No. 629,874. Patented Aug. 1, 1899.

J. C. SANTON.

ENGINE LATHE.

(Application filed Apr. 19, 1899.)

(No Model.) 3 Sheets—Sheet 1.

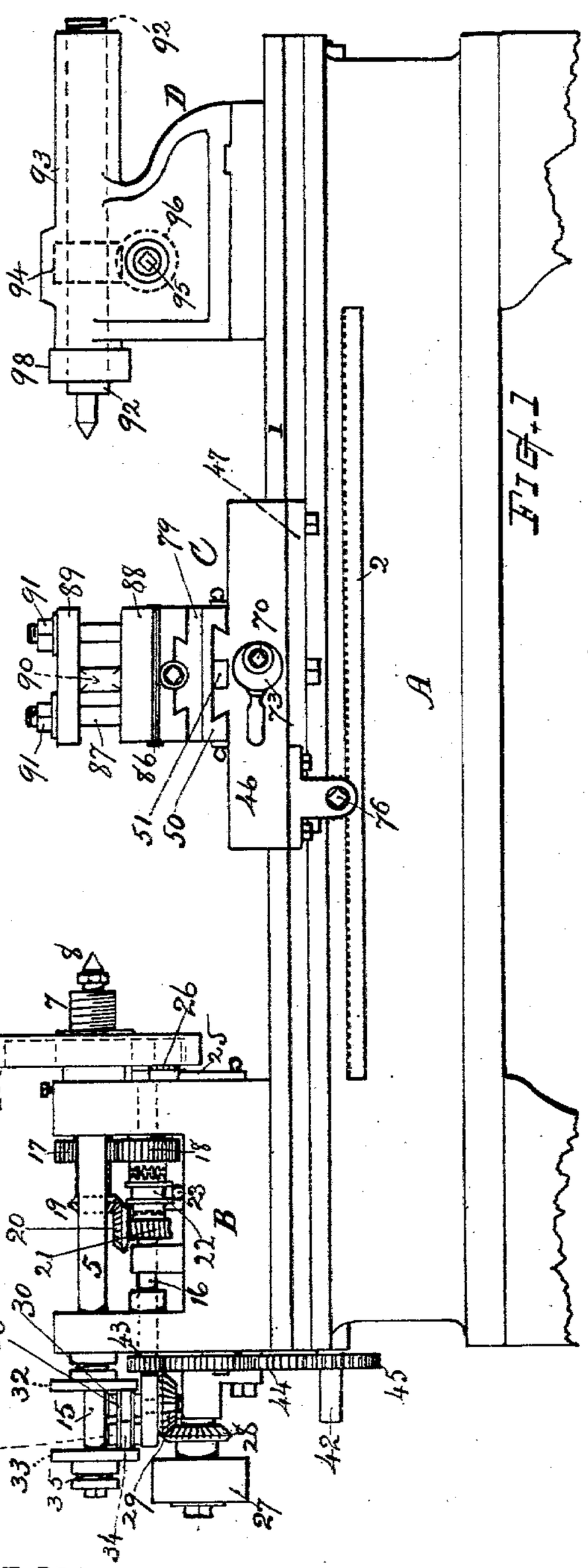

FIG. 1

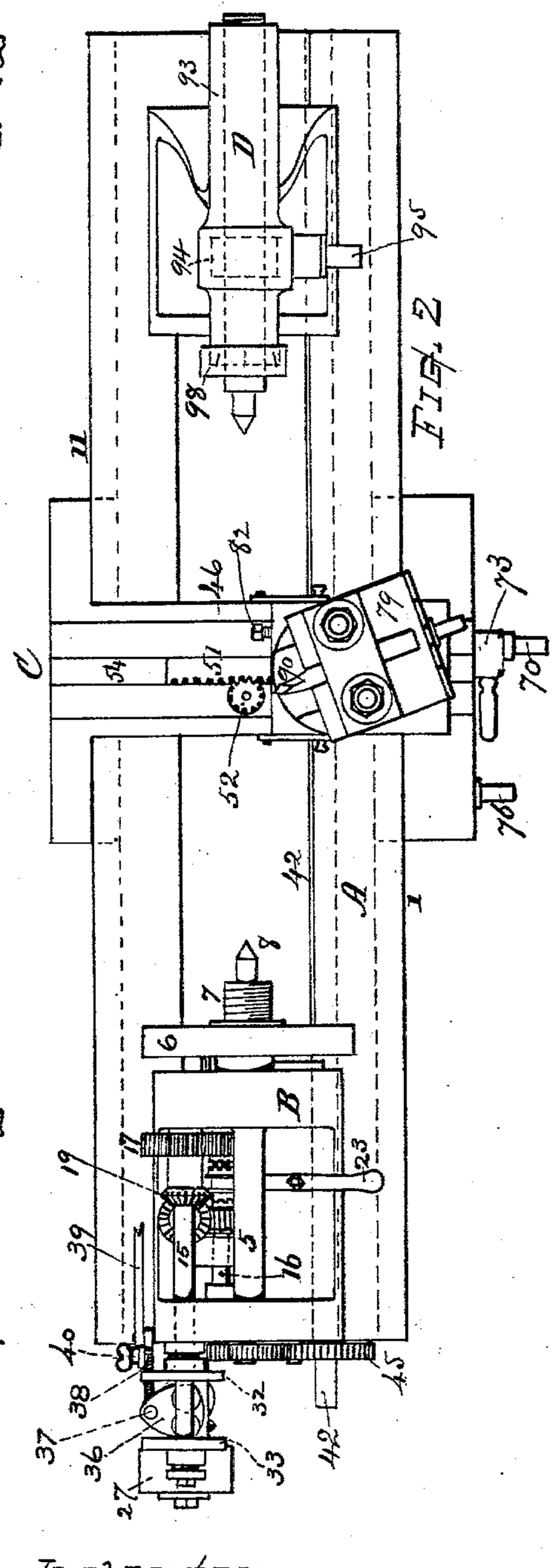

FIG. 2

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No. 629,874. Patented Aug. 1, 1899.

