No. 751,861. PATENTED FEB. 9, 1904.

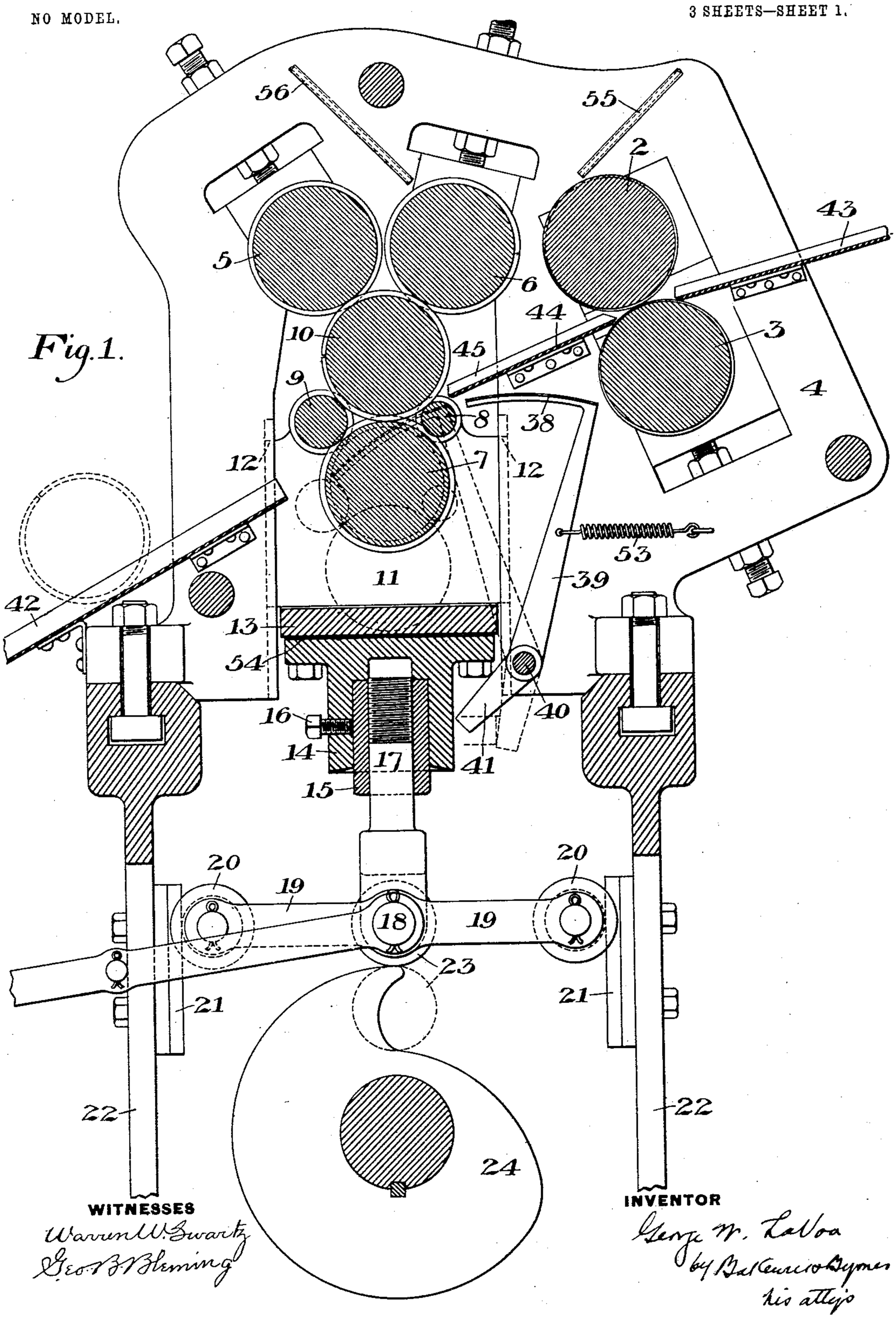
G. W. LA VOO.

APPARATUS FOR ROLLING RINGS.

