J. J. GRANT.

THREAD CUTTING ATTACHMENT FOR AUTOMATIC LATHES.

APPLICATION FILED APR. 17, 1907.

932,607.

Patented Aug. 31, 1909.

3 SHEETS—SHEET 1.

Fig 1.

Witnesses:

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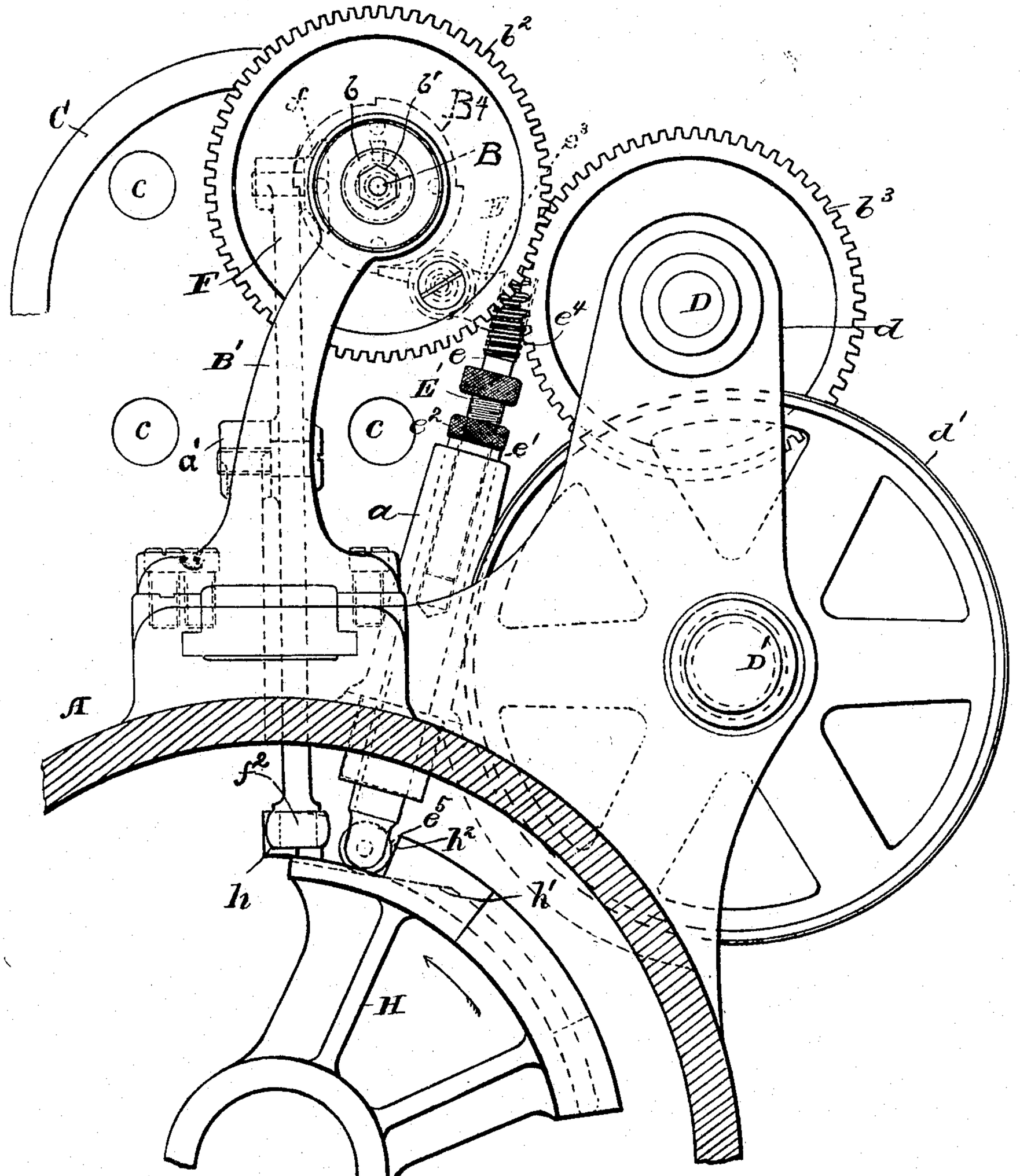
3 SHEETS—SHEET 2.

