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U. & F. L. EBERHARDT.

AUTOMATIC CUTTER GRINDING MACHINE.

No. 575,057. Patented Jan. 12, 1897.

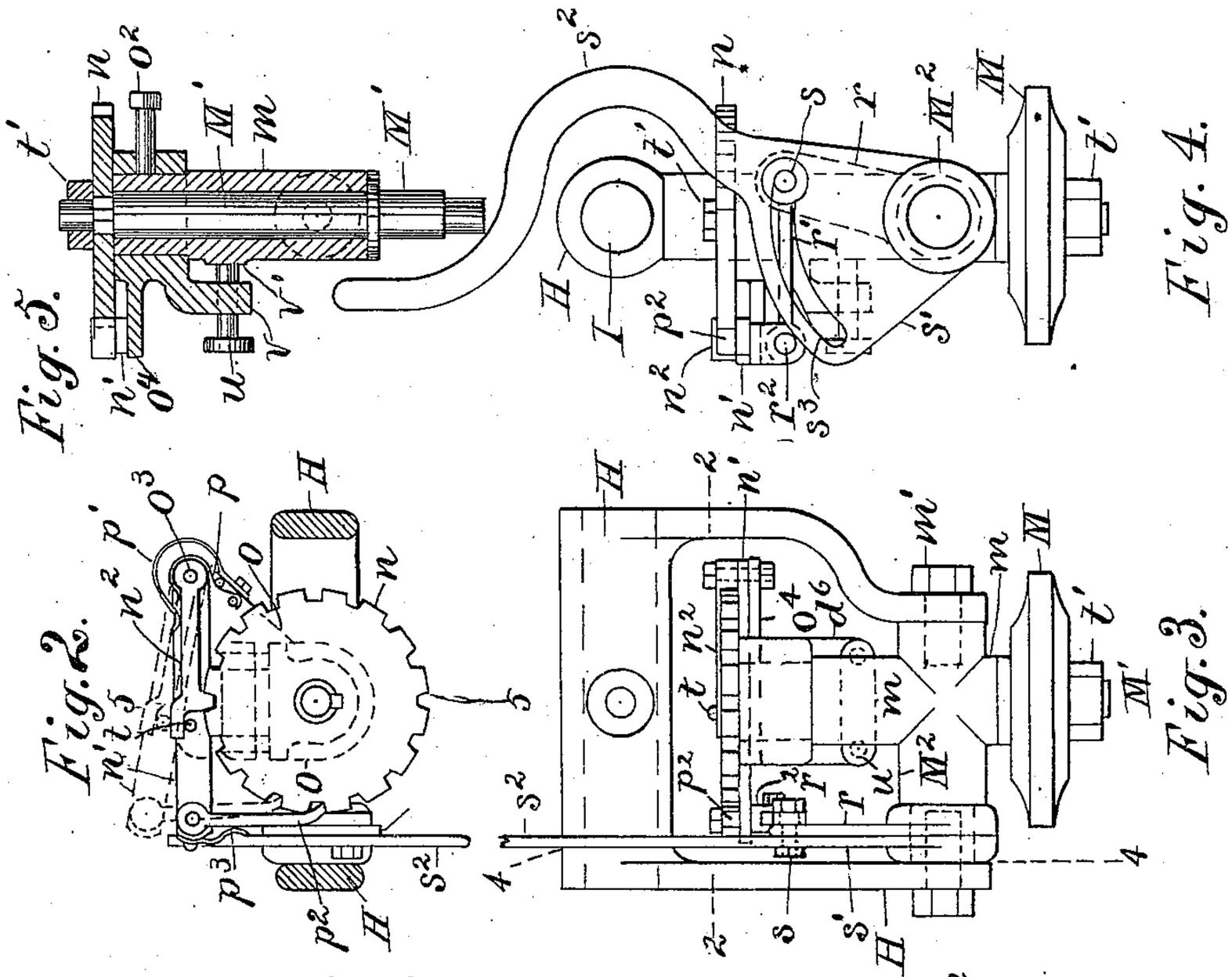

Fig. 5.

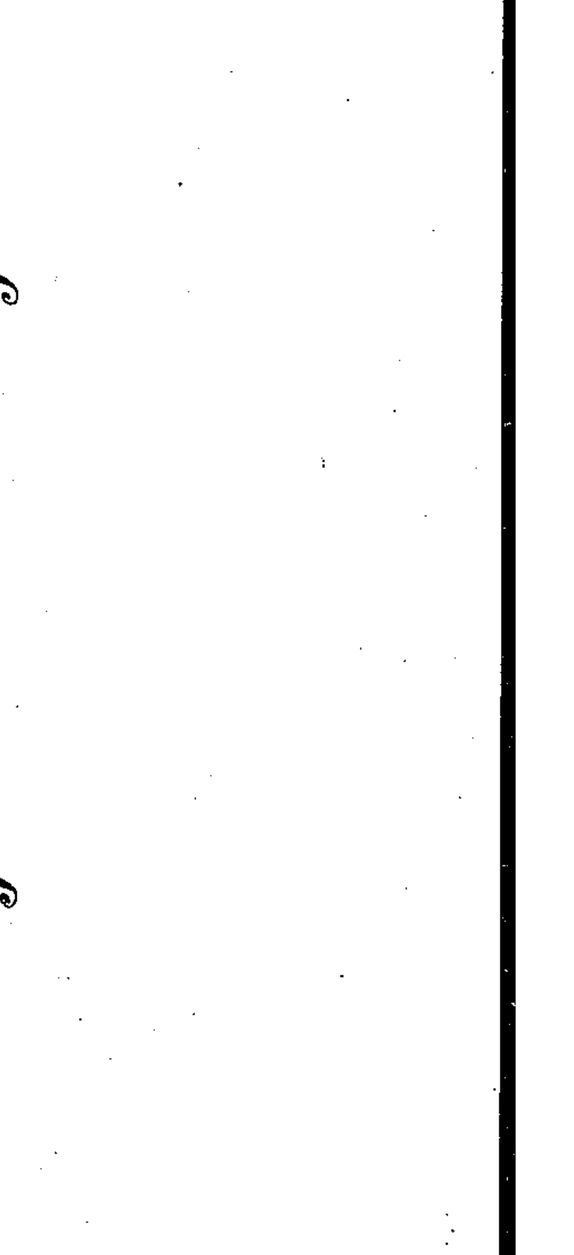

Fig. 4.

