(No Model.) 6 Sheets—Sheet 1.

C. A. WAGNER.

WOOD TURNING LATHE.

No. 455,780. Patented July 14, 1891.

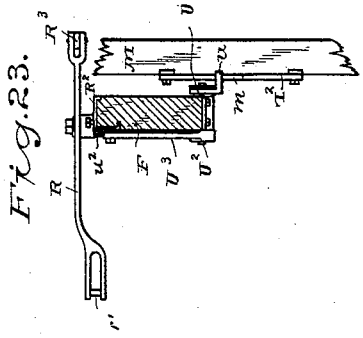

Fig. 23.

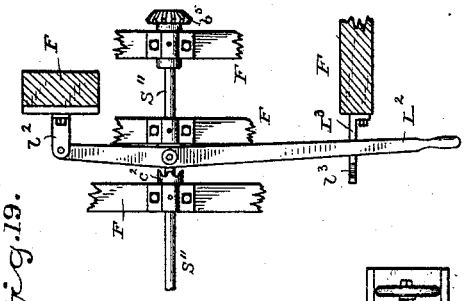

Fig. 19.

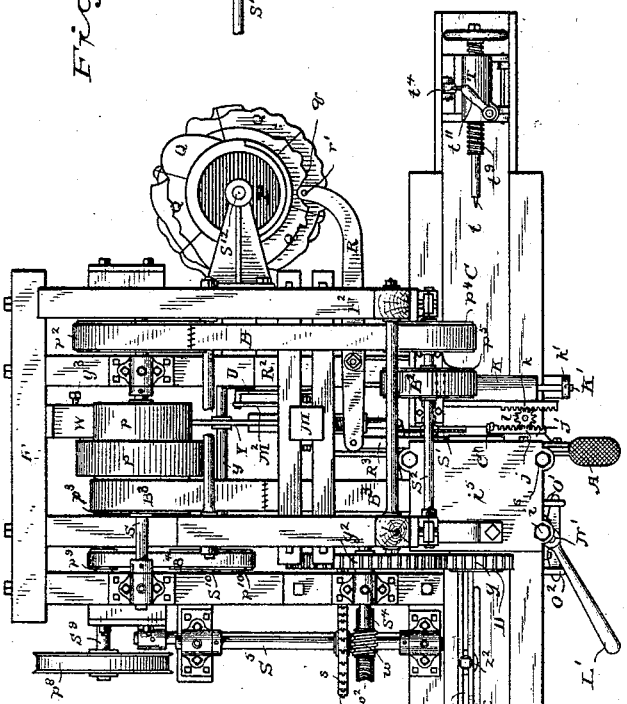

Fig. 1.

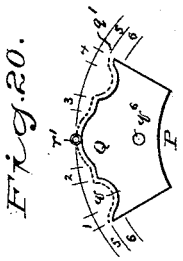

Fig. 20.

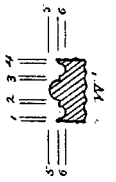

Fig. 21.

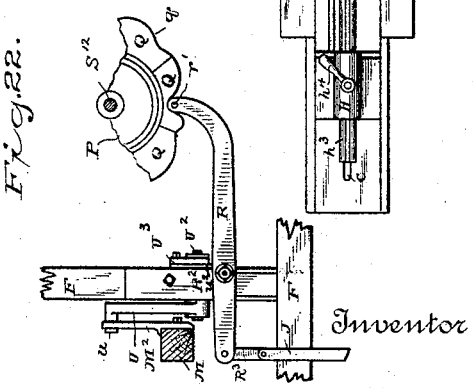

Fig. 22.

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(No Model.) 6 Sheets—Sheet 2.

C. A. WAGNER.

WOOD TURNING LATHE.

No. 455,780. Patented July 14, 1891.

