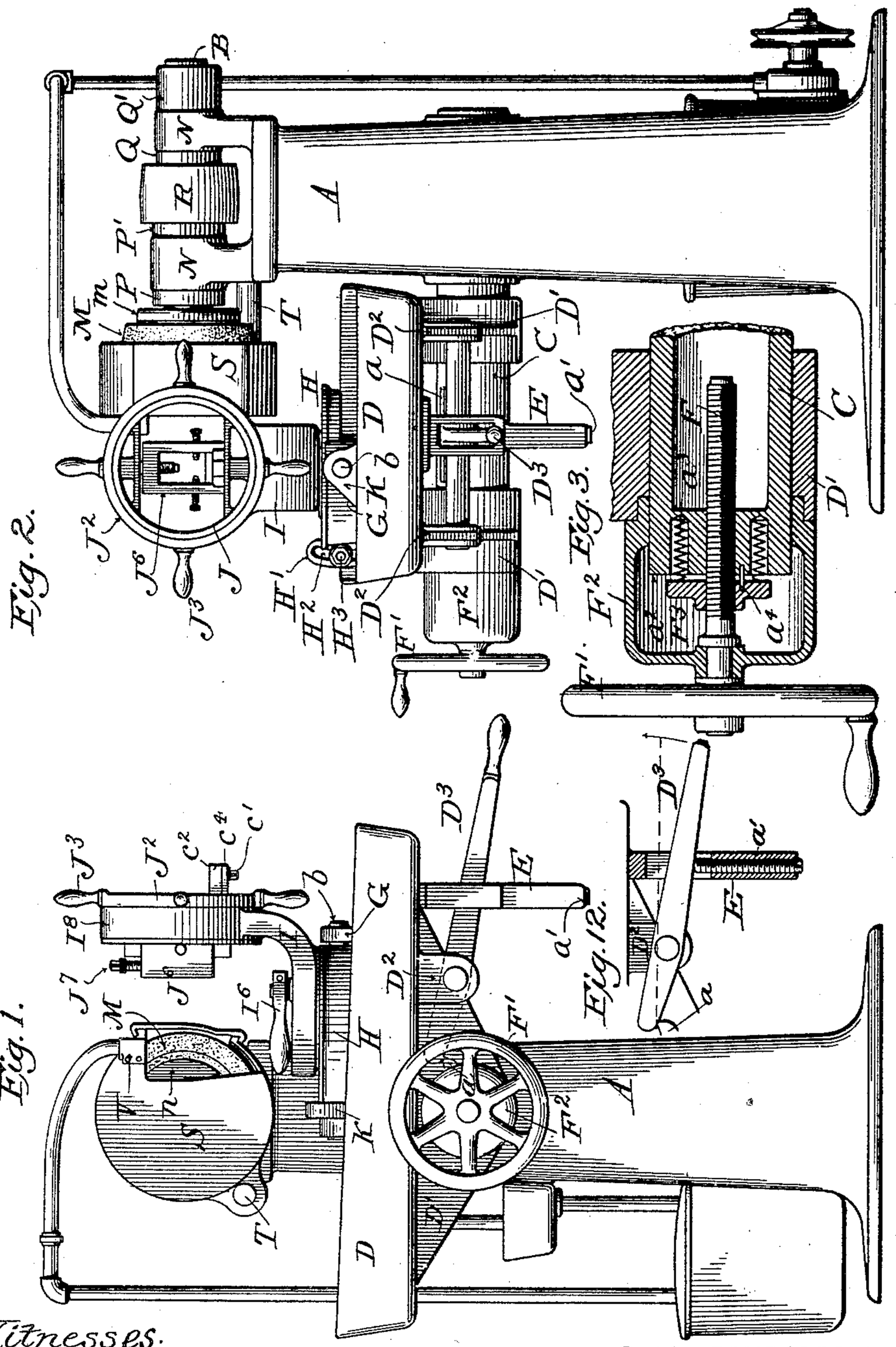
(No Model.) 5 Sheets—Sheet 1.

C. M. CONRADSON.

UNIVERSAL TOOL GRINDER.

No. 467,857. Patented Jan. 26, 1892.



Witnesses:
James L. Duhamel.
Horace A. Dodge.

