

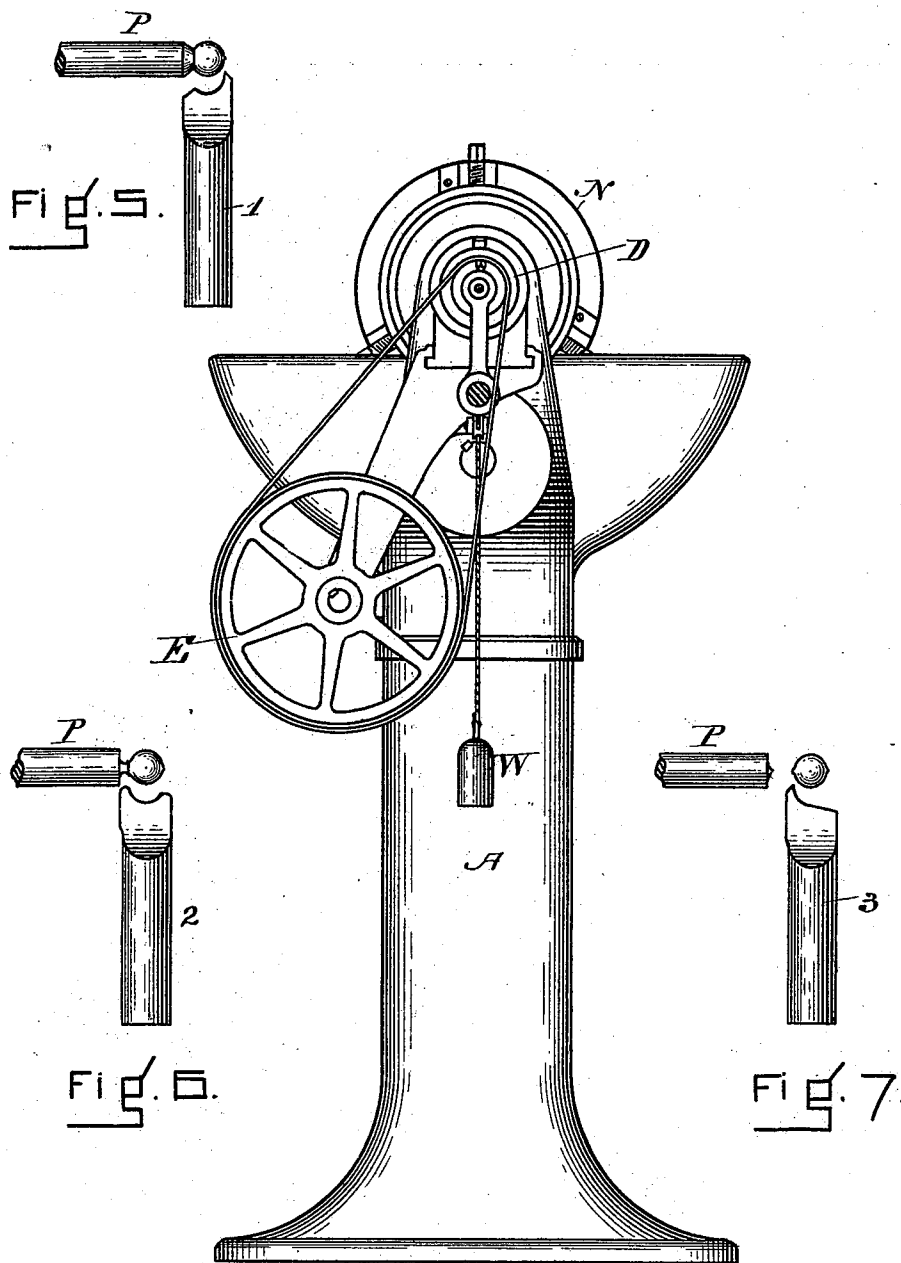
(No Model.)

3 Sheets—Sheet 1.

R. H. GRANT.
AUTOMATIC TURNING MACHINE.

No. 517,004.

Patented Mar. 20, 1894.



WITNESSES
Geoastolms.
L. H. Gawcette.

Fig. 1.

