C. F. WALP & A. F. O'LEARY.

METAL FORGING MACHINE.

APPLICATION FILED JAN. 15, 1916.

1,244,803.

Patented Oct. 30, 1917.

3 SHEETS—SHEET 1.

Fig. 3.

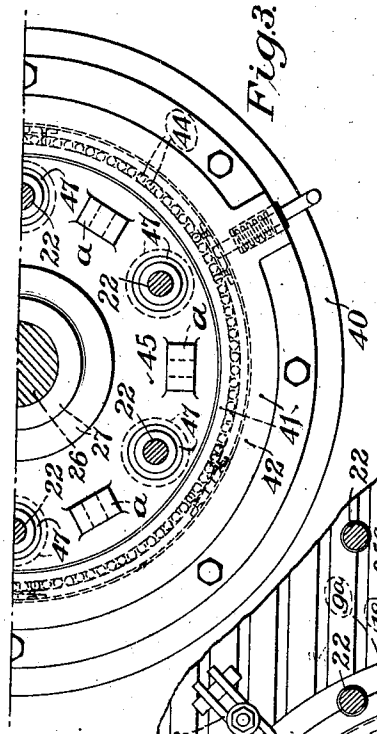
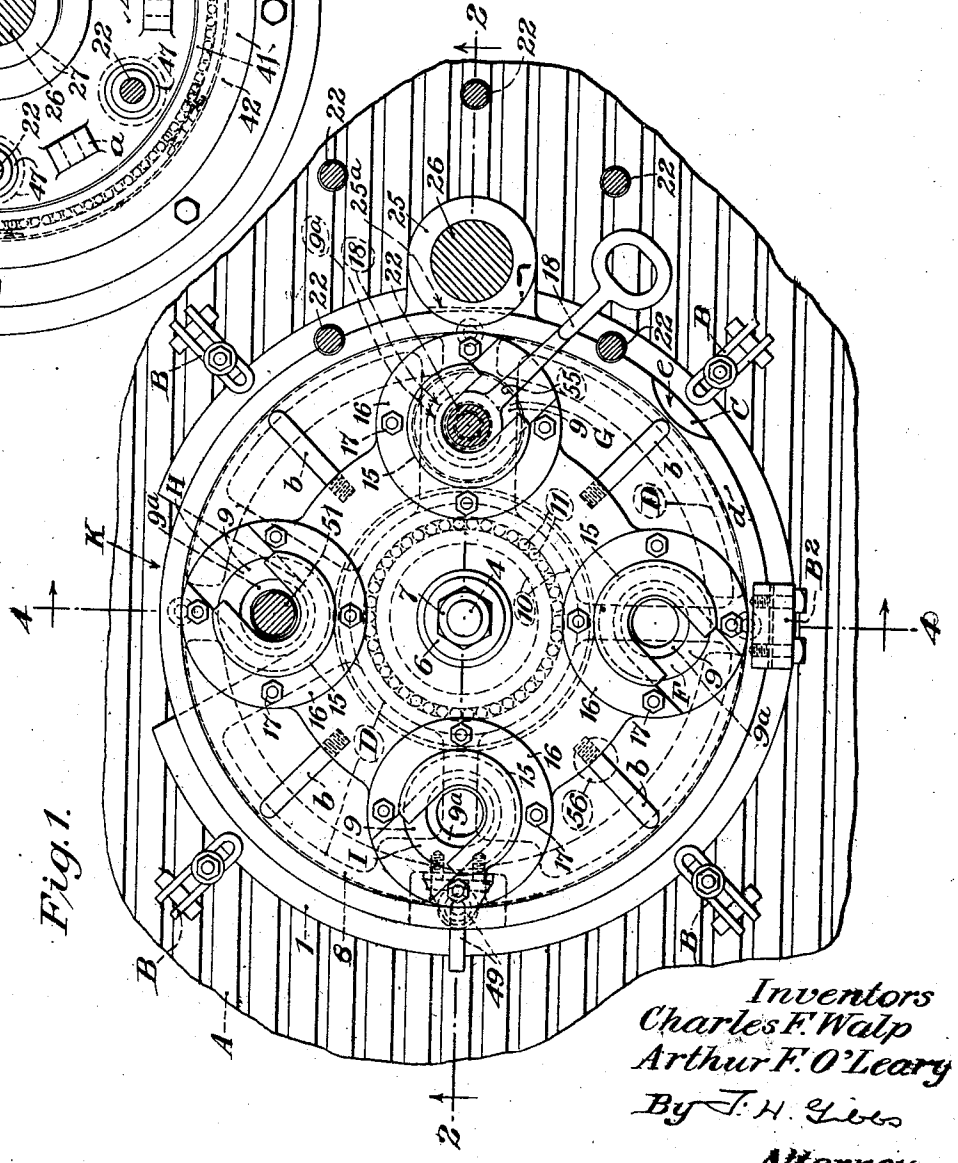


