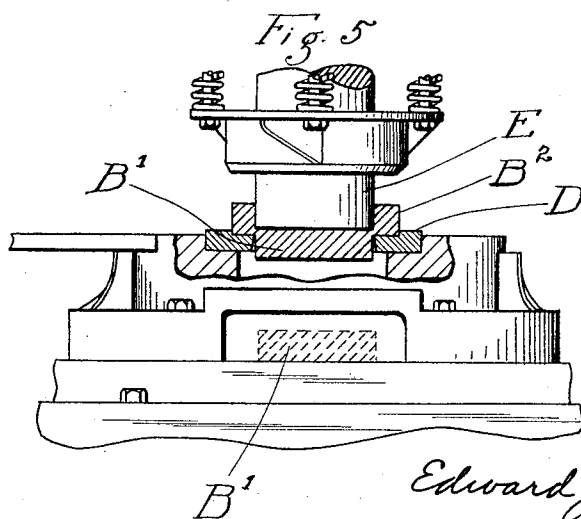
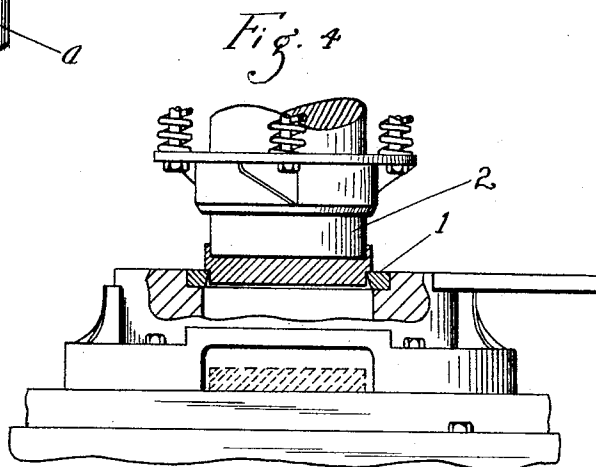
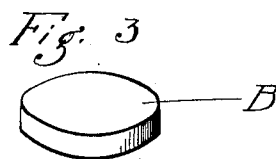
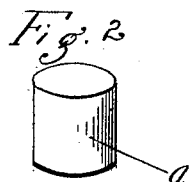
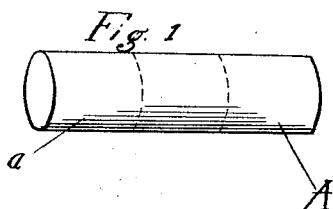


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APPLICATION FILED NOV. 17, 1919.

1,396,281.

Patented Nov. 8, 1921.

3 SHEETS—SHEET 1.



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Fig. 8

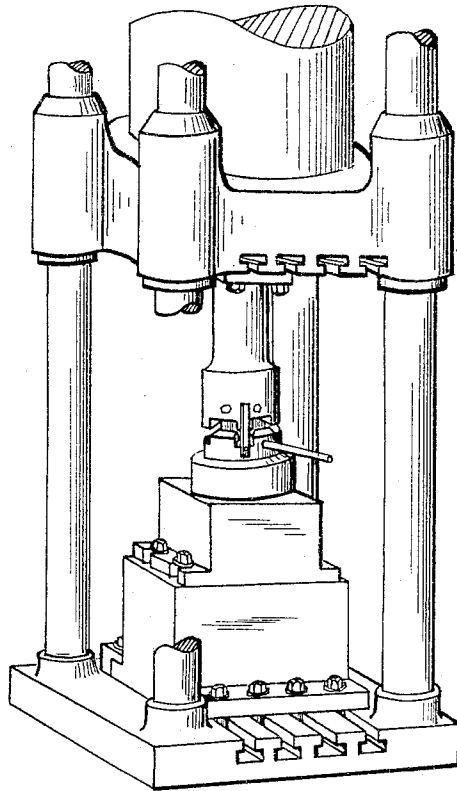
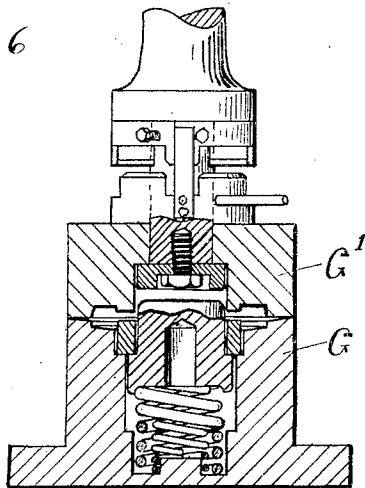


