C. B. GROFF.

RATCHET DRILL.

APPLICATION FILED AUG. 2, 1907.

1,013,653.

Patented Jan. 2, 1912.

2 SHEETS—SHEET 1.

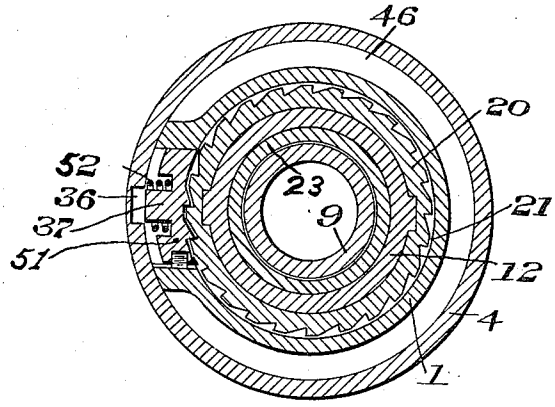

Fig. 3.

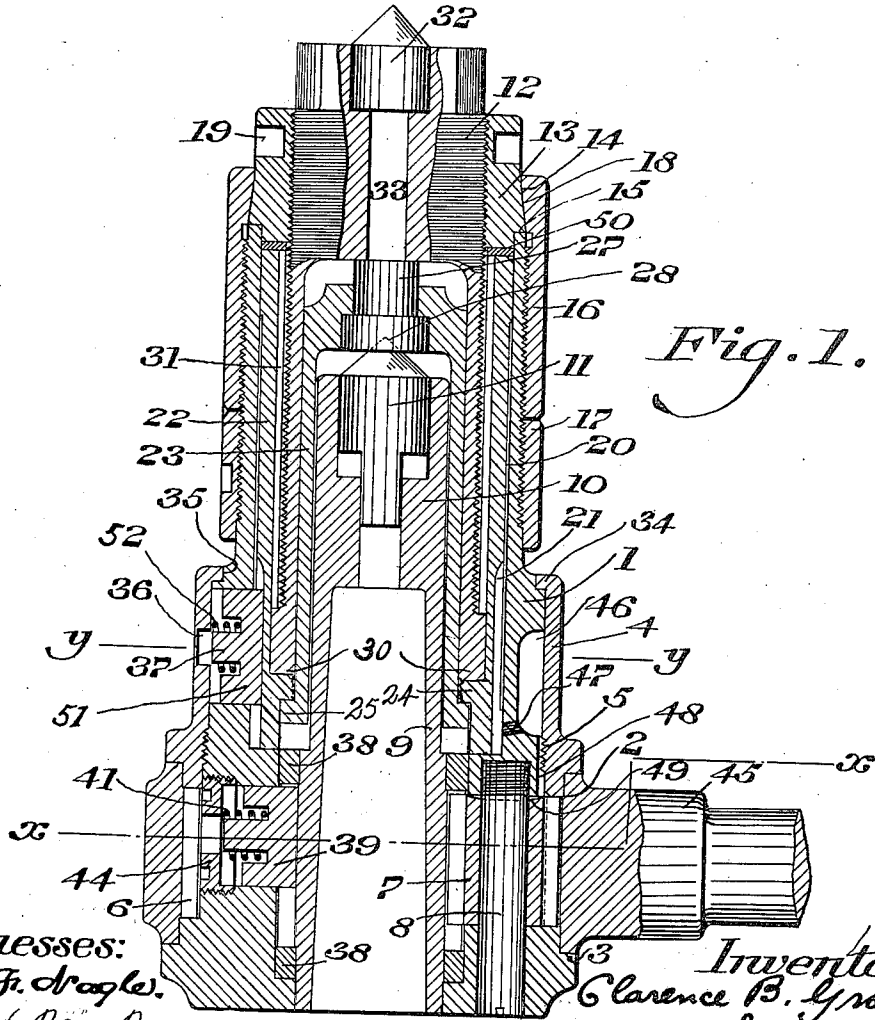

Fig. 1.

