No. 775,302. PATENTED NOV. 22, 1904.

L. T. KLINE.

AUTOMATIC LATHE.

APPLICATION FILED SEPT. 29, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

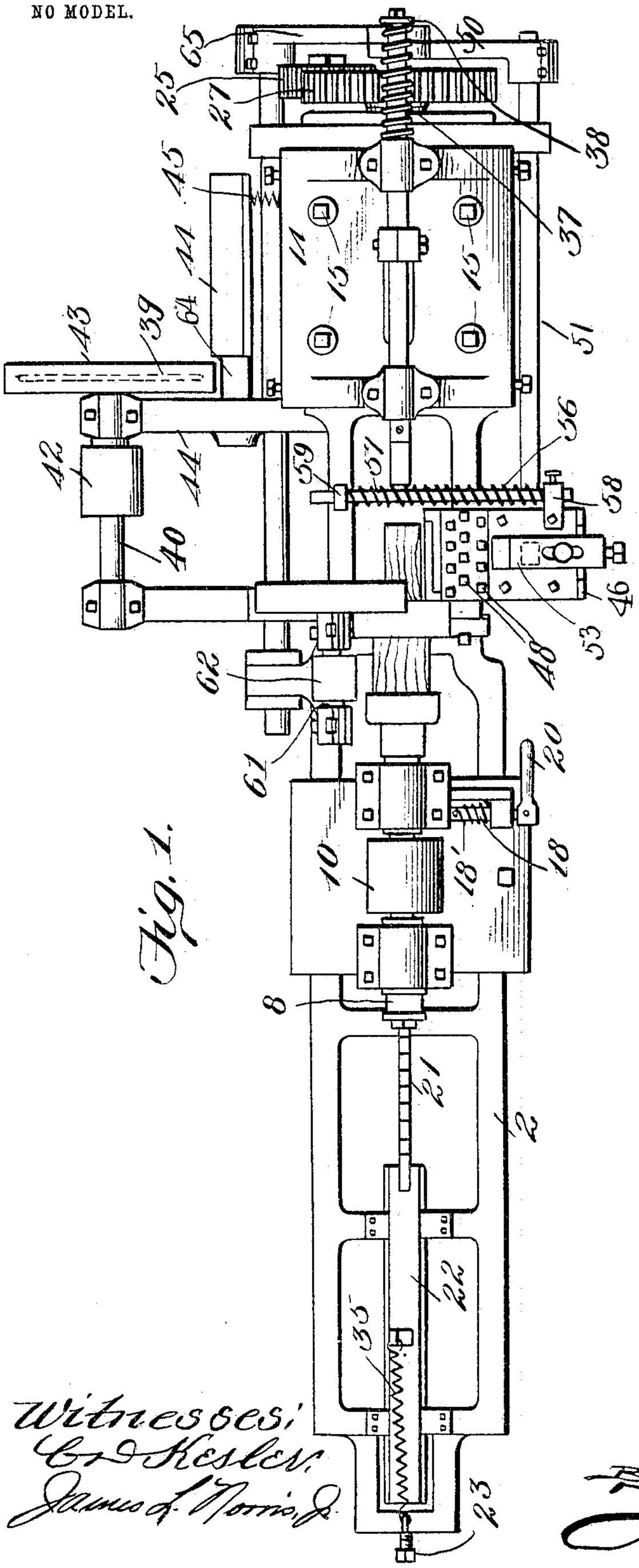

Fig. 1.

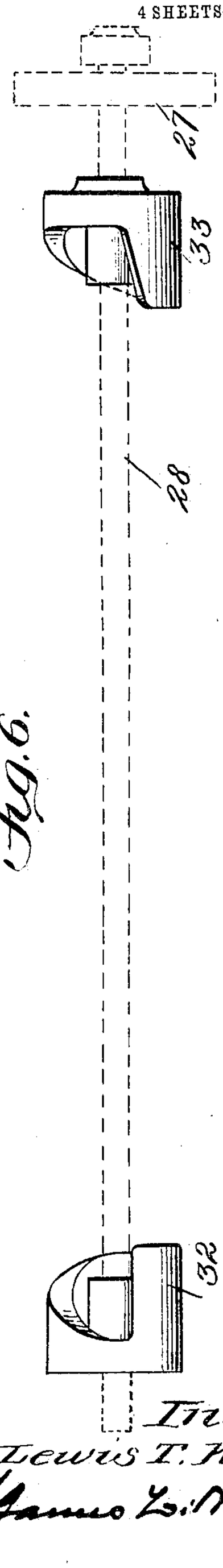

Fig. 6.

