No. 791,832. PATENTED JUNE 6, 1905.

W. J. SMITH.

TAP.

APPLICATION FILED MAR. 24, 1900.

3 SHEETS—SHEET 1.

Fig. 1.

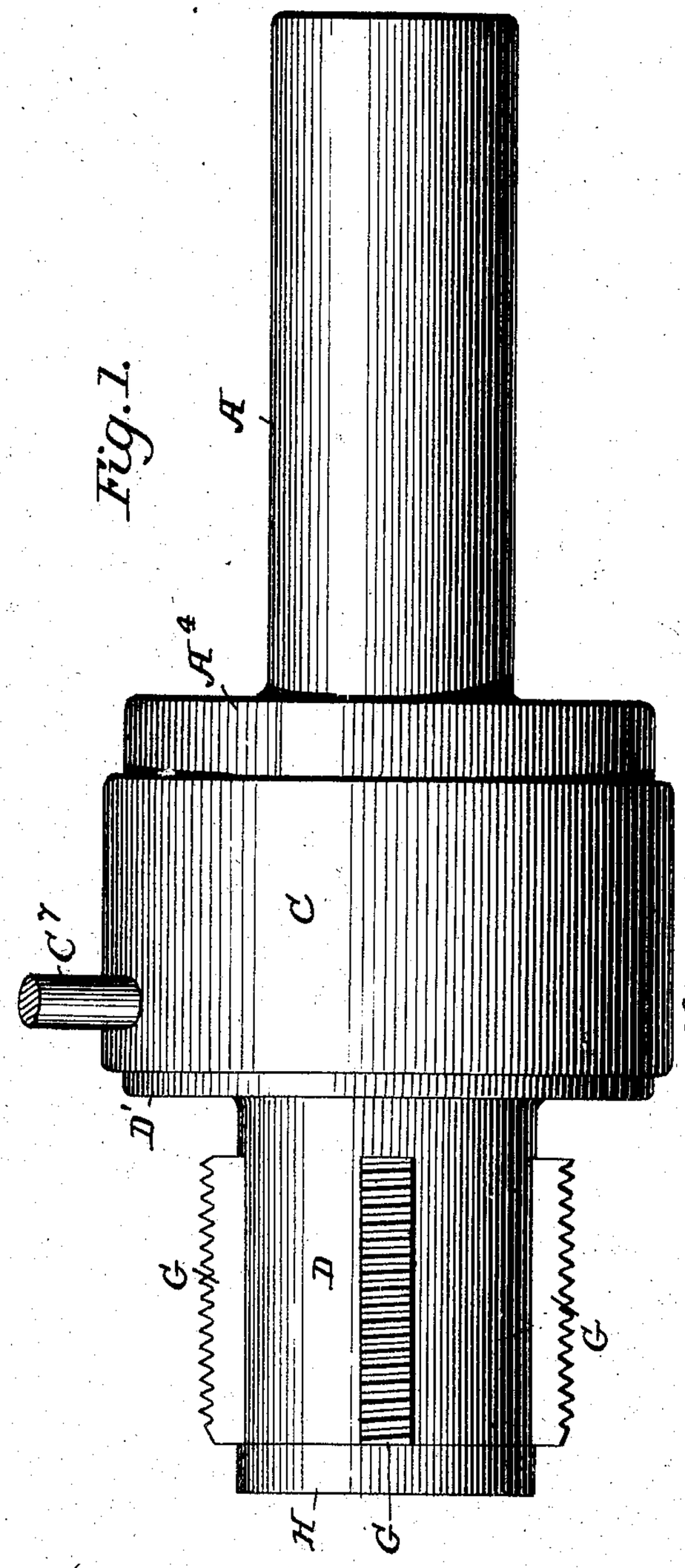
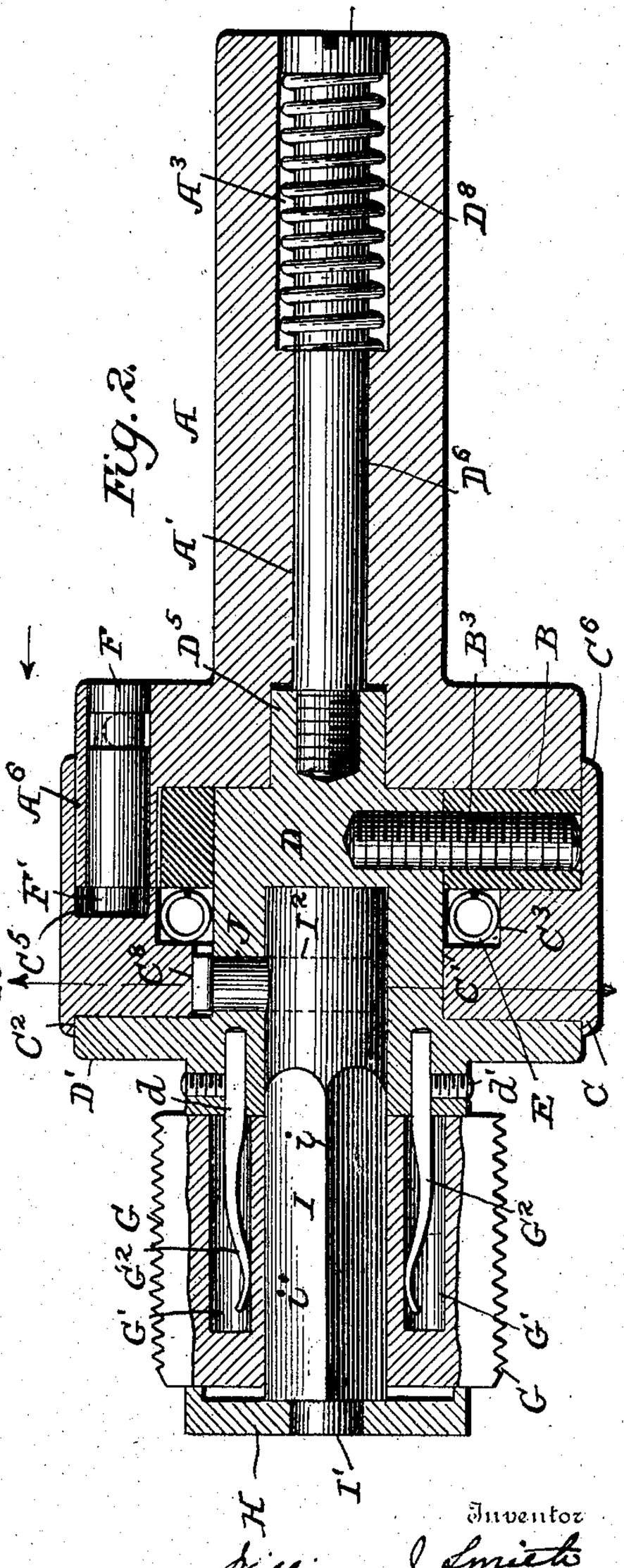


Fig. 2.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 4.

