

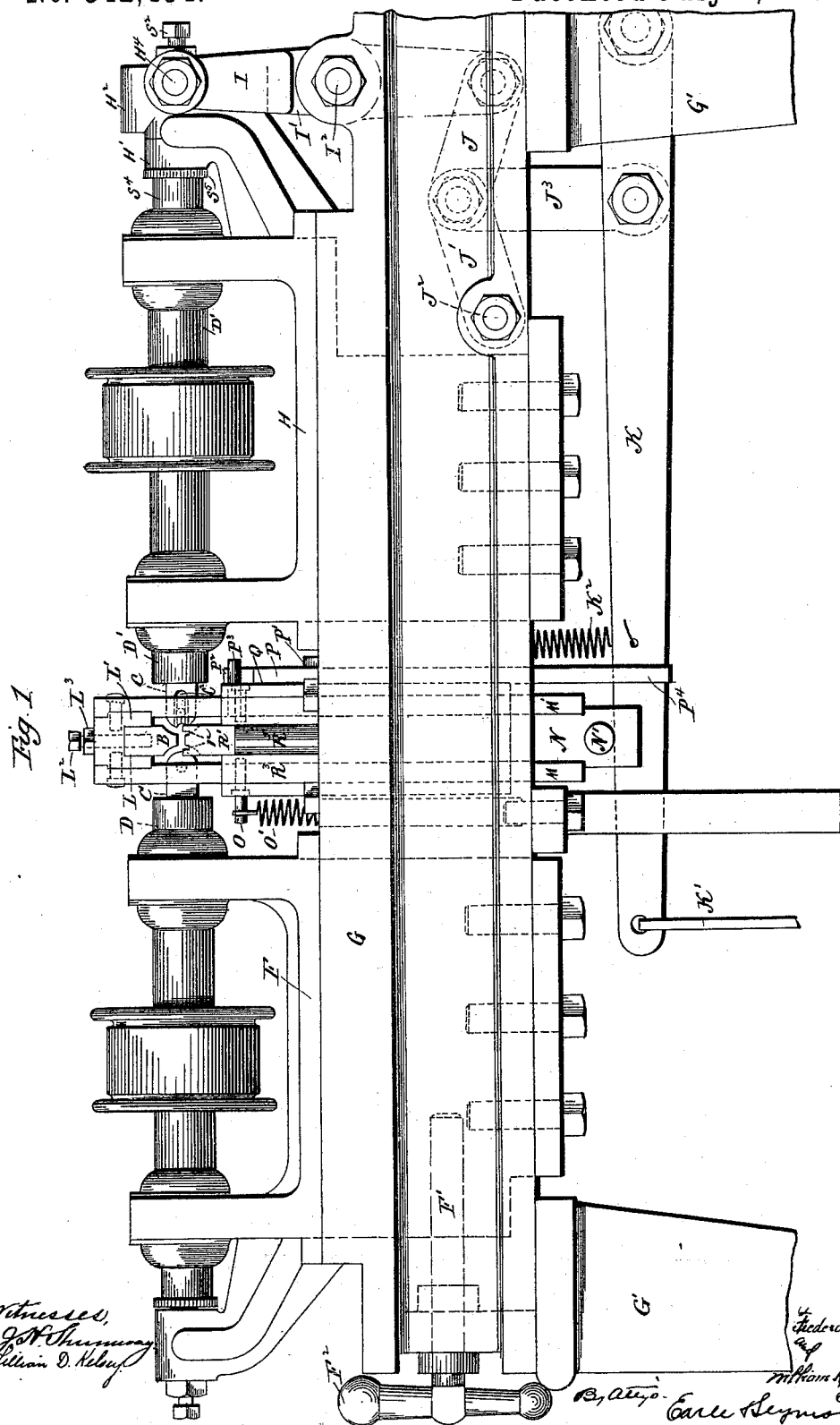
(No Model.)