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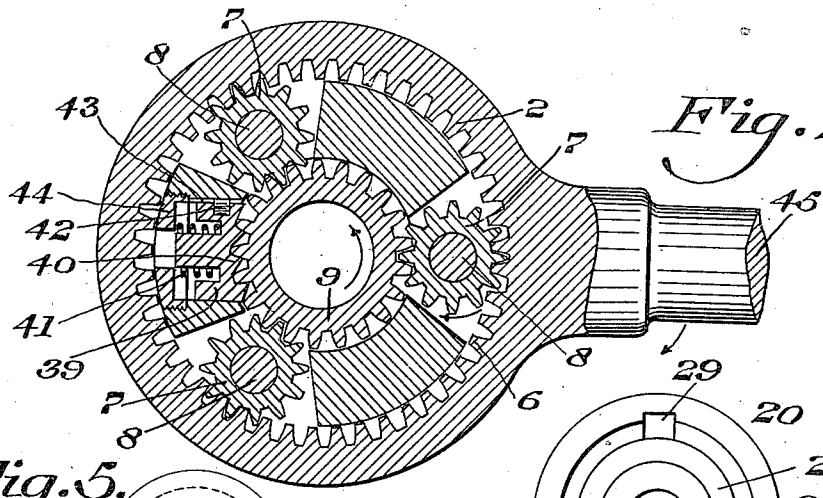


Fig. 2.

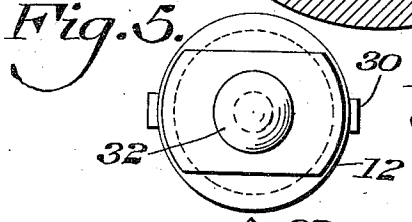
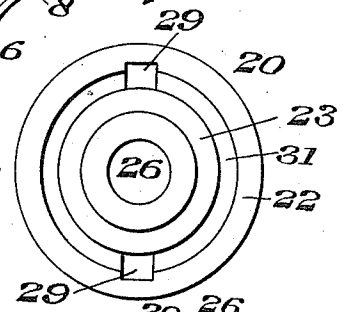


Fig. 5.

Fig. 7.



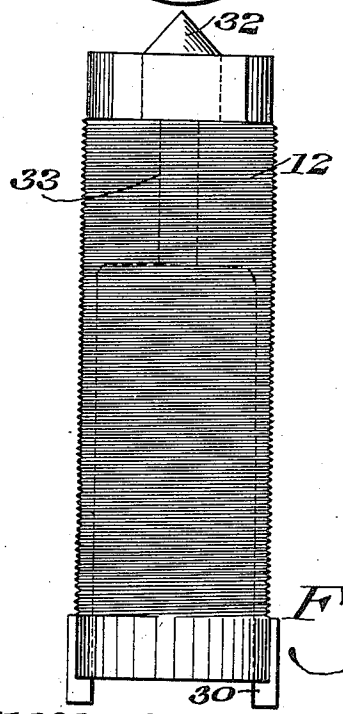


Fig. 4.

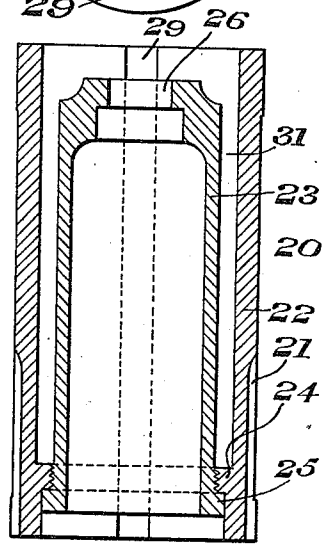


Fig. 6.

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UNITED STATES PATENT OFFICE.

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RATCHET-DRILL.

1,013,653. Specification of Letters Patent. Patented Jan. 2, 1912.

Application filed August 2, 1907. Serial No. 386,748.

To all whom it may concern:

Be it known that I, CLARENCE B. GROFF, a citizen of the United States, residing in the city and county of Camden, State of New Jersey, have invented a new and useful Ratchet-Drill, of which the following is a specification.

In a co-pending application, filed February 6th, 1907, Serial No. 356,039, I have shown and broadly claimed a novel construction of a ratchet drill in which automatic feeding means for the tool are provided, a release therefor and means for providing a long feed thereof with a minimum length of body.

My present invention, while embodying certain of the features shown in my prior application hereinbefore referred to, consists of a novel construction of a hollow feed screw, the walls of which are unapertured.

It further consists of a novel construction of a ratchet sleeve comprising an unapertured outer sleeve and an inner sleeve enveloping the upper end of the drill socket and forming a carrier for the center bearing which applies the pressure on the drill required to do the work.

It further consists of novel means for automatically removing the drill from the socket, consisting in my preferred form of a movable bearing center which abuts against the inner end of the feed screw when the same is in its extreme forward position or toward the working tool.

