

No. 882,133.

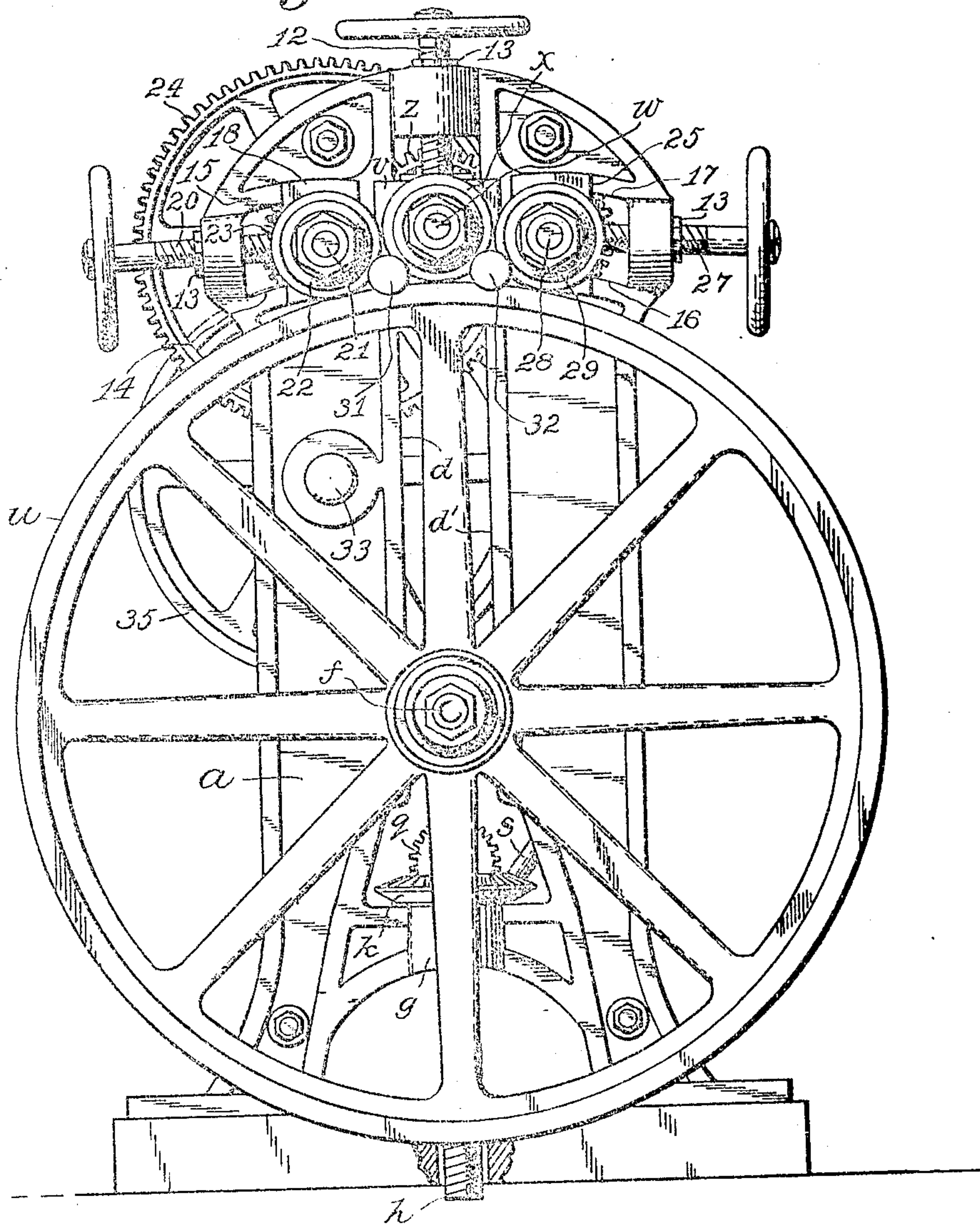
PATENTED MAR. 17, 1908.

J. R. WELCH.  
BENDING MACHINE.

APPLICATION FILED MAR. 28, 1907.

4 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Jay H. Gardner  
M. D. Beaty

INVENTOR:

John R. Welch,  
BY  
E. T. Silvers,  
ATTORNEY.

No. 882,133.

