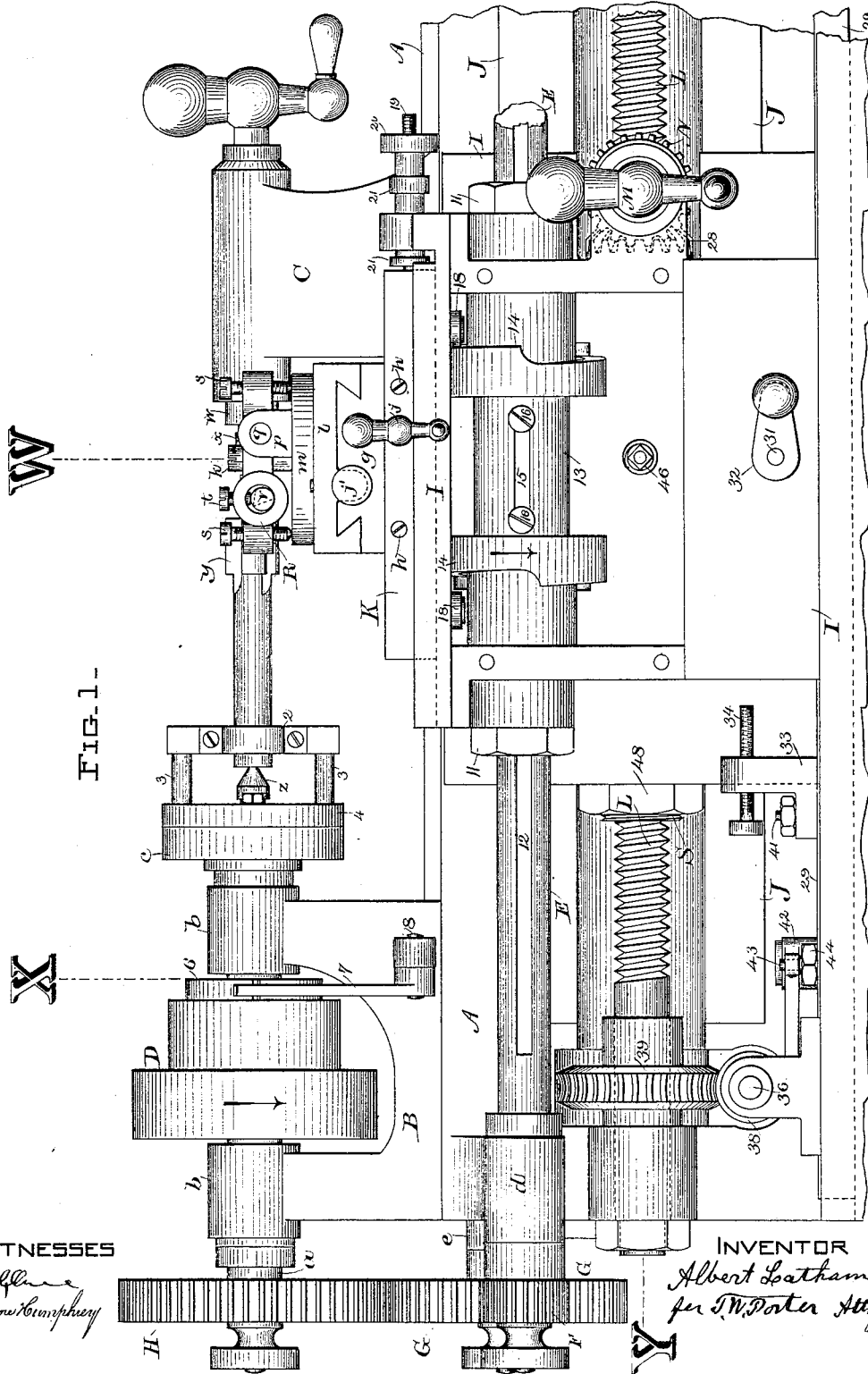


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COUNTERBORE FACING MACHINE.

No. 344,283.

