

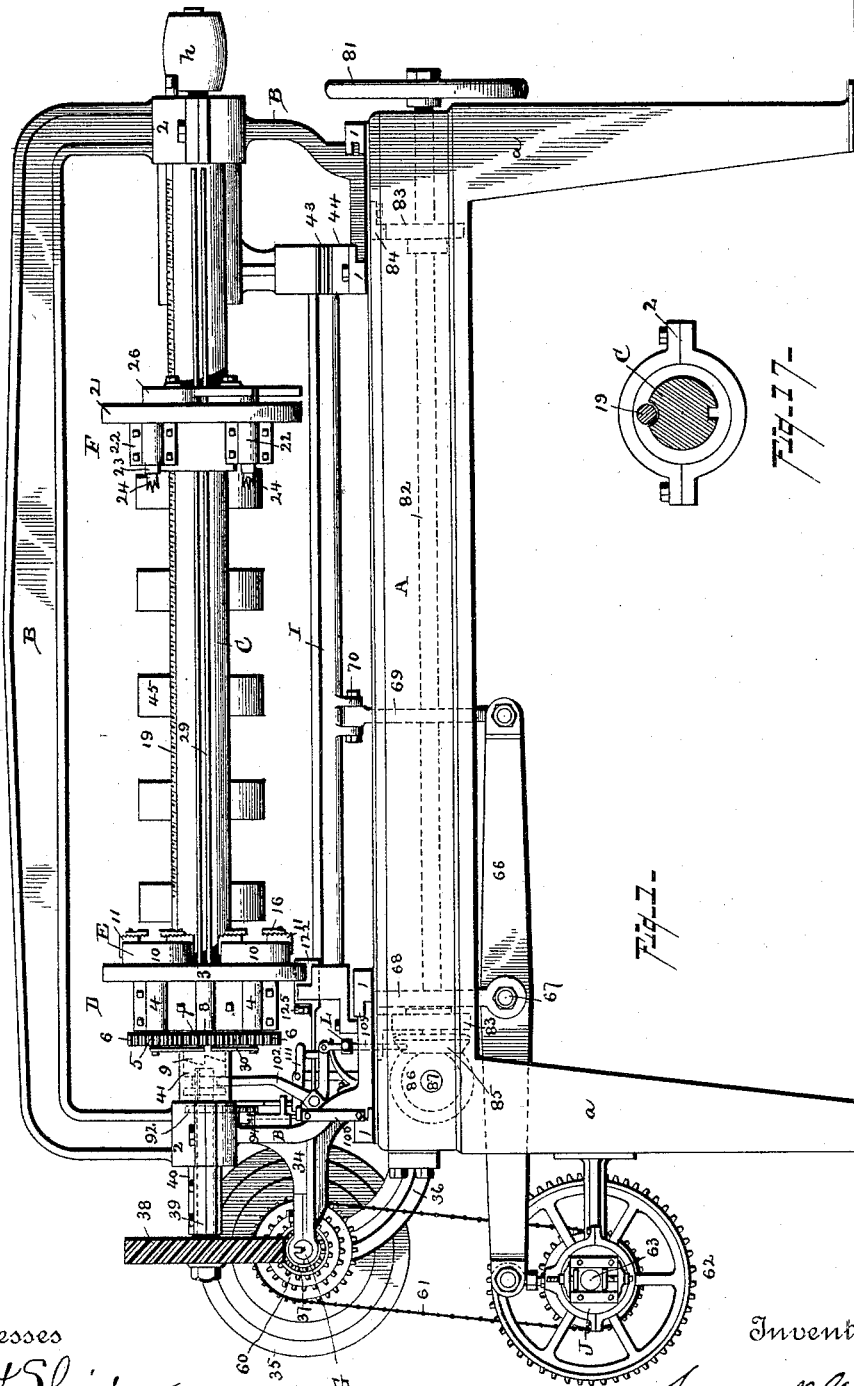
(No Model.)

5 Sheets—Sheet 1.

S. N. GOLDY.
WOOD TURNING LATHE.

No. 460,127.

Patented Sept. 29, 1891.



Witnesses
Albert Spiden,
D. C. Van Cott.

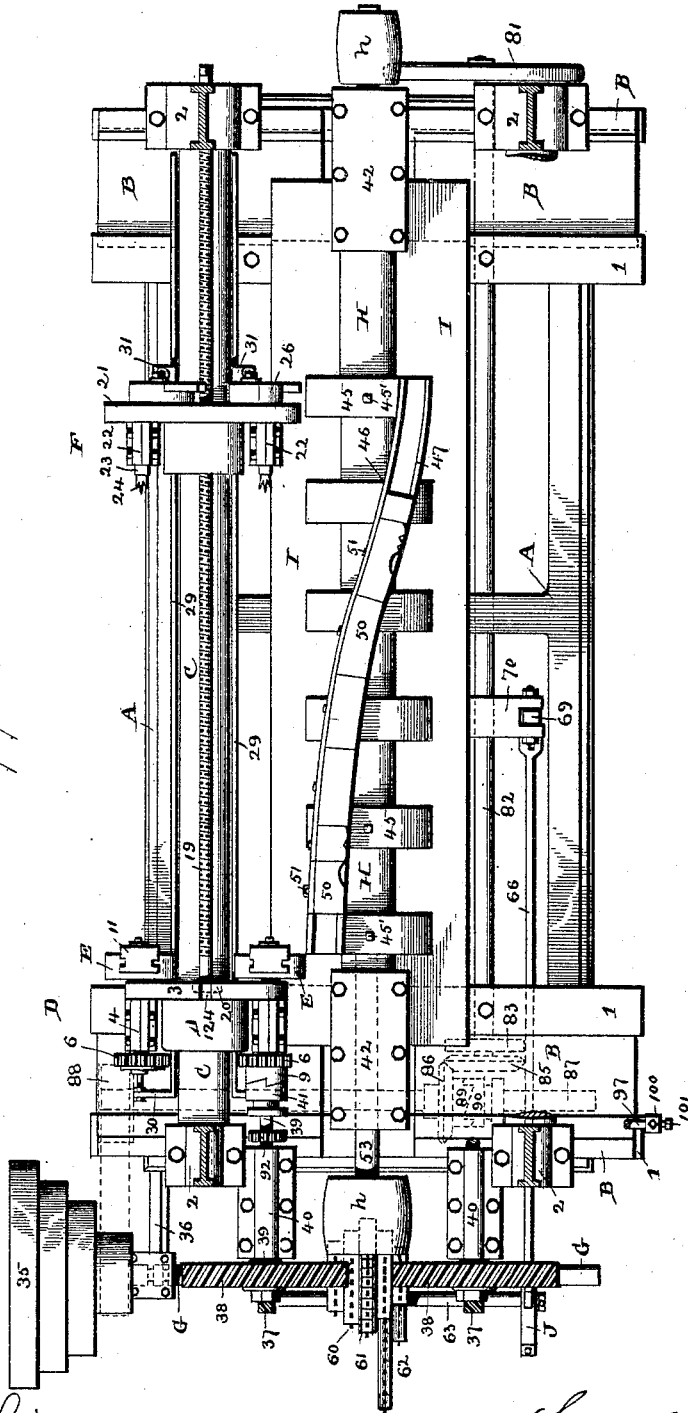
Inventor,
Samuel M. Goldy,
 By his Attorneys,
Myers & Webster.

