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METHOD OF AND APPARATUS FOR FORMING RIFLED BORES IN METAL.

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1,328,077. Patented Jan. 13, 1920.

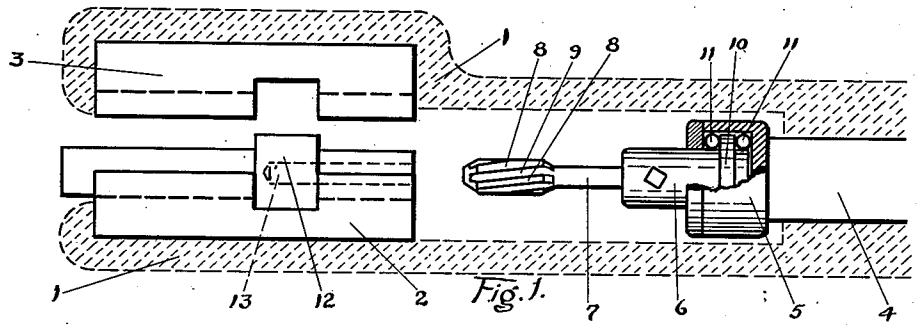


Fig. 1.

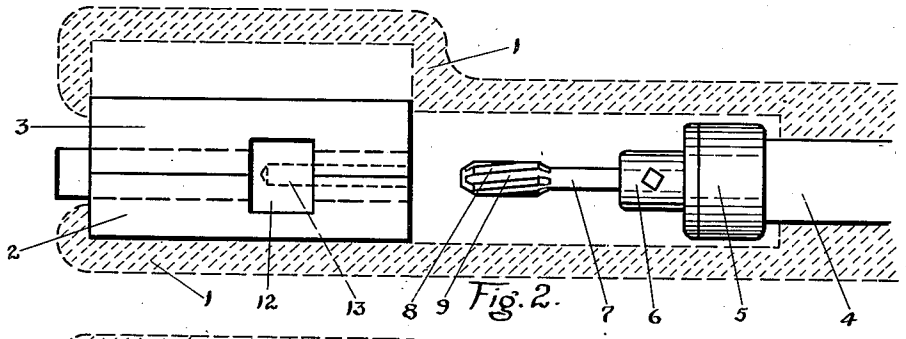


Fig. 2.

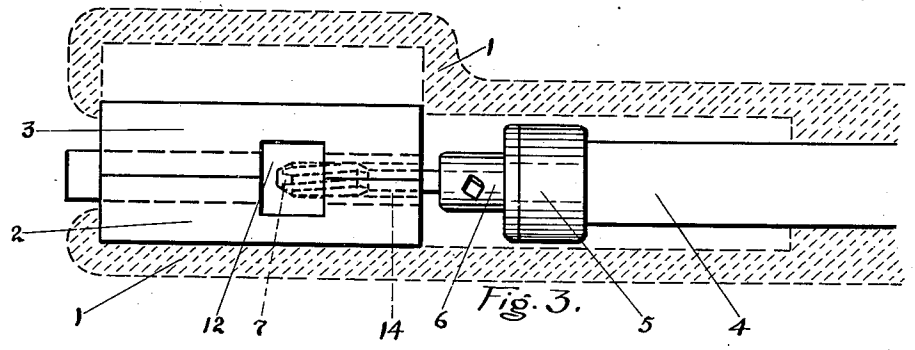


Fig. 3.

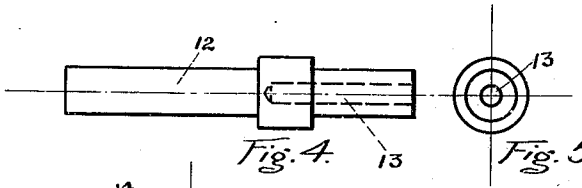


Fig. 4. Fig. 5.

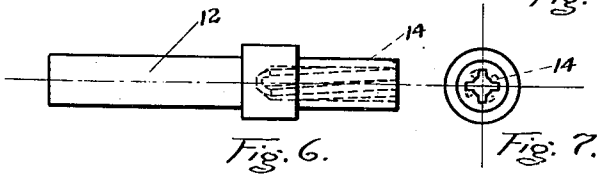


Fig. 6. Fig. 7.

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METHOD OF AND APPARATUS FOR FORMING RIFLED BORES IN METAL.

1,328,077. Specification of Letters Patent. **Patented Jan. 13, 1920.**

Application filed October 31, 1916. Serial No. 128,647.

