

**No. 668,863.**

**Patented Feb. 26, 1901.**

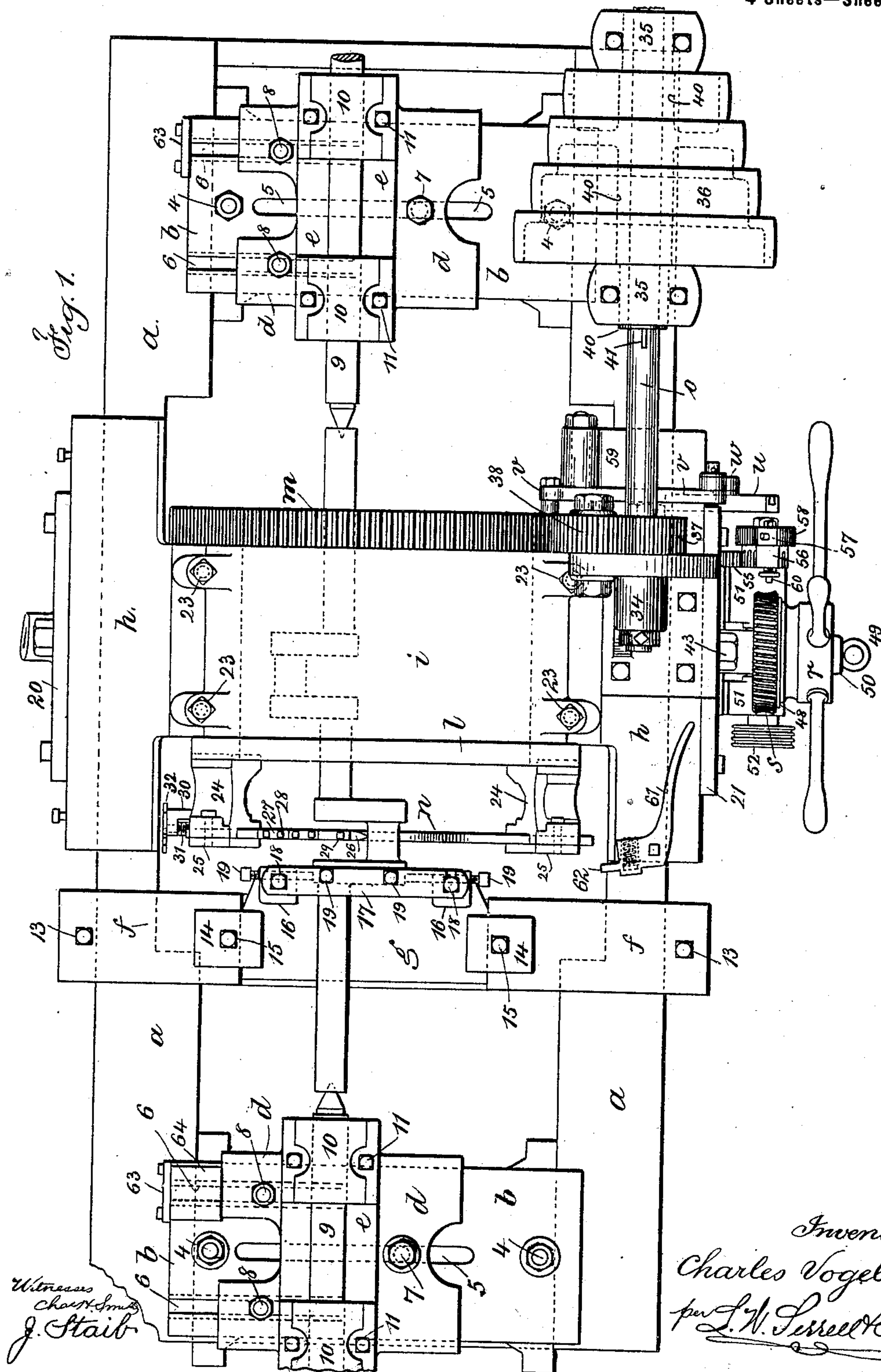
**C. VOGEL.**

**MACHINE FOR TURNING CRANK PINS AND ECCENTRICS.**

(Application filed June 28, 1900.)

(No Model.)

