

No. 721,212.

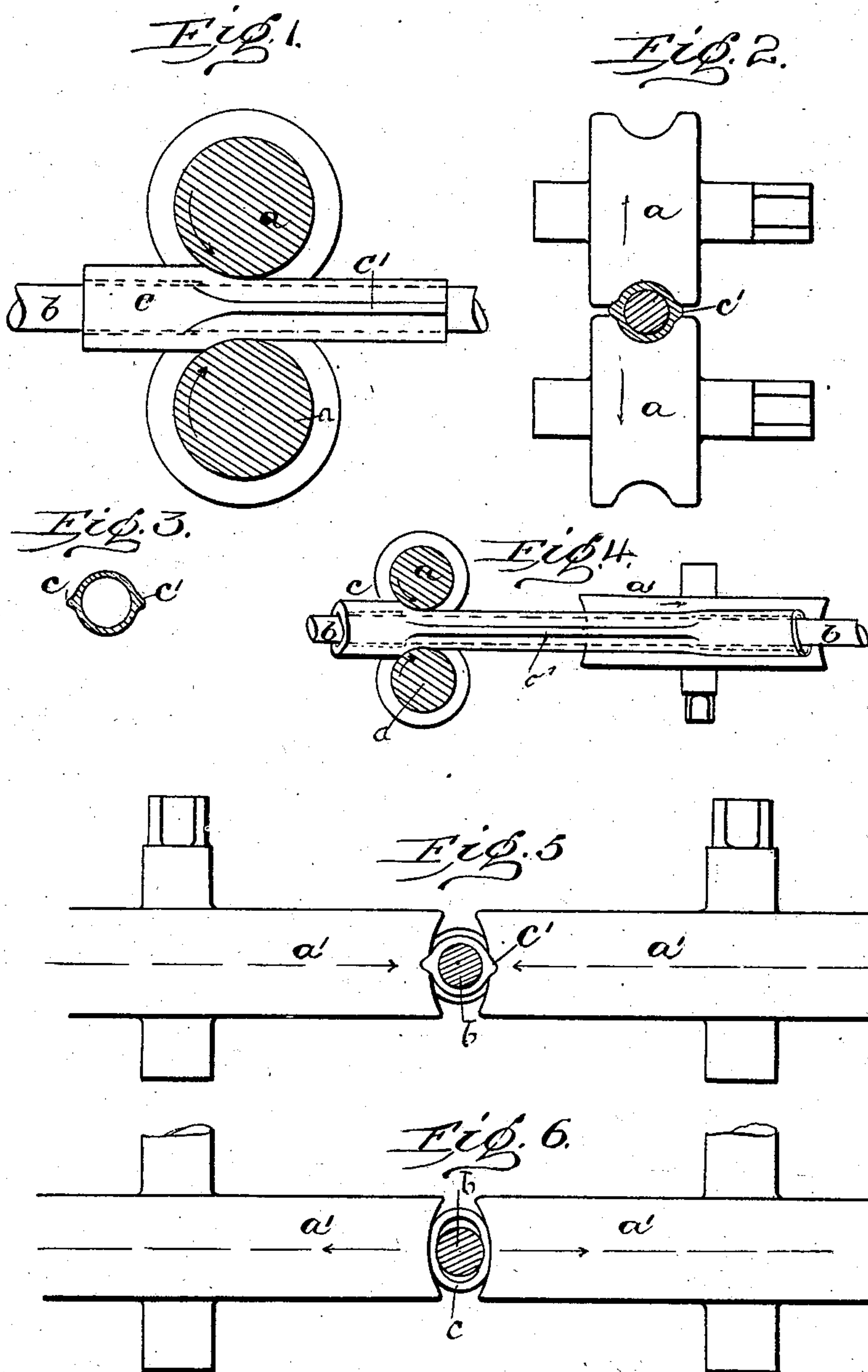
PATENTED FEB. 24, 1903.

