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MACHINE FOR CHANNELING TABLE LEGS.

No. 284,193. Patented Sept. 4, 1883.

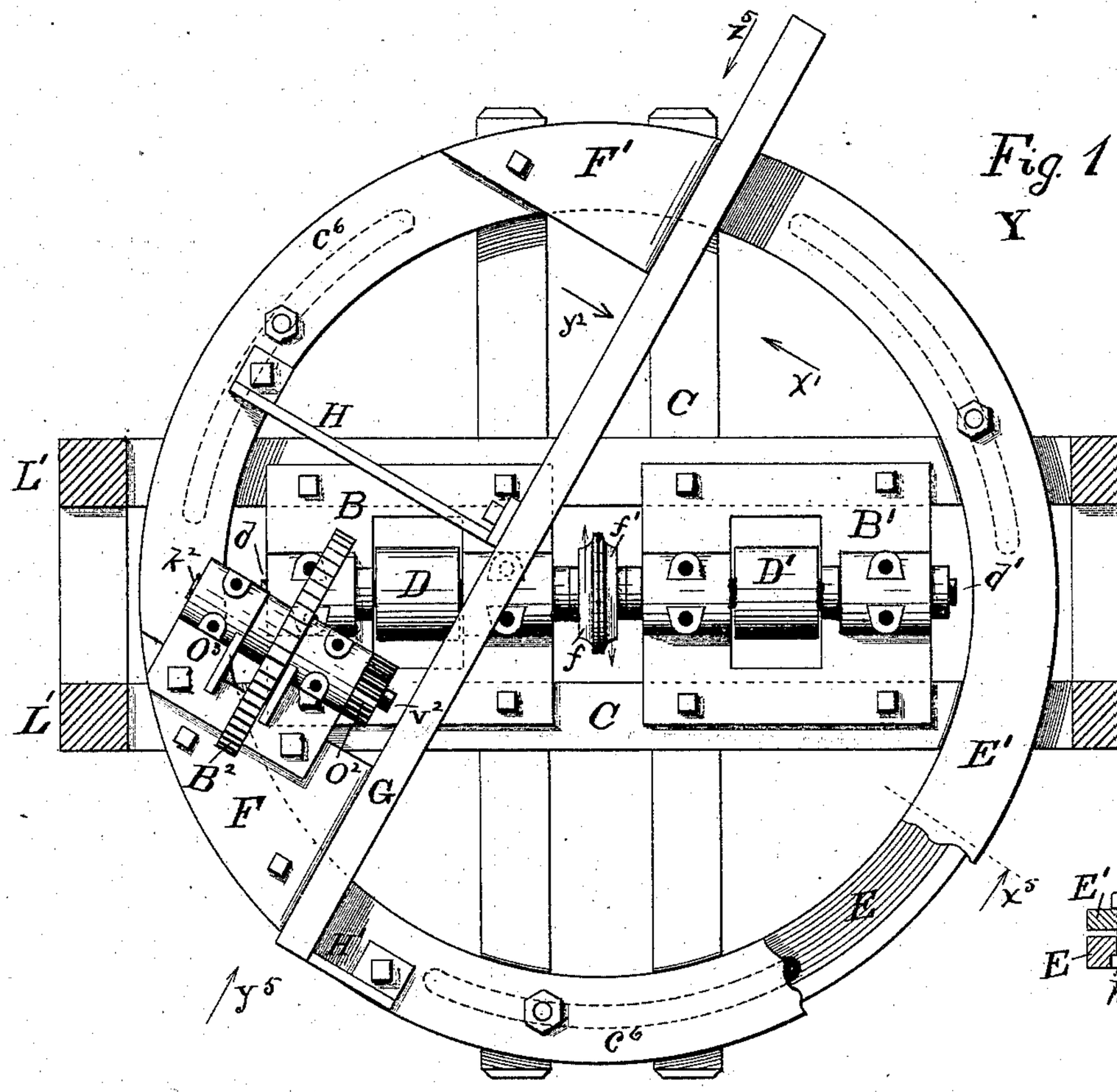

Fig. 1

Y

Fig. 13.

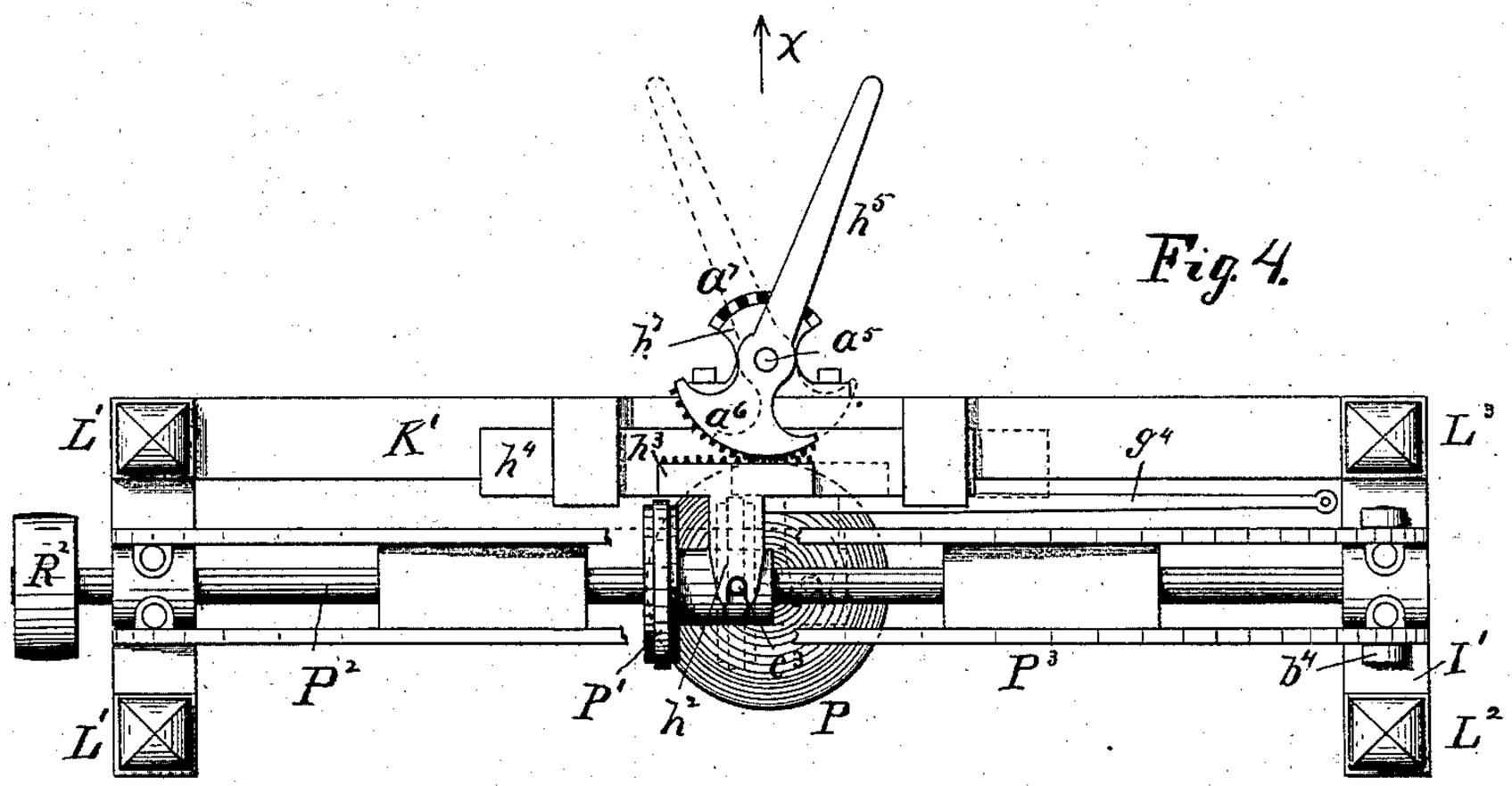

Fig. 4.

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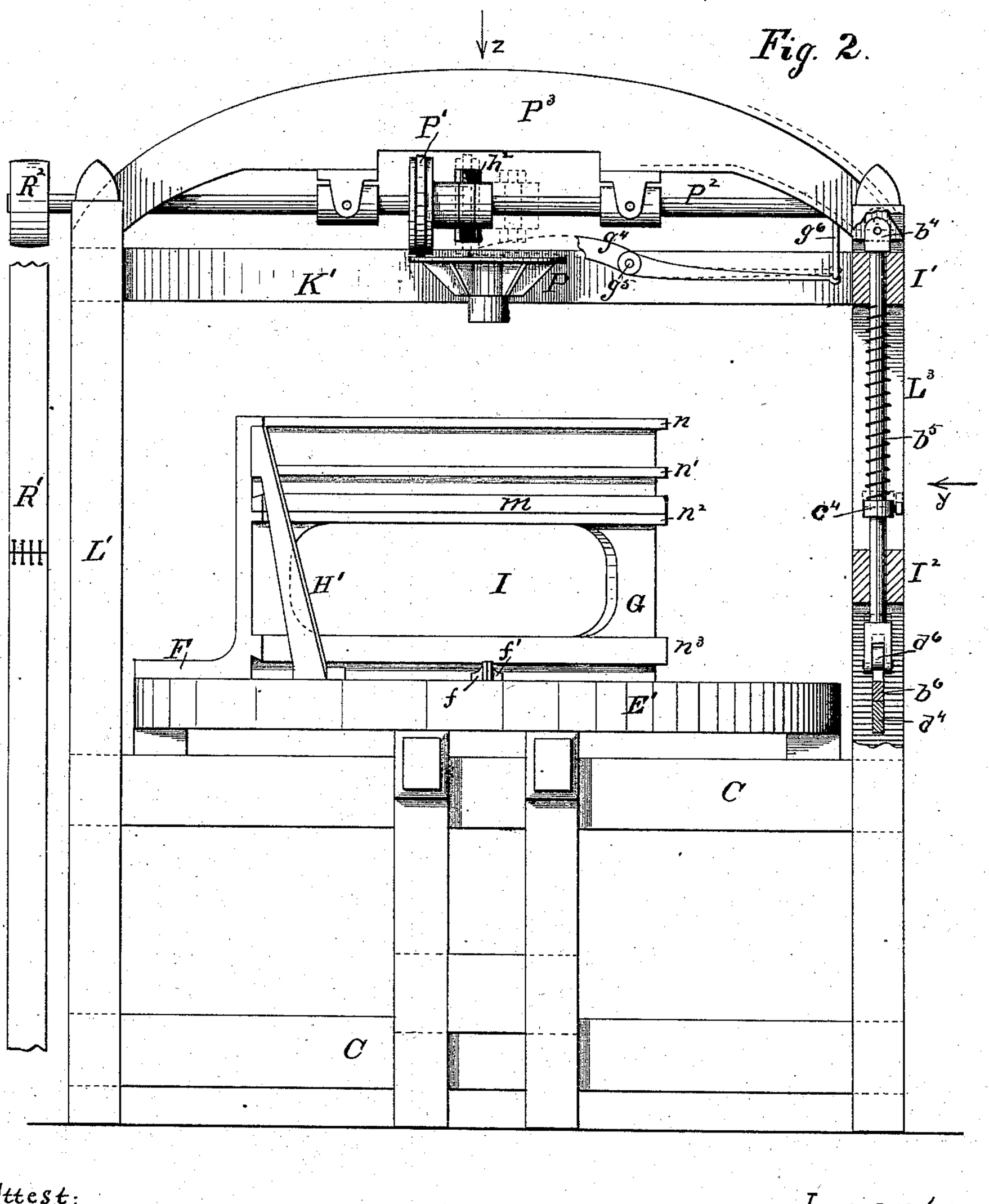
Fig. 2.