C. M. CONRADSON,
Inventor,
by Dodge & Sons
Attys.

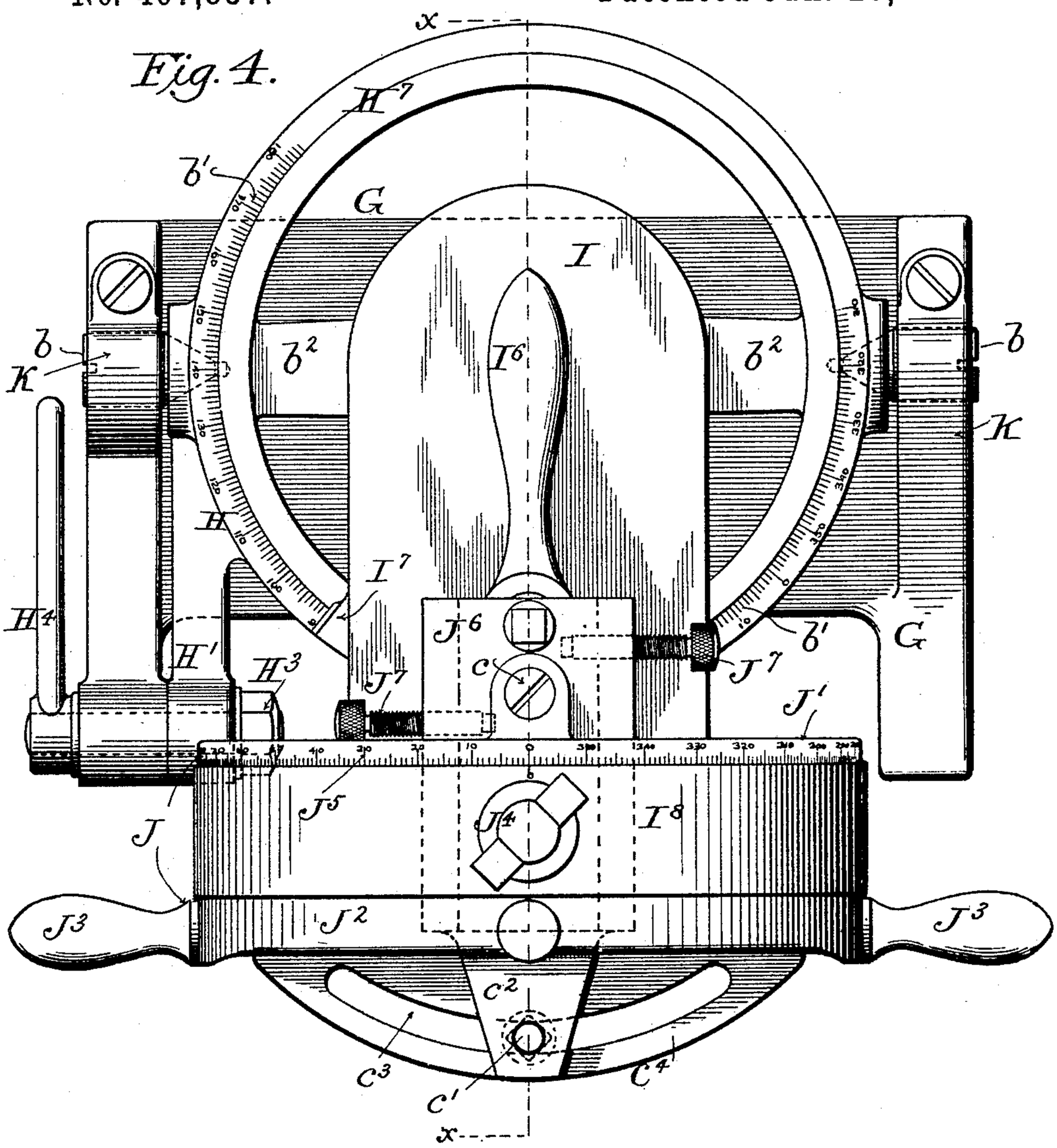
(No Model.) 5 Sheets—Sheet 2.

C. M. CONRADSON.

UNIVERSAL TOOL GRINDER.

No. 467,857. Patented Jan. 26, 1892.

Fig. 4.



Witnesses
Jamis F. Duhamel
Horace A. Dodge

Conrad M. Conradson
Inventor
By his Attorneys Dodger Lone.

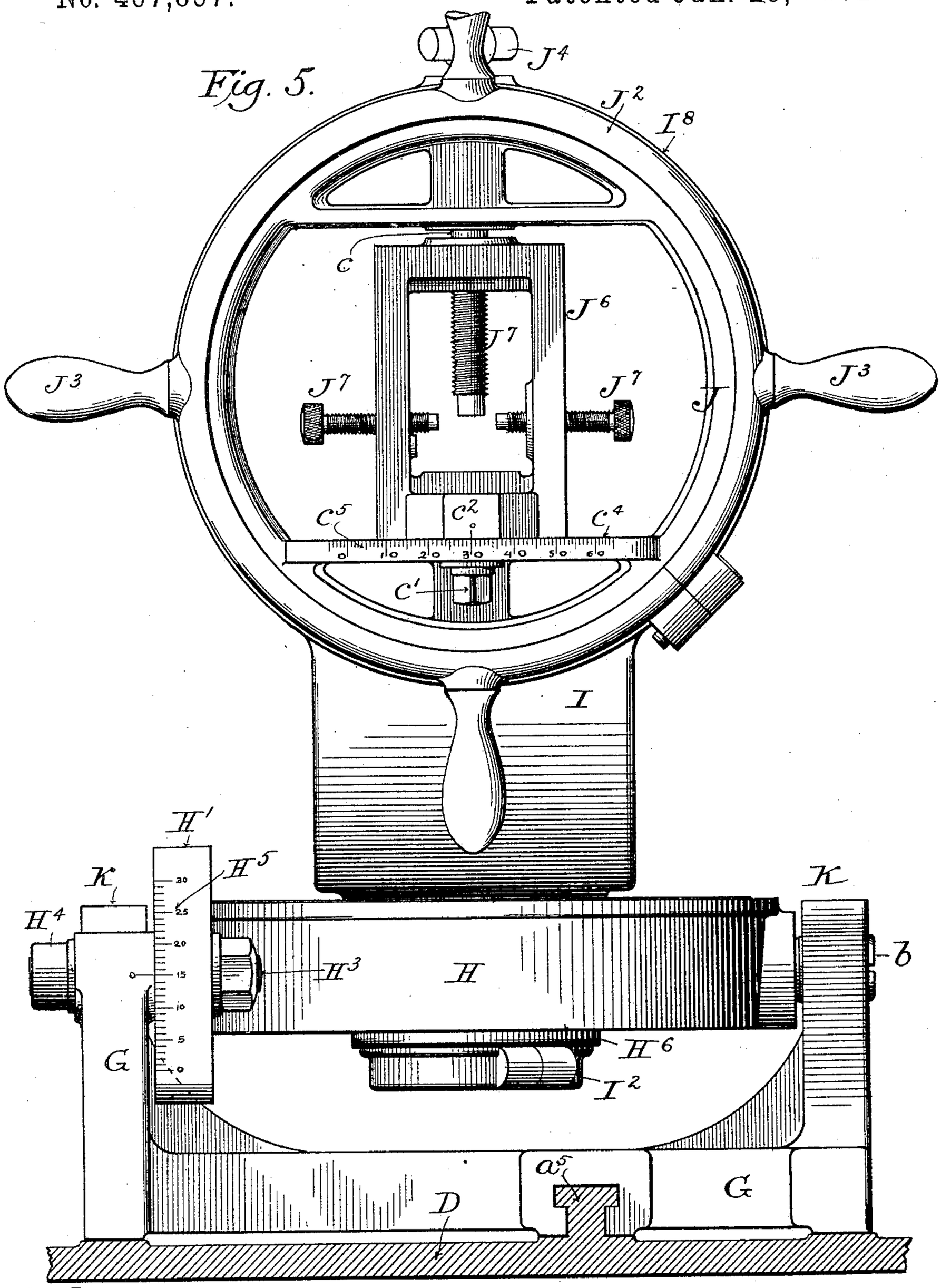
(No Model.) 5 Sheets—Sheet 3.

