

C. NAPIER,
 PROCESS OF AND APPARATUS FOR HEAT TREATMENT OF METAL OBJECTS.
 APPLICATION FILED JAN. 21, 1918.

1,265,944.

Patented May 14, 1918.

Fig. 1.

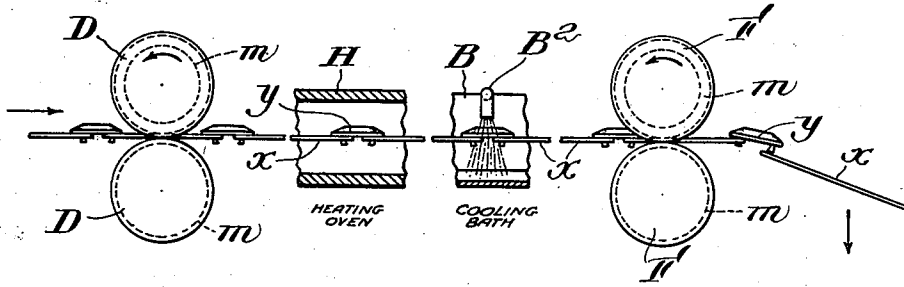


Fig. 2.

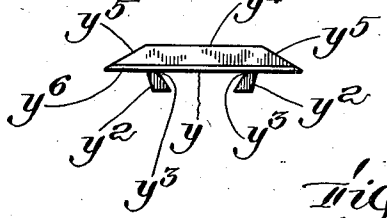


Fig. 3.

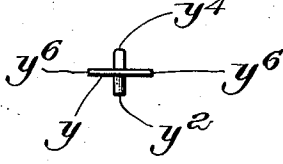


Fig. 4.

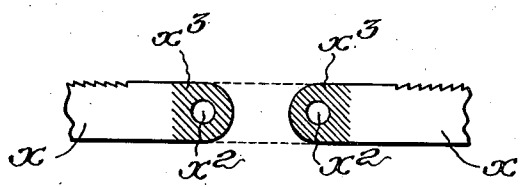
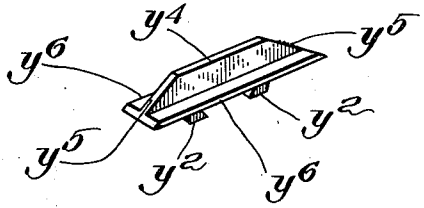


Fig. 5.

Inventor:
 Charles Napier;
 by *Roberts, Roberts & Cushman*
 his Attorneys.

UNITED STATES PATENT OFFICE.

CHARLES NAPIER, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO NAPIER SAW WORKS, INCORPORATED, OF SPRINGFIELD, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

PROCESS OF AND APPARATUS FOR HEAT TREATMENT OF METAL OBJECTS.

1,265,944.

Specification of Letters Patent.

Patented May 14, 1918.

Application filed January 21, 1918. Serial No. 212,906.

To all whom it may concern:

Be it known that I, CHARLES NAPIER, a subject of the King of Great Britain, and resident of Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Processes of and Apparatus for Heat Treatment of Metal Objects, of which the following is a specification.

This invention relates to the manufacture of saw-blades and other elongate metal objects such as are subjected to heat-treatment for hardening, tempering or like purposes.

In my Letters Patent No. 1,221,576, dated April 3, 1917, I have described and claimed a machine for the continuous treatment of a series of such objects, for instance saw-blades or the like, by first heating and then quenching in a cooling bath, the saw-blades or the like being connected by removable links so that a chain of blades and links is carried through the machine under longitudinal tension, a heating-oven and a cooling bath being traversed in succession by each member of the chain of saws, the individual saws being disconnected by falling away from the connecting links after they pass from the delivery rolls of the tension and feeding means forming a part of my said machine. The saw blades are thus delivered after being hardened and tempered throughout their lengths while under tension, and to an exact and uniform degree. A finishing operation is in practice still required to draw the temper or anneal the perforated ends of the saws, as customary, to prevent breakage at the ends held by the clamping jaws of the usual frames in which the saws are held for use. It is difficult to heat the ends for this purpose equally to a uniform length and it is highly desirable to finish the objects in one operation for economy of heat and handling.

I have therefore devised an improvement upon and modification of the process practised by the operation of my said patented machine which is also adapted to be practised by said machine, or other apparatus having related functions, whereby such elongate objects may be tempered or heat-treated uniformly throughout the greater part of their lengths, as before, but which shall also result in producing a product an-

nealed or softened at one or both of its ends without any second or separate operation.

This invention also relates to a member of a chain of objects adapted to be treated by my new method and constituting in connection with heating and cooling means for the chain of objects means adapted locally to modify the heating and cooling effect of the heating and cooling means, so as to permit one part of the object under treatment to be subjected to changes of temperature different from those permitted at another part.