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ENGINE LATHE.

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(No Model.) 3 Sheets—Sheet 2.

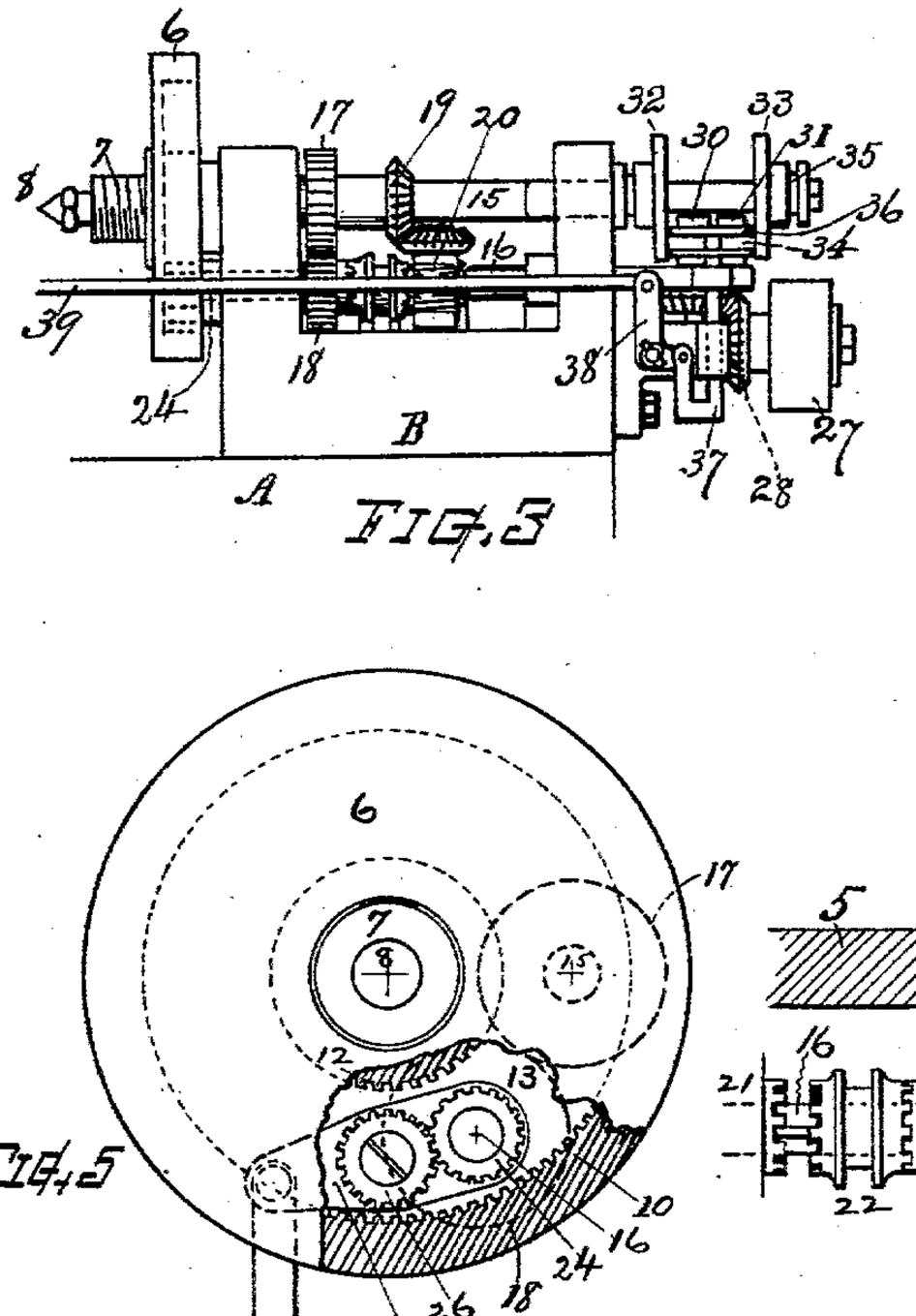

FIG. 3

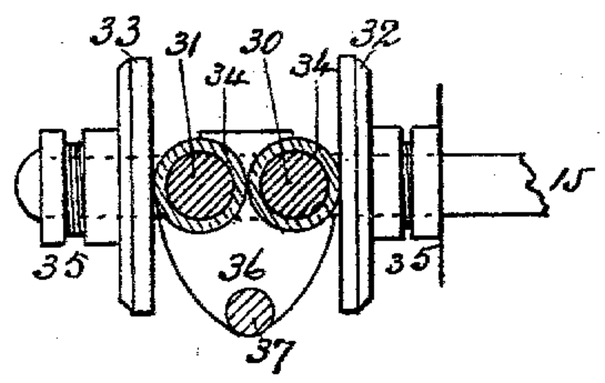

FIG. 4

FIG. 5

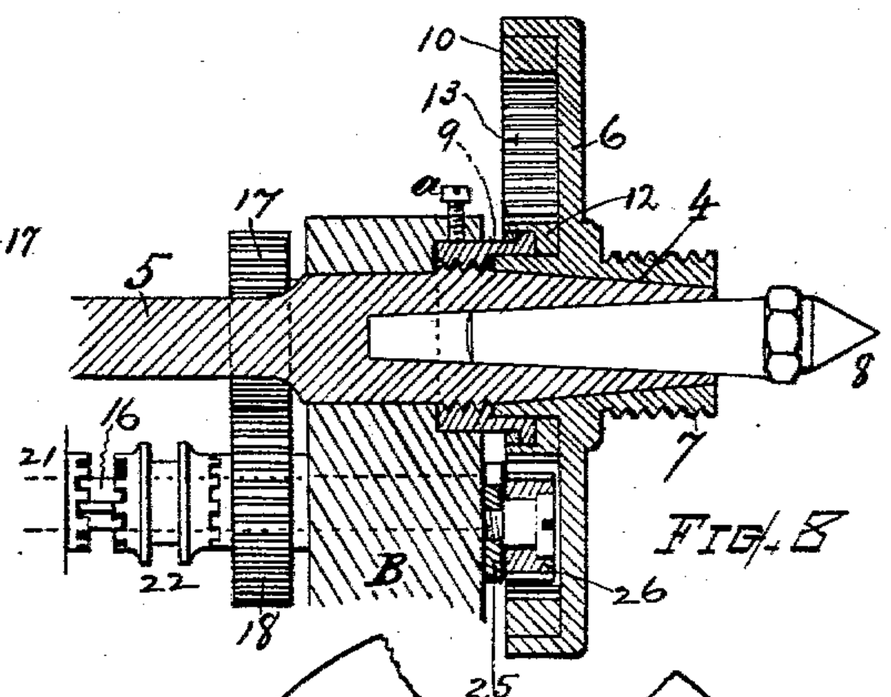

FIG. 8

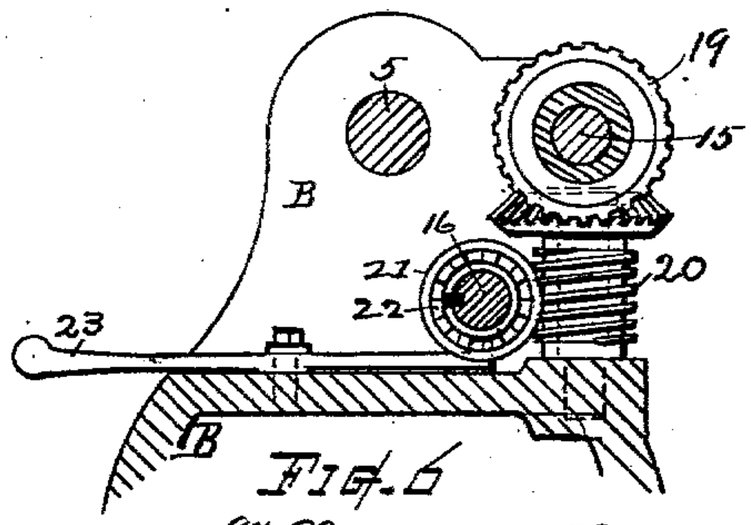

FIG. 6

FIG. 8a.

