

No. 721,214.

PATENTED FEB. 24, 1903.

M. MANNESMANN.
ART OF ELONGATING TUBES.

APPLICATION FILED OCT. 26, 1901. RENEWED SEPT. 17, 1902.

NO MODEL.

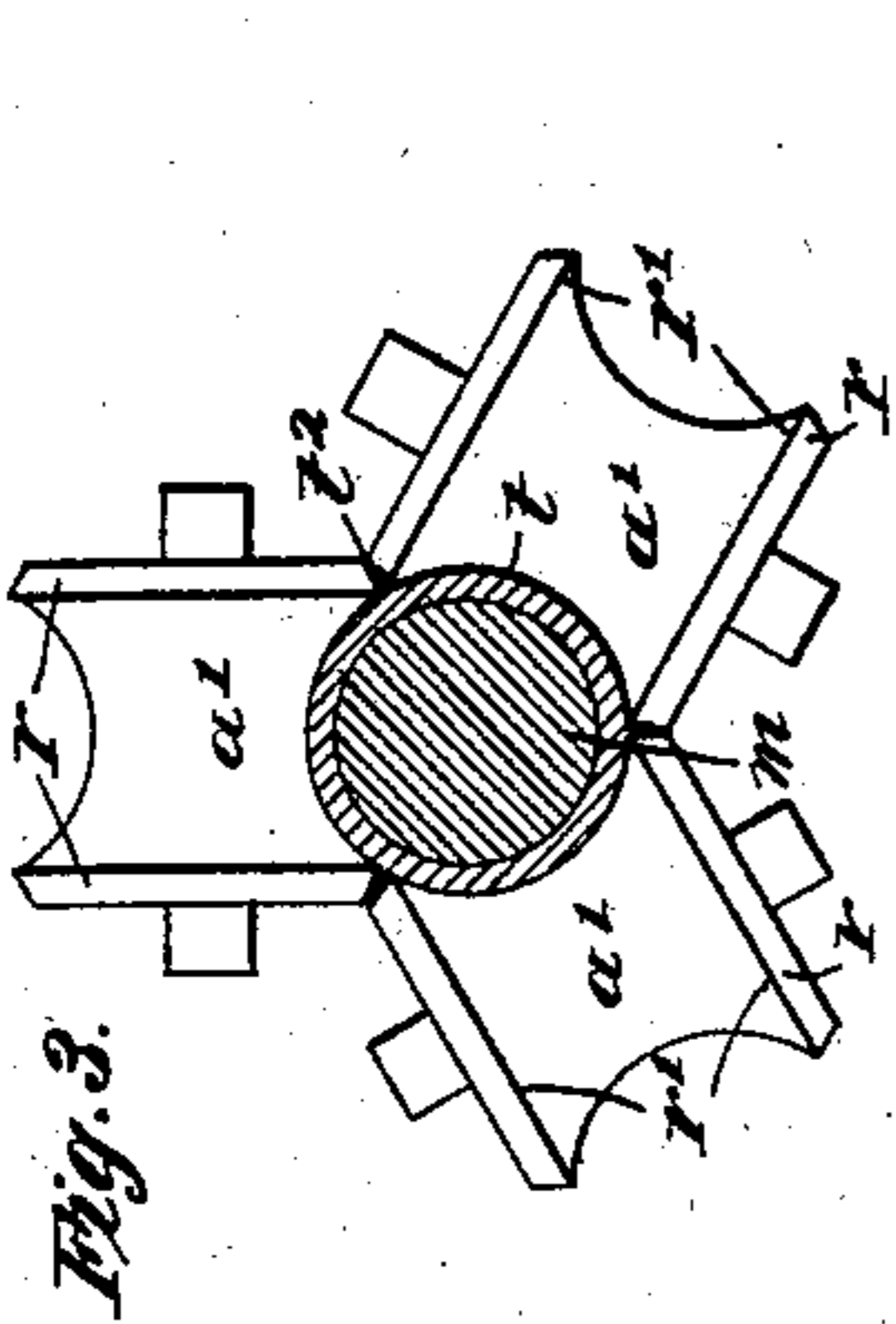


Fig. 3.