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Fig. 2-



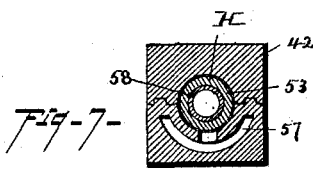
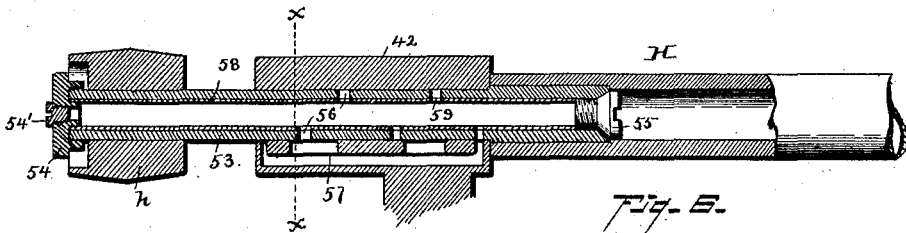
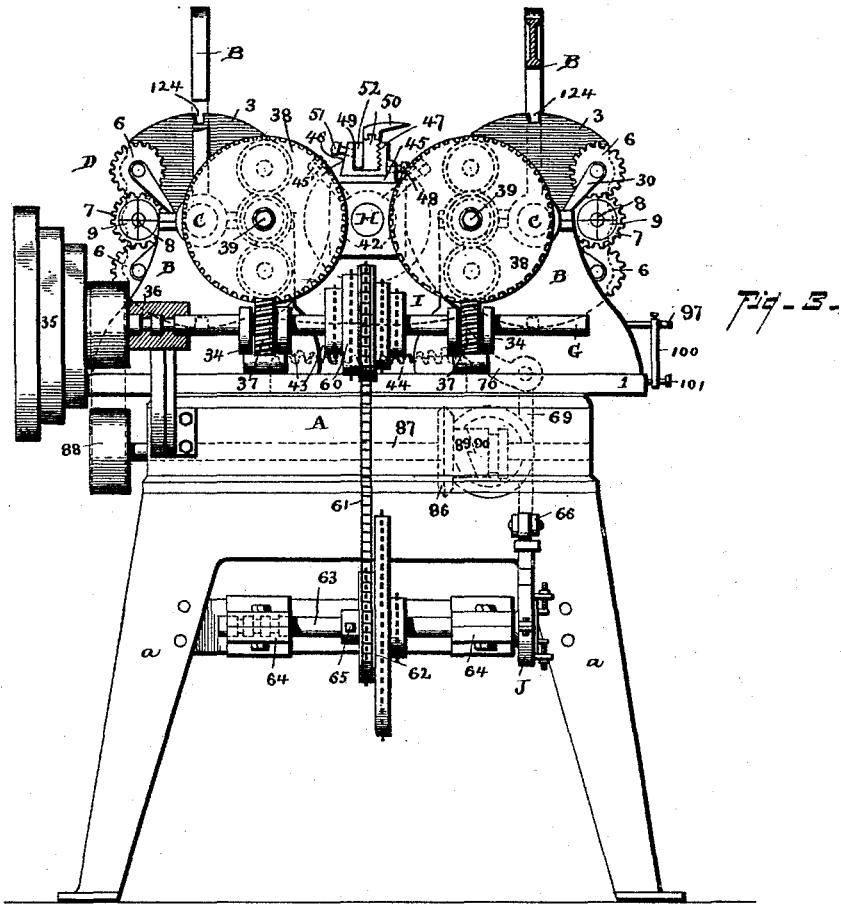
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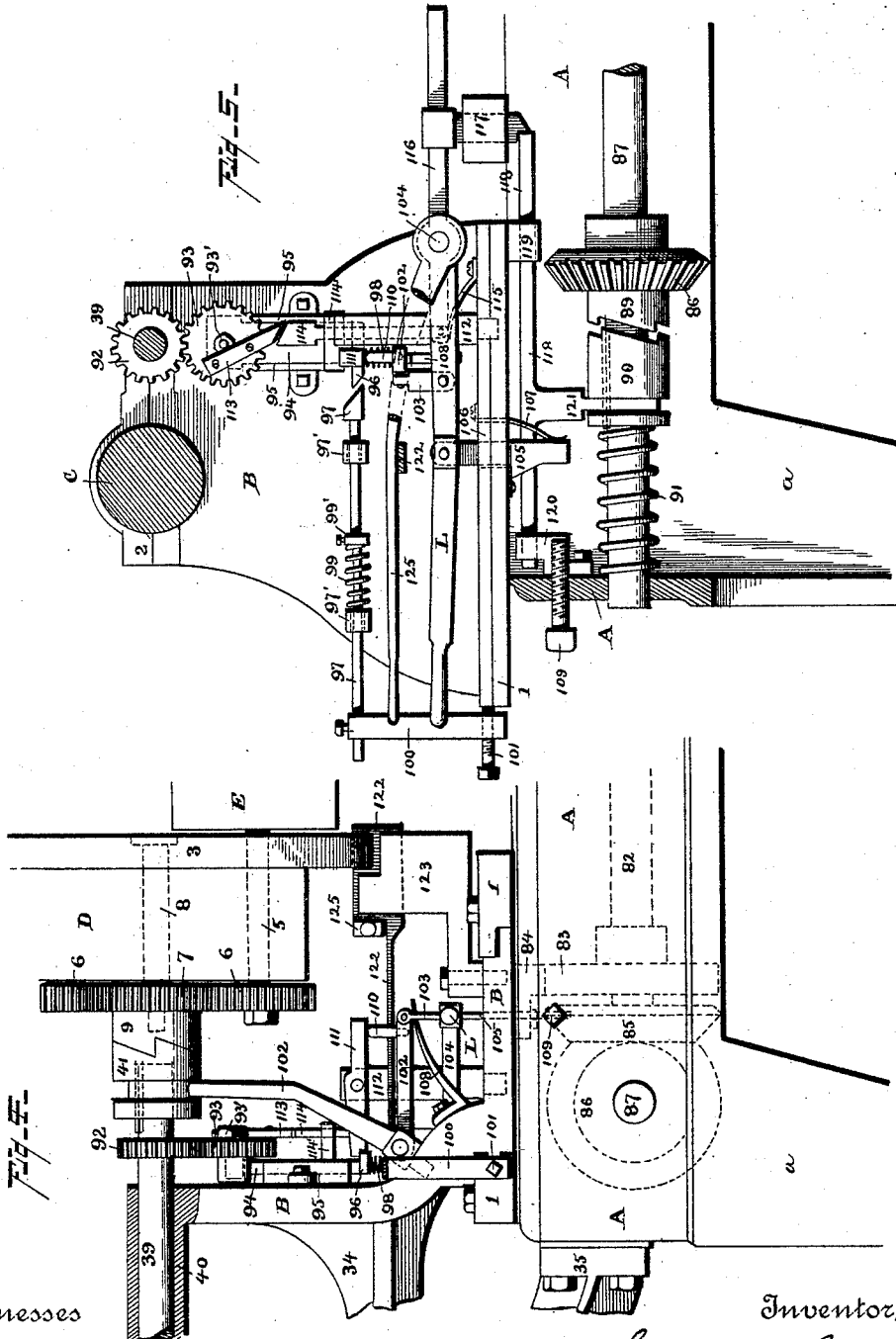
