C. G. OLSON.

MACHINE FOR FORMING GRINDING POINTS.

APPLICATION FILED JAN. 15, 1916.

1,193,049.

Patented Aug. 1, 1916.

4 SHEETS—SHEET 1.

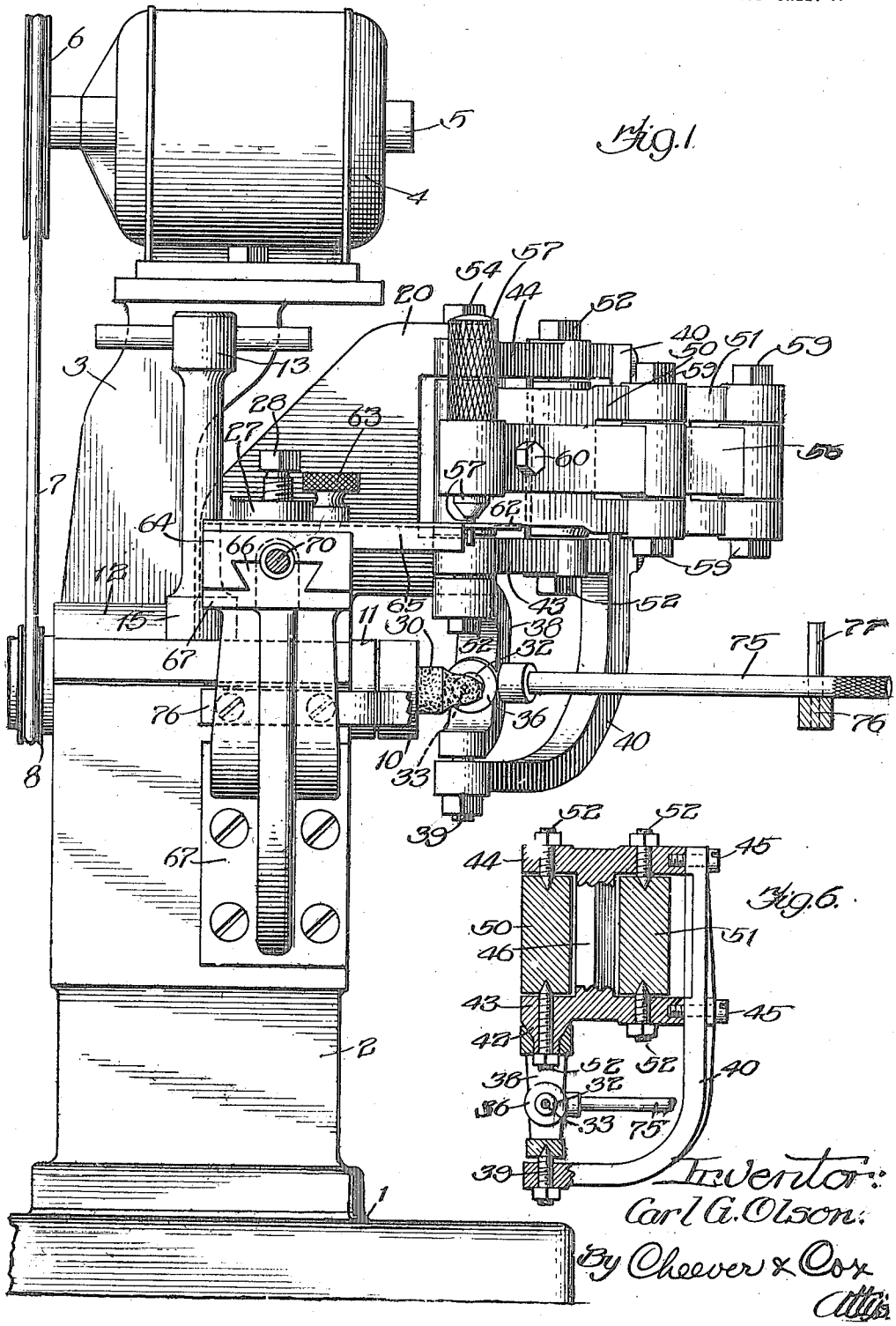


Fig. 1.

Fig. 6.