**4 Sheets—Sheet 1.**



Witnesses  
Chas. H. Smith  
J. Staib

Inventor  
Charles Vogel  
per L. W. Serrell & Son  
att

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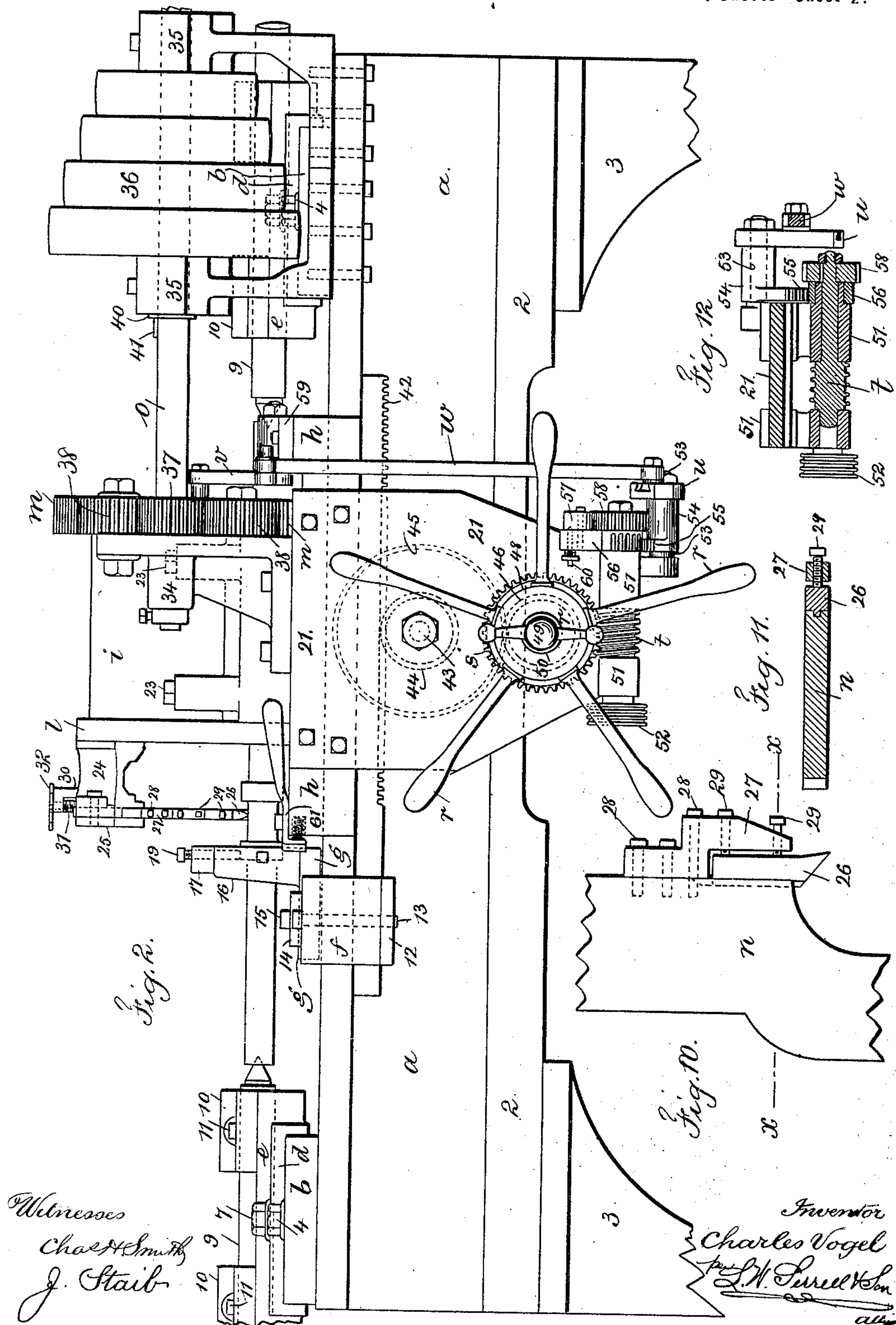
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4 Sheets—Sheet 2.





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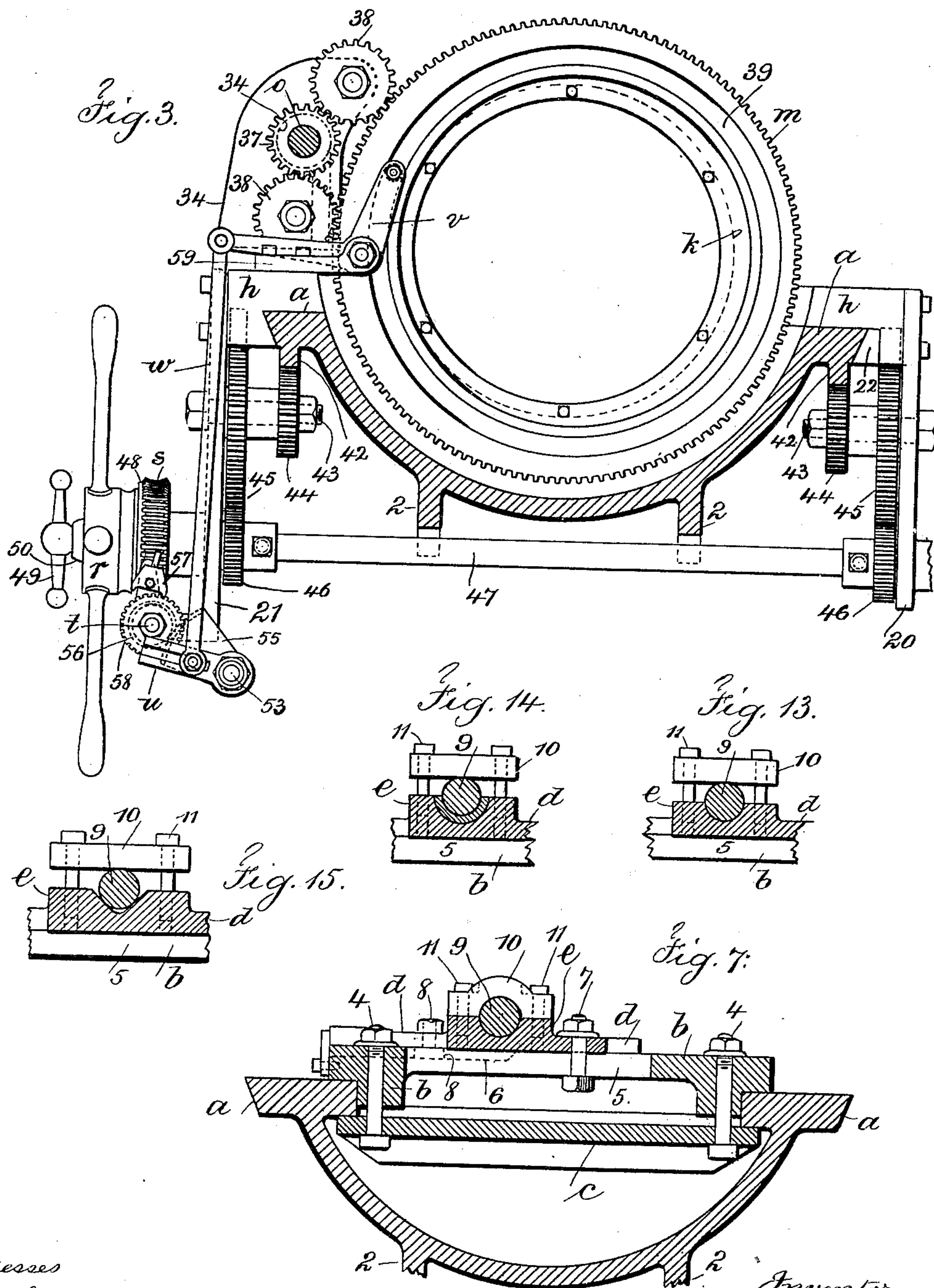
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4 Sheets—Sheet 3.



