(No Model.) 3 Sheets—Sheet 1.

J. I. WARMAN & C. WINTER.

APPARATUS FOR MAKING WHEEL HUBS FROM TUBULAR BLANKS.

No. 567,328. Patented Sept. 8, 1896.

Fig. 1.

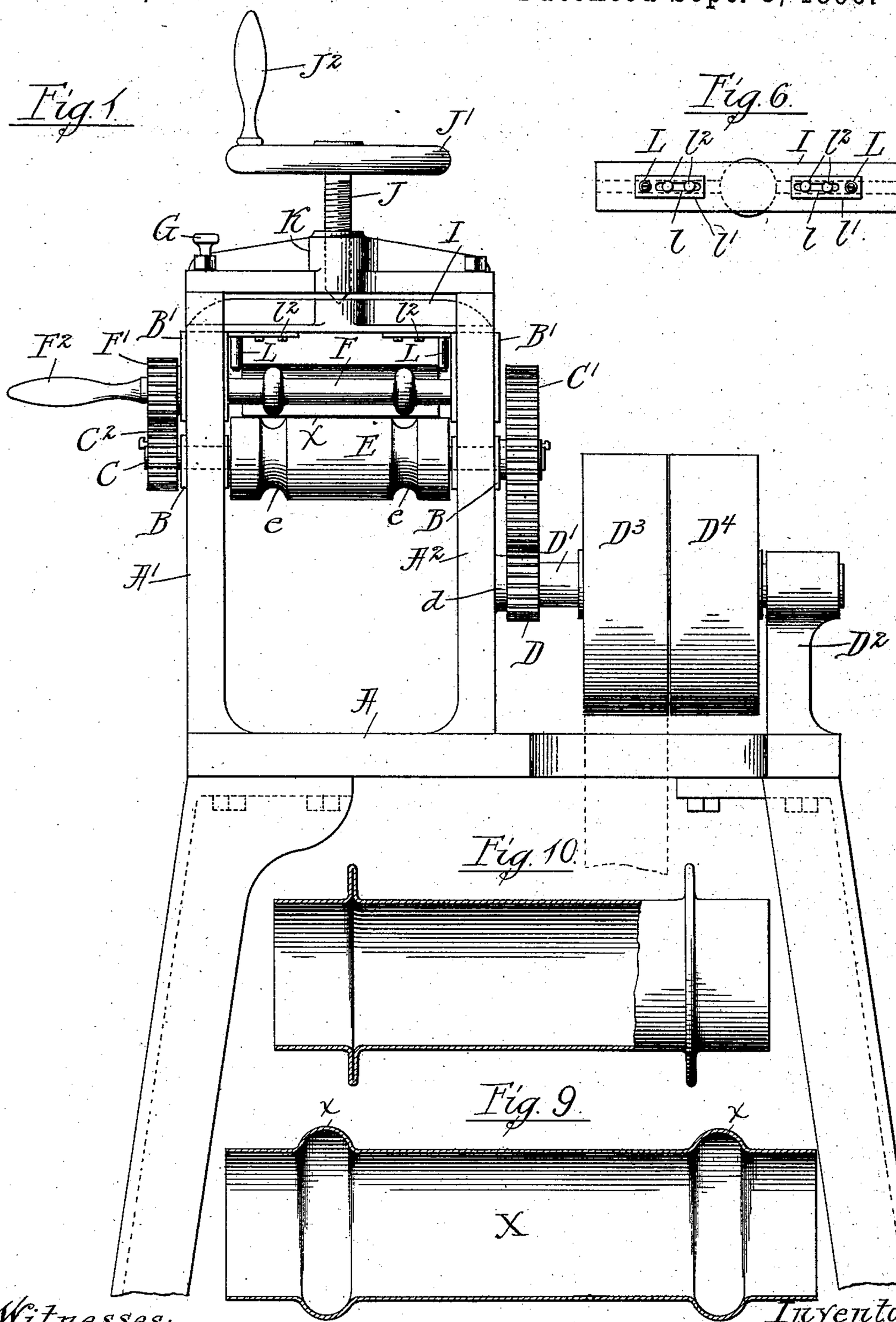

Fig. 6.

Fig. 10.

Fig. 9.

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Fig. 2.