Fig. 2.

Fig. 3.

Fig. 1.

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Fig. 6.

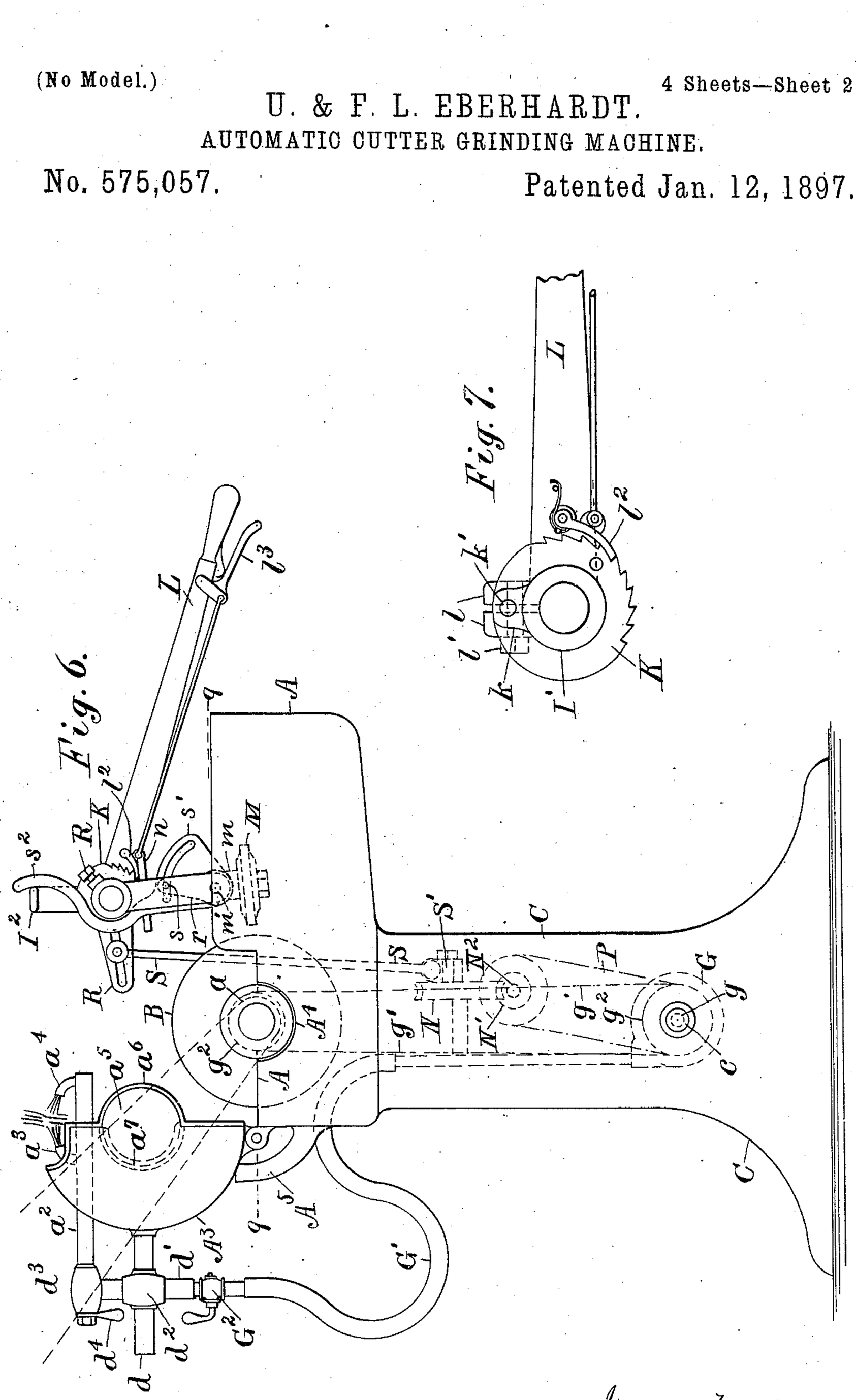

Fig. 7.

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AUTOMATIC CUTTER GRINDING MACHINE.

No. 575,057. Patented Jan. 12, 1897.

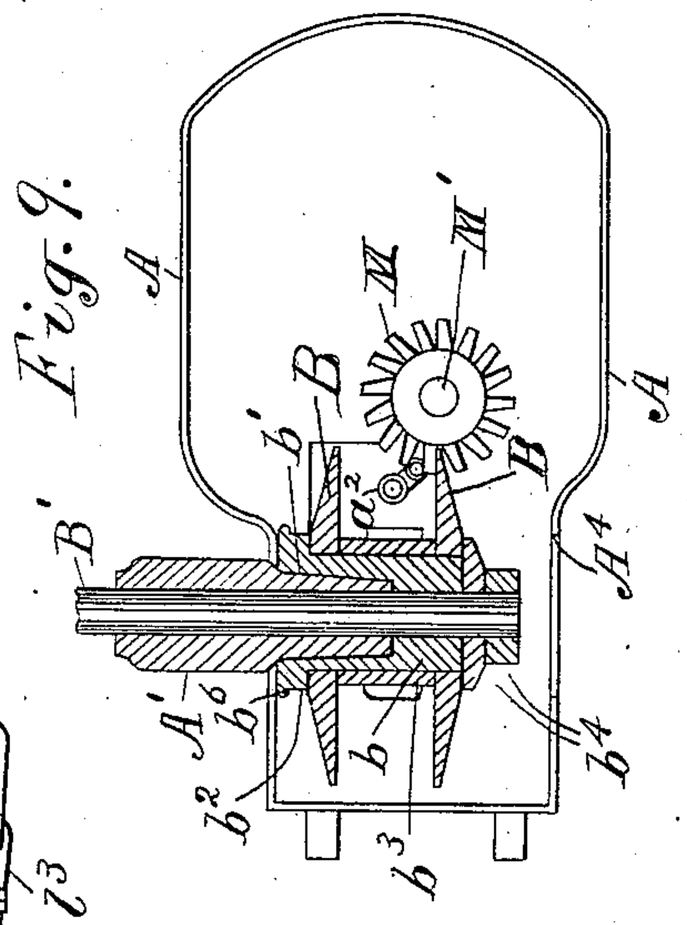

Fig. 7.