It further consists of a novel construction and combination with a hollow feed screw of a hardened steel center, novel means being provided whereby the same may be readily removed in case the same becomes broken or unduly worn.

It further consists of novel means for automatically lubricating the moving parts without employing oil holes extending through the outer casing.

It further consists of a novel construction of locking sleeve which is adapted to maintain the cap nut in the adjusted position given thereto.

It further consists of novel means for locking the ring nut with the casing when the parts are in assembled position.

It further consists of a novel construction of ring nut and co-acting pawl whereby a very compact device is produced. By this construction the ring nut can be removed by simply unscrewing it from the casing.

It further consists of novel means for holding the spring carried by the pawl in position and at the same time permitting the removal of the ring nut without injuring the spring.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown in the accompanying drawings, one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described except by the scope of the claims.

Figure 1 represents a vertical sectional view of a drill embodying my invention. Fig. 2 represents a sectional view on line *x*—*x* Fig. 1. Fig. 3 represents a sectional view on line *y*—*y* Fig. 1. Fig. 4 represents a side elevation of my novel construction of feed screw. Fig. 5 represents a top plan view thereof. Fig. 6 represents a sectional view of the ratchet sleeve employed. Fig. 7 represents a top plan view of the ratchet sleeve employed.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, in ratchet drills it is important that a suitable cutting motion be imparted to the tool and a proper amount of feed be given and some means must be provided for quickly and easily removing the tool from the work. My present invention is designed to obtain these results and in addition I have provided a maximum feed with a minimum length of body, which is of advantage where the space in which the drill is to be used is small.

In the drawings, I have shown a certain form for carrying out my invention, although it will be understood that I do not desire to be limited in every instance to the construction as herein shown and described, as other constructions may be employed and other instrumentalities used to accomplish

the same results, and I therefore desire to make any such changes as may be necessary which are within the scope of the claims.

In carrying out my invention I provide means which are so constructed that the tool is automatically fed to the work and if for any reason the friction between the tool and the work is so great that a further feeding is unnecessary, a release for the feed is provided which prevents further feeding of the tool until the excessive friction between the work and the tool is overcome, it being understood that the feeding means and release can be applied to and used with any form of drilling device. I further provide a hollow feed screw which is carried in the casing or body of the tool and extends any desired length in the casing and in the drawings I have shown it as nearly the entire length of the same, so that it will be seen that a long feed is permitted, and I also provide means for imparting a continuous cutting motion to the tool in either direction in which the handle is moved.

1 designates the casing or body of the drill upon which is mounted an internal gear 2 which is held in place between the shoulder 3 on the casing 1 and the ring nut 4, which is in threaded engagement as at 5, with a suitable part of the casing. The gear teeth 6 of the internal gear 2 mesh with the teeth of the pinions 7 and in the drawings, in the present instance, I have shown three pinions, although it will be apparent that any number may be employed and I have shown a plurality for the reason that the bearing is equally distributed. The pinions are held in place in the casing by means of screw pins 8 which are in threaded engagement with the casing, and around which pins the pinions 7 freely rotate, it being noted that the said pinions are situated in substantially the lower portion of the casing. The teeth of said pinions 7 mesh with the teeth in the drill socket 9 which is rotatably held in place in the casing but has some longitudinal play, it being noted that the teeth on the drill socket are on substantially the lower portion thereof and that the extension 10 of said drill socket extends upwardly into the body of the casing, and is provided with a bearing or button 11 for the tool which engages with the shank thereof.

12 designates a hollow feed screw having screw threads upon a suitable portion of its outer surface, the walls of said feed screw being apertured and said feed screw 12 being adapted to surround the drill socket 9 when in position and the threads on said feed screw being adapted to engage with the feed cone nut 13, the outer surface of which is provided with a cone face 14 and said nut thus serving as a friction feed cone nut and being provided in the present instance with a shoulder 15 adapted to rest against the end of the casing as is most clearly seen in Fig. 1.