Fig. 1.



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3 SHEETS—SHEET 2.

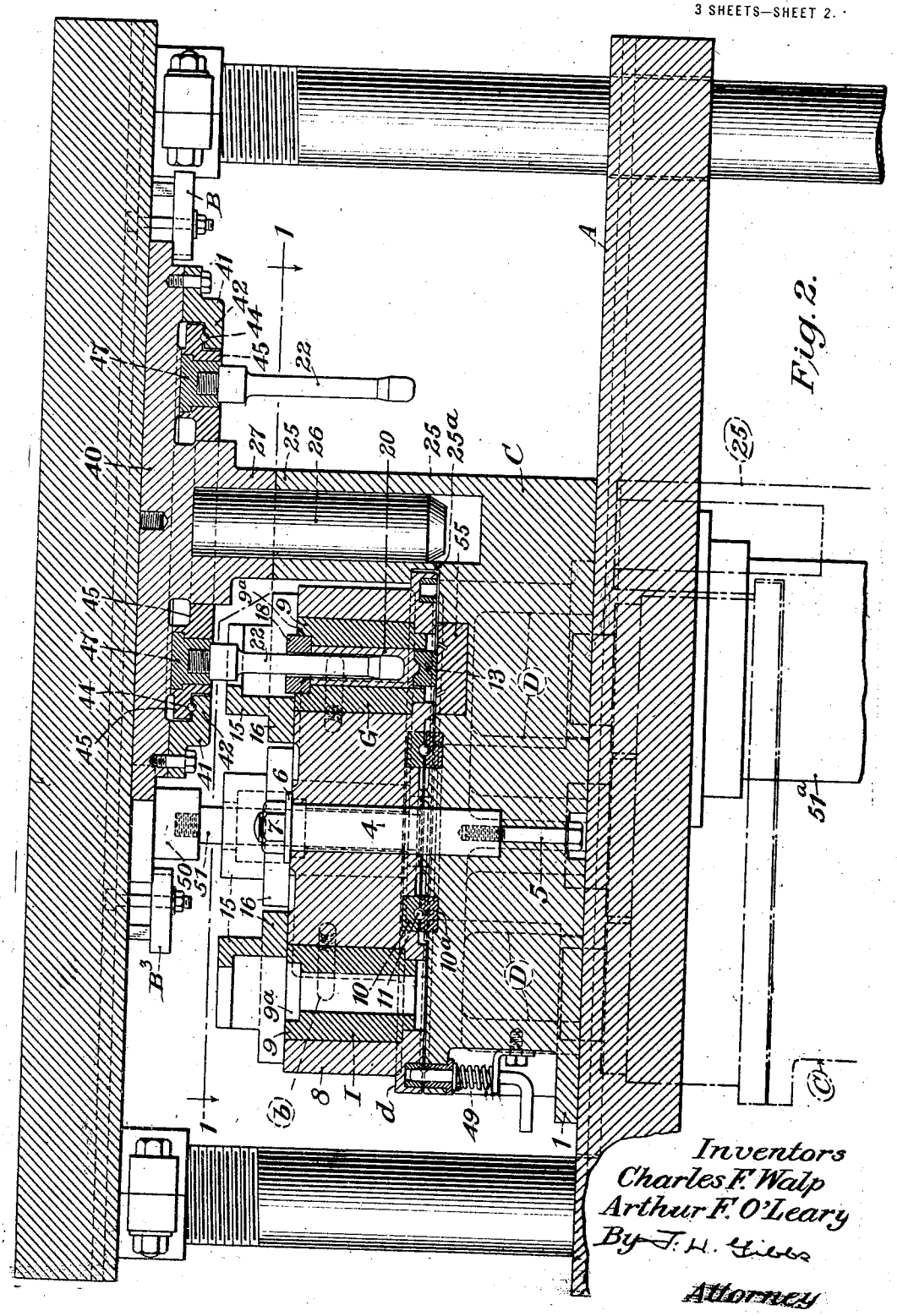


Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 4.