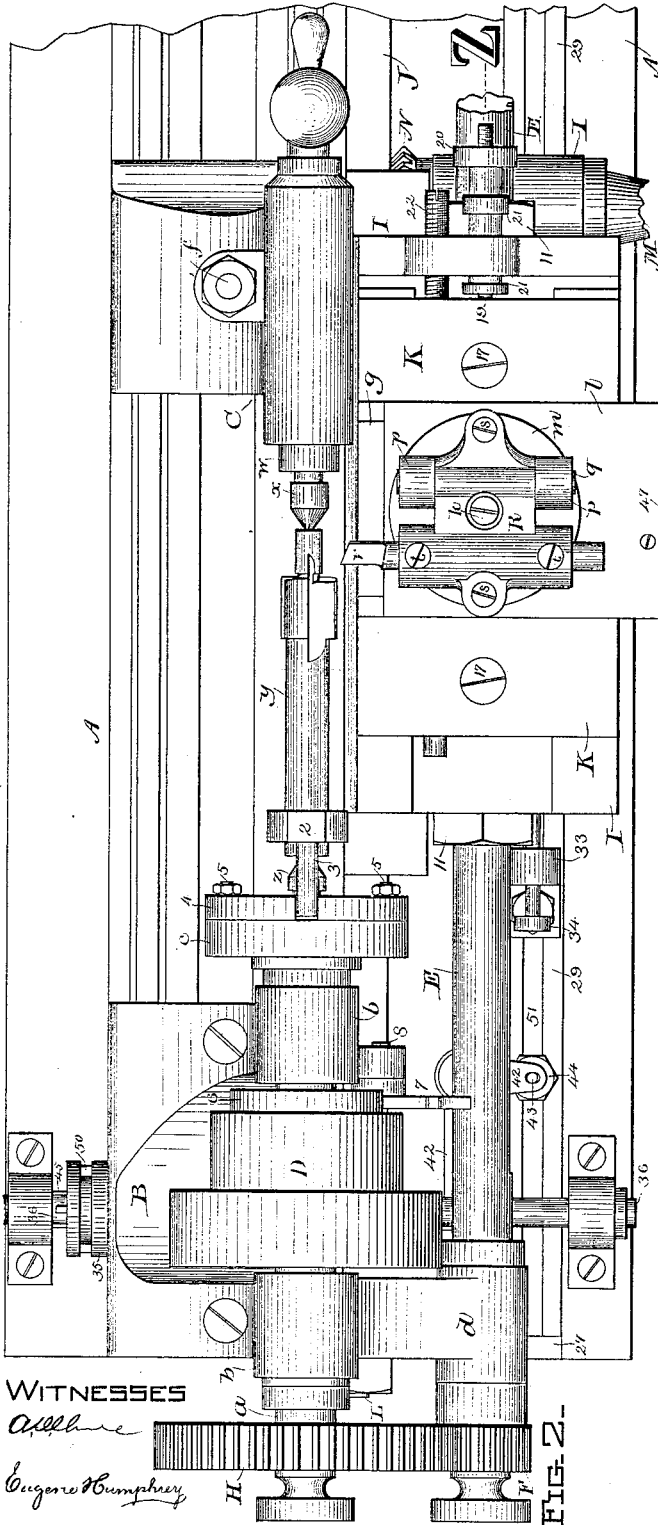
Patented June 22, 1886.



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Patented June 22, 1886.



WITNESSES

*Allen*  
*Eugene Humphrey*

FIG. 2.

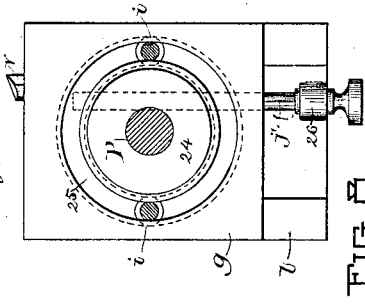


FIG. 3.