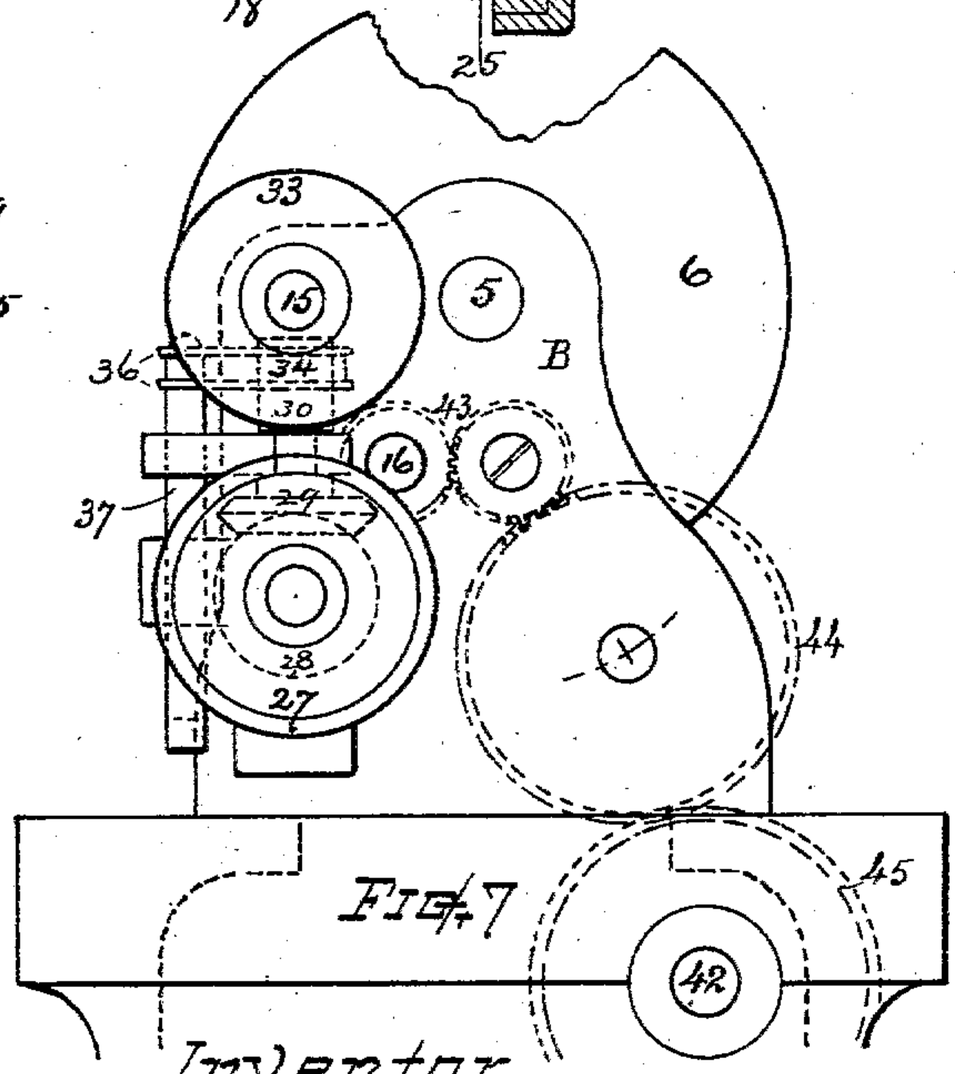

FIG. 7

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No. 629,874. Patented Aug. 1, 1899.

J. C. SANTON.

ENGINE LATHE.

(Application filed Apr. 19, 1899.)