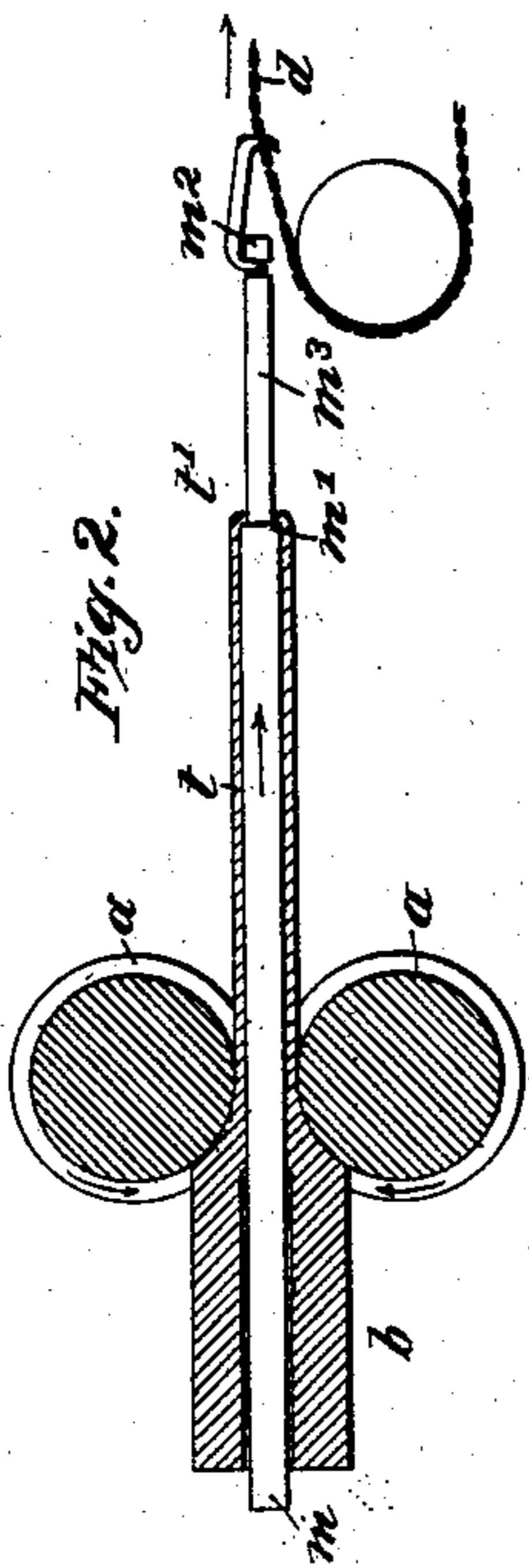


Fig. 2.