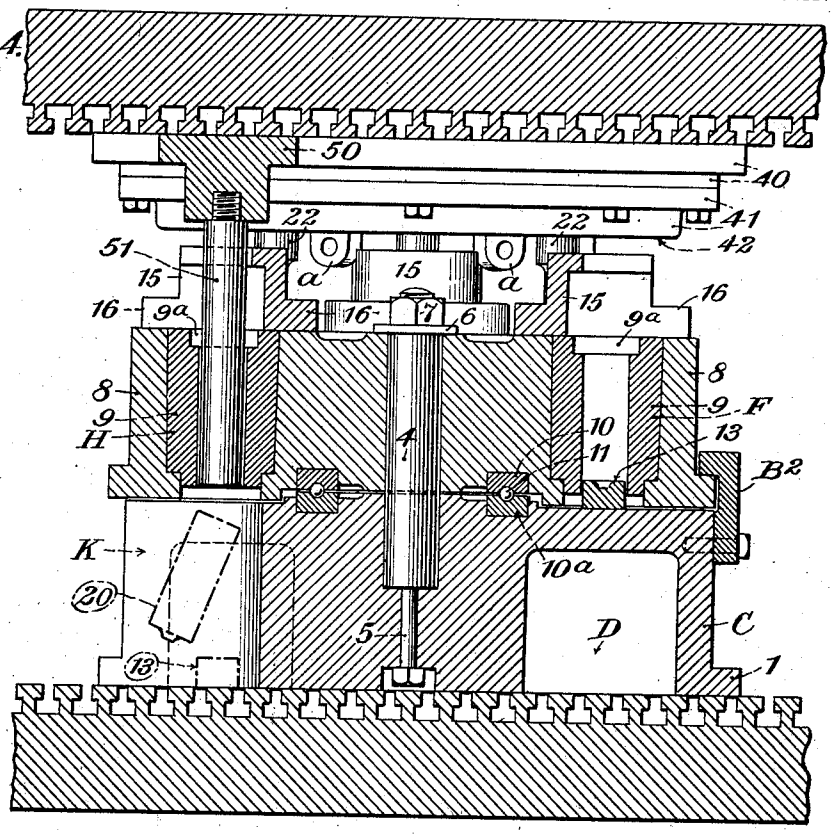
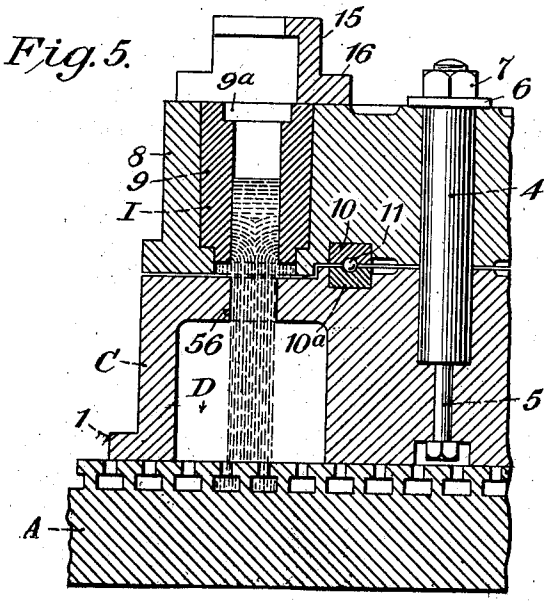


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES F. WALP AND ARTHUR F. O'LEARY, OF BERWICK, PENNSYLVANIA, ASSIGNORS TO AMERICAN CAR AND FOUNDRY COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF NEW JERSEY.

METAL-FORGING MACHINE.

1,244,803. Specification of Letters Patent. Patented Oct. 30, 1917.

Application filed January 15, 1916. Serial No. 72,270.