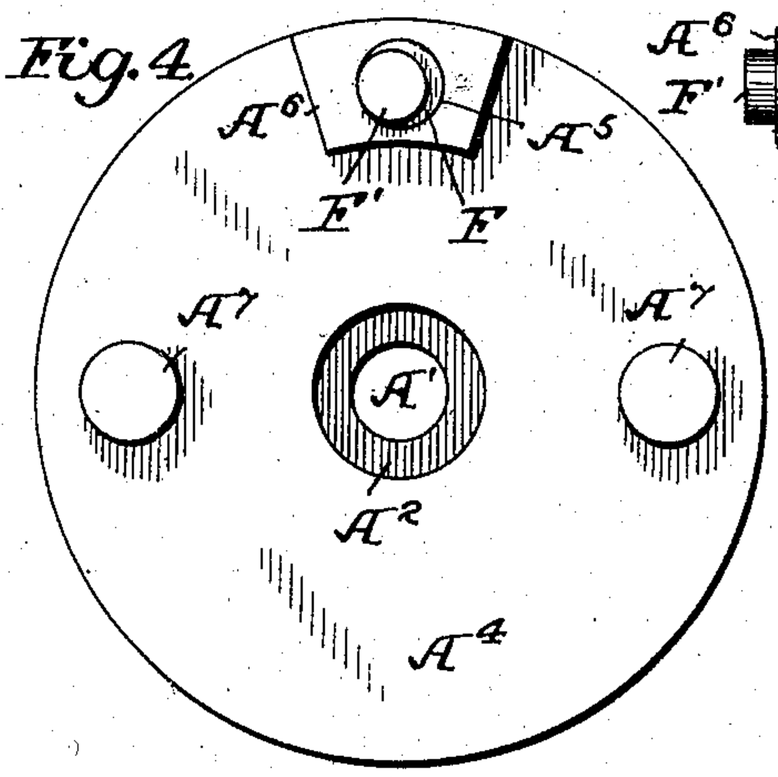


Fig. 3.

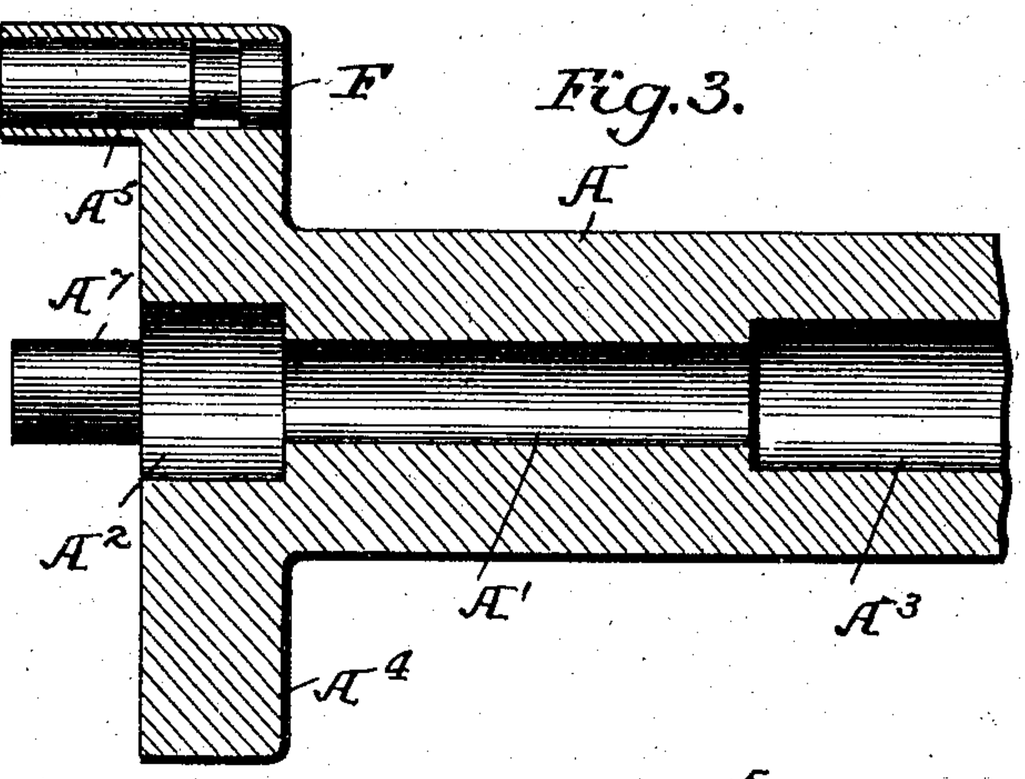


Fig. 5.