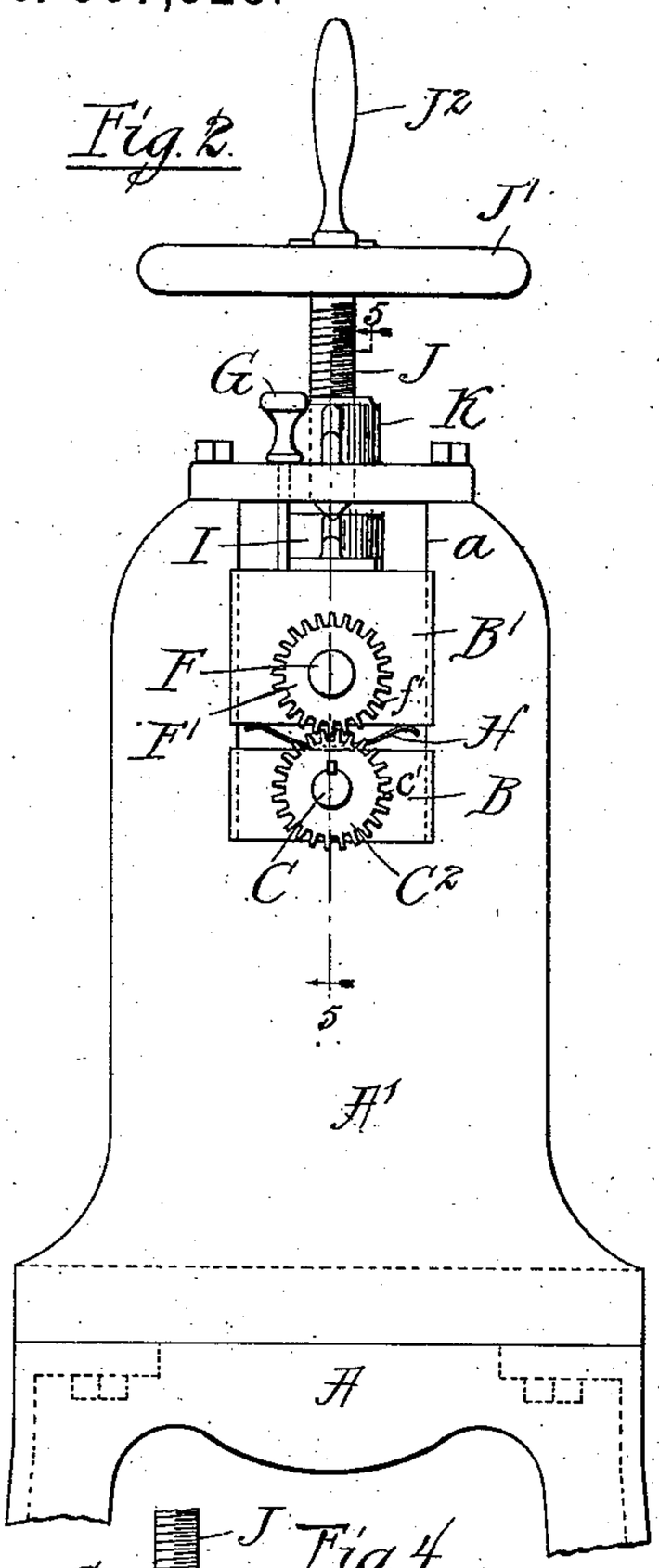


Fig. 3.