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MACHINE FOR CHANNELING TABLE LEGS.

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Fig. 3.

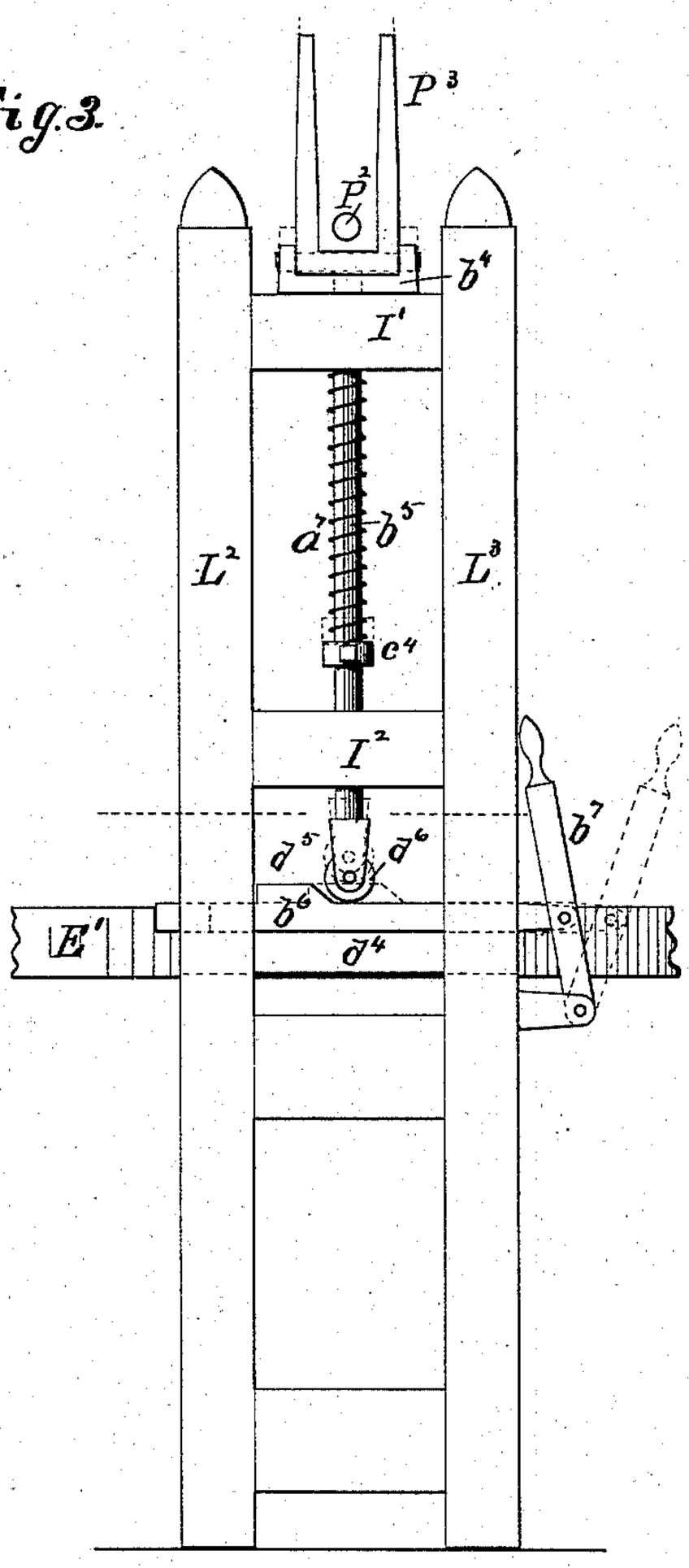
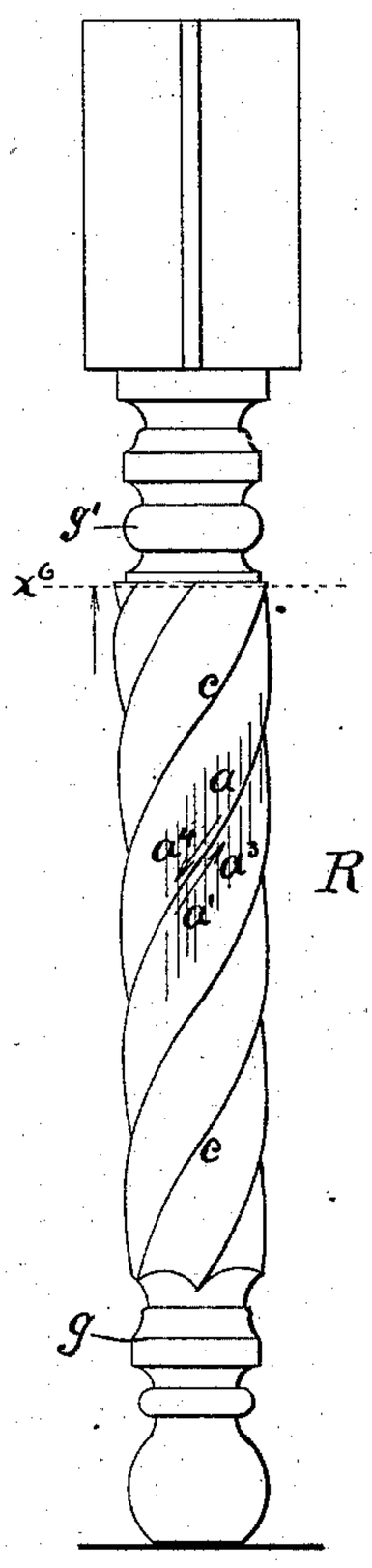


Fig. 12.



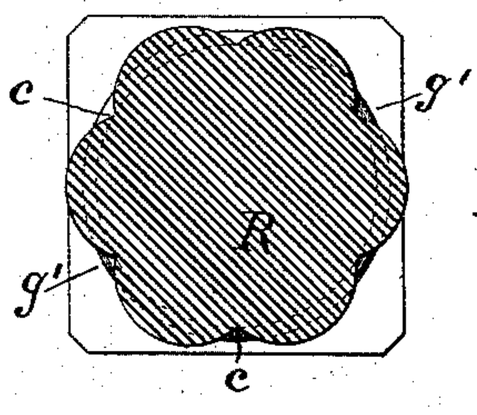


Fig. 20.

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Fig. 5.

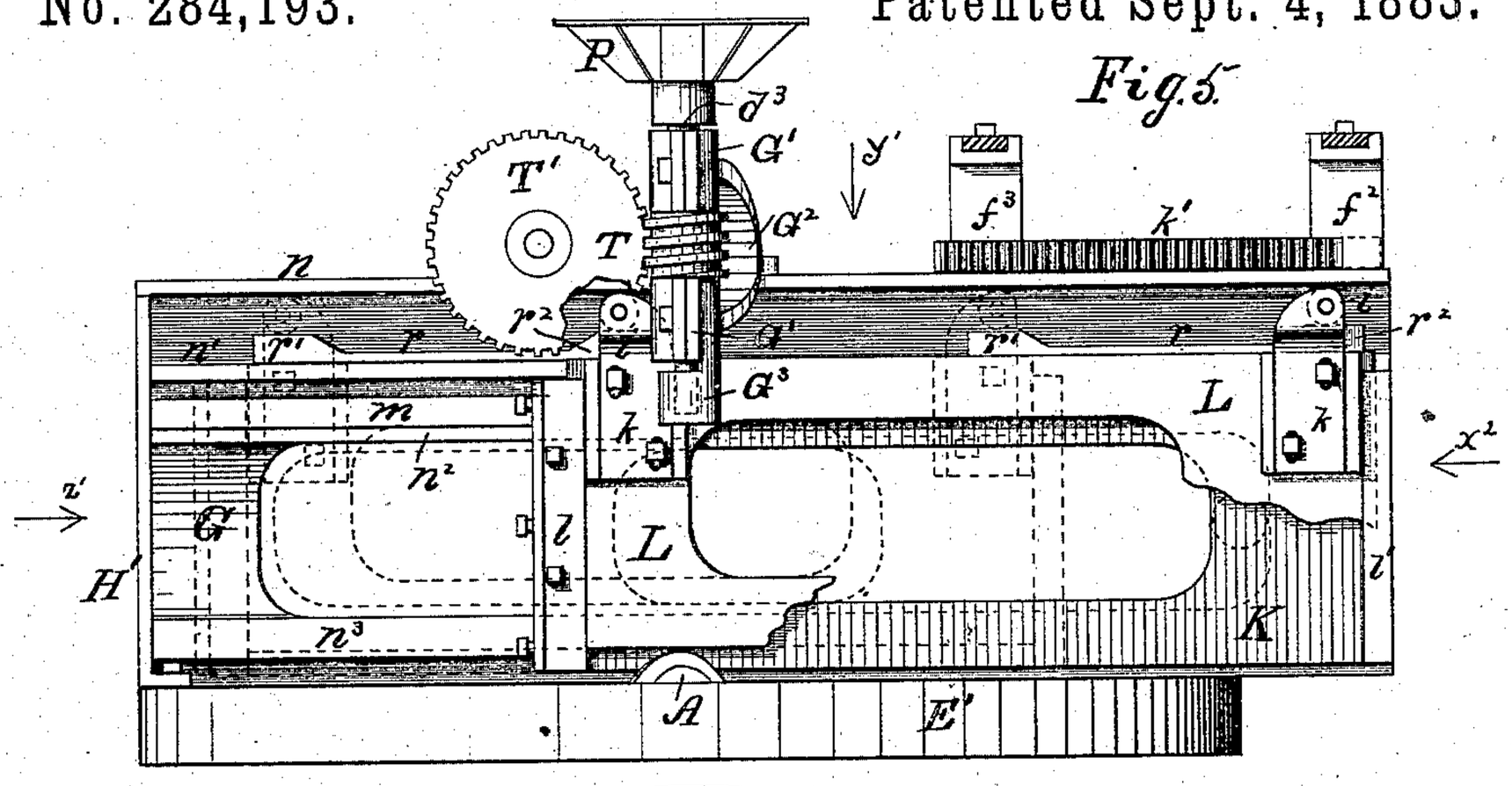

Fig. 6.