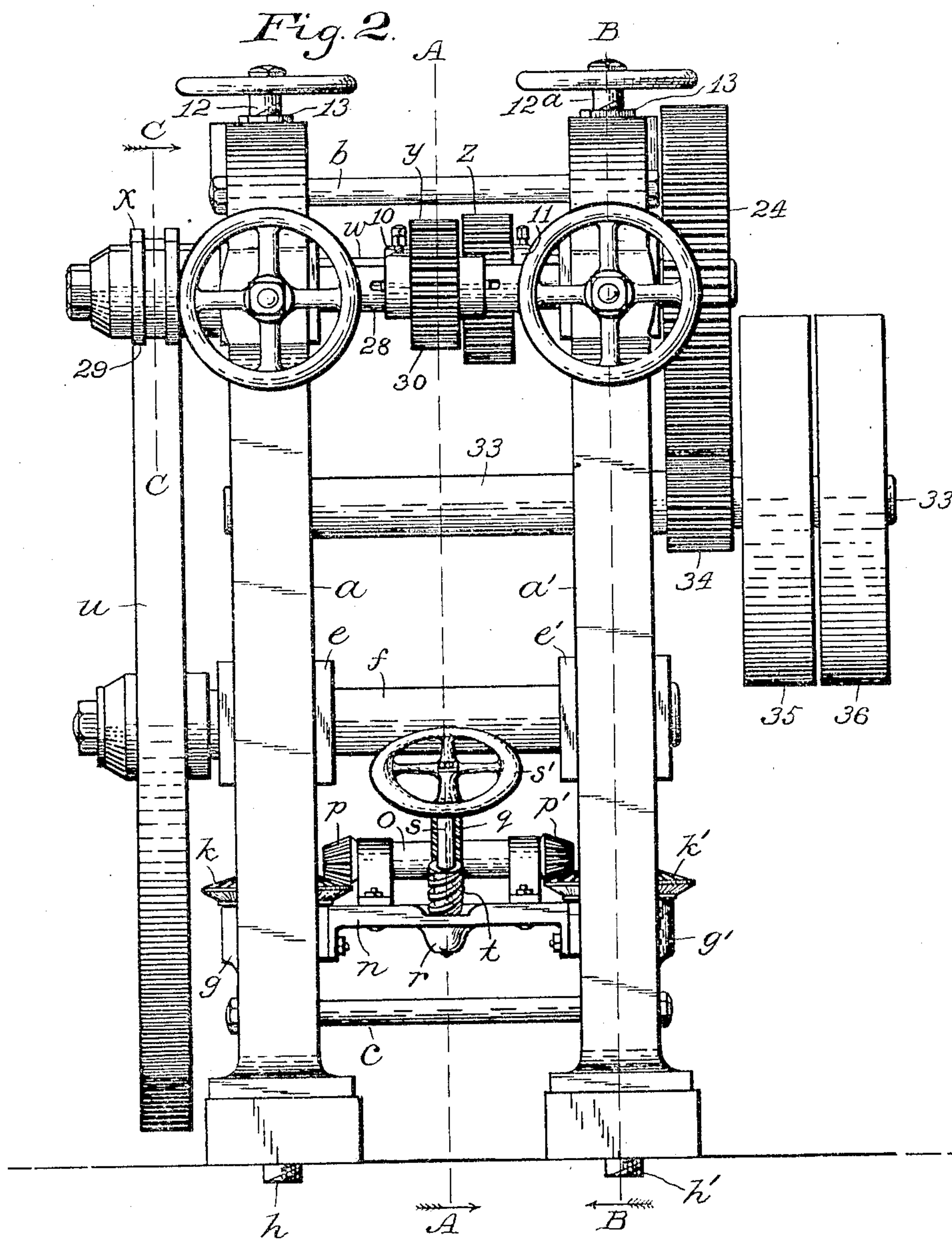
PATENTED MAR. 17, 1908.

J. R. WELCH.

## BENDING MACHINE.

APPLICATION FILED MAR. 28, 1907.

4 SHEETS—SHEET 2.



WITNESSES:

Jay H. Gardner.  
M. D. Beaty.

INVENTOR:

John R. Welch,  
BY  
E. T. Silvius,  
ATTORNEY.