(No Model.) 3 Sheets—Sheet 3.

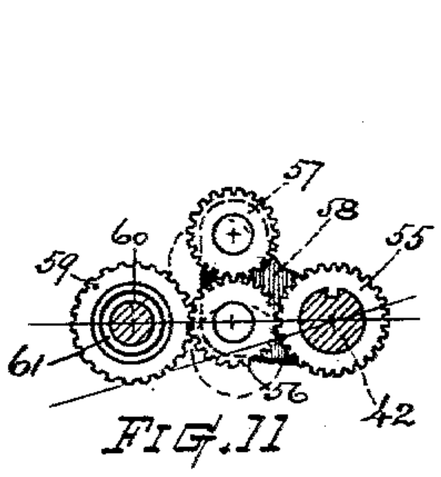

FIG. 11

FIG. 9

FIG. 12

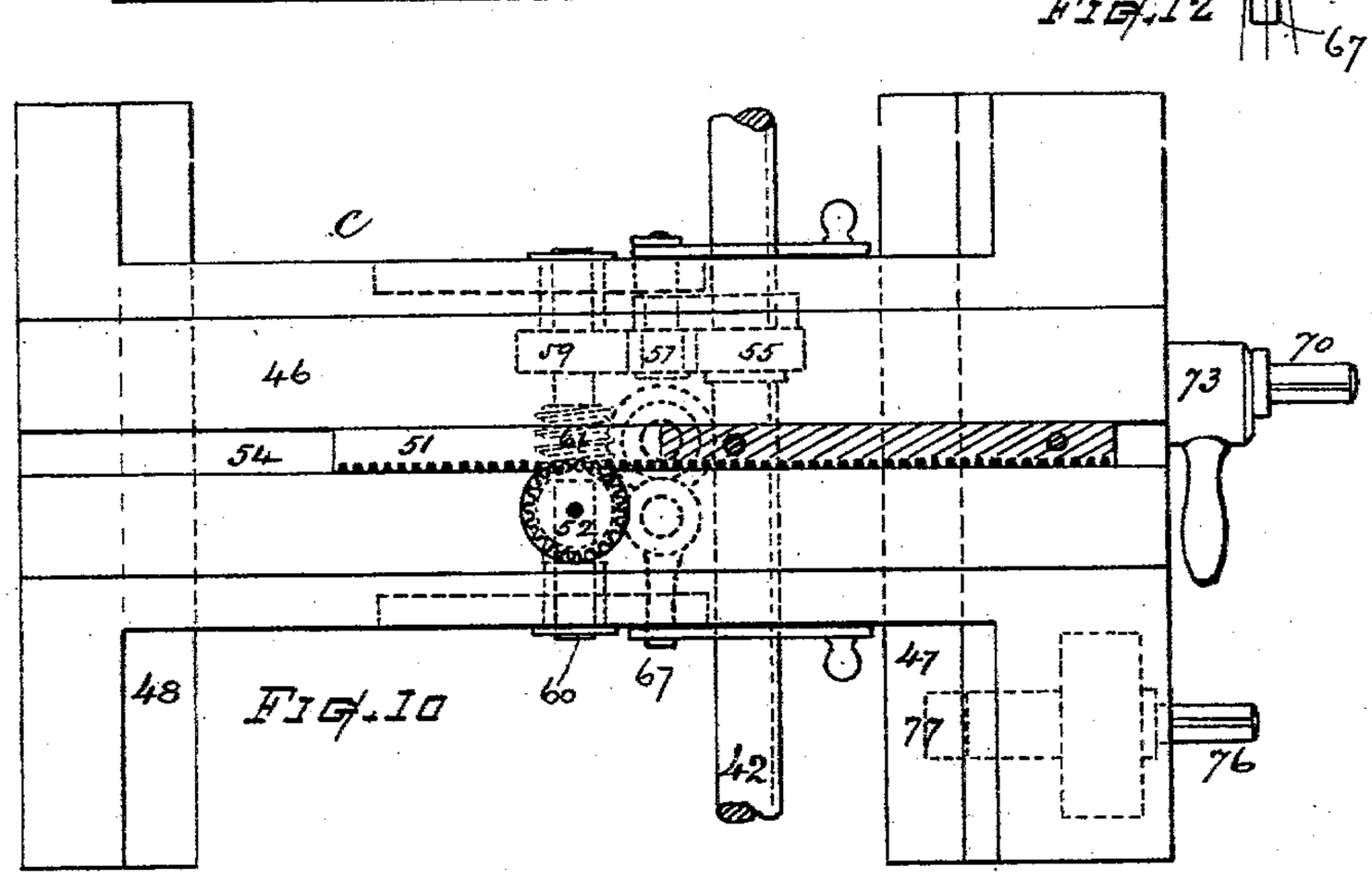

FIG. 10

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UNITED STATES PATENT OFFICE.

