June 28, 1938. C. E. SIMPSON 2,121,832

MECHANISM FOR AND METHOD OF RIFLING GUN BARRELS

Filed Feb. 24, 1937 3 Sheets-Sheet 1

Fig. 1.

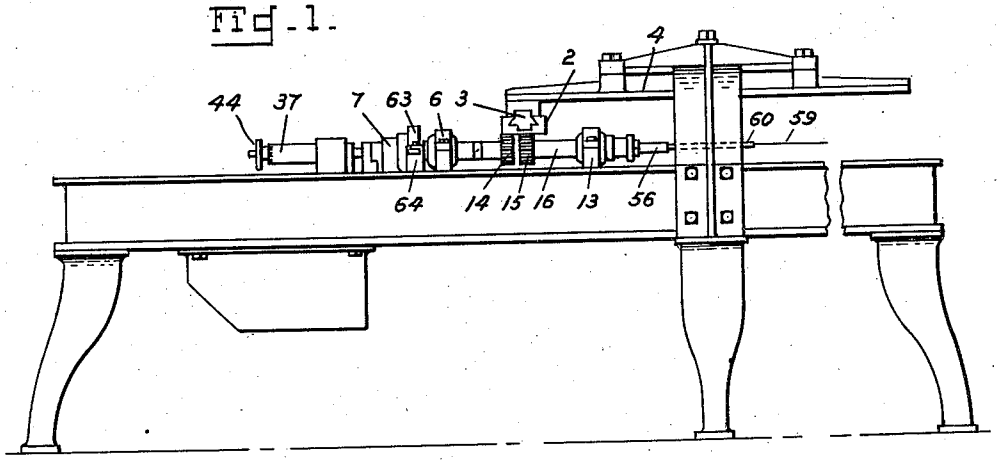



Fig. 2.

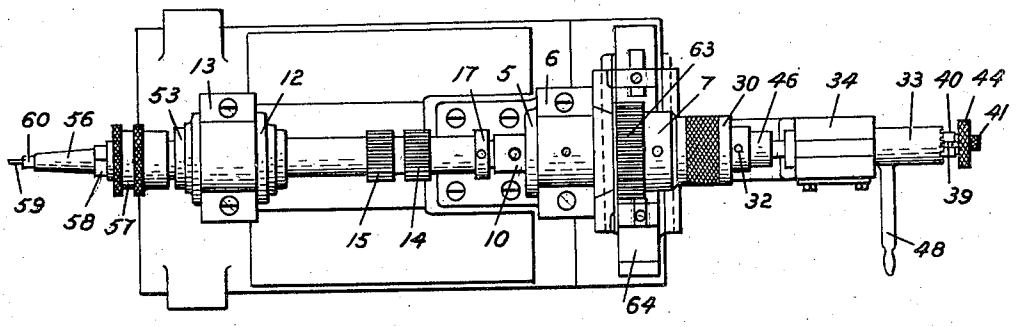



Fig. 9.

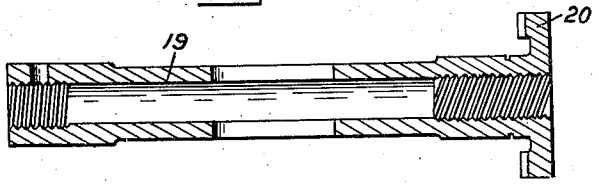



Fig. 10.

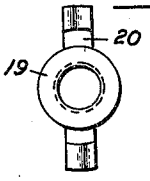



Fig. 12.

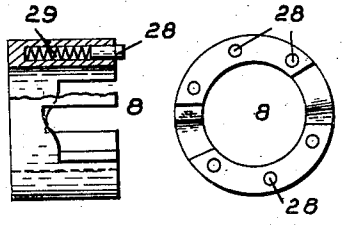



Fig. 13.

