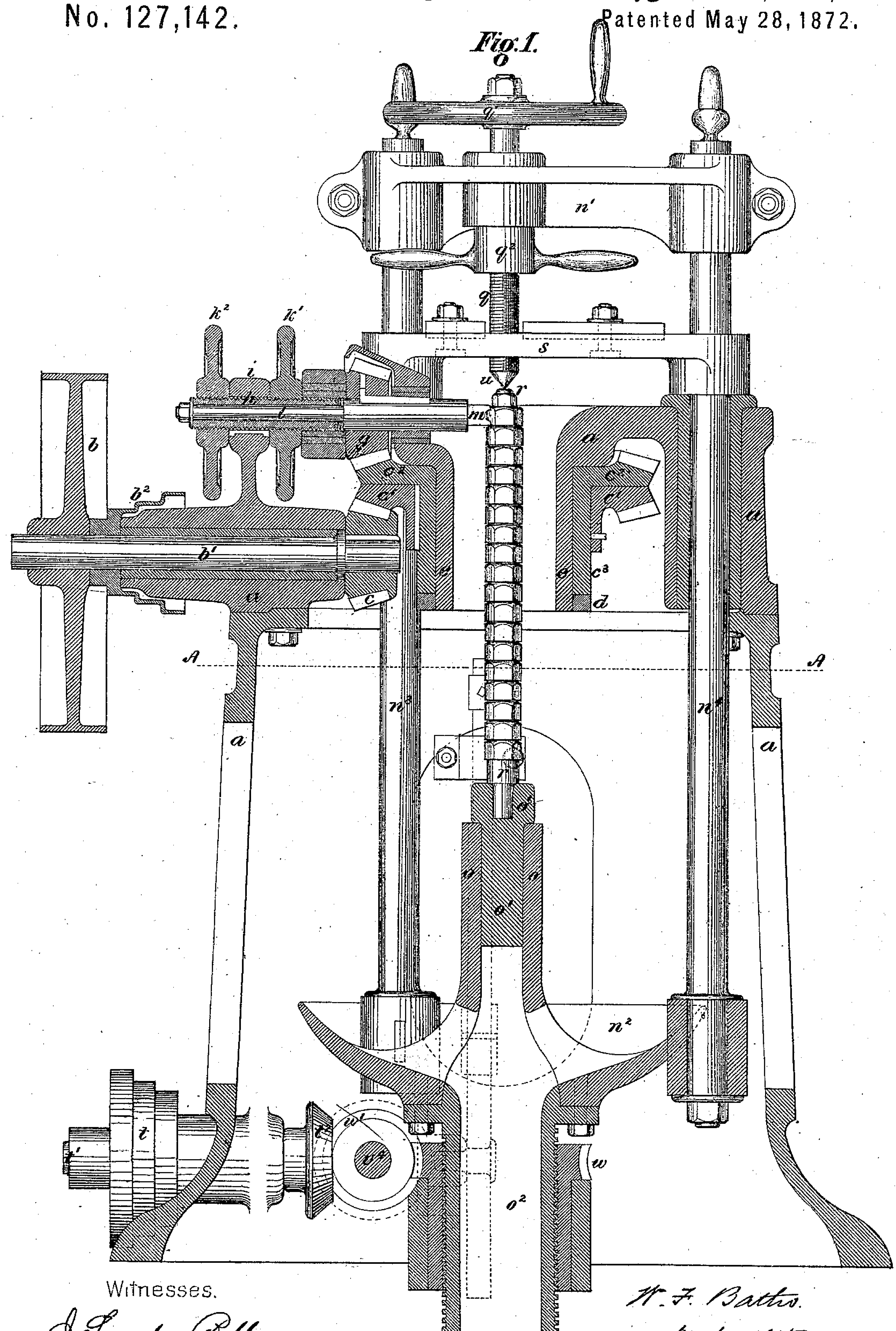
3 Sheets--Sheet 1.

WILLIAM F. BATHO.

Improvement in Machines for Planing the Facets of Polygonal Bars, Nuts, &c.

No. 127,142. Patented May 28, 1872.

Fig. 1.



Witnesses.

J. Snowden Bell.

Thos. J. Town

W. F. Batho.

by his Attorney.

Henry Baldwin Jr.