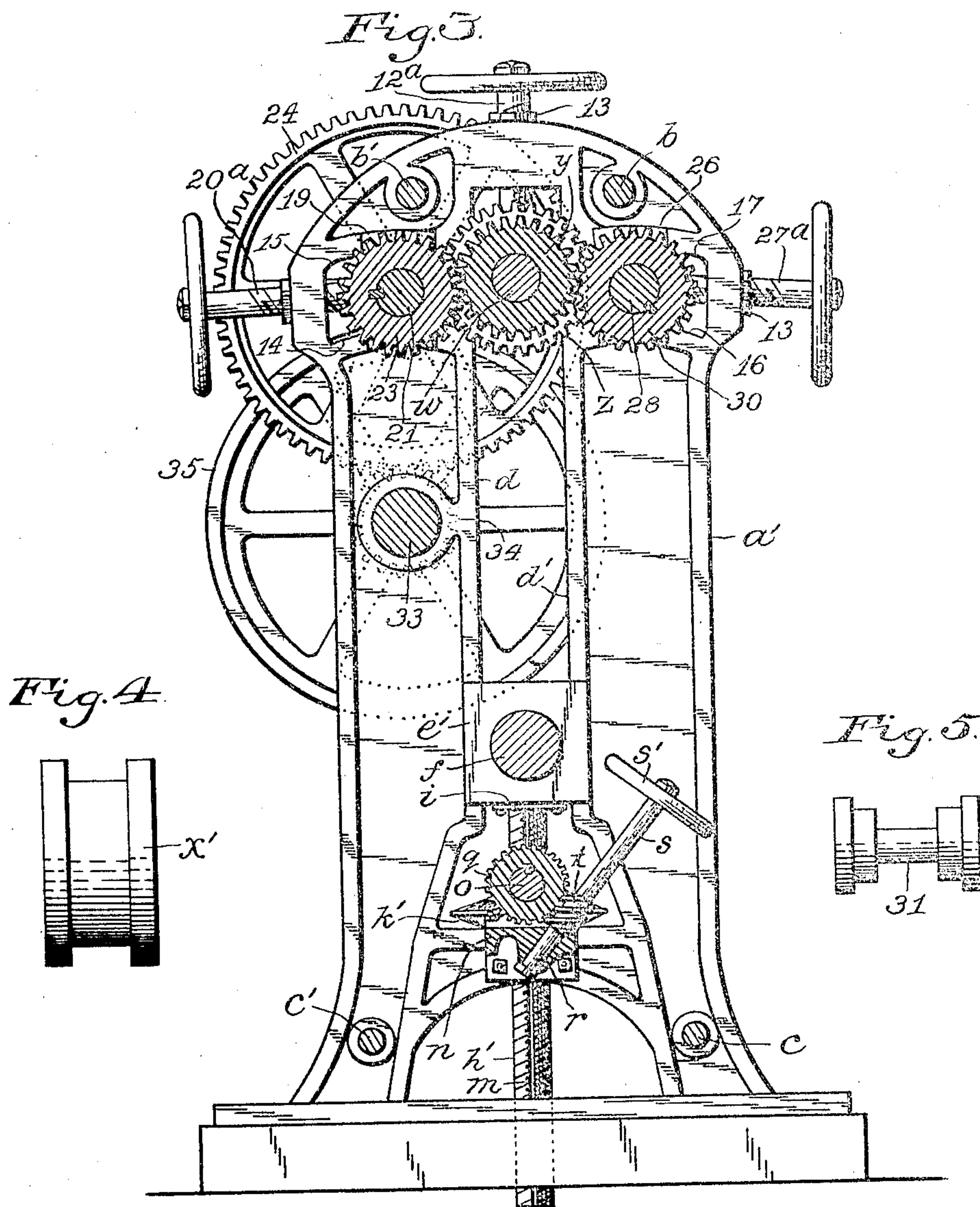


No. 882,133.

PATENTED MAR. 17, 1908.

J. R. WELCH.  
BENDING MACHINE.  
APPLICATION FILED MAR. 28, 1907.

4 SHEETS—SHEET 3.



WITNESSES.

Jay H. Gardner.  
M. D. Beaty.

INVENTOR:

John R. Welch,  
BY  
E. J. Silvers,  
ATTORNEY.



