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METHOD OF AND APPARATUS FOR ANNEALING

Filed April 2, 1927

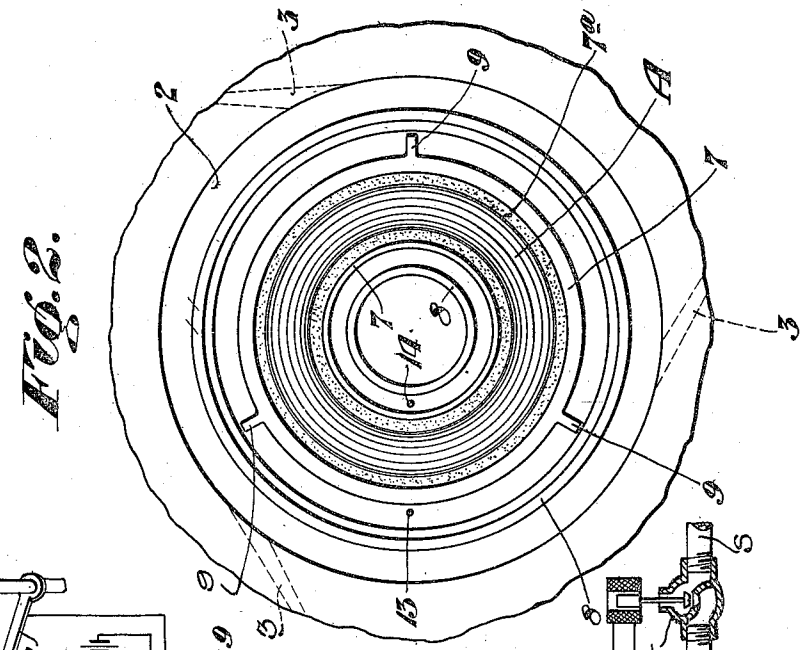

Fig. 2.

