June 11, 1929. Z. L. LITVINAS 1,717,047

MULTIPLE SPINDLE LATHE

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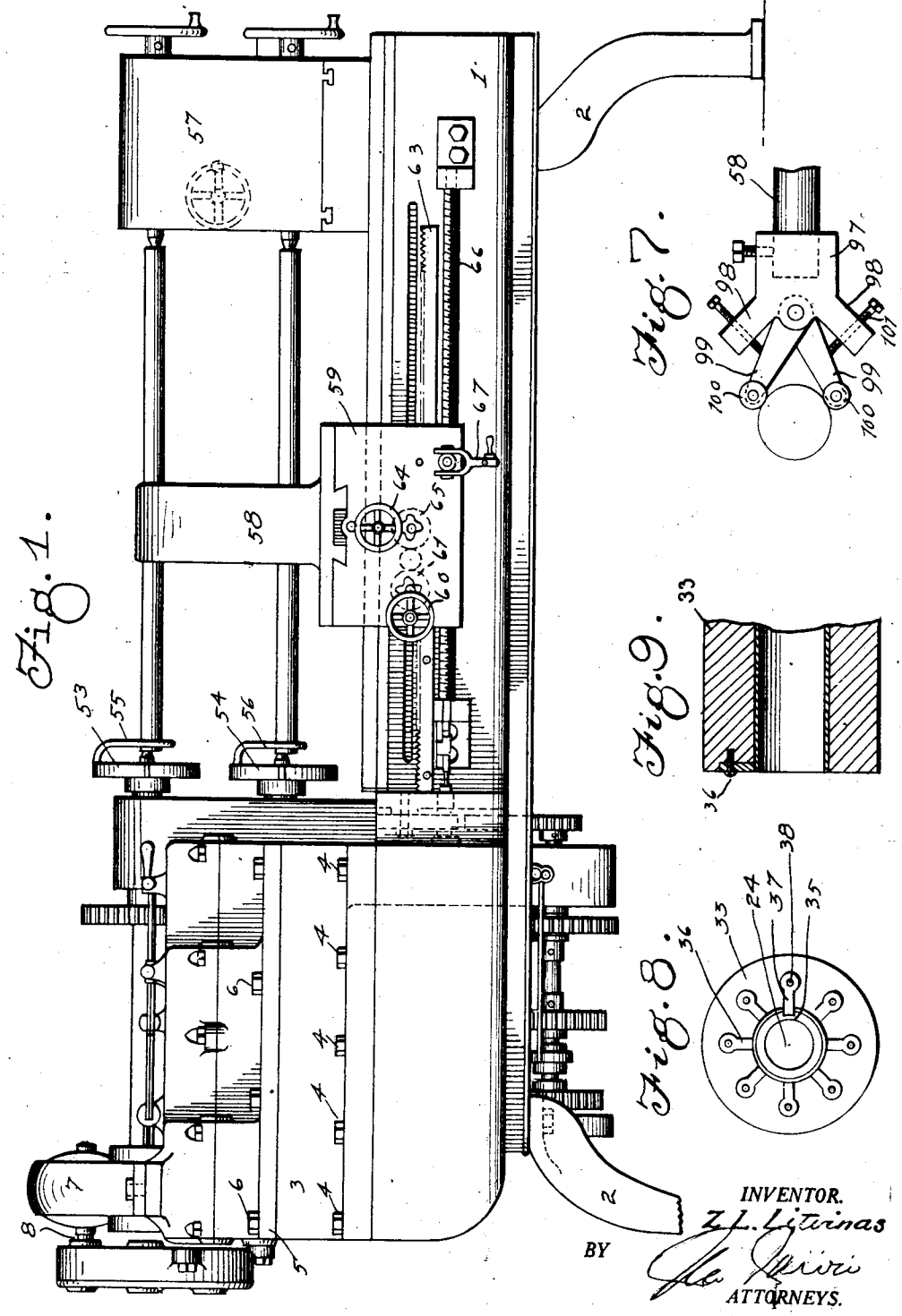


Fig. 1.

Fig. 7.

Fig. 9.

Fig. 8.

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Fig. 2.

