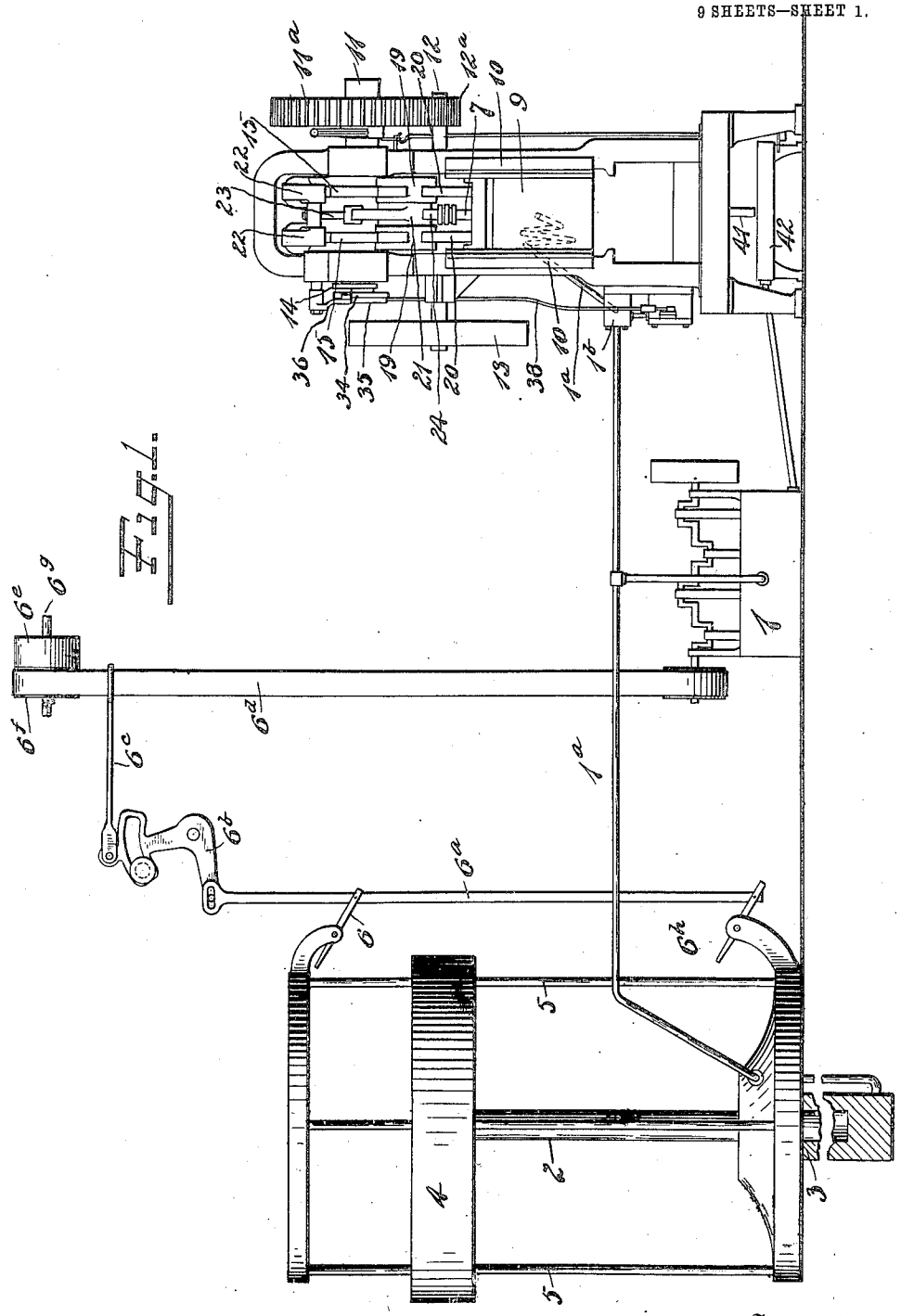
No. 795,020. PATENTED JULY 18, 1905.

K. BARTHELMES.

APPARATUS FOR PRODUCING SEAMLESS KNOBS.

APPLICATION FILED OCT. 21, 1904.

9 SHEETS—SHEET 1.



Witnesses
Chas. A. Leach
Geo. V. Rasmussen

Inventor
KURT BARTHELMES
By his Attorneys
Bartlett Burnes & Hutchinson

No. 795,020. PATENTED JULY 18, 1905.

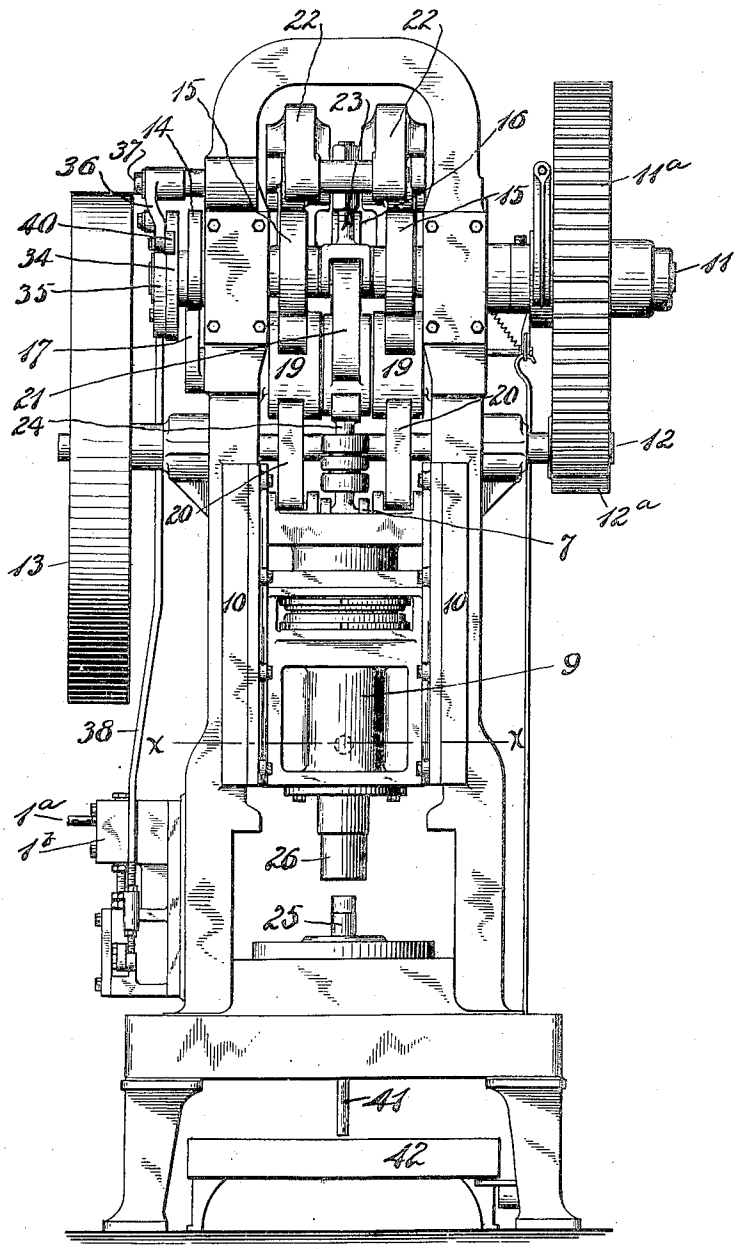
K. BARTHELMES.

