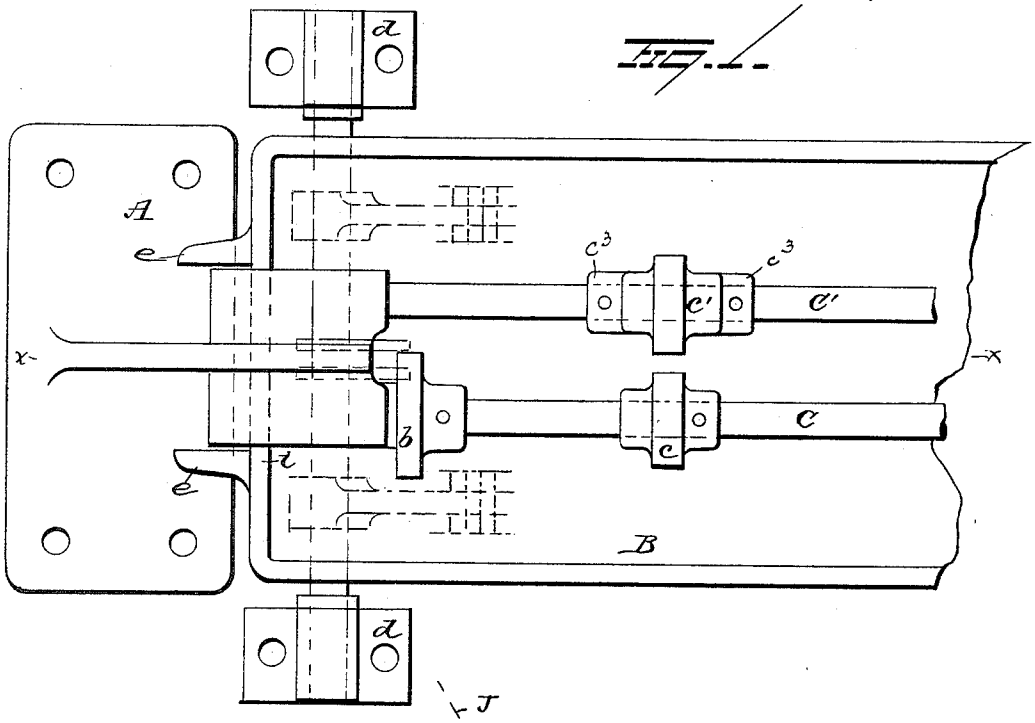
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J. COFFIN.

APPARATUS FOR TOUGHENING STEEL BARS

No. 399,381. Patented Mar. 12, 1889.

Fig. 1.



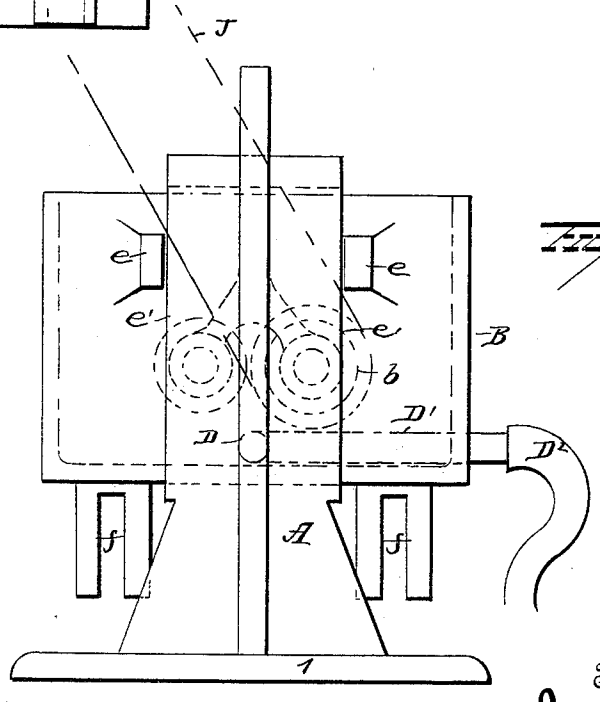


Fig. 3.