To all whom it may concern:

Be it known that we, CHARLES F. WALP and ARTHUR F. O'LEARY, residing at Berwick, Pennsylvania, and being citizens of the United States, have invented certain new and useful Improvements in Metal-Forging Machines, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and to use the same, reference being had to the accompanying drawings, which illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described except as required by the scope of the appended claims, as it is obvious that various modifications thereof will occur to persons skilled in the art.

In said drawings:

Figure 1 is a plan view of a portion of the lower or movable platen of a hydraulic press showing mounted thereupon in plan, a rotatable die socket and associated parts hereinafter more fully described; the view being taken on the line 1—1 of Fig. 2.

Fig. 2 is a central vertical sectional view taken through the upper and lower platens of a hydraulic press, through the parts shown in plan in Fig. 1, and through the associated parts which in operation are attached to the upper or fixed platen of the press.

Fig. 3 is a half inverted plan view of parts attached to the fixed platen, showing in section certain other parts on the line 1—1 of said Fig. 2.

Fig. 4 is a vertical sectional view; the section being taken on the line 4—4 of Fig. 1, looking in the direction indicated by the arrow.

Fig. 5 is a fragmentary detail sectional view hereinafter referred to.

The object of the invention is to provide means for forging tubular bodies, for cooling the dies and associated parts of the machine and for ejecting the forged metal from such dies.

In the general scheme of operation a series of male and female dies are employed all of which are mounted in rotatable carrying means so associated that they receive the material to be operated upon, pierce such material, eject the pierced material from the machine and permit cooling the empty female die and the male die while the former is moved progressively toward its material receiving position.

In carrying out such scheme, the parts are associated with a platen press, preferably of the type in which the upper platen is fixed, and the lower platen is movable upwardly toward such fixed platen, the fixed forging machine parts being secured in position to such platens and the movable parts of the forging machine being movable relatively to such so-called fixed parts.

As presses of the type required are serviceable in connection with may pressing operations upon various types of work, the press forms no part of the present invention and only the parts essential to an understanding of the invention are herewith illustrated.

Clamped to the movable platen A of said press by ordinary service clamps B is a stationary base member C which is provided with a perimetrical flange 1, circular in form. This base member is preferably formed from a hollow casting, cored out at D, at convenient intervals to secure lightness, as indicated by the dotted lines in Figs. 1, 2 and 4.

The central portion of the base is adapted to receive a pivot pin 4 which is secured in position by means of the machine screw 5 at its lower end, and the washer 6 and nut 7 at its upper end, the nut and washer connecting with the base a rotatable die socket 8 which is adapted to receive and carry the female dies 9, four of which are shown equidistantly disposed about the die socket indicated.

Intermediate the base C and die socket 8 are circular trackways 10—10ª which form ball races for friction reducing balls 11 adapted to run in said trackways and on which balls is rotatably supported the socket 8 before referred to.

As will be noted in Fig. 4, the base member is additionally cored out at K thereby forming a conduit through any one of the female die members 9 in register with said opening K and the interior of the base member through which may pass a temporary die member 13, illustrated in Figs. 2 and 4 and occupying the lowermost portion of said die members.

The female die members 9 are provided with a central opening extended therethrough, and in such die members are placed the removable die members 13 to form temporary bottom portions for such female die members.

Connected with the die socket in convenient juxtaposition to the female die members 9 are stationary stripper members 15 provided with base flanges 16 through which project machine screws or other suitable securing means 17 adapted to secure said stationary stripper members in position and, incidentally, said stationary stripper members overlie sufficient portions of the female die members to lock the latter in position in the die socket.

The upper portion 9^a of the female die members 9 is provided with a recess of larger diameter than the through bore of said die members and in the piercing operation hereinafter referred to, a temporary or removable stripper 18 is seated in said recesses 9^a, as shown in Figs. 1 and 2 after the billet 20 has been inserted.

It will be noted in Fig. 2 that the central opening in the removable stripper 18 is wider at the upper than at the lower side thereby forming a guide for the piercers 22 hereinafter referred to.

