No. 733,998 PATENTED JULY 21, 1903.

C. W. RICHARDS.

BOLT HEADING MACHINE.

APPLICATION FILED DEC. 29, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

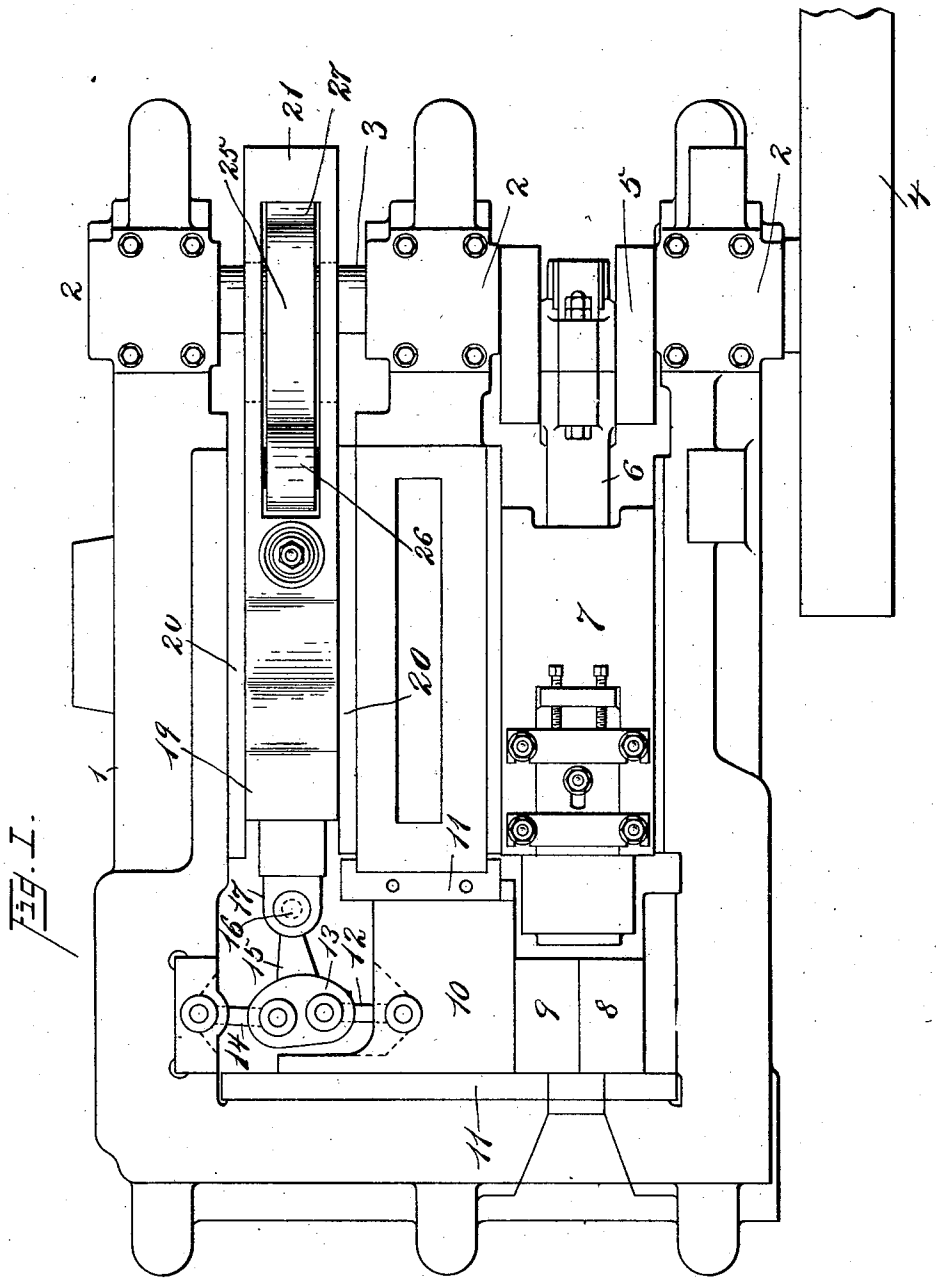


Fig. 1.

Witnesses:
A. L. Lord
Harry Lusk

Inventor,
C. W. Richards
by Glen Fisher
Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 733,998. PATENTED JULY 21, 1903.

C. W. RICHARDS.

BOLT HEADING MACHINE.

