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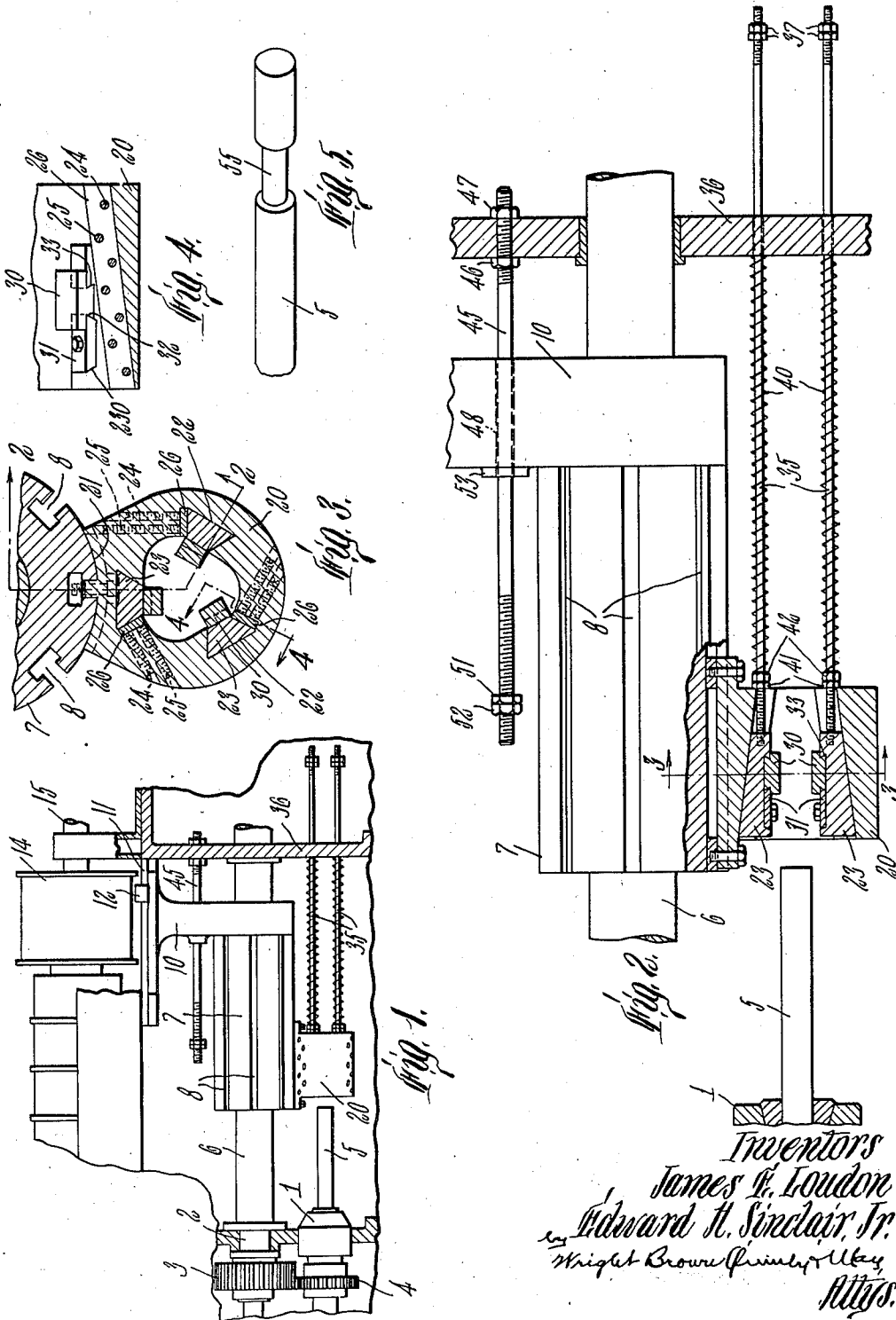
J. E. LOUDON ET AL

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LATHE TOOLING MECHANISM

Filed March 2, 1943

3 Sheets-Sheet 1



Inventors
James H. Loudon
Edward H. Sinclair, Jr.
Wright Brown & Co., Inc.
Attys.