M. MANNESMANN.
MACHINE FOR ROLLING TUBES.

APPLICATION FILED OCT. 10, 1901. RENEWED SEPT. 17, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:

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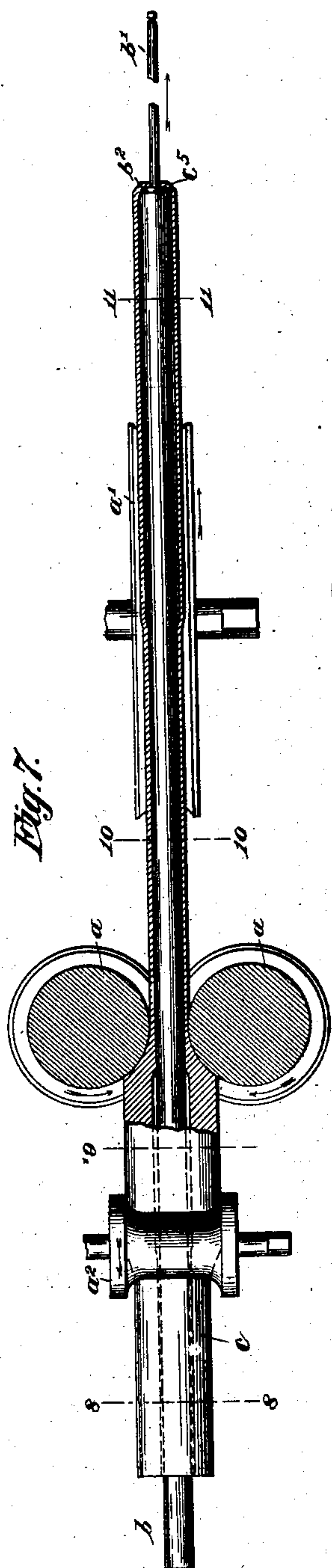


Fig. 7.