4 Sheets—Sheet 1.

F. WAIBLE & W. R. WILLETTS.  
MACHINE FOR HEADING RIVETS OF CHAINS.

No. 542,454.

Patented July 9, 1895.



Witnesses,  
J. H. Thompson  
William D. Keuff

Frederick Waible  
William R. Willett  
Inventors  
Carey & Sons

F. WAIBLE & W. R. WILLETTS.  
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Fig. 2

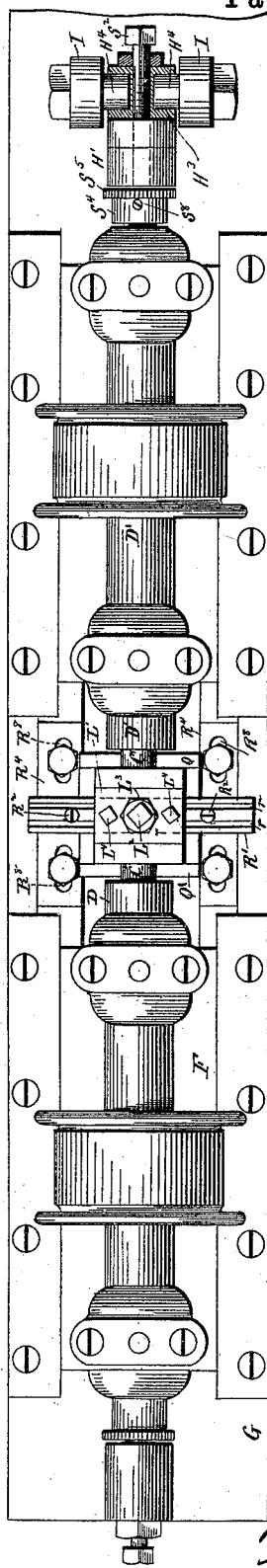


Fig. 10

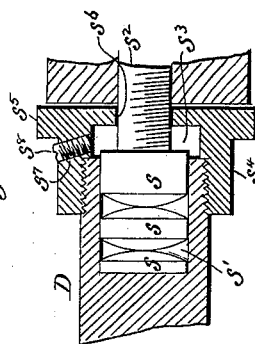
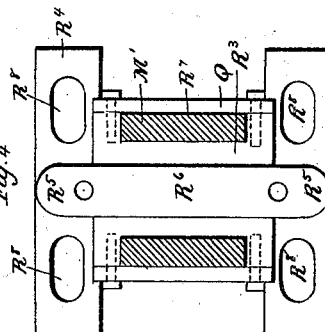


Fig. 4



Witnesses:  
*J. A. Summary*  
*Lillian D. Kelby*

*Fredrick Waible*  
*and William R. Willetts*  
 Inventors.  
*By Atty. Earn. Seymour*

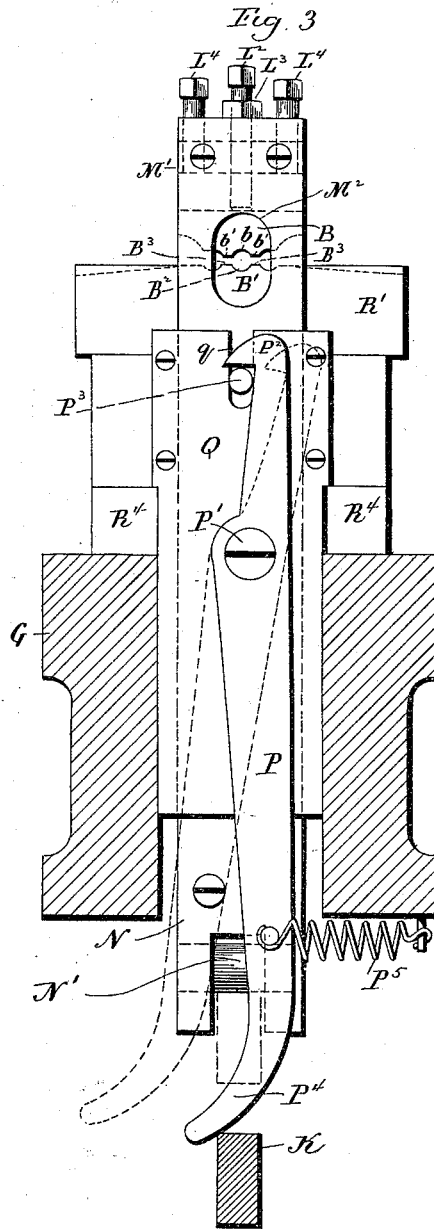
(No Model.)

