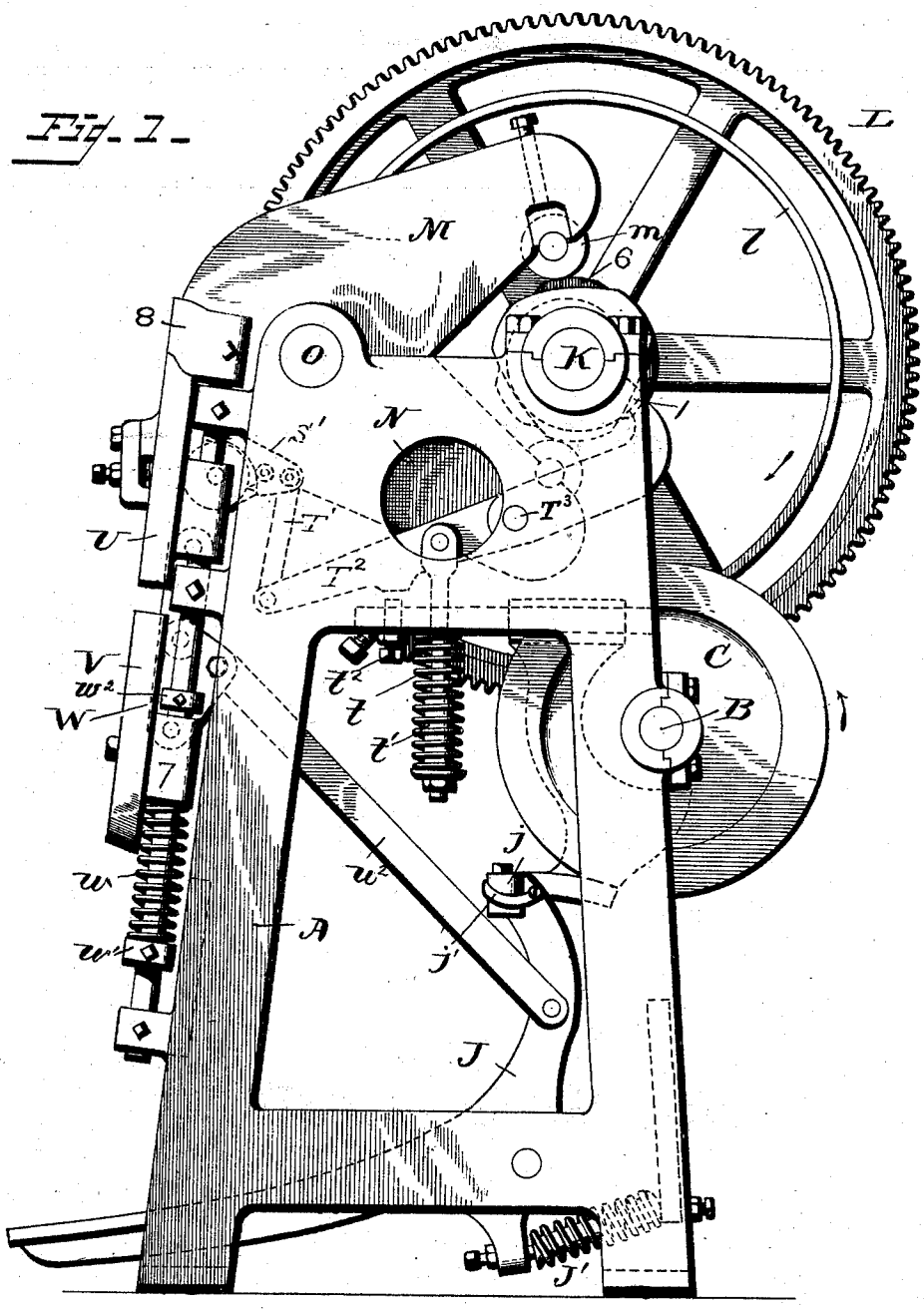
(No Model.) 5 Sheets—Sheet 1.

J. PLEUKHARP & W. K. LIGGETT.

HOOP MAKING MACHINE.

No. 502,407. Patented Aug. 1, 1893.

Fig. 1.



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(No Model.) 5 Sheets—Sheet 2.

