B. M. W. HANSON.

RIFLING MACHINE.

APPLICATION FILED NOV. 6, 1909

1,019,892.

Patented Mar. 12, 1912.

2 SHEETS—SHEET 1.

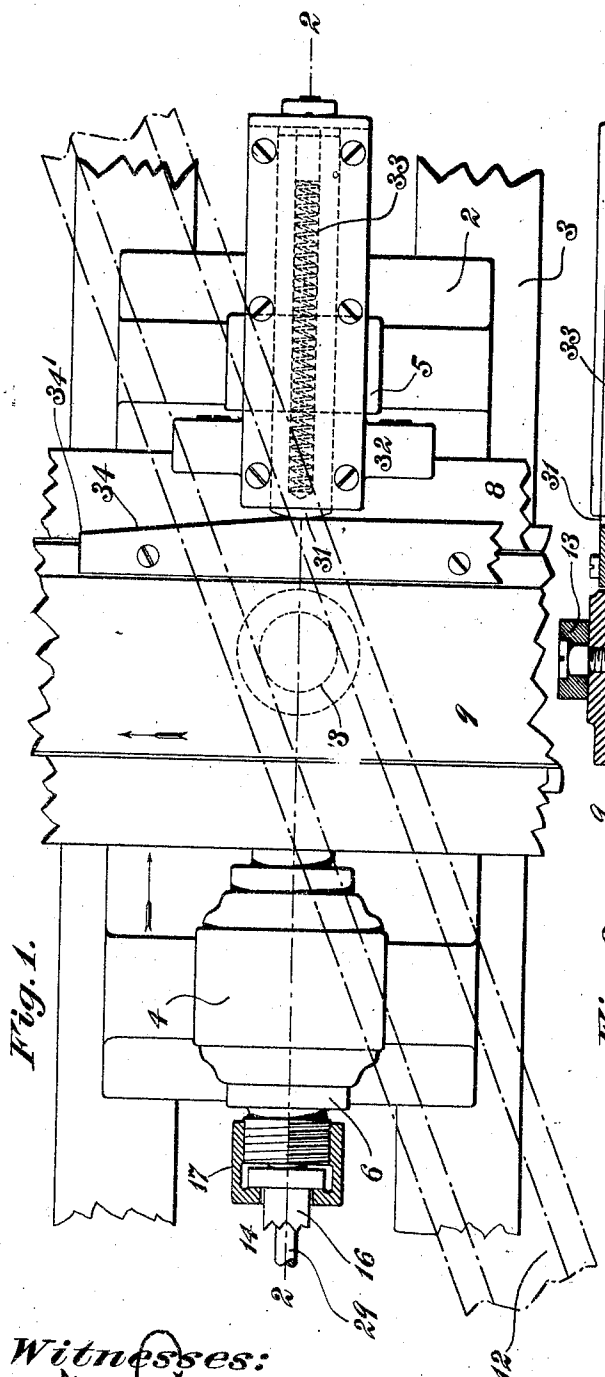

Fig. 1.

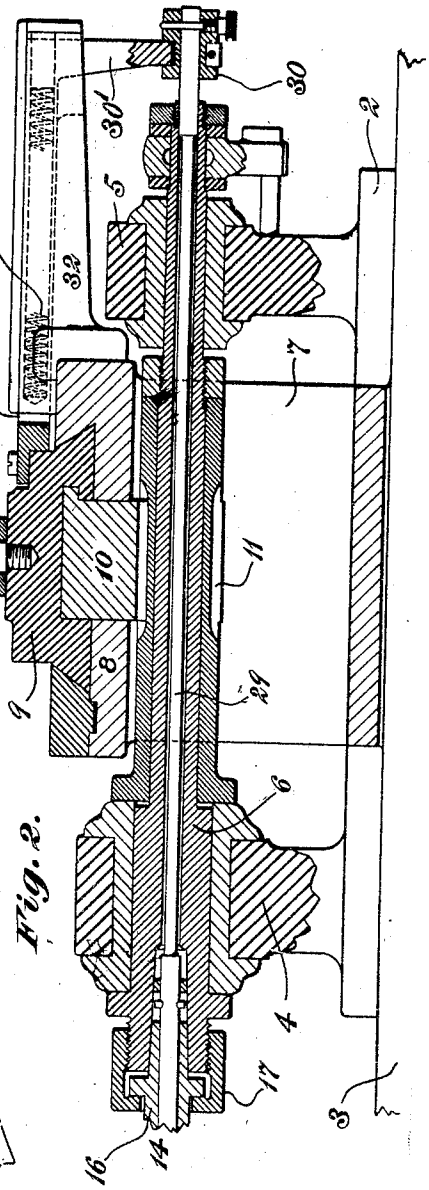

Fig. 2.

