Nov. 6, 1928. 1,690,571

J. S. DONALDSON

TOOL AND TOOL RETAINER

Filed Nov. 24, 1923 2 Sheets-Sheet 1

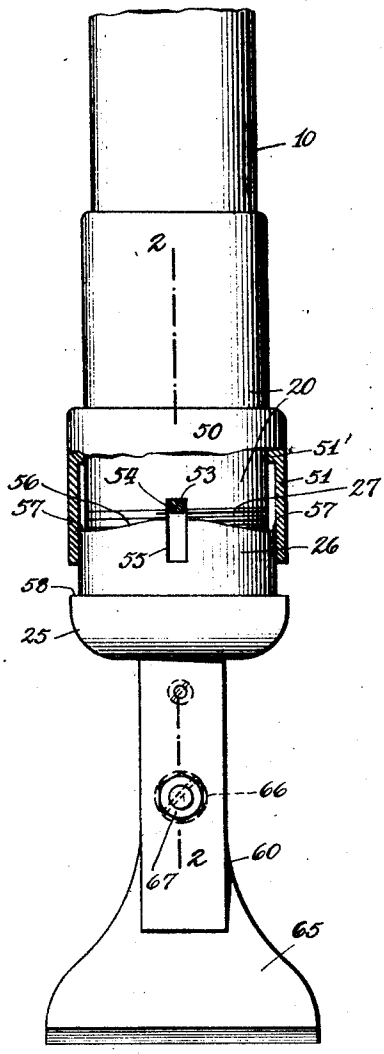

Fig. 1.

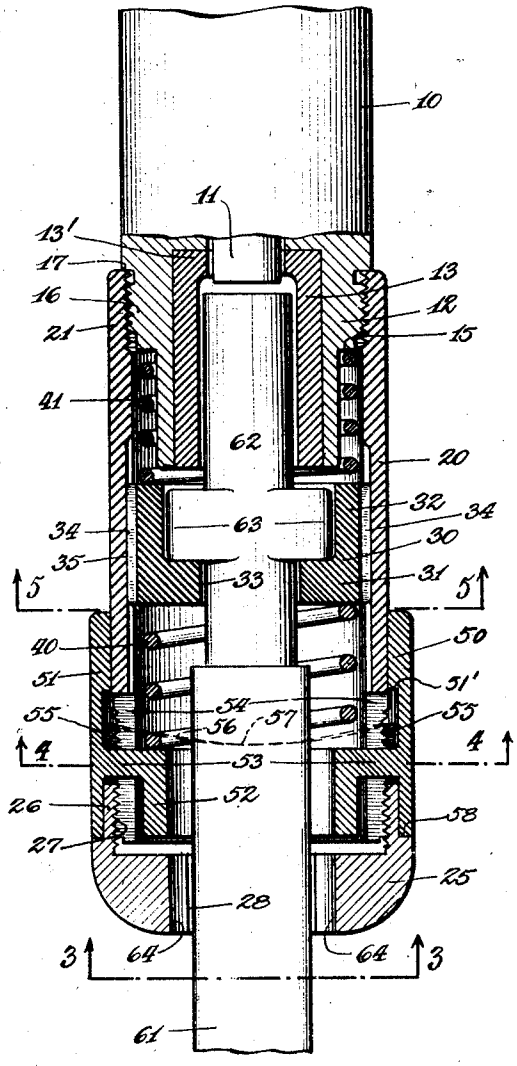

Fig. 2.

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Fig. 3.

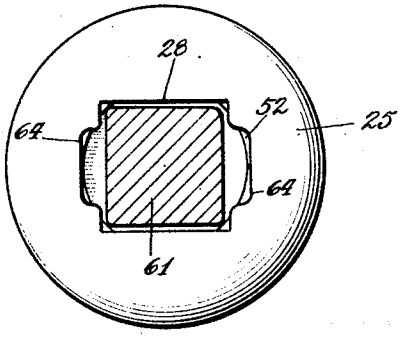


Fig. 4.