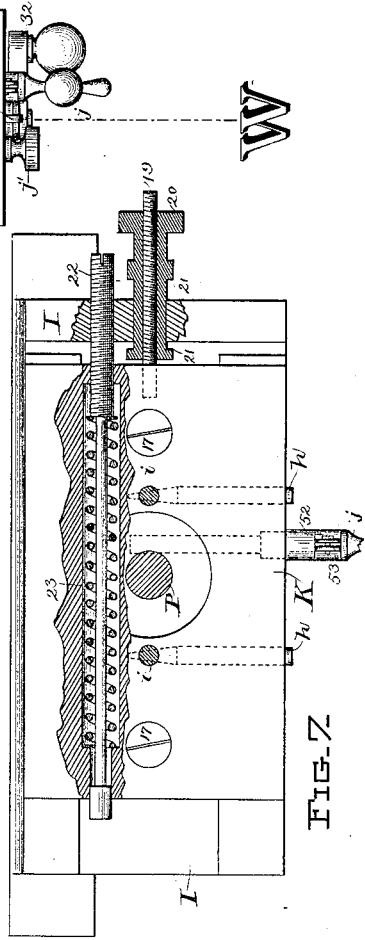


FIG. 7.

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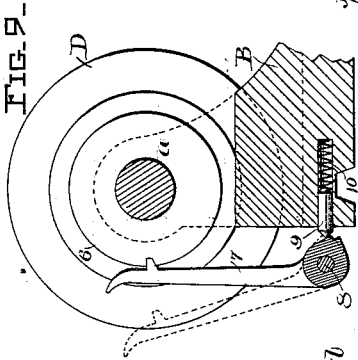
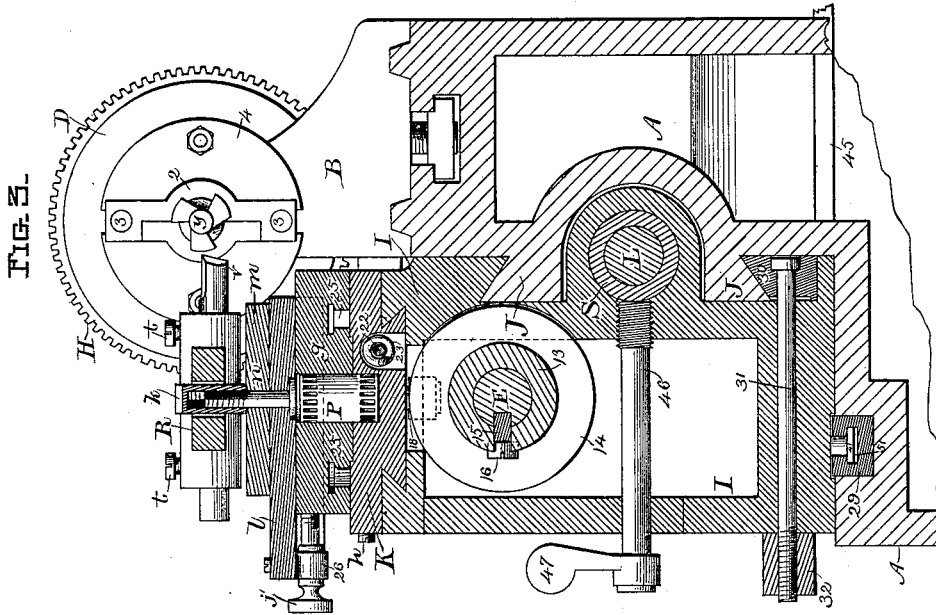


FIG. 15.