APPLICATION FILED DEC. 29, 1902.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. II

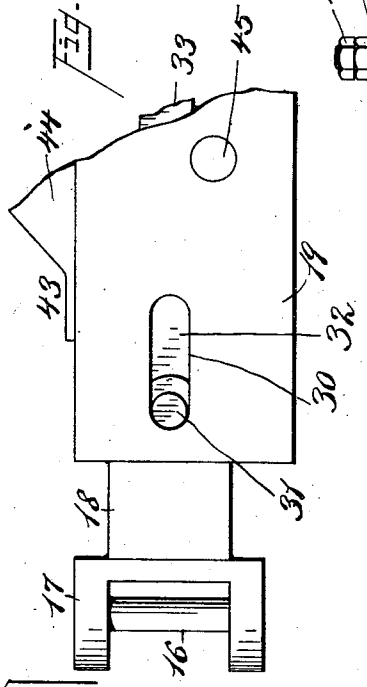
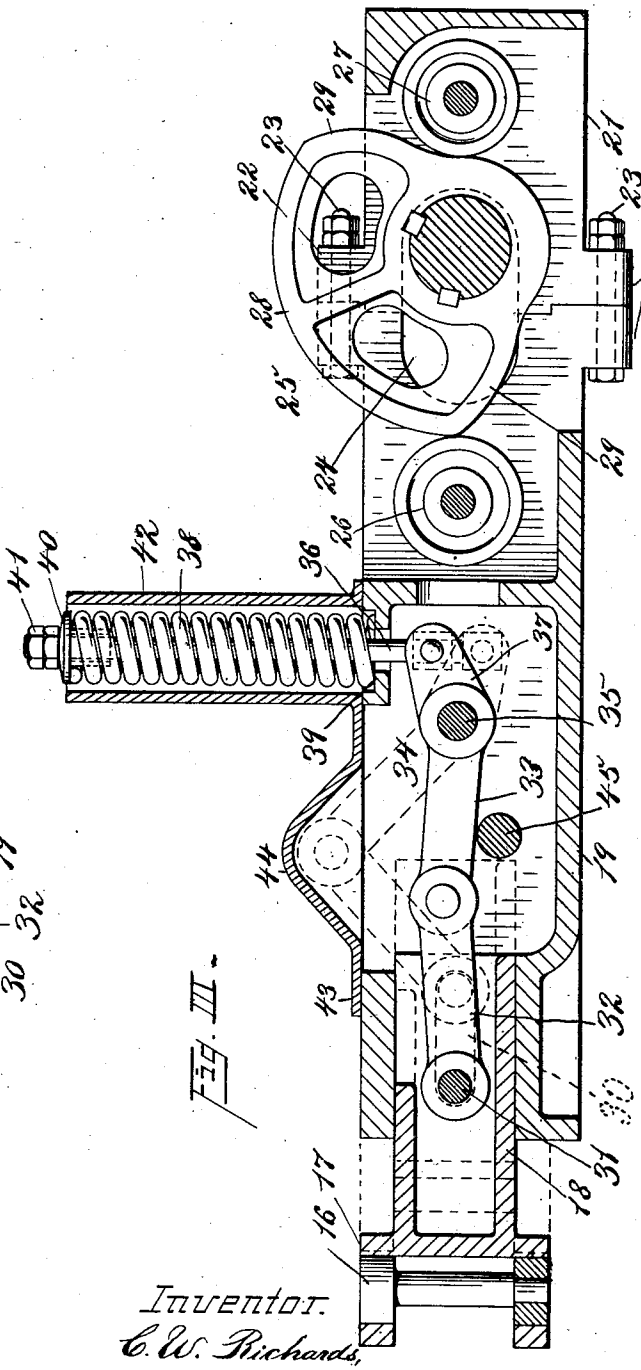


Fig. III.



Witnesses:

A. L. Lord

Harry Lueder

Inventor.

C. W. Richards,

by Wm. Fecher

Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 733,998. Patented July 21, 1903.

UNITED STATES PATENT OFFICE.

CHARLES W. RICHARDS, OF CLEVELAND, OHIO, ASSIGNOR TO THE ACME MACHINERY COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

BOLT-HEADING MACHINE.

SPECIFICATION forming part of Letters Patent No. 733,998, dated July 21, 1903.

