June 26, 1945. J. E. H. METZ 2,379,370

LATHE ATTACHMENT

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Fig. 1

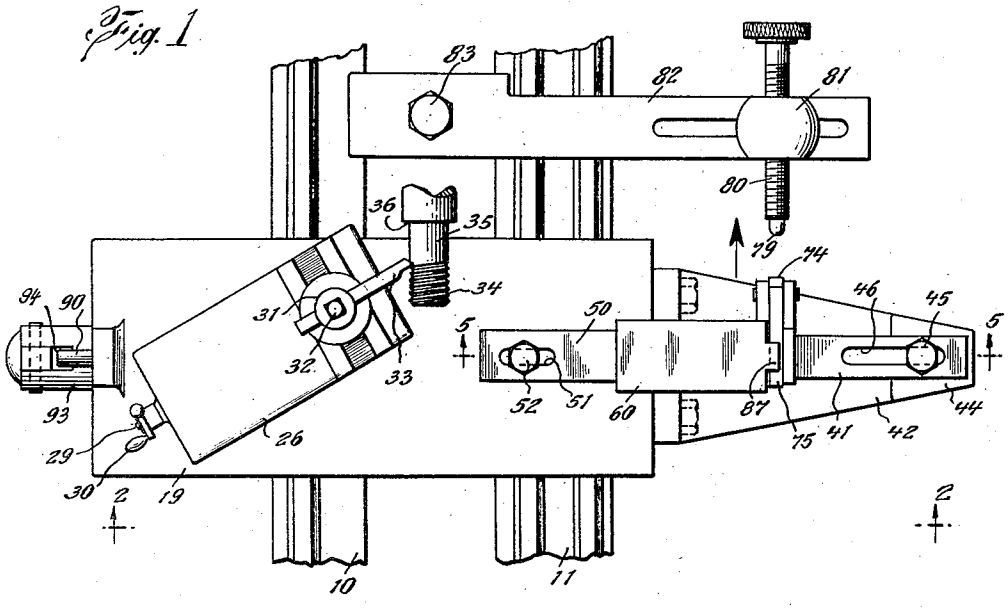


Fig. 2

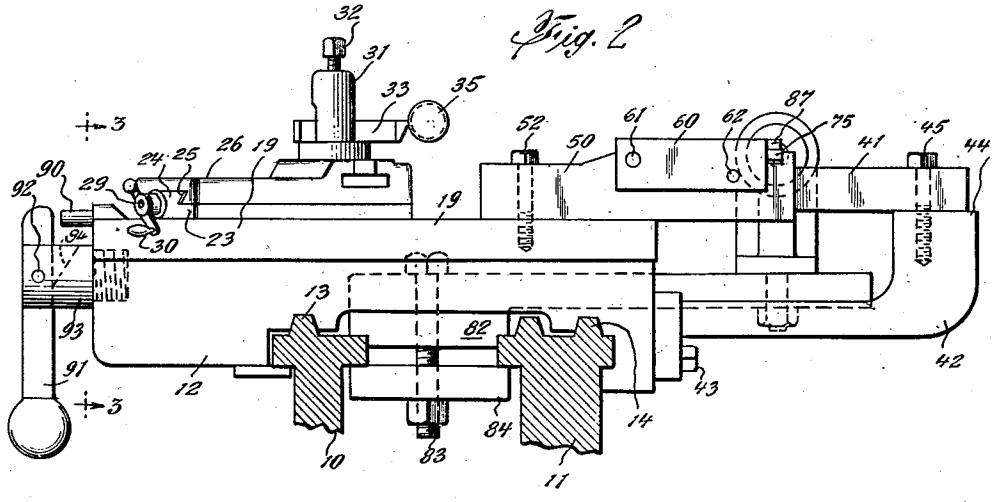
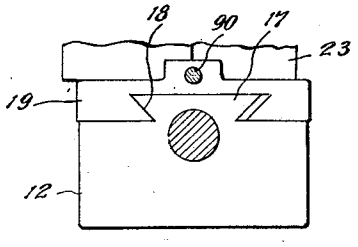


Fig. 3



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LATHE ATTACHMENT

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Fig. 4.