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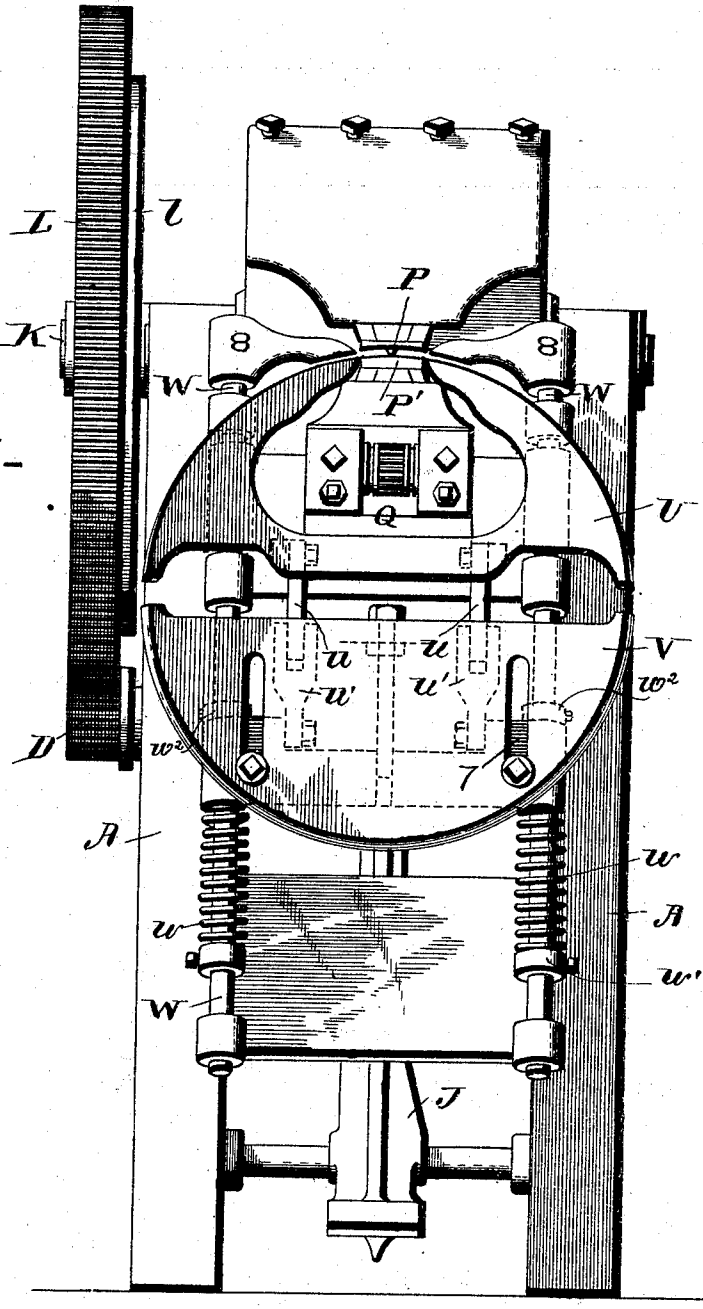
Fig. 2.



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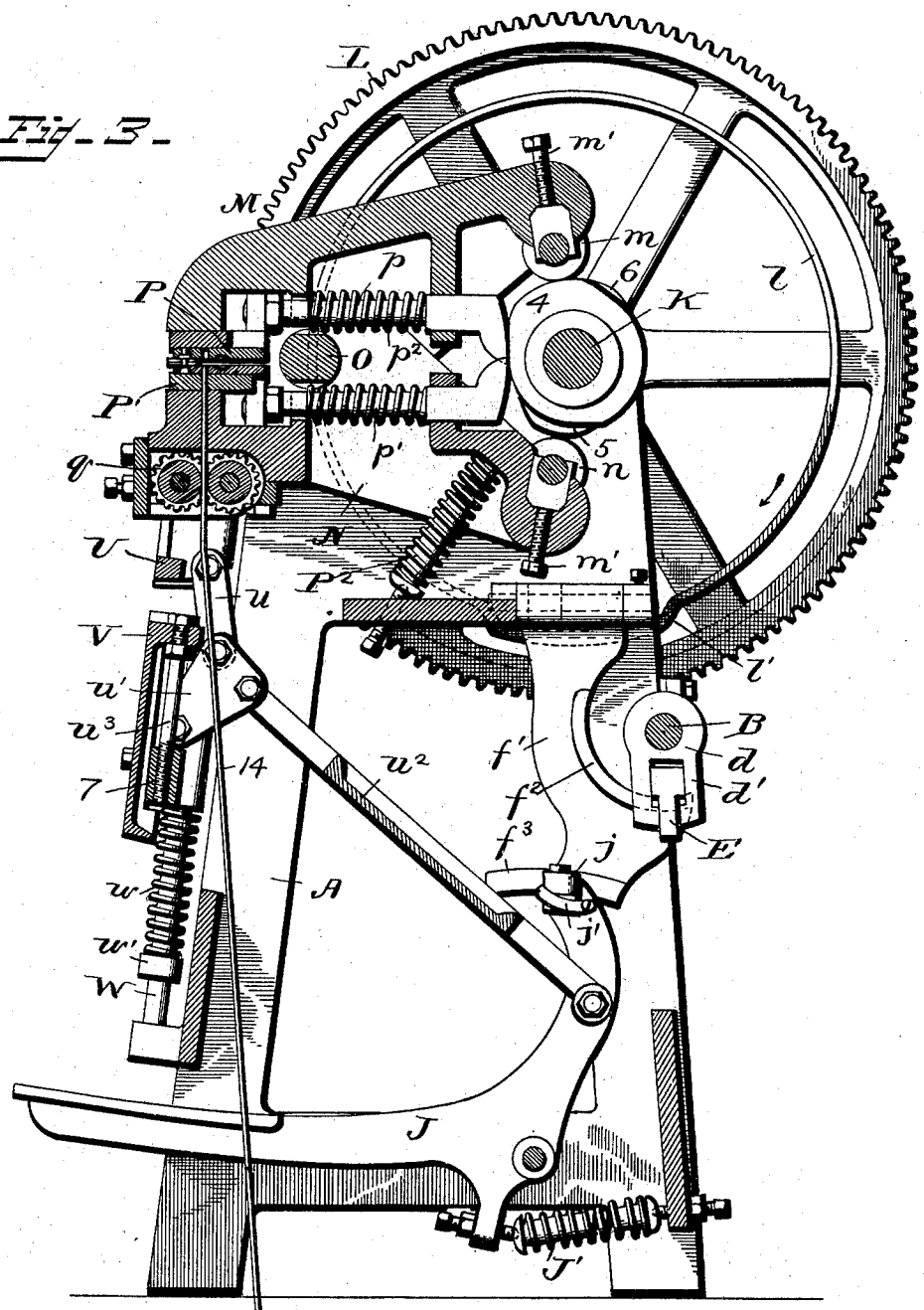
(No Model.) 5 Sheets—Sheet 3.