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APPLICATION FILED OCT. 21, 1904.

9 SHEETS—SHEET 2.

Fig. 2.



Witnesses
Chas. A. Low
Geo. V. Rasmussen

Inventor
KURT BARTHELMES
By his Attorneys
Bartlett Brownell & Mitchell

No. 795,020. PATENTED JULY 18, 1905.

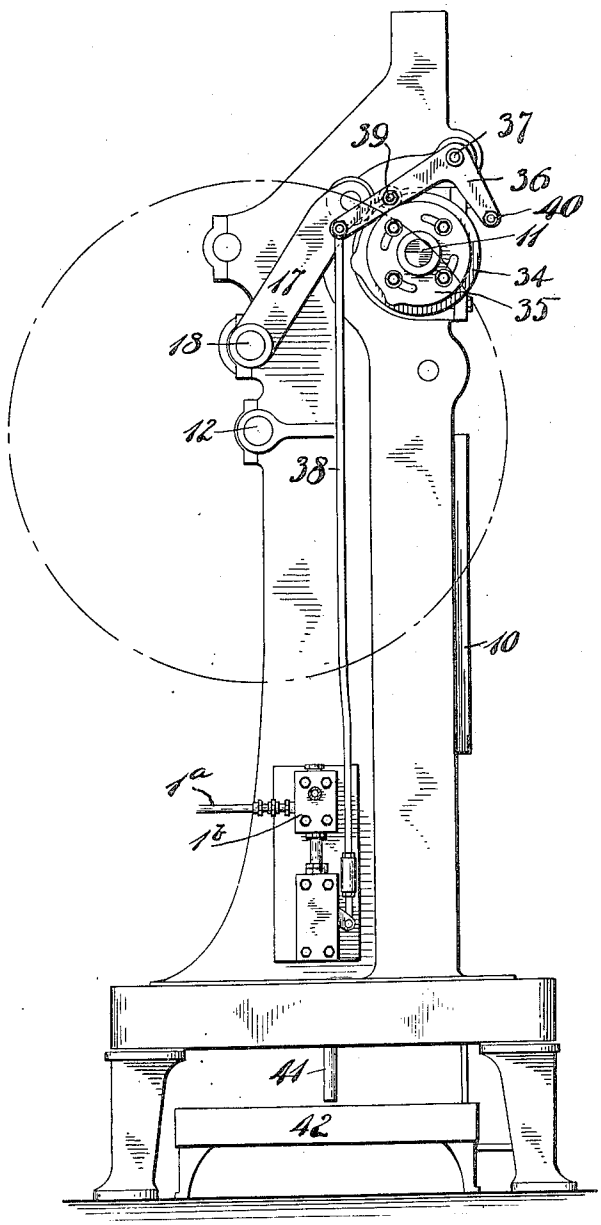
K. BARTHELMES.

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APPLICATION FILED OCT. 21, 1904.

9 SHEETS—SHEET 3.

Fig. 3.



Witnesses
Chas. A. Caryl
Geo. C. Rasmussen

Inventor
KURT BARTHELMES
By his Attorneys
Bartlett Brownell & Mitchell

No. 795,020. PATENTED JULY 18, 1905.

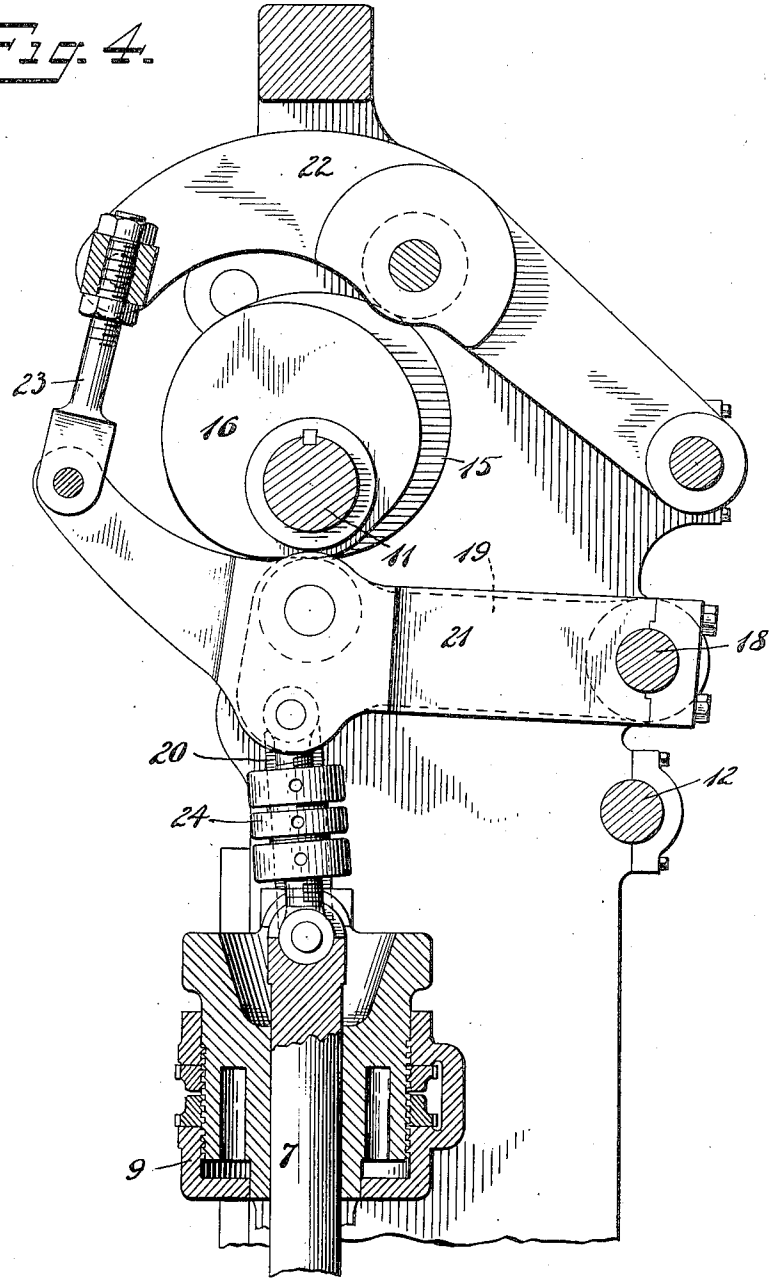
K. BARTHELMES.