Witnesses:

Inventor:
B. M. W. Hanson
By his Attorneys,
Sutherland & Anderson.

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Fig. 3.

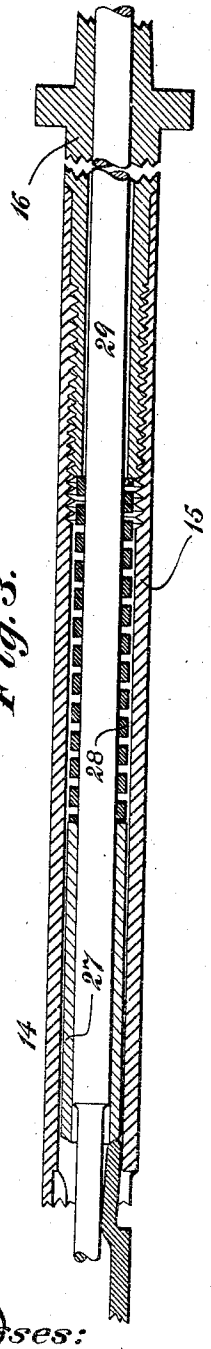


Fig. 4.

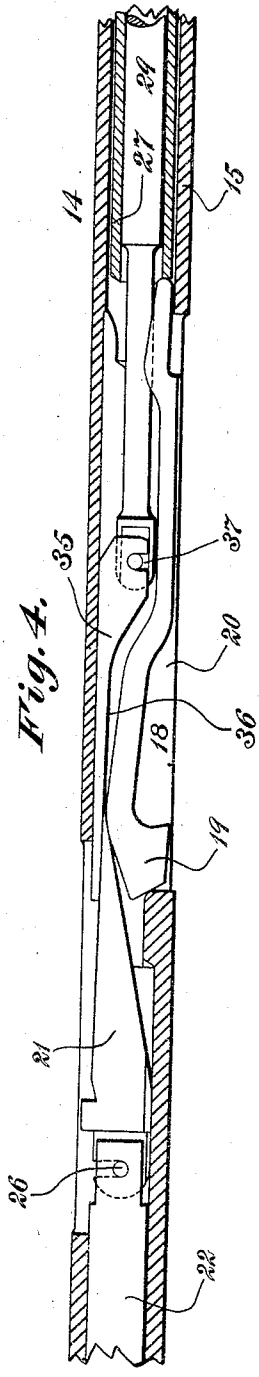
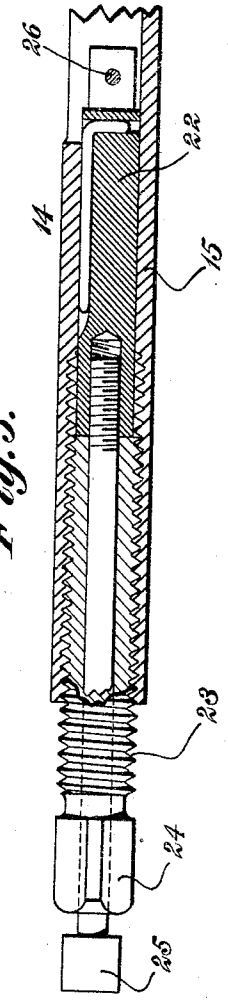


Fig. 5.



Witnesses:

Inventor:
B. M. W. Hanson
By his Attorneys,
Sutherland & Anderson.

UNITED STATES PATENT OFFICE.

BENGT M. W. HANSON, OF HARTFORD, CONNECTICUT, ASSIGNOR TO PRATT & WHITNEY COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF NEW JERSEY.

RIFLING-MACHINE.

1,019,892. Specification of Letters Patent. Patented Mar. 12, 1912.

Application filed November 6, 1909. Serial No. 526,593.

To all whom it may concern:

Be it known that I, BENGT M. W. HANSON, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Rifling-Machines, of which the following is a specification.

This invention relates to rifling machines the object of the invention being to provide an effective machine of this type whereby a rifle groove of greater cross sectional area at one place than at another can be obtained with precision.