AM. PHOTO-LITHOGRAPHIC CO. N.Y. (OSBORNE'S PROCESS.)

WILLIAM F. BATHO.

Improvement in Machines for Planing the Facets of Polygonal Bars, Nuts, &c.

No. 127,142. Patented May 23, 1872.

Fig. 2.

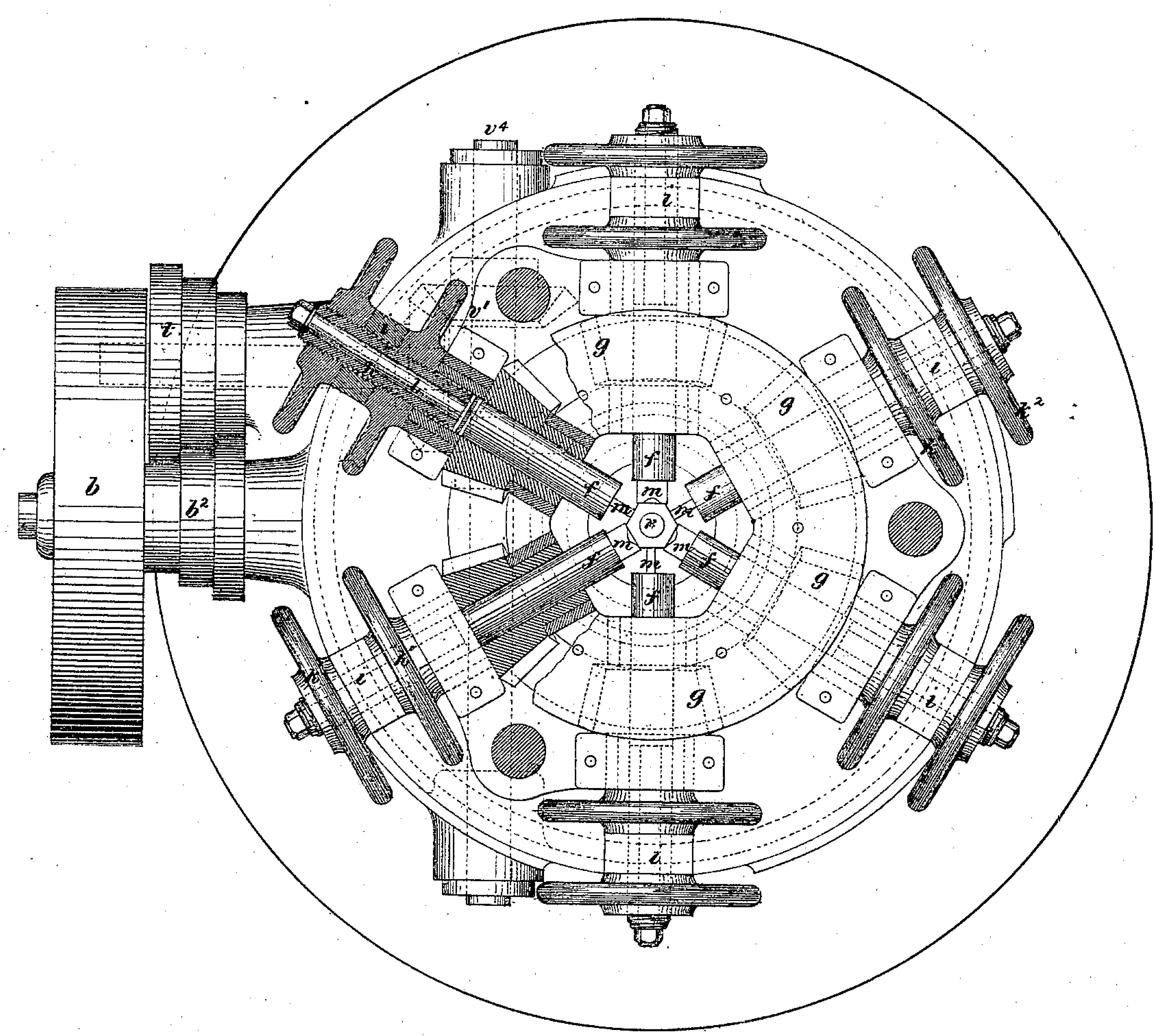


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Fig. 4.