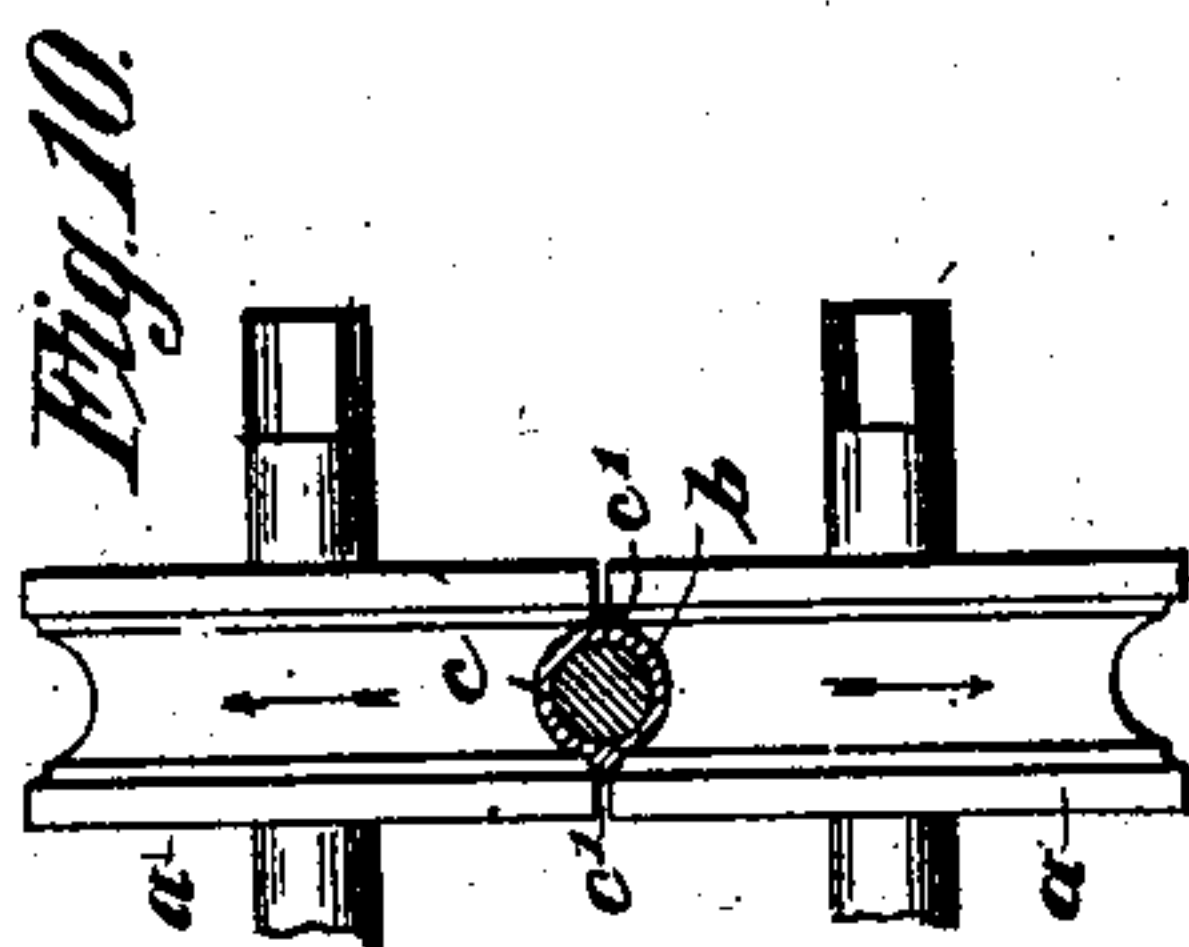


Fig. 10.



Fig. 12.

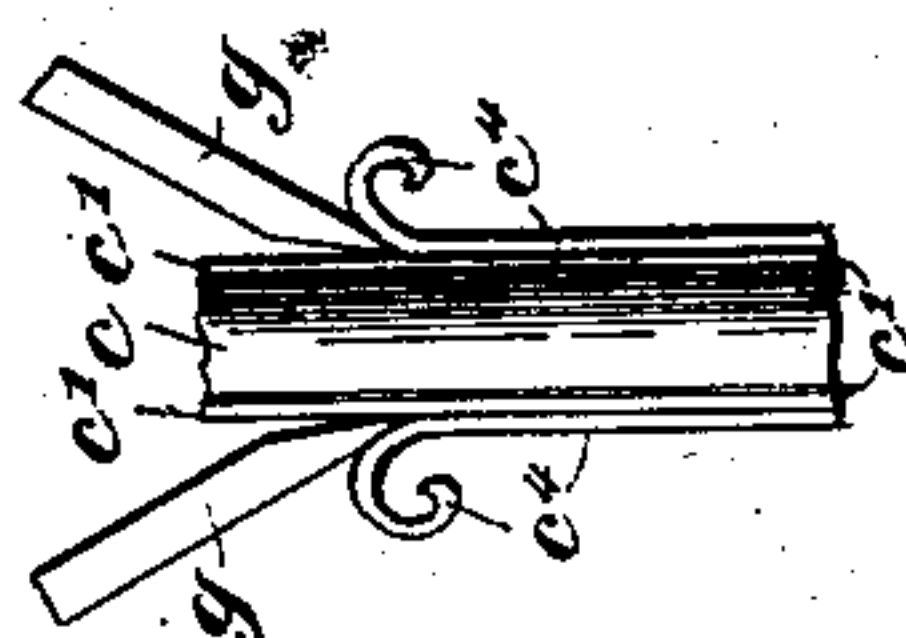


Fig. 13.

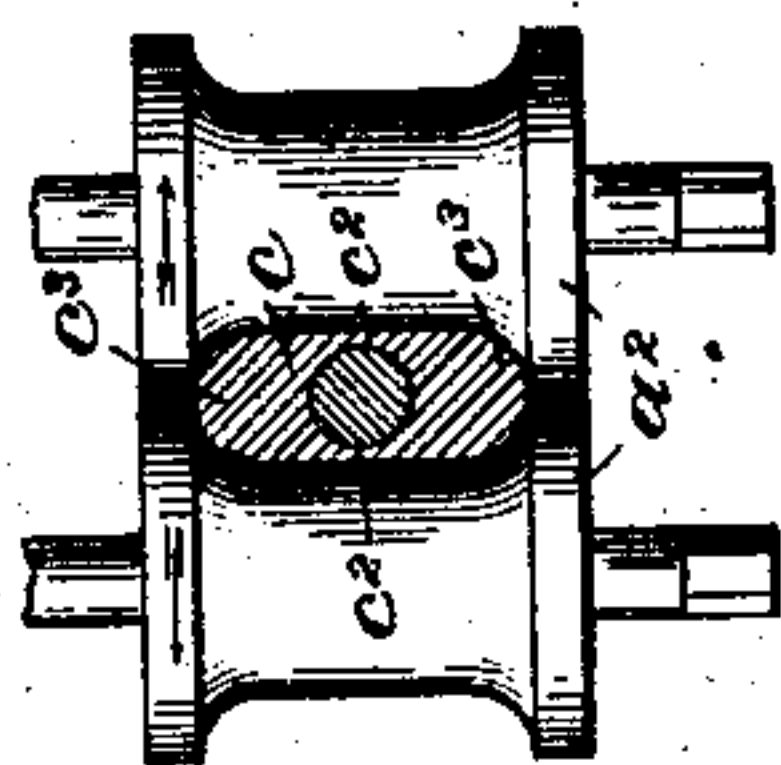


Fig. 9.