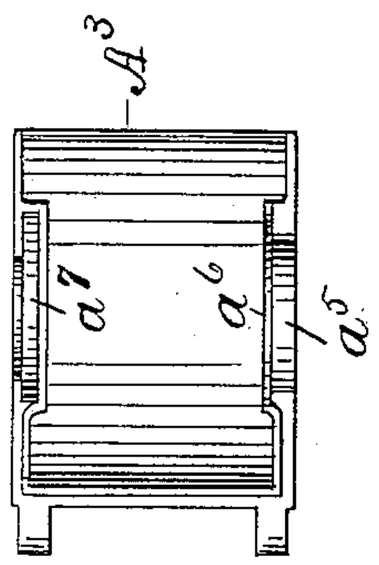

Fig. 16.

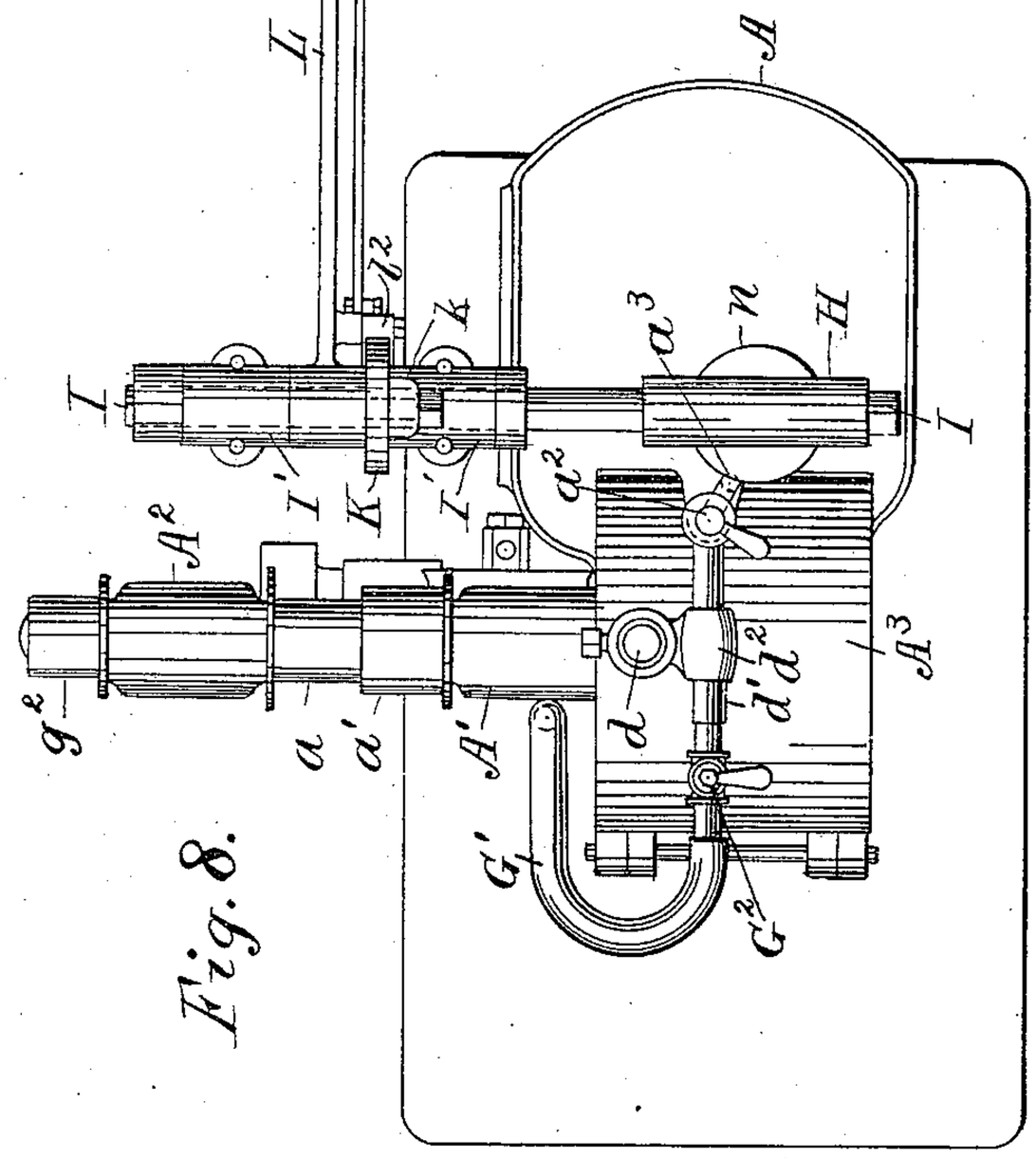

Fig. 8.

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AUTOMATIC CUTTER GRINDING MACHINE.

No. 575,057. Patented Jan. 12, 1897.

Fig. 12.

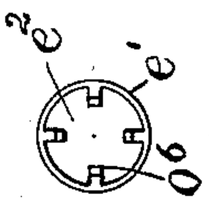


Fig. 11.

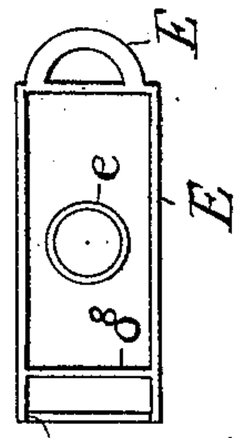


Fig. 13.

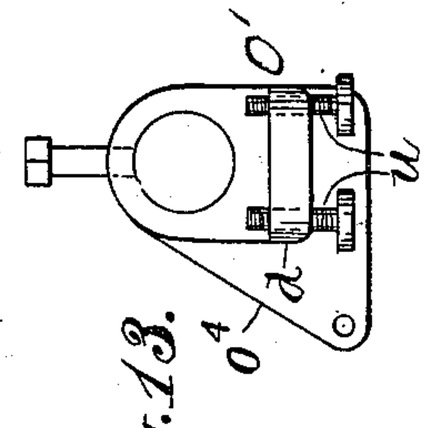


Fig. 14.

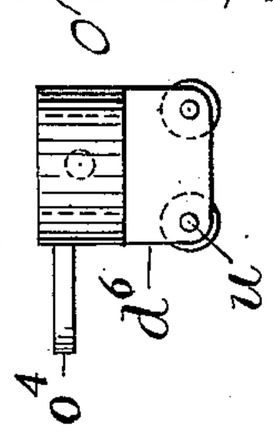


Fig. 15.

