Nov. 4, 1924.

1,514,070

A. K. SCHAAP

HEAT TREATMENT OF IRON

Filed June 2, 1923

Fig. 1.

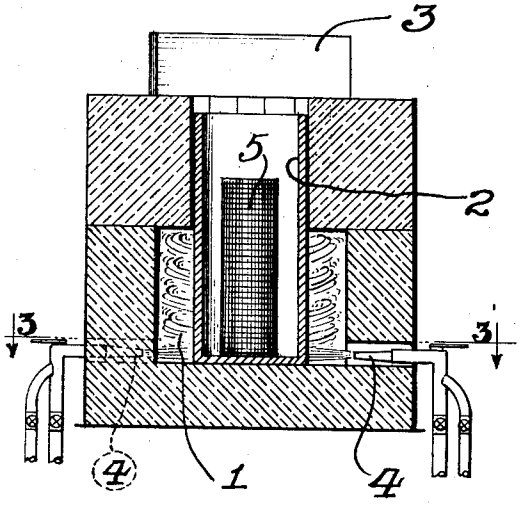


Fig. 2.

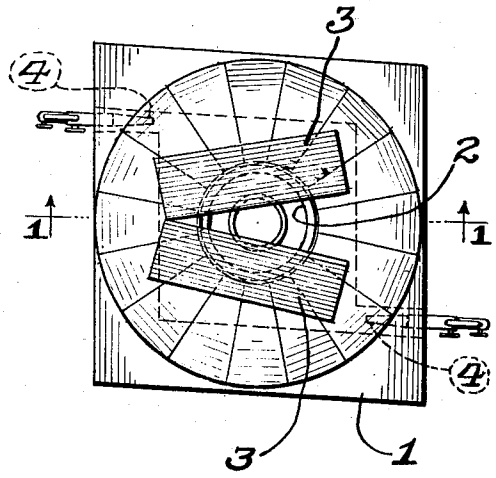


Fig. 3.

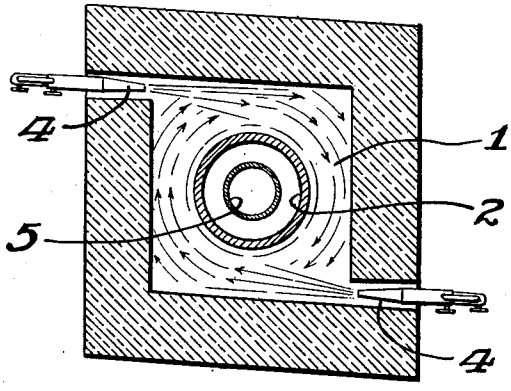
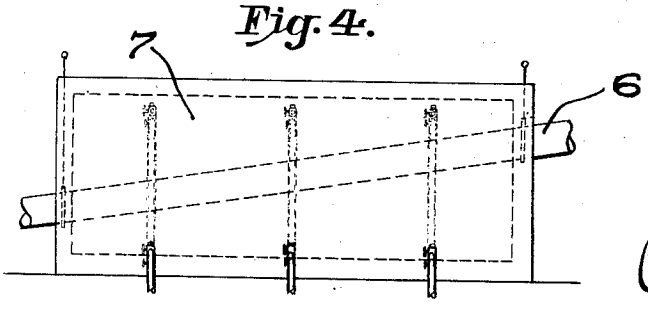


Fig. 4.



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Patented Nov. 4, 1924. 1,514,070

UNITED STATES PATENT OFFICE.

ALEXANDER K. SCHAAP, OF BROOKLYN, NEW YORK.

HEAT TREATMENT OF IRON.

Application filed June 2, 1923. Serial No. 642,999.

To all whom it may concern:

Be it known that I, ALEXANDER K. SCHAAP, residing at Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Heat Treatment of Iron, of which the following is a specification.

My invention relates to a new and improved process for treating cast iron, that is to say, alloys of iron with more than 1.40% of carbon, or specifically, alloys to the right of the point *a* in the modified Roberts-Austen-Roozeboom diagram.

One of the objects of the invention is to provide a process of annealing cast iron, that is, of converting a relatively hard cast iron into a soft cast iron, without at the same time introducing any elements, gases, or other conditions producing hardness, or hard spots in the material, retaining in said iron substantially the initial strength thereof, and at the same time eliminating shrinkage strains.

Another object of the invention is to provide a process of treating cast iron of the above characteristics so as to eliminate therefrom its tendency to grow upon heating not in excess of the so-called A. C. 1 temperature, alternating with cooling therefrom.

Another object of the invention is to provide a process for treating cast iron to produce a cast iron having malleability and the quality of being distorted without fracture, alike in nature, although not necessarily in extent, the same qualities possessed by so-called malleable cast iron.

Another object of the invention is to provide a process for treating cast iron which, by the change in the character and distribution of the carbon content increases the anti-friction qualities of the iron.

At this point it may be noted that hitherto in the treatment of grey cast iron a product has been obtained possessing to a limited extent some of the qualities mentioned above. Such treatments hitherto have transformed the said grey iron into a product of materially lower strength than the original metal as cast iron, and also have produced hard portions therein. I also call attention to the well known process of malleabilizing white cast iron, which, however, differs materially from the invention described herein, more especially in respect to the length of time required for the treatment.