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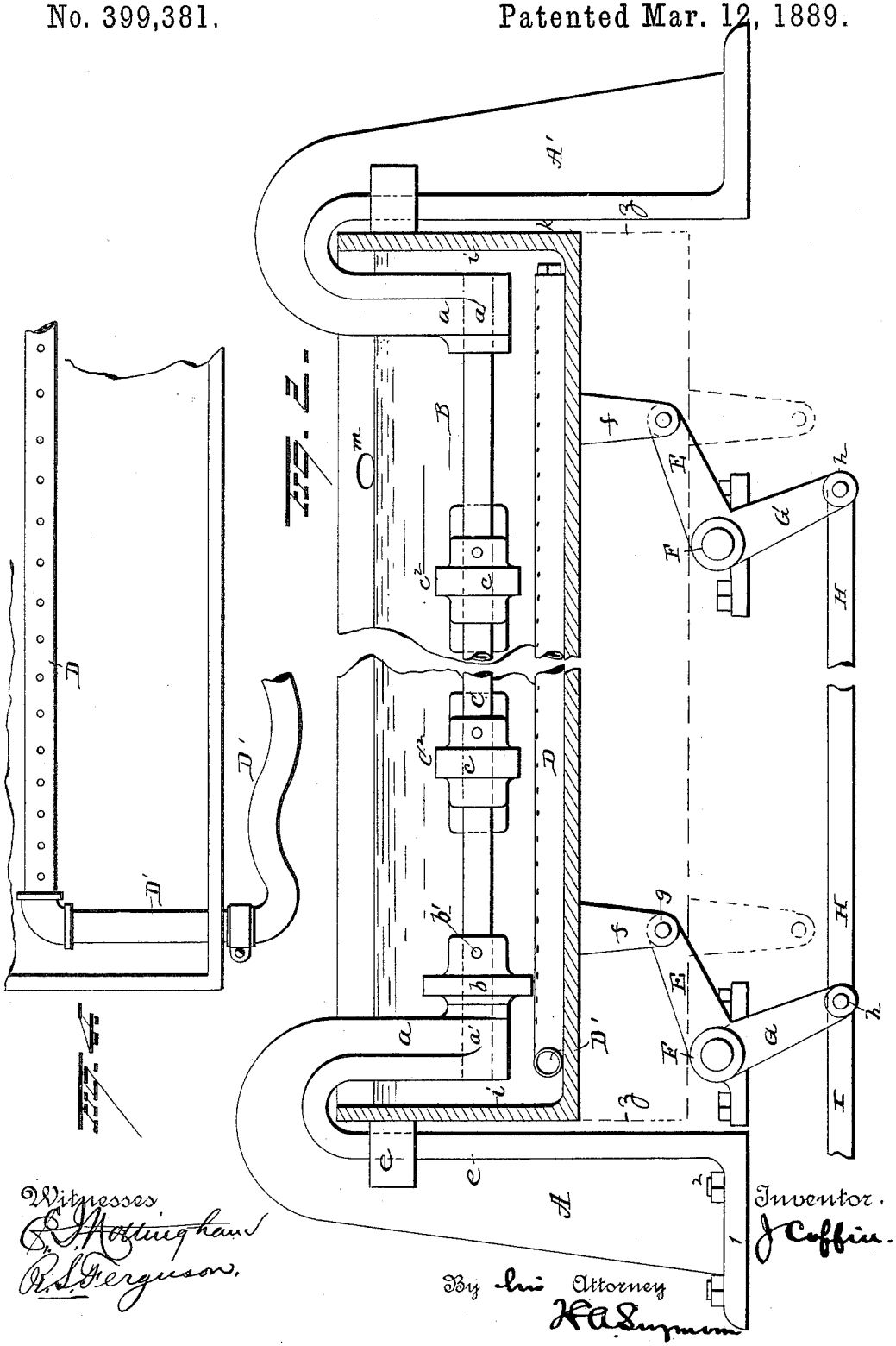
N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

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APPARATUS FOR TOUGHENING STEEL BARS.

No. 399,381. Patented Mar. 12, 1889.



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UNITED STATES PATENT OFFICE.

JOHN COFFIN, OF JOHNSTOWN, PENNSYLVANIA.

APPARATUS FOR TOUGHENING STEEL BARS.

SPECIFICATION forming part of Letters Patent No. 399,381, dated March 12, 1889.

Application filed November 13, 1888. Serial No. 290,680. (No model.)

To all whom it may concern:

Be it known that I, JOHN COFFIN, of Johnstown, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Toughening Steel Bars; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improved apparatus for toughening steel bars, and more particularly to toughen steel axles which have been manufactured by rolling or forging the same in any proper manner.

The apparatus constituting the subject of my invention consists, essentially, in mechanism for cooling off an axle or other bar after it has been, by heat or otherwise, brought to a proper amorphous condition, to toughen it; for placing the hot axle or bar upon a proper mechanism to revolve it rapidly on its longitudinal axis; while in motion for elevating a body of water or other preferred liquid matter to submerge the axle or bar and give it the proper amount of cooling, and, finally, for removing the axle or bar from the cooling influence of the bath.