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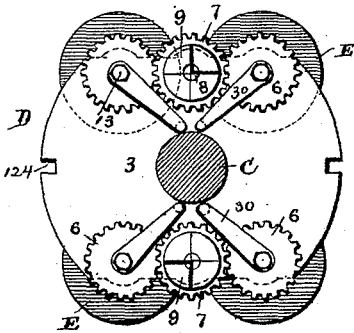
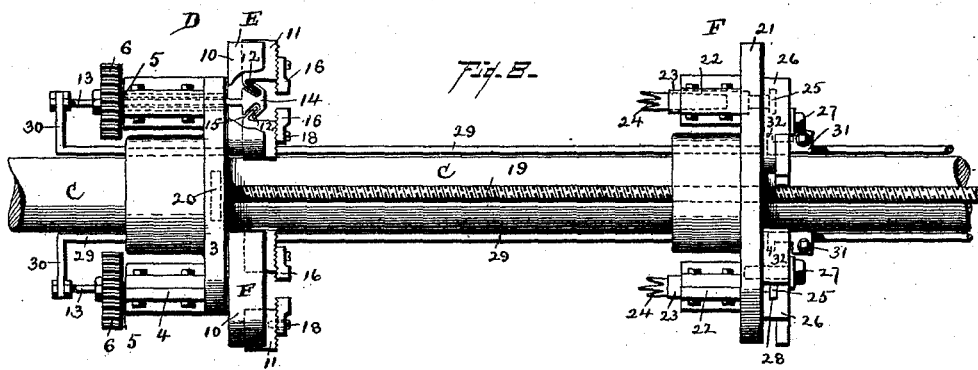


Fig. 9.

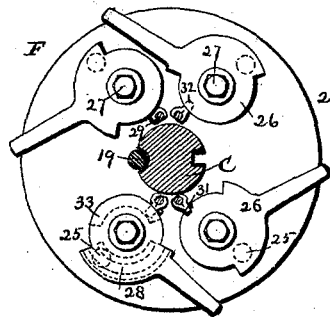


Fig. 10.

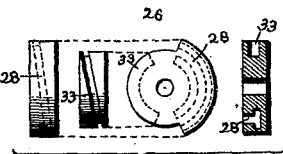
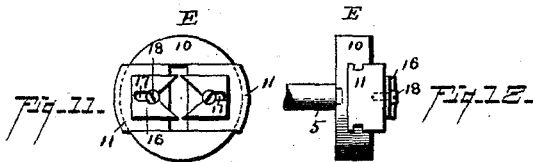


Fig. 13.

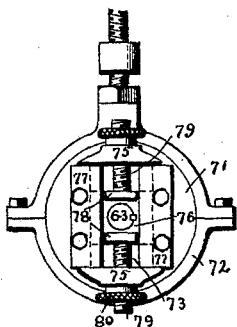


Fig. 14.

