

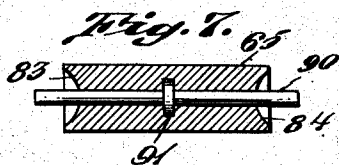
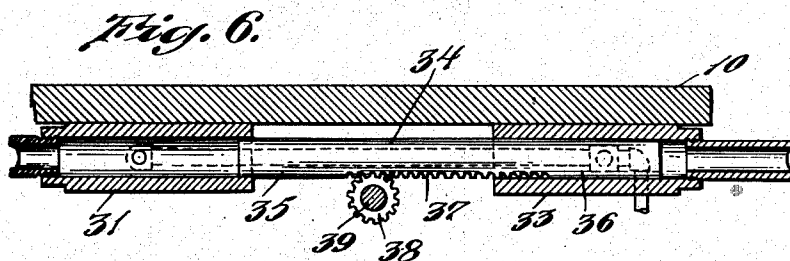
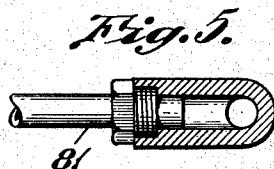
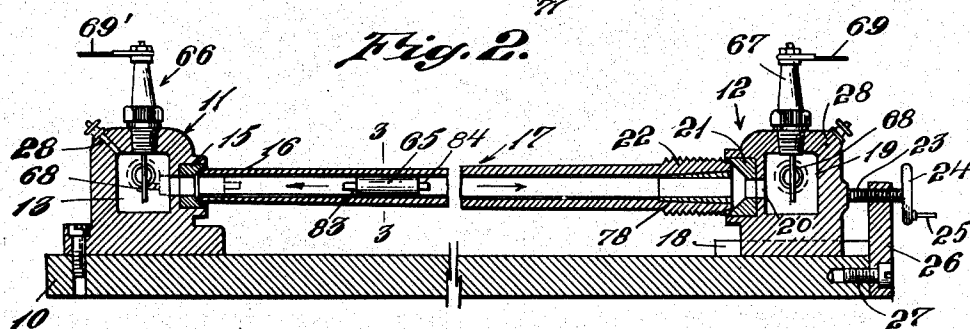
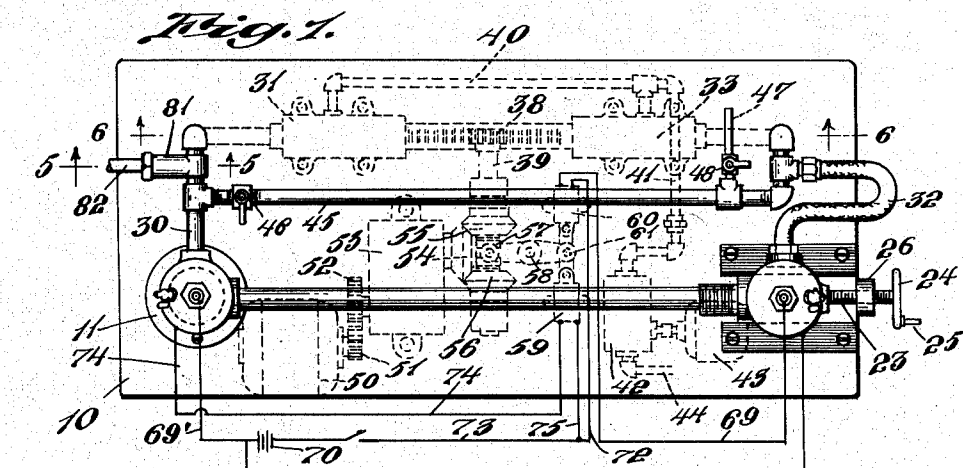
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RIFLE BARREL LAPPING MACHINE

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RIFLE BARREL LAPPING MACHINE

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11 Claims. (Cl. 51—59)

This invention relates to a machine for lapping the bore of a gun barrel and the rifling thereof.

It has been usual in the lapping of the rifled bore of a gun barrel to force the lapping tool through the barrel back and forth by reason of the long ram rod. This ram rod occupies considerable space and requires the force to be applied through the long length rod which is undesirable. In performing this operation, it is usual to lap the lands of the barrel and thereafter change tools and lap the rifling or helical grooves of the barrel requiring the changing of tools during the completion of the operation.