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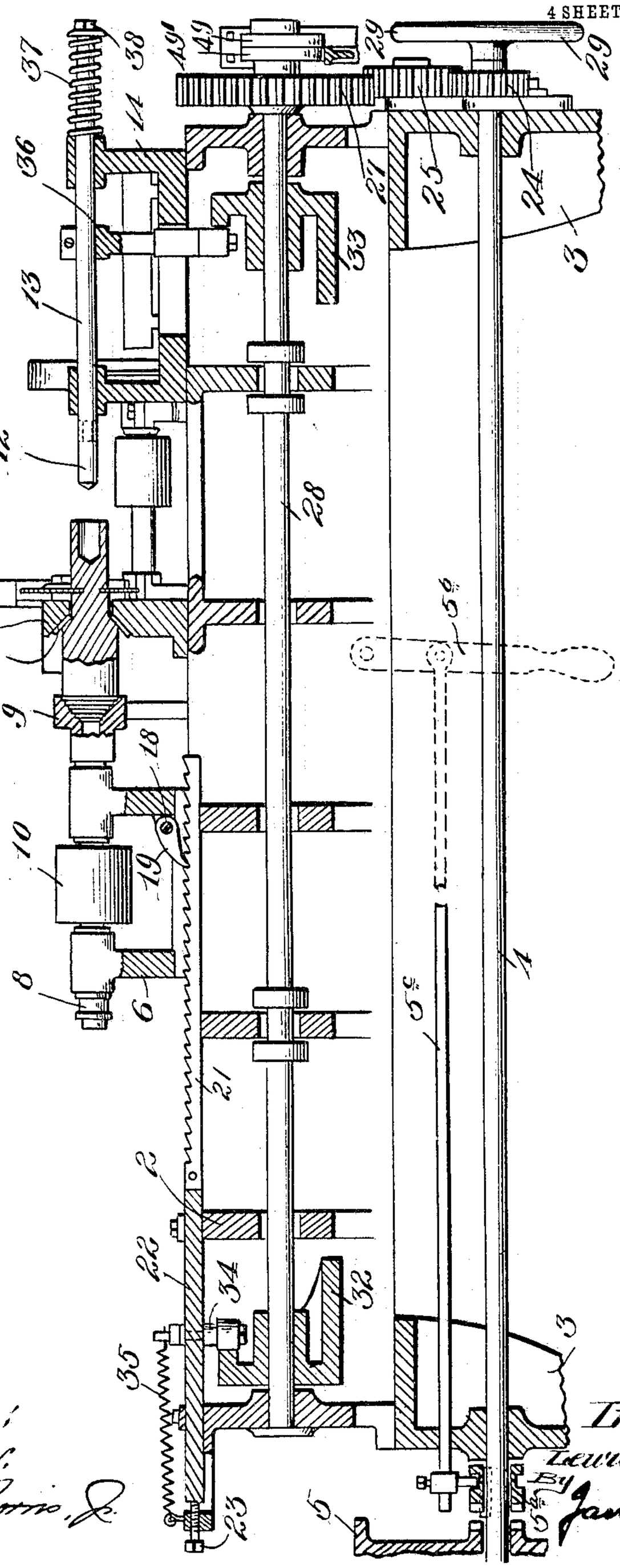
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