APPARATUS FOR PRODUCING SEAMLESS KNOBS.

APPLICATION FILED OCT. 21, 1904.

9 SHEETS—SHEET 4.

Fig. 4.



Witnesses
Chas. A. Peard
Geo. V. Rasmussen

Inventor
KURT BARTHELMES
By his Attorneys
Baldwin Brownell & Underhead

No. 795,020. PATENTED JULY 18, 1905.

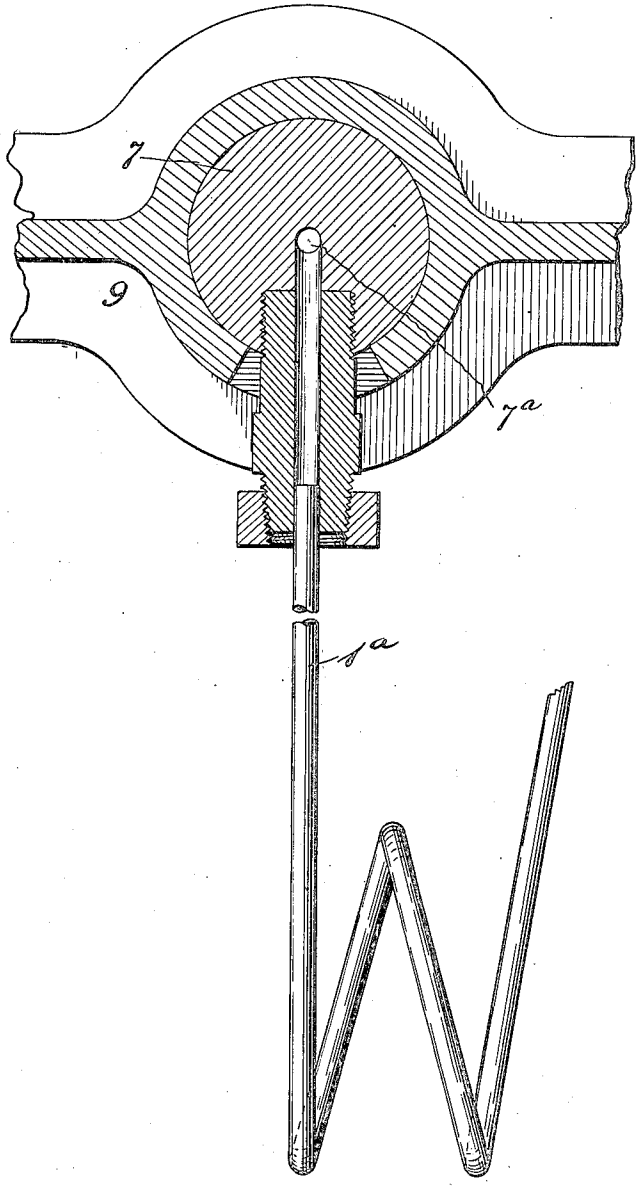
K. BARTHELMES.

APPARATUS FOR PRODUCING SEAMLESS KNOBS.

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9 SHEETS—SHEET 5.

Fig. 5.



Witnesses
Chas. A. Peed
Geo. V. Rasmussen

Inventor
KURT BARTHELMES
By his Attorneys
Bartlett, Brownell & Mitchell

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K. BARTHELMES.

APPARATUS FOR PRODUCING SEAMLESS KNOBS.

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9 SHEETS—SHEET 6.

Fig. 6.

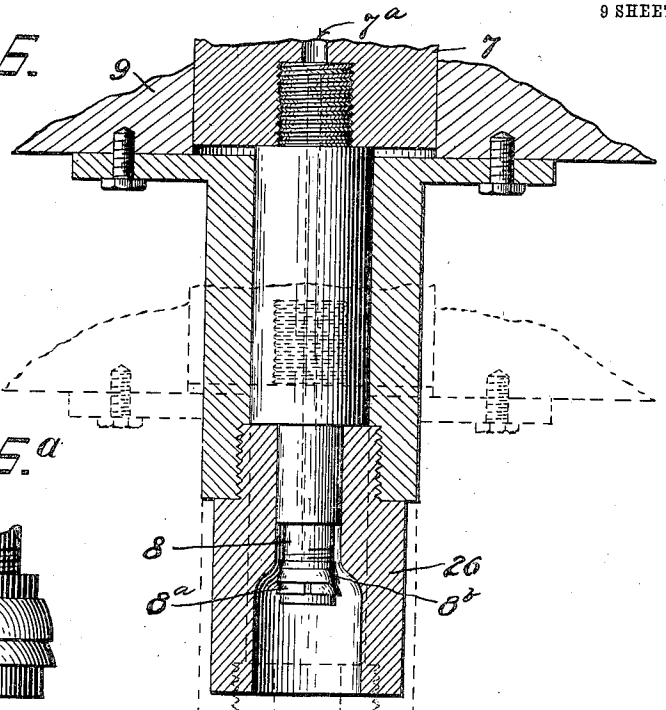


Fig. 6a.

Fig. 7.