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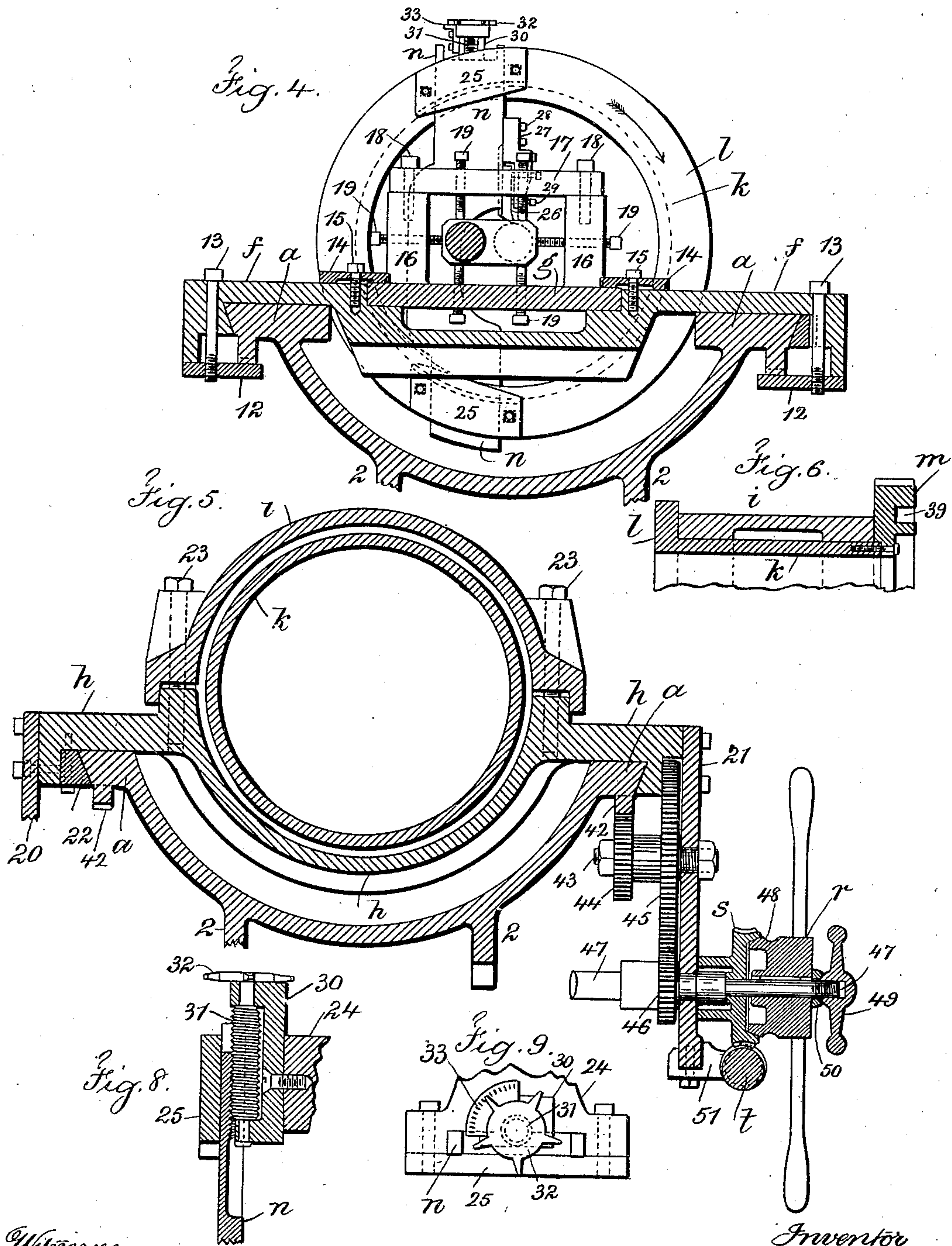
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4 Sheets—Sheet 4.



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# UNITED STATES PATENT OFFICE.

CHARLES VOGEL, OF FORT LEE, NEW JERSEY.

## MACHINE FOR TURNING CRANK-PINS AND ECCENTRICS.

SPECIFICATION forming part of Letters Patent No. 668,863, dated February 26, 1901.

Application filed June 28, 1900. Serial No. 21,874. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES VOGEL, a citizen of the United States, residing at Fort Lee, in the county of Bergen and State of New Jersey, have invented an Improvement in Turning-Machines for Cranks and Eccentrics, of which the following is a specification.

My invention relates to crank-shafts employed in connection with various devices in the mechanical arts for communicating power and to devices adapted to turn the crank-pins and eccentrics and true the crank-faces. Heretofore these parts have usually been turned in a lathe, and it has been exceedingly difficult not only to turn the crank-pins and eccentrics and surface the faces of the cranks with trueness and precision, but to accurately determine the spaced position of the cranks; and the object of my invention is to provide a device in which the cranks, eccentrics, and crank-faces are accurately turned and surfaced, while the crank-shaft and cranks are accurately held in a fixed and predetermined position.

In carrying out my invention and upon a suitable bed I provide longitudinally and transversely movable and adjustable supports for holding center-pins or the ends of a crank-shaft, a device adjustable to and for securely holding the crank, an open revoluble cylinder and adjustable tool-carrier connected therewith, a carriage supporting the same, means for rotating the revoluble cylinder and the tool around the work, and means for progressively and by a step-by-step movement feeding along the carriage, revoluble cylinder, and tool, so as to effect the cutting operations of the tool. All of these devices are hereinafter more particularly set forth.