Extending laterally from the base member, is a hollow post 25 which extends, as shown in Fig. 2, from the movable platen A to the section line 1—1 of said Fig. 2. The post 25 is hollow and serves as a guide and receptacle for a guide pin 26 which depends from the fixed platen of the press and is positioned in a suitable pin socket 27. The pin 26 may be held in position by any suitable means not at all important to the present invention.

For convenience of description, the female dies shown in plan in Fig. 1, have been lettered F, G, H and I, and will be hereinafter referred to in connection with such lettering.

Connected with the fixed platen of the press by service clamps B' is a fixed collar supporting member 40 to which is rigidly secured a fixed collar 41 having an inwardly connected supporting flange 42 provided with a ball race for the friction reducing balls 44, upon which latter rests a rotatable collar 45 which carries the piercers 22 or male dies adapted to coöperate with the female dies before described.

Suitably positioned in the rotatable collar 45, at convenient intervals, are the die sockets 47 and centrally of the rotatable collar is the pin socket 27 before referred to which serves as a bearing for the inner perimetrical face of said rotatable collar.

In convenient relation to the fixed and rotatable collars just described, is a socket 50 secured to the fixed platen by similar service clamps B^3. Secured to the socket 50 is an ejector 51 positioned vertically above the female die which occupies the position occupied in Fig. 1 by the die H so that when one of the male dies 22 is being projected into the billet in the die G, the ejector 51 will at the same time pass into the die H and eject through the bottom of said die H, the billet which has just previously been pierced in die G and also the temporary die 13 before indicated, said billet and temporary die passing through the conduit K in the base from which it may be removed due to the fact that the shell or outer wall of said base is broken away as shown in Figs. 1 and 4.

In operation it is essential that the die parts be properly positioned and be cooled after they have performed their function as forging members, and to that end, the means employed for carrying both sets of die parts are made rotatable, the die socket 8 rotating on the pivot pin 4 and the rotatable collar 45 carrying the male dies being rotatable on the fixed collar 41 so that either or both the male and female dies may be properly cooled between working intervals. To accomplish this permits a greater output from the machine and results in the economy of manufacture due to the long life of the die parts.

In practice the successive steps are as follows:

Referring to Fig. 1, the die F having arrived at the position shown in said figure, empty and cooled as hereinafter described, one of the temporary dies 13 is dropped to position in said die after which a suitably heated billet is placed therein. The latch 49 is released, the die F is moved to the position occupied by die G and in this position the temporary stripper 18 is inserted extending, as shown in said Fig. 1, underneath upper flange of the stationary stripper member 15, whereupon the press is operated by means of the ram 51^a or any suitable actuating means and the platens are brought into closer relation thereby forcing the male die into the heated billet and performing the pressing operation, the parts assuming the position shown in Fig. 2 in which it will be noted that one of the male dies has passed through both stationary and temporary portions of the stripper and into the billet which latter rests upon the temporary die 13 which member in turn rests upon a fixed die block 55 set into the upper face of the base member C.

Upon the return stroke of the press the male die is withdrawn from the billet and the parts carried by the movable platen are movable to the lowered position indicated by the dotted lines in said Fig. 2 in which the guide pin 26 is withdrawn from the hollow guide post 25. The male die 22 is with-

drawn from the billet and from the strippers and the ejector 51 occupies a position remote from the die in alinement therewith, thus finishing the piercing operation.

The next step is to advance the die from position G to the position H which brings the pierced billet into alinement with the ejector 51. Assuming that another billet has been inserted in die I which at this time would occupy the position originally occupied by the die F, the next operation of the press would pierce a billet and eject a pierced billet, after which, the now empty die would advance from the position H contra clockwise to a position which will bring the die into alinement with the opening 56 through the shell of the base member. Immediately, however, after the pierced shell is ejected from the die, suitable cooling fluid is placed by any convenient means in the latest emptied die. Such cooling fluid may escape slowly in the passage of the die from the position H to the orifice 56 meanwhile performing its cooling function, but when any of the dies have moved into coincidence with said orifice 56 such cooling fluid as may remain therein flows rapidly from the die through such orifice but as the die is still quite hot its interior is dried sufficiently in the passage contra clockwise from the orifice 56 to the position indicated at F.

The filling, piercing, ejecting and cooling operations may be carried on practically continuously during the operation of the machine and any number of dies may be employed though for convenience of illustration four are shown.

