(No Model.)

W. H. BROWN.

PROCESS OF MAKING SEAMLESS TUBES.

No. 316,600. Patented Apr. 28, 1885.

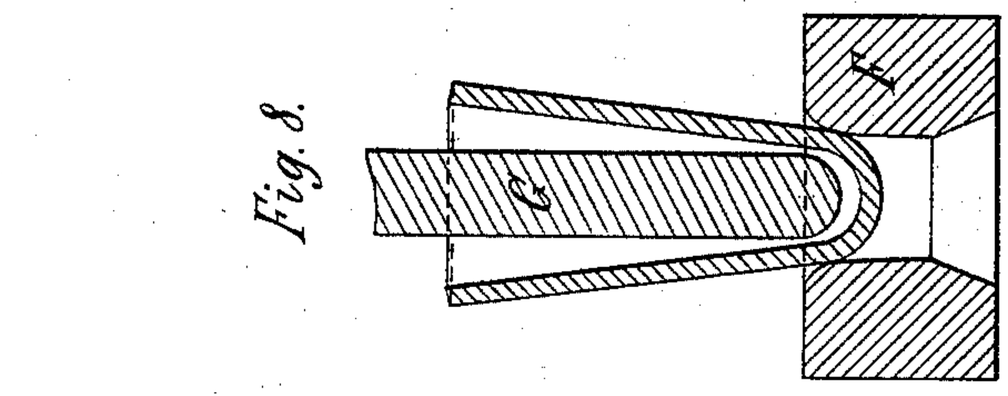

Fig. 8.

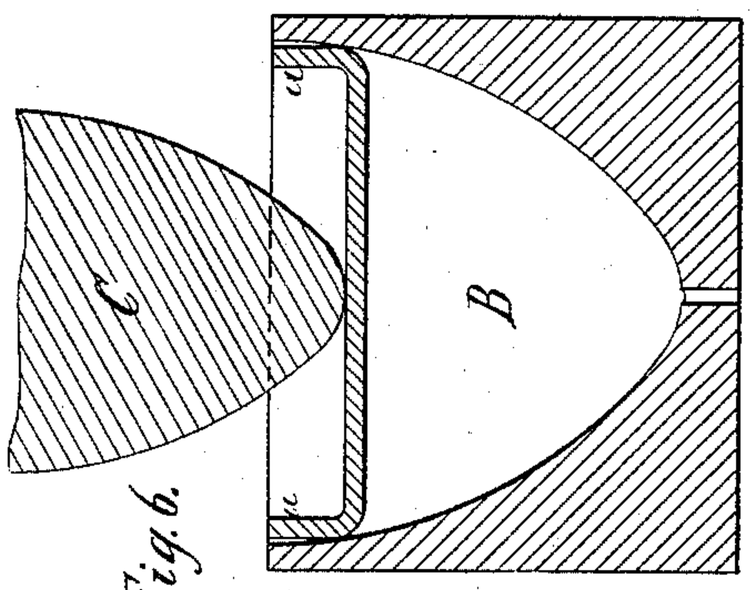

Fig. 6.

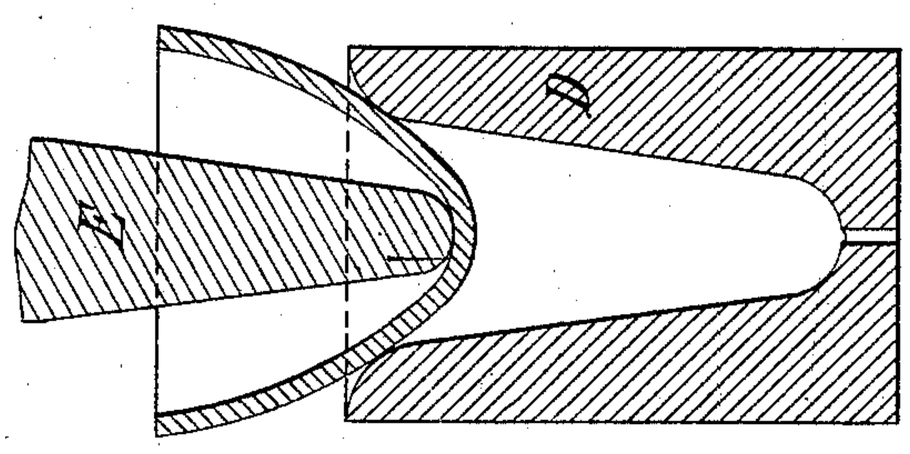

Fig. 7.

