

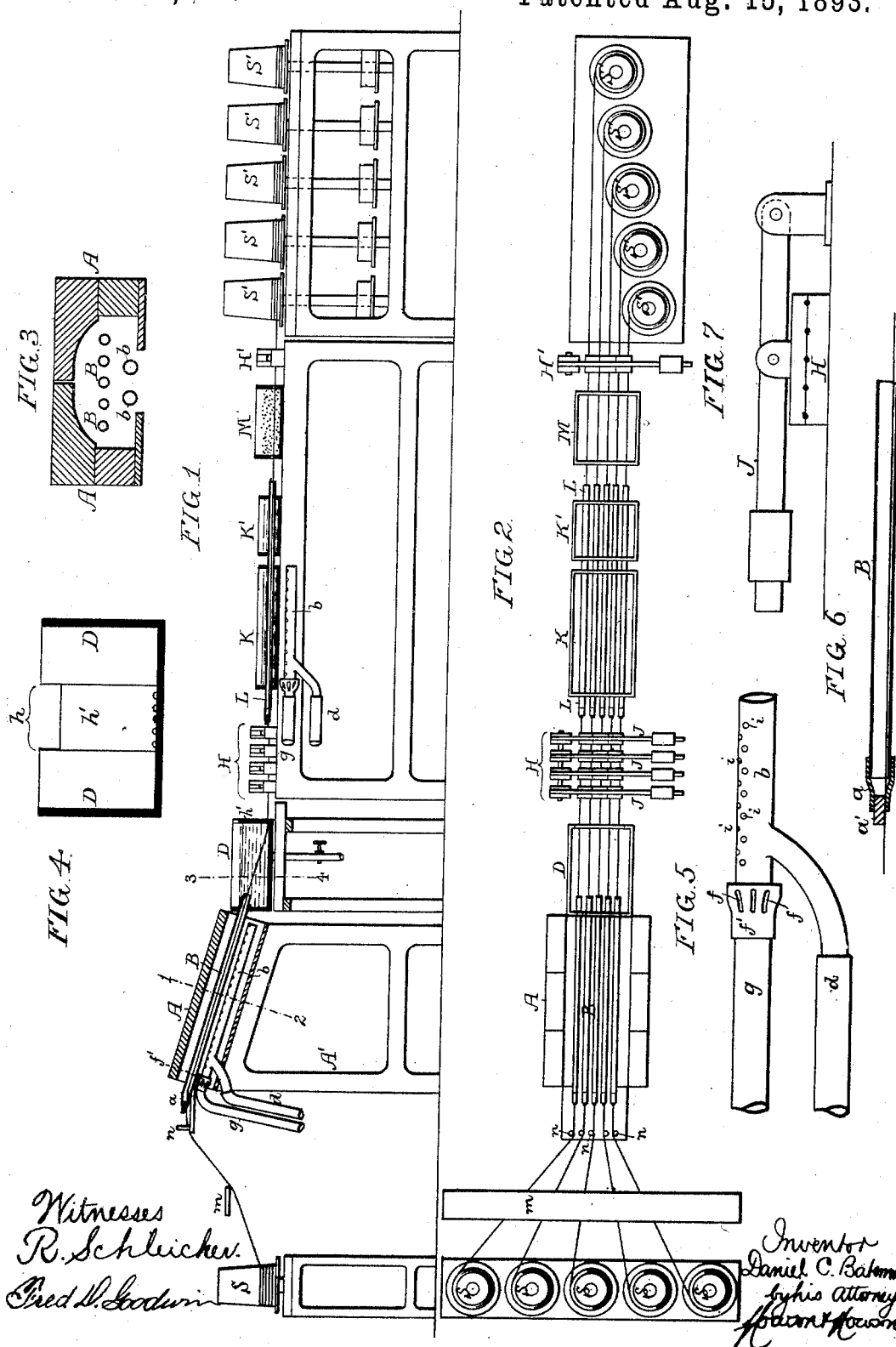
(No Model.)

D. C. BATEMAN.

APPARATUS FOR HARDENING AND TEMPERING STEEL WIRE.

No. 503,398.

Patented Aug. 15, 1893.



UNITED STATES PATENT OFFICE.

DANIEL CONRADE BATEMAN, OF CLECKHEATON, ENGLAND.

APPARATUS FOR HARDENING AND TEMPERING STEEL WIRE.

SPECIFICATION forming part of Letters Patent No. 503,398, dated August 15, 1893.

Application filed July 8, 1891. Serial No. 398,821. (No model.)

To all whom it may concern:

Be it known that I, DANIEL CONRADE BATEMAN, a subject of the Queen of Great Britain and Ireland, and a resident of Whitecliffe, Cleckheaton, Yorkshire, England, have invented certain Improvements in Apparatus for Hardening and Tempering Steel Wire, of which the following is a specification.

The object of my invention is to effect the hardening and tempering of steel wires in such a manner that the original brightness and color of the wire will not be impaired by said process of hardening or tempering so that the wire, after treatment, is in condition for use without subsequent cleaning or polishing, the invention being especially intended for the treatment of fine steel wire suitable for being made into teeth for card clothing.

In the accompanying drawings:—Figure 1, is a side elevation partly in section, of apparatus embodying my invention. Fig. 2, is a plan view of the same. Fig. 3, is a transverse section through the heating chamber, on the line 1—2, Fig. 1. Fig. 4, is a transverse section through the hardening tank, on the line 3—4, Fig. 1; and Figs. 5, 6 and 7, are enlarged views of details of the apparatus.

