March 15, 1932. P. BOISSOU 1,849,054

APPARATUS FOR THE MANUFACTURE OF METAL TUBES

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Fig.1

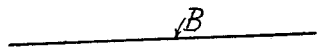


Fig.2

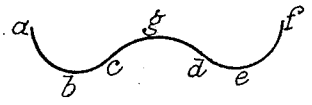


Fig.3

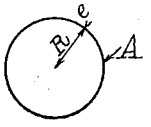


Fig.6

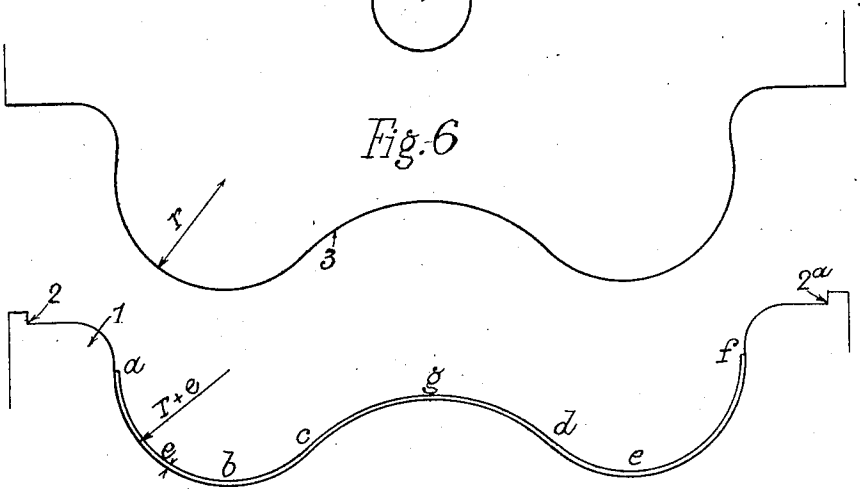


Fig.5

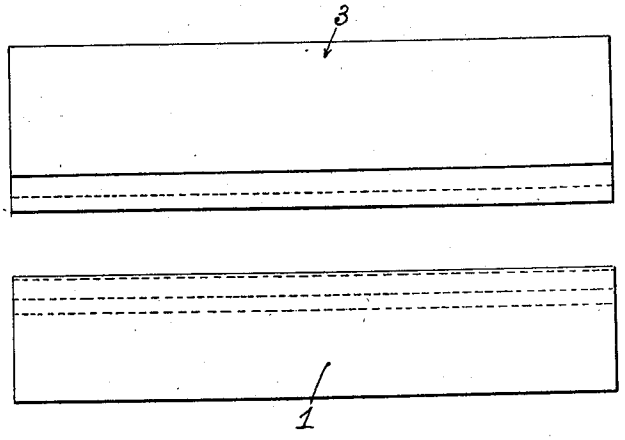
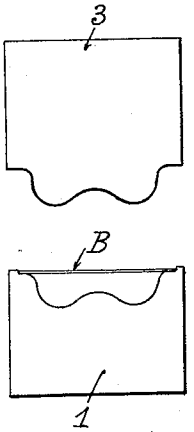


