(No Model.) 3 Sheets—Sheet 1.

F. PHILIPS.

MACHINE FOR HEADING BOLTS AND RIVETS.

No. 353,584. Patented Nov. 30, 1886.

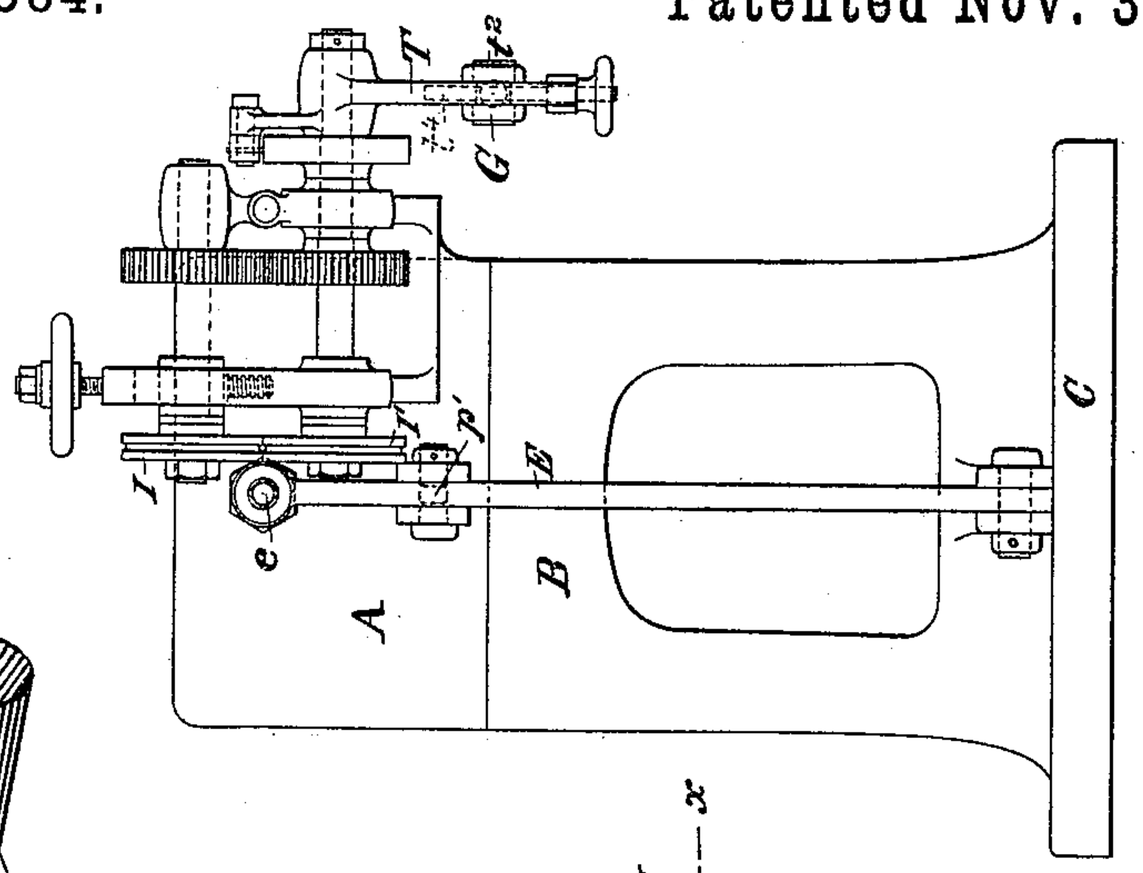


Fig. 2.