APPLICATION FILED MAR. 23, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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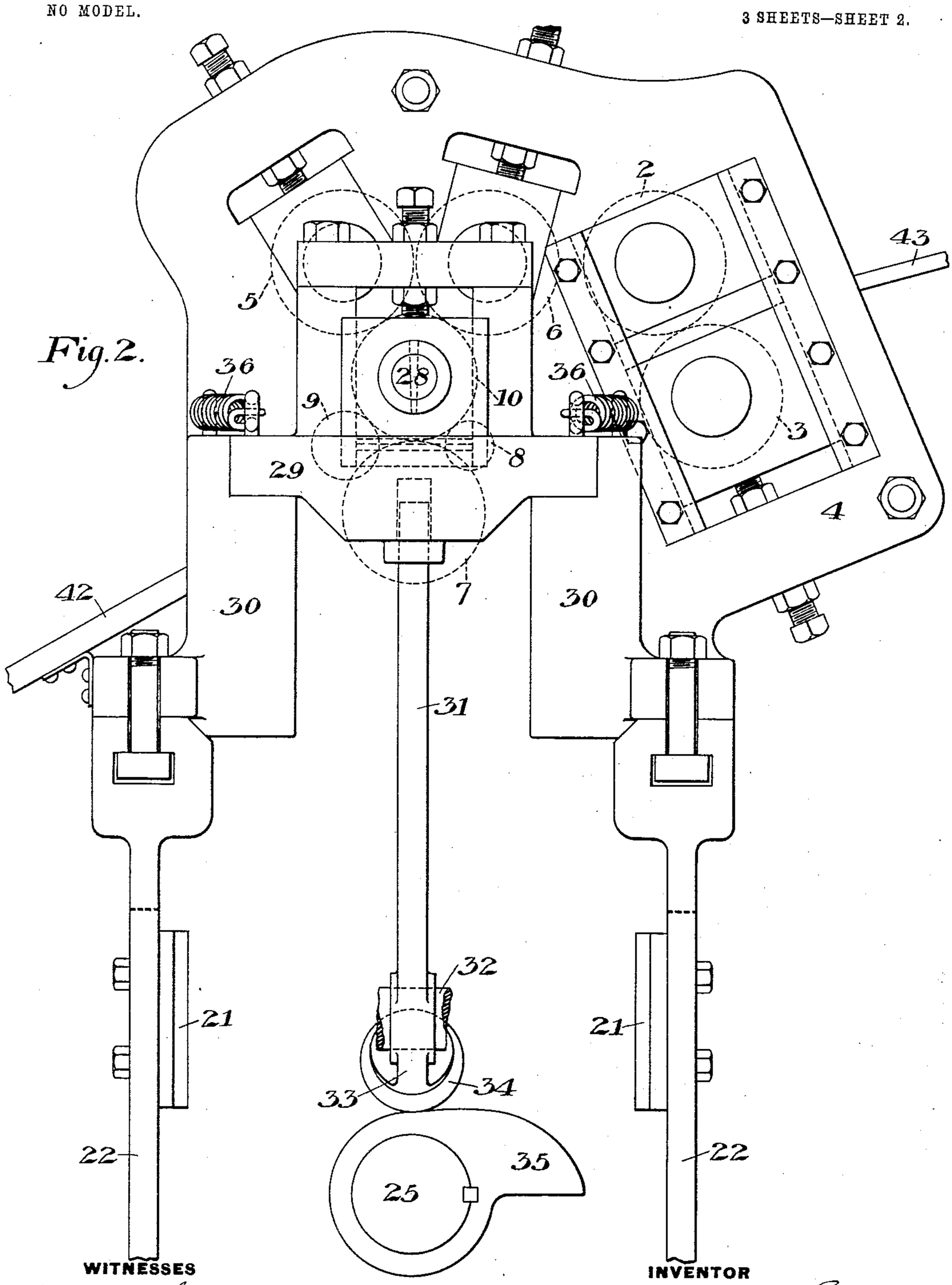
NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

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APPLICATION FILED MAR. 23, 1903.

