Jan. 9, 1951 C. TICHY 2,537,867

APPARATUS FOR PIERCING METALLIC BILLETS

Filed Oct. 10, 1945 2 Sheets-Sheet 1

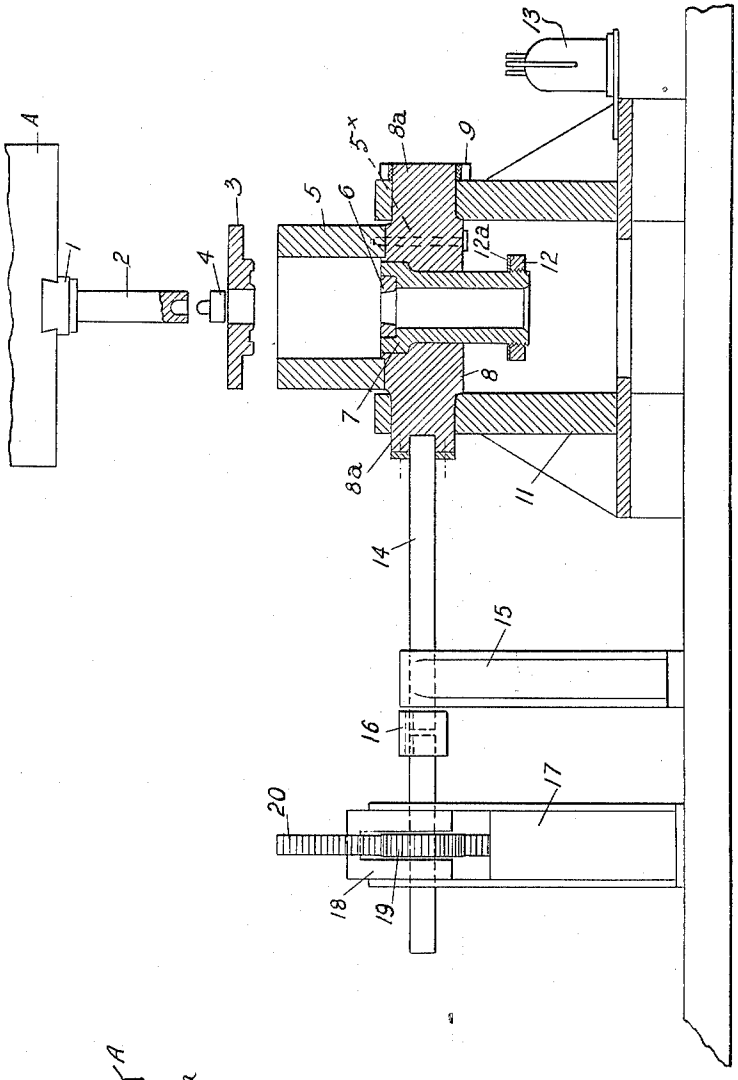


FIG. 1

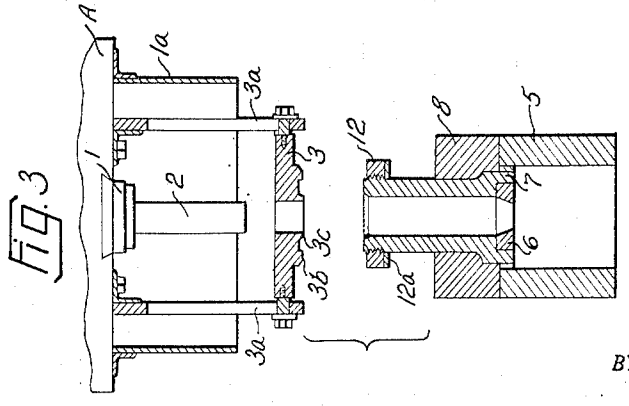


FIG. 3

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Fig. 5

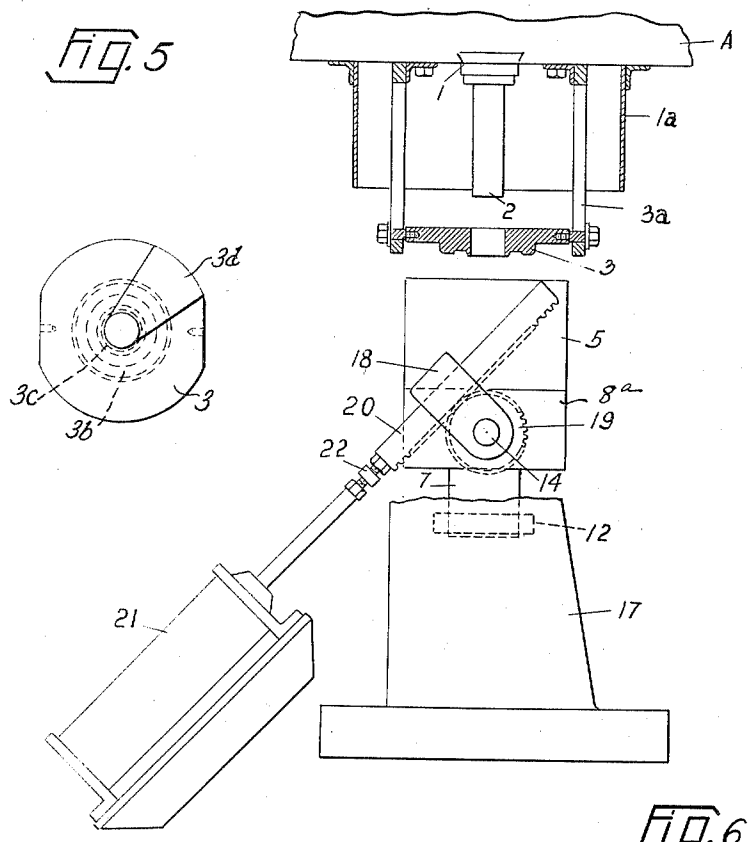


Fig. 6

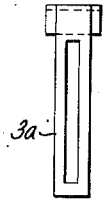


Fig. 7

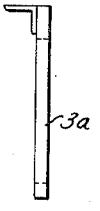


Fig. 2

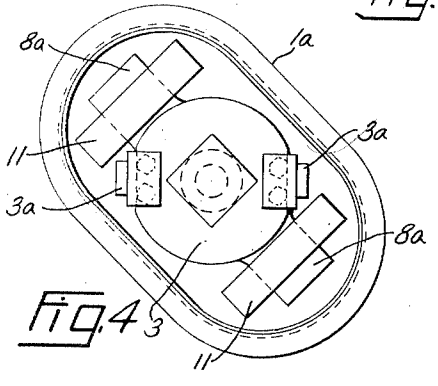


Fig. 4

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APPARATUS FOR PIERCING METALLIC BILLETS

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3 Claims. (Cl. 164—86)

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An object of this invention is to provide a device for piercing hot or cold non-ferrous metal billets using a piercing cap and mandrel forced through the billet by a hydraulic or mechanical press, and through a die seated in the billet knockout. The die may be of any desired shape.

Another object of the invention is to provide a billet container base, supported on trunnions and adapted to receive interchangeable billet containers for different size billets, a container cap fitted to slotted retainers, which cap acts as a guide for the piercing die and mandrel, also as a knock-out to remove the billet after being pierced.

A further object of the invention is to turn the billet container base through an arc of 180 degrees, bringing the knock-out under the container cap and press, and removing the pierced billet by the action of the press upon the container cap and knock-out when in this position. A slot is cut in the container cap as a guide when placing the piercing cap in position. The billet container base, mounted on trunnions, is turned by an operating cylinder transmitting motion through a rack and pinion combination through a shaft to the trunnion.

These objects and the additional objects of the invention will be described with reference to the accompanying drawings in which:

Fig. 1 is a view in elevation, partly in section, showing assembly of the billet piercing device.

Fig. 2 is a view in elevation of the billet piercing device showing the shaft end view of Fig. 1.

Fig. 3 is a longitudinal section showing the billet container, cap and guides, piercing mandrel and guard.

Fig. 4 is a plan view of Fig. 3 showing the location of the trunnions.