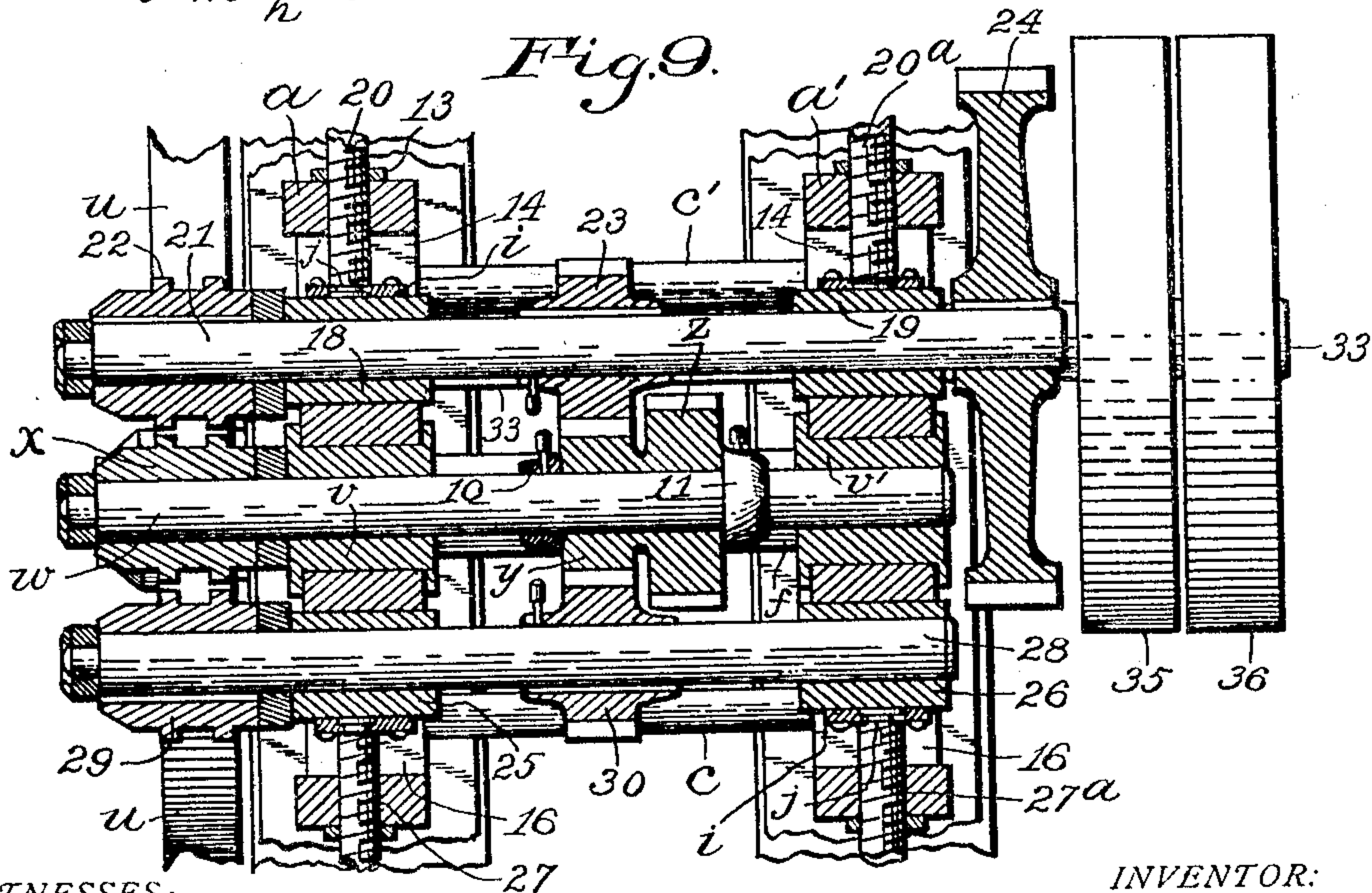
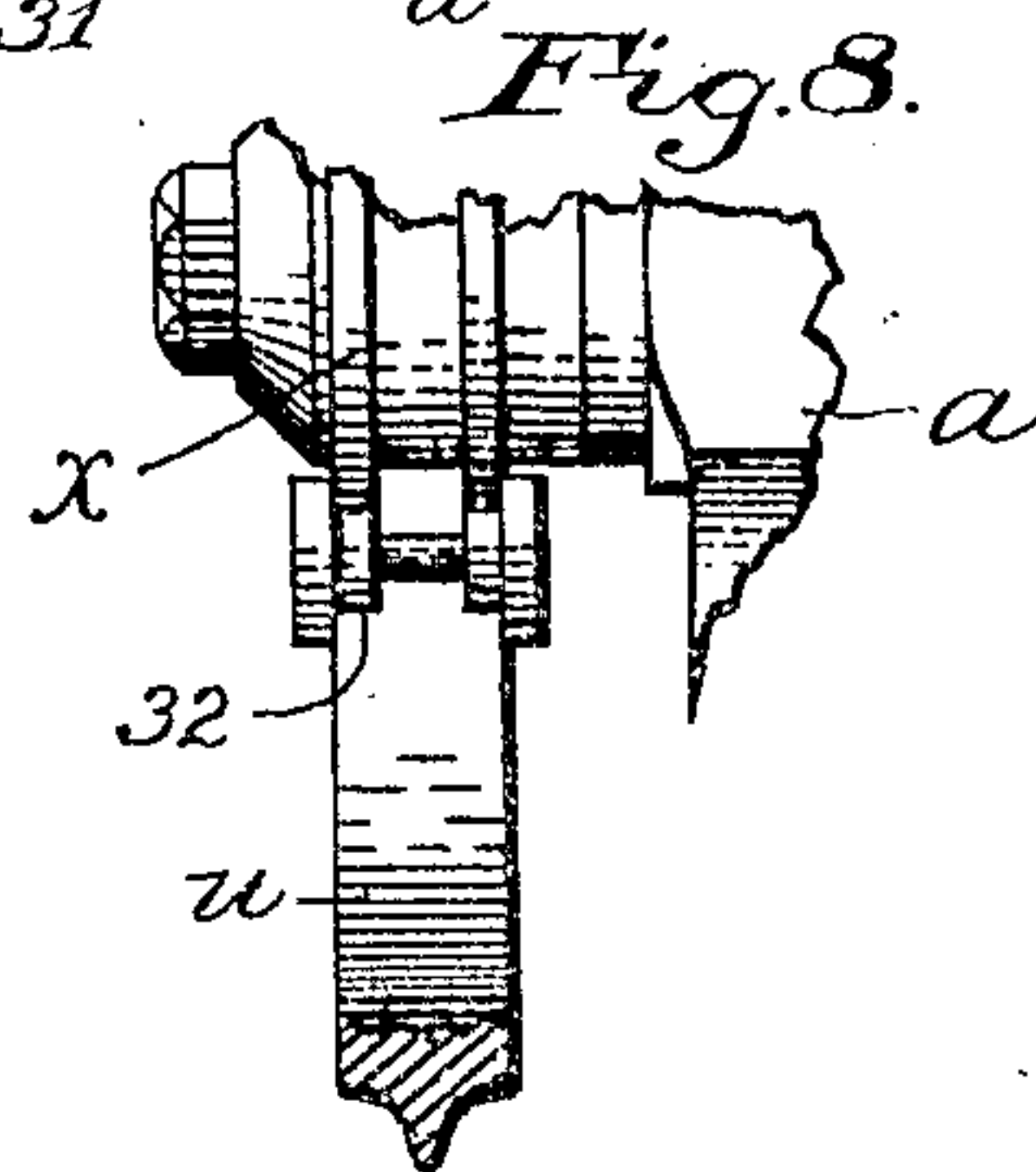