In the drawings accompanying and forming part of the present specification there is illustrated in detail one convenient form of embodiment of the invention which to enable those skilled in the art to practice said invention will be set forth in detail in the following description while the novelty of the invention will be included in the claims succeeding said description. The invention is of course not restricted to the disclosure made by said description and drawings for many variations within the scope thereof as expressed by said claims, can be adopted.

Referring to said drawings, Figure 1 is a top plan view of a rifling machine including the invention. Fig. 2 is a longitudinal sectional view on the line 2—2 of Fig. 1. Figs. 3, 4 and 5 represent collectively the rifling rod shown partially in Figs. 1 and 2. Like characters refer to like parts throughout the several views.

As briefly intimated hereinbefore the primary purpose of the invention is the production of an effective machine by which a rifle groove can be formed which is greater in cross sectional extent at one place than at another and the mechanism by which this relation is produced can vary greatly although in Figs. 1 and 2 of the drawings there are shown certain of the elements of a rifling machine of known construction with which are associated the improvements and the latter are of such a character that a rifle groove the bottom of which is tapered, is produced and in the present instance this tapering of the bottom of the groove (or grooves) is at the muzzle end of the barrel whether the same be part of a hand or large gun or rifle. The invention principally centers around the rifling or cutting mechanism and the means associated therewith.

The machine represented in Figs. 1 and 2 includes in its organization a slide or carriage as 2 which is usually supported by a bed 3 said slide having a movement longitudinally of said bed and mechanism, in practice, being provided to automatically operate said slide back and forth. On the upper side of said slide 2 is a head as 4 and a complemental standard or upright 5 which jointly support for rotation a hollow spindle as 6 with which the rifling rod, hereinafter more particularly described, is directly connected.

From the main slide or carriage 4 there are shown rising the bearings or webs 7 which are connected at their tops by a plate 8 which is provided with suitable ways for the auxiliary slide 9 which as will be obvious moves crosswise or transversely of the bed 3. It will be also understood that as the main slide 2 travels forward and backward it carries the auxiliary or cross slide 9 therewith. On the underside of said auxiliary slide 9 there is fastened a rack 10 in mesh with a pinion 11 fixed to the spindle 6. Suitably mounted over the slide 9 is what is known as a taper bar 12 which is shown by broken lines in Fig. 1 and said bar is grooved to receive a stud 13 on the top of the slide 9 it being the custom to make said stud in the form of an anti-friction roller and the groove in the taper-bar in which said roll travels, extends generally the complete length thereof. The taper bar 12 as will be perceived is disposed obliquely to the line of travel of the slide or carriage 2. As the carriage 2 advances it carries the slide 9 therewith and owing to the fact that the roller 13 is in the groove of the obliquely disposed bar 12 the slide 9 on the movement of the slide 2 is caused to move on the slide 2 whereby the rack 10 and pinion 11 will turn the spindle 6 so that therefore said spindle 6 has a combined rotary and endwise movement and this compound movement is what is utilized to cause the tool connected with the said spindle 6 to follow a spiral path.

The foregoing is a somewhat brief description of a type of rifling machine now in use and with which the improvements may be advantageously connected although

the invention is not limited in this respect for said improvements can be incorporated in radically-different types of rifling machines.

A rifling-rod such as satisfactorily answers the requirements is that denoted in a general way by 14 and which is shown in sections in the three Figs. 3, 4 and 5. I have termed the part 14 a "rod" as this is the name it is best known by in the art of ordnance. Said rod comprises an elongated tube as 15 the rear end of which is internally threaded to receive the shank portion of a hollow coupling member as 16 which has a tapered portion to fit a correspondingly shaped opening in the nose end of the spindle 6, said coupling member being held rigidly to said spindle by a nut 17 bearing against opposite lugs on said coupling member from which it will be obvious that as the slide 2 and spindle 6 are moved longitudinally of the bed, said tube 15 partakes of a similar motion.

A grooving tool of efficient type is that denoted in a general way by 18 and it has a cutting head 19 which is projectable through an elongated slot 20 in the tube 15. The tail or butt portion of the tool 18 has a sliding bearing upon the interior of the tube 15 just back of the rear end wall of the slot 20 as best shown in Fig. 4. The tube 15 is shown inclosing near its forward end a wedge 21 the active face of which bears at all times against the upper portion of the head 19 said wedge being normally fixed. It might be well to state at this time that while as intimated hereinbefore this cutting tool 18 is satisfactory other kinds or an entirely different cutting mechanism might be substituted therefor. In like manner various means might be employed for operating said tool with respect to the tube 15.

