

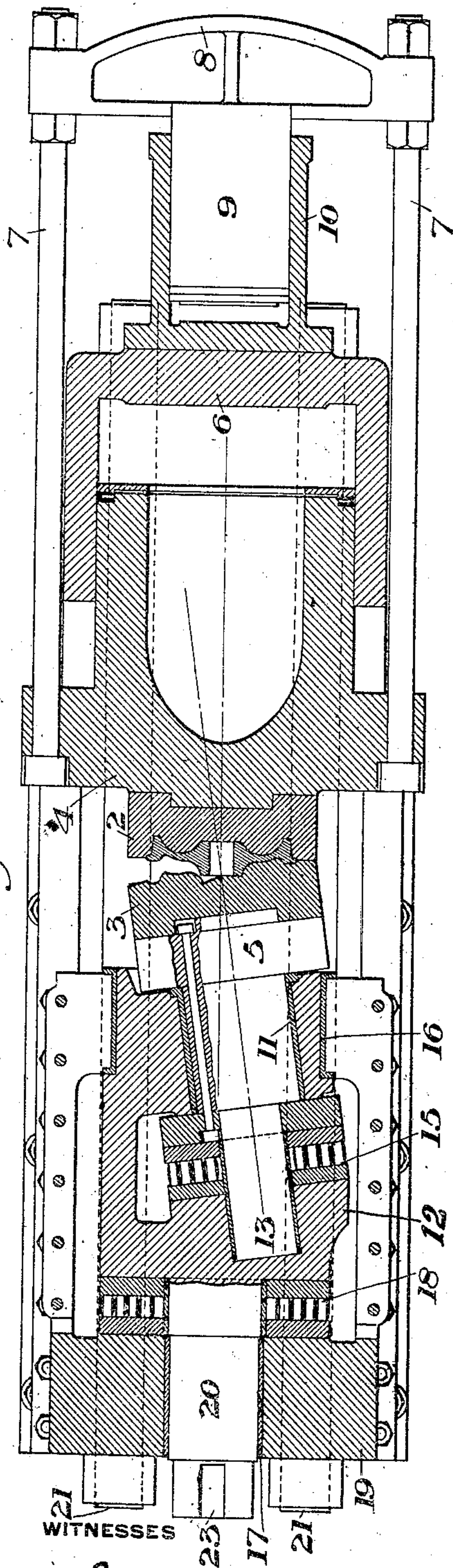
E. E. SLICK.
METHOD OF AND APPARATUS FOR FORGING METAL.
APPLICATION FILED DEC. 7, 1907.

915,232.

Patented Mar. 16, 1909.

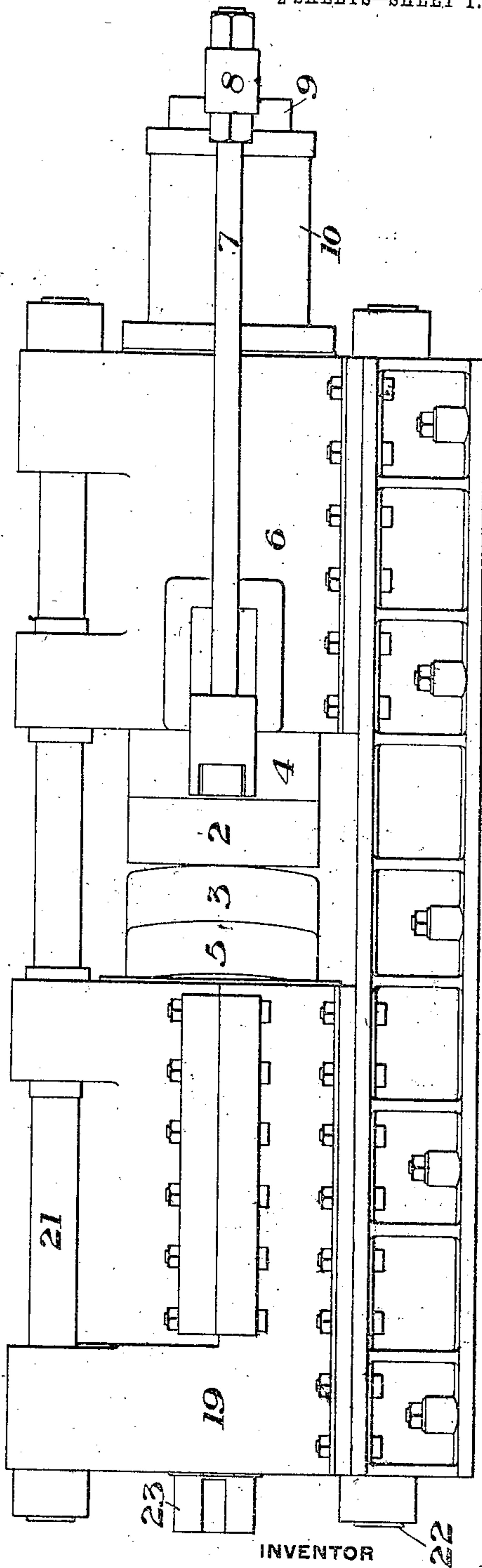
2 SHEETS—SHEET 1.

