

June 5, 1928.

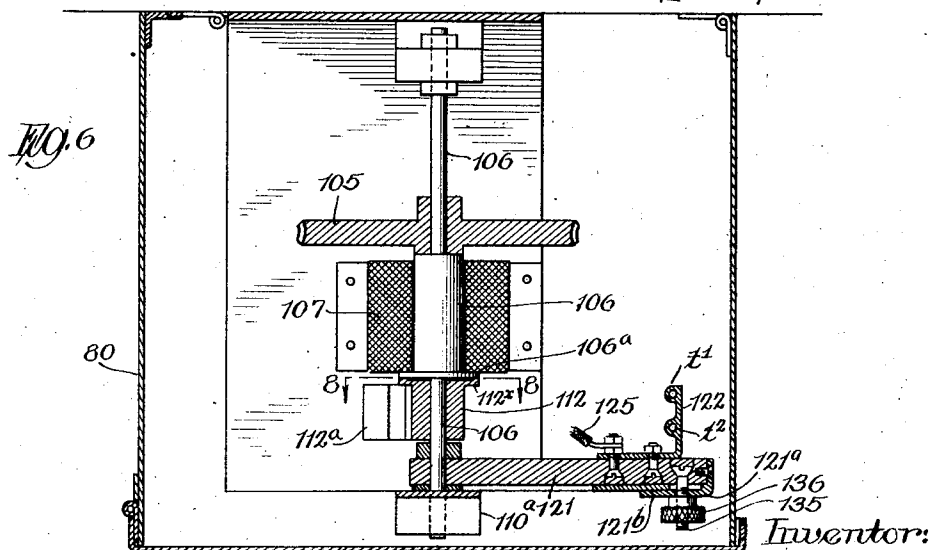
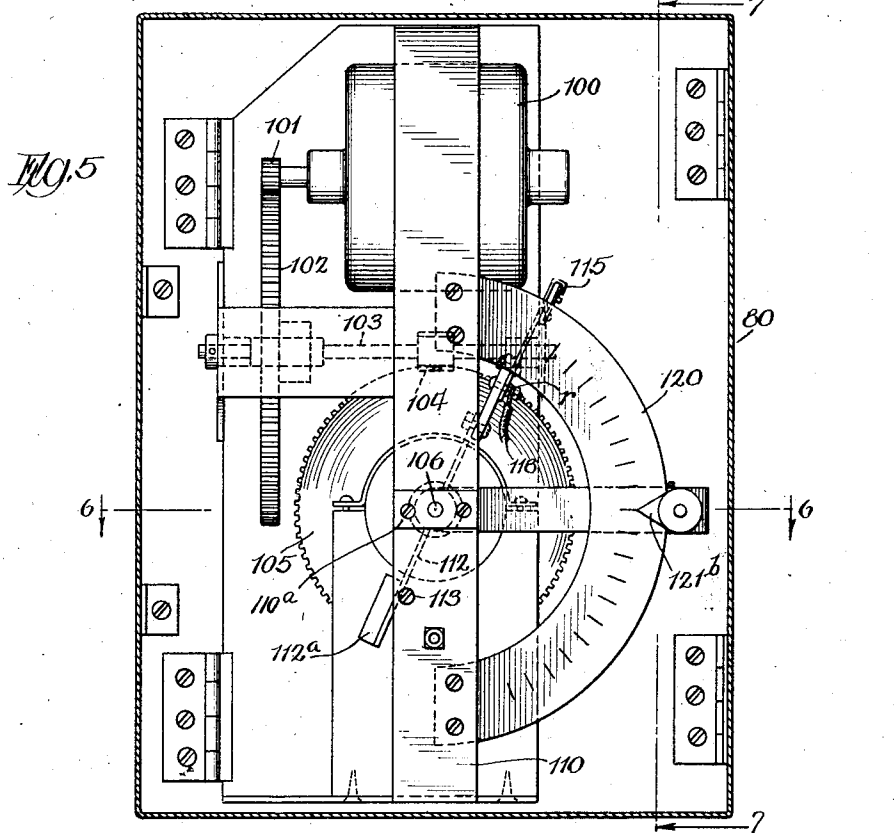
1,672,384

J. A. JENSEN

DELAY MECHANISM

Filed March 7, 1923

5 Sheets-Sheet 2



Inventor:
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by Sheridan, Jones and Sheridan Attys

June 5, 1928.