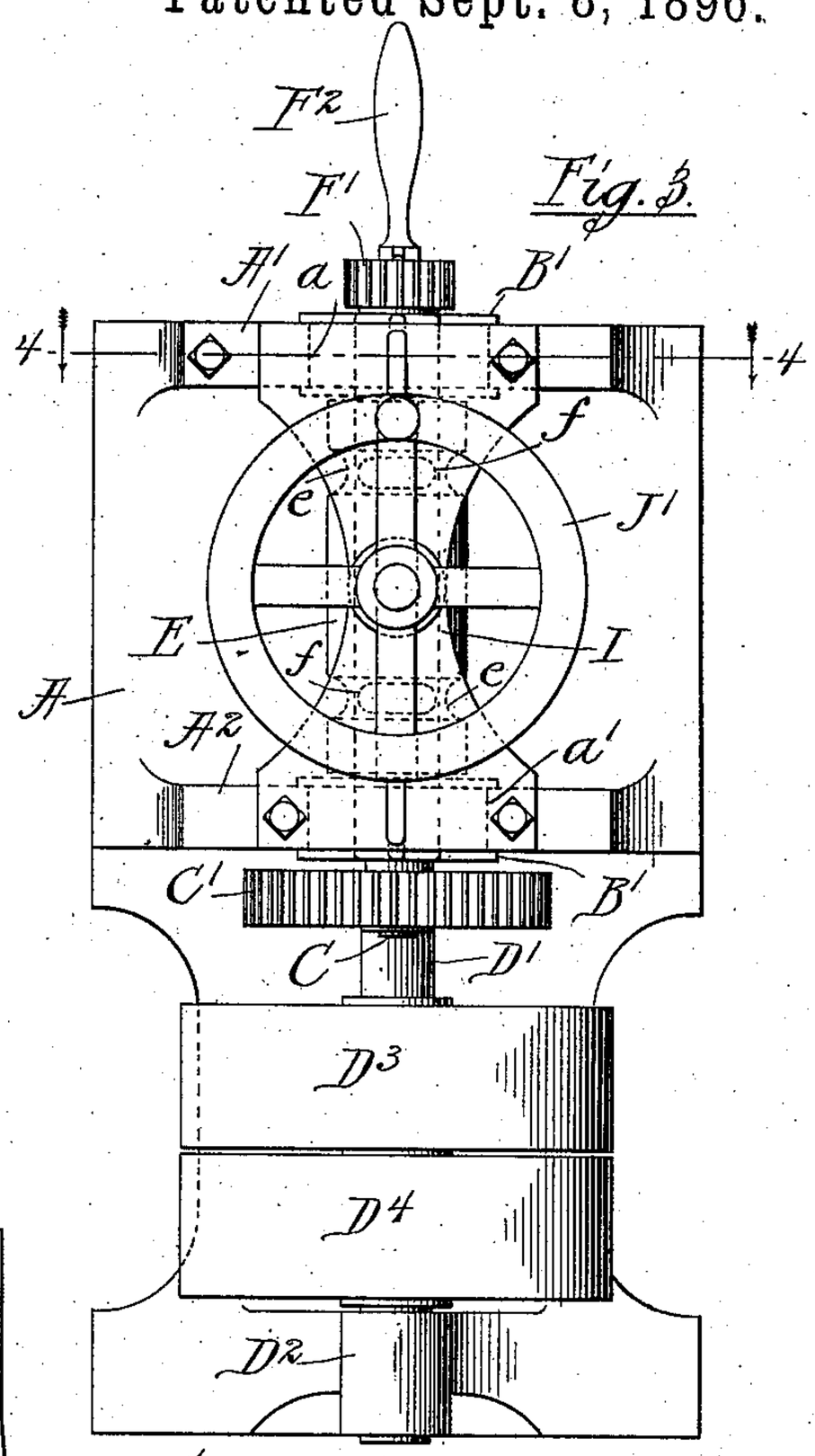


Fig. 4.

