

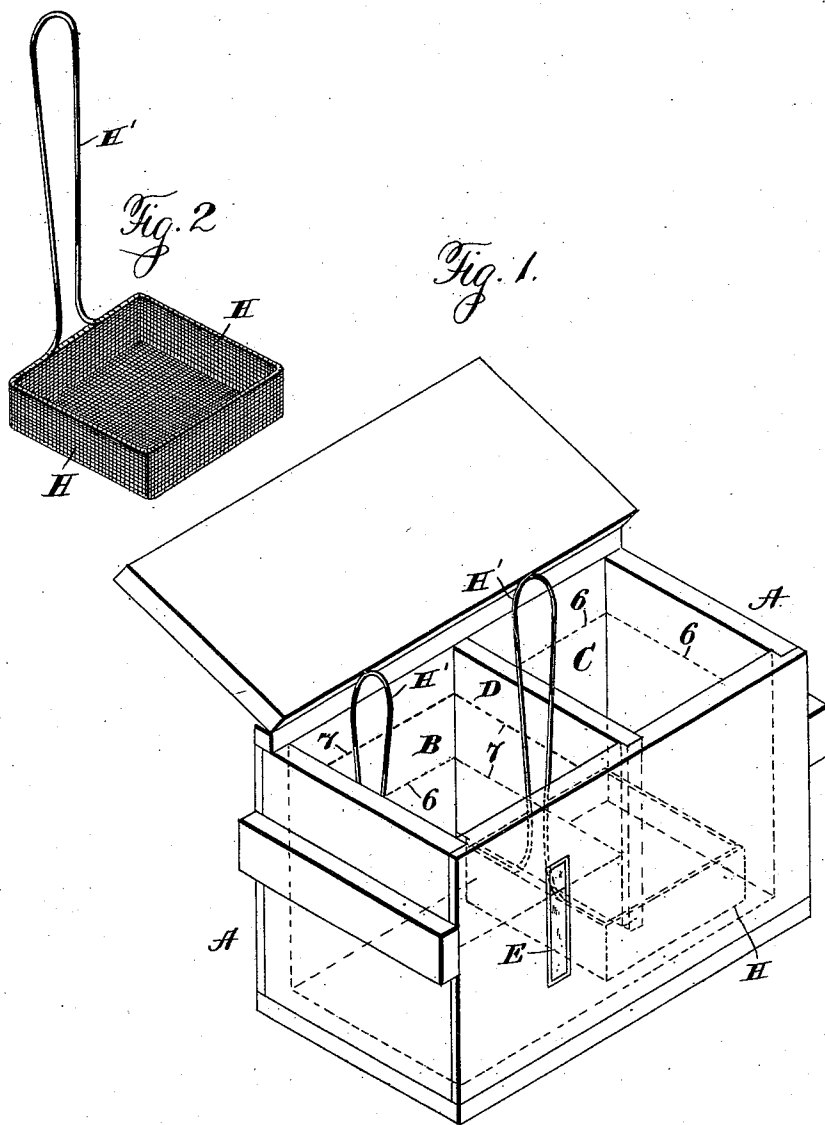
(No Model.)

2 Sheets—Sheet 1.

G. F. SIMONDS.
APPARATUS FOR HARDENING STEEL.

No. 466,441.

Patented Jan. 5, 1892.



