Jan. 22, 1929. 1,700,002

O. C. TRAUTMAN

APPARATUS FOR HEATING WIRE

Filed June 27, 1925 2 Sheets-Sheet 1

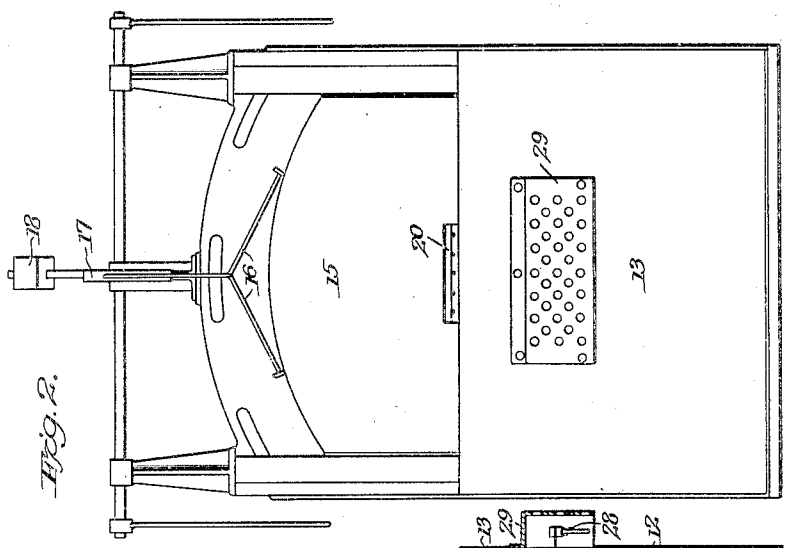


Fig. 2.

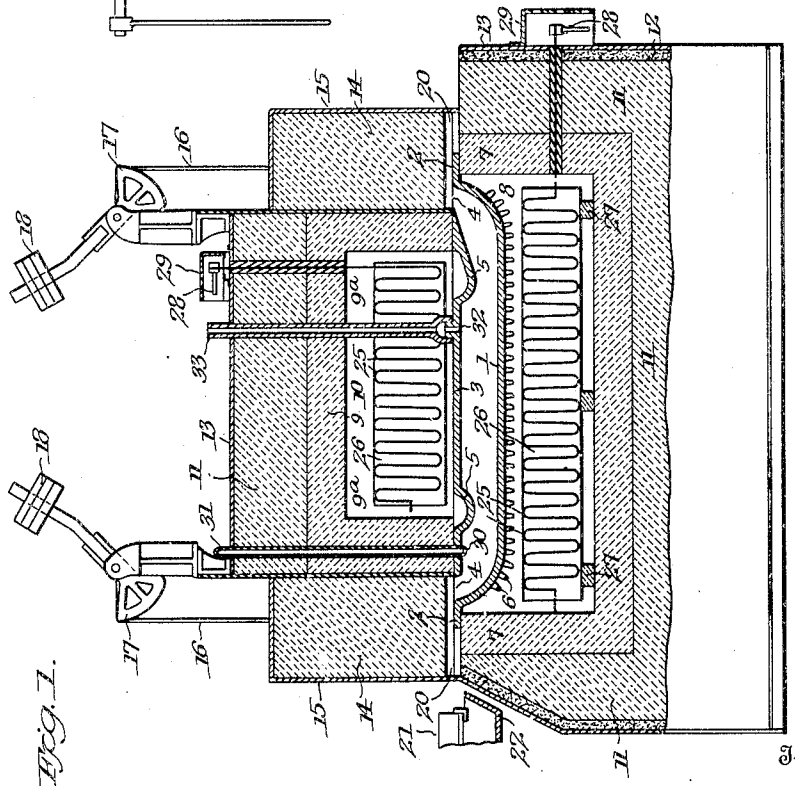


Fig. 1.

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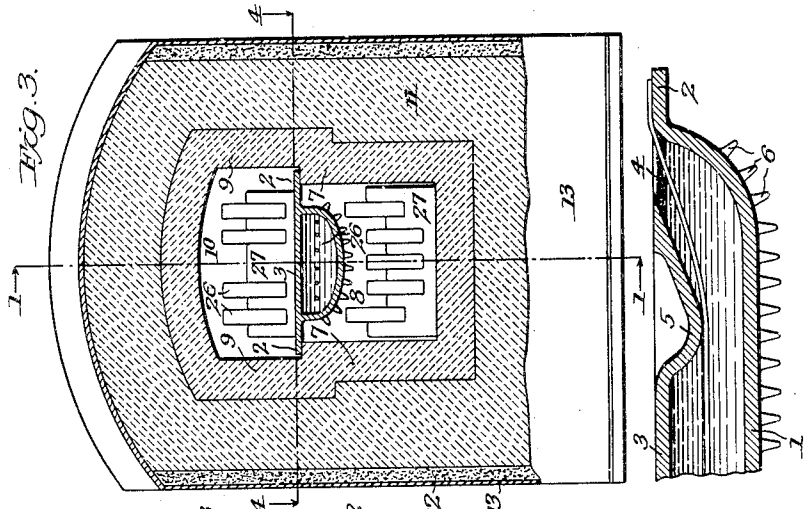


Fig. 3.