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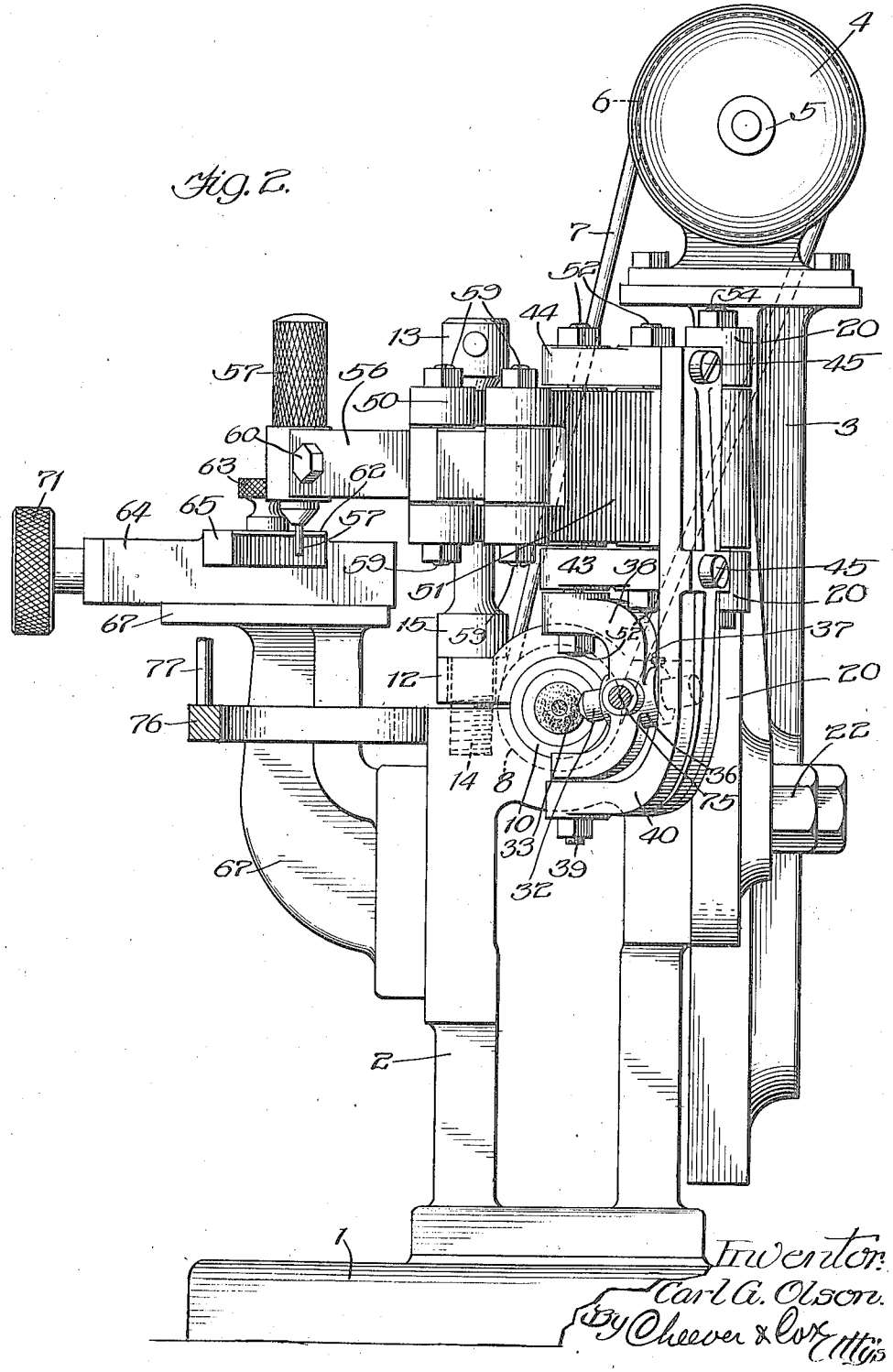
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