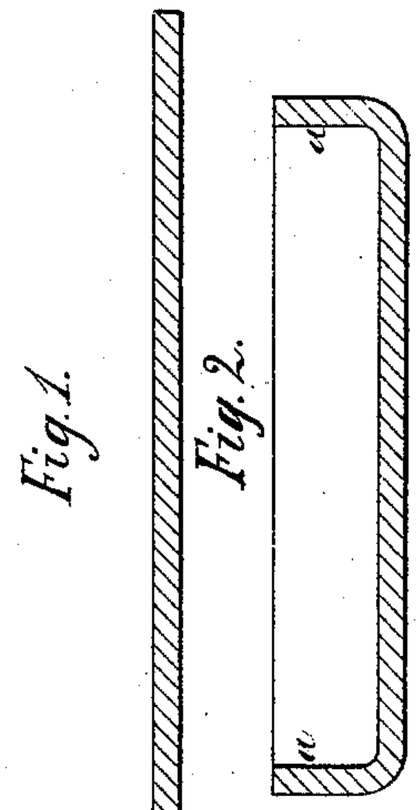

Fig. 1.

Fig. 2.

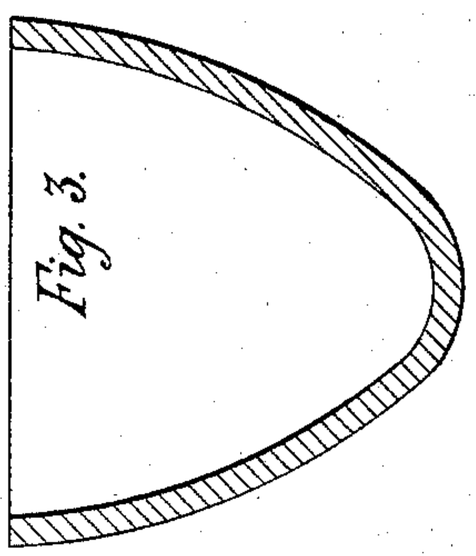

Fig. 3.

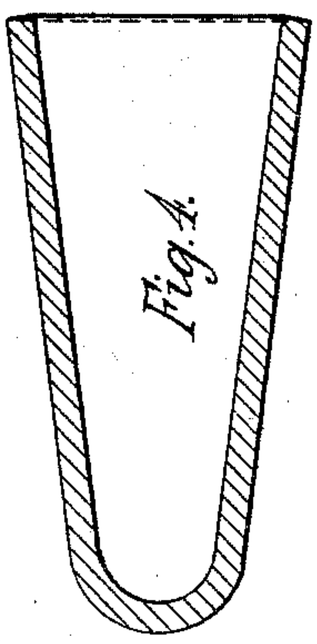

Fig. 4.

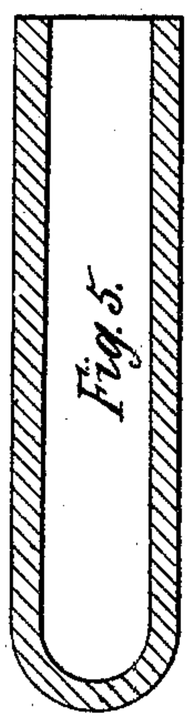

Fig. 5.

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UNITED STATES PATENT OFFICE.

WILLIAM HENRY BROWN, OF NEW YORK, N. Y.

PROCESS OF MAKING SEAMLESS TUBES.

SPECIFICATION forming part of Letters Patent No. 316,600, dated April 28, 1885.

Application filed January 26, 1885. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HENRY BROWN, a citizen of the United States, residing in the city and county of New York, and State of New York, have invented a new and useful Improvement in the Manufacture of Seamless Steel Cylinders, of which the following is a specification, reference being had to the accompanying drawings, forming part of this specification.

The invention relates to the manufacture of seamless cylinders of steel, either open throughout, as tubes, or closed at one end to constitute vessels or receptacles or parts thereof.