C. M. CONRADSON.

UNIVERSAL TOOL GRINDER.

No. 467,857. Patented Jan. 26, 1892.

Fig. 5.



Witnesses
James F. Duhamel.
Horace A. Dodge.

Conrad M. Conradson, Inventor.
by Dodger Lone Attys.

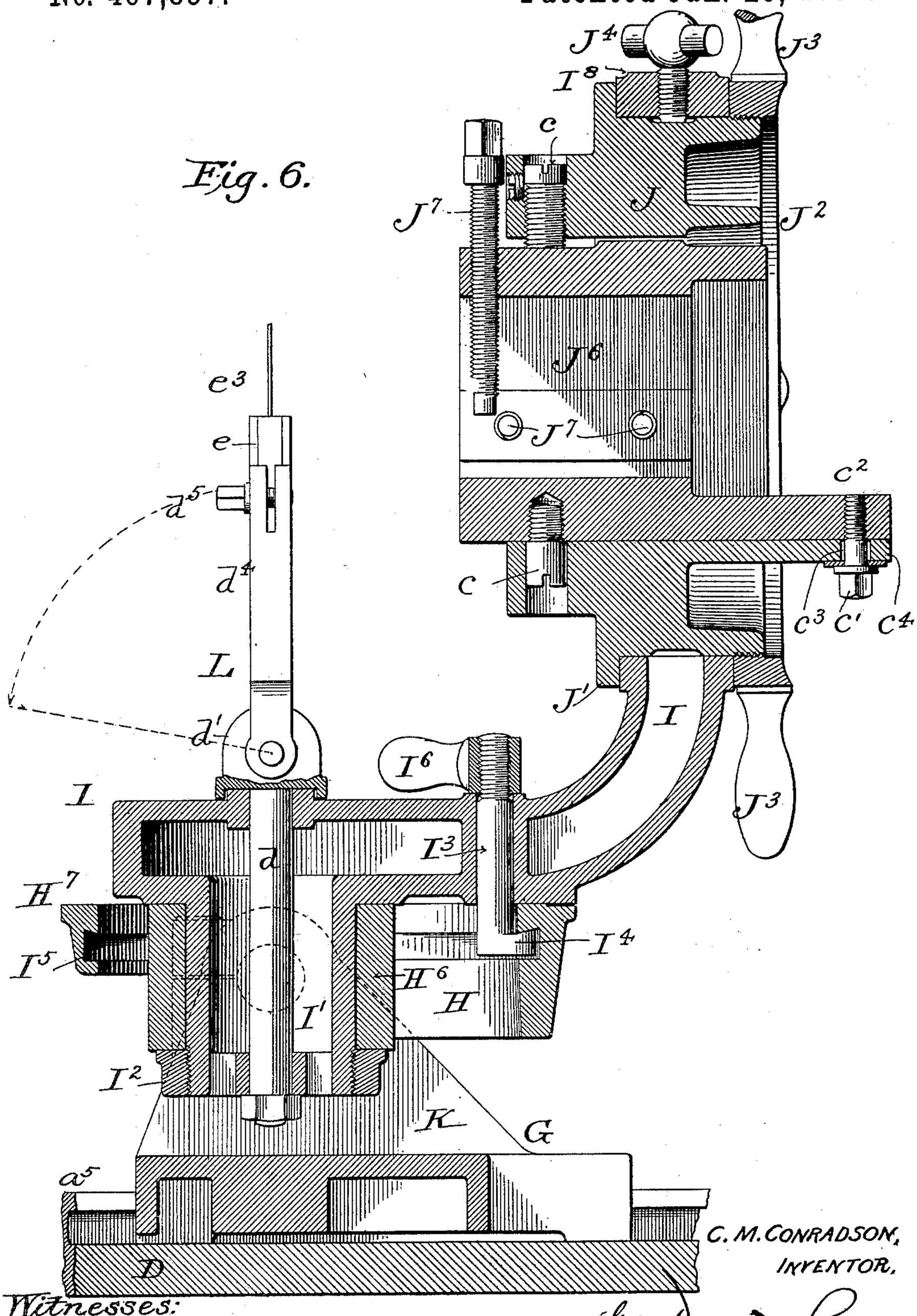
(No Model.) 5 Sheets—Sheet 4.

C. M. CONRADSON.

UNIVERSAL TOOL GRINDER.

No. 467,857. Patented Jan. 26, 1892.

Fig. 6.



Witnesses:
James F. Duhamel
Horace A. Dodge.

C. M. CONRADSON,
INVENTOR,
by Dodge & Sons,
Attys.

(No Model.) 5 Sheets—Sheet 5.

C. M. CONRADSON.

UNIVERSAL TOOL GRINDER.

No. 467,857. Patented Jan. 26, 1892.

Fig. 7.