16 designates an adjusting nut which is in threaded engagement with the casing 1 and which is held from disengagement with the casing by the friction of the threads and in the present instance I also employ a locking nut 17 which is adapted to abut against the adjusting nut 16 and maintain the same in adjusted position given thereto. The upper inner wall of said nut 16 is provided with a cone face 18 adapted to contact with the cone face 14 of the nut 13, so that when the nut is properly held in position the cone faces are in suitable engagement. The friction feed nut 13 is provided with recesses 19 for engagement with a tool for hand feeding or for taking down the drill. Surrounding the hollow feed screw 12 is the ratchet sleeve 20 having the ratchet teeth 21 thereon with which is adapted to engage a pawl 51 which is normally held in proper position by a spring 52 and is suitably mounted in the casing 1 so that the casing 1 is locked to the ratchet sleeve 20 when the former is rotated in one direction and movement between the ratchet sleeve 20 and said casing 1 is permitted when the casing is rotated in the opposite direction. The pawl 51 is provided with a stud 37 which works in a groove 36 in the casing 1, in order to properly guide the pawl, as will be clearly understood by reference to Fig. 3. In the present instance I have shown the ratchet sleeve 20 as comprising an outer unapertured sleeve or casing 22, at the lower end of which the ratchet teeth 21 are located.

23 designates an inner sleeve or casing which has threaded engagement near its lower end with an inwardly extending flange 24 carried by the outer casing 22, the lower end of the inner casing 23 being provided with a shoulder 25 which abuts against the flange 24 when the parts are in assembled position and thus prevents any improper movement of the inner sleeve 23 with respect to the outer sleeve 22. The outer end of the inner sleeve 23 is provided with an opening 26, having different diameters in which the different diameters of the bearing center 27 are adapted to engage, it being understood that the function of the bearing center 27 is to form the bearing for the center or button 11 and also to remove the drill from the socket 9 by imparting a forward movement to the bearing center 27 when the feed screw is approaching the forward limit of its travel. The larger diameter of the bearing center 27 is provided on its under side with a substantially cone shaped recess 28 which is adapted to receive the end of the center or button 11.

29 designates key-ways in the outer cas-

ing 22 of the ratchet sleeve 20, as most clearly seen in Figs. 6 and 7, and in the present instance I prefer to employ a plurality of such key-ways with which lugs 30 extending from the lower portion of the feed screw 12 are adapted to engage when the parts are in assembled position and thus prevent any rotation of the ratchet sleeve 20 with respect to the feed screw 12, it being understood that owing to the provision of the annular chamber 31 formed between the inner casing 23 and the outer casing 22 of the ratchet sleeve, the hollow feed screw 12 has relative longitudinal movement thereon.

32 designates a hardened steel center which has a bearing or seat in the end of the feed screw 12 and is adapted to bear against the arm of the "old man" or any fixed point.

33 designates an aperture in the end of the feed screw 12 whereby the center 32 may be readily removed by the insertion of a suitable drift or other implement whenever it is desired to change or renew said center 32. In the present instance, I provide the ring nut 4 with an inwardly extending flange or shoulder 34 which is adapted to be seated in the recess 35 of the casing 1 when the parts are in assembled position so that at such time the recess 36 on the inner face of the ring 4 is directly in line with the extension 37 of the pawl 51 so that said extension may extend into the recess 36, it being clearly understood from Fig. 1 that the spring 52 will abut against the inner face of the ring nut 4. By this construction the ring nut 4 may be removed from its position without injury to the spring 52, since there is no liability of the spring 52 entering the recess 36 when the ring nut 4 is being placed in position or removed.

38 designates bearing rings which surround the drill socket in order to provide a suitable surface for the rotation thereof.

39 designates a pawl having a plurality of teeth 40 thereon engaging with the teeth of the drill socket 9, said teeth on the pawl being so arranged with respect to the teeth on the socket 9 that when the operating handle is moved in one direction the teeth will lock and thus lock the casing to the drill socket and when the operating handle is moved in the opposite direction the teeth will freely ride and will permit relative rotary movement between the casing and the drill socket. The pawl 39 is actuated by the spring 41 in order to hold the same in proper position and the stud 42 carried by said pawl in the present instance moves in a suitable groove 43 in the casing, in order to properly guide the pawl. In the present instance, I have shown a pawl inserted in the casing 1 and held therein by means of a screw cap 44 which is in threaded engagement with said casing, although any other suitable means for connecting the pawl 39 with the casing may be provided. A handle 45 is connected in any suitable manner with the internal gear for operating the same.

It will be noted that in the present instance the pawl 39 is provided with an extension similar to the extension 37 seen on the pawl 51 and the cap 44 is apertured so as to receive the end of this extension while the spring 41 bears against the cap 44, as will be clearly understood from Fig. 1. The extensions on the pawl 39 and 51 serve to accurately guide the pawl in its movement and also as a retaining device for the springs which surround said extensions. By employing this construction there is no liability of the spring buckling or becoming distorted.

