T. WHITEHOUSE.

Tube-Drawing Mandrel.

No. 166,438. Patented Aug. 3, 1875.

Fig. 1.

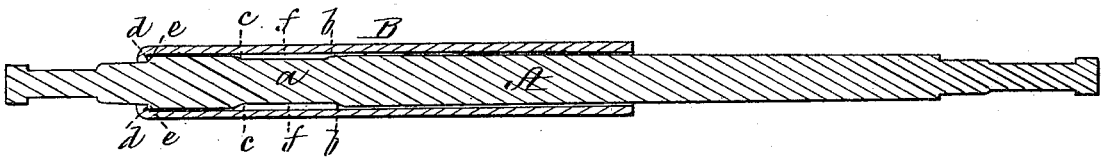


Fig. 2.

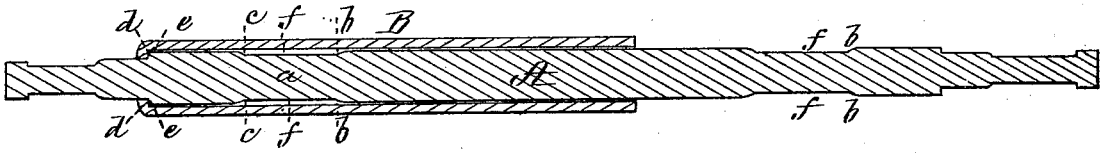


Fig. 3

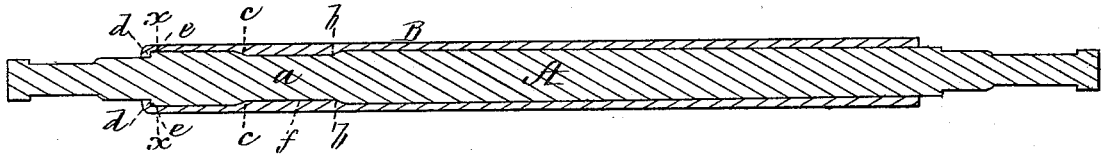


Fig. 4.

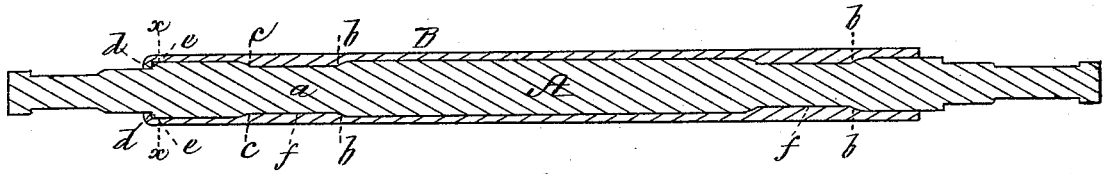


Fig. 5.

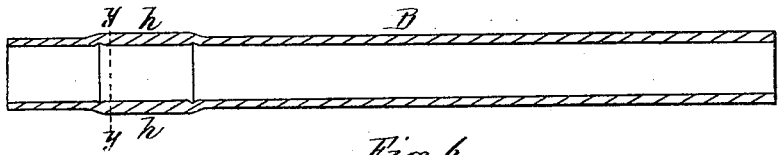
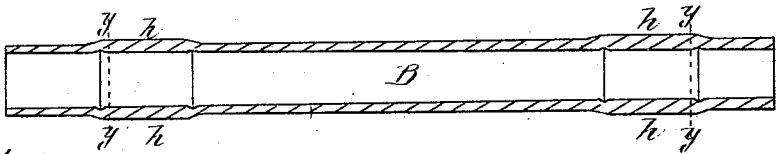


Fig. 6.



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UNITED STATES PATENT OFFICE

THOMAS WHITEHOUSE, OF SOMERVILLE, ASSIGNOR TO THE AMERICAN TUBE-WORKS, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN TUBE-DRAWING MANDRELS.

Specification forming part of Letters Patent No. **166,438**, dated August 3, 1875; application filed May 27, 1875.

To all whom it may concern:

Be it known that I, THOMAS WHITEHOUSE, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in the Manufacture of Seamless Drawn Metal Tubes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figures 1 and 2 are longitudinal sections through mandrels constructed in accordance with my invention, with tubes thereon ready to be drawn. Figs. 3 and 4 are longitudinal sections through the same after the tubes have been drawn by passing through the forming-die. Figs. 5 and 6 are longitudinal sections through the finished tubes after the mandrels have been withdrawn therefrom.