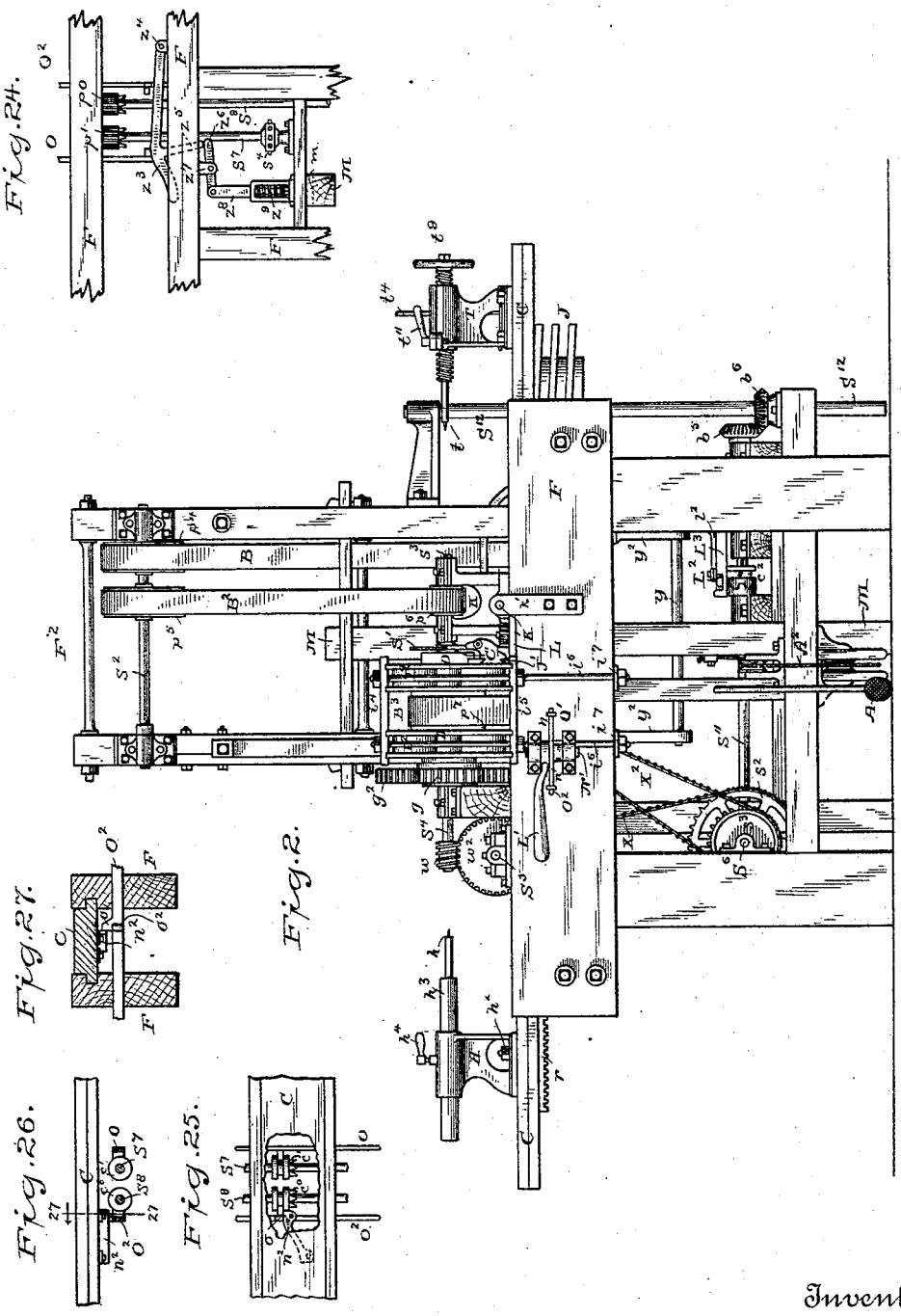

Fig. 24.

Fig. 2.

Fig. 27.

Fig. 26.

Fig. 25.

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(No Model.) 6 Sheets—Sheet 3.

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WOOD TURNING LATHE.

No. 455,780. Patented July 14, 1891.

Fig. 4.

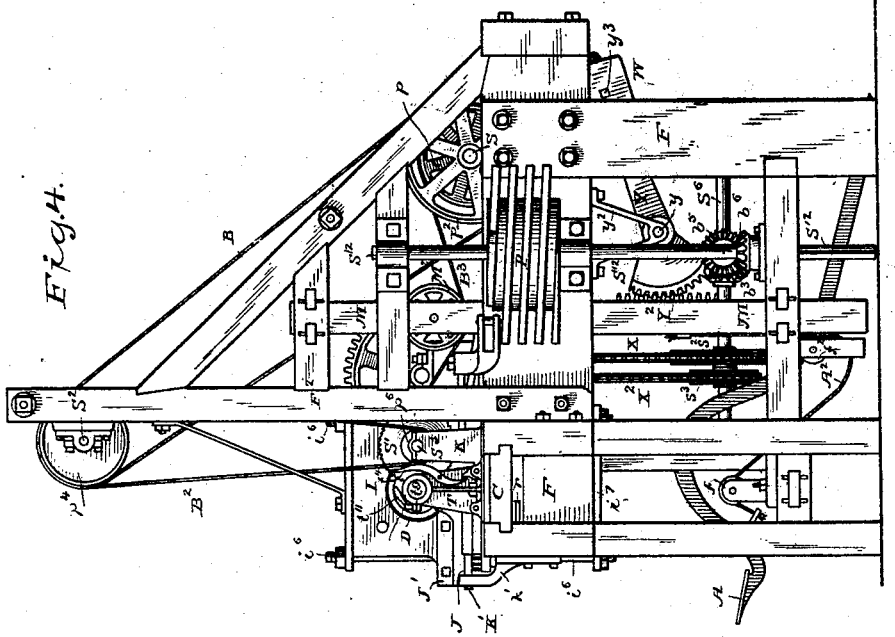
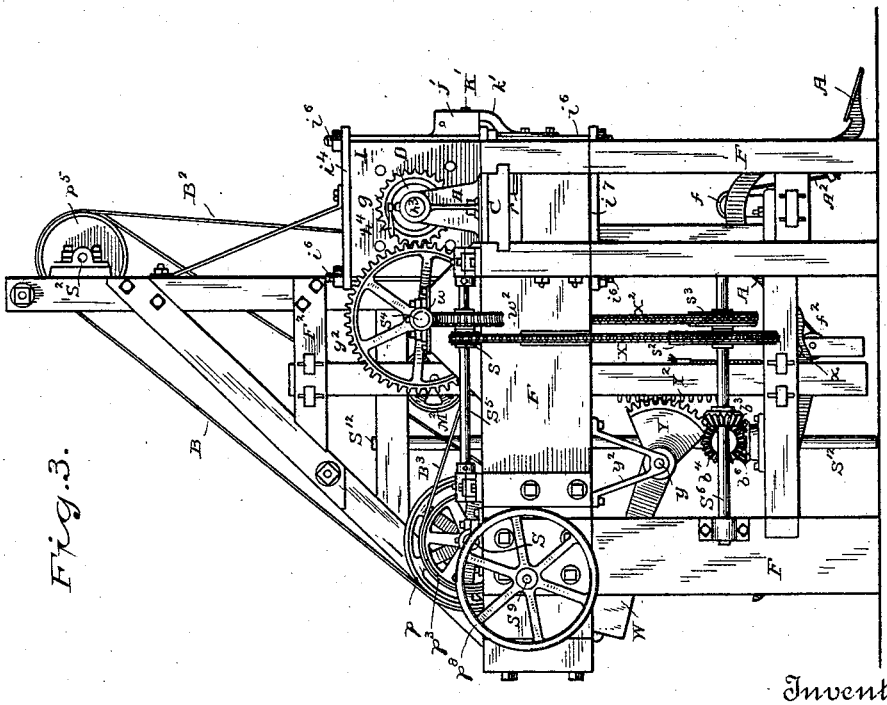


Fig. 3.



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(No Model.) 6 Sheets—Sheet 4.

C. A. WAGNER.

WOOD TURNING LATHE.