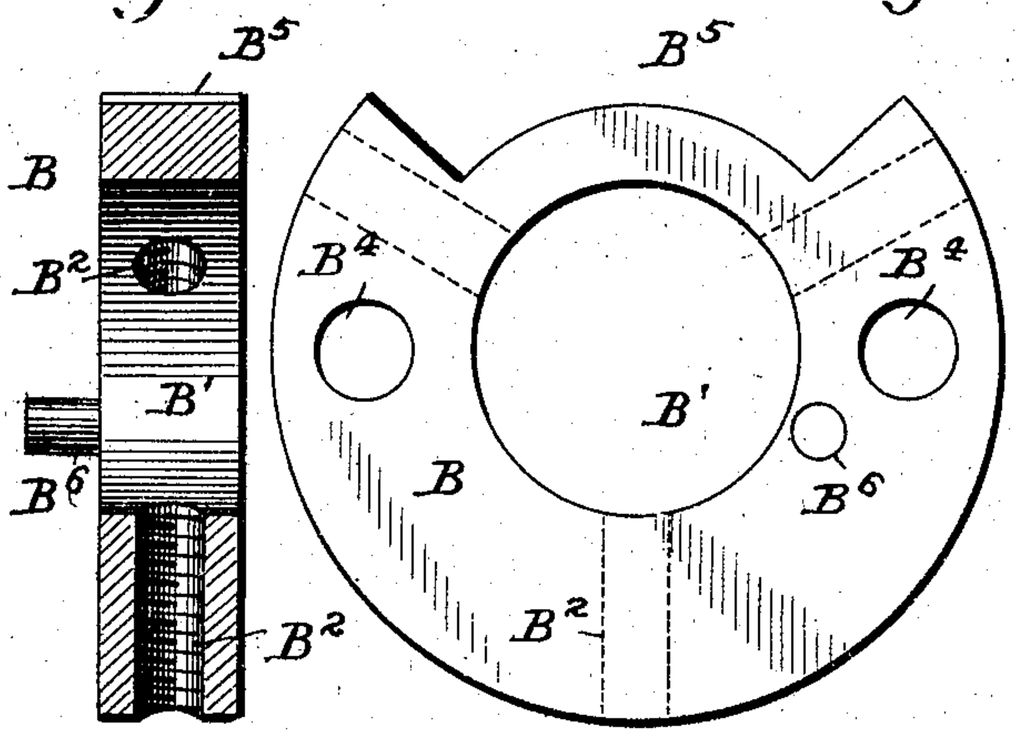


Fig. 6.

Fig. 7.

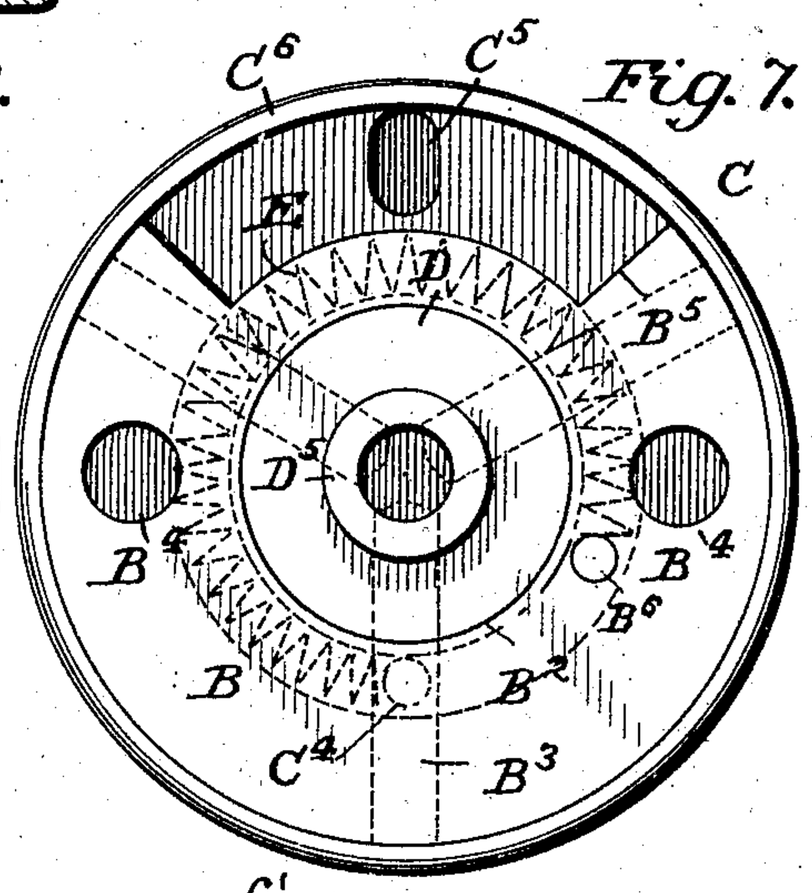


Fig. 14.

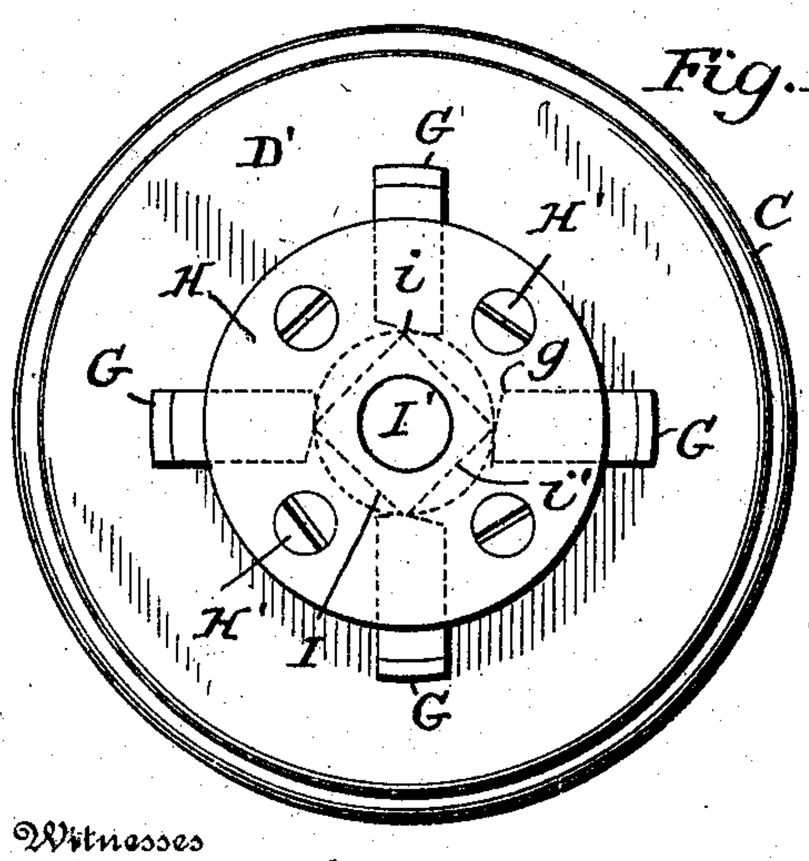
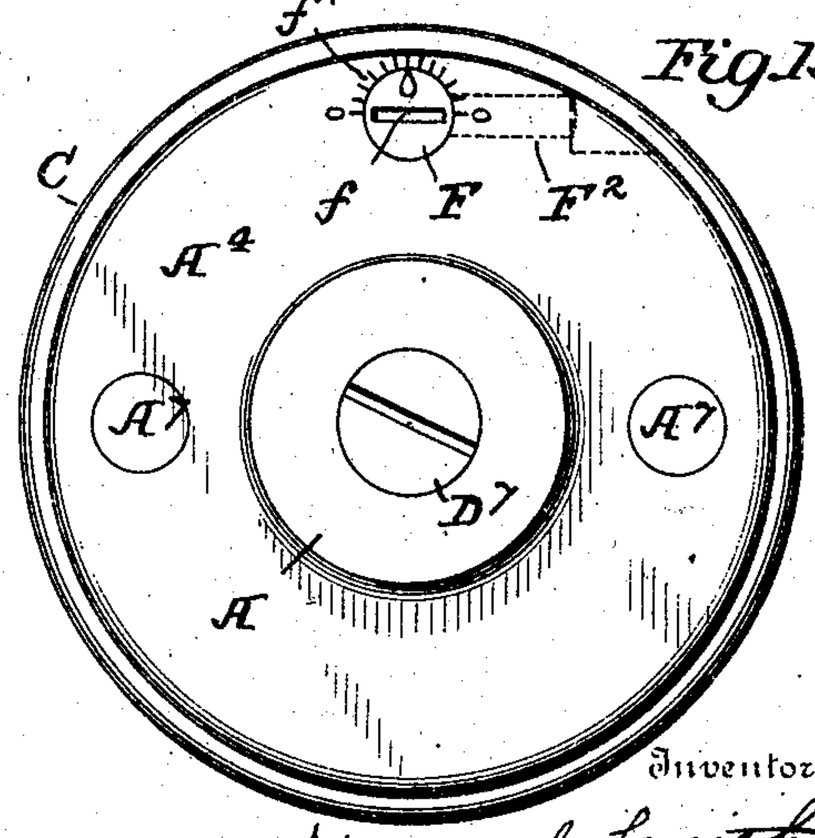