The object of rotating the male dies is to insure proper cooling and such dies are advanced step by step within the convenience of the operator and any number of such male dies may be employed though it is desirable to employ a plurality of such dies so that each die may be held a sufficient time in a portable cooling bath after it has performed its function in connection with the heated billet.

For convenience of rotating die carrying collar 45 lugs *a* are formed thereon into openings of which a suitable tool or handle may be inserted to secure sufficient leverage to rotate said collar and likewise handles *b* project radially from the rotatable die socket for the same purpose.

The die socket is formed with a perimetrical flange *d* which is continuous except as shown at *e* said flange passing into a suitable recess therefor formed at 25^a in the guide post 25 and clamps B^2 coöperate with other portions of said flange to prevent excessive rocking motion of the die socket during operation of the machine. The said flange *d* is cut away at *e* as indicated in Fig. 1 to permit clearing the guide post when the machine is to be dismounted.

What we claim is:

1. In combination in a forging machine, a stationary support, a stationary die block set into a recess therein, a central pivot, a multiple die socket member rotatable on said pivot, a plurality of female dies open at their tops and bottoms set in said die socket member and locking means adapted to secure said female dies successively in position in register with said die block.

2. In combination in a forging machine, a stationary support, a stationary die block and a rotatable member having die sockets supported by said support and tubular female dies in said sockets adapted to successively register with said die block.

3. In combination in a forging machine, a base member, a fixed die block positioned thereon, a plural die socket member rotatably mounted on the base member, tubular dies in said die socket member and a pivot on which the die socket member can rotate to carry the several dies into register with said die block.

4. In combination in a forging machine, a base member, a fixed die block, a rotatable plurality of tubular female dies, a temporary die member adapted for insertion in said female dies and means adapted to permit said temporary die member to pass from said female dies.

5. In combination in a forging machine, a rotatable plurality of male dies and female dies, guiding and locking means therefor and a fixed die block rigidly supported in alinement with one of said female dies.

6. In combination in a forging machine, a base provided with a conduit and a fixed die block, a rotatable die socket member mounted on said support and a plurality of dies in said die socket member arranged to successively register with the die block and said conduit.

7. In combination in a forging machine, male and female dies, rotatable supports therefor, one of said supports being provided with a pivot pin socket, a pivot pin and a hollow guide post and the other support comprising a rotatable collar adapted to carry the male dies and a guide pin adapted to penetrate said post.

8. In a piercing machine, a rotatable male die carrying member, a guide pin central thereof, a plurality of male dies connected with said member, a support comprising a hollow guide post adapted to coöperate with said pin, a conduit, a pivotal rotary female die socket member and a plurality of tubular female dies in said die socket member adapted to successively register with said conduit.

9. In a piercing machine, a rotatable male die carrying member, a plurality of male dies connected with said member, a support comprising a conduit, a pivotal rotary fe-

male die socket member and a plurality of tubular female dies in said die socket member adapted to successively register with said conduit.

10. In combination in a forging machine, coöperating rotating male and female die carrying members, relatively movable supports for said members relatively fixed with respect to the latter, dies carried thereby and registering guiding means carried by said supports.

11. In a forging machine, opposing platens one of which is movable, supports fixedly secured to said platens one of which supports is provided with a die block and a fluid conduit, a rotatable collar carried by the other support carrying a plurality of male dies, a rotatable die socket member carried by the first mentioned support and a plurality of female dies in said socket member adapted to successively register with said die block and said conduit.

12. In a forging machine in combination, a platen, another platen movable relatively thereto, a support fixedly attached to each platen, coöperating guide members extending from said supports, a female die carrying member rotatable on one of said supports, means for locking said die carrying member in position, a rotatable male die support carried by the other support, male dies retained thereby and open bottom female dies in said female die carrier.

13. In combination in a forging machine, a platen, another platen relatively movable thereto, a base member on one of said platens, a circular trackway thereon, a rotatable die holding member having a circular trackway secured thereto, friction reducing means intermediate said trackways, a plurality of female dies in said die-holding member, a rotatable male die carrying member connected with the other of said platens and male dies carried thereby.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

CHARLES F. WALP.
ARTHUR F. O'LEARY.

Witnesses:
FRED A. HOFFMAN,
F. N. RITTER.