One of the objects of this invention is to provide a machine which will be more compact in that the long ram rod for forcing the lapping tool back and forth through the barrel will be eliminated.

Another object of the invention is to provide a lapping tool which may be used for lapping the lands of the barrel and thereafter expanded without removal from the barrel to lap the helical rifling groove thereof.

Another object of the invention is to provide an arrangement so that the force applied to the lapping tool may be through hydraulic means.

A further object of the invention is to utilize this hydraulic means for expanding the tool after the lapping of the lands for thereafter lapping of the rifling groove.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawing:

Fig. 1 is a top plan view illustrating the main portions of this device in full lines, some of the usual operating mechanism as beneath the bed plate and in dotted lines;

Fig. 2 is a sectional view through the rifling barrel and the bed plate;

Fig. 3 is a section on line 3—3 of Fig. 2 prior to expanding of the lapping plug;

Fig. 4 is a similar section after expanding of the lapping plug;

Fig. 5 is a section on substantially line 5—5 of Fig. 1;

Fig. 6 is a section on substantially line 6—6 of Fig. 1;

Fig. 7 is a sectional view in detail of the plug.

In order to avoid the use of a long rod for manipulation of a lapping tool, I have provided the lapping tool of a soft material which may be expanded upon exercise of substantial pressure and have provided for the reciprocation of this

lapping tool by hydraulic means, fluid being used to force the lapping tool first in one direction and then in the other direction, means being provided for the travel or supply and withdrawal of the fluid on opposite sides of the lapping tool as the same is reciprocated. The lapping tool may be expanded so the lapping tool will enter the helical groove of the barrel and then the lapping continued that the grooved or rifled portion of the barrel may be lapped.

With reference to the drawing, 10 designates a bed plate upon which I have provided a fixed head 11 and a movable head 12. The fixed head contains a hydraulic chamber having an opening 14 and a soft packing 15 such as of "neoprene" surrounding the opening 14 and for the reception of one end 16 of the gun barrel designated generally 17. The other head 12 is slidably mounted on gibs 18 and has a hydraulic chamber 19 provided with an opening 20 about which there is soft packing 21 such as "neoprene" for the reception of the threaded end 22 of the barrel 17. When this head 12 is moved toward the head 11 with the barrel in the position illustrated in Fig. 2, the soft packing forms a tight connection between the chambers 13 and 19 and the bore of the barrel 17. The head 12 may be moved toward and from its position of sealing the barrel in place by means of the threaded shaft 23 and wheel 24 having handle 25 thereon, the same being threaded through a standard 26 secured to the bed plate by means of bolts 27. Air valves 28 are provided in each of the chambers 13 and 19.

The chamber 13 has conduit 30 connecting it to the cylinder 31 (see also Fig. 6) while the chamber 19 has a flexible conduit 32 connecting it to cylinder 33 (see also Fig. 6). Between these cylinders a rod 34 is provided forming a piston plunger 35 for the cylinder 31 and piston plunger 36 for the cylinder 33, the rod being provided with rack teeth 37 between these portions which engages with a pinion 38 on shaft 39 for the manipulation thereof.

The cylinders 31 and 33 are supplied with fluid through common pipe 40 communicating with conduit 41 and supply pump 42 operated by motor 43 and connected as at 44 to any suitable supply line. The transmission conduits 30 and 32 are connected together by conduit 45 having a shut-off valve 46 therein and form an arrangement for a drain of the chambers 13 and 19 by means of a conduit 47 having a shut-off valve 48 in the line.

Power is supplied to the pinion 38 by an electric motor 50 acting through pinion gear 51, gear

52 into transmission gear box 53, from which bevel gear 54 is driven continuously in one direction. Shaft 39 has loosely mounted thereon bevel gears 55 and 56 meshing gear 54 while between these gears there is a clutch 57 keyed on shaft 39. This clutch may be moved into engagement either with gear 55 or gear 56 by lever 57 pivoted as at 58 and operated electrically such as by solenoids 59 and 60 to throw the end 61 of this lever back and forth. It will be apparent that when the bar 34 is moved to the left, as shown in Fig. 6, so that its plunger 35 moves into the cylinder 31, the liquid is going to be forced from the cylinder 31 and into the end 16 of the barrel 17 to force the lapping tool 65 to the right as shown in Figs. 1 and 2, and this movement will occur until the rack terminates such movement or is driven in the opposite direction.