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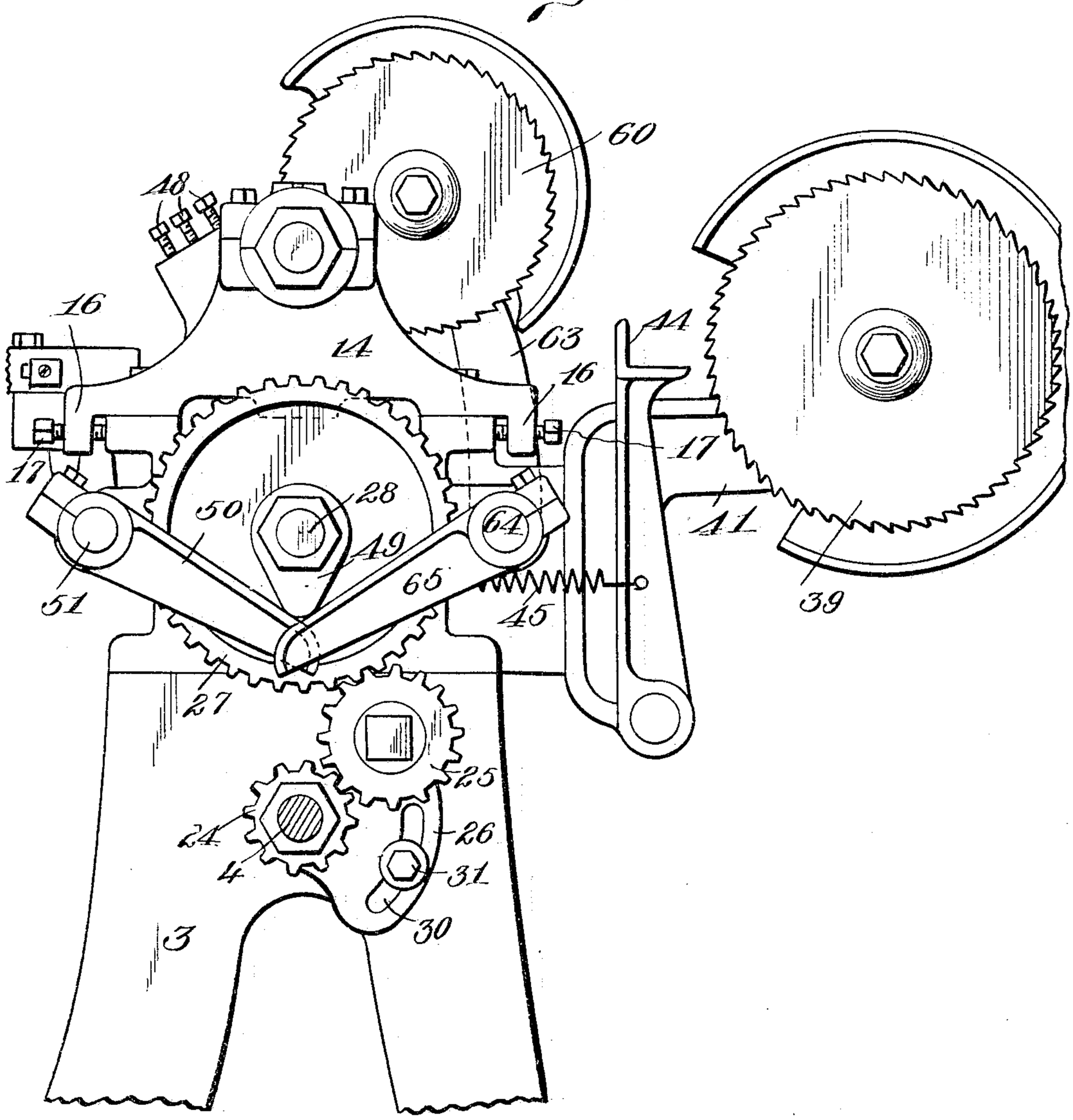
NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 3.