Fig. 15.



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3 SHEETS—SHEET 3.

Fig. 8.

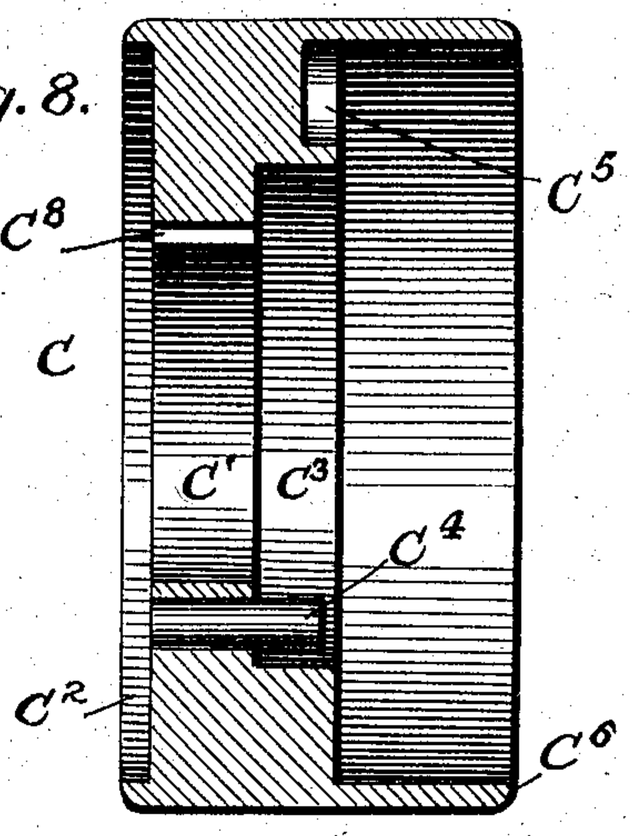


Fig. 9.

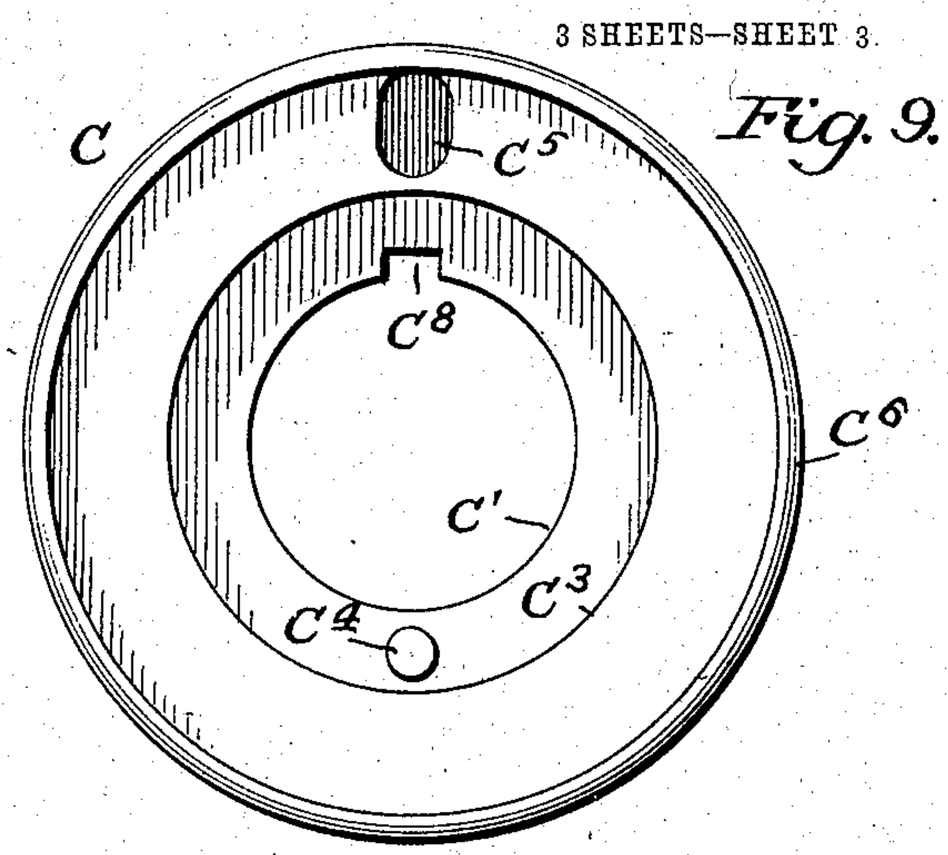


Fig. 10.