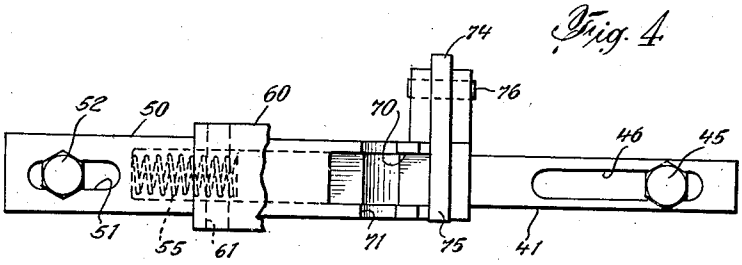


Fig. 5

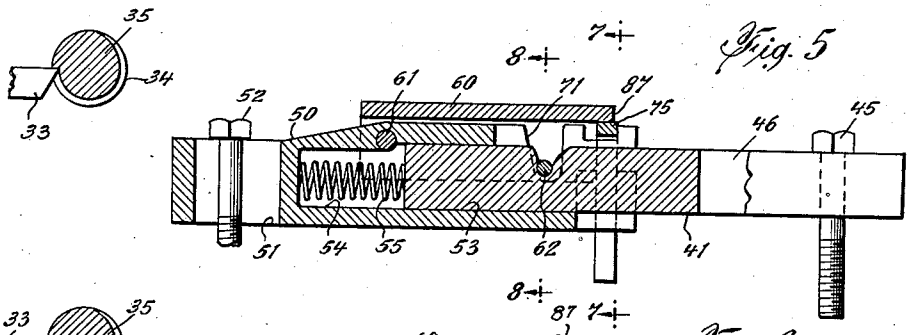


Fig. 6

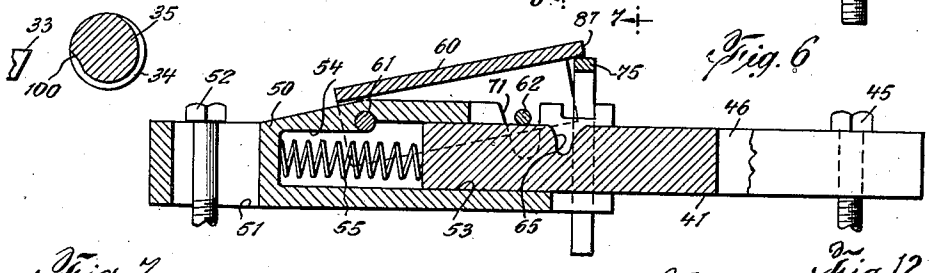


Fig. 7

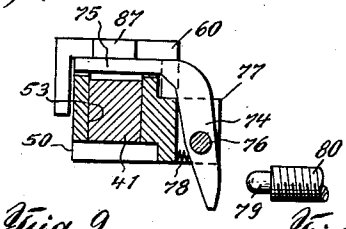


Fig. 8

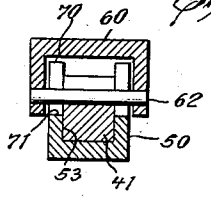


Fig. 12.

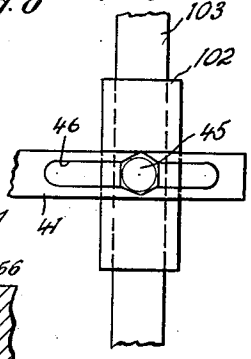


Fig. 9

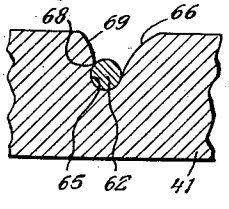


Fig. 10

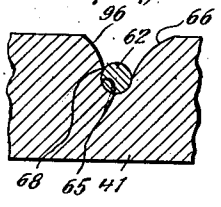
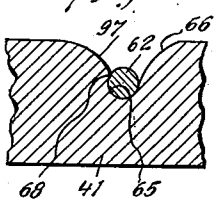


Fig. 11



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UNITED STATES PATENT OFFICE

2,379,370

LATHE ATTACHMENT

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Application August 24, 1943, Serial No. 499,862

11 Claims. (Cl. 82—24)

This invention relates to lathe attachments, and relates more particularly to a novel automatic retracting mechanism for cutting tools for lathes. In thread-cutting operations on lathes, the cutting tool must usually be retracted from the work at the end of the thread section. In many articles to be threaded, such as bolts, special plugs, screws, and the like, a flange is formed at the end of this thread section, and the cutting tool, which is being moved longitudinally of the lathe bed by a lead screw, must be quickly retracted; otherwise, the tool will cut into this flange and thus destroy the work and not infrequently the cutting tool as well.