J. PLEUKHARP & W. K. LIGGETT.

HOOP MAKING MACHINE.

No. 502,407. Patented Aug. 1, 1893.

Fig. 3.



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(No Model.) 5 Sheets—Sheet 4.

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HOOP MAKING MACHINE.

No. 502,407. Patented Aug. 1, 1893.

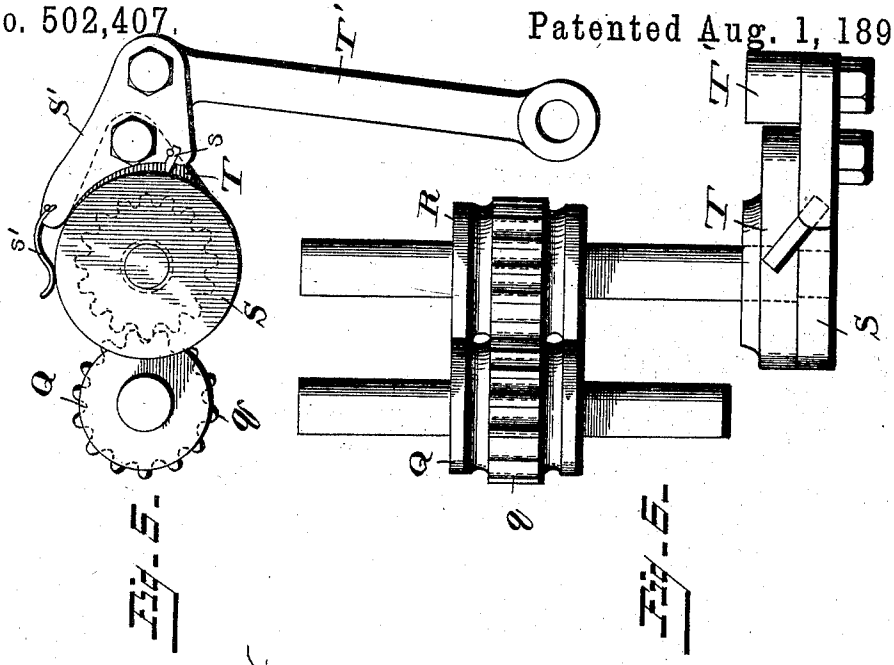

Fig. 5. Fig. 5.

