(No Model.)

L. L. BURDON.

METHOD OF STRAIGHTENING TUBES.

No. 381,526. Patented Apr. 24, 1888.

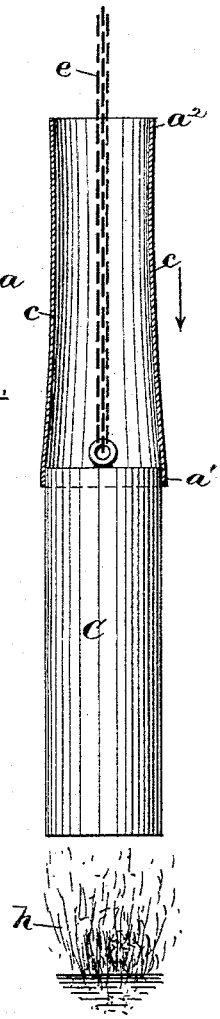

FIG. 3.

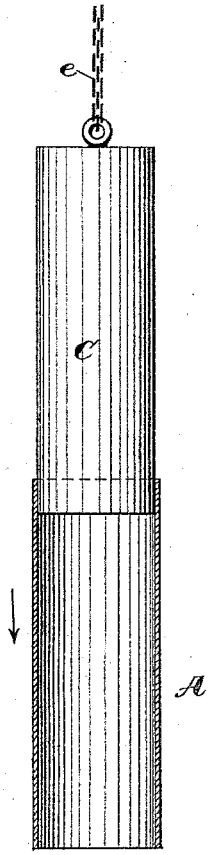

FIG. 4.

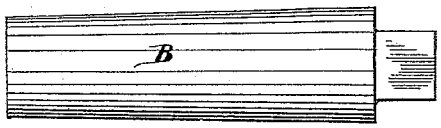

FIG. 2.

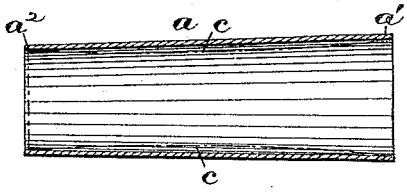

FIG. 1.

WITNESSES.

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UNITED STATES PATENT OFFICE.

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METHOD OF STRAIGHTENING TUBES.

SPECIFICATION forming part of Letters Patent No. 381,526, dated April 24, 1888.

Application filed October 4, 1887. Serial No. 251,398. (No model.)

To all whom it may concern:

Be it known that I, LEVI L. BURDON, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Methods of Straightening Metallic Tubes; 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention herewith relates to a new and improved process employed in straightening metallic tubes.

In the manufacture of seamless tubes, especially when drawn down to such an extent that the sides thereof are comparatively thin, it is found that the tendency of the metal intermediate of the end portions is to spring inwardly, thereby producing tubes which are somewhat smaller in diameter, or concave along the center portions, than at their ends. Tubes thus drawn are, moreover, slightly larger at one end than the other, owing to the fact that the plungers which shape them are made tapering. This is done in order that they may be readily withdrawn from the shells or tubes. For certain purposes—as, for example, in the manufacture of seamless shells for compound ingots—it is very essential that the tube be quite thin and at the same time substantially uniform in diameter, or cylindrical, throughout.

The object of my improvement is to straighten such concave tubes and at the same time make them uniform in diameter. To accomplish this result I make a standard, arbor, or core of proper length from suitable metal—as steel—which is perfectly true and cylindrical, its diameter being substantially the same as that of the large end of the tube to be operated upon. The arbor has a flexible connection attached to one end thereof, by which it is suspended. I next place the large end of the seamless tube over the upper end of the vertical arbor and subject the whole to the action of heat. Such heat may be generated in a suitably-arranged furnace, or the heat from a series of burning gas-jets may be directed against the arbor and tube, the result being that the tube expands and by its gravity passes over the arbor and drops therefrom at its lower end. Upon cooling the tube will be found to be true and uniform in diameter throughout.

In the accompanying drawings, illustrating my improvement, Figure 1 represents a longitudinal central sectional view of the seamless tube having one end larger than the other, corresponding to the size of the plunger or former, and by broken lines representing the tendency the metal has to assume a concave form. Fig. 2 is a side view of the plunger. Fig. 3 represents a suspended arbor having the tube (which is to be straightened) resting thereon preparatory to being heated; and Fig. 4 is the same after the heat has been applied, showing the tube straightened by its passage along the arbor and being in the act of dropping therefrom.

The following is a more detailed description of my improvement, including the manner of its operation.

B indicates the last of a series of plungers or formers which give the final shape to the seamless tube, said plunger being adapted to be mounted in a suitable press, as common. Such plungers are generally made slightly tapering or conical—that is, having one end a little larger in diameter than the other—so that the work may be removed therefrom with greater facility. In the drawings the degree or proportion of the taper is considerably exaggerated.

a, Fig. 1, designates a seamless tube or shell of metal as made or finished by said arbor and open at both ends, *a'* being the large end and a^2 the small end of the tube. The sides of the tube very frequently spring inwardly, as shown at *c* by the curved broken lines. To such an extent are the sides bent that it is impossible to force an arbor longitudinally through the tube without rupturing it. The tube *a* in this instance we will assume to be made from fine metal—as gold—and being quite thin and seamless, the curvature of its sides being due to the drawing process, which makes the metal hard and elastic and having somewhat of the qualities of a spring. This characteristic of metals,

developed during the drawing or hammering process, is well known to workers in metal.

C indicates an arbor of suitable length and turned off true and uniform in diameter throughout. The arbor may be solid and made of steel. The upper end is adapted to be attached to a chain or flexible connection, *e*, as clearly shown in Fig. 3.

The operation is as follows: The tube *a* is first mounted upon the upper end of the suspended arbor C, as shown in Fig. 3, and the whole then suitably disposed within a furnace and subjected to heat, which gradually expands the tube. The latter now slides downwardly along the arbor and finally drops therefrom, thereby straightening the tube and making its interior diameter uniform with the outer diameter of the arbor, as shown at A, Fig. 4.

During the foregoing operation the action of the heat is of course to heat both the arbor and the tube; but the latter, owing to the nature of the material and thinness of the shell, is more readily acted upon, thereby at the same time in a degree annealing it. Consequently the tube becomes self-straightening in its passage over the arbor, as stated. The tube upon cooling will be found to be practically true, the heat having removed the "temper" from the metal which had been present by reason of the "drawing" process in making the tube.

It is obvious that by heating the tube to a proper temperature and holding it stationary the arbor itself may be readily drawn endwise through the tube with substantially the same effect upon the tube as though it had been passed over the arbor.

I claim—

1. The method of straightening tubes, which consists, essentially, in passing a cylindrical arbor longitudinally through and in continuous contact with a heated tube of substantially the same diameter as the arbor, thereby giving to the tube a uniform interior diameter corresponding to the diameter of the arbor, substantially as hereinbefore set forth.

2. The hereinbefore-described improved mode of straightening metallic tubes, the same consisting in inserting slightly one end of the shaping-arbor within one end of the tube to be acted upon, and then subjecting the arbor and tube to the action of heat, which expands the tube and permits it to slide down and from the arbor by gravity.

In testimony whereof I have affixed my signature in presence of two witnesses

LEVI L. BURDON.

Witnesses:
CHARLES HANNIGAN,
GEO. H. REMINGTON.