Fig. 6

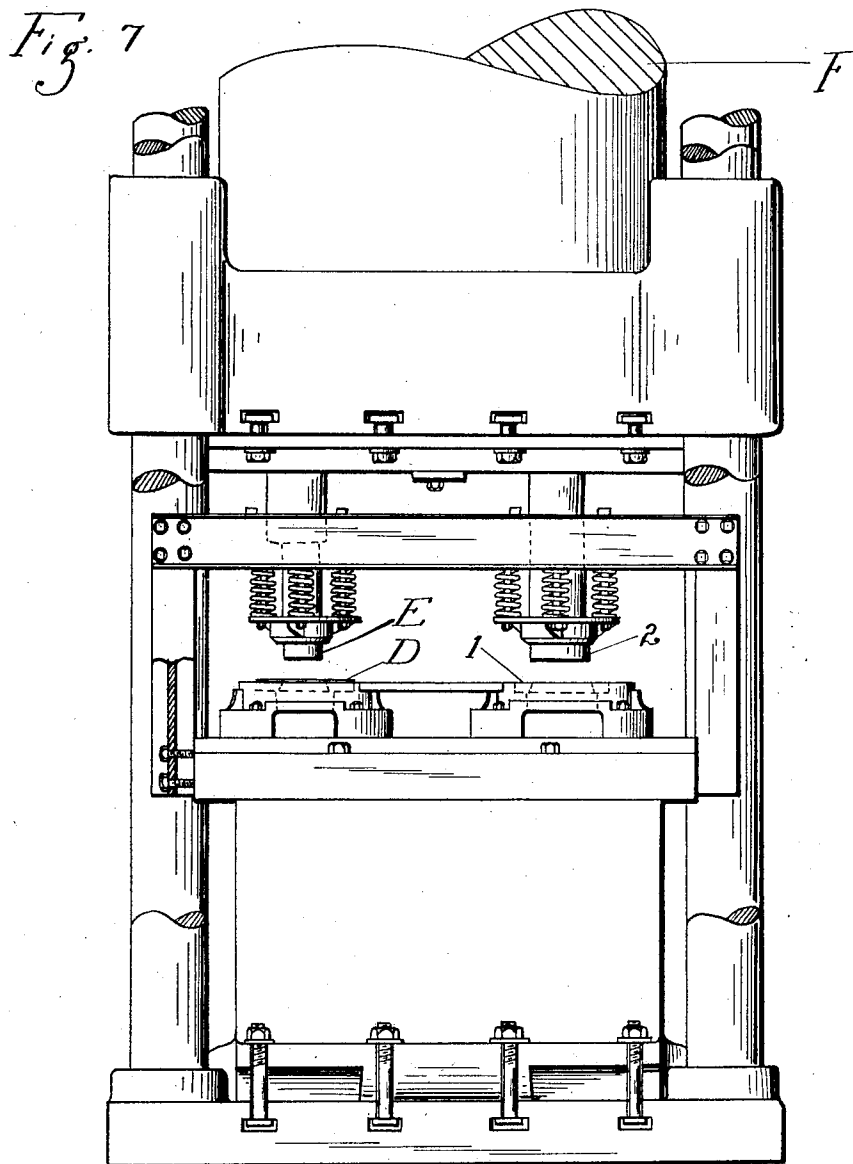


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UNITED STATES PATENT OFFICE.

