

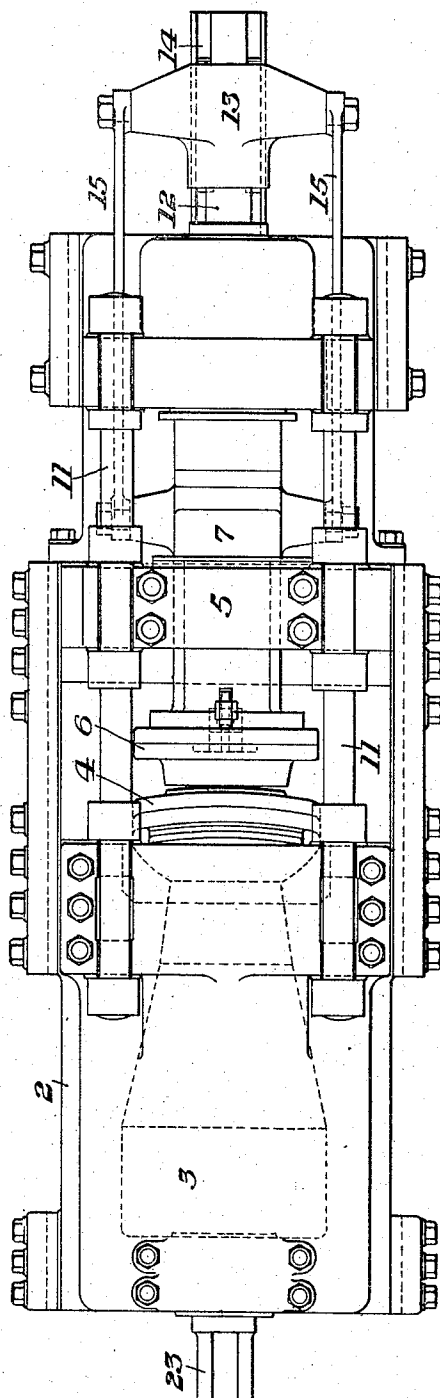
E. E. SLICK.
METAL FORGING APPARATUS.
APPLICATION FILED FEB. 20, 1911.

1,022,006.

Patented Apr. 2, 1912.

3 SHEETS-SHEET 1.

Fig. 1.



WITNESSES

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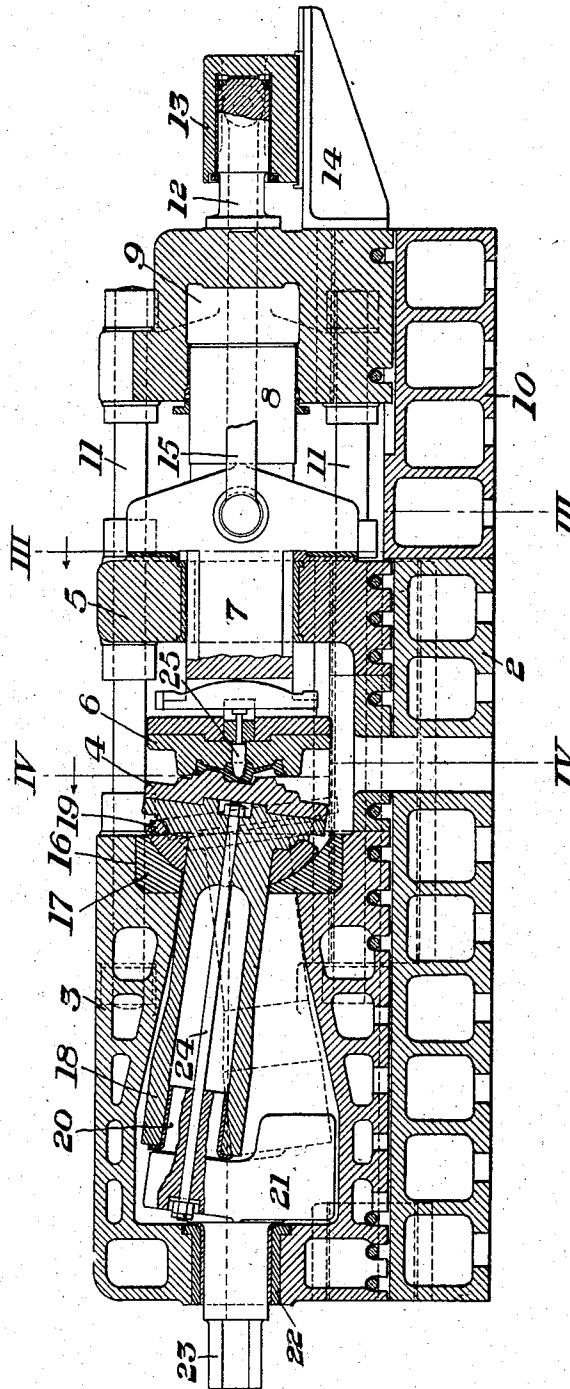
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Fig. 2.