Heretofore, it has been the practice to retract the tool from cutting position by hand, and since this operation cannot be performed quickly, it has always been necessary to slow down the lathe near the end of the thread section. Inasmuch as the tool must usually traverse the thread four or five times to obtain a thread of desired depth, the entire operation is exceedingly slow, not only because of this slow-up at or near the end of the thread section, but also because the lathe must be operated at relatively slow speeds for the entire operation. The work is also inferior to a die-cut thread, especially at the end of the thread section, for the reason that it is impossible for the human operator to withdraw the tool each time at exactly the same point, and accordingly the work shows evidence of this defect.

It is one of the principal objects of the present invention to provide means and mechanism for an automatic run-out of the cutting tool, the run-out occurring in each instance at exactly the same point in the thread. The run-out is exceedingly fast, and accordingly it is possible to cut the thread up to a point closely adjacent to the flange without any danger whatsoever of cutting into the flange. The operation is effected without reducing the speed of rotation at any point in the operation, and the quantity of work turned out is, in many cases, four or five times that which is possible by the conventional method of manually retracting the tool. Not only is the quantity as well as the quality of the work greatly improved by the use of the present invention, but perfect work can be turned out by a relative novice in lathe operation.

Another object of the present invention is the provision of a device of the character described which is simple and inexpensive in construction, and which can be quickly attached to any lathe having the usual thread-cutting means including a lead screw which moves a longitudinal carriage, as well as a cross-table slide which supports the usual cutting tool compound assembly.

Briefly, the present invention in one form may include a pair of telescopically-arranged elements, one fixed to the longitudinal carriage, and the other secured to the cross-table slide which carries the cutting tool assembly. Novel locking means normally retain these elements in fixed position relative to each other, and such position is maintained during the cutting cycle. When the carriage reaches a predetermined, adjusted position, the locking means are released and spring means urge the movable element outwardly, transversely of the lathe bed, thus also moving the cutting tool to non-cutting position.

One specific form of releasable locking means between the aligned locking elements or bolts, which, as aforesaid, may be telescopically arranged, consists in the provision of a cut-out portion extending downwardly from the upper wall of the fixed element, and a latch member carried by the movable element. The latch member, at one end thereof, is pivotally mounted on the movable element, and at the other end thereof a pin is arranged transversely which drops into the slot in the fixed element. A spring is so arranged as to urge the two elements in opposite directions. A bell crank lever or trigger mechanism, having a horizontal and a vertical portion, is so arranged as to raise the pivoted latch member upwardly, thus releasing the pin from the slot and permitting the cutting tool to be retracted by action of the spring. The trigger is actuated by contact with an adjustable, fixed stop associated with the bed of the lathe. Thus, as the longitudinal carriage moves in the direction of this fixed stop, the latter eventually contacts the trigger, thus releasing the cutting tool.

A device of the present invention may be used for cutting either external or internal threads, and may also be employed in boring operations and in connection with many other lathe operations wherein a cutting tool is employed, and wherein it is desired to quickly retract the cutting tool when the longitudinal carriage reaches a predetermined position. A number of the other uses of the device of the present invention will be pointed out more in detail hereinafter.

In the drawings:

Fig. 1 is a broken top plan view of a portion of the bed of a lathe, and showing one embodiment of the present invention in association therewith.

Fig. 2 is a vertical section taken on line 2—2 of Fig. 1.

Fig. 3 is a section taken on line 3—3 of Fig. 2.

Fig. 4 is a broken top plan view of the retracting element which causes the cross-table slide carrying the compound and cutting tool to move outwardly at the end of the thread-cuttng operation.