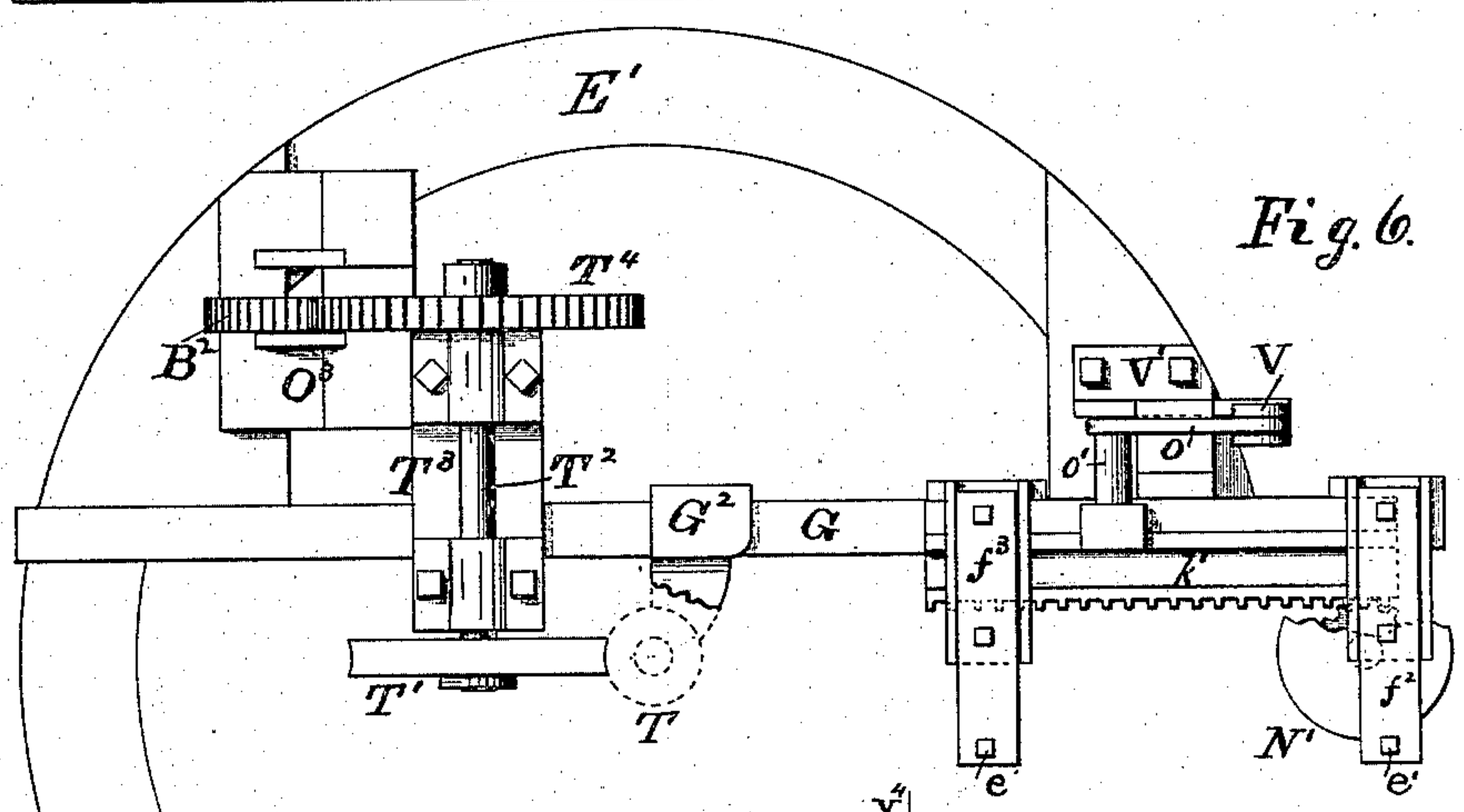

Fig. 7.

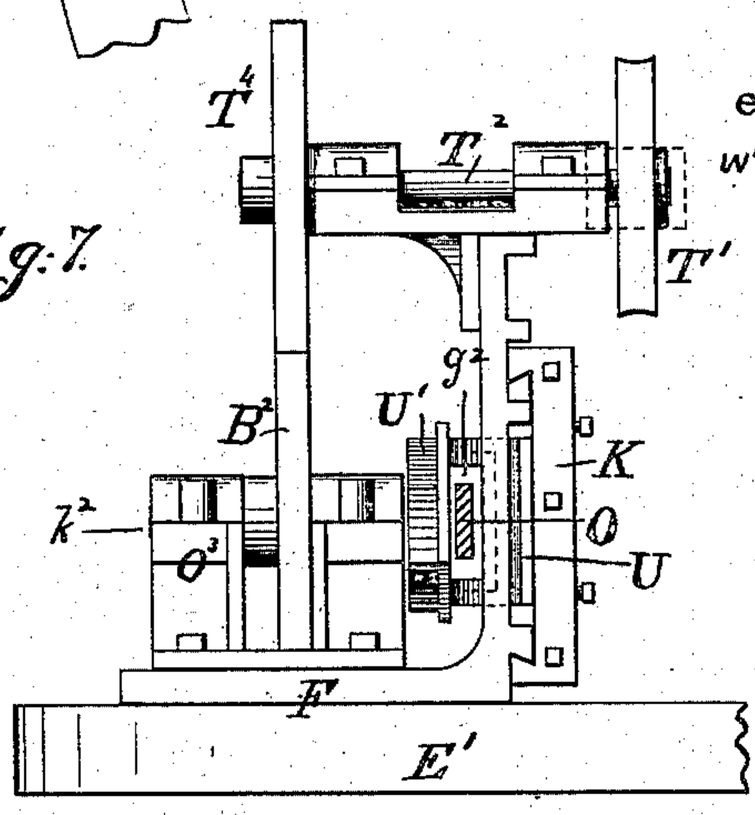

Fig. 8.

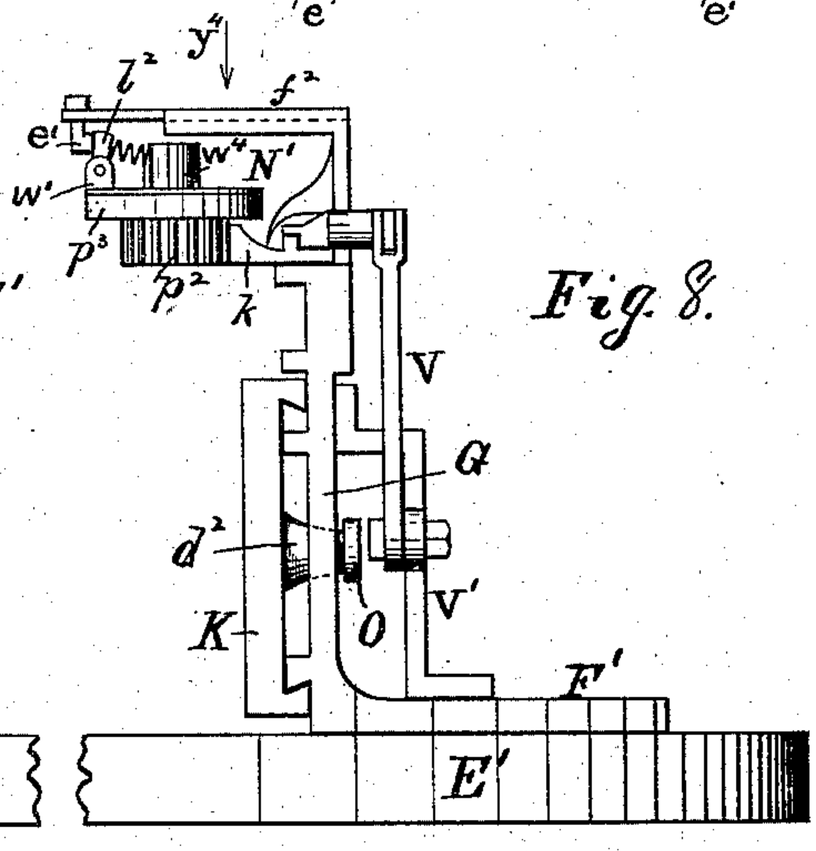

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Fig. 9.

