(No Model.)

14 Sheets—Sheet 1.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

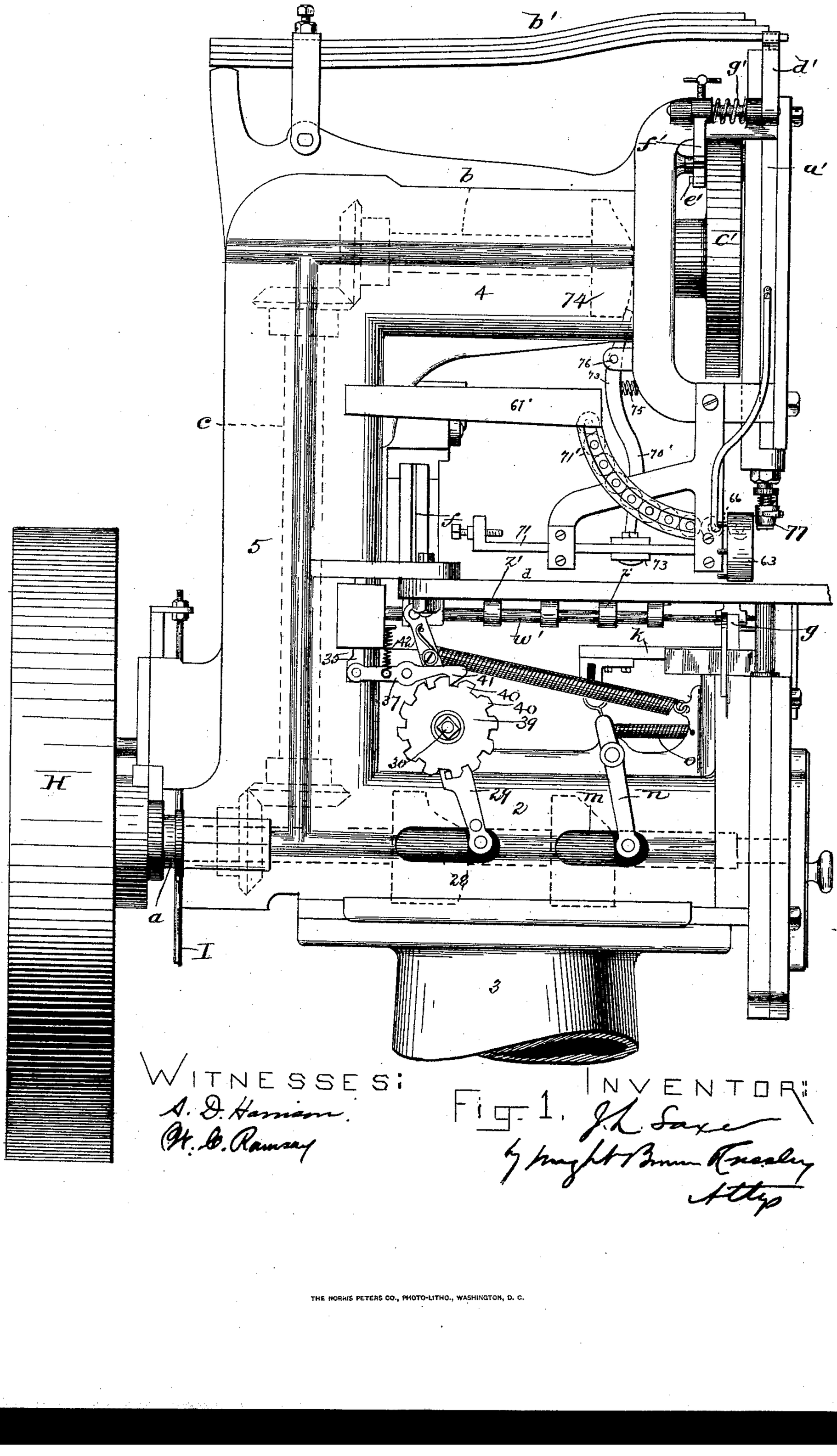


Fig. 1.

WITNESSES:
A. D. Harrison.
H. B. Ramsay

INVENTOR:
J. L. Saxe
by Wright Brown Quinby & Otty
Attys

(No Model.)

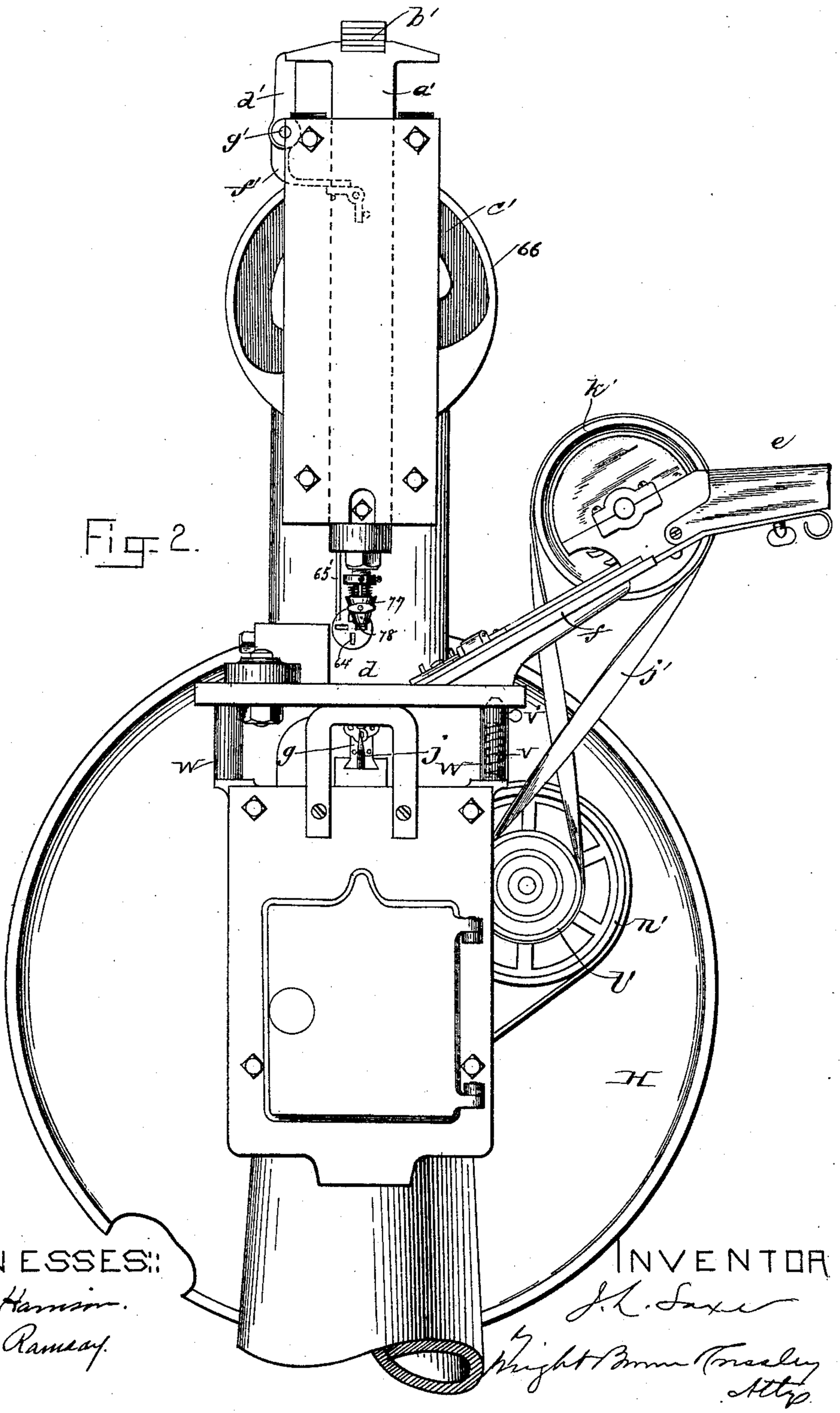
14 Sheets—Sheet 2.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

Fig. 2.



WITNESSES:
A. D. Harrison.
W. C. Ramsay.

INVENTOR
J. L. Saxe
by Wright Brown Quinby & Otty.

(No Model.)

14 Sheets—Sheet 3.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

Fig. 4.

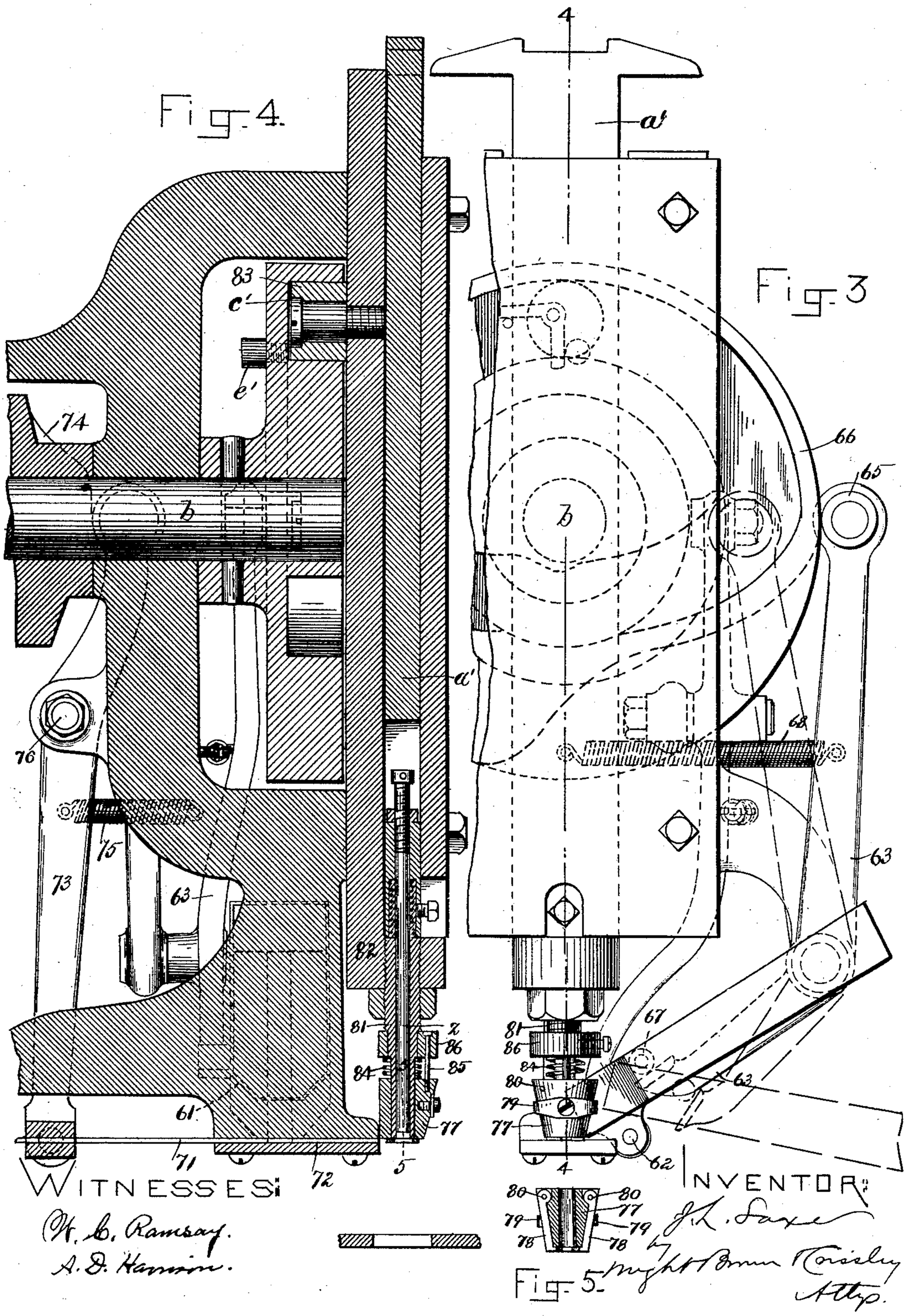


Fig. 3.

Fig. 5.

WITNESSES:

W. B. Ramsay.

A. D. Harrison.

INVENTOR:

J. L. Saxe

by Wright Brown Quinby & Otis

Attys.

(No Model.)

14 Sheets—Sheet 4.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

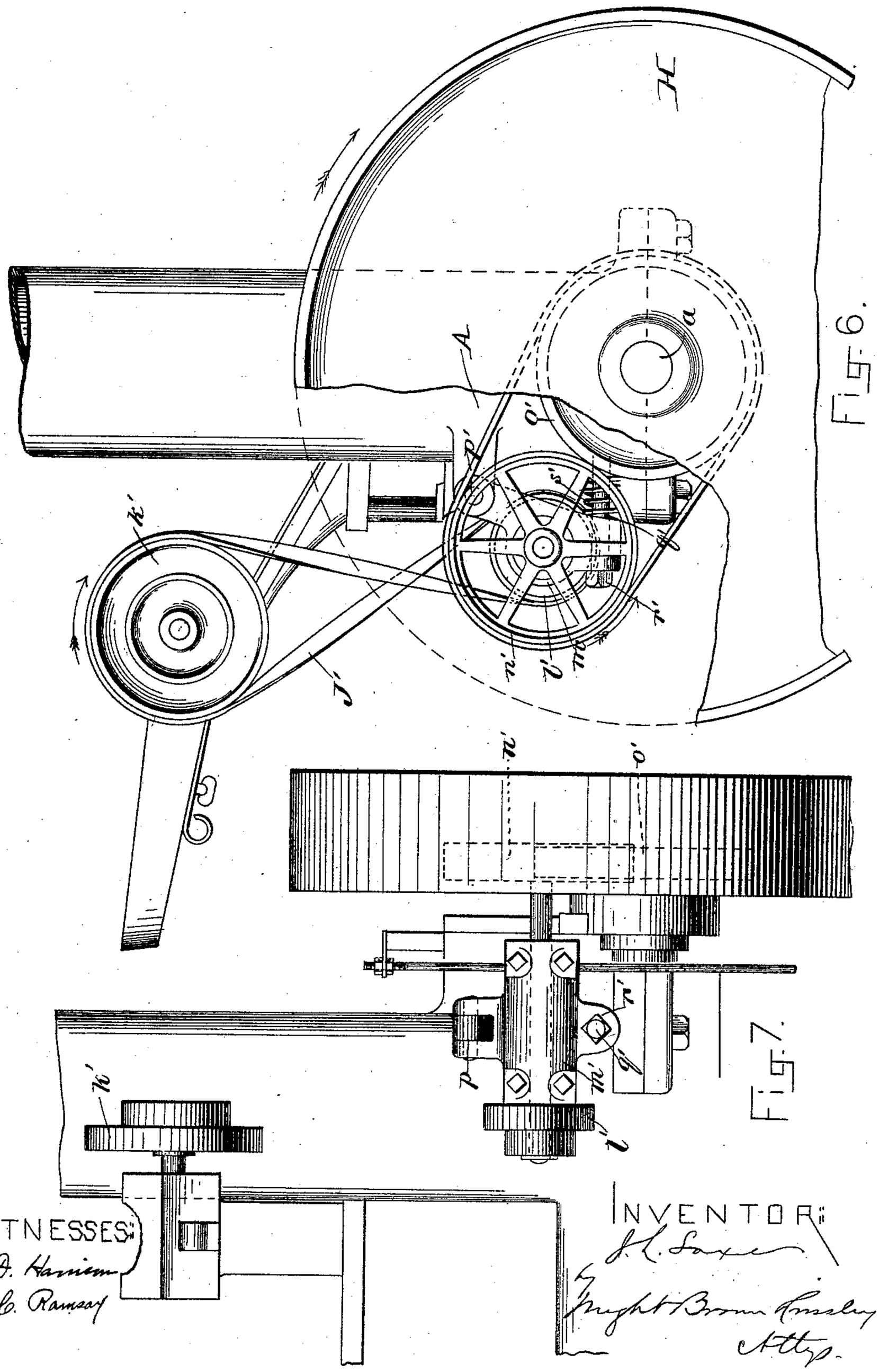


FIG. 6.

