

Jan. 17, 1928.

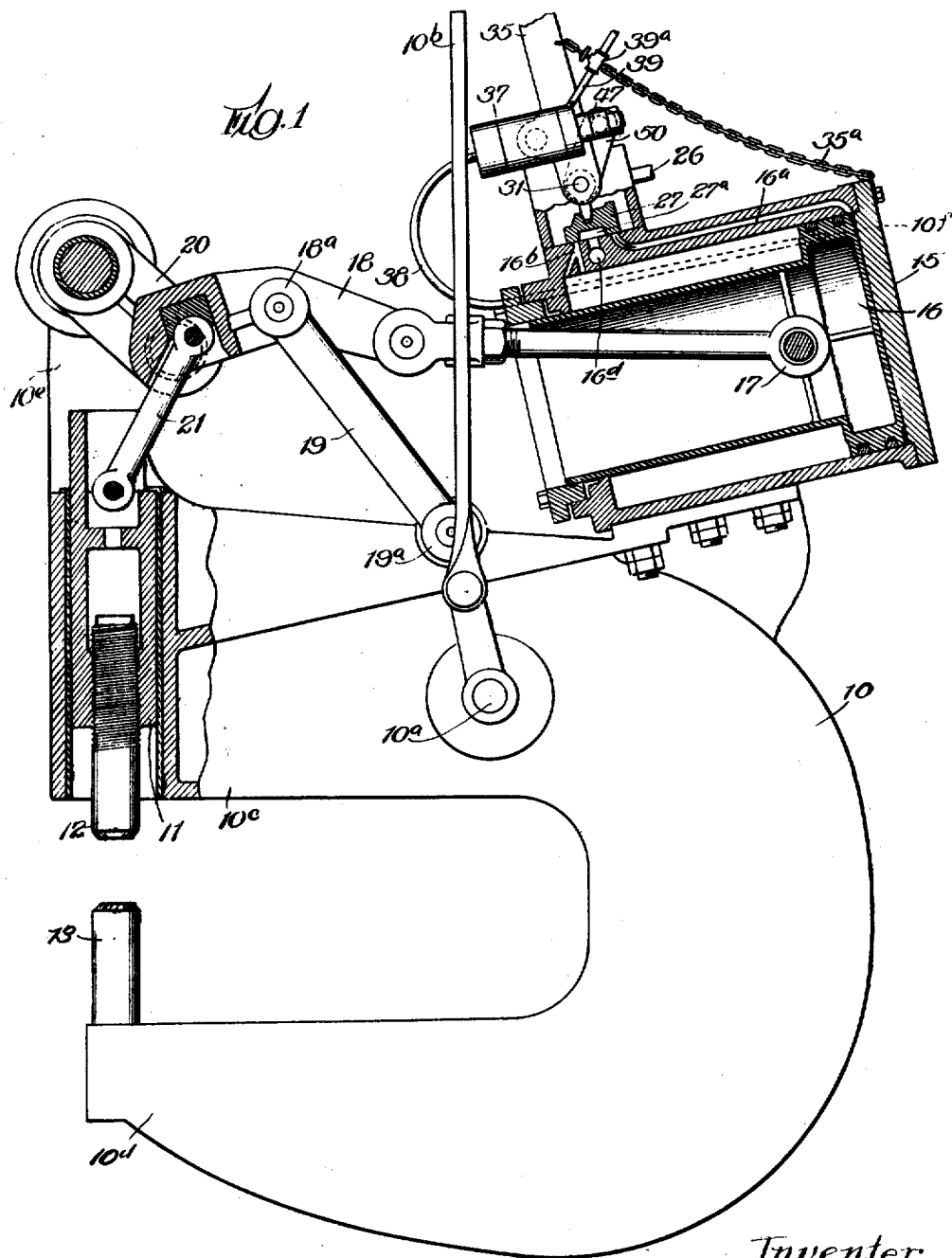
1,656,730

J. C. HANNA

DELAY VALVE

Filed Jan. 24, 1921

3 Sheets-Sheet 1



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Jan. 17, 1928.