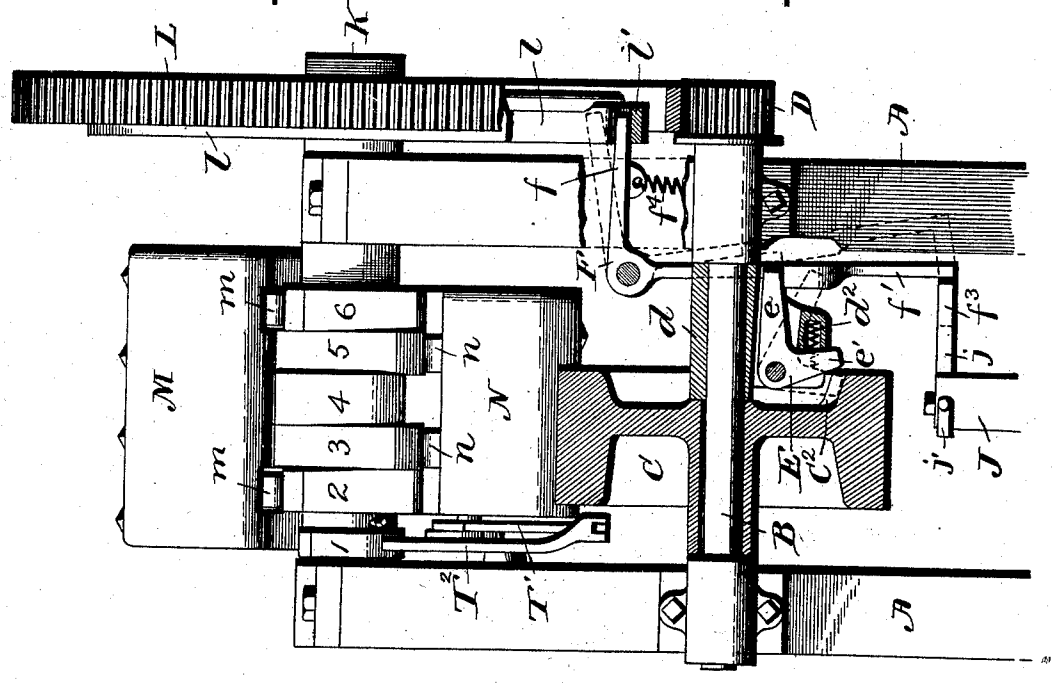

Fig. 5.

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(No Model.) 5 Sheets—Sheet 5.

J. PLEUKHARP & W. K. LIGGETT.

HOOP MAKING MACHINE.

No. 502,407. Patented Aug. 1, 1893.

Fig. 7.

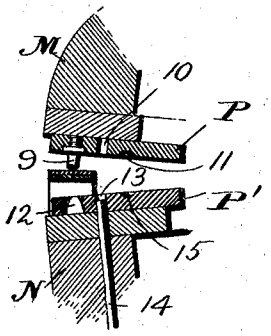


Fig. 9.

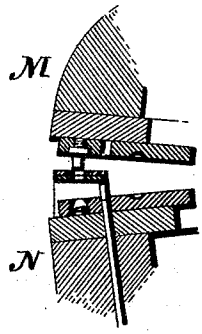


Fig. 11.

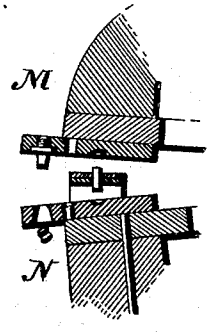


Fig. 8.

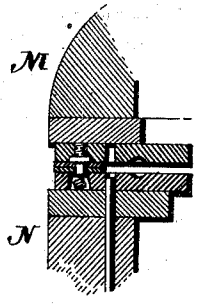


Fig. 10.

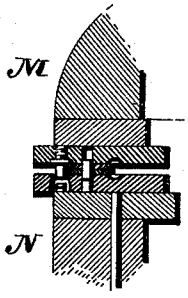


Fig. 12.

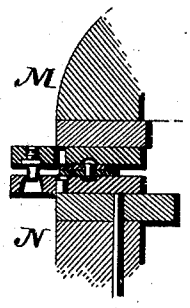


Fig. 13.

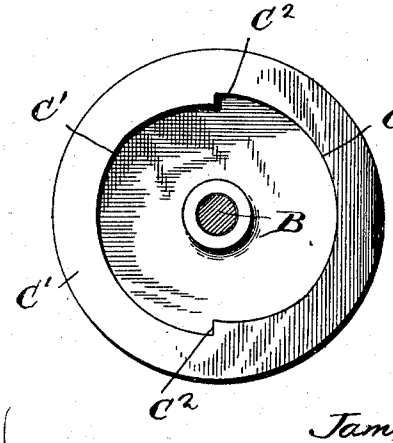
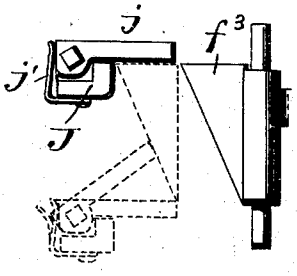


Fig. 14.



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UNITED STATES PATENT OFFICE.

JAMES PLEUKHARP AND WILLIAM K. LIGGETT, OF COLUMBUS, OHIO, ASSIGNORS TO THE PLEUKHARP BARREL MACHINE COMPANY.

HOOP-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 502,407, dated August 1, 1893.

Application filed April 12, 1892. Serial No. 428,865. (No model.)

To all whom it may concern:

Be it known that we, JAMES PLEUKHARP and WILLIAM K. LIGGETT, citizens of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Hoop-Making Machines, and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to hoop making machinery, and is designed to regulate the size of the hoop, punch the overlapping ends of the hoop iron, supply and insert the rivets in the openings formed in the said hoop iron and upset the ends of the said rivets, performing these several operations successively and automatically.

The improvements will be referred to in the following specification and more particularly pointed out in the claims.