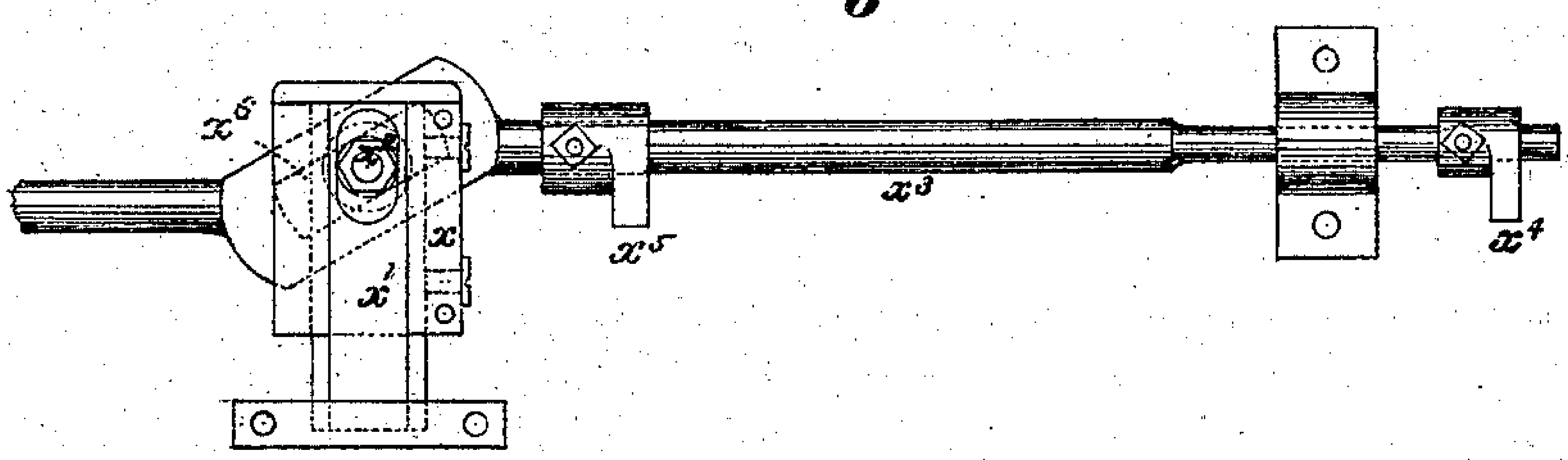
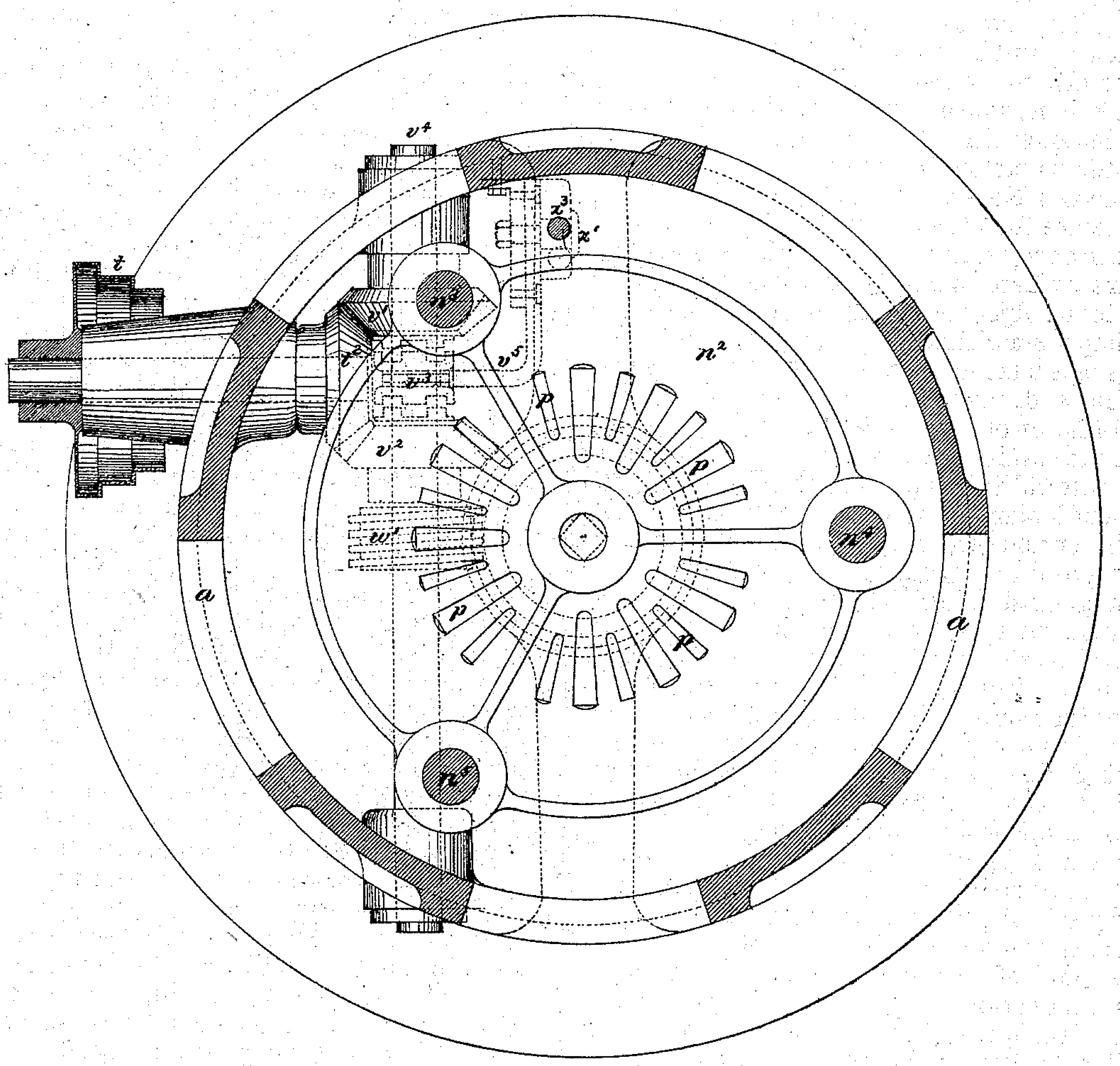