Fig. 5 is a broken section taken on line 5—5 of Fig. 1.

Fig. 6 is a view similar to Fig. 5, but shows the locking element in raised or unlocked position.

Fig. 7 is a section taken on line 7—7 of Fig. 5.

Fig. 8 is a section taken on line 8—8 of Fig. 5.

Fig. 9 is a broken section showing the locking pin, and cam surface receiving such pin.

Figs. 10 and 11 show modified cam surfaces.

Fig. 12 is a broken plan view of a modified form of the present invention.

In Figs. 1 and 2, elements 10 and 11 are slideways forming part of the bed of a conventional lathe, which slideways support the longitudinally-movable carriage 12. A lead screw (not shown) moves this carriage longitudinally of the lathe, and suitable means may also be provided for moving the carriage manually, all as is well known. The lower surface of the longitudinal carriage is appropriately formed to receive track elements 13 and 14 associated with bed elements 10 and 11. The upper surface of the carriage is formed with a male dovetail element 17 which is received within a female dovetail element or recess 18 formed on the lower surface of a cross-table slide 19, all as shown in Fig. 3. Both the longitudinal carriage and the cross-table slide may be more or less conventional structures, and are usually standard equipment with conventional lathes. The compound support 23 is rigidly mounted in any desired position on the upper surface of the cross-table slide, and is also formed with a male dovetail element 24 on its upper surface which is received within a female dovetail element or recess 25 formed on the lower surface of the compound rest 26. A lead screw 29 journalled in compound support 23 and rotatable by a crank 30 moves the compound rest inwardly and outwardly.

A compound head 31 carrying a set screw 32 receives the cutting tool 33 which, in the present instance, is assumed to be cutting a thread 34 in a bolt 35 having a flange or shoulder 36. In accordance with existing practices, the lead screw would move the longitudinal carriage 12 and the cutting tool 33 parallel with the axis of rotation of the bolt 35, which is supported in the usual chuck (not shown). When the cutting tool reaches a point adjacent to the flange 36 of the bolt, it is, of course, necessary to slow down the machine when the usual manual tool-retracting means are employed, and when the cutting tool arrives at a point closely adjacent to the flange, it is necessary for the operator to quickly rotate crank 30 in order to retract the cutting tool and prevent the same from damaging the face of the flange as well as causing damage to itself.

The automatic means for retracting the cross-table slide carrying with it the compound and the cutting element will now be described. A fixed, elongated member 41, which may be termed a locking bolt, is rigidly mounted on the longitudinal carriage by means of an angle bracket 42 which is secured at the inner end of the carriage by means of a machine screw 43. The opposite end 44 of the angle bracket receives one end of the fixed bolt 41 on its upper surface and is secured thereto by means of a machine screw 45. Inasmuch as the bolt 41 is preferably transversely adjustable relative to the lathe bed, the screw 45 passes through a slot 46 in bolt 41 rather than a round aperture. Bolt 41 is shown as being generally rectangular in transverse section, although it will be appreciated that this element can be otherwise shaped, if desired.

A second element 50 forming a movable locking bolt is mounted for movement longitudinally of fixed bolt 41. At one end thereof, this bolt is formed with a slot 51 which receives a machine screw 52 to securely mount the bolt 50 on the upper surface of cross-table slide 19. Bolt 50 is further formed with a longitudinal bore 53 of only slightly larger transverse sectional shape than fixed bolt 41, such fixed bolt being received within the bore, as shown particularly in Figs. 5 to 8. The bore may have a somewhat reduced extension 54 at its inner end, which receives a coil compression spring 55 which urges bolts 41 and 50 in opposite directions. A locking element or latch 60, which is of inverted U shape in transverse section, is pivotally mounted on bolt 50 adjacent to its upper surface by means of a pivot pin 61. At its end opposite the pivot pin, locking bolt 60 is provided with a locking pin 62 which extends transversely of the latch, and which is received within a recess in fixed bolt 41 of special contour. In this connection, reference is particularly made to Fig. 9.

