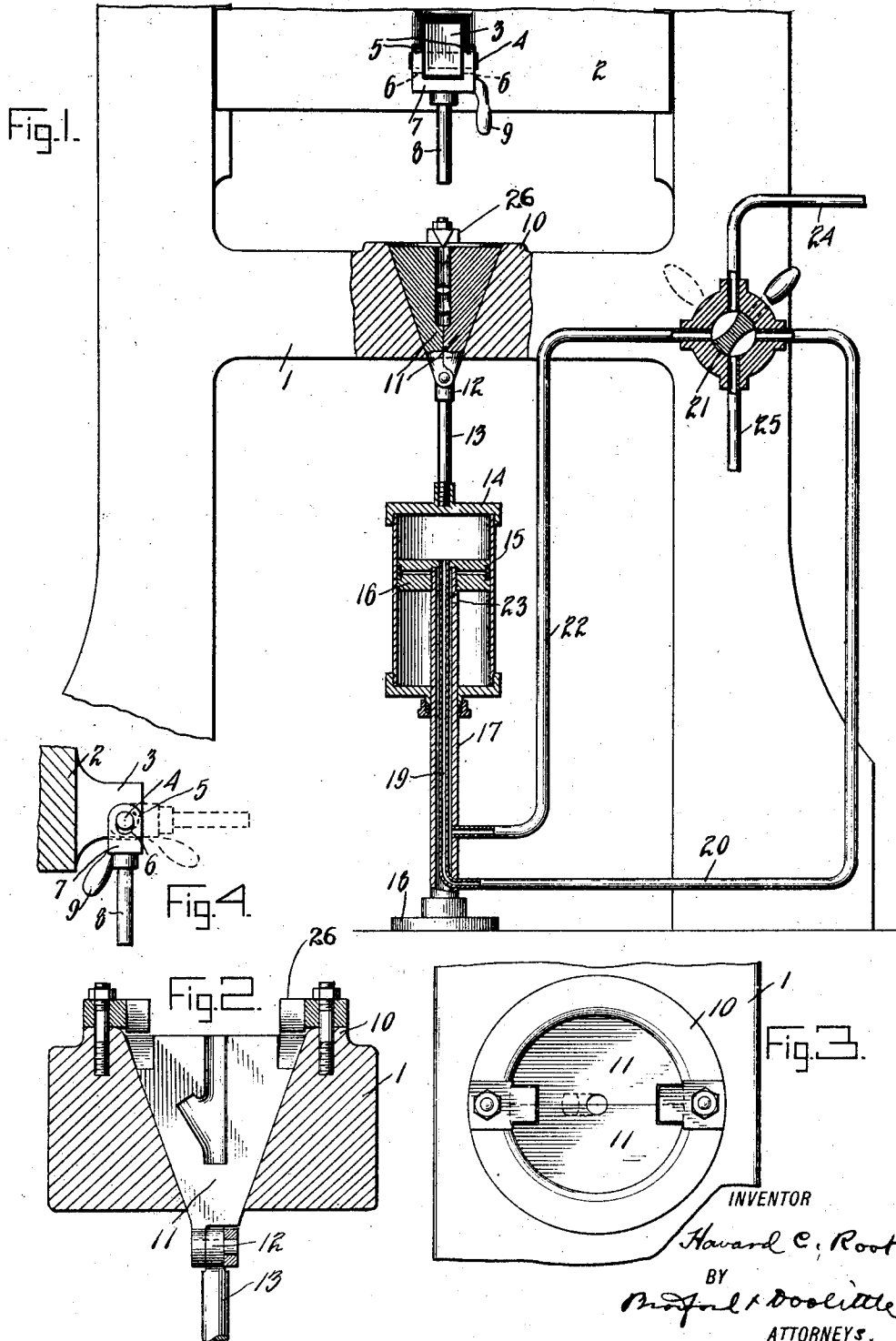


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METAL EXTRUSION APPARATUS.
APPLICATION FILED MAY 9, 1917.

1,377,094.

Patented May 3, 1921.



UNITED STATES PATENT OFFICE.

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METAL-EXTRUSION APPARATUS.

1,377,094.

Specification of Letters Patent.

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Application filed May 9, 1917. Serial No. 167,594.