In the accompanying drawings forming part of this specification, similar letters and numerals designate corresponding parts in the several figures, in which—

Figure 1 is a side view of a machine embodying our invention. Fig. 2 is a front view of the machine. Fig. 3 is an approximately vertical central section of the machine looking to the left. Fig. 4 is a rear view of the upper portion of the machine, partly in section and having parts broken away the better to illustrate the mechanism for throwing the machine in gear and out of gear, the relative disposition of the parts when the machine is in gear being shown by the dotted lines and out of gear by the full lines. Fig. 5 is a detail view of the wire feeding instrumentalities in side elevation. Fig. 6 is a top plan view of the mechanism shown in Fig. 5. Fig. 7 is a detail view of the jaws and dies showing the relation of the parts prior to the operation of the punching mechanism. Fig. 8 shows the relative position of the jaws and the dies after the operation of the punch. Fig. 9 shows the jaws and dies opened and the rivet in position to be sheared off and carried forward on the forward movement of the said dies. Fig. 10 shows the dies moved forward, the iron sheared off and the jaws and the dies closed, and the rivet in position in the overlapping ends of the hoop iron. Fig. 11 shows the jaws and the dies again opened, the dies moved still farther forward to bring the recesses therein opposite the ends of the rivets. Fig. 12 shows the jaws and the dies closed and the ends of the rivet upset. Fig. 13 is a side view of the continuously driven pulley by means of which the machine is set in active operation. Fig. 14 is a detail top plan view of the upper end of the treadle and the pivoted trip, the horizontal portion of the latter being broken away, showing the normal position of the trip by dotted lines and the position of the top end of the treadle when the latter is depressed by full lines, and showing the treadle returning to a normal position by the dotted lines.

The frame of the machine which is preferably of metal, is composed of two similar side pieces A which are connected and braced by suitable cross bars.

The shaft B journaled near its ends in bearings provided on the side pieces A, has a pulley C mounted and adapted to rotate freely thereon and is provided at one end with a pinion D the sleeve d of which extends to and abuts against the hub of the pulley C. This pinion D and sleeve d are keyed on the said shaft B so as to revolve therewith. A lateral extension d' projecting from the sleeve d is recessed to receive an elbow shaped pawl E which is pivotally connected with the said extension d' at the elbow. The horizontal member e of the pawl E projects away from the pulley C and the vertical member e' occupies a pendent position and is adapted to be pressed toward the pulley C by a spring d^2 which is fitted in a recess in the said extension d'. The side of the pulley C facing the pawl E, has cam faces C′ on the inner periphery of the band, and shoulders C^2 at points diametrically opposite each other. Obviously, when the member e' is projected within the plane of the pulley C it will be engaged by one or the other of the shoulders C^2, and locks the pulley C and shaft B so that they will revolve together. An elbow shaped trip F pivotally supported at the elbow has its horizontal arm f approximately parallel with shaft B and its vertical arm f' in a plane parallel with the

pulley C. The rear edge of the arm f' is provided with a cam f^2 which is eccentric to and extends about one-third way around the shaft B and is disposed so as to engage with the horizontal member e and disengage the vertical member e' from the pulley C. The lower end of the arm f' is provided with a lateral flange like projection f^3 which is inclined on its outer edge which normally extends within the path of an arm j which is pivotally connected with the upper end of the treadle J so that when the said treadle is pressed upon by the foot the arm j riding on the inclined edge of the flange f^3 will press the lower end of the arm f' out, (see the dotted lines in Fig. 4,) and release the pawl E. The spring j' serves to hold the arm j in an operative position and returns the same to a normal position after the treadle has returned to a normal position. While the treadle is pressed upon until the hoop is riveted, the arm f' will swing back to its first position and the butt end of the inclined flange f^3 will project across the path of the free end of the arm j (see the dotted lines Fig. 14) and when the treadle is released the arm j will turn on its pivot and ride over the said flange f^3 as indicated by the dotted lines in Fig. 14. The trip F may be returned to a normal position by gravity but to insure its quick and positive action a spring f^4 is provided and located between the horizontal arm f and the frame. The shaft K parallel with the shaft B and journaled on the said side pieces A, is provided on one end with a gear wheel L which is constructed to mesh with the pinion D and which has a rim l on its inner side to extend within the path of the free end of the arm f. This rim has a depressed portion l' which receives the end of the said arm f when the trip is in a normal position, *i. e.* when the machine is out of gear. During the time that the machine is in gear the arm f travels upon the rim l and holds the cam f^2 out of the path of the member e of pawl E. On this shaft K is mounted a series of cams 1, 2, 3, 4, 5, 6, for actuating the jaws which carry the punching and riveting mechanism and for operating the wire feeding devices.

The jaws M and N are mounted on a cross bar O and have anti-friction rollers m and n at their rear ends to travel on the respective cams 2 and 6 and 3 and 5. These anti-friction rollers are mounted in boxes which are let into the said jaws and which are adjusted by means of set screws m'. The die plates P and P′ located between and supported by the jaws M and N, respectively, have rods p and p' connected with and projected from their rear ends which are mounted in ribs on the inner side of the said jaws so as to slide therein. The rear ends of these rods p and p' are provided with shoes which are constructed to travel on the cams 4 by means of which the said rods and die plates are pressed forward in the operation of the machine. Springs p^2 mounted on the said rods p and p' and confined between a shoulder formed near the rear ends of the said rods and a rib near the front ends of the jaw serve to retract the said die plates after the riveting has been completed. The rear end of the lower jaw P′ is held against the cams 3 and 5 by means of a spring P^2. The weight of the rear portion of the jaw P is sufficient to hold it in engagement with the cams 2 and 6.