Fig. 1.



R. D. Little
W. W. Swartz.

Fig. 2.

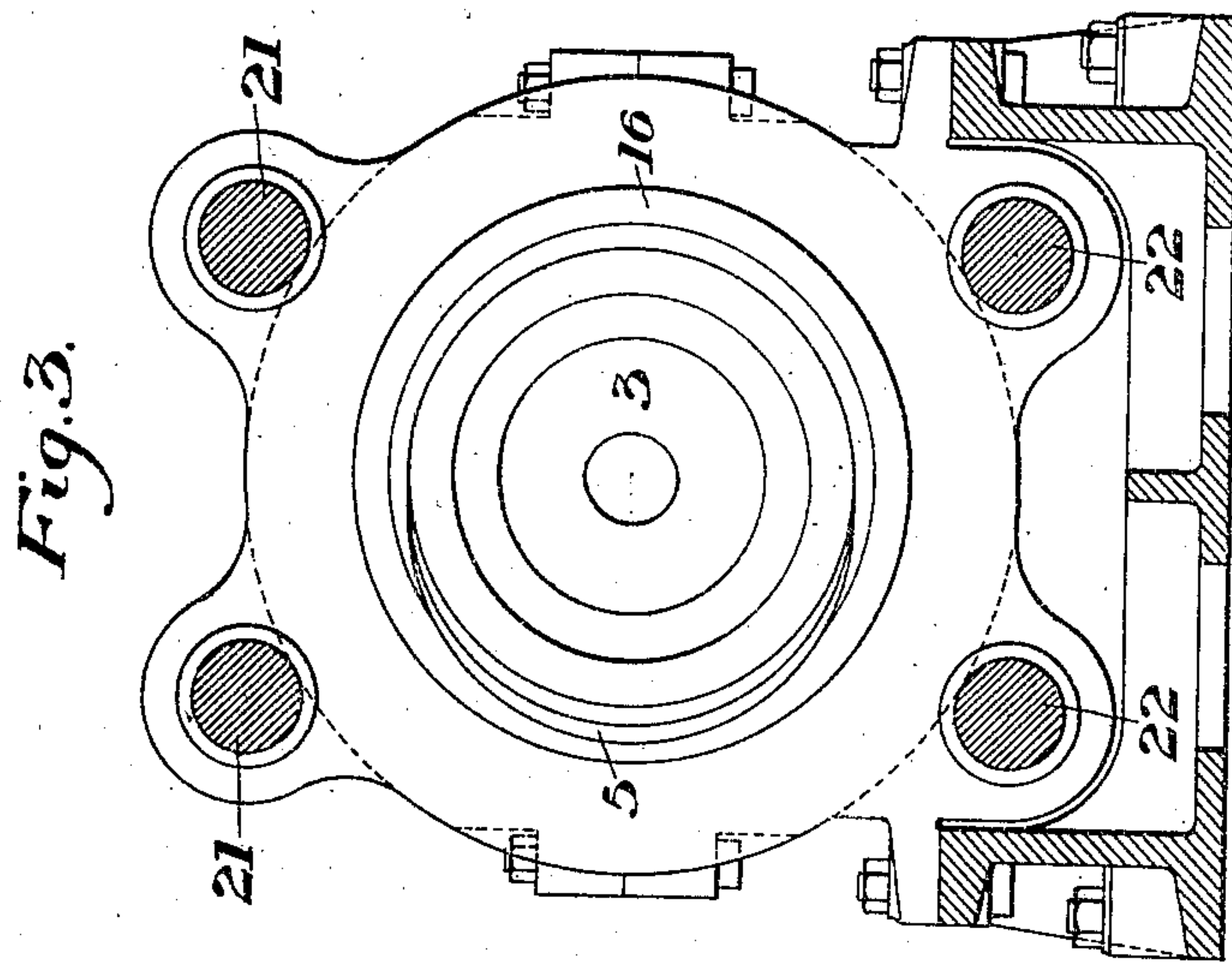


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WITNESSES

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UNITED STATES PATENT OFFICE

EDWIN E. SLICK, OF PITTSBURG, PENNSYLVANIA.

METHOD OF AND APPARATUS FOR FORGING METAL.

No. 915,232.

Specification of Letters Patent.

Patented March 16, 1909.

Application filed December 7, 1907. Serial No. 405,520.

To all whom it may concern:

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

Figure 1 is a sectional plan view showing one form of apparatus for carrying out my invention; Fig. 2 is a side elevation, and Fig. 3 is a face view of the wobbling shaft with the die removed.

My invention relates to the forming of objects such as steel car wheels, and is designed to provide a simple and effective process and apparatus by which the blank may be forged into the desired form. In my application No. 380678, filed June 25th, 1907, I describe a method and apparatus for this purpose, wherein rotating die surfaces are used with their axes at an angle to each other. In the present machine and process, I employ dies neither of which are positively rotated, but one of which is given a wobbling movement around and over the face of the other; that is, the face of the one die is rocked and its longitudinal axis moves in a conical path whose axis coincides with the axis of the other die.