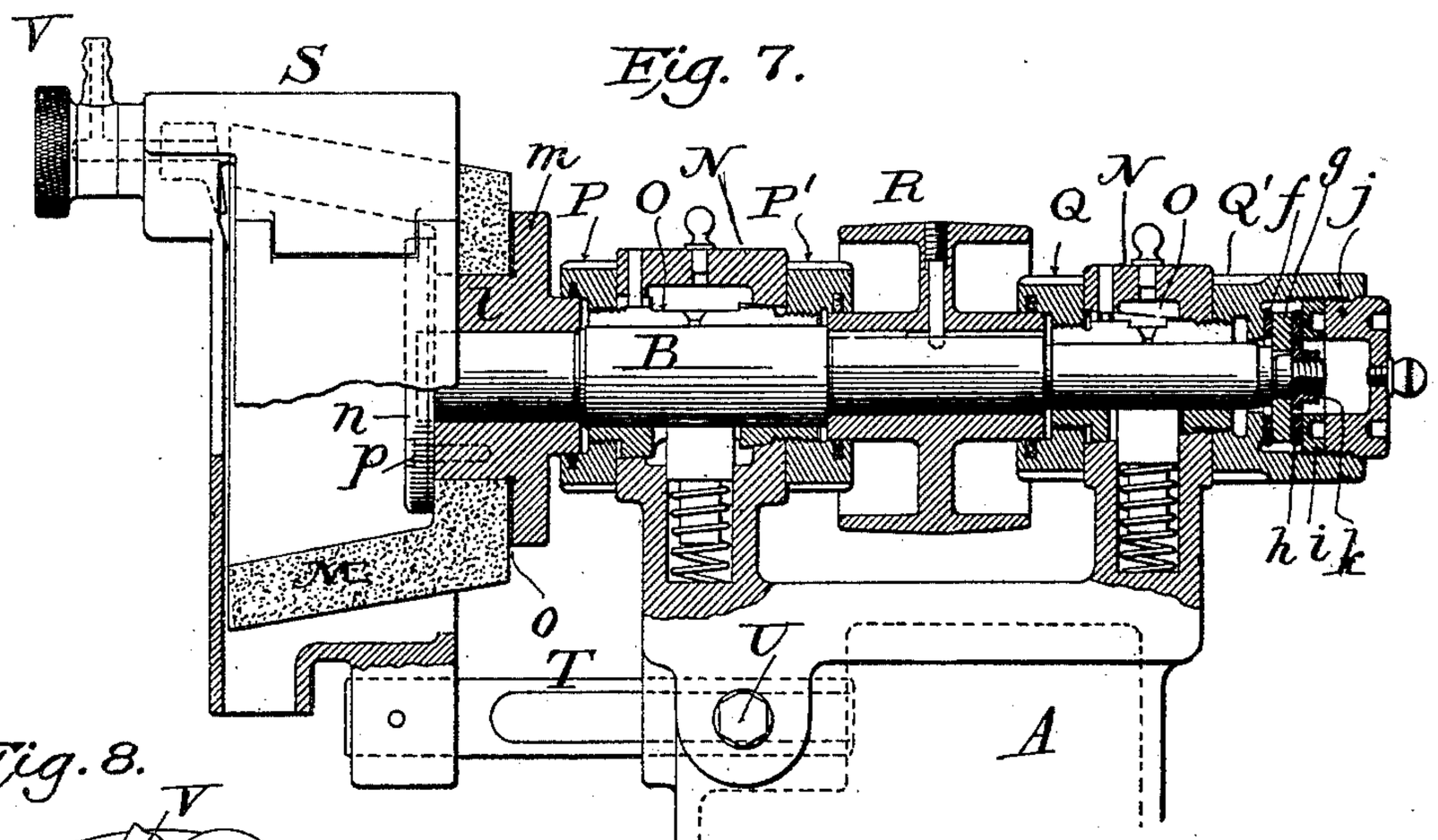


Fig. 8.

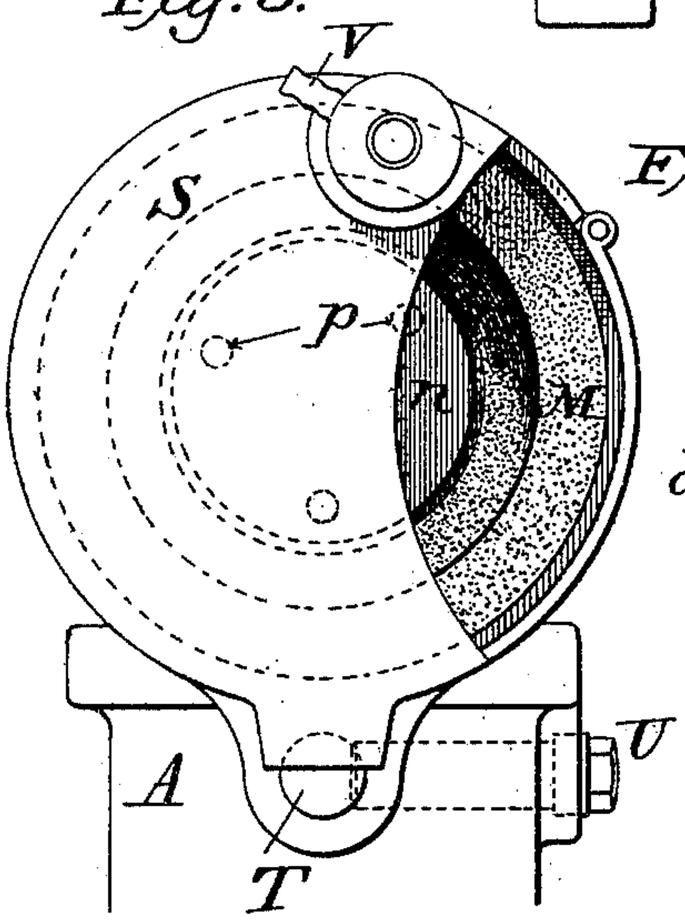


Fig. 9.

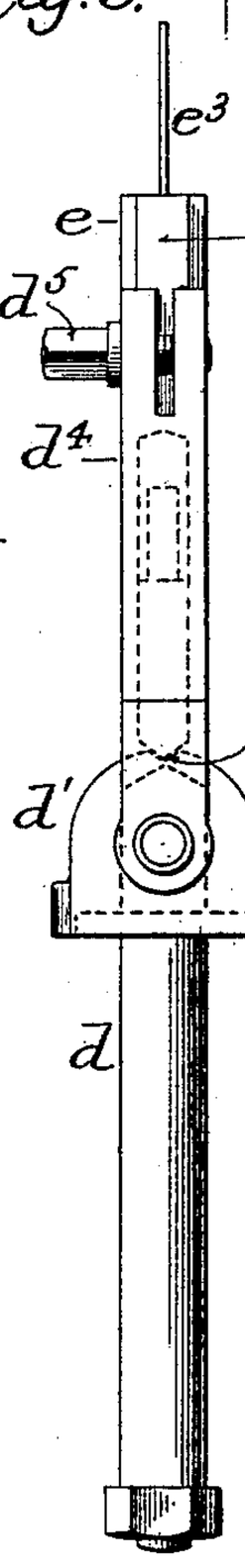


Fig. 10.