FIG. 7.

WITNESSES:
A. D. Harrison
H. C. Ramsay

INVENTOR:
J. L. Saxe
by Knight Brown Pressley
Attys.

(No Model.) 14 Sheets—Sheet 5.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

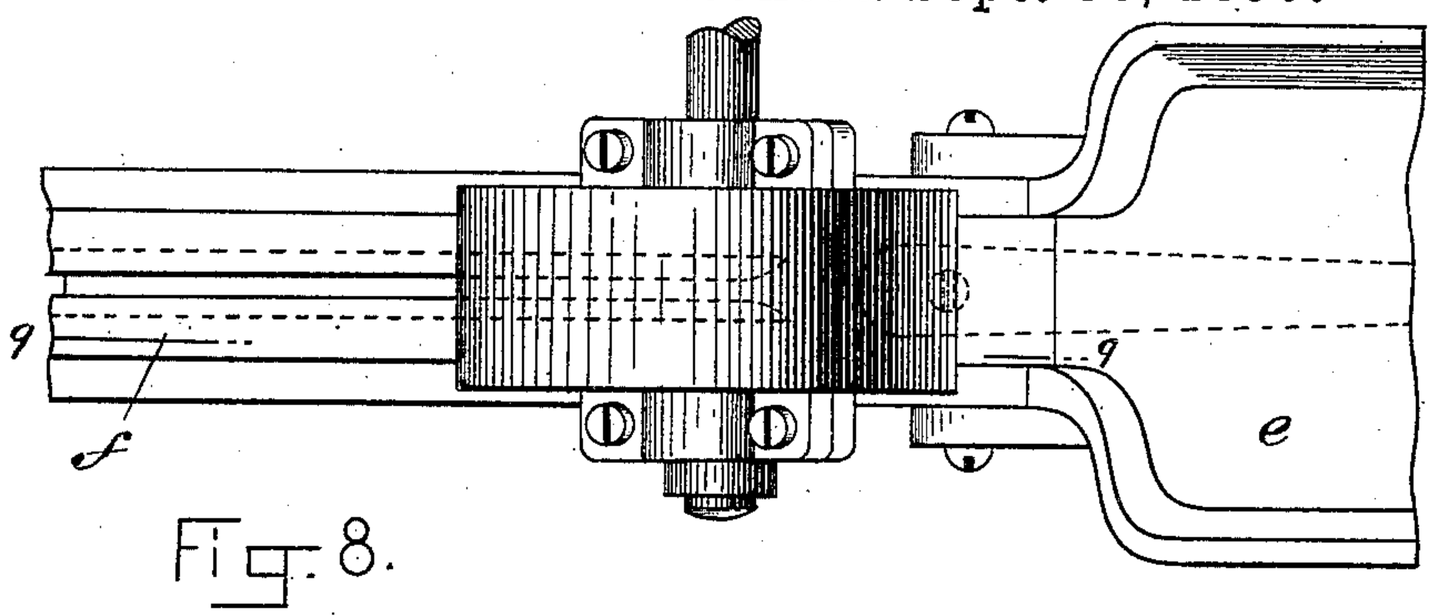


Fig. 8.

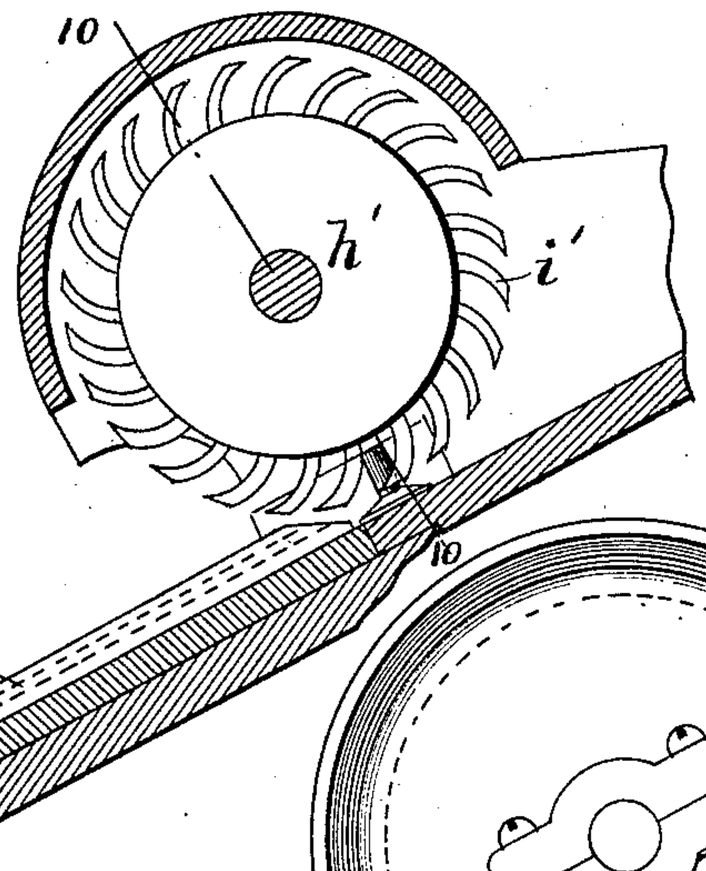


Fig. 9

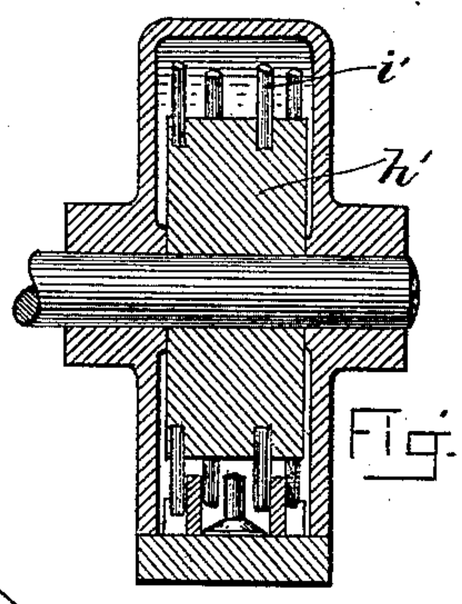


Fig. 10

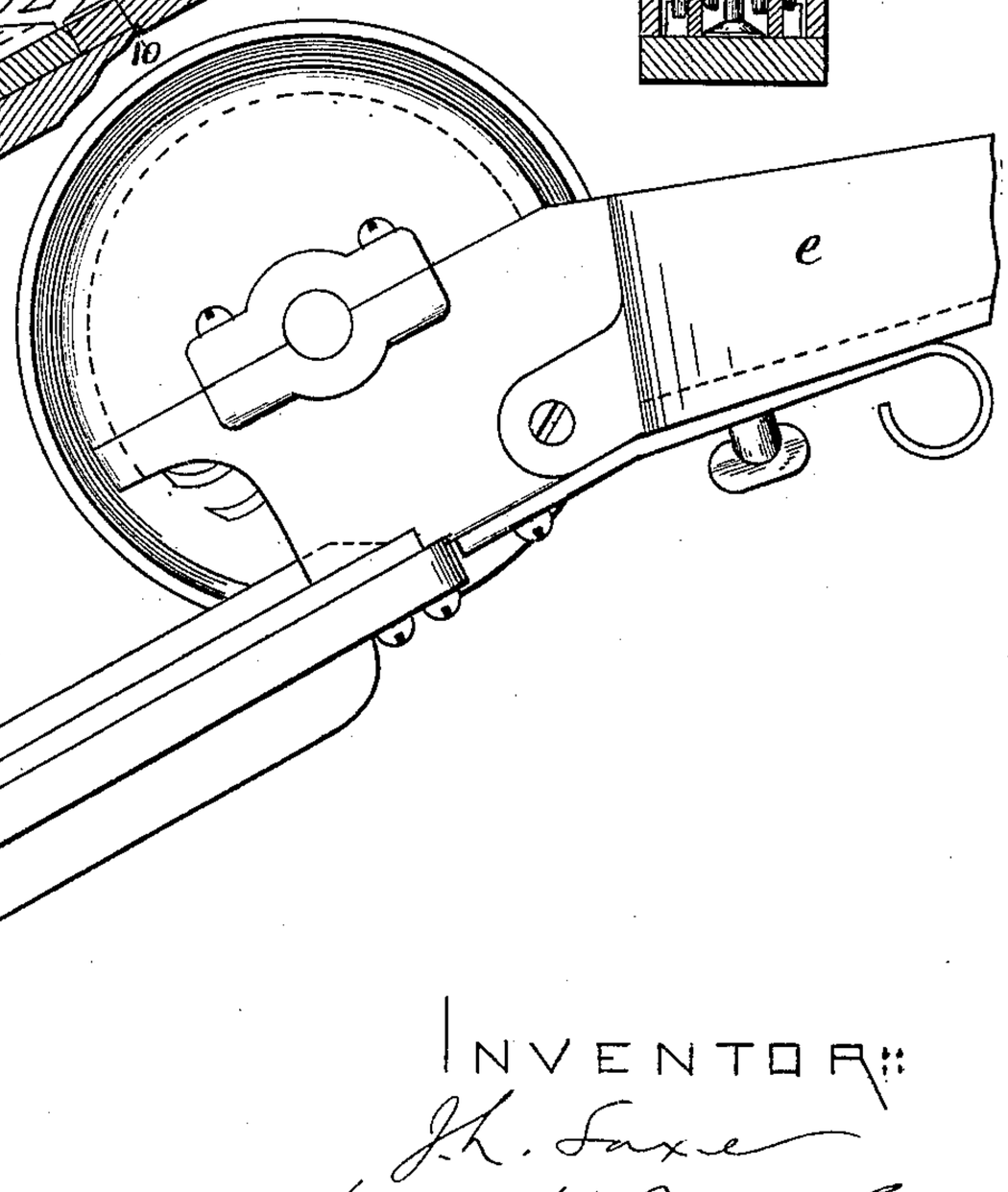


Fig. 11.

WITNESSES:
A. D. Harrison
H. C. Ramsay.

INVENTOR:
J. L. Saxe
by Wright Brown Quinby & Otty.

(No Model.) 14 Sheets—Sheet 6.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

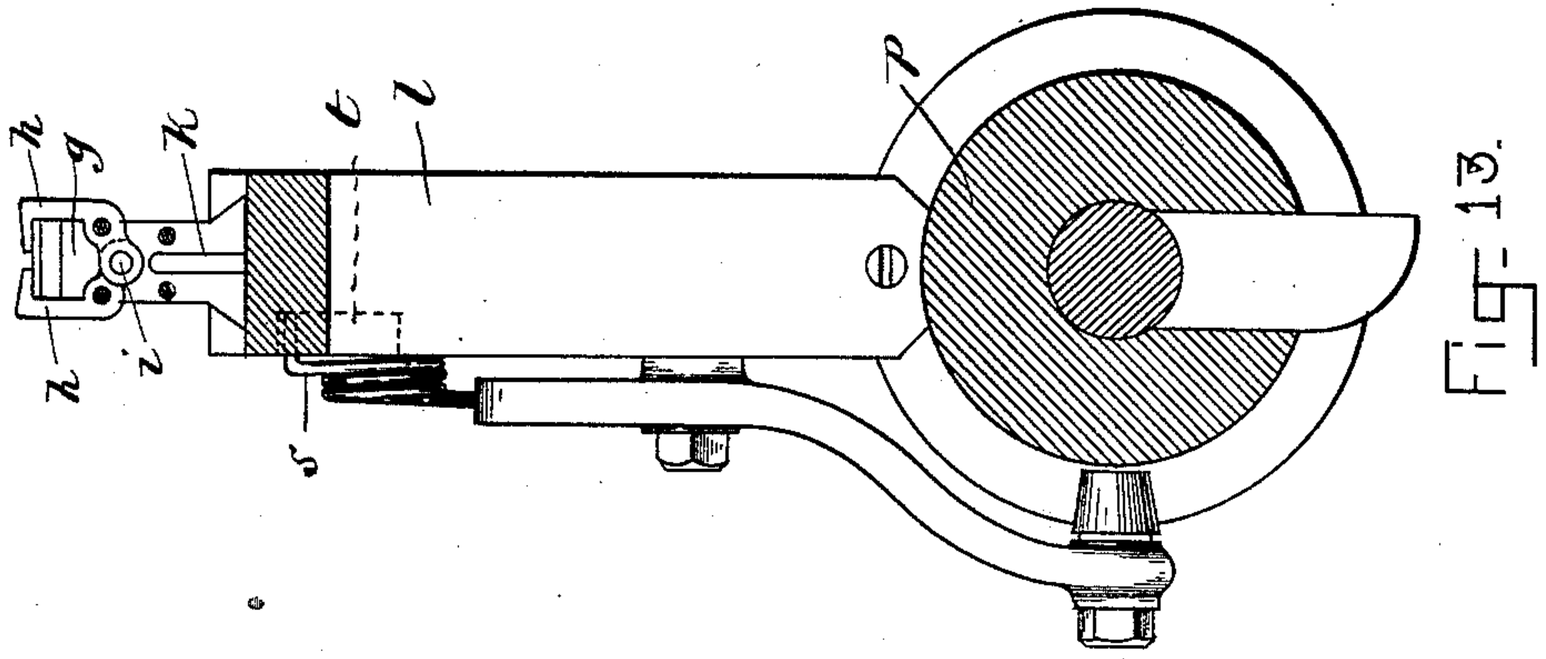


FIG. 13.

