

Jan. 16, 1945.

C. R. MOON

2,367,515

AUTOMATIC WORK EJECTOR

Filed July 23, 1943

2 Sheets-Sheet 1

FIG. 1

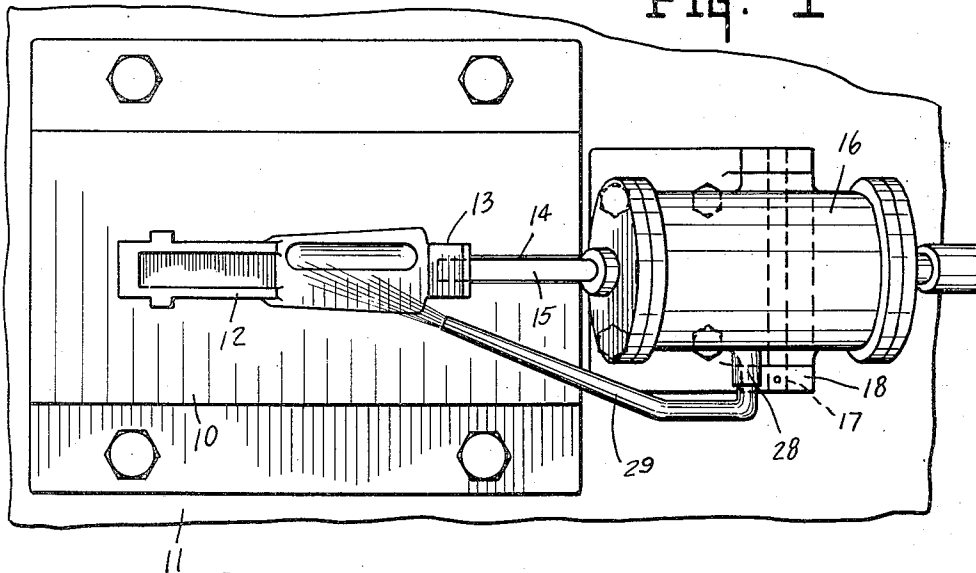


FIG. 2

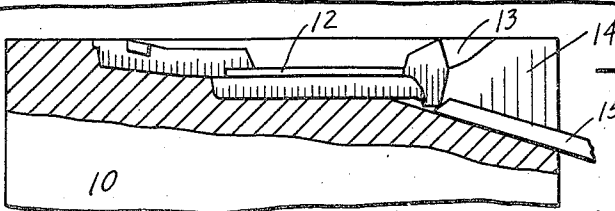
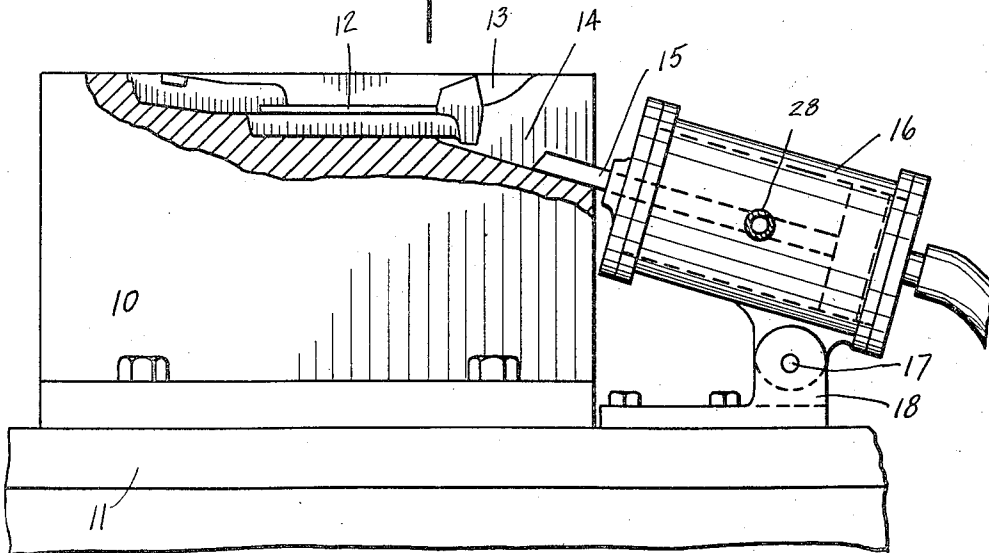