Application filed December 29, 1902. Serial No. 136,889. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. RICHARDS, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Bolt-Heading Machines, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The annexed drawings and the following description set forth in detail one mechanical form embodying the invention, such detail construction being but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings, Figure I represents a top plan view of a bolt-heading machine provided with my improvement; Fig. II, a side view of the forward portion of the toggle-slide in the same embodying my improvement, and Fig. III a longitudinal section of the toggle-slide.

In a machine for forming heads upon bolts or rivets or for upsetting metal to form enlargements upon the same the metal blank is clamped and held by a movable die acting against a stationary die while the heading or upsetting die is brought to act upon the blank. In certain forms of work a momentary support in the dies during a momentary action of the heading or upsetting die is sufficient, while in other forms of work such support must be for a greater or less space of time. The movable die is usually operated from a crank or eccentric upon the shaft which operates the heading-die from another crank or eccentric, and the connection between said former crank or eccentric and the movable clamping-die is usually through a pitman and a slide to a toggle device connected to the die. If no means are provided to retain the movable die, the latter will be reciprocated without stop from the rotation of the crank and the clamping of the blank will be momentary; but if such clamping is desired or required to be maintained for a space of time means must be provided for retaining the movable die closed for such space of time while the crank or eccentric continues its revolution. Such retention has been attained by providing a stop for the toggle device, holding the latter in its die-closing position, and by providing an adjustable compression device for the slide by means of which the slide will actuate the toggle device to close the dies before the crank or eccentric passes around in line with the slide and beyond such line. The present improvement is directed to such time adjustment and to providing a device which will prevent injury to the machine in the case any object should drop or otherwise come between the clamping-dies, and thus prevent the same from closing, in which case, without such provision, the several parts of the machine would be subjected to such strain that breaking of parts might result.

The machine-frame 1 has bearings 2 at one end, in which bearings a crank-shaft 3 is journaled. Said shaft has a pulley 4 or similar means for communicating rotary motion to it and has a crank 5, to which a pitman 6 is pivoted. The other end of said pitman is pivoted to a heading-slide 7, which slides in longitudinal ways in the frame and carries the heading or upsetting die, which acts upon the blank clamped and held between a stationary die 8 and a movable die 9, sliding transversely to the heading-die. The movable die is secured to a die-block 10, sliding in transverse ways 11 in the frame, and said die-block has one toggle-link 12, pivoted to it, the other end of which link is pivoted to a toggle-head 13, to which another link, 14, has one end pivoted, while its other end is rigidly pivoted to the frame of the machine. The links are of such length as to bring the movable die completely up against the stationary die when the links are in line with each other. The toggle-head has an arm 15 projecting from it, which arm is pivoted upon a pin 16 in a forked toggle-slide head 17, the hollow shank 18 of which slides in the forward end of the toggle-slide 19. Said slide is guided in longitudinal ways 20 in the machine-frame. The toggle-slide is essentially in the shape of a hollow box rectangular in cross-section and has a detachable cap 21 at