Fig. 6.

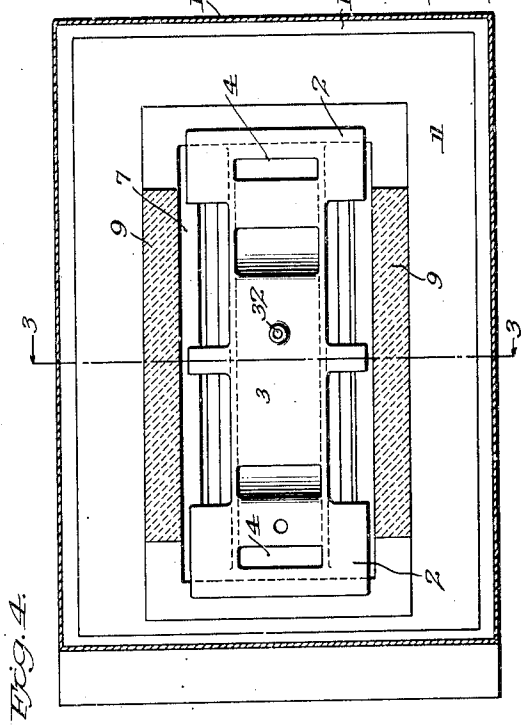


Fig. 4.

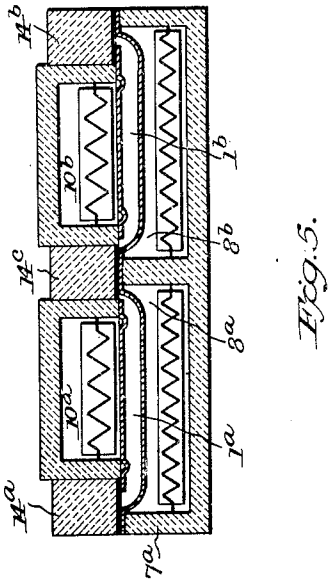


Fig. 5.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR HEATING WIRE.

Application filed June 27, 1925. Serial No. 39,923.

This invention relates to the heat treatment of metal wires, rods, and strips, and has for its objects the provision of a new and improved type and construction of furnace whereby the same can be heated rapidly, continuously, and economically to a uniform controlled temperature; the provision of a heating appliance whereby the wire or strip may be shielded against oxidation; the provision of a furnace or heating device whereby the temperature to which the wire or strip is heated is rendered independent of the surrounding air temperature, and a uniform product obtained; the provision of a new mode of heat control; while further objects and advantages of the invention will become apparent as the description proceeds.

In the drawings accompanying and forming a part of this application I have shown certain physical structures in which my inventive idea can be embodied, although it will be understood that the same are intended to be merely illustrative of the principles of my invention and not to be exhaustive of mechanical constructions.

Fig. 1 is a vertical longitudinal section of a preferred form of single-bath furnace; Fig. 2 is a right hand end elevation of the furnace shown in Fig. 1; Fig. 3 is a vertical cross-section of the furnace shown in Fig. 1; Fig. 4 is a horizontal sectional view corresponding to the line 4—4 in Fig. 3; Fig. 5 is a diagrammatic view of a modified form of furnace drawn to reduced scale and showing the use of plural pots in series; and Fig. 6 is an enlarged detail section of one end of the melting pot.

In the specific embodiment herein shown an elongated lead-pot, made of iron-chromium or other heat resistant metal or alloy, is mounted in radiation receiving relation to a suitable electrical resistance heating element inside a heat insulating casing. The lead-pot I have shown consists of an elongated trough 1 having a supporting flange 2 and closed at the top by an integral cover 3 excepting for slots 4—4 at the two ends left for the passage of the wires. The top is formed near each of the slots with a depending projection 5 adapted to hold the wire well submerged in the molten metal while the exterior of the trough portion is preferably thickly studded with integral protuberances 6 for the purpose of increasing the radiating and absorbing surface.

The flange 2 rests on the edge of a casing 7 made of fire brick or other refractory material which defines a rectangular chamber 8; superposed on this casing is a second refractory casing 9, shorter and wider than the first casing, and defining thereabove a second chamber 10. The side walls of the last named chamber are offset outwardly to define ledges for the flanges 2; the end walls 9^a—9^a of the latter chamber are here shown as supported on the lead-pot. The flange 2 of the pot is here shown as interrupted at the sides to allow communication between the chambers as shown in Fig. 4. The casings 7 and 9 are surrounded by other protective material indicated generally at 11 which may well be some insulating brick and this in turn by a layer 12 of other insulating material which may well consist of some insulating powder, and a shell 13 of steel plates. Located outside of the walls 9^a—9^a are removable blocks 14, 14 of heat insulating material constituting doors. I have shown these as consisting of metal shells 15 filled with heat insulating brick or other like material and supported by chains 16 from levers 17 supplied with counter-weights 18. The detailed construction is not important except that these doors are preferably of very substantial thickness so as not only to cover the flange 2 but also to project a considerable distance thereover. The bottom of each door is shown as formed with a wide and very shallow slot 20 for the passage of the wires, of which a plurality are frequently heated simultaneously.