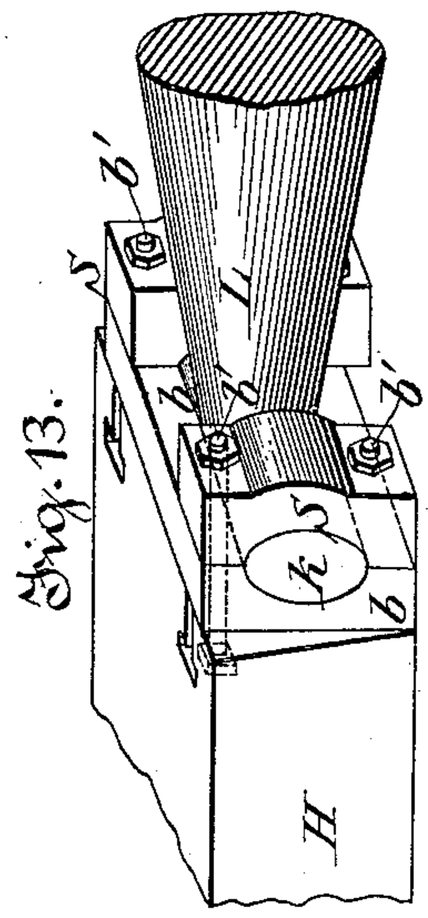
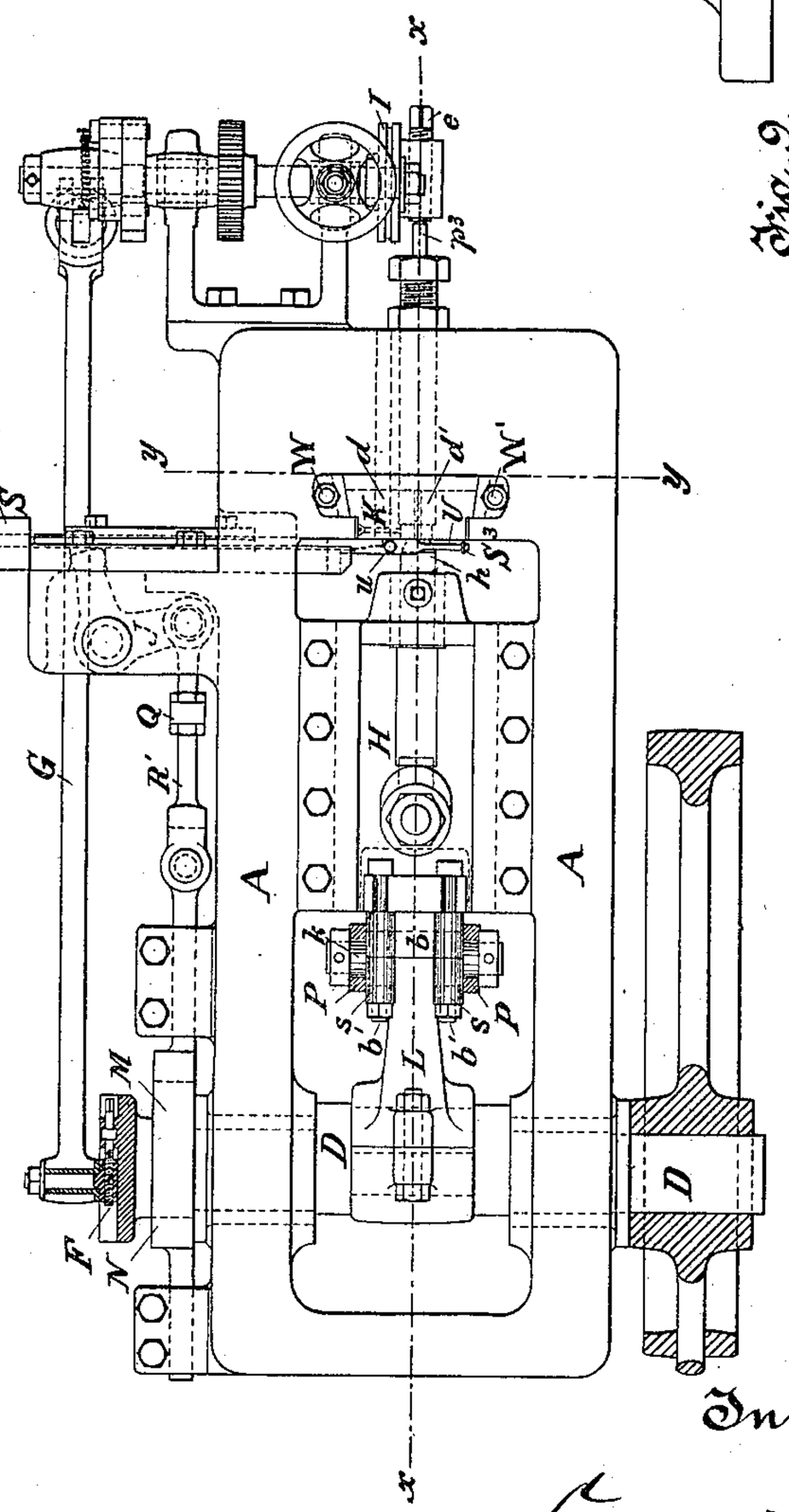


Fig. 13.

Fig. 1.



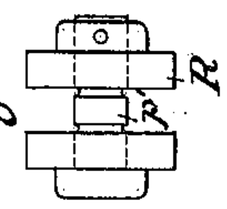


Fig. 9.

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William H. Doering

Inventor:
Frederick Philips

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F. PHILIPS.

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Fig. 4.