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PROCESS OF FORMING METAL ARTICLES.

1,396,281.

Specification of Letters Patent.

Patented Nov. 8, 1921.

Application filed November 17, 1919. Serial No. 338,578.

To all whom it may concern:

Be it known that I, EDWARD J. PAQUE, a citizen of the United States of America, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Processes of Forming Metal Articles, of which the following is a specification.

The object of my invention is a process for forming metal blanks, in which the grain of the metal is of finer and more uniform structure.

In the accompanying drawings I have illustrated the form of the metal in the successive steps and machines by means of which the steps may be taken.

Referring to the accompanying drawings:

Figures 1, 2 and 3 are perspective views of a billet, a slug cut therefrom and a disk formed from the slug, respectively.

Fig. 4, is a detail view partly in section and partly in side elevation of a die and punch adapted to trim the edges of the disk.

Fig. 5, is a similar view of a die and punch adapted to press the center from the ring.

Fig. 6, is a view partly in section and partly in elevation of apparatus adapted to compress the blank to form the finished article.

Fig. 7, is a view partly in front elevation and partly in section of a hydraulic press which comprises the edge trimming and the center press shown in Figs. 4 and 5.

Fig. 8, is a similar view of a hydraulic press containing the compressor shown in Fig. 6.

The steps of my process are as follows:—

First, a steel billet A, which has been formed by rolling by the usual rolling process, is cut transversely into a series of slugs *a*, each slug of which contains sufficient material to form a disk from which the article is to be made. Then a slug is set upon its end, as illustrated in Fig. 2, and is compressed in the direction of its axis by a steady pressure, such as is exerted by a hydraulic press, to form a disk B. The slug *a* in being changed into the disk B is subjected to a force at right angles to that to which it was subjected in being formed into

the billet. This refines the grain and increases the strength of the metal.

The second step in the process is to trim the edges of the disk. This is done by resting it upon a die 1, through which it is forced by a hydraulic punch 2.

The third step in the operation is to press the center from the disk by a slow, steady pressure, as contrasted with a series of short blows. This slow continuous pressure performs the removal of the center of the disk in one operation, thus preventing the cooling of the metal which occurs where a succession of blows is utilized, and preventing deterioration of the metal, which occurs from working the metal when cold.

In performing the third step of the operation, disk B is supported upon a die D, which has a central opening of the size of the plug B' which is to be removed from the disk. A punch E of the diameter of the hole in the die D may be utilized for removing the plug B' from the disk. Punch E may be actuated by a hydraulic press F. Since the plug B' has been removed by this steady pressure, the grain of the steel therein has not been deleteriously affected, and it may be utilized for forming smaller articles without further processing.

The fourth operation is to form the ring B², which has been formed from the disk B, into the finished article. This is done by compressing the ring between dies G, G', which are actuated by a slow continuous force, such as exerted by hydraulic pressure. The dies G, G' have complementary recesses which together are of the shape of the article. The steady pressure on these dies likewise enhances the character of the metal.

What I claim is:—

1. A process for forming a metal ring, which comprises first removing a slug from a longitudinally rolled billet by cutting it transversely, second, forming from the slug a disk that has a substantially greater transverse and smaller longitudinal dimensions than the slug by compressing it longitudinally, and third, forming from the disk the ring by pressing a plug from the center of the disk.

2. A process for forming a metal article, which comprises first removing a slug from a longitudinally rolled billet by cutting it transversely, second, forming from the slug
5 a disk that has a substantially greater transverse and smaller longitudinal dimensions than the slug by compressing it longitudinally, third, forming from the disk a ring by pressing a plug from the center of the disk, and fourth, compressing the ring lon- 10
gitudinally between dies to form the metal article.

In testimony whereof, I have hereunto subscribed my name this 12th day of November, 1919.

EDWARD J. PAQUE.