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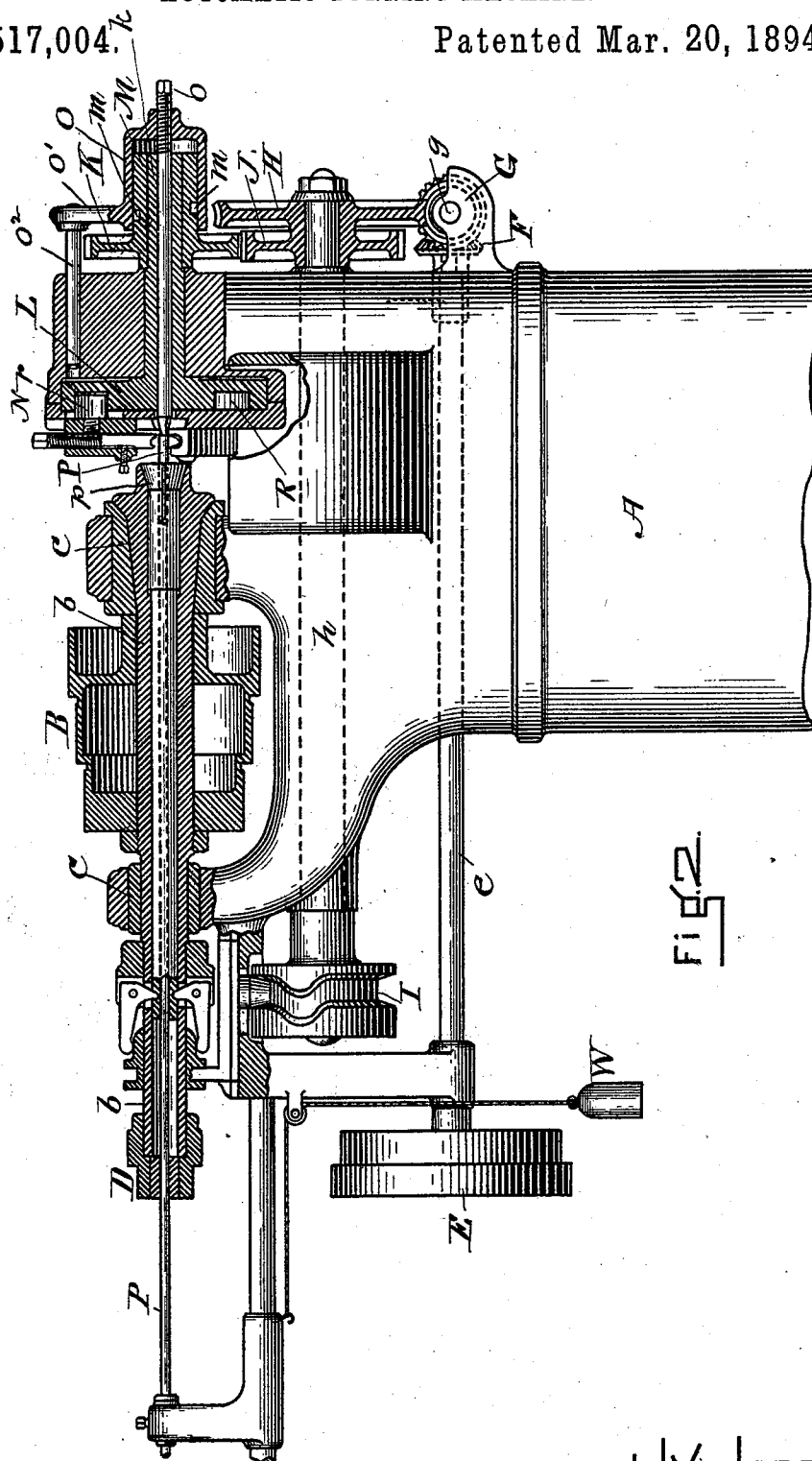
(No Model.)

3 Sheets—Sheet 2.

R. H. GRANT.
AUTOMATIC TURNING MACHINE.

No. 517,004.^K

Patented Mar. 20, 1894.