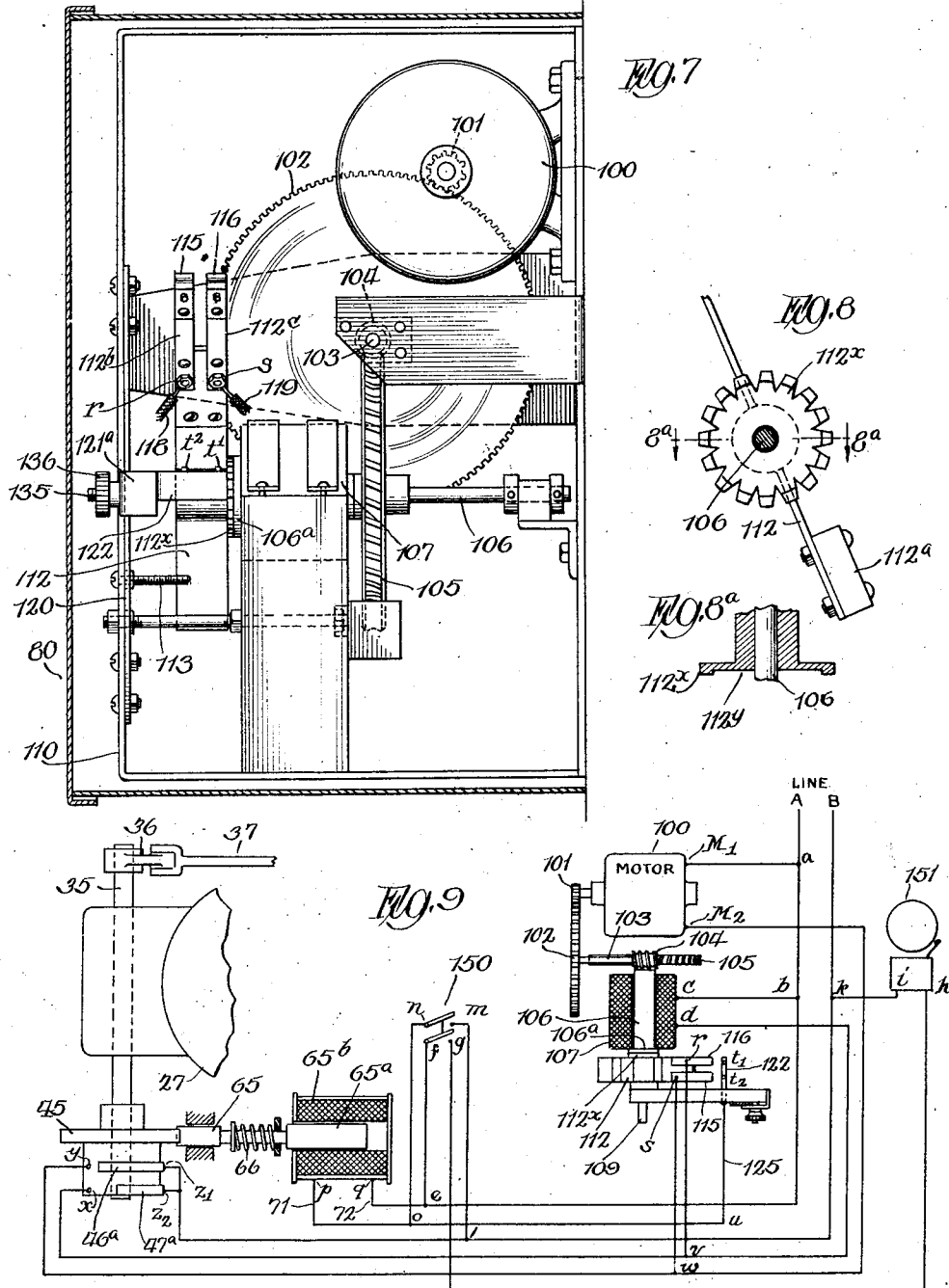
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5 Sheets-Sheet 3