4 Sheets—Sheet 3.

F. WAIBLE & W. R. WILLETTS,  
MACHINE FOR HEADING RIVETS OF CHAINS.

No. 542,454.

Patented July 9, 1895.



Witnesses  
J. H. Shumway  
William D. Kellogg

Frederick Waible,  
and William R. Willetts,  
Inventors.  
By Atty Earle Seymour

F. WAIBLE & W. R. WILLETTS,  
 MACHINE FOR HEADING RIVETS OF CHAINS.  
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Fig 5

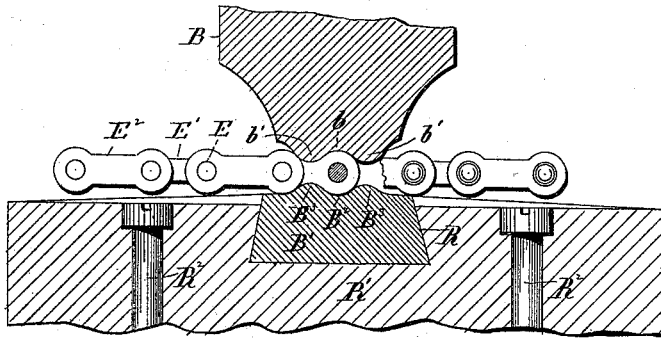


Fig 7

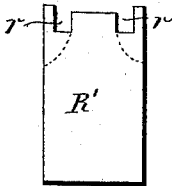


Fig 6

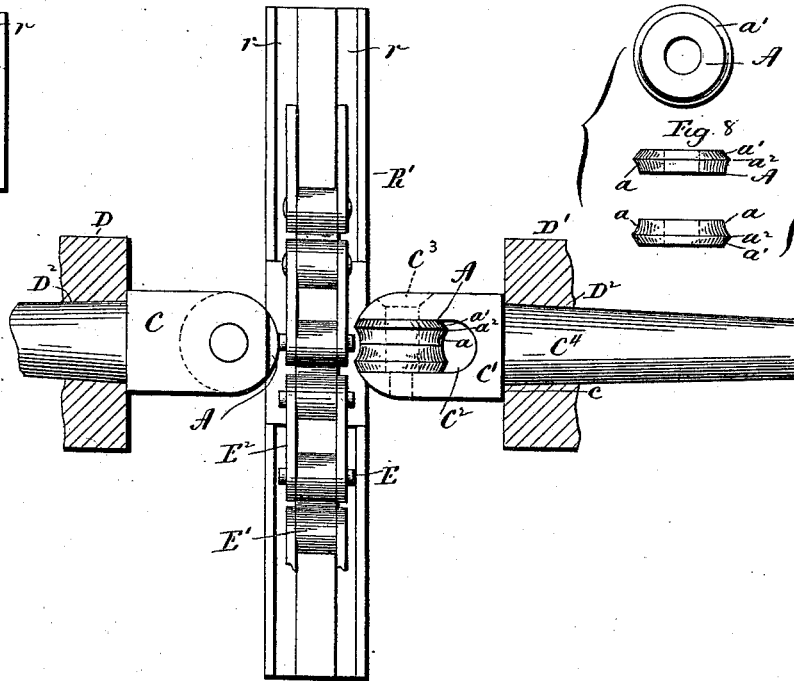
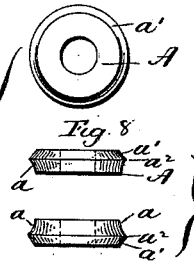