Fig. 2



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3 SHEETS—SHEET 3.

Fig. 3.

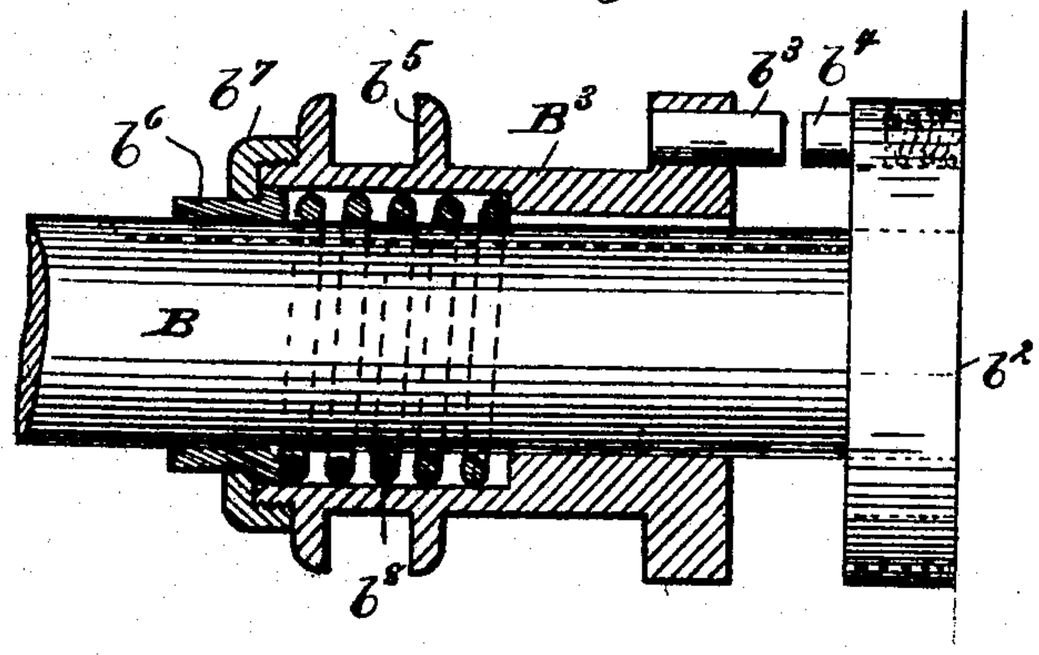
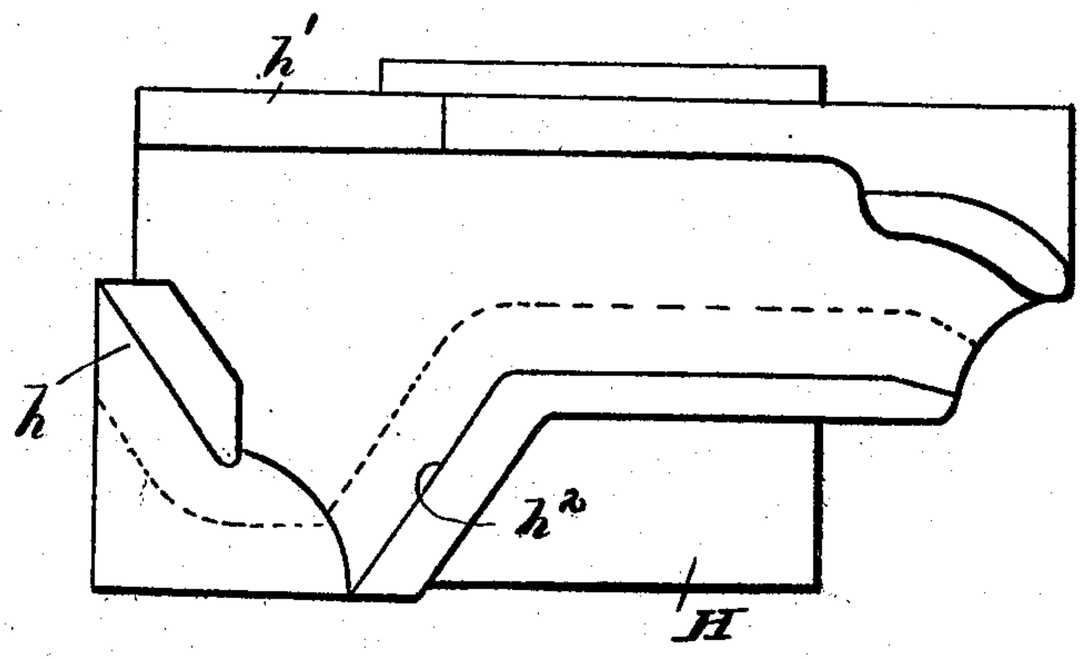