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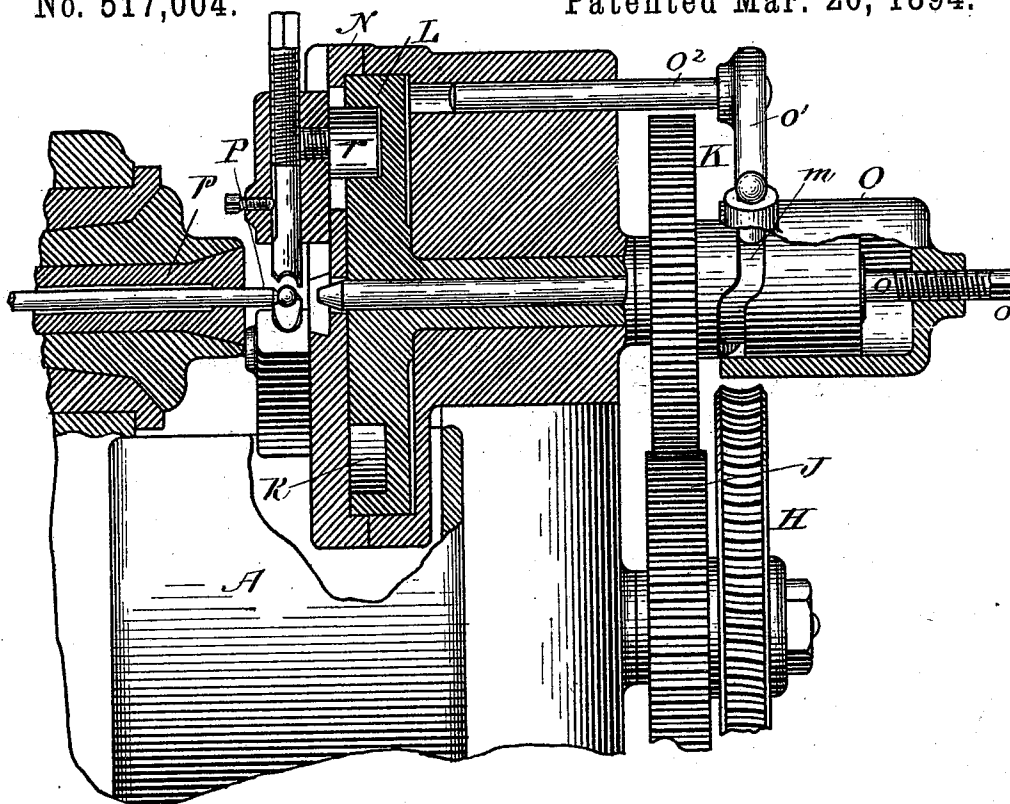


Fig. 3.

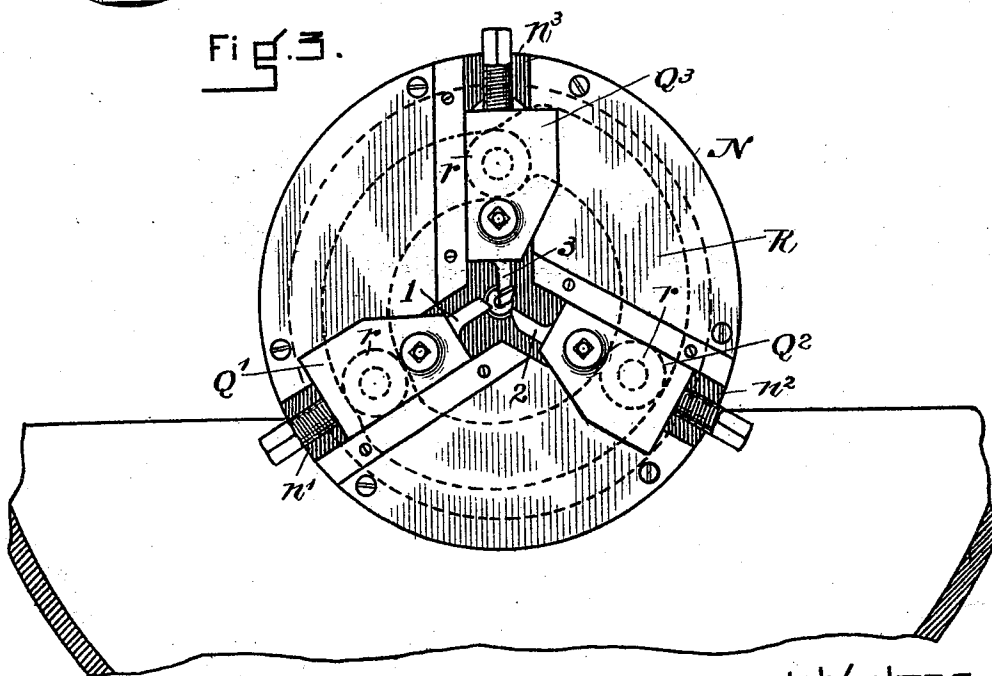


Fig. 4.