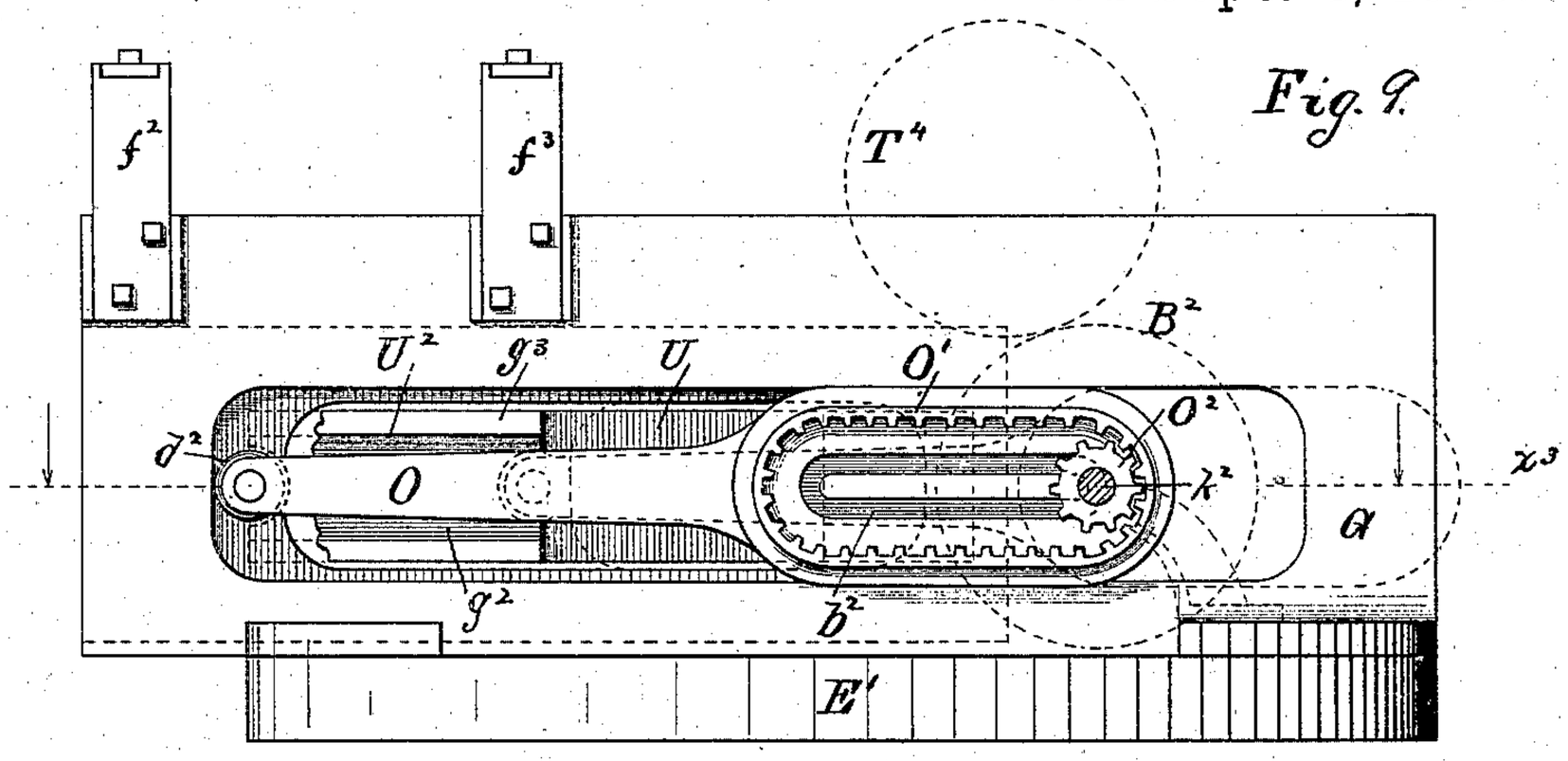
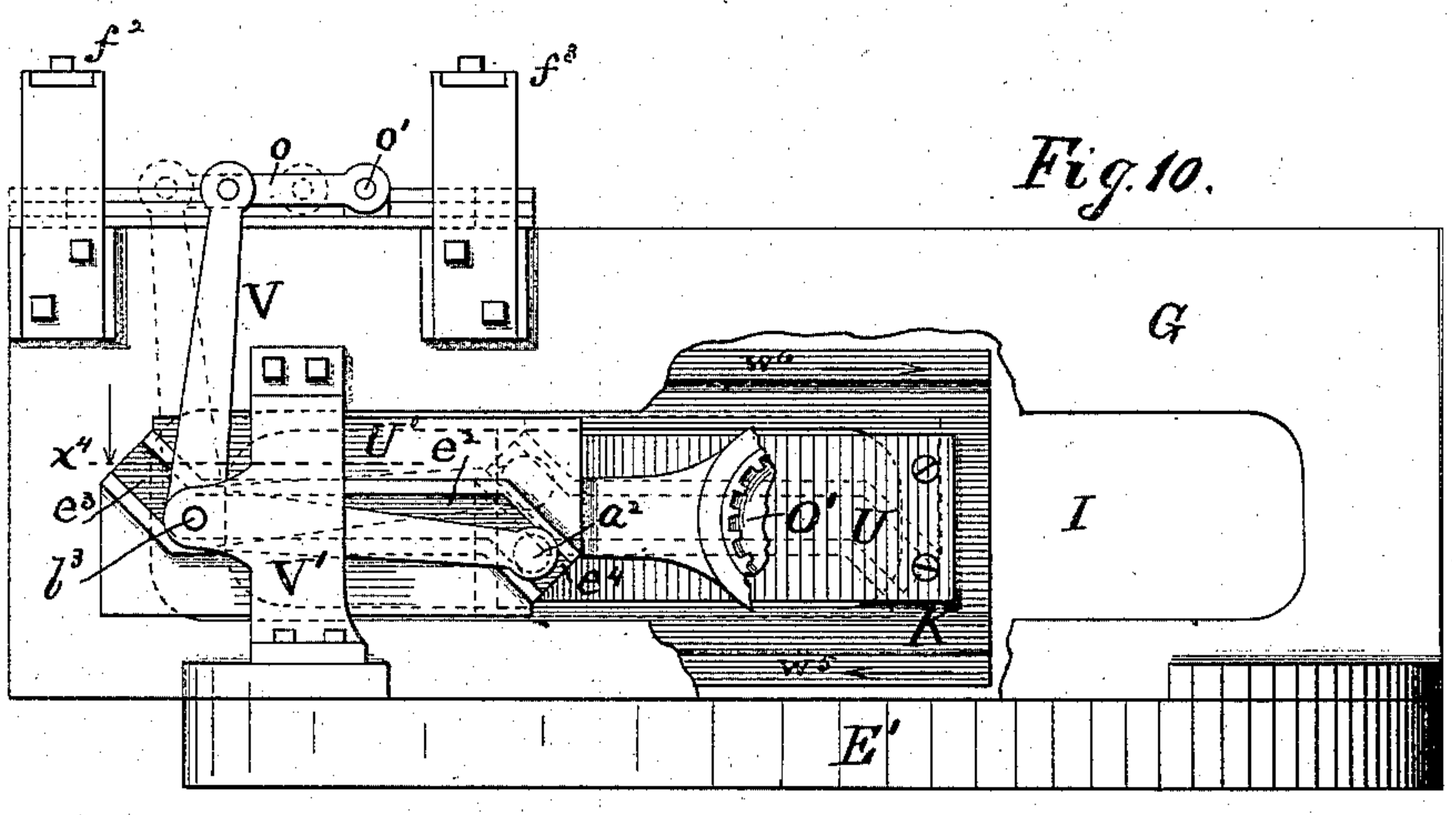


Fig. 10.



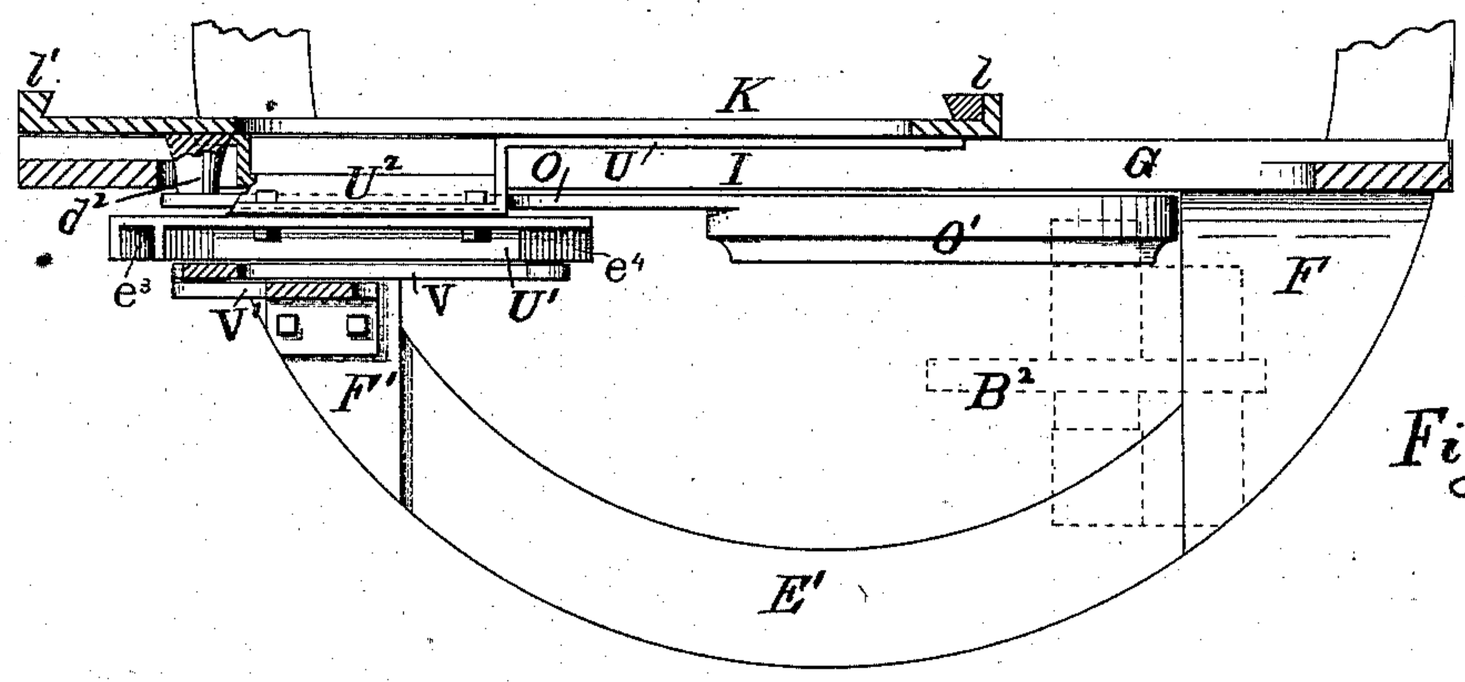


Fig. 11.

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MACHINE FOR CHANNELING TABLE LEGS.

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Fig. 14.