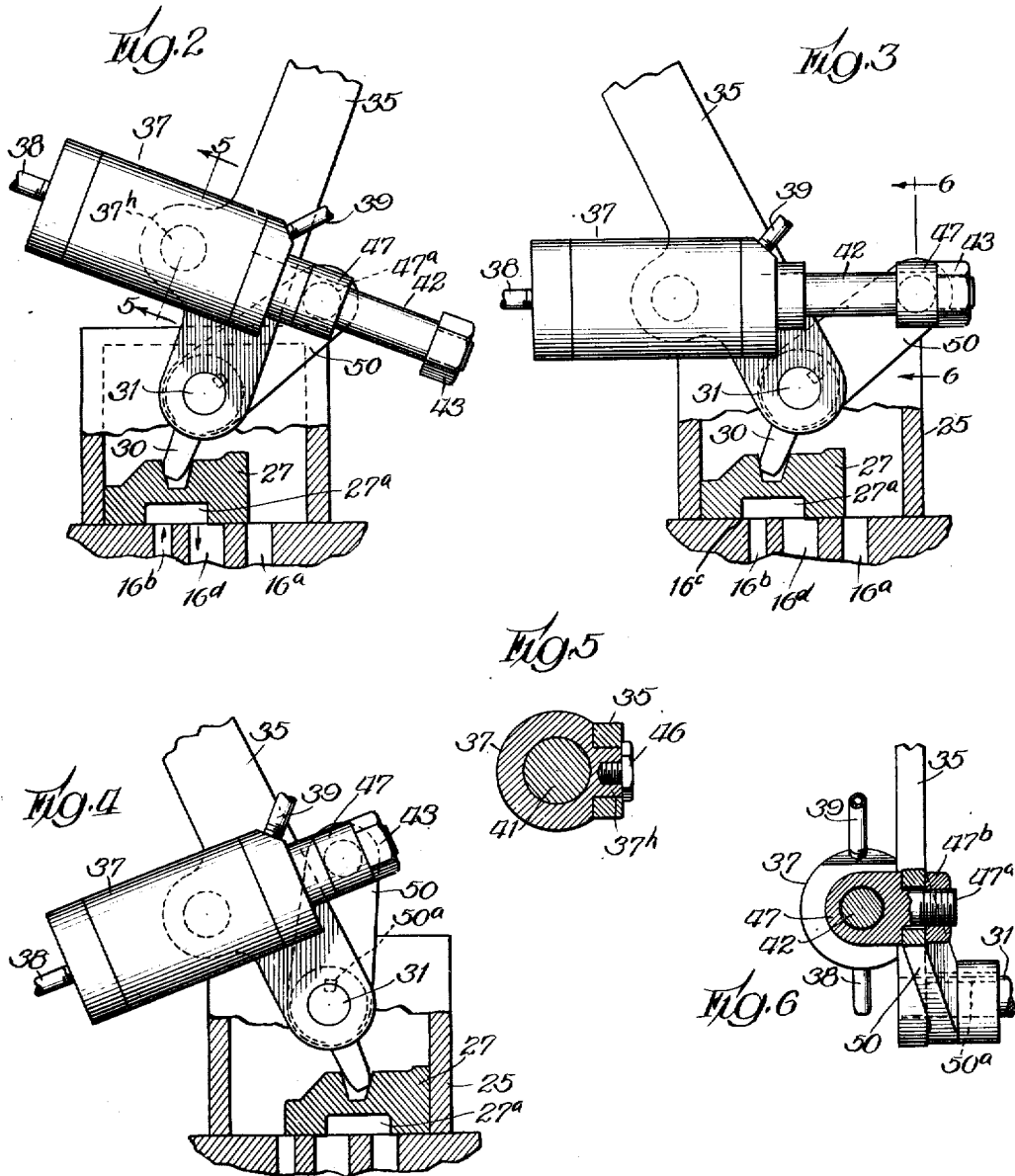
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DELAY VALVE

Filed Jan. 24, 1921

3 Sheets-Sheet 2



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Jan. 17, 1928.