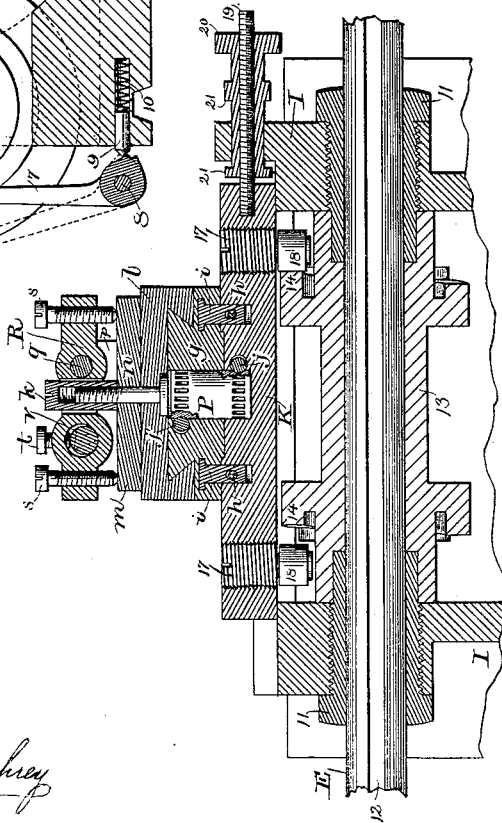


FIG. 4.

WITNESSES

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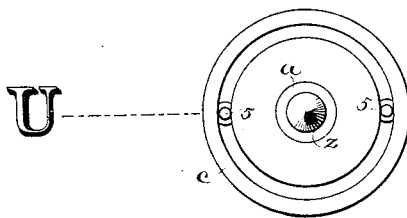
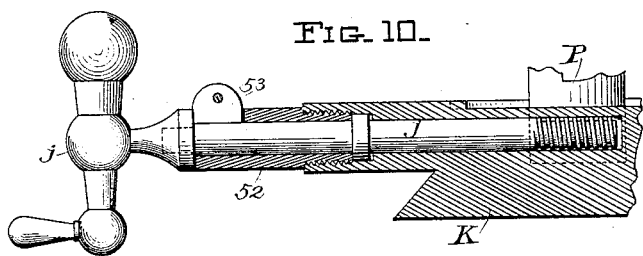
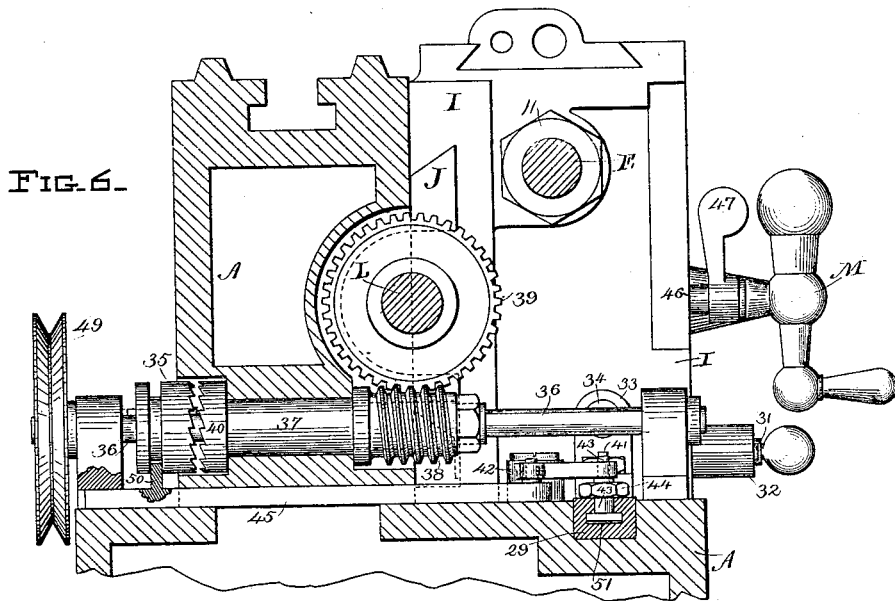
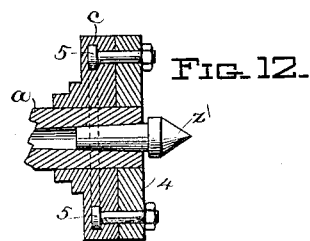


FIG. 11.



WITNESSES

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INVENTOR

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by *J. W. Parker Atty*

# UNITED STATES PATENT OFFICE.

ALBERT LATHAM, OF WALTHAM, MASSACHUSETTS.

## COUNTERBORE-FACING MACHINE.

SPECIFICATION forming part of Letters Patent No. 344,283, dated June 22, 1886.