In the drawings, 2 and 3 represent circular forging dies, each of which is removably bolted to supports 4 and 5. The support 4 forms the plunger of a hydraulic cylinder 6, the plunger having pull-back rods 7 connecting it to a rear cross-head 8 secured to or forming part of another plunger 9, in a hydraulic hold-back cylinder 10. The support 5 is a shaft or cylindrical support, seated within a bushing 11, carried in a rotary carrier 12. The longitudinal axis of the support 5 is at an angle to the axis of the support 2, these axes intersecting at about the point indicated. The support 5 has a rearward extension 13 of smaller diameter, and at the front end of which is a thrust collar 14 between the shoulder on the shaft and a roller bearing 15.

The carrier 12 is rotatably mounted on the same axis of rotation as the axis of the carrier 2, and is supported in suitable front and rear brasses or bushings 16 and 17, a roller thrust bearing 18 being provided between the carrier and the rear framework or housing 19.

20 is the shaft extension of the carrier 12, which is within the bearing 17.

Tie-rods 21 and 22 connect the parts of the frame which carry the two dies and receive the strains.

The dies 2 and 3 are provided with circular cavities cut therein, of the proper shape to form the object; in the present case a car wheel. These cavities form an inclosed shaping cavity at one side, this point of inclosing moving around as the die 3 rocks around in its gyratory or conical rocking movement.