Fig. 4.



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UNITED STATES PATENT OFFICE.

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THREAD-CUTTING ATTACHMENT FOR AUTOMATIC LATHES.

932,607. Specification of Letters Patent. Patented Aug. 31, 1909.

Application filed April 17, 1907. Serial No. 368,672.

To all whom it may concern:

Be it known that I, JOHN J. GRANT, a citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Thread-Cutting Attachments for Automatic Lathes, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to thread cutting devices and has particular regard to thread cutting attachments for use on automatic turret lathes such as screw-machines and the like. In the form here presented such attachment is shown as designed for use in connection with an automatic turret lathe of the type set up in my pending application filed April 28, 1906, Serial No. 314,197.

The object of said invention is the provision of a thread cutting device of the character described wherein the several operations will be performed with the utmost expedition and without the necessity of reversibly rotating any of the parts, and where the various adjustments required to effect the cutting of threads of different lengths and pitches may be quickly and easily effected.

To the accomplishment of these and related ends, said invention consists of means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—Figure 1 represents a front elevation of one end of a lathe of the general type referred to above, whereon is shown mounted a tapping device embodying the principles of construction of my invention; Fig. 2 is partly an end elevation and partly a cross-section of such machine and attached tapping device; Fig. 3 is a longitudinal cross-section on a larger scale of a portion of the die-shaft and certain appurtenant parts; and Fig. 4 is a development of the cam utilized to effect movement of certain parts connected with such tapping attachment.

Of the lathe or screw machine, as has been indicated, only one end is shown, this illustrated portion comprising the machine frame A, integral with which is formed the tool head C. In such head are provided a plurality of tool-holding sockets *c*, four in number as shown, which are adapted to receive, either fixedly or rotatably, as the case may be, the various tools utilized in performing the desired operations upon the stock. Such stock is suitably held in a rotatable spindle, not shown, of the usual type that is adapted to be successively presented to the several tools secured in the tool head as is fully described and set forth in my pending application above referred to. Operation of the various rotatable tools in such tool head, as also that of the screw-holding spindle in the manner just set forth, is had from a suitable back-shaft D, here shown as being tubular, that is journaled in bearings *d d* therefor provided on the rear side of machine bed A. Such back shaft is in turn driven from a second shaft D′ upon which is mounted a driving pulley *d*′.