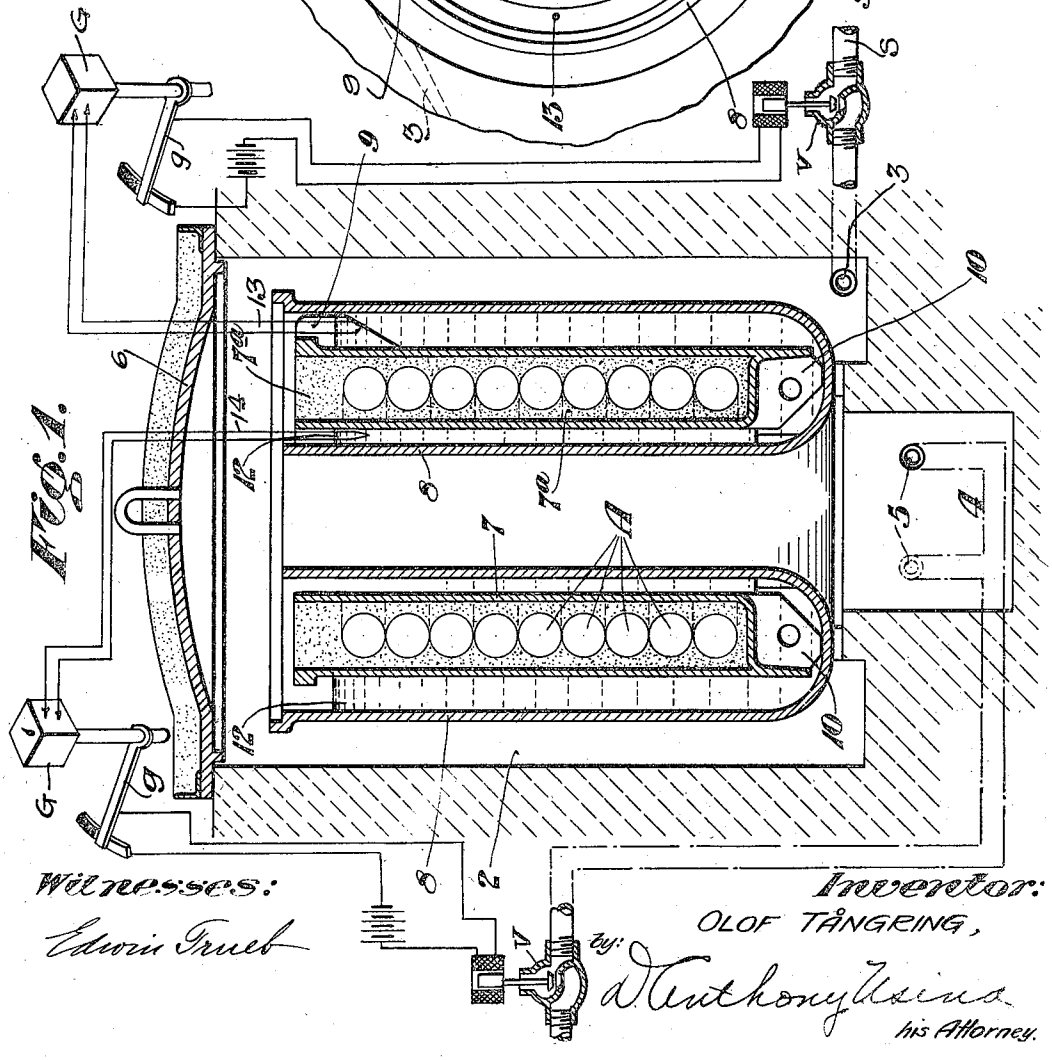

Fig. 1.

Witnesses:
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UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR ANNEALING

Application filed April 2, 1927. Serial No. 180,549.

This invention relates to methods of and apparatus for annealing and, while not limited thereto, relates more particularly to pot annealing bundles of wire, rods and the like, and has for its object the provision of a novel method and apparatus whereby an even annealing temperature may be had throughout the pot.

In the ordinary methods of pot annealing as now generally practiced, the pots are packed and placed in the annealing furnace where the flame strikes directly against the outside of the pot so that the material nearest the outside of the pot is subjected to a higher heat than the material farther away from the outside of the pot, tending to make the annealing uneven. Another cause of uneven annealing in the methods now generally practiced is that the flame and heat is directed against the lower portion of the pot so that the top of the pot and material within the upper portion of the pot has a lower temperature than the material in the lower portion of the pot.

The present invention entirely overcomes the above objections and provides a method and apparatus whereby pot annealing may be practiced so as to provide even annealing throughout the pot.

In the drawings, in which one form of apparatus is shown for carrying out my improved method—

Figure 1 is a sectional elevation through an annealing furnace having my improved annealing pot therein.

Figure 2 is a plan thereof with the furnace cover removed.

Referring more particularly to the drawings, the numeral 2 designates the annealing furnace chamber which is of circular cross section and is provided with a plurality of equally spaced burners 3 adjacent the periphery of its bottom wall. A center burner pit 4 is formed in the bottom of the furnace chamber and contains a plurality of burners 5. The top of the chamber 2 is adapted to be closed during the annealing operation by a removable closure 6.

The material to be annealed, which is shown as bundles of wire A, is packed in an annular pot 7, that is, the spaces between the bundles of wire A and the side walls of the pot 7 are filled or packed with a suitable packing 7^a such as sand, ground mica, etc., and a quantity of such material is also filled over the top bundle so as to close the top of the pot.

The pot 7 is adapted to be mounted within a second annular pot 8 during the annealing operation and to be spaced from the side and bottom walls thereof by spacing lugs 9 and 10 formed on the bottom and outside of the pot 7, so as to permit the circulation of a body of a liquid or fluid heat conducting medium 12 in the form of either a molten salt or molten aluminum.

The salt used as a heat conducting medium is preferably a mixture of an alkali chloride and alkali carbonate.

After the pot 7 is packed with the material to be annealed it is then lowered into the pot 8 in the annealing furnace to be heated.

Suitable heat responsive devices such as pyrometers or thermo-couples 13 and 14 are mounted in the spaces between the outer walls and inner walls, respectively, of the pots 7 and 8 so that their ends are immersed in the liquid heat conducting material 12. Suitable leads extend from the heat responsive devices to standard burner controls including galvanometers G, the needles g of which make and break a circuit to solenoid operated valves V in the gas supply lines S so as to automatically control the supply of fuel to the burners 3 and 5 and consequently the supply of heat in the furnace chamber 2.

In carrying out the method of this invention, the coils or bundles of wire or rods are packed in the pot 7 so that the spaces around said coils are filled with the packing material 7^a. The packed pot 7 is then preferably preheated to approximately 1000 degrees Fahrenheit and then lowered into the pot 8 which contains sufficient liquid heat conducting material 12 to fill the pot 8 to a point about four inches from its top after the pot 7 is inserted.