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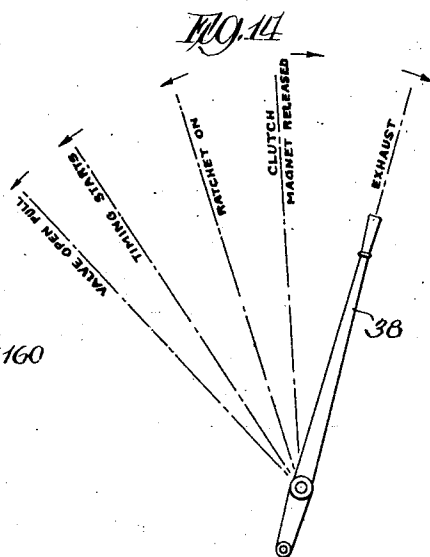
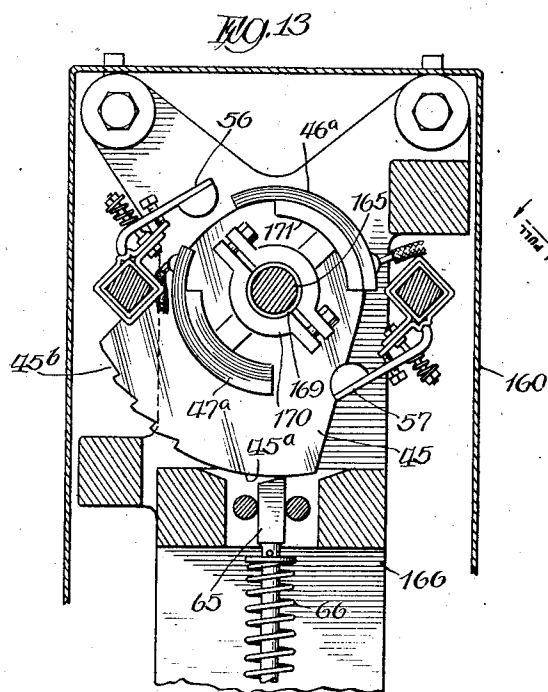
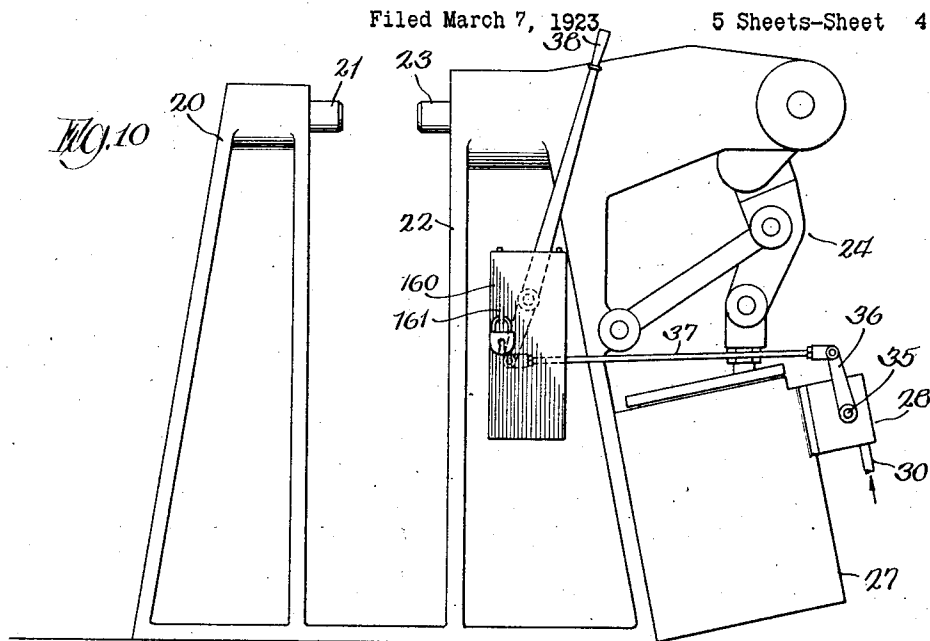
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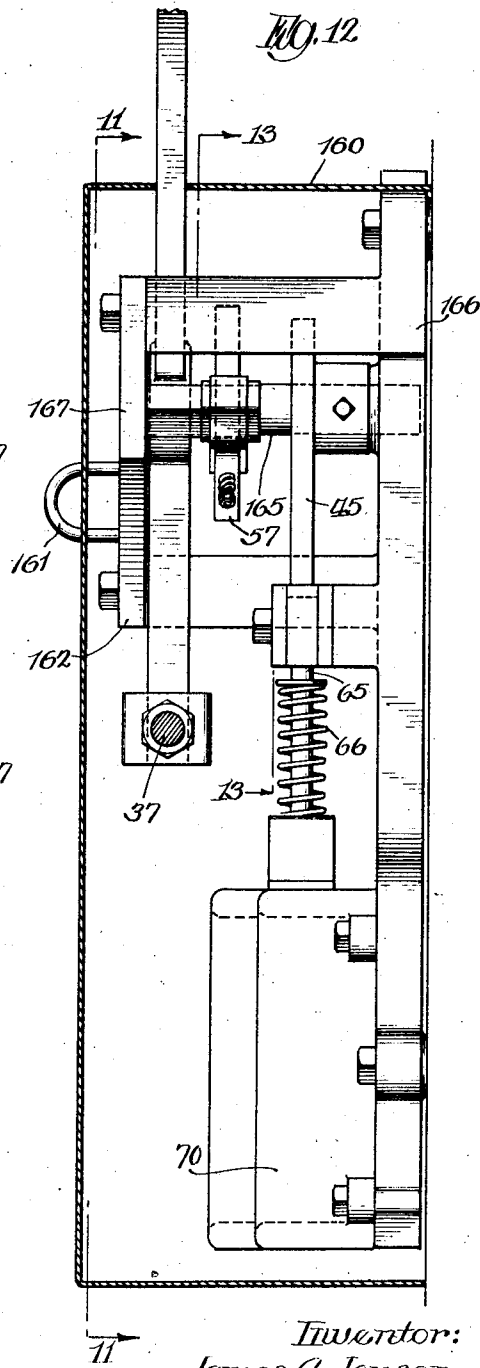
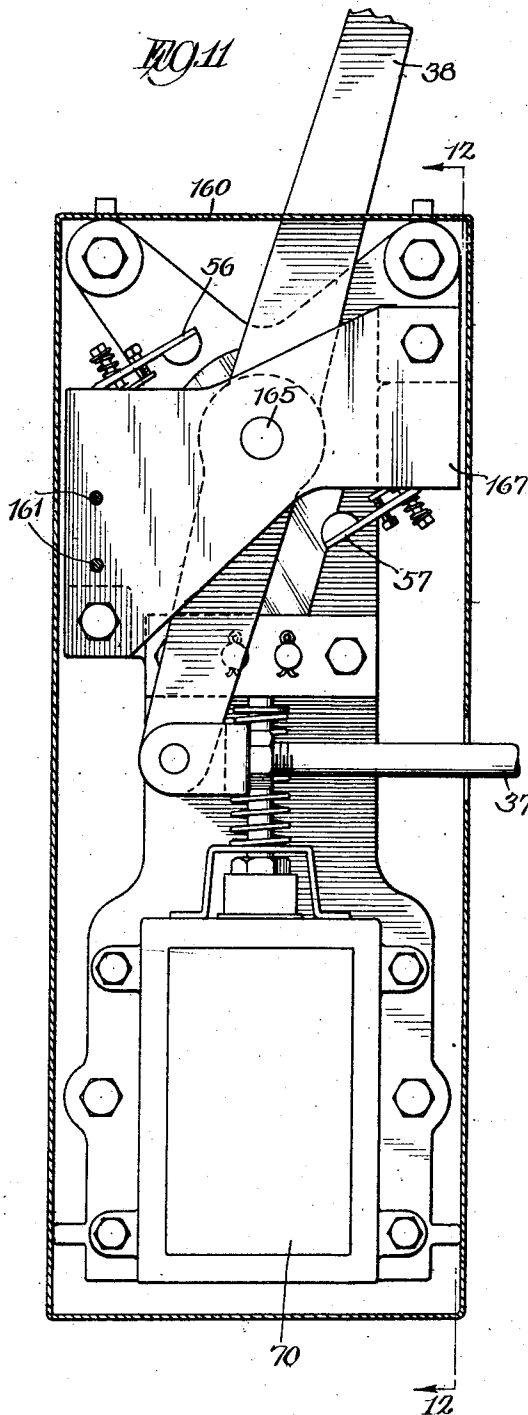
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DELAY MECHANISM