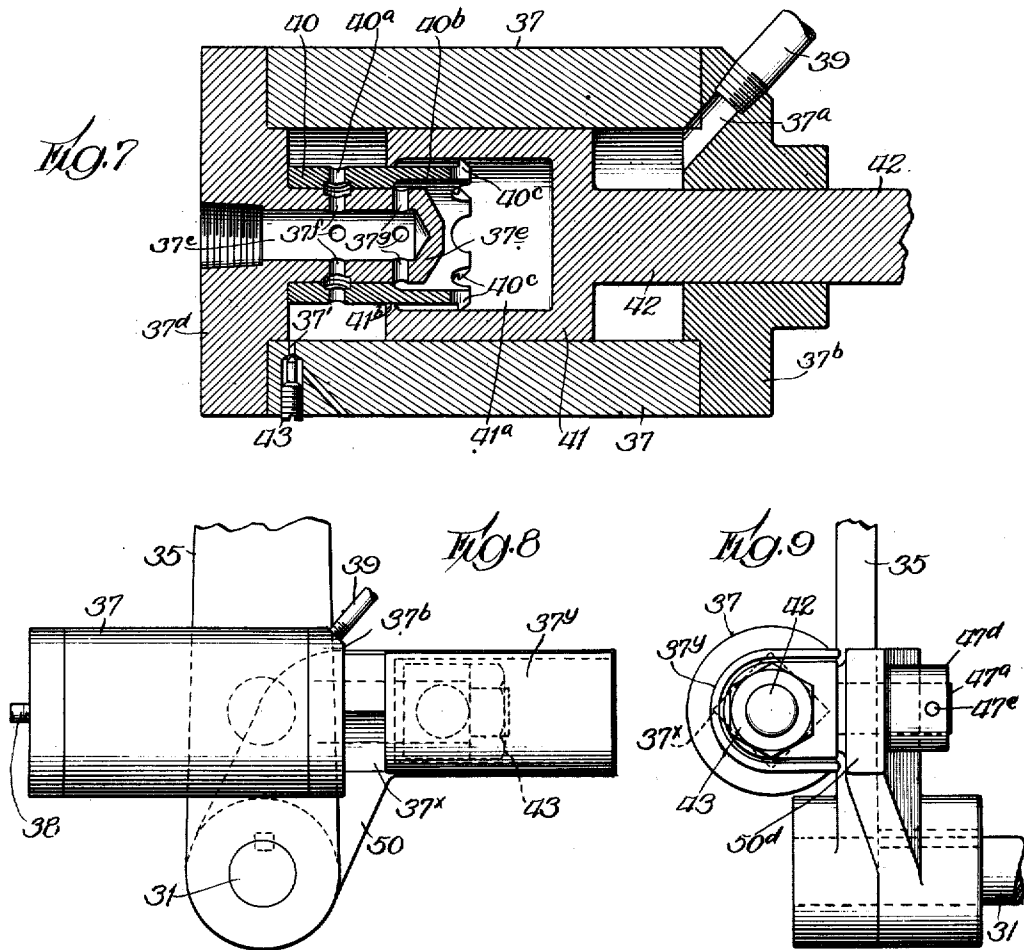
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DELAY VALVE

Filed Jan. 24, 1921

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

JOHN C. HANNA, OF CHICAGO, ILLINOIS, ASSIGNOR TO HANNA ENGINEERING WORKS,
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DELAY VALVE.

Application filed January 24, 1921. Serial No. 439,511.

This invention relates to delay valves, and has for its object to provide a delay valve which is especially adapted for use with riveting mechanism. In riveting, especially under the stimulus of production records, riveting is frequently done in a slipshod manner, so that calking of the rivet plates is frequently necessitated. By the use of my improved dwell valve the haste of the operator of the riveter will not interfere with the proper riveting, since the valve functions to maintain the riveting dies in actuation with full pressure upon the rivet for a sufficient period of time to ensure setting of the same. In a hasty operation, especially where the operators are working on a piece-work basis, they are accustomed to operate the riveting dies as rapidly as possible, without allowing sufficient time for setting of the rivets at the end of each riveting stroke, and, as stated, my delay valve ensures such action, regardless of the haste of the operator. My combination also while delaying return of the riveting dies until a desired period of time has elapsed, will permit manual reversal of the control valve and thereby of the riveting die before the pressure has built up in the delay valve, that is, before the encountering of an appreciable resistance by the riveting dies or before the traverse of the greater proportion of travel of the operating piston. This permits manual reversal of the riveting die should the work become disaligned or should any one be caught in the mechanism.

Another object consists in the construction of the associated mechanism, which is substantially such as to hinder any attempt to interfere with the functioning of the dwell valve.

These and other objects will be more fully set forth and described in the following specification and shown in the accompanying drawings, in which—

Figure 1 is a side elevation of a "Hanna" type of riveter, showing the delay valve applied thereto, a portion of the mechanism being shown in section, for clearness.