Fig. 8.



Fig. 16.

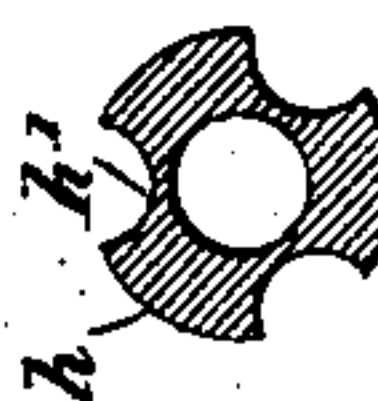


Fig. 15.

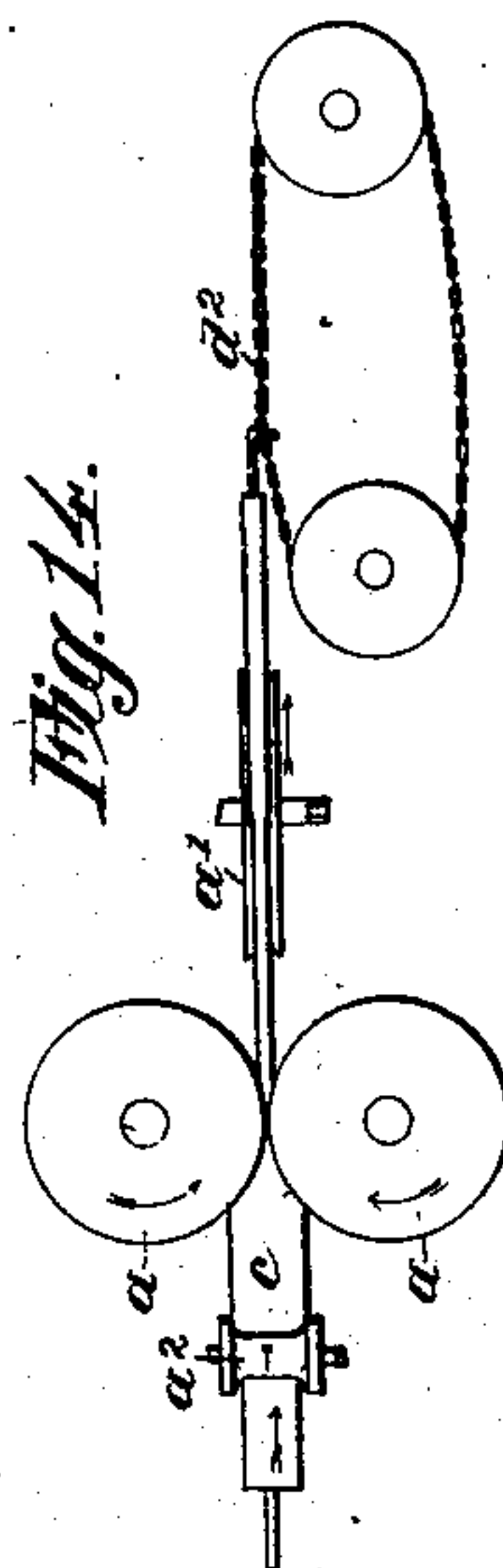


Fig. 14.



Fig. 11.

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MAX MANNESMANN, OF REMSCHEID-BLIEDINGHAUSEN, GERMANY.

MACHINE FOR ROLLING TUBES.

SPECIFICATION forming part of Letters Patent No. 721,212, dated February 24, 1903.

Application filed October 10, 1901. Renewed September 17, 1902. Serial No. 124,812. (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 Machines for Rolling Tubes, of which the following is a specification.

This invention relates to machines for rolling tubes; and it consists (a) in stretching-
10 rolls for first stretching out tubes or other hollow blanks, thereby producing longitudinal feathers, ridges, ribs, fins, or edges on the walls of the tube, of means for working down
15 these feathers or a part thereof in such a way as to cause the metal to flow in a circumferential direction, and thereby stretch the walls of the tube in the direction perpendicular to its axis for the purpose of enlarging the circumference of the tube without encountering
20 a considerable endwise stretching of the tube, in additional parts consisting of (b) means for producing grooved or flattened portions on the outside of the hollow billet or blank before the same is subjected to the stretching-
25 rolls, in means for cutting off parts of said ribs, ridges, fins, or feathers, and in means for endwise moving the mandrel through the machine.