WITNESSES

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UNITED STATES PATENT OFFICE.

ROBERT HOWARD GRANT, OF FITCHBURG, MASSACHUSETTS, ASSIGNOR TO
THE GRANT ANTI FRICTION BALL COMPANY, OF SAME PLACE.

AUTOMATIC TURNING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 517,004, dated March 20, 1894.

Application filed November 29, 1892. Serial No. 453,508. (No model.)

To all whom it may concern:

Be it known that I, ROBERT HOWARD GRANT, a citizen of the United States, residing at Fitchburg, in the county of Worcester and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Automatic Turning - Machines, of which the following is a full specification.

My invention relates to that class of automatic turning machines designed to turn small metallic balls, as are commonly used in ball bearings, and consists in certain details of construction which are hereinafter pointed out.

In my machine, the rod of metal from which the balls are cut, passes through a live spindle and is automatically fed to the cutting tools which are held in a cutter-head. This cutter-head, instead of being horizontal as is usually the case, is placed in a vertical plane perpendicular to the axis of the live spindle so that its axis forms a continuation of that of the said live spindle. Thus the necessity of revolving the cutter-head is avoided, the tools being held in tool holders, working in radial slots in the face of the cutter-head, and being moved by means of a cam within the cutter-head.

Referring to the accompanying drawings wherein like letters and numerals represent like parts:—Figure 1 is an end elevation of my improved automatic turning machine. Fig. 2 is a side elevation of same, with a section through axis of live spindle and cutter-head. Fig. 3 is a sectional view of cutter-head showing operating mechanism. Fig. 4 is a front elevation of cutter-head. Figs. 5, 6, and 7 are views of the three different tools 1, 2, and 3, showing operations performed by each.

In the drawings, A is the casting forming the standard of the machine; B is the step-pulley by which the power is applied to the machine. This pulley is fixed on a hollow spindle *b* turning in the bearings C C in the frame of the machine. On the outer end of the spindle *b* is fixed the small step-pulley D, from which a belt drives the larger pulley E, and the counter-shaft *e*.

By means of the bevel gears F, G, on the end of the counter-shaft *e*, the worm *g* is turned at right angles to *e*. This worm meshes

with the worm wheel H on the shaft *h*, parallel to *e*, and operating by means of a cam I, the mechanism usually employed in wire feed. On the same hub with the worm wheel H is a gear wheel J which meshes with the gear K. This gear K is attached to, and turns with, the hollow spindle *k* which forms the elongated hub of the cam L, described more fully below. The hub of the gear wheel K is itself prolonged, and on this elongation M is cut a cam groove *m*. By means of this cam an intermittent axial motion is given to a sleeve O, which incloses said cam, and which is prevented from turning with it by means of the arm O' carrying the rod O², parallel to the axis of the machine and sliding in and out of the hole in the frame of the machine. The outside end of the sleeve O is headed over and thus covers the ends of the concentric hubs *k* and M. Through the center of this head is screwed the end of the stop-rod *o*, which projects outside the head, and on the inside passes through the center of the hollow hub *k* of the cam. It will be seen that this rod *o* shares the axial motion of the sleeve O, produced by the cam *m*, and is used as a stop as follows:—The rod P from which the balls are cut by the tools in the cutter-head, is constantly urged forward through the center of the hollow spindle *b* by the weight W. P is however held firmly by the clutch at *p* except when a ball has been cut from the end and it is desired to move it along. The clutch *p* is then loosened by the cam I and the ordinary connecting mechanism shown in the drawings, and the rod P is pushed out to the cutter-head until it is stopped by the stop-rod *o* which has just been pushed out through the cutter-head by the cam *m*. The length of the stop-rod and consequently the point at which the feed-rod is stopped is adjusted by screwing said stop-rod one way or the other through the head of the sleeve O. For this purpose the outer end of the stop-rod is provided with a bolt-head. The cam *m* is so arranged that, just before the rod P is fed forward, the stop-rod *o* is pushed out, where it remains until P is again clutched by *p*, when it is drawn back again out of the way of the cutters. This operation is repeated after each ball is cut off the rod P.