Fig. 2 is a side elevation of the valve and operating handle, a portion of the riveting cylinder valve mechanism being shown in section, and the operating handle having been moved to riveting position to admit operating fluid for the riveting stroke.

Fig. 3 is a similar view, showing the

operating handle after movement to the opposite position, the delay valve functioning to delay actuation of the riveter valve;

Fig. 4 is a view similar to Fig. 3, after the delay valve has functioned to operate the riveter valve;

Fig. 5 is a detail cross section, taken on the line 5—5 of Fig. 2;

Fig. 6 is a similar view, taken on the line 6—6 of Fig. 3;

Fig. 7 is a vertical section, taken through the dwell valve, showing the same drawn to an enlarged scale;

Fig. 8 is a side elevation of the delay valve, showing a guard applied thereto; and

Fig. 9 is an end elevation of the structure shown in Fig. 8.

Like numerals refer to like elements throughout the drawings, in which—

10 designates generally a riveter frame supported or suspended by trunnions 10^a and hangers 10^b. In the upper stake 10^c of the riveter is the reciprocating plunger 11 carrying an adjustable die 12, which coacts with the fixed die 13 carried by the stake of the riveter frame. Carried upon the riveter frame is the cylinder 15, in which is reciprocably mounted a piston 16, to which is pivotally connected the connecting rod 17, pivotally attached at its other end to rocker arms 18. A radius arm 19 is pivoted to the riveter frame at 19^a, and to the rocker arms at 18^a, the latter being eccentrically trunnioned between toggle links 20, which are, in turn, pivotally mounted between up-
standing posts 10^d of the riveter frame 10. A toggle link 21 is pivotally attached to the movable rocker arm at one end and to the plunger at the other end, all of this construction being conventional with respect to this type of riveter. It will be obvious that when the piston 16 moves to the left, as viewed in Fig. 1, or toward the front end of the cylinder 15, a riveting stroke will
ensue.

Ducts 16^a and 16^b lead from the valve chest 25 to the rear and front ends of the cylinder 15, respectively. Operating fluid, such as air or steam, is pumped under pressure from any suitable source through the pipe 26 to the interior of the valve chest. A slide valve 27 is slidably mounted therein and adjacent the cylinder surface 16^c is provided with a recess 27^a. An exhaust port 16^d leads from the interior of the valve chest

to any desired outlet point. The recess 27^a is of such dimension as to permit the throwing of either of ducts 16^a or 16^b into communication with the exhaust port 16^d. The duct 16^b is bifurcated, as shown in Fig. 1, to ensure flow of actuating fluid to the front of the cylinder when the piston is at the limit of the riveting stroke. The slide valve 27 is of such size that when at one limit of its travel—as shown in Fig. 2, for example—the duct 16^a will be uncovered to permit flow of operating fluid from the interior of the valve chest 25 to duct 16^a, while when at the other extremity of its travel, as shown in Fig. 4, for example, it will substantially uncover duct 16^b to permit flow of operating fluid from the valve chest to the front of the cylinder for the return stroke of the piston 16. It will be understood that when the slide valve 27 has been just moved to the position shown in Fig. 2, the piston is presumably in the position shown in Fig. 1, and actuating fluid will flow through duct 16^a to advance the piston to actuate the riveting mechanism, this being the riveting stroke. The exhaust port 16^d is in communication with the duct 16^b, which permits exhaust of air or operating fluid from the front of the piston.

The slide valve 27 is engaged by an oscillatable finger 30, secured to a rotatable shaft 31, to rotate therewith. A main operating handle 35 is rotatable about the axis of the shaft 31 relative to the latter.

The delay valve cylinder 37 has an inlet port 37^a through the rear cylinder head 37^b. A duct 39 leads to the port 37^a from the main source of operating fluid, a shut-off valve 39^a being provided for closure when the apparatus is not in use. At the front end of the delay valve cylinder 37 is provided an inlet port 37^c through the front cylinder head 37^d, a pipe 38 leading therefrom to the cylinder port 16^c, which is located in advance of the piston 16 when the latter is at its rearward limit of travel. Projecting into the delay valve cylinder 37 in the cylinder head 37^d is the post 37^e, having a plurality of apertures 37^f and a second set of apertures 37^g—see Fig. 7. A slidable collar 40 is reciprocally mounted upon the post 37^e and is provided with a set of apertures 40^a, which may be aligned with apertures 37^f, and an enlarged recess 40^b at its open end, which may be aligned with apertures 37^g. At its extremity the sleeve 40 is provided with a flange 40^c.