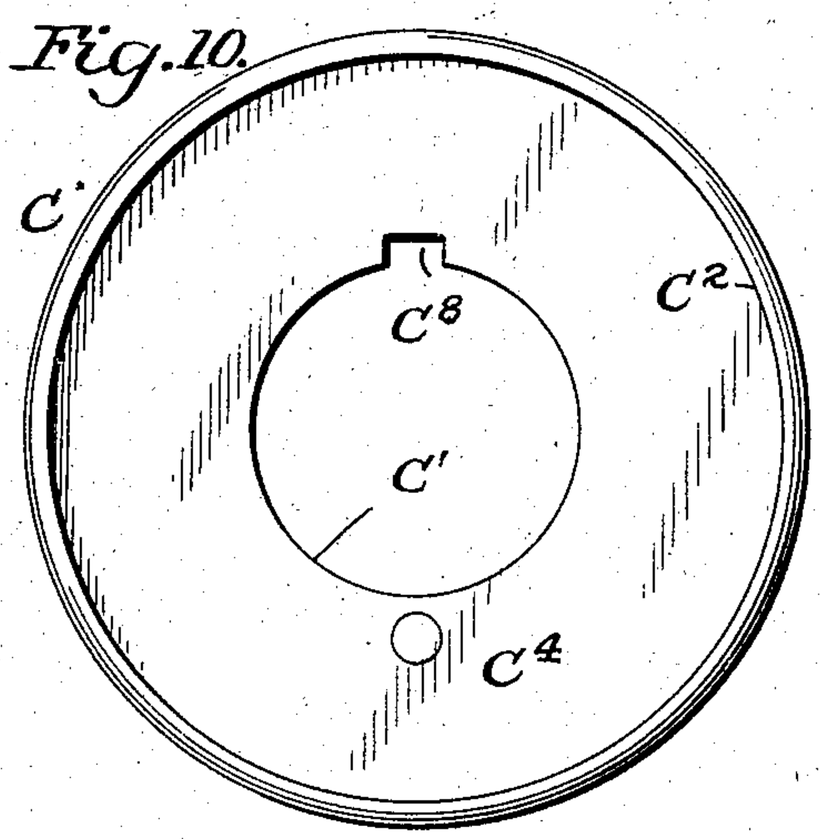


Fig. 13.

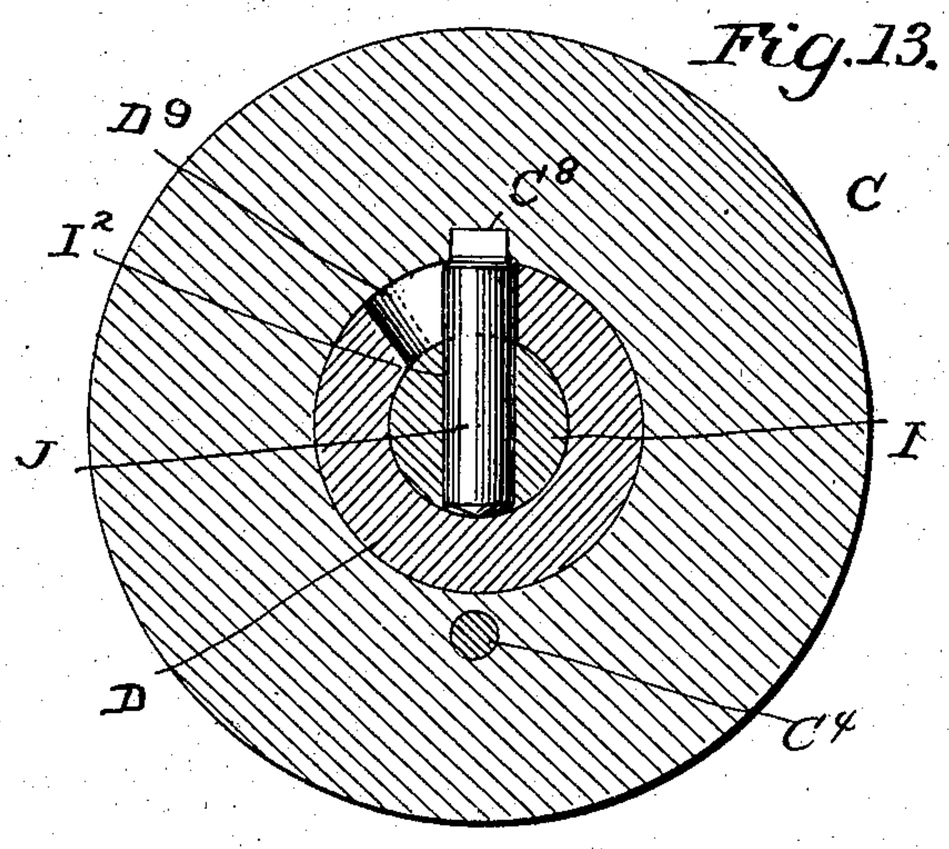


Fig. 11.