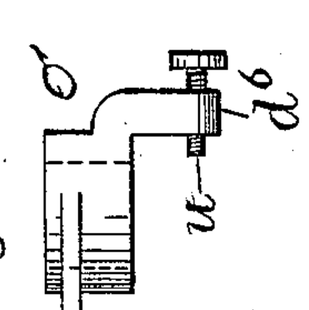
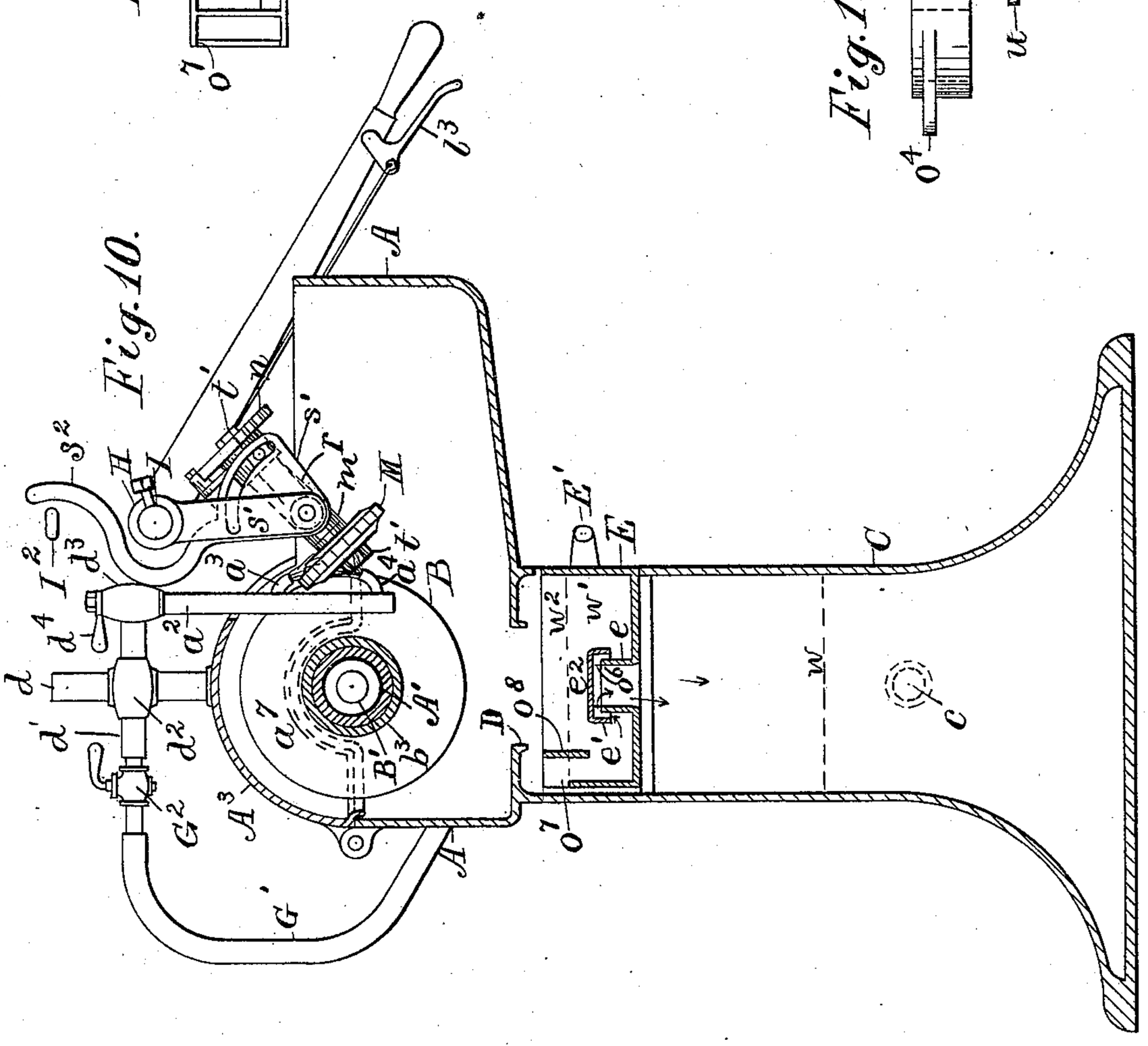


Fig. 10.



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UNITED STATES PATENT OFFICE.

ULRICH EBERHARDT AND FRED L. EBERHARDT, OF NEWARK, NEW JERSEY.

AUTOMATIC CUTTER-GRINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 575,057, dated January 12, 1897.

Application filed September 5, 1896. Serial No. 604,965. (No model.)

To all whom it may concern:

Be it known that we, ULRICH EBERHARDT and FRED L. EBERHARDT, citizens of the United States, residing at Newark, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Automatic Cutter-Grinding Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to furnish a convenient and effective means of accurately grinding the cutting-faces of such rotary cutters as are used in gear-cutting machines for forming the teeth of cog-wheels.

The invention is also applicable to the grinding of milling-cutters of various kinds, and relates partly to means for intermittently rotating the cutter after pressing one of its faces to the grinding-wheel to bring the succeeding face in contact with such wheel, and partly to means for lubricating and cooling the cutter during the grinding operation. For cooling and lubricating the cutter means is provided for discharging opposite jets of water or other lubricant toward the cutter upon both edges of the surface which is being ground, so that the cutter is not only moistened and cooled upon the side toward which the grinding-wheel revolves, but also upon the opposite side, which assists in clearing the chips and abraded particles from the grinding-wheel, while it operates most efficiently in preventing the cutter from overheating. The cutter is mounted upon a rotary spindle which is swung to and from the grinding-wheel by a yoke attached to a rock-shaft, and the rock-shaft may be oscillated by hand or automatically to bring the cutter in contact intermittently with the grinding-wheel. These means, with various constructive features which are claimed herein, are shown in the annexed drawings, in which—

Figure 1 is a front elevation of the machine. Fig. 2 is a plan of the index-wheel and devices for actuating the cutter, the view being taken in section on line 2 2 in Fig. 3. Fig. 3 is a rear elevation of the yoke and the cutter-holding device carried thereby. Fig. 4 is a side elevation of the same, taken on line 4 4 in Fig. 3; and Fig. 5 is a vertical section, at the center line where hatched, taken on line 5 5 in Fig. 2. In Fig. 1 the cutter-supporting spindle is shown adjusted in a nearly vertical position, and Fig. 6 is an end view of the machine with the cutter-spindle thus adjusted. Fig. 7 is an enlarged view of the detent for the rock-shaft hand-lever. Fig. 8 is a plan of the machine with the cover for the grinding-wheels closed. Fig. 9 is a plan taken in section, where hatched, upon line 9 9 in Fig. 6. Fig. 10 is a vertical section, where hatched, on line 10 10 in Fig. 1. Fig. 11 is a plan of the settling-pan with the cover e^2 removed. Fig. 12 is a plan of the cap e^2 inverted. Fig. 13 is a plan of the plate o' inverted and detached from the parts shown in Fig. 2. Fig. 14 is an edge view of the same, and Fig. 15 a side view of the same.