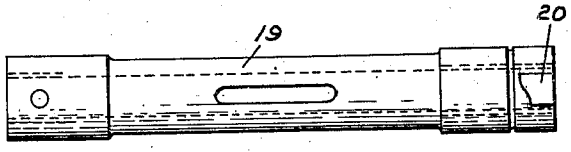



Fig. 11.

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MECHANISM FOR AND METHOD OF RIFLING GUN BARRELS

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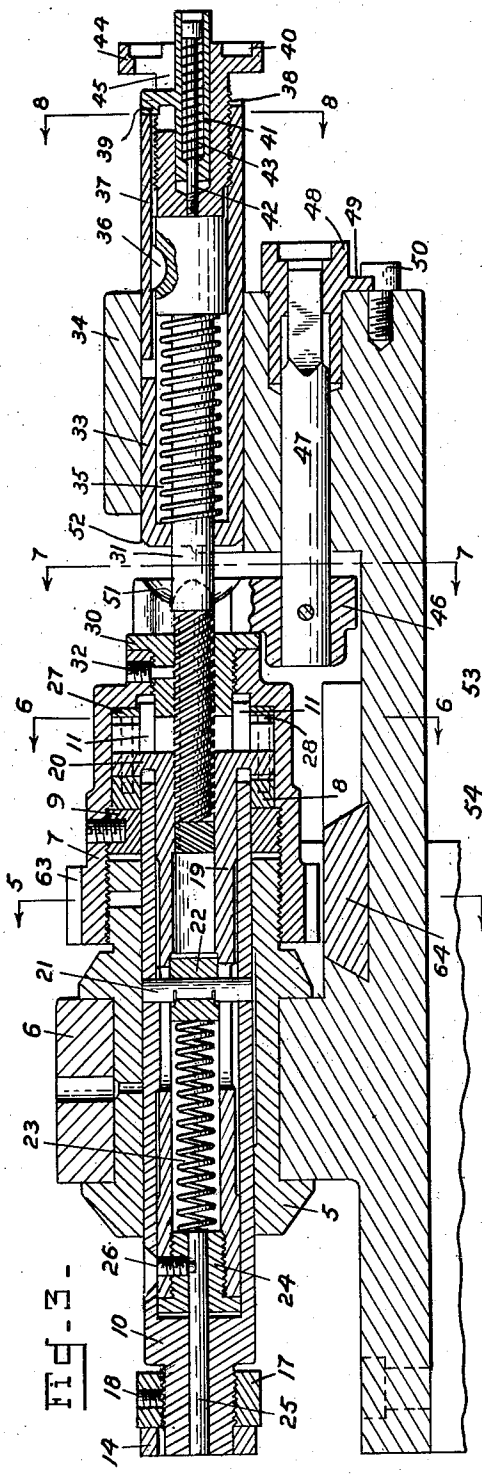


Fig. 3.

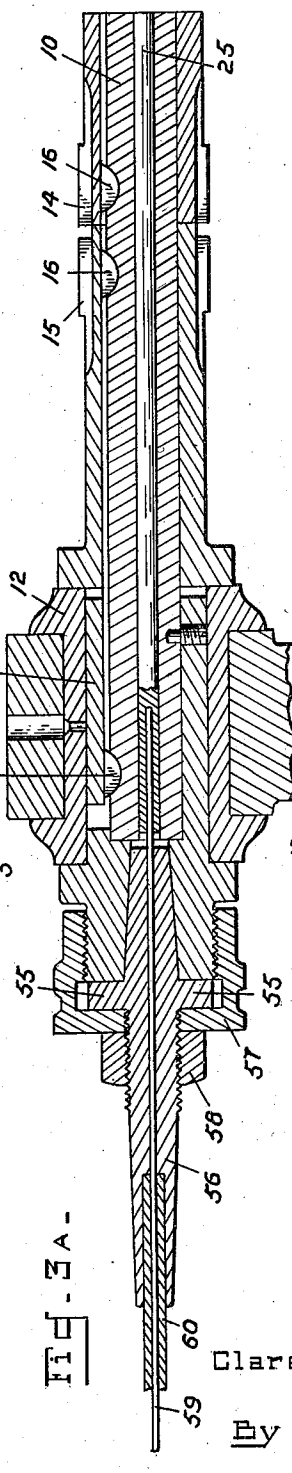


Fig. 3A.