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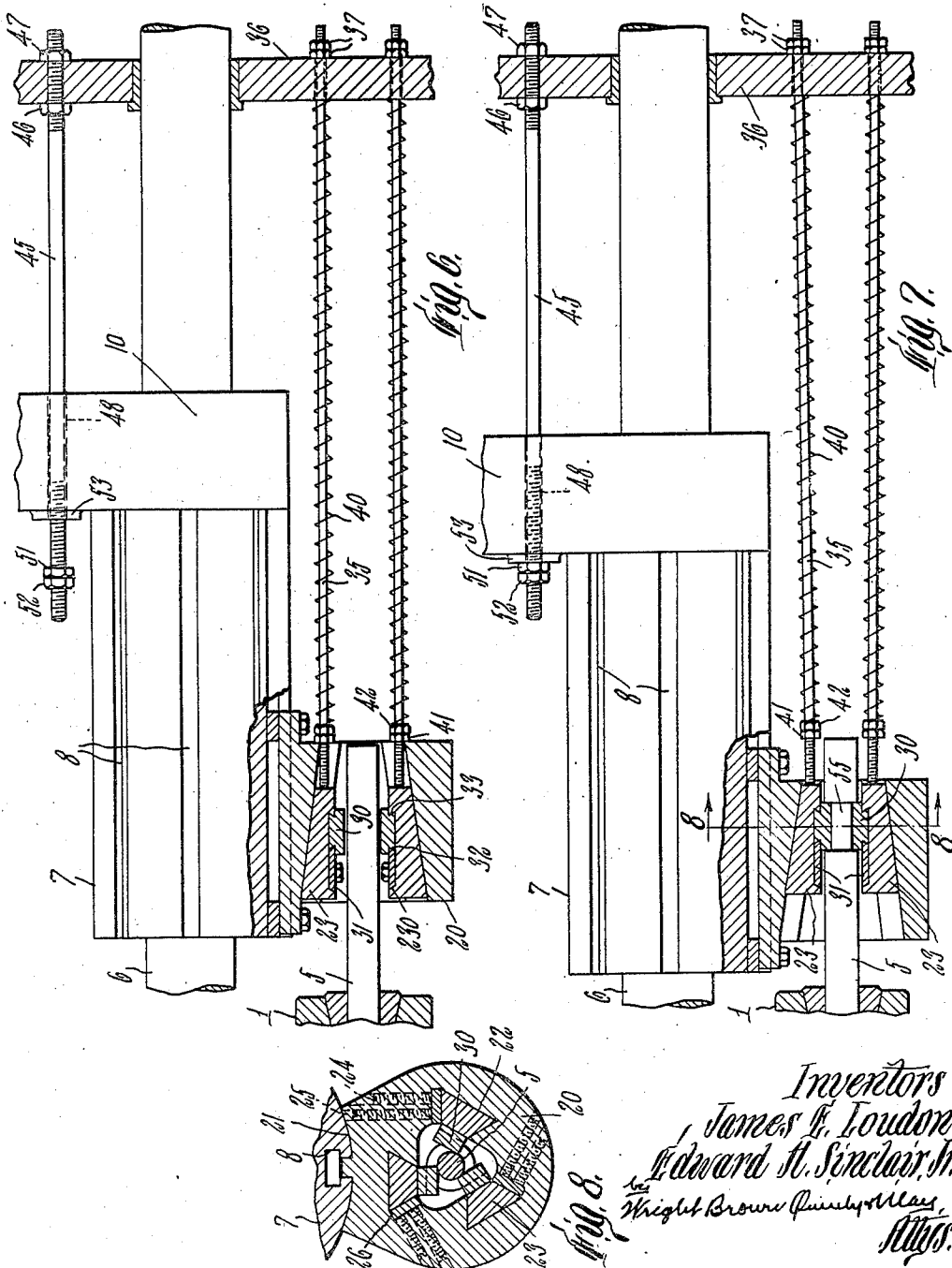
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3 Sheets-Sheet 2



Inventors
James E. Loudon
Edward H. Sinclair, Jr.
By Wright Brown Quincy & Co.
Attys.