In order to provide for this opposite drive, I have provided electrical connections 66 and 67 in the cylinders 11 and 12. Each of these consists of a flexible contact 68 which is insulated from the chamber and provides a means for electric wire 69, 69' to establish a communication into the middle portion of the chamber without short-circuiting to the ground of the chambers 11 and 12. The fluid used will be a non-electrical conductor. The lapping plug 65 is an electrical conductor and as it moves through the bore toward the end of its stroke it will contact the flexible wire 68 at one end and at the same time will be in communication with the wall edges about the opening 20 and thus will form an electrical connection from the flexible contact 68 to the chamber and complete the operating circuit through the electrical wires (to be described) to the solenoids to reverse the drive of the pinion 38 and consequently the flow of the liquid which is used to actuate the lapping tool. There will be sufficient flexibility in the contact 68 so that the time element for reverse will be accomplished for the mechanical shifting of the clutch to perform the desired function.

Electrical circuit of the solenoids for performing this shifting may be traced from the battery 70 through line 71 to the ground or cylinder 12 while the lead-in wire 69 will extend to solenoids 66 and thence from solenoids 66 through line 72 and 73 back to the battery. The wiring connection to the other electrical connection in chamber 11 is from battery 70 through line 69' to the chamber, thence through line 74 or the ground from the head 11 to the solenoid 59 and thence back through wire 75 and common line 73 to the battery.

It will be understood of course that the areas of the end of the plug 65 are greater than the total cross sectional areas of the grooves in the barrel so that the plug will reciprocate rather than the fluid passing by the plug through the grooves of the rifling.

By the arrangement so far described, it will be apparent that I may automatically reciprocate the plug 65 placed in the barrel 17 and which plug is cylindrical in shape, until the desired lapping has been performed on the lands of the barrel. A tapered bushing 78 in the enlarged threaded end of the barrel provides for a cylindrical surface for the guiding of this lapping plug.

After the lapping of the lands has been provided for, with the tool 65 in the shape shown in cross section in Fig. 3, it is desirable that lapping be provided for the grooves 80 which have been previously formed in the barrel and in or-

der to provide this function, I desire to change the shape of the plug 65 which will be of lead or some soft alloy.

The plug 65 is formed of some soft metal such as lead or an alloy of lead and is molded about a steel pin 90 having an enlargement 91 to prevent the pin being removed from the plug. The opposite ends 83 and 84 of this plug are concave to increase the area and also to so thin the portions at the end that they may be readily expanded to take up any wear which the first operation of lapping may have caused and also to cause the portions thereof to enter the rifling grooves into which this plug is expanded upon the application of the hydraulic pressure thereto.

For expanding of the tool 65, I have provided a connection 81 (see Figs. 1 and 5) to the conduit 30 with the conduit 82 connecting to some means for boosting the pressure in the system. The bar 34 will be stopped at some location so that the tool 65 will be intermediate the ends of the barrel along a portion thereof when rifling occurs. The valves 46 and 48 will be closed. The application of pressure from the booster will be applied to the end surface 83 of the plug 65 and will be resisted by reason of the end surface 84 of the plug which cannot move because the fluid in the system cannot flow. These surfaces will be of areas considerably greater than the cross sectional areas of the grooves which are to be lapped and the plug being of soft expandible material will expand into these grooves becoming foreshortened in an amount necessary for the flowing of the material into the grooves; and after this has been performed, pressure will be released and the lapping will continue with the plug now in the shape shown at 85 (Fig. 4) until the grooves 80 have been lapped.

I claim:

1. A machine for lapping the bore of a gun barrel comprising spaced supports having means thereon for mounting a gun barrel therebetween, a lapping tool in the barrel bore, a closed circuit including a liquid in said gun barrel, means for applying a force on the said liquid from either end thereof to move the same therein to act upon and propel through the bore of said gun barrel said lapping tool positioned therein, and electrical means for alternately reversing the direction of the application of force to the fluid in said gun barrel, comprising a circuit having a normally open contact positioned in the path of travel of said lapping tool to be engaged and closed thereby.