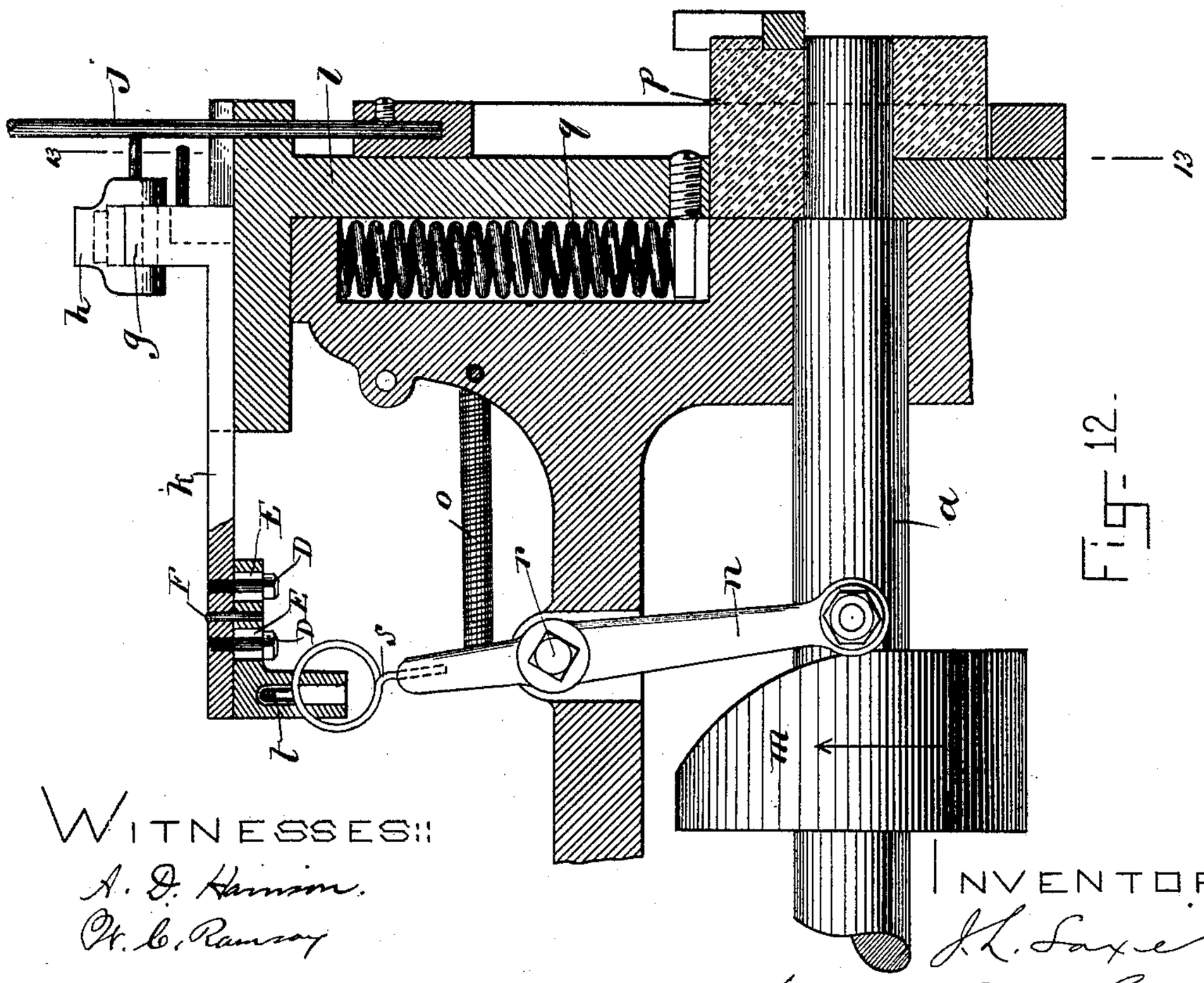


FIG. 12.

WITNESSES:
A. D. Hanson.
H. C. Ramsay

INVENTOR:
J. L. Saxe
by Wright Brown Quinby & Otty.
Attys.

(No Model.)

14 Sheets—Sheet 7.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249.

Patented Sept. 30, 1890.

Fig. 15.

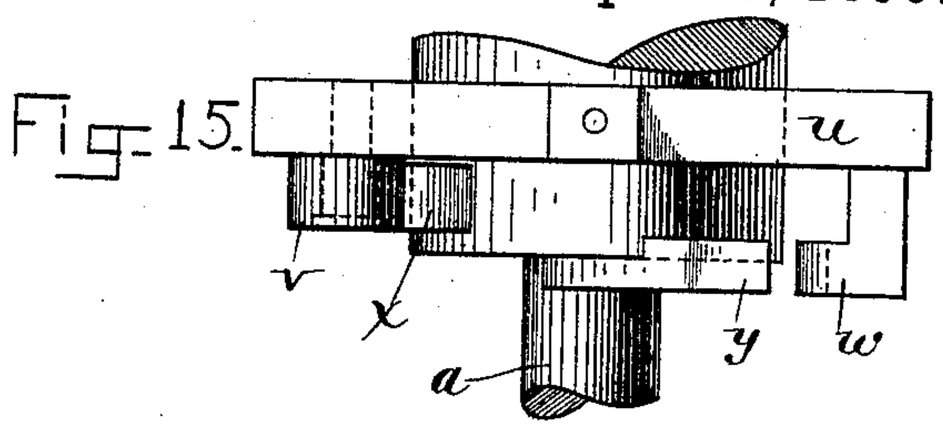
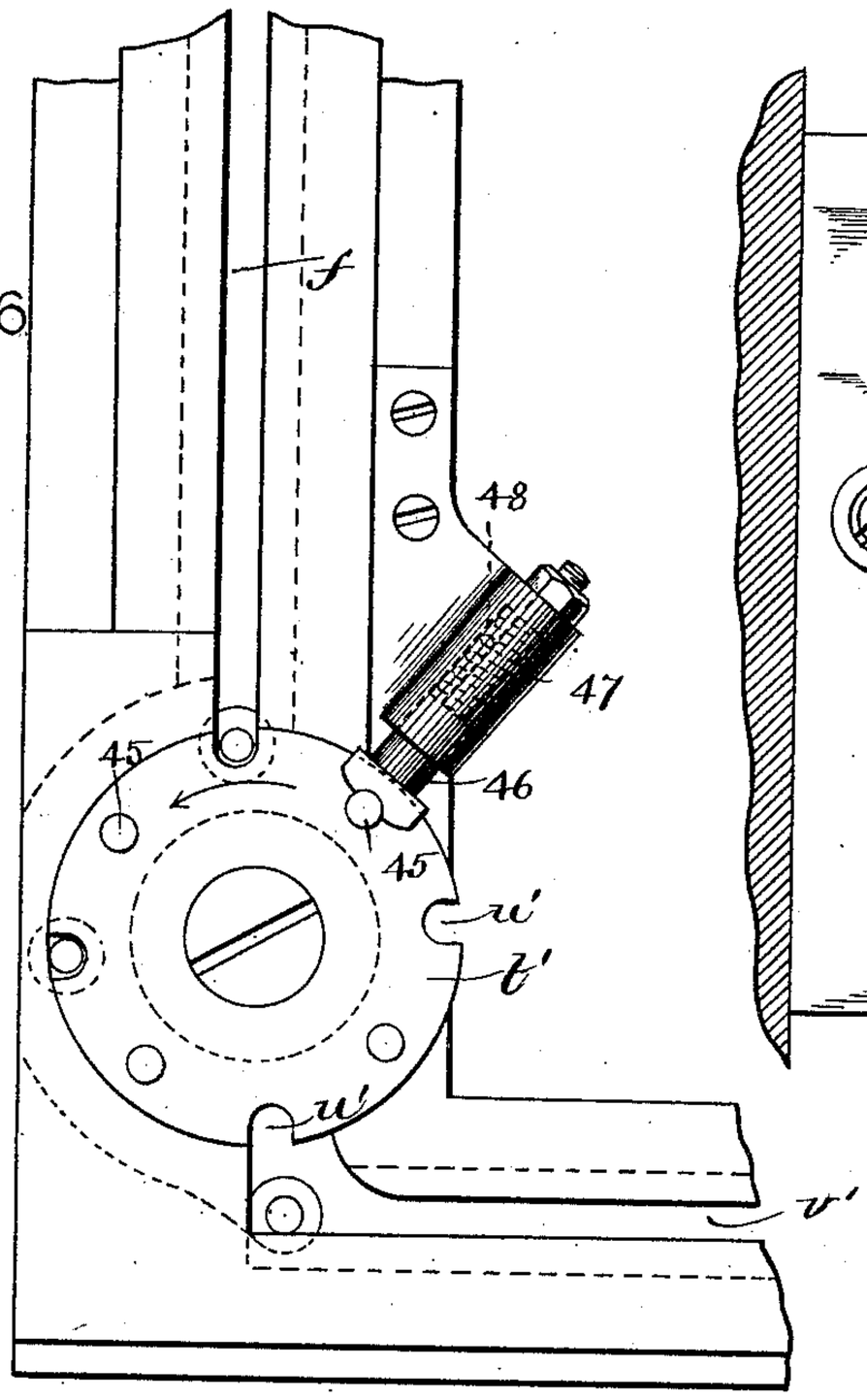


Fig. 16.



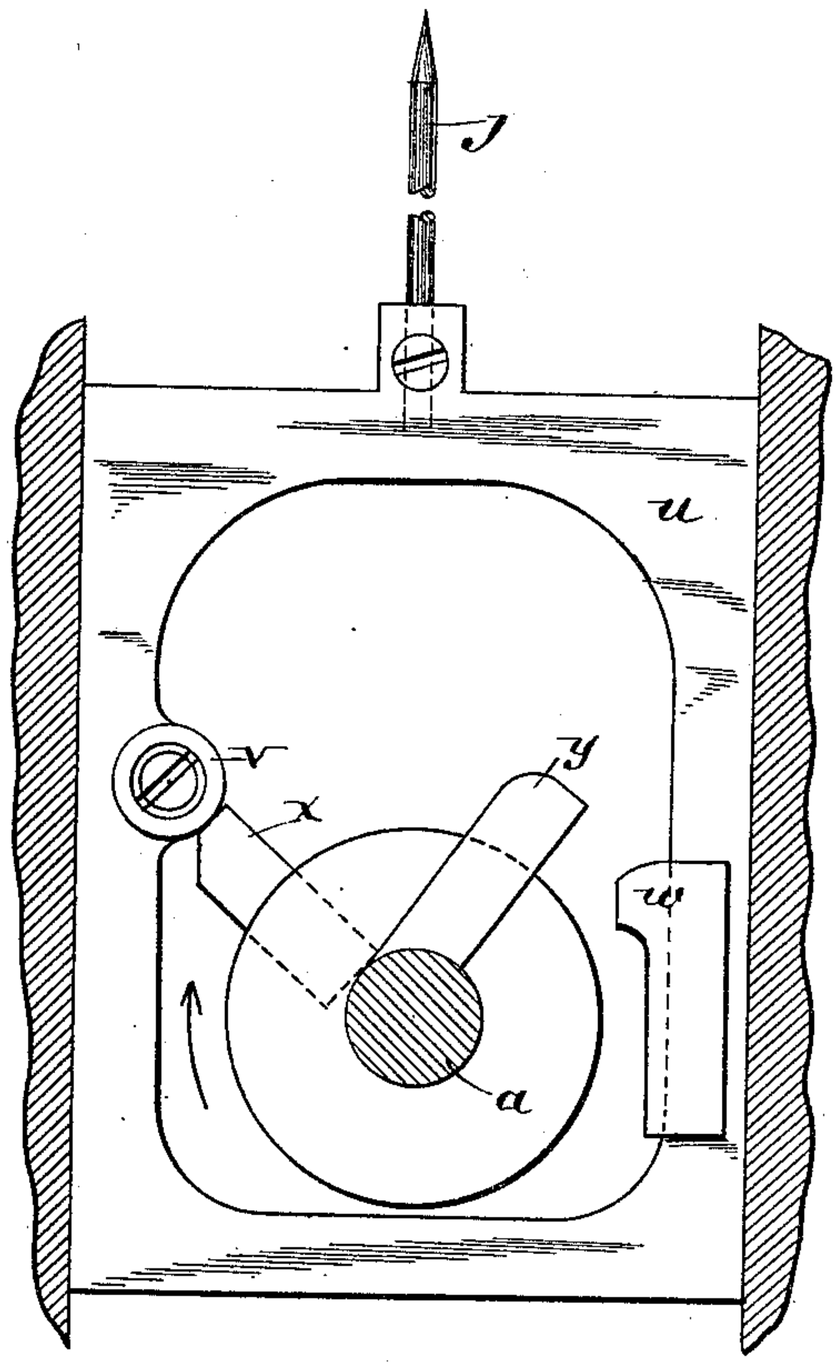


Fig. 14.

WITNESSES:

A. D. Harrison

H. C. Ramsay

INVENTOR:

J. L. Saxe

by Wright Brown Quinby & Otty.

Attys.