To all whom it may concern:

Be it known that I, HOWARD C. ROOT, a citizen of the United States, residing at Indianapolis, Marion county, and State of Indiana, have invented and discovered certain new and useful Improvements in Metal-Extrusion Apparatus, of which the following is a specification.

My invention relates to apparatus for forming metal products by the process to be hereinafter fully described and claimed. In shop practice and trade literature on the subject the process is commonly referred to as the "extrusion" process and apparatus intended for such purpose as "metal extrusion apparatus" and it is to be understood that wherever the word "extrusion" is used throughout the following specification and claims, it is intended to mean the forming or shaping of metal in dies provided with offset cavities adjoining the central chamber and extending therefrom. The object of the invention is to provide means of a semi-automatic character for quickly and effectively releasing the completed article from the die whereby successive operations may be carried out with great rapidity.

With this object and others in view, my invention is embodied in preferable form in the construction and arrangement hereinafter described and illustrated in the accompanying drawings.

In these drawings, Figure 1 is a front view in elevation, partly in section and partly broken away, of a suitable press, and of the controlling mechanism for the die constituting the essential feature of my invention; Fig. 2 a cross-section of the die at right angles to Fig. 1; Fig. 3 a top plan view of the die-ring, and Fig. 4 a detail side view of the extrusion plunger.

Referring to the drawings, 1 indicates the bed of a suitable press, and 2 indicates the ram of the press which is adapted to be operated by suitable power. Fixed on this ram is a head 3 provided with a trunnion pin 4, engaged by rings 5, which have elongated slots 6, and which rings form a part of an adjustable plunger head 7 carrying an extrusion plunger 8. 9 indicates a clamp arm adapted to hold the plunger fixed in either horizontal or vertical position. The function of the elongated slots 6 is to permit the base of the ram head 3 to bear directly

against the inner face of the head 7 when the ram and plunger are carried downward for the extrusion operation whereby a rigid bearing between the bracket and head is obtained, and the strain is removed from the trunnions 4. The function of the pivotal mounting of the plunger is to permit the same to be swung away from the space above the dies after the extrusion operation has been effected so as to permit the die to be forced up freely without obstruction in opening the same for the purpose of removing the formed article.

Mounted on the bed 1 is a die-ring within which is mounted a vertically movable die consisting of two similar complementary half sections 11, each of which is profiled to form one-half of the article to be produced from the extruded metal, these die sections being separated along the line of the greatest width of the article. In Figs. 1 and 2 the profile of a die adapted to form an article of a particular shape is shown, in this instance the die apparatus being adapted to form a valve body having an angular branch, but of course the form of the die may be changed to shape articles of various configurations. The apparatus has been of particular advantage in the extrusion of brass stock, which has heretofore been exceedingly difficult to shape by this method.

The die is preferably conical or tapering in shape in respect to its exterior surface and fits in a complementary seat in the press bed. The object of this formation is to provide a rigid support for the die and a seat that will enable the die to fit closely in the bed, notwithstanding a slight wear in the contacting surfaces, and at the same time to provide a construction which will enable the die sections to be swung apart as the die is elevated so as to permit of the removal of the completed article. The lower ends of the die sections are pivotally connected to each other and to a head 12 of a rod 13, which is fixed at its lower end to a head 14 of a pneumatic cylinder 15 and which cylinder constitutes the operating element for elevating and lowering the die. This cylinder is movable under the action of compressed air and within the same is mounted a fixed piston 16 carried on a tube 17 fixed to a suitable base 18. Within the tube 17 and

extending through the piston and communicating with the space in the cylinder 15 above the former, is a concentric tube 19. The tube 19 communicates by a pipe 20 with a four-way valve 21 and the outer tube 17 communicates by a pipe 22 with said valve and said tube 17 is constructed with an outlet port 23 leading to the space in the cylinder 15 below the piston. Pipe 24 leads to a source of compressed air and supplies such compressed air, respectively, to pipes 20 and 22 through the valve. The valve is also provided with a suitable exhaust port 25 with which the air lines on opposite sides of the piston are adapted to be placed in communication alternately.

Mounted on the die-ring and fixed to the press bed are die opening means consisting preferably of two wedge-shaped members 26 located at the front and rear of the die sections. These fixed wedges are adapted to split or separate the two die sections as the die is moved upward against the same, thus releasing the die from the completed article.