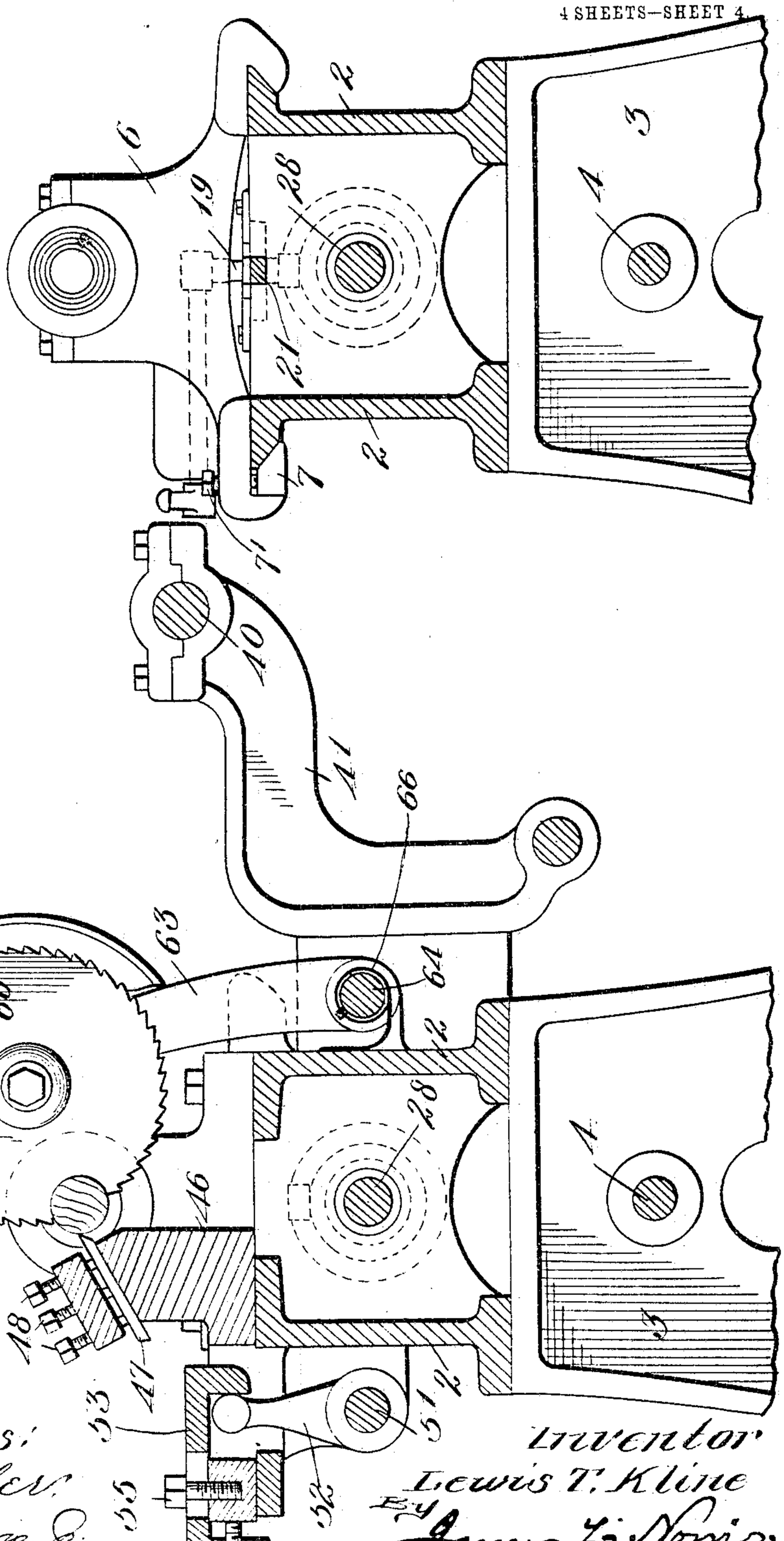

Fig. 4.

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No. 775,302. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

LEWIS T. KLINE, OF ALPENA, MICHIGAN.

AUTOMATIC LATHE.

SPECIFICATION forming part of Letters Patent No. 775,302, dated November 22, 1904.

Application filed September 29, 1903. Serial No. 175,008. (No model.)

To all whom it may concern:

Be it known that I, LEWIS T. KLINE, a citizen of the United States, residing at the city of Alpena, in the county of Alpena and State of Michigan, have invented new and useful Improvements in Automatic Lathes, of which the following is a specification.

This invention relates to lathes, and while the invention is not limited to use in any particular field it is of especial utility in the art of woodworking, as will hereinafter appear. In the latter case the machine can be employed with advantage for making different kinds of articles.

The improved lathe is stable and durable and its different parts can be reached with rapidity and facility, the operating mechanisms being so arranged as to be driven from overhead instead of by a drum carried on the lathe-frame. When said mechanisms are driven by such a drum, the latter, owing to its proximity to the floor, is in the way of dirt, which is an undesirable feature.

The machine hereinafter described as constituting one convenient embodiment of the invention includes two saws, one of which is used for cutting stock into the desired lengths, while the other subsequently cuts the turned material. Said machine also includes a chuck, a die containing a knife for rough or initially dressing the stock, and a boring-tool, and the functions of these several elements will be hereinafter set forth at length. Some of said elements, however, may in some cases be omitted.

As hereinbefore stated, I will describe one complete embodiment of the invention; but I wish to state at this point that I do not limit myself to the disclosure thus made, for certain variations as to several features of the invention may be adopted within the scope of my claims.

The invention is clearly represented in the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a plan view of a lathe including the invention. Fig. 2 is a longitudinal central sectional elevation. Fig. 3 is an end view of the lathe as seen from the right in Fig. 1. Fig. 4 is a transverse sectional elevation as seen from the right, the section being taken substantially centrally through the tool-slide. Fig. 5 is a similar view, the section being taken just to the left of the chuck. Fig. 6 is a plan view of two cams, hereinafter described, and their common supporting-shaft, the gear carried by the latter being illustrated by dotted lines.

Like characters refer to like parts in all the figures of the drawings.

The lathe includes in its construction a bed, as 2, mounted at its opposite ends upon legs or standards, as 3, constituting with the bed the main framing of the machine. These legs constitute a support for the shaft 4, running the entire length of the machine. Upon the head end of the shaft a pulley or band-wheel 5 is loosely mounted and is adapted in practice to be driven by a belt from an overhead pulley. Neither the said belt nor the overhead pulley is shown. The pulley or band-wheel is adapted to be coupled to and uncoupled from its shaft through the agency of a clutch, as 5^a, operable by a hand-lever, as 5^b, a rod, as 5^c, connecting the hand-lever and clutch, said rod being slidably supported by the framing of the machine. By shifting the hand-lever 5^b to the left in Fig. 2 the pulley 5 will be coupled to the shaft 4 to rotate the latter, the reverse result following upon the return movement of said lever. Other means can be employed, however, in lieu of the clutch mechanism for throwing the shaft 4 into and out of action.

The head-stock, which carries the work-chuck, and the spindle or mandrel receive their motion through intermediate connections from the said shaft 4, as will hereinafter appear. The head-stock is denoted by 6, and it is arranged for reciprocation on the upper side of the bed 2. Said upper side of the bed, at the head end thereof, is flattened and widened to provide an ample bearing-face to receive the under flat face of the head-stock 6, the upper side edges of said head end of the bed being of bevel tongue or flange form to fit correspondingly-shaped grooves in the opposite inner sides of the head-stock. What might be considered the lower wall of the groove on the left in Fig. 5 is formed upon a removable

gib 7, connected by screws or bolts, as 7′, with the body of said head-stock. By mounting the head-stock in the manner set forth a large bearing-surface for the same is provided, while at the same time said head-stock is rigidly held against lateral motion, although it is permitted to slide freely on the bed of the lathe.