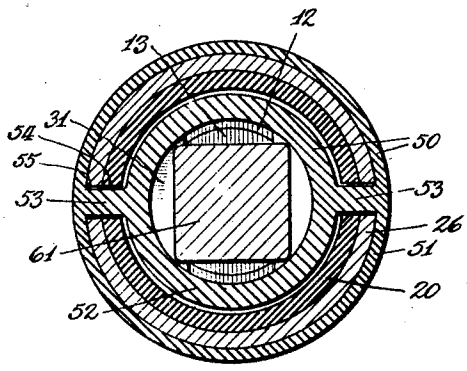
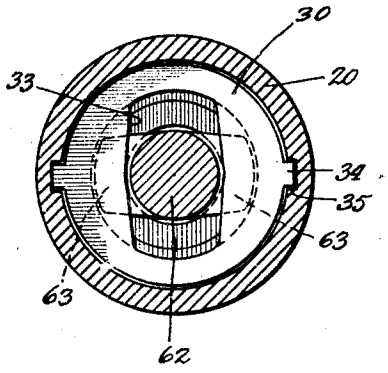


Fig. 5.



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UNITED STATES PATENT OFFICE.

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TOOL AND TOOL RETAINER.

Application filed November 24, 1923. Serial No. 676,742.

This invention relates to tools and tool retainers for automatic cutting and hammering devices to which the generic term "pneumatic chisels" may be applied. An object of the invention is to provide a pneumatic chisel with a tool retainer which may be adjusted to vary the force of the hammer blows on the tool so as to adapt the device either for heavy rough cutting, riveting, or other pounding, or for fine carving, or for any intermediate work.

United States Patent No. 1,443,461, issued to me on January 30, 1923, describes a tool retainer for pneumatic chisels which holds a tool in operative relation with the hammer of the chisel and enables a workman to turn and guide the tool without grasping it with his hand. The present invention may be incorporated in a device of the type described in that patent, and when so used serves to give a workman using a pneumatic chisel as complete control over the operation of the tool as he has heretofore obtained by grasping the tool in his hand, while at the same time the workman is protected from the injury which results from grasping a vibrating hammer-driven tool.

The present invention aims generally to improve the construction and operation of the device shown in my aforesaid patent. A tool retainer embodying the present invention may, like that shown in the former patent, be provided with two tool-engaging members, one of which is so mounted that it cannot be rotated with respect to the tool retainer and is adapted to hold the tool in the retainer but to permit the withdrawal of the tool when the tool is turned in one direction, and the other of which fits upon the tool in such a way as to prevent turning of the tool with respect to it and is rotatably mounted in the retainer and provided with releasable locking means by which its rotation may be prevented. According to the present invention the non-rotary tool-engaging member is held between two springs, and means are provided for adjusting its normal position to regulate the force of the hammer blows on the tool. Furthermore, the releasable locking means for the rotatably mounted tool-engaging member is normally held in locking position by the thrust of one of these springs so that no additional spring is required for the locking means.

Other features and advantages of the invention are hereinafter set forth in connection with a detailed description of the specific embodiment of the invention which is illustrated in the accompanying drawings, in which

Fig. 1 is a side view of a complete pneumatic chisel provided with my improved tool retainer, showing parts in section, and showing the locking sleeve pulled back to permit a release of the tool from the retainer;

Fig. 2 is an enlarged longitudinal section taken on the line 2—2 of Fig. 1 showing the locking sleeve in its operative position in which it prevents removing the tool from the retainer; and

Figs. 3, 4 and 5 are transverse sections taken on the lines 3—3, 4—4 and 5—5 of Fig. 2, respectively.

The drawings show the tool retainer applied to the ordinary barrel 10 of a pneumatic chisel. The barrel 10 contains the usual pneumatically operated hammer, the outer end 11 of which is shown in Fig. 2. The outer end 12 of the barrel 10 is provided with the customary central opening to admit the round end of the shank of the tool, and, as is usual, in this opening is fixed a sleeve 13 provided with a collar portion 13′ to limit the inward movement of the tool. The outer end 12 of the barrel 10 is formed to provide an inner shoulder 15, an externally threaded cylindrical portion 16, and an outer shoulder 17.

The tool retainer, comprising a sleeve 20 and parts carried thereby, is attached to the barrel 10 by screwing an internally threaded portion 21 at the inner end of the sleeve on the externally threaded portion 16 of the handle. The sleeve is screwed on to the barrel firmly so as to bring its inner end against the shoulder 17 of the barrel. The sleeve is not detached from the barrel in the ordinary use of the device and may, therefore, be permanently secured to the handle by means other than the threaded connection which has been described.

A rotatably mounted tool-engaging mem-

ber is located at the outer end of the sleeve 20 and consists of a cap 25 provided with an internally threaded cylindrical flange 26 which is screwed on external threads 27 formed on the outer portion of the sleeve 20. The cap 25 contains a central opening 28 of a shape to fit on the outer portion of the shank of the tool. In the drawings, this portion of the tool shank and the opening are square in form, but they may be made of any other desired shape, except circular.