In the drawings, Figure 1 represents a plan view of my improvement. Fig. 2 is an elevation. Fig. 3 is a section of the bed and elevation of the devices for rotating the revoluble cylinder and the parts adjacent thereto. Fig. 4 is a section of the bed and an elevation and partial section of the devices for receiving and securely holding the crank. Fig. 5 is a cross-section through the center of the revoluble cylinder, its carriage, and the bed and a partial elevation and section of the parts for progressively feeding the same along. Fig. 6 is a detached longitudinal sec-

tion through one edge of the revoluble cylinder and its support. Fig. 7 is a cross-section and partial elevation through the longitudinally and transversely adjustable devices for holding the center-pin or shaft. Fig. 8 is a vertical detached section and partial elevation showing the devices for feeding the tool-holder, and Fig. 9 is a plan of the devices shown in Fig. 8. Fig. 10 is a side elevation showing the cutting-tool and a part of the tool-carrier. Fig. 11 is a section through the parts shown in Fig. 10 at the line *xx* of said figure. Fig. 12 is a horizontal section and partial plan of a portion of the devices for progressively feeding along the carriage. Figs. 13, 14, and 15 illustrate modified forms of the clamping device for holding the center-pin or the crank-shaft.

*a* represents the main bed of the machine. This is preferably of semicircular form in cross-section, with a flat top forming a support for the devices carried by the bed, said bed having bevel edges and stiffening-ribs and supporting-legs 3. At either end of the bed *a* are longitudinally and transversely movable and adjustable supports for holding center-pins or the ends of a crank-shaft, and these parts are alike and each comprises a movable bed *b*, longer than the open center of the main bed *a* and extending across the open center and resting upon the flat upper surface of the bed and having depending portions fitting within the open center of the bed, between the opposite parallel edges, which form slideways for the movable bed *b*, and I provide a plate *c* and bolts 4, passing through the plate *c* and up through holes in the plate *b*, the tightening of which bolts draws the bed and the plate *c* together upon opposite faces of the bed *a*, (see Fig. 7,) so as to clamp the movable bed *b* firmly to the bed of the machine and prevent longitudinal movement. This bed *b* is provided with a transverse groove 5, approximately through the center of the bed, and with undercut slots 6, entering the bed from one end, parallel with each other and parallel with the groove 5. A slide-rest *d* comes directly above the bed *b* and is slightly wider than the bed *b*, so that side flanges pass down over and engage the parallel sides of the bed *b*, and a bolt 7 passes through the slide-rest *d*, down through the groove 5 of the bed



*b*, and bolts 8 pass through the slide-rest *d* and have heads in the undercut slots 6, said bolts 7 and 8 serving to rigidly clamp the slide-rest *d* to the bed *b*, the slide-rest *d* moving longitudinally and parallel of the bed *b*, and the bed *b*, with the slide-rest *d*, moving longitudinally of the bed *a* of the machine, thus providing for the motion in both directions and for the rigid clamping of the parts in a predetermined position.

The slide-rest *d* carries pillow-blocks *e*, with approximately central and semicircular depressions to receive and support the center-pin 9, and cap-plates 10 extend across the center-pin 9 upon the pillow-blocks, and bolts 11 pass through the cap-plates into the pillow-blocks to draw the same down against the center-pin and hold the same firmly in place. Instead of the center-pin 9 being supported in the said pillow-block the crank-shaft the crank-pins of which are to be operated upon may be carried directly in the pillow-blocks. Fig. 7 shows one form of pillow-block in which the cap-plate is made with a semicircular depression, as well as the pillow-block, while Figs. 13, 14, and 15 show modified forms of this construction. As between the form shown in Fig. 7 and that shown in Fig. 13 the only difference is that the cap-plate 10 in Fig. 13 is a straight plate resting directly upon the center-pin. The construction in Fig. 14 is similar to Fig. 13, except that a semicircular seat is shown in the pillow-block removable and interchangeable with other seats to provide for various sizes of crank-shafts. In Fig. 15 the pillow-block instead of being made with the semicircular seat is made with a seat of V form. These forms, however, are immaterial so far as my invention is concerned.

The devices for holding the crank and which are adjustable for securing the same in place comprise the following: A bridge-bar *f* (see especially Figs. 1 and 4) extends transversely across the bed *a* and with ends extending down upon the sides of the bed *a* to engage the bevel edges thereof and slide thereon, and under plates 12 are held by bolts 13, which pass through the bar *f* and the plates 12, so as to clamp the bridge-bar in place upon the bed, and when it is desired to move this bridge-bar the bolts are loosened. This bridge-bar *f* is provided with a central plate *g* and has a portion depressed beneath the plate *g*, said plate fitting in the central portion of the bar in a space provided for its reception, and I employ clamps 14, extending over the joint between the bar *f* and the plate *g*, with bolts 15 in the bar *f* drawing down the clamps 14 to secure the plate *g* in place. This plate *g* is provided with standards 16, above which is a cross-bar 17, secured to the standards by bolts 18, and adjusting-screws 19 pass upwardly through the plate *g*, downwardly through the cross-bar 17, and horizontally through the standards 16, the crank being received and held between the ends of the adjusting-screws, said screws being set

up tightly against the crank before the pin is turned, so that the same may be held in a fixed position and the strain of turning the crank-pin be largely taken off the crank-shaft. The plate *g*, with standards 16, is removable and interchangeable with other similar plates having standards set nearer together or farther apart and shorter or longer in length, so as to provide for cranks of different sizes. The bar 17 is pivotally held by one bolt 18 and is notched to receive the other bolt 18, so that said bar 17 may be swung to one side for placing the crank in position.