(No Model.) 14 Sheets—Sheet 8.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

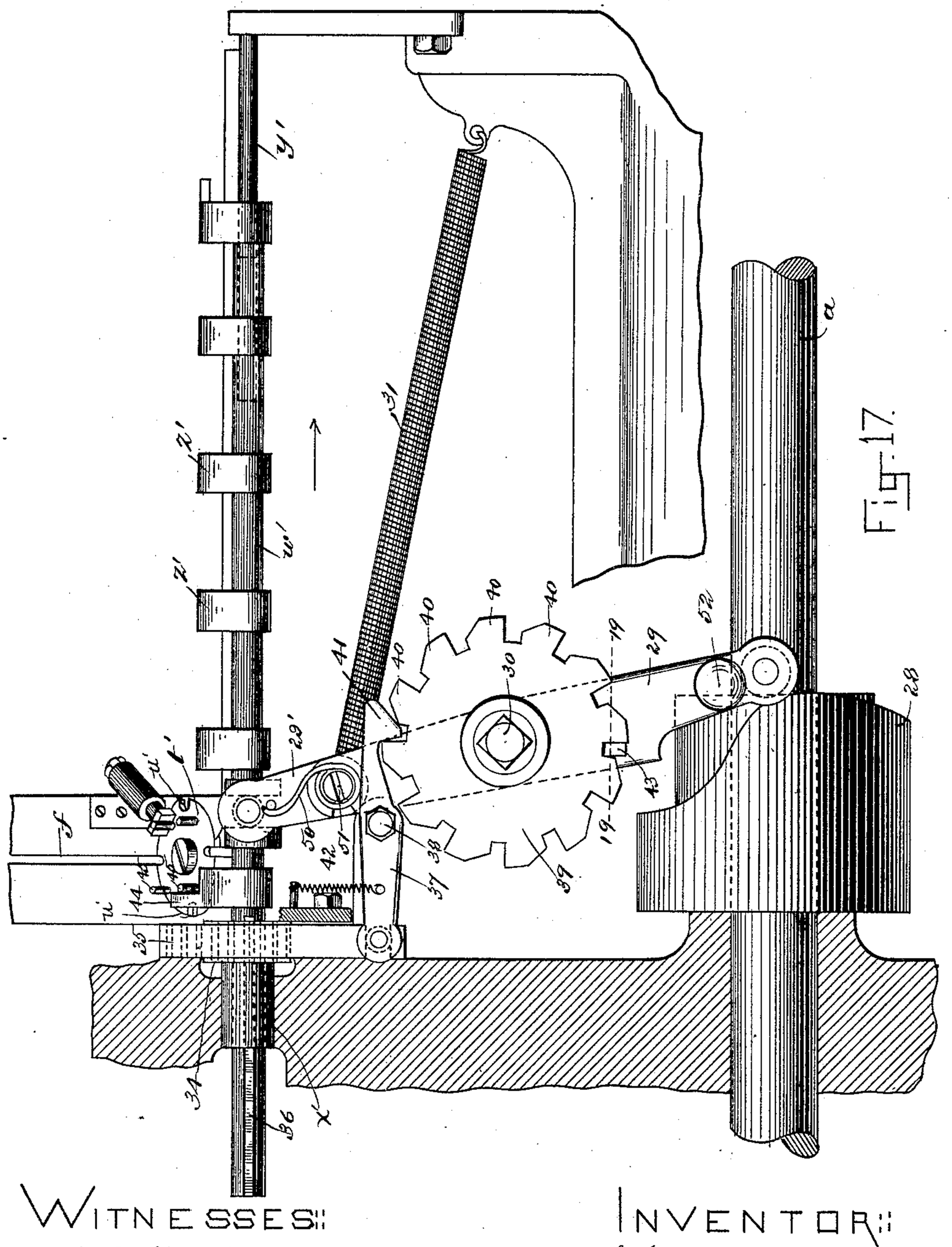


Fig. 17.

WITNESSES:
A. D. Harrison.
W. C. Ramsay

INVENTOR:
J. L. Saxe
by Wright Brown Quinby & Atty.

(No Model.) 14 Sheets—Sheet 9.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

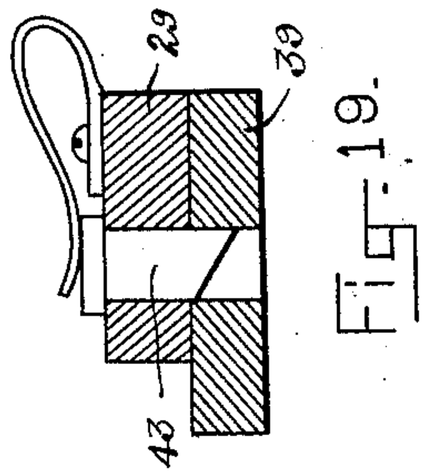


Fig. 19.

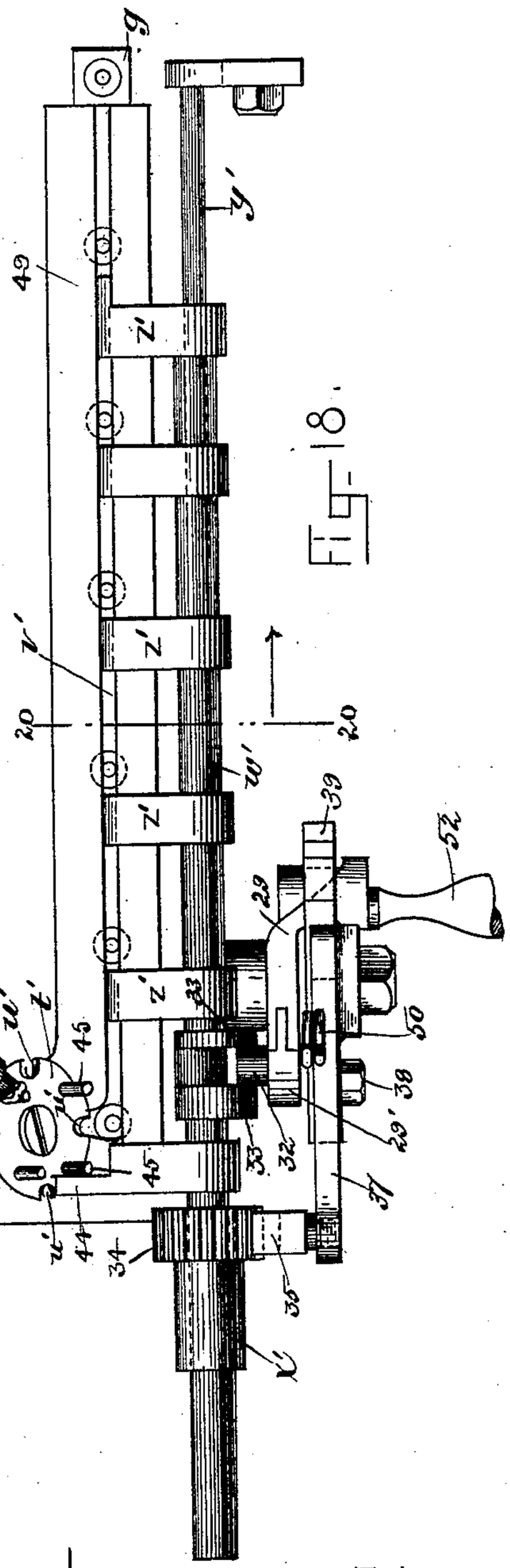


Fig. 18.

WITNESSES:

A. D. Harrison.

W. C. Ramsay

INVENTOR:

J. L. Saxe

by Wright Brown Quinby & Otty.

Attys.

(No Model.) 14 Sheets—Sheet 10.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

Fig. 21.

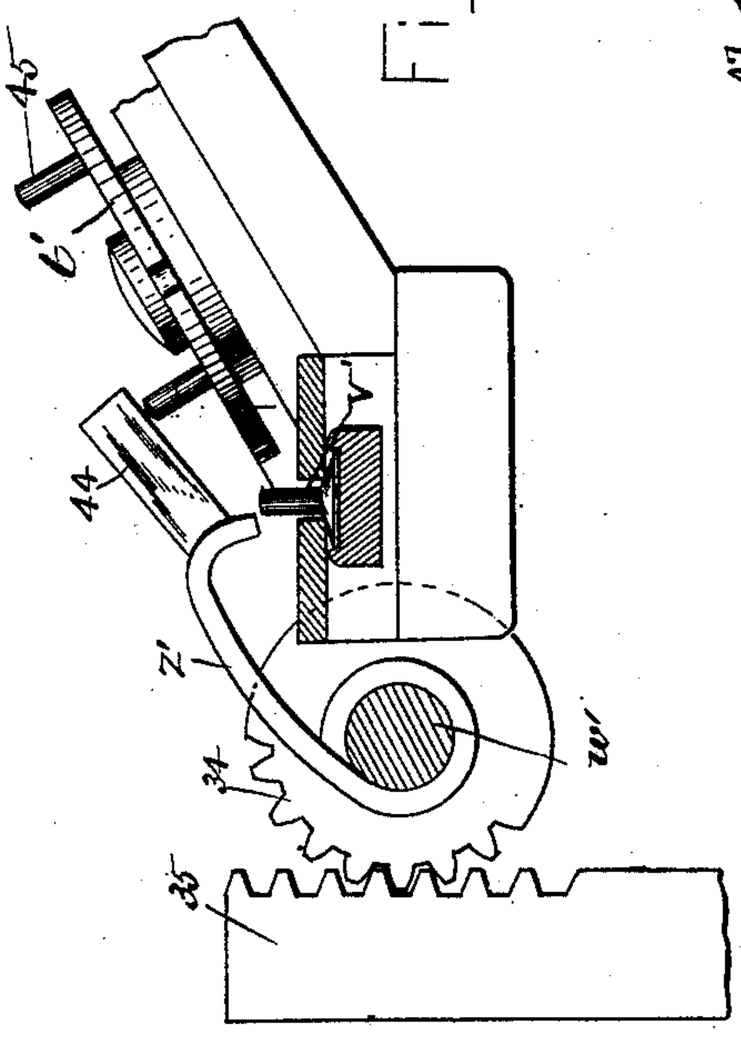
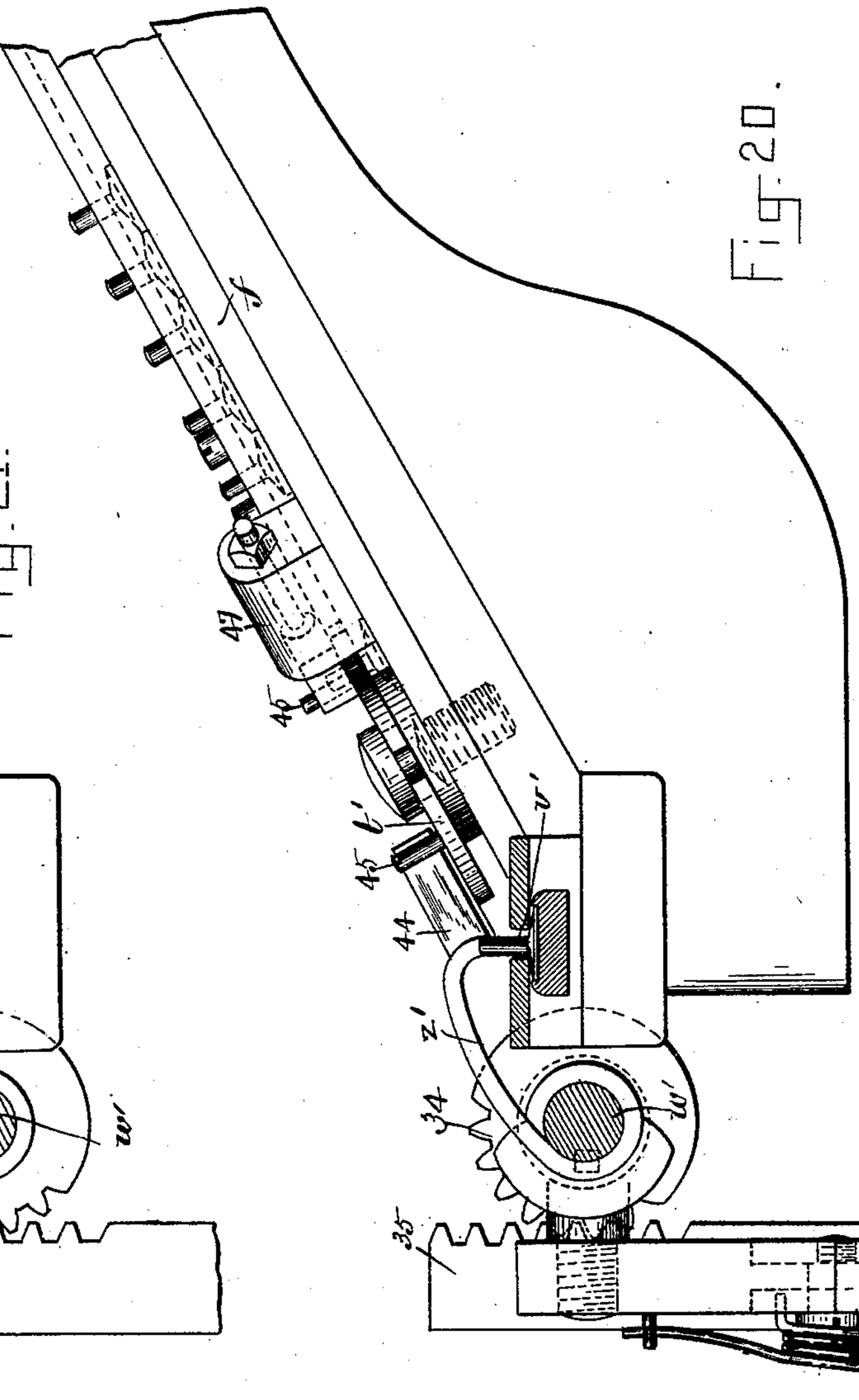


Fig. 20.