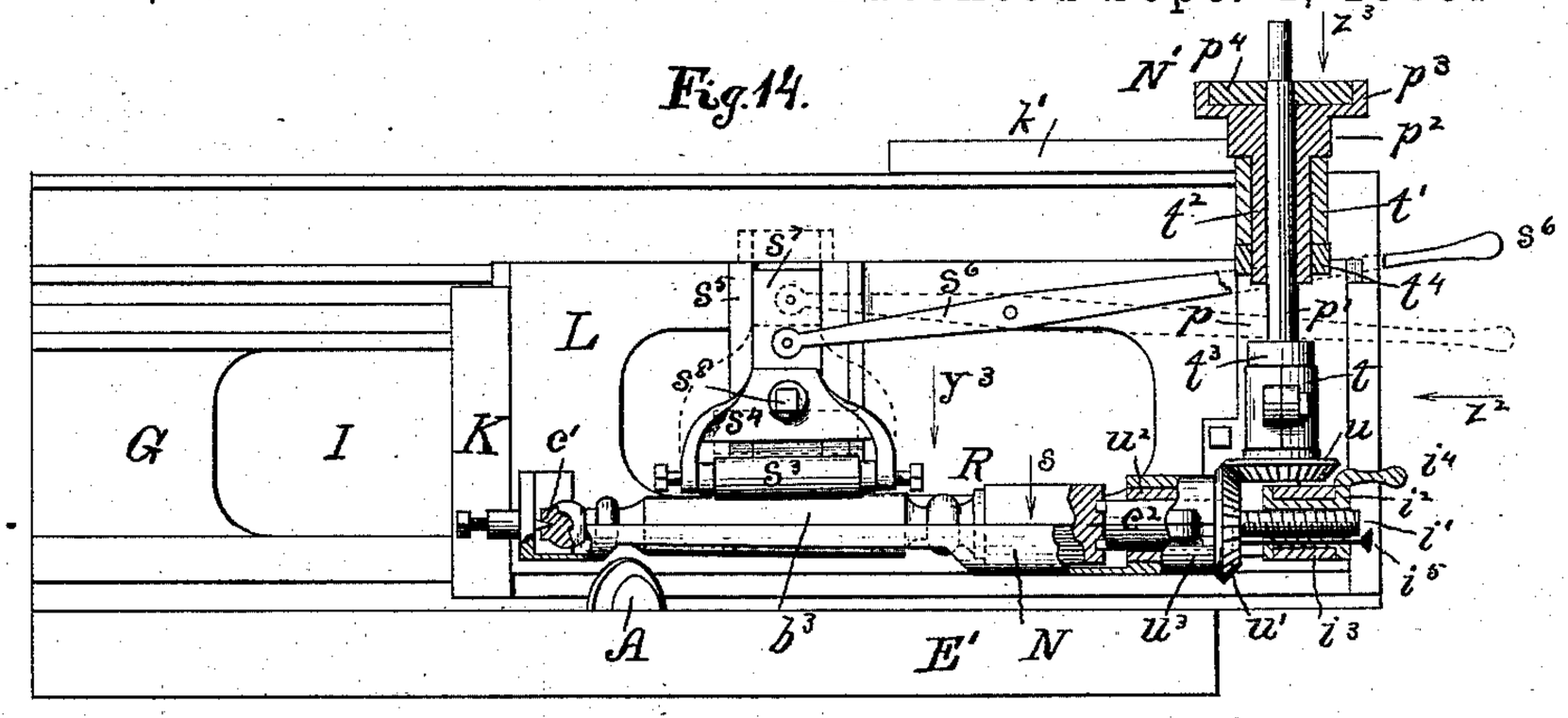


Fig. 16.

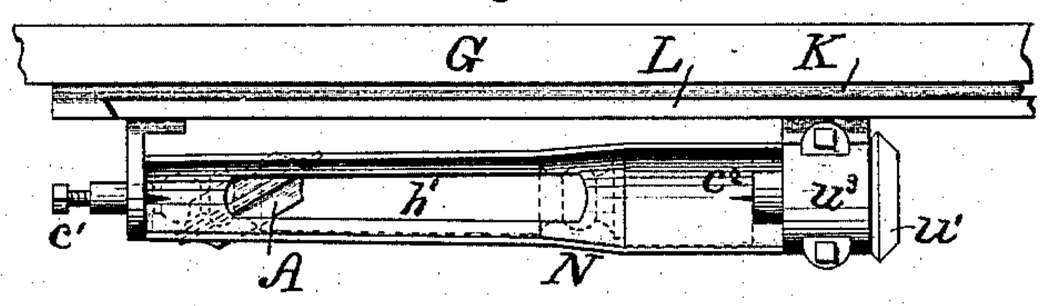


Fig. 17.

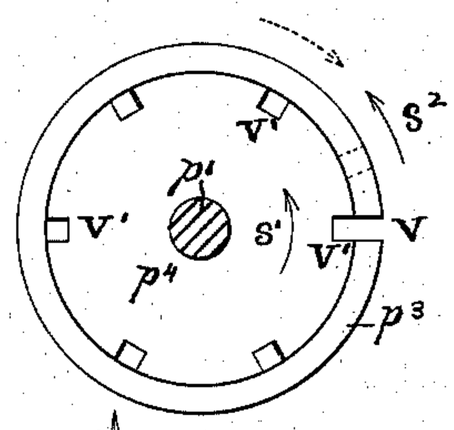


Fig. 18.

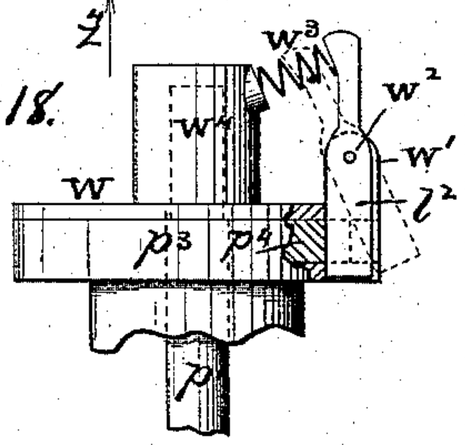


Fig. 15.

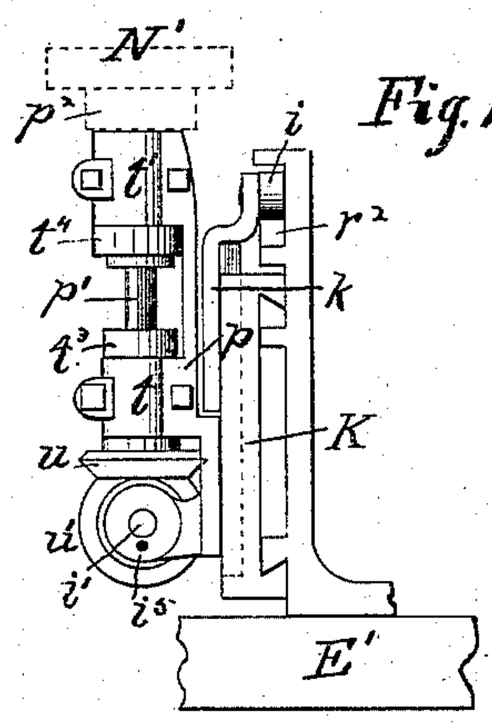
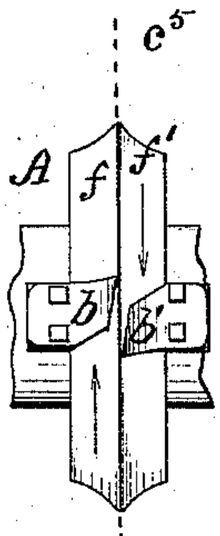


Fig. 19.



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Inventor:
H. J. Durgin
By E. B. Whitmore, Atty.

UNITED STATES PATENT OFFICE.

HENRY J. DURGIN, OF ROCHESTER, NEW YORK.

MACHINE FOR CHANNELING TABLE-LEGS.

SPECIFICATION forming part of Letters Patent No. 284,193, dated September 4, 1883.

Application filed April 18, 1883. (No model.)

To all whom it may concern:

Be it known that I, HENRY J. DURGIN, of Rochester, in the county of Monroe and State of New York, have invented a new and useful Improvement in Machines for Channeling Table-Legs, which improvement is fully set forth in the following specification and accompanying drawings.

The object of my invention is to produce a machine that will automatically form spiral beads or channels on table-legs previously turned, such as shown in Fig. 12, Sheet 3; and it consists in parts and devices combined and arranged substantially as shown in the drawings and hereinafter fully described, the same being more particularly pointed out in the claims.

Referring to the drawings, Figure 1, Sheet 1, is a plan of some of the lower parts of my newly-invented channeling-machine, showing the vertical corner-posts horizontally sectioned at a point near the upper ring of the bed, a part of the said ring being broken away to uncover the lower or base ring, many parts being omitted for the purpose of clearness; Fig. 2, Sheet 2, an elevation of the same, being a side general view of the machine, viewed as indicated by arrow x in Fig. 1, with parts omitted, parts being sectioned and broken away, other parts shown in full-line and dotted positions, and a part in perspective; Fig. 3, Sheet 3, an elevation of a part of the frame and other parts connected therewith, viewed as indicated by arrows y in Figs. 1 and 2, several parts shown in full-line and dotted positions; Fig. 4, Sheet 1, a plan of the upper parts of the machine, viewed as indicated by arrow z in Fig. 2, and from the same point in which Fig. 1 is viewed, with parts broken away and other parts shown in full-line and dotted positions, the parts beneath (shown in Fig. 1) being omitted; Fig. 5, Sheet 4, a front elevation of the fixed vertical frame secured to the upper ring of the bed, viewed as indicated by arrow x' in Fig. 1, many of the attached parts being shown, some of which are sectioned or broken away and shown occupying full-line and dotted positions, many parts being omitted for the purpose of clearness; Fig. 6, a plan of the vertical frame and part of the upper ring, with most of the parts shown in Fig. 5, all viewed as indicated by arrow y' in said latter figure, parts being broken away and many adjacent parts of the machine omitted for the sake of clearness, the view taken of the parts being the same as that of the parts shown in Fig. 1; Fig. 7, an end view of the vertical frame and parts attached, view taken as indicated by arrows z' in Fig. 5 and y^5 in Fig. 1; Fig. 8, a view of the opposite end of the vertical frame and parts connected therewith, the same viewed as indicated by arrows x^2 in Fig. 5 and z^5 in Fig. 1; Fig. 9, Sheet 5, a rear elevation of the vertical frame, viewed in an opposite direction from that in which Fig. 5 is seen, or in the direction indicated by arrow y^2 in Fig. 1, showing some of the parts attached thereat, some parts being shown in full-line and dotted positions, other parts shown in dotted position only, many parts being omitted for the purpose of clearness, and parts broken and sectioned; Fig. 10, a similar view of the vertical frame, showing other parts attached thereto, some of which parts being shown in full-line and dotted positions, and parts broken away and other parts omitted; Fig. 11, a plan of the main parts shown in Figs. 9 and 10, the vertical frame and other parts shown as being centrally and longitudinally sectioned on the dotted line x^3 in Fig. 9, with standard and bell-crank horizontally sectioned on the dotted line x^4 in Fig. 10, parts being broken away and other parts shown in dotted lines with parts omitted; Fig. 12, Sheet 3, an outline elevation of a table-leg, showing the spiral grooves to be formed by the machine herein described; Fig. 13, Sheet 1, a vertical cross-section of the upper ring and base ring, taken on the dotted line x^5 in Fig. 1, showing the form of said rings, a clamping-bolt to hold the same together being shown in place; Fig. 14, Sheet 6, a front elevation of the vertical frame, being the same view of said part as shown in Fig. 5 with various attached parts not shown in said latter figure, some of the parts being broken and vertically and centrally sectioned, and other parts shown in full-line and dotted positions; Fig. 15, a view of some of the same parts, viewed as indicated by arrow z^2 in Fig. 14, with parts broken and other parts shown in dotted lines; Fig. 16, a view of some of the parts shown in Fig. 14, viewed as indicated by arrow y^3 in the same, showing the tray for holding the blank leg in position to be chan-