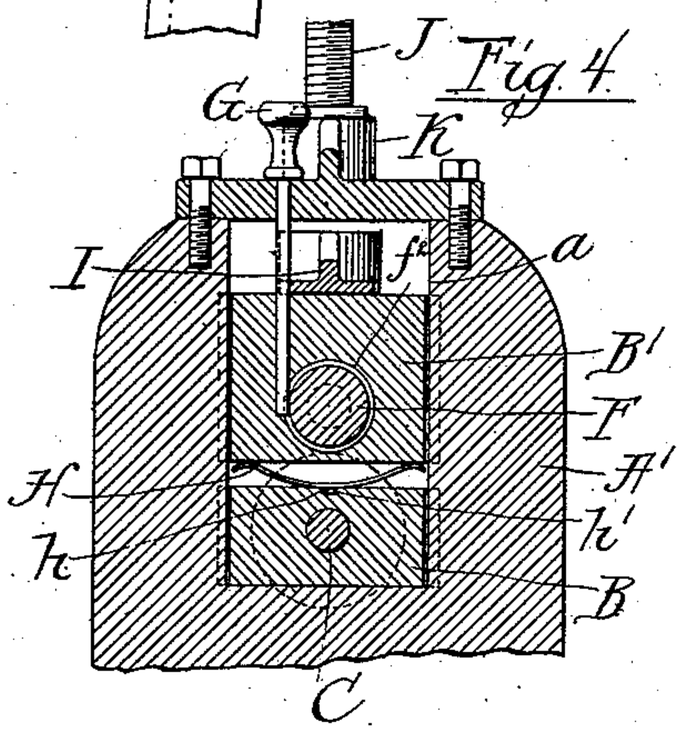
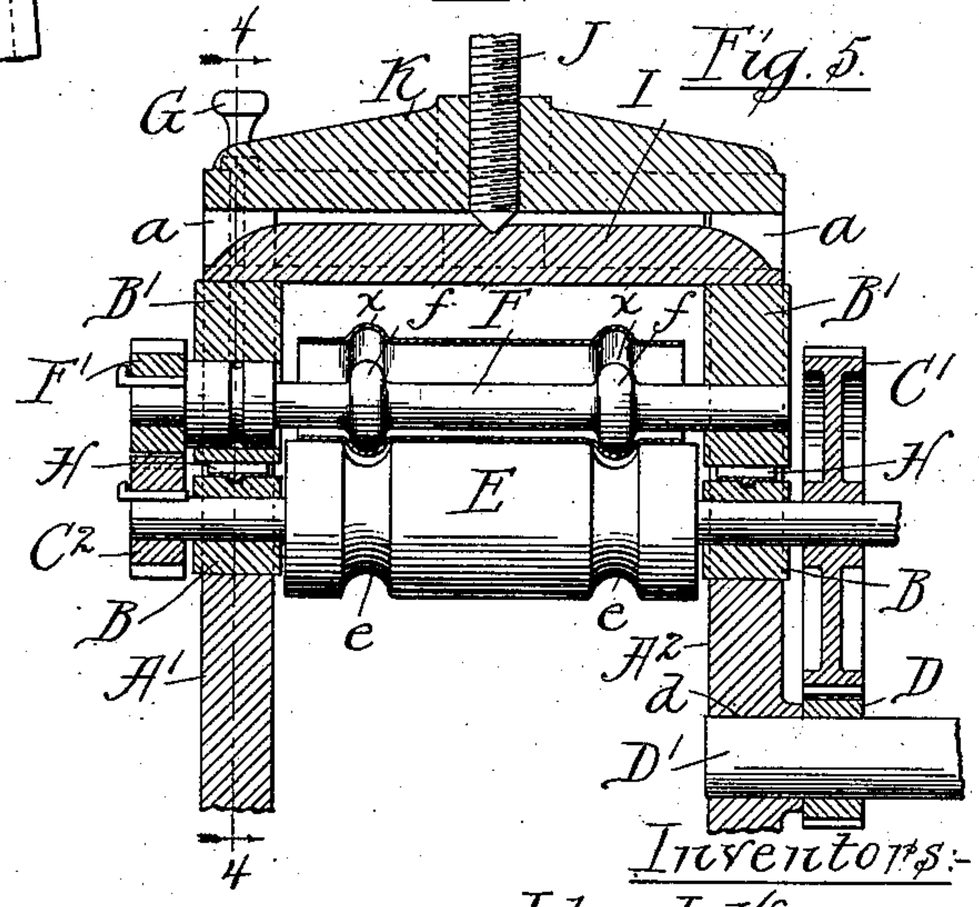


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 7.