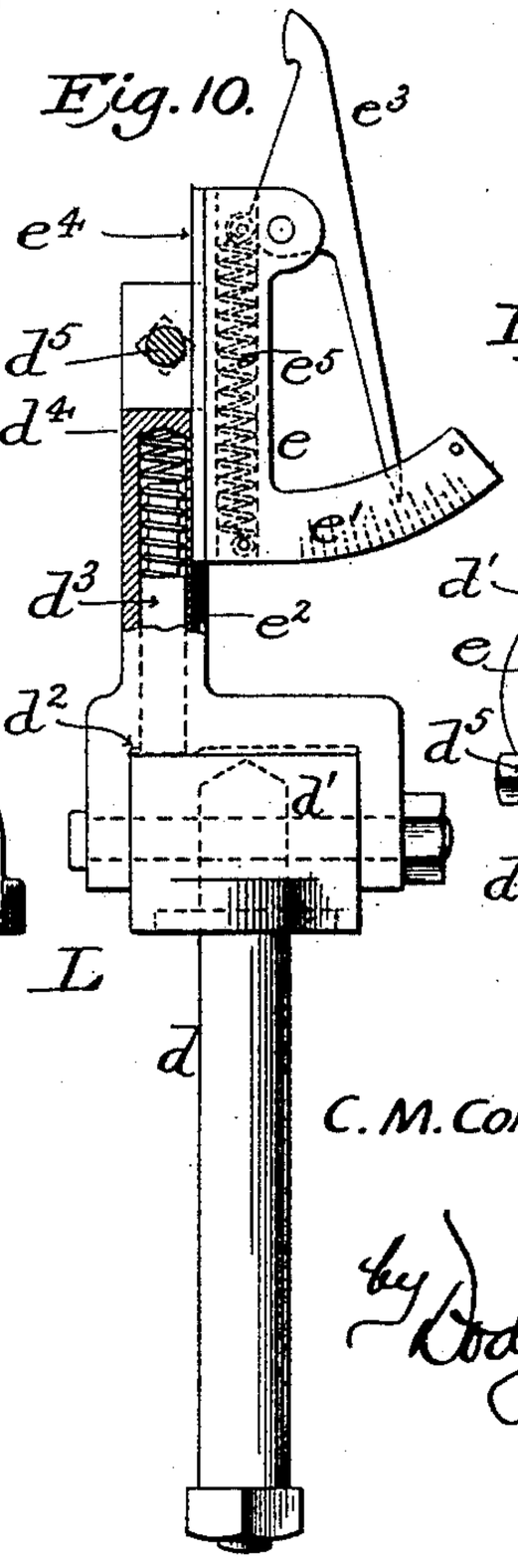
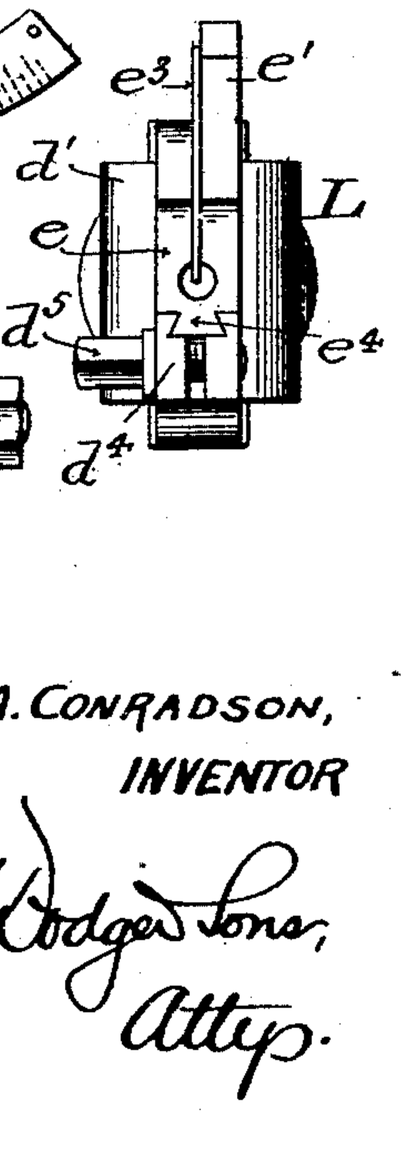


Fig. 11.



Witnesses:
James F. Duhamel.
Horace A. Dodge.

C. M. CONRADSON,
INVENTOR
by Dodge & Sons,
Attys.

UNITED STATES PATENT OFFICE.

CONRAD M. CONRADSON, OF MADISON, WISCONSIN.

UNIVERSAL TOOL-GRINDER.

SPECIFICATION forming part of Letters Patent No. 467,857, dated January 26, 1892.

Application filed May 19, 1891. Serial No. 393,368. (No model.)

To all whom it may concern:

Be it known that I, CONRAD M. CONRADSON, a citizen of the United States, residing at Madison, in the county of Dane and State of Wisconsin, have invented certain new and useful Improvements in Universal Tool-Grinders, of which the following is a specification.

My invention relates to machines for grinding tools; and it consists in various features and details hereinafter set forth and claimed.

In the drawings, Figure 1 is a front face view of my machine. Fig. 2 is a side view; Fig. 3, a sectional view, on a larger scale, of the screw-feed for the oscillating pan and the tool-holder carried thereby; Fig. 4, a top plan view of the tool-holder removed from the pan; Fig. 5, a rear face view of the same; Fig. 6, a vertical sectional view on the line $x\ x$ of Fig. 4; Figs. 7 and 8, views illustrating in detail the construction of the grinding-wheel, its guard, and driving-shaft; Figs. 9, 10, and 11, respectively edge, side, and top plan views illustrating the construction of the centering device; and Fig. 12, a sectional view showing the construction and arrangement of the pan-tipping lever and attendant parts.