NO MODEL. 3 SHEETS—SHEET 3.

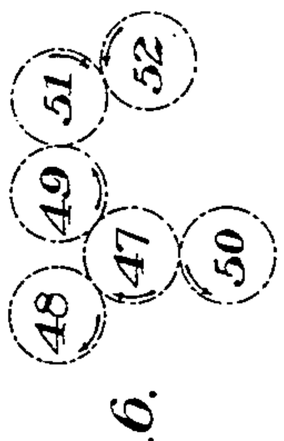

Fig. 6.

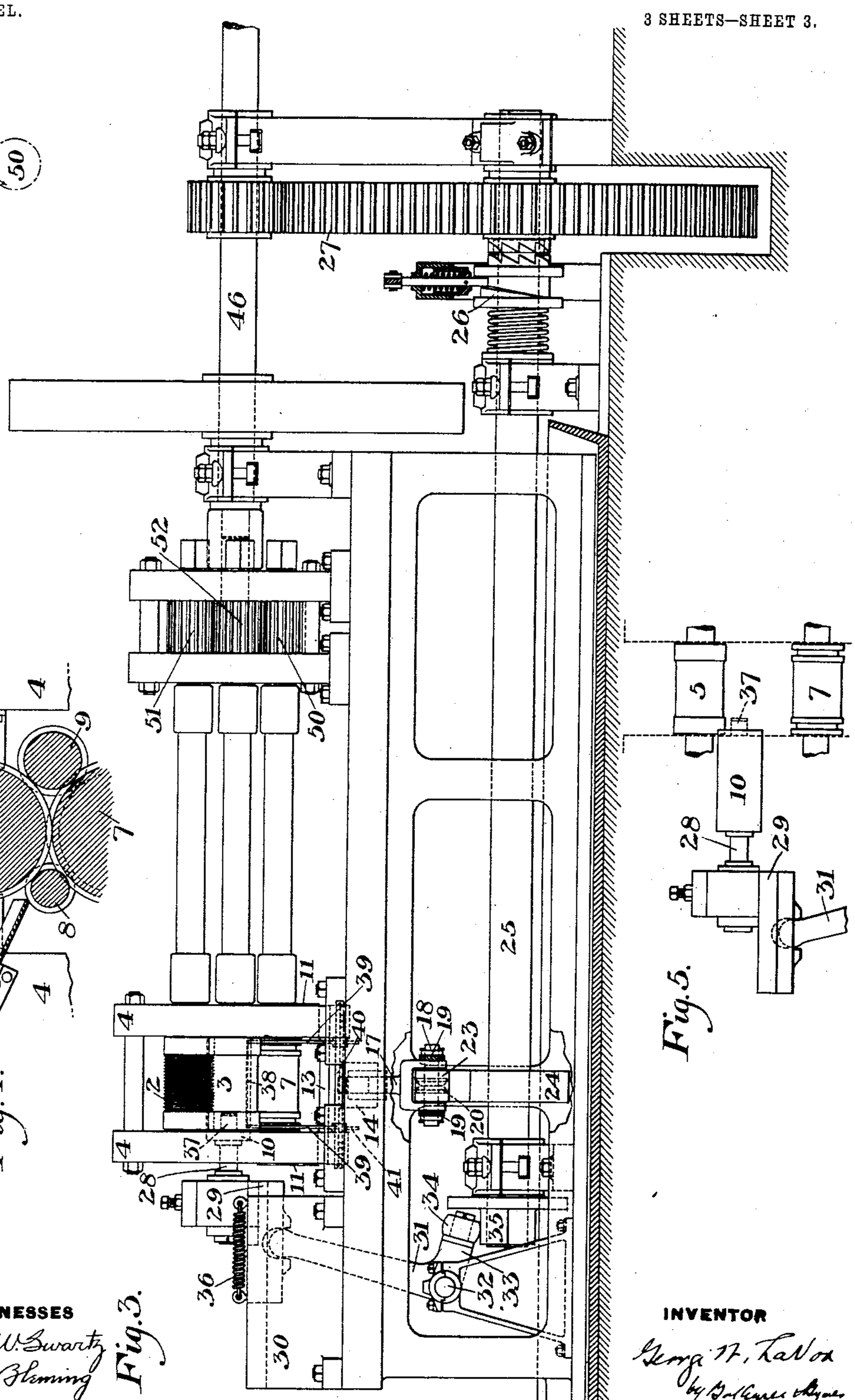

Fig. 4.