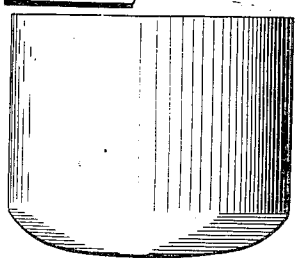
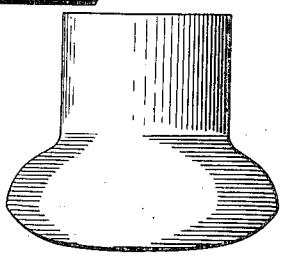


Fig. 8.



Witnesses
Chas. A. Gaud
Geo. P. Rasmussen

Inventor
KURT BARTHELMES.
By his Attorneys
Bakewell Browne & Hutchens

No. 795,020. PATENTED JULY 18, 1905.

K. BARTHELMES.

APPARATUS FOR PRODUCING SEAMLESS KNOBS.

APPLICATION FILED OCT. 21, 1904.

9 SHEETS—SHEET 7.

Fig. 9.

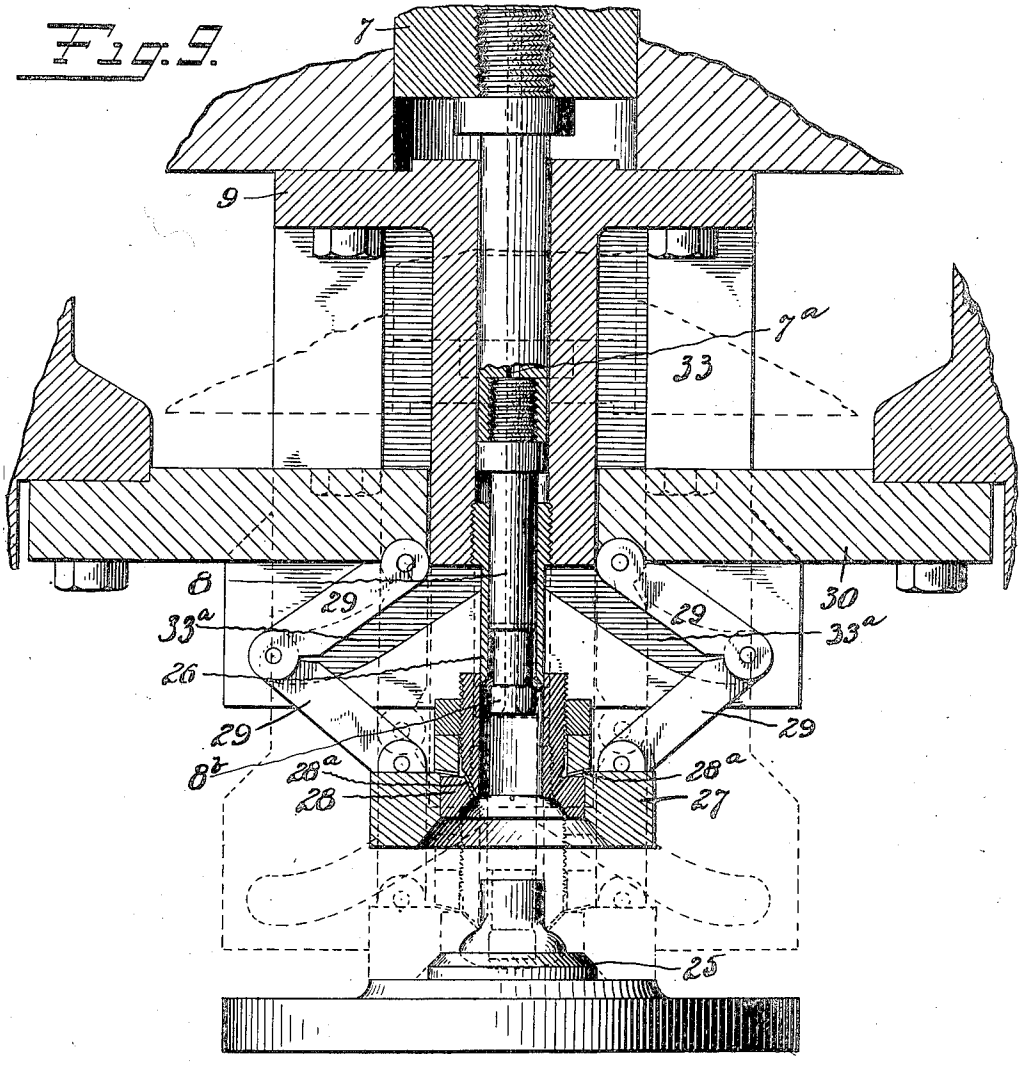
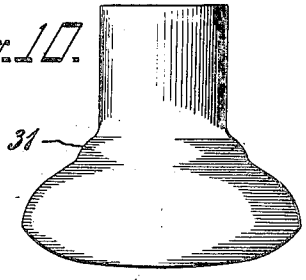


Fig. 10.



Witnesses
Chas. A. Peabody
Geo. T. Rasmussen

Inventor
KURT BARTHELMES
By his Attorneys
Baldwin Bronson & Peabody

No. 795,020. PATENTED JULY 18, 1905.

K. BARTHELMES.

APPARATUS FOR PRODUCING SEAMLESS KNOBS.

APPLICATION FILED OCT. 21, 1904.

9 SHEETS—SHEET 8.

Fig. 11.

