

June 23, 1925.

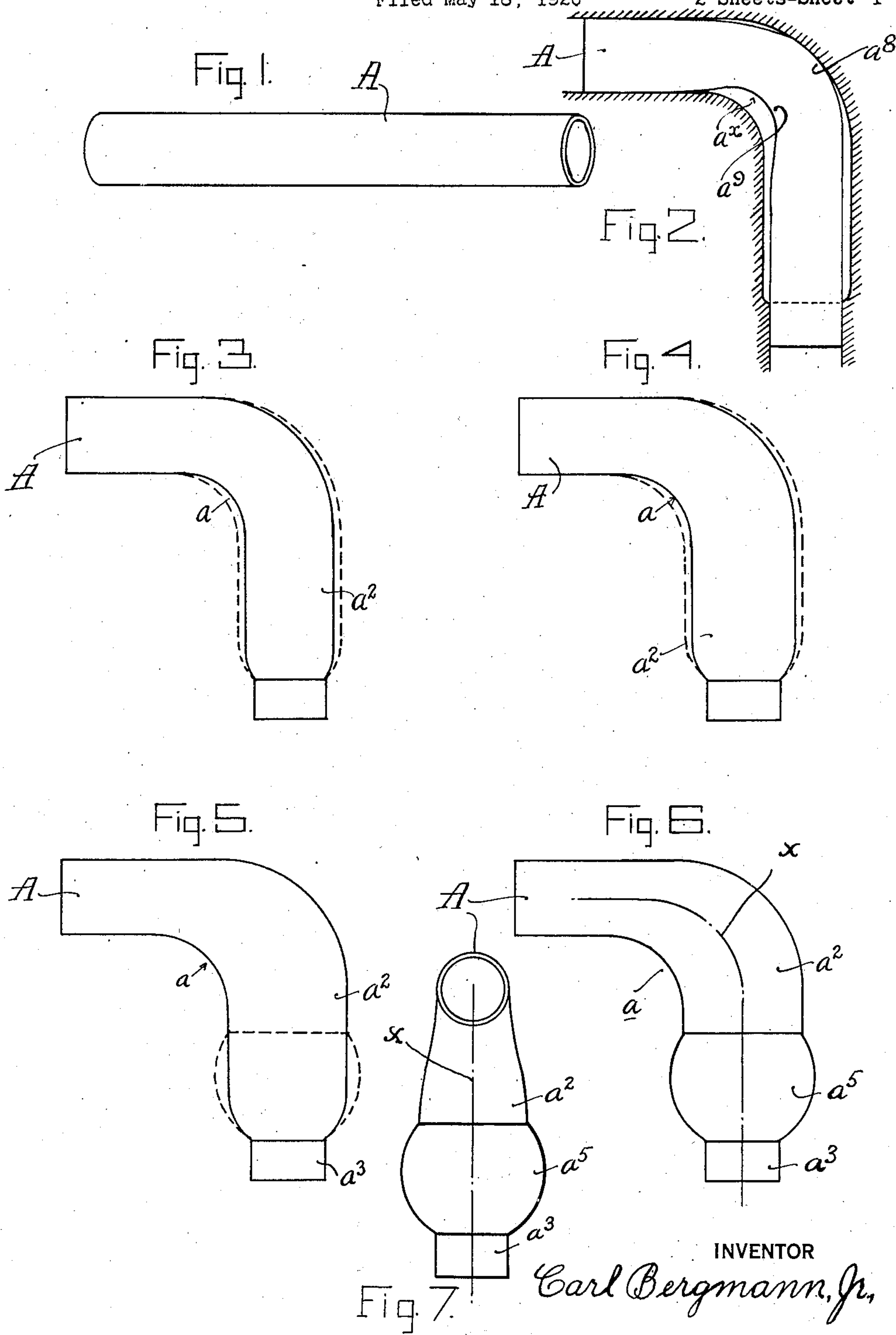
1,542,983

C. BERGMANN, JR

DRAWN ARTICLE AND METHOD FOR MAKING THE SAME

Filed May 18, 1920

2 Sheets-Sheet 1



INVENTOR

Carl Bergmann, Jr.,

June 23, 1925.