In the manufacture of drawn steel cylinders and tubes from disks of steel, as heretofore practiced, the entire process has been performed at very great expense while the metal has been in a cold state. This process is expensive, owing to the enormous power required for working the metal while cold in the earlier of the numerous successive drawing operations required when the thickness of the metal is great and the caliber of cylindrical cup-formed body under operation is large.

The object of this invention is to reduce the cost of the manufacture of seamless steel tubes, especially those of large size, and of the manufacture of seamless steel cylindrical vessels; and to this end the invention consists in performing the manufacture partly while the steel is hot and partly while the steel is cold—that is to say, performing the earlier stages of the manufacture, by which the disk is brought to the cylindrical form, while the steel is hot, and performing the latter stages, by which the steel is compressed, condensed, consolidated, and tempered, while it is in a cold state. The successive stages through which the steel passes in its conversion from the disk form to the cylindrical may be to a considerable extent varied without departing from my invention; but I have in the accompanying drawings illustrated a series of operations by which the conversion may be successively effected.

Figures 1, 2, 3, 4, 5 illustrate the changes of profile form which the disk of steel passes through while subjected to the folding operations in the hot state to be changed into a cylinder, the said views representing axial sections. Figs. 6, 7, 8 are axial sectional views illustrating the means employed to effect the successive changes of form.

Similar letters of reference indicate corresponding parts in the several figures.

The flat steel disk, Fig. 1, is heated, and while hot has its margin *a a* turned up all round, as shown in Fig. 2, by any well-known or suitable means—as by an ordinary flanging-machine—and during the same heat, or after reheating, the flanged disk is placed in a mortar-like die, B, (see Fig. 6,) to be therein subjected to the operation of a mandrel or plunger, C, by the direct forward movement of which toward the bottom of said die it is brought to the hemispheroidal cup-like form shown in Fig. 3. The cup-like piece is again heated and then placed in a die, D, of conical form, as shown in Fig. 7, to be therein subjected to the operation of the conical plunger E, which conforms to said die, and by the direct longitudinal movement of which the cup-like piece is brought to the conical cup form shown in Fig. 4. The conical cup-like piece is again heated, and while hot is forced through a die, F, by a longitudinally-moving mandrel or plunger, G, such as is shown in Fig. 8.

In all of the above operations the action to which the steel is subjected while hot is mainly that of folding, and this action may be repeated by as many operations as may be desirable between mandrels and dies of any suitable form or construction, and after the seamless piece has been brought to a cylindrical form, and as nearly as desirable to the caliber and thickness required, it may be cleaned by suitable means to remove the scale, and then subjected as many times as desirable, in a cold state, to a drawing action between a die and a triblet or mandrel in the manner commonly practiced in cold-drawing metal tubes and cylindrical articles, for the purpose of compressing, condensing, consolidating, and tempering the steel and giving a smooth surface to its interior and exterior.

I have not represented the dies or mandrels and triblets for the cold-drawing, as they are such as are commonly used in the manufacture of drawn cylinders and tubes.

If tubes are to be formed, the closed end left in the cylinder in forming it from the disk may be cut off at the termination of the hot-folding operations and before the cold-drawing operations, or after the first cold-drawing.

The operation of cold-drawing will be facili-

tated by tinning either the exterior or interior surface of the cylinder, or both of said surfaces. The tin will serve as a lubricant, and will also aid in giving a fine finish.

In this process of forming seamless steel cylinders the advantage consists in that the metal is subjected to the folding operations necessary to change its form from the disk to the cylinder while in that condition—viz., hot—in which it can be best folded but not well drawn, and is subjected to the drawing operation to condense, solidify, temper, and smooth it in the condition—viz., cold—in which it can be best drawn, and in which condition only, in fact, it can be drawn, but in which it cannot be so well folded.

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

The process of manufacturing drawn seamless cylinders of steel from disks by subjecting the metal in a hot state during the earlier stages of the process to the folding operations necessary to change the shape from the flat to the cylindrical, and afterward subjecting it in a cold state to the drawing operations by which the cylinders are condensed, consolidated, tempered, and finished, substantially as herein described.

WM. HENRY BROWN.

Witnesses:
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