The cutter-head, shown in section in Figs. 2 and 3 and in front elevation in Fig. 4, is constructed as follows: The cam L has the elongated hub or hollow spindle *k* which bears in the frame of the machine and is driven by gearing as above described. The cam itself consists of a flat circular disk having a groove of rectangular cross-section cut in its outer face. The frame of the machine is made so as to cover the back of the disk and inclose its periphery, so that the disk is sunk in the frame nearly flush with its outer surface. Over the outer face of the cam is placed a flat circular plate or cover. This plate has a rim or lip around the inner edge of its circumference which meets, and is rigidly secured to, the cylindrical portion of the frame inclosing the disk. The cam thus turns in a cylindrical box.

In the face of the plate N are cut three radial V slots n^1, n^2, n^3 , one hundred and twenty degrees apart, and in each of these slots slides a tool holder Q^1, Q^2, Q^3 . These tool holders are keyed into the slots in the usual manner. To the under side of each of these tool holders is attached a pin or roller, r^1, r^2, r^3 , which runs in the above-mentioned groove R of the cam L. These tool holders will thus be moved as the cam revolves and as they slide in radial slots in the rigid plate N, their motion will be radial and governed in extent by the curvature of the cam groove.

The groove R is made as follows:—For two hundred and forty degrees it is circular and concentric with the axis of revolution of the cam, and for nearly the remaining one hundred and twenty degrees it is spiral, running in toward the center, the two ends being connected by short smooth curves. It will be seen that each tool holder will be stationary and in its position farthest from the center during two-thirds of a revolution of the cam, and will move toward the center and be quickly withdrawn to its original position during the remaining third of a revolution. Further, there will be one point in the revolution of the cam when all the tool holders will be stationary and in their farthest position from the center, after which they will successively move toward the center and be withdrawn. These tool holders are provided with the tools shown in Figs. 5, 6, and 7. The figures representing tools 1, 2, and 3 respectively are held by the holders Q^1, Q^2 , and Q^3 . The machine is so arranged that, just as the tool holders and tools are all stationary and farthest from the center, as described above, the

revolving rod of metal, P, is fed forward to be acted upon by the tools, the distance to which it is fed being limited as above described by the stop rod *o*. As soon as the rod has been fed forward and clamped, the tool-holder Q^1 begins to move toward the center, and consequently tool 1, Fig. 5, begins to cut. As seen by the drawings this tool rounds the end of the rod and roughly shapes the ball before it is withdrawn. Tools 2 and 3, Figs. 6 and 7, then successively act on the rod, tool 2, shaping the ball further and tool 3 cutting it off the rod. After tool 3 has cut off the ball and been withdrawn, the three tools are in the extreme outward position so that the rod can again be fed forward, and the operation is repeated.

I claim—

1. In a ball turning machine a vertical stationary cutter head provided with the cam L, the tool holders Q^1, Q^2, Q^3 , and the three alternate, automatic, radially-working cutters, 1, 2, and 3, all working in the same plane at right angles to axis of live spindle, each cutter being provided with a cutting edge whereby a ball is formed by one contact with each cutter, substantially as described.

2. In a ball turning machine, a stop rod *o* concentric with the axis of the stock-holding live spindle *b*, and directly operated by the headed sleeve O, and the cam M, substantially as described.

3. A ball turning machine consisting of a stock-holding live spindle *b*, provided with a gravity feed motion, operated by the weight W, and a cam-operated clutch *p*, in combination with a vertical stationary cutter head, and a cam operated stop rod *o*, substantially as described.

4. A turning machine having a stock-holding live spindle *b* turning in bearings C C in the standard A, and provided with a wire feed operated by the cam I, in combination with a vertical stationary cutter head provided with the alternate, automatic, radially-working cutters, 1, 2, 3, operated by the cam L; and the axially-working stop rod *o* concentric with the stock-holding live spindle *b* and operated by means of the headed sleeve O and the cam *m*, substantially as described.

In witness whereof I have hereunto set my hand.

ROBERT HOWARD GRANT.

Witnesses:

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E. H. GILMAN.