1,542,983

C. BERGMANN, JR

DRAWN ARTICLE AND METHOD FOR MAKING THE SAME

Filed May 18, 1920

2 Sheets-Sheet 2

Fig. 8.

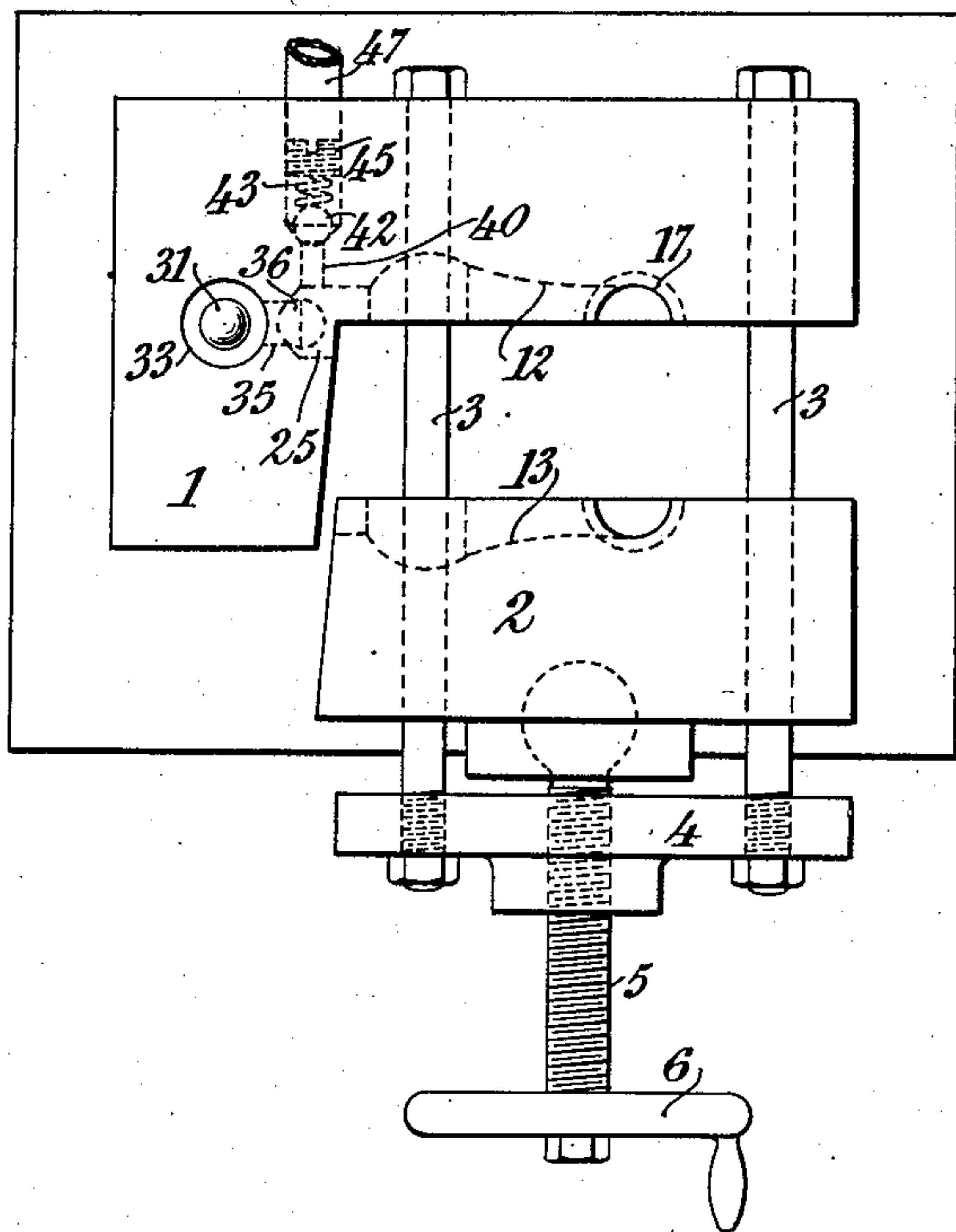


Fig. 11.

