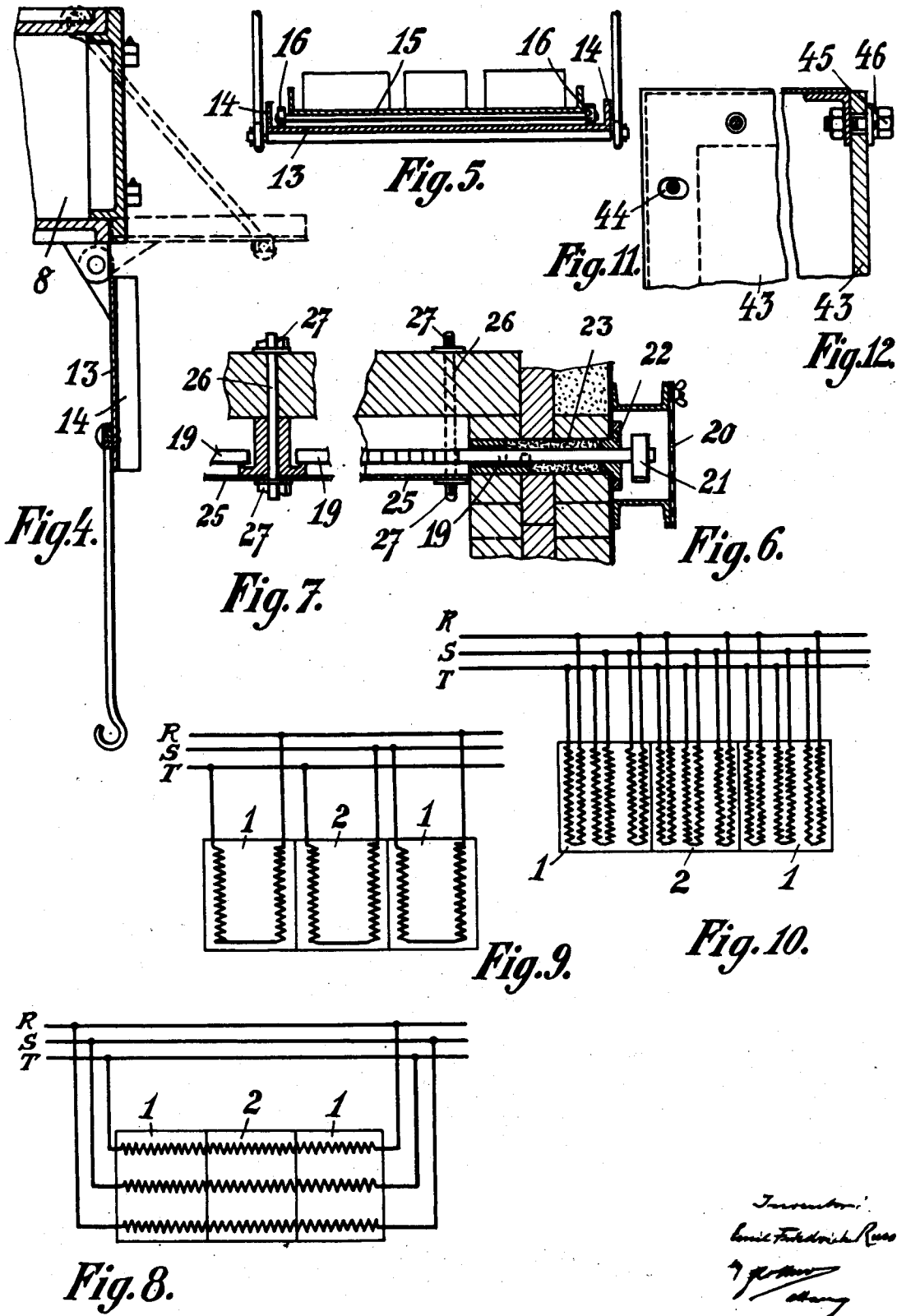
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ALUMINIUM MELTING FURNACE

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UNITED STATES PATENT OFFICE

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ALUMINIUM MELTING FURNACE

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4 Claims. (Cl. 13—20)

This invention relates to an aluminium melting furnace, which is tiltable like a cradle towards both sides from the vertical axis and has two melting chambers electrically heated from the roof and connected the one with the other by a common collecting chamber for the molten aluminium likewise provided with electrical heating for the roof and situated on a lower plane. These furnaces possess particularly the advantage over other known furnaces, that it is possible to continually work therewith, to overheat the aluminium metal and to keep the molten metal practically free from impurities. The invention relates to improvements of furnaces of this type.