I have provided novel means for automatically lubricating the working parts without employing any oil holes extending through any portion of the outer casing of the device and to accomplish this purpose I provide a chamber or recess 46 in the casing 1, as most clearly seen in Figs. 1 and 3, in which any suitable lubricating material such as a thick grease or graphite may be placed.

47 designates an aperture extending through the wall of the casing 1 and communicating with the chamber 46 and with the inner wall of said casing 1 so that the lubricating material may work down the ratchet teeth 21 on the ratchet sleeve 20 and thence to the bearing rings and to the teeth on the drill socket 9 and pinions 7. In order to lubricate the pins 8, I provide a groove or aperture 48 extending from the chamber 46 through said casing 1 so that lubricating material may pass to the teeth 6 of the internal gearing 2 and the teeth on the pinion 7. The upper face of the pinion 7 is provided with an incline or recess 49, which is adapted to carry the lubricant to the pin 8 whereby same is properly lubricated under all conditions. It will thus be apparent that all of the working parts are properly lubricated under all conditions and that there is no liability of any foreign material coming into contact with the lubricant.

50 designates a bearing ring or anti-friction device located between the end of the ratchet sleeve 20 and the feed screw 12, as is clearly seen in Fig. 1.

The operation of the parts will be readily understood. A tool or drill being placed in the drill socket and the "old man" or other suitable means being connected with the feed screw and the tool placed at a point where it is desired to work, the device is then ready for operation. When the handle 45 is moved down from its position seen in Fig. 2, that is in the direction of the arrow in said figure, the internal gear 2 is carried with the handle and the teeth 6 thereof mesh with the pinions 7 to cause the

same to move to the right, that is, in the direction indicated by the arrow with respect to said pinions in said Fig. 2. This movement of the pinions 7 would tend to rotate the drill socket to the left, that is, in the direction indicated by the arrow with respect to said drill socket in said Fig. 2, and as the teeth on said drill socket are in engagement with the teeth 40 on the pawl 39 and said pawl being so arranged that when the drill socket is moved toward the left, the pawl will lock so as to prevent independent movement of the drill socket and will cause the said drill socket and casing 1 to be locked together. This will cause the casing 1 to be rotated with the handle and internal gear 2 in the same direction of movement thereof and will thus carry with it the drill socket 9 so that the drill therein will be caused to move in a right hand direction, that is, in the cutting direction. When the handle 45 is now moved in the opposite direction, that is to the left, the internal gear 2 is moved with it and the teeth 6 thereof meshing with the pinions 7 will cause the same to rotate in the opposite direction to that indicated by the arrow in Fig. 2, which is to the left. This will impart, by reason of the engagement of the teeth, a right hand movement to the drill socket 9 and as the pawl 39 which is in engagement with the teeth on the drill socket 9, is so arranged that the same will freely ride the teeth of the socket so that the drill socket 9 is moved to the right, imparting a right hand movement to the tool or in a cutting direction. By this means it will be seen that a continuous right hand or cutting movement is imparted to the tool or drill in no matter what direction the handle is moved. The continued backward and forward movement of the handle, it will thus be seen, will impart a continuous rotary movement and I will now describe the feeding action, which takes place coincident with the movement of the handle, it being understood that the feed screw 12 and the ratchet sleeve 20 are always stationary and do not rotate.