The carriage and parts connected therewith for supporting the revoluble cylinder and adjustable tool-carrier comprise the following: The carriage *h* has a semicircular central portion and parallel flat portions at either side resting upon the bed *a*, with tapering parts engaging the tapering sides of the bed, so that the carriage is adapted to slide longitudinally of the bed. The carriage is provided upon either side with side plates 20 21, bolted to the sides of the carriage and extending downward as supports for the feeding mechanism, and I provide a wedge-shaped adjusting-bar 22, (see Fig. 5,) held to the under side of the carriage by bolts, for the purpose of taking up the slack and insuring the true movement of the parts. A semicylindrical cover *i* is connected by bolts 23 to the carriage *h*, and the open revoluble cylinder *k* extends through and between the cover *i* and the semicylindrical portion of the carriage and is supported thereby. One end of the open revoluble cylinder *k* is provided with a flange *l* and the other end with a gear-wheel *m*, the said gear-wheel being by preference a separate ring attached to the end of the open revoluble cylinder *k* by a number of bolts, (see Figs. 3 and 6,) and while I do not limit myself to thus making the open revoluble cylinder experience has demonstrated this to be the more satisfactory form of construction. Connected to and projecting from opposite sides of the flange *l* I provide brackets 24, each of which has an end plate 25, forming a guide for the tool-bar *n*, the respective ends of the brackets being grooved to receive the tool-bar and the end plates covering the same. (See Figs. 1 and 4.) The tool-bar *n* is slightly in the form of a yoke (see Fig. 4)—that is to say, one edge adjacent to the tool 26 is cut out, so as to provide ample room for the crank-pin. A finger-bar 27 is secured by bolts 28 to and in the same plane as the edge of the tool-bar, and the edge of the tool-bar *n* is grooved for a feather upon the tool 26, the tool passing between the bar *n* and the free end of the finger-bar and being clamped in place by bolts 29, passing through the finger-bar. (See Figs. 10 and 11.) On one of the brackets 24 I provide a head 30, said bracket being recessed for the head connected thereto by a screw. (See Fig. 8.) In this head is placed a feed-screw 31, the said head forming a bearing for the respective ends of the feed-screw,



the said screw being provided with a star-cam 32 upon the upper surface of the head and the head being provided with a vernier or scale 33, which, in connection with the points of the star-cam, indicate minute fractions of an inch in feed. The surface of the tool-bar adjacent to the head 30 is recessed and threaded, the threaded portion engaging the threads of the screw-feed 31, and it will therefore be apparent that as the screw-feed 31 is revolved in one direction the tool-bar  $n$  will be forced downward, and when said feed-screw 31 is revolved in the opposite direction the tool-bar will be drawn upward. The cutting-tool is thus advanced against the work, the star-cam 32 being turned either by hand or by any suitable device connected to the carriage of the machine.

The tool-bar, guided at both ends and supported on one side of the cylinder, is located away from the support where the work done by the tool is at all times visible, and the tool supported on one edge of the wide tool-bar provides a maximum of strength with a minimum of weight and material and makes possible the holding of the tool immovably in place, so that it is impossible for the tool-bar to spring or the tool to jump.

The devices for rotating the revoluble cylinder, the tool-bar, and cutting-tool comprise the following: The power-shaft  $o$  is mounted in suitable bearings at the respective ends, a bearing 34 being connected to the carriage  $h$  and bearings 35 to the upper surface of the bed  $a$ . The shaft  $o$  is operated by a series of pulleys 36, and the said shaft carries a pinion 37, meshing with two small gears 38, which latter gears mesh with the gear-wheel  $m$ , connected to the open revoluble cylinder, the said gears 38 having short pins, around which they turn, secured to the bearing 34. A hub 40 surrounds the shaft  $o$  in the bearings 35, and the series of pulleys 36 is secured to or made with this hub, and a spline 41 between the shaft  $o$  and hub 40 and secured to the shaft  $o$  and moving through a groove in the hub 40 connects the shaft and hub, so that the shaft is rotated by the series of pulleys 36 through the intervention of the hub 40 and the spline 41. The face of the gear-wheel  $m$  (see Figs. 3 and 6) is provided with an eccentric groove 39.

The devices for feeding along the carriage with the open revoluble cylinder, so as to cause the cutting-tool to travel longitudinally of the crank-pin in doing its work, comprise the following: The under side of the main bed  $a$  is provided with racks 42, (see Figs. 2, 3, and 4,) and the plates 20 21 are provided with pivot-pins 43, upon which are mounted pinions 44 and gears 45, the pinions 44 meshing with the racks 42 and the gears 45 meshing with the pinions 46, secured to the shaft 47, said shaft passing through the plates 20 21, which form bearings for the said shaft 47. A hand-wheel  $r$  is connected by a spline to the outer end of the shaft 47, and the head of

said hand-wheel is provided with a clutch-face 48, and loosely surrounding the shaft 47 is a worm-wheel  $s$ , and I provide a clamp 49 and a centering-ring 50 on the extreme end of the shaft the action of which is to move the hand-wheel  $r$  longitudinally of the shaft and bring its clutch-face 48 into engagement with an adjacent recess of the worm-wheel  $s$ , so that the two parts are operatively connected. The lower part of the plate 21 is provided with bearing-brackets 51, carrying a worm-shaft  $t$ , on one end of which is a knurled head 52 for turning the shaft  $t$  by hand. A shaft 53 is supported by one of the brackets 51, and it carries a sleeve 54, formed integral with a toothed sector 55. One of the bearing-brackets 51 (see Fig. 12) is prolonged as a bearing for the pawl-carrier 56, connected to the upper end of which is a pawl 57, whose position can be changed at pleasure by moving a spring-actuated pin 60 (see Fig. 2) so as to shift the pawl from one position to another. The pawl 57 engages the pinion 58, fast on the end of the worm-shaft  $t$ , and said pawl may be shifted and set in any one of three positions to engage the pinions 58 in opposite directions or to be free thereof, but the same is not new with me.