Slidably mounted in the cylinder 37 is the piston 41, having a rearwardly extending rod 42 extending through the cylinder head 37^b. This piston is chambered at 41^a to reciprocate upon the sleeve 40, and is provided with an inwardly projecting flange 41^b engageable with the flange 40^c of the collar. A bleed duct 37ⁱ leads from the interior of the

cylinder 37 at its front end, the passage of air or the like through the bleed duct being restricted by the adjustable needle valve 43.

The cylinder 37 is provided with a trunnion 37^h, upon which is pivotally mounted the operating handle 35—see Figs. 2 and 5, for example—the operating handle being maintained in position by a cap screw 46. The piston rod 42 is provided with a nut 43 at its extremity, and a collar 47 is slidably mounted on such rod exteriorly of the cylinder 37. This collar is provided with a threaded boss 47^a, which extends through an aperture at one end of the link 50, which, at its other end is keyed to the shaft 31 by a key 50^a. A nut 47^b prevents displacement of the link 50 from the boss 47^a, which is rotatable with respect to the link. The latter is offset, as shown in Fig. 6, for example.

In the actuation of the mechanism described, assuming the piston 16 to be in the position illustrated in Fig. 1 and the slide valve 27 to have been just moved to the position shown in Fig. 2, operating fluid will flow through duct 16^a to the interior of cylinder 15, and the piston 16 will be moved outwardly on its riveting stroke. The movement of the operating handle 35 to the right, to the position shown in Fig. 2, has resulted in the movement of cylinder 37 by virtue of the trunnion 37^h, the cylinder serving to move the link 50 also to the right, thereby positively moving the slide valve 27 to the left, to the position shown in Fig. 2. The operating fluid under full line pressure being constantly admitted at the rear end of piston 41, the latter will be moved to the front of cylinder 37, or to the left, as viewed in Fig. 7, this movement positively moving the sleeve 40 to the position shown in Fig. 7, thereby opening ports 37^f and 37^g. During the initial operation of the riveting stroke of the piston 16, the resistance is comparatively small after inertia has been overcome, and port 16^c is passed by the piston. Port 16^c is so located as not to be passed by piston 16 until inertia of the moving parts is overcome and the consequent initial fluid pressure peak has subsided to its minimum. As the resistance increases pressure in the riveting cylinder will build up, and this pressure will be transmitted through the duct 38 to inlet port 37^c of the delay valve cylinder 37 and through ports 40^a to the front of the cylinder 37, and then through ports 40^b to the interior of piston 41, so that such pressure will be effective upon the maximum cross sectional area of the piston. As soon as the pressure in the front of cylinder 37 builds up sufficiently to exert upon the front piston 41 a total force greater than that exerted upon the rear effective area of the piston, the latter will be moved to the right, during the last of which movement it will engage sleeve 40

and move the same into position closing ports 37' and 37^a. Assuming the riveting dies to have reached the limit of the riveting stroke, the operator will throw the operating handle to the position shown in Fig. 3, this movement being limited by a suitable stop, such as the chain 35^a, extending between and secured to the cylinder 15 and handle 35. This movement will move the cylinder 37 to the left. Owing to the extension of the rod 42, however, this motion will be relative to the link 50, which will remain stationary, as will shaft 31 and finger 30, thereby ensuring that the slide valve 27 will not move. The built-up pressure in the front of the cylinder 37 is gradually reduced, owing to the leakage of the operating fluid through the bleed duct 37', this leakage being regulable on adjustment of the leakage valve 43. As soon as this falls below a certain pressure, the line pressure acting upon the rear piston 41 will operate to move the same to the left, as shown in Figs. 4 and 7, whereby the link 50 will also be moved and the shaft 31 rotated to move the slide valve 27 to the position shown in Fig. 4.

By this mechanism, after the operator has initiated the riveting stroke to the point where the piston 41 is moved to the front of the cylinder 37, which movement occurs before the completion of the riveting stroke, he is unable to reverse the valve 27, and thereby the piston 16, until a desired interval of time has elapsed, thereby ensuring the proper setting of the rivets. This period of time, as will be obvious, can be varied according to the conditions met with by adjustment of the needle valve 43. It will also be apparent that full pressure is maintained in cylinder 15 until the delay valve functions to reverse the slide valve, thus ensuring full pressure on the rivet during the setting thereof.