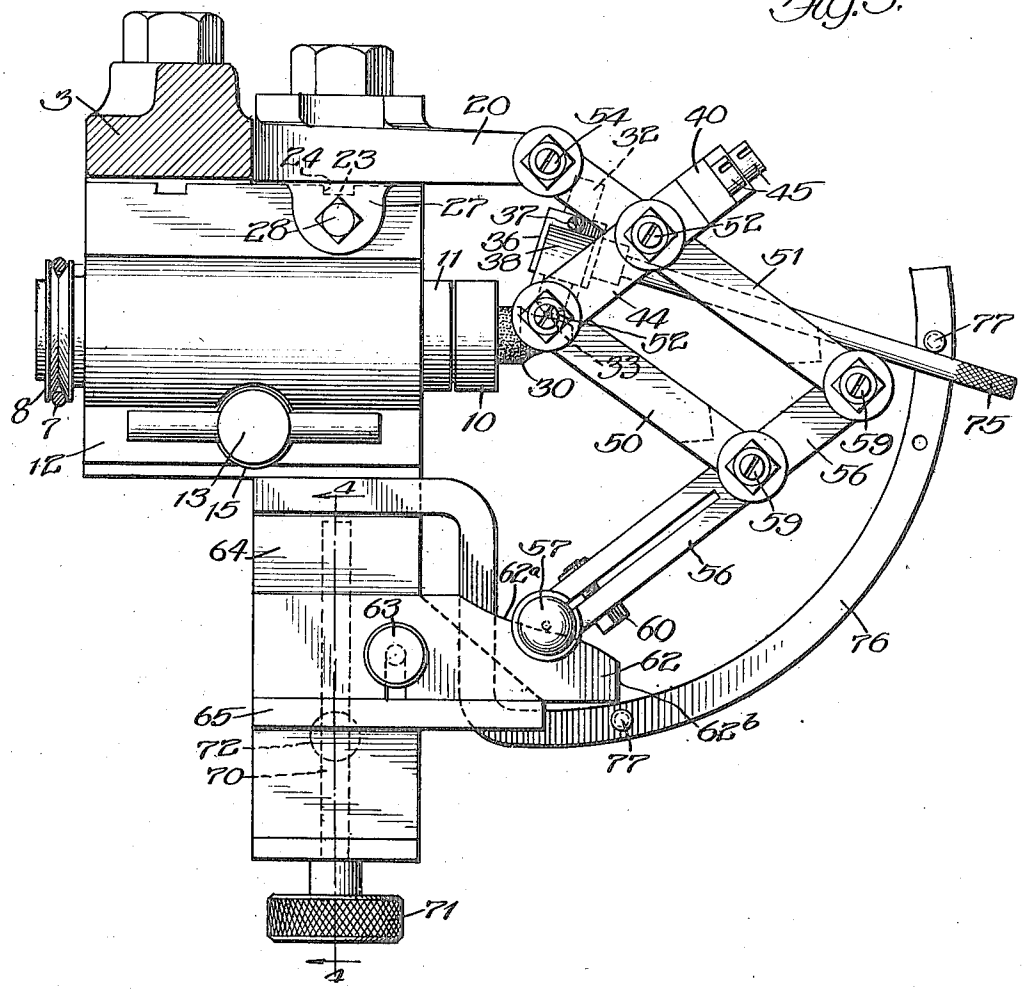
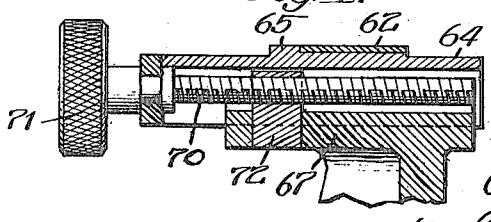


Fig. 4.