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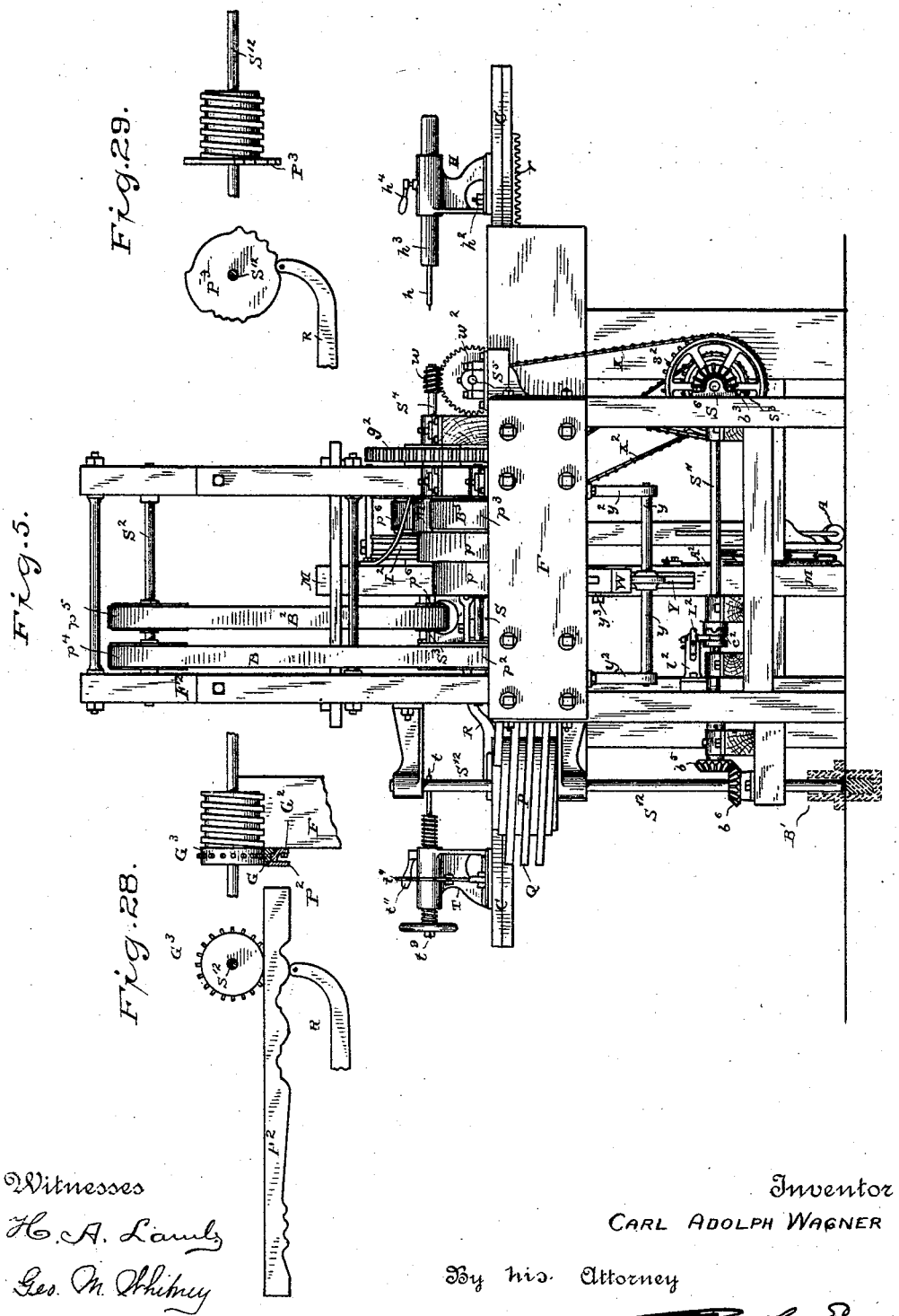
Fig. 29.

Fig. 5.

Fig. 28.



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(No Model.) 6 Sheets—Sheet 5.

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WOOD TURNING LATHE.

No. 455,780. Patented July 14, 1891

Fig. 9.

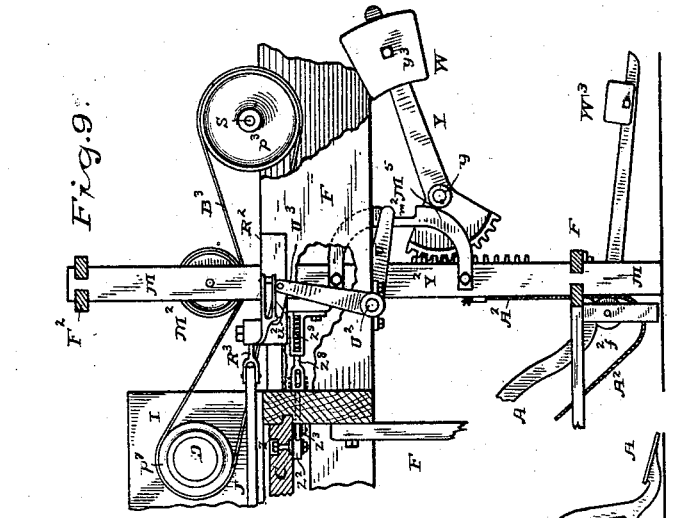


Fig. 8.

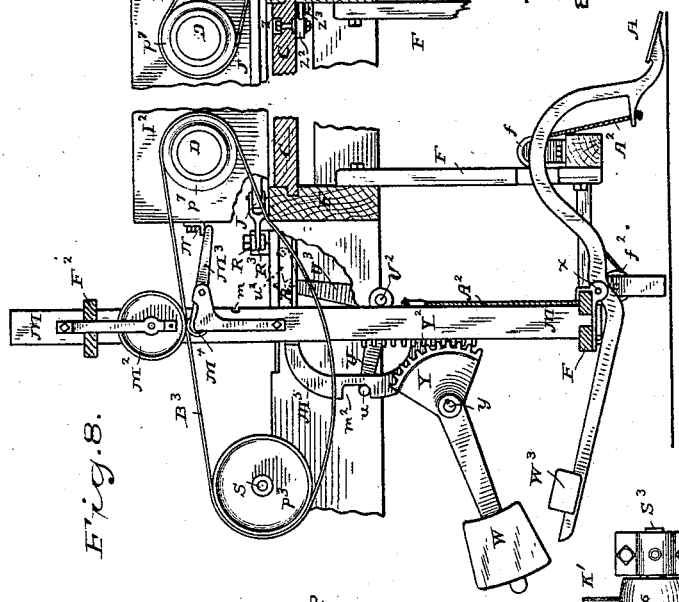


Fig. 7.

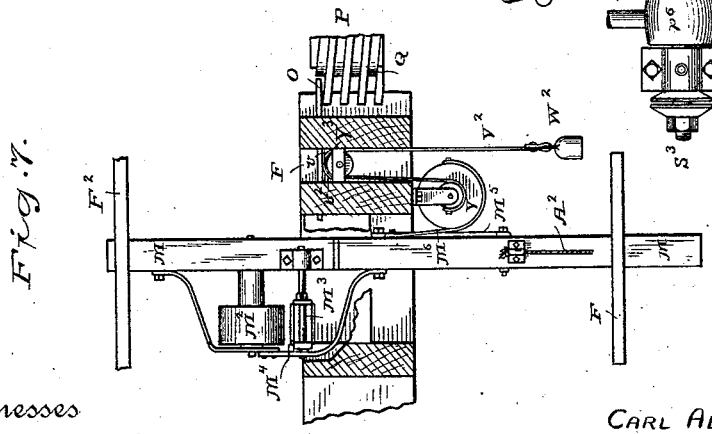
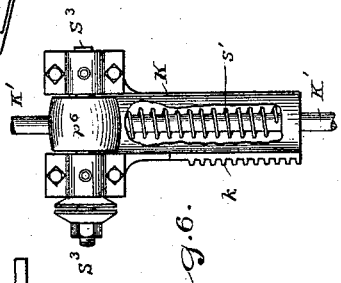


Fig. 6.