I provide a grooved rocker-arm  $u$ , connected to the sleeve 54, and a bell-crank lever  $v$  is pivoted to the plate 59 on the carriage  $h$ , said bell-crank lever having a roller running in the eccentric groove 39, and the other end of the bell-crank lever is pivoted to a connecting-bar  $w$ , passing down to an adjustable connection with the grooved rocker-arm  $u$ .

From the foregoing description of these parts it will be evident that as the open revoluble cylinder  $k$  rotates by the action of the gears 38, the pinion 37, and the shaft  $o$  the bell-crank lever  $v$  is caused to swing on its pivot by the action of the eccentric groove, so that the connecting-bar  $w$  is raised and lowered, swinging the grooved rocker-arm  $u$ , the sleeve 54, and the toothed sector 55 in its movement. The toothed sector in turn operates the pawl-carrier 56, swinging the pawl and turning the pinion 58 one or more teeth at a time. The pinion 58 revolves the worm-shaft  $t$ , and said shaft  $t$ , acting upon the worm-wheel  $s$ , will turn the same, and if the clutch-face 48 is in engagement with the worm-wheel  $s$  the shaft 47 will also be turned, and consequently with it the pinions 47, the gears 45, the pinions 44, and the same acting upon the fixed racks 42 will move the carriage with the open revoluble cylinder and the operating-tool longitudinally of the bed  $a$ .

Fig. 3 shows the pawl 57 in one position for the feed of the open revoluble cylinder and parts connected therewith in one direction of the bed, and it will be apparent that if the pawl 57 be turned into the opposite position the feed of the open revoluble cylinder by the aforesaid devices will be longitudinally of the bed in the reverse direction, the shaft  $o$ , the spline 41, and the hub 40 in the bearings 35



providing for the longitudinal movement of the shaft *o* during the aforesaid feeding movement.

For actuating the star-cam 32 for advancing the cutting-tool, as hereinbefore described, and instead of turning the star-cam by hand I provide a spring-actuated lever 61, pivoted to the surface of the carriage *h*. (See Figs. 1 and 2.) This lever is provided with a finger 62, and in the position of the parts shown in Fig. 2 the spring holds the finger of the lever away from the path of the star-cam 32 as the same is carried around with the open revoluble cylinder. If the feed is to be actuated through the star-cam 32 by the said lever 61, it is grasped by the hand and the finger 62 brought substantially parallel with the edge of the carriage *h* and into the path of the star-cam 32 as the same is carried around, so as to move the star-cam 32 one tooth at a time.

In the operation of the device herein described the tool 26 is to be replaced by other tools having different cutting edges, according to the work to be performed, as it is possible in the present machine not only to turn truly the crank-pins of crank-shafts, but to turn eccentrics on the crank-shaft and to true the opposite faces of the cranks, the various parts being, as hereinbefore described, adjustable, so that the shaft and cranks may be positioned for the various parts to be operated upon. It will also be apparent that when the worm-wheel *s* is not engaged by the clutch-face 48 the longitudinal feed of the carriage and open revoluble cylinder may be effected directly by the shaft 47 and gears connected thereto by turning the hand-wheel *r*, the clamp 49 in this case having been loosened and the pawl 57 set in the intermediate position, so as not to engage the pinion 58. In this manner a quick movement may be imparted to the carriage and open revoluble cylinder in either direction. A very slow and delicate movement may be imparted to the carriage and open revoluble cylinder with the pawl 57 in the intermediate position by engaging the worm-wheel *s* and clutch-face 48 by the clamp 49 and turning the worm-shaft *t* by the knurled head 52 by hand. This is especially available in putting the finishing touches on the work.

In connection with the movement of the beds *b* and slide-rests *d* and the accurate placing of the crank-shaft for the operations of the tool I find it advantageous to employ plates 63, bolted to one end of each bed *b* and projecting above the same, and blocks 64, made of predetermined dimensions and interchangeable with other blocks of different dimensions resting upon the beds and against the plates 63 and forming stops for the slide-rests *d*, as this permits the operator of the machine to bring the slide-rests positively and accurately to place against the blocks with the center-pins 9 in line and parallel with

the long center of the main bed without the necessity of careful measurements.

I claim as my invention—

1. In a turning-machine for cranks and eccentrics, the combination with supports longitudinally and transversely movable and adjustable for holding center-pins or the ends of the crank-shaft, of a device independent of the supports adjustable to and adapted for securely holding the crank in position, an open revoluble cylinder and an adjustable tool-carrier connected therewith and carried thereby, a longitudinally-movable carriage supporting the open revoluble cylinder, means for rotating the revoluble cylinder and tool, and means for progressively and by a step-by-step movement feeding along the carriage, revoluble cylinder and tool so as to effect the cutting operations, substantially as set forth.

2. In a turning-machine for cranks and eccentrics, the combination with supports longitudinally and transversely movable and adjustable for holding center-pins or the ends of the crank-shaft, of a device independent of the supports adjustable to and adapted for holding the crank securely in position, an open revoluble cylinder and an adjustable tool-carrier connected therewith and carried thereby, a longitudinally-movable carriage supporting the open revoluble cylinder, a power-shaft, a hub surrounding the shaft and an intervening spline whereby the shaft and sleeve turn together and bearings for the shaft at one end and for the hub, means for rotating the shaft and hub and operative devices interposed between the shaft and the open revoluble cylinder for rotating the same and the tool, substantially as set forth.