My invention further consists in utilizing a spray of water or submerged jets of cooling-liquid to agitate the water in a bosh, which latter is adapted to receive water or other cooling-liquid. This liquid is raised vertically a sufficient distance to completely cover an axle which has first been cooled after its manufacture, then reheated evenly, and afterward placed on fixed rotating devices from which motion is imparted. The operation of the jets of cooling-liquid, in connection with the body of cooling-liquid, has an agitating action on the latter near the revolving axle, to prevent spheroidal formation in the bath, which would retard the cooling action of said bath upon the submerged axle or round steel bar undergoing treatment.

There are two obvious methods of carrying into effect the above-indicated invention for toughening steel axles or similar round bars of steel.

The first of these consists in providing a fixed bosh or water-trough of a capacity suitable for the purpose, with proper axle-rotating devices placed in the bosh at such a distance from its bottom that water may be introduced to raise and completely cover an axle placed in contact with the revolving machinery. The axle, after sufficient heating, is placed on a rotary cradle set in motion, and then covered with water or other liquid or mixture of water and suitable ingredients, provision being made to cause the water or cooling-liquid to rise in the stationary bosh or trough, and after contact with the rotating axle for a sufficient length of time to give it a chill of proper depth.

The second and preferred form of apparatus for effecting a surface-chill of the axle or bar consists of a fixed rotating mechanism, and a bosh or trough adapted to be raised or lowered, and be secured in either an elevated or depressed position in the same vertical plane with the rotating machinery mentioned, proper provision being made to fill the bosh with water or other cooling-liquid and to discharge it. In this case the axle is heated evenly to a proper degree, then placed on the revolving cradle, the water-bosh filled and elevated to submerge the axle, and a spraying device started to give it a surface-chill, when it may be removed and the bosh depressed for a repetition of the process.

A detailed description will now be given of the apparatus as shown in the annexed drawings, in which—

Figure 1 is a plan view of the apparatus, a portion being broken away through the center. Fig. 2 is a side elevation partly in section. Fig. 3 is an end elevation of the mechanism, taken through the end A, (see Figs. 1 and 2,) and Fig. 4 is a detached plan view of the end of the bosh or water-trough, showing the water-spray pipe and its feeding-branch.

A A′ are two vertical bracket-stands, of metal, made sufficiently strong for their desired office, the upper portions being bent to return the ends downwardly and then produce free hangers *a a*, of sufficient length to nearly reach the bottom of the bosh or water-tank B. The latter is of such relative length to the secured position of the bracket-stands A A′ that its end walls, *i i*, may reciprocate vertically in the space *k*, intervening between the bent limbs *a a* of the bracket-stands A A′ and the main bodies of the latter. The de-

pending limbs *a a* of the bracket-stands A A′ are furnished at their extremities with a pair of bosses, *a′*, formed so that their axial perforations will be adapted to receive the ends of the parallel shafts C C′ and support them.

The shaft C is intended to have a revoluble movement in the bosses *a′*, that serve as boxes, and in order to give such a motion a sprocket-wheel, *b*, is located on the shaft near one end or adjacent to the boss *a′*, this sprocket-wheel being pinned or keyed to the shaft, as shown at *b′*, Fig. 1.

On the body of the shaft C a suitable number of round hubs or short cylinders, *c*, are affixed at spaced intervals, the central portion, c^2, of these hubs having increased diameter, as shown in Figs. 1 and 2.

The shaft C′ is located parallel and near to the shaft C and rigidly secured in its supporting-bosses. Upon its body, directly opposite the hubs *c*, a series of loose hubs, *c′*, of similar diameter to the hubs *c*, are secured from endwise displacement by the collars c^3, which latter are attached rigidly to the shaft C′, so as to permit the hubs *c′* to revolve freely. Upon the bottom of the bosh B, near the sides and a suitable distance from each end, as shown in Fig. 2, two pairs of depending bracket-lugs, *f*, are affixed, each of these lugs being bifurcated to form parallel jaws, as shown in Fig. 3.