The shaft B, to the forward end of which the threading tool, not shown, is designed to be attached, is both longitudinally slidably and rotatably mounted in one of the upper tool-receiving sockets *c* in the head C, its rearwardly projecting end being supported in a standard B′ removed some distance from the fixed tool head C and detachably secured on the top of the machine frame, Figs. 1 and 2. Such rear end extends some distance beyond standard B′ and between a collar *b*, secured on its extreme end by nut *b*′, and standard B′ is a spring B^2, the function of which is obviously to normally retract such die-shaft as I shall denominate the same, for the sake of convenience. Immediately adjoining the other side of standard B′ is rotatably mounted upon shaft B a gear b^2 that in the operation of the machine is intended to be continuously driven by a gear b^3 mounted upon drive shaft D. To effect operative connection of such rotatably mounted gear b^2 with the die-shaft a clutch collar B^3 is feathered on the latter intermediate of the tool head C and said gear b^2. The detailed construction of clutch collar B^3 is clearly shown in Fig. 3,

where it will be seen to comprise a collar proper bearing at one end a clutch pin b^3 that is adapted to engage a corresponding pin b^4 laterally projecting from gear b^2. One of said pins, b^4 as shown, is desirably resiliently mounted, in order to obviate any danger of the members becoming locked in case the pins meet end on. Such collar is also provided with an encircling groove b^5 adapted to receive the shifting device hereafter to be described. Said collar is furthermore formed with a bore of two different diameters, the portion of larger diameter being formed in the end removed from the clutch end of the collar. In such enlarged bore is slidably mounted a sleeve b^6, being retained against displacement by a nut b^7. Interposed between said sleeve b^6 and the offset between the larger and smaller bore portions within the collar is a spring b^8, that it will be seen resiliently retains said sleeve in its outermost position.

Intermediate of clutch collar B^3 and tool head C is a ratchet member B^4 fixedly mounted upon said shaft B but longitudinally adjustable therealong, a set screw b^9 being provided to secure it at the desired place on the shaft. Clutch collar B^3 is designed to have a range of movement sufficient to adapt it in one position to effect the engagement of resiliently supported sleeve b^6 with ratchet member B^4 and in another position to effect the engagement of clutch pins b^3 b^4. The effect of the first engagement will obviously be to advance shaft B against spring B^2 that it will be recalled, serves normally to retain the same in its retracted position. That of the second engagement will be to connect the shaft with the driving gear b^2.

Ratchet member B^4 and thereby shaft B is designed to be normally held against rotation by means of the engagement therewith of an oscillatorily mounted pawl E, Figs. 1 and 2. Said pawl is normally retained in position to thus engage and hold ratchet member B^4 by means of a rod E′ reciprocably mounted in a suitable hollow support *a* provided for this purpose on the top of machine frame A. Rod E′ comprises two sections *e e′*, the former being screw-threaded within the latter whereby adjustment of the length of said rod as a whole is to be readily had by simply rotating the upper section relatively to the lower, which latter is suitably feathered in support *a*, see Fig. 2, so as to prevent its rotation. A jam nut e^2 serves to lock the sections against relative rotation once the desired adjustment has been effected. Connection between rod section *e* and pawl E is had by providing the latter with a segmental worm gear e^3 wherewith a worm e^4 on the former is designed to mesh. The weight of the rod E′ is amply sufficient to maintain the pawl in the engagement aforesaid. Upward actuation of such rod, however, it will be clear, will release the ratchet member therefrom. Pawl E is provided with an elongated engaging face, Fig. 1, in order that its secure retention of the ratchet member B^4 will not be affected by the shifting of the latter whether due to a variation in its adjustment, or to the advance movement of the shaft whereon said ratchet member is mounted. Reciprocation of clutch collar B^3 is had by means of an oscillatory arm F suitably mounted on a bracket *a′* detachably secured to the top of machine frame A. Such arm bears at its upper end a swiveled fork *f* that rests in the encircling groove b^5 in the collar whereby it will be seen the shifting of the latter is effected without interfering with its rotation along with shaft B.