The wire feeding mechanism composed of grooved rollers Q and R is carried by the lower jaw P′. These rollers are suitably mounted in the said jaw and have cog gearing q intermediate of their ends by means of which the said rollers are positively rotated together. The journal of one of the rollers is extended and a wheel S secured thereto and a plate T mounted so as to turn loosely thereon. A pawl S′ pivoted between its ends to the said plate T is provided at its lower end with a biting or gripping point s which is adapted to engage with the wheel S and rotate the same to properly feed the wire for the rivets. The spring s' at the upper end of the pawl is adapted to press upon the plate T to hold the biting edge s in engagement with the wheel S. The rod T′ depending from the pawl S′ connects with the front ends of a lever T^2 the rear end of which is constructed to engage with the cam l and be operated thereby. This lever T^2 is pivotally supported at T^3 and is connected with the upper end of a vertical rod t on the lower end of which is mounted a spring t' the latter being confined between the portion of the frame and a stop at the lower end of the said rod t and an adjustable stop t^2 is provided for the lever T^2 to engage to regulate the throw thereof and the consequent feed of the wire for the rivets thereby regulating the length of the latter to suit the thickness of the hoop iron.

The formers U and V, each being semi-circular in outline, are located on the front side of the machine and are placed to form a complete circle when together. These formers are mounted on vertical guide rods W and are connected together by toggle levers u and u', the latter being connected with the treadle by the rod u^2. The lower former V is adjustably connected with a cross head 7 which is mounted on the guide rods W and to which the toggle levers u' are connected. The former is vertically adjusted with reference to the cross head by means of the set screw u^3 which passes through a rear extension of the former V and screws into the said cross head 7. Obviously, by adjusting the former V the machine can be adapted to different sizes of hoop. The springs w mounted on the lower portion of the guide rod W and supported on collars w' serve to return the formers V to a normal position after being actuated. Jaws 8 are provided above the upper former U to act in opposition thereto to grip the overlapping ends of the hoop iron. This upper jaw is cut away to permit the free

working of the lower jaw N and admit of the wire feeding mechanism being so disposed that the space between the rollers Q and R will come directly below the wire opening in the said jaw N as shown most clearly in Fig. 3.

The die P is provided with a punch 9 and opening 10 and a semicircular recess 11. The die P′ has an opening 12 directly opposite the punch 9 to receive the cutting, and an opening 13 opposite opening 10 to receive the wire 14, and a depression 15 corresponding with the depression 11 in the plate P to give the proper shape to the heads of the rivets.

The treadle J is held and returned to a normal position after being operated by the spring J′ which is interposed between a lower cross bar of the frame and a depending projection on the said treadle. The set screws are provided to regulate the tension of this spring as shown most clearly in Fig. 3.

The hoop iron, previously cut to the required length, is placed around the formers and its ends lapped. The overlapping ends being placed between the former U and the jaws 8 8, the operator presses down on the treadle J which through rod u^2 and the toggle levers u and u' separates the formers and at the same time lifts them sufficiently to clamp the overlapping ends of the hoop between the upper former and the jaws 8. The springs w carrying the weight of the formers act as a yielding resistance. When the treadle is depressed the upper former will be elevated until the hoop is clamped between it and the jaws 8, a continued downward pressure on the treadle forcing the lower former down against the tension of the springs w. By this construction provision is had to permit the overlapping ends of the hoop to slip during the separation of the formers U and V and yet hold them with sufficient tension during the operation of punching and riveting. At the same time the treadle is depressed the arm j will operate the trip F to release the pawl E and permit the same to lock the pulley C and the shaft B together, thereby starting the machine. The arm f' is held out of the path of the pawl E by the arm f riding on the rim l. The lower jaw then comes up first with the die against the work and immediately after the upper jaw comes down with the punches making the holes in the hoop. Then both jaws open simultaneously at which time the wire 14 is fed through suitable holes in the lower jaw the required length for a rivet. Both dies then move forward, the lower one shearing off the rivet in this movement. The lower die plate is of such thickness as to contain one whole rivet and enough of one above to make a head. The upper rivet is steadied by remaining partially in the lower die and when the jaws again come together these rivets are forced into the holes already punched in the hoops, the hoop being squeezed between the die plates. The jaws again open and the die plates move forward leaving the rivets in the hoop. The jaws now close bringing the recesses 11 and 15 in each die plate on the rivet making a sound head. Now both jaws open and the die plates are brought back to the point of starting by means of the springs p^2. The trip lever drops into the recess l' and the machine is automatically stopped and the completed hoop taken away. It will be understood that the hoop remains clamped and fixed during the process while the machine is running.