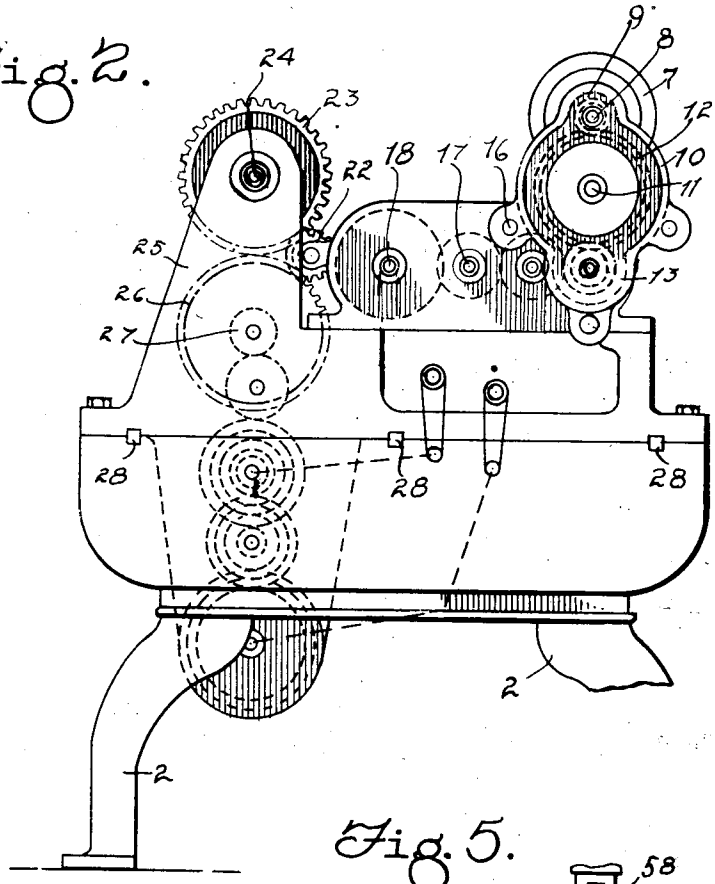


Fig. 5.

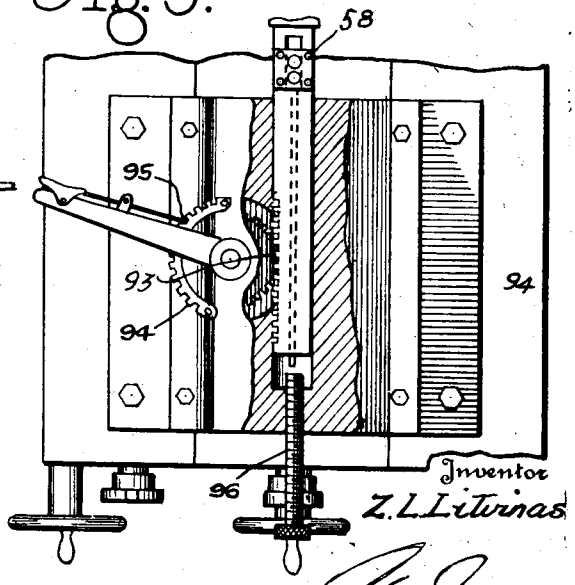
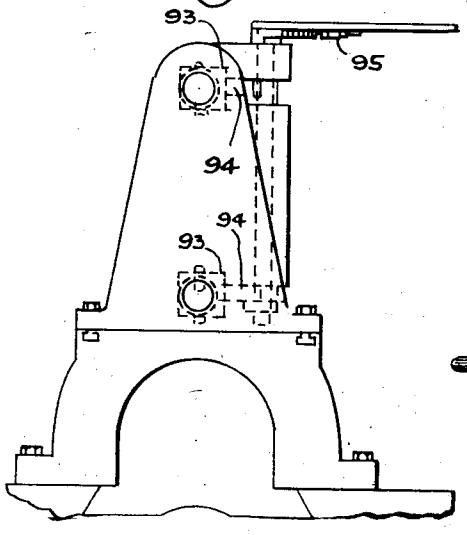


Fig. 6.



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Fig. 3.