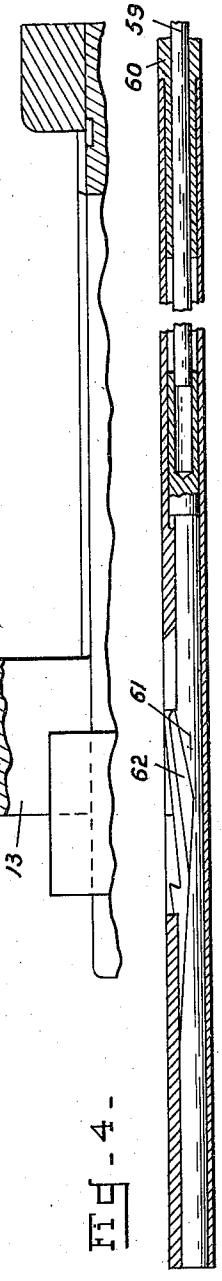


Fig. 4.

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MECHANISM FOR AND METHOD OF RIFLING GUN BARRELS

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Fig. 5.

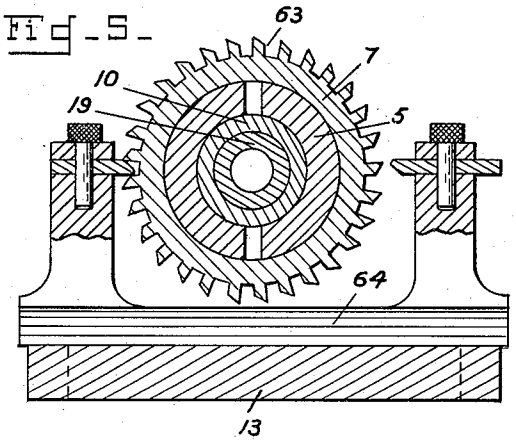



Fig. 6.

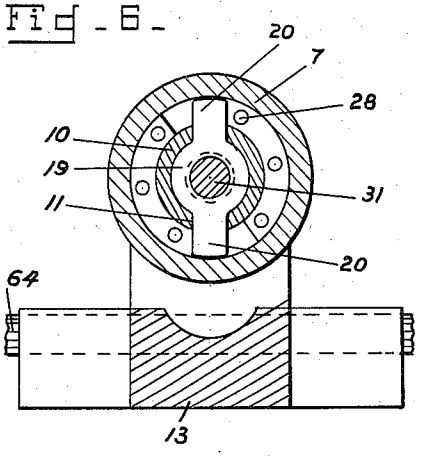



Fig. 7.

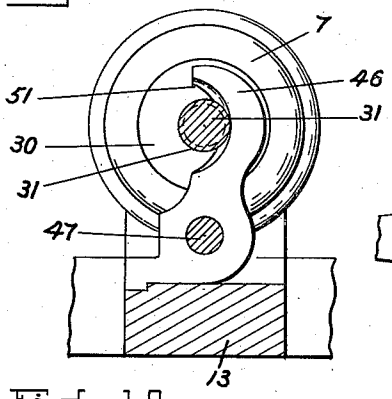



Fig. 8.

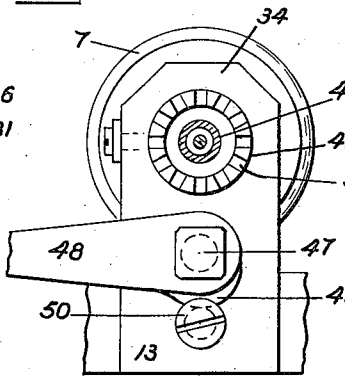



Fig. 14.

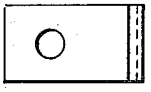


Fig. 15.

