No. 803,859. PATENTED NOV. 7, 1905.

I. J. SHIFLEY.

SHAPING MACHINE.

APPLICATION FILED JULY 6, 1905.

3 SHEETS—SHEET 1.

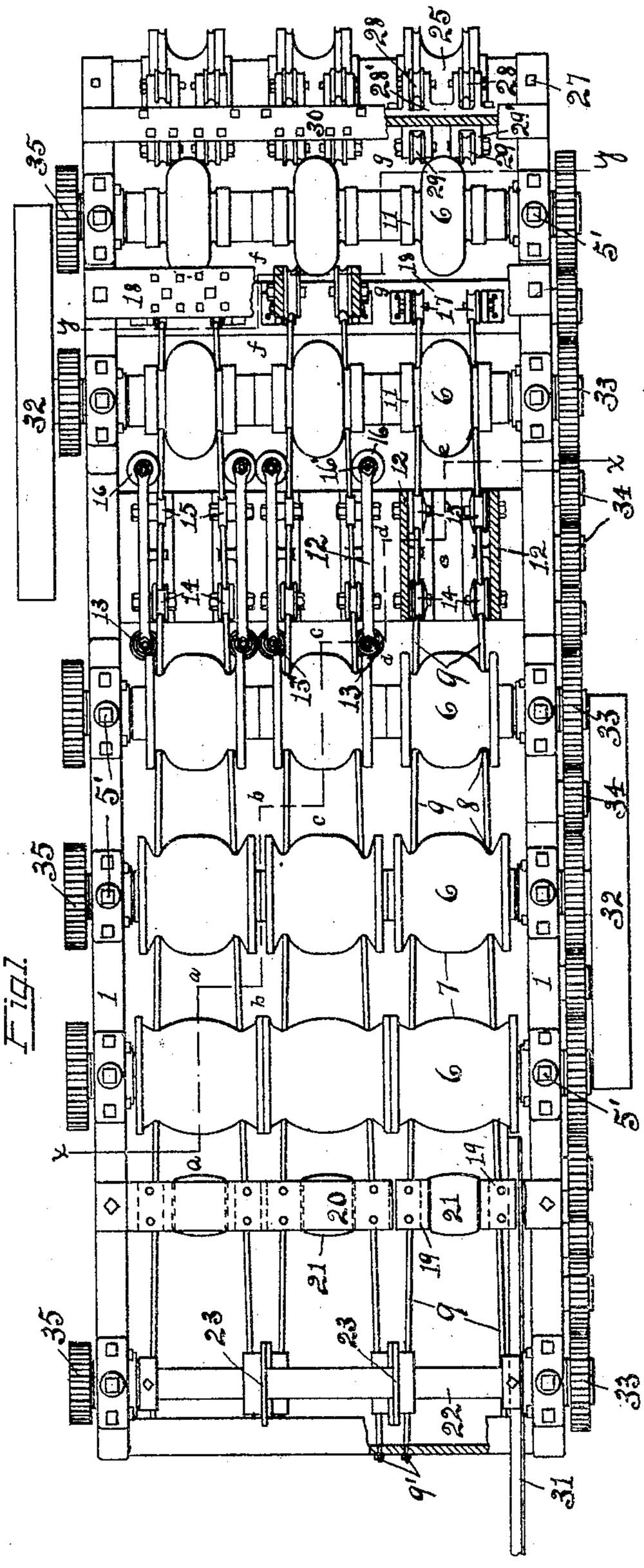


Fig. 1.

