

No. 721,210.

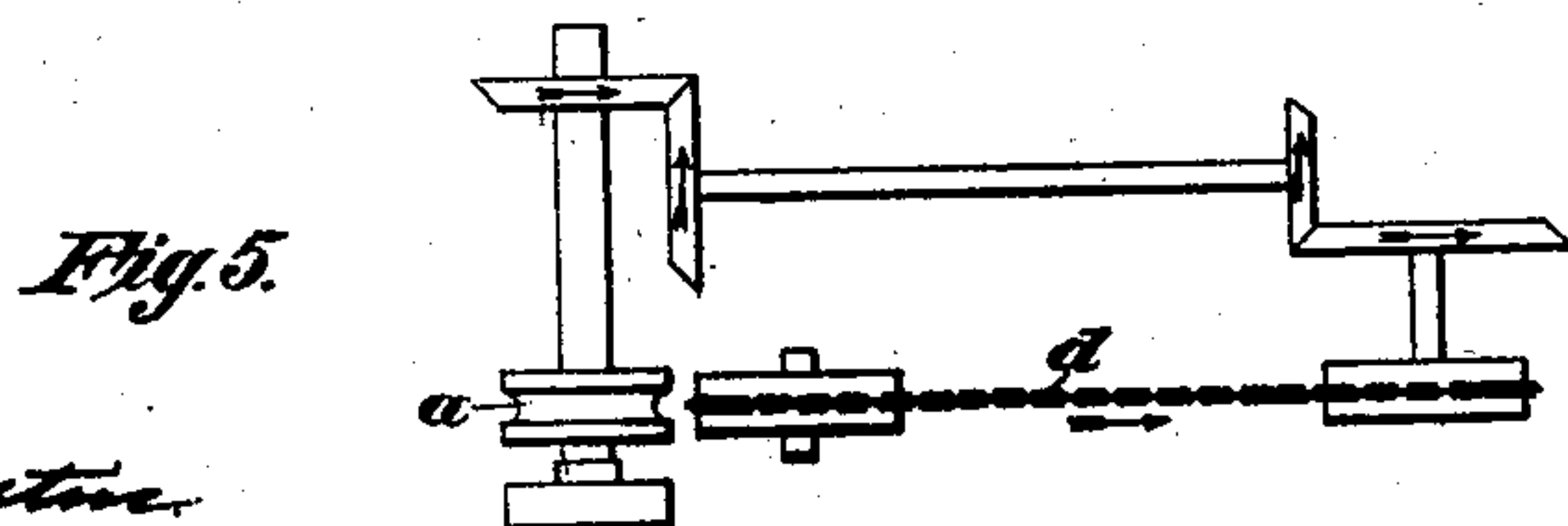
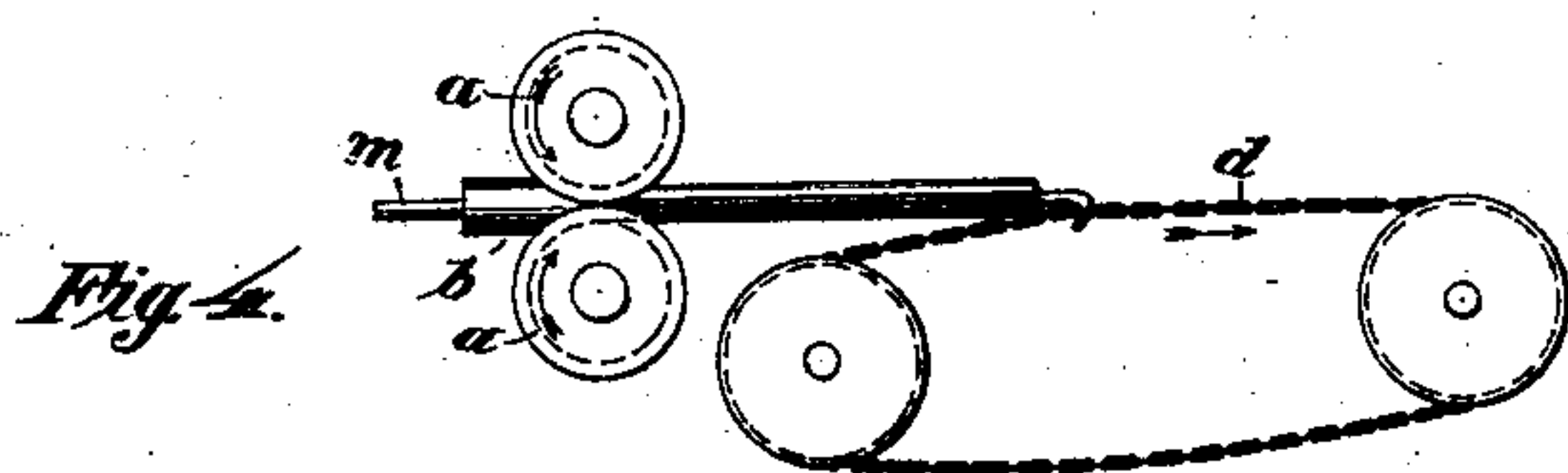
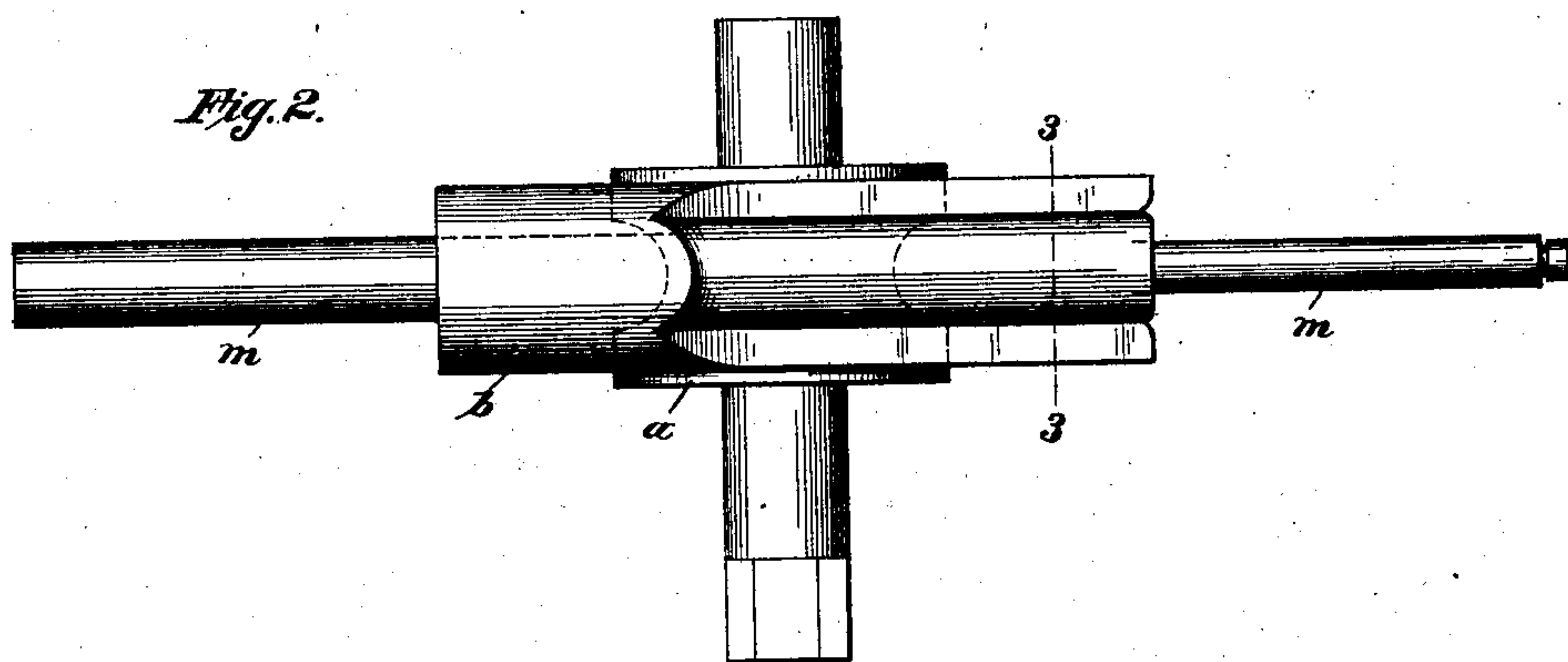