Principal objects of the invention are therefore to provide a continuous process for locally tempering and locally annealing each of a series of elongate metal objects, and to provide a member adapted to join such objects in a chain which shall be adapted locally to modify the heat-treatment of a part of each object adjacent to said member. Other objects are to provide such a member which shall be adapted to serve as a link holding the objects, such as saw-blades, in a chain while under longitudinal tension, but which shall be self-releasing when the tension ceases, in the same manner as the link-member employed in connection with such a chain as fully explained and claimed in my said patent.

In the accompanying drawing illustrating one species only of the new apparatus preferably employed in my new process,

Figure 1 is a diagram section through apparatus such as shown in my said patent, illustrating one class of product and one form of apparatus only;

Fig. 2 is a side elevation of a link-member;

Fig. 3 is an end elevation of said link-member;

Fig. 4 is a perspective of said link-member; and

Fig. 5 illustrates abutting annealed ends of two saw-blades adapted to be temporarily joined together by said link-member.

The apparatus, referring now to Fig. 1, is preferably such as to move a chain of the objects α to be treated under tension and at a predetermined rate through a heating-oven H and a cooling or quenching bath B in succession. Driven rolls F having grooves m may for instance be operated at a greater speed than tension rolls D having similar grooves, so that slippage of the chain of objects α at one of the rolls must occur

and tension will be maintained between D and F. The oven H may be any structure of refractory material heated in any convenient manner, as by gas-flame or electrically, sufficiently to bring the objects x during the time of their progress through the oven to the desired critical heat for the desired hardening or temper. As shown, the objects are relatively thin steel hack-saw blades, and the time during which it is necessary to subject them to treatment in oven H to bring them to a tempering heat is relatively short. From the oven H the heated blades pass immediately, during a predetermined time, to the cooling bath B, which may be any suitable trough or tank in which the saws are showered by a stream of suitable fluid, such as oil, delivered through pipe B².

The objects are connected, according to the present invention, by link-members y having a relatively considerable mass. In the preferred form shown a cast-iron or steel link is provided with lugs y^2 having inwardly facing shallow notches y^3 to take into perforations x^2 in the ends of two adjacent saw-blades x , the bodies of the link-members being furnished with a flange y^6 adapted to protect and cover a predetermined extent of the end of a saw engaged with the lug y^2 . A chine or rib y^4 on the opposite side of the link-member from the lugs y^2 provides additional mass, as well as a convenient handle for manually stringing together the saws and link-members and a lateral guide for coaction with the grooves m in the upper rolls D and F. Each link member is preferably beveled off at each end at y^5 to enable it readily to run under the rolls.

When the chain x, y is subjected to heat in the oven H, the ends x^3 of the saws or other objects and the link-members y are heated to the annealing point, but may not reach the temperature, in their time of passage, attained by the thinner objects x throughout the remainder of their lengths. But when the link-members y pass out of the oven, and into the cooling-bath, the temperature of all of the saws except the parts x^3 is rapidly lowered. By reason both of the greater mass of the link-members and the protection afforded the ends of the objects x by the flanges y^6 , so that the oil-shower does not at the places x^3 impinge directly on the objects x , the annealed ends x^3 of the objects cool slowly, so that when delivered they are still soft.

It will be obvious that both the objects treated and the form of the link-members may be varied as desired; it is apparent, for instance, that instead of depending on perforations in the objects and lugs on the link-members, this relation might be reversed, or

the links might be hinge-members attached each to a perforate or imperforate object so as to protect a part of it.

What I claim is:

1. The process of heat-treating metal objects comprising connecting them in a chain by temporary link-members having a relatively considerable mass adjacent to a predetermined portion of said objects, and progressively subjecting the chain during predetermined times first to an annealing heat and then to the action of a cooling fluid, whereby to temper the objects and leave the portions adjacent to said link-members in their annealed condition.

2. The process of heat-treating metal objects comprising connecting them in a chain by temporary link-members having a relatively considerable mass adjacent to one side of a predetermined portion of said objects, and progressively subjecting the chain of objects and link members during predetermined times first to an annealing heat and then to the action of a cooling fluid delivered from said side of said objects, whereby to temper the objects and leave in an annealed state the portions adjacent to and protected from the cooling fluid by said link-members.

3. A link-member adapted to join metal objects together in a chain during heat-treatment comprising means for engagement with the objects, and means adapted to contact with a substantial surface of the adjacent object, whereby to protect a substantial predetermined part of the member adjacent to the place of engagement of said link-member from rapid cooling.

4. A link-member adapted to join metal objects together in a chain during heat-treatment having thereon means adapted to engage the objects and a flange projecting over and protecting parts of said objects at and near the point of engagement of said means and object.

5. A link-member adapted to join metal objects together in a chain during heat-treatment having therein object-engaging means, means for protecting a surface of the objects, and a rib adapted to serve as lateral guide-means for the chain and to increase the mass of the link-member, whereby to delay cooling.

6. A link-member for use in tempering and annealing apparatus comprising a body having flanges and lugs projecting from the flanged portion adapted releasably to engage perforations in objects to be treated, whereby to temporarily connect said objects and link-members in a chain and to protect and cover portions of the objects.

Signed by me at Springfield, Massachusetts, this 17th day of January, 1918.

CHARLES NAPIER.