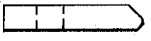


Fig. 18.

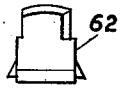



Fig. 16.




Fig. 17.

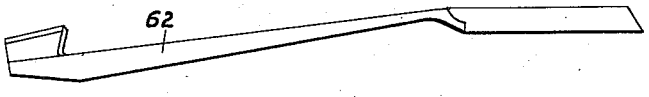



Fig. 19.

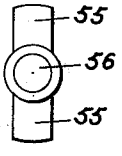



Fig. 20.

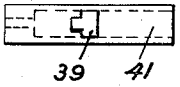
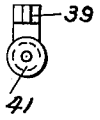



Fig. 21.




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Patented June 28, 1938 2,121,832

# UNITED STATES PATENT OFFICE

2,121,832

## MECHANISM FOR AND METHOD OF RIFLING GUN BARRELS

Clarence E. Simpson, Springfield, Mass.

Application February 24, 1937, Serial No. 127,506

6 Claims. (Cl. 90—28.1)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

The subject of this invention is a mechanism for and method of rifling gun barrels, and relates more particularly to a means for and method of rifling a gun barrel having an irregular bore when finished.

The main objects of the invention are the provision of a method of forming a rifled barrel having a varying diameter of bore, and of means for rifling such a barrel.

The invention is carried out broadly by rifling the barrel to varying depths and then reaming out the bore to the desired form, specifically it is accomplished by utilizing a specially constructed rifling bar to rifle the barrel to the varying depths desired and then reaming out the bore to the desired shape.

A practical embodiment of a machine for rifling a barrel is shown by way of illustration in the accompanying drawings wherein:

Fig. 1 is an elevation showing the left side of a Pratt and Whitney Company rifling machine with the rifling mechanism forming the subject of this invention installed thereon,

Fig. 2 is a plan view of the carriage and rifling mechanism,

Figs. 3 and 3*a* are longitudinal sectional views of the carriage and rifling mechanism,

Fig. 4 is an enlarged sectional view of the rifling bar,

Fig. 5 is a cross section on the line 5—5 of Fig. 3.

Fig. 6 is a cross section on the line 6—6 of Fig. 3,

Fig. 7 is a cross section on the line 7—7 of Fig. 3.

Fig. 8 is a cross section on the line 8—8 of Fig. 3.

Fig. 9 is a longitudinal sectional view of the expansion screw nut,

Fig. 10 is an end view of the expansion screw nut,

Fig. 11 is a plan view of the expansion screw nut,

Fig. 12 is a view in elevation, partly in section of the expansion cam,

Fig. 13 is a view in end elevation of the expansion cam,

Fig. 14 is a plan view of the index slide plate,

Fig. 15 is a view in side elevation of the plate,

Fig. 16 is a plan view of the rifling cutter,

Fig. 17 is a view in side elevation of the rifling cutter,

Fig. 18 is an end view of the rifling cutter,

Fig. 19 is an end view of the rifling rod holder,

Fig. 20 is a plan view of the adjusting screw lock,

Fig. 21 is an end elevation of the adjusting screw lock.

Referring to the drawings by numerals of reference:

There is provided a rifling machine, preferably the Pratt and Whitney Rifling Machine No. 3, which has a carriage 1 reciprocated in the usual manner by a lead screw, not shown, and carrying a transverse guide 2 in which slides a rack 3 reciprocated in the guide through means of a stud, not shown, sliding in the groove of cam bar 4. The foregoing is standard equipment and forms no part of the present invention.

Mounted on the carriage 1 is a bearing 5 carried in the bearing block 6 of the carriage and having its rear end reduced and threaded to engage the internal threads of an expansion cam housing 7. Within the cam housing and to the rear of the bearing 5 is an expansion cam 8 held in place by a retaining ring 9 which is threaded into the cam housing 7.