WITNESSES:

A. D. Harrison.
W. C. Ramsay.

INVENTOR:

J. L. Saxe
by Wright Brown Quinby & Otty

(No Model.) 14 Sheets—Sheet 11.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

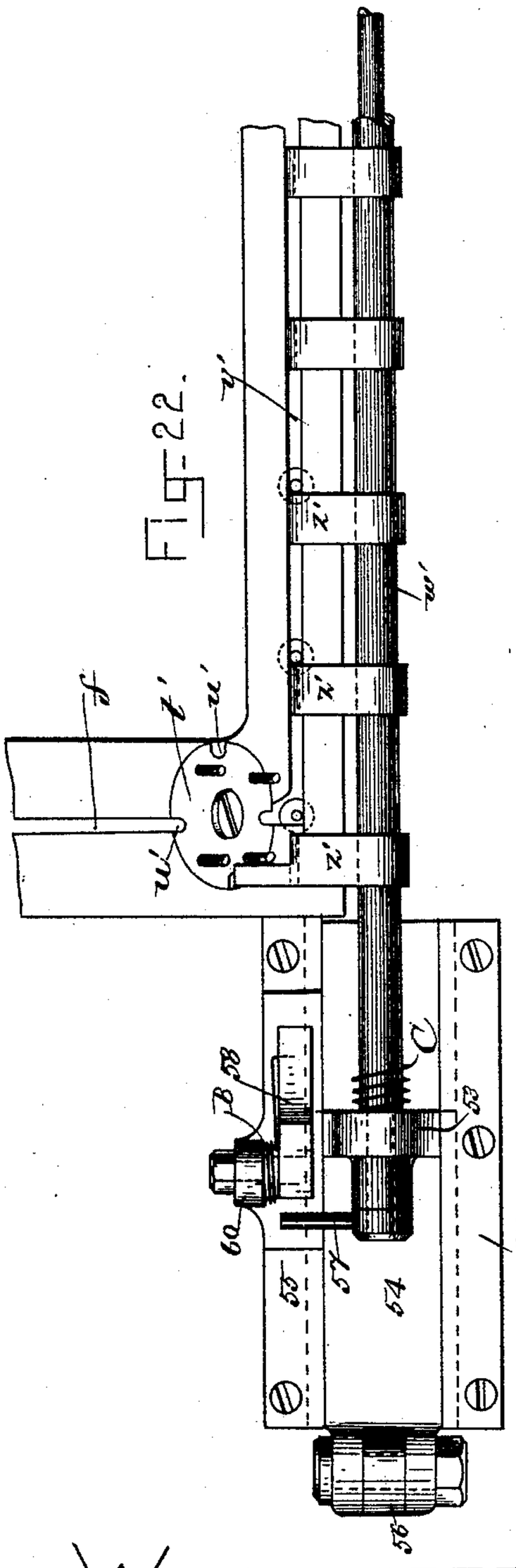


FIG. 22.

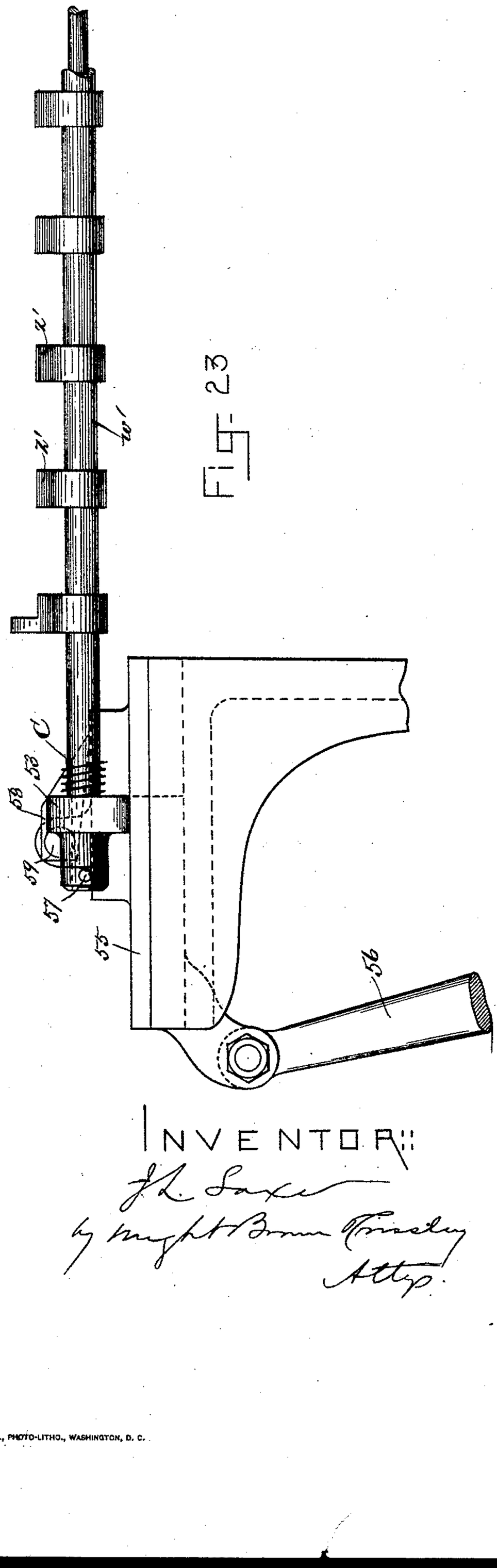


FIG. 23

WITNESSES:

A. D. Hamann.

M. C. Ramsay

INVENTOR:

J. L. Saxe

by Wright Brown Quinby & Atty.

(No Model.) 14 Sheets—Sheet 12.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

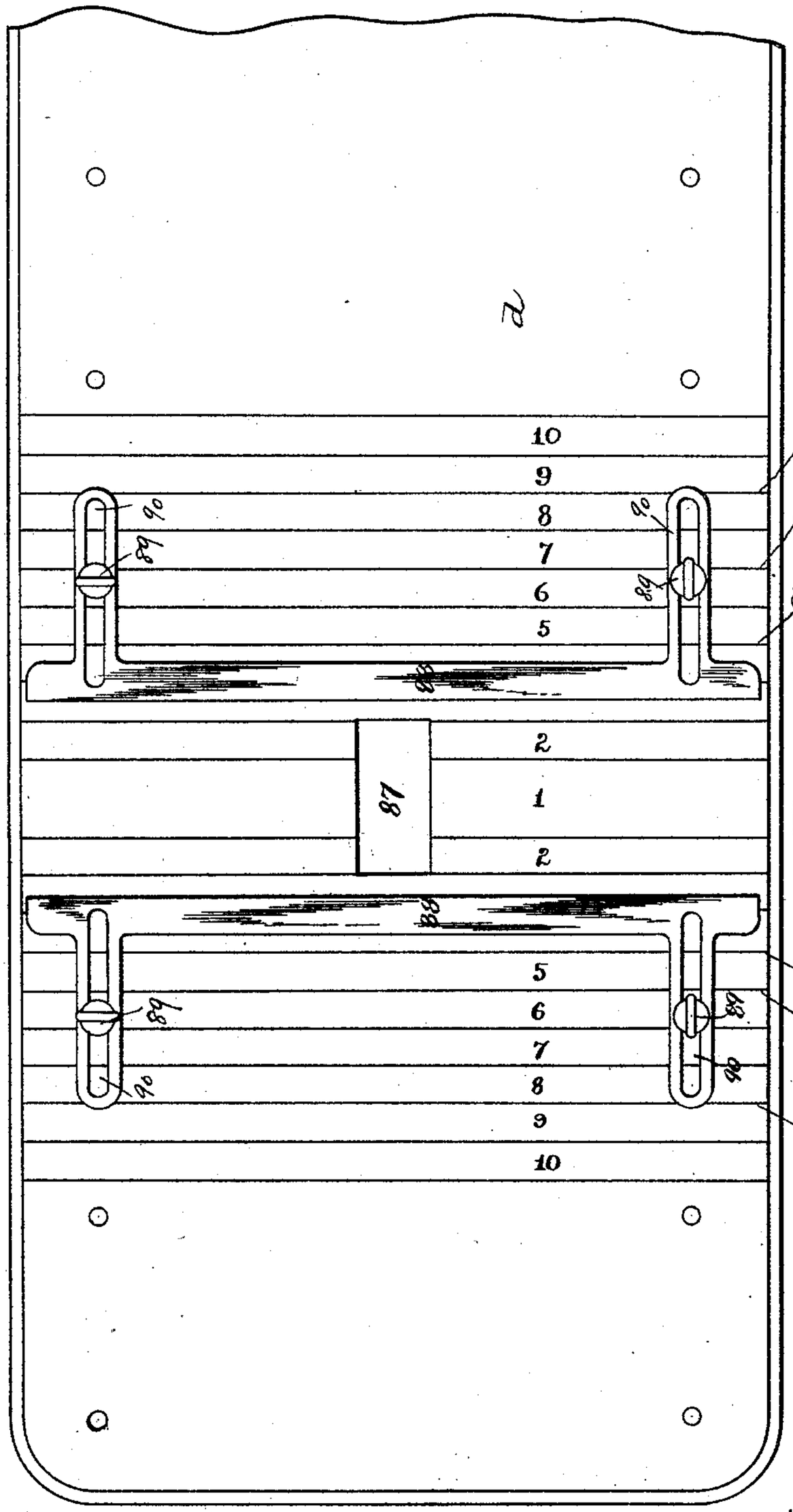


Fig. 24.

Fig. 25.

WITNESSES:

A. D. Harrison.

W. B. Ramsay

INVENTOR:

J. L. Saxe

by Wright Brown Quinby & Otty

Attys

(No Model.) 14 Sheets—Sheet 13.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

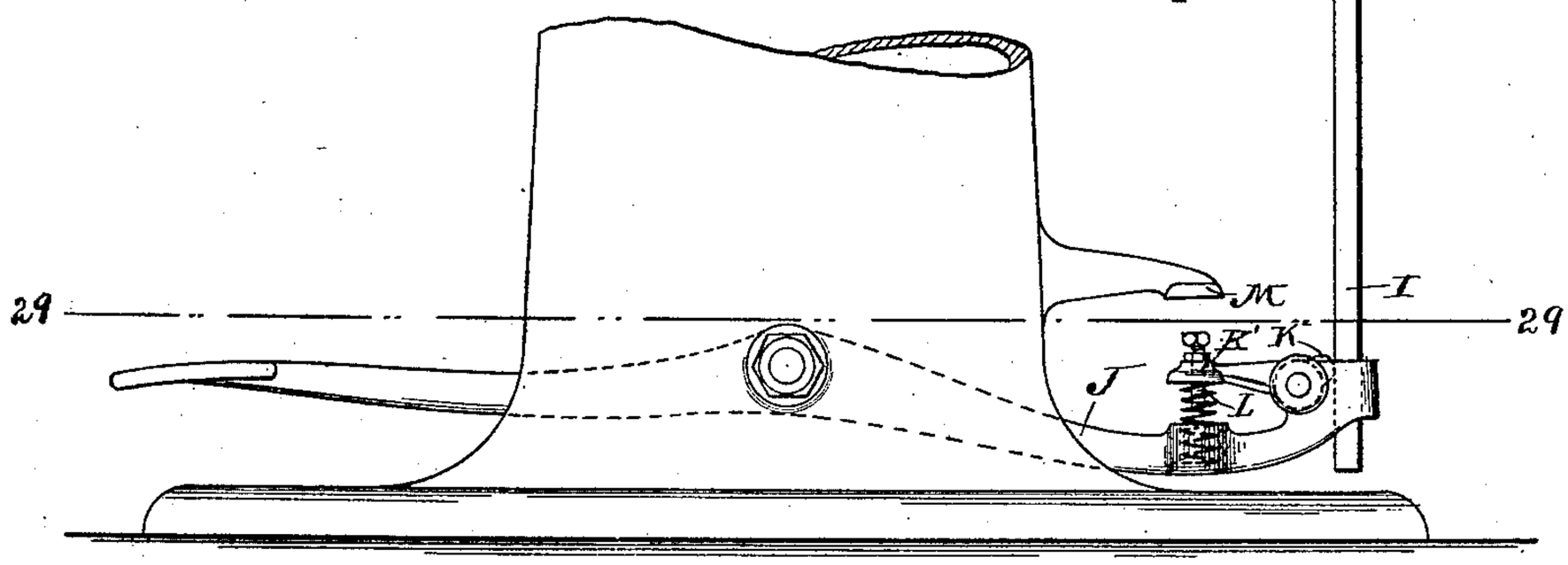


Fig. 26.

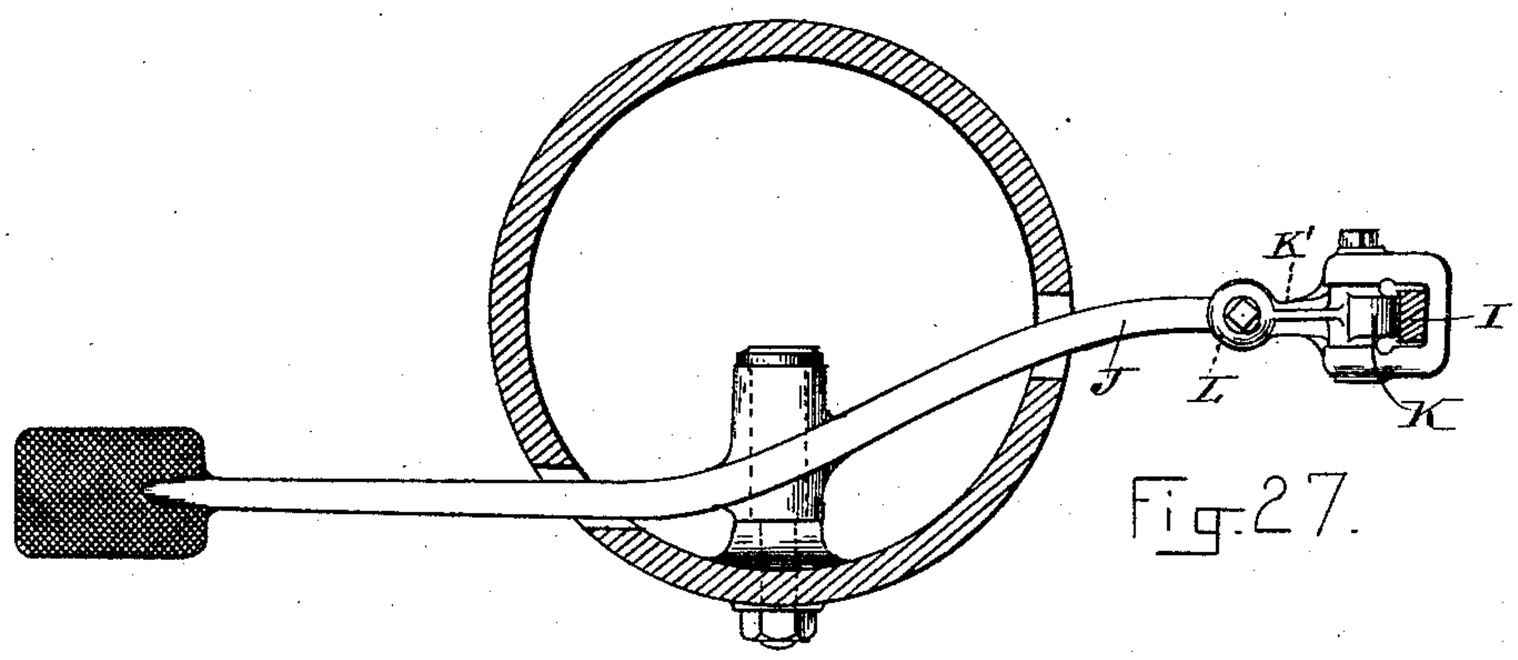


Fig. 27.