A indicates an upright column or standard carrying at its upper end the grinder shaft or spindle B, and provided on its front face with a large projecting stud C, (preferably hollow,) upon which is mounted the oscillating pan D. This pan D carries the tool-holding mechanism, and is also adapted to receive the waste-water, which is pumped from the pan and used again. The stud C, which is affixed rigidly to the column, is made circular in cross-section to receive the arms D′, formed on the under side of the pan, the arms being accurately fitted to the stud C, so as to move lengthwise thereof and oscillate thereon when permitted or desired. The pan is further provided on its under face with an ear or ears D^2, in which is pivoted a lever D^3, the inner end of which bears upon the upper face of a lug a, formed on the stud-arm C, while the outer end projects outward through a yoke E, projecting from the pan, as shown in Figs. 1 and 2. Now when the pan is in its normal position, (shown in Fig. 1,) the inner end of the lever will be resting upon the upper face of the lug, while the outer end will be resting upon the lower bar of the yoke E, as clearly illustrated in Fig. 12. If when the parts are in this position it should be found that the pan should be slightly higher or lower at one end or the other, the outer end of the lever may be raised or lowered slightly by means of a set-screw a', which, as shown in Figs. 1, 2, and 12, passes upward through the yoke and bears against the under side of the lever.

When it is desired to tip the pan to carry the tool across the face of the grinder, it is only necessary to raise the outer end of the lever, as shown in Fig. 12 by dotted lines, the inner end of the lever then acting as the fulcrum.

To move the pan and the tool-holder carried thereby bodily toward and from the grinder, I employ a threaded shaft F, carrying at its outer end a handle or hand-wheel F′, as shown in Figs. 1, 2, and 3. This shaft passes through a threaded opening formed in the end wall a^2 of the stud-arm C, and is swiveled in a cap-piece F^2, secured to the pan and fitting upon the stud-arm, as shown in Fig. 3. Now by turning the shaft the cap-piece will be moved inward or outward, according to the direction of rotation of the shaft, and will carry with it the pan to which it is secured. In order that this movement of the pan may not cause the inner end of the lever D^3 to ride off the lug a on the stud-arm C, the said lug is made of a length or width greater than the distance traveled by the pan, as shown in Fig. 2.

To prevent backlash or any looseness in the action of the pan-actuating shaft, I provide a nut or threaded collar F^3, which is applied to the shaft between the outer end of the arm C and the outer end of cap F^2, as shown in Fig. 3. Coiled springs a^3, seated in recesses in the arm C, urge the collar or nut away from the end of the arm and cause the threads on the shaft to bear snugly against the threads formed in the end of the arm C. The collar or nut is prevented from turning with the shaft by means of a pin or pins a^4, projecting from the collar into the end of the arm C, as also shown in Fig. 3.

As shown in Figs. 5 and 6, the pan is provided with guides or ways a^5 on the inner

face of its bottom, on which is mounted the tool-holder. This tool-holder, which is shown in detail in Figs. 4, 5, and 6, comprises, in a general way, a base G, a circular frame or circle H, mounted therein so as to tip or rock in a vertical plane or on a horizontal axis; an L-shaped frame I, mounted upon the circle H, so as to swing horizontally or upon a vertical axis, and, finally, a second circular frame or circle J, which is carried at the upper end of frame I and adapted to turn or rotate in a vertical plane or upon a horizontal axis, the tool to be ground being secured by devices carried by the circle or circular frame J. The base G is provided with upwardly-projecting ears K, which receive the journals *b*, upon which latter the frame H and the parts carried thereby may oscillate, the journals or bearings for frame H constituting what I term the "clearance axis." While the construction shown is preferred, of course I do not mean to limit myself to the use of the removable studs or journals *b*.

In order to regulate, control, or govern the oscillation of frame H to compensate for the clearance it is desired to give to the tool by grinding, I provide the said frame with an arm H′, Figs. 4 and 5, having a slot H², Fig. 2, concentric with the clearance axis and pass through the slot and adjacent portion of frame G a bolt H³, upon which screws a handle or lever H⁴. The bolt has at its inner end a head, preferably made in the form of a nut, and of course when the handle or lever H⁴ is turned it will clamp the arm H′ firmly in position against the side of the base G. In lieu of this construction any of the common forms of clamps now in use may be used.

In order to determine precisely the angle of inclination given to the frame H, the free end of the arm H′ is provided with a scale or with gradations, as at H⁵, Fig. 5, which are designed to be read in connection with a suitable mark or index on the base G.

The frame or "circle" H, which will advisedly be made of a single casting, comprises a central hub H⁶, a ring or circle H⁷, having gradations *b*′ on its upper face, one or more radial arms *b*², to give strength and rigidity to the frame, and the arm H′, already referred to. Into the hub H⁶ of the frame H fits a hub I′, projecting from the under side of the horizontal portion of the arm I, as clearly shown in Fig. 6, the lower end of the hub I′ being threaded to receive a clamping or retaining ring or nut I², Figs. 5 and 6, these devices constituting a vertical axis about which the frame I may swing in a horizontal plane.

In order to hold the frame I in its adjusted position, I employ a bolt I³, which passes vertically through the horizontal part of frame I, and is provided at its lower end with a lateral head or projection I⁴ to engage a groove or annular recess I⁵, formed in the frame or circle H, as shown in Fig. 6. At its upper end the bolt I is threaded to receive a handle I⁶, by turning which the bolt-head will be drawn up against the upper wall of the slot, and the frame I will be thereby clamped to the frame H. By throwing the handle or lever I⁶ around in the opposite direction the head or projection of the bolt will be allowed to fall away from the upper wall of the groove or slot and the frame will then be free to be moved. The upper wall of the groove or recess I⁵ is undercut slightly, so as to prevent the bolt from turning with the handle or lever.

In order to determine the angular position or adjustment of the frame I, the latter is provided with a pointer I⁷, which, moving over the scale or gradations *b*′, formed on the ring H⁷, shows at a glance whether or not the frame is in such position as to present the tool being ground at the proper angle to the grinder. This adjustment is employed when grinding the angular faces of tools. The upper end or vertical portion of the frame I terminates in a band or ring I⁸, in which is mounted the circle or circular frame J, as shown in Figs. 1, 2, 4, 5, and 6. The circle J is provided with an annular flange or rim J′, which, as clearly shown in Fig. 6, bears against the front face of the ring or band I⁸. The main portion of the circle J projects beyond the rear face of the ring I⁸, where it is provided with a ring J², having suitable handles J³, by means of which it and the said circle J may be turned or rotated in the frame I in a vertical plane about the axis of the tool as a center. This adjustment is employed when grinding the sides and top of the tool, and in order to hold the circle J in its adjusted positions, the ring or band I⁸ is provided with a set-screw J⁴, which, passing through the band, bears upon or against the main body of the circular frame J, as shown in Fig. 6.