its rear end, which end and the cap are open at top and bottom. The slide and cap have ears 22 at the upper and lower edges of their sides, and nutted bolts 23 are inserted through such ears and secure the cap to the slide. Longitudinal slots 24 are formed in the sides of the slide and cap to admit the drive-shaft and to permit of the slide reciprocating on the shaft. A cam 25 is keyed upon the shaft within the longitudinally-slotted or open rear portion of the slide, and said cam bears against two rollers 26 and 27, journaled upon bolts passed through the sides of the slide and cap, one roller forward of and one to the rear of the cam, so that the slide will be reciprocated as the cam revolves with the shaft. The bulge of the cam has a long portion 28 concentric with the shaft, so as to hold the toggle-head in its forward position for a portion of the revolution of the shaft, and abrupt shoulders 29 at the ends of such bulge to cause quick forward and back movement of the toggle-slide. The sides of the closed forward end of the toggle-slide have longitudinal slots 30, in which the ends of a bolt 31, passing through the hollow shank of the forked head 17, may slide. The bolt is confined from endwise play by the ways in which the slide reciprocates, and the longitudinal play of the toggle-slide head in the slide is limited by the ends of the slots. A toggle device is provided within the slide and consists of a toggle-link 32, pivoted upon said bolt and pivoted at its rear end to the long arm 33 of a toggle-lever 34, fulcrumed upon a bolt 35. A rod 36 is pivoted to the short arm 37 of the toggle-lever and passes through a coiled spring 38, the lower end of which rests in a seat 39 in the top of the toggle-slide. A cap 40 and nuts 41 are adjustable on the upper end of the rod and bear against the upper end of the spring. A tubular housing 42 surrounds the spring and projects from a top plate 43, having a bulge 44 to admit of the toggle-link and lever-arm buckling upward. A pin 45 is secured across the interior of the toggle-slide in the sides of the same and is so situated that it will be out of the way of the shank of the toggle-slide head when the latter is forced to the extreme of its inward position and will also have the long arm 33 of the toggle-lever rest against it when said arm and the other toggle-link are nearly straight, so as to prevent said toggle members from buckling downward under inward pressure. The slots in the sides of the toggle-slide and the bolt 31 in said slots also serve to limit the inward movement of the slide-head shank to prevent such shank from drawing the toggle members out to straight alinement, being of such length that the outward movement of the slide-head is limited to a point just before such members are straightened; but under the severe strains to which this kind of machine is subjected and from the possibility of the ends of the bolt or of the slots being worn or otherwise reduced the additional safeguard of the pin against the complete straightening and possible downward buckling of the toggle members becomes advantageous. The slots in the sides of the toggle-slide will also serve to limit the inward movement of the slide-head and the consequent overstraining of the spring by excessive compression of the same. The slots and the pin thus each form a stop for preventing undue buckling of the toggle members within the slide.

In practice the bulge of the cam will take care of the "timing" of the forward stroke of the toggle-slide and the consequent closure of the dies, as the slide will be held forward as long as the concentric bulge of the cam bears against the forward roller. If by accident a piece of metal or other object should get in between the dies to prevent their closing, the forked head will be forced inward into the slide and the toggle link and lever will buckle upward, drawing the rod downward against the spring, which will thus be compressed. As soon as the slide moves backward or the pressure is otherwise released the spring will again straighten the toggle link and lever and force the head outward into its normal position. The tension of the spring may be adjusted by the nuts upon the rod, so as to cause the head to yield at greater or less pressure, according to the character of the metal blanks held between the dies for heading. Injury to the dies and strain on the machine are avoided by this device, as the toggle-slide will yield whenever the slide cannot make its complete forward stroke. Heretofore this yield for the head of the slide has usually been accomplished by placing a heavy coiled spring within the slide to bear against the inner end of the shank of the head; but such spring has necessarily been of such size that both its limits of compression and expansion and its capacity for adjustment as to tension have been very slight. The extent of compression and expansion of the spring in the present device is slight in proportion to the play of the head, and slight adjustment of the nuts upon the spring-rod will change the tension of the spring. If a crank is used for reciprocating the toggle-slide instead of the cam, a stop may be provided to engage the toggle-head or the yielding slide-head, such as now used with toggle-slides having a coiled spring within them, and the link, lever, and spring will admit of the head sliding inward while the crank passes over the axial line of the slide on its forward throw in the same manner as in the heading-machines now in use, and the adjustment of the tension of the vertical spring will adjust the timing of this inward yield of the slide-head, and consequently of the closure of the clamping-dies. This feature needs no illustration or further description here, as the stop and coiled spring within the toggle-slide are described and illustrated in Patent No. 547,773, granted to Charles W. Durchschlag on the 15th day of

October, 1895, for heading-machine, and the present yielding support for the slide-head simply takes the place of the coiled spring in said patent. By employing the toggle device in the slide acting against a spring drawing upon the short arm of the toggle-lever a comparatively weak spring may be employed, and the extent of compression of such spring is comparatively small. The force of the spring, even though reduced by being applied to the short arm of the lever, will offer a greatly-increased resistance to the flexion of the toggle members at the joint between the same, so that the toggle device will offer comparatively great resistance to the first buckling of the members by resistance against the toggle-slide head. The grip of the clamping-dies is therefore firm and hard when no undue resistance is offered to their being closed. When the clamping-dies meet with resistance to their closing from some extraneous object obstructing the movement of the moving die, the toggle members will be flexed from their normal straight position and may then readily yield to the obstructing object. As it is not desirable to grip or hold this object in the dies, no clamping force is necessary or desirable and the toggle device in the slide may and does yield with increasing ease as the toggle members are flexed. The rear ends of the slots in the sides of the toggle-slide here serve as stops to prevent the links from being unduly flexed, and thus break the top of the slide, whether the yielding head is constructed to abut against the end of the slide or not when pushed fully inward.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore be made as regards the mechanism thus disclosed, provided the principles of construction set forth, respectively, in the following claims are employed.