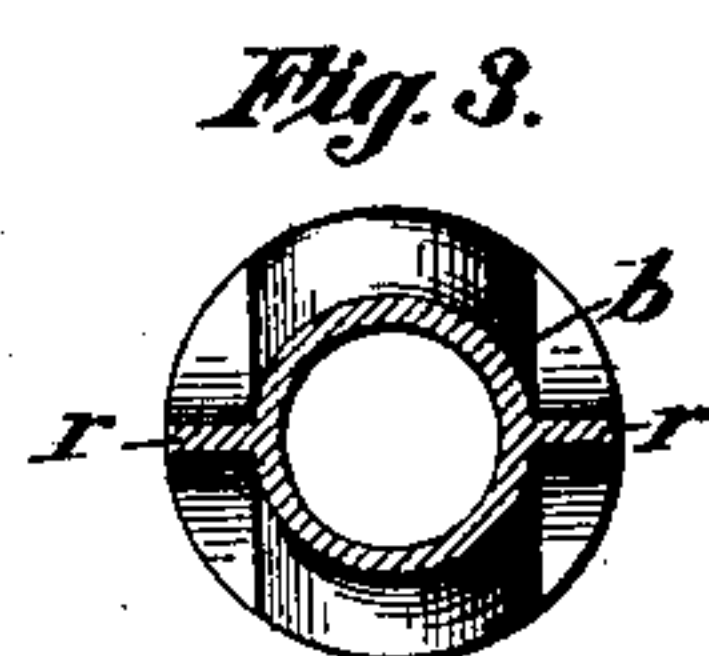
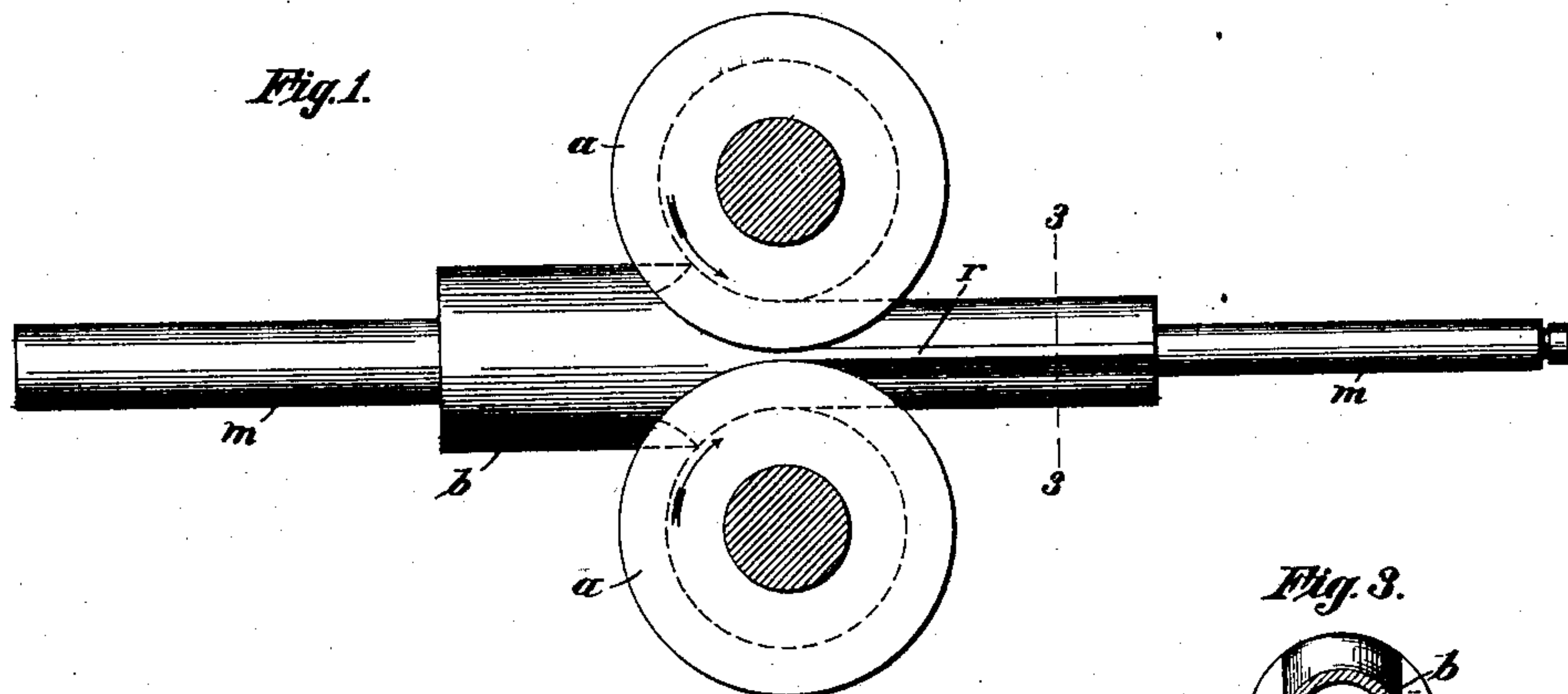
PATENTED FEB. 24, 1903.