Application filed April 5, 1886. Serial No. 107,920. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT LATHAM, of Waltham, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Counterbore-Facing Machines, which will, in connection with the accompanying drawings, be hereinafter fully described, and specifically defined in the appended claims.

10 Figure 1 is a front side elevation of a machine embodying my invention. Fig. 2 is a top plan view of the machine shown in Fig. 1. Fig. 3 is a transverse vertical section through the machine at the center of the tool-carriage, as at line W, Figs. 1 and 2, and viewed as from the right therein. Fig. 4 is a vertical section through the center of the tool-carriage on line Z, Fig. 2, and at ninety degrees to line W. Fig. 5 is a longitudinal horizontal section on line Y, Fig. 1. Fig. 6 is a transverse vertical section taken on line V, Fig. 5, and viewed as from the left therein. Fig. 7 is a detached plan view of base K of the tool-carriage and certain appendent devices, all above said base being removed. Fig. 8 is an inverted or under side plan view of the parts above base K. Fig. 9 is a detached sectional elevation, the section being on line X, Fig. 1, and viewed as from the right in that figure, and showing the devices for locking the live spindle at the initial point. Fig. 10 is an enlarged detached vertical section, showing a detail to be described. Fig. 11 is a detached view of the live-spindle, its center, face-plate, &c., as viewed from the right in Fig. 1. Fig. 12 is a section, as on line U, Fig. 11, with additional devices. Fig. 13 is a detached view showing the lock down devices by which plate *g* is held to bed K.

40 My invention relates to a machine adapted to cut the spiral end faces upon the respective teeth of counterbores to produce "clearance" or "freeing;" and it consists in features of novelty hereinafter fully described, and pointed out in the claims.

Referring again to the drawings, A represents the bed of the machine, shown with the right-hand portion broken away, which bed may be of such dimensions, weight, and strength as the nature of its service may require. Upon this bed, in the usual position, is secured the head-stock B, provided with the arbor or live-

spindle *a*, mounted in journal-bearings *b*, and carrying cone-pulley D, for driving by a belt and gear H, which latter meshes into intermediate gear, G, on stud *c*, which engages and drives gear F, secured on grooved rod E, journaled in bearings *d*, secured to bed A.

Upon bed A is formed a dovetail, J, Figs. 1 and 3, on which is mounted slide I, which is lineally actuated by screw-rod L, which is threaded in sleeve S, which latter by its gear 28 and shoulder-nut 48 embraces slide I, and so moves the same when it is itself locked by screw 46, and the rod L is rotated. For rotating said screw-feed rod L a tangent-wheel, 39, is secured thereon, and is engaged and actuated by screw 38, carried by cross-shaft 36, driven by a belt on its pulley 49. Thus when screw-sleeve S is locked by screw 46, as beforestated, and rod L is rotated, slide I will be accordingly moved to the left along bed A upon dovetail J, to which the slide is secured. When it is desired to move slide I to the right, screw 46 is retracted to liberate sleeve S, when by rotating spindle M, by its crank or cross-head, the gear N on said spindle, engaging the enmeshing gear 28 on the sleeve, rotates the sleeve upon the screw-rod, thereby moving the slide, the rod being in the meantime locked by the engagement of the screw and tangent-wheel; but, if preferred, slide I may be moved in both directions, by the employment of any well-known reversing devices, by which the belt or pulley 49 on arbor 36 may be driven in both directions; but the employment of crank-stud M and its bevel-gear N, for moving sleeve S to the right, are preferable in many respects, and especially in the matter of rapidity of movement.

For the purpose of rendering screw 38 operative or inoperative upon wheel 39 and its rod L, said screw and clutch 40 are formed upon sleeve 37, in which shaft 36 may revolve freely. A clutch, 35, formed to engage clutch 40, is splined to slide freely lineally on the shaft, but to rotate therewith, and a shipper-rod, 45, by its arm 50, engaged in a concentric groove in clutch, 35, serves to engage and disengage the same from 40. Said rod 45 is connected with one arm of crank-lever 42, pivoted to A, the other arm of said lever being pivoted by bolt 43 to slide 29, which moves in slot 27 in bed A, said bolt 43 being seated in a T-slot,

51, in the slide, and locked by nut 44, threaded thereon.