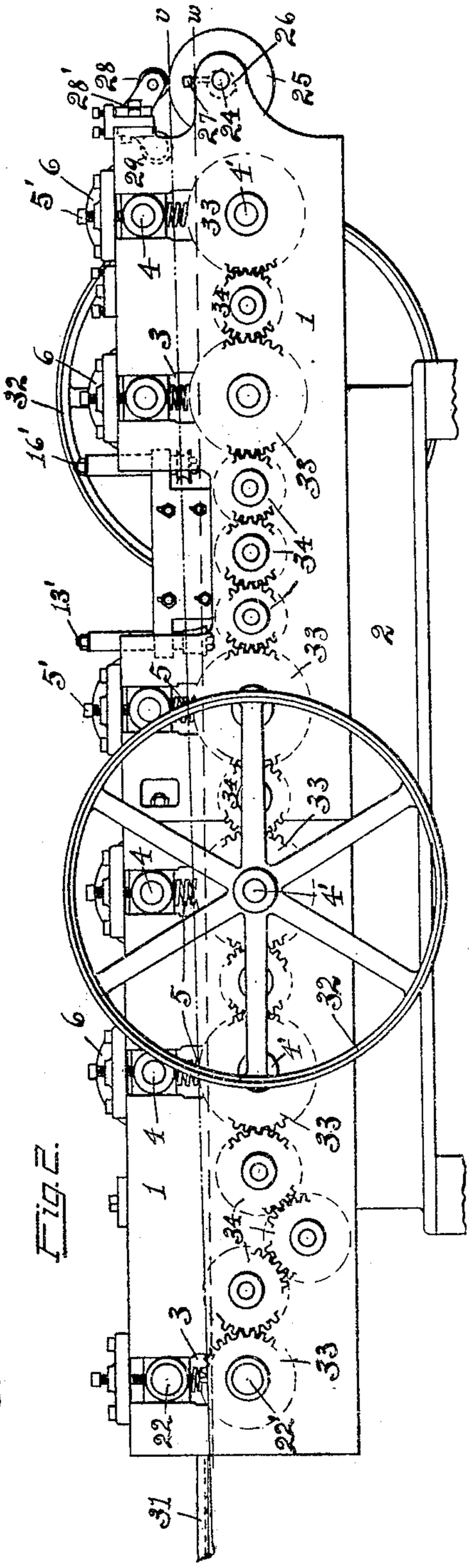


Fig. 2.

WITNESSES:

C. A. D. Young.

Mary L. Shay.

INVENTOR

Isaac J. Shifley,

By Dewey & Dewey

His attorneys.

No. 803,859.

PATENTED NOV. 7, 1905.

I. J. SHIFLEY.

SHAPING MACHINE.

APPLICATION FILED JULY 6, 1905.

3 SHEETS—SHEET 2.

Fig. 3.

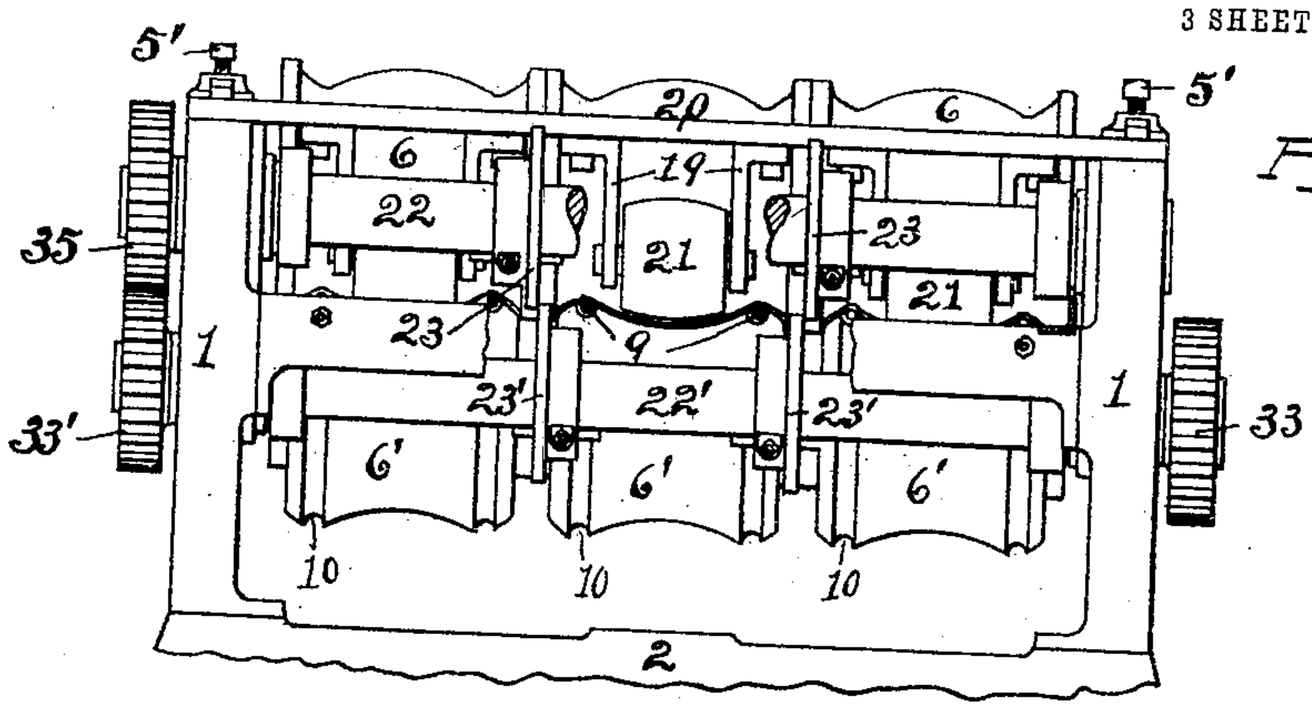


Fig. 4.