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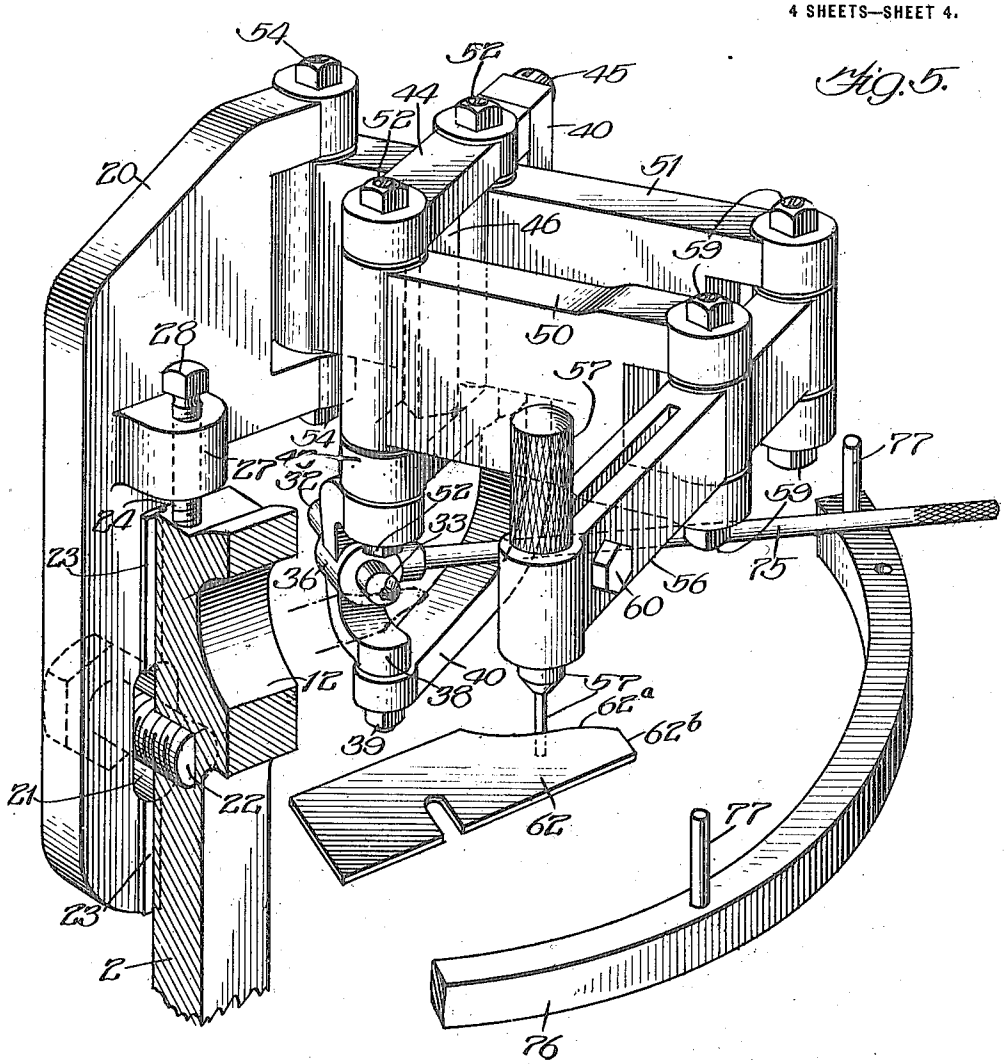
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4 SHEETS—SHEET 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR FORMING GRINDING-POINTS.

1,193,049. Specification of Letters Patent. Patented Aug. 1, 1916.

Application filed January 15, 1916. Serial No. 72,304.

To all whom it may concern:

Be it known that I, CARL G. OLSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Machines for Forming Grinding-Points, of which the following is a specification.

My invention relates to machines for configurating articles such as grinding points.

Grinding points of emery, or other abrasive, are employed for certain purposes in connection with machine tools, and for these purposes it is necessary that the points conform to definite shapes or patterns. These grinding points are bodies of revolution and in some cases their diameters may vary without disadvantage, but for any specific purpose the outline of an axial section must be repeated in all of the points of that set.

The general object of my invention is to provide mechanism whereby a given shape may be accurately reproduced as many times as desired without requiring much, if any, skill upon the part of the operator. In carrying out this general object it is my purpose, among other things, to provide a pantograph or quadrilateral linkwork, one part of which carries the forming tool.

Another purpose is to provide means for guiding said tool repeatedly along a specific path to produce a specific shape in the work.

Another purpose is to provide means for controlling the angular position of the tool relatively to the surface which it is at that instant forming upon the work.

Another object is to provide means whereby different templets may be substituted, also means whereby the templets may be adjusted toward and from the work, and the work may be adjusted up or down relatively to the point of the forming tool.