Dec. 21, 1943.

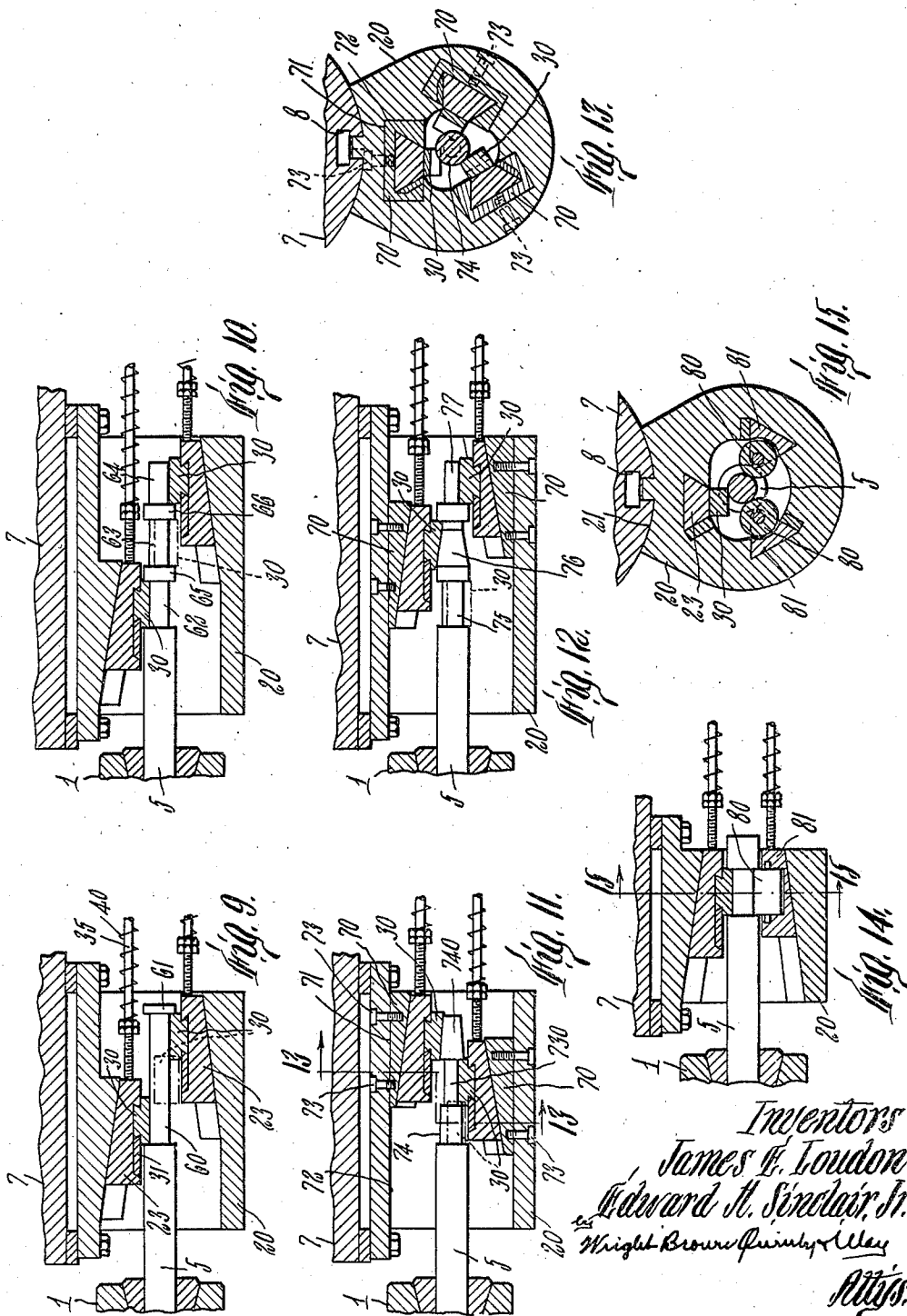
J. E. LOUDON ET AL

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LATHE TOOLING MECHANISM

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3 Sheets-Sheet 3



Inventors
James E. Loudon
Edward H. Smedley, Jr.
Wright-Brown Quincy & May
Atty's.