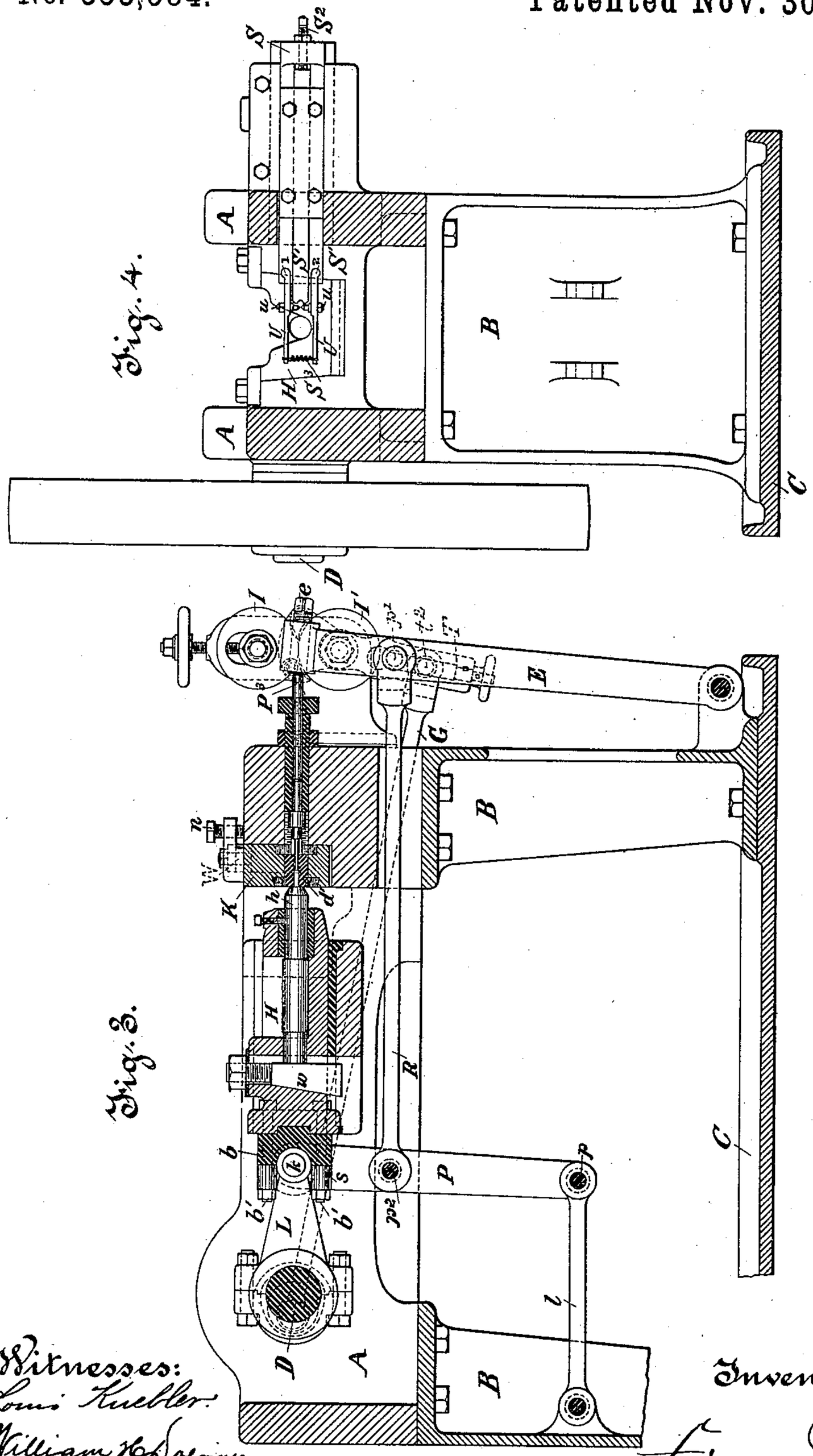

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

F. PHILIPS.

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No. 353,584. Patented Nov. 30, 1886.

Fig. 5.