FIG. 3

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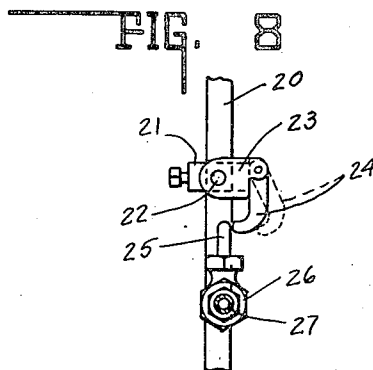
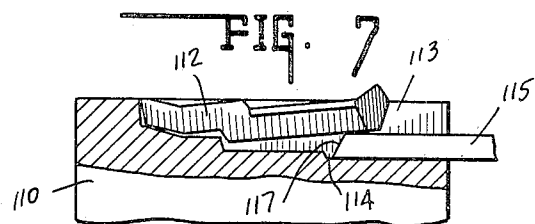
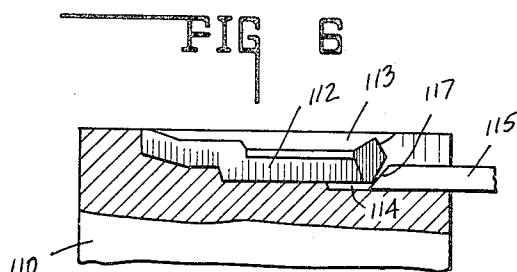
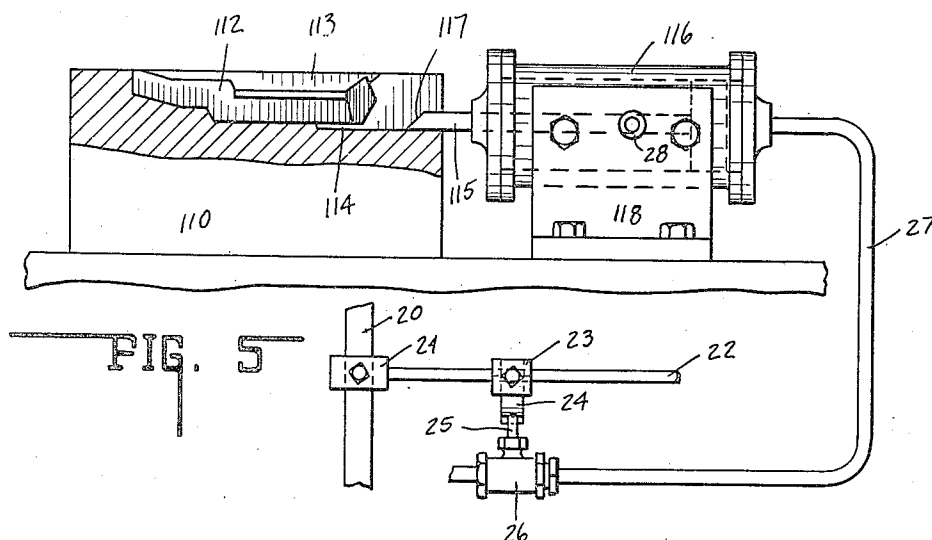
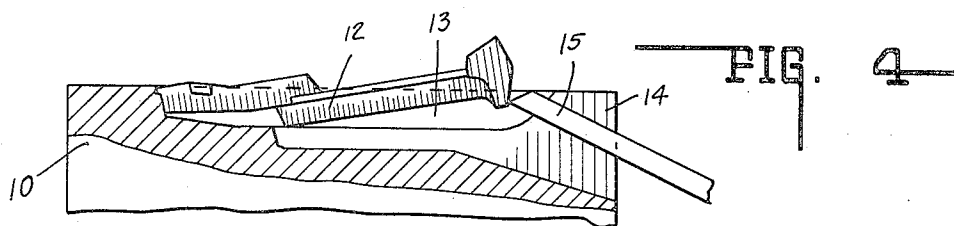
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2 Sheets-Sheet 2



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2,367,515

AUTOMATIC WORK EJECTOR

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Application July 23, 1943, Serial No. 495,841

7 Claims. (Cl. 113—50)

This invention relates to a mechanism for association with forging, forming or stamping dies operable to automatically eject the work from the die member following each operation and thereby eliminate manual removal of the work intermediate each blow of the hammer.

In forming forgings from hot billets of steel or like material, as well as stamping and forming rigid metal pieces of work, there are some designs and types of work which are difficult of removal between hammer blows and which in some instances are required to be chiseled out of the die following each operation. It is, therefore, the purpose of this invention to provide an automatic ejector for such work which will positively eject each piece as it is formed, discharging it into a suitable container or conveyor for the purpose, and thereby greatly facilitate the forging or stamping operations.