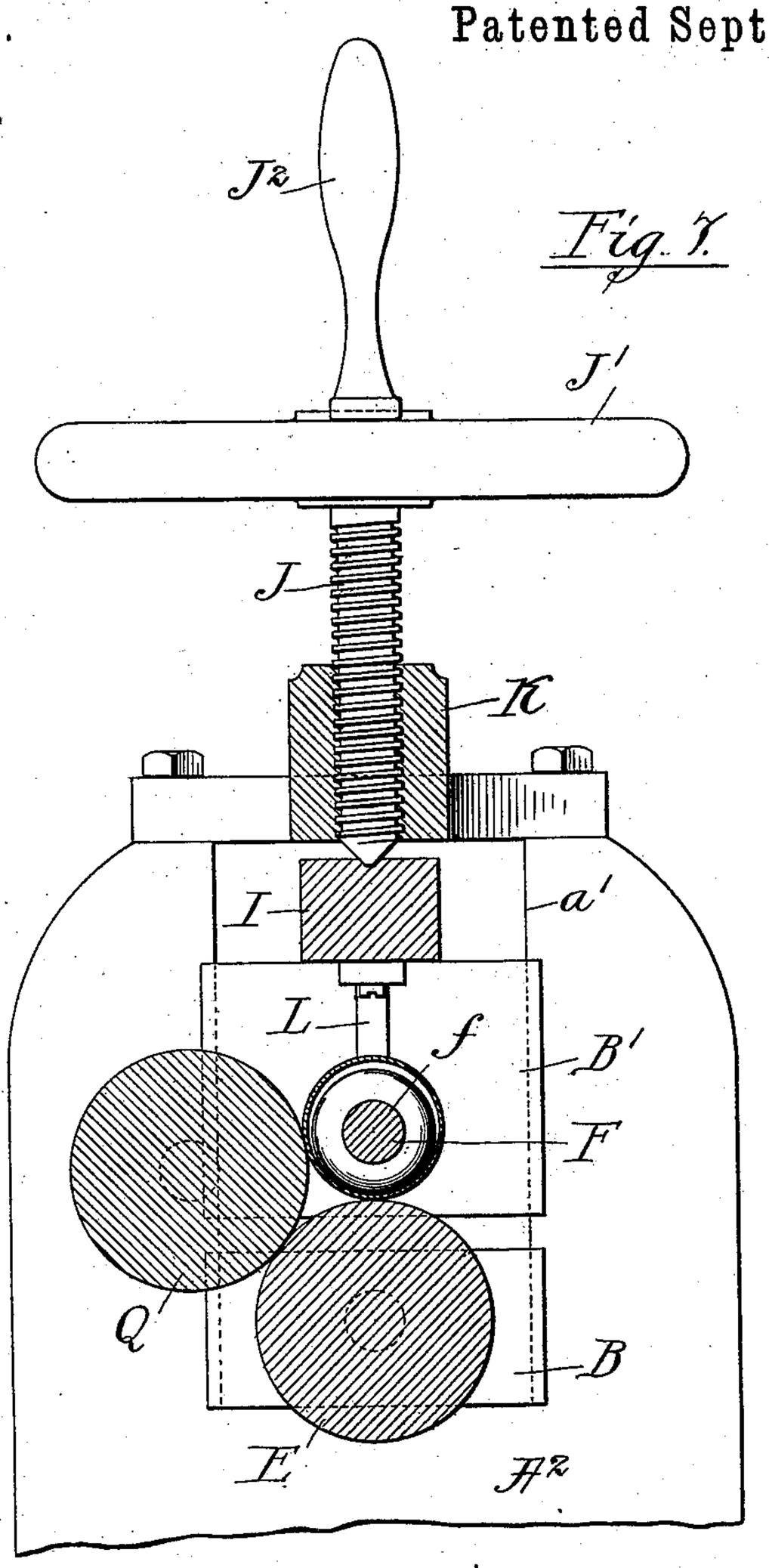
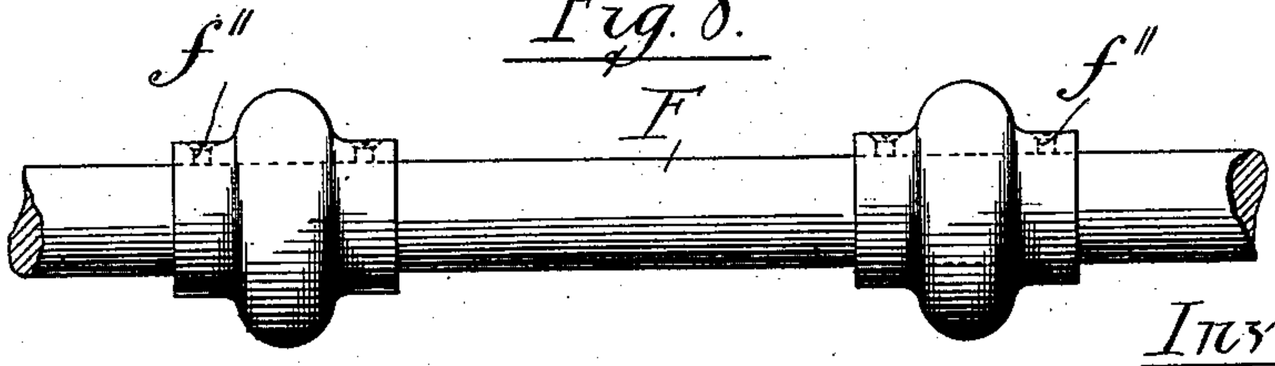


Fig. 8.



Witnesses:-
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by:- Dayton, Poole & Brown their Att'ys

UNITED STATES PATENT OFFICE.

JOHN I. WARMAN AND CARL WINTER, OF CHICAGO, ILLINOIS.

APPARATUS FOR MAKING WHEEL-HUBS FROM TUBULAR BLANKS.

SPECIFICATION forming part of Letters Patent No. 567,328, dated September 8, 1896.

Application filed September 12, 1895. Serial No. 562,240. (No model.)