Fig 9



Witnesses,  
*J. N. Shumway*  
*Lillian D. Kelcey*

*Frederick Waible,*  
*and William R. Willetts*  
 Inventors,  
*By* *Carle & Seymour*

# UNITED STATES PATENT OFFICE.

FREDERIK WAIBLE AND WILLIAM R. WILLETTS, OF WATERBURY, CONNECTICUT, ASSIGNORS TO THE AMERICAN PIN COMPANY, OF SAME PLACE.

## MACHINE FOR HEADING RIVETS OF CHAINS.

SPECIFICATION forming part of Letters Patent No. 542,454, dated July 9, 1895.

Application filed February 4, 1895. Serial No. 537,220. (No model.)

*To all whom it may concern:*

Be it known that we, FREDERIK WAIBLE and WILLIAM R. WILLETTS, of Waterbury, in the county of New Haven and State of Connecticut, have invented a new Improvement in Machines for Heading the Rivets of Chains; and we do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a view in side elevation of one form which a machine constructed in accordance with our invention may assume; Fig. 2, a plan view thereof; Fig. 3, an enlarged view of the machine, partly in elevation and partly in vertical section, and showing in particular the reciprocating die-frame and the locking-lever thereof; Fig. 4, a detached plan view of the die-block holder in which the slides of the die-frame are shown in section; Fig. 5, a detached sectional view showing the two dies, the die-block, and a section of chain which is shown in elevation; Fig. 6, a plan view showing the lower die and the two chucks in which the pairs of spinning-rolls are mounted; Fig. 7, a view in end elevation of the die-block; Fig. 8, a plan view showing a pair of rolls which are separated from each other; Fig. 9, a view of one of the rolls in side elevation; Fig. 10, a sectional view showing the anti-friction-bearings in the outer end of one of the spindles.

Our invention relates to an improvement in riveting-machines primarily designed for heading down the rivets of bicycle-chains, but also adapted to be used for heading the rivets of a great variety of objects, such, for instance, as casters, &c., the object of my present invention being to produce a simple and effective machine, having a large capacity for work of superior character.

With these ends in view our invention consists in a machine having certain details of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

We have chosen to illustrate our invention

as embodied in a machine for riveting bicycle-chains which are fed to it by hand. In adapting our machine to do other riveting work, or to rivet automatically-fed bicycle-chains, it will be somewhat modified, but the construction shown will serve for the purposes of illustrating our invention.

In the machine shown we employ two pairs of spinning-rolls A A, A A, and two gripping-dies B and B'. The said pairs of rolls are respectively journaled in chucks C C', each of which is constructed with a longitudinal slot C<sup>2</sup>, open at its outer end and at its sides and corresponding in width to the width of the paired rolls. Each chuck is furnished with a screw-stud C<sup>3</sup>, passing transversely through its slot C<sup>2</sup> and forming a bearing for the pair of rolls located therein. Each chuck is also formed with a tapering shank C<sup>4</sup>, between which and the body of the chuck a shoulder *c* is formed. The said chucks are mounted so as to be in line with each other in the adjacent inner ends of two spindles D D', constructed with tapering counter-bore D<sup>2</sup> D<sup>2</sup>, adapted to receive the tapered shanks C<sup>4</sup> C<sup>4</sup> of the chucks, as clearly shown in Fig. 6. The two rolls of each pair combine to form what might be termed "a split roll," the inner portions of their edges being correspondingly concave or grooved, as at *a*, to afford spinning-surfaces for heading the ends of the rivets E of the bicycle-links, which comprise also body-links E' and plate-links E<sup>2</sup>. The concave or grooved faces of the two rolls are shaped so that they conform in combined cross-section to the cross-section of the heads which it is desired they shall produce upon the ends of the rivets. As shown herein, they combine to produce a shallow concave groove forming a comparatively flat though rounded rivet-head; but they may be made deeper, if desired, and shaped to form a head of somewhat conical form. We do not limit ourselves, therefore, to grooving the rolls in any particular manner, as the character of their grooves will depend entirely upon the character of the heads which it is desired to form upon the ends of the rivets. As herein shown, the outer portions of the rolls are beveled as at *a'*, whereby they are better adapted to clear