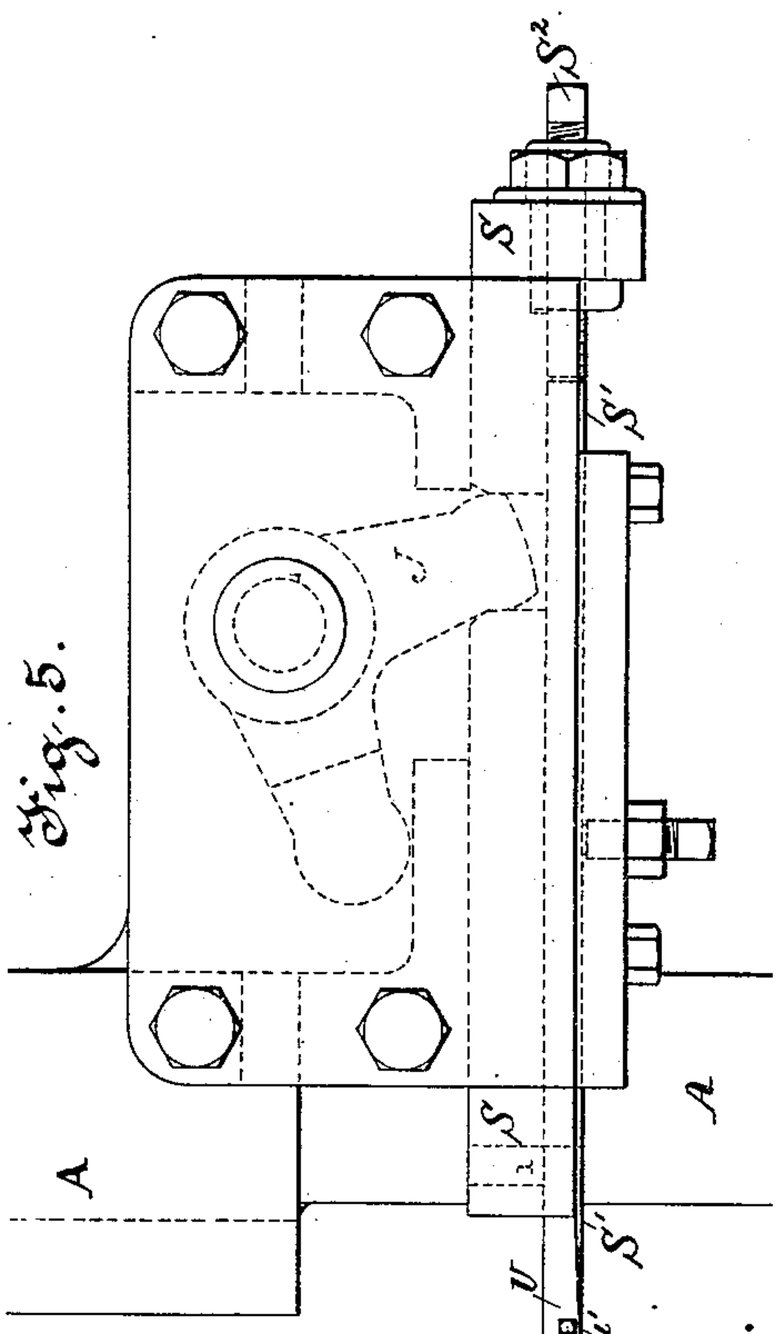


Fig. 6.

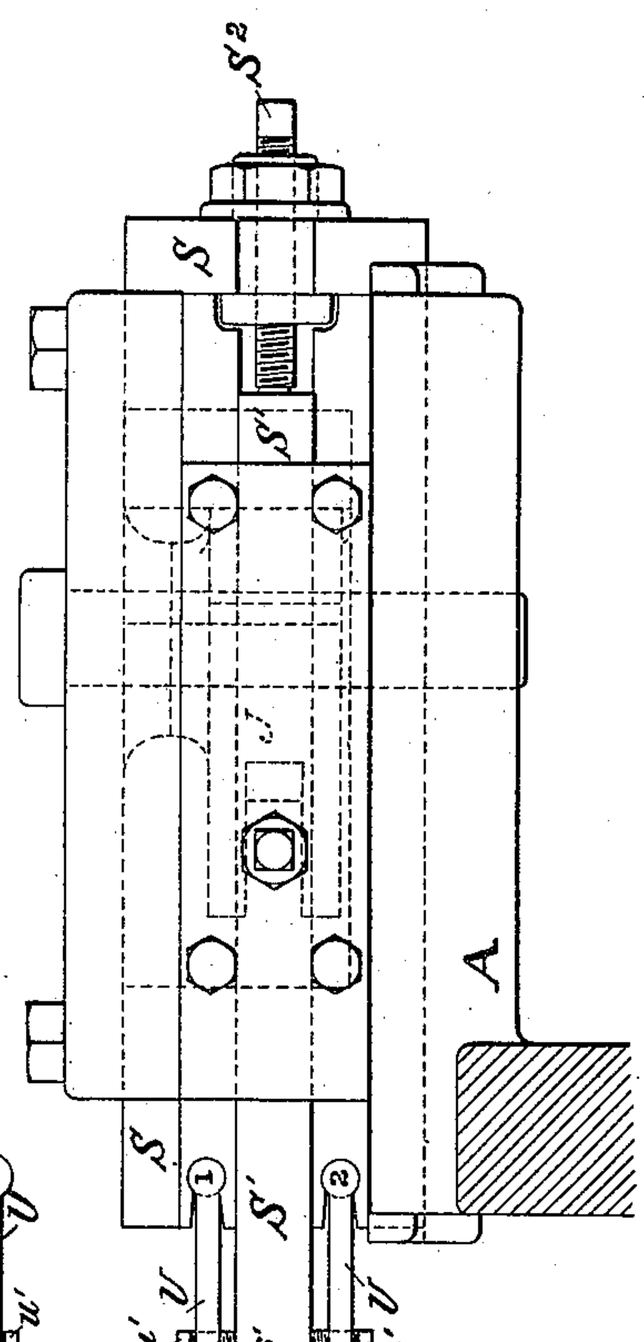


Fig. 10.