As before stated, the cone face 18 of the adjusting nut 16 is brought into suitable frictional contact with the cone face 14 on the feed nut 13 by screwing the said adjusting nut 16 upon the casing, it being noted that the said feed nut 13 is held in proper position by reason of the shoulder 15 thereon abutting against the end of the casing 1, so that it will always be held in proper position and the movement or amount of friction between the cone faces 14 and 18 can be positively adjusted by the operator for the desired amount of pull. It will be noted that by these means the amount of pull can be adjusted before the work is started, so that the tool will do the proper amount of cutting on no matter what character of material is operated upon. That is to say in cast iron, for example, the same amount of pull upon the handle will remove a greater amount of material than if the tool is working upon steel, the only difference being that there will be a difference in the thickness of cutting of the tool. Further it will be noted that the friction between the said cone faces 14 and 18 will be such that when the friction set up between the work and the tool becomes greater than the amount of friction between the said cone faces, the latter will slide upon each other, thus forming an automatic release and further when the work has been nearly accomplished, that is to say, for example when the point of the tool has passed through the material and yet the hole has not been completely drilled, the friction between the cone faces can be decreased by the operator, the required amount, in order that the feed will be slower so that there will be no bulging of the work or cracking and the tool will be fed more slowly so that a clean cut from beginning to end will be obtained and without any danger of breaking the drill. It will be noted therefore that as the handle 45 is rotated to the right from its position seen in Fig. 2, that is in the direction of the arrow in said figure, as previously explained, the casing will be locked to the handle through the intermediate mechanism and the said casing will be rotated. This carries with it the adjusting nut 17 and the cone nut 13 by reason of the frictional engagement, as above described, between the cone faces, so that the said nut 13 will be rotated and will thus be fed down upon the feed screw 12, imparting the required amount of feed to the tool, it being understood that this feed will be continued during the movement of the handle in the direction to the right until the friction between the work and the tool is such that the friction between the cone faces is overcome. When, however, the handle is moved in the opposite direction from that indicated in Fig. 2, the casing, as before described, will be released and will stand still so that there is no feeding. By this means the tool can be fed to its work until the friction is too great therebetween when there will be an automatic release of the feeding means. By reason of the hollow screw and the arrangement of the parts I am enabled to provide a long feed, since the hollow feed screw receives the major portion of the drill socket thus making the feed screw longer than it could be with any other construction given the same length of casing.

Attention is called to the fact that in the drill shown in Fig. 1 the pressure is applied directly to the end of the shank upon the upper portion of the tool and the operating

parts of the drill are free from pressure, it being noted that the feed screw being held from rotation by engagement of the "old man" the pressure will be exerted through the feed screw to the feed nut and thence to the outer sleeve or casing 22 on the ratchet sleeve 20, thence to the inner sleeve 23, thence to the bearing center 27, thence to the center or button 11 carried by the drill socket 10 and thence to the shank of the drill or working tool. Attention is also called to the fact that the internal gear 2, pinion 7, the teeth on the drill socket 9 and the pawl 39 are in substantially the same plane, so that the power is evenly applied in all directions and there is no tendency to twist the parts. The pawl 51 is seated in the body of the drill and adapted to interlock with the teeth on the ratchet sleeve 21 and the sleeve is adapted to be seated in a slotted hole in the arm of the old man which prevents the sleeve from rotating, and since the sleeve, body and pawl are locked together, these three parts are prevented from rotation and act as a base to hold the pinions stationary while they are actuated by the internal gear.

By reason of the fact that I am enabled to adjust the pressure or amount of feed, the construction herein is particularly adapted for use in reaming, it being understood that after a hole has been drilled it is often, and in fact in a great many cases, necessary to ream the same and I withdraw the tool and insert the reamer in the drill. The pressure required for operating the reamer can be adjusted to any desired amount in order that the reamer will accomplish its work, it being understood that by simply turning the adjusting nut 16 the amount of pressure between the friction faces 14 and 18 is adjusted with the corresponding result. The same advantages are derived from the drill herein described when the same is used for tapping.

It is to be especially noted that I locate the lugs 30 at the lower end of the feed screw 12 with a portion of them extending below the end of the feed screw, in order to obtain a maximum length of the feed screw and efficient bearing value for the lugs, it being seen by this construction that I am enabled to get a length of lug suitable for the purpose required without shortening the operative length of the feed screw. It will also be noted that the lower end of the inner sleeve 23 is recessed, as shown in Fig. 7, in order to permit the lugs 30 to enter and the key-ways 29 extend the entire length of the outer casing 22, as will be clearly apparent from Fig. 6, so that the lower end of the feed screw 12 can abut against the flange 24 carried by the outer casing 22. It will further be apparent that the outer end of the feed screw 12, as is clearly indicated in Figs. 4 and 5, is faced or squared off in any suitable manner so that it may be received in any suitable shaped opening, thereby retaining the feed screw and preventing rotation of the said feed screw.

In so far as I am aware, I am the first in the art to employ a single bearing center at the outer end of the device and a continuous ratchet, whereby I am enabled to use this ratchet as a single acting ratchet should the conditions be such as not to permit the clamping of the feed screw as required, in order to obtain a continuous motion. This device is adapted to be used as a single acting ratchet, in which case the center 32 simply bears against the arm of the old man, the result of which is that the device will only be operated when turned in one direction.

It is to be noted that in my present construction, the driving means are located below the tang of the working tool when the same is in assembled position. The working parts are suitably lubricated under all conditions and there are no holes or apertures in the outer casing through which foreign matter may enter to clog or injure the working parts.