Fig.4



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APPARATUS FOR THE MANUFACTURE OF METAL TUBES

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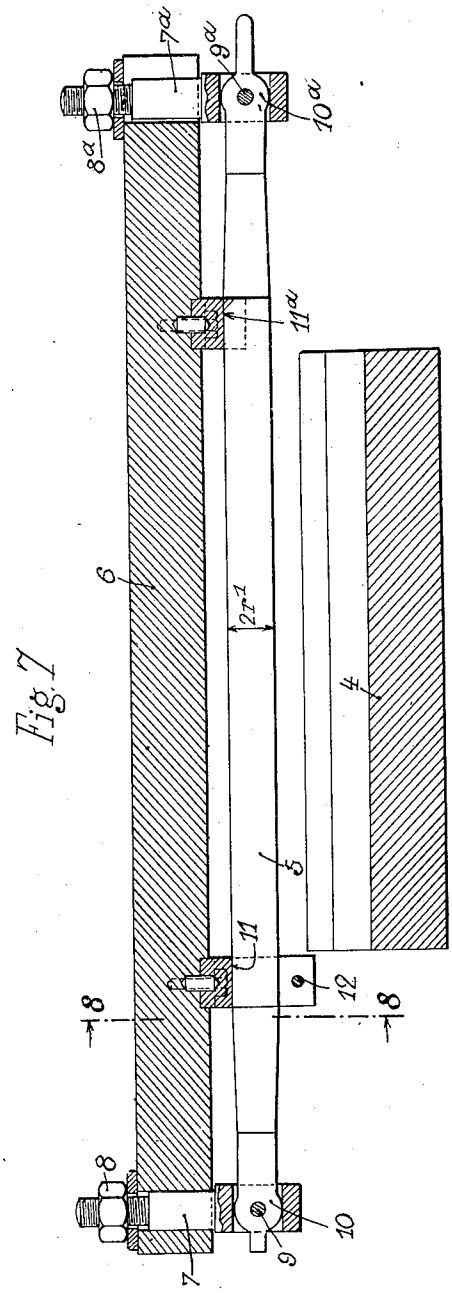


Fig. 7

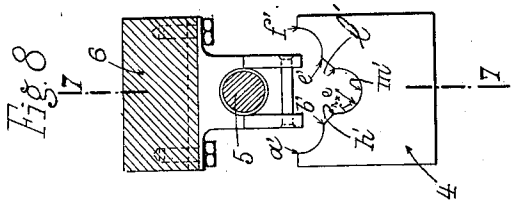


Fig. 8

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APPARATUS FOR THE MANUFACTURE OF METAL TUBES

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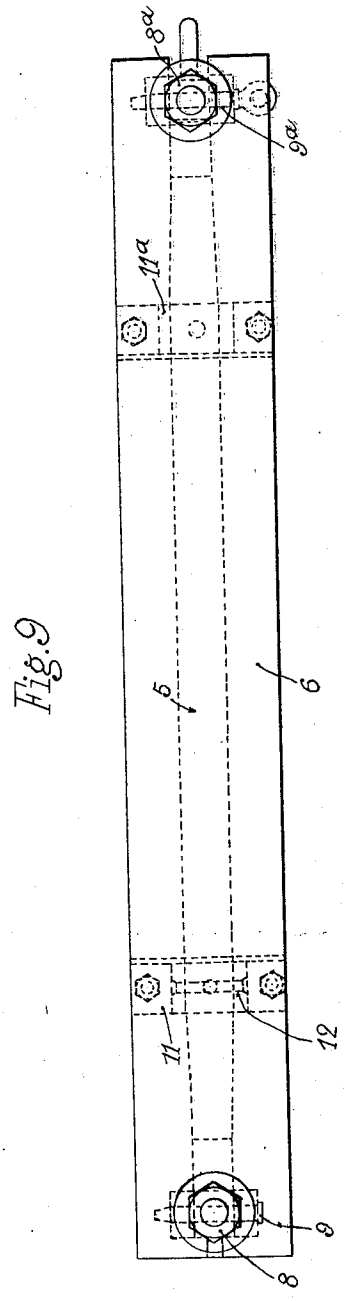