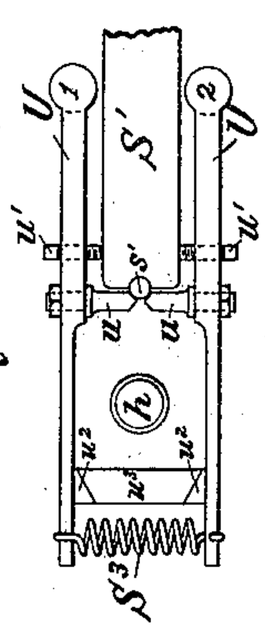


Fig. 12.

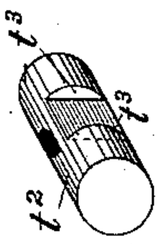


Fig. 8.

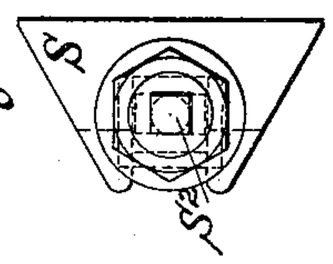


Fig. 11.

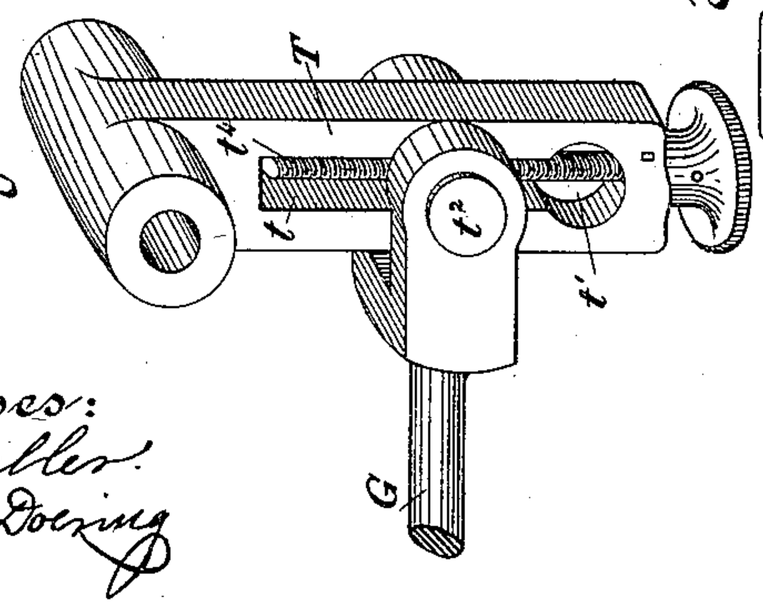
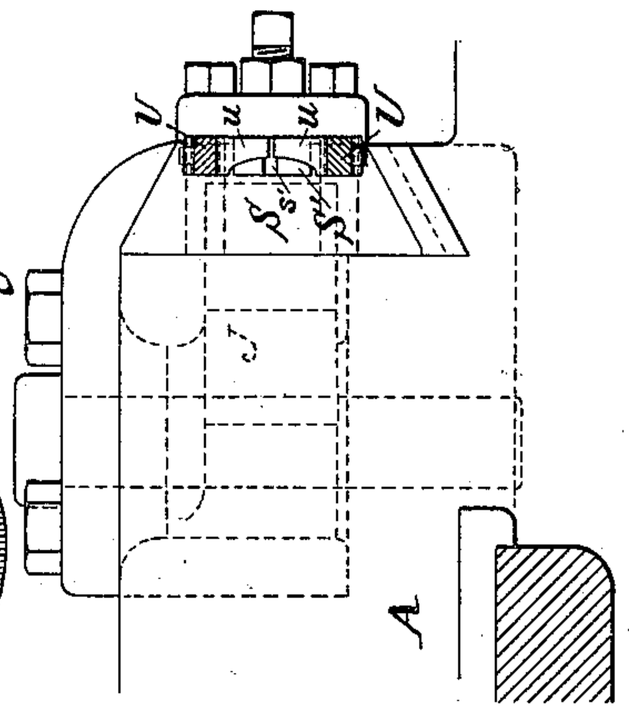


Fig. 7.