While the delay valve will function to prevent too quick return of the riveting dies, it will permit manual reversal prior to the time that pressure has built up in pipe 38 due to appreciable resistance to further movement of the piston 16; in other words, while port 16' may be uncovered by the main piston 16 and the sleeve valve 40 in position to open ports 37' and 37^a, the pressure in pipe 38 will not built up sufficiently to overcome pressure on piston 41 from the main fluid pressure line until movement of the main piston 16 is halted or resisted. This feature is desirable in that it permits quick reversal of the riveting die should the work being riveted become misplaced or disaligned, or should a workman be caught by the die or other mechanism.

To prevent interference with the function of the delay valve, I have illustrated in Figs. 8 and 9 a structure wherein the cylin-

der head 37^b is provided with an integral, non-circular portion 37^x, apertured to permit extension therethrough of the piston rod 42, and from this extends the curved shield 37^y surrounding the collar 47. The arm 50 is provided with an angularly disposed portion 50^d lying adjacent the shield 37^y. In this construction I may replace the nut 47^b, shown in Fig. 6, with a collar 47^a secured to the boss 47^a by a pin 47^e, or the like. The shield and arm portion 50^d prevent jamming or other interference with the piston rod 42.

While I have shown and described one embodiment of my invention, it will be obvious that the same is susceptible of numerous modifications and improvements, and I do not wish to be restricted to the form shown, except as defined in the appended claims.

I claim:—

1. In combination, a reciprocable die member, means to reciprocate said die member, means to control the riveting and return movement of said die reciprocating means, and operating mechanism to control the actuation of said controlling means, said mechanism comprising an operating member movable from riveting position to return position and vice versa, and means co-acting with said operating member and said controlling means to maintain said die member in riveting position under pressure for a period of time after movement of said operating member to return position to insure the setting of a rivet or the like.

2. In combination, a cylinder, a piston reciprocable therein, ducts leading to said cylinder, a valve to control flow through said ducts, means to actuate said valve, an operating handle, and a delay member operatively inserted between said handle and said actuating means, said delay member being actuatable by fluid pressure to disengage temporarily said operating handle from said actuating means.

3. In combination, a cylinder, a piston reciprocable therein, ducts leading to said cylinder, a valve to control flow through said ducts, means to actuate said valve, said means comprising a rotatable shaft, an operating handle rotatably mounted on said shaft, an arm secured to said shaft, and means operatively attached to said handle and to said arm, said last-named means being actuatable by fluid pressure to disengage temporarily said operating handle from said actuating means.

4. In combination, a cylinder, a piston reciprocable therein, a controlling valve for said cylinder, an actuating fluid supply, an operating member, a delay member operatively attached to said operating member and said controlling valve, said delay member comprising a cylinder and a piston,

means to convey actuating fluid from said supply to said delay cylinder at one end thereof, and means to convey actuating fluid from said first-named cylinder to the other end of said delay cylinder.

5. In combination, a cylinder, a piston reciprocable therein, a controlling valve for said cylinder, an actuating fluid supply, an operating member, a delay member operatively attached to said operating member and said controlling valve, said delay member comprising a cylinder and a piston, means to convey actuating fluid from said supply to said delay cylinder at one end thereof, and means to convey actuating fluid from said first-named cylinder to the other end of said delay cylinder, and a valve member, said delay piston being constructed and arranged to actuate said valve member.

6. In combination, a cylinder, a piston reciprocable therein, a controlling valve for said cylinder, an actuating fluid supply, an operating member, a delay member operatively attached to said operating member and said controlling valve, said delay member comprising a cylinder and a piston, means to convey actuating fluid from said supply to said delay cylinder at one end thereof, means to convey actuating fluid from said first-named cylinder to the other end of said delay cylinder, and a valve member operable to cut off flow to said delay cylinder from said main cylinder, said valve being movable by said delay piston.

7. In combination, a cylinder, a piston reciprocable therein, a controlling valve for said cylinder, an actuating fluid supply, an operating member, a delay member operatively attached to said operating member and said controlling valve, said delay member comprising a cylinder and a piston, means to convey actuating fluid from said supply to said delay cylinder at one end thereof, means to convey actuating fluid from said first-named cylinder to the other end of said delay cylinder, a valve member operable to cut off flow to said delay cylinder from said main cylinder, said valve being movable by said delay piston, and means to permit gradual escape of actuating fluid from one end of said cylinder.