It will now be apparent from the foregoing that I have devised a novel and useful construction of ratchet drill which embodies the features of advantage enumerated as desirable in the statement of invention and the above description and while I have, in the present instance, shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that it is susceptible of modification in various particulars within the scope of the claims without departing from the spirit and scope of the invention or sacrificing any of its advantages.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a ratchet drill, a casing, a ratchet sleeve mounted therein and adapted to be intermittently interlocked therewith, a hollow feed screw operatively connected with said sleeve and having only longitudinal movement with respect thereto, a bearing center movably carried by said sleeve and engaging said feed screw, a drill socket, a center bearing carried thereby and adapted to engage the bearing carried by said sleeve, and means co-acting with said drill socket and ratchet sleeve for rotating said drill socket.

2. In a ratchet drill, a casing, a ratchet sleeve carried thereby and adapted to be intermittently interlocked therewith, a hollow feed screw extending into said sleeve and having only longitudinal movement with respect thereto, a bearing carried by said sleeve and adapted to engage said feed screw, a drill socket extending into said sleeve, a

center bearing movably carried thereby and adapted to engage the bearing carried by said sleeve, means for automatically actuating said feed screw, and means co-acting with said drill socket and ratchet sleeve for rotating said drill socket.

3. In a ratchet drill, a casing, a ratchet sleeve carried thereby, means for intermittently interlocking said sleeve and casing, a hollow feed screw extending into said sleeve and having only longitudinal movement with respect to said sleeve, a bearing movably carried by said sleeve, a drill socket extending into said sleeve, a center bearing movably carried thereby and co-acting with the movable bearing of said sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

4. In a ratchet drill, a casing, a sleeve carried thereby, means for intermittently interlocking said sleeve and casing, a hollow feed screw extending into said sleeve and having only longitudinal movement with respect thereto, a movable bearing carried by said sleeve and engaging said feed screw, a drill socket extending into said sleeve, a bearing carried thereby co-acting with the bearing of said sleeve, a bearing carried by said feed screw in alinement with said movable bearing, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

5. In a ratchet drill, a casing, a sleeve carried thereby, and provided with ratchet teeth, a pawl co-acting with said teeth and provided with a lug, a ring carried by said casing and provided with a recess into which said lug is adapted to extend, a spring interposed between said ring and said pawl, a hollow feed screw extending into said sleeve and having only longitudinal movement with respect thereto, a bearing carried by said sleeve engaging said screw, a drill socket, a bearing carried thereby engaging the bearing of said sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

6. In a ratchet drill, a casing, a ratchet sleeve carried thereby comprising an inner and outer casing, the walls of which are unapertured, ratchet teeth carried by said outer casing, a movable bearing carried by said inner casing, a feed screw co-acting with said bearing and having only longitudinal movement with respect to said ratchet sleeve, means for intermittently interlocking said outer casing with said drill casing, a drill socket having its upper end surrounded by said inner casing, a bearing carried by said socket engaging the bearing of said sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

7. In a ratchet drill, a casing, a ratchet sleeve carried thereby and adapted to be retained against rotation in one direction and comprising an inner and outer casing the walls of which are unapertured, said outer casing having ratchet teeth, a movable bearing carried by said inner casing, a feed screw co-acting with said bearing and having only longitudinal movement with respect to said sleeve, means for intermittently interlocking said outer casing with said drill casing, a drill socket having its upper end surrounded by said inner casing, a bearing carried by said socket engaging the bearing of said sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

8. In a ratchet drill, a casing, a ratchet sleeve carried thereby, means for intermittently interlocking said sleeve and casing, a hollow feed screw, the lower end of which is surrounded by said sleeve, said feed screw being non-rotatable with respect to said sleeve but having longitudinal movement with respect thereto, a movable bearing carried by said sleeve and engaging said feed screw, a drill socket, a movable bearing carried thereby engaging the movable bearing of said sleeve, a center bearing carried by said feed screw at its outer end, means for preventing the rotation of said feed screw, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

9. In a ratchet drill, a casing, a ratchet sleeve carried thereby and adapted to be held against rotation in one direction, a hollow feed screw extending into said sleeve, a feed nut for said feed screw, means for preventing relative rotation of said screw and sleeve, a movable bearing carried by said sleeve and engaging said screw, a drill socket extending into said sleeve, a bearing movably carried thereby and in contact with the bearing of said sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