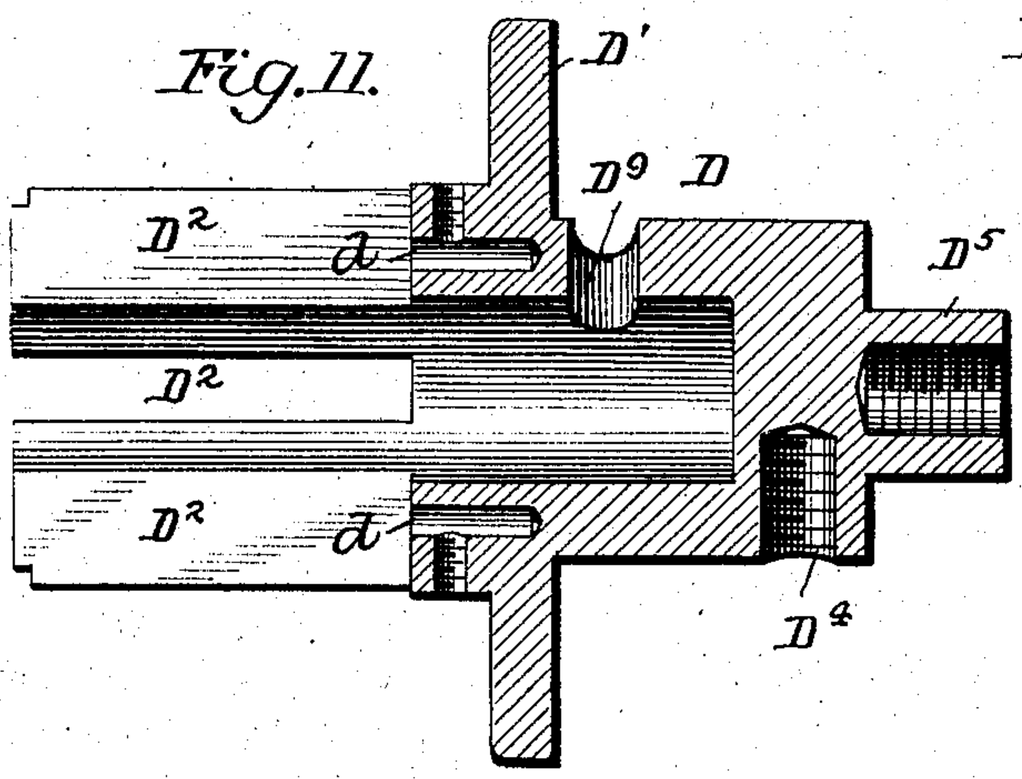
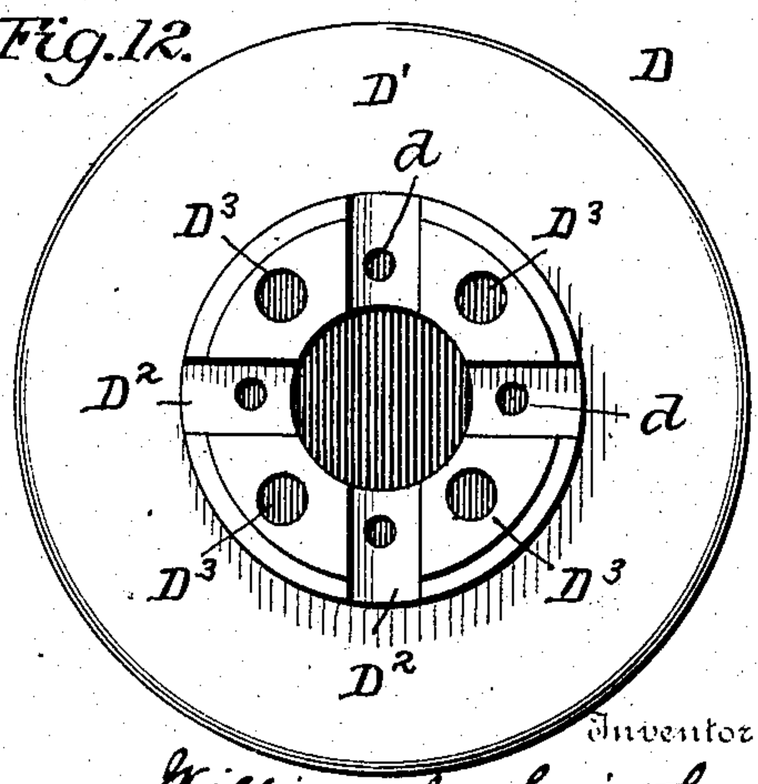


Fig. 12.



Witnesses

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No. 791,832. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

WILLIAM JOHN SMITH, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO GEOMETRIC DRILL COMPANY, OF WESTVILLE, CONNECTICUT, A CORPORATION OF DELAWARE.

TAP.

SPECIFICATION forming part of Letters Patent No. 791,832, dated June 6, 1905.

Application filed March 24, 1900. Serial No. 10,084.

To all whom it may concern:

Be it known that I, WILLIAM JOHN SMITH, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Taps, of which the following is a specification.

My invention relates to taps for screw-cutting and the like, and has for its object to improve and simplify the construction of such devices and provide for their adjustment and operation; and to these ends my invention consists in a tap embodying the various features of construction and arrangement of parts having the general mode of operation substantially as hereinafter more particularly pointed out.

In the accompanying drawings, wherein I have chosen to illustrate a tap adapted to cut internal threads of, say, two and one-fourth to two and one-half inches diameter with the desired pitch and wherein the drawings show the actual size of such a tool having this capacity, Figure 1 is a side elevation of the tool. Fig. 2 is a vertical longitudinal section. Fig. 3 is a vertical longitudinal section of the shank shown detached. Fig. 4 is a front end view of the shank. Fig. 5 is a vertical section of the retaining-ring. Fig. 6 is a front face view of the ring. Fig. 7 is a front end view of the tool, the shank being removed. Fig. 8 is a vertical section of the cam-operating sleeve. Fig. 9 is a rear view thereof. Fig. 10 is a front view thereof. Fig. 11 is a vertical longitudinal section of the holder detached. Fig. 12 is a front end view of the holder. Fig. 13 is a cross-section of the holder on the line 13, Fig. 2, looking in the direction of the arrow. Fig. 14 is a front end view of the tool with the cutters in position, and Fig. 15 is a rear end view of the tool.

One of the principal objects of this invention is to provide a small and compact tool of the character described which shall be adapted to operate in the limited space which exists in turrets and similar supports of tapping and other machines to which the tool is applied.

Another object is to avoid the use of outside tripping mechanism and to arrange all the operative parts within the normal circumference of the cam-operating sleeve without any projections or extensions beyond the body portion of the tool, the means for adjusting the cutters in their locked or unlocked positions being retained within the outside dimensions of the body of the tool and protected thereby.

Another object of the invention is to provide a simple construction whereby the cutters may be adjusted with great accuracy, so as to determine the exact diameter of the threads to be cut and still maintain the automatic operation of the parts regardless of the exact adjustment of the cutters.