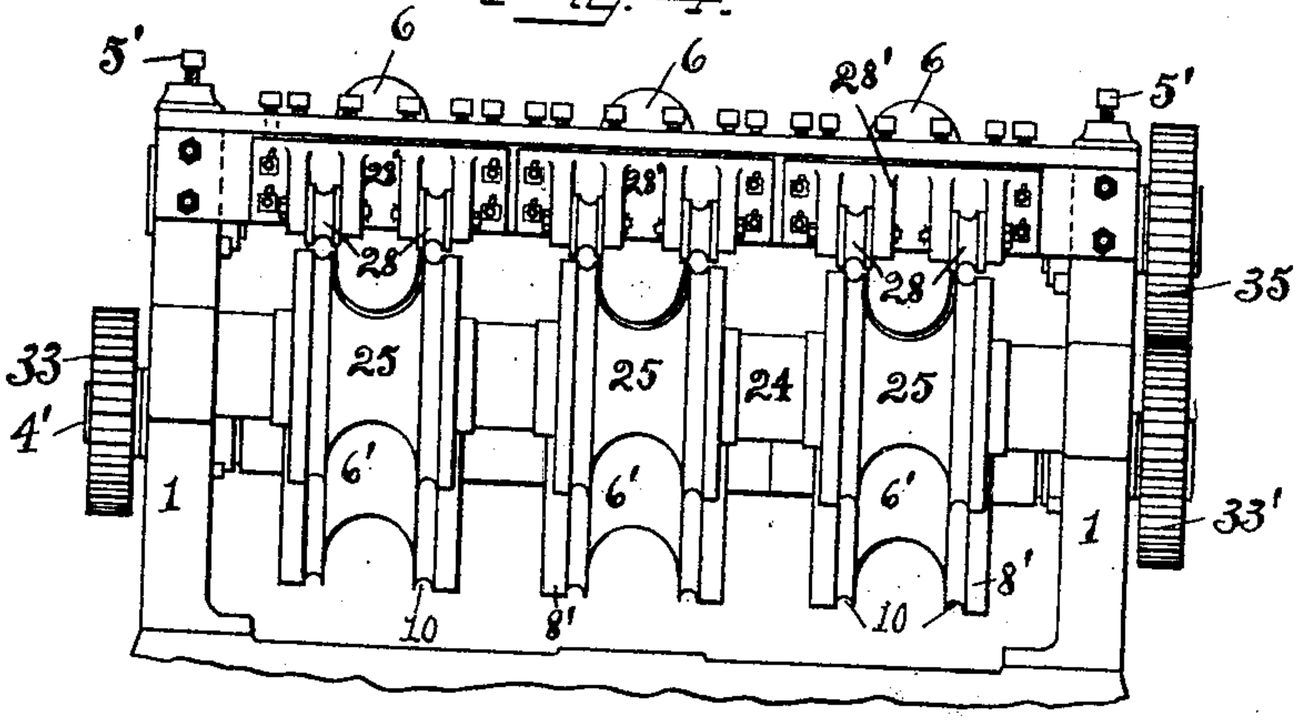
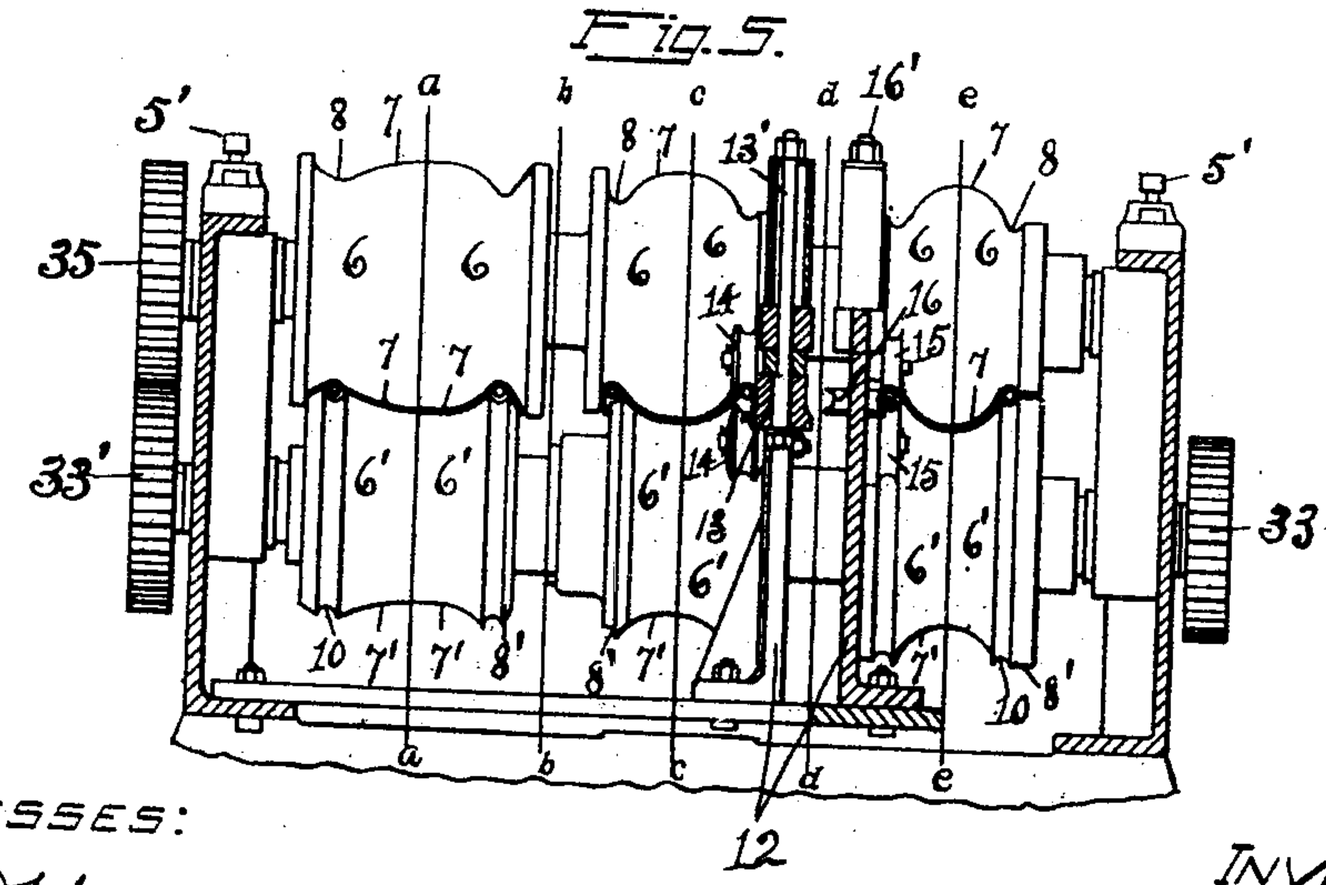