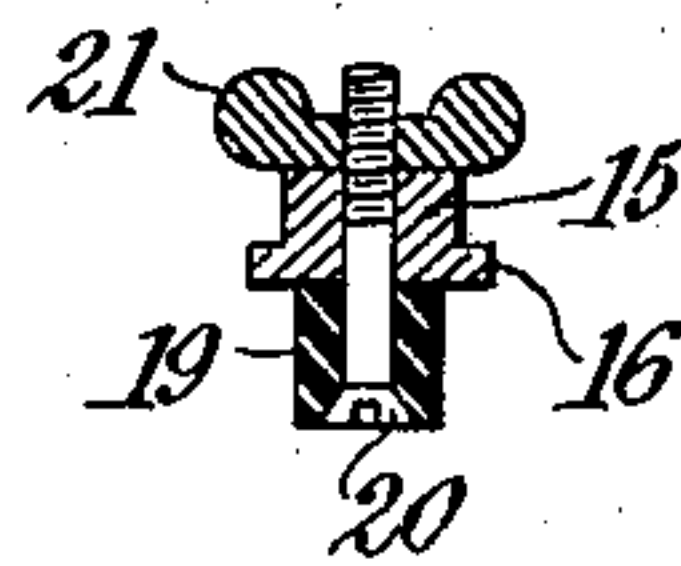


Fig. 9.