The head-stock rotatively carries the arbor or shaft 8, to the forward end of which is suitably fastened the chuck 9, the entering or work-engaging portion of which is threaded, so as to properly hold the work therein. To the arbor 8 is fastened in some suitable way the pulley or drum 10, connected by belting with an overhead drum, pulley, or the like, by which motion is transferred to the arbor 8, and consequently to the chuck 9, so that the latter will be rotated to correspondingly rotate the work held therein. The head-stock 6, as previously set forth, is freely slidable upon the bed 2, this being to permit an attendant to advance the said head-stock toward a die containing a roughing-knife, as will hereinafter appear. When the head-stock is in the desired position and at a proper point, the same will be mechanically operated so as to advance said head-stock and the chuck 9. The die, which carries a knife or cutter for initially operating upon the work held in the chuck 9, is denoted by 11, and its body or block is rigidly fastened or clamped—say by bolts—to the upper side of the bed 2 centrally of the width of the latter. In this way there is no possibility of the die, and consequently the work, being displaced while the latter is being operated upon. Said die is located between a boring-tool, hereinafter described, and the chuck 9, and it has a central opening through which the work is projected, said central opening being flared outward, as indicated in Fig. 2, at what is shown as the left side thereof to receive a diagonally-disposed cutter 12. The work held in the chuck 9 is moved through the opening in the die 11 as the head-stock 6 is mechanically advanced, and during such advancing motion the cutter 12, operating against the outer surface of the wood, rough-dresses its periphery, the wood being shaped to present substantially a cylindrical contour, it being presented in the latter condition to the turning-tool or finishing-knife. While the work is being advanced on the movement toward the right of the head-stock 6 a boring-tool is being simultaneously advanced, the axis of the tool in the present instance being coincident with that of the work.

It will be evident from the foregoing that the head-stock, and therefore the work carried thereby, and the boring or equivalent tool are arranged for advancing movement toward each other, and the means illustrated for obtaining such movment will be hereinafter described.

The boring-tool is denoted by 12′, and it is suitably fastened to the inner end of the spindle 13, supported by vertical bearings upon the tail-stock 14, mounted at the upper side of the bed. The tail-stock 14 is solidly clamped to the bed by vertically-disposed bolts, as 15, (see Fig. 1,) passing through perforations in the respective parts. The opposite sides of the tail-stock 14, as will be evident upon an inspection of Fig. 3, have depending flanges 16, through which screws 17 are tapped, the inner ends of the screws being arranged to engage the sides of the upper portion of the bed 2 in order to accurately adjust the tail-stock centrally of the width of the bed 2.

It will be remembered that the head-stock 6 can be moved back and forth on the bed 2 freely by hand, and said head-stock is advanced by hand up to a certain point, beyond which mechanical means are brought into action, so as to positively impart the remainder of the advancing stroke thereto, and the mechanism for accomplishing the result named will now be described.

Upon the head-stock 6 and extending transversely of the machine is mounted a spring-actuated rock-shaft 18, to the inner end of which is fixed the pawl 19, the outer end of said rock-shaft carrying a hand crank or lever 20, as indicated, respectively, by Figs. 1 and 2. The pawl 19 is held in engagement with the teeth of the rack-bar 21 by the spring 18′, surrounding its shaft, and can be lifted out of engagement with said teeth by the manipulation of the hand crank or lever 20. The rack 21 is power-driven, it being supported for reciprocation upon the bed 2 and being jointed at its head to the bar 22, which is slidably supported in suitable guides on the bed 2. The degree of movement of the sliding bar 22, and consequently the rack 21, is governed by an adjustable end stop, shown as a set-screw 23, (see Fig. 2,) tapped through the head end of the bed and its inner end in position for engagement by the said sliding bar. The rack 21, it will be seen on an inspection of Fig. 1, for example, is situated approximately centrally of the width of the bed of the lathe in order to avoid lateral and lifting strains to said rack.

Upon the shaft 4, in what is shown in Fig. 2 as the right or tail end of the lathe, is fixed a pinion 24, meshing with the pinion 25 on the adjustable bracket 26, the pinion 25 in turn meshing with the gear 27, (see Fig. 3,) carried at the corresponding end of the shaft 28, which also extends longitudinally of the machine and above and vertically alined with the shaft 4. On the shaft 4, at the tail end thereof and outside the gear 24, is threaded the hand-wheel 29, which holds said gear 24 in place and which also serves as a convenient means for operating the train of gears, whereby the mechanisms actuated thereby can be manually operated when occasion arises for the same. The gears 24 and 27 are removably

mounted, so as to change the ratio of speed between the several gears composing the train, and as the bracket 26 is mounted for swinging movement on the shaft 4 the intermediate gear 25, carried thereby, can be always maintained in mesh with the driving and driven gears whatever their relative sizes.