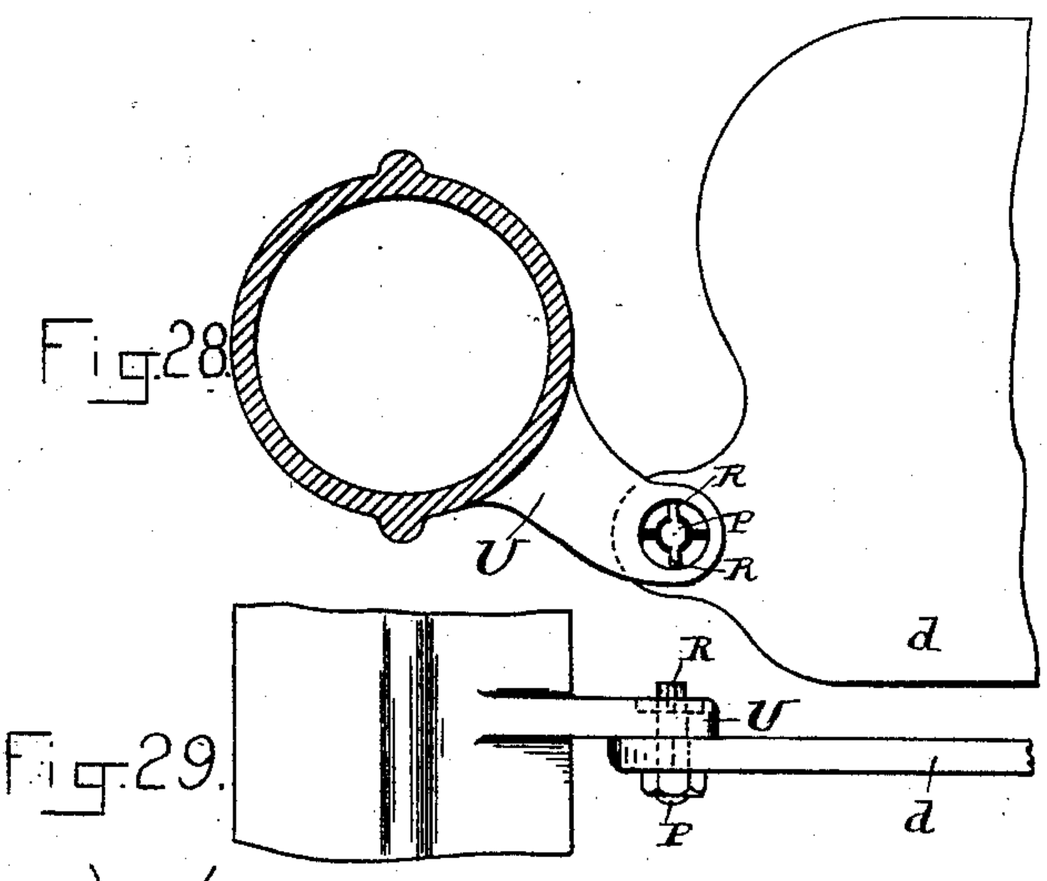


Fig. 28.

Fig. 29.

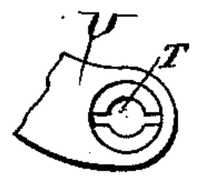


Fig. 30.

WITNESSES:
A. D. Harrison.
H. B. Ramsay

INVENTOR:
J. L. Saxe
by Wright Brown Quinby & Ormsby
Attys.

(No Model.)

14 Sheets—Sheet 14.

J. L. SAXE.

RIVETING MACHINE.

No. 437,249. Patented Sept. 30, 1890.

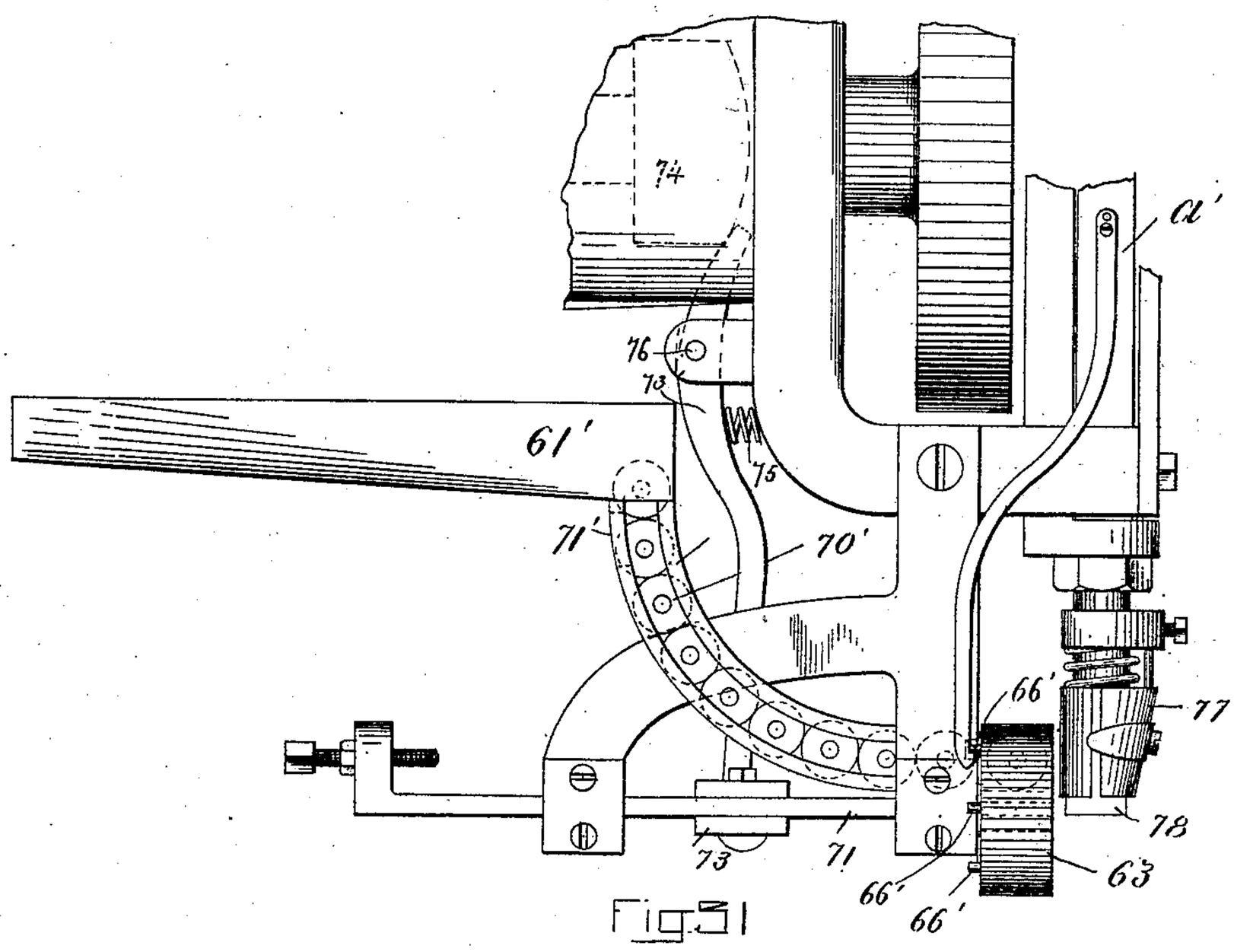


Fig. 31

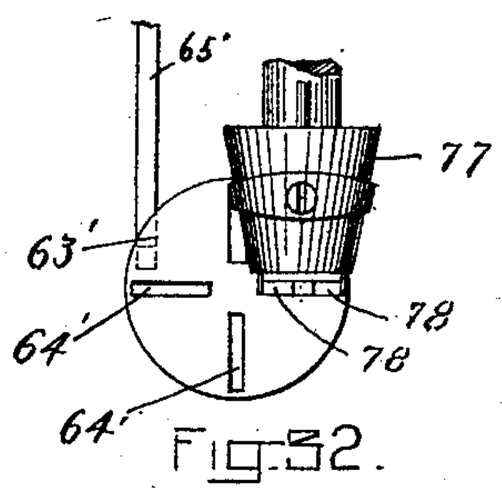


Fig. 32.

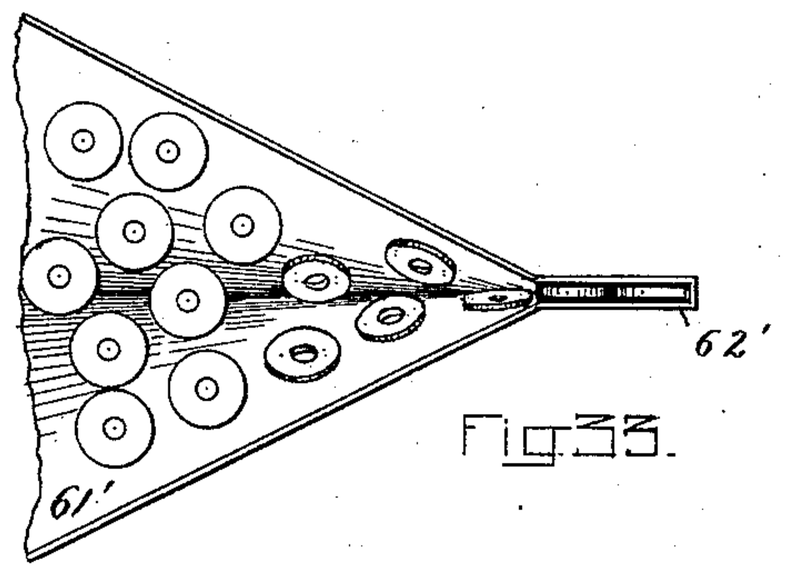


Fig. 33.

WITNESSES:
A. D. Harrison.
W. C. Ramsay

INVENTOR:
J. L. Saxe
by Wright Brown Quinby & Otto.
Attys.

UNITED STATES PATENT OFFICE.

JOHN L. SAXE, OF WATERBURY, CONNECTICUT.

RIVETING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 437,249, dated September 30, 1890.

Application filed May 7, 1888. Serial No. 273,070. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. SAXE, of Waterbury, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Riveting-Machines, of which the following is a specification.

This invention is an improvement on the riveting-machine which forms the subject-matter of Letters Patent No. 377,951, granted to Saxe, Seelye, and Coy January 31, 1888.

The invention has for its object to provide improved means for supplying the rivets to the anvil, which inserts the rivets in the work and supports them while they are being upset.

The invention also has for its object to provide improved means for supplying the burrs to the inserted rivets and to provide certain other improvements relating to the details of the machine.

To these ends my invention consists in the several improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of a riveting-machine embodying my improvements. Fig. 2 represents a front elevation of the same. Fig. 3 represents an enlarged elevation of a portion of the front of the machine. Fig. 4 represents a section on line 4 4, Fig. 3. Fig. 5 represents a section on line 5 5, Fig. 4. Figs. 6 and 7 represent elevations of the means whereby the rivet-agitator is rotated. Fig. 8 represents a top view of the rivet-agitator and portions of the receptacle and chute. Fig. 9 represents a section on line 9 9, Fig. 8. Fig. 10 represents a section on line 10 10, Fig. 9. Fig. 11 represents a side view of the rivet-receptacle, the agitator, and the inclined chute and an end view of the horizontal chute. Fig. 12 represents a side view of the rivet raising and supporting anvil and a partly-sectional view of the mechanism that operates it. Fig. 13 represents a section on line 13 13, Fig. 12. Figs. 14 and 15 represent side and top views of the punch or awl operating devices. Fig. 16 represents a top view of portions of the two rivet-chutes and the rivet-spacing wheel. Fig. 17 represents a side view of the rivet-feeding bar and its operative mechanism. Fig. 18 prepresents a top view of the mechanism shown in Fig. 17. Fig. 19 represents a section on line 19 19, Fig. 17. Fig. 20 represents a section on line 20 20, Fig. 18, showing the rivet-feeding fingers in position to move the rivets in the horizontal raceway. Fig. 21 represents a similar section, showing the said fingers raised above the rivets. Figs. 22 and 23 represent, respectively, top and side views of the rivet-feeding bar and modifications of the mechanism for operating the same. Figs. 24 and 25 represent, respectively, top and edge views of the work-supporting plate or table and the adjustable gages thereon. Fig. 26 represents a side view of the lower portion of the supporting-pedestal of the machine. Fig. 27 represents a section on line 29, Fig. 26. Fig. 28 represents a horizontal section of the ram 4 above the work-supporting table and a top view of a portion of said table. Fig. 29 represents a side view of the parts shown in Fig. 28. Fig. 30 represents a top view of the part U, shown in Figs. 28 and 29. Fig. 31 represents a side view of a part of the machine, showing the preferred burr-feeding mechanism. Figs. 32 and 33 represent parts of said burr-feeding mechanism detached.

The same letters and numerals of reference indicate the same parts in all the figures.