The mounting of the grinding-wheel and means for lubricating and cooling the cutter will be first described.

A designates a casing within which grinding-wheels B are revolved, the casing being mounted upon the top of a hollow column C and forming a water-trough to catch the water or other lubricant which is supplied to such wheel and flows thence into the top of the column by aperture D, which is provided with drip-flanges to direct the fluid into a straining-pan E.

Two grinding-wheels with beveled edges are used, each wheel having one plane surface to which the cutter-faces are applied, and the wheels are shown clamped upon a spindle, with their plane faces adjacent, at a suitable distance apart to apply the cutter to either face at pleasure.

The casing A is provided with a bearing A′, which is projected partly within the casing, and the grinder-spindle B′ is extended through such bearing and supported at its outer end by a bracket-bearing A^2, pulleys a and a' being provided between the bearings to receive the driving-belt, which rotates the grinders at a high rate of speed. A hub b, provided in one end with a recess b', is attached to the grinder-spindle, the recess fitting over the inwardly-projecting end of the bearing A′. The hub is provided at its inner

end with a collar b^2, against which one of the grinding-wheels B is fitted, and the other grinding-wheel is fitted to the outer end of the hub. A sleeve b^3 of suitable length is fitted to the hub between the grinding-wheels, and a nut and washer b^4 (applied to the outer end of the spindle) clamps the wheel securely upon the hub. Upon the outer side the casing is notched at A^4 concentrically with the spindle to afford space for removing the nut and washer b^4 when it is required to change the grinding-wheels.

A cover A^3 is hinged to the rear edge of the casing and curved to inclose the tops of the grinding-wheels. The outer side of the cover is formed with semicircular projection a^5 to fit the notch A^4, and such projection is provided with a rim extended into the casing, with an annular flange a^6 depending from its inner edge to cover the joint of the notch and recess and thus prevent the water from splashing out of the casing. The collar b^2 of the grinding-wheels is provided with a peripheral flange b^6, and the rear side of the cover is notched to fit over such flange and provided with an annular groove a^7, which directs within the casing any water that is thrown outwardly by such flange.

The cover A^3 is provided with a water-pipe a^2, carrying two nozzles a^3 and a^4, which are bent to discharge jets of water toward one another, as illustrated in Fig. 6. A stud d is mounted upon the top of the cover, and a pipe d' is swiveled upon the same at right angles by means of sockets d^2, which are clamped, respectively, to the stud and to the pipe. The end of the pipe d' is formed with a vertical socket d^3, in which the pipe a^2 is swiveled, and provided with a handle d^4 to turn the latter pipe for adjusting the nozzles a^3 and a^4 in the proper relation to the cutter and grinding-wheels when the cover is closed, as shown in Fig. 10.

In the drawings, the pipe a^2 is shown extended downward between the grinding-wheels B, through a notch in the front of the cover A^3, which brings the pipe between the two wheels, so as to direct the jets against the same side of the wheel, whichever one may be in use. If one wheel were used, the pipe a^2 would necessarily be extended past one side of the same, and the jets would in like manner operate upon the same side of such wheel. This arrangement is employed because the cutting-face of a rotary cutter is commonly a plane surface, which is ground by application to the plane surface of the wheel, and it is such plane side against which the water-jets are directed at opposite ends of the cutting-face where the grinder is operating.

A rotary pump G is mounted at one side of the column, and its spindle g, driven by a belt g', applied to pulleys g^2, upon the grinder-spindle and the pump-spindle. The inlet or suction of the pump, which may be constructed like an ordinary blast-fan for blowing air, is screwed into one side of the column, so as to draw a supply of water from the interior of the same, which is filled with water to the level indicated by dotted line w in Figs. 1 and 10. The outlet of the pump is connected by a hose G' with the pipe d', which is provided with a cock G^2 to regulate the flow of water from the nozzles a^3 and a^4.

The pan E is made as a drawer supported upon cleats F within the column, and as grease is liable to clog the grinding-wheels the pan is provided with means for separating from the water any grease which drips from the revolving journals within the casing.

The grease-separator is applied to an outlet-passage above the bottom of the pan, which passage determines the level of the fluid in the pan, and the separator consists of a flange projected downward adjacent to the mouth of such passage and below the edge of such mouth, so as to penetrate the surface of the water and thus intercept the grease from flowing into the outlet. The fluid discharged from the outlet of the pan falls within the column to supply the suction of the pump.

The pan is shown with a central outlet-passage in the bottom having a nozzle e projected upwardly and the separator-flange e' formed upon the edges of a cap e^2, the cap and flange being sustained at a little distance from the nozzle by small seats o^6 to permit the passage of the fluid. When such discharge-outlet is operative, the water rises only to the level indicated by the dotted line w', but provision is made, in case the space between the nozzle and the flange e' becomes clogged, for discharging the water from the inner end of the pan to prevent its overflow at the outer end, where the handle E' is provided. To effect this object, a notch is cut in the back end of the pan, forming an outlet-passage o^7, which restricts the highest water-level to the dotted line w^2. Adjacent to the passage o^7 a vertical flange o^8 is fixed, which penetrates the water when it reaches the level w^2 and prevents the grease from overflowing, while the water escapes freely through the passage o^7 into the column below. Either of these separator devices may be used separately for straining the oil from the water. The means for sustaining the cutter may be widely varied to coöperate with the devices already described, but the preferred form is constructed as follows:

The yoke H for presenting the cutter to the grinding-wheels is secured adjustably upon the rock-shaft I, which is mounted to turn in bearings I' upon the top of a vertically-adjustable post J. The post is fitted to slide in a vertical socket J' upon the outer side of the casing or trough A, and is provided with a screw J^2 for adjusting it vertically and with a set-screw j for clamping it when thus adjusted. A toothed disk or ratchet-wheel K is secured upon one of the bearings I' by lug k and bolt k', and a hand-lever L is secured adjustably upon the rock-shaft by a split hub

l, having clamp-screw l'. A pawl l^2 is pivoted upon the hand-lever and actuated by a handle l^3 near the outer end of the lever.