M. MANNESMANN.
ART OF ROLLING TUBES.

APPLICATION FILED OCT. 3, 1901. RENEWED SEPT. 17, 1902.

NO MODEL.

3 SHEETS—SHEET 1.



Witnesses

W. S. Austin

Emory H. Ogley

Inventor

M. Mannesmann

No. 721,210.

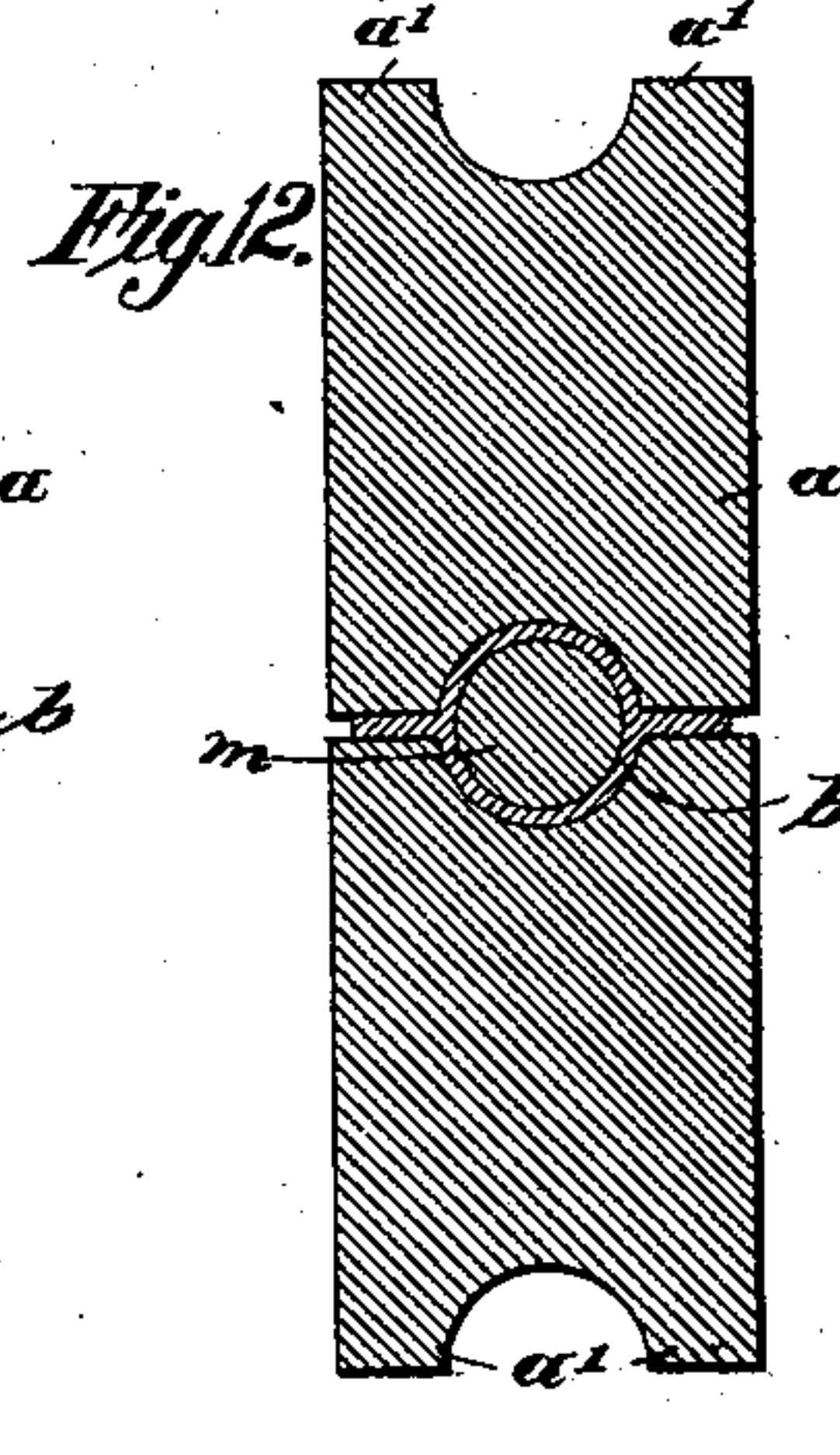
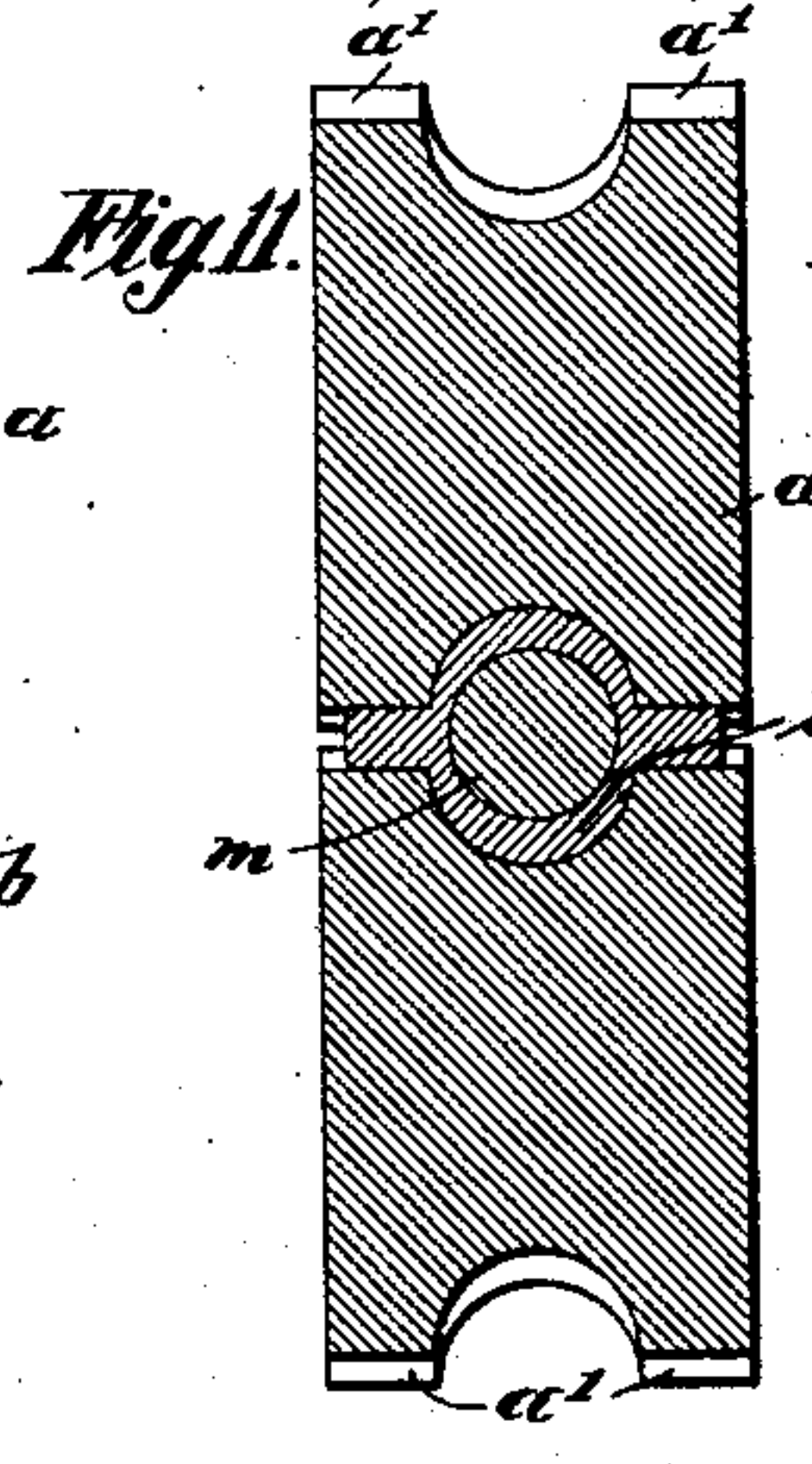