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Inventor:
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UNITED STATES PATENT OFFICE.

FERDINAND PHILIPS, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR HEADING BOLTS AND RIVETS.

SPECIFICATION forming part of Letters Patent No. 353,584, dated November 30, 1886.

Application filed July 7, 1886. Serial No. 207,319. (No model.)

To all whom it may concern:

Be it known that I, FERDINAND PHILIPS, a subject of the Emperor of Germany, residing in the United States, at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Heading-Machines for Making Rivets and Screw-Blanks, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view; Fig. 2, a front view; Fig. 3, a vertical longitudinal section in the direction *x x* of Fig. 1. Fig. 4 is a section through *y y*, Fig. 1. Figs. 5 to 8 are detached detail views of my shear-slide and carrier. Figs. 9 to 12 are other details, as hereinafter more fully described.

My invention relates to that class of rivet-machines which are more generally known as "solid-die" machines, in which the successive operations are as follows: Feeding the wire through a shear-die; cutting off a rivet-blank and carrying the same to the blank-die; heading of the projecting end, and ejecting the finished rivet from the die; and my improvements consist in certain new and useful mechanisms and combinations of mechanisms for carrying out the above enumerated successive operations with greatest efficiency and in a reliable manner with the smallest number of operating parts of such simplicity that they are not liable to unreasonable wear, thereby reducing repairs to a minimum.

I am further enabled by my invention to adjust the machines with ease and regulate the same for various kinds of work in a quick and reliable manner. This together with the little attention my various mechanisms and operations require while the machine is working enables me to reduce the number of attendants required for the care of such machines considerably.

Another claim to the usefulness of my invention is the easy access to all parts requiring attention and ready interchange of parts in case of repair.

With reference to the accompanying drawings, A is the main frame of the machine mounted on legs B and bed-plate C. The bed A is provided with bearings for the reception of a crank-shaft, D. On one end of this shaft is a fly-wheel pulley, from which motion is imparted to the shaft D. On the other end is an adjustable crank mechanism, F, which is connected by rod G to a rocking arm, T, of the feed mechanism in front of the machine. This feeding apparatus may be of any well-known construction.

As shown in the drawings, Figs. 1, 2, and 3, the rocking motion imparted to lever T by the rotary motion of crank F imparts in a well-known manner, by means of a ratchet-wheel and pawls, intermittent rotary motion to the feed-rollers I and I′, which serve to feed the wire from which the rivets are made at the proper time through the shear-die *d* of the machine, as is well understood. The required length of the wire thus fed to the machine is approximately regulated either by regulating the throw of the crank F or by regulating the position of the point where rod G and lever T connect, which can be done while the machine is running.

The manner in which rod G and arm T are connected is novel, and represented in Fig. 11. Arm T is slotted. The slot *t* ends in a widened portion, *t′*, large enough to receive a round pin, t^2. This pin is so flattened for a certain portion of its length that it can be pushed up between the sides of the slot *t*, with which it is held in sliding contact. Shoulders t^3 (see Fig. 12) secure it against side motion. Through this pin and the lower end of lever T passes a screw, t^4, secured to the lever T against lengthwise motion, but is allowed to turn freely. Rod G terminates in a jaw, which has the width of lever T. The pin t^2 passes through the jaw and the widened portion *t′* of lever T, and is then fixed in position in the slot *t* by the screw t^4. It is easily perceived that this mode of connecting the rod G and lever T is very simple, efficient, and central in its operation, and also fitted up with less expense than the one heretofore used, which is similar to that shown on the adjustable crank mechanism, (see Fig. 1,) the operation of which is well known. The wire which is thus fed through the shear-die *d* is gaged accurately by a gage, which stands in front of the shear-die *d*, (not shown in drawings,) to its proper length. After the feeding is ended the wire

is cut and transported to the blank-die *d'* by mechanism shown in detail in Figs. 5 to 8, also visible in smaller scale in Figs. 1 and 4.