The frame of the machine may be of any suitable construction. As here shown said frame includes the base 2, which is attached to the supporting-column 3 and contains the main drum-shaft *a*, the overhanging arm 4, which contains the shaft *b*, that actuates the upsetting hammer, and the vertical neck 5, which connects the said arm and base and contains the shaft *c*, through which motion is communicated from the driving-shaft *a* to the hammer-raising shaft *b*.

d represents the work-supporting plate or table attached to the frame between the base 2 and arm 4.

e represents the rivet-receptacle, which is in this instance an inclined tray secured to the upper end of an inclined chute *f*, which is suitably attached to the frame of the machine and extends downwardly from the rivet-receptacle to a point below the work-plate *d* and at a considerable distance from the rivet supporting and raising anvil *g*. Said anvil is

formed to support the head of an inverted rivet and is provided with jaws *h h*, which are pivoted at *i* to the anvil and normally project over the top of the anvil and grasp the head of a rivet, said jaws being held in their grasping positions by yielding pressure, so that they yield to permit the insertion of the shank of a rivet between them, substantially as shown in the patent above named. Suitable means are provided to open said jaws and free them from the rivet when the latter is inserted in the work, as shown in said patent. As the devices for closing and opening said jaws form no part of my present invention, I have not deemed it necessary to here represent them.

The anvil is moved horizontally and vertically by mechanism to be described, and is caused by said mechanism, first, to stand below the work-plate until an inverted rivet is inserted between the jaws *h h* by the positive feeding mechanism hereinafter described; then to move horizontally to a point in line with and under the upsetting-hammer; then to rise and insert the rivet-shank in the hole made for it by the punch *j*, (which has previously risen, perforated the work, and descended out of the way of the anvil;) then to descend, (its jaws at the same time opening and leaving the rivet in the work,) and finally to move horizontally back to its starting-point, where it is in position to receive another rivet, the described series of movements being the same as described in the above-mentioned patent.

The devices here shown to give the anvil the described movements are a horizontally-movable slide *k*, to which the anvil is directly attached, a vertically-movable carrier *l*, supporting the slide *k*, a cam *m*, lever *n*, and spring *o*, whereby the slide *k* is reciprocated horizontally on the carrier *l*, and a cam *p* and spring *q*, whereby the carrier *l* is reciprocated vertically. The cams *m p* are attached to the driving-shaft *a*, and the lever *n* is pivoted at *r* to a part of the frame of the machine and is held by the spring *o* against the side of the cam *m*, so that the lever *n* is oscillated by the cam and spring. The carrier *l* rests on the cam *p* and is held down thereon by the spring *q*, said cam being formed to give the carrier a quick upward movement, while the spring *q* moves the carrier as quickly downward when the cam releases it.

The lever *n* has a spring *s* at its upper end, which constitutes an elastic terminal for said lever and is loosely engaged with the slide *k* by entering a vertical socket *t* in said slide. The loose engagement of the spring with the slide permits the described vertical movements of the slide and anvil, which movements are necessarily independent of the lever *n*.

The punch *j*, which perforates the work for the reception of the rivets, is attached to a cross-head or slide *u*, Figs 14 and 15, which is vertically movable in guides in the frame of the machine, and is formed as a frame surrounding the driving-shaft *a*, and provided at one side with a stud having an anti-friction roll *v* and at the opposite side with a lug *w*.

x represents a cam attached to the driving-shaft in position to strike the roll *v* and raise the slide *u* and punch *j*.

y represents a cam attached to the driving-shaft and arranged to strike the lug *w* and depress said slide and punch immediately after they have been raised by the cam *x*. Provision is thus made for giving the punch a quick and positive movement in each direction.

The cam *x* and roll *v* are located in a different plane from the cam *y* and lug *w*, as shown in Fig. 15, so that the cam *y* cannot strike the roll *v* and the cam *x* cannot strike the lug *w*.

The upsetting-hammer *z* (see Fig. 4) is attached to a slide or bar *a'*, which slides in a vertical guide in the outer end of the arm 4 of the supporting-frame. Said bar is raised against the pressure of the hammer-operating spring *b'* by a cam *c'* on the shaft *b*, and is locked when raised by a latch *d'*, pivoted to the arm 4, and is released to be forcibly depressed by the spring *b'* at the proper time by the contact of a stud *e'* on the rear side of the cam *c'* with an arm *f'*, attached to the rock-shaft *g'*, to which the latch *d'* is attached. The means for raising the hammer, locking it in its raised position, and releasing it are substantially the same as described in the above-mentioned patent, to which reference is made for a fuller description.

The inclined rivet-chute *f* is formed to guide the rivets, with their heads downward, from the receptacle *e* to the lower end of the chute, and is provided with an agitating rivet-adjusting wheel *h'*, which is journaled in bearings over the chute *f* and is provided with curved pins or arms *i'*, which are so arranged as to their distance from each other and the distance of their outer ends from the bottom of the chute that only inverted rivets can enter the chute, as shown in Figs. 9 and 10. The wheel *h'* is rotated by a belt *j*, connecting a pulley *k'* on the shaft of said wheel with a pulley *l'*, the shaft of which is journaled in a swinging bearing *m'* and is provided with a pulley *n'*, which is held in frictional contact with a pulley *o'* on the driving-shaft *a*. The bearing *m'* is pivoted at *d'* to the supporting-frame, so that it is capable of swinging toward and from the friction-pulley *o'*. A bolt *q'*, affixed to the frame, passes through a slot in the bearing *m'* and has a nut *r'*, which may be adjusted to regulate the pressure of the pulley *n'* on the pulley *o'*. A spring *s'* holds the bearing *m'* against the nut *r'* and enables the bearing to follow the nut when the latter is adjusted to lighten the pressure of the wheel *n'* upon the wheel *o'*.

Near the lower end of the chute *f* is a spacing-wheel *t'*, which stands in the same plane as the chute. The periphery of the wheel *t'* extends across the chute and is provided with

a series of pockets u', each formed to receive a rivet-shank from the chute f. The under side of the spacing-wheel is formed to receive the heads of the rivet-shanks which enter the pockets. The spacing-wheel is rotated step by step by means hereinafter described, and by its rotation separates the lower rivet in the chute from the one next above it, the rivets being taken successively by the pockets of the spacing-wheel and delivered by said pockets at the lower end of the chute f, from which they pass, separated by spaces equal to the distance between the pockets, into the raceway end of a horizontal chute v', which extends from the chute f under the work plate d to a point near the anvil.

w' represents a reciprocating and rocking feed-bar, which extends parallel with the horizontal chute v' and is adapted to reciprocate endwise, said bar being supported at one end by a bearing x' and at the other end by a stud y'. The feed-bar w' is provided with a series of rivet-feeding fingers z', which are placed at uniform distances apart and project over the horizontal chute. The feed-bar is reciprocated lengthwise, preferably by the means shown in Figs. 17 and 18—viz., a cam 28 on the driving-shaft a, a lever 29, pivoted at 30 to the supporting-frame, and a spring 31, which holds one end of the lever against the cam 28, the other end of the lever having a stud 32, which projects between two cheeks or flanges 33 on the feed-bar, Fig. 18. The feed-bar is rocked or oscillated after each longitudinal movement, so that when it is moving in the direction indicated by the arrow in Fig. 18 its feeding-fingers will be depressed, as shown in Fig. 20, and will thus be in position to move the rivets along the horizontal chute toward the anvil, and when the feed-bar is moving in the opposite direction its fingers will be raised, as shown in Fig. 21, so that they will be above the rivets in the chute v' and will not move said rivets. To thus rock or oscillate the feed-bar, I prefer to employ the devices shown in Figs. 17, 18, 20, and 21—viz., a pinion 34, through which the feed-bar passes, (said feed-bar having a spline 36, engaging a groove in the pinion, so that while the pinion and feed-bar necessarily rotate together the feed-bar can slide lengthwise independently of the pinion,) a rack 35, engaging said pinion and fitted to slide in a guide on the supporting-frame, a lever 37, pivoted at 38 to a fixed lug on the frame and engaged with the rack 35, so that its oscillating movements will reciprocate the rack, and a multiple cam-wheel 39, pivoted at 30 to the lever 29 and formed with a series of teeth or cams 40, which co-operate with a shoulder or projection 41 on the lever 37.

When the lever 29 is moved in the direction indicated by the arrow in Fig. 17, the projection of the lever 37 is in the space between two of the cams 40, and the lever and rack are held up by a spring 42, the rack being in its highest position and the feeding-fingers z' depressed to engage and move the rivets toward the anvil. During this movement of the lever 29 the cam-wheel 39 is loose and is partially rotated by its engagement with the lever 37, so that said wheel imparts no movement to the lever 37 and rack 35. When the movement of the lever 29 is reversed, a spring-pressed bolt 43, which slides in the lever 29 and is beveled on one side, so as to be displaced by the partial rotation of the cam-wheel, springs out into the space between two of the cams 40 and locks the wheel to the lever 29 during the reverse movement of the latter, so that the cam 40, which bears against the inclined face of the projection of the lever 37, raises one end of the said lever, and thereby depresses the opposite end and the rack connected thereto, thus rotating the pinion 34 and the feed-bar in the direction required to raise the feeding-fingers and clear them from the rivets during their backward movement. Just at the end of said movement the cam 40, which displaced the lever 37, as last described, passes from under the projection 41 of said lever, whereupon the spring 42 draws the lever 37 and the rack 35 upwardly, and thus depresses the feeding-fingers, so that they are ready to move the rivets during the next forward movement of the feed-bar.

The first feeding-finger has a prong or extension 44, which at each depression of said finger is brought into position to engage a pin 45 on the spacing-wheel and give said wheel a partial rotation at each forward movement of the feed-bar. There are several pins 45 on the spacing-wheel—one for each pocket u'—and each partial rotation given to said wheel brings a rivet to the delivering end of the chute f, from which said rivet passes by gravitation into the chute v' just in advance of the first feeding-finger. Said finger moves the rivet along the horizontal raceway to the end of its beat, and then returns for another rivet, the first rivet remaining at the point where it was left by the first finger until the second finger returns and moves it forward, and so on until each finger has acted on the rivet. The last finger moves the rivet onto the anvil, where it is retained by the jaws $h\,h$, as already described.

It will be seen that the spacing-wheel and the feeding-fingers operating as described insure the accurate and positive delivery of the rivets to the anvil, each rivet being independently controlled and moved after entering the spacing-wheel. The delivery of the rivets to the anvil is therefore more accurate and certain than it would be if the rivets were forced forward in a column, each in contact with the one following it, as heretofore.

To insure the stoppage of the spacing-wheel after each partial rotation with one of its pockets in position to receive a rivet, I provide a spring-latch consisting of a bolt 46, adapted to slide in a socket 47, attached to the chute f and pressed toward the spacing-

wheel by a spring 48 in said socket. The bolt has a head, the outer face of which has a recess formed to fit either of the pins 45. Each partial rotation of the spacing-wheel brings a pin into coincidence with the said recess. The bolt yields as each pin first comes in contact with it, and by the pressure of its spring holds the pin sufficiently to prevent the wheel from being rotated by its momentum beyond the desired point.

The last feeding-finger has a lateral projection 49, which moves the foremost rivet onto the anvil. (See Fig. 18.)

To prevent damage in case of obstruction to the forward movement of the feed-bar, as by rivets sticking in the chute v' or otherwise, I make the upper end of the lever 29 in a separate piece or section 29′ and pivot it at 51 to the main portion of said lever. Said section is adapted to yield or swing backwardly when the lever is moving forward, so that in the event of an obstruction to the forward movement of either of the feeding-fingers the section 29′ would swing backwardly and no damage would result. Said section is normally held in line with the main portion of the lever by a spring 50. The lever 29 is preferably provided with a handle 52, so that it may be moved by the operator if occasion should require.

Figs. 22 and 23 show modifications of the means for reciprocating and oscillating the feed-bar and its fingers, in which the feed-bar is swiveled in a bearing 53, attached to a slide 54, which is reciprocated between fixed guides 55 55 by an oscillating lever 56. The feed-bar is provided with a pin 57, which, when said bar is moving forward and its fingers are in position to move the rivets in the chute v', passes under a wedge-shaped latch 58, which is pivoted at 59 to a fixed ear 60, said latch being lifted as the pin passes under it and having no effect on the feed-bar. When the bar commences to move back, the point of the latch 58 has dropped behind the pin 57, and the pin therefore moves back upwardly along the incline of the wedge 58, whereby the feed-bar is turned sufficiently to raise the fingers z' above the rivets in the chute v'. When the pin passes off from the rear end of the wedge, the weight of the fingers causes them to drop and turn the feed-bar, the pin 57 being thus moved to position to pass under the wedge during the next forward movement of the feed-bar.

71 represents a burr-feeding slide, which is reciprocated by means of a lever 73 and a cam 74 and spring 75, which oscillate said lever, the latter being pivoted to the frame at 76 and engaged at its lower end with the feeding-slide 71. The burrs are moved by the feeding-slide and the hereinafter-described devices co-operating therewith into the holder 77, which carries each burr down to the upper surface of the work and holds it there while the hammer z descends and upsets the rivet, as in the said former patent.

The burr-holder 77 is tubular and is provided with two jaws 78 78, Fig. 5, which are pivoted at 80 to the holder and are formed at their lower ends to grasp the opposite sides of a burr inserted between them by the slide 71. A spring 79, attached to the holder 77, bears against said jaws and presses them inwardly. The burr-holder has a slight yielding movement on a tube 81, which is attached to and projects downwardly from the slide 82, said slide being engaged by a trundle-roll 83 with the cam c', whereby the slide and holder are raised and lowered and the hammer z raised, as described in said former patent. A spring 84 presses the burr-holder downwardly and permits it to yield and adapt itself to different thicknesses of stock, as in said former patent. A headed bolt or pin 85, affixed to the holder and passing through a socket in a flange 86 on the tube 81, limits the downward movement of the holder. The hammer z when depressed passes through the tube 81 and through the burr-holder.

The work-plate d is ruled or graduated by two series of numbered graduations 91, extending from a common center, which is the point where the rivet is inserted and upset, the rivet being raised by the anvil through a slot 87 in said plate. (See Fig. 24.)