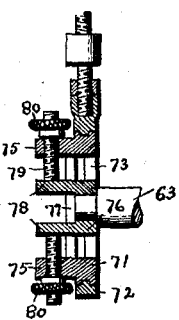


Fig. 15.

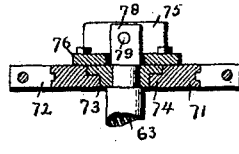


Fig. 16.

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UNITED STATES PATENT OFFICE.

SAMUEL N. GOLDY, OF SAN FRANCISCO, CALIFORNIA.

WOOD-TURNING LATHE.

SPECIFICATION forming part of Letters Patent No. 460,127, dated September 29, 1891.

Application filed August 22, 1890. Serial No. 362,771. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL N. GOLDY, a citizen of the United States of America, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Wood-Turning Lathes, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in wood-turning machinery; and it consists in the novel features of construction and combinations of parts hereinafter described, and pointed out in the claims.

The invention may be divided into four principal parts—namely, first, the rocking bed, which carries a cutter-arbor, and the mechanism for producing the rocking motion of the bed; second, the two carriers, each provided with four centers and devices for holding the work to be turned, and mechanism by which the work is revolved and turned round, oval, or polygonal; third, the mechanism for feeding the carrier to the cutters and for automatically reversing the carrier and stopping the work, and, fourth, the cutter-arbor, the cutters, and device for holding the cutters.

Figure 1 of the drawings is a side elevation of my improved wood-turning machine. Fig. 2 is a plan view of the same, the near carrier being removed. Fig. 3 is a front end elevation of the machine. Fig. 4 is an enlarged side elevation of a portion of the machine, showing the automatic reversing and stopping mechanisms. Fig. 5 is a front elevation of the same. Fig. 6 is an enlarged sectional view of one of the spindles of the cutter-arbor and its bearing. Fig. 7 is a transverse sectional view of said bearing, taken on the line *x x*, Fig. 6. Fig. 8 is a side elevation of a portion of the carrier-shaft, showing the head and tail stocks mounted thereon. Fig. 9 is an end elevation of the head-stock. Fig. 10 is a like view of the tail-stock, showing the cam-levers thereon. Figs. 11 and 12 show, respectively, a front and a side elevation of the chuck for holding the wood to be turned. Fig. 13 illustrates the arrangement of the grooves in the cam-levers. Figs. 14, 15, and 16 are detail views of the shifting eccentric. Fig. 17 is a

detail view of the bushed bearing for one end of the carrier-shaft.

Referring to the drawings, A represents the machine-table, mounted upon suitable legs *a*. Across the ends of the table and secured to the face of the same by bolts or other means are guide-plates 1 1. These plates extend slightly beyond the edge of the table and are a sufficient distance apart to admit of work-carriers B B sliding neatly between them. These carriers (two in number) and their connections are identical in every particular. Mounted in bearings 2 at each end of the carrier is the carrier-shaft C, upon the forward end of which is rigidly secured the head-stock D. The head-stock D consists of a head-plate 3, upon the front face of which are secured bearings 4 for the reception of short tubular shafts 5. Upon the inner ends of these shafts 5 (which are four in number) are secured chucks E, while their outer ends carry gear-wheels 6. An intermediate gear-wheel 7, carried by a short shaft 8, also mounted in a bearing 4, secured to the front face of the head-plate 3, (which shaft is headed upon its inner end to prevent displacement,) meshes with the two gear-wheels 6 on the same side of the head-stock. Cast integral with each gear-wheel 7 is one-half of a clutch 9, for a purpose that will hereinafter appear.

Chucks E consist of a body portion 10, through a groove in the face of which slide jaws 11. Upon the inner edge of each jaw is formed a lug 12, projecting at an acute angle. Rods 13 pass through the tubular shafts 5 and into the chucks E, where they are provided with cone-shaped heads 14, said heads being recessed, as at 15, for the reception of the lugs 12, as seen in Fig. 8. Jaws 16, made adjustable by means of a slot 17, (see Fig. 11,) are secured to the sliding jaws 11 by means of screws 18, passed through the slots and taking into the sliding jaw. The meeting edges of the two jaws are corrugated to insure the adjustable jaws against slipping.

The tail-stock F, splined upon the carrier-shaft C, is adapted to slide thereon to accommodate the length of stick to be turned. This sliding motion is accomplished by means of a screw-threaded rod 19, which is partly embedded in a groove formed in the periph-

ery of the carrier-shaft C, and is prevented from lengthwise movement by a shoulder or collar 20 upon one end, which fits within a suitable recess in the head-plate 3 of the head-stock. This rod passes through a suitable nut or screw-threaded opening within the tail-stock and through one of the bearings 2, which is bushed for its reception, as seen in Fig. 17, the outer end of the rod being fitted for a wrench.

The tail-stock consists of a plate 21, upon the inner face of which are secured bearings 22 for the reception of the spur-stocks 23, in the ends of which are formed recesses to receive the spurs 24. The opposite ends of the spur-stocks 23 pass through the plate 21 and have a flange 25 formed around their outer edge. Cam-levers 26, secured to the outer face of the plate 21 by means of screws 27, have T-shaped cam-grooves 28 around a portion of their inner face for the reception of the flanged ends of the spur-stocks 23.

Through suitable openings in the head and tail stocks pass four small rods 29, their forward ends, after passing through the head-stock, being bent at right angles, as at 30, and secured to the ends of the rods 13. Clamps 31, secured in any desired position upon rods 29 by means of set-screws, have projecting lugs 32, each of which takes into a cam-groove 33, formed in the peripheries of the cam-levers.

Mounted in suitable bearings 34, projecting from the front ends of the carriers B B, is the drive-shaft G, which carries the drive-pulleys 35. This shaft is grooved longitudinally, and is prevented from moving laterally by the grooved bearing 36, secured to the table of the machine, as clearly seen in Fig. 3. Bearings 34 are bifurcated upon their outer ends, and upon drive-shaft G and in this bifurcated portion are screw-gears 37, said gears sliding on the shaft as the carriers are moved, but are prevented from turning thereon by a feather entering the groove in the shaft.