neled, with the relative position of the cutter-head, the table-leg being shown in dotted lines; Fig. 17, a plan of the circular shifter, viewed as indicated by arrows z^3 in Fig. 14 and y^4 in Fig. 8, Sheet 4, with upper parts omitted to disclose the interior, the vertical shaft horizontally sectioned and a part shown in dotted position; Fig. 18, a side elevation of the shifter, viewed as indicated by arrow z^4 in Fig. 17, or in an opposite direction from that in which the same parts are seen in Fig. 8, parts sectioned and broken and other parts shown in full-line and dotted positions. Fig. 19 shows the independent oppositely-rotating cutter-heads, drawn in simple form with knives attached; and Fig. 20, a cross-section of the table-leg, taken on the dotted line x^6 in Fig. 12, and viewed as indicated by arrow in said figure. Figs. 12, 17, 18, 19, and 20 are drawn to various scales larger than those followed in making the other figures of the drawings. Figs. 1, 4, 6, 11, 16, and 17 are viewed from the same point of observation.

In manufacturing the table-legs to be channeled by this machine they are first turned in a lathe in the usual manner, the member b^3 at the middle thereof being left a slightly-tapering blank, as shown in Fig. 14, Sheet 6, upon which to receive the spiral channels *c*. (Shown in Fig. 12, Sheet 3.) The cutter-head for forming the channels I prefer to construct so as to form a channel complete while passing over the leg from one end of the blank to the other.

By observing Fig. 19, Sheet 6, in connection with Fig. 12, it will be seen that if the rotating cutter-head A were a single piece carrying the knives *b b'* in the same direction, while cutting a channel in the leg, one knife would cut favorably with the grain of the wood, while the other would cut against the grain and be liable to tear out the wood and leave one side of the bead rough, which would afterward require much smoothing with sand-paper—that is to say, if the parallel longitudinal lines *a a'* represent the grain of the timber, and the head were to turn so as to pass the wood in the direction indicated by the arrow a^3, the cutters would leave the wood smooth at *a'*, but rough on the side *a* of the channel, while if the direction of the rotation of the head were reversed, so as to move in the direction indicated by arrow a^4, the wood at *a* would be smoothly cut and at *a'* it would be left rough. To overcome this difficulty, I divide the cutter-head transversely, as if by a plane at right angles to the axis of its motion, (indicated by the dotted line c^5 in Fig. 19, Sheet 6,) and rotate the severed parts or disks *f f'* in opposite directions, as indicated by arrows in Figs. 19 and 1. These separate disks I run in close proximity, as shown, or in the places they would occupy were they together a single head, they being separated by a space that would be occupied by only a thin sheet of paper, and they are run independently on horizontal arbors *d d'*, Fig. 1, in the usual manner, said arbors resting in journal-boxes of the saddles B B', which saddles are suitably secured to horizontal timbers of the frame C. The arbors are rotated by belts upon the respective pulleys D D', leading from a convenient driving-shaft beneath the floor, said arbors being supplied with ordinary simple means for delicate longitudinal adjustment, for the purpose of bringing the cutter-heads exceedingly close together without having them touch each other and produce friction. When the disks are thus located abreast, they co-operate together to finish a channel in the work as the latter is carried against them by the sliding carriage, coming out at the end of the cuts simultaneously.

I prefer to form six spiral channels in a leg, leaving six raised beads, as shown. This is effected by carrying the leg horizontally over the cutters and back three times in succession, a channel being formed at each passage of the leg over the cutters. The position of the leg, when placed in the machine and ready to be acted upon by the cutters, is clearly shown in Fig. 14, Sheet 6. With its longitudinal motion the leg is slightly rotated, which gives to the channels a spiral form, as stated, the leg turning once around while traversing once over the cutters longitudinally.

For the sake of appearance, I prefer to form transverse raised parts or beads *g g'*, Fig. 12, Sheet 3, near the respective ends of the member b^3 of the leg, and of sufficient size to preserve the proportion of the leg. These beads are of a larger diameter than the diameter of the leg through at the bottoms of the channels, and, being near the respective ends of the blank b^3, the cutters are liable to cut into them as the said cutters come out of the cut at either end. To avoid this I have the machine constructed so as to raise the leg up from the cutters as soon as a cut is finished. When the cutters have completed one channel, the leg, by means of suitable devices, is turned quickly forward one-sixth of a complete revolution to receive the next channel. As shown in Fig. 14, Sheet 6, the leg, when ready to be operated upon by the cutters, is held between a fixed tapering point or center, *c'*, and driving spindle or center c^2 in a manner similar to that in which it would be held in an ordinary turning-lathe.

The parts and devices that enter into the make-up of this machine and necessary to operate upon the leg, as variously set forth above, I will now describe. I employ a strong iron ring, E, Fig. 1 of Sheet 1, of about five feet diameter, secured horizontally to the timbers of a suitable frame, C. (Clearly shown in Fig. 2, Sheet 2.) This ring forms a base for another similar ring, E', lying directly thereon, which latter ring carries many of the essential parts of the machine, as hereinafter described. The rings have a mutual bearing at the upper outer corner of the base-ring, as shown in Fig. 13, the same being a cross-section on the dotted line x^5 of Fig. 1, by means of which bearing the upper ring may be turned horizontally around on the base-ring to any

position of adjustment desired. Clamping-bolts *h*, passing through holes in the upper ring and circular slots c^6 in the lower ring, serve to hold the rings securely together. The rings and the saddles B B′, above described, carrying the arbors of the cutter-heads, are relatively so placed upon the timbers of the frame that the cutter-heads *f f′* shall be at the center of the rings, with their upper peripheries two or three inches above the plane of the upper surface of the upper ring.

A stiff vertical iron frame, G, (appearing in perspective in Fig. 2,) is rigidly secured by bolts to the upper ring, E′, and passes across said ring a few inches at one side of the center thereof and obliquely to the plane of the cutter-heads, said frame being provided with feet F F′ and braces H H′, secured to the ring. This frame carries a carriage, lifting-gate, the tray and centers for holding the leg, rack, pinion, gears, and many other parts, as will appear below. Said frame has an oblong opening, I, at the center thereof, and is further provided on its front face with the horizontal ribs or ledges *n n′* n^2 n^3, the last of which is dovetailed on its lower surface, as shown. A dovetailed strip, *m*, is secured to the frame G upon the rib n^2, which, together with the rib n^3, forms a parallel V-slide for a carriage, K, Sheets 4 and 6, which is constructed to slide longitudinally from end to end of the frame. Adjusting-screws (not shown) are employed to adjust the strip *m* vertically in the usual manner, to compensate for the wear caused by the sliding carriage K. This carriage is provided near its ends with vertical V-slides *l l′*, Fig. 11, Sheet 5, within which a gate, L, is fitted to slide vertically through a short distance. The gate is held up by hangers *k k*, secured thereto, provided with rollers *i i*, resting on tracks *r r* upon the rib *n′* of the frame. (See Fig. 15, Sheet 6.) The tracks *r r* have each equal and similar raised parts *r′* and r^2 at their corresponding ends, up and down the inclines of which the rollers *i i* roll as the gate is carried by the carriage forward and backward along the slides of the frame, as above stated. The dotted position of the carriage in Fig. 5 shows the same at its extreme left position, with the rollers of the hangers of the gate mounted upon the raised parts *r′ r′* of the tracks. In full lines the carriage is shown at its extreme right position, the rollers *i i* resting in this case on the raised parts r^2 r^2 of the tracks, rolling upon which raised parts draws the gate slightly up out of the carriage, as is the case when said rollers roll upon the parts *r′* at the other ends of the tracks during the horizontal reciprocations of the carriage.

In Figs. 14 and 16, Sheet 6, N is a light hollow tray for holding the leg R while being channeled, secured in a horizontal position to the face of the gate L by suitable fastenings. This tray is provided at one end with the fixed center, *c′*, and at the other with the driving-center c^2, the line of these centers being horizontal and exactly over the center of the cutter-heads *f f′* and ring E′, and when the gate is raised by the rollers *i i* mounting the parts *r′* and r^2 of the tracks *r*, as above described, the holder N will carry the leg up away from the cutters. An opening, *h′*, in the bottom of the tray permits the cutters to act upon the surface of the blank portion b^3 of the leg.

p, Figs. 14 and 15, is a suitable hanger, secured vertically to the face of the gate L, for the purpose of holding a vertical shaft, *p′*. This hanger is provided with journal-boxes *t t′*, the former of which has bearing directly upon the shaft *p′*, while the latter holds a sleeve, t^2, within which the shaft has bearing. Relative endwise motion of the shaft and sleeve is prevented by the respective ordinary collars t^3 and t^4, secured thereto. At its lower end the shaft *p′* is provided with a miter-gear, *u*, which engages a similar gear, *u′*, provided with a sleeve, u^2, the latter fitted to turn within the journal-box u^3 of the tray or holder N. The driving-center c^2 is fitted to slide longitudinally within the sleeve u^2 on an ordinary spline, (not shown,) by means of which the gear *u′* and center c^2 must rotate together; but the latter may slide endwise freely within said gear and sleeve. By the construction just described it will be understood that if the shaft *p′* be rotated from any cause the leg R will be correspondingly rotated within the tray.