UNITED STATES PATENT OFFICE

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LATHE TOOLING MECHANISM

James E. Loudon, Claremont, N. H., and Edward H. Sinclair, Jr., Windsor, Vt., assignors to Cone Automatic Machine Company, Inc., Windsor, Vt., a corporation of Vermont

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7 Claims. (Cl. 29—37)

This invention relates to tooling mechanism especially suitable for machines operating on bar stock, though not limited thereto, and has for an object to provide one or more tools operative on work at a predetermined portion of the length thereof and actuated by motion of means movable substantially parallel to the axis of the stock.

Another object is to provide such a mechanism which is suitable for use with one or more spindles of a multiple spindle lathe.

A further object of this invention is to provide such a mechanism wherein the stock is so supported adjacent to the position of tooling that bending or chattering is substantially wholly prevented.

A further object is to provide in such a mechanism means by which a plurality of tools may be given motion individual to the respective tools and wherein the tools may, if desired, operate on different lengthwise portions of the stock.

Further objects and advantages will appear from a description of certain embodiments of the invention shown in the accompanying drawings in which

Figure 1 is a fragmentary view partly in side elevation and partly in longitudinal vertical section of a multiple spindle lathe of the well known Cone type showing an embodiment of this invention associated with one of the work spindles, and in retracted position.

Figure 2 is a fragmentary view to a larger scale similar to a portion of Figure 1 but showing the tool mechanism in vertical section on line 2—2 of Figure 3.

Figure 3 is a detail sectional view on line 3—3 of Figure 2.

Figure 4 is a detail sectional view on line 4—4 of Figure 3.

Figure 5 is a perspective view of a work piece illustrating one type of work which may be done by mechanism embodying this invention.

Figure 6 is a view similar to Figure 2, but showing the mechanism in position about to start operating on a work piece.

Figure 7 is a view similar to Figure 6, but showing the tooling operation substantially completed.

Figure 8 is a detail sectional view on line 8—8 of Figure 7.

Figures 9 to 12 and 14 are fragmentary sectional views similar to a portion of Figure 7, but showing various other tooling operations which may be performed by the mechanism of this invention.

Figure 13 is a sectional view on line 13—13 of Figure 11.

Figure 15 is a sectional view on line 15—15 of Figure 14.

In the drawings, this invention is shown as applied to a multiple spindle lathe of the well known Cone type such as is shown, for example, in the Miller Patent No. 2,236,440 granted March 25, 1941, for Automatic multiple spindle machine. As is well known, such machines are provided with a spindle carrying drum or turret which is indexed about an axis, this axis being centrally arranged with reference to a plurality of rotary work carrying spindles which are arranged in circular array.

One of these spindles is shown at 1 in Figure 1, and it is arranged to be rotated from the rotation of a central shaft 2 coaxial with the turret or drum and which carries a gear 3 meshing with a gear 4 carried by the work spindle. The work 5 extends through the work spindle and machining operations are performed on that portion of the work which projects beyond the spindle. The shaft 2 is arranged to rotate within a sleeve 6 coaxial therewith, and this sleeve carries for reciprocation thereon, a tool holding turret 7 provided with T slots 8 in its periphery for the attachment thereto of tool holders of various kinds, depending upon the nature of the operation intended to be performed on the work. This turret 7 is fixed to a slide 10 guided from an overhead frame member 11 and provided with a cam follower 12 which projects upwardly into operative relation to cams (not shown) on a drum 14 carried by an overhead cam shaft 15. The tooling mechanism of this invention as applied to a machine of this type is carried by the turret 7, the axial motions of which are caused to bring the tools carried thereby into and out of the desired position along the length of the projecting work piece 5, and then by further motion of the turret 7 axially, the tools carried by this attachment are arranged to be fed into operative relation to the work or retracted therefrom.

As shown best in Figures 3 and 8, the tooling attachment comprises a tubular tool head 20 which has a concave side portion 21 engageable about a portion of the periphery of the tool turret 7 and provided with suitable means for engaging in one of the T slots 8, and for clamping the head in position at the desired lengthwise portion of the tool turret. The central opening of the tool head is arranged to receive therein the work piece 5 projecting from the work spindle

in one indexed position of the spindle carrying drum.