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(No Model.) 6 Sheets—Sheet 6.

C. A. WAGNER.

WOOD TURNING LATHE.

No. 455,780. Patented July 14, 1891.

Fig. 16.

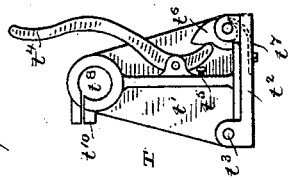


Fig. 17.

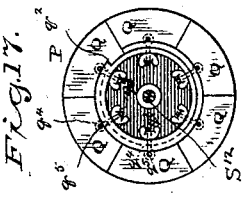


Fig. 18.

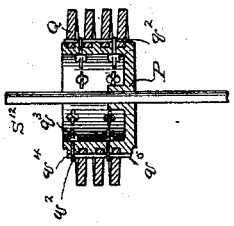


Fig. 13.

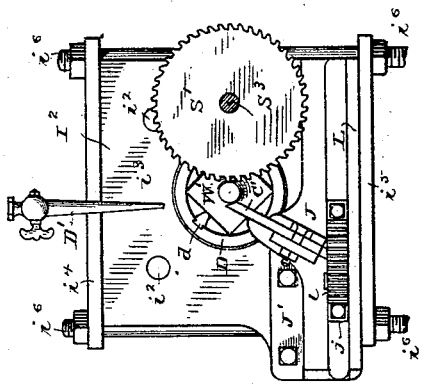


Fig. 14.

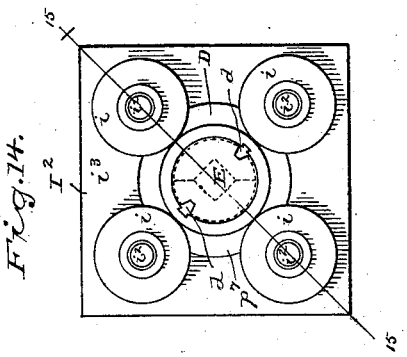


Fig. 15.

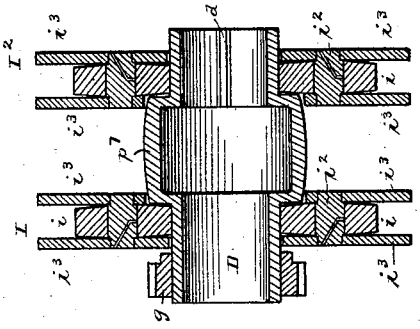


Fig. 12.

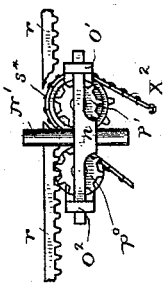


Fig. 10.

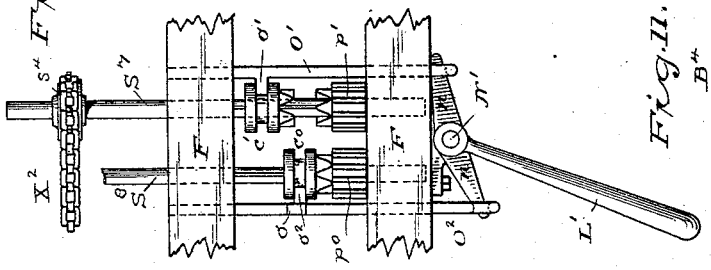
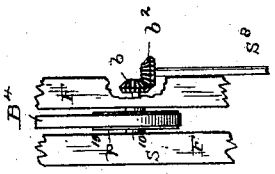


Fig. 11.



Witnesses

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Inventor

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UNITED STATES PATENT OFFICE.

CARL ADOLPH WAGNER, OF DANVILLE, KENTUCKY, ASSIGNOR OF FIFTY-ONE ONE-HUNDREDTHS TO SAMUEL LYONS, OF SAME PLACE.

WOOD-TURNING LATHE.

SPECIFICATION forming part of Letters Patent No. 455,780, dated July 14, 1891.

Application filed July 5, 1890. Serial No. 357,849. (No model.)

To all whom it may concern:

Be it known that I, CARL ADOLPH WAGNER, a citizen of the United States, and a resident of Danville, in the county of Boyle, Kentucky, have invented a new and useful Improvement in Wood-Turning Lathes, of which the following is a specification.

This invention relates to "automatic" machine tools or lathes for turning wood or the like to artistic shapes; and it consists in certain novel combinations of parts, as hereinafter described and claimed.

The general objects of the invention are to adapt a lathe to automatically produce delicate designs, such as have heretofore never been successfully produced by automatic machinery, so far as I am aware, with all the deep cuts and sharp edges of such designs truly and smoothly cut, and at the same time to provide for reproducing the work an unlimited number of times with absolute uniformity, and at least as rapidly as inferior work could be done by the most skillful workman on an ordinary gage-lathe, and, furthermore, to adapt the improved lathe to cut hard or soft wood or such substitutes for wood as hard rubber, ivory, celluloid, and like substances with equal ease and perfection.

The "wood," as it is hereinafter termed, is taken by the lathe in given lengths after it has been squared or reduced to any other uniform angular shape in cross-section and its ends have been trued and centered. It is rotated by novel means while it is fed longitudinally, and is simultaneously acted on by a rapidly-driven rotary saw and a non-rotary smoothing-cutter under the control of a moving pattern. At the end of each operation the wood and the pattern are stopped, the saw and cutter are retracted, and the pattern is reset for a succeeding operation without the interposition of the operator. Devices at the right hand of the operator quickly release the turned wood, and a lever at his left hand starts an automatic "back-feed," which is also automatically stopped. Another piece of wood having been introduced, the operator depresses a treadle and pushes to the left said lever at his left hand, which operations start the wood and apply the saw and cutter, after which the operation proceeds automatically until it is stopped in like manner as before. Provision is also made for constructing and using a changeable spiral pattern of any required length and for unclutching its shaft when the design is to be changed.

Six sheets of drawings accompany this specification as part thereof.