Seamless metal tubes drawn on mandrels are usually made with a tapering interior, which gives a greater thickness of metal at one end of the tube than at the other, the object of the taper being to facilitate the operation of removing the mandrel, and also to secure additional thickness of metal and increased durability at the end of the tube which is exposed to the greatest heat when used as a boiler-flue, the thick end being placed next to the furnace. Tubes having an extra thickness of metal at the thick end are, however, sometimes wanted, and these have been produced by the employment of a mandrel turned down at its smaller end with a shoulder, which does not interfere with the removal of the mandrel, as its large end is drawn out first. When, however, a tube having this extra thickness of metal for a short distance at both ends was wanted, (as often occurs,) it has heretofore been found impossible to produce it in the operation of "drawing," for the reason that if the mandrel was turned down at both ends with ordinary square shoulders it could not be removed, and, consequently, when it was desired to increase the thickness of the metal at the thin end of the tube, a short sleeve was slipped thereover and brazed in place, or a piece of tube of the required length and thickness was brazed directly to the thin end of the long tube. These methods are, however, expensive, and a tube so made, not being of one homogeneous piece of metal, is not durable, as it is liable to give out at the joints and leak.

My invention has for its object to overcome these difficulties, and to produce a seamless drawn tube in one piece having an extra thickness of metal at what is known as the thin end or at both ends, this extra metal being so disposed as to increase the exterior diameter of the tube without affecting or changing its interior diameter; and my invention consists in drawing the tube upon a mandrel turned down near its large end, or near both ends in a peculiar manner, so as to leave an annular depression or depressions with inclined or rounded shoulders, the metal being forced into the depression or depressions in the process of drawing the tube, that portion of the metal thus forced into the depression or depressions being afterward expanded or wedged out onto the outside of the tube by the inclined or rounded shoulder or shoulders of the mandrel as the latter is withdrawn from the tube, the interior of which is thus left of the same taper, and straight, as when drawn upon an ordinary mandrel, while the exterior diameter of the tube is correspondingly increased at the point or points where there is an extra thickness of metal.

To enable others skilled in the art to understand and use my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings, A represents a tapering mandrel, and B, Figs. 1 and 2, a metal tube placed thereover, and ready to be drawn for the last time through a circular forming-die, (not shown,) by which it is elongated and its diameter reduced in a well-known manner. Each of the mandrels shown in Figs. 1 and 3 is turned down near the extremity of its large end, leaving a neck or portion, *a*, of reduced diameter, shoulders *b c* being thus formed, one, *b*, of which is inclined or rounded, for a purpose to be presently described, while the other, *c*, may be inclined, round, or square, as desired. The tube B to be drawn is provided, as usual, with a shoulder, *d*, at one end, which fits against a square shoulder, *e*, at the end of

the mandrel, as is necessary, in order that both may be drawn through the die together. As the tube B is drawn through the die the metal is forced into the annular depression *f*, formed by turning down the mandrel, as seen in Figs. 3 and 4, and the tube is thus left with an extra thickness of metal at that portion of its length opposite to the annular depression of the mandrel. After the tube has been drawn the end provided with the shoulder *d* is cut off on the dotted line *x x*, Fig. 3, by a cold-chisel, or otherwise, and the removing-die is then applied, and the mandrel drawn out large end first, in the usual manner. This withdrawal of the mandrel causes the inclined shoulder *b* to act upon that portion of the metal which has been forced into the depression *f*, and wedge or force it out onto the outside of the tube, as seen at *h*, Figs. 5 and 6, the interior of the tube being left of the same taper, and straight, the same as if drawn upon an ordinary mandrel, the extra metal being disposed upon the outside of the tube, where it is wanted, the exterior diameter being thus correspondingly increased at this point. After the mandrel has been drawn out the end of the tube is cut off on the line *y y*, when it is ready for use.

It will be seen that if the shoulder *b* was square, instead of being inclined or rounded, it could not be withdrawn without spoiling the tube or breaking the mandrel, and by thus forming an annular depression at the large end of the mandrel I am enabled to produce a drawn tube in a single piece having an extra thickness of metal at the thin end, and a straight unobstructed interior surface—a desideratum heretofore unattained.

When it is desired to produce a tube having an extra thickness of metal at both ends, the mandrel is turned down, as seen in Figs. 2 and 4, so as to leave an annular depression, *f*, with an inclined shoulder, *b*, near each end, the metal being forced into these depressions when the tube is drawn through the forming-die, as seen in Fig. 4, and this metal is afterward wedged or forced out simultaneously at both ends of the tube by the inclined shoulders *b* on the withdrawal of the mandrel, as previously described. Both ends of the tube are then cut off on the lines *y y*, Fig. 6, when it is ready for use.

What I claim as my invention, and desire to secure by Letters Patent, is—

A tube-drawing mandrel, A, provided near its large end only, or near each end, with an annular depression, *f*, having an inclined or rounded shoulder, *b*, substantially as and for the purpose set forth.

Witness my hand this 22d day of May, A. D. 1875.

THOMAS WHITEHOUSE.

In presence of—
P. E. TESCHEMACHER,
N. W. STEARNS.