2. A machine for lapping the bore of a gun barrel comprising spaced supports having means thereon for mounting a gun barrel therebetween, a lapping tool in the barrel bore, a closed circuit including a liquid in said gun barrel, means for applying a force on the said liquid from either end thereof to move the same therein to act upon and propel through the bore of said gun barrel said lapping tool positioned therein, and electrical means for alternately reversing the direction of the application of force to the fluid in said gun barrel comprising a circuit having a normally open contact in each of said supports and positioned in the path of travel of the said lapping plug to be engaged and closed thereby.

3. A machine for lapping the bore of a gun barrel comprising spaced supports having means thereon for mounting a gun barrel therebetween and each provided with a chamber therein communicating with the said gun barrel, spaced cylinders provided with conduits leading therefrom

to said chambers, means for introducing a fluid into said cylinders, chambers and gun barrel and means for alternately applying a force first on the fluid in one cylinder, then on the fluid in the other cylinder to move the same to act upon and propel through the bore of said gun barrel a lapping plug positioned therein.

4. A machine for lapping the bore of a gun barrel comprising spaced supports having means thereon for mounting a gun barrel therebetween and each provided with a chamber therein communicating with the said gun barrel, spaced cylinders provided with conduits leading therefrom to said chambers, pistons mounted for reciprocal movement in said cylinders, means for introducing a fluid into said cylinders, chambers and gun barrel, and means for alternately moving said pistons to apply a force on the fluid in said cylinders to move the fluid to act upon and propel through the bore of said gun barrel a lapping plug positioned therein.

5. A machine for lapping the rifling of a gun barrel comprising spaced supports having means thereon for mounting a gun barrel therebetween, a lapping plug in the bore of the gun barrel, hydraulic means comprising a fluid movable within the bore of said gun barrel for propelling the plug through said bore, means for arresting the flow of fluid on one side of said plug, and means for applying simultaneously a hydraulic force on the opposite side of the said plug sufficient to longitudinally compress and laterally expand the plug in said bore.

6. The process of forming a lapping plug to conform to the shape of the rifling of a barrel to be lapped which consists in placing a cylindrical plug in the barrel and then applying pressure simultaneously on its opposite ends to expand the plug laterally into the rifling grooves of the barrel bore.

7. The process of lapping the rifling of a gun barrel which consists in first reciprocating in the bore of said gun barrel a lapping plug of a size to lap only the lands of the rifling, then applying a sufficient force on said plug while in the bore

to flow material therefrom into the channels of the rifling, and then continuing the reciprocating of the enlarged plug in the said bore.

8. The process of lapping the rifling of a gun barrel which consists in first hydraulically reciprocating a lapping plug of a size to lap only the lands of the rifling, then applying an hydraulic force on said plug while in the bore sufficiently to flow material therefrom into the channels of the rifling, and then continuing the reciprocation of the thus enlarged plug in the said bore.

9. The process of lapping the rifling of a gun barrel which consists in first hydraulically reciprocating a lapping plug of a size to lap only the lands of the rifling, then applying an hydraulic force on said plug while in the bore sufficiently to expand said plug diametrically into the rifling channels, and then continuing the reciprocation of the thus enlarged plug in the said bore.

10. A machine for lapping the bore of a gun barrel, comprising spaced supports having means thereon for mounting a gun barrel therebetween, a lapping tool in said bore, a closed circuit including a liquid in said gun barrel, a cylinder having a conduit leading to said bore and a piston in said cylinder operable for applying a force on said liquid to move the same through said gun barrel to propel said lapping tool through the said bore, and means engaged by said lapping tool and operable for controlling the action of said piston.

11. A machine for lapping the bore of a gun barrel, comprising spaced supports having means thereon for mounting a gun barrel therebetween, a lapping tool in said bore, a closed circuit including a liquid in said gun barrel, a cylinder having a conduit leading to said bore and a piston in said cylinder operable for applying a force on said liquid to move the same through said gun barrel to propel said lapping tool through the said bore, a reversing clutch operably connected to said piston, and means engaged by said lapping tool and operable for controlling the action of said clutch.

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