Also at one end I have shown the shell of the furnace as inclined to enable a quenching bath to be located adjacent thereto. The bath here shown consists essentially of an open ended trough 21 mounted in line with the slot 20 and adapted to have a continuous supply of cold oil pumped therein, in combination with a receiving tray 22 beneath the same adapted to catch the oil which flows therefrom. The bath is located as close to the slot 20 as conveniently possible.

Any suitable or convenient type of electrical heating elements may be employed. The type which I prefer and which I have illustrated diagrammatically herein comprises a sinuous resistor 25 detachably mounted upon a refractory supporting plate 26, a plurality of these plates being employed and received in slots formed in refractory supporting blocks 27. Current is led to and from these elements by suitable connections

28—28 here shown as housed inside protective castings 29—29. The lead-pot is formed at the end from which the wire issues with an aperture 30 which receives a tubular casing 31 adapted for the reception of a thermocouple (not shown) by reference to which the supply of current to the heating elements is controlled either manually or automatically as will be understood. The cover 3 is also formed between the projections 5 with a vent aperture 32 which preferably communicates with the outer air by way of a vent tube 33 which discharges at a point outside of the casing.

In practice the trough 1 is filled with lead or other low melting point metal or alloy, which is melted by the heat radiated thereto from the resistance elements. Owing to the fact that the chambers 8 and 10 are thoroughly insulated from the outer air and have no communication therewith, the operation of the furnace is substantially the same under all conditions. Preferably the surface of the bath inside the slots 4—4 is covered with charcoal, coke, carbon, or other carbonaceous material to prevent oxidation of the lead. This substance exhibits the further advantage that by combining with oxygen it produces within the entire slot 20 a reducing atmosphere which prevents oxidation of the heated wire as it passes therethrough.

In case it is desired to heat a wire or rod of comparatively large cross section it is frequently desirable to heat it in stages, rather than to pass it immediately from room temperature to the maximum temperature of the bath. For this purpose I use a multiple stage heating furnace as shown in Fig. 5. Here I have shown two lead pots 1^a and 1^b mounted in separate chambers 8^a and 8^b formed inside a single casing 7^a. Above the respective pots I have shown other casings 10^a and 10^b formed as before, movable doors 14^a and 14^b being provided at the two ends as before, together with a third door 14^c between the two chambers. I have shown all the chambers as provided with heating apparatus as before, although some of the resistance elements can frequently be omitted or left unused in connection with the preliminary pots. Any desired number of these pots can be used in series but two is generally sufficient.

I do not limit myself to any specific uses of my improved furnace. It finds its most important use in connection with the hardening and tempering of spring wire by which I mean either round wire as used for machine springs or flat wire as used for clock and motor springs; and in these capacities my improved furnace exhibits its greatest usefulness because of the uniformity of the product obtained therefrom; but it may likewise be used in annealing, and many other purposes, and many changes in detail can be made as will be well understood by those skilled in the art.

Having thus described my invention what I claim is:

1. In a furnace for heat treating wire, in combination, an elongated pot for molten metal, said pot having a horizontal flange, a casing having a horizontal ledge receiving said flange and defining with said pot a closed chamber, a second casing located above said pot and defining therewith a second chamber, electrical heating devices in said chambers, and means for the ingress and egress of wire to and from the ends of said pot.

2. In a furnace for heat treating wire, in combination, a rectangular casing having an upwardly facing ledge, a rectangular pot for molten metal having a peripheral flange resting on said ledge and having a top which is substantially closed excepting for openings adjacent the two ends, a second rectangular casing shorter and wider than the first casing, its end walls traversing the pot adjacent said openings, said casings defining with the adjacent portions of the pot two closed chambers, and electric resistance elements in said chambers.

3. In a furnace for heat treating wire, in combination, a rectangular casing having an upwardly facing ledge, a rectangular pot for molten metal having a peripheral flange resting on said ledge and having a top which is substantially closed excepting for openings adjacent the two ends, a second rectangular casing shorter and wider than the first casing, its end walls traversing the pot adjacent said openings, said casings defining with the adjacent portions of the pot two closed chambers, and a removable closure member outside each end wall of the upper chamber and overlying the openings and flange of said pot.

4. In a furnace for heat treating wire, in combination an elongated pot for molten metal having flanges at its ends, means in said pot for holding a wire submerged as it is drawn therethrough, a casing surrounding said pot, heating means for said pot inside said casing, and a removable door at the end of said pot overlying said flange, said door having a slot therein for the passage of wire.

5. A furnace for heating wire comprising a casing having plural chambers therein, lead pots in said chambers adapted to have the wire drawn through them in succession, and a removable door between said chambers made of heat insulating material and overlying the adjacent portions of said pots.

In testimony whereof I hereunto affix my signature.

OSCAR C. TRAUTMAN.