3. In a turning-machine for cranks and eccentrics, the combination with supports longitudinally and transversely movable and adjustable for holding center-pins or the ends of the crank-shaft, of a device independent of the supports adjustable to and adapted for securely holding the crank in position, an open revoluble cylinder and an adjustable tool-carrier connected therewith and carried thereby, a longitudinally-movable carriage supporting the open revoluble cylinder, a power-shaft, a hub surrounding the shaft and an intervening spline whereby the shaft and hub turn together and bearings for the shaft at one end and for the hub, a series of pulleys on the hub by which the hub and the shaft are turned, a pinion upon the shaft, gears upon the carriage meshing with the pinion and a gear-wheel meshing with the small gears and connected to the open revoluble cylinder for rotating the same and the tool, substantially as set forth.

4. In a turning-machine for cranks and eccentrics, the combination with supports longitudinally and transversely movable and adjustable for holding center-pins or the ends of the crank-shaft, of a device independent of the supports adjustable to and adapted for



securely holding the crank in position, an open revoluble cylinder and an adjustable tool-carrier connected therewith and carried thereby, a longitudinally-movable carriage 5 supporting the open revoluble cylinder, racks upon the under surface of the main bed, pinions meshing with the racks, and means substantially as shown and described and which means are adapted to be connected or disconnected for operating the feed either by hand 10 or with the rotation of the open revoluble cylinder, substantially as set forth.

5. In a machine for turning cranks and eccentrics, the combination with the main bed, 15 of a bed movable longitudinally of the main bed, a fixed stop upon said movable bed, a slide-rest and pillow-block upon and movable transversely of the movable bed, a removable gage-plate between said fixed stop and one end 20 of the transversely-moving bed, and means for clamping the movable beds, whereby the position of the crank-shaft may be accurately determined, substantially as set forth.

6. In a turning-machine, the combination 25 with the main bed, of a movable bed *b* having a transverse slot 5 and grooves 6 parallel therewith, a plate-clamp *c* and bolts 4 passing through the plate-clamp and bed for connecting the two parts and fixing them to the 30 main bed, a slide-rest *d* having integral pillow-blocks *e* adapted to receive and hold the center-pin 9 or crank-shaft in place, cap-plates 10 and bolts 11 for holding the center-pin or crank-shaft in a fixed relation to the pil- 35 low-blocks and bolts 7 and 8 passing through the slide-rest *d* and through the bed into the slot 5 and grooves 6 therein for holding the slide-rest in a fixed relation to the bed, sub- 40 stantially as set forth.

7. In a turning-machine for cranks and eccentrics, the combination with the main bed, 45 of a bridge-bar movable longitudinally of said main bed, and having a depression in its upper portion, and means for clamping said bridge-bar to the main bed, a removable and adjustable plate setting within the depressed portion of the bridge-bar, means for 50 clamping said plate to the bridge-bar, standards rising from said plate, a cross-bar pivoted at one end to one of said standards so that said cross-bar swings horizontally, means 55 for clamping said cross-bar to the other standard, and means for adjusting and holding the crank in position between the standards, the removable plate and the cross-bar, substantially as set forth.

8. In a turning-machine for cranks and eccentrics, the combination with the main bed, 60 of a bridge-bar movable longitudinally of said main bed and having a depression in its upper portion and means for clamping said bridge-bar to the main bed, a removable and adjustable plate setting within the depressed portion of the bridge-bar, means for clamp- 65 ing said plate to the bridge-bar, standards rising from said plate, a cross-bar pivoted at one end to one of said standards, so that said

cross-bar swings horizontally, means for clamping the free end of said cross-bar to the other standard, and adjusting-screws passing 70 up through the movable plate, down through the cross-bars and horizontally through the standards and adapted to be set up against the opposite faces and ends of the crank so as to hold the same rigidly in a predetermined 75 position, substantially as set forth.

9. In a turning-machine for cranks and eccentrics, the combination with the open revoluble cylinder and means for supporting and 80 rotating the same, of brackets connected to opposite sides of and projecting from said cylinder, a tool-bar for holding the tool extending entirely across said cylinder and sliding in ways in the faces of said brackets, a feed- 85 screw connected to one of the brackets and acting upon the tool-bar to progressively feed the tool-bar, substantially as set forth.

10. In a turning-machine for cranks and eccentrics, the combination with the open revoluble cylinder and means for supporting and 90 rotating the same, of brackets connected to opposite sides of and projecting from said cylinder, a tool-bar for holding the tool extending entirely across said cylinder and sliding in ways in the faces of said brackets, said 95 tool-bar having a threaded face in a recess at one end of the tool-bar, a feed-screw meshing with the same, a support for the feed-screw in one bracket, and means for progressively turning the feed-screw to a predetermined ex- 100 tent, substantially as set forth.

11. In a turning-machine for cranks and eccentrics, the combination with the open revoluble cylinder and means for supporting and 105 rotating the same, of brackets projecting from and supported by the said cylinder, a tool-bar sliding in ways in the faces of the said brackets and a tool carried thereby, a threaded face in a recess at one end of the tool-bar, a feed-screw meshing with the same, a support 110 for the feed-screw in one bracket and a star-cam on the upper end of the feed-screw, and a spring-actuated lever adapted to be brought into the path of the star-cam, substantially as 115 set forth.

12. The combination in a machine for turning cranks, of the main bed, a carriage upon the same having a semicylindrical bearing, a semicylindrical cover forming the other por- 120 tion of said bearing, bolts for holding said cover in place, an open revoluble cylinder within said bearing, having a flange upon one end of said cylinder and outside of said bearing, a ring having gear-teeth upon its periph- 125 ery secured to the other end of said cylinder and outside of said bearing, a tool-carrier carried by said revoluble cylinder, and means for rotating said cylinder, substantially as set forth.

13. In a turning-machine for cranks and eccentrics, the combination with the carriage, of 130 vertical plates connected at their upper edges to the opposite sides of the carriage and occupying a position parallel with the center of



the main bed, racks upon the under surface of the bed and at either side of and parallel with the center of the bed, pivot-pins carried by the said plates, pinions and gears mounted upon the said pivot-pins, the pinions meshing with the said racks, a cross-shaft having bearings in the said vertical plates, pinions thereon meshing with the said gears, a loose worm-wheel upon the said shaft, a worm-shaft engaging the said worm-wheel, means for connecting the worm-wheel and the shaft, and means substantially as specified for turning the worm-shaft by a step-by-step movement and so actuating the pinions and gears for feeding along the carriage, substantially as set forth.