Fig. 5.



WITNESSES:

C. A. D. Young.

Mary L. Shay.

INVENTOR

Isaac J. Shifley,

By Brown & Brown

His attorneys.

No. 803,859. PATENTED NOV. 7, 1905.

I. J. SHIFLEY.

SHAPING MACHINE.

APPLICATION FILED JULY 6, 1905.

3 SHEETS—SHEET 3.

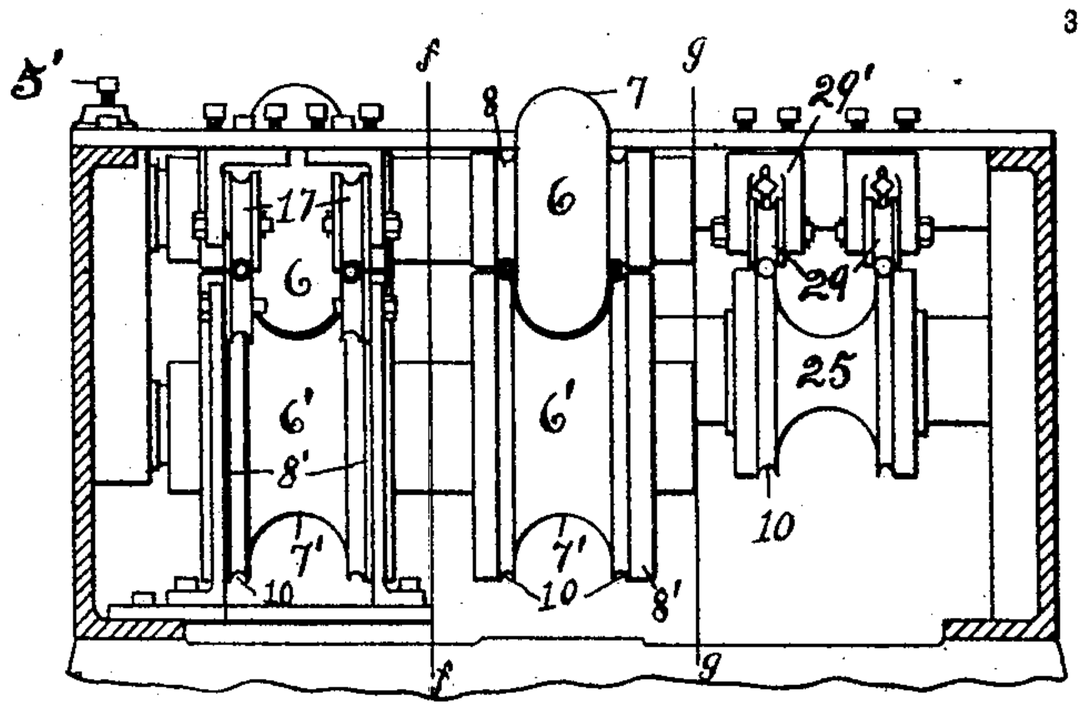


Fig. 6.

Fig. 7

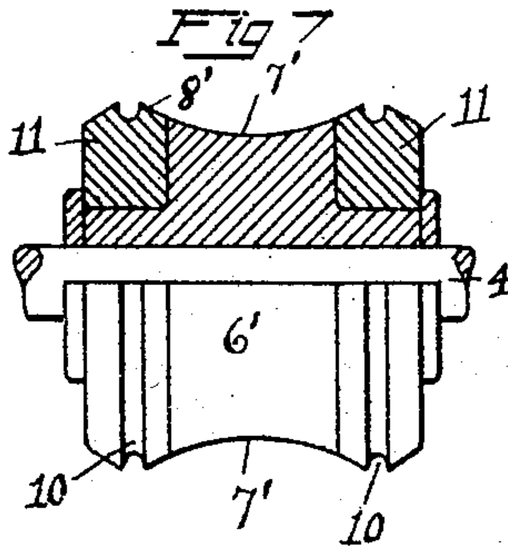


Fig. 8.