the links; and furthermore the thin edge  $a^2$ , formed where the beveled and curved surfaces merge into each other, has the function of cutting away any burr which may be produced by spinning down the rivet ends. If desired, however, the outer edges of the rolls may be left square, though we prefer the construction shown.

It will be understood that in the operation of the machine the rolls of each pair rotate with great rapidity in opposite directions, whereby the rivet-heads produced are regular in form and have a highly-finished smoothed appearance. We may explain that the rolls are thus driven in opposite directions, as described, by their engagement with the ends of the rivets on opposite sides of the longitudinal centers of the same. We should also explain that the chucks carrying the respective pairs of rolls are driven in opposite directions for the purpose of preventing the rivets from rotating. Each pair of rolls tends to rotate the rivet, and when the pairs of rolls are rotated in opposite directions the tendency of one pair balances that of the other, and the rivets remain stationary during the operation of spinning down their ends into heads.

One or both of the chucks must be moved for the purpose of securing clearance for the introduction of the chain between them and its removal from them and also to adapt them to approach each other, as required for spinning. As herein shown, we have provided for the normal movement of but one of the chucks, but both may be moved, if desired.

In the construction shown the spindle D, in which the chuck C' is mounted, is journaled in a normally-stationary head F, mounted upon the bed G of the lathe and adapted to be adjusted back and forth thereon in setting the machine by means of an adjusting-screw F', furnished at its outer end with a handle or crank F<sup>2</sup>. The spindle D', in which the chuck C' is mounted, is journaled in a head H, normally movable back and forth upon the said bed G for causing the chuck C' to be moved toward and away from the chuck C within the limits required for the introduction and removal of the chain and the spinning rivets thereof.

Various mechanisms may be resorted to for reciprocating the head H. As herein shown, the arm H' at the rear end of said head has secured to its outer face a heavy steel plate H<sup>2</sup>, furnished in its opposite edges with vertically-elongated slots H<sup>3</sup>, receiving adjustable pins H<sup>4</sup> H<sup>4</sup>, located in line with each other and mounted in the upper ends of the arms I I of a vertically-arranged forked lever I', hung upon a horizontal stud I<sup>2</sup>, and having its lower end connected with the outer end of a toggle-link J, the inner end of which is connected with the inner end of a corresponding toggle-link J', connected with the bed of the machine by a horizontal stud J<sup>2</sup>. The inner ends of the said toggle-links are

also connected to a vertically-arranged link J<sup>3</sup>, the lower end of which is attached to a horizontally-arranged long operating-lever K, pivoted at its outer end to one of the legs G' of the lathe, and having its inner end connected to a treadle of any approved construction, but having only a portion K' of its operating-rod shown. A spring K<sup>2</sup>, connecting the lever K with the bed of the machine, is employed for lifting the lever after the foot has been removed from the treadle. It will be readily understood that when the inner end of the lever K is depressed by means of the treadle the lever will act through the medium of the toggle-links and the forked lever to move the head H, and hence the chuck C' and the rolls carried thereby, inward, while when the downward pressure upon the treadle is removed the spring K<sup>2</sup> will act to reverse this movement. The devices shown for operating the head H are effective; but it will be understood that they may be replaced by any other suitable devices for the purposes of which many may be devised.