In the accompanying drawings, which illustrate an apparatus for carrying out my process, Figure 1 shows a longitudinal section through a pair of rolls with a mandrel and a tube between them, the rolls being grooved parallel to the axis of the tube. Fig. 2 shows
30 the same rolls seen from the outgoing end, the mandrel and tube being in cross-section. Fig. 3 is a cross-section of the tube leaving the rolls. Fig. 4 shows a pair of rolls with horizontal axes and small diameter for the
40 endwise stretching of the tube and also a pair of rolls of large diameters with vertical axes for the working or pressing down of the longitudinal feathers on the walls of the tube produced by the first small rolls. These second rolls can produce a great enlargement of
45 the circumference of the tube. Fig. 5 shows the second pair of rolls with a mandrel and tube on enlarged scale seen from the ingoing end. Fig. 6 shows the same from the outgoing end. Fig. 7 is a side elevation, partly in longitudinal section, of a machine compris-

ing a set of rolls for producing flattened parts on the circumference of the blank, a set of rolls for longitudinally stretching out said blank with flattened parts into a tube with
55 longitudinal feathers, fins, ribs, or ridges on its outside, a set of rolls for working down said ribs, ridges, and feathers, thereby enlarging the circumference of the tube, and a mandrel extending through the whole length
60 of the tube. Figs. 8 and 11 are cross-sections through the hollow billet and tube at the lines 8 8 and 11 11. Fig. 9 is a section after 9 9 in Fig. 7 and shows the cross-section of the tube with flattened side portions and the shaping-
65 rolls. Fig. 10 is a section after 10 10 in Fig. 7 and shows the stretching-rolls *a a* with the mandrel and the tube between them. Fig. 12 is another form of the cross-section of the blank at lines 10 10, Fig. 7, showing fins or
70 feathers and cutting-tools to cut off a part of the same. Fig. 13 is a plan view of Fig. 12. Fig. 14 is a diagram showing a side view of the rolls in Fig. 7 and a drawing device connected with the forward end of the mandrel.
75 Figs. 15 and 16 are cross-sections through hollow blanks with three or four grooved portions of the outside, which hollow blanks may be fed to a set of three or four stretching-rolls and by them rolled out into tubes
80 with longitudinal ribs on the outside of the same.

Similar letters of reference indicate corresponding parts.

The rolls *a a* (shown in Figs. 1, 2, and 4) stretch the tube *c*, with the aid of the mandrel
85 *b*, set between the rolls, endwise, forming upon the walls of the tube longitudinal feathers *c'*. The tube *c* then goes, in the same or a separate pass through the machine, through the
90 rolls *a'*, which work or press down the feathers *c'* and by the large diameter of these rolls enlarge the tube without stretching the same to any material extent. The tube or hollow
95 blank leaves the rolls in oval form if the mandrel between the rolls *a' a'* is cylindrical. It is advisable in all cases to draw the rolled tubes after being rolled out and enlarged through dies, either hot or cold, in order to
100 calibrate them or to bring them to a certain size or form in any other suitable way.

It is important that the rolls *a' a'* be of such

large dimensions that during the process of working down the feathers no endwise stretching or but very little stretching of the tube occurs. If the rolls $a' a'$ are of small diameter, an endwise stretching of the tube occurs during the process of working down the feathers, which endwise stretching is bad for the tube, as the molecules of the wall are torn apart at the point nearest to the feathers.

The revolving speed of the periphery of the rolls is preferably equal to the endwise movement of the mandrel. Instead of rolls to work down the ribs vibrating dies or other appliances may be employed.

Figs. 1 to 6 represent two rolls for the endwise stretching of the hollow blank and the forming of two longitudinal feathers upon the walls of the blank and two rolls for the working down of the feathers without endwise stretching of the tube; but instead of two rolls three or four rolls, forming a caliber, may be used. Instead of two feathers three or more may be formed on the tube. In this case the rolls for working down the feathers must be varied accordingly.

