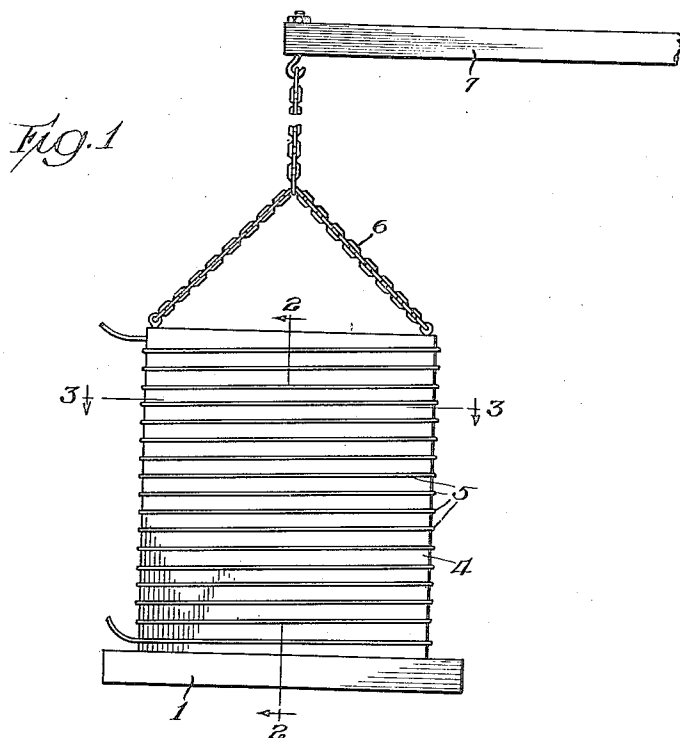
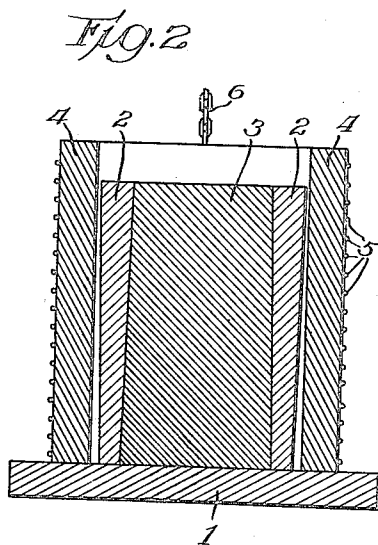
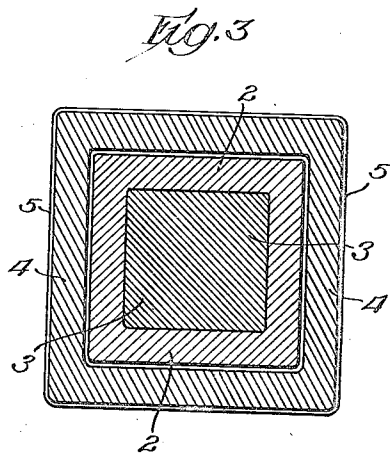


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 APPARATUS FOR RENDERING METAL HOMOGENEOUS.
 APPLICATION FILED FEB. 7, 1920.

1,419,280.

Patented June 13, 1922.



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APPARATUS FOR RENDERING METAL HOMOGENEOUS.

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Specification of Letters Patent. Patented June 13, 1922.

Application filed February 7, 1920. Serial No. 356,998.

To all whom it may concern:

Be it known that I, JOHN D. McNEILL, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Apparatus for Rendering Metal Homogeneous, of which the following is a full, clear, and exact description.

My invention relates to improvements in apparatus for rendering metal more homogeneous, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of my invention is to provide a device by means of which metal which is being cast may be subjected to magnetic influence, whereby a readjustment of the molecules of the metal is obtained in such a manner as to render the molded article more homogeneous than it would otherwise be.