The ratchet-wheel K, being held rigidly, serves to support the hand-lever (by means of the pawl l^2) in any required position, and thus when required serves to hold the yoke H in a convenient position for applying the cutter M to the cutter-spindle M', which is mounted in a bearing m within the yoke H. Such bearing, as shown in Fig. 3, is clamped within the arms of the yoke by a transverse hub M^2 and bolts m', and may be adjusted at various angles to present the edge of the cutter in various relations to the grinding-wheel.

In Fig. 6 the bearing is shown adjusted to hold the cutter-spindle nearly vertical, so that the periphery of the cutter may be directly applied to the wheel B, and the bearing is shown similarly arranged in Figs. 1, 3, and 4.

In Fig. 10 the bearing is shown tipped nearly forty-five degrees from the vertical to present a lateral edge of the cutter to the grinding-wheel. The yoke is adjustable upon the rock-shaft I to and from the bearing I', so that when one lateral face of the cutter-teeth has been ground upon one of the wheels B the cutter may be turned over upon its spindle, with the opposite side toward the grinding-wheels and the opposite lateral face ground upon the other wheel.

It should be noticed that Fig. 3 shows the opposite side of the yoke and bearing from that shown in Fig. 1, and Fig. 4 shows the opposite end of the hub M^2 from that shown in Fig. 10. Fig. 2 is projected from Fig. 3, the nearer side of the figure representing the rear or hidden side of the same parts where shown in Fig. 1. Figs. 4 and 5 are viewed from the right-hand side of the yoke where shown in Fig. 1.

The upper end of the spindle M' is provided with a detachable notched index n, as shown in Figs. 2 to 5, inclusive, and a pawl and detent are provided for respectively shifting and locking such index.

A supporting-plate o^4 to carry the detent and pawl is fitted movably upon the upper end of the bearing m and is provided with screws to clamp it when adjusted. An arm n' is pivoted upon the plate in the plane of the index by bolt o^3, and the detent n^2, lying over the said arm, is pivoted upon the same bolt and is pressed normally toward the index-wheel by a spring p. A pawl p^2 is pivoted to the free end of the arm and operates (when the arm is moved from the position shown in dotted lines in Fig. 2) to turn the index-wheel one notch and shift the cutter to grind the succeeding cutting-face. A spring p' is attached to the plate o^4 to press the arm n' forcibly toward the index, and means is provided for automatically shifting the arm to the position shown in dotted lines in Fig. 2 and thereafter permitting the spring p' to turn the index and shift the cutter as desired. Such means consists of a crank-arm r, pivoted loosely upon the hub M^2 and connected by a link r' with a swivel-eye r^2 upon the end of the arm n'. The crank-arm r is locked by bolt s to a slotted segment s', which has a lug s^2 extended upward past and around the rock-shaft I in proximity to a stop-bar I^2, fastened to the bearing I'.

The curved slot s^3 in the segment s' permits the crank-arm r to be locked thereto in different positions, as may be required, by the inclined adjustment of the bearing m' and spindle M'. The segment s' is viewed from opposite sides in Figs. 4 and 10, and the different relation of the crank-arm r to the lug s^2 is clearly shown in these two figures.

The pressure of the springs p and p' operates, after moving the pawl into the position shown in full lines in Fig. 2 to hold the detent n^2 pressed in the index to keep the same from turning until the rock-shaft is again oscillated and the cutter retracted from the grinder. The rotation of the rock-shaft to draw the cutter from the grinding-wheel, as shown in Fig. 6, presses the lug s^2 into contact with the stationary stop I^2 and crowds the lug toward the rock-shaft, as shown in the same figure, thus retracting the pawl to the adjacent notch upon the index-wheel n and lifting the detent n^2 from engagement with the index-wheel by means of a pin t, which is fixed in the arm n' adjacent to the end of the detent. When the yoke is swung to move the cutter again toward the grinding-wheel, the first part of the movement releases the lug s^2 from contact with the stop I^2 and permits the spring p' to actuate the pawl and turn the index as desired. During the turning of the index-wheel the detent is pressed upon the outer periphery of the index by its spring p and drops into the succeeding notch when opposite the same.

The hub of the plate o^4, which carries the arm n' and supports the pawl p^2, is fitted to rotate upon the upper end of the bearing m, as shown in Fig. 5, and may be adjusted in a small degree by set-screws u, (see Figs. 5, 14, and 15,) which are extended through an ear v upon the plate into contact with a seat v' upon the middle of the bearing, as shown in Fig. 5. By slackening one of the screws and tightening the other, the plate may be rotated slightly, thus operating through the detent and pawl to turn the index-wheel a little, when it is necessary to produce a slight adjustment of the faces of the cutter toward or away from the grinding-wheel. A collar T is fixed upon the rear end of the rock-shaft and formed with a lateral lug carrying a set-screw T' to contact with the bracket below the bearing I', so as to arrest the downward movement of the hand-lever and the motion of the cutter toward the grinding-wheel, which enables the operator to adjust the penetration of the grinder into the cutter in precisely the desired degree.

The oscillatory movement of the rock-shaft,

which is required to actuate the pawl and the index-wheel, may be performed by the hand-lever L after suitably grinding one of the cutting-faces, thus automatically shifting the cutter so as to grind all of its faces in succession, or the same oscillation of the rock-shaft may be automatically effected if desired, and provision is shown in Figs. 1 and 6 for thus oscillating the shaft and grinding all the cutting-faces upon the cutter without attention from the workman. Such means consists of a worm-wheel N, rotated by worm N′ upon a shaft N^2, which is driven by a belt P and pulleys upon the pump-spindle and worm-shaft, respectively.

A slotted crank-arm R is secured adjustably upon the rock-shaft by a set-screw R′ and is connected by a link S with a crank-pin S′ upon the face of the worm-wheel. When the set-screw R′ is tightened, the rock-shaft is controlled by the movements of the worm-wheel, and is oscillated to shift the cutter to and from the grinding-wheel and to rotate it intermittently, as described above.