This is accomplished by providing the fixed die member with a longitudinal groove in one end thereof communicating with the die through which an ejecting plunger is reciprocated to strike and eject the work. The plunger may be actuated by air pressure controlled by an automatically-actuated valve. Thus, as the hammer is raised from the work, the valve is actuated to permit a charge of air to enter an air cylinder and actuate the plunger which is arranged to strike the end or edge of the work. Depending upon the shape of the work, the end of the plunger may be beveled to slide thereunder for throwing it out of the die, or where this is not practical, the plunger and cylinder may be pivoted and mounted at an angle to strike under the end of the work to raise the end by reason of the angular relation, following it upwardly until the work is thrown from the die.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

Fig. 1 is a plan view of a die block showing the work formed therein and the relation of the ejector thereto. Fig. 2 is a section through the upper portion of the die block showing the ejector in inactive position mounted at an angle to the work. Fig. 3 is illustrative of the work showing a side elevation thereof with an ejector initially striking one end. Fig. 4 is illustrative of the work in the process of being thrown from the die with the ejector following its movement. Fig. 5 is the same as Fig. 2, showing a modified form and the automatic air control valve. Fig. 6 is the same as Fig. 3 showing the modified form of Fig. 5. Fig. 7 is the same as Fig. 4 in respect to said modified form. Fig. 8 is a side elevation of the automatic valve control of Fig. 5.

In the drawings there is shown a stationary die member 10, in this instance being the female die, which is mounted upon a bed 11 for receiving

work 12 to be formed by an overhead moving die member or hammer, such as a male die, not herein shown. The work may be formed in the die member 10, either hot or cold, such as the forging of a hot billet or the stamping of a cold piece, as the character of the work may warrant.

As shown in Figs. 1 and 2, the forming recess 13 of the die member 10 is provided with an end groove 14 communicating with the forming recess 13, in which the ejector plunger 15 extends. Wherein the end of the work is such that it is best removed from the die member by an upward end thrust, the recess 14 extends at an angle as does also the ejector plunger and the air cylinder 16 in which the plunger operates. The ejection of the work from the die member may be further facilitated by pivotally mounting the cylinder 16 as at 17 upon a hinged support 18 mounted on the bed 11 so that as the plunger strikes the end of the work it will follow it upwardly to throw it from the die as illustrated in Fig. 4. This angular relation of the plunger relative to the die block and work, and its upward swinging action in ejecting the work is particularly effective in ejecting hot forgings which are apt to stick in the die. This arrangement is further most effective wherein the end of the work is other than undercut so that there may be no normal wedging action as in the character of work to be hereafter referred to in the modified form.

This action of the ejector is shown in Figs. 1 to 4, inclusive. In Figs. 1 and 2 the relation of the ejector to the work is shown just after the forming operation and with the ejector in inactive position. Fig. 3 illustrates the relation of the ejector to the work as the former moves to its engaging and striking position. Fig. 4 illustrates their relation as the ejecting operation continues, wherein the ejector swings upwardly in order to throw the work clear of the die.

In the modified form of Fig. 5, the die member 10 is provided with a horizontal slot 114 communicating with the end of the forming recess 113. With this arrangement the air cylinder 116 is rigidly mounted on the bracket 118 and carries a horizontally extending ejector plunger 115 operating in the recess 114. This horizontally arranged ejector is effective when the end of the work 112 which is struck thereby is undercut or beveled or is sufficiently light and free of the die as in a cold stamping, to be readily ejected therefrom. With this arrangement the recess 114 is preferably dropped down to permit the plunger 115 to strike slightly below the work, the beveled end 117 giving the work an upward thrust as it slides under, such as to throw it upwardly and outwardly clear of the die.

This action is illustrated in Fig. 6 showing the plunger as it strikes the end of the work, and in Fig. 7 wherein it passes under the work, throwing

it upwardly with sufficient force of impact to toss it into a suitable conveyor or container.

In either form or arrangement of the ejector, the ejector plunger may be controlled so as to strike a hammer blow and discharge the work immediately following the forging or stamping operation. This automatic arrangement, while applicable to either form, is illustrated in Figs. 5 and 8. As shown therein, the hammer control rod 20 has pinned thereto a collar 21 carrying a handle 22. As the operator turns the rod 20 by the handle 22 in one air direction, the work is struck by the hammer. As he returns it in the opposite direction, it operates the ejector. For this purpose the handle 22 carries a collar 23 having pivoted therein a curved finger 24.