With reference now to the gripping-dies, one or both of them may be made movable. In the construction shown, for illustration, we have provided for the movement of the upper die B only. This die is entered at its upper end into a socket L, formed in the lower face of a block L', in which it is secured by means of a vertically-arranged screw-bolt L<sup>2</sup>, having a jam-nut L<sup>3</sup>. Two set-screws L<sup>4</sup> L<sup>4</sup>, mounted in the top of the block, impinge at their lower ends upon the upper edge of the die and set the same downward when the jam-nut L<sup>3</sup> is turned back to give clearance to the downward movement of the screw-bolt L<sup>2</sup>, which is not threaded except where it enters the die. The said block L' forms one member of a vertically-movable die-frame, which also comprises two corresponding vertically-arranged slides M M', the lower ends of which are bolted to the upper end of a block N, the projecting lower end of which is vertically-slotted to receive the upper edge of the operating-lever K and furnished with a transverse pin N', with which the lever engages for lifting the block N, and hence the slides M M', the block L', and the die B. The slide M is furnished toward its upper end with a horizontal pin O, for the attachment of the upper end of a heavy spiral spring O', the lower end of which is connected with the lathe-bed G in any convenient manner. The function of this spring is to draw the die-frame downward when it is relieved of the upward pressure of the operating-lever K against its pin N'—as, for instance, by the downward movement of the said operating-lever K under the action of the treadle. For locking the die-frame in its depressed position, in which the die B grips the chain, we employ a vertically-arranged pivotal locking-lever P, swinging upon a horizontal screw-stud P', mounted in a stationary cap-plate Q, which will be described hereinafter. The upper end of the

said locking-lever is furnished with a hook P<sup>2</sup>, which is engaged, when the die-frame is depressed, with a pin P<sup>3</sup>, mounted in the slide M', toward the upper end thereof and projecting horizontally therefrom. The lower end of the said locking-lever P is curved to form a trip P<sup>4</sup>, which coacts with the upper edge of the operating lever K. In the downward movement of the die-frame the said pin P<sup>3</sup> is carried into position to be engaged by the said hook by the action of a spring P<sup>5</sup>, connected with the said lever below the fulcrum thereof. The hook then serves to hold the die-frame downward in position to maintain the grip of the die upon the chain. When, on the other hand, the operating-lever K begins its upward movement preparatory to lifting the die-frame, it engages with the trip P<sup>4</sup> of the locking-lever and swings the same to one side to disengage the hook P<sup>2</sup> from the pin P<sup>3</sup> before it strikes the pin N' of the die-frame for lifting the same.

The lower face of the upper or outer die B is transversely grooved, as shown at Fig. 5, to adapt it to fit down over one or more sections of chain to prevent the same from having longitudinal movement under it during the spinning operation and also to centralize the rivets with the pairs of rolls in the chucks carried by the spindles. As herein shown, the die has a central transverse groove b and two corresponding ribs b' b', but of course the formation of its face will be varied to suit the particular character of the chain being operated upon.

The lower or inner die B', which, in the construction shown, is stationary, has a central transverse groove B<sup>2</sup> and two corresponding ribs B<sup>3</sup> B<sup>3</sup>. This die is of dovetail shape in cross-section and is entered endwise into a dovetail slot R, formed transversely in a long die-block R', which is secured by screw-bolts R<sup>2</sup> R<sup>2</sup> to a die-block holder (clearly shown in Fig. 4 of the drawings) consisting of a body R<sup>3</sup>, feet or flanges R<sup>4</sup> R<sup>4</sup>, and vertical webs R<sup>5</sup> R<sup>5</sup>, forming extensions virtually of the body and supporting the ends of the die-block, which is set into a long groove R<sup>6</sup>, formed in the body R<sup>3</sup> of the die-block holder, in line with the webs R<sup>5</sup> R<sup>5</sup>. The sides of the body R<sup>3</sup> are recessed, as at R<sup>7</sup> R<sup>7</sup>, to receive the slides M and M' of the die-frame, the said slides being firmly held in place in the said recesses by means of caps Q Q', which are bolted to the side faces of the body. The cap Q has mounted in it, as before stated, the screw-stud P', upon which the locking-lever P is hung, and is constructed at its upper end with a vertical slot q, which clears the locking-pin P<sup>3</sup>. We should also mention that each of the slides is provided near its upper end with a vertically-elongated clearance-opening M<sup>2</sup>, through which the outer ends of the chucks pass to permit their rolls to engage with the ends of the rivets.