Fig.9

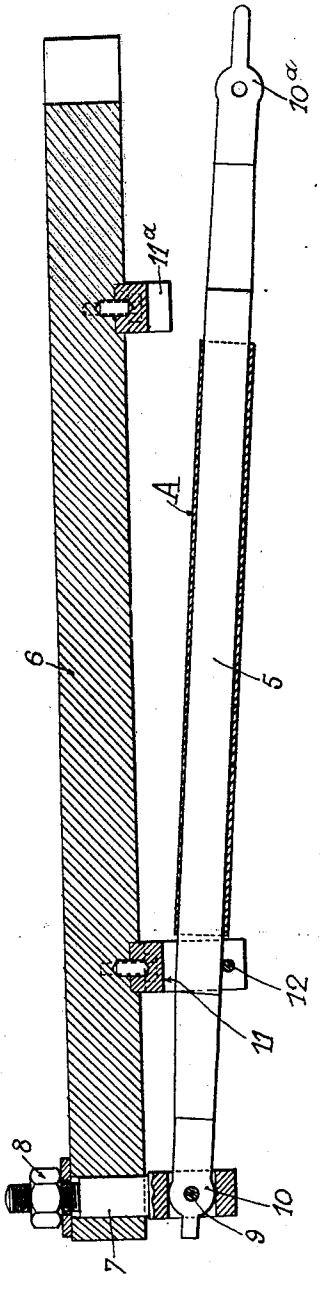


Fig.10

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Patented Mar. 15, 1932 1,849,054

UNITED STATES PATENT OFFICE

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APPARATUS FOR THE MANUFACTURE OF METAL TUBES

Application filed May 20, 1930, Serial No. 453,923, and in France October 11, 1929.

The present invention relates to an apparatus for the manufacture, by bending in a press, of metallic tubes from a flat sheet. The process which is to be carried out by means of said apparatus will be described hereunder for the sake of clearness.

The essential object of my invention is to provide a device by means of which a suitably shaped blank can be stamped into a perfectly straight tube of great length and well closed up, i. e. with the longitudinal edges of the blank brought closely together or even in overlapping relation.

In the accompanying drawings which are given solely by way of example to illustrate an embodiment of my invention:

Fig. 1 is an end view of a sheet of metal employed for the manufacture of the tube.

Fig. 2 is an end view of the sheet after the first stamping operation.

Fig. 3 is a cross-section of the tube.

Fig. 4 is an end view of the die and the matrix used in the first operation, with the sheet placed in position and,

Fig. 5 is the corresponding elevational view.

Fig. 6 is an end view, on a larger scale, of the matrix used in the first operation the sheet having been stamped in the preliminary operation.

Fig. 7 is a lengthwise section on the line 7—7 of Fig. 8, of the matrix, the mandrel, and the mandrel-carrier adapted for the second stamping operation.

Fig. 8 is a cross section on the line 8—8 of Fig. 7

Fig. 9 is a plan view corresponding to Fig. 7.

Fig. 10 is a view analogous to Fig. 7, showing the position of the mandrel after it has been pivoted about, in order to remove the stamped tube.

As herein represented, it will be supposed hereafter that it is desired to manufacture a cylindrical tube A of determined length, whose internal radius is R and thickness e (Fig. 3).

For this purpose, there is used a piece of sheet metal B (Fig. 1) whose length corresponds to the length of the tube to be obtained, and whose width is equal to the entire circumference of the tube.

In the first operation, the two longitudinal edges of the plate are stamped upon a width at each side somewhat exceeding one-fourth the width of the sheet, for instance for 3/8 of this width. The two stamped parts $a\ b\ c$ and $d\ e\ f$ (Fig. 2) have a circular outline whose radius R is equal to that of the tube to be obtained. The two parts are connected by a part $c\ g\ d$ which is necessarily curved in the inverse direction. This curvature may be as desired. In the second stamping operation, the central part $c\ g\ d$ is formed in such manner as to change its curvature and to close up the stamped piece by bringing together the edges a and f.

The first stamping (proceeding from the outline of Fig. 1 to that of Fig. 2) may be effected for instance by the tool outfit shown in Figures 4, 5 and 6, which is composed of a female matrix 1 of the proper outline to receive the spread-out sheet B (Fig. 4) and to longitudinally center it, due to its edges 2 and 2^a (Fig. 6), with reference to the outline which will produce the shape indicated in Fig. 2, when the die 3, actuated by a hydraulic press, places the sheet therein.

Due to the elasticity of the metal, the stamped piece tends to slightly open out when removed from the matrix, and hence the radius $r+e$ of the matrix (Fig. 6) should be such that r will be less than R. A first approximation may be,

$$r = \frac{9R}{10},$$

but this value is given only by way of example, and tests alone will determine the exact value depending upon the sheet metal and its thickness. The outline of the die 3 is readily deduced from the outline of the matrix, taking account of the thickness e of the sheet.