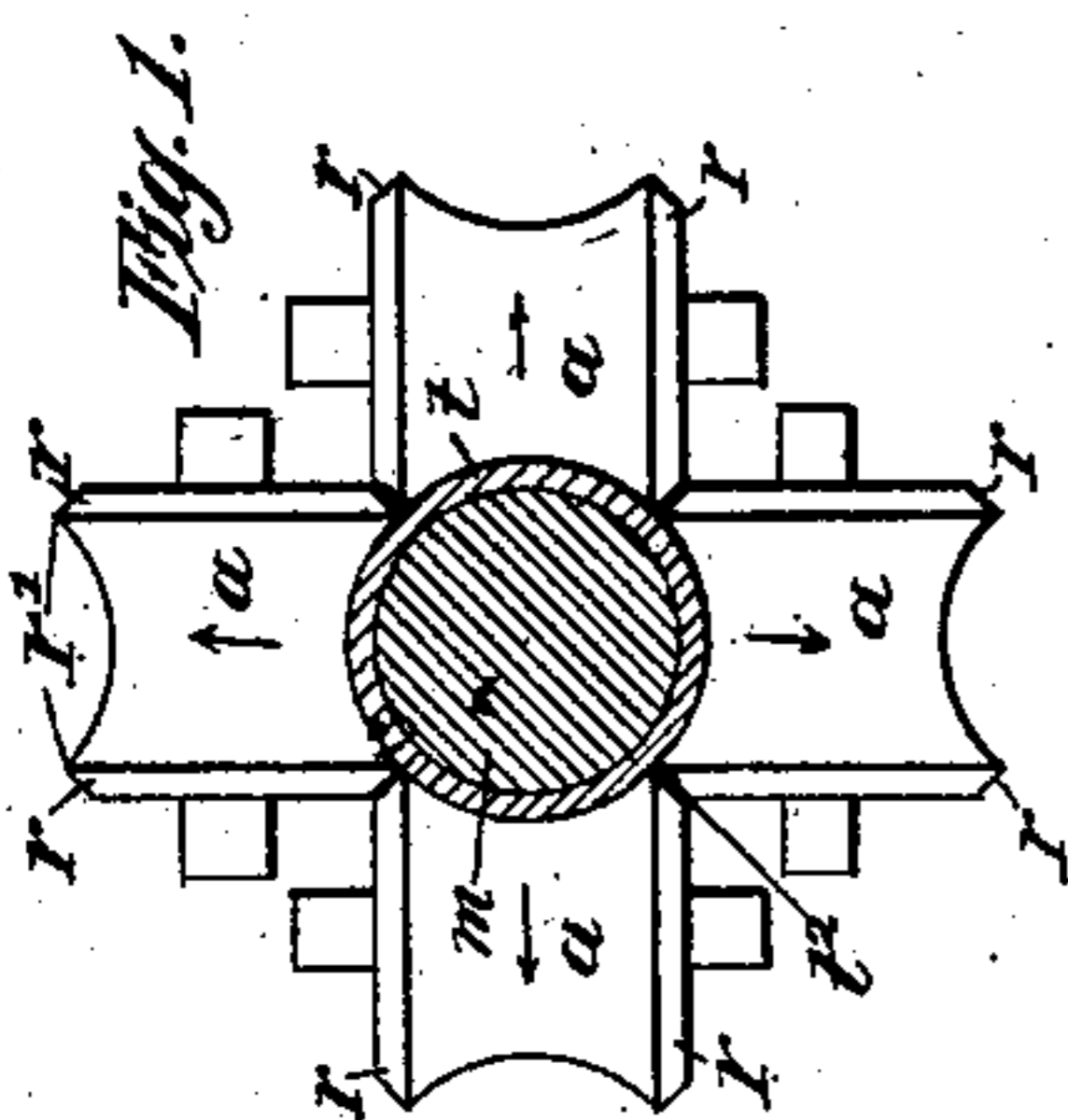


Fig. 1.

Witnesses

Emory & Boy
H. S. Austin

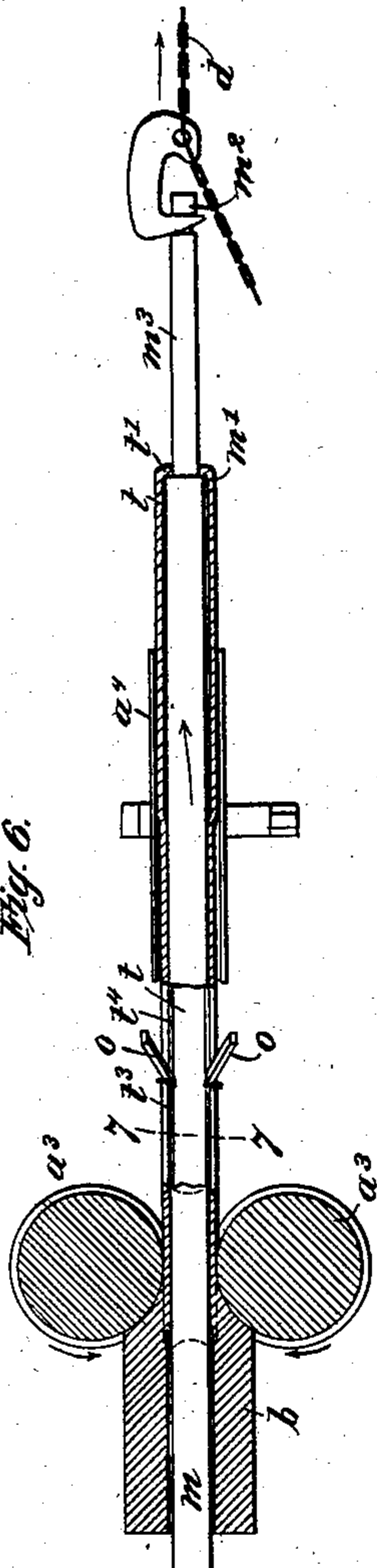


Fig. 6.