JOSEPH CLIFFORD SANTON, OF WORCESTER, MASSACHUSETTS.

ENGINE-LATHE.

SPECIFICATION forming part of Letters Patent No. 629,874, dated August 1, 1899.

Application filed April 19, 1899. Serial No. 713,545. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH CLIFFORD SANTON, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Engine-Lathe, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

The prime object of my invention is to provide a metal-turning or engine lathe which will operate with accuracy in the rotation of the work and which is not liable to be thrown out of perfect and proper alinement by the clamping of its parts at the various positions; also, to render the lathe powerful in operation, convenient for attendance, readily adjustable for the various speeds, and applicable to all classes of work for which engine-lathes are generally employed.

To this end my invention consists in a lathe mechanism and the various parts thereof constructed, combined, and organized for operation substantially as hereinafter explained, the particular subject-matter claimed being hereinafter definitely specified.

In the accompanying drawings, Figure 1 represents a front view of my improved lathe. Fig. 2 is a top plan view of the same. Fig. 3 is a rear view of the lathe head-stock and the operating mechanism thereof. Fig. 4 is a horizontal section of the speed devices, looking upward. Fig. 5 is a face view of the head-plate, a portion being shown broken away to reveal the reversing-gearing therein. Fig. 6 is a vertical transverse section through the head-stock and operating-shafts. Fig. 7 is an end section. Fig. 8 is a vertical longitudinal section through the head-plate and its stationary supporting-stem. Fig. 8ª shows the clamp mechanism for the tail-stock spindle by a section and internal end views thereof. Fig. 9 represents a side view of the tool-carriage and transverse section of the lathe bed or frame. Fig. 10 is a plan view of the carriage-saddle and slide-feeder rack. Fig. 11 is an elevation of the feed-gears for moving the tool-supporting slide in cross-feed, and Fig. 12 is a plan view of the feed-gears for moving the carriage longitudinally upon the bed.

Referring to the drawings, A denotes the bed or frame; B, the head-stock; C, the tool-supporting carriage, and D the tail-stock.

The bed is preferably formed, as best shown in Figs. 1, 2, and 10, with the flat top surface without the usual raised longitudinal guides, but provided with horizontal overhanging edge strips 1 and 11, having guiding-grooves beneath them and parallel along their edges. A toothed rack 2 is fixed to the front of the bed and another rack 3 along the interior edge, (see Fig. 9,) which racks serve in the operation of the tool-carriage as hereinafter explained.

In the head-stock B the usual rotating center spindle is dispensed with, and in place thereof, at the axial center, I provide a non-rotatable stem or center support-bar 5, immovably supported in the head-block uprights and having a projecting fore end, upon which there is formed a tapered bearing 4, whereon I mount a revoluble head or plate 6, having a suitable externally-threaded hub 7, upon which may be screwed the usual face-plate or chuck, (not shown,) while the center or point 8 is supported in an axial bore within the end of the stationary stem 5. (See Fig. 8.) The plate 6 is preferably confined to rotate close but free upon the tapered end 4 of the stem 5 by a flanged and threaded collar 9, screwed upon the stem and coupled with the plate, as indicated, and by means of which an accurate adjustment of the bearing can be effected. The collar is held at adjusted position by one or more set-screws threaded in the solid part of the head-stock and impinging against said collar, as shown at *a*, Fig. 8.

The head-plate is provided with an internally-toothed rim-gear 10 and an outwardly-toothed center gear 12, both concentric with the axis and having an annular space 13 between the outer and inner rows of gear-teeth, (see Fig. 5,) in which space I arrange the head operating and reversing gearing.

At suitable positions upon the head-stock frame I arrange an operating-shaft 15 and a gear-shaft 16, each axially parallel with the center stem 5 and turning in bearings on the

upright ends of said head-stock, as indicated. The operating-shaft carries a spur-gear 17, that meshes with a gear 18, running loose on the gear-shaft and having a clutch-hub on its side. It also carries a bevel-gear 19, that meshes with a similar gear connected with a worm-screw 20, running on an upright axis or stud and engaging with a worm gear-wheel 21, that also runs loose upon the gear-shaft and has a clutch-hub on its side. A shifting clutch-collar 22 is disposed between the clutch-hubs of the gear 18 and worm-wheel 21 and keyed to the shaft, which collar can be shifted by a suitable handle 23 for effecting operation of the gear-shaft 16 from the shaft 15 either through the spur-gear connection or through the bevel-gears and worm-gearing connection, as desired.