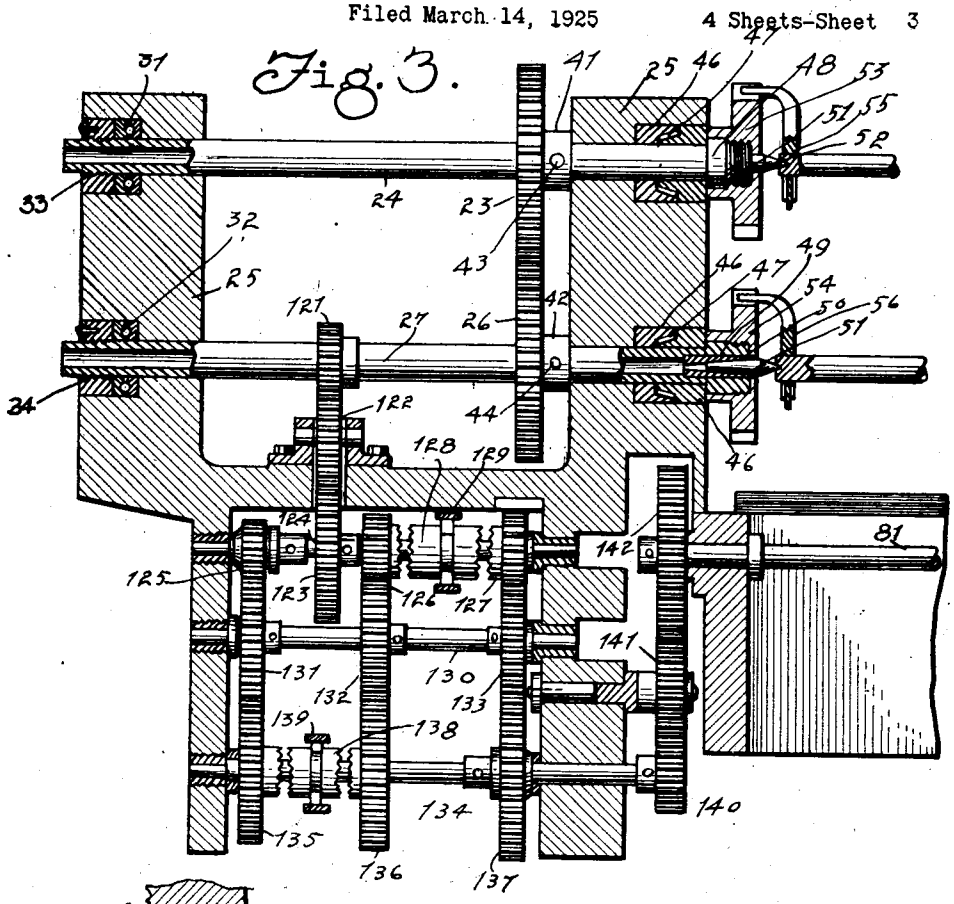
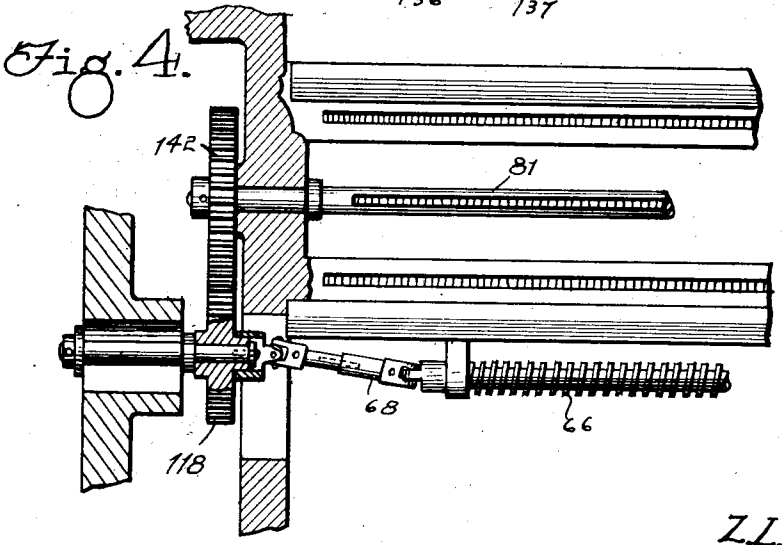


Fig. 4.