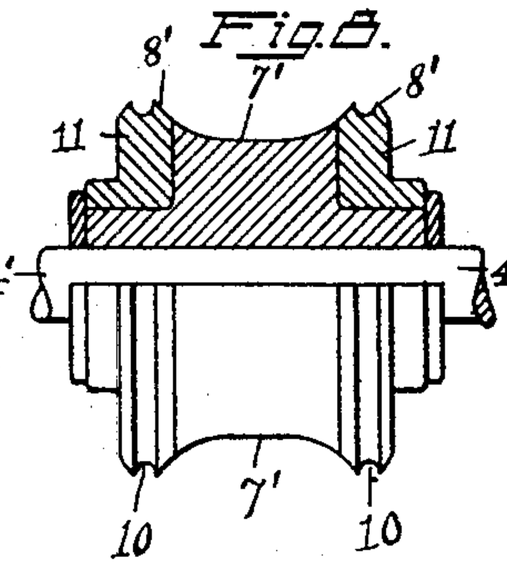


Fig. 9.

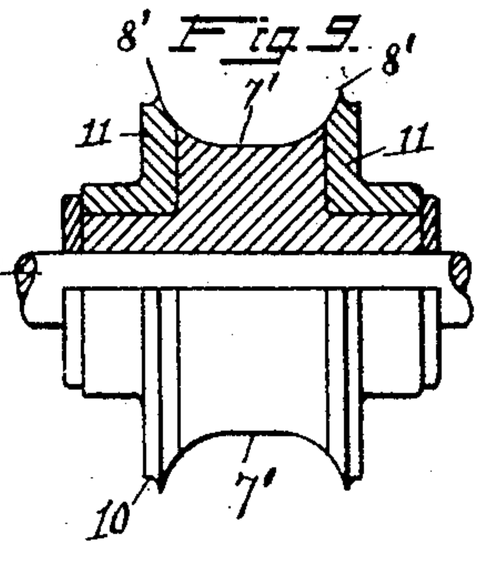


Fig. 10.

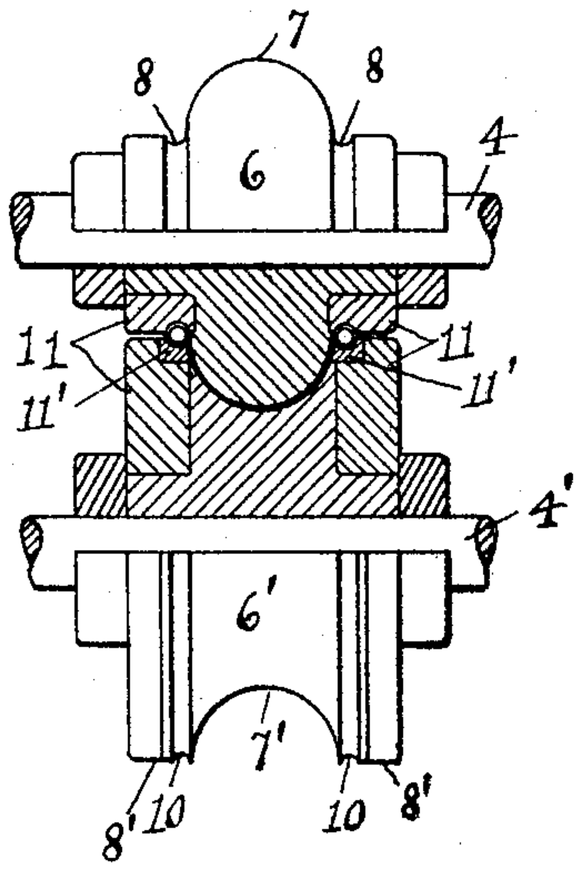
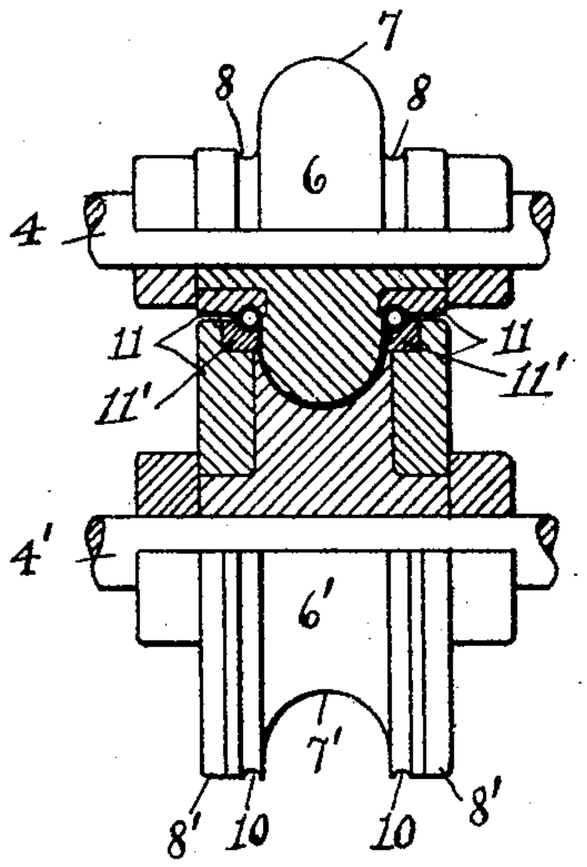