One arrangement of tools within the head is illustrated in Figures 3, 4, 6, 7 and 8. In these figures the tool head is shown as provided with three longitudinally extending dovetail guide slots 22 which are arranged at an angle to the axis of the work, the slots being inclined toward the spindle axes in the direction away from the spindles. Within each of these ways 22 is slidably mounted a tool carrier 23. Preferably, and in order to take up wear, the tool carrier is of less width than the dovetail guide slot so that adjustable wear take-up shims 28 may be interposed between one side face of the carrier and the corresponding side wall of the dovetail guide slot. These shims may be adjusted by adjustment of the screws 24 and 25. Each of these carriers is shown as provided with a forming tool 30 and each tool may be fixed in position on its carrier by a clamping plate 31 having beveled side edges, one engaging an inclined face 230 of the carrier and the other a dovetail base portion 32 of the tool 30 and pressing the opposite dovetail edge of the tool into engagement with a mating edge 33 on the tool carrier. Each of these tool carriers has threaded into its rearward face a rod 35 which extends through a frame member 36 which may be the wall of the driving mechanism column of the machine, and inwardly of this wall member 36, stop and check nuts 37 are shown as threaded thereon. The rod 35 is surrounded by a coil spring 40 which reacts between the inner face of the wall 36 and stop and check nuts 41 and 42 threaded on the rod 35 spaced somewhat from the adjacent ends of the tool carriers 23. The nuts 37 are so positioned along the rod 35 that when the nuts 37 contact with the wall member 36 the tools 30 are in the desired axial position along the work piece 5 for the tools to be effective thereon as shown in Figures 3 and 6. The stop and check nuts 41 and 42 are then in position where they engage the outer end of the tool head 20. When the parts are in this position, a stop rod 45 secured at its outer end between the nuts 46 and 47 on either side of the partition member 36, extends through a hole 48 through the slide 10 forwardly of which it is provided with the stop and check nuts 51 and 52 which in that position of the parts is still spaced away from a stop boss 53 integral with the slide 10. This permits the slide to be given a further motion toward the spindle drum before it is stopped by engagement of the stop nuts 51 against the stop boss 53, and during this motion tool carriers 23, being prevented from forward motion by the stop nuts 37, are forced inwardly by the longitudinal motion of the head 20 relative to the tool carriers, bringing the tool carriers toward each other and cutting into the work as shown in Figure 7, until such time as the stop nut 51 contacts with the boss 53 and stops further motion in that direction of the slide 10 and the tool turret 7.

On reverse direction of sliding motion of the slide 10 from the position shown in Figures 7 and 8 to the position shown in Figures 3 and 6, the springs 40 hold the tool carriers 23 in their same position lengthwise of the work, but the retraction of the tool head with respect to these carriers brings the tools outwardly into the position shown in Figure 6. Where three tool carriers are employed, as shown in these figures, each tool takes a portion of the cut and produces a neck on the work as at 55 in Figure 5.

Further retraction of the slide 10 toward the partition 36, the stop nuts then being in contact with the outer end of the tool head, causes the rods 35 to be retracted, bringing the stop nuts 37 away from the partition 36 as shown in Figures 1 and 2, this motion retracting the tool head, and with it the tool carriers and tools, beyond the end of the projecting work piece 5 so that the spindle drum may be indexed to bring a succeeding work piece into position to be operated upon by the tools of the attachment. The springs 35 hold the tool carriers in their forward and outer positions while the tool head is being retracted from the position of Figures 7 and 8 to that of Figures 1 and 2 and the attachment is then in condition for forward movement, after the spindle drum has been indexed, to move over the next presented work piece to the desired distance from its end and then to be moved into operative engagement therewith.