Upon a slide, S, which receives motion from the main shaft D by means of a cam, M, working between yoke N and a bell-crank, J, or by other convenient means, is mounted the shear proper, S', adjustable by screws S^2. The motion of the shear-slide is at right angles to the header. Shear S' is in shearing contact with the shear-die *d*, and clears the same during the time the wire is fed. The half-circular groove *s'* is the size of the wire. Upon the slide S are pivoted at 1 and 2 two carrier-arms, U U, one above and one below the shears S'. The pivots around which these arms vibrate form part of the arms U U. These carrier-arms are provided with removable fingers *u u*, which are set close to the face of the shear S', and are kept pressing toward each other by means of the spring S^3, combining the two arms U U. Set-screws *u'*, passing through the carrier-arms U U, and pressing against the shear S', serve to adjust the carrier-fingers *u u* central with the shear, and at any required distance from each other. The fingers *u u* are beveled, as shown in drawings, the bevels forming, with the cavity in the shear the proper shape to hold a piece of wire passed between the shear and fingers, while the opposite bevels act as cams and serve to open the fingers to let them pass over the piece of wire projecting from the shear-die. The fingers, which open while passing over the said projecting piece of wire, close immediately upon the same and hold it between themselves and the shear, which instantly cuts the same off and carries it to the blank-die *d'*, just in front of the heading-die *h*. Here the shear remains stationed until the header has pushed the wire partly into the die *d'*. Now the slide S begins its backward movement, allowing the fingers *u u* to open by riding over the wire firmly held in die *d'*. The header continues its forward movement for the formation of the rivet-head. It clears the carrier-arms, which are far enough apart to straddle the header; also is the spring S^3 to be placed out of its reach. The header now returns, and next follows the ejection of the newly-formed rivet, as hereinafter more fully referred to.

For heavy machines, or such as are fed by hand when the feeding of the wire against the weighted fingers *u u* requires some force, I provide the carrier-arms with small cams u^2 u^2, Fig. 10. These cams engage with corresponding faces of a cam, u^3, fastened against the die-block of the machine, and are thereby opened when the fingers are in front of the shear-die. In smaller machines the fingers *u u* are beveled in the direction of the wire-feed, and they are opened by the wire feeding against beveled edges of the fingers.

In order to secure absolute accuracy in the transportation of the rivet-blanks to the center of the blank-die, which latter has no definitely fixed position, owing to irregularities occurring in the heading-die and blank-die, I place a right-and-left-hand nut, Q, in the rod R', connecting the yoke N and bell-crank J, and thereby regulate the positions of the shearing and transporting apparatus with accuracy.

The header receives its reciprocating motion from the crank-shaft D. The crank portion of shaft D is connected with the header-slide H by a connecting-link, L.

Link L terminates in a cylindrical knuckle-joint, *k*, which abuts against the header-slide H, or preferably against a removable abutment, *b*, preferably made of bronze and recessed into the slide H, and is connected thereto and to the link L by means of bolts *b' b'*, passing through straps *s s*, encircling the knuckle-joint *k*, as plainly shown in Figs. 1 and 3. The knuckle *k* extends beyond the central web of link L on both sides thereof. The straps *s* encircle it similar to the cap of a bearing on both sides of the web. The bolts *b'* pass through the strap *s*, and through the abutment *b*, and are fastened in the header H. In order to relieve the bolts *b'* of any other than longitudinal strain the abutment *b* is recessed into the header, as said before, and as shown in Fig. 3. By tightening the bolt *b'* the abutment *b* and straps *s* are securely tightened to the header, holding knuckle *k*, which is an integral part of link L, and allowing it to swing freely between the bearing and cap *b* and *s*, respectively. The piece *b* can be made to be an integral part of the header; but in that case the fitting up and the repairs are more difficult. This arrangement, which is quite analogous to a jaw with pin, differs therefrom in the important point that knuckle *k* performs also the functions of a jaw-pin, while previous to this invention it has been the practice to let the knuckle abut against its abutment, pushing the header forward, while the backward movement was insured by passing a pin through the center of knuckle, connecting the same to jaw-like projections of the header, or vice versa. Any wear that was produced in the knuckle-joint manifested itself by bringing the strain upon the jaw-pin instead of the knuckle, and thereby causing its breakage. On the other hand, such said arrangement cannot be relied upon as transmitting any great amount of power in the backward direction, except when the proportions are very large. My invention, however, is equally reliable either way, depending in its backward movement on the strength of the bolts *b' b'*.

Other mechanism may be used for drawing the header back. For instance, such mechanism as described in my Patent No. 334,464, of January 19, 1886.

The header-slide H is guided in the bed A of the machine in a manner well understood, and carries the header proper, *h*, which is adjustable in the direction of its motion by some means—a wedge, *w*, for instance—to regulate

exactly the required distance of header *h* from the blank-die *d'*. The blank-die *d'* and shear-die *d* are both held in a common die-block, K, which is adjustable up and down by means of a screw, *n*, (see Fig. 3,) and sidewise by adjustable wedges W W'. These wedges have gib heads provided with screws for easy drawing.