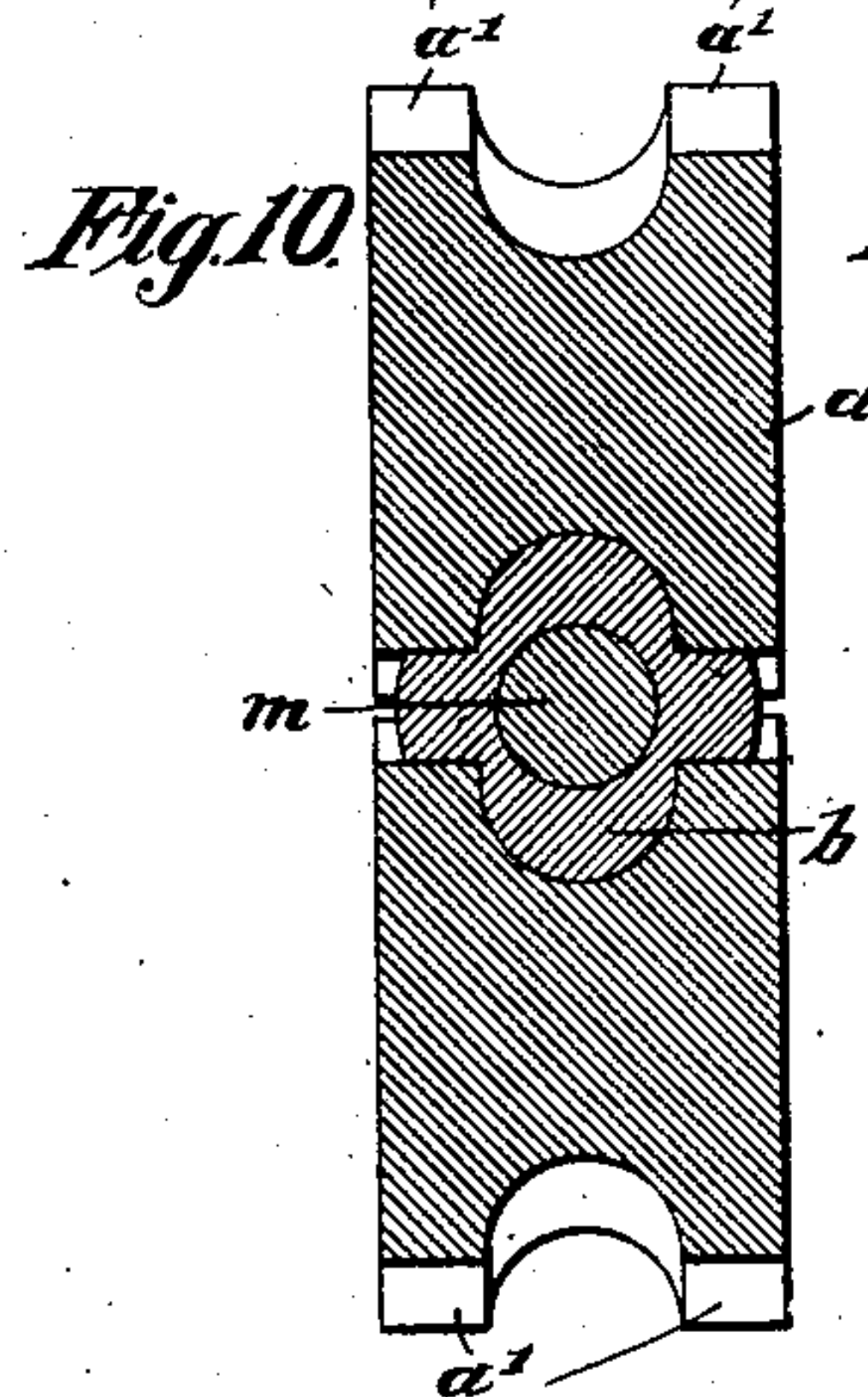
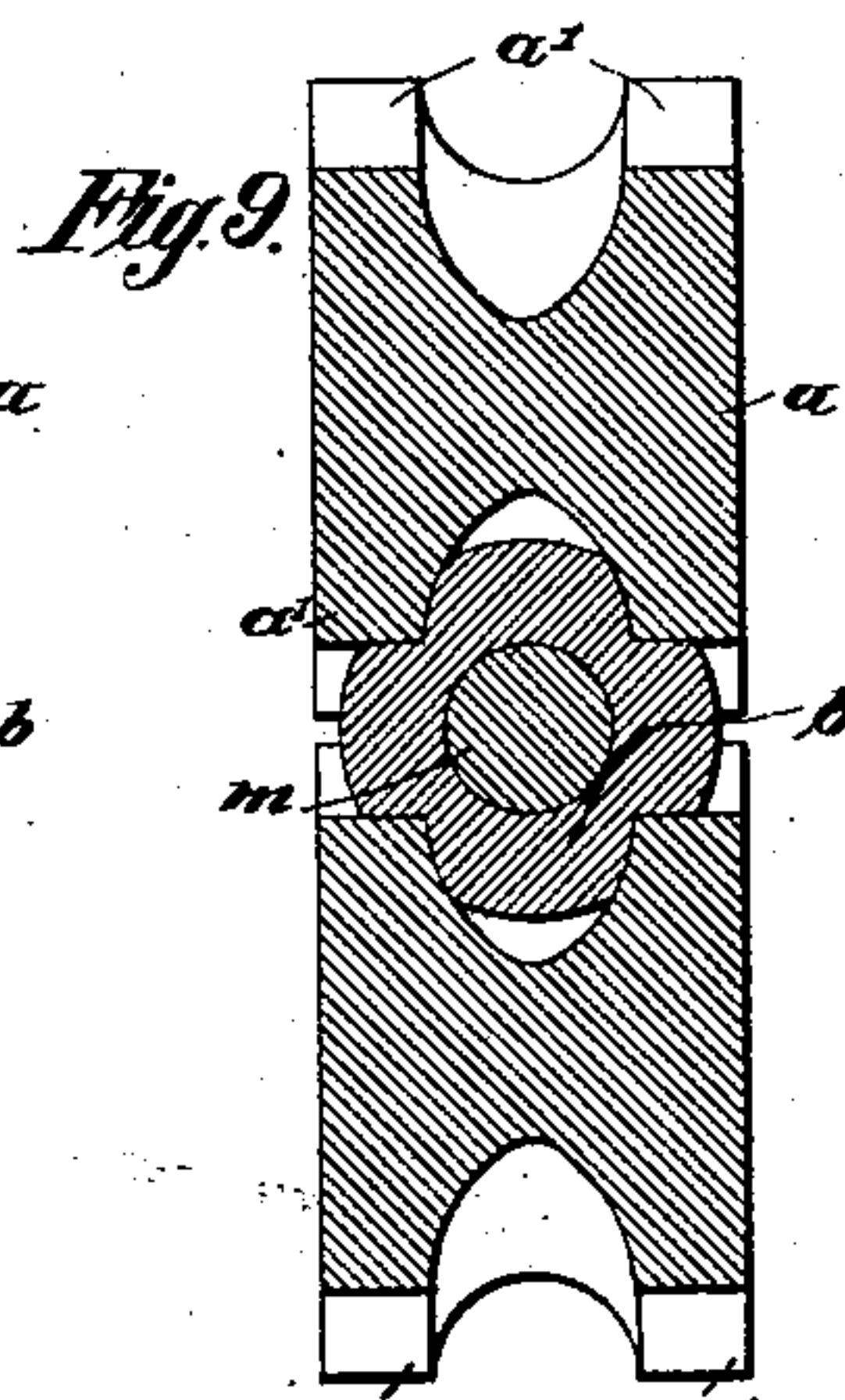
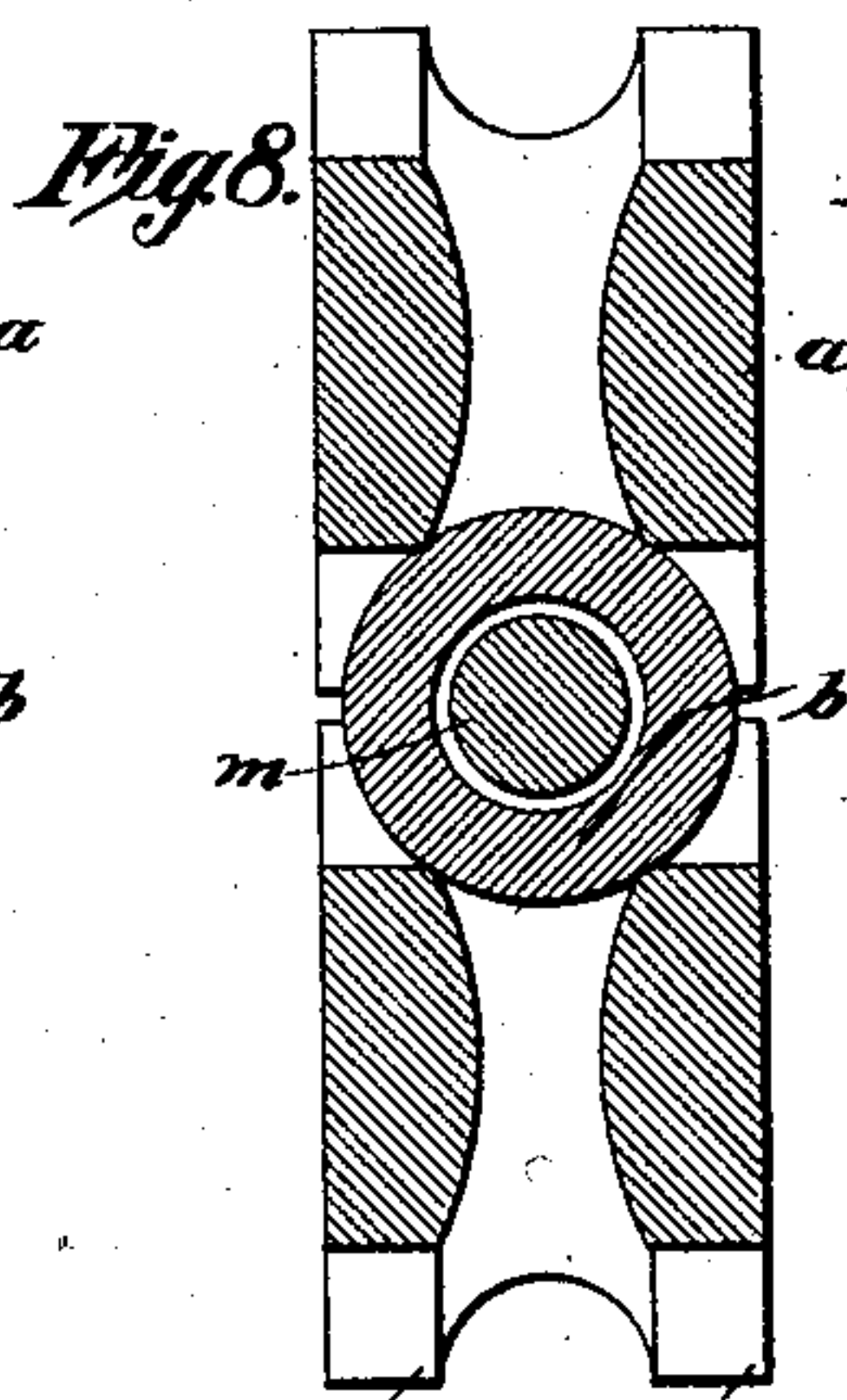