The bracket 26 has in it concentric with the axis of the shaft 4 the segmental slot 30 to receive the screw 31, tapped into the adjacent leg 3 and by which the said bracket 26 can be firmly maintained in a desired position and to also hold the teeth of the gear 25 in mesh with the two coöperating gears.

It will be understood from the foregoing that the shaft 28 is driven from the shaft 4 through the intervention of a reducing train of gears.

To the shaft 28, near the opposite ends thereof, are suitably-fixed cams, the one on the left being denoted by 32, while the other one is denoted by 33. The cam 32 is for imparting an advancing movement to the bar 22, and consequently to the rack-bar 21, so that when the head-stock 6 is connected with the rack-bar by the engagement of the pawl 19 with the teeth of said rack-bar said head-stock will be mechanically advanced. On the under side of the sliding bar 22 is mounted the depending projection or stud 34 in the form of an antifriction-roll, which is arranged to traverse the working inner face of the cam 32, which it will be seen is of the cylindrical type. The effective portion of the projection or stud 34 is held against the working face of the cam 32 by a coiled pull-spring 35, connected with the framework and also with the upper side of the sliding bar 22. When what might be considered the advancing portion of the face of the cam 32 has passed out of engagement with the projection or stud 34, the spring 35 will return the bar 22 to its primary position, with the outer end thereof against the adjustable stop 23. During the retracting motion of the bar 22 the rack-bar 21 is moved therewith. The working face of the cam 33 engages the lower end of an arm 36, clamped at its upper end to the boring-tool spindle 13, said arm extending through a longitudinal slot in the body of the tail-stock 14, and, as indicated in Fig. 2, that portion of the arm 36 which is engaged by the cam 33 is provided with an antifriction-roller. The working face of the cam 33 by engaging the depending rigid arm 36 operates through said arm to move the spindle 13 inward, so as to permit the entrance of the boring-tool 12′ into the work, which at this point has been rough-dressed by the cutter 12 in the die 11 and which is supported by said die, constituting a steady rest. The return movement of the spindle 13 is accomplished by a coiled spring 37, surrounding the outer end of said spindle and bearing against the tail-stock 14 and also against an adjustable collar or nut, as 38, on the outer end of said spindle. As the spindle 13 advances it slides through its bearings on the tail-stock 14, the spring 37 during this period being placed under compression, whereby when the working portion of the cam 33 passes off the lower end of the arm 36 said spring by relaxing can return the spindle to its primary position.

The stock is cut into requisite lengths by a saw, as 39, the shaft 40 of which is rotatively carried by brackets, as 41, suitably united to the bed 2. (See, for example, Figs. 1 and 3.) The saw-shaft 40 carries a drum 42, adapted to be driven by a belt actuated from a drum, pulley, or the like carried from a shaft or counter-shaft arranged overhead. The saw 39 is provided with the usual guard 43, and the work to be cut thereby is placed in the angular head of the swinging bracket 44, (see Fig. 3,) which swinging bracket is held in its retracted position by a coiled spring, as 45, connected thereto and also with the bed 2. When the work is laid in the angular head of the swinging bracket 44, the latter is swung outward, so as to permit the saw 39 to cut through the work. When a length of the stock has been cut off, such cut length is then put into the chuck 9. One end of the cut length of stock or, as it might be termed, "stick" is placed in the opening in the die 11, after which the head-stock 6 is advanced by hand, so that the chuck 9 can receive the opposite end of the said cut length of stock or stick, the pawl 19 of course being out of engagement with the teeth of the rack-bar 21. The chuck, however, is rotating, by reason of which the threads upon the inner side thereof will engage what is shown in Fig. 2 as the left end of the stick. The opposite ends of the stick will then be held by the chuck and die, respectively. The shaft 4 is then thrown into action in one of the ways hereinbefore set forth, so as to operate through the intermediate parts the shaft 28, and concurrently the pawl 19 is permitted to drop into engagement with the teeth of the rack-bar, whereby the rotating cam 32 by engaging the depending stud 34 on the bar 22 will move said bar 22 inward, imparting naturally a similar movement to the rack-bar 21, whereby the head-stock 6 will be advanced, the stick held in the chuck being pushed through the opening in the die 11, so that the cutter 12 in said die can remove the corners of the stick or rough-dress the same to a uniform size. While the head-stock 6 is advancing the spindle 13 is also advancing, so that the boring-tool 12′ can enter the rough-dressed end of the stick while the latter is supported by the die 11. The two cams 32 and 33 have their faces so formed that they impart advancing strokes in unison to the stock 6 and spindle 13.