The lower portion 65 of the slot is substantially semi-circular, and is of such size as to relatively snugly fit the external contour of locking pin 62. Surface 66, which is a continuation of the semi-circular surface 65 to the right thereof, is upwardly and outwardly curved. This surface merely acts as a guide to cause pin 62 to move downwardly in the recess 65. The semi-circular recess 65 stops at point 68 on its left-hand side, and the remaining upward surface 69 is outwardly curved. The upper wall of bolt 50 at its inner end is cut away, as shown at 70, and the side walls adjacent to such cut-out portion are further formed with substantially U shaped cut-out portions 71. The right-hand end of latch 60 is normally in the downward position, as shown in Figs. 2 and 5, by force of gravity, and the cut-out portions in bolt 50 thus permit locking pin 62 to move downwardly into semi-circular recess 65 in bolt 51. By virtue of the fact that when in this position locking pin 62 occupies a position lower than pivot pin 61, and by virtue also of the particular construction of recess 65—69 in bolt 41, it will be seen that bolt 50 cannot move with respect to bolt 41 but rather is it locked thereto.

A trigger having a vertical portion 74 and a horizontal portion 75 is pivoted at 76 on an extension 77 of bolt 50. A spring 78 urges the trigger in a counter-clockwise direction, when viewed as in Fig. 7. As the carriage moves in the direction of the arrow shown in Fig. 1, horizontal portion 74 of the trigger eventually contacts the inner terminal 79 of adjustable stop pin 80 which is mounted in a support 81 carried by a horizontal bracket 82. This bracket is secured by a bolt 83 to the lathe bed portions 10 and 11, a cross piece 84 extending between such bed portions on their lower surfaces, as shown in Fig. 2. When this occurs, horizontal portion 75 of the trigger is moved upwardly and contacts an extension 87 of latch 60, thus raising the latch to the position shown in Fig. 6. As the pin 62 thus moves upwardly, it passes the shoulder formed by point 68 in the recess, and then permits the pin to travel over surface 69, and further permits the movable bolt 50 to move to the right due to the action of spring 55. Spring 55 is of sufficient strength to move the bolt together with the cross-table slide, the compound support, and the cutting tool very quickly.

Because of the formation of slot 65—69 and shoulder 68, and because of the positioning of pivot pin 61 on a plane slightly higher than pin

62 when the latter is in its lower position of Fig. 5, this camming action of pin 62 does not cause any movement to the right of bolt 50, and thus permits the cutting tool 33 to run out smoothly but not abruptly, thus producing the tapered terminal portion 100 of the thread shown in Fig. 6. When the cutting tool is next returned to starting position for the second cut of the thread, the run-out at the end of the cycle occurs at exactly the same position.

After the tool support has been retracted in the manner described, the carriage is returned to starting position in the usual manner, and the following means are provided for moving the tool support forwardly into cutting position for the next cutting operation. A pin 90 is carried at the left-hand end of tool support 19, when viewed as in Figs. 1 and 2, which pin is engaged by means of a lever 91 pivoted at 92 on a support 93 carried by the carriage. When the lower end of lever 91 is manually drawn to the left, the upper end moves to the right against pin 90, thus forcing the tool support forwardly against the compression of spring 55 to a point where latch 60 descends by gravity, thus causing locking pin 62 to fall into recess 65. The slot 94 in which lever 91 is pivoted is so formed that it may be moved in a clockwise direction from the position shown in Fig. 2, but not in a counterclockwise direction in such position. Accordingly, the upper end of this lever acts as a stop when it is contacted by pin 90, which latter pin is preferably adjustable inwardly and outwardly in order to vary the distance of the run-out.

Cam surface 69 of the slot in bolt 41 may be varied for certain kinds of work, as shown at 96 and 97 in Figs. 10 and 11, respectively. For instance, if a relatively abrupt run-out is desired, surface 97 may be employed.