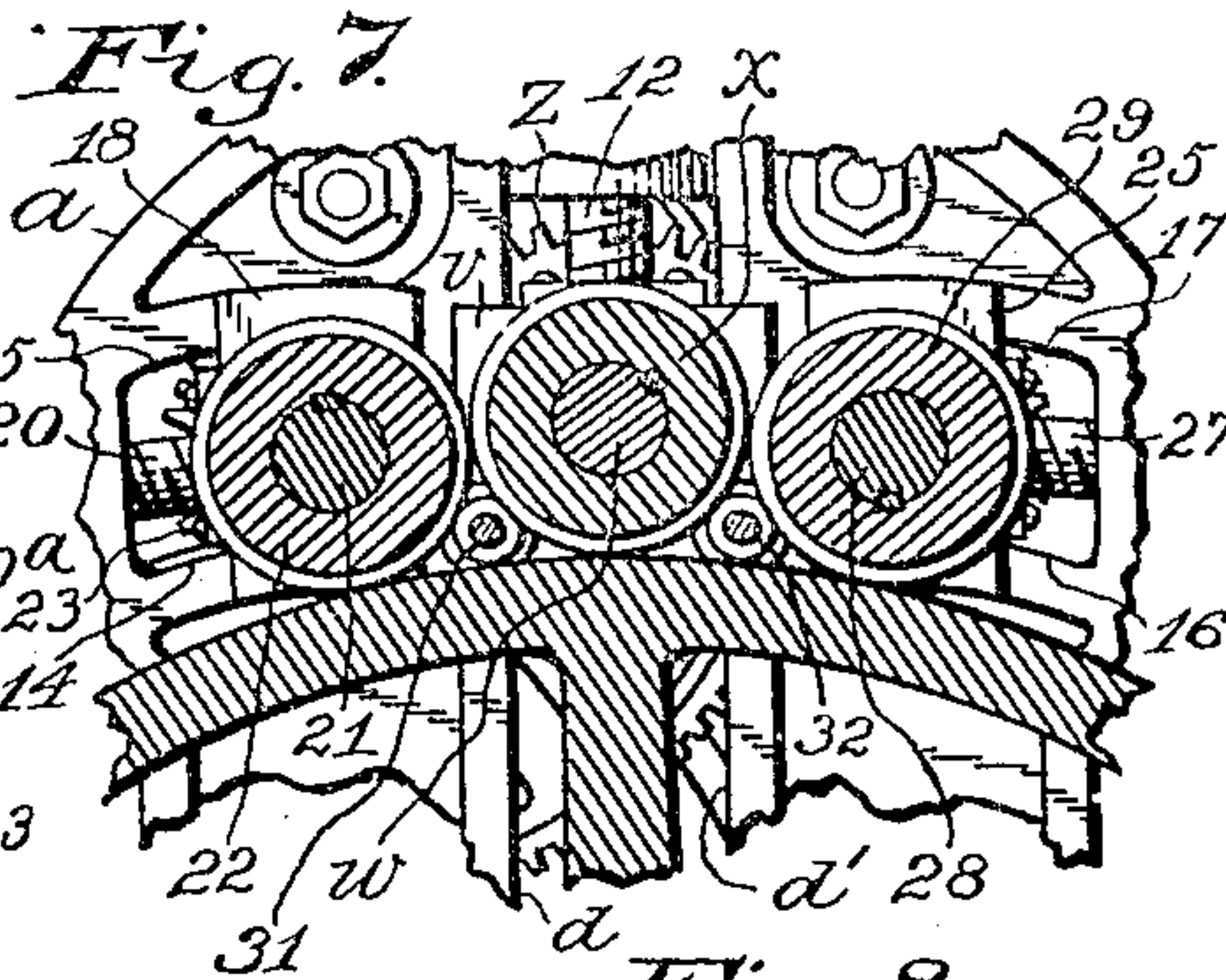
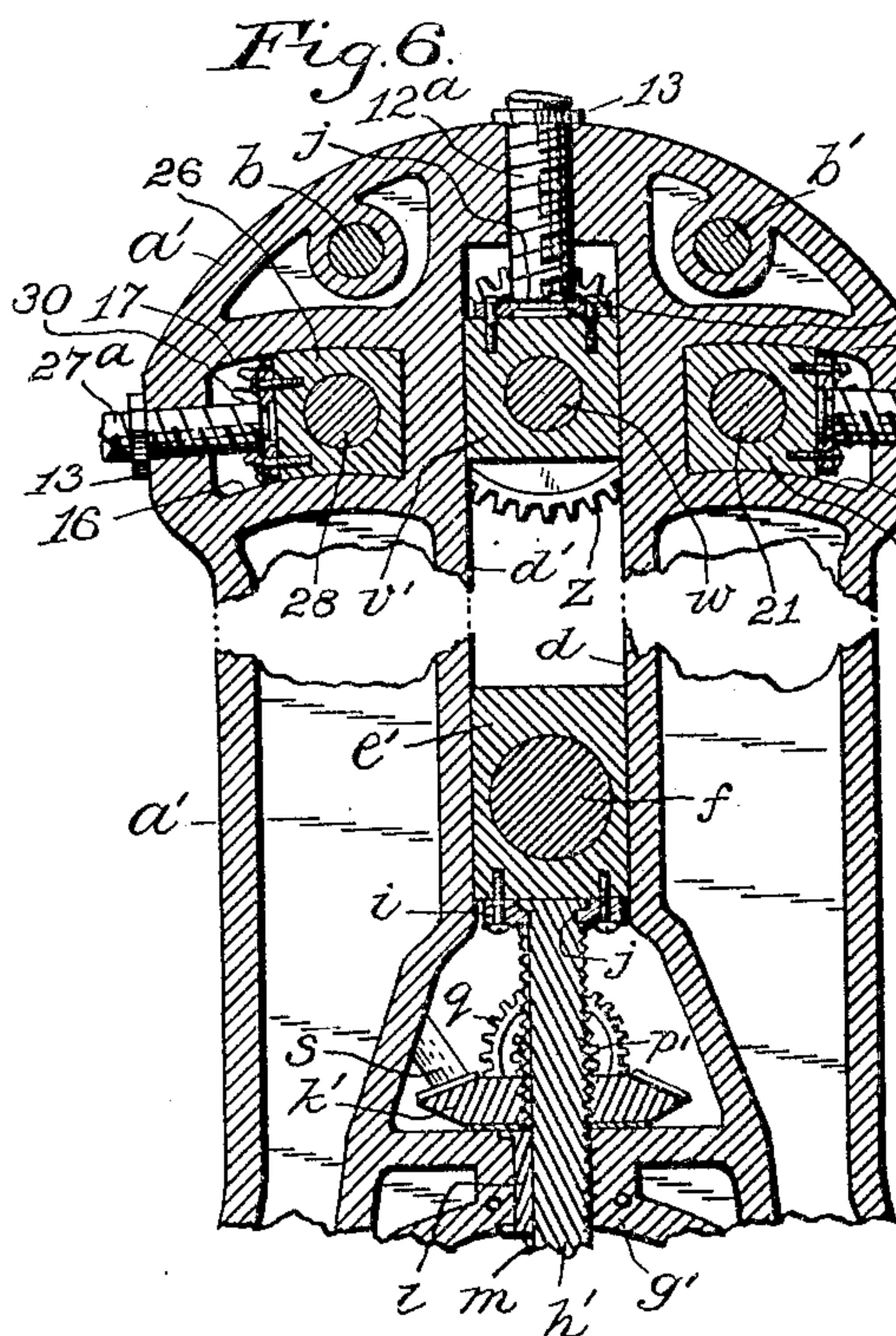
No. 882,133.