The set-screw T′ is slackened, so as to be out of use when the slotted arm R is secured to the rock-shaft. When the set-screw R′ is loosened, the crank-arm R has no effect upon the shaft, which may then be actuated by the hand-lever L to adjust the cutter in a suitable position and to turn the lower end of the cutter-spindle outward for removing the cutter when the grinding is completed. The index-wheel *n* is also removable and is secured, like the cutter, by a nut *t′*, so that an index-wheel may be used with notches corresponding to the number of cutting-faces upon the cutter.

The worm and worm-wheel N and N′ are represented as driven from the pump-spindle *g*, but as such spindle is connected with the grinder-spindle by the belt *g′* the worm is actuated indirectly by the cutter-spindle and may be driven directly therefrom with the same result. It will also be noticed that the pawl p^2, which intermittingly turns the index, is actuated by the stop I′ upon the frame of the machine and intermediate means which shift the pawl when the rock-shaft is suitably oscillated. Other means may therefore be used instead of the lug s^2 and stop I^2 for actuating the pawl p^2 without departing from the spirit of the invention. In the operation of the machine the pipe a^2 is adjusted vertically to bring the nozzles a^3 and a^4 upon opposite sides of the cutter, as shown in Figs. 9 and 10, the jets then throwing a flood of water upon both ends of the cut and also upon the grinding-wheel before and after its contact with the cutter. The wheel is thus cleaned in the most efficient manner, while the cutter is prevented from overheating by the jet which projects water upon it immediately after the cut, which draws out the heat conjointly with the opposed jet of water. The column operates as a reservoir to retain a supply of water, while the pump circulates the water from the column to the nozzles.

The pan operates as a settling-chamber to remove the sediment from the water before it enters the column and can be readily withdrawn and emptied, while the column itself is furnished with a removable cap C′ opposite to the suction-pipe *c*, which permits the removal of sediment from the column when required.

It is common in cutter-grinding machines to apply a jet of water to the grinder just prior to its point of contact with the cutter, but the operation of the grinder upon the cutter tends to generate a good deal of heat in the cutter, which is not in any way relieved by the water-jet when applied to the cutter prior to the cut.

In the present invention an auxiliary jet of water is applied to the cutter itself upon the side where the grinder emerges from the cut and where the water will remove the heat which has been generated during the cut.

In Fig. 6 the jets of water from the nozzles a^3 and a^4 are shown connected together and the water splashed laterally by the contact of such jets, because the cover A^3, with the water-pipe a^2, is turned backward into contact with a support or rest A^5; but when the cover is turned down into its operative position, as indicated in Fig. 10, the nozzles discharge their water upon the cutter at the upper and lower sides of the cut and thus operate as desired. By rotating the pipe a^2 in the socket d^3 the nozzles may be adjusted, as shown in Fig. 8, in any desired relation to the cutter or either of the grinding-wheels B, and when the nozzles are directed toward the upper and lower sides of the cutter the splash of the jets operates as effectively to maintain the grinding-wheel as if the edge were directed exclusively upon such wheel. It has also been common to immerse the grinder or cutter in water during the grinding of the cutter; but with such an arrangement the splash of the liquid wholly prevents any inspection of the cutter during the grinding operation, and the centrifugal force generated by the grinder tends to drive the liquid away from the cutter and thus permits the heating of the cutter in any undesirable manner. By the application of jets of water to the grinder at opposite sides or ends of the cut all these objections are obviated and the cutter is cooled in the most effective manner.

It is obvious that all of the improvements may be used in a tool-grinder where turning-tools, planing-tools, or cutters are held in the hand for application to the grinding-wheel, and the term "cutter" herein may be used to include such various forms of cutters.

Having thus set forth the nature of the invention, what is claimed herein is—

1. In a cutter-grinder, the combination, with means for sustaining the cutter and a grinding-wheel for making a cut upon the same, of water-jets applied at the opposite ends of such cut, to cool the cutter at opposite ends of the cut, substantially as herein set forth.

2. In a cutter-grinder, the combination, with the grinding-wheel and means for pressing a cutter thereon, of a water-pipe having two nozzles arranged to direct water-jets toward one another upon the same side of such wheel, as and for the purpose set forth.

3. In a cutter-grinder, the combination, with means for sustaining a cutter having notches in its periphery and a grinding-wheel adapted to intersect the cutter at one of the notches, of water-nozzles arranged to discharge jets upon opposite sides of the cutter adjacent to such notch, substantially as herein set forth.

4. In a cutter-grinder, the combination, with the grinding-wheel, of two nozzles arranged to direct water-jets toward one another adjacent to the periphery of such wheel, and means for sustaining a cutter and intermittingly to adjust the cutting-faces against the wheel at the junction of such jets, as and for the purpose set forth.

5. In a cutter-grinder, the combination, with the grinding-wheel and means for pressing a cutter thereon, of a water-pipe arranged adjacent to its periphery and provided with nozzles arranged to direct water-jets toward one another upon the same side of the wheel, and means for adjusting the pipe to vary the position of the nozzles, as and for the purpose set forth.

6. In a cutter-grinder, the combination, with a grinding-wheel and a casing and cover inclosing the same, and means for pressing the cutter upon the grinding-wheel, of a water-pipe sustained adjustably upon the cover and extended within the same, and provided with nozzle adapted to project a jet upon the side of the wheel, as and for the purpose set forth.

7. In a cutter-grinder, the combination, with a grinding-wheel and a casing having a hinged cover A^3 inclosing the wheel, and means for pressing a cutter upon such grinding-wheel, of the pipe d' supported adjustably upon the cover and having in its end the socket d^3 and the pipe a^2 swiveled in the socket and projected through the cover into proximity to the side of the wheel, and provided with the nozzles a^3 and a^4 adapted to project jets toward one another, as and for the purpose set forth.

8. In a cutter-grinder, the combination, with means for holding the cutter to the grinding-wheel, of a suitable casing having a bearing projected within the same and a spindle extended from such bearing, with hub b having recess b' to receive the bearing, a flange b^2 at the inner end of such hub, two grinding-wheels secured upon the hub with intermediate sleeve b^3, and nut upon the end of the spindle for clamping the parts together, the whole serving to sustain the hub intermediate to the grinding-wheels, substantially as herein set forth.