Fig. 5 is a plan view of the billet container cap.

Fig. 6 is a view in elevation showing the side of one of the slotted guides for the billet container cap, and

Fig. 7 is a view in elevation showing a front view of the same.

Referring to the drawings, we have shown in Fig. 1 the piercing mandrel 2 fitted into the mandrel holder 1. The piercing cap 4 fits into the piercing mandrel 2 and is forced through the billet by the press A. The container cap 3 fits snugly upon billet container 5 and also serves as a guide for the piercing cap 4 and the piercing mandrel 2. The billet container 5 is in the form of a hollow cylinder and is secured to the container base by cap screws 5×. It is interchangeable with other billet containers designed to fit on the container base. The selection of a container depends upon the size of the billet to be pierced.

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The container base 8 is supported on trunnions 8a, 8a and a trunnion stand 11. One trunnion is equipped with a friction braking device 9, to control the speed of rotation of the base. The other trunnion is connected to an operating shaft 14, supported by a bearing stand 15. The operating shaft 14 is connected by means of a coupling 16 to a pinion 19 and a rack 20, to the operating cylinder 21 Fig. 2, through the rack and cylinder coupling 22 Fig. 2. The rack and pinion are supported and guarded on the bearing stand 17 and guard 18 Fig. 1.

The operating cylinder 21 is shown diagrammatically only, since its function in operation is well known in various types of prime movers. It will, of course, contain a piston connected to the piston rod which leads to the coupling 22 and usual conduits for fluid pressure and valve means therefor will be employed as customary. The element 13, Fig. 1, diagrammatically shows a valve casing at the top of which is a hand lever for operating valve means leading to cylinder 21.

A recessed opening is provided in the container base 8. The knockout 7 is set in this opening making a sliding fit. The recessed portion of the opening forms a seat for the end of the knockout which holds the die 6. This end of the knockout and die constitutes the bottom of the billet container. The other end of the knockout is equipped with a cushioned retaining flange 12 which prevents it from passing through the opening. The cushion for the retaining flange is indicated as 12a.