Fig. 7 shows a machine for producing flattened parts c^2 on the outside of the blank with intermediate thicker portions c^3 by means of the shaping-rolls a^2 , Fig. 9. Two, three, or more, preferably positively driven, rolls may be employed for such shaping. Instead of flattened parts grooved parts may be produced at the outside of the blank by suitably grooving the rolls. The so-shaped hollow blank is then fed to the positively-driven stretching-rolls $a a$, which stretch the hollow blank on the mandrel into the shape shown in Fig. 10, in which two longitudinal ridges or feathers are produced on the outside of the blank. The blank passes then through the rolls a' , which work down the ribs c' and enlarge the circumference of the tube.

A mandrel b extends through the whole length of the hollow blank or tube and has a forward reduced end b' and a shoulder b^2 , which abuts against the forward reduced end c^5 of the hollow blank c . The forward end b' of the mandrel is connected with a drawing-chain d^2 of a drawing or pushing device, (shown in Fig. 14,) and the mandrel is drawn through the machine and forces the hollow blank through the machine, the speed of the mandrel being preferably equal to the revolving speed of the caliber of the rolls $a a$ and $a' a'$.

Instead of flattened parts $c^2 c^2$ on the blank c , Fig. 9, grooved parts on the outside of the hollow blank, as shown in Figs. 15 and 16, may be produced by the shaping-rolls.

When three or four stretching-rolls are employed instead of the two stretching-rolls $a a$, Fig. 7, three or four flattened or grooved parts h' and i' on the hollow blanks h and i , Figs. 15 and 16, may be used, the flattened or grooved parts h' and i' coinciding with the edges of the rolls.

Although the employment of flattened or grooved parts on the blank is not necessary in stretching out the hollow blank by the stretching-rolls, such shaping is advisable for reducing or avoiding the ridges on the outside of the tubes or for enabling a very strong reduction between the stretching-rolls, while producing longitudinal ribs on the rolled-out tube of so small dimensions that they can well be worked down by the enlarging-rolls $a' a'$. The shaping-rolls $a^2 a^2$ may be placed in alinement with the stretching-rolls $a a$ and the enlarging-rolls $a' a'$, as shown in Fig. 7, in which case the whole operation can be performed in one pass through the machine; but each step of the operation may be performed separately by placing the rolls $a a$ or $a' a'$ not in alinement or not close to the rolls $a a$; but the performing of all the steps in one pass through the machine is of advantage, as the whole operation can be made in one heat without taking the mandrel out off the blanks between two steps. Very important is the performing of the two steps in one pass through the machine—first, the stretching out and producing the ribs; second, the working down the ribs and enlarging the tube in case the hollow blank is rolled in a heated state. Then the material of the ribs is still hot enough to be worked down in one heat; but when the blank passes first through the stretching-rolls and then in a separate pass through the enlarging-rolls the relatively thin wall of the tube and rib is cooled down and the enlargement is made more difficult.

Instead of shaping-rolls other appliances for shaping or producing hollow blanks with flattened or grooved parts may be employed.

In giving the grooved or flattened parts suitable dimensions ribs on the outside of the tube may be nearly or entirely avoided. In such case the rolls $a' a'$ can serve to smooth the surface of the tube at those points which have been in contact with the edges of the rolls.

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

1. In a mechanism for rolling tubes the combination of a set of positively-driven rolls, provided with means for producing longitudinal ribs, ridges or feathers, on the blank during the rolling operation, and appliances for working down said ribs or feathers and enlarging the circumference of the tube on the mandrel, substantially as described.

2. A machine for rolling tubes which consists of a first set of positively-driven rolls having means for rolling out longitudinal ribs or feathers on a blank, and a second set of rolls, for rolling down said ribs or feathers and producing an enlargement of the tube on the mandrel, substantially as described.

3. A machine for rolling tubes which consists of a first set of positively-driven rolls having means for rolling ribs or feathers on

a blank and a second set of rolls, of larger diameter than the first rolls, for rolling down said ribs or feathers and producing an enlargement of the tube on the mandrel, substantially as described.

4. A machine for rolling tubes which consists of a set of positively-driven rolls for rolling out a hollow billet or blank, provided with means for producing longitudinal ribs, ridges or feathers on the blank during the rolling operation, a mandrel, and appliances for working down the ribs, ridges or feathers and enlarging the tube, which appliances are so placed that the rolling out of the blank and the working down said ribs, ridges or feathers is performed in one pass through the rolling-mill, substantially as described.