The foregoing invention has been described in connection with an assembly for cutting an external thread, and when an internal thread is to be cut, the same means may be employed, the only change occurring in the positioning of the tool compound 26—23, and in the formation of the cutting tool, neither of which form any part of the present invention. In this case, the distance which the cutting tool is retracted will usually be somewhat less than would be the case if the external thread is being cut, and this distance is determined by adjusting the distance which stop pin 90 projects to the left of the cross-table slide 19. The same arrangement may also be employed in cutting operations other than thread cutting, both externally and internally. The arrangements just described may be used for all cutting operations wherein the cutting tool is to move parallel with the axis of the work to be cut. In many cases, however, a tapered thread or a tapered bore, or otherwise, is desired, and in such case member 41 is not secured to bracket 42 but rather carries a slide 102 which is movable on a guide rod 103. This guide rod may be adjusted by known means to any desired angle, and accordingly the cutting tool follows such angle relative to the axis of rotation of the work.

The foregoing embodiments of the invention may, it will be appreciated, be modified considerably without departing from the spirit of the invention as defined by the appended claims. For instance, instead of the elongated members 41 and 50 being longitudinally extensible in telescopic relation, these members may constitute levers pivoted together at one end thereof, the opposite end of one of the levers being secured to the tool support, and the other to the carriage or to the guide rod.

What I claim is:

1. A lathe comprising, in combination, a lathe bed, means for supporting and rotating work to be cut, a carriage movable longitudinally of the bed, a tool support carried by the carriage, a cutting tool mounted in the support, means permitting movement of the tool support relative to the carriage generally transversely of the bed, and means for retracting the tool support when the tool has reached a predetermined position relative to the work, said means comprising a pair of elongated members mounted for movement longitudinally of each other, one of such members being secured to the carriage and the other of such members being secured to the tool support, means for urging such members in opposite directions, releasable locking means normally retaining the members in a locked, fixed position relative to each other, and means for releasing the locking means when the cutting tool has reached said predetermined position.

2. A lathe comprising, in combination, a lathe bed, means for supporting and rotating work to be cut, a carriage movable longitudinally of the bed, a tool support carried by the carriage, a cutting tool mounted in the support, means permitting movement of the tool support relative to the carriage generally transversely of the bed, and means for retracting the tool support when the tool has reached a predetermined position relative to the work, said means comprising fixed and movable, telescopically-arranged locking elements secured, respectively, to the carriage and to the tool support, means for urging said elements in opposite directions, releasable locking means associated with the elements for normally securing the same in fixed position, and means for releasing the locking means when the cutting tool has reached said predetermined position.

3. A lathe comprising, in combination, a lathe bed, means for supporting and rotating work to be cut, a carriage movable longitudinally of the bed, a cross-table slide mounted on the carriage, a tool support carried by the slide, a cutting tool mounted in the support, and means for retracting the slide when the tool has reached a predetermined position relative to the work, said means comprising aligned, telescopically-arranged locking elements secured, respectively, to the carriage and to the slide, spring means for urging said elements in opposite directions, releasable locking means associated with the elements for normally secured the same in fixed position, and an adjustable, fixed stop member associated with the bed for releasing the locking means upon contact therewith when the tool has reached such position.

4. A thread-cutting lathe comprising, in combination, a lathe bed, means for supporting and rotating work to be threaded, a carriage movable longitudinally of the bed, a tool support carried by the carriage, a cutting tool mounted in the support, means permitting movement of the tool support relative to the carriage generally transversely of the bed, and means for retracting the tool support when the tool has reached a predetermined position relative to the work, said means comprising fixed and movable, telescopically-arranged locking elements secured, respectively, to the carriage and to the tool support, spring means for urging the movable element

away from the fixed element, releasable locking means associated with the elements for normally securing the same in fixed position, and an adjustable, fixed stop member associated with the bed for releasing the locking means upon contact therewith, thus causing the tool to move away from the work.

5. In a lathe having means for supporting and rotating work to be cut, a longitudinally-movable carriage, a tool support carried by the carriage which is movable transversely of the axis of the work, and a tool carried by the support, the combination of means for retracting the tool support when the tool has reached a predetermined position in the cutting operation, said means comprising telescopically-arranged fixed and movable members disposed generally perpendicular to said axis, the fixed member being secured to the carriage and the movable member being secured to the tool support, means urging the movable member away from the fixed member, releasable locking means for normally locking the two members together, and means for releasing such locking means when the tool reaches said predetermined position.