14. In a turning-machine for cranks and eccentrics, the combination with the carriage, of vertical plates connected at their upper edges to the opposite sides of the carriage and occupying a position parallel with the center of the main bed, racks upon the under surface of the bed and at either side of and parallel with the center of the bed, pivot-pins carried by the said vertical plates, pinions and gears mounted upon the said pivot-pins, the pinions meshing with the said racks, a cross-shaft having bearings in the said plates, pinions thereon meshing with the said gears, a hand-wheel *r* and a spline connecting the same to the shaft whereby the shaft, the pinions and gears may be operated by hand to feed the carriage along upon the bed of the machine, substantially as set forth.

15. In a turning-machine for cranks and eccentrics, the combination with the carriage, of vertical plates connected at their upper edges to the opposite sides of the carriage and occupying a position parallel with the center of the main bed, racks upon the under surface of the bed and at either side of and parallel with the center of the bed, pivot-pins carried by the said plates, pinions and gears mounted upon the said pivot-pins, the pinions meshing with the said racks, a cross-shaft having bearings in the said plates, pinions thereon meshing with the said gears, a worm-wheel loose upon the said shaft, adjustable means for clamping the same to the shaft, a worm-shaft engaging the said worm-wheel, supports for the worm-shaft from one of the plates, a pinion fast to the said worm-shaft, a pawl for operating the pinion in either direction, a pawl-carrier and a toothed sector operating the same, an open revoluble cylinder supported by the said carriage, and means actuated by the rotation of the said cylinder for effecting the movement of the toothed sector, substantially as set forth.

16. In a turning-machine for cranks and eccentrics, the combination with the carriage, of vertical plates connected at their upper edges to the opposite sides of the carriage and occupying a position parallel with the center of the main bed, racks upon the under surface of the bed and at either side of and parallel

with the center of the bed, pivot-pins carried by the said plates, pinions and gears mounted upon the said pivot-pins, the pinions meshing with the said racks, a cross-shaft having bearings in the said plates, pinions thereon meshing with the said gears, a worm-wheel loose upon the said shaft, adjustable means for clamping the same to the shaft, a worm-shaft engaging the said worm-wheel, supports for the worm-shaft from one of the plates, a pinion fast to the said worm-shaft, a pawl for operating the pinion in either direction, a pawl-carrier and a toothed sector operating the same, an open revoluble cylinder supported by the said carriage and having an eccentric groove in one face, a bell-crank lever pivotally connected to the carriage and having a roller in the said eccentric groove, a connecting-bar pivoted to the bell-crank lever at one end and a grooved rocker-bar at its other end, and a sleeve connecting the rocker-bar to the toothed sector, substantially as and for the purposes set forth.

17. In a turning-machine for cranks and eccentrics, the combination with the carriage, an open revoluble cylinder and tool-carrier supported thereby, of vertical plates connected to and depending from the carriage and forming supports, racks upon the under surface of the bed and at either side of and parallel with the center of the bed, pivot-pins carried by the said plates, pinions and gears mounted upon the said pivot-pins, the pinions meshing with the said racks, a cross-shaft having bearings in said plates and pinions thereon meshing with the said gears, and a hand-wheel splined upon the said shaft and adapted by its rotation to move the devices hereinbefore specified and the carriage longitudinally of the bed, substantially as set forth.

18. In a turning-machine for cranks and eccentrics, the combination with the carriage, an open revoluble cylinder and tool-carrier supported thereby, of vertical plates connected to and depending from the carriage and forming supports, racks upon the under surface of the bed and at either side of and parallel with the center of the bed, pivot-pins carried by the said plates, pinions and gears mounted upon the said pivot-pins, the pinions meshing with the said racks, a cross-shaft having bearings in said plates and pinions thereon meshing with the said gears, a worm-wheel loose on said shaft and a hand-wheel splined thereon, the said parts having clutch-faces and means for bringing the same into engagement, and a worm-shaft engaging the said worm-wheel and an end to the said shaft adapted to be engaged by hand for turning the same and imparting slight progressive movements to the carriage upon the bed, substantially as set forth.

19. In a turning-machine for cranks and eccentrics, the combination with the carriage, an open revoluble cylinder and tool-carrier



supported thereby, of vertical plates connected to and depending from the carriage and forming supports, racks upon the under surface of the bed and at either side of and parallel with the center of the bed, pivot-pins carried by the said plates, pinions and gears mounted upon the said pivot-pins, the pinions meshing with the said racks, a cross-shaft having bearings in said plates and pinions thereon meshing with the said gears, a worm-wheel loose upon the said shaft, a hand-wheel splined upon the said shaft and engaging clutch-faces between the worm-wheel and hand-wheel and means for bringing the same into operative engagement, a worm-shaft meshing with the said worm-wheel and means substantially as set forth operating progressively by the movement of the open revoluble cylinder for turning the said worm-shaft and

progressively feeding the carriage along upon the bed, substantially as set forth. 20

20. In a turning-machine for cranks and eccentrics, the combination with an open revoluble cylinder and means for revolving the cylinder, and for moving the same longitudinally of the bed, of a tool-bar having a curved center forming a cut-away portion and extending transversely across and distant from one end of the open revoluble cylinder, means connected to the cylinder for supporting the tool-bar and for moving the same whereby the operation of the tool is at all times visible, substantially as set forth. 25 30

Signed by me this 25th day of June, 1900.

CHARLES VOGEL.

Witnesses:

GEO. T. PINCKNEY,  
S. T. HAVILAND.