Upon slide 29 is adjustably secured, by a T-bolt seated in its longitudinal T-slot 51, the stud 33, in which is threaded the screw 34, arranged in the path of slide I, so that when the same has moved the requisite distance, and against said screw 34, the slide 29 will be linearly moved, and, through the bell-crank 42 and shipper 45, the feed rod L will be arrested, and consequently the slide and parts there-by carried will be brought to a halt.

It will be obvious that by the general adjustment of stud 33 at any point along slide 29, and the more accurate adjustment by screw 34, slide I may not only be arrested at any point along bed A, but such point may be determined with accuracy and precision.

For securing slide I to dovetail J with requisite closeness, a gib, 30, Fig. 3, may be adjusted by clamping-bolt 31 and its screw-nut 32, as there shown.

For reciprocating the cutting-tool, the grooved rod E passes through slide I, and is journaled by bearing *d* on bed A, and by sleeves 11, threaded in the end portions of the slide, as shown in Fig. 4. A cam-sleeve, 13, shown with the right-and-left throw-cams 14, is mounted on rod E, and closely fitting between the end portions of the slide, said sleeve and rod being interlocked by the spline 15, Figs. 1, 3, which is secured in position by screws 16. Cams 14 are arranged to act against rolls or trundles 18, mounted on screw-studs 17, threaded in base K of the tool-carriage, which base is formed with a dovetail upon its under side, which is engaged by and slides in a corresponding groove in the top portion of slide I, as shown in Figs. 3, 4.

Upon base K is secured the rotary plate *g*, which is formed with a concentric central projection, 24, Fig. 8, which closely fits a corresponding recess in base K, as shown in Figs. 4, 7, said plate *g* being locked in position upon K by means of the T-studs *i*, which are seated in the corresponding concentric slot 25 in *g*, and are engaged by the conical-pointed pins *h*, Fig. 13, threaded in K, as shown in Figs. 1 and 7, thus allowing plate *g* to be freely adjusted in a rotary direction when pins *h* are retracted, but firmly locking it in position by their being advanced.

Upon the top side of plate *g* is formed a dovetail, fitting the corresponding groove in plate *l*, Fig. 4, which latter is thus secured to and may be linearly adjusted upon plate *g*, such movement of plate *l*, as also the rotation of plate *g*, being effected by means of stud P and endless screws *j* and *j'*, which, respectively, engage the "tangent-wheel" or "worm-gear" teeth cut upon the periphery of the stud at the ends thereof. Said screw *j* is journaled (not threaded) in plate K, and secured from lineal movement therein by the locking-sleeve 52, secured in K, and formed with clamping-ears 53, by which the screw is

locked and held from rotation, as shown in Fig. 10; therefore, as the screw is rotated by means of its crank, stud P will be rotated, and, if plate *g* has been released by turning back screws *h*, then plate *g* and the parts thereon mounted will be thereby rotated; but if plate *g* be locked down upon K, then the rotation of the stud P will, by its engagement with screw *j'*, linearly move plate *l*, which latter being connected with the screw *j'* by the band 26, seated between the collars on the screw and secured to the plate *l*, as shown in Figs. 3, 8, will move plate *l* coincidentally with itself.

If desired, plate *l* may be linearly adjusted by rotating screw *j*, instead of through screw *j'*, as above stated.

Upon plate *l* is secured the disk *m* by means of bolt *n* and its screw-nut *k*, said disk having formed upon it the ears *p*, between which is arranged and secured by pivot *q* the T-shaped tool-holder R, which rocks on said pivot, and is adjusted and locked by screws *s*, the tool *v* being secured in said holder by screws *t*.

By slacking nut *k* on bolt *n*, disk *m* may be rotatively adjusted to bring the tool holder R into position, so that the tool *v* therein will be nearly in the desired position; but to adjust the cutting-tool, so that the line of its cutting-edge shall be exactly at the intended angle, relatively to the axis of the counterbore, resort is had to screw *j* and coacting devices, by which plate *g* and the parts mounted thereon are accurately adjusted in a rotary path, as already described.