Witnesses:
J. A. Rutherford,
Geo. H. Rea

Inventor
George F. Simonds,
James L. Norris,
Attorney

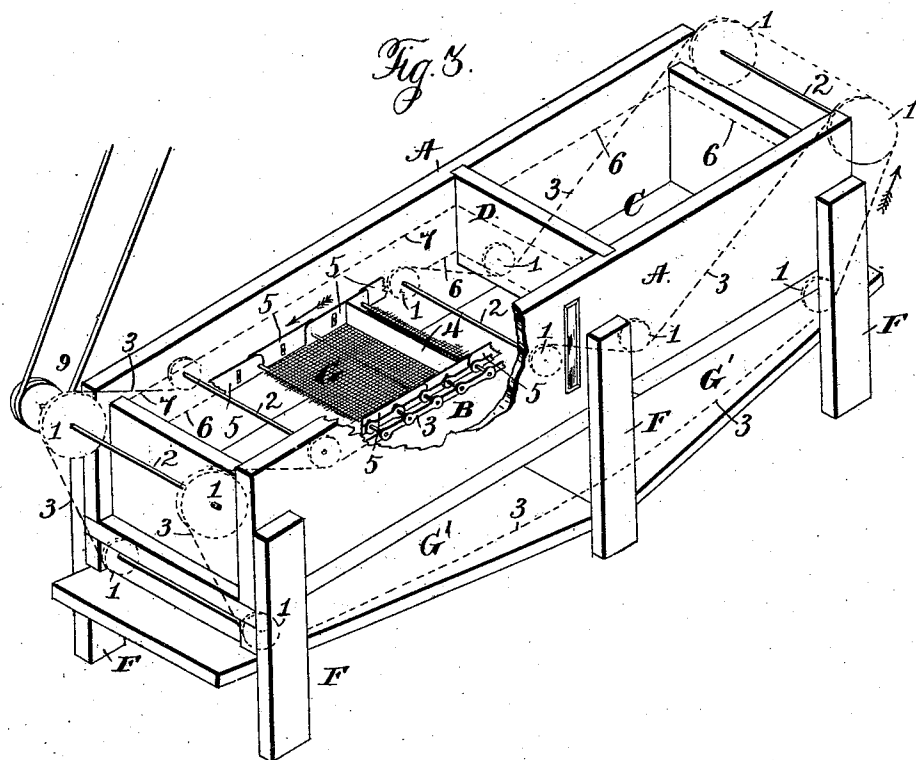
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2 Sheets—Sheet 2.

G. F. SIMONDS.
APPARATUS FOR HARDENING STEEL.

No. 466,441.

Patented Jan. 5, 1892



Witnesses
J. A. Rutledge
Geo. W. Rea

Inventor.
George F. Simonds,
James L. Norris,
Attorney.

UNITED STATES PATENT OFFICE.

GEORGE F. SIMONDS, OF FITCHBURG, MASSACHUSETTS.

APPARATUS FOR HARDENING STEEL.

SPECIFICATION forming part of Letters Patent No. 466,441, dated January 5, 1892.

Application filed August 22, 1891. Serial No. 403,458. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. SIMONDS, of Fitchburg, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Apparatus for Hardening Steel, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to an apparatus adapted to the practice of a process for hardening steel or steel articles, said process being described and claimed in a concurrent application filed of even date herewith and numbered in serial 403,459.

The purpose of the invention is to harden steel without subjecting it to undue strains in the process of cooling, thus avoiding fractures and warping of the parts.

It is a further purpose of the process to improve the quality of articles treated, and my present invention provides a novel apparatus whereby said process may be continuously practiced upon any suitable scale, said invention consisting in the novel parts and combinations of parts hereinafter fully described, and then more definitely pointed out in the claims concluding this specification.

To enable others skilled in the art to make and use my invention, I will proceed to describe the manner in which I have carried it out, reference being had for such purpose to the accompanying drawings, in which—

Figure 1 is a perspective view of a box containing the bath in which the articles are cooled. Fig. 2 is a similar view of a wire basket with which the heated articles are handled when this bath is used. Fig. 3 is a perspective view of a box adapted to contain the bath and constructed and provided with means for carrying on a continuous process of hardening.

In Fig. 1, A is a box the inside of which is divided into two compartments B C by the partition D, which extends about two-thirds of the distance from the top to the bottom of the box, thereby forming at the bottom of the box an open communication between the compartments B and C. E is an opening in the box in the front side of compartment B, provided with glass, for the purpose of observing the line of demarcation between the

brine and the oil floating upon it in compartment B.

As the specific gravity of oil is less than brine, with this apparatus I am able to keep the compartment C nearly full of brine and compartment B full to a line above the bottom of partition D, with such a depth of oil on top of the brine in compartment B as may be desired, for purposes hereinafter specified.

