

P. J. CULHANE, JR.
PUNCH PRESSER.
APPLICATION FILED SEPT. 20, 1917.

3 SHEETS—SHEET 1.



Inventor,
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By H. L. Smith, Brock & West
Attys.

1,315,010.

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3 SHEETS—SHEET 2.

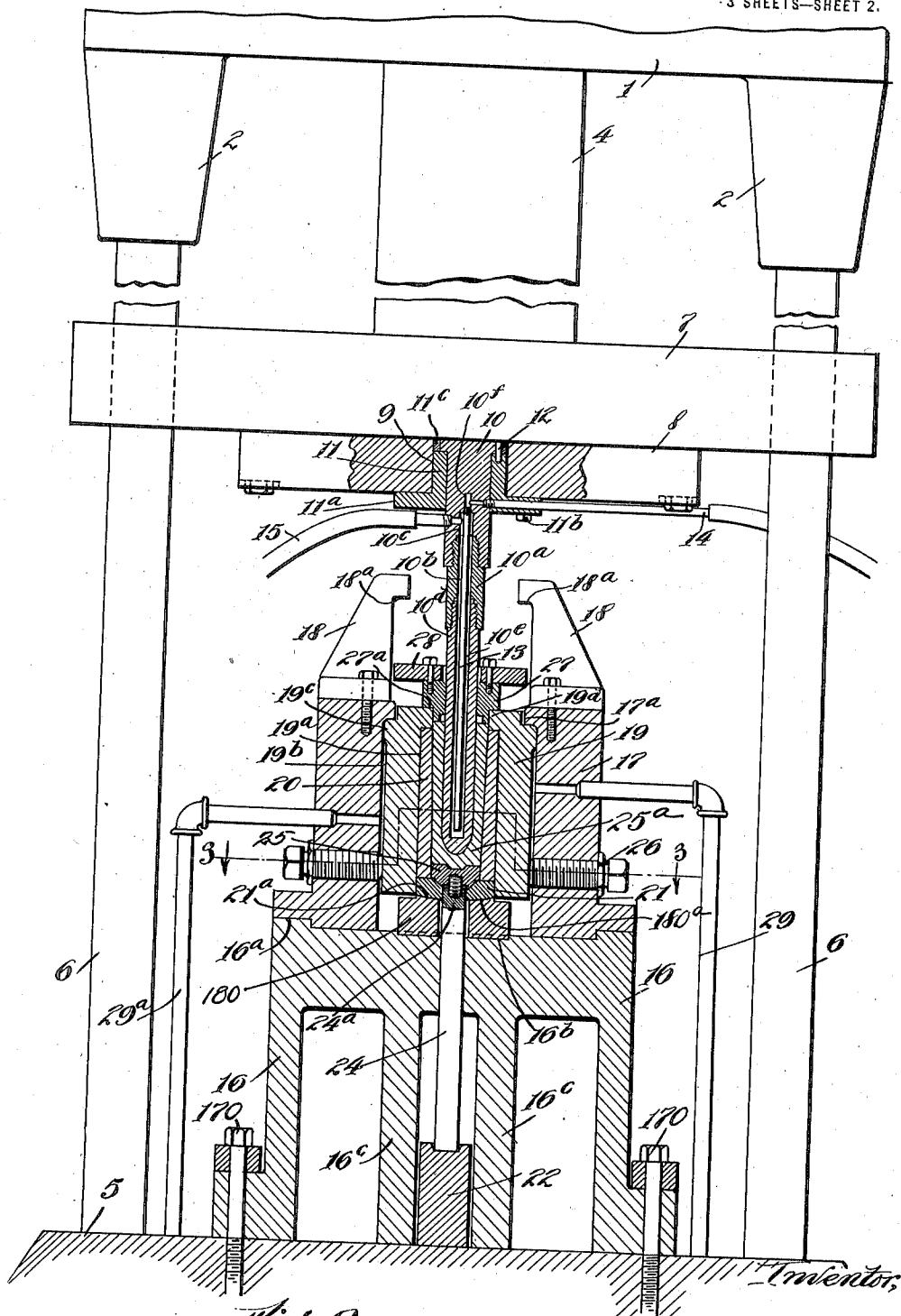


Fig. 2.