The operation of the wire feeding device is as follows: The lever T^2 being pivoted to the frame work of the machine at T^3 has its rear end projected within the path of the cam 1 which acts on the lever T^2 tending to force it away from the shaft K, the lever T^2 rocking on pivot x, when the end of the lever resting on cam, 1 is forced downward the other end will rise, consequently lift the pawl S′ raising up the biting edge s for a new hold on the disk S, the spring s' giving away sufficiently to allow it to slip. When the lever slips off the abruptly inclined edge of the cam the spring t' pulls the opposite end of the lever down till it is arrested by the stop screw t^2 which is adjusted to give any required stroke. By this action the biting edge s is forced into contact with the disk S and by the friction therewith revolves it and the shaft to which it is keyed and the rollers R, Q through a certain arc corresponding to the stroke of the lever T^2. The wire being pinched between the rollers R and Q, is fed up by this movement. The whole mechanism is so arranged that the cam 1 through the lever T^2 stores energy in the spring t until such time as it slips over the abrupt face on cam 1 when the spring is released and by its action through the rod t and the lever T^2, rod T′ the pawl S′ and the spring s' and plate T the disk s and rollers R and Q, the wire is fed up. The lever T^2 is mounted on the pivot x and the spring actuated rod t is connected to said lever. The spring s' bears on the plate T rather than on the disk S to avoid friction. It will be seen that in the upward motion of the rod T′ the arrangement of the pivot of the pawl S′ and the biting edge s are such that any resistance to said pawl tends to withdraw the biting edge from the surface of the disk S while a resistance to a motion in the opposite direction tends to force the biting edge harder against this disk.

Provision is had to limit the upward pressure of the springs w and arrest the upward movement of the slide or cross head 7 to allow the upper half of the former U to drop away from the jaws 8 when the treadle is elevated, in collars w^2 which are secured to the guide rods W. The relative position of the collars or stops w^2 and the cross head 7 is shown in Figs. 1 and 2. Fig. 1 shows the position of the parts when the treadle is depressed and Fig. 2 when elevated.

Having thus described our invention, what

we claim, and desire to secure by Letters Patent, is—

1. A hoop making machine comprising a former to shape the hoop iron about, gripping devices to hold the overlapping ends of the hoop iron, die plates movably related to the gripping devices and provided with punching, rivet holding and riveting instrumentalities, and mechanism for automatically actuating the said mechanisms, and moving the parts to successively bring the punching, rivet holding and riveting instrumentalities in operative relation to the overlapping ends of the hoop iron, substantially as described.

2. A hoop making machine comprising a former to shape the hoop iron about, gripping devices to hold the overlapping ends of the hoop iron, movable die plates provided with punching, rivet holding, and riveting mechanism, jaws to press the die plates together, and mechanism for independently and automatically actuating the jaws and moving the said die plates to successively bring the punching, rivet holding and riveting mechanism into proper relation with the over-lapping ends of the hoop iron, substantially as described.

3. A hoop making machine comprising a former, to shape the hoop iron about, gripping devices to hold the overlapping ends of the hoop iron, jaws, movable die plates carried by the said jaws and provided with the punching, rivet holding, and riveting devices, mechanism for automatically opening and closing the said jaws, and independent mechanism for automatically moving the said die plates relative to the jaws to successively bring the punching, rivet holding and riveting devices into proper relation with the overlapping ends of the hoop iron, substantially as set forth.

4. A hoop making machine comprising a former, to shape the hoop iron about, gripping devices to hold the overlapping ends of the hoop iron, jaws having ribs on their opposing sides, die plates provided with rearwardly projecting rods which are mounted in the said ribs, and mechanism for opening and closing the jaws and moving the said rods longitudinally in the said ribs, substantially as and for the purpose described.

5. In a hoop making machine comprising a former, to shape the hoop iron about, gripping devices to hold the overlapping ends of the hoop irons, jaws having ribs on their opposing sides, die plates provided with rearwardly projecting rods which are mounted in the said ribs, springs mounted on the said rods and confined between stops thereon and the said ribs of the jaws, and mechanism for opening and closing the jaws and independently moving the said rods forward against the tension of the said springs, substantially as described.

6. In a hoop making machine the combination with jaws, one of the jaws having an opening for the passage of the rivet forming wire, and a wire feeding mechanism carried by the said apertured jaw, of die plates located between the said jaws and pressed together thereby, and mechanism for moving the said die plates between the said jaws, whereby a portion of the wire is cut off sufficient to form a rivet, substantially as set forth.

7. In a hoop making machine the combination with jaws, one of the jaws having an opening for the passage of the rivet forming wire, and a wire feeding mechanism carried by the said apertured jaw, and consisting of two grooved rollers geared to revolve together, and mechanism for actuating the said rollers, of die plates located between the said jaws and pressed together thereby, and mechanism for moving the said die plates between the said jaws, whereby a portion of the wire is cut off sufficient to form a rivet, substantially as set forth.

8. In a hoop making machine the combination, with jaws one of the jaws having an opening for the passage of the rivet forming wire, and a wire feeding mechanism carried by the said apertured jaw, and consisting of grooved rollers of the plate T loosely mounted on the journal of one of the rollers, the disk S, the pawl S′ pivoted to the plate T and having spring s' and biting edge s, and means for actuating the said pawl to operate the said rollers, substantially as described.