By means of the rocking adjustment of tool-holder R upon its pivot *q* the side face of the cutting-tool below its edge may be adjusted relatively to a vertical line to produce the best effects when facing the ends of the lips of the counterbore, as will be described.

Upon arbor *a* is secured the face-plate *c* in the usual manner, and upon this plate is secured the slotted plate 4 by means of the T-shaped circumferential slot in plates *c*, and the bolts 5 and their nuts, as shown in Fig. 12, said plate 4 being formed with a slot to receive arms 3 of dogs 2 which is secured upon and drives the counterbore *y* when its lips are being finished to produce clearance. The counterbore is mounted upon center *z* in spindle *a* and center *x* of spindle *w* in tail-stock C, secured to bed A by bolts *f*, or in any known manner. An arm, 7, is pivoted at 8 to head-stock B, Figs. 1, 2, 9, and near the top of this arm is a stud or tooth, which enters a recess in the periphery of plate 6, secured to pulley D, as is clearly shown in Fig. 9. Said arm and its stud are held in or out of contact with plate 6 by a bevel-ended pin, 9, arranged to slide in head-stock B, and habitually thrust outward by helical spring 10, said pin acting against the cam-like inner face of arm 7, and when the apex of the cam is below that of the pin the latter tends to hold the arm against plate 6, as shown in Fig. 9, while if the upper end of the arm be moved away from 6, so that

the apex of its cam is above that of pin 9, then the latter holds the arm out of contact with 6.

The object of arm 7 to engage in the seat in 5 plate 6 is to constitute an initial point at which arbor *a* and the slotted dog-plate 4 shall always be when placing a counterbore in the machine for operation to produce clearance, and by the circumferential adjustment of dog-plate 4 on 10 face-plate *c*, as described, and when the same is once adjusted the counterbore-blanks may be milled in a separate machine and then transferred to this, and the freeing or clearance be produced without adjustment of any of the 15 parts, for as the dog by which the counterbore-blank is held from rotation while being milled to form the slots between the teeth has necessarily a certain circumferential relation to the position of the teeth, and if the dog remain in 20 such position till transferred to this machine, therefore with plate 4 once properly adjusted on face-plate *c* to such relation of the dog and teeth of the counterbore the teeth will always arrive at the cutting-tool *v* in proper time 25 when the cutter is brought in contact with the teeth by means of the cam on rod E.

In practical use, when arbor *a* is being rotated, the rod E is by the described gears also rotated, and by the action of the rod-driven 30 cam upon rolls 18, the base *k* and tool *v*, thereby supported, will be reciprocated.

When the counterbore has been placed in position on the centers and the machine put in motion, the operator, by means of spindle 35 M and its pinion N, engaging gear 28 on sleeve S, will move slide I to such position that the extreme throw of the cam, acting on rolls 18 of bed K, will move cutter *v* to a position to take the first chip of proper depth off the lips 40 of the counterbore at the rear part thereof, and the operator will so move slide I that at each revolution the cutter will take the proper chip till, by the conjoint action of such feed and the reciprocating movement of the tool, 45 caused by the action of the cam upon bed K, carrying the cutter *v*, the lips of the counterbore have received the requisite spirality of end face to constitute the clearance.

Instead of moving the slide by means of 50 spindle M, as just described, sleeve S may be locked by screw 46, and the slide I moved forward by rotation of screw-rod L, as before described. Both these means of forward movement of the slide are available and at times 55 respectively preferable.

The cams on rod E may be formed with as many "throws" as there are teeth in the counterbore; but the method shown is deemed 60 much preferable, for with a single throw all difficulty of forming the cams so that the throws will be equal and equidistant around the cam is avoided and the same result is readily effected by differentiating gears H F, 65 according to the number of teeth in the counterbore.