Figure 1, Sheet 1, of these drawings is a top view of the improved lathe. Fig. 2, Sheet 2, is a front view thereof. Figs. 3 and 4, Sheet 3, are elevations, respectively, of the left-hand and right-hand sides of the same. Fig. 5, Sheet 4, is a back view with certain parts omitted. Fig. 6, Sheet 5, is a top view of the saw-arbor and the slide which carries its bearings, the latter partly broken away to expose its spring. Figs. 7, 8, and 9, Sheet 5, are fragmentary sectional elevations showing details of the treadle mechanism and its connections, being respectively a front view and left-hand and right-hand side views. Figs. 10, 11, and 12, Sheet 6, are fragmentary detail views of the feed mechanism, Figs. 10 and 11 being plans, and Fig. 12 a front view, of the metallic parts, including the rack. Figs. 13, 14, and 15, Sheet 6, are respectively a fragmentary side view, with parts omitted and other parts in section, illustrating the turning operation, a like view behind the side plate in the foreground in Fig. 13, and a section on the diagonal line 15 drawn across Fig. 14. Fig. 16, Sheet 6, is a side elevation of the main portion of the head-stock. Figs. 17 and 18, Sheet 6, are respectively a top view and a vertical section of the spiral pattern. Fig. 19, Sheet 1, is a top view of the pattern-unclutching device. Figs. 20 and 21, Sheet 1, are diagrams illustrating the operation of said pattern. Figs. 22 and 23, Sheet 1, are fragmentary top and back views of the connections between the pattern and the saw and cutter with their appurtenances. Figs. 24 to 27, inclusive, Sheet 2, are respectively fragmentary plan views, a sectional front view, and a vertical cross-section on the line 27, showing additional details of the feeding mechanism; and Figs. 28 and 29, Sheet 4, each shows two fragmentary

views of an alternative pattern together with its appurtenances, as hereinafter set forth.

Additional modifications are represented by dotted lines in Figs. 5 and 14. Figs. 1 to 5, inclusive, and Figs. 7, 8, 9, 11, 17, 18, 19, and 22 to 27, inclusive, are drawn to one and the same scale. Figs. 6, 10, 12, 13, 14, 15, 16, 20, and 21 are enlarged one diameter from that scale, and Figs. 28 and 29 are drawn to a smaller scale.

Like letters of reference indicate corresponding parts in the several figures.

A bench-like main frame F, with a superstructure or top frame F^2, supports and guides the working parts of the lathe, including rotary shafts S S^2 S^3 S^4 S^5 S^6 S^7 S^8 S^9 S^{10} S^{11} S^{12} in suitable bearings, and a sliding carriage C in horizontal ways.

The carriage C is located at the top of the main frame F in front and is provided with a head-stock H and a tail-stock T, both having dead-spindles that terminate, respectively, in centers *h t*, between which the wood W′, Figs. 13 and 21, rotates during the turning operation in contact with a rotary circular saw S′ and a non-rotary smoothing cutter C′, which are fixedly located in a central position on the main frame and are automatically advanced and retracted under the control of a pattern P, Figs. 1, &c., or P^2, Fig. 28, or P^3, Fig. 29. Said rotary shaft S, located at the back of the main frame F at top, is the main shaft of the lathe and is provided with a speed-pulley *p p* to receive the driving-belt and with two driving-pulleys p^2 p^3, from the first of which a belt B extends to a pulley p^4 on the second shaft S^2, which is a countershaft in the top frame F^2 and carries another pulley p^5, from which a belt B^2 extends to the pulley p^6 of the saw-arbor S^3, which is thus continuously rotated. From said pulley p^3 on the main shaft S a belt B^3 extends to the pulley p^7 of a rotary drum D, which embraces the wood immediately to the left of the saw S′ and cutter C′ for rotating the wood. The left-hand end of said drum carries a toothed or gear collar *g*, which meshes with a gear-wheel g^2, fast on one end of the shaft S^4, which is a short shaft carrying at its other end a worm *w*. This meshes and drives a worm-wheel w^2, fast on the shaft S^5, which carries a sprocket-wheel *s*, that drives a chain X. This in turn drives a sprocket-wheel s^2, that is fast on the shaft S^6, together with a driving sprocket-wheel s^3, from which a chain X^2 extends to a sprocket-wheel s^4, Figs. 10, 12, and 24, fast on the shaft S^7 of the pair of feed-shafts S^7 S^8. These feed-shafts carry a pair of sliding clutch-sleeves c' c^0, splined thereto, and spur-pinions p' p^0, having clutch projections opposed to those of the respective clutch-sleeves, the teeth of both pinions being in constant mesh with a rack *r*, Figs. 2 to 5 and Fig. 12, fast on the bottom of the carriage C. When said shaft S^7 is clutched to said pinion p', the carriage, and therewith the wood, is fed from left to right. The back-feed shaft S^8 is driven continuously from an independent-driven pulley p^8, Figs. 1 and 3, through the shaft S^9, on which said pulley p^8 is fast, and which carries a pulley p^9, Fig. 1, from which a belt B^4 extends to a pulley p^{10} on the shaft S^{10}. This in turn carries a bevel-gear *b*, Fig. 11, in mesh with a bevel-gear b^2 on the rear end of said feed-shaft S^8. Through this train, when said feed-shaft S^8 is clutched to said pinion p^0, the carriage C is fed or run back from right to left. Said shaft S^6 also carries a bevel-gear b^3, in mesh with another b^4, fast on the left-hand end of the shaft S^{11}, which is a divided shaft that is normally coupled up by a clutch c^2, so as to transmit motion by a bevel-gear b^5 on its right-hand end to another one b^6, which is splined to the shaft S^{12}, which carries the pattern P. The pattern is thus caused to rotate normally in unison with the wood-rotating drum D whenever the latter is in motion.

The base of the tail-stock T is fixedly attached to the carriage C at its right-hand end, and the tail-stock as a whole is peculiarly constructed as follows: Its body or main portion *t′*, Fig. 16, is hinged to its base t^2 by a pintle t^3 at front, and is provided at its back with an unlocking and tilting lever t^4 and a stop-screw t^5 to limit its motion, the base t^2 being provided with a catch t^6, acted on by a spring t^7 and by said lever t^4 and engaged by the rear edge of the superbase when the parts are in normal condition. The upper part of the tail-stock has an internally-threaded and longitudinally-divided socket t^8 for a screw-spindle t^9, Figs. 1, 2, 4, and 5, having a hand-wheel at its right-hand end, and lugs t^{10}, Fig. 16, coact with a lever-screw t^{11}, Fig. 1, &c., to fasten said spindle. The "head-stock" H is adjustable on the left-hand end of the carriage C by means of a slot *c*, Fig. 1, in the latter, through which the attaching-bolt h^2 of the head-stock passes. It has a sliding spindle h^3, fastened by a lever-screw h^4, and provided with its center *h* in a customary manner, and after it is adjusted for a given pattern on wood of a given length requires no further attention until a different pattern or length of wood is to be used.