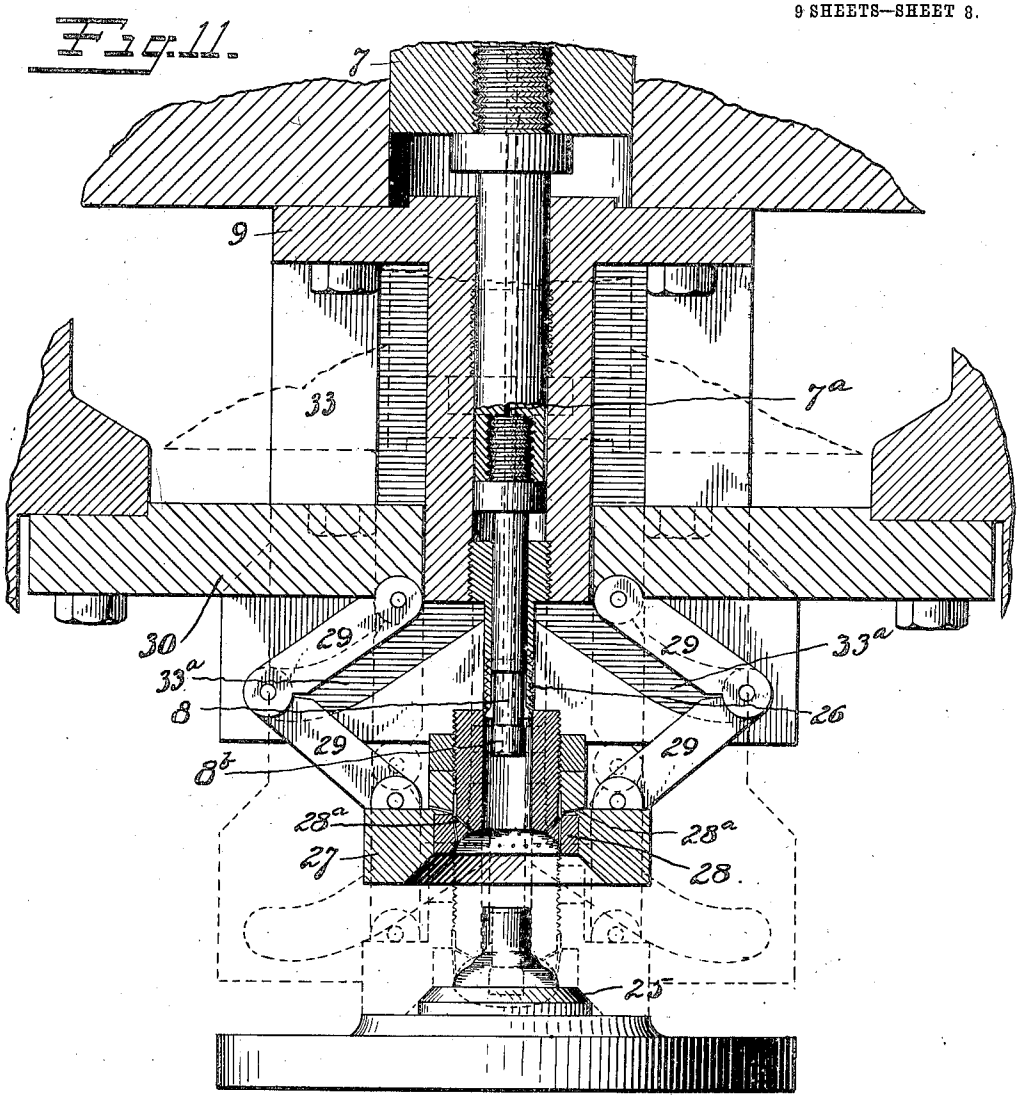
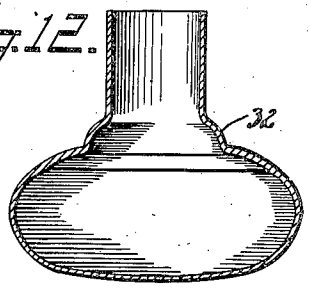


Fig. 12.



Witnesses
Chas. A. Peard
Geo. V. Rasmussen

Inventor
KURT BARTHELMES
By his Attorneys
Baldwin Bronson & Hubbard

No. 795,020. PATENTED JULY 18, 1905.

K. BARTHELMES.

APPARATUS FOR PRODUCING SEAMLESS KNOBS.

APPLICATION FILED OCT. 21, 1904.

9 SHEETS—SHEET 9.

Fig. 13.

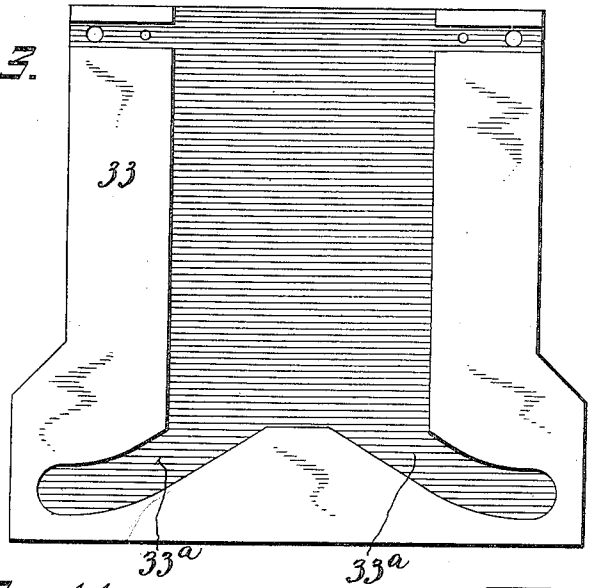


Fig. 14.

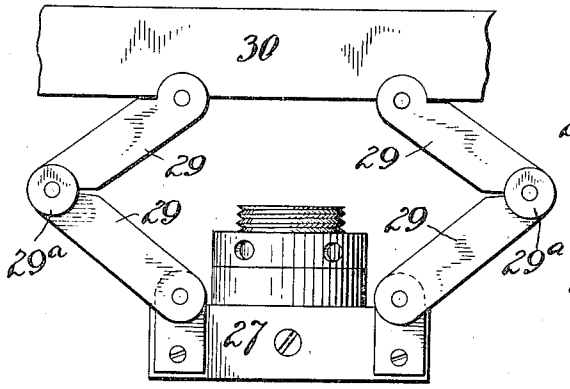
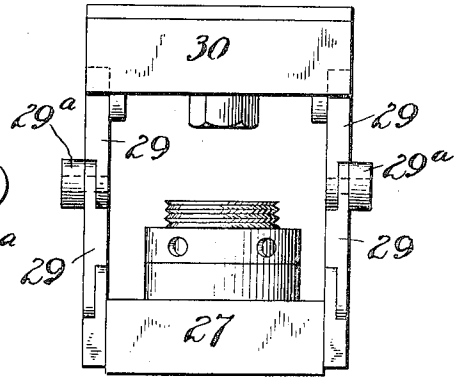


Fig. 15.



WITNESSES:

Chas. Weard

INVENTOR.

KURT BARTHELMES

BY

ATTORNEYS

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No. 795,020. Patented July 18, 1905.

UNITED STATES PATENT OFFICE.