To all whom it may concern:

Be it known that we, JOHN I. WARMAN and CARL WINTER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Making Wheel-Hubs from Tubular Blanks; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to an improved apparatus for making wheel-hubs and other articles from tubular metal blanks, and relates more particularly to a method of and means for expanding such blanks to a desired conformation by means of suitable tools applied to the interior thereof.

The object of the invention is to provide an extremely simple and improved construction in apparatus of the character referred to; and the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims.

The invention is herein described as used in the production of a bicycle-hub of improved construction.

As heretofore commonly constructed bicycle-hubs have either been drop-forged or, under more recent practice, turned out from a solid block of steel. Obviously either of these methods of construction necessitates a very considerable amount of work in the production of the finished hub, and because of the liability of making the hub unduly weak in some one place it has been necessary and it has been the common practice to make the hub of considerably greater weight than would be necessary to insure the proper strength were it certain that no flaws or weakened places existed in the structure.

By our improved apparatus the hub is made from a piece of metal tubing, preferably drawn steel, which by proper manipulations is caused to assume the required conformation and a hub thereby produced of a determined and substantially uniform thickness and of a known degree of strength. At the same time a large amount of time and labor is saved and the work of an ordinary attendant substituted for the relatively expensive labor of a skilled turner or drop-forge attendant, resulting in a very substantial saving in the cost of manufacture and at the same time the production of a more uniform and better article.

In practicing our invention, in the preferred manner, to produce a bicycle-hub, the steps are substantially as follows: A section of steel tubing of proper length is supported in a suitable manner so as to rotate about a longitudinal axis and a suitable tool is inserted within the blank and brought into forcible rolling contact with the interior of the latter as it rotates, the pressure of the tool being exerted in a radially-outward direction. The exterior of the tubing being supported against such outward pressure adjacent to but not opposite the point of contact of the tool with the interior of the tubing, the result is that as the blank is rotated an annular groove or expansion will be produced in the interior of the blank and a corresponding annular rib, bead, or flange upon the exterior thereof, this expanded portion being gradually enlarged or forced outward until the desired size has been reached.

The invention will be more readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation of a machine for carrying out our invention, the lower parts of the leg-standards being broken away to reduce the size of the figure. Fig. 2 is a side elevation of the same. Fig. 3 is a top plan view of the machine. Fig. 4 is a transverse vertical section taken on line 4 4 of Fig. 5. Fig. 5 is a longitudinal vertical section taken on line 5 5 of Fig. 2, showing a blank in axial section in position between the forming-rollers. Fig. 6 is a bottom plan view of the presser-bar, showing more particularly the arrangement of the adjustable guides. Fig. 7 is a view in central transverse vertical section of the upper part of a modification of the machine shown in Figs. 1 to 6. Fig. 8 is a detail of a modified form of expanding-roller. Fig. 9 is a detail of the tubular blank in axial section, showing its form after having been expanded. Fig. 10 is a view of the same blank in its final form.

As shown in said drawings, A designates,

as a whole, a suitable table or supporting-frame, provided at one end and near its central portion with parallel vertical supporting-standards A′ A², respectively. Each of said standards is provided in its upper end with a vertical guide-slot *a*, within which are mounted two journal-blocks B B′, adapted to slide vertically within the slot *a*. The lower pair of said journal-blocks B B are adapted to rest directly against the lower end of the slots *a* and support within their bearing-apertures the ends of a shaft C, extending transversely between the standards A′ A². One end of said shaft C is provided with a gear-wheel C′, keyed thereon exterior to the standard A², which gear-wheel intermeshes with and is driven by a pinion D, mounted upon a shaft D′, suitably supported in a bearing *d*, carried by the lower part of the supporting-standard A², and a pillow-block D², mounted and rising from the table A. The shaft D is provided with the usual fast and loose pulleys D³ D⁴, through which power is communicated by means of a belt to the shaft from any suitable counter-shaft or other source.

E designates a supporting-roller mounted rigidly upon the shaft C between the frame-standards, said supporting-roller being of general cylindric form and provided with two annular semicircular grooves *e e* near its respective ends.

F designates an expanding-roller revolubly mounted at its ends within the journal-blocks B′ B′, so as to extend above and parallel with the roller E. The smaller upper roller F is also made of cylindric form and is provided with circumferential beads arranged to register and fit within the grooves *e e* of the supporting-roller E when the bearings B B, carrying said roller F, are depressed to bring the latter into contact with the lower roller E. The beads *f f* are formed on a smaller radius than that of the grooves *e e*, so as to provide a space equal to the thickness of the wall of the blank between said interfitting parts when the latter are brought nearly together.