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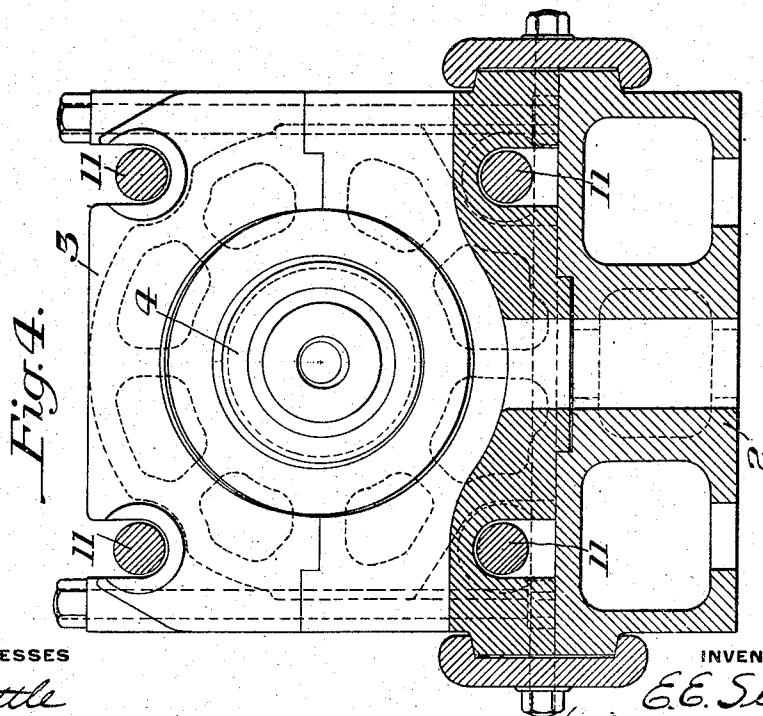
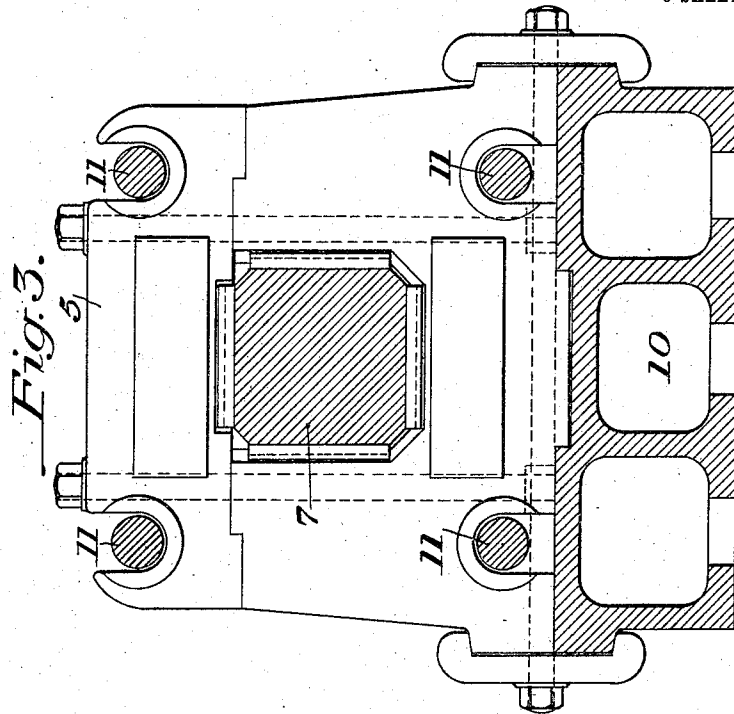
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UNITED STATES PATENT OFFICE.

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METAL-FORGING APPARATUS.

1,022,006.

Specification of Letters Patent. Patented Apr. 2, 1912.

Application filed February 20, 1911. Serial No. 609,719.