These and various other objects, which will be more readily apparent from the following description, are accomplished and carried out in the embodiment which I will now describe, and it is to be understood that while I shall describe the exact details of construction illustrated in the drawings the invention is not limited thereto, as these details may be changed and varied by those skilled in the art to accomplish substantially the same result in the same general manner without departing from the spirit of the invention, and some features of the invention may be used separately or in combination with other features or with other equivalent features.

Referring to the drawings, A represents what I have termed the "shank" of the tool, by which the tool is held in operative position in the turret or other operating machine in connection with which it is used. This shank is provided with a longitudinal opening A′, adapted to receive an extension of the holder, as hereinafter described, and this opening is preferably enlarged at the front end, as at A^2, and also at the rear portion, as at A^3, to receive a spring surrounding the extension of the holder. The shank is also provided with a head-piece A^4, and in this head-piece there is an opening A^5 to receive an adjusting-screw hereinafter described, and the head-piece has a forward hollow extension A^6

opposite this opening. Some means are provided for connecting the shank with the retaining-ring hereinafter described, and while these means may vary it is necessary to have such a connection as will properly carry the strain or stress between the shank and the operative parts of the device, and I have shown two pins A^7 projecting from the front face and adapted to engage suitable openings in the retaining-ring.

The part which I have defined as the "retaining-ring" B performs several functions, as will appear from the description hereinafter. It is provided with an opening B′ embracing the holder, to which it is adapted to be rigidly attached in any suitable way, and I have shown screw-openings B^2, through which screws B^3 may pass, their ends entering openings in the holder; but any other desirable means of connecting the parts can be utilized. The ring is provided with openings B^4 to receive the pins A^7 of the shank to transmit power from the shank to the holder through the medium of the ring. The ring is also cut away or recessed, as at B^5, to permit the movement of the holder and ring with relation to the extension A^6 on the shank. It is also provided with a pin B^6, which forms an abutment for one end of the spring controlling the cam-operating device, as hereinafter described.

The cam-operating device is shown in detail in Figs. 8, 9, and 10 in the form of a sleeve C and has a bearing C′, adapted to fit the holder D, and is preferably recessed on its front face, as at C^2, to receive the flange D′ of the holder, although, of course, these parts may be flush with relation to each other. The opposite side of the cam-operating sleeve is recessed at C^3 to receive the spring E, and in this recess is a pin or stud C^4, forming an abutment for the end of the spring. This face of the cam-operating sleeve is also provided with an elongated slot C^5 to receive the eccentric portion of the adjusting-pin F, hereinafter described, and the cam-operating sleeve is preferably provided with an extending flanged portion C^6, which embraces the retaining-ring B and preferably extends over the head-piece A^4 of the shank, so as to form a protection for the device against dust and dirt. The cam-operating sleeve may be operated in any suitable way to adjust it, and a convenient means is shown in the handle C^7, although any other well-known means may be used.

The holder D (best shown in Figs. 11 and 12) comprises a cylinder having a flange D′, and its forward portion is slotted, as at D^2, to receive the cutters G, and there may be any desired number of cutters and corresponding slots, four being shown in the present instance. These slots are preferably open at their forward ends, so that the cutters can be slid longitudinally therein, and the forward end of the holder is covered with an end piece H, being attached thereto in any suitable way, as by screws H′ fitting the openings D^3 in the end of the holder. The body of the holder is provided with openings D^4 to receive the screws B^3 of the retaining-ring, and it is provided with a rearward extension D^5, which may extend through the opening A′ in the shank, and on which extension the shank slides. This extension in the present instance, however, fits the end of the opening in the shank, and it has attached thereto a rod or bolt D^6, having a head D^7 forming an abutment for the spring D^8, which tends to retain the shank and holder in their normal positions, (shown in Fig. 2,) but permits the one to move longitudinally with relation to the other under tension of the spring.

The cutters G may be retained in their slots in any desired manner; but in the present instance I have shown them under spring-pressure tending to retract them, and they are provided with recesses G′, into which extend spring-fingers G^2, secured to the holder in any suitable way, as by entering the recesses *d*, where they are preferably clamped by the screws *d*′.

The radial position of the cutters is determined, and they are adjusted to proper cutting position and allowed to return to operative position by means of a cam-bar I, which is mounted in the holder D, and preferably its forward end I′ is supported in a bearing in the end piece H. This cam-bar has a number of cam-surfaces, and in the present instance it is shown in the form of a rectangular cam-surface, it being flattened at its sides I′, so as to present points or edges *i* bearing against the inner ends of the cutters G, and these cutters are preferably beveled or inclined at their inner ends, as shown at *g*. It is evident that according to the position of the cam-bar the cutters will be forced outward to a greater or less extent, and according to the relative position of the points or edges *i* on the inclined bottom portions of the cutters G will the cutters be moved to a greater or less extent. Thus assuming that the cutters are resting on the flat portions *i*′ of the cam-bar and the cam-bar is turned, the edges *i* coming in contact with the inclined ends *g* of the cutters tend to force them out, and they are forced out to a greater or less extent, according to whether the edges *i* bear on one or the other extremity of the inclined surfaces *g* or an intermediate point thereof. Of course the shape of the cam-bar can be varied according to the requirements, depending upon the number of cutters and the amount of movement that it is desired to give to them; but I have found the shape shown to be effectual and satisfactory in its operation.

Some means must be provided for connecting the cam-bar with the cam-operating sleeve, and while these may vary I have shown a pin

or stud J entering a slot or opening I^2 in the cam-bar and projecting upward through a segmental slot D^9 in the body of the holder. It is connected to the cam-operating sleeve by its end fitting a notch or recess C^8 in the bearing C′, so that as the cam-operating sleeve is rotated the cam-bar is rotated with it. In this construction the cam-operating sleeve, as before stated, is recessed to receive a spring E, bearing against the pin C^4 of the cam-operating sleeve and the pin B^6 of the retaining-ring, which, as before stated, enters into the recess C^3 of the cam-operating sleeve. This spring is so arranged that when the cam-operating sleeve is released it is automatically operated to turn the cam-bar to a position to allow the cutters to be retracted and when it is desired to extend the cutters into operative position the cam-operating sleeve is turned, so as to cause the cam-bar to rotate, when its edges coming in contact with the inner ends of the cutters will force them out, as before described. When the cutters are so forced out into operative position, some means should be provided for locking the cam-operating sleeve in position, and, while these means may vary, in the present instance I have shown a pin F mounted in the opening A^5 of the shank A and projecting through the extension A^6 and adapted to enter the slot C^5 in the cam-operating sleeve.