Filed March 7, 1923

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE.

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DELAY MECHANISM.

Application filed March 7, 1923. Serial No. 623,360.

This invention relates to improvements in delay mechanisms, more particularly a mechanism which is electrically actuated, and is especially adapted to use with riveting mechanism.

In present day practice the operators of riveting machines are largely paid on a piece work basis, which has a tendency to increase the output at the cost of workmanship. In the actuation of pneumatic or other fluid actuated riveting machines the riveting die may be advanced to the limit of riveting movement, but it is advisable in most operations that it be maintained at such limit for a sufficient period of time to permit the rivet to set. Operators working under the piece work system, in many instances, repeatedly retract the die from riveting position before set of the rivet in order to speed up the operations which results in improper set of the rivets, requiring calking of the riveting section. The present invention contemplates the provision of electrically actuated mechanism, which will prevent the operator from retracting the die at the completion of the riveting stroke for a period of time which may be predetermined or adjusted.

Other objects reside in the mechanism hereinafter described in the specification and shown in the accompanying drawings in which—

Figure 1 is a side elevation of a standard type of steam actuated riveter shown with its major axis vertically arranged, the cylinder and a portion of the valve chest being shown in section for convenience;

Fig. 2 is a plan view on the plane 2, 2 indicated in Fig. 1;

Fig. 3 is a section along the line 3, 3 of Fig. 2, drawn to an enlarged scale;

Fig. 4 is a vertical section along the irregular line 4, 4 of Fig. 3 with parts omitted;

Fig. 5 is a front elevation of the timing mechanism;

Fig. 6 is a horizontal section along the line 6, 6 of Fig. 5;

Fig. 7 is a section along the line 7, 7 of Fig. 5;

Fig. 8 is a section along the line 8, 8 of Fig. 6;

Fig. 8^a is a section along the line 8^a, 8^a of Fig. 8;

Fig. 9 is a diagrammatic view of the wiring connections;

Fig. 10 is a view similar to Fig. 1, showing a modification;

Fig. 11 is a vertical section of the locking mechanism shown in Fig. 10 taken along the line 11, 11 of Fig. 12, drawn to an enlarged scale;

Fig. 12 is a section along the line 12, 12 of Fig. 11;

Fig. 13 is a section along the line 13, 13 of Fig. 12;

Fig. 14 is a cycle chart showing the approximate relative time of various operations.