After a bore of the requisite depth has been formed in the stick by the tool 12′ the spindle 13 is backed off or retracted by the spring 37;

but the die still supports the bored stick for operation by a second saw and a turning or dressing tool, which latter may be of any suitable character. The dressing or turning tool is advanced as the boring-tool is being backed away from the work.

The tool-slide, which has a movement transverse of the bed of the lathe, is denoted by 46, and it has an angularly-disposed slot in its inner end to receive a tool, as 47, held against the bottom of said slot by a series of holding-screws, as 48, tapped into said tool-slide. The cutting edge of the tool therefore is presented at an angle to the stick or work supported by the chuck and work-rest 11.

Upon what is shown in Fig. 2 as the right end of the shaft 28 (see also Fig. 3) are fixedly secured cams 49 and 49′, the cam 49′ being adapted to operate the radial arm or lever 50, clamped to or otherwise fixedly secured to the outer end of the shaft 51, supported by suitable bearings upon the bed 2. To the inner end of said shaft 51 is suitably fixed the upright lever or arm 52, adapted to directly operate the tool-slide 46, the upper end of said arm or lever 52 extending into a slot in said tool-slide and being adapted to engage the inner depending lug on the bracket or plate 53. Said bracket or plate has a depending lip at its outer end through which the screw 54 is tapped, the inner end of the screw being arranged to engage the body of the tool-slide 46. The plate or bracket 53 is slotted to receive the screw 55, tapped into the body of the tool-slide, the two screws providing a means for adjusting and holding the plate or bracket 53 in the desired position, whereby the time of engagement of the inner depending lug of said bracket or plate may be regulated. At the time the boring-tool has been backed away from the stick the cam 49′ will engage the arm or lever 50 near the free end thereof and will swing said arm outward, thereby imparting an inward movement to the arm 52, so that the latter by engaging the relatively fixed part or plate 53 of the tool-slide 46 will move the latter inward to bring the edge of the tool 47 against the periphery of the rotating stick, which of course at this time is held in the chuck 9 and die 11. The cam 49′ is so shaped that it will maintain the slide momentarily in its inward position to permit the proper external shaping of the stick. When the cam 49′ passes off the lever or arm 50, the tool-slide will be returned to its initial position, and a spring, as 56, is shown for this purpose, said spring being of the coiled type and surrounding the rod 57, the outer end of which is fastened to a projection 58 near the outer side of the plate or bracket 53, while the inner end of said rod passes through an opening in the projection 59, rising from the bed 2 between the sides thereof.

In will be evident that the opposite ends of the coiled spring 56 bear against the projections 58 and 59, respectively. (See Fig. 1.)

When the slide 46 is moved inward, the spring 56 is naturally compressed, whereby when the cam 49′ passes out of contact with the lever 50 the spring will become effective to return the said tool-slide to its original position.

After the stick is bored and subsequently dressed by the knife 47 the dressed portion thereof is cut from the remainder while the stick is held in the die 11, and the saw 60 is shown for this purpose. This saw 60 is fixed to a shaft 61, carrying the drum or pulley 62, operated from the same drum that operates the pulley 10, or an independent pulley may be provided for the purpose. The shaft 61 is rotatively carried at the upper end of a swinging frame 63, rigidly fastened at its lower end to the rock-shaft 64, supported upon bearings on the bed 2 at the opposite side from which the shaft 51 is mounted, and the frame 63 is carried at the inner end of said shaft 64, (see, for example, Fig. 4,) while to the outer end of said shaft 64 is clamped or otherwise fixed the arm or lever 65 in position for engagement by the cam 49, said cam serving to operate against the arm 65 to swing the frame 63 inward, whereby the saw 60 can cut through the finished stick.

The return movement of the swinging frame is secured by a coiled spring 66, surrounding the shaft 64, acting against the latter and also against a suitable fixture. When the cam 49′ passes off the lever or arm 50, the companion cam 49 engages the arm 65, so as to swing said arm outward and downward, thereby moving the frame 63 inward, the tool 47 at this point having been moved away from the stock, whereby the rotating saw 60 will be caused to pass through the dressed end of the stick, thereby separating the latter from the remainder or that portion which is held in the die 11. The operation of the parts is such that when the cam 49 passes out of engagement with the lever or arm 65 the spring 66, which at this time is under compression, by relaxing returns the frame 63 to its normal position.