Fig. 11.



WITNESSES:
C. A. D. Young.
Mary L. Shaly.

INVENTOR:
Isaac J. Shifley,
By Dicen & Dicen
His attorneys.

UNITED STATES PATENT OFFICE.

ISAAC J. SHIFLEY, OF TOLEDO, OHIO.

SHAPING-MACHINE.

No. 803,859. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed July 6, 1905. Serial No. 268,520.

To all whom it may concern:

Be it known that I, ISAAC J. SHIFLEY, a citizen of the United States, and a resident of Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Shaping-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in the class of machines employing a plurality of coacting sets of rollers arranged in trains and adapted by easy and successive stages to form sheet-metal strips into eaves-troughs or other analogous fluted or corrugated articles of oval, octagon, or other shapes having single or double beaded edges; and it has special reference to improvements upon Letters Patent No. 759,480, granted to me May 10, 1904.

The invention consists in certain novel details of construction and combination and arrangement of the parts whereby a more perfect and positive operation of the machine is obtained and the objections incident to the use of such machines are obviated, as is fully described in the following specification and shown in the accompanying drawings, in which—

Figure 1 is a plan view of the machine embodying my invention with portions broken away and shown in section. Fig. 2 is a side elevation; Fig. 3, a rear end elevation with a portion broken away, and Fig. 4 a front elevation thereof. Fig. 5 is a transverse section looking toward the front of the machine, taken on the irregular dotted line *x x* in Fig. 1, the lines *a a*, *b b*, *c c*, *d d*, and *e e* in Fig. 5 corresponding, respectively, with the similarly-designated portions of said dotted line. Fig. 6 is a like view taken on the dotted lines *y y* in Fig. 1, with the lines *f f* and *g g* thereon corresponding, respectively, with the similarly-designated portions of said dotted line. Figs. 7, 8, and 9 are elevations of the lower forming-rolls of the first three sets, with part shown in longitudinal section; and Figs. 10 and 11 are similar views of the upper and lower rolls of the fourth and fifth sets, respectively, with portions shown in section.

Referring to the drawings, 1 1 represent the two side pieces of the frame, which are suitably connected together at their ends and supported by the standard 2. The sides 1 are provided with a series of transversely-alining vertical slots 3, in which the ends of the pairs of shafts 4 and 4′ are suitably mounted, the shafts of each pair being arranged in superimposed position and having their bearing-blocks yieldingly spaced apart by a compression-spring 5 and their vertical adjustment regulated by means of a set-screw 5′, bearing against the bearing-block of the upper shaft.

Each of the shafts 4 and 4′ has one or more similarly-shaped forming-rolls 6 and 6′ rigidly secured thereon, the number thereof depending upon the width of the frame or the number of trains of rolls it is desired to operate.

The rolls of each train are arranged in consecutive pairs, having their main line of bite in a common plane, the upper rolls 6 thereof having their operative portions provided centrally with the circumferentially-convexed portions 7, which terminate at either side thereof in the circumferentially concaved or reëntering portions 8, and the lower rolls 6′ having the central circumferentially-concaved portions 7′ to receive the convexed portions 7 of the upper rolls and their side edges formed with circumferentially-projecting ribs or portions 8′, which project within the concaved or reduced portions of the rolls 6. The circumferential shape or degree of convexity and concavity of the rolls of the successive pairs varies gradually and by easy stages from the initial to the final form, thus adapting their joint and successive operations to form a completed trough of the desired depth and size.