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Fig. 10.

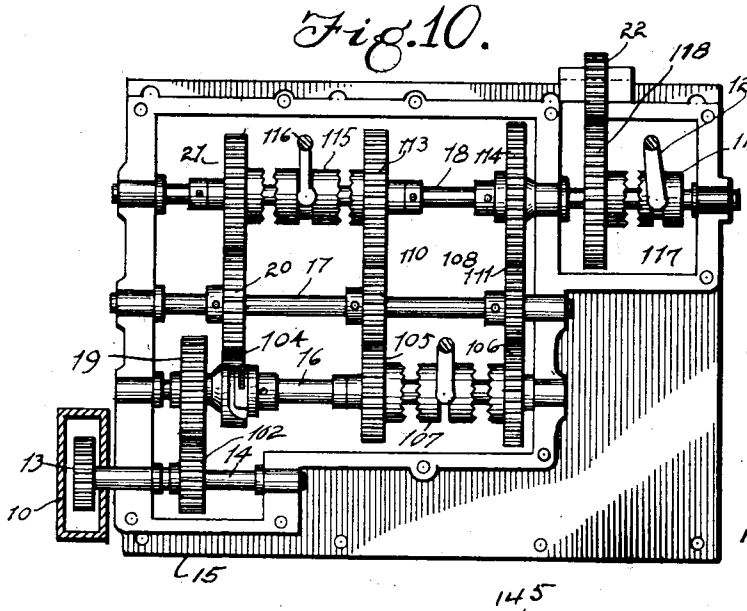


Fig. 11.

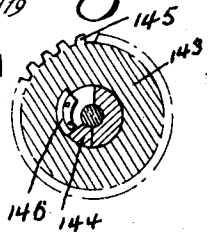


Fig. 15.

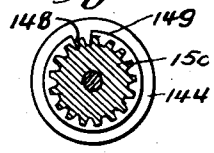


Fig. 13.

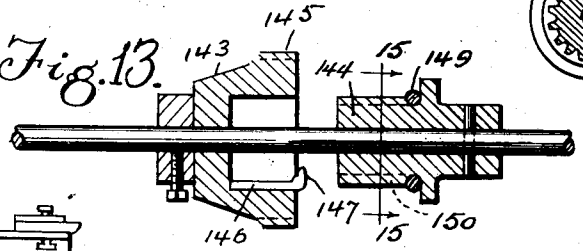


Fig. 12.

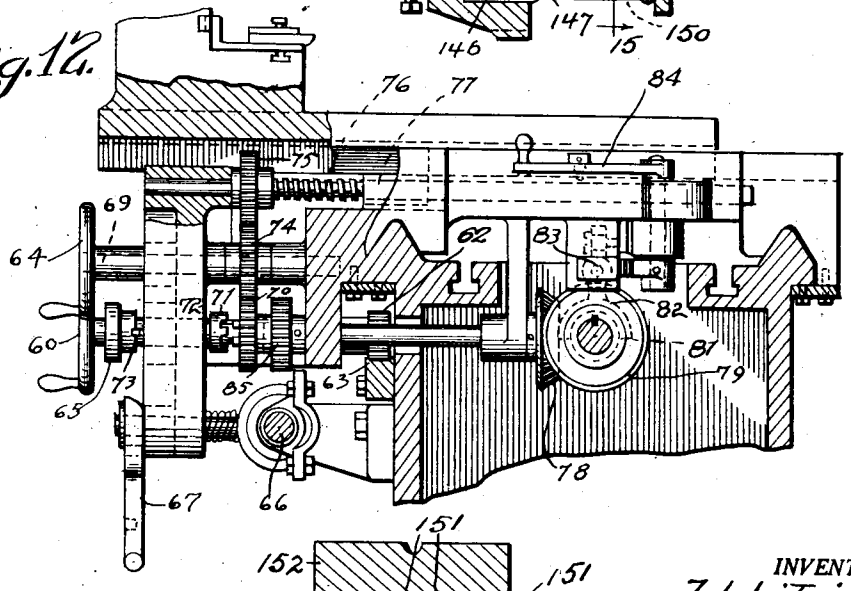
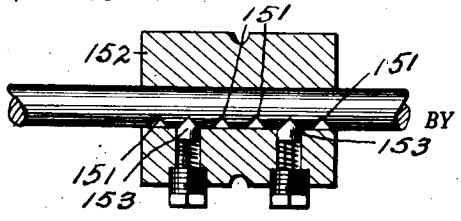


Fig. 14.