The retainer is provided with a non-rotary tool-engaging member to hold the tool in the retainer in position to be subjected to blows of the hammer. In the form shown the non-rotary engaging means comprises a plunger 30 slidably mounted within the sleeve 20 and having a disc-shaped portion 31 and a cylindrical bearing flange 32. The portion 31 is provided with an elongated aperture 33. To prevent rotation of the plunger with respects to the sleeve, the plunger is provided with keys 34 fixed in opposite sides thereof and adapted to slide longitudinally in key-ways 35 formed in the inner surface of the sleeve 20.

The plunger 30 is held between two compression springs 40 and 41. The spring 40 reacts between the plunger and a locking member 50 which is held against movement under the thrust of the spring by engagement with the cap 25. The spring 40, therefore, tends to throw the plunger 30 inwardly toward the hammer 11. The spring 41 reacts between the plunger and the shoulder 15 of the barrel. This spring, therefore, tends to throw the plunger away from the hammer. The spring 40 is much stronger than the spring 41 so that the position in which the plunger 30 is normally held by the two springs may be varied by varying the position of the outer abutment of the spring 40. Consequently the normal position of the plunger may be varied by adjusting the cap 25 longitudinally with respect to the sleeve 20. Thus, if the cap 25 is screwed further inward on the threaded portion 27 of the sleeve 20, the plunger 30 is moved inwardly toward, the barrel 10, while if the cap 25 is screwed outwardly, the plunger is moved further from the barrel.

The locking member 50 serves to lock the cap 25 against rotation with respect to the sleeve 20. The locking member consists of an outer sleeve 51, an inner ring 52, and two keys 53 which extend radially between the sleeve and the ring and are permanently secured to both of them, so that the sleeve, the ring, and the keys form together a single rigid member. The keys 53 pass through two diametrically opposite longitudinal slots 54 which are formed in the outer portion of the sleeve 20 and extend to the outer end of that sleeve. The sleeve 51 of the locking member fits loosely against the outer surface of the cylindrical flange 26 of the cap 25. The sleeve 51 has near its inner end a shoulder 51′ which fits loosely against the outer surface of the sleeve 20. The ring 52 of the locking member is carried by the keys 53 in position to form an abutment for the outer end of the spring 40.

The cylindrical flange 26 of the cap 25 covers the outer portions of the slots 54 in the sleeve 20, but does not extend far enough in to cover the inner ends of these slots, even when the cap 25 is screwed inwardly as far as possible on the threaded portion 27 of the sleeve 20. In the inner edge of the cylindrical flange 26 are two open longitudinal slots or recesses 55 which are located at diametrically opposite points. The portions 56 of the inner edge of the flange are curved, having their lowest points 57 at 90° from the recesses 55. When the cap 25 is turned so as to bring its recesses 55 into alignment with the slots 54 in the sleeve 20, the keys 53 of the locking member enter the recesses 55, as shown in Fig. 2, and serve to prevent rotation of the cap 25 with respect to the sleeve. The keys are retained in the slots 55 by the pressure of the spring 40 against the ring 52 of the locking member. When the keys are in the recesses, this pressure urges the locking member outwardly until its outer edge is brought into engagement with an external shoulder 58 formed on the cap 25. When the locking member is in this position, its sleeve 51 completely covers and protects the threaded portion 27 of the sleeve and the slots 54. The keys may be withdrawn from the recesses 55 so as to release the cap 25 by grasping the outer sleeve 51 and drawing the locking member inwardly against the force of the spring 40 until the locking member occupies the position shown in Fig. 1. If the cap 25 be then turned and the locking member be released, the spring 40 will urge the keys 53 against the curved portions 56 of the inner edge of the flange 26 of the cap 25.

In assembling the tool retainer the sleeve 20 is first screwed on the threaded portion 16 on the handle 10. The spring 41 is then inserted in the sleeve 20. The plunger 30 is inserted next. In inserting the plunger the keys 34 are placed in the slots 54 at the outer end of the sleeve 20 so that they slide into the keyways 35 which extend from the inner ends of the slots 54. The locking member 50 is then applied to the sleeve 20, the keys 53 being placed in slots 54. By grasping the outer sleeve 51 of the locking member, the locking member is then pulled inwardly against the force of the spring 40 so that it uncovers the threaded portion 27 at the outer end of the sleeve 20

The cap 25 is then applied by screwing its internally threaded flange 26 upon the threads 27.