To all whom it may concern:

Be it known that I, EDWIN E. SLICK, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Metal-Forging Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to apparatus used in forging and more particularly relates to forging apparatus of the class shown in my earlier Patent No. 915,232, dated March 16, 1909, for a method of and apparatus for forging metal.

One difficulty met with in the operation of forging apparatus of the class to which this invention relates is to provide means for resisting the end thrust caused by the forging operations.

One object of this invention is to provide a simple and effective forging apparatus having novel means for forging metal blanks to the desired contour and size and having improved means whereby the forging apparatus is actuated.

Another object of my invention is to provide apparatus for forging having novel means for resisting the enormous end thrust developed in the operation of the apparatus and for extending the life of such thrust-resisting surfaces.

Referring to the drawings, Figure 1 is a plan showing forging apparatus constructed and arranged in accordance with my invention. Fig. 2 is a sectional side elevation of the apparatus shown in Fig. 1 showing the manner in which the one forging die is caused to wobble in imparting a forging movement to the apparatus. Fig. 3 is a sectional end elevation taken on the line III—III of Fig. 2, showing the manner in which one forging die shaft is mounted in the frame of the apparatus. Fig. 4 is a similar view, the section being taken on the line IV—IV of Fig. 2 showing the front of the wobbling die face forming part of this apparatus.

In the accompanying drawings, 2 designates the bed-plate or base-plate of the apparatus, having, as shown, a stationary bearing or support 3 for the wobbling die 4 and its shaft 18. Also mounted on the bed plate 2 is the bearing or support 5 for the shaft 7 which is arranged to be adjusted length-

wise in the support 5, in a direction parallel with the length of the base plate 2. A non-rotary forging die 6 is detachably secured on the flanged end of the die shaft 7 which is mounted in the support 5 and the rear end of the shaft 7 is provided with a plunger 8 projecting rearwardly into the stationary fluid pressure cylinder 9 which is mounted upon the extension 10 to the base plate 2. The cylinder 9 is rigidly connected to the bearing 5 by the tie-rods or bolts 11, these parts being also securely connected together through the base plate 2 and base plate extension 10. The rear end of the cylinder 9 is provided with a stationary piston 12 which extends into the movable pull-back cylinder 13, mounted on the shoe or sliding support 14 secured in place to the rear end of the cylinder 9, and the pull-back cylinder 13 is connected to the rear end of the die shaft 7 by means of the links or eye bars 15.

Mounted in the recess 16 in the front end of the bearing or support 3 is a removable bearing block 17 having a concave face and the outer end of the wobbling die shaft 18 is provided with a ring 19 having a convex spherical face co-acting with the concave face of the bearing block 16, the spherically faced ring 19 being detachably secured in place on the flanged end of the shaft 18.

The shaft 18, as shown, is made hollow and extending into the opening in this hollow shaft is the crank pin 20 on the crank 21 which is mounted in the bearing 22 provided in the rear end of the support 3. The crank 21 is provided with the usual wobbler 23 through which it is connected by the usual coupling box and driving spindle with a driving motor. The construction of this coupling mechanism being old and well known is not further described, and any desired type of motor may be employed in driving the forging apparatus.

A tie rod or bolt 24 extends through an opening provided for that purpose in the crank pin 20 and a similar opening in the die end of the shaft 18 to securely hold the parts in assembled position.

Preferably the stationary die 6 is provided with a forging pin 25 to center the blanks during the forging operation and to form an axial recess or hole in the forged blanks. Such pin however may be used or not, as is found necessary or considered desirable.

In the operation of my improved apparatus, fluid pressure is admitted to the pull-back cylinder 13 so as to retract the non-rotary die 6, this movement advancing the end of the plunger 8 into the cylinder 9 and causing the die 6 to move away from the die 4. A suitably shaped blank which ordinarily is heated is then placed between the opposing faces of the dies and fluid pressure is admitted to the cylinder 9 so as to advance the plunger 8, and, through the shaft 7, the die 6, so as to bring the opposing faces of the dies into engagement with the opposite faces of the blank to be forged. Before placing the blanks in position the driving motor is preferably started so as to rotate the crank 21, which will cause the wobbling shaft 18 describing a conical path whose apex is at or adjacent to the intersecting axial centers of the opposing dies. The rocking or wobbling movement of the shaft 18 and its die 4 is then continued while fluid pressure is being constantly applied to the plunger 8 so as to gradually advance the face of the die 6 toward the face of the opposing die 4 and the blank held between the die faces is forced into the cavities in the opposing die faces and is in this way forged to the desired contour and size. After the completion of the forging operation the die 6 is retracted and the so-formed blanks removed, and the above described operations are repeated as often as is required in the operation of my improved apparatus.