The forming of a bead on one or both edges of a trough is facilitated by the interposing of a forming rod or mandrel 9 between the registering concaved and projecting portions 8 and 8′ of the several pairs of rolls, said mandrels having their rear ends secured to the rear connecting-piece of the frame, as shown at 9′ in Fig. 1, and projecting thence between the rolls of all or a portion of the pairs of a train, thus providing guides over which the edges of the strips being operated on are gradually looped by the coacting portions of the rolls. The projecting portions 8′ of the lower rolls of the pairs coacting with the mandrels 9 are formed with circumferential grooves 10 for receiving and forming a seat for said man-

drels, as shown in Figs. 3 to 11. While I have shown two mandrels for each train of rolls, it will be apparent that either one may be removed from the machine, and thus form only a single bead on the trough. It will be noted that the contour of the bead-forming portions of each successive pair of rolls have approximately the same relative degree of change in their shape as do the body portions of said rolls. The companion mandrels 9 converge at their forward ends in the same degree as the contraction which the work undergoes in consequence of the increase in curvature or depth of the portions 7 and 7′ of the rolls and are disposed in a common plane, which extends forwardly and slightly upwardly from a horizontal plane in a degree corresponding to the gradual increase in depth which the work undergoes as it passes through the successive pairs of rolls, as shown by the dotted line *v v* in Fig. 2, the dotted line *v w* being the plane of bite of the rolls.

Considerable difficulty has been experienced in the operation of machines of this class, due to the difference in diameter of the upper and lower rolls of the several pairs and also to the binding of the stationary mandrels against the revolving faces of the coacting rolls, thus tending to draw back on the rolls and necessitating a considerable increase of power to drive them. To obviate this difficulty, I so shape the registering, concaved, and convexed portions 7 and 7′ of the several pairs of rolls that their point of bite or grip on the work for the purpose of passing it through the machine is approximately the central half of the width of said portions, the curved sides thereof being slightly reduced to form a clearance, so that the work is not gripped tightly at such points, thus substantially reducing the friction of the rolls with the sides of the concaved portion of the work. This difficulty is further remedied by providing the lower rolls of the first three pairs, as shown in Figs. 7, 8, and 9, and both the upper and lower rolls of the next two pairs, as shown in Figs. 10 and 11, (should five parts be employed in the machine,) with the two loose collars 11, which are disposed at the sides of the concaved and convexed portions 7 and 7′ of the rolls and form the circumferentially-concaved or reëntering portions 8 of the upper rolls and the circumferentially-projecting portions 8′ of the lower rolls, or, in other words, the portions of the rolls coacting with the mandrels 9, thus permitting the mandrel-engaging portions, as well as a portion of the side walls of the circumferential concavity 7′ of the lower rolls, to accommodate themselves to the linear velocity of the work rather than to the angular velocity of the rolls. While all of the rolls of the several pairs of a machine may be provided with the loose collars 11, if so desired, it was thought unnecessary in the machine embodying the construction shown in the drawings to so equip the first three upper rolls, inasmuch as they do not cause a tight binding of the work against the mandrels 9, but simply direct the edges of the work over said mandrels in the initial stages of the bead formation.

Owing to the sharp inner circumferential edge of the grooves 10, formed in the collars 11 of the lower rolls 6′ of the last two pairs, and the pressure exerted on said edges as the work comes in contact therewith, it is found quite essential to secure a hardened-metal ring 11′ over the collars 11 at such points, as shown in Figs. 10 and 11, thereby greatly prolonging the lives of said rolls.

Between the fourth and fifth pairs of rolls of each train are disposed the vertical standards 12 12, which carry the small rollers 13 and 16, turning on vertical axes 13′ and 16′, and the pairs of rollers 14 and 15, turning on horizontal axes, said rollers 13 and 16 and the pairs of rollers 14 and 15 coacting with the associated mandrel in the order of their notation for the purpose of assisting by easy stages the turning of the bead around the mandrel. The rollers 13 and 16 are made adjustable with respect to the mandrels 9 by making their spindles eccentric, while the rollers 14 and 15 are made adjustable by mounting their spindles in vertical slots, as shown in Figs. 2 and 5. Each mandrel is further coöperated with and assisted in the bead-forming process by a third pair of rollers 17, which turn on horizontal axes and are suitably mounted to the transverse frame-pieces 18, disposed between the fourth and fifth pairs of shaping-rolls 6 and 6′.

Rotatably mounted between the hangers 19, which are suspended from the transverse frame-piece 20 in advance of the first pair of shaping-rolls 6 and 6′ of each train, is an idler-roll 21, which has its circumference convexed and projecting slightly below the surface plane of the mandrels 9 to impart the initial longitudinal crimp to the work preparatory to its being acted upon by the first pair of shaping-rolls. In addition to starting the central crimp the roll 21 tends also to steady and firmly hold the work to the mandrels as its forward end comes in contact with and is gripped by the first pair of shaping-rolls.

In case more than one train or set of shaping-rolls is employed in one machine a pair of shafts 22 22′ are suitably journaled in the frame at the rear of the idler-roll 21 and in horizontal alinement with the shafts 4 and 4′, respectively, and have the coacting rotary knives 23 and 23′ rigidly secured thereon, the same being adapted to cut large sheets of metal into strips of suitable width to be passed to each train of rolls.