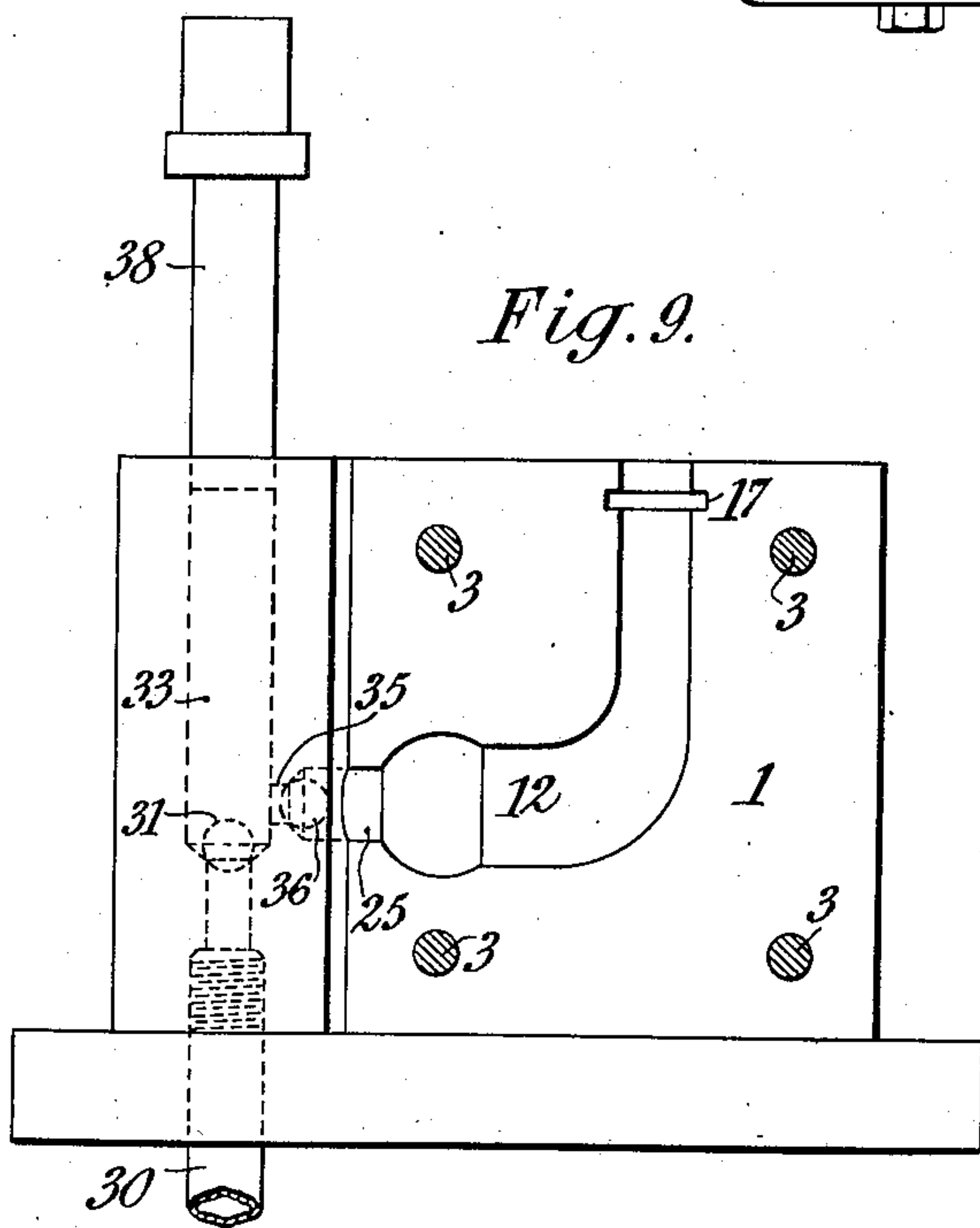
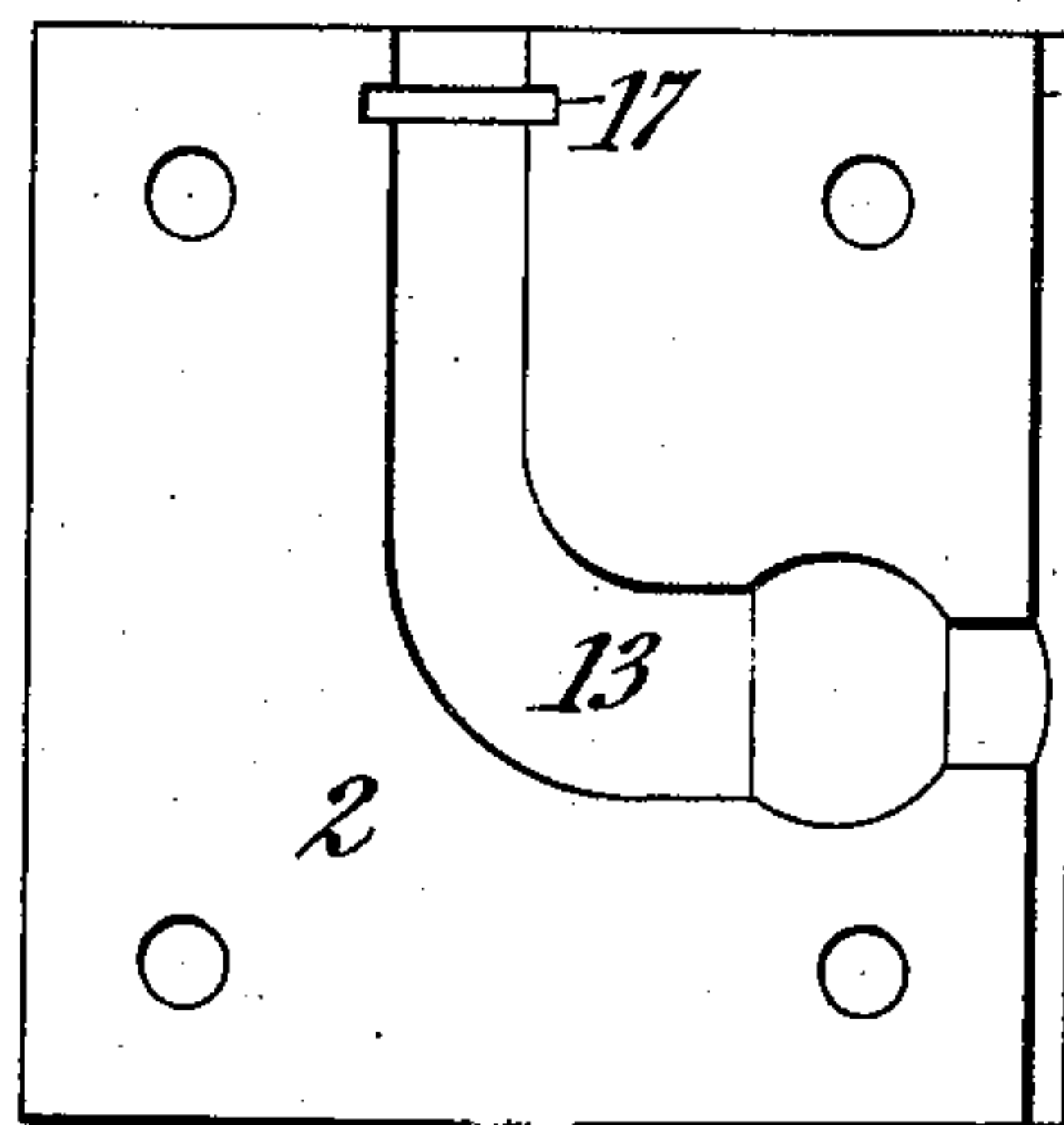