The advantages of my invention will be apparent to those skilled in the art. The die 6 is positively prevented from rotating and the wobbling die 4 is wobbled without positive rotation thereof, although there may be some slight rotative movement of the die 4 during the continued wobbling of this die. The thrust bearing formed by the spherical faces on the opposing bearing blocks provide a simple and effective means for taking up the enormous end thrust put upon the apparatus by the forging operations, which reduces the movement of the opposing thrust faces to a minimum.

The apparatus is simple and is easily kept in repair, and expensive delays in the operation of the apparatus caused in making repairs to the apparatus are avoided and overcome.

Modifications in the construction and arrangement of the parts may be made without departing from my invention as set forth in the claims. The shape of the forging dies may be modified in many ways to suit the particular article being forged, and other changes may be made.

I claim:—

1. Apparatus for forging comprising opposing dies, shafts on which the dies are

mounted, supports for said shafts, means for causing relative approach of said dies and means on the end of one die shaft arranged to wobble said die and shaft with respect to the support therefor.

2. Apparatus for forging comprising opposing dies, shafts on which the dies are mounted, supports for said shafts, means for causing relative approach of said dies and a driving shaft having a crank connection with one of said die shafts and arranged to wobble said die and shaft with respect to the support therefor.

3. Apparatus for forging comprising opposed die faces at an angle to each other, shafts on which said die faces are mounted, supports for said shafts, means for causing relative approach of said die faces and means including a crank connected to one shaft and arranged to wobble said die and shaft with respect to the support therefor.

4. Apparatus for forging comprising a die support, a die holder having a shaping die on one end thereof angularly mounted in the support and a rotatable crank connected to said die holder and arranged to wobble said die and shaft with respect to the support therefor.

5. Apparatus for forging comprising a support, a die holder having a forging face thereon angularly mounted in the support and a rotary driving shaft having a crank, said crank being connected to the angular die holder and arranged to wobble said die and shaft with respect to the support therefor.

6. Apparatus for forging comprising opposed die faces at an angle to each other, shafts on which said die faces are mounted, supports for said shafts, means for causing relative approach of said die faces and means including a crank connected to one shaft and arranged to wobble said die and shaft with respect to the support therefor.

7. Apparatus for forging comprising a forging die, a holder therefor, a support for the die holder, and means connected to the die holder arranged to wobble said die and shaft with respect to the support therefor.

8. Apparatus for forging comprising opposing dies, shafts for said dies, supports for the die shafts, means for moving one shaft on its support to cause relative approach of the dies, means on the opposite shaft for wobbling said shaft in its support and a thrust bearing on the wobbling shaft and shaft support, the contacting faces of said bearing having spherical faces.

9. Apparatus for forging comprising opposing dies, shafts for said dies, supports for the die shafts, means for moving one shaft on its support to cause relative approach of the dies, means on the opposite shaft for wobbling said shaft in its support and a thrust bearing on the wobbling shaft

and shaft support, the contacting faces of said bearing being one concave and the other convex.

10. Apparatus for forging comprising opposing dies, shafts for said dies, supports for the die shafts, means for moving one shaft on its support to cause relative approach of the dies, means on the opposite shaft for wabbling said shaft in its support, and a thrust bearing on the wabbling shaft and shaft support with a removable ring on the shaft having a convex face forming one bearing face of the thrust bearing.

11. Apparatus for forging comprising opposing dies, shafts for said dies, supports for the die shafts, means for moving one shaft on its support to cause relative approach of the dies, means on the opposite shaft for wabbling said shaft in its support, and a thrust bearing on the wabbling shaft and shaft support with a removable ring on the shaft support having a concave face forming one bearing face of said thrust bearing.

12. Apparatus for forging comprising opposing dies, shafts for said dies, supports for the die shafts, means for moving one shaft on its support to cause relative approach of the dies, means on the opposite shaft for wabbling said shaft in its support, and a thrust bearing on the wabbling shaft and shaft support, said bearing comprising removable rings on the shaft and shaft support with contacting spherical wearing faces.

13. Apparatus for forging comprising opposing die faces, supports therefor, one of said dies being mounted in its support to permit wabbling of said die with respect to its support and means for actuating said wabbling die.

In testimony whereof, I have hereunto set my hand.

EDWIN E. SLICK.

Witnesses:

G. W. NEILL,
H. M. CORWIN.