9. In a hoop making machine the combination with jaws, one of the jaws having an opening for the passage of the rivet forming wire, and a wire feeding mechanism carried by the said apertured jaw, and consisting of grooved rollers of the plate T loosely mounted on the journal of one of the rollers, the disk S, the pawl S′ pivoted to the plate T and having spring s' and biting edge s, the lever T^2 mounted between its ends on a spring actuated rod t and connected at one end with the pawl S′ and adapted to have its other end actuated by a cam, and an adjustable stop t^2, substantially as and for the purpose described.

10. In a hoop making machine the combination of gripping devices to clamp the overlapping ends of the hoop iron, two formers and mechanism for separating the said formers to stretch the hoop, substantially as described.

11. In a hoop making machine the combination with the jaws 8 and the formers, of mechanism for moving the formers to clamp the hoop between the jaws and the upper former, and separate the said formers, substantially as described.

12. In a hoop making machine the combination of the jaws 8, guide rods, formers mounted on the said guide rods, springs to support the said formers on the guide rods, and mechanism to separate the formers and press them against the jaws 8 against the tension of the said springs, substantially as described.

13. In a hoop making machine the combination with gripping devices to clamp the

overlapping ends of the hoop iron, the formers, and mechanism for separating the formers to stretch the hoop, of an adjusting mechanism to adjust the relative distance apart of the said formers, substantially as and for the purpose described.

14. In a hoop making machine the combination with gripping devices to clamp the overlapping ends of the hoop iron, the formers, and the treadle, of toggle levers connecting the formers to effect a separation thereof to stretch the hoop, and a rod connecting the said toggle levers with the treadle, substantially as set forth.

15. In a hoop making machine the combination with the former for shaping the hoop, jaws for gripping the ends of the hoop, shaft K provided with cams for actuating the said jaws, gear wheel L secured on shaft K and provided with rim l having depressions l', and the shaft B having pinion D in mesh with gear wheel L, of a continuously driven pulley C mounted on shaft B, a pawl E constructed to interlock and normally held out of engagement with the said pulley, and a trip for releasing the said pawl to permit it to engage with the said pulley to start the machinery, and having one end constructed to travel on the said rim l, substantially as and for the purpose specified.

16. In a hoop making machine the combination with the former for shaping the hoop, jaws for gripping the ends of the hoop, shaft K provided with cams for actuating the said jaws, gear wheel L secured on shaft K and provided with rim l having depressions l', and the shaft B having pinion D in mesh with gear wheel L, of a continuously driven pulley C mounted on shaft B, a pawl E constructed to interlock and normally held out of engagement with the said pulleys, and a trip for releasing the said pawl having a cam edge f^2 to engage with the said pawl, and having a lateral extension f^3 inclined on its outer edge to be engaged by the treadle, and having a horizontal arm f to engage with the said rim l, substantially as described for the purpose specified.

17. In a hoop making machine the combination with the former for shaping the hoop, jaws for gripping the ends of the hoop, shaft K provided with cams for actuating the said jaws, gear wheel L secured on shaft K and provided with rim l having depression l', and the shaft B having pinion D in mesh with gear wheel L, of a continuously driven pulley C mounted on the shaft B, a pawl E constructed to interlock and normally held out of engagement with the said pulley, a sleeve d keyed on said shaft B and having a lateral extension, a pawl E pivoted to the said lateral extension and adapted to interlock with the pulley C, and a trip for releasing the said pawl having a cam edge f^2 to engage with the said pawl, and having a lateral extension f^3 inclined on its outer edge to be engaged by the treadle, and having a horizontal arm f to engage with the said rim l, substantially as and for the purpose described.

18. In a hoop making machine the combination with the former for shaping the hoop, jaws for gripping the ends of the hoop, shaft K provided with cams for actuating the said jaws gear wheel L secured on shaft K and provided with rim l having depressions l', and the shaft B having pinion D in mesh with gear wheel L of a continuously driven pulley C mounted on shaft B, a pawl E constructed to interlock and normally held out of engagement with the said pulley, a trip for releasing the said pawl having a cam edge f^2 to engage with the pawl, and having a lateral extension f^3 inclined on its outer edge, and a treadle having a pivoted arm j to engage with the inclined edge of the said lateral extension f^3, substantially as described for the purpose specified.

19. In a hoop making machine the combination of the jaws 8, guide rods, formers mounted on the said guide rods, a cross head 7, springs mounted on the said guide rods, collars w' and w^2, and actuating mechanism for separating the formers and pressing the upper former against the said jaws 8, substantially as described.

20. In an organized machine for making hoops, the combination with the rivet wire feeding mechanism, of the lever T^2 pivoted between its ends and carrying a pawl at one end to actuate the said feeding mechanism, and adapted to be operated on at the other end by a cam, an adjustable stop t^2, and a spring for returning the said lever to a normal position after being actuated, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

JAMES PLEUKHARP.
WILLIAM K. LIGGETT.

Witnesses:
J. E. SUTER,
MAY MASON.