Like numerals refer to like elements throughout the drawings in which 20 designates one jaw of a riveter carrying the anvil die 21. Paralleling the jaw 20 is jaw 22, in which is reciprocally mounted the riveting die 23, operated through link mechanism generally indicated by numeral 24, this being a well known construction known to the art as the Hanna type of riveter, the link mechanism receiving its actuation through the piston rod 25 carried by reciprocating piston 26, mounted in the cylinder 27. Duct 27^a leads from valve chest 28 to the front end of cylinder 27 while duct 27^b leads to the rear end of the cylinder from valve chest 28. This valve chest is provided with a source of steam or other actuating fluid indicated by numeral 30 and is provided with an exhaust port 31. A slide valve 32 controls admission and exhaust to and from the ends of the cylinder, as will be obvious. This slide valve is actuated by the arm 35^a carried upon shaft 35, which is oscillated or partially rotated by lever 36, operably connected to the operating handle 38 by an intermediate connecting rod 37, pivotally connected at its ends to the lever 36 and handle 38 respectively. Operating handle 38 is pivoted at 38^a to the jaw 22 in the embodiment shown. It will be obvious that movement of the operating handle 38 to the left as viewed in Figs. 1 and 3 in the direction of the arrows, will operate to move the slide valve 32 from the position shown in Fig. 1, in which operating fluid from the valve chest 28 has been flowing through duct 27^b to drive the piston 26 to the front end of the cylinder, such motion being the retrac-

tive movement of the piston which retracts the die 23 from riveting position. Any movement of the handle to the left, as stated, will first move through a neutral position in which port 27^b is closed to further admission, while exhaust through duct 27^a and port 31 will be cut off. Further movement of the valve 32 opens duct 27^a to operating fluid, and operates to commence the riveting stroke of piston 26 and die 23.

In the embodiment shown in Figs. 2 and 4 for example, a sectional case 40 is located on the side of the valve chest 28 opposite to the lever 36, sections 40^a and 40^b of the case being normally locked in enclosing position by means of padlock 41, or the like. The shaft 35 is extended into the casing 40, as shown in Figs. 2 and 4, for example, and carries thereon a rotatable ratchet cam 45 having a smooth portion 45^a and a ratchet portion 45^b. Concentrically mounted on the shaft 35 are also the contact disks 46 and 47 carrying contact strips 46^a and 47^a mounted on a segment of the respective disks. It will be noted that strip 47^a begins some distance after the beginning of strip 46^a, for a purpose hereinafter described. Current leads 49 and 50 are attached at z^1 , z^2 to strips 46^a and 47^a respectively.

Projecting inwardly from a frame 40^a is the supporting rod 55 upon which are mounted the contacts 56 and 57 adapted to contact with the strips 46^a and 47^a respectively. Current leads 59 and 60 are attached at points y and x to the contacts 56 and 57, respectively. Located beneath cam 45 in casing 40 is the reciprocable locking pawl 65 normally contacting with the periphery of the cam 45 and yieldingly maintained in such contact by the coil spring 66. Located at the bottom of the casing 40 is solenoid casing 70, in which is mounted solenoid coil 65^b, the stem of the pawl 65 being provided with a plunger 65^a as indicated in Fig. 9 for example, functioning in a well known manner in coaction with the solenoid coil 65^b, to which current leads 71, 72 are attached at points p and q , for example, see Fig. 9.

Located preferably at a convenient point is a casing generally indicated by numeral 80, in which is mounted the timing mechanism. A convenient location for this casing is the office of the superintendent or foreman where the timing mechanism may be readily adjusted to vary the time, and where access by the operator, or tampering is inconvenient at all times. Mounted in the casing is an electric motor 100 having a pinion 101 meshing with a gear 102 on shaft 103, which in turn carries a worm 104 meshing with worm gear 105 on shaft 106, this gearing constituting a speed reduction gearing, as will be obvious. The shaft 106 is rotatable with gear 105, as stated, and extends through spaced solenoid magnet coil