Meshing with the gears 37 are large screw-gears 38, carried by shafts 39, mounted in suitable bearings 40 on the upper portion of the carriers. On the inner end of each shaft 39 is splined a half-clutch 41, designed to engage with the half-clutches 9, secured to the gear-wheels 7 of the head-stock.

Midway between the carrier-shafts C C and parallel with the same is the cutter-arbor H, supported at each end in bearings 42, said bearings being supported by upwardly-projecting arms secured to a rocking bed I. This rocking bed has for its bearings a convex rack-bar 43 upon each end, the teeth of which mesh with the teeth of rack-bars 44, secured to the machine-table.

On arbor H, at suitable intervals, are detachably secured by means of set-screws 45' flanges or collars 45, in the peripheries of which are cut grooves 46, into which slides the cutter-holder 47, which is secured therein

by means of set-screws 48. The holder is set spirally with relation to the axis of the cutter-arbor, so that the cutters will make a shearing cut. In the cutter-holder, along its whole length, is a groove 49, one side of which groove is corrugated to prevent the cutters from flying out. The cutters 50 may be formed in short lengths and of different designs, so as to be more readily adapted to different styles of work. They may also be made of a single piece of metal, or the blade may be made separately and dovetailed upon the shank, as shown in Fig. 3. The shank of the cutter is corrugated to correspond with the corrugations in the cutter-holder, and is held therein by means of a set-screw 51, which bears against a metal backing-plate 52, placed behind the cutter. This backing-plate may have a rubber facing upon one side to correct any slight unevenness there may be in the cutter. If desired, the corrugations on the cutter-shank and in the cutter-holder may be of a given distance apart—say one-tenth of an inch—and numbered, respectively, 1 2 3 4, &c., which arrangement will greatly facilitate the setting up of different designs. Arbor H carries a band-pulley *h* upon each end, around either of which may be passed a belt leading from any suitable source of power for revolving the arbor.

As the cutter-arbor must attain to a very high speed, the bearings must be kept well oiled to prevent overheating. To accomplish this I have provided the means shown in Figs. 6 and 7. In each end of the arbor, which is hollow, is fitted one end of a steel tube 53, which forms the spindle for the arbor. The outer end of this tube is closed by a screw-cap 54, while its inner end may be closed by a screw-plug 55, thus forming an oil-reservoir within the tube. If desired, screw-plug 55 may be removed and the whole arbor made to serve as an oil-reservoir. A small screw-tap 54' in the screw-cap 54 is for the purpose of refilling the reservoir when necessary. The oil flows from the reservoir onto the bearing 42 through perforations 56 in the tube 53, any waste oil being received by a chamber 57, formed in the lower part of the bearing 42. If desired, this chamber may be filled with a wick or waste to absorb the oil and assist in lubricating the bearing. In order to regulate the flow of oil through perforations 56, a thin tube 58, having perforations 59, which register with the perforations 56 in tube 53, is placed within the tube 53, so that a slight turn of the inner tube will partially close the perforations 56, and thus decrease the flow of oil, or the flow may be stopped entirely.

I make no claim herein to the above-described automatically-lubricating mechanism, as that forms the subject-matter of another application for patent filed by me in the United States Patent Office on the 25th day of September, 1890, Serial No. 366,569.

Mounted on the center of drive-shaft G are different-sized sprocket-wheels 60, (five in

number,) having, respectively, twenty, twenty-five, thirty, thirty-five, and forty teeth each. A sprocket-chain 61 passes around one of these wheels and down around one of a set of three sprocket-wheels 62, mounted in bearings 64, secured to a cross-bar of the machine-table. These wheels have, respectively, twenty, forty, and eighty teeth each, and are secured to the shaft 63 by means of a set-screw 65 in order that they may be shifted into alignment with wheels 60 when it is desired to shift the chain 61 from one wheel to another. Upon one end of shaft 63 is secured an eccentric J, which connects with one end of a lever 66, which is pivoted in its center, as at 67, to a downwardly-hanging arm 68, secured to the table of the machine. To the free end of the lever is connected one end of a rod 69, the other end of which rod is pivoted to an outwardly-projecting arm 70, secured to the rocking bed I. It will be seen that, through the medium of lever 67 and its connections, the turning of the eccentric causes bed I to rock back and forth.

For a reason that will hereinafter appear it is necessary that the eccentric should at certain times have a greater throw than at others. To produce such result I have provided a shifting eccentric, which is shown in detail in Figs. 14, 15, and 16. The eccentric consists of a metal disk 71, surrounded by the ordinary eccentric-strap 72. Through the middle portion of the eccentric and extending to within a short distance of the periphery on either side is a slot 73, which is wider upon the outer face of the eccentric than upon the inner face, thereby forming ledges 74, as seen in Fig. 16. At each end of this slot, and consequently diametrically opposite each other, are formed outwardly-projecting lugs 75. Perforations through these lugs are for a purpose that will hereinafter appear. A slide 76, having flanges formed along the upper edge of two opposite sides, is adapted to slide in the slot 73, the flanges on the slide resting upon the ledges of the slot, the slide being held therein by means of two metal holding-plates 77, overlapping the edges of the same and secured to the outer face of the eccentric by means of screws or bolts. Upon the outer face of the slide 76 are cast two projecting lugs 78, of sufficient width to neatly slide between the plates 77, and secured to each of these lugs in any suitable manner is a screw-threaded rod 79, which passes through the perforation in the lug 75 and has a nut 80 upon its free end, which bears against the outer face of the lug 75.

To decrease or increase the throw of the eccentric, it is simply necessary to simultaneously loosen one nut 80 and tighten the other, when, through the medium of the slide 76, the eccentric will be moved to or from the center of the shaft, as will be readily understood.