Another object is to provide means whereby the tip or point of the tool may maintain its station irrespective of the angular position of the tool holder.

Another object is to provide means for adjusting the tool longitudinally to compensate for wear.

These, and other objects, will become apparent from the detailed description hereinafter contained.

I accomplish my objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the complete machine. By "front elevation" I mean that elevation which the operator sees when he is in the normal position for manipulating the mechanism. Fig. 2 is an end elevation looking toward the left in Fig. 1. In this view some of the smaller parts are in section to better disclose the construction. Fig. 3 is a top plan view of the machine, the motor being removed to prevent obstructing the view of the parts beneath. Fig. 4 is a detailed section on the line 4—4, Fig. 3. Fig. 5 is a perspective view illustrating the operation and relative positions of the parts. In this view certain portions are broken away for the sake of clearness. Fig. 6 is a vertical section through the axis of the tool holder and contiguous parts.

Similar numerals refer to similar parts throughout the several views.

In the form which I have chosen to illustrate the invention, the machine has a base 1 of any suitable configuration surmounted by a standard 2 which constitutes the main supporting frame-work of the machine. Rising from the standard 2 is a bracket 3 supporting an electric motor 4. The motor shaft 5 is provided with a sheave 6 which drives a band 7. This in turn drives a sheave 8 which rotates the emery stick or whatever object is to be configurated. It will be understood that other types of power mechanism may be employed instead of a motor. According to the present design, the sheave 8 is rigidly fastened to the rear end of the chuck or work-holder 10 which holds the object to be configurated. This work-holder is journaled in a bushing 11. The bushing is held stationary by means of a clamp 12 which is tightened by means of a hand screw 13, having at its lower end a threaded stud 14 which screws down into the standard 2 as best shown in Fig. 2. Said stud passes through a suitable aperture in the clamp 12 and above the stud an annular shoulder 15 is formed which bears on the top of the clamp, causing it to firmly grip the bushing. In the preferred design the clamp is integral with the standard 2 at one side of the bushing,—that is, the side opposite to the hand screw 13. This makes a simple and rigid construction and only

a slight movement of the clamp is necessary to grip or release the bushing 11.

A pantograph bracket 20 is adjustably supported upon the standard. The preferred construction is clearly shown in Fig. 5 and near the upper portion of the sheet in Fig. 3. Said bracket has a vertically elongated slot 21 which receives a stud 22, the inner end of the stud screwing in to the back of the standard. A rib or feather 23 is formed on the inside of the bracket and fits into a groove 24 formed on the back of the standard and thus guides the bracket in a vertical direction. By tightening the stud 22 the bracket will become fixed. By loosening the stud somewhat the bracket will be free to move in a vertical direction to a new position of adjustment. In order to control the vertical adjustment of the bracket to a nicety, I form a lug 27 on the inside of the bracket and thread this vertically to receive an adjusting screw 28. The lower end of this screw seats upon the top of the standard 2. When it is desired to adjust the bracket, the stud 22 is backed off slightly and the screw 28 is then given a turn or two, or a portion of a turn, in the proper direction to raise or lower the bracket as the case may be. The stud 22 is then again tightened, whereupon the bracket will become fixed until it again becomes necessary to adjust it to a new position.

In my machine the work-holder 10 is rotated, preferably at a high speed, and this imparts a corresponding speed to the work. The configurating is accomplished by causing the cutting part of the tool to pass along the side or end of the rotating work. In the design shown, the tool consists of a small rod 32, having at its forward end a point 33 of some very hard material, such as a chip of sapphire or diamond. To produce the configuration desired, it is essential that the cutting point of the jewel shall have a definite path in moving across the surface of the work.