The sleeve t^2 forms one and the same piece with a pinion, p^2, and circular dial-box, p^3, (see Fig. 8, Sheet 4,) which piece turns freely upon the shaft *p′*. A dial, p^4, Sheet 6, is fitted to turn freely within the hollow of the dial-box and rigidly secured to the shaft *p′*, turning with it. The dial-box has an opening, *v*, formed in its outer edge, and the dial has corresponding openings or notches, *v′*, formed at regular intervals around its periphery. If a notch of the dial be brought to meet the opening *v* of the dial-box and a body filling the two be inserted therein, the dial and dial-box will be thereby locked together, on account of which the pinion, shaft, driving-center c^2, and other parts will either stand or rotate together, as the case may be. A rack, *k′*, lies upon the upper rib, *n*, of the frame G in position to engage the pinion p^2, and when the carriage K is reciprocated, as above stated, the pinion will be rotated in one direction or the other and cause the leg R to rotate or not, according to whether the dial and dial-box are locked together, as above stated.

The carriage K, with the gate and other parts attached, is moved forward and backward along the vertical frame by a vibrating arm, with internal gear and pinion, moving in rear of the frame G. (Shown in Sheet 5.) O is the said vibrating arm, connected at its small end to the carriage by means of a stud, d^2, projecting from the rear surface of the carriage back through the opening I in the frame. At the other end this arm is made broad, and formed with an internal oblong gear, O′, within which works a pinion, O^2, the rotation of which latter causes the cogs of the gear to

traverse the pinion, giving to the arm a longitudinal reciprocal motion. The pinion O^2 is secured at the end of a short horizontal shaft, k^2, (see Sheets 1 and 4), resting in the bearings of a stand, O^3, bolted to the foot F of the frame, said stand being shown in dotted lines in Figs. 9 and 11. A channel, b^2, having parallel sides and circular ends formed in the vibrating arm O, within the line of cogs of the gears O′, and parallel therewith, traverses a reduced part, v^2, of the shaft k^2, Sheet 1, projecting beyond the pinion as the arm is carried around, which serves to keep the teeth of the gear and pinion at all times in cog. Motion is communicated to the shaft k^2 from a friction-disk, P, Sheets 1 and 2, acted upon by a suitable friction-driver, P′, secured to a shaft, P^2, the latter resting horizontally in bearings of a supporting-arch, P^3, at the top of the corner-posts L′ L^3 L′ L^2 of the frame C. A belt, R′, running upon the pulley R^2 from some suitable source, gives motion to the shaft P^2. The disk P is secured at the upper end of a vertical shaft, d^3, rotating in journal-boxes G′ G′ of a hanger, G^2, secured at the top of the frame G. The foot of this shaft rests in a step, G^3, and the boxes G and step are held by the hanger G^2 sufficiently far from the face of the frame to allow the gate, with its hangers k, to pass back of the same, as indicated.

A worm, T, Sheet 4, is secured to the shaft d^3, the threads of which engage the teeth of a worm-gear, T′, secured to a shaft, T^2, the latter resting horizontally in journal-boxes of a saddle, T^3, secured across the upper edge of the frame G. At its opposite end the shaft T^2 is provided with a gear, T^4, which connects with the gear B^2 of the shaft k^2, to rotate the latter. Thus it will be seen that the friction-driver P′ furnishes power to all of the automatically-moving parts of the machine except the cutters, and that by means of said driver and the intermediate gearing the leg R is carried longitudinally forward and backward over the cutters, or fed against the same, and at the same time caused to rotate. This compound motion of the leg gives to the channels a spiral form, as shown. When one channel has been formed upon the leg, the latter is turned forward or shifted to receive the next channel by means of a shifter, N′, Sheets 4 and 6, which shifter consists of the dial-box p^3 and dial p^4, already described, a locking-latch, l^2, and other combined parts. A circular cap, w, is secured to the upper side of the dial-box covering the dial. This cap is provided at its outer edge with a vertically-projecting part, w', to which the latch l^2 is pivoted at w^2 in position to have its lower end enter the opening v of the dial-box, and also a notch v' of the dial when one of the latter is presented. A spring, w^3, having its ends bearing, respectively, against the latch above the pivot and a raised portion, w^4, of the cap, tends, by expansion, to force the lower end of the said latch into the notches v' whenever either one is brought to correspond to the openings v of the box. When the latch occupies the notch v', the dial and dial-box are mutually locked, as above stated, and must rotate together; but should the latch be lifted from a notch v' and the dial-box turned to allow said latch to occupy another notch, the leg R will be caused to turn an equal distance upon its centers, (the gears u and u' being equal.) The latch is thrown out of a notch v' at each end of every cut by means of trips e e', one of which being encountered by the latch as it arrives thereat. The trips are held in position by simple adjustable brackets or vertical arms f^2 f^3, reaching from the back of the frame G. The number of notches in the dial determines and is equal to the number of channels cut on the leg, and during the time the cutters are operating the latch occupies a notch of the dial and the pinion p^2 is rolling regularly along the rack. As above stated, I prefer to form six channels in the leg, and have therefore six notches in the dial, and to shift the latch from one notch to the next it is evident the pinion must roll along the rack to the amount of at least one-sixth of a complete revolution after the cutters have ceased cutting at either end of a channel. This makes the travel of the carriage greater than is desirable, and I provide means to avoid it. This is done by accelerating the rotation of the pinion at each end of the cut by sliding the rack k' endwise for a short distance in an opposite direction from that in which the carriage is moving at the time. The rack is not held rigidly to the frame, but rests in bearings within which it may be slid longitudinally, which is done by the following means: A plate, U, Sheets 4 and 5, is secured rigidly to the back surface of the carriage K, formed with a bend or parallel offset part, U^2, extending back through the opening I in the frame G. This part U^2 is divided, so as to make room for the vibrating arm O, the sides g^3 of the divided part projecting slightly beyond the back surface of said arm. A channel-plate, U′, is secured to the parts g^3, leaving space g^2, Fig. 7, back of it for the vibrating arm to move freely. It is to be borne in mind that the plate U and channel-plate U′ are carried forward and back with the carriage and vibrating arm, the bent part U^2 of the plate U moving along in the space I of the frame G as the carriage reciprocates. The channel-plate is formed with a horizontal channel, e^2, having one end, e^3, turned abruptly upward and the other end, e^4, turned abruptly downward. A bell-crank, V, having a horizontal and vertical arm, is pivoted at l^3 to a standard, V′, bolted to the frame G, said bell-crank being hung in such a position that it shall move in a vertical plane, with its horizontal arm parallel with the channel-plate in front of the channel e^2, the pivot-point l^3 being about on a line with the horizontal part of the channel e^2. The horizontal arm of the bell-crank is supplied at its extreme end with a roller, a^2, turning on a horizontal stud of the arm, in position to traverse the channel e^2 as the channel-plate is

reciprocated. At its upper end the bell-crank is connected to the rear side of the rack k' by means of a link, o, and stud o'. Now, while the roller a^2 is traversing the horizontal part of the channel no motion of the rack will occur; but when said roller enters either the upturned or downturned end of the channel the rack will be moved to the right or left, as the the case may be, in its bearings on the frame.

The drawings show the parts in their respective positions when the carriage is at its extreme right position on the frame, and from Fig. 10 it will be seen that the rack is moved by the bell-crank intermittingly, and only when the carriage is approaching the end of its motion in either direction, or for a short distance after starting therefrom, and always in the opposite direction from that in which the carriage is moving. This gives to the pinion p^2 a temporary accelerated rotation one way and the other for the purpose of shifting the latch l^2 quickly from one notch in the dial to another, as above stated, during a comparatively short travel of the carriage, which is desired. To follow the movements of the parts more closely, when the carriage K is approaching the end of its motion in the direction indicated by arrow w^5—that is, to its right-hand position when viewed from in front—and the roller a^2 is moving downward in the bend e^4 in the channel, the rack will move in the opposite direction and accelerate for a brief interval the motion of the pinion and the leg, the former in the direction indicated by arrow s^2, Fig. 17, and the latter in the direction indicated by arrow s in Fig. 14. When the carriage commences to return in the direction indicated by arrow w^6, the roller will move up the bend e^4 and briefly accelerate the motion of the pinion in the opposite direction. The cutters operate only when the roller is moving along the horizontal part of the channel, holding the rack motionless. When a leg is put in the machine, the carriage is about at its extreme right-hand position, as shown in Fig. 14, the cutters beginning to operate in each case at the small end of the leg. Now, if in viewing said figure, as a matter of convenience it be supposed that the leg has passed over the cutters and returned, the cutters just emerging from the channel, and the carriage continuing its motion, then the operations of the bell-crank, rack, pinion, &c., just above described, are about to commence. The accelerated motion given the pinion by the roller moving down the bend e^4 turns the dial-box and dial rapidly in the direction indicated by arrow s^2 a little more than one-sixth around, turning the leg also a corresponding distance in the direction pointed by arrow s, bringing it about in position to receive the next channel. At this juncture the latch l^2 is thrown out of the notch of the dial by encountering the trip e', and when the carriage returns, the roller, moving up the bend e^4, causes the dial-box to reverse its motion quickly, but without moving the dial, the latter, with the leg, remaining stationary until the latch reaches and drops into another notch of the dial and again controls the rotary motion of the leg in time to receive the cutters for a new channel. The intermittent motion of the dial from the shifting of the latch is in the direction indicated by arrow s', and that of the leg in the direction pointed by arrow s. The rate of the accelerated motion of the pinion depends upon the angle of the bends e^3 and e^4.

The operation of the shifter is the same at both ends of the cut. In order to do the shifting at the ends of the cuts, it is necessary for the carriage to move such a distance along the frame after the cutting has ceased that the beads g and g' of the leg are carried over the cutters and liable to be marred. To make said beads so small as to clear the cutters, or to place them so far away from the ends of the blank b^3 as not to be reached by the cutters before the shifting is done, would destroy the symmetry of the leg and much injure its appearance. I give to them each such a diameter as will preserve the form of the leg and save them from being marred by the cutters by raising the gate L, as above described. By referring to Fig. 20, Sheet 3, it will be seen that the crown of the bead g' is above the bottom of the channels and in danger of being marred by the cutters, unless provided against, as set forth. As the gate is raised and lowered the teeth of the pinion p^2 slide up and down in the teeth of the rack.