8. In combination, a cylinder, a piston reciprocable therein, a controlling valve for said cylinder, an actuating fluid supply, an operating member, a delay member operatively attached to said operating member and said controlling valve, said delay member comprising a cylinder and a piston, means to convey actuating fluid from said supply to said delay cylinder at one end thereof, means to convey actuating fluid from said first-named cylinder to the other end of said delay cylinder, a valve member operable to cut off flow to said delay cylinder from said main cylinder, said valve

being movable by said delay piston, means to permit gradual escape of actuated fluid from one end of said cylinder, and means to regulate the rate of such escape.

9. In combination, a main cylinder, a piston reciprocable therein, an actuating fluid supply, a valve to govern the flow of said fluid to said cylinder, a valve-actuating means, an operating member, a delay member operatively inserted between said actuating means and said operating member and comprising a cylinder and a piston reciprocable therein, and a rod extending outwardly of said cylinder and carried by said piston, being operatively attached to said valve-actuating means, said cylinder being operatively attached to said operating member.

10. In combination, a main cylinder, a piston reciprocable therein, an actuating fluid supply, a valve to govern the flow of said fluid to said cylinder, a valve-actuating means, an operating member, a delay member operatively inserted between said actuating means and said operating member and comprising a cylinder and a piston reciprocable therein, and a rod extending outwardly of said cylinder and carried by said piston rod, being limitedly slidable with respect to and engageable with said valve-actuating means, said cylinder being operatively attached to said operating member.

11. In combination, a main cylinder, a piston reciprocable therein, an actuating fluid supply, a valve to govern the flow of said fluid to said cylinder, a valve-actuating means, an operating member, a delay member operatively inserted between said actuating means and said operating member and comprising a cylinder and a piston reciprocable therein, and a rod extending outwardly of said cylinder and carried by said piston, being operatively attached to said valve-actuating means, said cylinder being pivotally attached to said operating member.

12. In combination, a main cylinder, a piston reciprocable therein, an actuating fluid supply, a valve to govern the flow of said fluid to said cylinder, a valve-actuating means, an operating member, a delay member operatively inserted between said actuating means and said operating member and comprising a cylinder and a piston reciprocable therein, said piston being provided with a rod extending outwardly of said cylinder, said piston rod being provided with a limiting means and being slidably attached to said valve-actuating means between said limiting means and said cylinder.

13. In combination, a main cylinder, a piston reciprocable therein, an actuating fluid supply, a valve to govern the flow of said fluid to said cylinder, a valve-actuating means, an operating member, a delay mem-

ber operatively inserted between said actuating means and said operating member and comprising a cylinder and a piston reciprocable therein, a rod extending outwardly of said cylinder, and a collar carried by said valve actuating means, said piston rod being slidable on said collar and provided with means to engage the same at one limit of its relative sliding movement.

14. In combination, a main cylinder, a piston reciprocable therein, an actuating fluid supply, a valve to govern the flow of said fluid to said cylinder, a valve-actuating means, an operating member, a delay member operatively inserted between said actuating means and said operating member and comprising a cylinder and a piston reciprocable therein, a rod extending outwardly of said cylinder, and a collar carried by said valve-actuating means, said piston rod being slidable in said collar and provided with means to engage the same at one limit of its relative sliding movement, said collar being pivoted to said valve-actuating means.

15. In combination, a main cylinder, a piston reciprocable therein, an actuating fluid supply, a valve to govern the flow of said fluid to said cylinder, a valve-actuating means, an operating member, a delay member operatively inserted between said actuating means and said operating member and comprising a cylinder and a piston reciprocable therein, a rod extending outwardly of said cylinder, a collar carried by said valve-actuating means, said piston rod being slidable in said collar and provided with means to engage the same at one limit of its relative sliding movement, and a guard surrounding said piston rod and collar.

16. In combination, a main cylinder and piston, a valve, an actuating means therefor comprising an arm and an operating member, a delay member operatively inserted between said operating member and said arm, said delay member comprising a cylinder and a piston reciprocable therein and having a piston rod extending outwardly thereof, said arm having a portion lying adjacent the path of travel of said piston rod, and a guard surrounding said piston rod.