KURT BARTHELMES, OF NEW BRITAIN, CONNECTICUT, ASSIGNOR TO P. & F. CORBIN, OF NEW BRITAIN, CONNECTICUT, A CORPORATION OF CONNECTICUT.

APPARATUS FOR PRODUCING SEAMLESS KNOBS.

SPECIFICATION forming part of Letters Patent No. 795,020, dated July 18, 1905.

Application filed October 21, 1904. Serial No. 229,469.

To all whom it may concern:

Be it known that I, KURT BARTHELMES, a citizen of the United States, residing at New Britain, Hartford county, Connecticut, have invented certain new and useful Improvements in Apparatus for Producing Seamless Knobs, of which the following is a full, clear, and exact description.

My invention relates to improved apparatus for the production of seamless knobs.

The main object of my invention is to provide an apparatus for the production of knobs from sheet metal, whereby said articles may be produced with rapidity, uniformity, and at little expense.

In the accompanying drawings, Figure 1 is a diagrammatic view of the apparatus employed by me in producing door-knobs. Fig. 2 is a relatively enlarged front elevation of the press. Fig. 3 is a side elevation of the press, some of the parts being detached. Fig. 4 is a side elevation on a still larger scale of certain details of construction. Fig. 5 is an enlarged cross-section of certain parts on the plane of the line $x x$, Fig. 2. Fig. 6 is a sectional view of certain parts detached. Fig. 6^a is a relatively enlarged detail view. Fig. 7 is a relatively enlarged side elevation of an article operated upon by the dies shown in Fig. 6. Fig. 8 is a similar view of the article after it has been operated upon by the said dies. Fig. 9 is a sectional view of other dies employed to transform the shape of the article of Fig. 8 to that of Fig. 10. Fig. 10 is an elevation of the article produced by the dies of Fig. 9. Fig. 11 is a sectional view of certain other dies adapted to act upon an article of Fig. 10 and convert it into an article like that shown in Fig. 12. Fig. 12 is a sectional view of the article produced by the dies of Fig. 11. Fig. 13 is a view of the inside of one of the guide-plates detached. Fig. 14 is a front elevation of certain toggle-levers with associated parts detached. Fig. 15 is an end elevation thereof.

The method or process of manufacture employed by me to produce seamless knobs is made the subject-matter of another application; but in order that the mechanism employed may be more easily understood I will first briefly describe said process. It comprises taking a cup-shaped blank (which may be easily formed in any well-known manner and conforming generally to the outline of the article of Fig. 7) and applying external pressure to the side walls by a suitable die to convert its form to that of the article of Fig. 8. During this operation its interior is reinforced by liquid under heavy pressure, which liquid serves the purpose of a mandrel. This contracting of the side wall forms the contracted shank portion of the article, which, if desired, may be further contracted by the external application of a smaller die, whereby the article will assume the appearance of that shown in Fig. 10, the shank of which, if desired, may be still further contracted by a still smaller die, so that it will approximate the outline indicated in Fig. 12, and so on. During all of the steps of contracting the side wall the article is internally reinforced by liquid under heavy pressure, as aforesaid. This liquid I introduce into the article in any suitable manner, preferably by means of a plunger, the end of which is allowed to enter the knob before the die encounters the outside of the same, which plunger may be withdrawn after the outside die has descended and while the latter is down, so that the inner wall of the shank will be ironed and drawn out to give to the same the desired thickness and a smooth and even contour both internally and externally. To this end I preferably provide at the inner end of the plunger a suitable enlargement, which when drawn through the shank encounters the inner side wall thereof, producing said drawing and ironing effect. Incidentally I may also apply such pressure to the liquid as to actually distend or blow out the walls of the bulbous portion of the article to cause it to conform to the inner wall of said surrounding dies.

Now referring to the drawings, 1 represents a compressor of any suitable construction and by means of which suitable fluid may be pumped through pipe 1^a into what I term an

"accumulator." The accumulator may also be of any suitable form, but preferably comprises a piston 2, vertically mounted in a cylinder 3. The piston 2 carries a weight or weights 4, which may be guided or steadied by rods 5 5. By the use of the compressor the piston 2 is forced upwardly, lifting the weight 4 until it encounters a lever 6, which it trips and by which the belt 6^d may be shifted from a fixed pulley 6^e to a loose pulley 6^f on a driving-shaft 6^g through the medium of suitable mechanism—for example, link 6^a, bell-crank lever 6^b, and belt-shifter 6^c. In Fig. 1 the belt is shown on the loose pulley and obviously the piston 2 and weight 4 are descending. When the weight nears its lowermost position, it engages a second lever 6^h, which it trips, throwing the belt from the loose pulley to the fixed pulley, whereupon the compressor 1 is driven, again lifting the weight. By this means a constant pressure may be maintained in the pipe 1^a, said pressure depending entirely upon the amount of weight at 4.

The pipe 1^a not only connects the compressor 1 with the cylinder of the accumulator, but also connects the latter with the press. Operating in the pipe 1^a and in time with the press is a suitable valve, the valve-case being indicated at 1^b. This pipe 1^a terminates in what I term an "inside gate" 7, which has a central liquid-passage 7^a, Fig. 5, leading down to and through a plunger 8, which latter preferably has near its lower end a split ring 8^a and a drawing head or enlargement 8^b, performing the functions hereinafter described. The inside gate has a reciprocal movement in an independently-movable outside gate 9. (See Figs. 5 and 6.) The back of the outside gate may be cut away sufficiently to permit the pipe 1^a to be connected to the inside gate and to allow of the proper independent reciprocal movement of said gates. The outside gate 9 is guided in suitable ways 10 10 and is designed to carry the dies which operate against the outer side of the article.

The particular means for operating the gates and opening and closing the valve in pipe 1^a in the proper time and for the intended purpose may be varied at will; but in the preferred form they comprise suitable cams mounted upon shaft 11, which shaft may be driven by gears 11^a and 12^a, the latter being mounted upon shaft 12, which in turn carries the fly-wheel 13.

14, 15, 15, and 16 are the inside and outside gate-operating cams. The cam 14 swings the lever 17, keyed on shaft 18.