Fig. 3.



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by his Attorney

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127,142

UNITED STATES PATENT OFFICE.

WILLIAM FOTHERGILL BATHO, OF BIRMINGHAM, ENGLAND, ASSIGNOR TO WILLIAM SELLERS & CO., OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN MACHINES FOR PLANING THE FACETS OF POLYGONAL BARS, NUTS, &c.

Specification forming part of Letters Patent No. 127,142, dated May 28, 1872.

To all whom it may concern:

Be it known that I, WILLIAM FOTHERGILL BATHO, of Birmingham, in the county of Warwick, in England, a subject of the Queen of Great Britain, have invented a certain new and useful Improvement in Machines for Planing or Cutting and Shaping Metals, Woods, or other Materials, for which Letters Patent for the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, were granted to me on the 20th day of May, 1868, and sealed November 17, 1868; and I do hereby declare that the following is a specification of such of my said improvements as I desire to secure by Letters Patent of the United States.

It is the object of my invention to plane, cut, or shape, simultaneously, two or more of the sides or surfaces of nuts, tubes, or rods; and, to this end, my improvements consist of the combination of a series of radial cutter-spindles, with mechanism for sustaining and traversing the material to be operated upon in a direction perpendicular to the axes of the cutter-spindles. My invention further consists in a mode of combining and operating the cutters for planing, cutting, or shaping the flat surfaces upon the work, in virtue of which the path or circle described by the cutting-edge of one cutter in its revolution intersects the path of the cutting-edge of the simultaneously-acting adjacent cutter, without any collision between the several cutting-edges, so that two or more finished faces, each of less width than the cutting-edges, may be simultaneously cut or shaped upon the work.

In the accompanying drawing, which makes part of this specification, the foregoing features of my said improvements are exemplified in a machine for shaping or finishing hexagonal nuts; and of this machine Figure 1 is a sectional elevation; Fig. 2, a plan, partly in section; Fig. 3, a sectional plan at the line A A of Fig. 1, showing the feed motion; and Fig. 4 an elevation of the device for starting and stopping the feed.