In Figures 2, 3, 6, 7 and 8 all of the tools are shown in alinement with each other lengthwise of the work piece, but if desired they may be disposed differently, as shown, for example, in Figures 9 and 10. In Figure 9 the tools are shown as overlapping each other lengthwise so that one of the tools cuts the work nearest to the spindle, another one cuts somewhat further toward the end of the work, as shown by dotted lines in Figure 9, and the third cuts still further toward the end of the work so as to produce a relatively long reduced diameter portion 60 of the work, leaving an enlarged head 61 at its outer end. In Figure 10, the tools are shown as having no overlapping cutting portions, each tool acting at its own lengthwise position along the work to produce three reduced diameter portions 62, 63, and 64, spaced by enlarged diameter shoulders 65 and 66 therebetween. It will be noted, however, that in each of the constructions thus far described, the tools work at different angular positions around the work, each tool thus acting as a steady rest with respect to the other tools so that chattering of the relatively long work piece is effectively prevented.

In all these constructions it will also be noted that each of the tools cuts to the same depth in the work, but it may be that in some cases cutting to different depths may be desirable. Where this is so, constructions such as are shown in Figures 11, 12 and 13 may be employed in which instead of having sloping ways cut directly into the tool head, these ways may be formed as parts of separate inserts 70, each having its own slope, and preferably each having an outer face parallel to the work axis as at 71 mating a non-tapered head socket or groove 72 in which it may be secured as by screws 73. As shown in Figure 11, a pair of such inserts, each having sloping ways, the slopes of which differ from each other are employed, and they are arranged to come into action at different lengthwise portions of the work so that one tool produces a reduced diameter portion 74 outwardly of which the diameter is further reduced to form the portion 730 and the end portion of the work is cut to tapering contour as at 740.

In Figure 12 an arrangement is shown in which the tools do not have any overlapping zones, one of them cutting the reduced diameter portion 75, the second a tapered portion 76 spaced axially from the portion 75, and the third cutting a reduced diameter portion 77 spaced axially from the portion 76, the reduced diameter portions being of different diameters.

In some cases it may be desired that all of the cutting be done by a single tool, as shown in Figures 14 and 15, and when this is desired the work may be supported against the thrust of this tool by a pair of rollers 80 journaled in carriers 81 movable in the ways of the tool head and in place of the tool carriers at these angular positions.

From the foregoing description of certain embodiments of this invention, it should be evident to those skilled in the art that various other modifications and changes might be made without departing from the spirit or scope of this invention.

We claim:

1. The combination with a work spindle, of a tool head movable lengthwise of said work spindle to bring a tool on said head into and out of a desired axial relation to work projecting from said spindle, means for relatively rotating said spindle and tool head, a tool carrier supporting said tool and mounted on said head for motion relative to said head with a component toward and from the axis of said work spindle, means engageable with said carrier for limiting the motion of said carrier with said head in one direction while the motion of said head continuing thereafter causes said carrier and tool to move toward said work axis, and means for moving said tool head to position said tool at a predetermined axial relation to the work and then when the axial motion of said tool carrier has been stopped to feed said tool into the work to a predetermined extent as said head is moved in one direction and for withdrawing said tool from the work and then retracting the tool axially from the work as said head is moved in the opposite direction.

2. The combination with a work spindle for supporting a length of work, of a head movable lengthwise of work carried by said spindle, means for so moving said head, means for relatively rotating said spindle and head, said head having a longitudinal guide portion inclined toward the axis of said spindle in the direction away from said spindle, a tool carrier slidable along said guide portion and having a tool, means yieldingly holding said carrier in position on said guide retracted from said axis, means for limiting the motion of said carrier with said head in said lengthwise direction whereby said tool is moved to a predetermined position along the work by movement of said head, continued motion of said head thereafter causing relative sliding of said carrier and head to bring said carrier and tool toward the work axis to cause said tool to act upon the work.

3. The combination with a work spindle, of a tubular tool head through which work projecting from one end of said spindle may extend, said head being movable lengthwise of such work, means for relatively rotating said spindle and head, said tool head having on its inner face a longitudinal guide portion inclined toward the axis of said spindle in the direction away from said spindle, a tool carrier slidable along said guide portion and holding a tool for operation on the work, means yieldingly retaining said carrier near to the spindle end of said head with said tool retracted from the work, means for limiting the movement of said carrier with said head toward said spindle to an amount corresponding to that lengthwise portion of the work where action on the work by said tool is desired, whereby on further motion of said head toward said spindle said carrier is moved toward said axis

and said tool operates on the work at said lengthwise portion, and means for moving said head lengthwise of the work.

