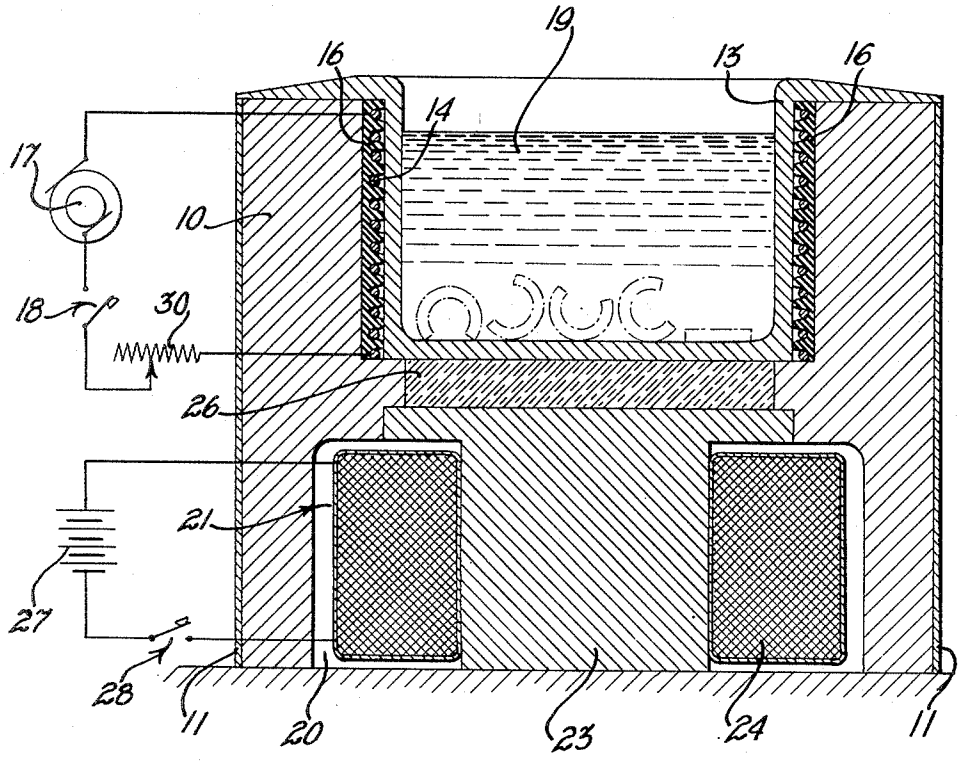
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HEAT TREATING APPARATUS

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UNITED STATES PATENT OFFICE

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HEAT-TREATING APPARATUS

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This invention relates to heat treating apparatus, and more particularly to electro-magnetic heat treating furnaces.

In the process of hardening certain metallic parts, it is common practice in some instances to subject the parts to heat within a furnace and then quench the heated parts in a bath of oil, water or other suitable quenching material. Thus, for example, in order to effect the proper hardening of parts, such as magnets, they should be heated to the proper or critical temperature preliminary to the quenching operation. This critical temperature is sometimes designated as the "non-magnetic point" for the reason that when certain magnetic materials are heated to a temperature which lies within the so-called "critical range" they immediately lose all of their magnetic properties.

The primary object of this invention is to provide simple and effective apparatus to facilitate the heating of work to a proper temperature.

In accordance with the general features of the invention, one embodiment thereof comprises an electrical heat treating furnace provided with a lead bath and a strong electro-magnet arranged to attract and thereby retain steel parts or the like within the molten lead in the bottom of the lead container. The electro-magnet retains the parts in the bottom of the container until they are heated to their critical temperature, at which point they lose their magnetic properties and rise to the surface of the lead bath.

These and other objects will be apparent from the following detailed description and the accompanying drawing wherein a heat treating furnace representing one embodiment of the invention is disclosed.