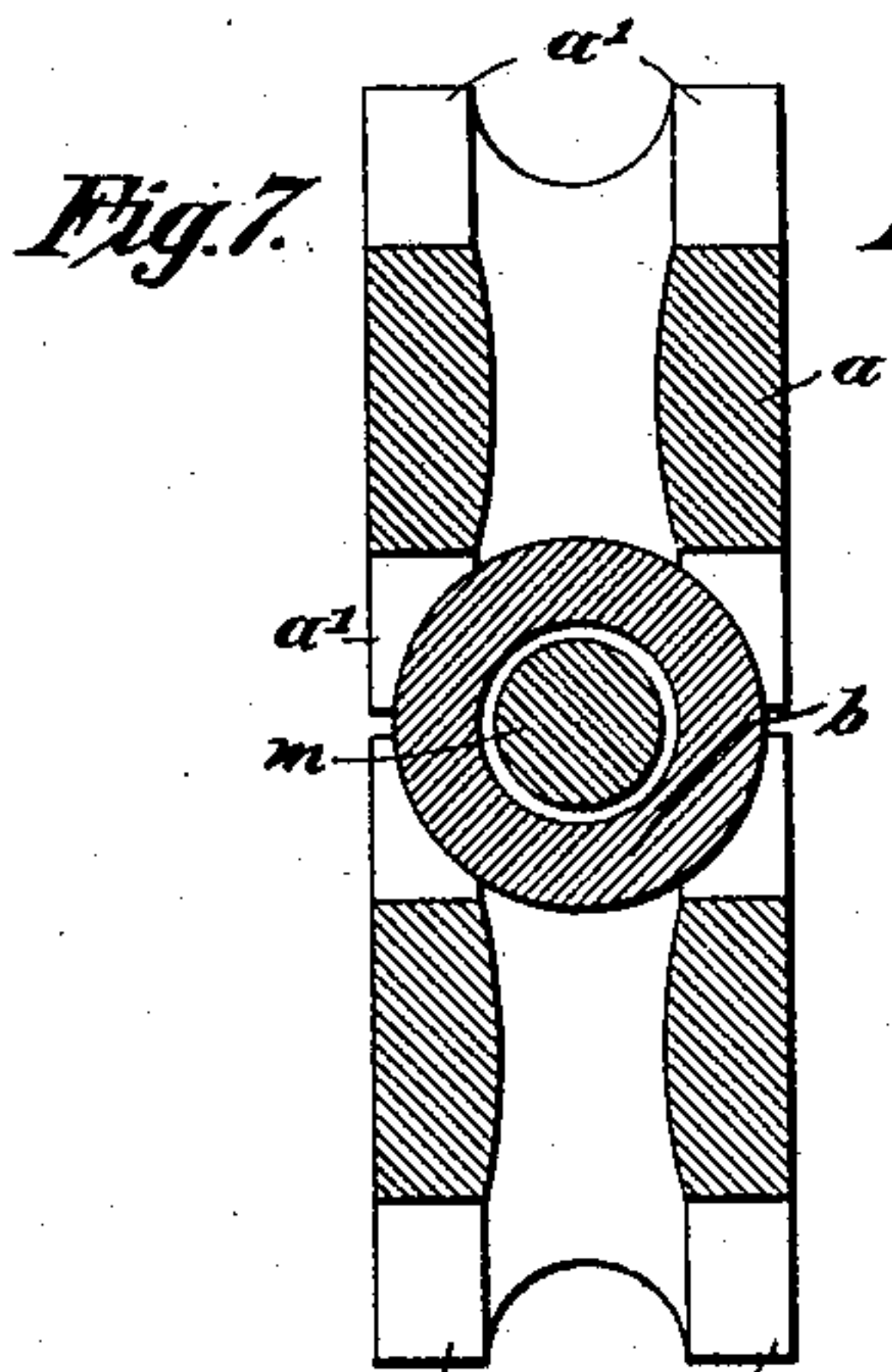
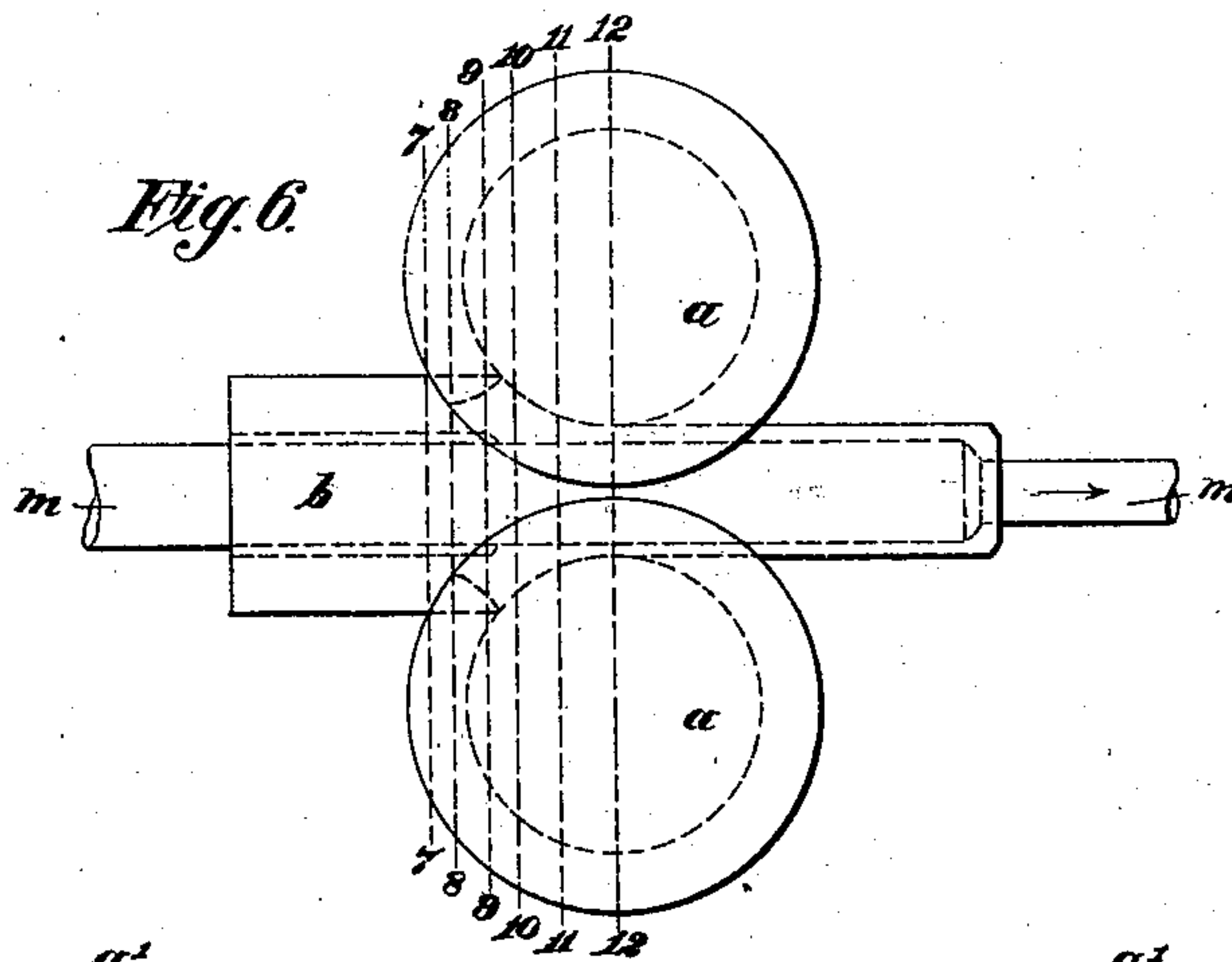
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3 SHEETS—SHEET 2.