Fig. 3.

Fig. 5.

WITNESSES

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No. 751,861. Patented February 9, 1904.

UNITED STATES PATENT OFFICE.

GEORGE W. LA VOO, OF STEUBENVILLE, OHIO.

APPARATUS FOR ROLLING RINGS.

SPECIFICATION forming part of Letters Patent No. 751,861, dated February 9, 1904.

Application filed March 23, 1903. Serial No. 149,072. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. LA VOO, of Steubenville, Jefferson county, Ohio, have invented a new and useful Apparatus for Rolling Rings, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional side elevation showing a cluster-mill constructed in accordance with my invention. Fig. 2 is an end elevation of the same. Fig. 3 is a front elevation on a smaller scale. Figs. 4 and 5 are detail views hereinafter referred to, and Fig. 6 is a diagrammatic view of the pinion-gearing.

My invention relates to the rolling of rings, couplings, protectors, &c., in cluster-mills whether the same are welded or not, and more particularly to the forming of internally-screw-threaded rings, though parts of the invention are applicable to the formation of plain ring-shaped articles or to the bending of blanks into circular shape.

The invention is designed to increase the output, to reduce the amount of hand-labor, and to improve the operation of these mills. It consists in providing ejector mechanism by which the circular article formed is stripped from its inner mandrel and dropped from the machine and the mandrel then moved into normal position.

It also consists in mechanism for lowering, dropping the rollers below the mandrel to allow its withdrawal, and the returning of these lower rollers to their normal position for the next operation.

The invention further consists, as applied to inwardly-screw-threaded rings, in using a pair of feed-rollers for the cluster-mill, one of which is provided with screw-threads to roll threads upon the blank, which then passes forward and is rolled into ring form and welded, if desired. The screw-threading and bending into ring form are carried out at the same heat, the blanks being cut to length before passing between the screw-threading and feeding rollers.

In the drawings, 2 and 3 represent the threading feed-rolls, these being mounted in adjustable bearings in the general housing 4 of the cluster-mills. In the form shown the upper roll 2 is formed with screw-threads upon its surface, which impress screw-threads upon the upper face of the hot blank as it is fed into the cluster-mill. I have shown the cluster-mill as having upper shaping-rolls 5 and 6, a lower shaping-roll 7, a bending-roll 8, and a guide-roll 9, the rolls 8 and 9 being below and at opposite sides of the mandrel 10. The upper rolls 5 and 6 are mounted in adjustable bearings, while the rolls 7, 8, and 9 are carried in bearings mounted in vertical end slides 11, having edge guiding portions 12, which engage guides on the housings. The slides 11 are connected by the cross-head 13, at the center of which is a shafting 14, having a central hole receiving an internally-threaded sleeve 15, which is held against rotation by set-screw 16. A stem 17 is screwed into the sleeve 15 and is forked at its lower end to engage a short shaft 18, having oppositely-projecting rigid guide-arms 19, carrying-rollers 20, which move along guides 21, secured to vertical standards 22. A roller 23 is mounted upon a central portion of the shaft 18 and is engaged by a cam 24, mounted on a shaft 25, which extends to one side and has clutch connection 26 with driving-gear 27. The cam 24 is arranged to lift the rollers 7, 8, and 9 to their normal position, then retain them in that position for a certain period, and then lower the slides when the point of the cam is reached, after which they remain lowered until the mandrel has been returned to its normal position.