The gear-shaft 16 extends into the annular space 13 of the head-plate and is there provided with a spur-gear 24, and a swinging arm 25 is fulcrumed about the axis thereof adjacent to said gear and the end of the head-stock. Upon said arm I arrange a pinion 26, that turns upon a suitable stud and meshes with the gear 24. By raising or depressing the arm (which may be provided with any suitable means therefor) the pinion 26 can be shifted into engagement alternately with the rim-gear 10 or with the center gear 12, as desired, for rotating the head-plate, the direction of its rotation being forward or backward, accordingly as the rim-gear or center gear is engaged.

The driving-pulley is represented at 27. It is connected with a bevel-gear 28, and both rotate upon a suitable stud or axis supported upon a bracket or portion of the head-stock frame.

Between the driver-pulley 27 and the operating-shaft 15 I preferably arrange a variable-speed mechanism organized as follows: Two rollers 30 and 31 are disposed with parallel axes perpendicular to the axis of the shaft 15 and radial thereto between two broad flange-disks 32 and 33, keyed upon said shaft. (See Figs. 3, 4, and 7.) One of the rollers 30 has its axis connected by a bevel-gear 29 with the gear 28, fixed to the driving-pulley. Narrow belts or loose rings 34, of leather or other suitable material, are arranged around each of the rollers, which ring-belts are squeezed against each other in the space between the two rollers and against the faces of the respective disks at either side of the rollers. The disks are best provided, as at 35, with means for their adjustment toward or from each other and for properly regulating the frictional contact upon the rollers or ring-belts. The ring-belts 34 are supported between movable guides 36, whereby they can be shifted toward or from the axis or center of the disks. Said guide-plates are connected with a sliding standard 37, working in bearings on the frame and operatively combined with an angle-lever 38 and rod 39 or other suitable means, whereby said ring-belts can be moved up and down the rollers while the mechanism is in operation. The rod 39 may extend the full length of the lathe or so far as convenience requires. The power and motion are transmitted from the pulley 27 through the beveled gears 28 and 29 and rollers to the disks 32 and 33, which are keyed to the shaft 15, and the relative speed at which said shaft is thereby rotated is variable according to the position of the ring-belts up or down on the face of the disks.

A clamp nut or device 40 is preferably combined with the angle-lever 38 for retaining the ring-belt shipper and parts connected therewith at any adjusted position.

A longitudinal shaft 42 extends through the interior of the bed for giving power and motion to the carriage and tool-feeding mechanisms. Said shaft is operated from a pinion 43 on the end of the gear-shaft 16 through the intermediate and change gears 44 and 45, which gears can be arranged as heretofore employed in lathes to be interchanged for different proportioned gears for desired speeds in well-known manner.

The carriage C comprises a saddle-plate 46, the front and rear sides of which have secured thereto inwardly-projecting guiding and supporting plates 47 and 48, which extend beneath the edge strips 1 and 11 of the bed and are fitted to slide longitudinally in horizontal grooves beneath said edge strips. The front guide 47 is best provided with a downward-beveled lip or flange and its groove made with a counter-matching dovetail form, as shown in Fig. 9. The carriage is supported and guided independent of the top bed-surface and wholly by the plates or sliding pieces 47 and 48, which run beneath and are protected from falling chips and dirt by the overhanging edge strips, thus providing a guiding means which is not subject to rapid wear nor liable to be thrown out of perfect alinement by the careless dropping or striking of tools, files, or pieces of metal upon the top of the bed, which is a source of destruction to the guideways of the ordinary lathe.

The carriage-slide 50 for cross-feed is attached to a rack 51, that meshes with a pinion 52 on the top end of a vertical shaft 53, disposed through the cross-bar of the saddle, said rack being fitted to or sunk within the central groove 54 between the dovetail guides on which the slide moves and said pinion works within a circular recess adjacent to said groove, so that the slide can pass over the upper surface thereof without contact.

The pinion-shaft 53 is connected with the longitudinal feed-shaft 42 by a train of gearing, such as indicated in Figs. 9, 10, 11, and 12, and comprising the gear 55, splined to turn with and to slide along said feed-shaft, the gear 56, meshing therewith, and the intermediate gear 57, the two latter journaled on studs fixed in a swinging arm 58, shiftable for swinging either of the gears 56 or 57 into mesh with a gear 59, mounted on a short

shaft 60, that turns in bearings carried by downwardly-extended side portions of the saddle-plate. Said shaft carries a worm-screw 61, that engages with a worm gear-wheel 62, mounted on a vertical stud 63, secured in the under side of the saddle-plate. The worm-wheel gear is united by its hub with a spur-gear 64, which meshes with a gear 65, journaled on a horizontally-swinging arm 67 and arranged for intermeshing either with the fixed rack 3 or with a gear 66 on the upright shaft 53, that operates the cross-feed pinion 52 and rack 51. When the gear 65 is meshed with the rack 3, the cross-feed is off except by hand-shaft 70; but the longitudinal feed of the carriage and tool by power is then in effect, and it can be run from or toward the head-stock, accordingly as the gear 56 or intermediate gear 57 (see Fig. 11) is thrown into engagement with the gear 59 and by means of which the direction of motion of the worm-shaft 60 is controlled.

When it is desired to operate the cross-feed by power, the gear 65 is shifted into mesh with the gear 66, so that the power is transmitted through shaft 53 and pinion 52 to the rack 51, which is connected to the slide 50.