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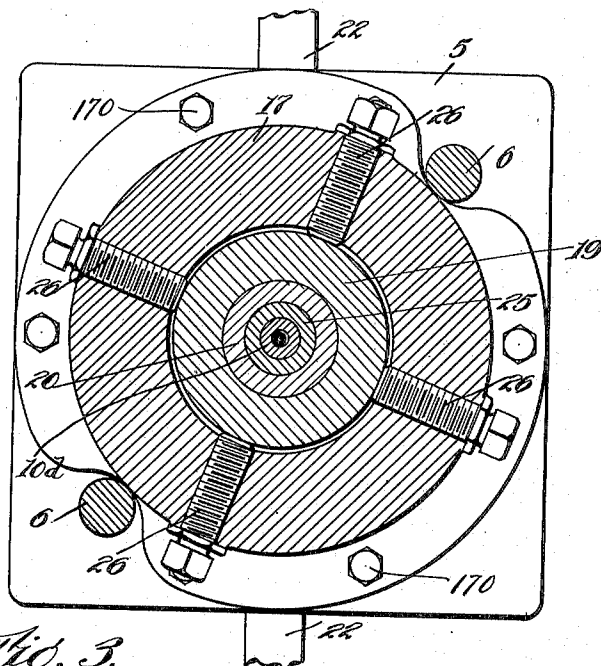


Fig. 3.

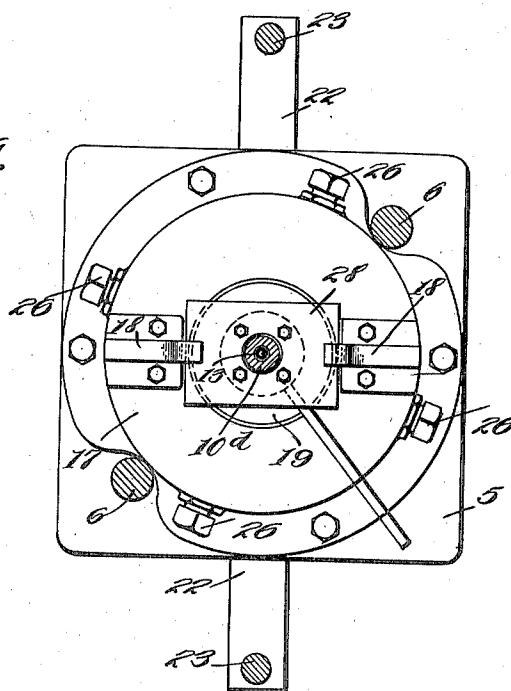


Fig. 4.

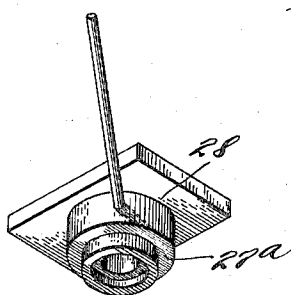


Fig. 5.

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UNITED STATES PATENT OFFICE.

PATRICK J. CULHANE, JR., OF CLEVELAND, OHIO, ASSIGNOR TO THE HYDRAULIC
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PUNCH-PRESSER.

1,315,010.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, PATRICK J. CULHANE, Jr., a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Punch-Pressers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to presses and, while certain features thereof are capable of use in a broader or more general field, it has proven of particular importance in hot pressed work and especially in connection with the production of articles having the characteristics and general shape of high explosive shells.

In the manufacture of such shells, it has heretofore been necessary to subject the heated billet to two punching operations in order to secure a measurable degree of accuracy therein but, because of the tendency of the punch to drift, such inaccuracies have developed as to necessitate the condemnation of a comparatively high proportion of such shells. It is the object of this invention to provide a press wherein the punching of the shell may be accomplished by a single operation and the inaccuracies obviated, thus greatly increasing the efficiency and the output of the machine. Further and more limited objects of the invention will appear in the specification and will be realized in and through the combinations of elements embodied in the claims forming part hereof.

In the drawings, Figure 1 represents a side elevation of a punch press embodying my invention; Fig. 2 an enlarged sectional detail through the lower part of said press, the upper portion being shown in elevation and the section being taken at substantially right angles to Fig. 1; Fig. 3 a sectional view corresponding to the line 3—3 of Fig. 2; Fig. 4 a view at right angles to the punch, taken above the bars 18; and Fig. 5 a perspective view of the pilot for the punch.