The driving-center c^2 is provided with a threaded stem, i', passing back through a sleeve-nut, i^2, fitted to turn in a journal-box, i^3, projecting out from the face of the gate L. The sleeve-nut has a handle, i^4, by means of which it may be turned one way or the other to move the center c^2 longitudinally toward or from the leg. A pin, i^5, is caused to pass longitudinally through the substance of the sleeve-nut and enter a hole in the end of the gear u', to lock said sleeve-nut and gear together during the operation of the cutters upon the leg. When both turn together, no longitudinal motion of the center within the sleeve can take place.

A pair of parallel rollers, s^3, are caused to rest longitudinally and bear down upon the leg when in the machine, to counteract the upward pressure against the leg, due to the action of the cutters. These rollers are held in a hanger, s^4, secured to a slide, s^7, which latter is fitted to slide vertically within V-ways s^5, upon the face of the gate. A simple lever, s^6 pivoted to the gate, enables the attendant to operate the rollers at pleasure. The hanger is held to the slide s^7 by means of a pivot-bolt, s^8, upon which it may freely turn to allow the rollers to adjust themselves to the taper of the leg.

It will be understood that the rate of speed of the disk P, Sheets 1 and 2, and consequently that of the parts driven thereby, may be increased or diminished by causing the friction-driver P′ to act at a point nearer to or farther

from the center of said disk, the shaft P^2 moving at a uniform rate. For the purpose of varying the speed, the driver P′ is provided with a long hub and fitted to slide freely on a spline upon the shaft. A clutch, h^2, spanning the hub and acting upon pins c^3 projecting therefrom, is provided, the rear part of which is formed into a toothed rack, h^3, and secured to a sliding bar, h^4, fitted to slide in bearings upon an upper timber, K′, of the frame C. A lever h^5, pivoted at a^5 to a bracket, h^7, secured to the timber K′, is formed with a concentric toothed segment, a^6, adapted to act upon the rack, as shown. A concentric notched arc, a^7, under the lever assists to hold the latter in positions of adjustment, a simple catch upon the under surface of the lever (not shown) being fitted to enter the notches of the arc.

All the moving parts of the machine driven by the driver P′ have to be stopped when a leg is to be taken out of or inserted in the machine. This is quickly and conveniently accomplished by simply lifting the driver off the disk P. For this purpose the arch P^3 is constructed to slightly tilt on the frame-timbers, as indicated by dotted lines, carrying the shaft P^2 and driver with it. The arch at the right-hand end, as appearing in Fig. 2, rests within jaws b^4 of a vertical rod, b^5, fitted to slide vertically through the cross-timbers $I' I^2$ of the frame C. (Shown clearly in Fig. 3.) A sliding piece or lifter, b^6, is fitted in mortises through the posts L^2 and L^3 of the frame, to slide horizontally therein, a simple lever, b^7, being connected to the said lifter to operate the same. The lifter is further supported by a bar, d^4, fixed in said posts, which may be separated from the lifter by friction-rollers. The lifter has a raised part, d^5, upon its upper edge, and the rod b^5 is supplied at its lower end with a roller, d^6, arranged to roll on the edge of the lifter when the latter is moved endwise by the lever. When the lifter is moved in a direction to bring the part d^5 under the roller, the latter will roll up the incline and raise the arch a short distance, sufficient to raise the driver P′ off the disk P, for the purpose above stated, without stopping the shaft P^2. A spiral spring, a^7, on the rod, tending to expand between the cross-timber I′ and an adjustable collar, c^4, of the rod, acts with the weight of the arch to hold the driver P′ firmly against the surface of the disk P while the machine is operating. After the driver P′ has been raised from the disk P, as above stated, the momentum of the moving parts tend to carry them on for a short distance. To prevent this and to cause the parts to stop immediately upon raising the driver, I employ a simple automatic brake, g^4, to press upon the surface of the disk as soon as the driver is raised therefrom. This brake is in the form of a lever pivoted at g^5 to the timber K′ of the frame. The farther end of the lever is connected by means of a rod, g^6, to the arch near the end at which the latter is lifted, the lifting of which causes the short end of the lever to press down upon the disk, as will be readily understood from inspecting Fig. 2. The short end of the lever, where it rests upon the disk, is made broad and faced with leather or other suitable substance. When the arch is brought down, the brake will in consequence be raised from the disk.

In operating the machine, the attendant stands at the point indicated by Y in Fig. 1, the operating-handles all being brought in convenient reach therefrom. The rollers *i i* of the gate roll along the straight horizontal parts of the tracks *r r* during the time the cutters are acting on the leg. The raising of the gate takes place immediately after the cutters cease cutting at either end of the blank, and the lowering of the gate ceases just before the cutters strike into the timber at the commencement of a cut. The raising and lowering of the gate take place simultaneously with the moving of the rack and shifting of the leg.

It is not new in wood-working machinery to employ independent cutter-heads operating simultaneously on the same piece of work and rotating in contrary directions; nor is it new in such machinery to seasonably raise the work out of reach of the cutters by automatic means, or to automatically turn the work on its centers while being carried longitudinally against the cutters for the purpose of giving it a spiral form. Such features of construction and operation I do not claim, broadly.

I claim as my invention—

1. In a machine for forming spiral channels in table-legs and similar work, a cutter-head composed of two disks severed by a plane transverse to the axis of motion of the head, said disks being each provided with knives and turning in opposite directions on suitable shafts, and co-operating to complete, simultaneously, a channel in the work, substantially as set forth and shown.

2. In a machine for forming spiral channels in a table-leg, a cutter-head composed of two disks severed by a plane transverse to the axis of motion of the head, said disks being each provided with knives and turning in opposite directions on suitable shafts, and co-operating to complete, simultaneously, a channel in the work, with automatic means to turn the work on its centers while being acted upon by the knives, substantially as specified.

3. In a machine for forming spiral channels in a table-leg and similar work, a cutter-head composed of two disks severed by a plane transverse to the axis of motion of the head, said disks being each provided with knives, and turning in opposite directions on suitable shafts, and co-operating to complete, simultaneously, a channel in the work, with automatic means to shift the work at the end of each cut into position to receive a new channel, substantially as set forth.

4. The combination, in a table-leg-channeling machine, of a sliding carriage carrying a holder and driving-center for the work, and a

shaft connected with the driving-center by means of suitable gearing, said shaft being provided with a pinion working against a movable rack, with means to give the latter intermittent motion in a direction contrary to that in which the carriage is moving, substantially as and for the purpose set forth.

5. In a machine for forming spiral channels in a table-leg, the vertical shaft p', secured to a horizontally-moving part or body, and provided with a pinion, p^2, and a movable rack, k', to rotate the pinion as the shaft is carried along horizontally, with means to move the rack intermittingly, substantially as set forth.

6. The combination, in a table-leg-channeling machine, of a driving-center for the work, provided with an externally-fitting sleeve, the latter fitted to turn within a journal-box of the sliding frame or carriage, said driving-center having a reduced part or stem provided with a screw-thread, and a screw-nut for the stem, fitted to turn in a bearing attached to said sliding carriage, in line with the said journal-box, by means of which said driving-center may be given endwise or longitudinal motion, and means to lock said sleeve and nut together so both shall turn together, and means for operating them, substantially as shown and set forth.

7. In a table-leg-channeling machine, the vertical shaft p', with dial p^4 secured thereto, and sleeve t^2, fitted to turn upon said shaft, and provided with a pinion, p^2, and dial-box p^3, inclosing said dial, in combination with rack k', to turn the pinion, and means to lock said dial and dial-box, so that both shall move together, substantially as described and shown.

8. In a table-leg-channeling machine, the combination of a tilting arch or part carrying a driving-shaft provided with a friction-driver, and a friction-disk secured to a vertical shaft held to the frame of the machine, and provided with a worm engaging the teeth of a gear secured to a horizontal shaft held by the frame, and connected by means of suitable gearing with the vibrating arm attached to and moving the sliding carriage carrying the leg to be channeled, with means to tilt the arch, substantially as and for the purpose set forth.

9. In a table-leg-channeling machine, the combination, with frame-timbers and tilting arch or part supported thereon, of a rod for tilting the arch, provided with a spiral spring for holding the arch down upon its bearings, and a lifter beneath the rod for the purpose of moving the latter up or down, with means to operate said lifter, the said tilting arch carrying a shaft provided with a friction-driver operating upon a disk secured to a vertical shaft held to the frame of the machine, and provided with a worm caused to engage the teeth of a gear secured to a horizontal shaft of the frame, and connected by suitable gearing with the sliding carriage carrying the work, with means to adjust the friction-driver longitudinally upon the shaft for the purpose of regulating the speed of the disk, substantially as described.

10. In a machine for forming spiral channels in table-legs, the combination of a cutter-head composed of two disks severed by a plane transverse to the axis of motion of the head, said disks being each provided with knives and turning in opposite directions, with a base-ring secured to the frame-timbers and an upper ring resting adjustably on the base-ring, the upper ring supporting a rigid vertical frame upon which the sliding carriage reciprocates, carrying the tray or holder for the work and other parts, with means to secure said rings rigidly together, by means of which adjustability of the upper ring the spiral channels may be given different rates or degrees of twist, substantially as set forth and shown.

11. The combination, in a machine for forming spiral channels in table-legs, of a cutter-head composed of two disks severed by a plane transverse to the axis of motion of the head, said disks being provided with cutters and rotated in opposite directions, with a base-ring secured to the frame-timbers and an upper ring resting adjustably on the base-ring, the upper ring supporting a rigid vertical frame upon which the sliding carriage reciprocates, carrying the centers for holding the work in such position that the line of the centers shall cross the axis of motion of the disks over the point at which said axis pierces the plane dividing said disks in all positions of adjustment of the said upper ring, substantially as set forth and shown.

12. In a machine for forming spiral channels in table-legs and similar work, a cutter-head composed of two disks severed by a plane transverse to the axis of motion of the head, said disks being each provided with cutters and rotating in opposite directions on suitable shafts, and co-operating to complete, simultaneously, a channel in the work, in combination with a suitable holder for the work and means to feed the latter against the cutters, substantially as set forth.

13. A machine for forming channels in table-legs and similar work, having two contrary rotating cutter-heads provided with knives acting together to form and complete simultaneously a single and the same channel or groove in the work, in combination with a holder for the work and an automatic reciprocating feed to carry the work against the cutters from either direction, and automatic means to adjust the work for a new channel, so that a channel may be formed and completed each time the work is carried by the cutters by said automatic feed, substantially as set forth and shown.

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