In connection with the wedge 21 there is coöperative an operating device as the plunger 22 which is shown for ease of assemblage as made in two detachably-connected sections the inner one of which has a sliding movement in the tube 15 near the forward end thereof while the outer one of which extends through the bore of a plug as 23 threaded into the extreme forward end of said tube 15 said plug having a head as 24 coöperative with a head or enlargement 25 on the outer end of the outer section of said plunger 22. The wedge 21 is also for ease of assemblage separably connected with said plunger 22 by a pivotal connection as 26 so that a certain amount of lateral motion of the wedge with respect to the plunger is permitted in view of which the intermittent or step by step advance movement of the cutting tool 18 can be effected during which said tool moves radially of the tube 15. The square head 24 serves as a limit stop for the head 25 and it coöperates with indexing means which is common in this art and which is not shown. The indexing device has a square opening into which this head 24 is thrust on the advancing movement (toward the left in Figs. 1 and 2) of the slide 2 and when the head 24 is thrust into this opening and when the part in which said opening is situated is turned the plug 23 will be moved farther into the tube 15 thereby increasing the distance of travel of the plunger 22 the limit of relative advancing movement of said plunger being reached when the head 25 strikes the head or stop 24. It should be stated that as the tube 15 is advanced the head 25 strikes a fixed abutment (not shown) which arrests the movement of the plunger 22 with the tube 15 or causes a relative movement of said plunger 22 and wedge 21 the consequence being that the wedge causes the tool 19 to advance outward one step, each step being repeated with each advancing movement of the slide 2. It might be stated at this point that the wedge 21 bears normally against a part fixed relatively thereto during the major part of the operation of the machine and it therefore follows that when the wedge 21 is moved toward the right in Fig. 4 relatively to the tube 15 said wedge forces the cutter 18 outward one step. The normally relatively fixed part shown in the drawings and against which this wedge has a bearing will be hereinafter described.

The extreme rear end of the cutting tool 18 is illustrated as having a bearing against the sleeve 27 and said tube 15 is shown as inclosing a coiled spring 28 of some considerable power preferably the rear end of which engages the shank of the coupling 16 which is relatively stationary with respect to the tube 15 and the forward end of which engages against said sleeve 27 which is slidable in the tube 15 by reason of which the spring tends at all times to move the cutting tool 18 forward and to hold the head 19 of the same firm and solid against the active face of the wedge 21. The spring therefore acts on the tool 18 in opposition to the wedge 21 and while the wedge serves conveniently to move the tool outward the constant tendency of the spring is to move said tool inward. In Fig. 4 of the drawings the tool 18 is shown in its extreme retracted position the cutting tip thereof being approximately flush with or in the plane of the circumference of the tube 15. In rifling the tool first travels longitudinally of the interior of the barrel blank and makes a cut and on the return movement of the tool, means are provided for retracting the tool to prevent it injuring the work. Such means are quite old and are not shown. The tool 18 therefore cuts step by step into the work each step causing a deepening of the grove. The step by step advancing means for the cut-

ting tool is therefore located at one end of the tube 15. As will hereinafter appear means are provided for so operating upon said tool as to cause the same to taper the bottoms of the rifle grooves near the muzzle end of the barrel, and the means which secures this result operates from the opposite end of said tube 15.

Within the tube 15 and extending longitudinally thereof is a rod as 29 which acts to control or actuate the wedge 21 to obtain the desired taper to which allusion has been made. This rod has a sliding movement in the tube 15 longitudinally thereof and preferably it is operated in opposite directions by cam mechanism and spring means as will hereinafter appear, the operating means for said rod being adapted to draw or pull the same during the tapering operation, so that the rod is not subjected to torsion as would be the case were said rod given a thrust or rotated during such particular action. This rod 29 extends uninterruptedly from the wedge 21 to a point beyond the rear or outer end of the spindle 6, having a sliding movement in said spindle through which it projects. There is shown as fastened to the outer end of said rod 29, a collar 30 peripherally grooved to receive the lower end of the pendent arm 30′ of the spring-plunger 31 supported for endwise movement by a bracket 32 on the outer bearing or standard 7. The said plunger 31 is longitudinally bored to receive the push spring 33 bearing against the closed forward end of said bore and against a plug closing the rear open end of said bore, the constant tendency of the spring being to move the plunger inward or toward the left in Figs. 1 and 2. For operating the said plunger in opposition to the spring thereof a cam 34 is represented the working portion of said cam being on a slant. This cam is shown as fastened to the outer side of the auxiliary slide 9, and its beveled surface is the means which is utilized in the present case to secure a gradual backing off or inward movement of the cutting or grooving tool 18 on the movement of the tube 15 into the barrel of the rifle. It will be evident that as the plunger 31 is moved backward and forward a corresponding movement is imparted to the rod 29 owing to the described connection between the two parts.