Upward movement of rod E′ and also oscillation of clutch collar actuating arm F is had by means of a combined cam H, Figs. 2 and 4. Such rod and arm are respectively provided with rollers e^5 and f^2 designed to be engaged at the proper time by the cam surfaces of said drum. The latter, a development of which appears in Fig. 4 of reference, is designed to effect movement of the rod and of the arm so as to produce the following actuation of die-shaft B. In the normal, or inoperative, position of the shaft the parts occupy relative positions substantially as shown in Fig. 1 of the drawings. In other words clutch collar B^3 is in engagement with neither driving member b^2 nor ratchet member B^4, and rod E′ is left free to hold such ratchet member against rotation. In this state of affairs spring B^2 is also clearly free to hold said shaft B in its retracted position. Assuming now the stock that is to be operated upon by the tapping tool to be properly positioned in alinement with shaft B, the cam H will have been so timed that cam face *h* thereon engages roller f^2 of arm F to move collar B^3 into engagement with ratchet member B^4 and thereby advance the die-shaft upon the stock at a rate determined by the character of the cam surface. This forced advance is intended to continue long enough only to start the thread; the tool feeds itself after once started. Since such stock is rotated by the stock spindle while the die shaft still remains held against any rotation, the obvious effect will be the cutting of a thread in the stock, the length of which will be determined by the release of ratchet member B^4 upon the upward actuation of rod E′. Such actuation is had by engagement of cam surface *h′* and roller e^5 and can be accurately timed by varying the length of the rod in the manner before described, the cam in question being longer than necessary to effect release in any particular position of adjustment. Upon release of the die shaft the latter rotates freely with the stock until clutch collar B^3 is shifted in the reverse di-

rection from that just set forth by the engagement of cam face h^2 with roller f^2 on arm F, the effect of which is to bring clutch pins b^3 b^4 into engagement. The ratio of gear b^2 to the stock in the spindle is such that upon this engagement a rotation of die shaft B is effected in the same direction as, but at a higher rate of speed than, that of the stock in the spindle. Accordingly the result of such rotation is to unthread the die from the stock, the shaft being thereupon immediately retracted by the action of spring B^2.

Since the time of the release of the ratchet member from pawl E may be varied by simply lengthening or shortening sectional rod E′, it is obvious that no occasion will arise for a change in the pitch of cam face h'. In other words adjustment of the length of thread cut is to be accomplished by simply rotating one rod section within the other. By the worm and worm gear connection shown between the rod and pawl E, instead of a plain rack and pinion, the facility with which this adjustment is to be had is much increased. The forward movement of the die-shaft is regulated in the same fashion independently of the throw of the cam face h. The latter need not be changed, for by merely moving the ratchet member one way or the other along the die-shaft, such advance is correctly timed. This timing however, need not be more than approximate in its exactness, for any forward movement of clutch collar B^3 after the shaft is once free to rotate results simply in additional compression of the spring b^8 whereby sleeve b^6 is resiliently supported. This spring serves the further function of adjusting the advance movement imparted to the collar by the cam, which it is not designed should require to be changed, to the requirements of the particular thread being cut. In other words this spring constitutes a compensating means, so that if during the brief engagement of the collar with the ratchet member, the former is advanced more rapidly than the threading tool requires, having regard to the fineness of the thread being cut, the spring will simply be compressed. Injury to stock and cutting tool, both, is thus prevented. The object in housing the spring in question in the manner shown in Fig. 3 is not merely to add to the neatness of the construction, but also to hold the spring in question under an initial degree of tension sufficient to insure the prompt starting of the threading tool upon its engagement with the stock.

Standard B′ and bracket a being both detachably mounted on the machine frame A, it will be evident that the threading device in the form here illustrated is in truth an attachment and as such particularly adapted for use with turret lathes where it is frequently desirable to make changes in the tools. The supports just referred to upon removal carry with them the die-shaft and all appurtenant parts, leaving the tool head, as also top of the machine frame, clear for the attachment of such other tool as may be required in the stead of the threading tool.

It should possibly be noted that while the device as shown and described is adapted to the cutting of right-hand threads, by slight modifications, that are easily made, being known in the art, such device can be adapted for the cutting of left-hand threads just as well.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any one of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In mechanism of the class described, the combination of a die-shaft both longitudinally slidably and rotatably mounted; means tending to retract said die-shaft; a member transversely movable with respect to said die-shaft adapted normally to engage and hold the same against rotation; means adapted positively to withdraw said holding member; and other means independent of said withdrawing means adapted longitudinally to advance said die-shaft and positively to rotate the same, substantially as described.