Extending through the bearing 5 and into the expansion cam housing 7 is the enlarged portion of a hollow shaft 10 bifurcated for a short distance at its rear end as indicated by the numeral 11. The forward reduced end of this shaft 10 enters a bearing 12 carried in a bearing block 13 spaced from the bearing block 6. Mounted on the shaft 10 between the blocks 6 and 13 are pinions 14 and 15 suitably keyed to the shaft as at 16—16, and also mounted on the shaft is an adjusting collar 17 which may be locked in adjusted position by the set screw 18, the purpose of the collar being to retain the pinions in proper position with relation to each other.

Within the enlarged rear portion of the shaft 10 is positioned an expansion screw nut 19 in the form of a tubular member interiorly threaded adjacent to its rear end and formed at that end with diametrically opposite wings 20—20 adapted to enter the slots 11 in the bifurcated portion of the shaft and also the slots in the expansion cam 8. The forward faces of the wings 20—20 are of a contour to engage the cam faces of the expansion cam 8. The expansion screw nut 19 is constrained to rotate with the hollow shaft by means of a seat lock pin 21 passing through apertures in the shaft 10 and through slots formed in the expansion screw nut 19 so as to permit the

nut a motion of translation with respect to the shaft. The pin 21 also passes through an aperture in a seat block 22 which is located within the expansion screw nut 19 and forms an abutment for the rear end of a cutter collapsing spring 23, the forward end of which engages the expansion screw plug 24 threaded into the forward end of the expansion screw nut 19 and apertured to receive the cutter rod 25 which may be locked in place therein as by the screw 26. A thrust washer 27 is preferably positioned between the rear end of the expansion cam housing 7 and the expansion cam 8 to take the thrust of plungers 28 mounted in recesses in the cam and acted on by springs 29.

Threaded into the rear end of the expansion cam housing 7 is an expansion screw nut stop 30 axially bored to permit the passage of an expansion screw 31. The stop may be locked in place by a set screw 32. The expansion screw extends rearwardly into its housing 33 which is carried in a block 34 formed on the carriage. The housing 33 is keyed in the block to permit limited sliding movement thereof with relation to the block. The expansion screw 31 is headed at its rear end, and between the head and forward wall of the housing is a spring 35 surrounding the screw shank. A key 36 is carried by the head and enters a keyway 37 formed in the housing. The rear end of the housing 33 is serrated as at 38 to receive a lock 39 of the adjusting screw 40. The lock 39 is preferably a finger extending radially from a tubular member 41 within which is a lock screw 42 threaded into the adjusting screw 40 and serving to confine between its head and the bottom of the tubular member 41 a spring 43 which urges the lock toward its forward or serration engaging position. The adjusting screw 40 is formed at its rear end with a knob 44 and is slotted at 45 to accommodate the lock.

Between the rear end of the expansion cam housing 7 and the block 34 is positioned a collapsible dog 46 mounted on the forward end of a shaft 47 which is journaled in the block 34 and has squared on its rear end a lever 48. A lip 49 on the lever may engage under the head of a screw 50 for the purpose of retaining the assembly in place. The dog 46 is dished out on its rear face at 51 to be engaged by the beveled forward edge 52 of the expansion screw housing 33 to thereby cam the dog 46 to one side.

Within the bearing 12 is positioned with a turning fit the rear end of a sleeve 53 to which the forward end of the hollow shaft 10 is keyed as at 54. The forward end of the sleeve is slotted to receive the wings 55—55 projecting from the rifling rod holder 56, the rear end of which enters the front end of the sleeve with a close fit and which is clamped in place by a cap nut 57 threaded on the front end of the sleeve and locked by a nut 58 threaded on the rifling rod holder 56. A wire or cable 59 has its rear end secured in the cutter bar 25 and passes through the rifling rod holder 56 and rifling rod 60 and has its front end secured to a cutter expanding wedge 61 which operates to position the rifling cutter 62 to the proper depth of cut.

The gun barrel is bored in the usual way to the desired caliber, it is then rifled to the desired depths with the device herein shown or in other manner, and the lands then reamed to give the interior of the barrel the desired contour.

