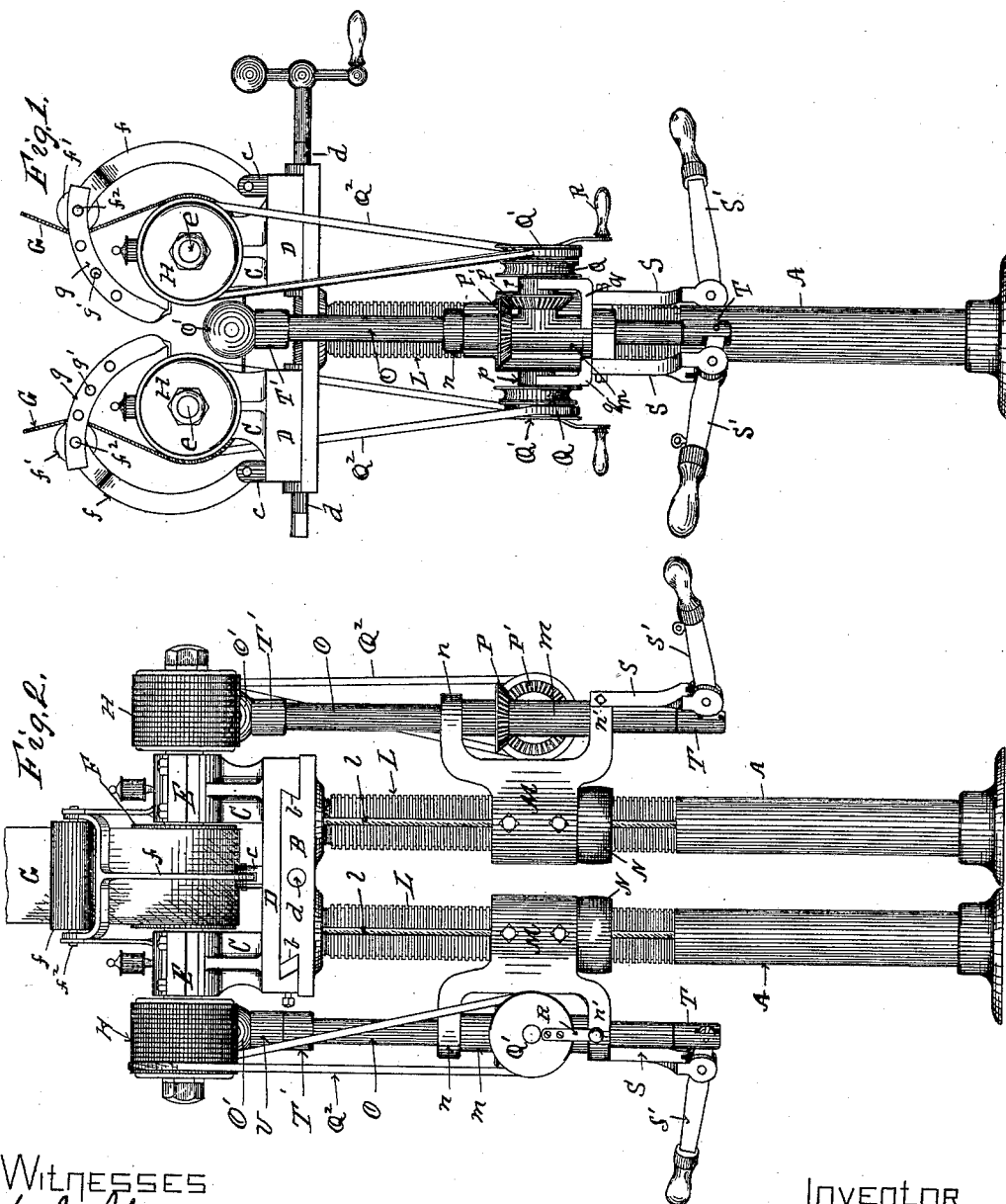


(No Model.)