In the operation of the apparatus, the blank is preferably heated and then inserted end first into the opening in the die. The plunger 8 is then swung down by the operator into vertical position and the press operated to carry the plunger against the end of the blank and force the metal into the die, whereupon it will be extruded from the central bore of the die into the lateral passageway indicated in Fig. 2 and shaped in the two halves of the die. After the article has been thus formed, the operator raises the plunger 9 to horizontal position to clear the space above the die and then operates the valve 21 to establish communication from the source of compressed air through the pipe 20 and the inner tube 19 to the space in the cylinder 15 above the piston 16, whereupon the cylinder will be forced up, thus lifting the die 11 and carrying the same into contact with the releasing wedges 26 which, thereupon, force the dies apart laterally, this separation being permitted and aided by the conical formation of the die and its seat. This action releases the two sections thereof from the completed article enabling the same to be readily removed. To restore the die sections to operative position the controlling valve is moved so as to establish communication between the space above the upper side of the piston and an exhaust port leading to the atmosphere, and at the same time to admit compressed air to the space in the cylinder below the piston, whereupon the cylinder will be carried downward so as to lower the die sections to their proper position within the press bed.

Having thus described my invention, what I claim is:

1. In a metal extrusion apparatus a ta-

pered seat, a bodily movable die composed of separate sections formed to close together to inclose the die cavity, and means arranged above said die in line with its movement and in position to meet the joint between the said sections as the die is raised, whereby said die is opened for the discharge of the article formed therein, substantially as set forth.

2. In metal extrusion apparatus, in combination with a movable die having separable sections; a fixed die-section separating member mounted beyond the die in line with the separation between the die sections, power means for carrying the die against said member to separate the sections, and manually actuated means for controlling the operation of said power means.

3. In metal extrusion apparatus, in combination with a movable die having separable sections, a wedge fixed in line with the line of separation between the sections and beyond the die, and power means for moving the die against said wedge to separate the sections.

4. In metal extrusion apparatus, in combination with a movable die having separable sections provided with tapering walls, a die bed having a complementarily tapered seat to receive said die, a die-section separating member beyond said die, means to effect the relative movement of the die and said separating member to carry the same into contact to force the die sections apart and power means for effecting such relative movement.

5. In metal extrusion apparatus, in combination with a movable die having separable sections provided with tapered walls, a bed having a complementarily tapered seat to receive said die, a wedge fixed beyond said die opposite the line of separation between the sections, power means for forcing the die against said wedge to separate said sections and means for manually controlling the operation of said power means.

6. In a metal extrusion apparatus the combination of a frame, a conical die seat, a die formed of two complementary parts formed to fit and slide in said die seat when closed, a movable cylinder mounted on a fixed piston and connected to the lower ends of said members which members are connected together by a hinged joint, a fixed piston in said cylinder, means for supplying fluid power to operate said piston in either direction, a plunger above said die for compressing the work therein, and means arranged in line with the point of separation between the members composing said die for automatically opening the same as the die is raised, substantially as set forth.

7. In metal extrusion apparatus, in combination with a movable die having separable sections, means for forcing said sec-

tions apart when the die is opened, an air cylinder and piston connected to said die and having communication with a source of compressed air, and a manually operated
5 valve for controlling the alternate admission of air to the opposite sides of said piston.

8. In metal extrusion apparatus, in combination with a vertically movable die, composed of two separable sections, said sections being tapered and mounted in a tapered seat, wedge means fixed above the die on the line of separation between the sections, an air cylinder and piston operatively
10 connected to the lower end of said die, means of communication between a source of compressed air and said cylinder on opposite sides of the piston, and a manually con-

trolled valve for admitting air alternately to said opposite sides.

9. In metal extrusion apparatus, in combination with a vertically movable die having separable sections, means for moving said die, means for separating the die sections, a press ram, and an extrusion plunger
25 mounted on said ram for adjustment out of the path of the die.

In witness whereof, I have hereunto set my hand and seal at Indianapolis, Indiana, this 16th day of April A. D. nineteen hundred and seventeen.

HOWARD C. ROOT. [L. s.]

Witnesses:

H. P. DOOLITTLE,
M. L. SHULER.