10. In a ratchet drill, a casing, a feed nut, having a friction face, adjustably carried thereby, means for locking said nut in its adjusted position, a ratchet sleeve carried by said casing, means for intermittently interlocking said sleeve and casing, a hollow feed screw, an adjusting nut adjustably carried thereby and having a friction face co-acting with the friction face of said first bearing nut, a drill socket extending into said sleeve, a bearing carried thereby and in contact with the movable bearing of said sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

11. In a ratchet drill, a casing, a ratchet sleeve comprising an inner and an outer casing non-rotatably carried by said casing, means for intermittently interlocking said sleeve and casing, a hollow feed screw hav-

ing only relative longitudinal movement with respect to said sleeve, a movable bearing carried by said sleeve and abutting against said feed screw, a drill socket extending into said sleeve, a bearing carried thereby and in contact with the movable bearing of said sleeve, means co-acting with said drill socket and ratchet sleeve for actuating said drill socket, and means for automatically actuating said feed screw.

12. In a ratchet drill, a casing, a ratchet sleeve comprising an inner and outer sleeve secured together near their lower ends and carried by said casing, means for intermittently interlocking said sleeve and casing, a hollow feed screw located between said inner and outer sleeve and having only relative longitudinal movement with respect thereto, a feed nut for said feed screw, a movable bearing carried by said inner sleeve and engaging said feed screw, a drill socket surrounded by said inner sleeve, a a bearing carried by said drill socket and in contact with the bearing of said inner sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

13. In a ratchet drill, a casing, a ratchet sleeve comprising an inner and an outer sleeve detachably secured together at one end, means for intermittently interlocking said outer sleeve and said casing, a hollow feed screw surrounding said inner sleeve, a feed nut for said feed screw, a movable bearing carried by said inner sleeve and engaging said feed screw, a drill socket extending into said inner sleeve, a bearing movably carried thereby and in contact with the bearing of said sleeve, means for automatically actuating said feed screw, and means co-acting with said drill socket and sleeve for actuating said drill socket.

14. In a ratchet drill, a casing, a sleeve carried thereby, a hollow feed screw surrounded by said sleeve and having its outer end apertured, a center located in alinement with said aperture, a feed nut for said feed screw, a drill socket, a center movably carried thereby and having thrust connection with said feed screw, driving means for said drill socket, and means for automatically actuating said feed screw.

15. In a ratchet drill, a casing, a ratchet sleeve comprising an inner and an outer sleeve secured together near one end, there being longitudinal grooves in said outer sleeve, a hollow feed screw located intermediate said inner and outer sleeves, lugs carried by said feed screw and engaging the grooves of said outer sleeve, means for intermittently interlocking said outer sleeve and casing, a bearing movably carried by said inner sleeve and engaging said feed screw, a drill socket extending into said inner sleeve, a bearing carried thereby and in contact with the bearing of said sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

16. In a ratchet drill, a casing having a chamber for lubricating material therein, a sleeve, having unapertured walls provided with ratchet teeth, carried by said casing, the latter having a passage leading from said chamber to said teeth, means carried by said casing adapted to intermittently interlock said sleeve and casing, a bearing carried by said sleeve and in contact with said feed screw, a drill socket extending into said sleeve, a bearing carried thereby and in contact with the bearing of said sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket.

17. In a ratchet drill, a casing having a chamber for lubricating material therein, a sleeve having unapertured walls provided with ratchet teeth and carried by said casing, the latter having a passage leading from said chamber to said teeth, a spring actuated pawl carried by said casing adapted to intermittently interlock said sleeve and casing, a feed nut for said feed screw, a bearing carried by said sleeve and having thrust connection with said feed screw, a drill socket extending into said sleeve, a bearing carried thereby having thrust connection with the bearing of said sleeve, and means co-acting with said drill socket and ratchet sleeve for actuating said drill socket, there being a passage leading from said lubricating chamber to said driving means.

18. In a ratchet drill, a casing having its outer face recessed to form an oil chamber, a ratchet sleeve within said casing, means carried by said casing adapted to interlock with said sleeve, a ring nut carried by said casing adapted to form with said recess an oil chamber and to maintain said pawl in assembled position, a hollow feed screw surrounded by said sleeve and adapted to be held against rotation in one direction, a bearing carried thereby and having thrust connection with said feed screw, a drill socket, a bearing carried thereby in contact with the bearing of said sleeve, and means for permitting the passage of oil from said chamber to said driving means.

CLARENCE B. GROFF.

Witnesses:
H. S. FAIRBANKS,
E. HAYWARD FAIRBANKS.