A further object of my invention is to provide a device of the type described consisting of a mold, and an electro-magnetic device associated therewith which may be brought into operative relation with the mold to exert the magnetic influence at the time when the metal is passing from a heated state to a cool state.

A further object of my invention is to provide a device of the type described in which the electro-magnetic device is readily removed or applied to the mold at will.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which—

Figure 1 is a side view of a device,

Figure 2 is a section along the line 2—2 of Figure 1, and

Figure 3 is a section along the line 3—3 of Figure 1.

In carrying out my invention, I provide a base or mold board 1, upon which are disposed sides 2 of the mold. The latter is preferably of metal, and the sides may be made integral, if desired. As shown in the drawings, the sides are preferably tapered from the tops to the bottom in order to provide an ingot 3 of tapered form, this form being such that the mold 2 may be

readily withdrawn therefrom when the ingot has been cast.

Disposed externally of the sides 2 of the mold is a hollow core 4 which is made preferably of brass or other non-magnetic material and which supports a coil of wire 5, the latter being in the shape shown in Figure 1 and constituting a solenoid. The top of the solenoid is preferably secured by means of a chain 6, or in any other suitable manner, to a lifting device 7 which, in the present instance, I have shown as an arm. It will be understood that any suitable form of lifting device, such as a crane or similar mechanism, may be used.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The device is primarily designed for use with iron, but may be used in connection with any metal such as steel, iron, or nickel, or alloys of the same which are at all subject to magnetic influence. The metal is melted in the usual manner, and the melted metal is run into the mold 2. Shortly after the mold has been filled and before the metal has cooled enough to approach the critical range, the solenoid is lowered and placed around the mold. A direct current is then passed through the solenoid and a magnetic force of great intensity is attained, the metal ingot serving as a path for the magnetic flux. As the metal continues to cool, it passes through the critical range, during which time magnetic transformations occur. During this period and at these points, the magnetic force, acting on the mold and the molecules of the metal, cause the latter to more readily attain a more homogeneous relation with one another, and give a metal which is more easily worked in subsequent rolling operations, or a casting which is not to be subjected to this operation, a stronger more durable structure.

I am aware that attempts have been made to render metal homogeneous by agitation of the molecular structure produced by alternating currents. Such, however, would not fulfill the purpose of my invention. The agitation of the molecules is not sought after, nor is it desirable for my purpose. In the first place, such treatment is liable to cause undue heat which cannot be properly controlled, whereas in my invention the direct current serves the purpose of gener-

ating a magnetic flux, whose magnetic influence tends to the readjustment of the molecules which are already in motion, i. e., the mass is still hot and the molecules require no further agitation.

It is necessary for the purposes of my invention that the magnetic force be applied while the iron or other metal is cooling from its liquid to the solid form, that is to say, until the temperature has fallen below the critical range.

In the use of a device such as I have set forth, the solenoid may be removed entirely from the mold, so that the latter may be filled in the ordinary manner. When the solenoid is replaced, however, and the current is turned on, the metal in the mold, as stated, forms a portion of the path for the magnetic flux. In other words, the solenoid has a north and a south pole, depending upon the direction in which the current is passed through the solenoid, and the molecules tend to arrange themselves along definite lines, thus rendering the metal more

homogeneous than would be the case were the magnetic force not applied.

While I have shown the preferred form of the device, it is obvious that various forms might be made, without departing from the spirit and the scope of the invention.

I claim:

1. An apparatus for rendering cast metal more homogeneous consisting of a mold for receiving molten metal, and a solenoid arranged to slip over the metal, whereby on the energization of the solenoid a uni-directional magnetic flux may be maintained in the metal of the mold.

2. An apparatus for rendering cast metal more homogeneous which consists in a mold for receiving molten metal, a solenoid having a hollow core adapted to be brought into position around the mold, and means secured to the core for removing it out of operative relation with the mold.

JOHN D. McNEILL.