The head or forward end portion 35 of the rod 29 is beveled as at 36 to coöperate with the wedge 21 and this head portion is preferably connected with the body of the rod by a pin and slot joint denoted in a general way by 37. In Fig. 4 the endwise-movable or longitudinally-reciprocative rod 29 is assumed to be at the extreme end of its retractive or back stroke the cutting tool 18 at this time being in its ineffective position. Just prior to tapering the rod 29 is moved forward so that the wedge surface 36 of the head thereof will act against the laterally-movable wedge 21 to press the same and consequently the tool 18 outward the amount of movement depending upon the taper to be given to a rifle groove on its bottom and near the muzzle of the blank. As the tool travels along the interior of the barrel commencing at the muzzle end thereof, the rod 29 is gradually drawn backward thereby gradually removing the advancing influence of the wedge 21 against the tool 18 so that the spring 28 can cause the tool to equally gradually draw back the result being that the interior of the muzzle up to a certain point will have a groove the bottom of which is tapered. At the conclusion of the tapering operation the tool commences its regular cut and the depth of this is controlled solely by the indexed wedge 29 which at the conclusion of each slight movement thereof finds a solid bearing against the wedge head 35 of the rod 29. It might be stated at this point that the cam 34 is the means which in the present case is provided to impart an advancing movement to the rod 29. It will be obvious that each time the tool operates upon the gun blank the tapering and normal cutting operations occur in sequence. The invention, however, does not concern this particular detail but resides rather in certain broad relations although it will be apparent that the machine is so organized to taper the bottoms of the rifle grooves at their forward ends the taper being in each case an outward one. During both tapering and normal grooving the tool is being turned although there may be other ways within the spirit of the invention by which the spirality of the grooves can be secured nor is it essential that there be a relative endwise movement between the tube 15 and the rod 29 or their equivalents.

Just before the tool 18 enters the barrel blank or tube the entering portion 34′ of the cam 34 will be at or near the tip or inner end of the plunger 31 so that as the slide 9 follows the direction of the arrow in Fig. 1 said cam 34 can thrust the plunger 31 to the right in said figure and thereby gradually draw the rod 29 to the right also whereby the tool 19 as the same travels along the interior of the blank, can be permitted to gradually recede under the influence of the spring 28. Of course the rod 14 is being turned during tapering so as to give the tapered portion of the groove the necessary spirality and which naturally conforms with that of the remainder of the groove. After the tapering of the groove has been formed the cutter 18 strikes against the indexed wedge 21 by virtue of which the requisite depth of cut can be made. After the tip of the plunger 31 has passed from off the beveled or active portion of the cam 34 it

rides along the ineffective or straight portion of the cam and during this time the cutting tool is operating normally or is making a cut in parallelism with the longitudinal axis of the blank. On the backward movement of the slide 9 and with it the cam 34 the plunger 31 is drawn backward by the spring 33 as the beveled portion of said cam rides along the tip of said plunger by reason of which through the intermediate parts the tool 18 can be moved outward the necessary extent to commence on the next forward movement of the rifling rod, a taper cut.