PATENTED MAR. 17, 1908.

J. R. WELCH.  
BENDING MACHINE.

APPLICATION FILED MAR. 28, 1907.

4 SHEETS—SHEET 4.



WITNESSES:

Jay H. Gardner.  
M. D. Beaty.

INVENTOR:

John R. Welch,  
BY  
E. T. Silvius,  
ATTORNEY.



# UNITED STATES PATENT OFFICE.

JOHN R. WELCH, OF ALEXANDRIA, INDIANA, ASSIGNOR TO KEEFER-HEART IRON AND STEEL COMPANY, OF ALEXANDRIA, INDIANA, A CORPORATION OF INDIANA.

## BENDING-MACHINE.

No 882,133.

Specification of Letters Patent.

Patented March 17, 1908.

Application filed March 28, 1907. Serial No. 365,084.

*To all whom it may concern:*

Be it known that I, JOHN R. WELCH, a citizen of the United States, residing at Alexandria, in the county of Madison and State of Indiana, have invented certain new and useful Improvements in Bending-Machines; and I do declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to machines for bending metal so as to form bands or hoops of the metal, the invention having reference more particularly to a machine for forming hollow wheel rims or felloes, the machine being adapted to the purpose of bending solid bars or rods into forms of rings or bands ready to have the ends of the bar or piece of metal welded or otherwise connected together to complete the product.

Objects of the invention are to provide a bending machine of simple construction adapted for general use for the above-mentioned purposes and which will be adapted particularly for bending either channel iron or tubing of various cross-sectional forms so as to bring the ends of the pieces of metal together to be connected in the construction of metallic rims or felloes for wheels, and to provide a bending machine that will be adapted to be used in bending metal for forming tires of the wheels, also to provide a bending machine which may be operated expeditiously and be economical and durable in use, a still further object being to provide a bending machine that will be capable of performing its operations accurately and so as to produce true work.

With the above-mentioned and minor objects in view the invention consists in a bending machine comprising an upright frame in which a pattern roll is mounted adjustably, a plurality of bending rolls mounted in the frame to cooperate with the pattern roll, and gearing for operating the rolls, all of novel arrangement; and the invention consists further in the novel parts and the combinations and arrangements thereof as hereinafter particularly described and pointed out in the appended claims.

Referring to the drawings, Figure 1 is a side elevation of the improved bending machine; Fig. 2, an end elevation thereof; Fig.