The shaft 53 has fixed thereon a worm gear-wheel 69, and within the saddle I provide a horizontal shaft 70, having a worm-screw 71 at its inner end adapted to engage with and operate said wheel 69 and the cross-feed mechanism, while its outer end is fitted for the reception of the turn-key wrench or handle 72, by which it can be turned by hand. The shaft 70 is rotative and supported eccentrically within a bushing or sleeve 73, arranged horizontally within a suitable opening formed in the carriage-plate, as indicated by dotted lines, Fig. 9, and said sleeve is provided with a suitable handle or means whereby the sleeve can be partially rotated to throw the worm-screw 71 into and from engagement with the worm-wheel 69 when desired. The bushing-sleeve 73 may be cut away on a portion of its body, forming therein a flat surface or surfaces that move into contact with the top of the bed-frame or other suitable stop for limiting the rotative movement of said sleeve at the proper position of engagement or retraction of the worm devices 71, carried by the shaft 40, supported therein. When using the cross-feed by power, the hand feed-worm 71 is thrown out of engagement with the gear 69.

A hand-shaft 76, fitted for receiving a crank, turn-key, or handle on its outer end, is journaled in a suitable bearing fixed to the carriage-front, and said shaft is provided with a pinion 77 on its inner end that meshes with the rack 2, said devices serving as a means for moving the carriage longitudinally along the bed.

The swivel-plate 79 is connected to the slide 50 by a dovetailed pintle-center 80, surrounded by a friction clamping-ring 81, which ring is controlled by the screw-bolt 82 for tightening and loosening the same. The tool-post slide 83 is mounted on a dovetailed way on said swivel-plate and controlled by the feed-screw 84 in well-known manner. This tool-post slide is formed with a semicylindrical transverse top projection 85, having openings therethrough, within which are hinged by the pivot-pin 86 two upright backwardly and forwardly swinging bolts 87, and upon said bolts I arrange clamp-plates 88 and 89, between which the turning-tool 90 is secured by means of nuts 91 on the threaded top ends of the hinged bolts 87. The lower clamp-plate is fitted to seat upon the semicylindrical top of the slide-plate, so that any desired degree of backward or forward tilt can be attained for the tool by loosening the nuts 91 and swinging the clamp-plates and tool to the position desired and there tightening the nuts, the clamping of all the adjusting and holding joints being effected by turning down the two nuts.

The tail-stock D, I provide with a non-rotary screw-threaded center spindle or bar 92, sliding endwise through an accurately-fitted bore in the top or guiding part 93 of the stock-casting. Upon said threaded center bar I arrange a revoluble nut 94, confined from endwise movement within a centrally-disposed recess in the casting. Beneath said nut there is a transversely-disposed shaft 95, journaled in the body-casting and having its fore end fitted for reception of the turn-key wrench, crank, or hand-wheel, and carrying at its rear end a gear-wheel 96, that meshes with the nut 94 by means of spiral gear-teeth on their adjacent peripheries, meeting on a plane preferably at forty-five degrees inclination to the respective axes, so that rotation of the handle-shaft 95 will effect rotation of the nut 94 and the consequent advancement or retraction of the center bar 92, as required. The fore end of the center-bar guide 93 can be made with an inward taper or tunnel-shaped recess 97, surrounding the bar, and an exterior screw-thread about its projecting end, as indicated in Fig. 8a, a collar or rim-nut 98, and a conical slitted hub 99, that surrounds the center bar and fits within the tapered recess. When the collar is screwed onto the end of the guide, the several sections of the slitted conical hub 99 are forced inward and caused to uniformly bind upon and securely retain the center bar at any position and to release the same when the collar is unscrewed, this closing and releasing action being effected without changing the accurate central relation of the center bar, as will be obvious from an inspection of the drawings.

The bottom of the tail-stock or cricket seats flat upon the bed-frame and is provided with suitable lugs that fit within the opening in the bed for preserving its proper alinement with the other parts of the lathe.

The tail-stock can be secured in position by the usual fastening devices, which are not herein shown.

I claim as of my invention and desire to secure by Letters Patent—

1. In an engine-lathe, the combination with the head-stock, of the stationary non-rotatable axis-stem having a tapered projecting end, and an axial bore for the support of the center point therein, a revoluble head-plate having an internal-tapered eye mounted on the tapered projecting end of said stem, an adjustable connecting device for confining and regulating said head-plate longitudinally thereon, comprising the flanged and threaded collar screwed upon the stem, and coupled by sliding ring-joint with said head-plate, means for securing said collar stationary in the head-stock frame, and means for operating said head-plate, all substantially as set forth.

2. In an engine-lathe, the combination, with the head-stock, of the stationary non-rotatable axis-stem having a tapered projecting fore end, a revoluble head-plate mounted to turn on said tapered end, and having means, as a threaded hub for supporting a chuck or face-plate thereon, an adjusting-collar retaining said head-plate upon its tapered bearing, an inwardly-toothed rim-gear and an outwardly-toothed center gear fixed within said head-plate, an operating-gear and a shiftable intermediate gear disposed within the annular interior space, means for imparting motion to said gears, and means for shifting said gearing to engage said rim-gear or said center gear, or to occupy idle position between the same, substantially as set forth.

3. In an engine-lathe, the combination of a non-rotatable axial stem fixed in the head-stock, the center carried in the end of said stem, a revoluble head-plate mounted on the end of said stem and provided with means for attachment thereto of a face-plate or chuck, an operating-shaft, a gear-shaft, means for rotating said head-plate in connection with said gear-shaft, a spur-gear connection, and a beveled-gear and worm-gear connection between said operating-shaft and gear-shaft, and a shiftable clutch mechanism adapted for alternately throwing either of said gear connections into or out of effective action, for the purpose set forth.