All the parts of the tool retainer may thus easily be removed from the sleeve 20 and replaced therein without detaching the sleeve 20 from the handle 10. In consequence any part of the tool retainer which has become worn or injured may easily be replaced. I have found, however, that, after continuous use of the device in stone cutting for one year, the only parts of the tool retainer which require replacement are the springs which may occasionally be broken.

A tool 60, which is used with the retainer, has a shank of the same general type as that of the tool described in my aforesaid Patent No. 1,443,461. The outer portion 61 of the tool shank is non-circular in cross-section, being shown as square. The inner portion 62 of the shank is cylindrical and smaller than the outer portion. On the cylindrical portion 62 are two diametrically opposite shoulders 63. The extreme width across these shoulders is greater than the width of the outer portion 61, and the square opening 28 in the cap 25 is accordingly provided with two diametrically opposite recesses 64 to permit the passage of the shoulders 63 through the cap 25.

The operative portion 65 of the tool is detachably secured at the outer end of the shank in a manner described in United States Patent No. 1,458,171 issued to me on June 12, 1923. The screw 66 which secures the operative portion to the shank is provided with a lock nut 67 in order that the screw may not be loosened by the vibration of the tool. While the cost of making the shank 61, 62 is necessarily somewhat greater than the cost of an ordinary round tool shank, this fact does not add to the cost of operation of the pneumatic chisel, for since the operative portion 65 is detachably secured to the shank the shank may be used indefinitely by the substitution of a new operative portion for one which has become worn in use.

When the tool is to be inserted in the tool retainer, the locking member 50 is drawn inwardly to the position shown in Fig. 1, and the cap 25 is turned through 90° from the position shown in Figs. 1 and 2, so that the keys 53 rest on the lowest points 57 of the curved portions 56 of the inner edge of the flange 26 of the cap. This turning of the cap brings the recesses 64 of the cap into alignment with the elongated aperture 33 in the plunger 30. The shank of the tool is then inserted in the tool retainer, the shoulders 63 of the tool shank passing through the recesses 64 in the cap and through the aperture 33 in the plunger. The cap 25 is then turned through an angle of 90°, bringing its recesses 55 into alignment with the slots 54 in the sleeve 20. As soon as the position of alignment is reached the keys 53 of the locking member 50 enter the recesses 55 and the locking member is forced outward by the spring 40 to the position shown in Fig. 2. The shoulders 63 of the tool shank then extend at right angles to the elongated opening 33 in the plunger 30 so that the tool shank is held in the tool retainer and its longitudinal position therein is determined by the position of the plunger 30.

In using the pneumatic chisel, the workman places one hand upon the barrel 10 and the other upon the sleeve 20 or the sleeve 51 of the locking member. He is thus enabled to guide the tool without grasping an oscillating part of the device. After the tool is driven forward by each blow of the hammer, the spring 40 throws the tool inwardly into position to be subjected to the next blow of the hammer, and at the same time the spring 40 serves to press the locking member 50 outward so that the keys 53 are held firmly in the recesses 55, eliminating all danger of a turning of the cap 25, which would release the shoulders of the tool shank from the plunger 30.

In order to remove the tool from the retainer, the locking member is pulled inwardly to the position shown in Fig. 1, and the cap 25 is turned, usually by grasping the projecting portion 61 of the tool shank, until the keys 53 come against the lowest points 57 of the curved portions 56 of the inner edge of the flange 26 of the cap. This brings the shoulders 63 of the tool shank into alignment with the elongated aperture 33 in the plunger 30 and releases the tool so that it may be withdrawn from the retainer. The proper position to which to turn the cap in order to release the tool is made apparent by the release of the tool, which may be felt by the hand which is turning the tool and cap. After the tool has been withdrawn, the cap is held against accidental displacement by the friction between the inner edge of the flange 26 of the cap and the keys 53 which are urged against the points 57 of this edge by the spring 40. The cap is thus held in proper position for the insertion of another tool.

To regulate the force of the hammer blows on the tool it is necessary only to draw the locking member 50 inward to the position shown in Fig. 1, and then, while holding the locking member in this position, to screw the cap 25 further inwardly on the threaded portion 27 of the sleeve 20 if a stronger blow is required, or to screw the cap outwardly if a weaker blow is required. In either case, after the desired adjustment is made, the locking member 50 is released and the cap is turned until the keys 53 enter the

recesses 55, locking the cap and tool against further turning.