In order to withdraw the mandrel endwise and strip the ring from it and then return the mandrel, I mount it upon a shaft 28, which extends to one side of the housings and is carried in a long bearing in a sliding head 29. The edges of this slide move in suitable guideways of supports 30. The lower portion of the slide is provided with a curved opening containing the curved upper end of the lever-arm 31, which forms one end of a bell-crank pivoted at 32. The other arm, 33, of the bell-crank is provided with a friction-roller 34, which coacts with a cam 35. This cam 35 is mounted on the shaft 25 and serves to move

the mandrel outwardly as the inclined portion of the cam acts upon the roller. When the point of the cam is reached, the mandrel is at its outermost point, and as the point of the cam is passed the mandrel is quickly returned to normal position by springs 36, which are compressed during its outward movement. I may of course use positive means for moving the mandrel in both directions, but preferably give a quick return movement.

During the outward movement of the mandrel the blank which has been formed is stripped from it by the collars on the rolls 5 and 6, they being preferably aided by stripper-plates 37, as shown in Fig. 4, these projecting inwardly from the housing at the ejecting side and having curved inner ends arranged to engage the blank. To prevent the ring thus ejected from dropping upon the roller 7 and between the rollers 8 and 9, where it would rest, I preferably provide a tilting cover or deflector 38, which is secured to levers 39, mounted on a shaft 40, carried in bearings in the housing and having a lever-arm 41, which is engaged by the plate 13 during the downward travel of the slides 11. The cover or deflector 38 is thus thrown into the position shown in dotted lines in Fig. 1, in which position the dropping ring or blank will roll along it and thence into a chute 42, extending to the rear of the machine. When the deflector is released, it is drawn back by a spring 53.

I preferably provide a feed-shelf 43, leading to the feed-rolls 2 and 3, and also a guide-plate 44, having guiding end flanges 45 between the rolls 2 and 3 and the mandrel and leading to the pass between the mandrel and the bending-roll 8. The mandrel is of such a size that will correspond to or be less than the interior diameter of the ring to be formed, and in the form shown the diameter of the mandrel is preferably equal to the extreme diameter of the threaded spring-ring formed.

The main driving-shaft 46 is coupled to the central driving-pinion 47. The two upper pinions 48 and 49 and the lower pinion 50 mate directly with this central pinion. The driving-pinion 51 for the upper feed-roll meshes with the pinion 49, and the driving-pinion 52 for the lower roll meshes with the driving-pinion 51. Each of these pinions has a wabbler connection with the corresponding roll of the mill, all of the rolls being driven except the bending-roll and the guide-roll, which rolls are driven by friction with the mandrel. The arrangement of the pinions is shown in Fig. 6. The rolls 5, 6, 7, 8, and 9 are all provided with end collars, which work upon the edges of the blank.

To cushion the drop of the slides 11 and to exert a yielding pressure upon the rolls 7, 8, and 9, I preferably provide rubber cushions 54 between the plate 13 and the block 14. I also preferably provide pipes 55 and 56 for conducting cooling fluid to the threads of the upper feed-roll and to the mandrel and shaping-rolls.

I preferably form the threading feed-roll 2 of a series of transverse sections secured together end to end with the threads in registry, thus obtaining a cheap and easily-repaired threading-roll. I also preferably arrange the bearings for the rollers 2 and 3 as shown in Fig. 2, so that they may be slipped out endwise without interfering with the other rolls and without taking the housings apart.

In order to make the blank thicker at a point opposite to the ends where a spring-ring is made without welding the ends together, I preferably make the roll 3 eccentric, so that it will thin down the metal of the blank near its ends and allow full thickness at its middle portion. This assists in holding the ring in proper shape and adds to its resilience.