19 19 are levers also keyed to shaft 18. The levers 19 are connected by links 20 20 to the outer gate 9. It follows, therefore, that the cam 14 will lift the outer gate 9. Between and independent of the levers 19 19 is a lever 21, which is freely supported on the shaft 18 and connected to lever 22 by means of link 23. The cams 15 15 serve to depress the outer gate 9 by engagement with antifriction-rollers carried by the levers 19 19. These cams 15 15 also serve to lift the middle gate by operating against antifriction-rollers carried by the levers 22 22. The cam 16 serves to depress the inside gate 7 by bearing against an antifriction-roll carried by the lever 21, the latter being connected to said inside gate 7 through the medium of link 24. The particular construction of the various unions, antifriction-bearings, and the like is immaterial to this invention, and therefore need not be described in detail. The cams 14, 15, and 16 are so set relatively to each other that the movement of the gates will be substantially as follows, for, say, a single operation. When a blank is placed upon the support 25 as indicated in Fig. 2, the cam 16 will move the inner gate 7 downward, causing the plunger 8 to enter the blank and to assume the position indicated in dotted lines, Fig. 6. During this operation it should be stated that the valve in the pipe 1^b is opened, allowing liquid to flow into and fill the said blank. The outside gate 9 then descends under the influence of cams 15 15, and the die 26, carried thereby, engages with the open end of the blank, reducing its diameter to correspond to said die and converting it from the form shown in Fig. 7 to the form shown in Fig. 8. The presence of the surrounding die 26 acts as a stopper to prevent the outflow of the liquid, which being under heavy pressure reinforces the blank from within and prevents the improper collapse of the same. When the outside die 26 is moved to the limit of its downward excursion, the cams 15 then operate the levers 22, lifting the same, and thereby the inside gate 7, withdrawing the plunger 8 from the blank, drawing it down to the desired thickness, and ironing out any unevenness in the inner wall of the shank. At or about this time the valve in pipe 1^a is closed. As soon as the split ring 8^a of the plunger 8 is withdrawn from the blank it expands and overstands the upper edge thereof. At this time the cam 14 swings the lever 17 and elevates the outer gate-carrying die 26. This movement is more rapid than that of the rising plunger 8, with the result that the latter serves as a stripper to free the blank from engagement with the surrounding wall of the die 26. The article thus formed may be termed a "knob" and for some purposes may be complete; but if it is desired to further reduce the diameter of the knob-shank this may be accomplished by substituting a smaller die—such, for example, as shown in Fig. 9. In this figure 27 is what I term a "holder" carrying a die 28, shaped on its inner side to correspond to the desired shape of the inner wall of the bulbous portion of the article to be produced. This holder is suspended by toggle levers or links 29 29, hung from a stationary part 30 of the frame of the press.

The outside gate 9 carries a die 26, as before, the inner wall of which is of smaller diameter than the diameter of the blank upon which it is to operate, the function of the same being to reduce the said shank to the desired dimensions. The intermediate knuckles of the toggle-levers 29 29 may carry end rollers, which project into cam-grooves 33^a 33^a in plates 33, carried by the outer gate 9. The lower ends of these grooves flare outwardly, while the intermediate and upper ends of said grooves are vertical. By referring now to Fig. 9, it will be seen that when the plates 33 descend the first movement will cause the toggle-levers 29 29 to straighten out, moving the holder 27 rapidly downward in advance of the die 26. When the holder 27 is in its lowermost position, with its die 28 engaging with the blank being operated upon, the toggle-levers will be straightened out. The further descent of the plates 33 and the outside gate 9 is permitted by reason of the fact that the rollers at the ends of the toggle-levers will then lie in line with the vertical parts of the grooves 33^a. The further descent of the outside gate will continue to move the die 26 downwardly. The plunger 8 will, as before, move in advance of the die 26 and will consequently enter the blank before the shank thereof is contracted by said die 26. When this is accomplished, the plunger 8 will, as before, be withdrawn in advance of the die 26; but in this case said plunger need not operate as a stripper, because the holder 27 will perform that function while the die 26 is being elevated. When, however, the inclined walls near the lower ends of the grooves 33^a 33^a encounter the rollers at the intermediate joint of the toggle-levers, the latter will be expanded and the toggle-levers foreshortened, quickly drawing up the holder 27, which freely leaves the blank. It should be stated that while the holder is in its down position the pressure of liquid within the knob-blank tends to force out or blow out the side walls of the knob to conform to the shape of the die 28. To permit this, suitable backflow-ports 28^a are provided in said die 28, so that any liquid contained between the inner wall of said die and the outer wall of said blank may flow out. Should it be desired to still further reduce the diameter of the shank, a similar set of holders, dies, and toggle-levers to that illustrated in Fig. 9 may be employed, the same being indicated in Fig. 11 by similar characters, the proportions only being varied.

In the second operation incidental to the use of the particular die shown in Fig. 9 it will be observed that there will be an annular ridge 31 produced in the side wall of the blank between the shank and body portion. (See Fig. 10.) While such a ridge is common in a finished knob, it is obvious that if it is desired to further reduce the shank of the knob from that shown in Fig. 10 it will be desirable to remove said ridge, so as to give the bulbous portion of the knob an even contour. For this reason in working the third operation sufficient weight may be provided on the accumulator to give the proper pressure to force out the bulbous portion of the shell to conform to the shape of the die 28 in the holder 27, (shown in Fig. 11,) thus removing the ridge 31, shown in the blank of Fig. 10. The particular die 26 (shown in Fig. 11) will leave in the blank shown in Fig. 12 the annular ridge 32, which may be retained finally as an ornament to the finished knob. Obviously by the use of another die in place of the die 26 of Fig. 11, but having the same diameter and a square end, the junction of the knob-shell and the knob-shank could be made abrupt or angular instead of rounded, as shown in Fig. 12.

From the foregoing it will be seen that the pressure of the liquid within the shell is useful not only as a reinforcement, but also to expand the bulbous portion of the knob to cause the external wall thereof to correspond to the contour of the shell-shaping die 28, carried by the holder 27, whatever that may be.