107 and is provided intermediate its ends with a flattened disk portion 106^a. The shaft 106 is extended to the front of the casing and journaled in a frame 110^a projecting inwardly from the pedestal 110. Freely rotatable upon the extended portion of shaft 106 is the contact arm 112, provided with a counterweight 112^a at its lower end, which causes the arm 112 to normally rest in the position indicated in Figs. 5 and 7, for example, against the stop pin 113. At its upper end the arm 112 is provided with spaced fingers 112^b and 112^c terminating in the contacts 115 and 116. Current leads 118, 119 are attached at points r and s to the fingers 115, 116 respectively. The arm 112 is provided with the flattened disk portion 112^x at its hub portion and adjacent the disk 106^a. This disk 112^x is preferably formed with the serrated finger construction shown in Figs. 8 and 8^a, being recessed or counterbored at 112^y, the recess, extending beyond the notches thus allowing access of air to the contacting surfaces, thereby substantially eliminating the gripping of the disks 106^a and 112^x, due to the presence of oil between the surfaces when the coupling action is not desired. Concentric with the shaft 106 is the segmental dial 120, having suitable divisions indicated thereon, the segment being attached by screws or the like to the pedestal 110, see Figs. 5 and 6. Rotatable upon the rod 106 is the dial arm 121 having contact elbow 122 having contacts t^1 , t^2 thereon, adapted to be contacted by the contacts or fingers 116 and 115 respectively. A current lead 125 is attached to the elbow 122, see Fig. 6, for example. The arm 121 is provided with the angularly bent clamp 121^a overlying the face of the dial 120 and having an indicating tip 121^b. A clamping screw 135 and knurled nut 136 coact with the clamp 121^a to clamp the arm 121 in any desired position to the dial 120. When current runs through the motor 100 the same will rotate at a uniform speed, which speed will be reduced through the gearing described above and transmitted at reduced ratio to the rotatable shaft 106. Upon closing the circuit containing solenoid 107, the disk 112^x will be drawn into engagement with disk flange 106^a of shaft 106, causing it to rotate therewith, likewise rotating the arm 112. It is with the initiation of movement of the arm 112 that the timing of the mechanism begins. Movement of the arm 112 will continue until the fingers 115, 116 contact with the elbow 122 when contact is established between such fingers and the contacts t^1 , t^2 , after which the disk 106^a will slip relative to the disk 112^x without injury to the mechanism.

The current or power circuits have been diagrammatically illustrated in Fig. 9, the contact and terminal points being indicated

as shown therein, the main line wires being A and B and terminals of the motor M^1 , M^2 . For convenience I will refer to the various effective circuits by a single letter, the circuits being defined below by contact and terminal points, as follows:

O circuit is $AaM_1M_2wyz_lkB$

P circuit is $Bklz_2wvdcba$

Q circuit is Bkz_2ywst_2upqA

R circuit is $Aabcdvrt_1t_2swyz_1kB$

S circuit is $AqponmlB$

T circuit is $BklhgfeA$

In the operation of the mechanism described above, assuming the riveting mechanism to be in the position illustrated in Fig. 1, movement of the operating handle 38 to the left will operate to move slide valve 32 through neutral position described above during which movement the locking pawl 65 will ride upon the smooth portion 45^a of cam 45. This permits the lever 38 to be moved back and forth without restraint from neutral position to that shown in Fig. 1. Further movement to the left brings the locking pawl into contact with the ratchet portion 45^b of cam 45, after which return of the operating handle 38 to piston retracting position is impossible until after release of the pawl 65. The operator in moving the handle 38 to full open position causes first the contact of the contact 56 with the strip 46^a and later contact of contact 57 with strip 47^a. The first contact closes circuit O, which throws the motor 100 into circuit and operation thereof commences with consequent rotation of the shaft 106. When the second contact is established between terminal 57 and strip 47^a circuit P is closed, which initiates the timing operation by throwing solenoid 107 into circuit as previously described. The arm 112 is now traveling toward the contact elbow 122 and the riveting die 23 has either reached its ultimate riveting position or is approaching the same. When contact is established between fingers 115, 116 and the contacts t^1 , t^2 circuit Q is closed, throwing the solenoid 65^b into circuit and by well known effect plunger 65^a is retracted, moving pawl 65 out of locking engagement with the cam 45, whereupon the operating handle 38, may be removed from the position indicated in Fig. 1, retracting the die promptly to a new riveting operation. It will be obvious that in the period of time during the rotation of the arm 112 the rivet will have had time to set. Normally the return movement of the disks 46, 47 would result in contact between terminal 57 and 47^a being broken before the ratchet portion 45^b of cam 45 had passed the pawl 65 and this breaking of contact would break the current through solenoid 107, permitting the release of the arm 112, this in turn breaking the circuit of the solenoid 65^b and permitting release of the pawl 65, which

would engage the ratchet portion 45^b and prevent the return of valve 32 to neutral position. To prevent this interference, the strip 46^a has been arranged to extend beyond the strip 47^a as a result of which terminal 56 will remain in contact with strip 46^a, after breaking the contact between terminal 57 and strip 47^a. As a result of this construction and also the provision of contact between finger 116 and contact elbow 122, a new circuit is formed, this being the R circuit outlined above, which includes the solenoid 65^b, which thus functions to retain the pawl 65 out of contact with the cam until the smooth portion 45^a thereof overlies the pawl. The breaking of contact between terminal 56 and strip 46^a will then permit release of the pawl 65, which will ride upon the smooth portion of the cam 45. It will be apparent from the described mechanism that by locating the timing mechanism at a point inaccessible to the operator, or locking the same to prevent such access, tampering with the mechanism will be prevented and the operator must permit sufficient set of the rivets. To vary the amount of time for such set, the arm 121 may be adjusted relative to the dial segment 120 to increase or decrease the distance between normal position of the arm 112 and the arm 121, thereby the time required for contacts 115 and 116 to travel from rest position to contact with the elbow 122. The serration or notching of the disk 112, as shown in Fig. 8, decreases the possibility of oil between the disks 112^a and 106^a holding the same in clutched relation after the breaking of the circuit of solenoid 107.