In Fig. 3 the billet container is shown with the knockout directly under the container cap, in a position to press out a pierced billet under the force of the container cap and press. This figure shows the die 6 fitted into the knockout 7, the retaining flange 12 and cushion 12a. The container cap 3 is shown resting in the slotted retainers or guides 3a, 3a. In this figure 3b indicates the concentric ring of the cover which fits closely into the container during the piercing operation; 3c is the concentric ring of the cover which fits into the knockout when the pierced billet is being pressed from the container. A sectional view of the guard 1a is shown in this drawing.

Figure 4 is a plan view of Fig. 3 and shows the relative positions of the trunnions 8a, 8a, trun-

nion supports 11, 11, slotted retainers or guides 3a, 3a, and the guard 1a.

In Fig. 5 is shown a plan view of the container cap 3. The plan view of the cap shows a milled slot 3d running from the edge of the cap to its center opening. In operation, this milled slot 3d forms a guide and path for the piercing cap 4 when the latter is placed in the center opening before the piercing operation starts.

Fig. 6 and Fig. 7 show views in elevation of one of the slotted retainers or guides 3a, 3a for the container cap.

The operation of the billet piercing device, using either hot or cold billets is as follows: A billet is placed in the container 5, while it is moving from the knockout position to the piercing position, actuated by the operating cylinder 21, through the rack 20 and pinion 19 and the shaft 14. The container is automatically positioned under the press by the adjustable stop. The operator then starts the press A into motion which lowers container cap 3 upon billet container 5, fitting closely because of concentric ring 3b. The operator then slides the piercing cap 4 along the milled slot 3a in the container cap until it drops into the central opening of the container cap. The press motion is continued and the piercing mandrel 2 engages the piercing cap 4 pushing the slug of metal and piercing cap 4 through the die 6. The press is then returned to the open position.

The operating valve 13 is set to rotate the container base 8 through 180 degrees actuated by the operating cylinder 21, through the rack 20, pinion 19 and shaft 14. The rotation is halted by the adjustable stop, placing the knockout 7 in the upper position as shown in Fig. 3. The press is again set in motion, the container cap 3 descends and fits closely on the knockout due to the concentric ring 3c and, pushing on knockout, presses the pierced billet from the container. The press returns to the open position, the operating valve 13 is reversed causing the billet container 5 to return to the piercing position as described above. During this motion a billet is placed in the container and the operations are repeated. The guard 1a moves with each stroke of the press, protecting the operator from injury. In the manufacture of hollow extruded shapes and tube blooms made from aluminum or aluminum alloy billets, it is the usual practice to drill these billets in case of small extrusions. This is a slow expensive operation and permits only the production of billets with round holes. By means of the invention set forth hereinabove, billets of aluminum or aluminum alloy may be pierced. A standard hydraulic or mechanical press is used to drive a die through the billet. Either hot or cold billets may be so pierced and non-ferrous metals other than aluminum may also be pierced by this device. The device as shown is provided with an adjustable stop so as to accurately position the billet container under the press. A brake to control the speed of the operation and an operating valve to control the operating cylinder are provided. A guard for the protection of the operator is located adjacent to the brake.

Having described my invention, what I claim and desire to secure by Letters Patent is as follows:

1. Apparatus adapted for the piercing of metallic billets consisting of a press head and a piercing mandrel thereon, an apertured container adapted to receive various sizes of billet containers, and rotating means for said container base adapted to rotate the base about 180° in combination with a die, at the base of the billet container, the die consisting of, a piercing cap, guide means on the press head for said piercing cap, a slidable apertured billet ejector positioned at the base of the billet container having an exposed end for engagement by said guide means under the action of a press upon rotation of said base.

2. In an apparatus for the piercing of metallic billets consisting of a press and a piercing mandrel actuated thereby, a billet container, means for rotating the container to invert the same relatively to the press, and an apertured billet ejector normally projected through the base of the billet container for actuation by the press when the billet container is inverted, in combination with a press and a piercing mandrel actuated thereby, a billet container, means for rotating said container to invert the same relative to the press, an apertured billet ejector projected through the base of the billet container for actuation by the press when said billet container is inverted, a die in the billet container and carried by the aperture billet ejector, and a container cap slidably carried by the press head for directly engaging the ejector.

3. In an apparatus for the piercing of metallic billets consisting of a press and a piercing mandrel actuated thereby, a billet container, means for rotating the container to invert the same relatively to the press, and an apertured billet ejector normally projected through the base of the billet container for actuation by the press when the billet container is inverted, in combination with a press and a piercing mandrel actuated thereby, a billet container, means for rotating said container to invert the same relative to the press, an apertured billet ejector projected through the base of the billet container for actuation by the press when said billet container is inverted, a die in the billet container and carried by the apertured billet ejector, and a container cap slidably carried by the press head for directly engaging the ejector then the said cap being formed with a guide aperture for receiving both a piercing cap and the piercing mandrel of the press.

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