In using the apparatus the blanks are cut to proper length and heated to less than a welding heat. One of these heated blanks is then fed between the rolls 2 and 3 and a thread thereby formed on its upper surface. These rolls are preferably so located that the front end of the blank enters the pass between the pass and the bending-roller before its rear end leaves the pass between the rollers 2 and 3, and as its front end moves forward it is guided by the intermediate plate and flanges. The hot blank is then rolled into ring form in the cluster-mill, the passes between the shaping-rolls and mandrel being of the proper depth to prevent crushing of the threads. The blank is thus rolled into ring form, its ends being free and not welded together. The operator then throws in the clutch, if the same has been thrown off, and the rotation of the shaft 25 first lowers the slides 11 and then draws the mandrel outwardly. As the mandrel moves endwise the ring is stripped and rolls out to the rear. The mandrel is then automatically returned to its normal position, and the cam 24 then raises the slides 11 and the lower rollers to their normal position. It will be understood that the operator may allow the shaft 25 to rotate continuously, and by feeding in the blanks at the proper intervals the motions will be automatic, or he can stop and start the shaft 25, as desired, between the operations.

The advantages of my invention result from the increased output and the doing away with the laborious work of handling the screw-threaded mandrel, which operation is difficult, especially with large-sized protectors. The use of the threaded feed-rolls does away with the necessity for the present mandrel and enables the ring to be automatically ejected, while the ring may be rolled at the same heat as that used in screw-threading.

While the invention is especially applicable to the rolling of spring-ring protectors having inner threads, the ends being free and non-welded, the mill may be used for rolling welded

rings or bending blanks into ring form for making couplings, and many changes may be made in the form and arrangement of the different parts without departing from my invention.

I claim—

1. The combination with a cluster-mill arranged to roll blanks into rings, of a pair of preliminary rolls in front of said mill, at least one of said preliminary rolls being provided with external screw-threads arranged to form screw-threads upon one side of the blank as it passes to the cluster-mill; substantially as described.

2. The combination with a cluster-mill arranged to roll blanks into rings, of a pair of preliminary rolls in front of the mill, at least one of said preliminary rolls having external screw-threads arranged to screw-thread one face of the blank, and mechanism for positively driving at least one of said preliminary rolls; substantially as described.

3. The combination with a cluster-mill arranged to roll blanks into rings, of a pair of preliminary rolls in front of the entrance-pass of said mill, the upper of said preliminary rolls having external screw-threads arranged to screw-thread the upper face of the blank, and means for driving at least one of said feed-rollers; substantially as described.

4. A cluster-mill having a pair of feed-rolls, one of which is screw-threaded, the rolls being so arranged that the blank will enter the bending-pass before it leaves the feed-rolls; substantially as described.

5. The combination with a cluster-roll arranged to roll a blank into a ring, of a pair of preliminary rolls in front of the entrance-pass of said mill, at least one of the preliminary rolls being externally screw-threaded to form screw-threads on one face of the blank, said cluster-mill having a mandrel, and mechanism for automatically moving the mandrel endwise to strip the ring; substantially as described.

6. A cluster-mill having the rolls below the mandrel carried in vertically-movable slides, mechanism for raising and lowering the slides, and mechanism for moving the mandrel endwise in a predetermined relationship to the movement of the slides; substantially as described.

7. A cluster-mill having the rolls below the mandrel carried in vertically-movable slides, automatic mechanism for raising and lowering the slides, and automatic mechanism for moving the mandrel endwise in a predetermined relation to the movement of the slides; substantially as described.

8. A cluster-mill having vertically-movable lower rolls, a cover arranged to prevent the ring from dropping on the lower roll, mechanism for moving the cover over these rolls when lowered, and mechanism for moving the mandrel endwise to strip the ring; substantially as described.

9. A cluster-mill having mechanism for raising and lowering the lower rolls, mechanism for moving the mandrel in both directions, and driving connections arranged to operate both of said mechanisms automatically; substantially as described.

10. The combination with a cluster-mill arranged to roll a blank to ring form, of a pair of preliminary shaping-rolls in front of the entrance-pass, one of the preliminary rolls being externally screw-threaded, and the other being eccentric; substantially as described.

In testimony whereof I have hereunto set my hand.

GEORGE W. LA VOO.

Witnesses:
L. M. REDMAN,
H. M. CORWIN.