3, a vertical sectional view approximately on the line A A in Fig. 2; Fig. 4, a front view of one of the bending rolls; Fig. 5, a front view of different form of bending roll used as supplementary to the other bending rolls; Fig. 6, a fragmentary vertical sectional view on the line B B in Fig. 2; Fig. 7, a fragmentary vertical sectional view on the line C C in Fig. 2; Fig. 8, a fragmentary view showing one of the supplementary rolls arranged in connection with one of the bending rolls and the pattern roll; and, Fig. 9, a sectional view approximately at the axes of the shafts of the bending rolls.

The bending machine, in a practical embodiment, comprises a frame having two suitable upright members *a* and *a'* of similar construction, and transverse members *b* and *b'* and *c* and *c'* connected to the upright members, and additional transverse members obviously may be employed if desired, the upright members having suitable bases for the support of the frame, the upright members being provided each with a pair of opposing vertical guides *d* and *d'* in which are arranged a pair of journal boxes *e* and *e'*, supporting a rotative roll shaft *f*, the shaft extending outward beyond the frame, and the journal boxes being adjustable vertically in the guides. The lower portions of the frame members *a* and *a'* are provided with combined bearings and guides *g* and *g'* below the journal boxes, and adjusting screws *h* and *h'* are guided and movable vertically therein, the journal boxes having suitable plates *i* attached to the bottoms thereof and extending into grooves *j* that are formed in the screws so that each screw and a box is connected together. On each combined bearing and guide *g* or *g'* is a combined nut and bevel gear wheel *k* or *k'* through which one of the adjusting screws extends for forcing the screw upwardly, the combined guide and bearing having a spline *l* therein extending into a groove *m* in the screw to prevent rotation of the screw. A beam *n* is attached to the exterior of the two combined guides and bearings *g* and *g'*, and obviously may be attached to other portions of the upright members of the frame if preferred, and a rotative shaft *o* is suitably journaled on the beam, the ends of the shaft having beveled pinions *p* and *p'* that are in engagement with the combined nuts and wheels *k* and *k'* respectively, a worm wheel *q* being secured also



to the shaft *o*. The beam *n* is provided with a suitable journal bearing *r* in which is mounted a rotative shaft *s* having a hand wheel *s'*, a worm *t* being secured to the shaft *s* in engagement with the wheel *q*, whereby the shaft *f* may be raised or lowered for adjustment of the pattern roll *u* which is mounted on the outer end of the shaft *f*. The pattern roll is preferably secured to the shaft *f* and it has a relatively large diameter, being designed to pattern the felly or band into an annular shape so that the inner side of the tire or felly may be rolled true to the pattern roll. The face of the roll *u* may be made in various shapes as may be required, and it is intended to supply different wheels each having a different diameter to suit different diameters of rims or tires that may be required. In the use of a roll of less diameter than the roll shown the shaft *f* would obviously be elevated to the required extent. A pair of journal boxes *v* and *v'* are arranged in the upper portions of the guides *d* and *d'* so that they are above the boxes *e* and *e'*, and they support a rotative roll shaft *w* that extends outward beyond the frame and to the outer end of which is secured a suitable bending roll *x* or *x'*, the latter differing only in being devoid of extension hubs, the rolls being grooved to receive the material to be bended, such roll cooperating with the roll *u*. Two gear wheels *y* and *z* are secured together or formed integrally side by side and are mounted on the shaft *w* rotatively and guided against longitudinal movement on the shaft by means of collars 10 and 11 that are secured to the shaft, the wheels being driven between the collars, and by shifting the collars on the shaft it will be seen that the relative positions of the gear wheels may be changed. The boxes *v* and *v'* are provided with adjusting screws 12 and 12<sup>a</sup> which are provided with lock nuts 13 and connected to the boxes in a manner similar to that in which the screws *h* and *h'* are connected to the boxes *e* and *e'*, but so as to be rotative and like the other screws serve as pressure screws.

The frame members *a* and *a'* are provided in the upper portions thereof with opposing guides 14 and 15, and 16 and 17 respectively. Journal boxes 18 and 19 are mounted in the guides 14 and 15 and are provided with controlling screws 20 and 20<sup>a</sup>. A roll shaft 21 is journaled in these boxes and extends outward beyond the frame, and the shaft has a bending roll 22 secured thereto to cooperate with the roll *u*. A gear wheel 23 is secured to the shaft in engagement with the gear wheel *y*. Another gear wheel 24 is secured to the shaft 21 for driving the roll shafts. A pair of boxes 25 and 26 are mounted in the guides 16 and 17 and are provided with controlling screws 27 and 27<sup>a</sup> provided with lock nuts 13. All of the controlling screws are