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Patented June 11, 1929. 1,717,047

UNITED STATES PATENT OFFICE.

ZENONAS L. LITVINAS, OF CHICAGO, ILLINOIS.

MULTIPLE SPINDLE LATHE.

Application filed March 14, 1925. Serial No. 15,649.

This invention is directed to an improved multiple spindle lathe constructed for operation by hand or power, and adapted for milling, slotting, turning, boring and dressing with certainty and precision of operation.

The invention contemplates an improved speed change device, through the use of which, the spindles of the multiple lathe may be driven at any one of a plurality of different speeds through a simple control means.

The invention also contemplates the use of means by which the spindles may be adjusted longitudinally and locked in such adjustment in a simple convenient manner to insure their positive relation to cooperating parts; also a steady rest adapted to be removably engaged with the tool holder and operating to support the intermediate portion of the work piece to insure proper cooperation of the tool therewith.

The invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a front elevation of the lathe constructed in accordance with my invention.

Fig. 2 is an end view of the lathe.

Fig. 3 is a sectional view showing particularly the drive for the work holder and tool holder.

Fig. 4 is a sectional detail showing the drive for the thread cutting feeds.

Fig. 5 is a plan partly in section of the tool holder.

Fig. 6 is a front elevation of the same.

Fig. 7 is a side elevation of the steady rest.

Fig. 8 is an end elevation of the spindle lock.

Fig. 9 is a sectional view of the same.

Fig. 10 is a view in side elevation with the cover removed of the spindle feed.

Fig. 11 is a transverse section through the driving gear on one of the shafts of the spindle feed.

Fig. 12 is a broken vertical sectional view illustrating the means for controlling the movement of the tool carrier.

Fig. 13 is a longitudinal section of the parts of the driving or lock gear, shown separated.

Fig. 14 is a sectional view illustrating the means for preventing casual displacement of the clutch member when operated.

Fig. 15 is a sectional view on line 15—15 of Fig. 13.

The improved lathe comprises the usual bed 1 supported on legs 2. At one end of the bed is arranged a frame 3 preferably secured by bolts 4, this frame carrying an auxiliary base 5 removably secured to the frame 3 by screws 6, the auxiliary base supporting a motor 7, the shaft 8 of which is provided with a gear 9. The auxiliary base supports a gear casing 10, in which is mounted a shaft 11, having a gear 12 in mesh with the gear 9, and also in mesh with a pinion 13 mounted on a shaft 14 journaled in a gear box 15.

Shafts 16, 17, and 18, are mounted in the gear box and provided with intermeshing transmission gears 19, 20, and 21. Gear 21 operates a gear 22 and the latter cooperates with a gear 23 mounted on a shaft 24 journaled in the upper end of a standard 25 on the frame 3, this gear 22 also cooperating with a gear 26 on a shaft 27 mounted in standard 25 directly below shaft 24. Keys 28 cooperate with the meeting edges of the bed 1 and the lower part of the frame 3 to insure a more accurate gear cooperation and drive.

The shafts 24 and 27, which carry the work pieces 29 and 30, are mounted for rotation in the standard 25 on ball bearings 31 and 32 and carry bushings 33 and 34, the bushings being provided with internal threads to cooperate with threads on the respective shafts. Means are provided, as shown more particularly in Figs. 8 and 9, for locking the bushing in adjusted relation to thereby hold the shaft with the desired pressure on the work pieces, such means consisting in providing each of the shafts 24 and 27 with a keyway 35 and providing the bushings 33 and 34 concentric with the shaft with a series of recesses 36 to receive a key 37 adapted to fit any one of the recesses and engage the keyway 35, the key being held in place by a set screw 38 passing through the key and into the bushing. Thus the bushing may be locked in any desired position of adjustment, as will be obvious. By reference to Fig. 3, it will be noted that the bushing is entirely housed in a recess in which the ball bearings are housed and that there is no projection whatever beyond the standard 25. Thus, the parts are protected against accidental contact which might otherwise tend to disturb the adjustment. The shafts 24 and 27 are provided with gears 23 and 26 for a purpose which will be later described, these gears being fixed upon the shafts to integral collars 41 and 42 carrying set screws 43 and 44.