The means for supporting and guiding the tool will now be described. The tool is supported in a holder 36 carried by a yoke 38, the holder having a set screw 37 by means of which the tool may be fixed after it has been adjusted longitudinally in the holder. The yoke is supported at the bottom by a pivot pin 39 carried at the bottom of an arm 40, as shown in detail in Fig. 6. The upper branch of the yoke is conically reamed at the top to pivot upon the conical projection 42 extending downward from the cross arm 43. Said cross arm 43 and a similar cross arm 44 above it are both secured to the arm 40 by machine screws 45 or other suitable fastening devices, and are preferably cast of a single piece with the upright connecting member 46. Thus the parts 40, 43, 44 and 46 are rigidly secured together and move as a single piece. These parts are articulately connected to two parallel bars 50, 51, preferably by means of pivot pins 52. The bar 51 extends in both directions from the cross bar 44 and at the rear end is articulately connected to the pantograph bracket 20 by pivot pins 54. Articulately connected to the outer ends of the parallel bars 50, 51 is a bar 56 which supports the tracing pin 57 and may, therefore, be referred to as the "tracer bar." The tracer bar is pivotally connected to the ends of the bars 50, 51 by pivot pins 59 and the construction is such that the inner end of the bar 44, the pivotal axis whereof is in line with the jewel point of the tool, has a movement similar to but of smaller proportions than the movement of the tracer pin 57. The tracer bar is bifurcated at its outer end and carries a clamping screw 60 the result being that when the screw is tightened it will cause the tracer bar to firmly grip the body of the tracer pin and when backed off will release said tracer pin and permit the same to be removed. The tracer pin projects considerably above the top of the bar 56 and is knurled to afford a firm grip to the operator.

The tracer pin coöperates with a templet 62 which consists of a flat plate secured by a set screw 63 to a sliding table 64 as best shown in Figs. 3 and 4. Said table is provided with a transverse ridge 65 which forms a stop or abutment for backing up the templet. The table slides upon suitable ways 66 formed upon the bracket 67 rigidly fastened to the standard 2, as best shown in Figs. 1 and 2. An adjusting screw 70 having a knurled head 71 engages the sliding table for adjusting it and works in the nut 72 mounted in the bracket 67 as best shown in Fig. 4. As a result of this construction the templet may be adjusted forward or backward by suitably rotating the screw 70, 71.

Extending laterally from the tool holding yoke 38 is a controlling rod 75. The function of this rod is to rotate the yoke about its axis and thus change the angular position, in a horizontal plane, of the jewel pointed tool. At the outer end the controlling rod sweeps over an annular stationary guide bar 76 which for convenience may be referred to as a "quadrant". This quadrant is provided with stop pins 77 for limiting the angle through which the controlling rod may be swung. The quadrant is held stationary in any suitable manner, being supported in the present case upon the standard 2 as best shown in Figs. 1 and 3.

Operation: From the foregoing it will be evident that bars 44, 50, 51 and 56 constitute what may be termed a pantograph or parallel reducing mechanism or quadrilateral linkwork, and that when the tracer pin 57 is made to pass along the edge of the templet 62 it will cause the vertical axis

of yoke 38 to trace a similar but proportionately reduced path. The tool is longitudinally adjustable and in use its jewel point should be substantially in line with said axis; hence, said point, which does the cutting as the work rotates past it, will follow a path similar to the edge of the templet, but on a reduced scale, and will reproduce in the work a configuration corresponding to the outline of the templet. Inasmuch as the work revolves, the configuration produced therein will be a surface of revolution. When the operator is cutting the side surface of the work, he holds the controlling rod 75 in contact with the rear stop pin 77 as shown in Fig. 3. This holds the longitudinal axis of the tool perpendicular to the surface of the work. He then causes the tracer pin to travel along the side surface 62^a of the templet. Ordinarily it is desirable to form a square end on a grinding point, and in such case a square end 62^b will be formed at the end of the templet as shown in plan in Fig. 3. When the operator has finished forming the side surface of the grinding point or other work, he removes the point of the tool entirely from the work by moving the tracer pin away from the templet and toward the work (when viewed as in Fig. 3). He then takes the controlling rod 75 and swings it as far forward as it will go; that is, until it is arrested by the forward stop pin 77. At this time the axis of the cutting tool will be coincident with, or parallel to the axis of the work. The operator then brings the tracer pin into contact with the square end 62^b of the templet and moves the pin forward and back along this squared end. This produces a square end on the work. The advantage in making the tool holder swingable about a vertical axis passing through the end of the jewel point is to enable the operator to hold the tool so that its longitudinal axis will always be normal (that is perpendicular) to the surface against which it is acting.