It sometimes happens that due to breaking of the mechanism or the presence of a faulty rivet, or other cause, that the delay ordinarily acquired by functioning of the timing mechanism could be dispensed with and for that purpose I have provided the double pole switch generally indicated in Fig. 9 by numeral 150. Should it become desirable to throw off the timing mechanism and eliminate the pawl, the operator closes the switch 150 completing the circuit S, which immediately energizes solenoid 65^b and releases the locking pawl 65. To indicate to the foreman or superintendent the use of this timing destroyer a circuit is provided including a bell 151, or the like, which is included in circuit T, this circuit being closed by switch 150 at the time of closing circuit S, and the ringing of the bell will announce to the foreman or superintendent interference with the timing mechanism by the operator.

In Figs. 10 to 13 I have illustrated a modified form of mechanism in which the location of the cam contact disks etc. is different from that in the form described above, the function being otherwise identical.

cal. This modified construction of operating handle 38 is pivoted as before upon the frame of the riveter and extends through a suitable slot in the top of casing 160, which is likewise secured to the frame of the machine being lockable in position by means of a padlock or the like, inserted through bail 161, which is carried by the frame 162 extending outwardly in the casing 160 from the frame of the riveter. A rotatable shaft 165 is journaled at one extremity in the plate 166 upon which the casing is mounted and at the other end in the plate 167 carried by and forming a part of the frame 162. The operating handle 38 is secured to the shaft 165 and pivots about the axis thereof as will be obvious. Secured to the shaft 165 are the contact segments 170, 171 (see Fig. 13) the former carrying contact strip 46^a, the other carrying contact strip 47^a. An insulating bushing 169 is inserted between segments 170, 171 and shaft 165. In this construction the contacts 56 and 57 are located at opposite sides of the shaft 165, the strips and contacts being arranged in such wise that, as in the other construction, contact 56 will contact with strip 46^a before establishing contact between terminal 57 and strip 47^a, the function being identical with that of the first described form.

The cam 45 is also secured to the shaft 165 to rotate therewith, and the locking pawl 65 underlies disk 45 as in the first form, the solenoid case 70 being enclosed by casing 160, as shown in the drawings. The function of this modified form being similar to that first described, it is unnecessary to further detail the operation.

In Fig. 14 I have diagrammatically indicated the cycle of operations and their approximate relative time of occurrence.

It will be apparent that my invention is susceptible of modification and change and I do not wish to be restricted to the form shown in the drawings or described in the specification, except as defined in the appended claims.

What I claim is—

1. In combination, riveting mechanism comprising a die reciprocable to and from riveting position, a control member, a locking member coactable with said member to permit movement thereof to riveting position and to normally prevent return therefrom, means to move said locking member out of locking relation after the lapse of a predetermined period of time, said last named means being electrically actuated, emergency manually operable means to actuate said release means and an alarm associated with said manually operable means to signal the use of the same.

2. In combination, riveting mechanism, comprising a die reciprocable to and from riveting position, actuating mechanism

therefor, delay mechanism coacting therewith and comprising a rotatable member having a ratchet portion, a locking pawl coacting therewith to permit rotation in one direction of said lockable member and to normally prevent return rotation, a magnetic release means coacting with said locking pawl, a source of current, and means to throw said magnetic means into circuit therewith.

3. In combination, riveting mechanism comprising a die reciprocable to and from riveting position, actuating mechanism therefor, delay mechanism coacting therewith and comprising a rotatable member having a ratchet portion, a locking pawl coacting therewith to permit rotation in one direction of said lockable member and to normally prevent return rotation, a magnetic release means coacting with said locking pawl, timing mechanism operable to actuate said magnetic release after the lapse of a predetermined period of time.

4. In combination, a control member movable to and from operating position, a lockable member rotatable therewith and provided with a ratchet portion, a locking pawl normally contacting with said ratchet portion to permit movement of said control member to operating position and to prevent its return therefrom, a solenoid coactable with said pawl to withdraw the same from locking position, electrically actuated timing mechanism, a source of current, means actuated by said control member to throw said timing mechanism into circuit.