In order to determine the angular position of the circular frame J and the tool carried thereby, I provide the annular rim J′ with gradations, as at J⁵, which, when read in connection with a pointer or zero marking on the ring or band I⁸, shows just the angular position of the circular frame and tool.

J⁶ indicates a hollow block carrying screws J⁷, by means of which the tool to be ground is held rigidly in position. This block fits within an opening in the circular frame J, to which it is pivotally connected by means of vertical studs or journals *c*, as shown in Fig. 6. The swinging movement of the block is controlled by means of a clamping-bolt *c*′, which is carried by an arm *c*² projecting from the block, and projects through a slot *c*³, formed in an arm *c*⁴ of the circular frame J, as clearly shown in Figs. 4, 5, and 6. The rear face of arm *c*⁴ is graduated, as at *c*⁵, Fig. 5, so that the angle given to the tool may be accurately and quickly determined.

In grinding tools with a round nose the tool is clamped in the block J⁶ and then centered by the centering device L. (Shown in Figs.

6, 9, 10, and 11, but omitted from Figs. 1, 2, and 4.) This device consists of a stem or rod d passing centrally and vertically through the hub I′, in which it is swiveled. The upper end of the stem or rod is provided with a head or enlargement d', having a notch or seat d^2, adapted to receive the end of a spring-pressed pin d^3, carried by an arm or rod d^4 of the centering device, the said arm or rod d^4 being hinged or pivoted to the head of the rod or stem d, so as to swing down out of the way, as shown in Fig. 6. When the part d^4 is up in its vertical working position, the spring-pin will be seated in the recess d^2 and hold the part d^4 in position; but, owing to the formation of the seat or recess d^2, the part d^4 may be readily swung down out of the way, the beveled end of the pin readily riding out of the recess. The upper end of the rod or arm d^4 is split, and the two parts are drawn together by a screw or bolt d^5, so as to clamp and hold the arc block e, carrying the graduated arc e' and lever or pointer e^3. One of the vertical faces of the arm or rod d^4 is provided with a dovetail groove e^2 to receive a corresponding rib e^4, formed on the back face of the arc block, by means of which construction vertical adjustment of the arc block and its pointer or index relatively to the standard d d^4 is secured.

The indicator or pointer e^3 is pivoted at a point between its ends to the upper end of the block e, while its lower end works over the graduated arc e', a coiled spring e^5 being employed to hold the upper end against the rounded nose of the tool during the centering operation and to return the indicator to its normal position. The object of using this centering device is to insure the placing of the center of the tool in line with the vertical axis on which the tool-holder frame I swings.

After a tool is clamped in the holder it is adjusted by the screws J^7 until the indicator or pointer e^3 (whose upper edge touches the face to be ground) indicates upon the graduated arc e' the same angle or measurement for all the faces to be ground, the pointer being applied to each of said faces successively by being turned upon the vertical axis d. When the tool is thus centered, it is rigidly clamped in the holder and is ground by swinging the tool-holder frame about its vertical axis. The flat faces tangential to the round nose may be separately ground by tipping the pan D and carrying the faces across the face of the grinder. If clearance is desired, the holder is tipped upon the horizontal axis b b.

Where from the nature of the tool the latter cannot be mounted within the block J^6, a separate tool-holding clamp may be employed, the clamp to which the tool is secured being in such case secured to the block.

From the foregoing description it will be seen that the tool when once applied to the block J^6 may have four distinct adjustments—viz., first, an adjustment in a horizontal plane about the vertical axis c c; second, an adjustment with the circle J about its own axis; third, a horizontal adjustment with the frame I about the vertical axis H^6 I′, and, fourth, an adjustment in a vertical plane upon the clearance axis.

If the tool to be ground is bent, the tool box or block J^6 is adjusted or rotated upon its vertical axis c c. If the tool is required to have a definite amount of clearance on a face at an angle to its axis, (as is the case with screw-threading tools, for instance,) the circular frame H is tipped or rocked upon the clearance axis. To secure the required horizontal angles, the frame I is swung around in a horizontal plane on the axis H^6 I′, and to present the tool to the grinder so as to grind its different sides the circle J is rotated so as to turn the tool about its own axis. From this it will be seen that it is possible to present the tool to the grinder in most any position and to grind a number of tools to the same gage, thereby insuring perfect uniformity in the work.

While the machine is of considerable value in any shop for grinding tools its advantages are best realized and appreciated when used in connection with a chart giving the angular adjustments for each standard tool to be ground. The machine is also particularly well adapted for grinding special tools, as the tool-holder can be set directly to the exact angle of clearance or rake without stopping to calculate the angles.

In grinding thread-cutting tools the machine is particularly valuable, as any desired angle of clearance can be obtained on either side of the tool without changing the top angle.

The grinder M, heretofore referred to, may be made of emery, corundum, or other suitable material, and has the form of a hollow frustum of a cone with an internal annular ledge or flange at its smaller end, as shown in Fig. 7. This grinder is secured to the end of the shaft B, journaled in suitable boxes or bearings N, formed on the upper end of the column or standard A. The boxes or bearings are made tapering to receive conical brasses O, threaded at their ends to receive the adjusting and holding rings P P′ and Q Q′, which latter bear against opposite faces of the boxes or bearings.