The valve-operating mechanism, whereby the valve and pipe 1^a is opened and closed at the proper time, may be of any suitable form, but is preferably as indicated best in Fig. 3. In this view 34 35 are cams on shaft 11. One of these cams—for example, 34—may be fixed thereon, while the other may be adjustable, suitable means, such as bolts, being employed to fix said cam 35 on cam 34, but to allow of angular adjustment of the one relatively to the other. The cam 35 may be the one employed to open the valve, while the cam 34 closes the same. In the special arrangement shown the moment of opening may be varied by shifting the angular position of cam 35 relatively to cam 34. These cams 34 and 35 operate on a lever 36, hinged at 37 and connected to the valve mechanism through the link 38. 39 40 are offsets on the lever-arm 36. When the parts are in the position shown in Fig. 3, the valve will be closed. In this position it will be observed that the offset 39 stands in the path of the high part of the cam 35. At the proper instant this high part of said cam will engage said offset and shift the lever 36 and open the valve, incidentally bringing the offset 40 into the path of movement of the high part of the cam 34, which when the latter reaches said offset trips the lever 36 and closes the valve. Any overflow of liquid from the article to be formed may be caught in a hollowed-out part of the press-frame and thence conducted through pipe 41 to a pan 42.

To prevent bursting the knob, the valve in the pipe 1^a should be open while the die is contracting the side walls thereof. This action of the die tends to displace a small portion of the liquid or fluid within the knob, and obviously if it could not flow back it

would at least distort and possibly break the unreinforced part of the shell or blank. The importance, therefore, of providing means to vary the time of operating the valve is manifest.

I have sought to make it clear that the accompanying illustrations and description set forth only the preferred form of the apparatus employed by me for producing seamless knobs. This apparatus, it is obvious, may be modified in many ways without departing from the spirit and scope of this invention.

What I claim is—

1. In an apparatus for forming knobs from cup-like blanks, a support therefor, means for supplying liquid under pressure to the interior of said blank and a die for contracting the side walls of said blank to form a shank of reduced diameter.

2. In an apparatus for forming knobs from cup-like blanks, a support therefor, means for supplying liquid under pressure to the interior of said blank, a die for contracting the side walls of said blank to form a shank of reduced diameter, and a plunger arranged to enter said blank in advance of said die and to be withdrawn through the shank portion thereof before said die is withdrawn from said blank.

3. In an apparatus for forming knobs from cup-like blanks, a support therefor, means for supplying liquid under pressure to the interior of said blank, a die for contracting the side walls of said blank to form a shank of reduced diameter, and a plunger arranged to enter said blank in advance of said die and to be withdrawn through the shank portion thereof before said die is withdrawn from said blank, a portion of said plunger overstanding and holding said blank while said die is being elevated whereby the former will act as a stripper.

4. In an apparatus for forming knobs from cup-like blanks, means for supporting said blank, a plunger arranged to enter said blank, means for supplying a liquid to the interior of said blank, means for applying heavy pressure to said liquid, a holder-die for said blank and means for moving said holder-die into contact with said blank whereby the pressure of liquid within said blank will expand the bulbous portion thereof to correspond to the shape of the adjacent wall of said holder-die.

5. In an apparatus for forming knobs from cup-like blanks, means for supporting said blank, a plunger arranged to enter said blank, means for supplying a liquid to the interior of said blank, means for applying heavy pressure to said liquid, a holder-die for said blank and means for moving said holder-die into contact with said blank whereby the pressure of liquid within said blank will expand the bulbous portion thereof to correspond to the shape of the adjacent wall of said holder-die, and outlets or backflow-ports in said holder-die.

6. In an apparatus for forming knobs from cup-like blanks, means for supporting said blank, a plunger arranged to enter said blank, means for supplying a liquid to the interior of said blank, means for applying heavy pressure to said liquid, a holder-die for said blank and means for moving said holder-die into contact with said blank whereby the pressure of liquid within said blank will expand the bulbous portion thereof to correspond to the shape of the adjacent wall of said holder-die, and a shank-forming die arranged to follow said holder-die down and to engage with the shank of said blank and reduce its diameter after said holder-die has reached its operative holding position.

7. In an apparatus for forming knobs from cup-like blanks, means for supporting said blank, a plunger arranged to enter said blank, means for supplying a liquid to the interior of said blank, means for applying heavy pressure to said liquid, a holder-die for said blank and means for moving said holder-die into contact with said blank whereby the pressure of liquid within said blank will expand the bulbous portion thereof to correspond to the shape of the adjacent wall of said holder-die, a shank-forming die arranged to follow said holder-die down and to engage with the shank of said blank and reduce its diameter after said holder-die has reached its operative holding position, and means to cause said shank-shaping die to be withdrawn from engagement with said blank before said holder is removed therefrom.

8. In a press for forming knobs from cup-like blanks, inner and outer gates, means for moving said gates independently up and down, said means being arranged to move the inner gate downwardly in advance of the outer gate and upwardly in advance of said outer gate, a pipe for conducting liquid, a valve therein and means operating in time with said gates to open and close said valve.

9. In a press for forming knobs from cup-like blanks, an inner and an outer gate, means for moving said gates independently, said means being arranged to move said inner gate downwardly in advance of the outer gate and upwardly in advance of said outer gate, a passage through said inner gate, a hollow plunger carried thereby, a pipe for conducting liquid to said plunger, a valve in said pipe, and adjustable means for controlling the time of operation of said valve.

10. In an apparatus for forming knobs from cup-shaped blanks, a press for operating directly and externally upon said blanks, an accumulator wherein a heavy pressure of fluid is maintained, a pipe leading from said accumulator to said press for directing fluid into

a blank when the same is in position on the press, and means to maintain in said accumulator a continuous pressure during the contraction of said blank.

11. In an apparatus for forming knobs from cup-shaped blanks, a press, a die operated by said press and arranged to engage the outer side walls of said blank at the opening thereof, whereby the side walls may be contracted, means to supply fluid to the interior of said blank preparatory to the application of said die thereto.

12. In an apparatus for forming knobs from cup-shaped blanks, a press, a die operated by said press and arranged to engage the outer side walls of said blank at the opening thereof, whereby the side walls may be contracted, means to supply fluid to the interior of said blank preparatory to the application of said die thereto, said die acting as a stopper to prevent the outflow of the liquid.

13. In an apparatus for forming knobs from cup-like blanks, a support for the blank, a die for contracting the side walls of said blank to form a shank of reduced diameter, a liquid-supply pipe arranged to conduct liquid into said blank, means for maintaining said liquid under heavy pressure while the die is operating upon said blank, and a valve for cutting off said liquid-supply after the said die has performed its function.

Signed at New York, N. Y., this 19th day of October, 1904.

KURT BARTHELMES.

Witnesses:
R. C. MITCHELL,
L. VREELAND.