It is often desired in hardening steel to cool the article treated with great rapidity to make it very hard and then complete the process by cooling slowly to prevent quick and uneven contraction and fractures. This is sometimes done by cooling in a vat of brine and then transferring the partially-cooled article through the air into a basin of oil; but this method is very objectionable, as the good effects of the process of cooling first in brine and then in oil are greatly diminished by the interruption in the process of cooling during the transfer from the brine to the oil. To obviate this difficulty I proceed as follows: The basket H, (shown in Fig. 2,) formed of wire and provided with a vertical handle H', rising from any one of its sides, is passed down through the oil into the brine in compartment B, as shown in Fig. 1, with the handle of basket at or near the other end of compartment B, as indicated in Fig. 1. Said basket is then moved under partition D, so as to rest on the bottom of compartment C, the location of the handle of the basket then being against or near the partition D, as indicated in Fig. 1. The articles to be hardened are then dropped into the basket in the brine, and the basket is removed to compartment B and lifted up through the brine into the oil floating upon the surface of the brine. There it is allowed to remain until the articles are sufficiently cooled to complete the process. The articles are retained in the brine or the oil for such time as may be desired to produce the best results. By these means the work is accomplished without any interruption, and great advantages are derived in obviating the risk of warping and breaking, and a remarkable improvement is effected in the quality of articles hardened.

In Fig. 3, A is a box supported on legs F F,

the inside of which is divided into two compartments B C by the partition D, which extends about two-thirds of the distance from the top to the bottom of the box, thereby forming at the bottom of the box an open communication between the compartments B C. E is an opening in the box A in the front side of compartment B for the purposes set forth in the description relating to the part E in Fig. 1. G is a continuous wire apron carried by endless chains 3 3, and which is moved along by the rotating sprocket-wheels 1 1 in its course through the compartment C, under partition D, through, up, and out of compartment B, passing over the end of and down under the box A and then up to the point of again entering the compartment C. 4 and 5 are guards attached at the sides and across the continuous wire apron H to retain the articles to be hardened upon the apron while it is passing in, through, and out of compartments B and C. 2 2 are shafts connecting each pair of sprocket-wheels 1 1. 9 is the wheel by which the power is furnished to move the sprocket-wheel at the outer end of compartment B, which in turn moves the continuous wire apron H. 6 6 is a dotted line approximately representing height of brine in compartments B and C. 7 represents, approximately, the height and position of oil above the surface of the brine in compartment B. G' is an inclined drip-board to catch the oil dripping from the wire apron as it passes under the box A and also to convey it into a proper receptacle at its lower elevation. By means of this construction, as shown in Fig. 3, I am able to operate the process continuously by placing the articles on the apron in compartment C. They travel first through the brine and then through the oil, falling from the apron at the end of the box into any proper receptacle provided for them. The articles can be left in the brine or the oil a longer or shorter time by varying the speed of the apron, the depth of the bath, or the distance traversed by the apron between the point of entrance and the point of emergence in the compartments B and C. The same result may also be produced in other well-known ways. It will be understood that I do not confine myself strictly to brine and oil, as other quick and slow cooling liquids may be substituted

in the process; nor do I limit my invention to the specific features of construction and arrangement described, as these may be considerably varied without departing from my invention.

What I claim is—

1. An apparatus for use in hardening or tempering steel and steel articles, comprising a box having a partition that does not extend to the bottom of said box, thereby dividing the box into two compartments that communicate below said partition, a glazed opening or indicator in the front side of one of said compartments for the purpose of showing the line of demarcation between the brine and oil or other cooling media in that compartment, and means, substantially as described, for conveying the articles to be tempered from the quick-cooling medium in one compartment into the slower-cooling medium in the other compartment without intermediate exposure, substantially as specified.

2. An apparatus for use in hardening or tempering steel and steel articles, comprising a box having two compartments that communicate below a separating - partition, a glazed opening or indicator in the front side of one of said compartments for the purpose of showing the line of demarcation between the brine and oil or other cooling media in that compartment, a traveling apron or conveyor common to both of said compartments and adapted to be moved from one to the other through the communicating opening, and sprocket-gearing, arranged substantially as described, for causing said apron to travel through and from the compartment containing a quick-cooling medium under the partition, then up and through the compartment containing the slower-cooling medium, and thence downward under the box and upward to again enter and pass through the first-named compartment, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 19th day of August, A. D. 1891.

GEORGE F. SIMONDS.

Witnesses:

HARRIS C. HARTWELL,
CHARLES F. RICHARDSON.