In Figs. 1 and 2, A represents a heating furnace composed preferably of slabs of refractory material mounted upon a suitable frame work A' and containing a series of tubes B, of which there may be as many as desired, five being shown in the present instance. These tubes are upwardly inclined from their forward ends toward the rear ends, the forward end of each tube passing into a tank D and being submerged in oil or other liquid, which is maintained at a desired level in said tank and is caused to circulate through the same in any available manner.

To the rear end of each tube B is applied a short tube *a* of rubber or other elastic or semi-elastic material the outer projecting end of this tube being closed by a plug *a'* of like material, as shown more clearly in the enlarged view Fig. 6. The tubes B may be heated in any desired manner, as for instance by a fire built directly in the furnace A or by gas introduced into the same from any outside generator. In the drawings, however, I have shown in the lower part of the furnace two burner tubes *b* each of which is supplied with

gas from a suitable pipe *d*, air entering the burner tube through openings *f* in a cap *f'* at one end of said tube (see Fig. 5) or the supply being augmented, if desired, by a blast of air through a pipe *g* communicating with said cap, the mixture of gas and air escaping through openings *i* in the tube *b* and, when ignited, enveloping the tubes B.

In the front end of the tank D is a slot *h* to which is adapted a slide *h'* having in its under edge as many notches as there are wires to be treated (see Fig. 4) and in advance of the tank D are a series of presser pads H of rubber or other flexible or elastic material, each of these pads being acted upon by a weighted lever J so as to press it into contact with its body, as shown in Fig. 7.

In advance of the presser pads H is a vessel K containing lead or other metal or alloy which can be melted at a comparatively low temperature and through this vessel pass a series of tubes L closed at their rear ends by elastic tubes and plugs in the same manner as the tubes B and projecting at their front ends some distance beyond the vessel K and, by preference, through a supplementary vessel K' through which water or other cooling liquid is caused to circulate.

The vessel K and its contents may be heated in any suitable manner so as to maintain the soft metal or alloy in a molten state, the means shown in the present instance for heating said vessel K being similar to those adopted for heating the tubes B in the furnace A.

In advance of the vessel K' is a tray M containing powdered lime, chalk, or the like, and in advance of this tray is another set of presser pads H'.

The wires are drawn from spools S and pass first under a bearing bar *m* thence around guide pins *n* and thence through the plugged upper ends of the tubes B and in passing through the latter they are heated, owing to the temperature at which said tubes are maintained. The wires emerge from the contracted forward ends of the tubes B and pass through the oil or other liquid in the tank D whereby the hardening of the wires is effected, the wires finally passing from the tank D through the notches in the bottom of the slide *h'* which closes the end of said tank. The

surplus oil is removed from the surfaces of the wires by their passage beneath the presser pads H and the wires then enter the plugged rear ends of the tubes L in the lead bath K and in their passage through these tubes they are subjected to such a degree of heat as will properly temper or anneal the same, this degree of heat being readily regulated by the proper regulation of the temperature of the lead bath. In passing through the projecting ends of the tubes L the wires are cooled gradually so as to be at a low temperature when they emerge from said tubes and pass through the lime or chalk in the tray M, and thence beneath the presser pad H' prior to being wound upon the spools S'.

A prominent feature of my invention is the hardening and tempering of the wires while they are free from oxidizing influences, for it will be observed that each tube B is sealed against air at one end by the tube *a* and plug *a'* and at the other end by the liquid in the tank D and the same is true of the tempering tubes L for when each of said tubes is closed at one end and projects some distance beyond the lead bath at the other end, the heating of that portion of the tube which is within the lead bath is sufficient to prevent the inflow of air into the open end of the tube to such an extent as to bring such air into contact with the heated portions of the wire passing through the tube, the projection of the tube beyond the lead bath being sufficient to insure such cooling of the wire before the air acts upon the same, that said air has no chance of exercising an oxidizing effect upon the wire. If desired, however, the delivery ends of the tubes L may be closed by plugged tubes of asbestos or like heat resisting material. By preventing the wires from coming in contact with the air while said wires are heated, no hard scale or film is formed upon the wires but, on the contrary, the original brightness, color and tenacity of the wires are effectually preserved.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination of the tube through which the wire is drawn, with heating devices for the tube and means for closing the end of said tube, said means comprising an elastic tube applied to and projecting beyond the end of the heating tube and an elastic plug closing the end of said elastic tube, substantially as specified.

2. The combination in apparatus for hardening and tempering steel wires of draft mechanism for the wires, the inclined tubes, a furnace for heating the same, a hardening bath in which the lower ends of said tubes are submerged, tempering tubes through which the wires pass after leaving said hardening bath, means for heating said tempering tubes and means for preventing the access of air to the interior of the heated portions of both sets of tubes, substantially as specified.

3. The combination of the metal bath, the tempering tubes passing through the same and each having a yielding plug at the inlet end, means for heating said bath and a cooling bath through which said tubes also project, substantially as specified.

4. The combination in apparatus for hardening and tempering steel wires, of draft mechanism for the wires, the inclined heating tubes, the furnace for heating the same, the hardening bath in which the lower ends of said tubes are submerged, presser pads for cleaning the wires as they emerge from said bath, a metal tempering bath having tempering tubes passing through the same, means for heating said bath a tray containing powdered lime or chalk through which the wires pass after leaving the tempering tubes and yielding devices for closing the heating and tempering tubes against the passage of air, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses:

DANIEL CONRADE BATEMAN.

Witnesses:

EUGENE ELTERICH,
HARRY SMITH.