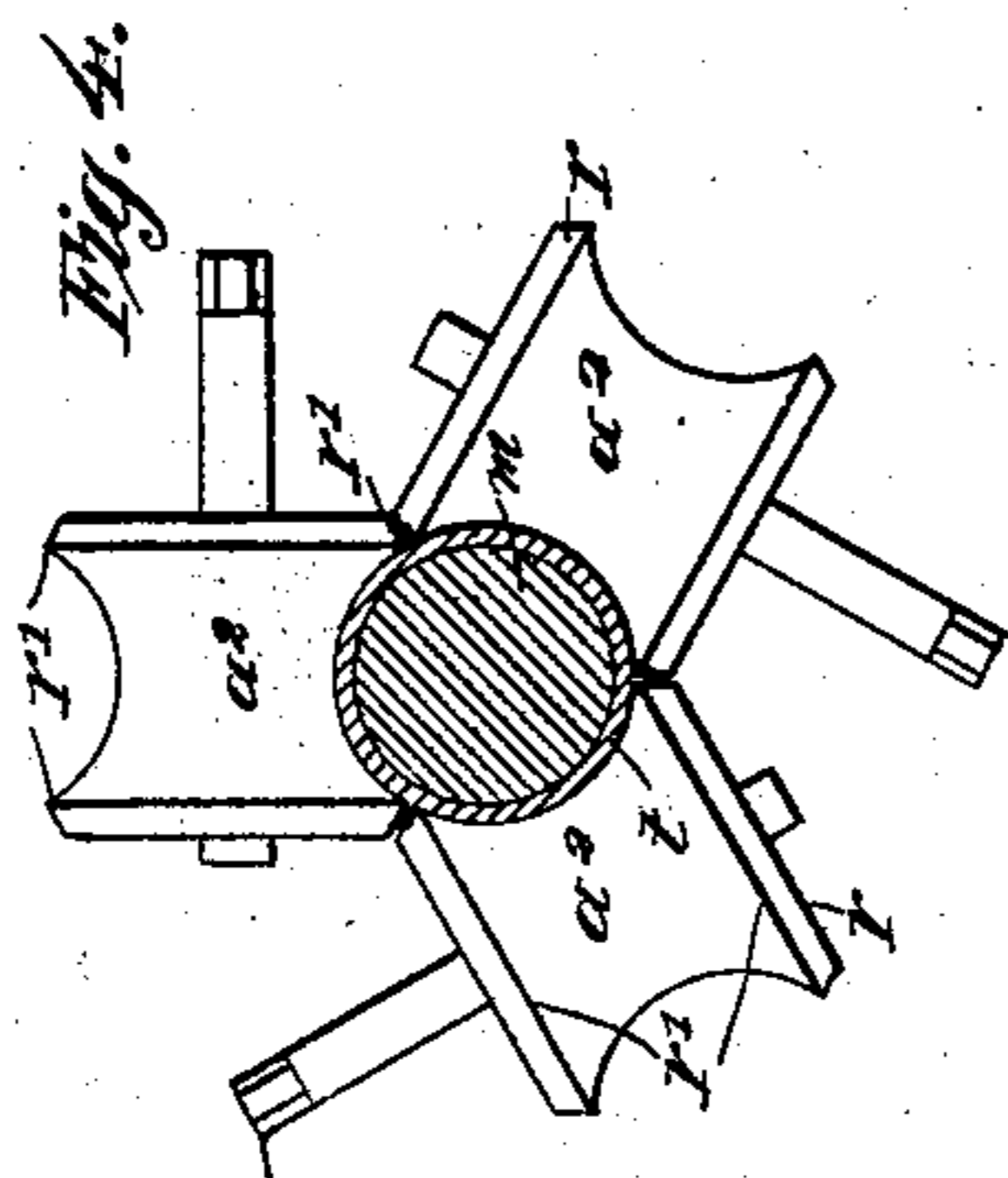


Fig. 4.