In the present case the cutting of the grooves commences at the muzzle and is concluded at the breech of the barrel, and each groove, therefore, has a forward outwardly tapered portion. The parts are preferably so arranged that as the rifling rod 14 travels toward the right in all the figures, cutting is taking place while following the usual custom as already intimated, no cutting occurs on the opposite movement of the rod. Of course, it is not a matter of consequence where the cutting is commenced, but in the construction shown, it initially occurs at the place indicated. The barrel during rifling is held fast in a chuck or other suitable device, the slide 2, as will be understood, during the cutting or rifling action traveling toward the right in Figs. 1 and 2. As the slide 2 moves toward the right the auxiliary slide 9 is carried therewith, and owing to the action of the taper bar 12 against the stud or antifriction roller 13 on said auxiliary slide, the latter is caused to follow the direction of the arrow in Fig. 1, thereby through the rack 10 and pinion 11 turning the rifling rod 14 in the manner already described so as to secure spirality of the grooves. As the rod 14 is moved toward the left in the various figures the plug 23 is first indexed by the head 24 being turned, as already set forth, beyond which point the head 25 strikes a fixed abutment whereby on the continued movement of the rod toward the left, said head 25 will be thrust relatively toward and against the head 24, the result being that the wedge 21 through the described parts is moved toward the right relatively in Fig. 4 whereby said wedge 21 will move the cutting tool 19 outward one step and against the wedge 35 which at this time is at rest with respect to the rod 14. After the indexing operation and after the wedge 21 has thrust the tool 19 outward the latter is in position to cut, and when the rod 14 moves toward the right, the tip of the cutter 19 will be brought against the barrel at the muzzle, the inner end of the plunger 31 at this time being against the wedge or taper face of the former 34. At this time the two slides 2 and 9 are moving, and as the wedge face of the former 34 travels against the plunger 31, the latter is thrust to the right thereby moving the rod 29 in a corresponding direction and through said rod 29 drawing the wedge 35 gradually away from the wedge 21 so that the tool 19 and hence the wedge 21 can move inward. This latter operation is a gradual one and owing to the fact that the rod 14 is endwise moving, the tool will initially taper the groove, the tapering operation ceasing when the plunger 31 passes off the active face of the former beyond which the groove is cut, but not tapered. The operations are repeated until the groove is of the requisite depth when a second cut is formed, indexing occuring after each cut has been made.

What is claimed is:—

1. A tubular rifling rod provided with a rifling tool, a second rod inclosed in said tubular rod, means for intermittently operating the rifling tool whereby said tool will progressively deepen the groove, a taper controlling device coöperative with the tool and operative by said second rod, and means for pulling said second rod to cause the same to effect the action of said taper controlling device and thereby secure tapering of the groove.

2. A rifling rod provided with a rifling tool, a wedge acting against said tool to move the same radially of the rod, means for operating said wedge and thereby the tool to regulate the depth of cut, a second wedge active against the first wedge, means for moving the second wedge in the direction of the length of the rifling rod, and means for moving the tool in the opposite direction during the movement of the second wedge.

3. A rifling rod provided with a rifling tool, a wedge acting against said tool to move the same radially of the rod, a second wedge for also controlling the tool, means for moving the second wedge longitudinally of the rifling rod, and means for simultaneously moving the tool but in an opposite direction.

4. A rifling rod provided with a radially and longitudinally movable rifling tool, a movably mounted wedge for shifting said tool radially of the rod, spring operated means acting against the rifling tool and tending to move the same longitudinally of said rod, a second wedge controlling the position of the rifling tool, and means for imparting a movement to the second wedge in a direction opposite to the direction in which said spring operated means tends to move said rifling tool.

5. A tubular rifling rod having a slot, a rifling tool within said rod, the active portion of the tool being movable through said slot, a wedge active against said tool for moving the same radially to thereby govern the depth of cut, a second wedge directly active against the first wedge, means for

drawing the second wedge away from the first wedge, and means for imparting a thrust to the rifling tool in a direction opposite to that of said draw.

6. A rifling rod provided with a rifling tool, a wedge active against said tool for shifting the same radially of the rod, a second wedge active directly against the first wedge, means for pulling said second wedge away from the first wedge in the direction of the length of the rod, and means for imparting a thrust to the tool in the direction opposite to that of the tool.

7. A rifling machine having a rifling rod provided with a rifling tool, a second rod inclosed in the first rod, means for intermittently operating the rifling tool whereby said tool will progressively deepen the groove, a taper controlling device coöperative with the tool and operative by said second rod, a carrier for the rifling rod provided with a taper bar, and means for transferring the effect of said taper bar to said second rod for exerting a pull thereupon to thereby effect the action of the taper controlling device.

8. A rifling rod provided with a rotary longitudinally movable rifling tool, a wedge, a plunger for operating the wedge, means for connecting the plunger and wedge to permit movement of the wedge radially of the rod, a second wedge operative against the first wedge, means for pulling the second wedge away from the first wedge, and means for moving the rifling tool longitudinally of the rod during the pulling operation and in a direction opposite to the pull.

9. A rifling machine comprising a tubular rod provided with a rifling tool, a second rod inclosed in said tubular rod, means for pulling said second rod during the rifling operation, and means for transferring the effect of said second rod to the rifling tool to cause the action of the latter during said pull.

In testimony whereof I affix my signature in presence of two witnesses.

BENGT M. W. HANSON.

Witnesses:
W. M. STORRS,
H. W. KILBOURNE