Initially a stick cut from stock by the saw 39 in the manner hereinbefore described is placed between the die 11 and the rotating chuck 9, said two last-mentioned parts upholding the stick, the head-stock 6 at this point being in its advanced position. The pawl 19 is then dropped between adjacent teeth of the rack-bar 21, and the latter being in motion the head-stock will be moved toward the right in Fig. 2 or advanced so as first to secure the cut stock in the chuck and afterward to move the stick through the die 11, whereby the cutter or knife 12 in the latter can rough-dress the stick. During the advance of the head-stock 6 the spindle 13 is also being advanced, so as to cause the tool

12′, carried thereby, to bore out the stick. After the spindle has reached the limit of its inward movement, into which position it was carried by the action of the cam 33, it is returned to its primary position by the relaxing-spring 37. After the stick has been bored the dressing or turning tool 47 is moved into position, as hereinbefore set forth, to finish the stick to the desired external shape, and after the said operation is accomplished the finished bored stick is cut by the saw 60, as hereinbefore described, the tool-slide 46 and the swinging frame 63 being operated in succession by the cams 49′ and 49 to secure the two last-mentioned results. The two cams 49 and 49′ are adjustable, so that their points of engagement with the respective parts can be regulated.

Having thus particularly described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a head-stock provided with a work-holder, a reciprocatory rack-bar located substantially centrally of the bed of the machine, a pawl mounted on the head-stock, a rock-shaft on the work-holder, to which said pawl is connected, a crank-arm carried by the rock-shaft, and a coiled spring surrounding the rock-shaft and acting against the latter to normally hold the pawl in engagement with the teeth of the rack-bar, a die having an opening for the passage of the work and a cutter for the latter, a spindle provided with a boring-tool, mechanism for reciprocating the spindle, said mechanism imparting an advancing movement to the spindle concurrently with the advancing movement of the head-stock, a slide for carrying a turning or dressing tool for the work, cam mechanism for imparting an advancing motion to the slide, and a swinging frame provided with a saw, said swinging frame being operable by the same cam mechanism that advances the slide, to carry the saw to and through the work.

2. The combination of a head-stock provided with a work-holder, a support for the work, a slide having a tool to operate upon the work, an oscillatory shaft having arms, one of which carries a rotative saw, and cam mechanism for actuating the other arm to advance the saw toward the work and for also advancing said tool-slide, said cam mechanism being arranged to advance the slide and saw in succession.

3. The combination of a head-stock provided with a work-holder, a die having an opening for the passage of the work and also having a cutter for the latter, one of said parts being movable with respect to the other and the die constituting a rest for the work, a slide provided with a dressing or turning tool, an oscillatory frame carrying a rotative saw, and mechanism for operating said slide and frame in succession to first carry the dressing-tool against the work and subsequently to cause the saw to move against and through the work.

4. The combination of a head-stock, a cam for advancing the same, said head-stock having a work-holder, a support or rest for the work, a slotted slide provided with an adjustable bracket extending across said slot and having a lug projecting into said slot, a shaft provided with an arm for engaging the lug to impart an advancing movement to the slide, a second arm carried by the shaft, a cam in position to engage the second arm and serving to operate the same in a direction to cause the advance of the slide, a rod rigidly connected with the slide, and a projection having an opening to receive and suitably guide one end of said rod, and a spring surrounding the rod and bearing against the projection and slide respectively to retract said slide.

5. The combination of a head-stock provided with a work-holder, a die having an opening for the passage of the work and also having a cutter for the latter, one of said parts being movable with respect to the other and the die constituting a rest for the work, a slide provided with a dressing or turning tool, an oscillatory frame carrying a rotative saw, a rock-shaft provided at its inner end with an arm for actuating said slide to impart an advancing movement thereto, an arm carried upon the outer end of said rock-shaft, and a power-driven shaft having cam mechanism for operating said outer arm and frame in succession.

6. The combination of a head-stock provided with a work-holder, a support for the work, a slide having a tool to operate upon the work, an oscillatory shaft having arms one of which carries a rotative saw, cam mechanism for actuating the other arm to advance the saw toward the work and for also advancing said tool-slide, said cam mechanism being arranged to advance the slide and saw in succession, and a coiled spring surrounding said shaft, acting against the latter and serving to return the saw to its primary position.

7. The combination of a head-stock, a cam for advancing said head-stock, the latter having a work-holder, a support or rest for the work, a slotted slide, a slotted bracket extending across the slot in said slide, having lugs at its inner and outer ends, the inner lug extending into the slot of the slide, a screw tapped through the outer lug and engaging the slide, a second screw extending through the slot in the bracket and tapped into the slide, a shaft provided with an arm for engaging the inner lug to impart an advancing movement to the slide, a second arm carried by said shaft, a cam in position to engage the second arm and serving to operate the same in a direction to cause the advance of the slide, a rod rigidly connected with the slide, and a projection having an opening to receive

and suitably guide one end of said rod, and a spring surrounding said rod and bearing against the projection and slide respectively, to retract said slide.

8. The combination of a head-stock, a cam for advancing the same, a support or rest for the work, a slotted slide provided with an adjustable bracket extending across the slot of the slide, having a lug projecting into the said slot, means for engaging said lug to impart an advancing movement to the slide, and independent means for retracting said slide.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

LEWIS T. KLINE.

Witnesses:
H. W. WIXSON,
ARTHUR L. KLINE.