Referring now to the drawing, it will be observed that an upright cylindrical furnace housing 10 constructed of any suitable refractory material is surrounded by a shell or metallic casing 11. A depression is provided within the upper portion of the furnace housing 10 to accommodate a crucible 13 constructed of any suitable heat resisting material, such as graphite. Encircling the crucible 13 is a heating coil or element 14 which is supported in position by means of insulating mountings 16. The heating coil 14 forms a part of an electrical circuit which includes a suitable source of alternating current supply 17 and a switch 18. The coil 14 upon the closing of the switch 18 serves to heat a bath 19 of treating material, such as lead or other material having a relatively high specific gravity.

Positioned beneath the crucible 13 within a recess 20 provided in the lower portion of the furnace housing 10 is an electro-magnet 21. This magnet, which comprises a soft iron core 23 within a coil winding 24, is separated from the bottom of the crucible 13 by a block of suitable heat insulating material 26, the coil 24 being electrically connected with a battery 27 included within a circuit provided with a switch 28.

In the operation of the furnace the switch 18 is closed and the current flow through the heating coil 14 may be controlled by means of an adjustable resistance 30 so as to heat the lead bath 19 to the desired temperature. Work, such as the U-shaped magnets shown by dot and dash lines, may be dropped into the molten lead, and upon the closing of the switch 28 the electro-magnet 21 will be energized sufficiently to attract the work toward the bottom of the bath. The work will be retained in the designated position by the force of the magnet 21 until it has been heated to its critical temperature. Upon being heated to this critical temperature, the work immediately loses all of its magnetic properties and consequently will rise to the surface of the lead bath. The critical temperature is the temperature at which certain metallic parts should be quenched in order to effect the proper hardening thereof and hence when the work rises to the surface of the lead bath it will serve to positively indicate that the critical temperature has been reached. By this simple and unique apparatus an operator may easily and quickly ascertain when the work has been heated to the proper temperature preliminary to the quenching thereof and as a result the process of heat treating parts is greatly facilitated.

It is to be understood that the invention is

not limited to the exact construction herein described and that the appended claims have been drawn to define modifications which come within the true spirit and scope of the invention.

What is claimed is:

1. In heat treating apparatus, a bath of treating material for the reception of work having a lower specific gravity than the treating material, means for heating the bath, and magnetic means for retaining work within the lower portion of the bath until the work has been heated to a predetermined temperature when work is freed from the influence of the magnetic field and changes its position.

2. In heat treating apparatus, a bath of treating material having a relatively high specific gravity for the reception of work having a lower specific gravity, means for heating the bath, and an electro-magnet positioned externally of the bath for retaining work within the bottom of the bath until the work has been heated to its critical temperature when the work is freed from the influence of the electro-magnet and changes its position.

3. In a heat treating apparatus, a bath of treating material of sufficient specific gravity to float material to be treated, means for heating the bath, and magnetic means for retaining the material submerged in the bath until the material has been heated to the temperature at which it loses its magnetism, whereupon the material rises to the top of the bath and thereby indicates the completion of the heat treatment.

4. In a heat treating apparatus, a bath of treating material for the reception of work, means for heating the bath, an electromagnet positioned beneath the bath which is effective for retaining the work submerged until it attains a predetermined temperature when it is automatically released and rises to the surface of the bath due to the buoyant force of the bath.

5. An apparatus for heat treating ferrous articles, comprising a bath of treating material of greater specific gravity than the articles to be treated, means for heating the bath, and magnetic means for retaining the articles submerged in the bath until they reach a critical temperature when they are freed from the action of the magnetic means and change their position.

6. An apparatus for heat treating ferrous articles, comprising a bath of molten metal of greater specific gravity than the articles to be treated, and an electromagnet positioned adjacent the bath for retaining the articles submerged therein until they are heated to the temperature at which they lose their magnetism when due to the buoyant force of the bath they change their position.

7. An apparatus for heat treating ferrous articles, comprising a bath of molten metal of greater specific gravity than the articles to be treated for receiving a plurality of indiscriminately arranged articles, and an electromagnet positioned adjacent the bath for retaining the articles submerged therein until they are heated to the temperature at which they lose their magnetism when the buoyant force of the bath is effective for changing the position of the articles.

In witness whereof, we hereunto subscribe our names this 29 day of October A. D., 1926.

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CLARENCE JOHN ZERN.