Describing by reference characters the various parts illustrated herein, 1 denotes the top frame having the stops 2 and supporting the cylinder 3. 4 denotes the piston or ram, which is movable through the frame 1 in the ordinary manner. The top frame is supported from the bottom platen 5 by means of the columns 6. These columns serve as guides for the top platen 7 having

secured to the bottom thereof the punch holder 8. The punch holder is provided with a central bore 9 to which the upper portion 10 of the punch is secured by means of a bushing 11 having a bottom flange 11^a by which it is bolted to the punch holder, as indicated at 11^b. At its upper end the central bore of the bushing is enlarged, as shown at 11^c, to form a shouldered seat for the flanged top of the punch member 10. The punch member is held against rotation by means of a dowel pin 12 fitted into the upper portion of one side of the bushing and entering cooperating semi-circular recesses in the reduced upper end of said bushing and the lateral portion of the flange at top of the punch member 10.

10^a denotes a removable extension which is threaded into the lower end of the punch member 10 and which is provided with a central bore 10^b registering with a like bore 10^c in the member 10.

10^a denotes a removable extension which is said member being threaded into the lower end of the member 10^a and being provided with a central bore 10^a adapted to register with and form a continuation of the bores 10^b and 10^c. A tube 13 is threaded into the upper end of the bore 10^a, extending downwardly within and spaced from the bores 10^b and 10^c, the lower end of said tube being above the bottom of the bore 10^a. The upper end of the tube communicates with the bore 10^a in the member 10 for the purpose of conducting water or other cooling agent supplied through the pipe 14 to the annular chamber surrounding the said tube, the liquid thus supplied being conducted away through the tube 15 which communicates the upper portion of the bore 10^a. Flexible tubing is employed as part of the inlet and outlet connections to accommodate the movements of the top platen.

Supported by the bottom platen 5 is a base 16, the base being shown as secured to said platen by means of bolts 170. The upper surface of this base is provided with an outer annular seat 16^a for the lower portion of the die holder 17 and with an inner annular seat 16^b for the lower portion of the die bottom 180. This die bottom is a member which takes the thrust of the punch and transmits the same to the base and bottom platen. Secured to the top of the die holder 17 are the bars 18, the upper ends of said

bars being projected inwardly, as indicated at 18^a, to form fingers which, when necessary, will strip the pilot (to be described hereinafter) from the punch.

5 Within the die holder is mounted the die casing 19. This casing is provided with an internal cylindrical surface 19^a and an external cylindrical surface 19^b, the said surfaces extending upwardly from the bottom 10 of the casing. Above the surface 19^b, the casing is slightly flanged or shouldered, as indicated at 19^c, whereby it is adapted to engage and rock slightly within the inner surface of the die holder 17, being supported 15 against upward movement by means of the inwardly projecting flange or shoulder 17^a on said holder. The inner cylindrical surface 19^a extends upwardly from the bottom nearly to the top of the casing, the upper 20 end of the casing being provided with an inwardly projecting flange or shoulder 19^d which is adapted to engage the top of a bushing 20 forming a part of the female die and the lower end whereof is supported on top 25 of a false bottom 21 resting upon the die bottom 180. The bore of the bushing 20 is slightly flared outwardly from bottom to top to permit of the flowing of the metal during the punching operation. In Fig. 2, 30 the amount of taper is exaggerated for purposes of illustration; in practice, the taper will be about $\frac{1}{16}$ inch. The upper surface of the bottom 180 is provided with a concave seat 180^a for the complementary convex 35 lower surface 21^a of the false bottom plate 21. The cooperating surfaces 180^a and 21^a are preferably segments of a common sphere, whereby a ball-and-socket joint is formed between the parts 180 and 21. As will appear from Fig. 2, a slight clearance is provided 40 between the lower end of the die casing and the subjacent portion of the die bottom 180.

22 denotes a knockout bar which normally rests upon the bottom platen and is 45 supported between guides 16^c formed with the base. This knockout bar is operated by means of rods 23 connected to opposite sides of the top platen 7 and extending through 50 said bar. These rods are provided each with a suitable head or projection 23^a which, when the top platen has been elevated a predetermined distance, are adapted to engage the bottom of the bar 22, thereby to lift 55 the same and the parts connected therewith.

24 denotes a knockout pin which is supported by the bar 22 and which extends through a bore in the central portion of the die bottom 180, it being noted that sufficient 60 clearance is provided between said pin and the wall of said bore to permit of the adjustment to be described hereinafter. The upper end of the pin fits within a central bore in the false bottom plate 21 and is connected 65 by means of a screw 24^a to the com-

bined knockout plate and bottoming or forming member 25. The member 25 is fitted within the bottom of the bushing 20 and its upper surface is so shaped as to give the desired form to the bottom of the blank 70 25^a; in the embodiment illustrated herein, the upper surface of the said member forms the bottom of the shell blank. The bottom of the member 25 is shown as frusto conical in shape whereby it fits within and seats 75 upon a correspondingly shaped seat in the top of the false bottom 21. The parts 19^d, 20 and 25 constitute members of the female die cooperating with the punch or male die.