88 88 represent adjustable gages secured to the work-plate at opposite sides of said slot by set-screws 89, passing through slots 90 in said gages, the slots enabling the gages to be adjusted. The graduations 91 enable the distance of either gage from the central point to be accurately determined. The two adjustable gages and the graduated plate enable the rivets to be inserted at any desired distance from either edge of a belt or other like article placed on the plate. These gages are not used simultaneously; but one is used to guide one edge of a belt or other article being riveted and the other is used to guide the other edge. Both edges of the belt do not bear at the same time against both guides. It will be seen that by duplicating the gages the necessity of turning the belt around after riveting it at or near one edge and presenting the other edge to the same gage is obviated.

A belt A, Fig. 6, may be placed on the friction-pulleys o' n' to communicate motion from the former to the latter in case the wheel h' becomes so clogged by the rivets that the pulley n' cannot be rotated by its frictional contact with the pulley o'.

The bolt 46, Fig. 16, which prevents overrotation of the spacing-wheel, may be formed to engage the pockets u' instead of the pins 45.

The handle 52, Fig. 17, on the lever 29 enables the operator to operate the rivet-feeding devices by hand to charge the horizontal chute v' with rivets preparatory to the operation of the machine or to supply rivets while the machine is operating in case the automatic feeding devices fail to supply the rivets properly.

A spring B, Fig. 22, is preferably applied

to the latch or wedge 58 to hold the latter down with a yielding pressure. The feed-bar *w'* may also be provided with a spring C, Figs. 22 and 23, the tendency of which is to turn the bar in the direction required to depress the feeding-fingers *z'*, and thus overcome friction at the bearings of the feed-bar, which might prevent the prompt depression of said fingers.

The socket *t*, Fig. 12, which receives the spring-terminal of the lever *n*, is secured to the slide *k* by screws D D, which pass through slots E E in the bracket in which said socket is formed, said slots and screws permitting the socket to move on the slide *k* in case the movement of the slide should be obstructed. Normally the socket and slide are rigidly connected by a pin F, of metal sufficiently soft to easily break or shear in case of an obstruction to the movement of the slide, thus preventing the breakage of any of the other parts of the machine.

To provide for the automatic stoppage of the machine after the insertion and heading of each rivet, I provide automatic means whereby the usual spring-pressed clutch, which is released by the depression of a treadle, and thus caused to connect the driving-pulley H with the shaft *a*, is prevented from remaining released and continuing to connect the driving-pulley and shaft after a complete rotation of said shaft, so that if the operator neglects to remove his foot from the treadle the rotation of the shaft will not be continued. To this end I make use of the devices shown in Figs. 26 and 27, in which I represents the rod which releases the spring-pressed clutch when raised by the treadle J, and thereby allows the spring of the clutch to move the latter so as to connect the shaft *a* with the driving-pulley. Said rod passes loosely through a slot in the rear end of the treadle, and is normally held in engagement with one side of said slot by a cam K, which is held by a spring L in contact with said rod. When the forward end of the treadle J is depressed by the operator's foot, the cam K, binding on the rod I, raises the latter and causes it to release the clutch. A fixed stop M stands in position to strike an arm K' on the cam and lift the cam, so that it releases the rod I and allows the latter to drop to position to arrest the clutch when the latter is moved back to its inoperative position by the rotation of the shaft *a*, so that the rotation of the shaft will be arrested whether the operator releases the treadle or not.

The clutch which I have referred to is of well-known construction in eyeleting and other machines, and as its construction forms no part of my invention I have not shown it in the drawings nor described it specifically.

I prefer to make the work-supporting plate or table readily detachable from the frame of the machine and to so connect it with the machine that it may swing to and from its operative position, so that the parts below it may be exposed without removing the work-plate from the machine. To these ends I secure to the work-plate *d* a bolt P, which extends upwardly from the upper side of the table and is provided at its upper end with wings or lugs R R, Figs. 28 and 29. To the frame of the machine is affixed an ear or bracket U, having a hole T formed, as shown in Fig. 30, to receive the bolt P and its lugs R R when the latter are turned to one position. After the bolt and its lugs are inserted in said ear a partial rotation of the bolt will move the lugs out of line with the portions of the hole in the ear through which they passed, so that the work-plate cannot be raised until said lugs are moved to coincide with the said portions of the hole. This connection of the work-plate with the supporting-frame permits both the swinging movement and the easy removal of the work-plate, as will be readily seen.

The work-plate may be locked in its operative position by a spring-bolt V, Fig. 2, in one of the posts W, which support the swinging end of said plate, said bolt entering a recess in the under side of the work-plate, and being provided with a handle V', whereby it may be retracted to release the work-plate.

It is desirable that the outer portion of the table, or that portion nearest the anvil, be free to rise above its normal position, so that in case of any derangement whereby the anvil or any part moving vertically with it is caused by the upward movement of the anvil to strike the table the latter will yield in an upward direction and thus avoid breakage of any of the colliding parts. This freedom of upward motion of the table may be produced by making the hole T in the ear U enough larger than the bolt P to permit the bolt to play laterally in said hole. It will be seen, therefore, that the table is adapted to swing horizontally to and from its operative position and to swing or yield upwardly and to be entirely removed from the machine. I do not limit myself, however, to the described devices whereby these results are obtained, and may variously modify the same and employ suitable equivalents thereof without departing from the spirit of my invention.

In Figs. 31, 32, and 33 I have shown as the means for feeding the burrs to the holder 77 a hopper 61', which does not oscillate, but is suitably affixed to the frame of the machine. The bottom of said hopper is inclined and is flat or approximately flat at its higher end and V-shaped at its lower end, the depth of the V and the inclination of its sides gradually increasing from the upper to the lower ends of the hopper, so that the burrs resting on the bottom of the hopper at the lower end are nearly vertical and can pass in a vertical position into a chute 62'. Said chute conducts the burrs to a spacing-wheel 63', which has radial slots 64' and is journaled on a stud affixed to the supporting-frame of the machine. The slots 64' are formed to receive

burrs from the lower end of the chute, the wheel being rotated step by step and held after each step, so that one slot coincides with the lower end of the chute and receives a burr therefrom, while the preceding slot, containing a burr, stands in line with the burr-feeding slide 71, so that when said slide moves forward it enters the slot in line with it and ejects the burr from said slot and forces said burr between the jaws 78 78 of the holder 77 in the manner already described.

The spacing-wheel 63′ is rotated step by step by means of a dog or latch 65′, which is attached to the hammer-carrying slide or bar a' and engages one of a series of studs or pins 66′ on the spacing-wheel, so as to give the latter a partial rotation each time the hammer rises. Any other suitable mechanism may be employed, however, to rotate the spacing-wheel, it being necessary to give it a partial rotation just before the burr-feeding slide moves forward to enable one of its slots to receive a burr from the chute and while the slide 71 is ejecting the burr previously inserted in the preceding slot.

The chute 62′ is preferably provided with a longitudinal slot 70′ in one side to enable the burrs to be removed from the chute by a tool inserted in the slot and moved along the same to push the burrs to the upper end of the chute. In the back of the chute is an opening 71′, through which the burrs may escape when they are pushed back, as last described.

The burrs are placed in the hopper promiscuously and are caused to pass to the lower end of the hopper and into the chute partly by gravitation and partly by the jar attending the operation of the machine.

I am aware that it is old to provide work-tables with graduations and gages, and therefore wish to be understood as limiting my claim relating to such like details of my invention to a special combination of a particular kind of graduated and slotted work-table with two gages arranged thereon, so as to engage both edges of the belt and admit of the belt being riveted on both sides at different times without turning it, thereby effecting a large economy of time and labor in riveting belts.

I claim—

1. In a riveting-machine, the combination, with a rivet-receptacle and an inclined chute leading therefrom, of a spacing-wheel and means for rotating the same, whereby the rivets are separated from each other, a substantially horizontal chute communicating with the inclined chute, and a series of feeding-fingers and operating mechanism therefor, whereby the separated or spaced rivets are moved positively and intermittingly through the horizontal chute, as set forth.

2. The combination of the inclined chute, the spacing-wheel therein, having the pins 45, means, substantially as described, for rotating said wheel step by step, and the spring-pressed grooved detent adapted to co-operate with said pins in arresting the rotation of the wheel, as set forth.

3. The combination, with a rivet guide or chute, of a feed-bar having fingers arranged to bear against rivets in said chute, mechanism for reciprocating said bar and fingers longitudinally, and means for holding said fingers in a depressed position during a longitudinal movement of the bar in one direction and for elevating said fingers during the opposite movement, whereby the fingers are caused to alternately move and pass over the rivets, as set forth.

4. The combination, with the inclined and horizontal chutes, of the spacing-wheel in the inclined chute, having pins 45, the feed-bar having fingers z', one of which is formed to engage the pins of the spacing-wheel, and thereby rotate the latter, and mechanism for reciprocating and rocking said feed-bar, as set forth.

5. The combination, with the chute v' and means of supplying rivets thereto, of the feed-bar w', having fingers z', the oscillating lever 29, whereby said bar is reciprocated, the rack 35, the pinion 34, engaged, as described, with the feed-bar, the cam-wheel 39, pivoted to the lever 29, the locking-latch 43, whereby said wheel is locked to the lever during the backward movement of the latter, and the lever 37, pivoted to a fixed support and arranged, as described, to be operated by the cam-wheel and turn the feed-bar, as set forth.

6. The combination, with the chute v' and the feed-bar w', having fingers z', of the bar-operating lever 29, having a spring-yielding section 29′, engaged with the bar w', as and for the purposes specified.

7. The combination, with the inclined chute f and the agitating-wheel h' co-operating therewith, of the friction-wheel o' on the driving-shaft, a shaft journaled in a swinging bearing m' and having a friction-wheel n' and a pulley l', means for adjusting said bearing to regulate the frictional pressure of the wheel n' on the wheel o', and a belt connecting the pulley l' with the pulley k' on the shaft of the agitating-wheel, as set forth.

8. The combination of the laterally and vertically movable anvil having rivet-holding jaws, mechanism to operate said anvil, substantially as described, a work-support, a substantially-horizontal rivet chute or guide below said work-support, an inclined chute and a spacing device whereby rivets are supplied at regular intervals to the horizontal chute, a series of rivet-feeding fingers arranged at uniform distances apart, and mechanism, substantially as described, whereby said fingers are operated to feed a series of rivets intermittingly forward through the horizontal raceway, as set forth.

9. The combination of the anvil, the slide k, carrying the anvil, the carrier l, supporting said slide, mechanism for reciprocating said carrier vertically, the pivoted lever n, having

the terminal spring loosely engaged with the slide *k* to permit the independent vertical movements thereof, and means, substantially as described, for oscillating said lever and spring and thereby reciprocating the slide and anvil horizontally, as set forth.

10. The combination, with the work-support and means for holding the work thereon against upward pressure, of the punch, the cross head carrying the punch and provided with the projections *v w*, arranged in different planes, and the positively-rotated cams *x y*, arranged the former to act on the projection *v* and the latter to act on the projection *w*, as set forth.

11. In a riveting-machine, the burr-holder having the pivoted jaws 78 78 and the operating-spring 79 for said jaws, as set forth.

12. In a riveting-machine, the combination of the feed-bar having the feeding-fingers, the pivoted lever 29, engaged with said bar and adapted to be oscillated to reciprocate the feed-bar lengthwise, and mechanism, operated by the oscillations of said lever, whereby the feed-bar is rocked, as set forth.

13. In a riveting-machine, the combination of the feed-bar having the feeding-fingers, the pivoted lever 29, engaged with said bar and provided with a handle whereby it may be oscillated by hand to reciprocate the feed-bar, and mechanism, substantially as described, operated by the oscillations of said lever, whereby the feed-bar is rocked, as set forth.

14. In a riveting-machine, the combination, with the feed-bar having the feed-fingers and the mechanism for reciprocating and oscillating it, of a spring C, whereby the feed-fingers are normally depressed, as set forth.

15. In a riveting-machine, the combination, with the anvil-supporting slide *k* and the operating-lever *n*, of the socket *t*, having a fragile or easily-broken connection with said slide, as and for the purpose specified.

16. The combination, in a riveting-machine, with rivet supplying, inserting, and heading mechanism, of a clutch on the driving-shaft, the clutch-releasing rod I, the treadle J, having a cam adapted to automatically secure said rod to the treadle, and a fixed stop M, whereby the cam is displaced to release said rod, as set forth.

17. In a riveting-machine, the combination, with rivet supplying and inserting mechanism, substantially as described, of a work-supporting plate or table located above said mechanism, substantially as described, and pivotally connected with the supporting-frame, whereby it may be moved from its operative position to uncover said mechanism, as set forth.

18. In a riveting-machine, the combination, with rivet supplying and inserting mechanism, substantially as described, of a work-supporting plate or table located above said mechanism and co-operating devices, substantially as described, on said table and on the supporting-frame of the machine, whereby the table is both pivotally and detachably connected with said frame, as set forth.

19. In a riveting-machine, the combination, with vertically-movable rivet-inserting devices, substantially as described, of a vertically-movable work-supporting plate or table located over said inserting devices and adapted to yield in an upward direction and thereby avoid breakage in case of contact with the points beneath it, as set forth.

20. The work-supporting table having a bolt provided with lugs or wings, combined with the fixed ear or bracket having a hole formed to receive said bolt and its lugs, the bolt being adapted to turn in said ear to permit the swinging of the table and to interlock with said ear excepting when in one position, as set forth.

21. The combination, in a riveting-machine, of a burr-holder, as 77, a feeding-slide to insert burrs in said holder, a slotted spacing-wheel arranged between the burr-holder and slide, means for rotating said wheel step by step, a burr-hopper, and a chute extending from the hopper to the spacing-wheel, the latter having slots extending through it from side to side for the passage of the burrs through the wheel, one of said slots coinciding with the feeding-slide at each stoppage of the spacing-wheel, so that said slide passes through the spacing-wheel in moving forward and ejects a burr therefrom.

22. In a riveting-machine, the inclined hopper 61′, fixed to the frame of the machine and having its lower end V-shaped and terminating in a contracted chute 62′, having upright parallel walls, into which chute the burrs gravitate and necessarily stand edgewise, substantially as shown and described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 30th day of March, A. D. 1888.

JOHN L. SAXE.

Witnesses:
C. F. BROWN,
A. D. HARRISON.