No claim is laid in this application to the above-described eccentric, as it forms the basis

of a separate application filed by me of even date herewith.

The carriers B are fed to the cutters by means of hand-wheels 81, secured on the outer ends of shafts 82, (only one of each being shown,) running horizontally beneath the face of the machine-table. On this shaft are secured two gear-wheels 83, which mesh with rack-bars 84, secured to the under side of the carrier. Upon the inner end of shaft 82 is secured a beveled gear 85, which meshes with a similar gear 86, secured on a horizontal shaft 87, running beneath the face of the machine-table at right angles to shaft 82. Motion is imparted to shaft 87 through the medium of a belt passed around a pulley 88, secured on its outer end, and thence around one of the pulleys 35 on the drive-shaft G, as seen in Fig. 3. The beveled gear 86 is loose on its shaft and carries a half-clutch 89. The other portion 90 of the clutch is splined upon shaft 87 and is thrown into engagement with the portion 89, as will be hereinafter described, by means of a spring 91, surrounding the shaft and interposed between the half-clutch 90 and the frame of the machine.

When the carriers have been fed forward as far as necessary for the requirements of the work, the revolutions of the work are automatically stopped and the carriers returned to their normal positions by the mechanism shown on an enlarged scale in Figs. 4 and 5.

On the shaft 39, adjacent to the half-clutch 41, is secured a small gear-wheel 92, which meshes with a slightly-larger gear 93, journaled upon a bolt 93', screwed into the upper end of a slide 94, held in position between guide-plates 95, secured to the rear face of the carrier. The lower end of this slide carries a beveled shoe 96, with which a latch 97 engages, and when in engagement holds gears 92 and 93 apart against the pressure of a small spiral spring 98, which bears against the lower face of the shoe. Latch 97 slides in keepers 97', secured to the carrier, and is held in its normal position by a spiral spring 99, which surrounds a portion of the latch and is interposed between one of said keepers and an adjustable collar 99', secured on the latch. Adjustably secured to the outer end of the latch by means of a set-screw is the downwardly-hanging stop 100, having an adjusting-screw 101 in its lower end, which screw is designed to strike the outer end of guide-plate 1 when the carrier has been fed forward the required distance.

Pivoted to a lug on the rear face of the carrier is a bell-crank lever 102, the upwardly-extending arm of which engages a groove in the periphery of the half-clutch 41, while its horizontal arm is connected by a link 103 to a lever L, pivoted to a stud 104, projecting from the carrier. A spring-catch 105, pivoted to lever L, projects downwardly through a slot 106 in the bottom of the carrier and is held in engagement with the edge of the slot by the pressure of a leaf-spring 107. This catch

holds lever L down against the upward pressure of a leaf-spring 108, which bears against the outer end of the horizontal arm of the bell-crank lever 102. An adjusting-screw 109, tapped through the end of the machine-table in alignment with the spring-catch 105, serves to release said catch on the return of the carriage, for a purpose which will be more fully hereinafter described.

A pin 110, secured upon the outer end of the horizontal arm of the bell-crank lever 102, contacts with one end of a short lever 111, pivoted in its center to an upright 112, rising from the base of the carrier, its other end being notched, the notch resting upon the side of the shoe 96 upon the lower end of slide 94. Upon the outer face of gear-wheel 93 is secured a dog 113, the beveled end of which projects beyond the periphery of said gear-wheel and is designed to engage the upper beveled end of a vertical slide 114, held normally in a raised position by a leaf-spring 115, said slide working in a keeper 114', secured to the guide-plates 95, its lower end being pivoted to the end of a lever 116. This lever, which is pivoted to the stud 104, carries upon its free end a downwardly-hanging catch 117, which engages with one end of a rod 118, said rod being loosely supported in a perforated lug 119, secured to the under face of the carrier, and in a keeper 120, secured to the machine-table. A downwardly-hanging arm 121 of rod 118 is bifurcated at its lower end, said bifurcated end engaging a groove formed around the periphery of the half-clutch 90 on shaft 87.

A spring-latch 122 is secured at one end to the rear face of the carrier, (not seen,) its free end working in a guide 123, secured to the upper face of the base of the carrier and entering one of the notches 124, formed in two opposite sides of the head-plate 3 of the head-stock D, said latch holding the head and tail stocks and the carrier-shaft stationary while the cutters are at work. This latch is drawn out of engagement with the head-plate by means of a lever 125, pivoted at its inner end to the stud 104, said lever bearing on top of the spring-latch, as best seen in Fig. 5, where the latch is shown in section in a depressed position.

Two operators are required to operate this machine, one standing upon either side of the machine and performing the same work—that of putting in the unturned sticks, giving the carrier-shaft a half-turn, feeding the work to the cutters, and taking out the finished work.

The first thing for the operator to do is to put the unturned sticks into position. This is done by placing one end of the stick into the chuck, the center of the other end resting against the spur 24. A partial revolution of the cam-lever 26 will, through the medium of the T-groove 28, force the spur 24 forward into the end of the stick, while the rods 29 by the same movement will be forced toward