It will be understood that a jewel pointed tool, in spite of its hardness, will ultimately wear and present a flat surface or facet to the work. This reduces its effectiveness in cutting. I am able to present a new cutting point to the work under such conditions by adjusting the tool vertically either upward or downward. This is accomplished as hereinabove suggested by raising or lowering the pantograph bracket 20 relatively to the standard 2. This is accomplished by manipulating the stud 22 and adjusting screw 28 shown (among other places) in the left portion of Fig. 5.

As the templet-holding table 64 is adjustable toward and from the axis of rotation of the work it is possible to produce grinding points of different diameter with the same templet. To illustrate, by bringing the working edge of the templet closer to the axis of the work there will be produced a grinding point having the same shaped outline, but having a larger diameter. Conversely, a thin point may be produced by adjusting the templet away from the axis and thus bringing the jewel point of the tool closer to the axis of revolution of the work.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a machine of the class described, the combination of a main supporting frame, a rotatable work-holder supported therein, a tool holder, a quadrilateral link-work consisting of bars pivoted together and articulating upon parallel axes, one of said bars being pivoted to the main supporting frame, another of said bars carrying said tool holder and another of said bars forming a tracer bar; and a templet for guiding said tracer bar, said tool-holder being rotatable relatively to its supporting bar about an axis parallel to the axes of the pivots which connect the parts of the link-work.

2. A machine for forming grinding points and the like, consisting of a main supporting frame, a work-holder rotatable about a horizontal axis, a quadrilateral link-work supported upon said frame and rotatable about a vertical axis, said link work consisting of bars articulating about vertical axes, one of said bars being extended and forming a tracer bar, a tracing pin carried at the extremity of said tracer bar and arranged in vertical position, a stationary templet having a horizontal working edge for guiding said tracer pin, and a tool holder carried by said link-work and being rotatable with respect to said link work, said holder being rotatable about a vertical axis.

3. A machine for forming grinding points and the like, consisting of a main frame, a work-holder journaled in said frame and rotatable about a horizontal axis, a quadrilateral link-work consisting of four bars pivotally connected together upon vertical axes, the first of said bars extending beyond the link-work and being pivotally connected at its extended end to the main frame and swingable in a horizontal plane, the second of said bars also extending beyond the link-work and constituting a tracer bar, a templet for guiding said tracer bar, and a tool holder supported at the junction of the third and fourth bars of the link-work, said tool holder being rotatable about an axis coincident with the axis of articulation at the junction of said third and fourth bars.

4. A machine for forming grinding points and the like comprising a main supporting

frame, a rotatable workholder journaled in said frame, a linkwork pivotally supported on said main frame and rotatable about a vertical axis, and a tool holder carried by said link-work, said tool holder being rotatable relatively to said linkwork and permitting adjustment of the tool relatively to the tool holder in a direction at right angles to the axis of rotation of the tool holder relatively to the linkwork.

5. A machine for forming grinding points and the like, said machine having a main frame, a rotatable work holder journaled in said frame, a linkwork supported by said main frame, a tool holder supported by said linkwork, said tool holder being rotatable relatively to the linkwork, about a vertical axis, and means for adjusting said work holder in a horizontal direction.

6. A machine for forming grinding points and the like, consisting of a main frame, a rotatable work-holder journaled in said frame upon a horizontal axis, a link-work pivotally supported on said frame, the members of the link-work articulating upon vertical axes, one of the members of the linkwork being extended and constituting a tracer bar, a templet for guiding said tracer bar, a tool holder mounted on said link-work and being rotatable with respect thereto, and a tool carried by said tool holder, said tool extending horizontally and being longitudinally adjustable in its holder.

7. In a machine of the class described, the combination of a main frame, a rotatable work holder journaled in said frame upon a horizontal axis, a link-work pivotally supported on said frame, the members of the linkwork articulating upon vertical axes, one of the members of the linkwork being extended and constituting a tracer bar, a templet for guiding said tracer bar, a tool holder mounted on said linkwork, said tool holder being rotatable relatively to the linkwork about a vertical axis, a controlling rod extending horizontally from said tool holder whereby the angular position of the tool holder about its axis may be manually controlled, and stops for limiting the angular movement of said controlling rod.