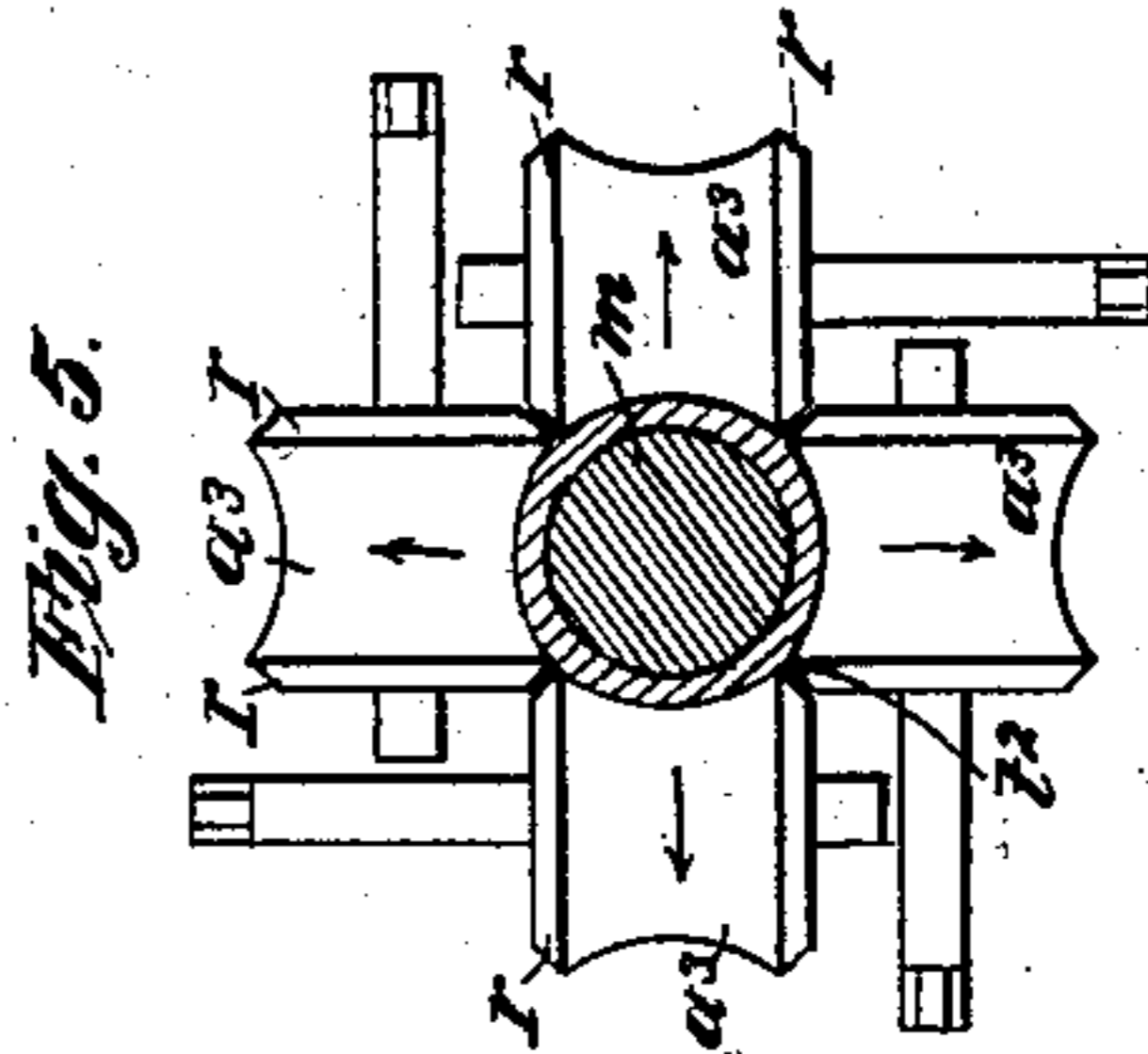


Fig. 5.

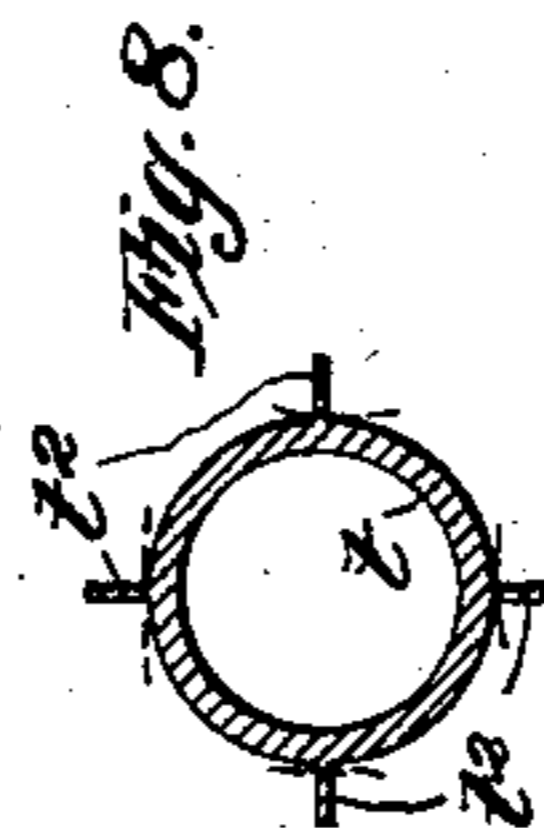


Fig. 8.

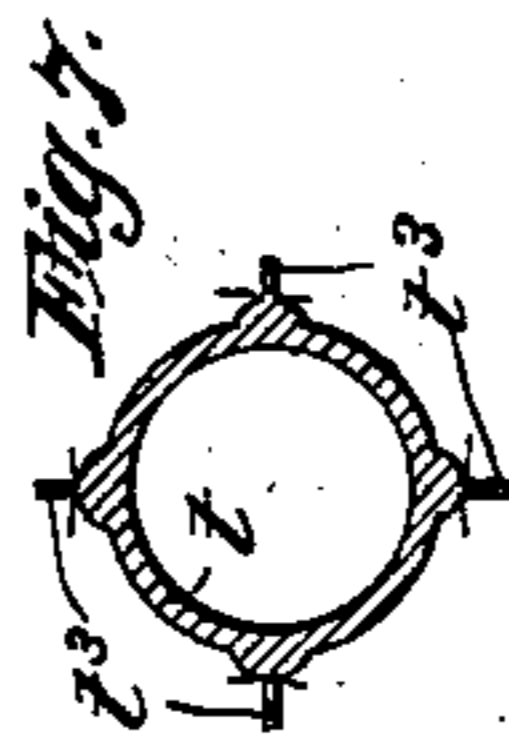


Fig. 7.

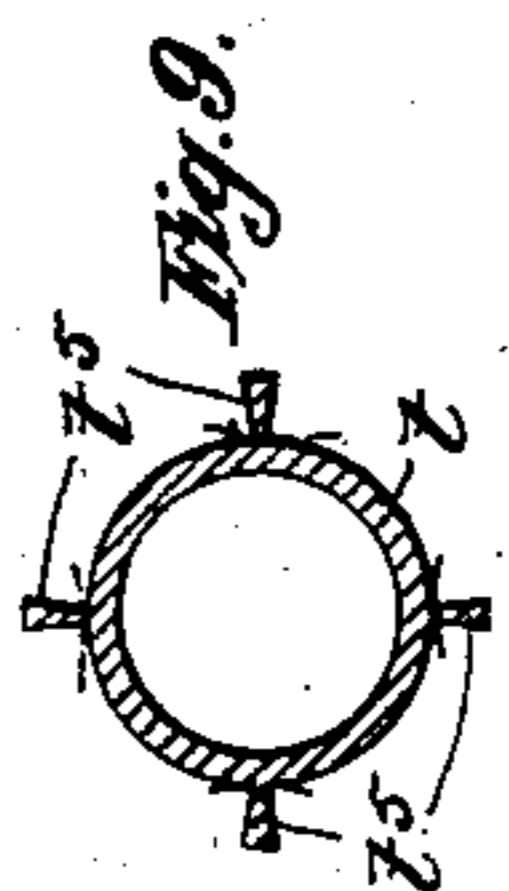


Fig. 9.