In hot punching operations, the punch 80 tends to drift toward one side or the other of the female member or die casing. This results in punching the work out of center. As a result, it has heretofore been found necessary in the manufacture of high explo- 85 sive shells to subject the blanks to two punching operations. In order to prevent this drifting of the punch and also to compensate for the uneven wearing thereof, the die casing is adjustably supported within 90 the holder by means of the ball-and-socket connection between the bottom of said casing (provided by the member 21) and the die thrust member 180, said ball-and-socket connection being formed between the false bot- 95 tom plate 21 and the said member. For the purpose of securing such adjustment, a suitable number of screws 26 are radially mounted within the die holder 17 with their inner ends adapted to abut against the lower 100 end of the die casing. Four such screws are indicated, but it will be evident that the number may vary in accordance with any particular installation and the incidents of use. By adjusting these screws, the bottom 105 of the die casing (the portion remote from the punch) may be so moved as to vary the axial position of the female die with respect to the punch thereby to compensate for the drift and wearing of the punch and to insure such 110 accuracy in operation as will not only obviate a second punching operation but will reduce the number of imperfections to a negligible minimum. The limited adjustment requisite for this purpose is permitted by the 115 pivotal connection between the female die and the die holder through the casing shoulder or flange 19^c. Other adjusting means, as wedges, obviously may be employed in place of the screws 26. 120

Surrounding the punch is the pilot 27, said pilot having a central bore for the lower punch member and being provided with a ledge 27^a whereby it may be supported on top 125 of the die casing, the lower end of the pilot being adapted to fit within the flange or shoulder 19^d of said casing. Secured to the upper end of the pilot is the stripper bar 28 which is adapted to be engaged by the fingers 18^a on the upward stroke of the punch. 130

For the purpose of cooling the female die member, the space provided between the outer surface of the die casing and the inner surface of the die holder is supplied with a cooling liquid, the liquid being circulated through such space by means of the pipes 29, 29^a.

In operation, the heated billet will be inserted within the bushing 20 and the pilot will be applied in the manner shown in Fig. 2. The punch will then be operated in the usual manner. On the upstroke, should the pilot adhere to the punch, it will be removed therefrom by the engagement of the stripper plate with the fingers 18^a, and can then be removed. Further upward movement of the punch causes the rods 23 to lift the knockout bar 22 and thereby lift the shell blank to a position where it can be readily removed. Whenever occasion may require, the screws 26 may be adjusted so as to line up the blank properly to compensate for the drift and wear of the punch, thus insuring accuracy in the punching operation as well as in the product. The ball-and-socket joint formed between the members 18 and 21 and the arrangement of the adjusting screws 26 permits this adjustment to be made conveniently and enables the work to be moved in any desired direction; and this adjustment is all that is necessary in order to enable the operation to continue.

By the construction illustrated and described herein, I have produced a self-contained means for adjusting the female die and the work supported thereby with reference to the punch or male die and one which enables the work to be performed not only with half the number of operations heretofore employed but with extreme accuracy.

Having thus described my invention, what I claim is:—

1. In an apparatus of the character described, the combination, with a die punch, a female die and a casing therefor and means for moving one of such die members toward and from the other, of means cooperating with the portion of said casing which is remote from the punch for adjusting the casing and the female die therein with respect to the axis of the punch.

2. The combination, with a punch and a die casing and means for moving one of such die members toward and from the other, of a holder for the die casing, and means associated with the holder for adjusting the position of the die casing with respect to the axis of said punch.

3. The combination, with a punch and a die casing and means for moving one of such die members relatively to the other, of a die holder engaging a portion of the die casing which is adjacent to the punch, and means carried by the die holder and engag-

ing the casing at a point which is remote from the punch for adjusting the said casing with respect to the axis of the punch.

4. The combination, with a punch and die casing and means for moving one of such die members relatively to the other, of a die holder wherein the die casing is supported for adjustment to vary its axial position with respect to the punch, and screws carried by the die holder and operatively engaging the die casing for so adjusting said casing.

5. The combination, with a punch and a die casing having a bore for the article to be punched and means for moving one of such die members relatively to the other, of a closure member for the casing, a member adapted to receive the thrust of said punch, a member adjustably interposed between the two last mentioned members, and means for adjusting the die casing, the closure member, and the intermediate member relatively to the thrust-receiving member.