Fig. 10.



INVENTOR

Carl Bergmann Jr.,

By Attorney

Gustav R. Thompson

Patented June 23, 1925.

1,542,983

UNITED STATES PATENT OFFICE.

CARL BERGMANN, JR., OF WEST HOBOKEN, NEW JERSEY, ASSIGNOR OF ONE-HALF TO
GUSTAVE R. THOMPSON, OF NEW YORK, N. Y.

DRAWN ARTICLE AND METHOD FOR MAKING THE SAME.

Application filed May 18, 1920. Serial No. 382,372.

To all whom it may concern:

Be it known that I, CARL BERGMANN, Jr., a citizen of the United States, and a resident of West Hoboken, county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Drawn Articles and Methods for Making the Same, of which the following is a full, clear, and exact specification.

10 This invention relates to a drawn article, and a method for producing the same.

The invention provides a drawn, tapered, seamless elbow, or bent article, and particularly an elbow forming part of the sound-
15 conveying tube of a talking machine, and having an undercut portion or inner shoulder at its larger portion, either when finished or during its process of manufacture.

20 The invention also provides a novel method for forming said article.

25 An embodiment of said article, and also of an apparatus for making the same, is illustrated in the accompanying drawing. Said drawings are also useful in explaining said process.

In said drawings,

Figures 1-4 illustrate the article in successive stages of formation.

30 Figs. 5 and 6 illustrate two forms of the completed article, the construction shown in Fig. 5 having the relation of an intermediate stage to the form of article shown in Fig. 6.

35 Fig. 7 is a view in elevation, at right angles to the view in Fig. 6, of the article shown in Fig. 6.

Fig. 8 is a top plan view of one of the forming dies of the apparatus, the other dies being similar in construction.

40 Figs. 9 and 10 are face views of the two parts 1 and 2 of the die, the view being in elevation.

45 Fig. 11 is a detail sectional view of a tampon or plug for closing the end of the tubes used for forming the article.

50 The article of the present invention is a seamless drawn article, typically and most conveniently of soft copper tubing A, bent as indicated at a , and tapered, as indicated at a^2 . The taper a^2 is preferably with respect to the axis of said tube in two planes at right angles to one another. For example, by reference to the line x in Fig. 6, it will be seen that the portion a^2 is tapered,
55 and also by reference to line x in Fig. 7

(which is a view at right angles to Fig. 6) it will also be seen that the portion a^2 is tapered. The bend a is preferably through a right angle, as shown in Fig. 6. The portion a^3 may be removed if desired. The tapered portion may terminate in a drawn spherical portion a^5 , this portion conveniently forming a ball connection with a socket, and hence the article or elbow is particularly suitable for constituting part of the sound-conveying tube of a talking-machine. It will be observed that there are undercut portions or inner shoulders at the lines where the portions a^2 and a^5 and a^3 and a^5 meet, which seems to preclude the use of simple inside forming tools in making such an article. The two ends of the article are ordinarily of the original dimensions of the tube A, and consequently the end a^3 and the opposite end will be of equal diameter.