The expanding-roller F is driven from and uniformly with the supporting-roller E by means of intermeshing pinions F′ and C², provided with relatively long teeth *f′ c′*, which permit the distance between the rollers to be changed a considerable extent without separating the pinions arranged upon the end of the expanding-roller F and the end of the shaft C, respectively, exteriorly to the standard-frame A′. The expanding-roller F is made removable from its bearings by simply withdrawing it endwise therefrom in order to permit the placing of a blank thereon, being to this end provided with a handle F², and being held in operative position by means of a gravity-bolt G, arranged to slide vertically within the upper portion of the standard A′ and adapted to rest at its lower end in engagement with an annular groove *f*², formed in the journal of the roller F, the upper end of said gravity-bolt being provided with a suitable knob by means of which it may be raised when desired for the purpose of releasing the roller. The expanding-roller F is normally held in its position most remote from the supporting-roller E by means of semielliptical springs H H, interposed between the bearing-blocks B B′, said springs being held in position by means of rectangular-shaped lugs *h*, secured thereon, which engage corresponding recesses *h′*, formed in the proximate surfaces of the bearing-blocks B.

In order to depress the bearing-blocks B′ B′ and thus bring the expanding-roller F into forcible contact with the interior of the wall of the blank interposed between said rollers, a horizontally-disposed presser bar or plate I is arranged to extend between the standards with its ends within the upper parts of the vertical slots *a* and resting upon the upper surface of the bearing-blocks B′ B′.

J designates a feed-screw threaded vertically within a cap-plate K, rigidly secured to the upper ends of the standards A′ A², and arranged to impinge at its lower end upon the upper side of the presser-bar I, so as to depress the said bearing-blocks B′ B′ against the action of the springs H H. The upper end of the feed-screw J is provided with the usual hand-wheel J′ and handle J².

In order to prevent the tubular blank from endwise movement upon the expanding-roller F during the forming operation, roller-guides L L are secured to and depend vertically from the under side of the bar I in position to engage the respective ends of said blank. Said roller-guides are made adjustable lengthwise of the bar by means of slots *l l*, formed in their base portions *l′*, through which the attaching-screws *l*², by means of which said guides are secured to the part I, extend.

The operation of the device constructed as above described is as follows: The gravity-bolt G being lifted to release the expanding-roller F, the latter is withdrawn far enough to insert a tubular blank X between the guide-supports L L and in position for the expanding-roller to be inserted therethrough. The expanding-roller is then replaced and locked in operative position, the machine started, and the feed-screw turned on, so as to force the expanding-roller F toward the supporting-roller E and the bead portions thereof into forcible contact with the interior of the tube section interposed between the rollers. The frictional contact of the tube between the rollers rotates the blank and forms annular grooves opposite the beads, the outer surface of the tube gradually assuming a corresponding expanded or beaded form, as shown in Fig. 11. As the tube is expanded the feed-screw is gradually turned down to keep the expanding-roller in operative contact therewith until the bead *x* has been forced outwardly the full depth of the annular groove *e* or until the blank has been sufficiently expanded, whereupon the machine is stopped,

the expanding-roller withdrawn, and the blank removed. It may be noted at this point that the rollers are driven at a relatively slow rate of speed and that the action of the same upon the metal is a rolling and drawing action, as distinguished from a spinning action.

The blank when removed from the machine will have assumed the shape shown in Fig. 9, and in order to complete the formation of the spoke-flanges it is necessary to compress the opposite sides of the bead together to cause it to assume the form of a flat double-thick flange, as shown in Fig. 10. This shaping of the flanges may be performed by means of any suitable dies in a manner well understood by those skilled in the art.

In Figs. 7 and 8 is shown a modification of the machine illustrated in Figs. 1 to 6, in which an auxiliary idle-roller support Q is mounted parallel with and adjacent to the roller-support E and expanding-roller F, and at one side thereof. The supporting-roller Q is so arranged that when the machine is in operation the periphery of the same will rotate in contact with the lower supporting-roller E and with the exterior of the blank, said auxiliary roller being provided with annular grooves similar to and arranged to register with those of the roller E. The purpose of the roller Q is to maintain the blank in accurate parallelism with the expanding-roller F and supporting-roller E during the expanding operation.