On each side of the bosh B the boxes *d* are secured upon a proper foundation. These are designed to give support to two transverse rock-shafts, F, which have the crank-arms E mounted on and secured to them near each end, so as to permit a pivotal engagement of the outer ends, *g*, of these cranks with the forked bracket-lugs *f*, between the parallel jaws of which they are located. About midway between the crank-arms E the cranks G are affixed to the rock-shafts F. These latter-named cranks are located at right angles to the other crank-arms, E, and project vertically downward when the latter-named cranks lie in a horizontal plane. The two pairs of crank-arms E are located in parallel planes, so that when the lower cranks, G G, are connected by a link-bar, H, pivoted to the lower extremities of these cranks, a vertical reciprocating movement may be given to the bosh B by a horizontal reciprocation of the link-bar. When the bosh is lowered, it will occupy a relative position with regard to the parallel shafts C C′, as shown in the dotted lines *y y y*. (See Fig. 2.)

At one end of the bosh B, and preferably the end where the sprocket-wheel *b* is attached to the shaft C, an actuating bar or rod, I, is attached to one of the cranks G, which bar may be connected to any proper mechanism to give it a limited endwise movement, and thus raise or lower the bosh a proper distance, as may be required. Upon the sprocket-wheel *b* an endless chain, J, is placed, and it has engagement with a mating sprocket-wheel, (not shown,) the latter being located on a shaft connected to a source of power and motion, so that a movement of the chain may be effected to rotate the wheel.

At each end of the bosh B two projecting blocks, *e e*, are fastened. These are spaced a sufficient distance apart to have a sliding engagement with the parallel side edges, *e′*, of the bracket-stands A A′, and thus be adapted to prevent side oscillation of the bosh when it is moved by the rock-shafts F and attached mechanism.

Beneath the parallel shafts C C′ a spray-pipe, D, is placed which extends nearly the length of the bosh B, and is supported near the bottom of the latter. This pipe is perforated on its upper surface to permit the escape of water or other cooling-liquid in numerous forcible jets upwardly against the axle-surface when the latter is placed on the revolving cradle above said pipe. One of the ends of the spray-pipe D is secured to the branch pipe D′, which extends through the side of the bosh, and to the outer end of the branch pipe a flexible pipe, D^2, is attached, which is of a proper length to allow it to have a connection of its outer end with an adequate source of water-supply, whereby water may be introduced in proper volume into the bosh. An outflow-orifice, *m*, (see Fig. 2,) allows the heated water which rises to escape from the bosh near its upper edge.

In order to facilitate the working of the apparatus hereinbefore described, the upper end of the bosh B may be located near the surface of the floor or ground or level of the building in which the device is placed. To effect this a walled excavation is made, of sufficient capacity to allow the bosh to be lowered in it. The boxes *d* of the rock-shafts F are located on this wall, which will afford them a stable foundation. The margin of walled excavation is shown at *z z* in Fig. 2.

In operation the bosh is filled with water or other suitable liquid and the rotating mechanism set in motion, the shaft C revolving toward the fixed shaft C′, the axle, which has been rendered sufficiently hot throughout its entire length, being placed upon the cradle formed by the hubs *c c′*, which will instantly communicate a rapid rotary motion to the axle in a direction at right angles to its axis. The water trough or bosh B is now raised until the axle is entirely submerged, the water thus displaced escaping at the overflow *m*, and the water may be turned into the spray-pipe D to cause jets to impinge upon the rotating axle. When a surface-chill has been communicated to the axle-body to render its outer surface black, and which in the judgment of an expert operator will have penetrated the body of the axle to a sufficient depth, the axle is removed and bosh lowered and another axle placed in position, when the operation may be repeated, it being understood that the axles as they are removed from the bosh are placed where they will be supported level, and not in contact with wet ground or other damp sur-

faces that would have a tendency to cool the axle unevenly and possibly warp it.

It is evident that slight changes might be resorted to in the form and arrangement of the several parts described without departing from the spirit and scope of my invention, and hence I do not desire to limit myself to the precise construction herein set forth; but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a frame and a cradle carried thereby for supporting the article to be toughened, and mechanism for rotating the article, of a water-container located below the cradle, and devices for elevating the container.

2. The combination, with a frame, a stationary cradle supported thereby, and devices for rotating the article carried by the cradle, of a water-container located under the cradle, and mechanism for raising the container up to the cradle, substantially as set forth.

3. The combination, with a frame and a stationary cradle carrying a rotating mechanism, of a vertically-movable bosh of water beneath the rotating mechanism, and means for raising this bosh until the rotating mechanism is submerged by the water therein, substantially as set forth.

4. The combination, with a supporting-frame and a stationary cradle carrying an axle-rotating mechanism, of a vertically-movable bosh, means for raising the latter until its contained water submerges the axle on the revolving mechanism, and a spray-pipe to cause jets to impinge upon the axle, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN COFFIN.

Witnesses:
A. MONTGOMERY,
S. G. NOTTINGHAM.