Witnesses
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Emory H. Bagley

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No. 721,210.

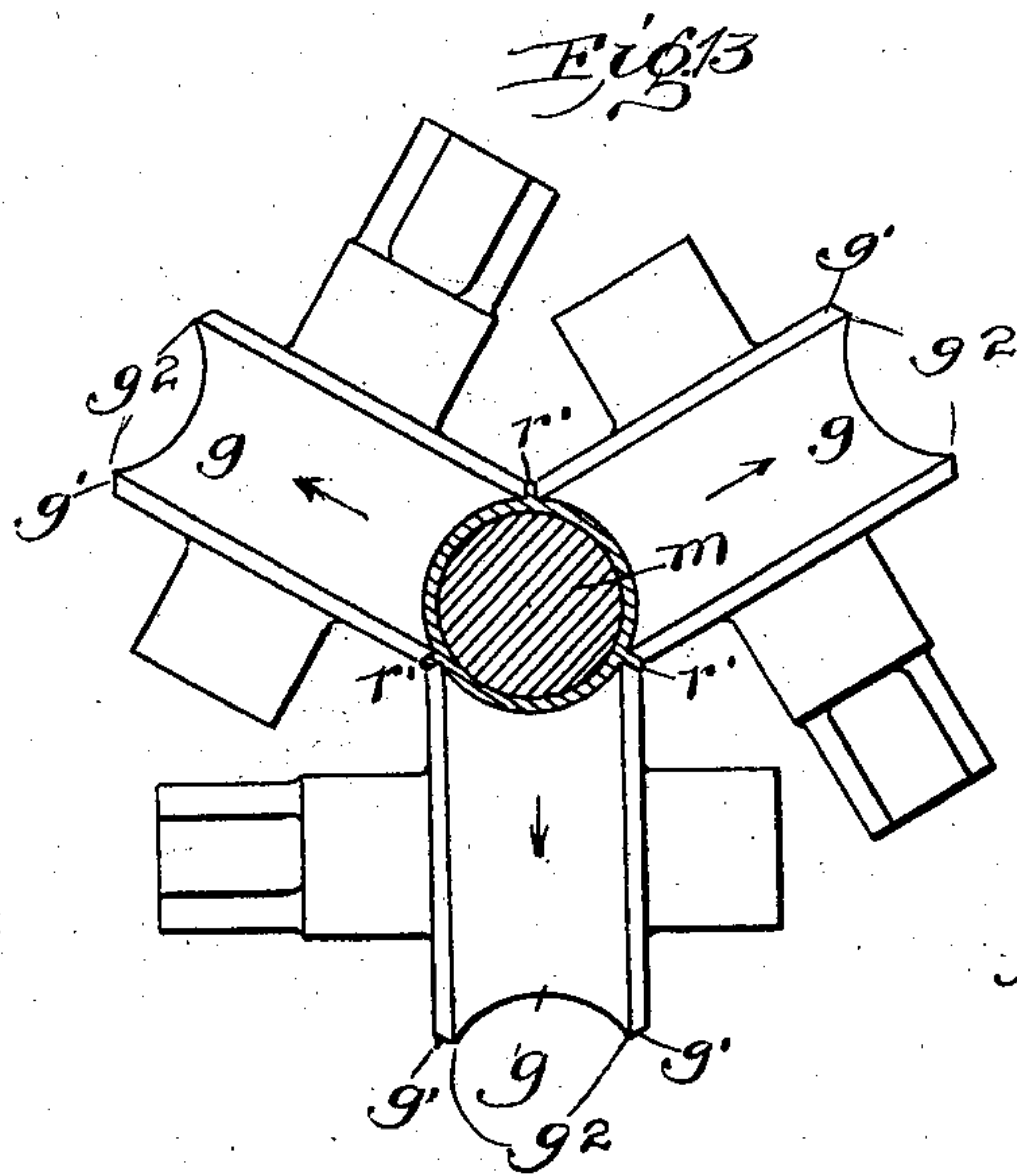
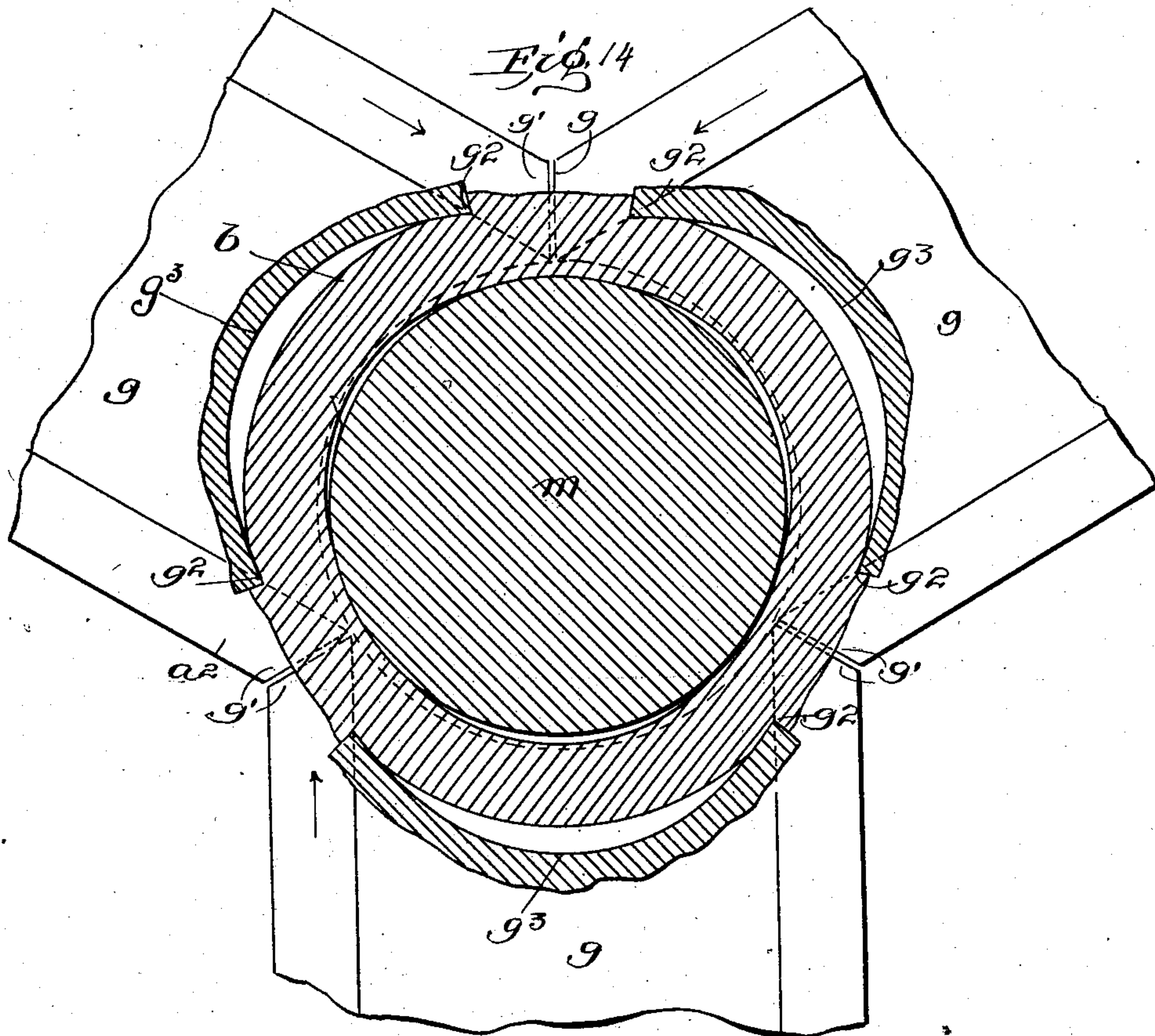
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NO MODEL.

3 SHEETS—SHEET 3.



Witnesses:
J. M. Fowler Jr.
L. E. Wilson

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UNITED STATES PATENT OFFICE.

MAX MANNESMANN, OF REMSCHEID-BLIEDINGHAUSEN, GERMANY.

ART OF ROLLING TUBES.

SPECIFICATION forming part of Letters Patent No. 721,210, dated February 24, 1903.

Application filed October 3, 1901. Renewed September 17, 1902. Serial No. 124,808. (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 certain new and useful Improvements in the Art of Rolling Tubes, of which the following is a specification.

This invention is an improvement on my pending application, Serial No. 77,926, filed
10 October 7, 1901, in which a hollow billet or blank is rolled out into a tube between positively-driven rolls and a stationary or loose mandrel, the rolls compressing the blank on the mandrel and squeezing some of the material of the blank between their edges, so as
15 to form longitudinal ribs, ridges, feathers, or fins on the tube.

My improvement has for its object to use instead of a loose or stationary mandrel a
20 positively endwise actuated mandrel which is drawn through the rolls by a draw-bench.

In application Serial No. 68,988 only the friction of the rolls on the blank furnishes the power to draw in and roll out the blank;
25 but in the present application the friction of the rolls on the blank is aided by the friction of the positively endwise moved mandrel on the inner surface of the blank, whereby a greater reduction of the blank between the
30 rolls can be obtained.

This invention is an improved art of rolling tubes from a hollow blank or billet, in which (a) the simultaneous action of positively-driven rolls and (b) a positively-actuated mandrel (drawn in longitudinal direction through the rolls) and (c) a proper calibrating of the rolls are simultaneously made use of for rolling the blank or billet into a tube; and the invention consists of the art of
40 rolling tubes by subjecting the hollow blank or billet, which is considerably larger than the roll-groove, to the simultaneous action of positively-driven rolls and a longitudinally-drawn mandrel in connection with properly-calibrated rolls, the edges of which first impinge upon the blank before the main bodies of the rolls take hold of the same and then squeeze sidewise a certain quantity of material at the spaces between the edges of the
45 rolls, so as to form exterior longitudinal ribs, fins, or ridges along the tube thus formed.