In forming the present article, a piece of soft copper tubing, as indicated at A, Fig. 1, is preferably used, and this is bent in suitable manner, preferably by heating the portion where the bend is to be made, and bending; when bent in this manner the tube usually collapses somewhat at the bend, as indicated at a^x in Fig. 8. The bent tube is then placed in a die having an interior portion somewhat larger than the tube, and partaking generally of the final form of the article (see Fig. 2). The tube is then expanded or drawn against the sides of the die, preferably by a liquid on the inside of the tube, to which pressure is transmitted in any suitable manner. In placing the bent tube in the die, the long side a^8 of the bend is placed as near as possible against the corresponding long side of the bent portion of the die, the greatest space between the tube and die being at the short side a^9 of the bend. By placing the bent tube in this manner in the die, bursting of the tube is prevented; the long side a^8 not being subjected to an excessive amount of drawing, and the metal at the short side a^9 of the bend readily undergoing the readjustment to bring it against the short side of the bend of the die. The form of the tube, after undergoing the drawing in the die is shown in full lines in Fig. 2.

The final form of the elbow or article is usually produced as a result of several acts of drawing on the original tube. The

extent to which the material will draw at each stage depends on the material and is ascertained by experiment, guided of course by intelligent assumptions based on knowledge of the ductile properties of the material, etc.

The partially drawn tube in the form shown in full lines, Fig. 3, may be placed in a second drawing die, and further expanded, in the same manner as in the first instance. The tube, after the second drawing operation will have the form shown in dotted lines, Fig. 3 and full lines Fig. 4. The second drawing die will have the form shown in dotted lines Fig. 3.

The partially drawn tube in the form shown in full lines Fig. 4 may be placed in a third die and subjected to a third drawing operation. The tube will thereafter have the form shown in dotted lines Fig. 4 and full lines Fig. 5. The third drawing die will have the form shown in dotted lines Fig. 4.

The spherical portion α^5 of the elbow is preferably formed by placing the article having the form shown in full lines Fig. 5, in a fourth die and drawn to the form shown in full lines Fig. 6. The form of the die is shown in dotted lines Fig. 5.

The article may be drawn from its initial to its final form by any number of stages, as may be found necessary or desirable.

After each drawing operation it is preferable to anneal the articles.

The bent tube or elbow may, in any of its drawn stages, be utilized as a finished and complete article.

The portion α^3 may be cut off if said portion has no purpose in the use to which the elbow is to be put.

When the elbow shown in Fig. 6 is to be used as part of a sound-conveying tube, the part α^3 is cut off, and the elbow is preferably plated and assembled with the other parts which go to make the complete sound-conveying tube, or so-called "tone arm."

The apparatus for forming the elbow, preferably comprises a series of dies of successively larger sizes, corresponding to the degree to which the partially formed article is to be drawn or stretched at each stage. One of said dies is shown in Figs. 8, 9 and 10.

The die preferably comprises two sections or parts 1 and 2, having formed therein the bent and tapered recesses 12 and 13, corresponding (together) to the form to which the article is to be drawn therein. The die-sections 1 and 2 preferably slide toward and from one another on bolts or tie-rods 3. The article to be drawn is placed between the die-parts and the die-parts brought together and held together by suitable means, as for example, a clamp-screw

5 threaded in a yoke 4 fastened at one end of the bolts or tie-rods 3, and bearing at its end against the die-part 2. A hand-wheel 6 serves for manipulating the clamp-screw.

When the article is placed in the die one end thereof is closed, the means for this purpose being conveniently a separate plug or tampion 15. This plug conveniently comprises a disk having a shoulder 16 adapted to fit within a recess 17 in the die parts 1 and 2. It also comprises an expansible portion 19, adapted to fit within the end of a tube, and be expanded therein, to tightly close the same, by means of a taper-headed-bolt 20 and wing-nut 21.