By arranging the slides in line with the upper and lower dies and adapting the upper

ends of the slides to permit the rolls to pass through them the downward draft of the die-frame is located in the plane of both dies to obvious advantage in firmly holding the work with the minimum expenditure of power.

The die-block R', in which the stationary die B' is mounted, has the additional function of guiding the chain and preventing the same from being laterally displaced, the face of the die being for that purpose constructed with two parallel longitudinal grooves r r, which receive the side plates E<sup>2</sup> of the chain and thus prevent the chain from moving laterally, except within the narrow limits required for forcing the rivets into engagement with the rolls of the chuck C, which is not normally movable. If both chucks were moved, it would not be necessary to provide for any lateral movement of the chain.

Bicycle-chains are made in different styles, sizes, and widths, and to adapt the machine to take different chains some provision must be made for adjusting it with that end in view. Such adjustment may be effected in a variety of ways. We provide for it in the machine shown by adjusting the position of the head F by means of the screw F' and handle F<sup>2</sup> and also by providing for the lateral adjustment of the die-block holder, which is moved exactly in proportion to the movement of the head F'. For this purpose the feet R<sup>4</sup> R<sup>4</sup> are furnished with elongated bolt-holes R<sup>8</sup>, receiving the bolts R<sup>9</sup>, by means of which the holder is secured to the lathe-bed G. Of course provision might be made for changing the throw of the reciprocating head H, but we prefer to move the normally-stationary head as being the more convenient. Furthermore the wear of the spinning-rolls may be compensated for by setting up the normally-stationary head F toward the other head. It will be understood that the dies B and B' are removable and that they may be interchanged with other dies conforming to the shapes of other chains. By making the gripping-surfaces of the dies narrow one pair may be used to grip chains of the same style, but varying in width.

On account of the severe end-thrust of the spindles we prefer to locate antifriction-bearings in their ends, as shown in Fig. 10 of the drawings, in which three small bearing-pieces S, having rounded faces, are located within a chamber S', formed within the extreme end of the spindle. The outer bearing-piece is recessed to receive the flat inner end of an adjustable screw S<sup>2</sup>, which practically receives the whole thrust of the spindle. The said bearing-pieces are kept immersed in oil, which is supplied to them from an oil-chamber S<sup>2</sup>, formed in an adjustable cap S<sup>4</sup>, having a knurled flange S<sup>5</sup> screwed onto the end of the spindle and having an opening S<sup>6</sup>, through which the inner end of the said screw S<sup>2</sup> passes. The cap is also furnished with a small filling-opening S<sup>7</sup> normally closed by a screw-plug S<sup>8</sup>. The particular character of this bearing may be

changed; but we prefer to employ some such bearing, which may be said to be a bearing of the ball type.

Having now described in detail one form which our machine may assume, we will proceed to briefly set forth the mode of its operation.

The several parts of the chain are assembled in long lengths, which are introduced into the machine by the hand of the operator thereof. A link having been brought into position between the two dies, the treadle is operated to depress the upper die, whereby the said link is firmly held down upon the lower die and centered with one of its rivets in line with the spinning-rolls in the chucks, which, as the die-frame descends, advance toward the ends of the rivet; with which they engage and spin down, so as to form smooth highly-finished heads at one operation. As soon as the ends of the rivet have been headed, the operator relieves the pressure upon the treadle, allowing the die-frame to rise and the chuck carried by the movable head to retire. The chain is then moved so as to bring the next succeeding rivet into line with the chucks, after which the chain is again gripped and the chucks advanced, and so on. Inasmuch as the ends of each rivet are simultaneously spun down, the work may be very rapidly prosecuted, and subsequent finishing of the heads of the rivets is not necessary, as they are left smooth and uniform by the spinning-rolls. The speed with which the machine may be operated depends only upon the capacity of the operator to feed the chain and manipulate the treadle.