Instead of having two cams on rod E to give alternating movements to cutter *v*, but

one such cam need be employed, in which case a helical spring, 23, is arranged on the lineally-adjustable rod 22, threaded in slide I and extended into bed K, and arranged so that said 70 spring will at one end act against a shoulder of the rod, while its opposite end acts against bed K, and when the rod and spring are thus employed a rod, 19, is threaded in bed K and 75 has threaded upon it the sleeve 20, having collars 21 on each side of I to serve as stops to limit the movement of bed K by spring 23.

It will be obvious that when spring 23, rods 22 19, and sleeve 20 are employed with a single 80 cam the cam and rod 22, with its spring 23, may be so arranged that the cam will force the cutter toward the counterbore, while the spring presses the slide K toward the cam; or the spring may force the slide K to bring 85 cutter *v* into contact with the counterbore, while the cam limits and controls the extent and effect of such movement. In the latter case spring 23 would act against bed K in the direction indicated in Fig. 7, while in the other 90 case it would act upon it in the opposite direction, the rod 22 being lineally adjusted, so that the shoulder next its inner end would serve as the abutment of the spring, sleeve 20 being also adjusted so that the operative collar 21 thereon would co-operate with the other 95 parts to serve as a stop when they were thus operating.

It will be obvious that feed-rod L may be driven direct from spindle *a* by a suitable 100 connection with the gears that drive cam-shaft E, instead of being driven by a worm-gear operated by a separate belt, as shown.

I claim as my invention—

1. The combination, in a lathe or machine 105 duly organized to support and rotate the counterbore, of a slide mounted upon the bed of the machine, a cam having abutting support in said slide, a rod connected with and arranged to rotate the cam and rotated positively with a determined relation to the movement of the arbor that drives the counterbore, and a mechanism adapted to hold the tool that acts upon the counterbore, mounted upon and 110 arranged to move with said slide and arranged to be actuated by said cam independently of the slide, substantially as specified.

2. The combination, with bed A, provided with the counterbore supporting and rotating devices, of rod E, and gears by which the 120 same is driven positively from the driving-arbor that actuates the counterbore, slide I, mounted upon bed A and provided with means to move it thereon, cam 14, mounted on and driven by said rod, and a cutting-tool-carrying device mounted upon and moving 125 with said slide, and arranged to be actuated by said cam, substantially as specified.

3. The combination, with bed K and plates *g* and *l*, and stud P, having teeth at each end 130 thereof, of screws *j j'*, engaged with the teeth of said stud and respectively journaled in and secured from lineal movement in said bed K, substantially as specified.

4. The combination, with slide I, of bed K, arranged to slide thereon, plate *g*, mounted and provided with means to rotate it on bed K, plate *l*, arranged to slide on plate *g*, plate *m*, pivotally mounted on plate *l*, the pivot-bolt *n*, and securing-nut *k*, and pivotal tool-holder R, mounted on plate *m*, all substantially as specified.

5. The combination of a tool-carrying slide and a threaded nut or sleeve interlocked therewith, an actuating-screw provided with means of rotation and engaged in said nut, a device by which to lock or liberate said nut at will, and a spindle having geared connection with said nut and provided with a crank or head by which to rotate the same and said sleeve, substantially as specified.

6. The combination of spindle 36, with means for rotating and liberating it, screw 38, tangent-wheel 39, screw-rod L, threaded sleeve S, with its gear 28, spindle M, with its gear N, and means for rotating the spindle, all substantially as specified.

7. Shipper-bar 45, engaging clutch 35, crank-lever 42, slide 29, stud 33, adjustable on slide 29, and adjustable screw 34, threaded in said stud and arranged in the path of slide I, all combined substantially as specified.

8. The combination, with arbor *a*, of pivotal arm 7, formed on its lower portion with a cam-like projection and near its top with a detent or tooth, a spring-actuated bolt, 9, arranged to engage said cam, and a plate or disk carried by said arbor and having a recess or seat to engage said tooth, substantially as specified.

9. The combination of face-plate *c*, formed with a concentric T-groove, plate 4, formed to interlock dog 2, and bolts 5, engaged with and securing plates *c* and 4 together, substantially as specified.

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Witnesses:

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