(No Model.)

E. IVINS.

MANUFACTURE OF SEAMLESS DRAWN TUBES.

No. 601,966. Patented Apr. 5, 1898.

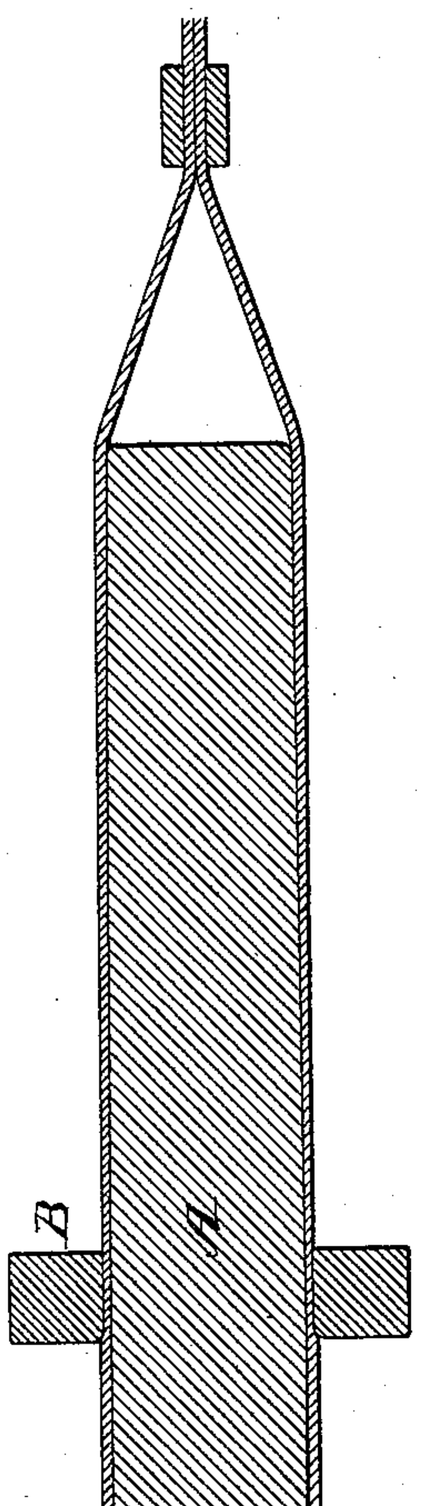

Fig. 1.

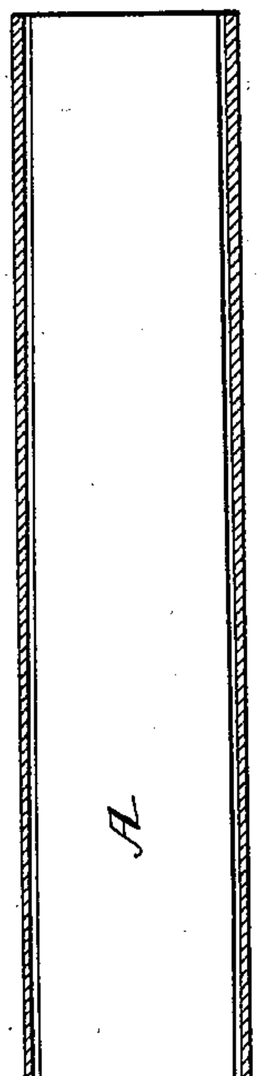

Fig. 2.

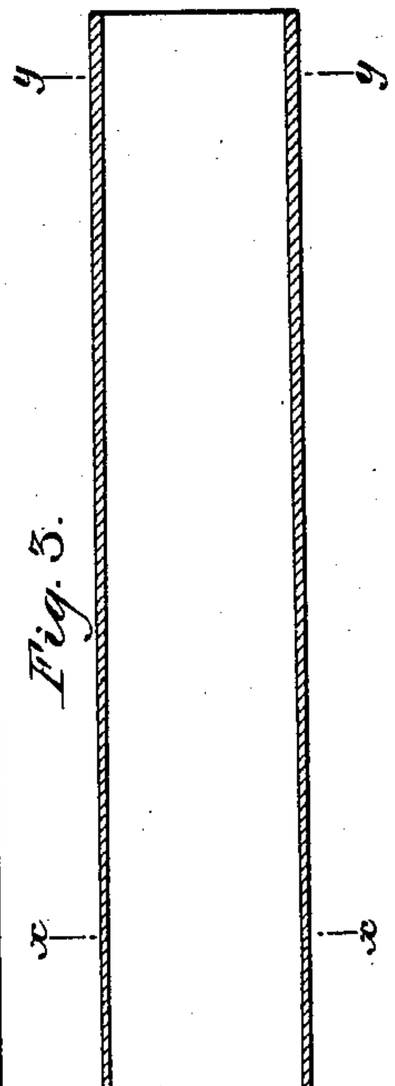

Fig. 3.

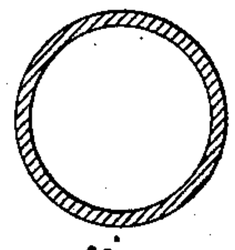

Fig. 6.

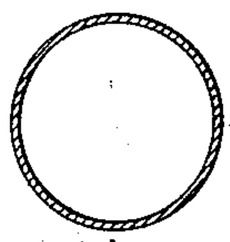

Fig. 5.

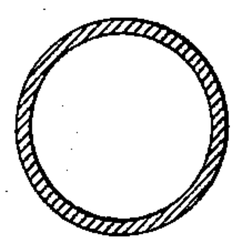

Fig. 4.

Witnesses:
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UNITED STATES PATENT OFFICE.

ELLWOOD IVINS, OF PHILADELPHIA, PENNSYLVANIA.