Inventor

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UNITED STATES PATENT OFFICE.

MAX MANNESMANN, OF REMSCHEID-BLIEDINGHAUSEN, GERMANY.

ART OF ELONGATING TUBES.

SPECIFICATION forming part of Letters Patent No. 721,214, dated February 24, 1903.

Application filed October 25, 1901. Renewed September 17, 1902. Serial No. 124,814. (No model.)

To all whom it may concern:

Be it known that I, MAX MANNESMANN, a citizen of the Empire of Germany, residing at Remscheid-Bliedinghausen, Germany, have
5 invented new and useful Improvements in the Art of Elongating Tubes, of which the following is a specification.

This invention relates to the stretching out of hollow blanks or billets on a mandrel into
10 tubes by means of rollers, rolls, or other rolling-tools; and it consists, first, in producing longitudinal fins, feathers, ribs, or ridges on the outside of the hollow blank by compressing
15 the hollow blank on a mandrel by rolling-tools, squeezing down parts of the material of the blank into the open space between the rolling-tools, thereby producing longitudinal
20 fins, feathers, ribs, or ridges on the blank, and stretching out in longitudinal direction the body of the hollow blank between the mandrel and the rolling-tools and the fins in the open space between the rolling-tools.

The invention consists, further, of additional features or steps to produce a large re-
25 duction in one pass and to form a smooth or enlarged tube, which will be fully described in the later part of the description and pointed out in the claims.

I am aware that heretofore the attempt has
30 been made to form longitudinal ribs of limited size on tubes by a drawing process, which ribs were worked down by a subsequent drawing-pass. (See Patent No. 74,551, dated April 1, 1856, to Brooks.) In the said process the ribs
35 were produced between a mandrel and rollers, forming a closed caliber, which caliber consisted of a central grooved part for the body of the tube and parts in the closed caliber for the ribs. The caliber of the rolls left room
40 for the ribs, and edges of the rolls touched each other outside of the ribs.

In my invention the ribs or feathers are formed in the open space between the rims of the rolls, the edges of the rolls squeeze down be-
45 tween them a portion of the material of the hollow blank and produce fins, feathers, ribs, or ridges on the blank, and then the rolls stretch out in longitudinal direction the body of the blank on the mandrel and the fins or feathers
50 between the rims of the rolls outside of their edges. By my process the material from which the fins or feathers are formed is

stretched out longitudinally and at the same time has liberty to flow sidewise in the un-
limited open space between the rims of the 55 rolls. If more material is between the rolls and the mandrel than they can stretch out in longitudinal direction, then the difference of quantity is pressed into the open space be-
60 tween the rolls and can escape. In the above-referred-to old drawing process the quantity of material to be transferred into the space formed by the caliber of the rollers at the sides of the grooved parts for the body of the tube is limited by the dimensions and 65 form of the caliber. The height of the ribs must be so small that they can be worked down by the next pass through the rolls; otherwise they would produce folds in the wall of the tube and spoil the same. In my 70 process the height of the fins or ribs is unlimited. After being formed they are cut away entirely or partly. In the latter case only the rest of the fins or ribs being in suitable form and of small height are worked 75 down. While in Patent No. 14,551 the amount of reduction of the cross-area of the hollow blank in one pass is limited by the height of the produced ribs, which dare not be large
80 in order that they may be worked down afterward, in my process this limit does not exist, as the ribs or feathers of any height produced in rolling are cut off and only the rests worked down in order to get a smooth tube
85 or a tube enlarged on the mandrel.

In the accompanying drawings, Figure 1 is an end elevation of a set of four (not positively driven) rollers through which the tube with the mandrel is drawn. Fig. 2 is a vertical longitudinal section through the hollow 90 blank and rollers, showing the mandrel in connection with a drawing-bench. Fig. 3 is a set of three loose (not positively driven) rollers through which the tube on the mandrel is drawn seen from the outgoing end. 95 Figs. 4 and 5 are sets of three and four positively-driven rolls in end elevation. Fig. 6 is a vertical longitudinal section through a hollow blank, a set of rolls for stretching out the same and producing fins on its outside, a 100 set of cutters for cutting off the outer parts of said fins, rolls for working down the rests of said fins and for enlarging the tube, and a mandrel extending through the whole length

of the hollow blank and tube and connected at its forward end with a drawing-chain. Fig. 7 is a cross-section through the tube after line 7 7 in Fig. 6. The dotted lines indicate the parts of the fins to be cut off by the cutters, while the rests of the fins remaining on the tube have to be worked down by the second set of rolls, Fig. 6. Figs. 8 and 9 show cross-sections with longitudinal fins at the outside, which fins are to be cut off entirely, as indicated by the dotted lines.