4. The combination with a work spindle, of a tubular tool head through which work projecting from one end of said spindle may extend, said head being movable lengthwise of such work, means for relatively rotating said spindle and head, said tool head having on its inner face a longitudinal guide portion inclined toward the axis of said spindle in the direction away from said spindle, a tool carrier slidable along said guide portion and holding a tool for operation on the work, means yieldingly retaining said carrier near to the spindle end of said head with said tool retracted from the work, means for limiting the movement of said carrier with said head toward said spindle to an amount corresponding to that lengthwise portion of the work where action on the work by said tool is desired, whereby on further motion of said head toward said spindle said carrier is moved toward said axis and said tool operates on the work at said lengthwise portion, means for moving said head lengthwise of the work, and means for limiting the extent of said lengthwise motion to limit the depth to which said tool is to feed into the work.

5. The combination with a work spindle, of a tubular tool head through which work projecting from one end of said spindle may extend, said head being movable lengthwise of such work, means for relatively rotating said spindle and head, said tool head having on its inner face a longitudinal guide portion inclined toward the axis of said spindle in the direction away from said spindle, a tool carrier slidable along said guide portion and holding a tool for operation on the work, means yieldingly retaining said carrier near to the spindle end of said head with said tool retracted from the work, means for limiting the movement of said carrier with said head toward said spindle to an amount corresponding to that lengthwise portion of the work where action on the work by said tool is desired, whereby on further motion of said head toward said spindle said carrier is moved toward said axis and said tool operates on the work at said lengthwise portion, means for moving said head lengthwise of the work, means for limiting the extent of said lengthwise motion to limit the depth to which said tool is to feed with the work, and means carried on the interior of said head in position to take the thrust on the work produced by the pressure of the tool thereon.

6. The combination with a work spindle, of a tool head movable lengthwise of said work spindle to bring a tool on said head into and out of a desired axial relation to work held by said spindle, a tool carrier block carried by said head and having a way sloping lengthwise toward the axis of said spindle, a tool carrier having a portion engaging said way and supporting said tool, means for moving said head lengthwise of said spindle, means for stopping the motion of said tool carrier with said head in one direction while said head continues to move, such continued motion of said head causing motion of said tool carrier relative to said sloping way and toward said work axis, means limiting the motion of said head, yielding means acting on said carrier tending to move said carrier toward the outer end of said way relatively to said work axis, and means for moving said head lengthwise of said work axis.

7. In combination with a multiple spindle lathe

having an indexable drum, a plurality of rotary work spindles arranged in circular array about the indexing axis of said drum and arranged to support work pieces projecting from one end of each of said spindles at one face of said drum, a support arranged coaxially with said drum and projecting from said one face, a slide movable on said support from and toward said face, means to rotate said spindle, means to index said drum, and means to move said slide, of a tubular tool head carried by said slide, said head when said slide is retracted being clear of said work pieces to permit indexing of said drum, said head being positioned to receive a work piece therein in one indexed position when said slide is moved toward said drum, said tool head having a guide portion therein inclined toward the axis of a work piece extending thereinto, a tool carrier mounted to slide on said guide portion and having a tool for operating on the work extending into said head, a fixed wall member spaced from said drum face,

5 a rod secured at one end to said carrier and extending through openings in said head and wall member, a stop on said rod engageable with said head and determining the forward limiting position of said carrier with relation to said head, a spring surrounding said rod and reacting between said stop and said wall member for yieldingly holding said carrier in said limiting position, a stop on said rod back of said wall member 10 limiting the motion of said carrier toward said drum face thereby determining the axial position at which said tool may be operative on a work piece, and means for limiting the extent of motion of said head toward said drum face after motion in the same direction of said carrier has been stopped to determine with the slope of said guide portion the extent of inward feed of said tool with relation to the work.

JAMES E. LOUDON.
EDWARD H. SINCLAIR, JR.