the head-stock through the medium of the lugs 32 on the clamps 31, working in the cam-groove 33. This movement of rods 29 will draw upon rod 13, which will cause the cone-shaped heads 14 in the center of the chucks to be drawn down upon the lugs 12, which will close the jaws and lock the stick in the chuck, as will be seen by an inspection of Fig. 8. When the two spaces next to the operator have been filled, he bears down upon lever 125, which draws the spring-catch 122 out of engagement with the notch in the head-plate 3, thus allowing the head and tail stocks to be given one half-revolution, in which position they will be again locked by the spring-catch. The cutter-arbor, the drive-shaft G, shaft 87, and shaft 63 are now put in motion and continue so during the entire working of the machine. The operator now bears down upon lever L, which is held in depressed position by the spring-catch 105 engaging with the under side of the carrier B, as seen in Fig. 5. This downward movement of lever L draws down the horizontal arm of the bell-crank lever 102, which throws the perpendicular arm of said lever toward the head-stock, carrying with it the half-clutch 41, which now engages with the half-clutch 9 on the intermediate gear-wheel 7, as seen in Fig. 4. The continuous revolution of the drive-shaft G gives a continuous revolution to the shaft 39 through the medium of the two screw-gears 37 and 38. Consequently as soon as the clutch is formed between 41 and 9 the revolutions of shaft 39 are at once imparted to the work to be turned. Hand-wheel 81 is now turned to the right, which revolves shaft 82, when the gear-wheels 83, meshing with rack-bars 84, will feed the carrier toward the cutters, bringing the sticks to be turned into the path of the cutters, when stop 100, which had been previously adjusted by means of the adjusting-screw 101, comes into contact with the end of guideway 1, which will draw latch 97 out of engagement with the shoe 96 upon the lower end of the slide 94, when the spring 98 will force the slide upward and cause gear 93 to mesh with gear 92, which causes the former to revolve. The diameters of gears 92 and 93 are such that while gear 93 is making one revolution gear 92, and consequently the work, is making one and one-quarter revolutions, which insures a perfect finish of the work before the carrier is reversed. When gear 93 has nearly finished its revolution, the beveled dog 113 strikes the beveled end of the slide 114, which forces the latter downward, thus depressing one end of the lever 116 and lifting the catch 117, which releases the rod 118 and allows spring 91 to throw half-clutch 90 into engagement with the half-clutch 91. Now, as the shaft 87 has a continuous revolution, as before mentioned, and the beveled gear 86 is loose upon said shaft, it will be seen that as soon as the clutch is formed the gear-wheel 86 will revolve with the shaft, and, being in mesh with the beveled gear 85, shaft 82 will

be revolved in the opposite direction from which it was turned by the hand-wheel, thus reversing the carrier, and when the carrier has been reversed a short distance the spring-catch 105 will come into contact with the adjusting-screw 109, disengaging the former from the edge of slot in the machine-table, which, through the medium of lever L and the link 103, will release the leaf-spring 108, which throws the horizontal arm of bell-crank lever 102 upward and the perpendicular arm away from the head-stock, thus disengaging half-clutches 9 and 41 and stopping the work. The upward movement of the horizontal arm of the bell-crank lever, through the medium of the pin 110 and lever 111, draws slide 94 downward, thus disengaging gear-wheels 92 and 93. The slide 94 and gear 93 are held in this downward position by the latch 97 engaging the shoe 96 until they are again released by the forward movement of the carrier. When the carrier has been reversed to its proper position, lug 119, which is fastened to the bottom of the carrier, abuts against the upper portion of the bifurcated arm 121 and draws the half-clutch 90 out of engagement with half-clutch 89, in which position it is held by the catch 117 coming in contact with the end of rod 118. The reverse movement of the carrier is now completed. Having filled the two empty spaces while the turning was in progress, the operator gives the head-stock a half-revolution, which brings the finished work toward him to be removed, and places the unturned sticks into position to be turned. He then bears down on lever L and operates the hand-wheel 81, as before described.

The number of sides to be given the work is determined by the number of throws given the rocking bed by the eccentric while the work is making one revolution, and the character of the sides, whether straight, concave, or convex, is determined by the amount of throw. For instance, if it is desired to turn square work it is necessary that the eccentric should make four revolutions while the work is making one, which causes the cutters in the arbor carried by the rocking bed to come into contact with the work at every quarter-revolution of the work, thus producing four sides. To produce six or eight sides, it is simply necessary that the eccentric be given six or eight throws to one revolution of the work.

To change the number of revolutions of the eccentric, it is simply necessary to change the sprocket-chain 61 from one combination to another of the sprocket-wheels 60 and 62, wheels 62 being kept in alignment with wheels 60, as before described.

If the eccentric were set with its center true to the center of its shaft, there would be no throw and no movement to the rocking bed, and consequently round work would be produced. As the eccentric is moved from the center the sides of the work, which are

convex, become correspondingly straighter until a straight side is produced, when, if still more throw is given the eccentric, concave work is the result.

While I have described my machine as applicable to turning wood, it is evident that the same system, modified as to speed and cutters, would be applicable also to turning stone and other hard substances.

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

1. A lathe having a positively-actuated rocking bed, a cutter-arbor mounted on the bed, and two work-carriers, one on each side of the bed.

2. A lathe having a rocking bed, a cutter-arbor mounted on the bed, and two work-carriers, one on each side of the bed, each carrier being provided with four work-holding centers and both capable of presenting work to the cutter at the same time.

3. In a lathe, the combination, with the drive or main shaft G, the shaft 63, carrying an eccentric, and connections between said shafts for giving the eccentric a variable speed independent of the speed of the main shaft, of a rocking bed, connections between the eccentric and said bed, a cutter-arbor mounted on the bed, and two work-carriers, one on each side of the bed.

4. In a lathe, the combination, with the main shaft G, the shaft 63, carrying an adjustable eccentric, and connections between said shafts for giving the eccentric a variable speed independent of the speed of the main shaft, of a rocking bed, connections between the eccentric and the bed, a cutter-arbor mounted on the bed, and two work-carriers, one on each side of the bed.

5. In a lathe, the combination, with the main shaft carrying a set of differential sprocket-wheels, shaft 63, carrying a set of differential sprocket-wheels longitudinally movable thereon, a chain connecting both sets of wheels, and an eccentric secured on shaft 63, of a rocking bed, connections between the eccentric and the bed, a cutter-arbor mounted on the bed, and two work-carriers, one on each side of the bed.

6. In a lathe, a cutter-arbor consisting of an arbor proper, a series of collars on the arbor, each having a transverse groove in its periphery, and a cutter-holder secured in the grooves in said collars.

7. In a lathe, a cutter-arbor comprising an arbor proper, a series of collars detachably secured on the arbor, each having a transverse groove in its periphery, and a cutter-holder detachably secured in the grooves in said collars.