17. In combination, a main cylinder and piston, a valve, an actuating means therefor comprising an arm and an operating member, a delay member operatively inserted between said operating member and said arm, said delay member comprising a cylinder and a piston reciprocable therein and having a piston rod extending outwardly thereof, said arm having a portion lying adjacent the path of travel of said piston rod, and a guard surrounding said piston rod, said guard having its extremities lying adjacent said portion of said arm.

18. In combination with a die, a fluid pressure actuated means to move said die into

and out of riveting position, a valve to control admission and exhaust of fluid pressure to and from said means, an operating member operable to effect movement of said valve to either riveting or return position, and means to delay the movement of said valve to return position after movement of said operating member to corresponding position to insure setting of a rivet or the like by said die.

19. In combination with a die, a fluid pressure actuated means to move said die into and out of riveting position, a valve to control admission and exhaust of fluid pressure to and from said means, an operating member operable to effect movement of said valve to riveting and return positions, and means to delay the movement of said valve to return position after movement of said operating member to return position, said delay means being actuable by fluid pressure.

22. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member transmitting the movement of said operating member directly to said valve in one direction, and comprising means to reverse the movement of said valve a desired period of time after the reversal of said member.

21. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member transmitting the movement of said operating member directly to said valve in one direction, and comprising means to reverse the movement of said valve a desired period of time after the reversal of said operating member, said delay member permitting immediate reversal of said valve upon reversal of said operating member during unresisted movement of said main piston.

22. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member

operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof, means to supply pressure fluid from said main cylinder to the other end of said delay cylinder.

23. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof, means to supply pressure fluid from said main cylinder to the other end of said delay cylinder, and a valve controlling admission of fluid pressure from said main cylinder to said delay cylinder.

24. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof; means to supply pressure fluid from said main cylinder to the other end of said delay cylinder, and a valve controlling admission of fluid pressure from said main cylinder to said delay cylinder, said last named valve being actuated by said delay piston.

25. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof, means to supply pressure fluid from said main cylinder to the other end of said delay cylinder, and a valve controlling admission of fluid pressure from said main cylinder to said delay cylinder, said piston being operatively connected to said valve to positively move the same adjacent either limit of travel of said delay piston.

26. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof, means to supply pressure fluid from said main cylinder to the other end of said delay cylinder, and a valve controlling admission of fluid pressure from said main cylinder to said delay cylinder, said delay cylinder being provided with an adjustable outlet adjacent the end to which the fluid pressure from said main cylinder is supplied.

In testimony whereof, I have subscribed my name.

JOHN C. HANNA.

operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof, means to supply pressure fluid from said main cylinder to the other end of said delay cylinder.

23. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof, means to supply pressure fluid from said main cylinder to the other end of said delay cylinder, and a valve controlling admission of fluid pressure from said main cylinder to said delay cylinder.

24. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof, means to supply pressure fluid from said main cylinder to the other end of said delay cylinder, and a valve controlling admission of fluid pressure from said main cylinder to said delay cylinder, said last named valve being actuated by said delay piston.

25. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof, means to supply pressure fluid from said main cylinder to the other end of said delay cylinder, and a valve controlling admission of fluid pressure from said main cylinder to said delay cylinder, said piston being operatively connected to said valve to positively move the same adjacent either limit of travel of said delay piston.

26. In mechanism of the class described, in combination, a main cylinder, a piston reciprocable therein, a source of pressure fluid, a valve member operable to control admission to and exhaust from said cylinder of pressure fluid, an operating member, a valve actuating member in operative engagement with said valve, and a delay member operatively interposed between said operating member and said actuating member, said delay member comprising a cylinder, a piston reciprocable therein and operably attached to said operating member, means to supply pressure fluid from said source to said cylinder at one end thereof, means to supply pressure fluid from said main cylinder to the other end of said delay cylinder, and a valve controlling admission of fluid pressure from said main cylinder to said delay cylinder, said delay cylinder being provided with an adjustable outlet adjacent the end to which the fluid pressure from said main cylinder is supplied.

In testimony whereof, I have subscribed my name.

JOHN C. HANNA.

CERTIFICATE OF CORRECTION.

Patent No. 1,656,730.

Granted January 17, 1928, to

JOHN C. HANNA.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, line 87, for claim numeral "22" read "20"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of February, A. D. 1928.

Seal.

M. J. Moore,
Acting Commissioner of Patents.

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