5. In combination, a control member movable to and from operating position, a lockable member rotatable therewith and provided with a ratchet portion, a locking pawl normally contacting with said ratchet portion to permit movement of said control member to operating position and to prevent its return therefrom, a solenoid coactable with said pawl to withdraw the same from locking position, electrically actuated timing mechanism, a source of current, means actuated by said control member to throw said timing mechanism into circuit, said timing mechanism being constructed and arranged to automatically throw said solenoid into circuit after the passage of a predetermined period of time.

6. In combination, a control member movable to and from operating position, a lockable member rotated thereby, a locking member coacting therewith to permit movement of said control member in one direction and to normally prevent its return, an electrically actuated timing mechanism, electrically actuated release means for said locking member, a source of current, means actuated by said control member to throw said timing mechanism into circuit with said current source.

7. In combination, a control member movable to and from operating position, a lockable member rotated thereby, a locking member coacting therewith to permit movement of said control member in one direction and to normally prevent its return, an electrically actuated timing mechanism, electrically actuated release means for said locking member, a source of current, means actuable by said control member to throw said timing mechanism into circuit with said current source, said timing mechanism being operable to actuate said release means after a predetermined period of time.

8. In combination, a control member movable to and from operating position, locking means associated therewith to permit movement to operating position and to normally prevent return therefrom, electrically actuated release means operable to release said locking mechanism, timing mechanism comprising a motor and a movable circuit-maker, a source of current, means actuated by said control member to throw said motor into circuit with said source, a second means also actuated by said control member to thereafter couple said circuit-maker with said motor, said circuit-maker, a predetermined period of time after said coupling action, operating to actuate said releasing means.

9. In combination, a control member movable to and from operating position, locking means associated therewith to permit movement to operating position and to normally prevent return therefrom, electrically actuated release means operable to release said locking mechanism, timing mechanism comprising a motor and a movable circuit-maker, a source of current, means actuated by said control member to throw said motor into circuit with said source, a second means also actuated by said control member to thereafter couple said circuit-maker with said motor, said means comprising a solenoid and a disk carried by said circuit-maker.

10. In mechanism of the class described comprising a power line, a motor, a shaft actuated thereby at uniform speed, a contact arm normally at rest, a contact elbow adjustable to different positions relative to said contact arm and contactable thereby, means to throw said motor into circuit with said line, means to couple said contact arm to said shaft, a circuit including said arm and elbow and being closed by the contact of the one with the other.

11. In mechanism of the class described, a dial, an arm adjustable on said dial, a contact elbow carried by said arm, a rotatable shaft, a freely rotatable contact arm concentric therewith, and means to couple said arm to said shaft, said last named means

comprising a solenoid and a magnetically susceptible disk carried by said arm.

12. In mechanism of the class described, a source of current, a manually operable control member movable to and from operating position, means comprising a locking member coacting therewith to permit movement to and normally prevent movement from operating position, a solenoid associated therewith operable to move said locking member, a rotatable shaft, a motor to rotate said shaft, a rotatable contact member, electrically actuated means to couple said contact member to said shaft, means actuated by said control member to throw said motor into circuit with said current source, means likewise actuable by said control member to subsequently actuate said coupling means, a member contactable by said contact arm after a predetermined period of time to throw said locking member release means into circuit with said source of current.

13. In mechanism of the class described, a manually operable control member, locking means coacting therewith and comprising a locking member, permitting movement to and preventing movement from operating position of said control member, electrically actuated releasing means to move said locking member out of locking position, a rotatable shaft, a contact arm electrically actuated means to couple said arm to said shaft and a member contactable by said contact arm after a predetermined amount of travel thereof, said member being in circuit with said releasing means, a source of current, means actuable by said control member in movement toward operating position to throw said coupling means into circuit with said current source.

14. In mechanism of the class described, a manually operable control member, locking means coacting therewith and comprising a locking member, permitting movement to and preventing movement from operating position of said control member, electrically actuated releasing means to move said locking member out of locking position, a rotatable shaft, a contact arm electrically actuated means to couple said arm to said shaft and a member contactable by said contact arm after a predetermined amount of travel thereof, said member being in circuit with said releasing means, a source of current, means actuable by said control member in movement toward operating position to throw said coupling means into circuit with said current source, an auxiliary circuit containing a manually operable normally open switch, said releasing means being in said last named circuit whereby operation of said switch will actuate said releasing means.

15. In mechanism of the class described, a reciprocable piston, a valve operable to con-

trol admission and exhaust to and from said cylinder, a control member, a cam operably attached to said control member and having a contactable portion, said contactable portion being partially toothed to form a ratchet 5 portion, a locking member normally contacting said cam to permit movement thereof in one direction and to coact with said ratchet portion to prevent movement in the opposite direction save prior to contact with 10 said ratchet portion, and electrically actuated means to move said locking member from contact with said cam.

In testimony whereof, I have subscribed my name.

JAMES A. JENSEN.