9. In the cutter-grinder, the combination, with a column having a stationary casing supported thereon with a grinder-wheel mounted therein, of a rock-shaft mounted upon the casing adjacent to the grinder with means for oscillating the same at pleasure, a yoke upon the rock-shaft with bearing and spindle to sustain the cutter, and means for intermittently adjusting the cutter to present its cutting-faces successively to the grinder, substantially as herein set forth.

10. In a cutter-grinder, the combination, with a casing and a grinder-wheel mounted therein, of a rock-shaft having bearings mounted adjustably upon the casing, as by the post J, a yoke carried by the rock-shaft, a bearing secured adjustably in the yoke, and a spindle mounted in the bearing to carry the cutter and present it in variable positions to the grinder-wheel, substantially as herein set forth.

11. In a cutter-grinder, the combination, with a casing and a grinder-wheel mounted therein, of a rock-shaft mounted adjacent to the grinder with means for oscillating the same at pleasure, a yoke upon the rock-shaft with bearing and spindle to sustain the cutter, an index-wheel upon the cutter-spindle, a pawl to turn the index-wheel and a stationary stop upon the machine with intermediate means adapted to actuate the pawl when the rock-shaft is suitably oscillated, substantially as set forth.

12. In a cutter-grinder, the combination, with a casing and a grinding-wheel mounted therein, of a rock-shaft mounted adjacent to the grinder with means for oscillating the same at pleasure, a yoke upon the rock-shaft with bearing and spindle to sustain the cutter, an index-wheel upon the cutter-spindle, a pawl to turn the index and a detent to lock the same, and a stationary stop upon the machine with intermediate means adapted to actuate the pawl and detent when the rock-shaft is suitably oscillated, substantially as set forth.

13. In a cutter-grinder, the combination, with a casing and a grinder-wheel mounted therein, of a rock-shaft mounted adjacent to the grinder, a yoke upon the rock-shaft with bearing and spindle to sustain the cutter, a hand-lever for oscillating the rock-shaft, and a pawl and ratchet for holding the same in its adjusted position, substantially as herein set forth.

14. In a cutter-grinder, the combination, with a casing and a grinder-wheel mounted therein, of a rock-shaft mounted adjacent to the grinder, a yoke upon the rock-shaft with bearing and spindle to sustain the cutter, a crank-arm secured to the rock-shaft, and means actuated by connection with the grinder-spindle, for vibrating such crank-arm and oscillating the rock-shaft automatically, as and for the purpose set forth.

15. In a cutter-grinder, the combination, with a casing and a grinder-wheel mounted therein, of a rock-shaft mounted adjacent to the grinder, a yoke upon the rock-shaft with bearing and spindle to sustain the cutter, a crank-arm secured to the rock-shaft, a worm and worm-wheel actuated by connection with

the grinder-spindle, and a crank-pin upon the worm-wheel with link connected to the crank-arm upon the rock-shaft, to oscillate the same automatically, substantially as herein set forth.

16. In a cutter-grinder, the combination, with a casing and a grinder-wheel mounted therein, of a rock-shaft mounted adjacent to the grinder, with means for oscillating the same at pleasure, a yoke upon the rock-shaft with bearing and spindle to sustain the cutter, an index-wheel upon the cutter-spindle, the hub *o* fitted to turn upon the bearing and provided with screws *u* for fine adjustment, and with the plate *o'* provided with the detent n^2 fitted to the index, as and for the purpose set forth.

17. In a cutter-grinder, the combination, with a casing and a grinder-wheel mounted therein, of a rock-shaft mounted adjacent to the grinder, the yoke II upon the rock-shaft with bearing *m* having hub M^2 clamped adjustably within the yoke, the spindle M' for carrying the cutter and provided with the index *n*, a pawl for actuating the index, means, as crank-arm *r* and link *r'*, oscillated upon the hub M^2 for vibrating the pawl, means, as the slotted segment *s'* and lug s^2, oscillated upon the hub M^2, and connected adjustably with the crank-arm *r* and a fixed stop to move the crank-arm, the whole arranged and operated to intermittingly turn the index when in various positions of the bearing *m* within the yoke, substantially as set forth.

18. In a cutter-grinder, the combination, with a grinding-wheel, of the casing A with bearing A' at the upper edge, upon the side, having spindle projected into the casing to carry the grinding-wheel, the casing being provided with notch A^4 opposite the end of the spindle, and with the hinged cover A^3 provided with the semicircular projection a^5 having flange a^6 to close the joint of the notch, substantially as herein set forth.

19. In a cutter-grinder, the combination, with a grinding-wheel, of the casing A with bearing A' at the upper edge, upon the side, having spindle projected into the casing to carry the grinding-wheel, the spindle being provided with hub having the peripheral flange b^6, and a cover A^3 being hinged to the casing and notched to fit over such flange, and provided with an annular groove a^7 to direct the water within the casing, substantially as herein set forth.

20. In a cutter or tool grinder, the combination, with a casing inclosing a grinding-wheel, and supported upon a column, (as C,) of a spindle supporting the grinding-wheel within the casing, one or more nozzles to direct water upon the grinding-wheel and tool or cutter, an aperture through the bottom of the casing, a pan fixed removably in the column and provided with a grease-separator, as set forth, and discharging the water into the bottom of the column, and a pump to circulate the water from the column to the nozzle, as and for the purpose set forth.

21. In a cutter or tool grinder, the combination, with a casing inclosing a grinding-wheel, and supported upon a column, (as C,) of a spindle supporting the grinding-wheel within the casing, one or more nozzles to direct water upon the grinding-wheel and tool or cutter, an aperture from the bottom of the casing, a pan receiving the water from such aperture, and discharging the water into the bottom of the column, the pan having a discharge-outlet above the bottom, and a grease-separator consisting of a flange projected downward adjacent to such outlet below the bottom of the same, and a pump to circulate the water from the column to the nozzle, as and for the purpose set forth.

22. A grease-separator for a cutter or tool grinder, comprising a pan fixed removably below the grinding-wheel to receive the water discharged therefrom, such pan having a discharge-outlet above the bottom, and a flange projected downward adjacent to such outlet below the bottom of the same to prevent the escape of grease therefrom, substantially as herein set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

ULRICH EBERHARDT.
FRED L. EBERHARDT.

Witnesses:
JOS. B. PIERSON,
THOMAS S. CRANE.