2. In mechanism of the class described, the combination of a die-shaft both longitudinally slidably and rotatably mounted; means tending to retract said shaft; a driving member rotatably mounted upon said shaft; a ratchet member fixedly mounted thereon; a shiftable member non-rotatably mounted on said shaft between said ratchet and driving members and adapted to engage the former to advance said shaft upon the work, and the latter to operatively connect the same with said shaft; and means apart from said shiftable member adapted to engage said ratchet member to hold said shaft against rotation.

3. In mechanism of the class described, the combination of a die-shaft both longitudinally slidably and rotatably mounted; means tending to retract said shaft; a driving member rotatably mounted upon said shaft; a ratchet member fixedly mounted upon said shaft but longitudinally adjustable therealong; a pawl adapted to engage said ratchet member to hold said shaft against rotation; and a collar splined on said shaft between said ratchet and driving members and adapted to engage the former to advance said shaft upon the work, and the latter to operatively connect the same with said shaft.

4. In mechanism of the class described, the combination of a die-shaft both longi-

tudinally slidably and rotatably mounted; means tending to retract said shaft; a driving member rotatably mounted upon said shaft; a ratchet member fixedly mounted upon said shaft but longitudinally adjustable therealong, a pawl adapted to engage said ratchet member to hold said shaft against rotation; means for controlling said pawl; a collar splined on said shaft between said ratchet and driving members and provided with a clutch adapted to engage the latter; resilient means interposed between said collar and said ratchet member; and means adapted to shift said collar alternately into engagement with said ratchet and driving members.

5. In mechanism of the class described, the combination of a die-shaft both longitudinally slidably and rotatably mounted; means tending to retract said shaft; a driving member rotatably mounted upon said shaft; a ratchet member fixedly mounted on said shaft but longitudinally adjustable therealong; a pawl adapted to engage said ratchet member to hold said shaft against rotation; a reciprocable rod connected with said pawl and normally retaining the same in such engagement; a cam adapted to reciprocate said rod; a collar splined on said shaft between said ratchet and driving members and provided with a clutch adapted to engage the latter; resilient means interposed between said collar and said ratchet member; and cam-actuated means adapted to shift said collar alternately into engagement with said ratchet and driving members.

6. In mechanism of the class described, the combination of a die-shaft both longitudinally slidably and rotatably mounted; means tending to retract said shaft; a driving member rotatably mounted upon said shaft; a ratchet member fixedly mounted on said shaft but longitudinally adjustable therealong; a pawl adapted to engage said ratchet member to hold said shaft against rotation; a reciprocable rod adjustably connected with said pawl and normally retaining the same in such engagement; a cam adapted to reciprocate said rod; a collar splined on said shaft between said ratchet and driving members and provided with a clutch adapted to engage the latter; resilient means interposed between said collar and said ratchet member; and cam-actuated means adapted to shift said collar alternately into engagement with said ratchet and driving members.

7. In mechanism of the class described, the combination of a die-shaft both longitudinally slidably and rotatably mounted; means tending to retract said shaft; a driving member rotatably mounted upon said shaft; a ratchet member fixedly mounted on said shaft but longitudinally adjustable therealong; a pawl oscillatorily mounted and adapted to engage said ratchet member to hold said shaft against rotation, said pawl bearing a segmental gear; a reciprocable rod of adjustable length bearing a rack in mesh with said gear, thereby normally retaining said pawl in engagement with said ratchet; a cam adapted to reciprocate said rod; a collar splined on said shaft between said ratchet and driving members and provided with a clutch adapted to engage the latter; resilient means interposed between said collar and said ratchet member; and cam-actuated means adapted to shift said collar alternately into engagement with said ratchet and driving members.