By my investigations and researches I discovered that the valuable qualities desired to be imparted to gray cast iron could be best produced when the gray cast iron was heated above the temperature of the so-called A. C. 1 point without exposing it to deleterious gases, or other influences or conditions, causing it to become hard in portions thereof. For example, a process of electric heating might be employed, where no harmful influences were created, but it would be cheaper to heat with gas and protect the iron from influences causing hardness therein. For example, I discovered by experiment, that cast iron or steel receptacles, refractory materials, and other substances, did not suitably protect the iron from contact with deleterious gases, but a container consisting of wrought iron suitably disposed, would afford the desired protection.

It is also a fact that in the treatment of malleable cast iron by surrounding the same with iron oxide, lime, or other substances, the metal is not protected from deleterious gases, or other injurious influences.

Having thus set forth the objects of the invention, we shall now describe a preferred method for carrying the same into effect.

I first provide a pot, preferably of wrought iron, in which the cast iron is to be treated. In practice, I prefer to employ a pot having imperforate sides and bottom, and having an open upper end, through which the cast iron objects to be treated are put into the receptacle. This pot is mounted upon a suitable support in a furnace, preferably made with walls of fire-resisting material, having walls made as nearly heat non-conducting as possible, so as to retain the maximum amount of the heat produced within the furnace.

The furnace is heated by a plurality of gas jets, preferably so disposed with relation to the pot or pots, that the flame from the jets impinges on the walls of the furnace, rather than on the pot or pots.

The temperature is then raised exteriorly of the pot to such a degree that the temperature of the cast iron being treated is raised to A. C. 1, or what is known in the art as the critical temperature at which the character of the material under treatment becomes non-magnetic, which point will vary somewhat with the composition of the iron treated.

The castings are then preferably removed from the furnace and preferably air-cooled. The cooling may, however, be either accel-

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erated or retarded without departing from the essential elements of my process.

In order better to impart a clear understanding of my invention I have provided a drawing which illustrates schematically a preferred form of embodiment of application which may be employed to carry out the process.

In the drawing:

Figure 1 is a vertical sectional view taken through a furnace in which the metal to be treated is placed, the view being taken on line 1—1 of Figure 2.

Figure 2 is a top plan view of the furnace shown in Figure 1.

Figure 3 is a horizontal section taken on line 3—3 of Figure 1.

Figure 4 is an elevational view showing schematically another form of container.

Referring now to the drawing, wherein similar characters of reference designate similar parts, the numeral 1 designates a suitable furnace which may be constructed of fire brick or other highly refractory substance. Contained in the furnace, in the present instance, is a receptacle or pot 2 preferably formed of wrought iron. This pot has imperforate bottom and side walls and, in the present instance, is open at its upper end. The open upper end of the pot or receptacle 2 may, if desired, be closed as by means of the fire bricks 3, which are positioned upon the said open end of the pot. Any other suitable means may be employed for effecting this closure.

The receptacle or pot may be heated as by means of the gas jets 4, which are preferably so disposed with relation to the walls of the furnace and the receptacle that the flame impinges against the walls of the furnace rather than upon the receptacle.

Deposited in the pot in the present instance is the cast iron to be treated consisting of piston rings disposed in the column 5.

With the parts disposed as above described, the flame is maintained within the furnace until it is sufficiently heated to raise the temperature of the cast iron under treatment to the A. C. 1 point, whereupon the heat is shut off and the iron allowed to cool. This cooling may take place within or without the furnace.

I have found that this whole process, with castings of ordinary size, such for instance as with castings of one inch cross section may be carried out in a period not excluding one hour. With large castings a greater period of applied heat, of course, must be provided, naturally the cooling operation takes longer. The longer time involved with larger castings, however, is solely caused by the relatively longer time involved in the heating and cooling operations.

In Figure 4 I have shown schematically a wrought iron container 6 disposed upon an incline within a suitably gas heated furnace 7, the idea being to provide a construction wherein a closed container may be employed and wherein the casting may be moved through the furnace, making the process a continuous one.

It will accordingly be seen that I have provided a process attaining, among others, all the ends and objects above pointed out, and which attains results with ferrous metal having the above characteristics not heretofore produced.

As many changes could be made in this construction without departing from the scope of the following claims, it is intended that all matter contained in the above description shall be interpreted as illustrative only and not in a limiting sense.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The hereindescribed process of treating gray iron castings, which consists in heating the castings to a temperature above A. C. 1, while protecting them from deleterious gases, or other harmful influences, and then immediately permitting them to cool while exposed to atmospheric conditions.

2. The herein described process of treating ferrous metal castings, containing more than 1.40% carbon, which consists in providing a suitable wrought iron pot open at the top, placing the metal in said pot, enclosing said pot in a suitable furnace, and then heating the furnace to raise the temperature of the metal to a point in excess of the A. C. 1 point, and then allowing the iron to cool.

3. The hereindescribed process of treating iron castings which consists in heating the castings above the A. C. 1 point while protecting them in an open wrought iron container, and then immediately permitting the castings to cool while exposed to atmospheric conditions.

4. The hereindescribed process of treating iron castings which consists in providing a container of wrought iron having imperforate side and bottom walls and having an opening at the top, then heating said container and its contents in a furnace to a temperature above A. C. 1 point, and then allowing the metal to cool.

In testimony whereof, I affix my signature.

ALEXANDER K. SCHAAP.