5. A machine for rolling tubes which consists of a first set of positively-driven rolls for rolling out the hollow billet or blank and having means for producing longitudinal ribs, ridges or feathers on the blank during the rolling operation, and a second set of rolls placed in alinement, with the first rolls, for rolling down said feathers and enlarging the blank in the same pass, substantially as described.

6. A machine for rolling tubes which consists of a first set of positively-driven rolls having means for rolling out the hollow billet or blank and producing longitudinal ribs, ridges or feathers on the same, and a second set of rolls placed in alinement with the first rolls and of larger diameter than the first rolls, for rolling down the feathers and enlarging the blank in the same pass, substantially as described.

7. A machine for rolling tubes which consists of a set of positively-driven rolls provided with means for rolling out the hollow billet or blank and producing longitudinal ribs, ridges or feathers on the blank during the rolling operation, of a mandrel, a drawing or pushing device for moving the mandrel through the rolls, and appliances for working down the ribs, ridges or feathers, substantially as described.

8. A machine for rolling tubes, which consists of appliances for producing grooved or flattened parts on the circumference of a hollow blank, of a set of positively-driven stretching-rolls provided with means for rolling out said billet or blank, and of a mandrel, substantially as described.

9. A machine for rolling tubes, which consists of appliances for producing grooved or flattened parts on the circumference of a hollow blank, of a set of positively-driven stretching-rolls provided with means for rolling out said billet or blank, of a mandrel, and of a drawing or pushing device for moving the mandrel through the rolling-mill, substantially as described.

10. A machine for rolling tubes which consists of appliances for producing grooved or flattened parts on the circumference of a hollow blank, of a set of positively-driven

stretching-rolls provided with means for rolling out said hollow billet or blank, of a mandrel, and of a drawing or pushing device for moving the mandrel through the rolling-mill, and of appliances for working on those parts of the circumference of the tube, that had been in contact with the edges of the stretching-rolls, substantially as described.

11. A machine for rolling tubes, which consists of appliances for producing grooved or flattened parts at the circumference of a hollow blank, of a set of positively-driven rolls provided with means for rolling out said hollow billet or blank, and producing longitudinal ribs, ridges or feathers on the same during rolling, of a long mandrel extending through the whole length of the rolled-out tube, of appliances for endwise actuating the mandrel and of appliances for working down said ribs ridges or feathers, substantially as described.

12. A machine for rolling tubes, which consists of appliances for producing grooved or flattened parts at the circumference of a hollow blank, of a set of positively-driven rolls provided with means for rolling out said hollow billet or blank, and producing longitudinal ribs, ridges or feathers on the same during rolling, of a long mandrel extending through the whole length of the rolled-out tube, of appliances for endwise actuating the mandrel and of appliances for working down said ribs ridges or feathers, all of such appliances and rolls being so located to each other that the whole operation is performed at one pass through the machine, substantially as described.

13. A machine for rolling tubes, which consists of rolls provided with means for producing grooved or flattened parts at the circumference of a hollow blank, of a set of positively-driven rolls provided with means for rolling out said hollow billet or blank and producing longitudinal ribs, ridges or feathers on the same during rolling, of a long mandrel extending through the whole length of the rolled-out tube and having a reduced forward end and a shoulder for abutting against the forward reduced or closed end of said hollow blank, of appliances for endwise actuating the mandrel and of appliances for working down said ribs, ridges or feathers, all such appliances and rolls being in alinement to each other so that the whole operation is performed in one pass, substantially as described.

14. A machine for rolling tubes, which consists of rolls provided with means for producing grooved or flattened parts at the circumference of a hollow blank, of a set of positively-driven rolls provided with means for rolling out said hollow billet or blank and producing longitudinal ribs, ridges, fins or feathers on the same during rolling, of a longitudinal mandrel extending through the whole length of the rolled-out tube and having a reduced forward end and a shoulder for

abutting against the forward reduced or
closed end of said hollow blank, of appliances
for endwise actuating the mandrel, of appli-
ances for cutting off parts of said fins, feath-
5 ers, ribs or ridges, and of appliances for
working down the rest of said ribs, fins, ridges
or feathers, such appliances and rolls being
placed in alinement to each other so that the
whole operation is performed in one single

pass through the machine, substantially as is
described.

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

MAX MANNESMANN.

Witnesses:

EMORY H. BOGLEY,
DAVID H. MEAD.