To all whom it may concern:

Be it known that I, LEWIS E. BOYER, a citizen of the United States, residing at Easton, in the county of Northampton and State of Pennsylvania, have invented a certain new and useful Improvement in the Methods of and Apparatus for Forming Rifled Bores in Metal, of which the following is a specification.

This invention relates to an improved method of and apparatus for imparting a spiral or rifled conformation to the walls of bores in metal or articles formed of metal.

In constructing such articles as rock drill pistons, for instance, which have an internal rifled bore arranged, in use, to engage a rifle bar, for rotation purposes, it has heretofore been necessary to bore out a comparatively large portion of the center of the piston, to screw-thread the interior of this cavity and then insert therein a tubular nut the interior surface of which has been previously rifled. The employment of this method has been compulsory owing to the fact that it has been impossible to economically rifle the wall of a bore which is open at but one end, or which, being open at both ends, has an opening at only one end of a diameter equal to or greater than that of the bore. Pistons produced with this construction have been uniformly weak and subject to breakage owing to the loss of metal sustained, and the frequent loosening of the rifle nut in use has been an additional serious disadvantage.

The object of the present invention is to eliminate the use of a rifle nut or other intermediate means and their accompanying evils by applying the rifled conformation of the inner bore of the piston directly to the wall of the bore itself by forging, whereby the bore may be rifled more perfectly and more expeditiously than by previously known methods, resulting in a piston structure which will be more efficient in operation and possessed of increased strength and durability.

In the accompanying drawings I have illustrated an apparatus for carrying out my improved method, in which—

Figures 1, 2 and 3 show the successive steps in the cycle of operations incident to the execution of the process,

Figs. 4 and 5, respectively, side and end views of a rock drill piston blank preparatory to being treated by the present method, and

Figs. 6 and 7, side and end views, respectively, of the piston blank subsequent to its treatment, provided with a rifled interior bore.

I have here shown my method as carried out in connection with a heading machine the body 1 of which supports a pair of article holding dies or jaws 2 and 3, the jaw 2 being stationary and the jaw 3 movable. Coacting with the jaws 2 and 3 is a plunger 4 which has a reciprocatory movement, carrying a head block 5 in which is mounted a cylindrical punch holder 6. In this holder 6 is keyed or otherwise suitably secured a punch or former 7 which acts as a rifling member, provided with spiral flutes 8 and grooves 9. The holder 6 is revolubly mounted in the head block 5, being provided for this purpose with a circumferential flange 10 the opposite sides of which bear against balls 11 so that the rifling member 7 is at all times freely revoluble.

The above described apparatus is utilized to carry out my improved method in the following manner. The piston blank or other article 12 to be treated is first provided with a preliminary cylindrical bore 13 of the desired length but of a diameter preferably slightly less than that finally desired. The article 12 is then heated to the required forging temperature and placed between the jaws 2 and 3, this step being illustrated in Fig. 1. The machine is then operated to close the movable jaw 3 upon the stationary jaw 2 and article 12 as shown in Fig. 2. The plunger 4 carrying the head block 5 and revoluble rifling member 7 is then advanced toward the article 12 as shown in Fig. 3, the rifling member 7 entering the bore 13 and traveling to the limit of its movement. The rifled member in passing into the bore 13 revolves freely and as it is forced in the spiral flutes 8 each forges a corresponding spiral channel or groove in the wall of the bore 13, the metal displaced thereby contributing toward the formation of flutes therein corresponding to the grooves 9 in the rifled member. The plunger 4 and punch 7 are then retracted to the position shown in Fig. 2 and the jaws finally opened to the position at the commencement of the operation illustrated in

Fig. 1, the whole operation above described being completed within the space of a fraction of a second. The rifled bore 14 produced by the herein described method is perfectly formed, and requires no further treatment except cleaning by a sand blast or other means.

In forming a rifled bore by the employment of this method it is not always necessary to first provide the article with a preliminary bore, or when the article to be treated is of comparatively soft material the preliminary heating of the same could be dispensed with, and it is to be understood that instead of having the plunger 4 reciprocable the article 12 could be moved theretoward, and instead of having the rifled punch 7 revoluble the article 12 might be caused to revolve, the essence of the invention comprising the formation of a bore with an interior rifled conformation by the use of a rifled member, in the manner above described.

What I claim is:

1. The method of imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging which consists in forcing a rifling member thereinto but not beyond the same and withdrawing the rifling member therefrom through the same end by a quick reciprocatory movement, whereby the contour of the wall of the bore formed in the article will correspond with that of the rifling member.