In carrying out the process, the metal blank, either pierced or solid, is placed between the dies, pressure is applied to the cylinder 6 to force the dies into contact at one side, and power is applied to the wobbler 23 of the shaft 20 to rotate the carrier 12. As this carrier rotates, the die 3 is moved around in an orbital path but without any rotation on its own axis. As above stated, this movement is such that any point on the die 3 moves on the surface of a cone having its apex in the axis of the die 2. This intersection of the axes is important in forming car wheels, but is not essential, as the work may be done at any distance from the axes, and tires may be formed in this way. The pressure and rotation are continued until the wobbling movement of the die 3 in its movement around the blank has forced the hot metal into the mating cavities of the two dies and given the proper shape. The rotation of the carrier 12 may then be stopped, the plunger 4 retracted, and the metal removed.

The advantages of my invention result from the simplicity of the device, and the efficient forging action which takes place. Owing to this forging action taking place along successively different radii around the wheel, the entire pressure is concentrated successively along these different lines or parts, thus obtaining an efficient forging action with much less pressure than would be necessary if all parts were forged at the same time. The wheel may thus be forged at a lower heat than it could be if the forging action were applied to all parts at the same time, thus giving a better quality of metal in the finished wheel or article. The metal in the blank is allowed to flow freely to the desired shape, and scale is allowed to drop from between the dies, to give a smoother surface finish.

Many changes may be made in the form

and arrangement of the dies and their operating connections, the dies may be used for forming other articles, such as tires, flanges, and heads, and also blanks for gear wheels having cut teeth, and other articles, since I consider myself the first to use the non-rotating dies, one die having the circular rocking movement on the other. Several sets of dies may be employed in successively shaping the article.

I claim:—

1. The method of shaping metal, consisting in forcing it into a non-rotary die by rocking another die upon it in a circular path and simultaneously adjusting the distance between said dies; substantially as described.

2. The method of shaping articles between die cavities, consisting in rocking one die around a circular path, and forcing one of said dies against the other; substantially as described.

3. The method of shaping articles between die cavities, consisting in rocking one die around a circular path, and forcing the other die against the rocking die; substantially as described.

4. The method of shaping metal, consisting in forcing it between coacting die faces, by rocking one die in a circular path while holding the other die against rotation and limiting outward flow of the metal at all points in the circumference; substantially as described.

5. In forging apparatus, a pair of dies, means for varying the distance between said dies, and connections arranged to rock one die in a circular path without rotation thereof; substantially as described.

6. In apparatus for forging metal, a pair of dies having concentric cavities, means for forcing one of said dies toward the other, and connections arranged to rock one die in a circular path upon the other while both are held against rotation; substantially as described.

7. In apparatus for forging metal, a pair of dies having coacting cavities arranged to shape the metal to its desired form, arranged with their faces at an angle to each other, mechanism for rocking one die in a circular path, and mechanism for forcing one of said

dies toward the other; substantially as described.

8. In apparatus for forging metal, a pair of dies having coacting cavities arranged to shape the metal to its desired form, arranged with their faces at an angle to each other, mechanism for rocking one die in a circular path, and mechanism for forcing the other die toward the rocking die; substantially as described.

9. In a forging press, a rotating die carrier, and a die holder having a shaping surface on one end rotatably mounted therein at an angle to the axis of the carrier; substantially as described.

10. In a forging machine, a rotary die holder, and a non-rotating die holder arranged to support the opposite die, said dies having annular coacting die cavities; the dies being arranged to forge the metal on successively different radii; substantially as described.

11. The method of shaping metal, consisting in forming it between opposing die faces by forcing it into the die cavities of one of said dies by rocking the opposing die upon it in a circular path; substantially as described.

12. In a forging press, a carrier, means for rotating the same and a rotatable shaft angularly mounted in the carrier and having a die or shaping surface on one of its ends; substantially as described.

13. The method of forming metal consisting in forcing it into annular concentric die cavities of two opposing dies by rocking one die upon it in a circular path; substantially as described.

14. The method of forming metal consisting in forcing it into annular concentric die cavities of two opposing dies by rocking one die upon it in a circular path and gradually decreasing the distance between the opposing faces of said dies; substantially as described.

In testimony whereof, I have hereunto set my hand.

EDWIN E. SLICK.

Witnesses:

GEO. B. BLEMING,
R. D. LITTLE.