In Fig. 8 we have shown a modification in which the expanding-rollers are made in the form of rings or collars F′, adjustably mounted upon a shaft F^2, and secured in position by means of suitable screws f''. It will of course be understood that when the longitudinal distance between the expanding-rollers is changed a supporting-roller E having its grooves *e e* arranged at corresponding distances apart will be used in lieu of the one shown.

We claim as our invention—

1. A machine for making wheel-hubs from tubular blanks, comprising a supporting-frame provided with parallel vertical standards, each provided with a vertical guide-slot, upper and lower journal-blocks arranged within each of the guide-slots, an expanding-roller mounted to extend between said standards, having its ends engaged with the upper pair of said journal-blocks and so constructed as to slide freely endwise from its bearings, a key arranged to hold the expanding-roller from endwise movement, a supporting-roller mounted to extend parallel with the said expanding-roller and having its ends engaged with the lower pair of journal-blocks, an annular depression formed in said roller-support at a point opposite the acting part of the periphery of the expanding-roller, a feed-screw arranged to act upon said upper pair of journal-blocks to depress the latter, and means for rotating the expanding-roller upon its longitudinal axis, substantially as described.

2. A machine for making wheel-hubs from tubular blanks, comprising a supporting-frame having parallel supporting-standards, each provided with a vertical guide-slot, upper and lower journal-blocks arranged within each of said guide-slots, an expanding-roller mounted to extend between said standards, having its ends engaged with the upper pair of said journal-blocks and arranged to slide endwise from its bearings, an annular groove in said roller, a keyway in the upper journal arranged to extend transversely of the roller and to intersect the annular groove thereof; a key adapted to fit said keyway and engage the groove of the roller, a supporting-roller arranged to extend parallel with said expanding-roller and having its ends engaged with the lower pair of journal-blocks, said supporting-roller being provided with a circumferential depression arranged opposite the acting part of the periphery of the expanding-roller, a feed-screw arranged to act upon said upper pair of journal-blocks to depress the latter, intermeshing pinions mounted upon the ends of said expanding and supporting rollers, respectively, and means for rotating one of said parts, substantially as described.

3. A machine for making wheel-hubs from tubular blanks, comprising a supporting-frame, provided with parallel vertical standards, each provided with a vertical guide-slot, upper and lower journal-bearings arranged within each of said guide-slots, an expanding-roller shaft mounted to extend between said standards, having its ends engaged with the upper pair of said journal-bearings, provided with annular expanding-ribs and made accurately cylindric throughout its main length at each side of the ribs, and arranged to slide endwise from its bearings, an annular groove in said roller, a keyway in the upper journal arranged to extend transversely of the roller and to intersect the annular groove thereof; a key adapted to fit said keyway and engage the groove of the roller, a supporting-roller mounted to extend parallel with said expanding-roller shaft and having its ends engaged with the lower journal-bearings, said supporting-roller being provided with circumferential depressions arranged opposite the peripheries of the said expanding-rollers, a feed-screw arranged to force the expanding and supporting rollers together, springs acting in opposition to said feed-screw, guides arranged to hold the blank from longitudinal movement, intermeshing pinions connecting said expanding and supporting rollers, and means for rotating the latter, substantially as described.

4. A machine for making wheel-hubs from tubular blanks, comprising a supporting-frame provided with parallel vertical standards, each provided with a vertical guide-slot,

upper and lower journal-blocks arranged within each of said guide-slots, a shaft mounted to extend between said standards having its ends engaged with the upper pair of said journal-blocks, provided with expanding-rollers adjustably mounted concentrically upon said shaft and constructed to slide endwise freely from its bearings, a key arranged to hold said shaft from endwise movement, a supporting-roller mounted to extend parallel with said shaft and having its ends engaged with the lower pair of journal-blocks, said supporting-roller being provided with circumferential depressions arranged opposite the peripheries of the said expanding-rollers, an auxiliary supporting-roller revolubly mounted adjacent to and parallel with said shaft and main supporting-roller, a feed-screw arranged to force the expanding-roller and main supporting-roller together, springs acting in opposition to said feed-screw, adjustable guides arranged to hold the blank from longitudinal movement, intermeshing pinions connecting said shaft and main supporting-roller, and means for rotating the latter, substantially as described.

In testimony that we claim the foregoing as our invention we affix our signatures, in presence of two witnesses, this 6th day of September, A. D. 1895.

JOHN I. WARMAN.
CARL WINTER.

Witnesses:
TAYLOR E. BROWN,
ALBERT H. GRAVES.