Upon reference to Fig. 7 it will be noted that the brasses are slotted or divided lengthwise, so that when they are adjusted longitudinally through the conical openings of the boxes they will be compressed sufficiently to take up the wear. The ring Q′ is made with a socket in its outer face to receive the rings f g h, which, in connection with the nut k screwing onto the end of the shaft, hold the latter in its proper position. A ring i and cap j screw into the open end of the ring Q′ and exclude the dirt and assist in holding the parts in proper position. Between the boxes or bearings there is affixed to the shaft B a driving-pulley R, which receives motion from any suitable source of power, while upon the

inner end of the shaft is a collar *l*, having an annular flange *m*. The smaller end of the grinder is slipped onto the collar *l*, and a disk or plate *n* is then applied to the outer face of the internal flange of the grinder, as shown in Fig. 7. Between the flange *m* and the inner end of the grinder and between the plate *n* and the inner face of the grinder-flange is placed a rubber or other elastic washer *o*, and the parts are then secured together by means of screws or bolts *p*, which pass through the plate and into the collar, thereby effectually attaching the grinder to the shaft.

The grinder works in a housing or casing S, which, as shown in Figs. 1, 7, and 8, is cut away on its front face to allow the tool to be brought into contact with the grinding-surface. This housing is carried by an arm T, adjustably secured to the main frame by means of a set-screw or bolt U, and is also provided with a nipple V, to which to connect a water-supply pipe.

Having thus described my invention, what I claim is—

1. In a tool-grinding machine, the combination, with a main frame and a grinder mounted therein, of a pan provided with a tool-holder, and means for oscillating or tipping the pan to carry the tool across the face of the grinder.

2. In a tool-grinding machine, the combination, with a main frame and a grinder mounted therein, of a pan provided with a tool-holder, means for moving the pan and tool-holder bodily toward and from the grinder, and devices for oscillating the pan and tool-holder to carry the tool-holder across the face of the grinder.

3. In combination with standard A, having stud C, pan D, mounted thereon and provided with a tool-holder, and a lever D^3, journaled on the pan and bearing at its inner end upon the lug on a stud C, whereby when the outer end of the lever is raised and lowered the pan and its tool-holder will be tipped or rocked upon the stud C.

4. In combination with standard A, having stud C, pan D, provided with arms D′ to receive the stud and with an ear D^2, in which is mounted a lever D^3, a lug *a*, formed on the stud-arm C to receive the inner end of the lever, and a yoke E, projecting from the pan to receive the lever.

5. In combination with standard A, having stud-arm C, pan D, mounted thereon, a cap F^2, fitting over the end of arm C, but attached to the pan, and a screw-shaft F, swiveled in the cap and engaging the stud-arm, all substantially as shown.

6. In combination with standard A, having stud-arm C, pan D, mounted thereon and provided with a cap F^2, a screw-shaft F, swiveled in the cap and engaging the arm C, a threaded collar F^3, applied to the shaft, springs a^3 between the collar and the end of arm C, and a pin a^4, extending from the collar to the arm to prevent rotation of the collar.

7. In a tool-grinder, a tool-holder comprising a base, a frame mounted therein on a horizontal axis, an upright standard journaled in the frame so as to swing in a horizontal plane, and a circular frame journaled in the upper end of the standard and adapted to turn or rotate upon the axis of the tool to be ground.

8. In combination with base G, the frame H, journaled therein and provided with the graduated ring H^7, and the L-shaped frame I, journaled on the frame H and provided with tool-holding devices.

9. In combination with base G, the frame H, journaled therein and provided with the annular groove I^5, the L-shaped frame I, journaled on frame H and carrying tool-holding devices, and a bolt I^3, having at its lower end a lateral arm I^4 to engage the groove and provided on the upper face of a portion of frame I with a lever I^6.

10. In combination with frame H, having hub H^6, an L-shaped frame I, having a hub I′ to fit the hub H^6, devices for locking the frames together, and tool-holding devices carried by the upper end of the frame I.

11. In combination with frame H, an L-shaped frame journaled thereon so as to swing horizontally, a locking device for the two frames, a ring or circular frame mounted in the upper portion of frame I and adapted to receive the tool to be ground, and means for holding the ring in its adjusted position.

12. In combination with the frame I, having the band or ring I^8, the circular frame J, journaled therein, and the tool-block J^6, journaled in the ring.

13. In combination with the base G, the frame H, journaled therein so as to rock or oscillate in a vertical plane, a support I, mounted upon the frame H so as to swing in a vertical plane, a circular frame J, carried by the support I and adapted to turn in a vertical plane, and tool-holder J^6, journaled in the ring or frame J and adapted to swing in a horizontal plane.

14. In combination with the base G, the frame H, journaled therein, the support I, journaled on frame H, the ring-frame J, journaled in the support I, and scales or gradations for determining the relative angular positions of the frames G, H, I, and J.

15. In combination with the frame I, having band or ring I^8, the ring or circular frame J, mounted therein and provided with a flange J′, and a ring or band J^2, provided with handles J^3 and secured to the ring J, all substantially as shown.

16. In combination with frame I, having the ring J journaled therein, a slotted arm c^4, projecting from the ring, a block J^6, journaled in ring J upon vertical pivots *c c* and provided with an arm c^2 to move over the arm c^4, and a bolt carried by the arm c^2 and projecting through the slotted arm c^4.

17. In a tool-grinder, the combination, with a tool-holder and its supporting-frame, of a centering device for the tool.

18. In a tool-grinder, the combination, with an L-shaped supporting-frame I, carrying a tool-holder at its upper end, of a centering device applied to the frame I in line with its axis.

19. In combination with a tool-holder and its supporting-frame, a centering device hinged or pivoted, as shown, so as to swing down out of the way.

20. In combination with stem or rod d, provided with head d' and a seat d^2, an arm or rod d^4, pivoted to the rod d and having a spring-pressed pin d^3 to enter the seat d^2, a block e, carried by rod d^4, and a pointer or indicator pivoted in the block.

21. In combination with the grooved and slotted rod d^4, the screw or bolt d^5, the arc block e, mounted in the slotted rod, and the pointer and spring.

22. In a tool-grinding machine, the combination, with the main frame and the grinder mounted therein, of tool-holding devices adjustable in a vertical plane about the axis of the tool and in a horizontal plane upon a vertical axis which if extended upward would touch the center of the tool to be ground.

In witness whereof I hereunto set my hand in the presence of two witnesses.

CONRAD M. CONRADSON.

Witnesses:

W. R. BAGLEY,

J. H. NICHOLS.