The second stamping operation, that is when proceeding from the stamped piece Fig. 2 to the tube Fig. 3, may be effected by means of the tools represented in Figs. 7 and 10. Herein, the apparatus comprises a matrix 4 whose outline is adapted for the obtainment

of the tube by a single pressing operation during which the edges a and f will slightly overlap by reason of the width of the stamped parts $a\ b\ c$ and $d\ e\ f$. It comprises from top to bottom a recess $a'\ b'\ e'\ f'$ (Fig. 8) adapted to receive the first stamped part, also two faces situated at 45°, $b'\ h'$ and $l'\ e'$, and a recess having a semicylindrical form $h'\ m'\ l'$ whose radius is r^1+e.

The value of r^1 is preferably between the said values of r and R, by reason of the elasticity of the metal, as above stated. The 45-degree faces are suitably joined to the upper recess and to the lower half-cylinder, so as to facilitate the slipping of the sheet when it is bent.

The tool apparatus is completed by a cylindrical mandrel 5 of radius r^1. It is carried by a mandrel-carrier 6, and is held under the mandrel-carrier by two stretchers 7—7^a mounted on the mandrel carrier at its two ends and provided with nuts 8—8^a. Two pins 9—9^a hold the ends 10—10^a of the mandrel in the heads of the two stretchers 7—7^a. The mandrel 5 rests on the mandrel-carrier 6 by means of two bearings 11—11^a disposed between the two stretchers and adjacent the same (Figs. 7, 9 and 10) and supported by the mandrel-carrier. The bearing 11 comprises a forked bracket traversed by a stop pin 12.

By tightening the nuts 8 and 8^a of the stretchers 7—7^a, the mandrel will be brought against the bearings 11 and 11^a, and the mandrel is thus deflected at the middle, which deflection is so regulated that it will be annulled when bending the preliminarily pressed sheet on the matrix 4.

After the second stamping, the operator releases the nut 8^a of the stretcher 7^a, then removes the pin 9, and takes off the said stretcher 7^a, and he lowers the mandrel 5 until it bears upon the pin 12 (Fig. 10). At this time, the space between the mandrel 5 and the bearing 11^a is sufficient to allow the removal of the tube A by its own weight.

Obviously, the invention is not limited to the form of construction herein described and represented, which is given solely by way of example.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. A device for the manufacture of metallic tubes comprising pressing means including a plate, a mandrel forming a longitudinal core for the tube and having one end swingingly secured to said plate, whereby it may be swung in a vertical plane, means for securing its other end to the plate in a readily removable manner and an abutment for limiting the swinging motion of the mandrel.

2. A device for the manufacture of metallic tubes comprising pressing means including a plate, a mandrel forming a longitudinal core for the tube supporting means on said plate for so carrying the mandrel that at least one end thereof may clear its support, whereby allowing the tube to be removed longitudinally, and means adjustable at will to give a predetermined counter-deflection to the mandrel prior to the stamping operation.

3. A device for the manufacture of metallic tubes comprising pressing means including a plate, a mandrel forming a longitudinal core for the tube, two bearings secured to said plate and disposed to bear on the mandrel at points situated on either side of the middle portion serving for the stamping operation, two stretching devices disposed respectively at the end of the mandrel and adapted to act thereon to press it against the bearings, whereby it is bent to a predetermined amount prior to the stamping operation.

4. In a device as claimed in claim 3, the further feature residing in that one end of the mandrel is pivoted to one stretcher while the other is secured to the other stretcher which is longitudinally slidable on the plate.

5. A device for the manufacture of metallic tubes from a suitably shaped blank comprising pressing means including a mandrel carrier, a mandrel forming a longitudinal core for the tube, supporting means on said mandrel carrier for pivotally securing said mandrel on one end, the other being detachably mounted, thereby allowing the tube to be removed longitudinally, said supporting means being further located on each side of the middle mandrel portion which serves for the stamping operation whereby the blank may be wholly closed up around the mandrel, and means whereby the mandrel may be given an adjustable counter-deflection equal and contrary to the deflection given to it by the stamping of said blank.

In testimony whereof I have signed my name to this specification.

PIERRE BOISSOU.