6. In a lathe having means for supporting and rotating work to be cut, a longitudinally-movable carriage, a tool support carried thereby which is movable transversely of the axis of the work, a tool carried thereby, the combination of means for retracting the tool support when the tool has reached a predetermined position in the cutting operation, said means comprising a pair of elongated members mounted for movement longitudinally of each other, one of such members being secured to the carriage and the other of such members being secured to the tool support, means for urging such members in opposite directions, releasable locking means normally retaining the members in a locked, fixed position relative to each other, and means for releasing the locking means when the cutting tool has reached said predetermined position.

7. In a lathe having means for supporting and rotating work to be cut, a longitudinally-movable carriage, a tool support carried by the carriage which is movable transversely of the axis of the work, and a tool carried by the support, the combination of means for retracting the tool support when the tool has reached a predetermined position in the cutting operation, said means comprising telescopically-arranged fixed and movable members disposed generally perpendicular to said axis, a guide member disposed generally longitudinally of the lathe, the fixed member being secured to, and being movable on, said guide member, and the movable member being secured to the tool support, means urging the movable member away from the fixed member, releasable locking means for normally locking the two members together, and means for releasing such locking means when the tool reaches said predetermined position.

8. In a lathe having means for supporting and rotating work to be cut, a longitudinally-movable carriage, a tool support carried thereby which is movable transversely of the axis of the work, a tool carried thereby, the combination of means for retracting the tool support when the tool has reached a predetermined position in the cutting operation, said means comprising a pair of aligned, extensible members mounted for movement longitudinally of each other, a guide rod positioned generally longitudinally of the axis of the work but being non-parallel therewith, one of such members being carried on, and being slidable along, said guide rod, the other of such members being secured to the tool support, means for urging the latter member to non-cutting position, and releasable locking means normally retaining said member in cutting position.

9. In a lathe having means for supporting and rotating work to be cut, a longitudinally-movable carriage, a tool support carried by the carriage which is movable transversely of the axis of the work, and a tool carried by the support, the combination of means for retracting the tool support when the tool has reached a predetermined position in the cutting operation, said means comprising a pair of members arranged for longitudinal, sliding movement relative to each other, the first member being secured to the tool support, and the second member to the carriage, spring means urging the tool support away from the work to be cut, and releasable locking means between the members for holding the tool support in advanced position, said means comprising a hinged latch formed with a transverse pin, carried by the first member, the second member having a transverse slot receiving the pin, and means for releasing the latch, the wall of the slot which engages the pin being so formed as to provide progressive rearward movement of the tool support upon release so as to form a tapered terminal in the slot in the work cut by the tool.

10. In a lathe having means for supporting and rotating work to be cut, a longitudinally-movable carriage, a tool support carried by the carriage which is movable transversely of the axis of the work, and a tool carried by the support, the combination of means for retracting the tool support when the tool has reached a predetermined position in the cutting operation, said means comprising a pair of members arranged for longitudinal, sliding movement relative to each other and being disposed transversely of the work to be cut, the first member being secured to the tool support, and the second member to the carriage, spring means urging the tool support away from the work to be cut, and releasable locking means between the members for holding the tool support in cutting position, said means comprising a hinged latch formed with a transverse pin, carried by the first member, the second member having a transverse slot receiving the pin, and means for raising the latch to release the pin, the wall of the slot which engages the pin having a vertical portion at its lower end, and an inclined portion at its upper end, in order to permit the tool, upon release, to cut a tapered terminal in the slot so cut by the tool.

11. In a lathe having means for supporting and rotating work to be cut, a longitudinally-movable carriage, a tool support carried by the carriage which is movable transversely of the axis of the work, and a tool carried by the support, the combination of means for retracting the tool support when the tool has reached a predetermined position in the cutting operation, said means comprising a pair of members arranged for longitudinal, sliding movement relative to each other, the first member being secured to the tool support, and the second member to the carriage; spring means urging the tool support away from the work to be cut, releasable locking means between the members for holding the tool support in advanced position, and latch means for releasing the locking means when the predetermined position has been reached by the cutting tool.

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