The ends of shafts 24 and 27, opposite the bushings 33 and 34, are supported in a head stock 25 in appropriate anti-friction bearings made up of independent parts 46 having in-

terposed anti-friction rollers 47. The adjacent ends of the shafts 24 and 27 are circumferentially enlarged as at 48 and 49 and these shafts, which constitute the spindles, are terminally formed for the reception of the chucks 50, adapted in the usual manner to receive the work centers 51 having the usual pointed terminals 52. The enlarged ends of the spindles are threaded to receive face plates 53 and 54 and clamps 55, 56, are carried by the face plates to engage the work pieces 29 and 30. The opposite ends of the work pieces are supported in a tail-stock indicated at 57, Fig. 1, and particularly constructed in accordance with a patent issued to me September 16, 1924, No. 1,508,662.

A tool holder 58 is adjustably mounted in a base 59 which may be adjusted longitudinally of the bed 1 through the medium of a hand wheel 60 or through a power clutch 61, the operation of either of which actuates a gear 62 for cooperation with a rack 63 secured to the bed frame. The tool holder proper is adjusted longitudinally of the base, that is, transverse the bed frame by means of a hand wheel 64 or a power clutch 65, either of which serves to move the tool holder, as will later appear. The tool holder base is operated for the usual function of thread cutting through the movement of a thread shaft 66 adapted to be connected to or disconnected from the tool holder base in the usual manner by a handle 67, the thread shaft 66 being operated in a manner to be later described through a flexible link drive 68, Fig. 4.

The hand wheel 64 is mounted on the end of a shaft 69. The shaft of hand wheel 60 carries a pinion 70 having a clutch face 71 adapted at will to be engaged by a clutch face 72 mounted on a sleeve 73 and operated by the power clutch element 65, the pinion 70 meshing through an intermediate pinion 74 with a pinion 75 secured upon a threaded shaft 76 adapted for cooperation with a lug 77 depending from the tool holder 58. The shaft of hand wheel 60 is provided at its inner end with a bevel gear 78 adapted to be engaged by either one of two opposing bevel gears 79 and 80 mounted upon a shaft 81, the said bevel gears 79 and 80 having sliding key limited movement with the shaft 81, and shiftable at will through yokes 82 cooperating with the bevel gears and carried by a shaft 83 longitudinally movable by means of a lever 84 adapted to be locked in operative position by any convenient means. Thus the shaft 69 may be driven in either direction from the shaft 81.

In Fig. 5, the tool holder 58 is provided with rack teeth 93 adapted to be engaged by the teeth of a lever operated segment 94 and having the usual dog and segment locking means 95. A threaded bar 96 extending through the end of the holder serves as an endwise locking means for the holder. As shown in Fig. 7, the tool holder 58 is provided at its free end with what I term a steady rest which is adapted to support the central portion of a bar being operated upon, where such bar is of unusual length, so that the central portion of the bar is maintained in exact alignment with its ends. The steady rest comprises a socket head 97 removably secured upon the end of the tool holder and having divergent branches 98 fixed with relation to the head and between which branches are pivotally mounted arms 99 carrying terminal rollers 100 to engage the work piece. The arms are held in adjusted relation by means of set screws 101 threaded through the branches 98.

The spindle drive is shown in Fig. 10, as contained in the gear box 15, the pinion 13, receiving its rotation from the motor, is secured on shaft 14, which shaft within the gear box is provided with a gear 102 meshing with the gear 19 on shaft 16. The shaft 16 carries a lock gear 104 and gears 105 and 106, the latter gears being connected to the shaft at will through the medium of a clutch 107 operated by a handle 108 on the outside of the gear box. Shaft 17 is provided with gears 20, 110, and 111, meshing respectively with pinion 104 and gears 105 and 106. Shaft 18 is provided with gears 21, 113, and 114, meshing respectively with gears 109, 110, and 111, the gears 112 and 113 being fixed with relation to the shaft 18 at will through the medium of a clutch 115 operative through a handle 116 on the exterior of the gear box. The shaft 18 extends into a chamber 117 of the gear box and is there provided with a gear 118 which is in mesh with the gear 22. The gear 118 is fixed with relation to the shaft at will through the medium of a clutch 119 controlled by a handle 120.