The newly-formed rivet is ejected from the blank-die by means of ejector E, which pushes against pin p^3, the motion of which force is transmitted against the end of the shank of the newly-formed rivet, as plainly shown in Fig. 1. The rivet is thereby removed from the die. The motion of the ejector may be obtained by means of separate cams from the main driving-shaft; but it has been the preferred practice to make use of the motion of the header or the main crank of driving-shaft for this purpose. It is evident that wherever this is done the ejector finishes its motion at the moment when the header is at the end of its stroke, and, inasmuch as the stroke of the header is in all cases considerably longer than the rivets to be made, it is evident that the ejector in such cases has quite a considerable amount of lost motion, and in most cases begins to eject when it has its greatest velocity. This circumstance produces in most cases an unpleasant shock in the operation, and not unfrequently causes a breakage, especially in such cases where rivets are made from hot iron, which permits the rivets to adhere closely to the die. To prevent this, I reduce the whole motion of the header to that of the length of the longest rivet to be made on a machine, and, giving this amount of motion to the ejector, it acts upon the rivet immediately after the header begins its return-stroke. It begins with ease and runs almost the entire one-half revolution of the main crank-shaft for its operation.

To obtain the desired effect, I place on each side of the knuckle *k*, upon extensions thereof, a lever, P, (see Fig. 3,) pivoted to a compensating-link, *l*, being connected with a stationary portion of the machine, or in some other manner compensate for the up-and-down motion of the fulcrum *p* of lever P. Between the levers P, I lay the rod R, which connects with the lever E and P by means of pins *p'* and p^2. Now, by regulating the length of the lever P relative to that of lever E and relative to the amount of motion of the header, and by suitably locating the points *p'* and p^2, I can obtain any desired amount of motion for the ejector. It is evident that the lever P could be in many other ways connected to the header or other similarly-moving portion of the machine; but I prefer the manner shown as the simplest and most efficient, being central with the motion of the header, not liable to get out of order, and in no way apt to put any strain upon the header-slide itself.

Not unfrequently it happens that a breakage in the interior of the die prevents the ejector from moving forward. In order to avoid in such cases a breaking of the parts connected therewith, I make the pin *p'* in the ejector particularly weak by turning grooves in the same, as shown in Fig. 9. It will break in such exceptional cases, preventing the breakage of more important parts.

The ejector E is provided with an adjustable screw, *e*, which regulates slight irregularities and possible wear in the length of ejector pin p^3.

Having thus described the various successive operations of my machine and the improvements in mechanisms relative thereto, I claim—

1. In a machine for making rivets or screw-blanks, the combination, with the crank-shaft D and link L, having knuckle *k*, abutting against a corresponding cavity on the header-slide, of straps *s*, encircling the knuckle *k*, and secured to the header by means of screws *b'*, as and for the purposes described.

2. In a machine for making rivets or screw-blanks, the combination, with the crank-shaft D and link L, having knuckle *k*, of a slide, H, removable abutment *b* for the knuckle *k* interposed between the heading-slide H and the knuckle *k*, and straps *s*, encircling the knuckle, and bolts *b'*, connecting said slide H, knuckle *k*, abutment *b*, and straps *s*, as and for the purposes described.

3. In a machine for making rivets or screw-blanks, the combination, with the heading mechanism, of a lever, P, compensating-link *l*, rod R, and ejector E, said lever P being so proportioned relative to lever E that the linear motion of point *e* of lever E is less than the linear motion of the heading mechanism, as and for the purpose described.

4. In a machine for making rivets or screw-blanks, the combination of the crank-shaft D with link L, lever P, suspended from the knuckle or link L, compensating-link *l*, rod R, and lever E, having screw *e*, said lever P being shorter than lever E, as a means to reduce the amount of linear motion of screw *e* as compared with the amount of linear motion of the header, as and for the purpose described.

5. In a machine for making rivets or screw-blanks, the combination, with the main bed A, of a die-block, K, movable up and down by screw *n* and sidewise by wedges W W', as and for the purpose described.

6. In a machine for making rivets or screw-blanks, the combination, with a shear-slide, S, of two carrier-arms, U, pivotally connected with said slide S, and provided with fingers *u*, secured to said arms, and spring S^3, combining said arms, and screws *u'*, passing through said arms, substantially as and for the purposes described.

7. In a machine for making rivets or screw-blanks, the combination, with the crank-shaft and an adjustable crank mechanism, F, of a jawed rod, G, slotted lever T, and threaded and shouldered pin t^2, passing through the jaw of rod G and lever T, and being adjustable in po-

sition by screw t^4, substantially as and for the purpose described.

8. In a machine for making rivets or screw-blanks, the combination of levers P and E and rod R by pins p' and p^2, one of which at least is weakened, as and for the purpose described.

9. In a machine for making rivets or screw-blanks, the combination, with a shear-slide, S, of arms U with fingers u and cams u^2, pivotally secured to the slide, and cam u^3, fastened to the machine stationary, as and for the purpose described.

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