connected to the journal boxes so that the boxes may be moved in either direction in their guides. The boxes 25 and 26 support a roll shaft 28 that extends outward beyond the frame and on which is secured a roll 29 to cooperate with the roll *u*, and a gear wheel 30 is secured to the shaft 28 in engagement with the gear wheel *y*. It will be seen that the gear wheel 23 may drive the wheel *y* about the shaft *w* and turn the shaft 28 by means of the wheel 30, and that motion must be imparted to the shaft *w* by means of the roll *x*, rolling upon the work while being bent, the roll *u* being also turned by means of the work running between it and the live rolls 22 and 29. The rolls *x*, 22 and 29 may be as small in diameter as they can be conveniently made, and in some cases it may be preferred to use slightly larger rolls in which case the shafts 21 and 28 may be spread apart the required distance, and then the gear wheel *z* is to be set over into the place now occupied by the smaller wheel *y*. It is designed to have the contacts of the bending rolls with the roll *u* as close as possible in order to obtain the best results and in some cases it is desirable to provide additional contacts which is accomplished by means of two supplementary rolls 31 and 32 formed similar to spools with enlarged ends serving as guides in connection with the other rolls. Each one of the supplementary rolls is held in place by two of the bending rolls and the roll *u*. These supplementary rolls prevent the work from springing away from the roll *u* between either two of the bending rolls. It is designed that the supplementary rolls shall bear against the two adjacent bending rolls and the work with slightly less force than the bending rolls exert on the work, and the supplementary rolls will slip either against the work or against the bending rolls.

A counter shaft 33 is mounted in the frame and has a pinion 34 secured thereto that drives the gear wheel 24, there being tight and loose belt pulleys 35 and 36 mounted on the counter shaft whereby the machine may be driven by belt transmission.

In practical use the size of bending rolls that may be desired will be placed on the shafts 21 and 28, and those rolls should be adjusted so as to bear against the pattern roll *u* which will represent the internal diameter of the rim or tire that is to be formed, and when necessary the roll *u* should be adjusted vertically with respect to the bending rolls as 22 and 29. The bending roll *x* should then be adjusted to the roll *u* after which the machine will be ready for operation. The material to be bent will be in the form of bars or tubes or channel section metal, and should be run through the machine longitudinally between the pattern roll and the bending rolls. When the bending is completed the resulting ring will be slightly



larger than it is intended to be finally made, the roll *u* being slightly greater in diameter than the finished diameter of the rim or tire, so that the ends of the bar or tube will not overlap on the roll *u*, such ends afterward being trimmed and welded together according to the improved way of making hollow wheel rims of metal. Of course the diameter of the pattern roll *u* will differ slightly when it is not intended to trim the ends of the piece that forms the rim or tire.

Having thus described the invention, what is claimed as new is—

1. A bending machine including a frame provided with vertical guides and also a plurality of pairs of approximately horizontal guides, a pair of journal-boxes mounted adjustably in the vertical guides, a pattern roll having a shaft journaled in the journal-boxes, a plurality of pairs of journal-boxes mounted each in a pair of the horizontal guides, a plurality of roll shafts each mounted in a pair of the plurality of pairs of journal-boxes and provided with a bending roll to cooperate with the pattern roll, a bending roll mounted opposite to the pattern roll between the other bending rolls, and a supplementary roll inserted removably between the pattern roll and two of the bending rolls and retained thereby.

2. A bending machine including an upright frame provided with a plurality of pairs of guides, a pattern roll mounted on the frame, a plurality of pairs of journal-boxes provided with controlling screws and mounted each in a pair of the guides adjustably, a plurality of roll shafts each mounted in a pair of the journal-boxes and provided with a bending roll to cooperate with the pattern roll and also having a gear wheel secured thereto, a single roll shaft journaled in the frame between two of the plurality of roll shafts and provided with a bending roll to cooperate with the pattern roll, a gear wheel mounted rotatively on the single roll shaft in engagement with the gear wheels of the plurality of roll shafts, and transmission

driving gearing connected with one of the plurality of roll shafts.

3. A bending machine including an upright frame, a pattern roll mounted on the frame, two roll shafts mounted in the frame and provided each with a bending roll to cooperate with the pattern roll, each roll shaft being adjustable toward or from the other one and having a gear wheel secured thereto, one roll shaft having also a driving gear wheel secured thereto, a counter-shaft mounted in the frame and having a pinion secured thereto in engagement with the driving gear wheel, a drive pulley mounted on the counter-shaft, a single roll shaft mounted in the frame between the two roll shafts and provided with a bending roll to cooperate with the pattern roll, and two gear wheels having different diameters mounted rotatively on the single roll shaft and movable on the shaft either one into engagement with the gear wheels of the two adjustable roll shafts.

4. A bending machine including an upright frame, a pattern roll to shape a rim or tire mounted adjustably on the frame, a plurality of relatively small bending rolls mounted on the frame to cooperate with the pattern roll and adjustable thereto, an intermediate bending roll mounted on the frame between two of the plurality of bending rolls to cooperate with the pattern roll and also with the plurality of rolls, and a pair of supplementary rolls having flanges on their ends to cooperate with and retained by the pattern roll and an adjacent pair of the bending rolls, the plurality of rolls being geared together and driving the pattern roll, and the intermediate roll being driven by the pattern roll.

In testimony whereof, I affix my signature in presence of two witnesses, on the 22 day of March, 1907.

JOHN R. WELCH.

Witnesses:

JOSEPH G. BRANUUM,  
SAMUEL G. PHILLIPS.