2. The method of imparting a rifled conformation to the interior of a metal article which consists in forcing a freely revoluble rifling member thereinto and withdrawing the same therefrom, whereby the contour of the wall of the bore formed in the article will correspond with that of the rifling member.

3. The method of imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging which consists in providing the article with a preliminary bore, forcing a rifling member into but not beyond the said bore and withdrawing the rifling member therefrom through the same end by a quick reciprocatory movement, whereby the contour of the wall of the bore will correspond with that of the rifling member.

4. The method of imparting a rifled conformation to the interior of a metal article which consists in providing the article with a preliminary cylindrical bore, forcing a freely revoluble rifling member thereinto and withdrawing the same therefrom, whereby the contour of the wall of the bore will correspond with that of the rifling member.

5. The method of imparting a rifled conformation to the interior of a metal article which consists in providing the article with a preliminary bore of a diameter less than that finally desired, forcing a freely revoluble rifling member thereinto and withdrawing the same therefrom, whereby the contour of the wall of the bore will correspond with that of the rifling member.

6. The method of imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging which consists in preparing the article for forging, forcing a rifling member thereinto but not therebeyond and withdrawing the same therefrom through the same end by a quick reciprocatory movement, whereby the contour of the wall of the bore will correspond with that of the rifling member.

7. The method of imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging which consists in providing the article with a preliminary bore, preparing the article for forging, forcing a rifling member into but not beyond the said bore and withdrawing the same therefrom through the same end by a quick reciprocatory movement, whereby the contour of the wall of the bore will correspond with that of the rifling member.

8. The method of imparting a rifled conformation to the interior of a metal article which consists in providing the article with a preliminary bore of a diameter less than finally desired, heating the article, forcing a freely revoluble rifling member into the said bore and withdrawing the rifling member therefrom, whereby the contour of the wall of the bore will correspond with that of the rifling member.

9. An apparatus for imparting a rifled conformation to the wall of an end-inclosed bore in a metal article by forging comprising article supporting means and means to force a rifling member into but not beyond the article and to withdraw the rifling member through the same end by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

10. An apparatus for imparting a rifled conformation to the wall of an end-inclosed bore in a metal article by forging comprising article supporting means and means to force a freely revoluble rifling member into but not beyond the article and to withdraw the rifling member through the same end by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

11. An apparatus for imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging comprising means for supporting the article to be rifled and a rifling member arranged to be forced into but not beyond said article

and withdrawn therefrom through the same end of the article by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

12. An apparatus for imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging comprising means for supporting the article to be rifled and a freely revoluble rifling member arranged to be forced into but not beyond said article and withdrawn therefrom by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

13. An apparatus for imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging comprising article holding means, means for supporting a rifling member, one of said means being revoluble, the said rifling member being arranged to be forced into but not beyond the article and withdrawn therefrom through the same end of the article by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

14. An apparatus for imparting a rifled conformation to the interior of a metal article comprising article holding means, means for supporting a rifling member, one of said means being freely revoluble, the said rifling member being arranged to be forced into but not beyond the article and withdrawn therefrom.

15. An apparatus for imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging comprising article supporting means, a plunger, a rifling member mounted on said plunger and arranged to be forced into but not beyond said article and withdrawn therefrom through the same end of the article by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

16. An apparatus for imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging comprising article supporting means, a reciprocating plunger associated therewith and a rifling member revolubly mounted on said plunger and arranged to be forced into but not beyond said article and withdrawn therefrom through the same end of the article by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

17. An apparatus for imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging comprising article holding jaws, a plunger and a rifling member carried by said plunger arranged to be forced into but not beyond said article and withdrawn therefrom through the same end of the article by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

18. An apparatus for imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging comprising a plurality of article holding jaws, a reciprocating plunger, a freely revoluble rifling member carried by said plunger and arranged to be forced into but not beyond said article and withdrawn therefrom by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

19. An apparatus for imparting a rifled conformation to a single-ended bore forming the interior of a metal article by forging comprising a pair of article holding jaws, a reciprocating plunger coacting therewith, a head block on said plunger, a freely revoluble holding member housed in said plunger and a rifling member secured in said holding member arranged to be forced into but not beyond the article to be rifled as the plunger is reciprocated and to be withdrawn therefrom by a quick reciprocatory movement, the resultant contour of the interior corresponding with the rifling member.

In testimony whereof I have hereunto set my hand.

LEWIS E. BOYER.