Similar letters indicate similar parts.

a and a' are loose (not positively driven) rollers; a^2 and a^3 , positively-driven rolls.

b is the hollow blank; t , the rolled-out tube; t' , the forward reduced end of t .

t^2 t^3 and t^4 t^5 are longitudinal ribs or feathers on the outside of the tube.

m is the mandrel; m^2 , the forward end of the same connected with the drawing-chain d .

m' is a shoulder which abuts against the forward reduced end of the hollow blank.

m^3 is a reduced part of the mandrel; r , the rims outside of the edges r' of the caliber.

o represents chisels for cutting off partly or entirely the fins.

The rollers, rolls, mandrel, and blank move in the direction of the arrows.

The operation is as follows: A hollow blank is placed on a mandrel and drawn through the loose rollers or the positively-driven rolls by the draw-bench or other device for positively endwise actuating the mandrel. The rolls or the rollers, which are preferably three or four in number, form a pass, through which the blank is forced by the positively-driven mandrel, abutting with its shoulder against the reduced forward end of the hollow blank. The rolls or rollers compress and stretch out the blank strongly, squeeze down between the edges portions of the material of the blank, and compress those portions in the open space between the rims of the rolls or rollers outside of the edges of the caliber, thereby forming on the outside of the blank or rolled-out tube longitudinal fins, feathers, ribs, or ridges, the height of which varies according to the reduction of the cross-area of the blank in the pass through the rolls or rollers to the diameter of the rolls or rollers, the temperature at which the blank is rolled out, and to the thickness of the fins, &c. All material of the hollow blank which cannot be stretched out in longitudinal direction by the rolls, rollers, and mandrel is crowded up in the open space between the rims of the rolls or rollers and can escape sideways, while the main body of the blank or tube is compressed between the caliber of the rolls or rollers and the mandrel and stretched out in longitudinal direction. The fins, feathers, ribs, or ridges thus formed in the open space between the rolls and rollers have rough edges and may be of different size at different parts of the rolled-out tube. Such fins, feathers, ribs, or ridges remain on the tube after rolling, or they are partly or entirely cut off. Fig. 6

shows such cutting off the outer parts of the fins on the tube, the cross-section of the tube and fins being seen in Fig. 7. The chisels are fixed to the frame of the rolling-mill and take off the part t^3 of the fins along the dotted lines, while the parts t^4 remain on the tube and may be worked down by the second set of rolls a^4 in Fig. 6, whereby the tube is enlarged on the mandrel, so that the same can be drawn out.

In Fig. 8 a tube is shown with fins of equal thickness, and in Fig. 9 of dovetail shape, which fins may be entirely cut off along the dotted lines. In such case the rolls a^4 in Fig. 6 may be used to compress the tube, preferably at the points where the fins had been located, in order to smooth the tube or to enlarge it to such an extent that the mandrel can be drawn out; but any other means may be used for loosening the tube on the mandrel.

In case of using positively-driven rolls it is not always necessary to draw the mandrel positively through the rolls. A stationary or loose mandrel may be employed. For a strong stretching out of the hollow blank, however, it is preferred to employ instead of loose rollers positively-driven rolls in combination with an endwise-actuated mandrel, the same being pushed or drawn through the roll-pass by any pushing or drawing device.

The rolls a^3 (shown in Fig. 6) are preferably positively driven and with the speed of the mandrel or rolled-out tube.

The stretching out of the blank into a tube and the cutting off of the fins or parts thereof may be made in separate operations, and the working down the rests of the fins or enlarging the tube on the mandrel may be made separately, too; but it is preferred to stretch out the blank and cut off the fins in one pass through the machine and also to work down the rests of the fins in the same pass. In rolling in hot state the stretching out the blank, the cutting off the fins, and the working down the rest of the same can be performed with such an endwise speed of the rolled-out tube that all three operations can be performed in the pass through the machine before the thin ribs of the tube are too much cooled down to prevent the working down and enlarging the tube.

The described process can be used in hot or cold stretching out of tubes; but for strong stretching of course a rolling in hot state is preferred.

Instead of three or four rolls or rollers forming the caliber two or any other number of rolls, rollers, or other rolling-tools may be employed.

Instead of chisels for cutting off the fins other means may be employed—for instance, revolving-roll cutters, &c.