MANUFACTURE OF SEAMLESS DRAWN TUBES.

SPECIFICATION forming part of Letters Patent No. 601,966, dated April 5, 1898.

Application filed April 19, 1897. Serial No. 632,813. (No model.)

To all whom it may concern:

Be it known that I, ELLWOOD IVINS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in the Manufacture of Seamless Drawn Tubes, of which the following is a specification.

My invention relates to the manufacture of seamless drawn tubes, which may be either cylindrical or tapering as regards their external form, but which vary in thickness or gage in different parts of their length, the object of my invention being to so form such tubes that any desired internal configuration may be imparted to them and material variations in the gage or thickness of the tube may be effected by a single draft of the same through the die-plate.

In the accompanying drawings, Figure 1 is a diagram illustrating the first step in the method of carrying out my invention. Fig. 2 is a diagram illustrating the second step of the process. Fig. 3 is a sectional view of the completed tube; and Figs. 4, 5, and 6 are respectively transverse sections on the lines *w w*, *x x*, and *y y*, Fig. 3.

It is well known that in drawing a steel tube between a die-plate and an internal ball or mandrel in the usual manner only a very slight reduction in the thickness of the tube can be effected at a single draft, a difference of one or one and a half gages of the standard Birmingham gage being the maximum amount of reduction possible in good practice. The reason of this is that the friction between the die-plate and the internal ball or mandrel will, if any greater reduction is attempted, overcome the tensile strength of the drawn portion of the tube and the latter will be torn apart, or the end portion of the same, which is gripped between the draft-tongs, will be pulled off. As a consequence of this the method which has been proposed of varying the internal diameter of a tube as it is being drawn by employing a tapering internal ball or mandrel and varying the position of the tapering nose of this mandrel in respect to the die-plate as the drawing operation proceeds has proven a failure, especially for the production of tubes which are of fine gage throughout, as any attempt to obtain more than an infinitesimal change in thickness in the walls of the tube by this method invariably results in the rupture of the drawn tube or the pulling off of the end of the same which is held by the tongs. In order to overcome this objection, I use a traveling mandrel A, which is drawn through the die-plate B with the tube and which has an exterior configuration similar to that of the desired internal configuration of the tube which is being drawn, the die-plate and tube being such that as the tube is drawn through the said die-plate it will be pressed onto this mandrel and will conform to the shape of the same, the tube and mandrel being drawn forward as a unit.

The mandrel is of incompressible material, preferably of hardened steel. As the mandrel travels with the tube therefore there is no friction such as is caused by drawing the tube between two fixed opposing surfaces—such as a die-plate and an internal ball or mandrel—but only the friction caused by the compression of the tube upon the traveling mandrel. Hence much greater reductions in the thickness of the tube are possible than by the ordinary method of procedure. For instance, I have in practice produced at one draft a tube varying in thickness at different parts of its length to the extent of five or six gages.

After the tube, with its internal mandrel, has been drawn through the die-plate it becomes necessary to remove the mandrel from the tube, and in order to effect this result, especially where the tube is thickened or reduced in thickness at points between its ends, it becomes necessary to expand the tube until its portion of least internal diameter can be drawn from the mandrel. This may be done by hammering the tube, thereby subjecting it to intermittent pressure, which will effect the desired stretching of the metal, the aim being to effect the expansion of those portions of the tube which are of the smallest internal diameter. The expanded tube after being drawn off the mandrel is then drawn through a die-plate of proper aperture and without internal ball or mandrel, whereby the diameter of the tube is reduced to the desired extent and the outer surface of the tube has the proper finish imparted to it, this reduction in the diameter of the tube effecting no appreciable change in the thickness of

the walls of the tube, but causing simply a slight elongation.

It will be evident that in carrying out my invention a tube of any desired internal conformation can be produced. For instance, the tube may be thicker at one end than at the other or may be thicker or thinner at the ends than at a point or points between the ends, as many variations as desired in the thickness of the walls of the tube being made between the opposite ends of the tube and the change in thickness being either gradual or abrupt, as required. The external surface of the tube may be either cylindrical or tapering, as desired.

My invention has been especially devised for the manufacture of seamless drawn tubes of steel; but it may be used in the manufacture of tubes of iron, copper, brass, or other material with like good results.

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

1. The mode herein described of making seamless drawn metal tubes having walls of greater or less thickness between the ends than at the ends, said mode consisting in inserting in a tube, before drawing the same, a mandrel having an external configuration, similar to that of the desired internal configuration of the drawn tube, then compressing the tube upon the mandrel so as to cause it to conform internally to the external shape of the mandrel, then expanding the tube by subjecting to intermittent pressure the outside of those portions of the tube which have the least internal diameter, and then withdrawing the mandrel from the tube, substantially as specified.

2. The mode herein described of making seamless drawn metal tubes having walls of greater or less thickness between the ends than at the ends, said mode consisting in inserting in a tube, before drawing the same, a mandrel having an external configuration similar to that of the desired internal configuration of the drawn tube, then compressing the tube upon the mandrel so as to cause it to conform internally to the external shape of the mandrel, and then expanding the tube by subjecting to intermittent pressure the outside of those portions of the tube which have the least internal diameter, and then withdrawing the mandrel from the tube, and then again subjecting the tube to pressure throughout its length, whereby it is reduced in diameter and a surface finish is imparted to it, substantially as specified.

3. As a new article of manufacture, a seamless drawn metal tube, having its walls between the ends of greater or less thickness than at the ends, the difference in gage between the thick and thin portions of the tube exceeding two gages, substantially as specified.

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

ELLWOOD IVINS.

Witnesses:
WILL. A. BARR,
JOS. H. KLEIN.