An embodiment of the invention is illustrated by way of example in the accompanying drawings, in which:

Fig. 1 shows a tiltable furnace in vertical section through the tilting plane.

Fig. 2 is a section taken at right angles to Fig. 1.

Fig. 3 shows a gate-like charging device.

Fig. 4 shows the front end of a gate-like charging device in side elevation partly in section.

Fig. 5 is a front view of Fig. 4.

Fig. 6 shows in vertical section the protecting device for exchanging the heating loops.

Fig. 7 is a part cross section of Fig. 6.

Figs. 8, 9 and 10 show different connections of the heating elements to the net.

Fig. 11 shows in front elevation a portion of the furnace end plate with means for fixing on the furnace.

Fig. 12 is a part cross section of Fig. 11.

In the drawings 1 designates the two melting chambers and 2 the common collecting chamber which lies on a slightly lower plane than the melting chambers and into which the molten metal flows from these melting chambers. In the bottoms of the two melting chambers grooves 3 are provided as clearly shown in Fig. 1, along which grooves the metal runs from the melting chambers into the collecting chamber. The melting chambers 1 may be shut off from or connected with the collecting chamber by means of refractory doors shiftable by counter weights. It is possible by means of these doors 5 to dam and regulate the temperature in the melting chambers 1 to the greatest possible extent. When melting ingots, higher temperatures may be employed than for melting sheet metal waste. It is even possible by means of the doors 5 to work with different temperatures in the melting chambers 1. It is advisable to provide pyrometers 6 on the roof to enable reading of the temperature

in the chambers situated thereunder. A pyrometer 7 may also be fitted in the collecting chamber 2 for measuring the bath temperature the pyrometer 7 being adapted to be raised and lowered by hand in order to protect the protecting tube of the pyrometer from being attacked by the molten aluminium when measurements are not being taken.

The charging of the furnace is effected with the aid of gates 8 and 9 arranged one on each side of the furnace. The gate 8 has a sliding door 10 directly in front of the melting chamber and a folding door 11 at its other end. On the roof of the gate chamber a flap 12 is arranged adapted to act as a valve when oil and other impurities on the metal to be melted are to be evaporated by the waste heat of the furnace. After opening the folding door 11 the metal is charged into the gate chamber 8 whereupon the folding door 11 is closed and the sliding door 10 raised. The metal can then be pushed through a hole in the folding door 11 into the melting chamber 1, e. g. by means of rods. A charge plate 13 is hingedly mounted on the front end of the gate which, when in the position shown in dotted lines in Fig. 4, facilitates the introduction of the metal into the gate chamber 8 but, when folded down, leaves the space in front of the door free. As is shown particularly in Figs. 4 and 5, an edge 14 projects upwards on each side of the charge table and renders it possible to push the charge into the chamber 1 by means of a single charge truck 15. The charge truck 15 is mounted on rollers and the upwardly projecting edges 14 of the table 13 prevent the truck from running off laterally. In the case of the gate 9 shown on the left side of Fig. 2 a hinged roof 17 is provided and a piston 18, corresponding accurately to the cross sectional area of the gate chamber, is shiftable in this gate chamber. In the position illustrated, the piston 18 closes the front end of the gate chamber 9. For introducing metal the roof flap 17 is opened the metal is charged into the chamber 9 and pushed into the melting chamber 1 with the aid of the piston 19 the roof flap 17 being either opened or closed.

The heating of the three furnace chambers 1 and 2 is effected with the aid of exchangeable heating elements 19 fitted on the roof. In order to facilitate the exchanging of the heating element they are subdivided into several bands. Each band can be pulled out through a lateral aperture closed by a removable brick. The wires connecting the heating elements to the electric terminals need previously only be detached after

lowering a protecting guard. These elements are shown in Figs. 6 and 7 wherein 20 designates the guard which allows access to the terminals 2, after having been lowered. 22 is the protecting brick which must be removed towards the outer side and 23 designates the interposed slag wool. It is consequently easily apparent how the individual heating elements 19 can be removed in lateral direction.

10 In order to protect the heating bands from being attacked by the molten aluminium, the heating elements are covered with a plate 25 made of refractory material. This covering must be so constructed that it does not offer great resistance to the passage, as otherwise the heating elements 15 19 may easily become overheated. The mounting of these cover plates 25 is illustrated in Fig. 7. The individual plates 25 are each mounted on a bolt 26, which is made of flat material so that it can be fixed by wedges 27 at the top and bottom.