At the extreme forward end of the frame is journaled a shaft 24, carrying the work-supporting rolls 25, which are shaped to correspond to the front roll 6′ and are loosely mounted to turn on eccentric bushings 26 (shown in Fig. 2) to permit of their vertical

adjustment with respect to the shaft. A binding-screw 27 locks the shafts 24 in adjusted position. Rollers 28 and 29 are suitably mounted in brackets 28′ and 29′, adjustably secured to the forward frame-piece 30, and are adapted to coact with the beads of the work and hold it to the roll 25 as it leaves the machine, the roller 28 being disposed directly above said roll 25. The purpose of the roll 25 is to support and prevent the longitudinal bowing of the work, due to its weight as it leaves the machine.

A guide-strip 31 is secured to the rear of the frame of the machine for guiding the work as it is fed to the operating-rolls.

Two drive-pulleys 32 are shown as being keyed to two of the shafts 4′ on opposite sides of the machine and impart motion to the other shafts 4′ and 22′ through the medium of the spur-gears 33 and pinions 34. The shafts 4 and 22 receive their motion from their companion shafts 4′ and 22′, respectively, through the meshing gears 33′ and 35′, which are disposed on the opposite side of the frame to the gears 33.

In the operation of my machine the sheets of metal are fed to the rotary knives 23 and 23′, by which they are cut into strips of the desired width and passed on under the idler-rolls 21 and between the rolls 6 and 6′ to be gradually and progressively formed into proper shape thereby. As the strips of metal pass through the machine each successive pair of rolls 6 and 6′, augmented by the bead-forming rollers 13, 14, 15, 16, and 17, acts upon and by easy stages progressively changes the form thereof until they are delivered from the last pair of rolls in the shape of completed eaves-troughs or other analogous articles, which are either oval, octagon, or other shape, according to the contour of the forming-rolls.

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

1. In a shaping-machine, the combination with a series of consecutive pairs of rolls having differentially-shaped forming-surfaces varying progressively and by easy stages to conjointly form a trough member, and a pair of mandrels passing between the rolls of the several pairs, of an idler-roll mounted in advance of the first pair of rolls to hold the work to the mandrels and give the initial formation thereto preparatory to its being engaged by the first pair of rolls.

2. In a shaping-machine, the combination with a series of consecutive pairs of rolls having their forming-surfaces differentially shaped to progressively vary by easy stages, of a work-supporting roll mounted to turn loosely on an eccentric bushing in front of the final pair of rolls and shaped to conform to the lower roll of said final pair.

3. In a shaping-machine, the combination with a series of consecutive pairs of rolls having their forming-surfaces differentially shaped to progressively vary by easy stages, of an idler-roll mounted in advance of the first pair of rolls to give the initial form to the work, and a work-supporting roll loosely mounted on an adjustable eccentric bushing in front of the final pair of rolls and shaped to correspond to the lower roll of the last pair.

4. In a shaping-machine, the combination with a series of consecutive pairs of rolls having their forming-surfaces differentially shaped to progressively vary by easy stages, of a work-supporting roll adjustably mounted in front of the final pair of rolls, and adjustably-mounted pressure-rollers coacting with the work-supporting roll to hold the work in place thereon.

5. In a shaping-machine, a series of consecutive pairs of differentially-shaped forming-rolls, bead-forming mandrels disposed between the coacting surfaces of the rolls of the several pairs, a series of differentially-shaped rollers turning on vertical axes and a series of differentially-shaped pairs of rollers turning on horizontal axes coacting with said mandrels to progressively complete the forming of the bead around the same.

6. In a shaping-machine, the combination with shaping-mandrels, of a series of consecutive pairs of rolls disposed to shape the work about said mandrels, a portion of said pairs of rolls having loose circumferential collars mounted on one roll in position to coact with the mandrels and a portion of said pairs having circumferential collars mounted on both rolls in position to coact with the mandrels.

7. In a trough-forming machine, a series of successive pairs of rolls, the pairs of rolls being shaped progressively and having trough-body and bead forming portions circumferentially formed thereon, the central half of the body-forming portions of the coacting rolls being approximately the point of grip of the work the remaining surface being formed with a slight clearance whereby the work is gripped rigidly only at its central portion, shaping-mandrels disposed between the bead-forming portions of the rolls of the several pairs, and collars loosely mounted on a portion of the rolls to coact with the mandrels and forming the bead-forming portions thereof.

8. In a trough-forming machine, a mandrel, a series of pairs of differentially-shaped rolls, coacting with said mandrel to progressively form a trough by easy stages, a portion of said rolls having loose rings or collars forming the portions thereof coacting with the mandrel.

9. The combination with a fixed element, of a rotatable shaping-roll having peripheral contact with said fixed element, said roll having a ring or collar mounted to turn loosely thereon and forming the surface portion of the roll in contact with said element.

10. The combination with a pair of shaping-rolls, and a fixed element disposed between and coöperating with the shaping-surfaces of said rolls, of a ring or collar mounted on each roll to turn loosely thereon and forming the surface portions thereof coöperating with the element to shape the work.

In testimony whereof I have hereunto signed my name to this specification in the presence of two subscribing witnesses.

ISAAC J. SHIFLEY.

Witnesses:
C. W. OWEN,
MARY I. SHAY.