8. In mechanism of the class described, the combination of a die-shaft both longitudinally slidably and rotatably mounted; means tending to retract said shaft; a driving member rotatably mounted upon said shaft; a ratchet member fixedly mounted on said shaft but longitudinally adjustable therealong; a pawl oscillatorily mounted and adapted to engage said ratchet member to hold said shaft against rotation, said pawl bearing a segmental worm gear; a reciprocable rod comprising two sections, one being adjustably mounted within the other and bearing a worm in mesh with said gear, whereby said pawl is normally retained in engagement with said ratchet; a cam adapted to reciprocate said rod; a collar splined on said shaft between said ratchet and driving members and provided with a clutch adapted to engage the latter; resilient means interposed between said collar and said ratchet members; and cam-actuated means adapted to shift said collar alternately into engagement with said ratchet and driving members.

9. In mechanism of the class described, the combination of a die-shaft both longitudinally slidably and rotatably mounted; a spring tending to retract said shaft; a driving member rotatably mounted upon said shaft; a ratchet member fixedly mounted on said shaft but longitudinally adjustable therealong; a pawl oscillatorily mounted and adapted to engage said ratchet to hold said shaft against rotation, said pawl bearing a segmental worm gear; a reciprocable rod comprising two sections one screw-threaded in the other and bearing a worm in mesh with said gear, whereby said pawl is normally retained in engagement with said ratchet; a collar splined on said shaft between said ratchet and driving members and provided with a clutch adapted to engage the latter; resilient means interposed between said collar and said ratchet member; an oscillatory arm adapted to shift said collar; and a cam adapted both to swing said arm and to reciprocate said rod.

10. In mechanism of the class described, the combination with a die-shaft, of means

adapted to retain the same against rotation, said means comprising a ratchet member fixedly mounted upon said shaft, a pawl adapted to engage said ratchet member to hold the same against rotation; a reciprocable rod of adjustable length connected with said pawl and normally retaining the same in such engagement; and a cam adapted to reciprocate said rod to release said ratchet member, such release being timed by length of said rod.

11. In mechanism of the class described, the combination with a die-shaft, of means adapted to retain the same against rotation, said means comprising a ratchet member fixedly mounted upon said shaft, a pawl oscillatorily mounted and adapted to engage said ratchet member to hold the same against rotation, said pawl bearing a segmental gear; a reciprocable rod of adjustable length bearing a rack in mesh with said gear, thereby normally retaining said pawl in engagement with said ratchet; and a cam adapted to reciprocate said rod to release said ratchet member, such release being timed by length of said rod.

12. In mechanism of the class described, the combination with a die-shaft, of means adapted to retain the same against rotation, said means comprising a ratchet member fixedly mounted upon said shaft, a pawl oscillatorily mounted and adapted to engage said ratchet to hold the same against rotation, said pawl bearing a segmental worm gear; a reciprocable rod comprising two sections, one being screw-threaded in the other and bearing a worm in mesh with said gear, whereby said pawl is normally retained in engagement with said ratchet; and a cam adapted to reciprocate said rod to release said ratchet member, such release being timed by length of said rod.

13. In mechanism of the class described, the combination with a die-shaft, of means for advancing the same upon the work, such means comprising a member longitudinally adjustably fixed upon said shaft, a collar slidably mounted upon said shaft, a cam-actuated arm adapted to shift said collar into engagement with said member to thus advance the shaft, and a resiliently supported sleeve borne by said collar and adapted to actually contact with said member.

14. In mechanism of the class described, the combination with a die-shaft, of means for advancing the same upon the work, such means comprising a member longitudinally adjustably fixed upon said shaft, a cam-actuated arm adapted to shift said collar into engagement with said member to thus advance the shaft, a sleeve slidably mounted in such collar and held against disengagement therefrom, said sleeve being adapted upon movement of such collar to actually contact with said fixed member, and a spring interposed between said collar and sleeve to resiliently support the latter, said spring being held under an initial degree of tension.

Signed by me, this 19th day of March 1907.

JOHN J. GRANT.

Attested by—

D. T. DAVIES,

JNO. F. OBERLIN.