The tool holder drive is particularly illustrated in Fig. 3, wherein spindle 27 is provided with a gear 121, which through the medium of an intermediate gear 122, meshes with a gear 123 on a shaft 124 journaled in standards depending from the bed 1. The shaft 124 has a gear 125 and is also provided with loose gears 126, 127, which gears may be operatively connected to the shaft at will through the medium of a clutch 128 operated by a handle 129. A shaft 130 is arranged below shaft 124 and is provided with gears 131, 132, and 133, in mesh respectively with gears 125, 126, and 127. A shaft 134 is arranged below shaft 130 and is provided with gears 135, 136, and 137, in mesh respectively with gears 131, 132, and 133, the gears 135 and 136 being controlled by a clutch 138 operated by a handle 139. The shaft 134 extends beyond one of the standards and is provided with a gear 140 which, through an idler 141, is in mesh with a gear 142 for operating the tool holder drive shaft 81. The thread cutter feed, illustrated particularly

in Fig. 4, is operated from gear 118, which is connected with the flexible link drive 68, which is driven by gear 142.

In Figs. 11, 13, and 15, is shown a form of lock gear which are indicated at 104, 114, and 137. These lock gears are designed to automatically interlock under a predetermined driving speed and release under a greater driving speed. The gears are made up of two parts shown separated for convenience in Fig. 13, the parts including a socket section 143 and a gear section 144, the former being adjustable on the shaft and the latter fixed thereon. The section 143 has an annular series of gear teeth 145 for cooperation with the adjacent gear, and is interiorly provided with a dog 146, having a projecting end 147 adapted to seat between the spaced ends 148 of a band 149 carried on the section 144. The section 144 in that portion fitting within the section 143 is formed with longitudinal teeth 150 to be engaged by the dog 146 under predetermined relative speed of the shaft. When the part 143 is operated at high speed, the dog 146 is held from cooperation with the teeth 150 and the gear is free. Under slower speed, the dog locks the parts together, as will be apparent. The spaced ends 148 of the band 149 serve to initially trip the dog in the relative changes of speed.

In Fig. 14, there is shown a means for holding the clutches against casual displacement, such means consisting in forming in the shaft a series of notches 151 and providing the sliding clutch member, indicated at 152, with spring pressed dogs 153, adapted to engage the notches. Of course the notches are arranged to hold the clutch in either an inoperative, that is, central position, or in operative, that is, either end position.

If it is desired to drive the tool holder by motor power or from the work, the operator actuates clutch 88 for the proper control, and under hand manipulation may feed the tool holder longitudinally of the work if desired, or under power manipulation, feed it regularly. The thread cutter control is obviously governed through the handle 67. Speed change mechanism for the spindles and for the tool feed control are readily apparent from the above description, it being understood that various speeds and directions of operation are readily secured through manipulation of the proper clutches.

What I claim is:

A multiple spindle lathe, a motor, a plurality of spindles, standards in which the spindles are mounted, a tool carrier, a speed changing mechanism for controlling the rotation of the spindles, bearings for one end of the spindles and through which the spindles are longitudinally movable, the outer face of one of the standards being recessed concentric with each spindle to receive the bearing therefor, and means cooperating with the bearings for the longitudinal adjustment of the spindles, said means including bushings having threaded connection with the spindles and adapted to cooperate with the bearings, said bushings having a diameter corresponding to that of the bearings and being completely housed and accurately fitting in the bearing receiving recesses, one face of the bushings being formed with a plurality of recesses, and a locking member adapted to cooperate with any one of said recesses and with a keyway in the spindle to lock the bushing in any one of a plurality of different positions with respect to the spindle.

In testimony whereof I affix my signature.

ZENONAS L. LITVINAS. [L. S.]