The formation of the fins and feathers takes place in the open space between the rolls or the rims of the same, whereby the fins or feathers have rough outer edges. The equivalent of such open space between the rolls

would be present if there were provided edges or shoulders outside of the fins to form a closed caliber, but these outer edges so far distant from the body of the tube that the fins or feathers would not regularly touch them. In such case the same rough outer edges of the fins or feathers would result.

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

1. The improvement in the art of stretching out tubes and other hollow bodies, which consists in compressing a hollow blank on a mandrel by rolling-tools, squeezing down parts of the material of the blank in the open space between the rolling-tools, thereby producing longitudinal fins, feathers, ribs or ridges on the outside of the blank, stretching out in longitudinal direction the body of the hollow blank between the mandrel and the rolling-tools, and the fins, feathers, ribs or ridges in the open space between the rolling-tools, substantially as described.

2. The improvement in the art of stretching out tubes and other hollow bodies, which consists in compressing a hollow blank on a mandrel by rolling-tools, squeezing down parts of the material of the blank in the open space between the rolling-tools, thereby producing longitudinal fins, feathers, ribs or ridges on the outside of the blank, stretching out in longitudinal direction the body of the hollow blank between the mandrel and the rolling-tools, and the fins, feathers, ribs or ridges in the open space between the rolling-tools, and partly or entirely cutting off said fins, feathers, ribs or ridges, substantially as described.

3. The improvement in the art of stretching out tubes and other hollow bodies, which consists in compressing a hollow blank on a mandrel by positively-driven rolls, squeezing down parts of the material of the blank in the space between the rims of the rolls, thereby producing longitudinal fins, feathers, ribs or ridges on the outside of the blank, stretching out in longitudinal direction the body of the hollow blank between the mandrel and the rolls, and the fins, feathers, ribs or ridges in the space between the rims of the rolls, and partly or entirely cutting off said fins, feathers, ribs or ridges, substantially as described.

4. The improvement in the art of stretching out tubes and other hollow bodies, which consists in compressing a hollow blank on a positively endwise actuated mandrel by positively-driven rolls, squeezing down parts of the material of the blank in the space between the edges of the rolls, thereby producing longitudinal fins, feathers, ribs or ridges on the outside of the blank, stretching out in longitudinal direction the body of the hollow blank between the mandrel and the rolls, and the fins, feathers, ribs or ridges in the space between the edges of the rolls, and

partly or entirely cutting off said fins, feathers, ribs or ridges, substantially as described.

5. The improvement in the art of stretching out tubes and other hollow bodies, which consists in compressing a hollow blank on a positively endwise actuated mandrel by positively-driven rolls, squeezing down parts of the material of the blank in the space between the edges of the rolls, thereby producing longitudinal fins, feathers, ribs or ridges on the outside of the blank, stretching out in longitudinal direction the body of the hollow blank between the mandrel and the rolls, and the fins, feathers, ribs or ridges in the space between the rims of the rolls, and partly or entirely cutting off said fins, feathers, ribs or ridges, the whole operation being performed in one pass through the machine, substantially as described.

6. The improvement in the art of stretching out tubes and other hollow bodies, which consists in compressing a hollow blank on a positively endwise actuated mandrel by positively-driven rolls, squeezing down parts of the material of the blank in the space between the rims of the rolls, thereby producing longitudinal fins, feathers, ribs or ridges on the outside of the blank, stretching out in longitudinal direction the body of the hollow blank between the mandrel and the rolls, and the fins, feathers, ribs or ridges in the space between the rims of the rolls, and partly or entirely cutting off said fins, feathers, ribs or ridges, and compressing the parts of the circumference of the rolled-out tube where the fins, feathers, ribs or ridges had been located, the whole operation being performed in one pass through the machine, substantially as described.

7. The improvement in the art of stretching out tubes and other hollow bodies, which consists in compressing a hollow blank on a positively endwise actuated mandrel by positively-driven rolls, squeezing down parts of the material of the blank in the open space between the rolls, thereby producing longitudinal fins, feathers, ribs or ridges on the outside of the blank, stretching out in longitudinal direction the body of the hollow blank between the mandrel and the rolls, and the fins, feathers, ribs or ridges in the open space between the rolls, and partly or entirely cutting off said fins, feathers, ribs or ridges, working down longitudinal ribs or rests of feathers and enlarging the tube, the whole operation being performed in one pass through the machine, substantially as described.

8. The improvement in the art of stretching out tubes and other hollow bodies, which consists in compressing a hollow blank on a positively endwise actuated mandrel by three or more positively-driven rolls, squeezing down parts of the material of the blank in the open space between the rolls thereby producing longitudinal fins, feathers, ribs or ridges on the outside of the blank, stretching out in

longitudinal direction the hollow blank between the rolls, and partly or entirely cutting off said fins, feathers, ribs or ridges, working down longitudinal ribs or rests of feathers,
5 and enlarging the tube, the whole operation being performed in one pass through the machine, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

MAX MANNESMANN.

Witnesses:

PRESTON B. RAY,
EMORY H. BOGLEY.