A hollow cylindrical frame, *a*, affords suitable bearings for the working parts. Suitably mounted in the frame is a shaft, b^1, on the outer end of which is fixed a driving-pulley, *b*, while on its inner end is fixed a bevel-pinion, *c*. A hollow bearing, *e*, forms part of the main frame, and upon this hollow bearing the long hollow boss c^3 of an annular bevel-wheel, c^2, turns freely. The upper end of this long hollow boss is firmly secured in the central opening of an annular bevel-wheel, c^1, which gears into the pinion *c* on the shaft b^1. By means of a collar or washer, *d*, secured on the lower end of the hollow bearing *e*, the bevel-wheels c^1 and c^2 are prevented from falling and better secured in their places. By this arrangement the bevel-pinion *c* on the shaft b^1, receiving motion from the pulley *b*, imparts it to the bevel-wheel c^2 through its hollow boss c^3, so that this wheel c^2 serves as a common driver to all of the spindles, and actuates them simultaneously, as will be presently further described. The cutter-spindles or tool-carriers *f* are, in this instance, arranged radially, at equal distances apart, around a common center, and (as is preferable in all cases, whatever may be the number of the spindles) in a horizontal plane. The inner end of each spindle is suitably adapted to receive and hold properly a cutting-tool having cutting-edges of any required form, (those shown in the drawing being similar to the roughing-out drills used in cotter-drilling machines,) and the spindles are adjusted by means of any of the approved appliances for adjusting revolving drill-spindles, though the mode shown in the drawing is one which I have found effective, and which consists in casting a bracket, *i*, on the frame with a hollow shaft or bush, *h*, sliding freely upon the bracket. The bush or shaft *h* has a screw-thread cut on its surface to take into corresponding female screws within the bosses of hand-wheels k^1 k^2. The shaft *h* is grooved longitudinally to slide upon a key, *l*, which prevents it from turning. The spindle may be traversed in or out by turning the wheel k^1, which acts upon the screwed surface of the shaft *h*, and it may be locked at any point of its traverse by turning the wheel k^2, which acts as a jam or lock-nut. By these means each of the spindles may be advanced and adjusted to work, or retracted to remain inoperative, or for any desired change of the cutters. For cutting or shaping flat surfaces, and especially for work such as that exemplified in the drawing, in which the finished faces of the nuts respectively, are to be of less width than the width of the cutting-edges, I make the cutting-tools *m* of flat steel, and so adjust them in their respective spindles that when in operation one cutter is half a revolution in advance of the cutter next adjacent to it on each side, by which arrangement, when one cutting-edge is vertical, the one adjacent to it on each side is horizontal, and the path or circle described by the cutting-edges of one cutter in its revolution intersects the path or circle described by the cutting-edges of the adjacent cutters, but without coming into collision with either of them. The traversing-frame n^1 n^2, which carries the work to be operated upon by the cutting-tools, consists of a three-armed casting or cross-head, n^1, near the top of the frame a, and a dish-shaped casting, n^2, near the bottom of the frame, these two castings being connected together by three rods or sliding shafts, n^3 n^4 n^5. The concave casting n^2 has a convex central boss, o, which carries an ordinary steel center socket or chuck, o^1, conforming to the work being shaped, and it has a long lower hollow cylindrical part, o^2, projecting downward concentric with the boss or chuck o^1. On the exterior of this cylindrical part o^2 a screw is cut, the purpose or function of which screw will be presently described. The cuttings or shavings from the work pass to the hollow cylinder o^2 through radial openings p p in the concave n^2, which thus receives the whole of the waste products of the cutting and discharges them through the cylinder o^2, preventing any damage or obstruction thereby to the operation of the machine. The cross-head n^1 has a central opening, in which a screw-shaft, q, works a cone or center, u. It is traversed in the opening by means of a hand-wheel, q^1, and has below the cross-head a lock-nut, q^2, and handles for turning it.

In the operation of this machine the nuts are placed upon a mandrel, r, which is centered between the cone u and the socket or boss o^1, in which a suitable recess is provided for the reception of this mandrel or of its shank. Two vises or chucks, or other convenient means adapted to the form of the work to be shaped, may be substituted for the boss and the center u to grasp the work firmly. A three-armed casting, s, of a form suited to the kind of work to be shaped, serves to "steady" the nuts while being operated upon.