20 The connecting up of the heating elements 19 to the net may be effected in four different manners as illustrated in Figs. 8 to 10.

25 1. All three chambers 1 and 2 may be heated by three continuous loops, as is shown diagrammatically in Fig. 8.

2. Each of the three chambers can be connected up to one phase of the net, as illustrated in Fig. 9.

30 3. Each of the three chambers 1 and 2 can be connected to the three phases as shown in Fig. 10.

4. The connection may be effected as described under 2 and 3 and illustrated in Figs. 9 and 10, except that for varying the absorbing capacity of the collecting chamber 2 an ordinary adjustable 35 transformer or a three-phase current transformer is connected up in series in order to alter the capacity by 50%.

40 As shown in Fig. 2 electric heating elements 24 are also arranged in the melting chambers 1 for increasing the heating capacity.

Further, the pouring spouts 28 shown at the sides in Fig. 1 are provided with electrical heating elements 29 in order to prevent the metal from solidifying in the spouts, and these spouts are 45 preferably covered by a heated plug 30.

Below the roof of the collecting chamber 2 a fan 38 is arranged which is driven mechanically from the outer side and opposes the rise of the 50 heat so as to prevent an accumulation of heat within the range of the electric heating elements and to force the heat to the place where it is required, namely on to the molten bath.

For pouring off the molten metal the furnace 55 can be tilted to either side. For this purpose it is mounted on a double runner 31 which is shiftable on rollers 32. The tilting movement is effected by hand drive or in the case of large furnaces by a drive controlled by a press button. Two hand 60 wheels 33 are provided for hand drive for which, in the case of electric press button control, two switches must naturally be substituted. In the case of hand drive the operator engages the hand wheel 33 in question by means of its pedal 34 and a claw clutch 35. The transmission is then 65 effected by bevel wheels 36 and a worm wheel and worm.

Above the spouts 28 a slag door 37 is provided. If necessary, only one tap or pouring aperture 38

can be arranged on one side and one slag removing door 37 on the other side.

The masonry must be carried out very carefully in order to prevent all soiling of the aluminium.

5 The hearth therefore consists according to Fig. 2 of magnesite stones 39. Under this course of magnesite stones 39 a course of semi-insulating stones 40 and thereunder an insulating layer 41 are provided. Further in order to avoid a chemical action between the magnesite stones 39 and the semi-insulating stones 40 at high temperature a thin layer of chromium ore plates 42 is interposed between the courses 39 and 40. Experience has shown that there is a danger of the magnesite 15 and Chamotte stones entering into combinations in a disagreeable manner, whereby the masonry may be prematurely destroyed. On the ends of the furnace mild steel end plates 43 are arranged. As these mild steel plates do not tear but may 20 distort and warp, they are provided with sufficient reinforcements. Further all direct heat radiation onto these end plates 43 is avoided at the operating apertures. The plates 43 have, as shown in Figs. 11 and 12, elongated holes 44 and they are 25 fixed by means of bolts 45 with spring washers 46. Consequently, the end plates can never bulge in the case of expansion under heat.

I claim:—

1. In an aluminium melting furnace adapted 30 to be tilted like a cradle to each side of the vertical central axis, consisting of two melting chambers heated from the roof and a common collecting chamber for the molten aluminium, all chambers provided with electric roof heating, the collecting 35 chamber situated on a lower plane than the plane of said melting chambers and communicating with said melting chambers, vertically shiftable refractory doors between said melting chambers and said collecting chamber, and bottom plates in 40 said melting chambers having longitudinal grooves adapted to conduct the liquid metal from said melting chambers into said collecting chamber, even when said doors are closed.

2. In an aluminium melting furnace with two 45 melting chambers and a common collecting chamber, refractory sliding doors between said melting chambers and said collecting chamber, and charging devices on the front end of said melting chambers and each having a door at its inlet and 50 outlet ends.

3. In an aluminium melting furnace with two melting chambers and a common collecting chamber having slag removing apertures, refractory 55 slide doors between said melting chambers and said collecting chamber, doors in said apertures, and pouring spouts extending from said collecting chamber below said slag removing apertures.

4. In a tiltable melting furnace with melting 60 chambers and a common collecting chamber and charging chambers on the front end of the melting chambers, tables pivoted on the front end of said charging chambers, means for lowering said tables when not in use, and for raising same into 65 horizontal position for use, said tables having upwardly projecting side edges for guiding trucks for conveying the charge.

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