8. In a lathe, the combination, with a carrier provided with rack-bars upon its under side and movable within guides on each end of the frame, of a longitudinal shaft provided with gear-wheels in mesh with said rack-bars, a hand-wheel upon its outer end, and a bevel-

gear upon its inner end, a transverse shaft, a bevel-gear normally loose thereon and in mesh with the bevel-gear on the longitudinal shaft, and an automatically-actuated clutch engaging with the bevel-gear on the transverse shaft, for the purposes stated.

9. In a lathe, the combination, with a carrier having a perforated lug on its under side, of a shaft, as 87, carrying a loose bevel-gear provided with a half-clutch, an annularly-grooved half-clutch splined upon the shaft and a spring bearing against the splined clutch, a rod having a bifurcated arm in engagement with the splined clutch, said rod being loosely supported in a keeper on the frame and in the lug on the carrier, a spring-actuated lever pivoted to the carrier and provided with a catch for holding the rod in a retracted position, and means for automatically operating the lever to release the catch, so as to permit the rod to slide forward and throw the half-clutches into mesh, for the purposes stated.

10. In a lathe, the combination, with the carrier, of shaft 39, journaled therein, gear-wheel 92 on said shaft, gear-wheel 93, meshing with wheel 92 and carrying a radial bevel-ended dog, a slide movable in line with said dog, a spring-actuated lever pivoted to the carrier and provided on its outer end with a downwardly-hanging catch, the inner end of said lever being pivoted to said slide, a slide-rod mounted in a lug on the carrier and a keeper on the frame and provided with a bifurcated arm, shaft 87, carrying a loose bevel-gear provided with a half-clutch, an annularly-grooved half-clutch splined upon the shaft, with which said bifurcated arm is engaged, and a spring on said shaft and bearing against the splined clutch, for the purposes stated.

11. In a lathe, the combination, with a head-stock having a chuck provided with sliding jaws, of a tail-stock having a longitudinally-movable spur, and mechanism for simultaneously operating said jaws and spur.

12. In a lathe, the combination, with a head-stock having a chuck mounted upon a tubular shaft, said chuck being provided with sliding jaws having inwardly-projecting angular lugs, of a tail-stock having a longitudinally-movable spur provided with a flanged head, a cam-lever having a T-shaped cam-groove in its inner face for the reception of the spur-head, a rod 13, passing through the chuck-shaft and provided on its inner end with a conical head having a groove adapted to receive the angular lugs on the jaws, a rod 29, passing through the tail and head stocks and connected with rod 13, and a lug clamped onto rod 29 and engaging with a peripheral cam-groove in the cam-lever, for the purposes stated.

13. In a lathe, the combination, with the carrier and a head-stock mounted upon the carrier-shaft, said head-stock having a chuck

mounted upon the inner end of a shaft 5, which is provided upon its outer end with a gear-wheel 6, of a shaft 39, journaled in one end of the carrier, provided on its inner end with a splined half-clutch and on its outer end with a screw-gear in mesh with a smaller screw-gear on the drive-shaft, a gear-wheel 7, mounted on a shaft journaled in the head-stock, said wheel 7 being in mesh with wheel 6 and provided with a half-clutch, a hand-lever and intermediate mechanism for throwing said half-clutches into gear, and automatic means for throwing them out of gear, for the purposes stated.

14. In a lathe, the combination, with the carrier having a slot in its base, the wheel 7, journaled in the head-stock and provided with a half-clutch, and the shaft 39, journaled in the carrier and provided on its inner end with a splined half-clutch, of a bell-crank lever 102, pivoted to the carrier, the vertical arm of said lever being in engagement with the splined clutch, a spring under the horizontal arm of said lever, a hand-lever L, pivoted at one end to the carrier and connected to the horizontal arm of the bell-crank lever, a spring-actuated catch 105, pivoted to lever L and passing through the slot in the carrier, and a stop 109, fixed in the frame, substantially as described, and for the purposes set forth.

15. In a lathe, the combination, with the carrier, the shaft 39, mounted thereon, and the gear-wheel 92, fixed upon said shaft, of a slide 94, working in ways 95 on the carrier, a gear-wheel 93, journaled on a stud fixed in the upper end of said slide, and mechanism for automatically depressing said slide on the rearward movement of the carrier, whereby wheel 93 is thrown out of engagement with wheel 92, as and for the purposes stated.

16. In a lathe, the combination, with the carrier, of the spring-actuated slide 94, working in guides 95 on the carrier, provided with a projecting shoe upon its lower end and carrying a gear-wheel at its upper end, as described, a lever 111, pivoted to a standard rising from the base of the carrier, the bell-crank lever 102, the horizontal arm of which is provided with a vertical pin 110, resting under one end of lever 111, the other end of said lever being in engagement with the shoe on the slide, the hand-lever L, connected to the horizontal arm of the bell-crank lever, a spring-actuated catch 105, pivoted to said lever, and an adjustable stop fixed in the frame, as and for the purposes stated.

17. In a lathe, the combination, with the bed and the carrier, of the slide 94, constructed as described, the shoe on said slide being beveled on its under side, a downwardly-beveled catch 97, having a spring-actuated guide-rod loosely mounted in keepers on the carrier, and a downwardly-hanging stop attached to said rod for contacting with the bed-plate as the carrier moves forward, whereby slide

94 is automatically released so as to be thrown upward by its spring, as and for the purposes described.

18. In a lathe, the combination, with the carrier, of a head-stock and a tail-stock mounted on the carrier-shaft and provided with a plurality of centers, and a screw-shaft partially embedded in the carrier-shaft, passing through the tail-stock, and swiveled at one end in the head-plate of the head-stock, its

other end being journaled in a bushed bearing and adapted to receive a wrench, as and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

SAMUEL N. GOLDY.

Witnesses:

JAMES L. KING,
FRANK I. ZIMMERMAN.