When the parts are in the positions shown in Fig. 2, the cam-operating sleeve is locked or held in position to maintain the cutters in operative relations, and when it is desired to release the cutters the screw F is withdrawn from the slot C^5. To do this, the shank A moves longitudinally with relation to the holder D against the stress of the spring D^8, and this movement may be accomplished in different ways, as manually or mechanically; but it is preferable to accomplish the movement automatically in cutting internal screw-threads. To do this, the movement of the tap and its turret or other support is stopped at the proper time, and then the continued rotation of the nut or other device being tapped will cause the cutting edges of the cutters to move the holder forward until the end of the screw F is withdrawn from the slot C^5, when the cam-operating sleeve, under stress of the spring E, will be rotated, causing the cam-bar to rotate, releasing the cutters and allowing them to be withdrawn from the threads. So, also, in adjusting the cutters to make the proper threading the cam-operating sleeve is rotated, turning the cam-bar and forcing the cutters outward until the pin F comes opposite the slot C^5, when, under the stress of the spring D^8, it will engage the same and the parts will be locked in operative position.

When the tap is used on a turret or similar machine, the cam-operating sleeve may be rotated automatically by the handle C^7 coming in contact with some portion of the machine, so that as the tap is brought into operative position the sleeve will be rotated so as to bring the slot C^5 opposite the screw F, when the spring D^8 will cause the shank to slide longitudinally on the holder and lock the parts in operative position.

It is desirable to provide means whereby the depth of the threads to be cut can be determined with exactness—as, for instance, in compensating for wear of the cutters or otherwise—and to do this I provide means whereby the movement of the cam-bar can be regulated so that the cutters will be thrown outward to a greater or less extent when the cam-operating sleeve is in its locked position. To do this, in the present instance the pin F is provided on its forward end with an eccentric F′, and the slot C^5 of the cam-operating sleeve is elongated to receive the eccentric. The pin F is also provided with means for adjusting it in proper position, in the present instance being provided with a screw-slot *f*, and there are graduations *f′* around the opening in the head-piece in which the screw is mounted, and in this way the screw can be turned to the right or left, moving the eccentric F′ in the elongated slot C^5, so as to determine the relative position of the edges *i* of the cam-bar I with relation to the inclined ends of the cutters G. When this screw is adjusted, it may be secured in position by a set-screw F^2 or otherwise.

Such being the general construction of the apparatus, its operation will be understood from what has been before set forth, and it will be seen that while the shank of the tool is supported in a turret or other holder the material in which the screw-thread is to be cut is intended to be supported in a chuck or other device and to be rotated thereby, the turret or chuck, whichever it may be, moving while the screw-threads are being cut. When, however, the thread is practically completed, the longitudinal feed is arrested, and then the continued rotation of the material will draw the two principal members of the tool apart, so that the shank and the holder will slide longitudinally with relation to each other, permitting disengagement of the screw or locking device F from the cam-operating sleeve. When under stress of the spring E, the members will be automatically rotated with relation to each other, so that the cam-bar will be in position to allow the cutters to be retracted. In starting a new thread, as above intimated, the relation of the cam-bar to the cutters can be adjusted by the screw F, and then by the movement of the cam-operating sleeve they are forced outward into operative position, and under the stress of the spring D^8 the shank and holder will move with relation to each other, so that the parts will be locked together. It will thus be seen that the device comprises, essentially, two members, which slide longitudinally with relation to each other, and a

cam-operating sleeve controlled by the relative position of the sliding members and operated automatically to move the cam-bar into position to release the cutters. It will further be observed that the parts are simple in construction and relatively small in size, and there are no projecting portions, except the handle C^7, (when used,) beyond the periphery of the cam-operating sleeve, and all the parts are protected from dust and dirt.

The means for supporting and positively locking the cutters in position are capable of fine adjustment, so as to regulate the depth of the threads without interfering with the automatic operation of the device.

Having thus described the preferred embodiment of my invention and set forth the general principles thereof, so as to enable those skilled in the art to make and use the same, without limiting myself to the precise details what I claim is—

1. A tap, comprising a shank and a cutter-holder, in combination with a cam-bar to act on the cutters, a sleeve to operate the cam-bar, both carried by the said holder, a locking element on the shank and another locking element on the said sleeve, the holder being longitudinally movable with relation to the shank to release the locking elements.

2. A tap comprising a holder, radially-moving cutters mounted therein, a cam-bar for moving the cutters, a cam-operating sleeve mounted on the holder, a shank mounted to move longitudinally with relation to the holder, and a locking device between the shank and cam-operating sleeve controlled by the longitudinal movement of the said sleeve.

3. A tap comprising a holder, radially-moving cutters mounted therein, a cam-bar for moving the cutters, a cam-operating sleeve mounted on the holder, a shank mounted to move longitudinally with relation to the holder, and a locking device and cam-adjusting device between the shank and cam-operating sleeve controlled by the longitudinal movement of the said sleeve.

4. A tap comprising a shank, a holder having slots, radially-moving cutters mounted in said slots, a cam-bar mounted in a recess in said holder, a cam-operating sleeve mounted on the holder, a pin connecting the sleeve and cam-bar, the holder being mounted to move longitudinally with relation to the shank, and a locking device carried by said shank and engaging the cam-operating sleeve.

5. A tap comprising a holder having slots, radially-moving cutters mounted therein, a cam-bar mounted on the holder for moving the cutters, a cam-operating sleeve mounted on the holder, connections between the sleeve and cam-bar, a spring mounted in a recess in said sleeve, a retaining-ring fixedly mounted on the holder and having a pin projecting into the recess in the sleeve, a shank mounted to move longitudinally with relation to the holder, an adjusting-pin mounted on the shank, and an eccentric on said adjusting-pin engaging a slot in the sleeve, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM JOHN SMITH.

Witnesses:

PHILIP F. LARNER,

F. L. FREEMAN.