By actual use of the tool retainer described, I have ascertained that this adjustment makes it possible to position the tool either so that it receives the full force of the hammer blows, or so that it is normally just out of reach of the hammer where it is not struck by the hammer except when the operative portion of the tool is pressed against the work. A pneumatic chisel provided with the tool retainer is, therefore, adapted both for the heaviest rough cutting and for fine carving, as well as for any intermediate grade of work. The workman's control of the force of the hammer blows is fully as complete as that which is attained when the workman actually grasps the shank of the tool with his hand, while at the same time the workman's hand is relieved of substantially all vibration.

What I claim is:

1. The combination with a barrel containing a reciprocatory hammer and a tool to be driven by said hammer, of a tool retainer secured to the barrel and having a relatively strong spring tending to urge the tool toward the hammer, and a relatively weak spring tending to urge the tool away from the hammer.

2. The combination with a barrel containing a reciprocatory hammer and a tool to be driven by said hammer, of a tool retainer secured to the barrel and having a spring tending to urge the tool toward the hammer, a spring tending to urge the tool away from the hammer, and means for varying the normal position in which the tool is held by said springs between a position in which the tool receives the full force of the blows of the hamer and a position in which the tool is out of reach of the hammer.

3. The combination with a barrel containing a reciprocatory hammer and a tool to be driven by said hammer, of a tool retainer secured to the barrel and having a slidably mounted member engaging the tool, a relatively weak spring engaging the inner side of said slidable member, an abutment for the inner end of said spring in fixed relation to the barrel, a relatively strong spring engaging the outer side of said slidable member, an abutment for the outer end of said spring, and means for adjusting said abutment toward and away from the barrel to vary the normal position of the tool with respect to the hammer.

4. The combination with a barrel containing a reciprocatory hammer and a tool having a shank, the outer portion of which is non-circular in cross-section and the inner portion of which is of less diameter than the outer portion and provided with a shoulder, of a tool retainer secured to said barrel and provided with a first disc containing an elongated aperture to permit the passage of said shoulder when the tool is turned in one direction relatively thereto, a second disc containing an aperture fitting the non-circular portion of the tool shank, a relatively weak spring reacting between the barrel and the first disc, a relatively strong spring reacting between the first disc and the second disc, means for adjustably moving the second disc toward and away from the barrel, and releasable locking means for restraining rotation of the second disc with respect to the first disc.

5. The combination with a barrel containing a reciprocatory hammer, a sleeve attached to the barrel, a plunger in said sleeve, a cap mounted on the outer end of said sleeve, a tool having a shank extending through said cap and engaging said plunger, a relatively weak spring reacting between said barrel and said plunger, a relatively strong spring reacting between said plunger and said cap, and means for adjusting said cap longitudinally of the sleeve to vary the normal position of the plunger and tool with respect to the hammer.

6. The combination with a berrel containing a reciprocatory hammer and a tool having a shank, the outer portion of which is non-circular in cross-section and the inner portion of which is provided with a shoulder, of a tool retainer comprising a sleeve surrounding the shank of the tool and attached to the barrel, a plunger in said sleeve having an aperture through which the shoulder on the tool shank may pass when the tool is turned in one direction, means for preventing rotation of the plunger with respect to the sleeve, a cap mounted on the sleeve for longitudinal and rotary movement with respect thereto and containing an aperture fitting the non-circular portion of the tool shank, a relatively weak spring reacting between the barrel and the plunger, a relatively strong spring reacting between the plunger and the cap, means for adjusting the cap longitudinally of the sleeve, and releasable locking means adapted to lock the cap to the sleeve in any longitudinal position of the cap when the cap is turned so that the shoulder on the tool shank is out of alignment with the aperture in the plunger.

7. The combination with a barrel containing a reciprocatory hammer and a tool having a shank, the outer portion of which is non-circular in cross-section and the inner portion of which is provided with a shoulder, of a tool retainer comprising a sleeve attached to the barrel and having a threaded outer portion, a plunger in said sleeve having an aperture through which the shoulder on the tool shank may pass when the tool is turned in one direction, means for preventing rotation of the plunger with respect to the sleeve, a cap having a threaded portion

engaging a threaded portion of the sleeve and containing an aperture fitting the non-circular portion of the tool shank, a relatively weak spring reacting between the barrel and the plunger, a relatively strong spring reacting between the plunger and the cap, and releasable locking means adapted to lock the cap to the sleeve when the cap and tool are turned so that the shoulder on the tool shank is out of alignment with the aperture in the plunger.