6. The combination, with a punch and a die casing having a bore for the article to be punched, and means for moving one of such members relatively to the other, of a member adapted to receive the thrust of said punch, a member adjustably interposed between the last mentioned member and the closure member, and means for adjusting the die casing, closure member and intermediate member relative to the thrust-receiving member.

7. The combination, with a punch and a die casing and means for moving one of such die members relatively to the other, of a bushing within said die casing, a thrust-receiving member at the end of said casing which is remote from the punch, a forming member within the portion of said bushing which is remote from said punch, a supporting member for the last mentioned member within the die casing and operatively interposed between the said bushing and the thrust-receiving member and adjustable relatively to the last-mentioned member, and means cooperating with the die casing for adjusting the same transversely with respect to the punch together with the forming member and the supporting member.

8. The combination, with a punch and a die casing and means for moving one of such die members relatively to the other, of a bushing within the die casing, a knockout plate within said bushing, a pin for said plate, a thrust-receiving member through which said pin loosely extends and having a concave surface presented toward the bushing, a plate interposed between the knockout plate and the thrust-receiving member and having a convex surface cooperating with the concave surface of said member, means

for adjusting the die casing and said plates transversely with respect to the punch, and means operative by the movement of the die members from each other for operating the said pin.

9. The combination, with a punch and a die casing and means for moving one of such die members relatively to the other, of a bushing within the die casing, a knockout plate within said bushing, a pin for said plate, a thrust-receiving member through which said pin extends, a plate interposed between the knockout plate and the thrust-receiving member, the engaging surfaces of the thrust-receiving member and the plate cooperating therewith producing a ball-and-socket connection, means for adjusting the die casing and said plates transversely with respect to said punch, and means operative by the movement of the die members from each other for operating the said pin.

10. The combination, with a punch and means for operating the same, of a base, a die casing, a bushing in said casing and serving to support the latter, a thrust-receiving member on said base and operatively interposed between the same and said die casing, the said member having a concave surface presented toward the said casing, a plate having a convex surface complementary to said concave surface and interposed between said member and the bushing, a knock-out plate within said bushing and supported by the last mentioned plate, means for adjusting the die casing and the said plates transversely with respect to the said punch, and means operative by the movement of the punch away from the die casing for automatically operating the knockout plate.

11. The combination, with a punch and means for operating the same, of a die comprising a casing and a closure for a portion thereof which is remote from the punch, a ball-and-socket support for said closure, and means cooperating with the casing for adjusting the same and the closure transversely with respect to said punch.

12. The combination, with a punch and means for operating the same, of a die comprising a casing and a member for forming the end of the blank which is remote from the punch, a ball-and-socket support for said member, and means for adjusting the said casing and member transversely of said punch.

13. The combination, with a punch and means for operating the same, of a die comprising a casing and a closure for the portion thereof which is remote from the

punch, a support for said closure comprising two members having a ball-and-socket connection, one of said members being movable with the casing, and means cooperating with the portion of the casing adjacent such movable member for adjusting the casing, the closure and the movable member transversely of said punch.

14. The combination, with a male and a female die member, and means for moving one of said members relatively to the other, of a ball-and-socket support for one of said members, and means for adjusting the last-mentioned member with reference to said support.

15. The combination, with a male and a female die member and means for moving one of said members relatively to the other, the female member having a portion opposed to the thrust of the male member, of means for varying the axis of the female member with relation to the male member, and a support for the said portion of the female die member, the cooperating surfaces of said support and said portion forming a ball-and-socket joint.

16. The combination, with a male and a female die member, and means for moving one of said members relatively to the other, of a support for the female member, said support including a ball-and-socket support for the portion of the female member which is remote from the male member, and means for adjusting the female member on said support.

17. The combination, with a punch and a female die member, of means cooperating with the portion of said member which is remote from the punch for rocking said member about the punch facing portion thereof.

18. The combination, with a punch and a female die member, of means for supporting the punch facing portion of said member against movement across the axis of said punch, and means cooperating with a portion of said member which is remote from the first mentioned portion for varying the position of the axis of the said member relatively to said punch.

19. The combination, with a punch and a female die member, of a curved support for the end of said member which is remote from said punch, a rocking support for the punch facing portion of said member, and means for adjusting said member with respect to both supports thereby to vary its axial relation to said punch.

In testimony, whereof, I hereunto affix my signature.

PATRICK J. CULHANE, JR.