It is apparent from the suggestions made already that changes from the construction herein shown and described may be made in carrying out our invention, and we would therefore have it understood that we do not limit ourselves to such construction, but hold ourselves at liberty to make such changes as fairly fall within the spirit and scope of our invention. Thus, we might easily make the machine purely automatic in its action by dispensing with the stationary die and replacing it by a movable die in the nature of a sprocket-wheel, which would automatically feed the chain, which would be gripped upon the wheel in the manner already illustrated by a reciprocating die of substantially the character shown and described. We are aware, however, that a riveting-machine having two pairs of spinning-rolls, of which the rolls of each pair rotate in opposite directions, and means for holding the work subjected to their action, is old, and we do not claim, therefore, such a construction broadly.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a riveting machine, the combination with two pairs of spinning-rolls, one being movable toward and away from the other; of two dies or work-holders, and a reciprocating

frame in which one of the dies or work-holders is mounted, and which comprises two slides respectively located on the opposite sides of the other die or work-holder and arranged in the same vertical plane therewith so that downward draft upon the frame will be directly through the dies or work-holders, substantially as described.

2. In a riveting machine, the combination with two pairs of rolls arranged in line with each other and one of them being movable toward and away from the other; of two work-holders or dies, and a reciprocating frame carrying the upper work-holder or die, and moving the same toward and away from the other work-holder or die, and comprising two slides located in the vertical plane of the work-holders or dies, and constructed at their upper ends to give access to the rolls to the work held by the dies or holders, substantially as described.

3. In a riveting machine, the combination with two pairs of spinning-rolls respectively arranged to rotate in opposite directions, and one being movable toward and away from the other, of two gripping dies, a reciprocating die-frame in which one of the dies is mounted, and a locking-lever for holding the said frame in the operating position of the die which it carries, substantially as described.

4. In a riveting machine, the combination with two pairs of rolls, a reciprocating head with which one pair of rolls is connected, an operating-lever, connection between the said head and lever, whereby the head is moved back and forth, two gripping-dies located between the pairs of rolls, and a reciprocating die-frame in which one of the dies is mounted, and which is adapted at its lower end to be engaged and lifted by the said lever, substantially as described.

5. In a riveting machine, the combination with two pairs of rolls, of chucks in which the same are mounted, oppositely revolving spindles carrying the chucks, a movable head having one of the spindles journaled in it, two gripping dies located between the chucks, a reciprocating die-frame having one of the dies connected with it, an operating-lever adapted to engage with one end of the said frame for lifting it, connection between the said lever and the movable head, whereby the same is advanced with its spindle and chuck toward the other spindle and chuck, and a locking-lever adapted to lock the die-frame in its depressed position, and constructed to be unlocked by means of the engagement with it of the operating-lever, substantially as described.

6. In a riveting machine the combination with two pairs of spinning rolls, of two chucks in which the said pairs of rolls are mounted, two spindles carrying the chucks, means for rotating the spindles in opposite directions, two dies located between the rolls, and one of them being movable, and anti-friction bearings for the spindles, consisting of bearing-pieces having conical surfaces, located within

chambers formed in the ends of the spindles, caps fitting over the ends of the spindles, and receiving oil for the lubrication of the said bearing-pieces, and end-thrust screws passing through the said caps and engaging with the outer bearing-pieces within the chambers substantially as set forth.

specification in the presence of two subscribing witnesses.

FREDERIK WAIBLE.  
WILLIAM R. WILLETTS.

Witnesses:

WILLIAM WEBSTER,  
HUGH A. PENDLEBURY.

In testimony whereof we have signed this