8. The combination with a barrel containing a reciprocatory hammer and a tool having a shank, the outer portion of which is non-circular in cross-section and the inner portion of which is provided with a shoulder, of a tool retainer comprising a sleeve attached to the barrel and having a threaded outer portion, a plunger in said sleeve having an aperture through which the shoulder on the tool shank may pass when the tool is turned in one direction, means for preventing rotation of the plunger with respect to the sleeve, a cap having a threaded portion engaging a threaded portion of the sleeve and containing an aperture fitting the non-circular portion of the tool shank, a locking member slidably mounted on said sleeve adjacent to said cap, means for preventing the locking member from turning with respect to the sleeve, cooperating engaging means on the locking member and the cap adapted to prevent rotation of the cap when the cap and tool are turned so that the shoulder on the tool shank is out of alignment with the aperture in the plunger, a relatively weak spring reacting between the barrel and the plunger, and a relatively strong spring reacting between the plunger and the locking member and serving to urge the plunger toward the barrel and to retain the locking member in engagement with the cap.

9. The combination with a barrel containing a reciprocatory hammer and a tool to be driven by said hammer, of a tool retainer, releasable locking means in said retainer to engage the tool and prevent its withdrawal therefrom, and a movable element in the retainer engaging the tool and a spring reacting between said movable element and said locking means and serving to urge said movable element and the tool toward the hammer and to hold said locking means in said locking position.

10. The combination with a barrel containing a reciprocatory hammer, of a tool, a portion of whose shank is non-circular in cross-section, a sleeve surrounding the shank of the tool and attached to the barrel, a plunger in said sleeve, means for retaining said plunger against rotation with respect to the sleeve, cooperating engaging means on said plunger and the tool shank to retain the shank within the sleeve and to permit the shank to be withdrawn when turned in one direction with respect to the sleeve, a spring urging said plunger toward the barrel, a disc rotatably mounted on the sleeve and containing an aperture fitting the non-circular portion of the tool shank, and releasable locking means receiving the thrust of said spring and urged thereby into position to lock said disc against turning with respect to the sleeve.

11. In a tool retainer the combination of a sleeve having its outer portion threaded and containing a longitudinal slot, a cap at the outer end of said sleeve having a threaded cylindrical flange in engagement with the threaded portion of the sleeve and adapted to cover the outer portion of the slot in the sleeve and containing a recess in its inner end, a compression spring in said sleeve, and a member for releasably locking said cap against rotation with respect to said sleeve consisting of a portion within said sleeve receiving the thrust of said spring, a key extending through the slot in the sleeve, and an outer portion slidably mounted against the outer side of the sleeve.

12. In a tool retainer, the combination of a sleeve having a threaded portion at its outer end and containing two diametrically opposite longitudinal slots, a cap at the outer end of the sleeve having a threaded cylindrical flange engaging the threaded portion of the sleeve and containing two diametrically opposite recesses in its inner end, a compression spring in said sleeve, and a locking member consisting of a sleeve slidably mounted on the outside of said sleeve and the outside of the flange of said cap, two radial keys extending through the slots in the sleeve, and a ring secured to the inner ends of said keys and receiving the thrust of said spring.

13. In a tool retainer, the combination of a sleeve having a longitudinal slot in its outer portion, a cap at the outer end of said sleeve having a cylindrical flange rotatably mounted on said sleeve adapted to cover the outer portion of said slot and having a recess in its inner end, and a member for locking said cap against rotation with respect to said sleeve, comprising a part located within the sleeve and receiving the thrust of said spring, a key extending through the slot in the sleeve, and means secured to the outer end of said key for moving the locking member against the force of the spring.

14. The combination of a tool, comprising a cutting or hammering portion and a shank, the outer portion of which is non-circular in cross-section and the inner portion of which is of less diameter than the outer portion and is provided with oppositely disposed shoulders extending radially outward beyond the periphery of the non-circular portion of the shank, and a tool retainer provided with a first disc containing an elongated aperture

adapted to permit the passage of the shoulders of the tool shank when the tool is turned in one direction, a second disc containing an aperture fitting the non-circular portion of the tool shank and two recesses extending from said aperture to permit the passage of the shoulders through the aperture, and releasable locking means for restraining rotation of the second disc with respect to the first disc.

In testimony whereof I have hereunto set my hand.

JOHN SHEARMAN DONALDSON.