The operation of the rifling device herein shown is as follows:

When a cutting stroke is started the expansion cam 8 acting on the wings of the expansion screw nut 19 will cause the rifling cutter 62 to be wedged out to the desired depth of cut. The cutter will stay in this position during a predetermined portion of the cutting stroke due to the fact that the pull of the cutter will be sufficient to cause the expansion screw housing to slide forwardly in its bearing until its forward beveled edge 52 meets the cam surface 51 of the collapsible dog 46. This movement is due to the expansion screw 31 moving into the expansion nut as the rifling bar is rotated.

After the forward end of the housing contacts the collapsible dog, the resistance will be sufficient to cause the expansion screw 31 to be held stationary until the cutter collapsing spring 23 has been compressed by the rearward travel of the expansion screw nut 19 until it contacts its stop 30. During this portion of the action, the rifling cutter 62 will be gradually wedged outwardly to a greater depth of cut.

During the remainder of the cut, the spring 35 will be compressed until the key 36 reaches the end of the keyway 37 when the dog 46 will be collapsed and the springs will cause the rifling cutter 62 to be retracted for the return stroke.

The depth of cut is regulated by turning the expansion cam housing 7 through means of the ratchet teeth 63 formed thereon and acted upon by the index slide 64 to rotate the casing with a step by step movement.

I claim:

1. The combination with a rifling machine including a carriage and means for axially rotating a rifling bar, of a rifling bar, a cutter carried by the rifling bar, and mechanism actuated by the bar rotating means to automatically expand the cutter a predetermined amount upon starting a cutting stroke; retain the cutter in such position during a desired portion of such stroke; gradually expand the cutter during another portion of the stroke; and maintain a uniform depth of cut during the remainder of said stroke.

2. The combination of a rifling machine including a carriage and means for axially rotating a rifling bar, of a rifling bar, a cutter carried by the bar, a wedge for expanding the cutter, and mechanism actuated by the bar rotating means to automatically move the wedge to expand the cutter upon start of a cutting stroke; retain the wedge in such position during a predetermined portion of such stroke; gradually move the wedge to further expand the cutter during a subsequent portion of such stroke; and then retain the wedge in such final position during the remainder of the stroke.

3. The combination with a rifling machine including a carriage and means for axially rotating a rifling bar, of a rifling bar, a cutter carried by the rifling bar, and mechanism actuated by the bar rotating means to automatically expand the cutter at the start of a cutting stroke; retain the cutter in such expanded position during a predetermined portion of such stroke; further expand the cutter during a subsequent portion of such stroke; retain the cutter in expanded position during the remainder of the stroke; and collapse the cutter upon completion of the stroke.

4. The combination with a rifling machine including a carriage and means for rotating a rifling bar, of a rifling bar, a cutter carried by the rifling bar, and mechanism actuated by the bar rotating means for expanding the cutter at the start of a cutting stroke; further expanding

the cutter during such stroke; and automatically retracting the cutter at the end of the stroke.

5. The combination with a rifling machine including a carriage and means for rotating a rifling bar, of a rifling bar, a cutter carried by the rifling bar, and mechanism actuated by the bar rotating means for varying the depth of cut of the cutter during a cutting stroke and retracting the cutter at the end of the cutting stroke.

6. A rifling bar, a cutter carried by the rifling bar, an expansion cam associated with the rifling bar, an expansion screw nut, cam surfaces on the nut cooperating with the surfaces on the expansion cam to initially and automatically translate the nut axially, a connection between the nut and cutter, an expansion screw engaged by the nut, means associated with the nut and means associated with the screw cooperating upon rotation of the bar during a cutting stroke whereby the screw advances into the nut during a predetermined portion of the stroke; the nut gradually threads on the screw during a further portion of the stroke; and the screw advances into the nut during the remainder of the stroke, means including the before mentioned means for collapsing the cutter at the end of the stroke, and means for rotating the bar.

CLARENCE E. SIMPSON.