The other end of the article in the die is open and in communication with a passage 25, the walls of which closely engage the outer surface of the contiguous portion of the article or elbow, so as to provide a tight, or substantially tight joint between the article and the walls of the die around the passage 25.

Fluid (water or oil for example) previously compressed, or not, as may be preferred, is then admitted to the interior of the article in the die, through the passage 25 and the open end of the article. The pressure of the fluid, or pressure applied thereto, if not previously compressed, expands the tubular article and draws or presses the walls of the articles against the walls of the die, and makes it conform to the size and shape of the die.

As shown, water is admitted through a pipe 30 and outwardly opening valve 31 to a cylinder 33 in communication with the passage 25 of the die through a part 35 and an outwardly opening valve 36. Water is admitted into the cylinder 33 and compressed therein and forced into the interior of the article in the die by means of a piston 38 conveniently mounted on the reciprocating slide of an ordinary power press. The water compressed in the article is held therein between strokes by the valve 36.

Means are preferably provided for relieving the die from increases of pressure after the article has been expanded or drawn therein due to continued action of the piston 38. These means conveniently comprise a vent passage 40 communicating with the passage 25, and normally closed by a valve 42, pressed by a spring 43, the compression of which serves to keep the valve closed under normal working pressures, but yields under excessive pressures to vent the liquid flowing through the valve 36. A sleeve 45 serves for adjusting the compression of the spring 43, and a pipe 47 serves for carrying off the vented liquid.

After the drawing is completed in one die, the die-parts are separated and the article removed and placed in another or other

successive dies, and expanded or drawn therein to final form, in a manner similar to that described.

After each drawing operation the article is preferably annealed.

The inventive ideas herein set forth may receive other embodiments and forms than those herein specifically illustrated or described.

The apparatus herein set forth is claimed in a separate divisional application.

What is claimed is:—

1. A cold drawn, bent, seamless, tubular article of metal of the character described, tapered from one side of said bend to the other, said article being curved through approximately a right angle substantially throughout said bend.

2. A cold drawn, bent, seamless, tubular article of metal of the character described, tapered from one side of said bend to the other said taper being with respect to the axis of the tube in two planes at substantially right angles to one another.

3. A cold drawn, bent, seamless, tubular article of metal of the character described, tapered from one side of said bend to the other, said article having a ball-like tubular boss or enlargement thereon.

4. A cold drawn, bent, seamless, tubular article of metal of the character described, tapered from one side of said bend to the other, said article having openings at its ends of substantially equal diameter.

5. A method of forming seamless, tapered, bent, drawn articles of metal of the character described, comprising bending a tube of substantially uniform diameter, and successively expanding said bent tube against tapered dies of increasing size.

6. A method of forming seamless, tapered, bent, drawn articles of metal of the charac-

ter described, comprising bending a tube of substantially uniform diameter, and successively expanding said bent tube against tapered dies of increasing size, each die having a bend and said tube being placed in the first die with the long side of the bend adjacent the long side of the bend of said die, whereby the amount of drawing of the metal on the outer side of the bend is minimized.

7. A method of forming seamless, tapered, bent, drawn articles of metal of the character described, comprising bending a tube of substantially uniform diameter, placing said bent tube in tapered dies of increasing size and with corresponding bends, and successively expanding said tube by compressed fluid.

8. A method of forming seamless, tapered, bent, drawn articles of metal of the character described, comprising bending a tube of substantially uniform diameter, placing said bent tube in tapered dies of increasing size and with corresponding bends, and successively expanding said tube by compressed fluid, said tube being placed in the first die with the long side of the bend adjacent the long side of the bend of said die, whereby the amount of drawing of the metal on the outer side of the bend is minimized.

9. A method of forming seamless, tapered, bent, drawn articles of metal of the character described, comprising placing a bent tube of substantially uniform diameter in a die, with the wall of the tube at the outer side of the bend or turn therein, close to the wall of the die, and expanding the tube, whereby the amount of drawing of the metal on the outer side of the bend is minimized.

In witness whereof, I have hereunto signed my name.

CARL BERGMANN, JR.