Extending upwardly in the path of movement of the finger 24 as the handle is swung to an operating position, there is a valve actuating pin 25 mounted upon an air control valve 26 in the air line 27 leading to the air cylinder 16 or 116. Thus, as the control handle 22 is swung to operative position as shown in Fig. 8, finger 24 strikes the side of the pin 25 and swings about its pivotal mounting to clear over the upper end of the valve pin. But as the operating handle is returned following the forging or stamping operation, the finger is restricted against pivotal movement whereby its curved portion engages the end of the valve pin and forces it downwardly to open the air valve and thereby actuate the ejector plunger.

The length of stroke of the plunger is controlled by the location of an exhaust port 28 in the cylinder 16 or 116, and in the case of a hot forging, said exhaust port may be connected to an exhaust pipe 29 directed on the die for giving it a periodic cooling air blast. The valve 26 automatically closes upon the finger 24 passing over the pin 25 and, therefore, the duration of the air pressure may be controlled by the length of the curved portion of the finger.

The invention claimed is:

1. The combination with a die member having a walled recess in which work is formed, of an ejector plunger having a beveled striking end formed thereon, said die member having a groove communicating with a side wall of said recess and extending outwardly therefrom and in a plane substantially below that of the bottom of said recess through which said plunger may operate, and a driving mechanism with which said plunger is connected for causing the beveled end thereof to strike said work under impact of a hammer blow to thereby dislodge it and force it upwardly over the wall of said forming recess.

2. The combination with a die member having a recess in which the work is formed, of an ejector plunger, said die member having a horizontally extending groove communicating with the side wall of said recess through which said plunger may operate to strike one edge of the work to force it against the opposite wall of the recess, and a pivotally mounted driving mechanism with which said plunger is connected for causing said plunger to strike one edge of the work in a direction to wedge it upwardly from its forming recess and move upwardly therewith about the pivotal mounting of said mechanism for discharging it therefrom.

3. The combination with a die member having a recess in which work is formed, of an ejector

plunger, said die member having a groove communicating with one side wall of said recess and extending downwardly and outwardly at an angle thereto through which said plunger may operate to strike the edge of the work at said angular relation for prying it loose from its forming recess to discharge it therefrom, and a driving mechanism with which said plunger is connected for imparting said action thereto.

4. The combination with a die member having a recess in which work is formed, of an ejector plunger, said die member having a groove communicating with one side wall of said recess and extending downwardly and outwardly at an angle thereto through which said plunger may operate to strike the edge of the work at said angular relation for prying it loose from its forming recess to discharge it therefrom, and a driving mechanism pivotally mounted adjacent said die member with which said plunger is connected for imparting said action thereto while permitting said plunger to move upwardly with the released work about said pivotal mounting.

5. The combination with a die member having a recess in which the work is formed, of an ejector plunger having a beveled striking end, said die member having a groove communicating with a side wall of said recess and extending downwardly and outwardly therefrom through which said plunger may operate and strike the work in an upwardly and forwardly direction, and a driving mechanism pivotally mounted, adjacent said die member with which said plunger is connected for causing the beveled end thereof to strike the edge of said work to wedge thereunder and cam said work upwardly from the die member and follow the upward movement of said work about the pivotal connection of its driving mechanism.

6. The combination with a die member having a recess in which work is formed, of an ejector plunger, said die member having a groove communicating with said recess through which said plunger may operate to strike the work, a compressed air piston and cylinder mechanism with which said plunger is connected for causing it to impart a hammer blow upon said work under air pressure exerted in said mechanism, a normally closed valve for controlling compressed air to said cylinder mechanism, a die operating control member, and a camming finger on said control pivotally mounted to pass over said valve when said control is moved in one direction and be locked in camming engagement therewith for opening the same when moved in the opposite direction for actuating said plunger to dislodge the work following each forming operation thereof.

7. The combination with a die member having a walled recess in which the work is formed, of an ejector plunger, said die member having a groove communicating with a side wall of said recess below the bottom thereof and extending outwardly therefrom through which said plunger may operate to strike an edge of the work formed in said recess, a beveled striking end formed on said plunger, and a driving mechanism operatively connected to said plunger for actuating it to impart a hammer blow against the work in an upward direction to force it upwardly and over the wall of the recess to dislodge it therefrom.

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