The axis of the wood-rotating drum D is coincident with that of the centers *h t* of the head-stock and tail-stock, and with the spindle t^9 unlocked and retracted and the upper part of the tail-stock tilted forward the wood is readily removed from or inserted through the drum, as the case may be. With wood of a size to which the drum is fitted motion may be transmitted thereto from the drum by one or more inwardly-projecting ribs *d*, Figs. 13 and 14, within one or both ends of the drum, and the drum may be adapted to rotate smaller wood by suitable bushings, as represented by dotted lines at E, Fig. 14, such bushings to be fastened within the drum and adapted for the passage of the wood lengthwise therethrough without obstruction, while it rotates with the drum.

The drum D is supported on the frame F, so as to rotate freely by peculiarly-constructed roller-bearings I I². (Shown in detail by Figs. 13 to 15.) In each bearing four wheel-shaped rollers *i* are mounted on non-rotary shafts *i*², having lubricating-bores, as shown in Fig. 15, and held at both ends in vertical plates *i*³, which are kept in place by grooved top and bottom plates *i*⁴ *i*⁵ and by vertical bolts *i*⁶ and anchoring-bars *i*⁷, which unite said plates and clamp the whole to the frame. The drum is kept in place endwise by the contact of a central enlargement, which forms its pulley *p*⁷, with the sides of the rollers *i* at their perimeters, as shown in Figs. 14 and 15.

The cutter C′ and saw S′ may be of any approved construction. They are carried, respectively, by slides J K, located side by side and provided with longitudinal racks *j k*, opposite each other, which are meshed by a pinion *l*, that rotates on a fixed stud upon a sole-plate L, let into the top of the frame F. Said slide J works in dovetail ways J′, formed partly by the adjoining side of the roller-bearing I². Said slide K works on a guide-rod K′, held at both ends by brackets *k*′, bolted directly to the frame.

The pattern-surface of the pattern P is a spiral peripheral edge *q*, of the required shape, (represented in Figs. 1 and 20) formed on segmental wooden sections Q. These sections are fitted to a spiral groove *q*², Figs. 17 and 18, in the periphery of the inner metallic part of the pattern, which is of cup shape, and are fastened in place by thumb-nuts *q*³ on radial screws *q*⁴, the outer ends of which interlock with rods *q*⁵, passing through central holes *q*⁶, Fig. 20, in those segments which are in line therewith respectively, and thus through all the segments. The cutter C′ and saw S′ are moved by this pattern in the following manner: Said pattern-surface *q* engages at the front of the pattern with a little roller *r*′ at the bifurcated and rearwardly bent right-hand end of a lever R, which is fulcrumed on a slide R² and connected by a link R³ with the rear end of said slide J. This slide being connected as to motion with said slide K by said racks and pinion *j k l*, as aforesaid, it follows that the cutter C′ and the saw S′ are so drawn simultaneously toward the axis of the wood to the extent demanded by the pattern, and as the wood is fed longitudinally past the cutter and saw it thus receives the shape represented by the pattern, as illustrated diagrammatically by Figs. 20 and 21, where the numbers 1 to 6, inclusive, represent corresponding parts of that portion of a given design represented by one of said sections Q, and the dotted line *q*′, Fig. 20, represents the path of the axis of the little roller *r*′, which determines the effective circumference of the pattern. The circumference of the turned wood W′, Fig. 21, is one-half said effective circumference of the pattern in the lathe, as shown in the accompanying drawings. The pattern may be reproduced full size or larger or smaller, if preferred. A spiral spring *s*′, Fig. 6, surrounding said rod K′ within a tubular body of the saw-slide K, tends to retract the saw and through said racks and pinions *j k l* performs the same function for the cutter C′, while through the link R³ and lever R it presses the little roller *r*′ against the pattern-surface *q*. As the pattern P rotates it is lifted, together with its shaft S¹², so as to keep the effective point of the pattern-surface *q* opposite the little roller *r*′. This is effected by a horizontal bar O, Fig. 7, at a fixed height, projecting into the spiral space between the pattern-sections Q and engaged by the latter. At the end of a given turning operation the drum D and carriage C, and therewith the feed-train, which includes the feed-shaft S⁷ and its pinion *p*′, are automatically stopped, and said lever R is automatically retracted through the medium of said slide R², so as to permit said spring *s*′ to throw the saw S′ and cutter C′ away from the wood and at the same time to clear the pattern P, which is then automatically dropped to the position in which it is shown in the drawings preparatory to the next turning operation. Such automatic adjustments of the lathe at the end of the turning operation originate at the carriage C, and the devices whereby they are effected are shown in Figs. 1 to 5, Figs. 7 to 9, and Figs. 22 to 24. Said carriage C is provided adjacent to its said slot *c* with a long slotted plate *z*, Figs. 1 and 9, carrying a depending roller *z*², the spindle of which is adjustable within the slot of said plate in an ordinary manner, and is fastened at a given point, determined by the length of the wood that is to receive the design of the pattern. In the path of said roller *z*² the main frame F is provided with a bar-incline *z*³, Fig. 24, attached to the frame at its left-hand end by a hinge *z*⁴, and provided with a rigid arm *z*⁵, which projects rearwardly against one end of a short lever *z*⁶, attached to the frame by a central fulcrum-piece *z*⁷, and pivoted at its other end to the tail of a spring-projected bolt *z*⁸, which works in a housing *z*⁹, attached to the frame. The nose of this bolt *z*⁸ engages with a notch *m* in the front of a vertical slide M, which works in central guides in the main frame F and top frame F², and is the master-slide of the automatic controlling devices of the lathe. It is held down while the turning operation is in progress by said spring-bolt *z*⁸, and when the latter is retracted through the aforesaid connections by the contact of said roller *z*² with said incline *z*³ at the end of the turning operation the slide is automatically elevated from the position in which it is shown in Figs. 2 to 5 and Fig. 9 to the position in which it is shown in Fig. 8. This is effected by a weight W through the medium of a toothed sector Y and a rack Y², the latter affixed to said slide A. Said sector has for convenience a long pivot *y*, by which it is pivoted in hang-

ers y^2, depending from parts of the frame F, and the weight W is adjustable on its lever end, being fastened in any desired position by a set-screw y^3.