The furnace cover or closure 6 is then placed in position and the heat responsive devices 13 and 14 are mounted through the

closure 6 so that their ends are immersed in the liquid heat conducting medium 12, the heat responsive devices 13 being in the space between the outer walls of the pots 7 and 8 and the heat responsive device 14 being in the space between the inner walls of the pots 7 and 8. The burners 3 and 5 are then lighted and the pots raised to an annealing temperature. The supply of fuel to the burners 3 and 5 will be automatically controlled by the heat responsive devices 13 and 14 through the standard control mechanism described above.

The burners 3 will direct a flame against the outer walls of the pot 8 while the burners 5 will direct a flame against the inner walls of the pot 8 so as to more evenly distribute the heat than when the flame is directed against the outer walls of an annealing pot as heretofore, also, due to the liquid heat conducting material 12, the heat will be evenly distributed around the pot 7 which, due to the packing material around the coils or bundles of wire, will be evenly distributed to the wire so that an even and perfect annealing of the wire takes place.

The heat responsive devices 13 and 14 control the burners 3 and 5, respectively, so that if the inner portion of the pots 7 and 8 are getting more heat than desired the heat responsive device 14 will be directly affected, while if the outer portion of the pots 7 and 8 are getting more heat than desired the heat responsive device 13 will be directly affected. Therefore, if either set of burners are delivering an excess of heat they will be controlled independent of the other and without waiting until the whole body of liquid heat conducting material is raised to the excessive temperature, thus affording a more even and perfect control of the annealing temperature.

After the wire or other material is annealed, the inner pot 7 is removed from the pot 8, and placed on a cooling rack where it is allowed to cool slowly to room temperature.

While I have shown a specific form of apparatus for carrying out my invention and described a specific series of steps as comprising my improved method, it will be understood that I do not wish to be limited specifically thereto since various modifications may be made without departing from the scope of my invention as defined in the appended claims, as for instance, the packing material 7^a may be omitted from the pot 7, other means than the pyrometers 13 and 14 may be used to regulate the fuel supply to the burners 3 and 4, and any other well known fluid or liquid heat conducting medium may be used in the pot 8 instead of the molten salt and aluminum mentioned.

I claim—

1. The method of annealing bundles of wire and rods, which consists in packing said bundles in an annular pot, mounting said first named pot in a second annular pot containing a quantity of a fluid heat conducting medium so that said heat conducting medium surrounds said first named pot, applying heat to the outer and inner walls of said second named pot to heat said heat conducting medium, and regulating the supply of heat by the temperature of said heat conducting medium.

2. An annealing apparatus comprising an annular outer pot, an annular inner pot mounted within said outer pot and spaced from the walls thereof, said last named pot being adapted to contain the articles to be annealed, a quantity of a fluid heat conducting medium in said outer pot and surrounding said inner pot, means for supplying heat to the outer surface of said outer pot, and temperature responsive means immersed in said heat conducting medium for controlling the supply of heat to said outer pot.

3. An annealing apparatus for bundles of wire and rods, comprising the combination with a heating furnace, of an outer annular pot, an inner annular pot mounted within said outer pot and adapted to contain the material to be annealed, a quantity of a liquid heat conducting medium in said outer pot and surrounding said inner pot, a plurality of burners arranged in said furnace for supplying heat to the outer and inner annular walls of said outer pot, and temperature responsive means immersed in said heat conducting medium adjacent the inner and outer walls of said outer pot for controlling the operation of said burners.

4. The method of annealing which consists in providing an annular body of fluid heat conducting medium, mounting a container containing the articles to be annealed in said body of liquid heat conducting medium, supplying heat to said body of liquid heat conducting medium, and regulating the supply of heat applied to said liquid heat conducting medium by the temperature of said medium.

5. The method of annealing which consists in providing an annular body of fluid heat conducting medium, preheating a container having the work to be annealed therein so as to preheat the container and the work, mounting the preheated container and work to be annealed in said body of liquid heat conducting medium, supplying heat to the inner and outer side surfaces of said body of liquid heat conducting medium, and regulating the supply of heat applied to said liquid heat conducting medium by the temperature of said heat conducting medium.

In witness whereof I have hereunto signed my name.

OLOF TANGRING.