Only by the simultaneous combination of the three effects stated—namely, the action of positively-driven rolls, the longitudinal motion of a mandrel drawn positively through
55 the rolls, and the proper calibrating of the rolls, so that the edges of the grooves of the same impinge first on the blank—can the blank or billet be stretched out sufficiently to produce a finished tube in one heat and
60 one pass. If the proper calibrating of the rolls and the consequent squeezing action of the edges of the rolls on parts of the blank or billet were omitted and the blank or billet merely treated in the well-known manner be-
65 tween positively-driven rolls with oval caliber, it would be impossible to complete the tube in one pass, even if the positively-driven rolls and the longitudinally-actuated mandrel were simultaneously employed, for the
70 simple reason that the tube would assume between the rolls an oval shape and would be compelled to be turned for an angle of ninety degrees and be then again passed through a second set of rolls of smaller cali-
75 ber, then again be turned for an angle of ninety degrees and again passed through a set of rolls of still smaller caliber, and so on until the required length and thickness of the tube are obtained. 80

In the accompanying drawings, Figure 1 represents a side elevation of a two-roll rolling-mill, illustrating my improved process of rolling tubes. Fig. 2 is a plan view of Fig. 1, in which the upper roll is taken off in order
85 to show the blank in the process of being rolled out. Fig. 3 is a vertical transverse section of the tube on line 3 3, Figs. 1 and 2, without the rolls and mandrel. Figs. 4 and 5 are a side elevation and plan view of a draw-
90 bench for imparting a draw motion to the mandrel. Fig. 6 is a diagram of the rolls, mandrel, and blank. Figs. 7 to 12 are vertical transverse sections, respectively, on lines 7 7, 8 8, 9 9, 10 10, 11 11, 12 12 in Fig. 6, showing
95 the progress of the blank through the rolls and the changes imparted thereto by the squeezing edges and rims of the rolls. Fig. 13 is an end view of a rolling-mill with three rolls, the mandrel and the rolled-out tube be-
100 ing in cross-section. Fig. 14 is a cross-section through the mandrel and tube shortly after

the first points of contact at the entry of the roll-pass. The adjacent surfaces of the three rolls are marked by section.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, *a a* and *g g g* are the rolls, *b* a hollow blank or billet, and *m* a mandrel on which the blank is placed. To the rolls *a a* and *g g g* positive motion is imparted in the direction shown by arrows in Figs. 1 and 13, while simultaneously with the motion of the rolls a longitudinal motion is imparted to the mandrel *m* by a suitable draw-bench or other equivalent mechanism *d* and shown in Figs. 4 and 5. The caliber of the rolls is such that at both sides of the grooved working faces circumferential rims *a'* and *g'* are formed. The edges between the grooves and the rims first impinge upon the blank, whereby the hollow blank or billet is squeezed at the sides and rolled out into a tube in one pass.

In Fig. 2 the upper roll is removed in order to clearly show the action of the rolls on the blank.

Fig. 3 shows a cross-section of the tube along the line 3 3, Figs. 1 and 2, illustrating the rolling out of the longitudinal ribs or feathers *r* alongside of the tube, said ribs or feathers being produced by the squeezing of the material in the spaces between the ribs of the rolls. These ribs or feathers *r* can be readily removed, if necessary, from the finished tube by cutting them off, or they may remain thereon, as desired.

Fig. 14 is a cross-section through the mandrel and the blank shortly after the points of first impingement of the rolls on the hollow blank. The rolls touch the blank only at their edges *g*², the part of the caliber adjacent to the blank at this point being marked by section. While the edges *g*² of the rolls impinge upon the hollow blank and compress it on the mandrel, the grooved center portions of the rolls *g*³ do not yet touch the blank. Fig. 13 shows the feathers *r'* between the circumferential rims *g'* *g'* of the rolls *g*.

The caliber of the rolls is nearly a circle in cross-section. The edges may be sharp or rounded off.

In carrying out my improved process of rolling tubes a hollow blank or billet the exterior diameter of which is considerably larger than the groove of the rolls is subjected to the action of positively-driven rolls and the action of a longitudinally-drawn mandrel and simultaneously to the squeezing action of the edges of the rolls, which impinge first on the sides of the blank, produce a gradual squeezing or crowding of the material in lateral direction and the formation of longitudinal ribs or feathers between the edges or the rims of the rolls. The grooves with their sharp or rounded-off edges are the most important working parts of the rolls, which act on the blank together with the drawn mandrel and which may be aided by parallel or other rims

outside of the edges and grooves. In the latter case the rims compress and roll out the fins, feathers, or ribs squeezed down or produced by the edges. The rolls in such case impinge on the blank not only at their grooved portion or caliber, but, besides, at the rims, so as to roll down the ribs or feathers and take powerful hold of the same. The drawing forward of the tube and ribs causes the material of the blank under the compression action of the rolls to be drawn out and stretched.

Instead of two rolls, as shown in Figs. 1 to 12, three or more rolls may be employed, as shown in Figs. 13 and 14, which are still more capable of strongly reducing the cross-section of a blank or billet in one pass without producing inside folds on the rolled-out tube than two rolls.

By the above-described process, and especially with the use of three or four rolls forming a caliber, a relatively large reduction can be performed in one pass. The reduction may even be so much increased that the tube or blank after one pass through the rolling-mill has twice, three times, or more the length of the hollow blank before the pass.

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

1. The art of rolling a hollow blank or billet between two or more rolls and a mandrel which consists in subjecting the blank to the action of positively-driven rolls and a longitudinally-actuated mandrel simultaneously with the squeezing action of the edges of the rolls, whereby a relatively large reduction of the blank and a stretching of the same in a longitudinal direction into a tube with longitudinal ribs or feathers is produced, substantially as set forth.

2. The art of rolling a hollow blank or billet between two or more rolls and a mandrel, which consists in subjecting the blank to the action of positively-driven rolls and a longitudinally-actuated mandrel, simultaneously with the squeezing action of the edges of the rolls which impinge upon the blank before the main body of the caliber takes hold of the blank, whereby a stretching of the blank in longitudinal direction into a tube with longitudinal ribs or feathers is produced, substantially as set forth.

3. In the art of rolling tubes, the process of rolling a hollow blank or billet between two or more rolls, and a mandrel, which consists in subjecting a hollow blank or billet simultaneously to the action of two or more positively-driven rolls, which impinge upon the blank before the main body of the caliber takes hold of the blank, and a longitudinally-actuated mandrel in connection with the squeezing action exerted by the edges and the rims of the rolls, whereby the blank is stretched out to a tube with longitudinal fins, ribs or feathers.

4. The art of rolling a hollow blank or billet between two or more rolls and a mandrel,

which consists, in subjecting the blank to the action of positively-driven rolls and a longitudinally-actuated mandrel simultaneously with the squeezing action of the caliber of the rolls, the distance between the edges of the grooves being of smaller size than the diameter of the blank or billet before it is rolled out, whereby a relatively large reduction of the blank is obtained and a tube is produced with longitudinal ribs, fins or feathers, substantially as set forth.

5. The art of rolling a hollow blank or billet between rolls and a mandrel, which consists, in subjecting the blank to the action of three or more positively-driven rolls and a longitudinally-actuated mandrel simultaneously with the squeezing action of the edges of the rolls, whereby a relatively large reduction of the blank is obtained and a tube is pro-

duced with longitudinal ribs, fins or feathers, substantially as set forth. 20

6. The art of rolling a hollow blank or billet between rolls and a mandrel which consists in subjecting the blank to the action of three or more positively-driven rolls and a longitudinally-actuated mandrel, simultaneously with the squeezing action of the edges of the rolls, whereby in one pass a reduction is obtained by which the rolled-out tube has twice or more the length of the hollow billet before passing the rolls, substantially as set forth. 25 30

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

MAX MANNESMANN.

Witnesses:

ARCHER PETER,
EMORY H. BOGLEY.