To automatically stop the drum D and the carriage C when the slide M is elevated, the slide carries a belt-tightener pulley M^2, which when the slide is lowered keeps taut the belt B^3, which drives said drum, as shown in Fig. 9, and when the slide is elevated loosens the same, as shown in Fig. 8, and to hold the loosened belt the slide further carries a lever M^3, Fig. 8, carrying a roller M^4 to press the loosened belt against the belt-tightener pulley, and actuated when the slide is elevated by contact with a fixed tappet N, Fig. 8.

To retract the slide R^2 of the pattern mechanism, as aforesaid, the slide M carries at a suitable point a rearwardly-projecting U-shaped bar M^5, having a central notch m^2. This notch is occupied by a crank-pin u at the extremity of a lever-arm U, which is fast at its other end on one end of a short rock-shaft U^2, and the latter carries at its other end a lever-arm U^3, the outer end of which is connected by a link u^2 with said slide R^2. Consequently when the slide M is elevated said slide R^2 is retracted, and therewith the pattern-lever R, saw S′, and cutter C′, as aforesaid, and as soon as the pattern P is freed by the retraction of said pattern-lever R said bar O is retracted, so as to drop the pattern P, together with its shaft S^{12}. This in turn is effected by a strap-and-pulley mechanism, for example, connecting said bar O with said slide M and with a weight W^2. From the former a strap M^6 extends partly around the larger circumference of a pulley V, of two diameters, and is attached thereto. From the smaller circumference of the same a strap V^2 extends over a pulley V^3 to said weight W^2, and from said strap V^2 crossed straps v v^2 extend from opposite sides of said pulley V^3 to the bar O, which is retracted, as aforesaid, through the medium of said strap v. The sudden fall of the pattern P and its shaft S^{12} at the end of each turning operation may be cushioned by a suitable buffer adapted to admit the lower end of the shaft and containing a cushion of rubber or the like, as represented by dotted lines at B′, Fig. 5.

The operation of running back the carriage C after removing the turned wood and temporarily readjusting the tail-stock T is illustrated by Figs. 1 to 3 and Figs. 10 to 12, which see. The back-feed shaft S^8, with its clutch c^0, receiving continuous rotation in the proper direction through the pulley p^8, shaft S^9, pulley p^9, belt B^4, pulley p^{10}, shaft S^{10}, and bevel-gears b b^2, and its pinion p^0 being in constant mesh with the carriage-rack r, as aforesaid, it is only necessary to unclutch the main-feed pinion p' from its shaft S^7 and to clutch the back-feed pinion p^0 to its shaft S^8. This is effected by means of a hand-lever L′, Figs. 1, 2, and 10, through the medium of a short vertical rock-shaft N′, having a pair of arms n, which are coupled to the front ends of a pair of slides O′ O^2, the latter having in turn projections o' o^2, which engage, respectively, with the clutch-sleeves c' and c^0, Figs. 10 and 12. Consequently by moving said lever L′ to the right or drawing it outward, as in Fig. 10, the carriage C is simultaneously disconnected from the main-feed shaft S^7 and connected with the live back-feed shaft S^8, and the carriage is thus run back from right to left. Such back-feed of the carriage C is automatically arrested by devices shown in Figs. 25 to 27. These devices consist of a horizontal incline n^2, formed by a little casting attached to the bottom of the carriage C at a suitable point, and a vertical projection o on said slide O^2 by which the back-feed clutch-sleeve c^0 is manipulated. When the carriage is approaching its starting-point at the end of the back-feed, said incline n^2 coacts with said projection o and shifts the slide O^2, and therewith the clutch-sleeve c^0, so as to unclutch the back-feed pinion p^0 and thus arrest its rotation. The master-slide M is re-elevated to simultaneously start the drum D, carriage C, and pattern P and to readjust the pattern-slide O at the beginning of each turning operation through the aforesaid connections by a treadle mechanism. (Illustrated by Figs. 1 to 5, and more particularly by said Figs. 7 to 9, which see.) This is effected by depressing a treadle A, which projects at the front of the lathe, is fulcrumed at x to the frame F, and is normally elevated, as in Figs. 4 and 9, by a counter-weight W^3. The frame F is further provided with a pair of sheaves f f^2 at fixed points, and around these, as shown in Fig. 8, a cord A^2 passes from the lever of the treadle A near its front end to the slide M at a convenient point, where it is fixedly attached. Consequently when the treadle A is depressed, as aforesaid, the slide M is depressed therewith, and the parts displaced by its elevation, as aforesaid, are thus restored to their several effective positions. The slide is automatically fastened and sustained in its elevated position by the spring-bolt z^8 engaging with its notch m, as aforesaid, and the turning operation proceeds automatically, as before described.

While the pattern-sections Q are being assembled or removed from the pattern P a hand-lever L^2, Figs. 2, 5, and 19, fulcrumed to the frame F at l^2 and coupled to said clutch c^2, is released from the notch l^3 of a locking-bracket L^3 at the front of the lathe and shifted to its position represented in Fig. 19, so as to disconnect the two ends of the shaft S^{11} and adapt the bevel-gears b^5 b^6 to rotate freely with the shaft S^{12}.

A drip-supply (represented by its outlet at D′, Fig. 13) may provide in an ordinary manner for keeping the cutter C′ cool, and other like accessories may be added.

The alternative pattern P^2 (shown in Fig. 28) consists of a straight wooden bar readily cut from a board, having a pattern-surface at

one edge and connected along its other edge with a combined guide and rack-bar G, embracing a track-bar G^2, attached to the frame F, and meshed by a cog wheel G^3 carried by the pattern-shaft S^{12}. The pattern edge of the pattern P^2 engages with the little roller of the pattern-lever R and operates in the same manner as that of the pattern P.

The alternative pattern P^3 (shown in Fig. 29) consists of a single disk having a short pattern-surface on its edge. The disk is carried directly by the pattern-shaft S^{12}, by way of illustration, and its said pattern-surface coacts with the little roller of the pattern-lever R, as in the other arrangements.

Both of said alternative patterns are suitable only for short and simple designs, whereas the aforesaid spiral pattern P facilitates reproducing longer designs and provides for spreading out the design, so as to reproduce all its artistic details with nicety.

Other like modifications will suggest themselves to those skilled in the art.

Details which have not been specified may be of any approved description.

Having thus described the said lathe, I claim as my invention and desire to patent under this specification—

1. The combination, in a wood-turning lathe, of a reciprocating carriage carrying a head-stock and a tail-stock, both of which are provided with centers which carry the wood between them, and a hollow rotary drum located at a fixed point between said centers and adapted to rotate the wood as the latter is fed longitudinally therethrough, substantially as hereinbefore specified.