4. In combination, with the lathe-head mechanism, comprising the revoluble head-plate, the actuating-gears therefor, and its operating-shaft; of the opposite perpendicular-faced disks mounted on said shaft, two parallel cylinder-rollers disposed between said disk-faces, with their axes radial to the shaft-axis, loose ring-belts respectively surrounding said rollers and adapted for squeeze contact between the two rollers, and between the respective rollers and disk-faces, a guide for controlling said ring-belts, means for moving said guide to shift the ring-belts endwise along the rollers, and means for imparting rotary motion and power to said rollers, for the purposes set forth.

5. The combination with the lathe-head mechanism and its operating-shaft, of the oppositely-facing disks mounted and keyed on said shaft, means for adjusting said disks toward or from each other, two straight cylinder-rollers disposed in non-contacting parallel relation between said disks, and axially radial to the shaft, ring-belts loosely surrounding said rollers and adapted for squeeze contact between the rollers and also between the roller and disk faces, the drive-pulley, its axis mounted in a bearing-support fixed to the head-stock, bevel-gears connecting the drive-pulley and roller-axis, a movable guide embracing said ring-belts, a guide-rod carrying said guide, an angle-lever pivotally connected for actuating said guide-rod, and a shifting bar connected with said angle-lever, for controlling the adjustment of the ring-belt guides, all substantially as and for the purpose set forth.

6. In an engine-lathe, the combination of the stationary center supporting the head-plate rotatable on said stem, the gear-shaft, the reversing-gearing connecting said gear-shaft and head-plate, the operating-shaft, a quick-speed gear-train and a slow-speed gear-train from said operating-shaft to the gear-shaft, clutch devices for operatively connecting either of said gear-trains for action, the driving-pulley, and a variable speed and power transmitting mechanism, substantially as described, operatively connecting said driving-pulley to said operating-shaft, and means for controlling the variation of said transmitting mechanism, substantially as set forth.

7. In an engine-lathe, the bed having a plain horizontal top surface and longitudinal guide-grooves on the front and rear edges, the carriage supported thereon by detachable guide-plates secured to the carriage-plate and extending inward into said grooves, one of the grooves and guide-plates having a counter-matching dovetailed form, the longitudinal feed-shaft within said bed, means for rotating said feed-shaft in connection with the lathe-head mechanism, an internal rack fixed to said bed, and the feed-operating gearing carried upon the under side of the carriage and comprising a gear rotating with and sliding on said shaft, a gear engageable with said rack and intermediate gearing, all combined for operation substantially as set forth.

8. In an engine-lathe, the combination with the bed, and the carriage guided and supported on said bed; of the feed-shaft, the internal rack, a gear rotating with and sliding upon said shaft, a worm-shaft mounted in said carriage, a direct and intermediate gear carried on a vertically-swinging arm and adapted for operatively connecting said feed-shaft gear with said worm-shaft gear, a worm gear-wheel actuated by said worm, a gear united to said worm-wheel, and a gear meshing therewith mounted on a horizontally-swinging arm and adapted for swinging into and from engagement with said rack, for the purposes set forth.

9. The combination with the carriage or sad-

dle plate having the cross-feed guideway, the slide movable thereon and carrying the tool-supporting devices; of a rack attached to said slide, a pinion engaging said rack, mounted on a shaft within the carriage, a foot-gear on said pinion-shaft, a shifting-gear with means for throwing it into and out of mesh with said foot-gear, the feed-shaft, and an operating-train of gearing connecting said shift-gear with the feed-shaft, substantially as set forth.

10. In an engine-lathe, the combination with the carriage, the cross-feed slide carrying the tool-supporting devices, and means for operating the carriage-feed by power; of the cross-feed rack attached to said slide, the pinion engaging said rack, a worm-wheel fixed on the pinion-shaft, a hand-shaft provided with a worm-screw, and fitted for the reception of a crank wrench or handle at its outer end, a rotatable bearing-sleeve fitted in the carriage-plate and having said hand-shaft journaled eccentrically therein, and means for partially rotating said sleeve to throw the hand-shaft worm into and from engagement, for the purpose set forth.

11. In an engine-lathe, a tool-support comprising a slide-plate having the transverse semicylindrical top projection with recesses therein, a pair of bolts their heads fitted in said recesses and hinged in axially concentric connection with said semicylindrical portion, a pair of tool-holding clamp-plates arranged on said bolts, said plates having oppositely adjacent faces adapted for embracing the tool between them, one of said plates seated and rockably adjustable upon the cylindrical top surface, and clamping-nuts arranged upon the threaded top ends of said bolts, above the upper clamp-plate; whereby clamping of the tool and the adjusting-hinge is simultaneously effected, substantially as and for the purposes set forth.

12. In a turning-lathe, the combination with the tail-stock having an endwise-movable non-rotatable screw-threaded center bar guided therein, and a revoluble nut threaded on said center bar and confined from endwise movement within the stock; of the hand-shaft journaled in the tail-stock body below and in axially transverse relation to said center bar, the fore end of said shaft projecting at the front, and a gear-wheel fixed on the rear end of said shaft, the adjacent peripheries of said gear-wheel and said nut being provided with spiral gear-teeth engaging and operatively connecting said parts, substantially as shown and described.

Witness my hand this 17th day of April, 1899.

JOSEPH CLIFFORD SANTON.

Witnesses:
CHAS. H. BURLEIGH,
ELLA P. BLENUS.