8 In a machine for forming grinding points and the like, the combination of a main frame, a rotatable work holder journaled in said frame upon a horizontal axis, a linkwork pivotally supported on said frame, the members of the linkwork articulating upon vertical axes, one of the members of the linkwork being extended and constituting a tracer bar, a templet for guiding said tracer bar, a tool holder mounted on said linkwork, said tool holder being rotatable relatively to the linkwork about a vertical axis, a controlling rod extending horizontally from said tool holder, a horizontal stationary member over which the end of said rod sweeps, and stops rising from said horizontal stationary member for limiting the movement of said rod.

9. A machine for forming grinding points and the like, including a main frame, a quadrilateral linkwork pivotally supported upon said frame, one of the members of the linkwork extending beyond the outlines of the linkwork and constituting a tracer bar, a templet for guiding said tracer bar, a tool holder supported upon said linkwork, a work holder rotatable upon a horizontal axis, said work holder being axially adjustable in the frame for bringing the work nearer to or farther from the tool holder when the tool holder is in the position which it occupies when the tracer bar is in coöperative engagement with the templet.

10. A machine for forming grinding points and the like, including a main frame, a quadrilateral linkwork, a hinge connecting said linkwork to said frame, one of the members of the linkwork constituting a tracer bar, a templet for guiding said bar, a tool holder mounted on said linkwork, said tool holder being rotatable relatively to the linkwork upon an axis parallel to the axis of said hinge, a rotatable work holder, a bushing wherein said work holder is journaled, and a clamp on said main frame for holding said bushing, said bushing being adjustable in said clamp, in the direction of the axis of rotation of the work holder.

11. A machine for forming grinding points and the like, including a main frame, a quadrilateral linkwork hinged to said frame and swingable about a vertical axis, a tool holder mounted on said linkwork, and being rotatable with reference thereto, a work holder journaled in said main frame and rotatable about a horizontal axis, a tracer pin mounted on said linkwork, a templet for guiding said tracer pin, and a table slidingly supported on said main frame for carrying said templet, said table being horizontally movable toward and from the axis of rotation of the work holder.

12. A machine for forming grinding points and the like, including a main frame, four bars articulately connected together in the form of a parallelogram, said bars being relatively movable about vertical axes and one of the bars being hinged to the main frame so as to swing about a vertical axis, another one of said bars forming a tracer bar, a tool holder mounted on one of the bars of the parallelogram and being rotatable with respect thereto, a work holder journaled in said main frame and arranged horizontally, approximately on a level with the tool holder, a templet for guiding said tracer bar, a table for supporting said templet, said table being slidable upon the main frame in a direction toward and from the

axis of the work holder, and an adjusting screw for controlling the position of the table.

13. A machine for forming grinding points and the like, comprising a main frame, a work holder journaled in said frame, a quadrilateral linkwork hinged to said frame and swingable about a vertical axis, the members of the link work articulating upon vertical axes, one of the members of the linkwork constituting a tracer bar, a templet for guiding said tracer bar, a tool holder carried by said linkwork, said tool holder being rotatable relatively to the linkwork about its own vertical axis, and said tool holder being in the form of a yoke whereby a space is provided at one point along its axis of rotation, and a tool mounted in said tool holder at the said space therein, the axis of the tool intersecting, at right angles, the axis of rotation of the tool holder.

14. A machine for forming grinding points and the like, comprising a main frame, a work holder journaled therein, a templet supported on the main frame, a first bar hinged to the main frame, a tracer bar hinged to the free end of the first bar and carrying a tracer pin at its outer end to coöperate with said templet, a tool holder, and two arms pivoted together at their ends and carrying the tool holder at the joined ends of said arms, one of said arms being pivoted to the first bar between the ends thereof and the other arm being pivoted to the tracer bar between the ends of said tracer bar, whereby the tool holder always occupies a position between the tracer pin and the point where the first bar is hinged to the main frame, and both of said arms contribute to the support of the tool holder.

In witness whereof, I have hereunto subscribed my name.

CARL G. OLSON.