2. The combination, in a wood-turning lathe, of a reciprocating carriage carrying a head-stock and a tail-stock, both of which are provided with centers which carry the wood between them, and a wood-rotating drum, through which the wood is fed longitudinally by said carriage, the centers of such tail-stock being movable endwise and also into and out of line with the drum for admitting and freeing the wood, substantially as hereinbefore specified.

3. In a wood-turning lathe, a tail-stock having its base attached to the carriage and its upper portion hinged to such base at front and provided at its back with a spring-catch pivoted to the base, and with an unlocking and tilting lever pivoted to said upper portion, which also carries a screw-retracted center, substantially as hereinbefore specified.

4. The combination, in a wood-turning lathe, of a reciprocating carriage carrying a head-stock and a tail-stock, both of which are provided with centers which carry the wood between them, a wood-rotating drum through which the wood is fed longitudinally by said carriage, and a cutter or cutters movable into contact with the wood adjacent to the delivery end of the drum, substantially as hereinbefore specified.

5. In a wood-turning lathe, a rotary saw and a non-rotary smoothing-cutter movable into contact with the wood at diametrically-opposite points and carried by slides which are connected as to such movement by racks on the respective slides, and a pinion on a relatively fixed support, substantially as hereinbefore specified.

6. The combination, in a wood-turning lathe, of a pattern, a lever moved thereby, a pair of cutter-carrying slides moved in opposite directions by said lever and connected with each other as to movement, and a slide carrying the fulcrum of said lever, substantially as hereinbefore specified.

7. The combination, in a wood-turning lathe, of a pattern, a lever moved thereby, a pair of cutter-carrying slides moved in opposite directions by said lever and connected with each other as to movement, and a spring inclosed within one of said slides and tending to throw the cutters away from the work, substantially as hereinbefore specified.

8. The combination, in a wood-turning lathe, of a pattern, a lever moved thereby, a pair of cutter-carrying slides moved in opposite directions by said lever and connected with each other as to movement, a spring acting upon said slides and said lever, and a slide carrying the fulcrum of said lever, substantially as hereinbefore specified.

9. In a wood-turning lathe, a hollow wood-rotating drum having a central pulley enlargement and supported by roller-bearings which embrace its ends and comprise wheel-like rollers, the inner sides of which coact with the sides of said pulley enlargement, substantially as hereinbefore specified.

10. In a wood-turning lathe, a hollow wood-rotating drum having one or more internal ribs to coact with wood, of angular shape in cross-section, fed longitudinally through the drum, and means for so feeding the wood, substantially as hereinbefore specified.

11. The combination, in a wood-turning lathe, of a carriage moving the wood lengthwise, a hollow wood-rotating drum through which the wood passes, a movable pattern, a cutter or cutters moved by said pattern, and mechanism transmitting rotary motion from said drum to said pattern, substantially as hereinbefore specified.

12. The combination, in a wood-turning lathe, of a carriage moving the wood lengthwise, a hollow wood-rotating drum through which the wood passes, and a feed-train connecting said drum with said carriage for the effective feed, substantially as hereinbefore specified.

13. The combination of the wood-feeding carriage C, the wood-rotating drum D, driven by a belt, the rotary pattern P, driven from said drum, the stop-roller z^2, traveling with said carriage, the spring-projected bolt z^8, retracted by said roller, the master-slide M, having a notch engaged by said bolt and carrying the belt-tightener pulley M^2, and means for automatically elevating said master-slide

when said bolt is retracted, substantially as hereinbefore specified.

14. The combination of the wood-rotating drum D, driven by a belt, the main-feed train driven from said drum, the automatically-retracted bolt z^8, the master-slide M, having a notch engaged by said bolt and carrying the belt-tightener pulley M^2, and means for automatically elevating said master-slide when said bolt is retracted, substantially as hereinbefore specified.

15. The combination, with the vertically-movable master-slide M and with the belt-tightener pulley M^2, carried by said slide, of the lever M^3, its roller M^4, and the tappet N in the path of said lever, substantially as hereinbefore specified.

16. The combination, with the vertically-movable master-slide M and with the slide R^2, which carries the fulcrum of the pattern-lever, of the notched bar M^5, carried by said master-slide, the lever-arm U, engaged by said bar, and the lever-arm U^2, movable with said lever-arm U and coupled to said slide R^2, substantially as hereinbefore specified.

17. The combination, with the vertically-movable master-slide M and with the pattern-elevating bar O, of the strap M^6, attached to said master-slide, the pulley V, strap V^2, weight W^2, and straps $v\ v^2$, connecting said strap V^2 with said bar, substantially as hereinbefore specified.

18. The combination, with the vertically-movable master-slide M and means for automatically elevating the same, of the treadle A, the cord A^2, and the pulleys $f^2\ f^2$ in fixed bearings, arranged as shown, for lowering said slide at the beginning of each turning operation by depressing the treadle, substantially as hereinbefore specified.

19. The combination of the carriage C, reciprocated by rack and pinions, the independently-driven back-feed train, and means for coupling the latter to one of said pinions, comprising the clutch-slide O^2, having the projection o, and the incline n, carried by said carriage and coacting with said projection o, substantially as hereinbefore specified.

20. In combination with the carriage for moving the wood lengthwise and with a main-feed train and an independently-driven back-feed train for reciprocating the carriage, the lever L′, rock-shaft N′, slides O′ O^2, clutch-sleeves $c'\ c^0$, pinions $p'\ p^0$, and rack r, substantially as hereinbefore specified.

21. In a wood-turning lathe, a rotary pattern having its effective surface in the form of a spiral peripheral edge, substantially as hereinbefore specified.

22. In a wood-turning lathe, a rotary pattern having its effective surface in the form of a spiral peripheral edge formed by wooden segments which are fastened in a spiral groove in the periphery of the inner part of the pattern, substantially as hereinbefore specified.

23. In combination with a rotary and vertically-movable pattern having its effective surface in the form of a spiral peripheral edge, the movable bar O, coacting therewith to elevate the pattern, substantially as hereinbefore specified.

24. In combination with a rotary pattern having its effective surface in the form of a spiral peripheral edge formed by removable segments, and the shaft S^{12}, on which the inner part of such pattern is fast, the divided shaft S^{11}, connecting-gears $b^5\ b^6$, and clutch c^2, and the hand-lever L^2 and locking-bracket L^3, controlling said clutch, substantially as hereinbefore specified.

CARL ADOLPH WAGNER.

Witnesses:
J. S. MOORE,
J. M. BAILEY.