The feed-motion is imparted to the sliding frame n^1 n^2 in the following manner: A shaft, t^1 suitably mounted in the lower part of the frame a, carries at its outer end a speed-cone, t, which is to be driven directly from a corresponding speed-cone, b^2, on the shaft b^1. On the inner end of the shaft t^1 is fixed a bevel-pinion, t^2, which gears with two bevel-pinions, v^1 v^2, placed loosely upon a cross-shaft, v^4, which cross-shaft is moved endwise by means of an ordinary clutch and feather device, so as to drive the cross-shaft in either direction desired by bringing one or the other of the pinions v^1 v^2 into gear with the pinion t^2, or by leaving the clutch midway between the pinions v^1 and v^2, so that neither of them is in gear with the pinion t^2, the cross-shaft remains at rest. At a proper point on the cross-shaft v^4 a worm, w', is mounted so as to engage with the teeth of a worm-wheel, w, which is mounted upon the lower cylindrical hollow screw o^2 of the concave n^2 hereinbefore described, and this worm-wheel w has a screwed boss or center adapted to the screw on the part o^2 of the concave n^2. Through these combinations motion is imparted to the hollow screw o^2 and its concave n^2, so as to feed the work up or down according as the forked clutch is moved to bring the bevel-pinion v^1 or the bevel-pinion v^2 into gear with the bevel-pinion t^2, while by so moving the clutch that neither of the pinions on the cross-shaft meshes with the pinion t^2, the feed is arrested.

An automatic device for arresting the feed is shown in Fig. 4. A bracket, x, bolted to the frame a is fitted with a slide, x^1, that can traverse to and fro within the bracket. Upon the slide x^1 is a stud, x^2, which takes into a diagonal slot, x^6, cut in the lower end of a vertical sliding-shaft, x^3, guided by suitable bearings, which carries two tappets, x^4 x^5, that are adjustable (by means of set-screws) up and down on the shaft x^3. A strap, v^5, is attached by one end to the sliding clutch on the cross-shaft v^4 and by its other end to the slide x^1. By so adjusting these tappets that the outer edge of the dish or concave n^2 shall, in its upward and downward movements, come in contact with one or the other of these tappets, the traverse of the frame will be arrested, for as the stud x^2 receives from the diagonal slot x^6 in both the upward and downward motion of the sliding shaft a transverse motion of an extent equal to the inclination of the slot x^6, it is obvious that each movement of the shaft moves the slide in one direction or the other, and thus acts directly upon the clutch on the cross-shaft v^4; it is, therefore, only requisite that the inclination of the diagonal slot should be great enough to move the clutch sufficiently far to disengage the bevel-pinion v^1 or v^2 from the pinion t^2, and to so adjust the tappets that the shaft x^3 shall be lifted far enough to make the stud traverse the slot.

Although I have described and illustrated my improvements as applied to a machine having six cutting-tools and adapted to shape hexagonal nuts, it is obvious that any other number of cutters or tools desired may be operated, and, except where only two tools were used, it would not be necessary in any case to turn the work. For cutting work that is to be triangular in its cross-section, it would only be necessary to remove three of the cutters in the machine represented in the drawing, leaving the alternate three cutters to operate upon the three faces to be shaped. For more than six faces it would of course be necessary to increase the number of spindles and cutters.

The sectional outline of the finished surfaces may also be varied by using cutters having edges conformable to the shape desired—as, for example, if the cutters had convex ends and these ends were provided with the usual grooved or serrated cutting-edges, the faces shaped by them would have corresponding hollow or concave forms.

By imparting to the work being shaped a rotatory motion simultaneous with the up or down traversing motion hereinbefore described, the work would have, in addition to its vertical feed, a spiral feed around a common axis, and the shaped faces would present a corresponding spiral finish of a pitch conformable to the relative speeds of the two feed-motions. This rotatory feed-motion can be derived by any of the well-understood and approved devices for that purpose in machine-tools.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. The combination of the series of radial spindles and the series of flattened cutters with the mechanism for sustaining and traversing the material to be operated upon in a direction perpendicular to the axes of the cutter-spindles.

2. The arrangement of the series of flattened cutters in relation to each other in the manner described, so that while simultaneously rotating and each intersecting the path of those adjacent to it the cutting-edges of the tools do not come into collision with each other.

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Witnesses:
JOE. I. PEYTON,
EDWD. C. DAVIDSON.