I therefore particularly point out and distinctly claim as my invention—

1. In a bolt-heading machine, the combination with a toggle-slide and a toggle-slide head having longitudinally-sliding movement at the end of the slide, of a toggle-link pivoted to said head, a toggle-lever having one arm pivoted to said link, and a spring connected to the other arm of said lever to straighten the latter and the link and force the head outward.

2. In a bolt-heading machine, the combination with a toggle-slide and a toggle-slide head having longitudinally-sliding movement at the end of the slide, of a toggle-link pivoted to said head, a toggle-lever having one arm pivoted to said link, a rod pivoted to the other arm of said lever, and a coiled spring around said rod and having one end rigidly supported and the other end bearing against a nut upon the end of the rod.

3. In a bolt-heading machine, the combination of a toggle-slide, means for reciprocating the same, a toggle-slide head having longitudinal play in the end of said slide, a toggle-link pivoted to the shank of said head, a toggle-lever fulcrumed in the slide and having its long arm pivoted to said link, a rod pivoted to the short arm of said lever, a coiled spring supported against the upper side of the slide and surrounding said rod, and a cap and adjusting-nuts upon the rod and bearing against the upper end of the spring.

4. In a bolt-heading machine, the combination of a toggle-slide having rollers in its rear portion, a cam upon the drive-shaft and bearing against said rollers, a toggle-slide head having its shank sliding in the forward end of the slide, a toggle-link having one end pivoted in the shank of said head, a toggle-lever fulcrumed in the slide and having the end of its long arm pivoted to the link, an upright housing upon the top of the slide and having a spring-seat at its lower end, a rod passing up through said housing and pivoted to the short arm of the lever, a coiled spring in the housing and surrounding the rod resting against the seat, and a cap and adjusting-nuts upon the rod and bearing against the upper end of the spring.

5. In a bolt-heading machine, the combination with a toggle-slide and a toggle-slide head having longitudinally-sliding movement at the end of the slide, of a toggle device pivoted to the slide and head, a spring connected to the toggle device and tending to straighten the same and move the head outward, and a stop arranged in the slide to limit the inward movement of the slide-head and to prevent buckling of the toggle device in an improper direction.

6. In a bolt-heading machine, the combination of a toggle-slide, a toggle-slide head having longitudinally-sliding movement at the end of the slide, a stop limiting the inward movement of such head, two toggle members pivoted to each other and respectively to the slide and head, and a spring connected to straighten said toggle members and move the head outward.

7. In a bolt-heading machine, the combination of a toggle-slide, a toggle-slide head having longitudinally-sliding movement at the end of the slide, stops limiting the inward and outward movements of such head, two toggle members pivoted to each other and respectively to the slide and head, and a spring connected to straighten said toggle members and move the head outward.

8. In a bolt-heading machine, the combination of a toggle-slide having longitudinal slots in the outer portions of its sides, a toggle-slide head having longitudinally-sliding movement in the outer end of the slide and having a transverse bolt through its shank and with its ends sliding in the slots to limit the play of the head, two toggle members pivoted to each other and respectively to the slide and head, and a spring connected to straighten said toggle members and move the head outward.

9. In a bolt-heading machine, the combination with a toggle-slide and a toggle-slide head having longitudinally-sliding movement at the end of the slide, of a toggle-link pivoted to said head, a toggle-lever having one arm pivoted to said link, a spring connected to the other arm of said lever to straighten the latter and the link and force the head outward, and a pin transversely secured in the slide against which the toggle-lever may bear when in its straightened position.

10. In a bolt-heading machine, the combination with a toggle-slide and a toggle-slide head having longitudinally-sliding movement at the end of the slide, of a toggle-link pivoted to said head, a toggle-lever having its long arm pivoted to said link, a spring attached to the short lever-arm to draw upon the same, and a stop against which the lever-arm may rest when in its straightened position.

In testimony that I claim the foregoing to be my invention I have hereunto set my hand this 31st day of May, 1902.

CHARLES W. RICHARDS.

Witnesses:
WM. SECHER,
HARRY SUSSER.