2 Sheets—Sheet 1.

R. CONRADER.  
MACHINE FOR TURNING, GRINDING, AND POLISHING SPHERICAL BODIES.  
No. 418,350. Patented Dec. 31, 1889.



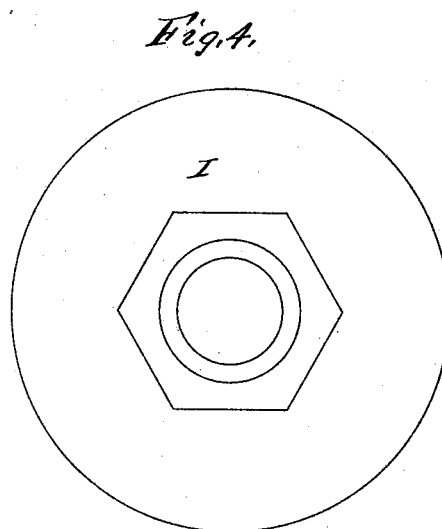
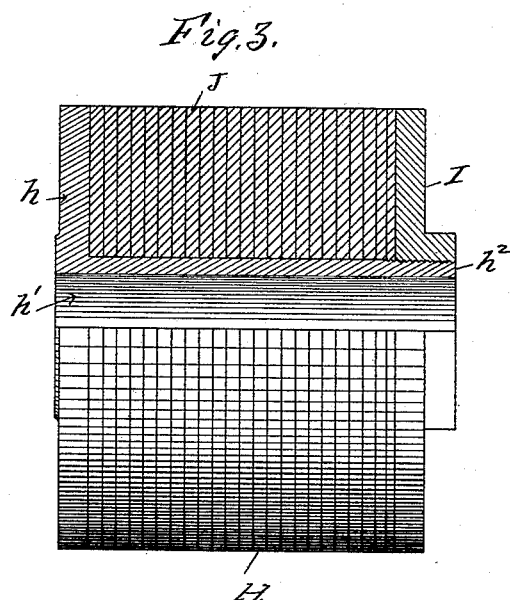
WITNESSES  
G. J. Sturgeon  
H. Sturgeon.

INVENTOR  
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By. *H. Sturgeon*  
Att'y.

(No Model.)

2 Sheets—Sheet 2.

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MACHINE FOR TURNING, GRINDING, AND POLISHING SPHERICAL BODIES.  
No. 418,350. Patented Dec. 31, 1889.



WITNESSES  
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# UNITED STATES PATENT OFFICE.

RUDOLPH CONRADER, OF ERIE, PENNSYLVANIA.

MACHINE FOR TURNING, GRINDING, AND POLISHING SPHERICAL BODIES.

SPECIFICATION forming part of Letters Patent No. 418,350, dated December 31, 1889.

Application filed October 12, 1889. Serial No. 326,855. (No model.)

*To all whom it may concern:*

Be it known that I, RUDOLPH CONRADER, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Turning, Grinding, and Polishing Spherical Bodies; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

My invention consists in the improvements in machines for turning, grinding, and polishing spherical bodies hereinafter described and explained, and illustrated in the accompanying drawings, in which—

Figure 1 is an end view of my machine in elevation. Fig. 2 is a side view of the same in elevation. Fig. 3 is a sectional view of one of the friction-rollers of my machine. Fig. 4 is an end view of the same.

Like letters refer to like parts in all of the figures.

In the construction shown of my improved machine for turning, grinding, and polishing spherical bodies, A A are columns supporting a bed B, secured to the tops thereof. This bed B is provided with transverse gibs or ways *b b*, upon which two independently-moving carriages D D, actuated by right and left hand screws *d d*, travel in and out toward each other. On each of the carriages D D are standards C C, having journal-boxes E E thereon, in which shafts *e e* are mounted parallel to each other, and having pulleys F F thereon between the boxes E, around both of which a driving-belt operates.

For the purpose of adjusting the strain of the belt G whenever the carriages D D and the shafts *e e*, mounted therein, are moved together or apart, according as the sizes of the balls to be ground or polished vary, I hinge to a lug *c* on each carriage D an arm *f*, forked at its upper end and having an idle-pulley *f'* mounted therein, and I also secure another set of stationary arms *g* to the boxes E on each carriage D, which, by means of holes *g'*

therein, are adapted to engage with the journals *f*<sup>2</sup> of the idle-pulleys *f'*, so that the distance apart of the idle-pulleys *f' f'* may be varied as desired. Other means will, however, readily suggest themselves as a substitute for the belt-regulating mechanism described; or two belts may be used, if desired. Therefore I do not desire to confine myself to the special construction described of this feature of my device.

On the ends of each of the shafts *e e*, I secure cylinders H, of leather or other suitable material. These cylinders H, I preferably construct of a collar *h*, having a sleeve *h'* thereon, the outer end *h*<sup>2</sup> whereof is screw-threaded and adapted to receive a screw-threaded collar I, this sleeve *h'* being adapted to fit and be secured upon the ends of the shaft *e*. The space between the collars *h* and I of the cylinder H, I fill, preferably, with disks of leather, which are firmly compressed together between the collars *h* and I by screwing the collar I upon the end *h*<sup>2</sup> of the collar *h'*, after which the outer surface of the cylinder so formed is turned off smooth. The upper portions L of the columns or posts A A are screw-threaded, and in each also is a vertical groove *l*.

On each column A is a vertically-traveling carriage M, having a cylindrical opening therein adapted to pass over the threaded portions L of the columns A. A spline (not shown) is secured within the cylindrical opening in the carriage M, adapted to fit and operate in the groove *l* in the column A, and under the carriage M is a nut N, fitting into the threaded portion M of the column, by means whereof the carriage M can be raised or lowered to any desired position.

Mounted in a sleeve *m* and bearings *n n'* on each of the carriages M is a vertical shaft O, upon which shaft is secured, by means of a spline and groove, (not shown,) a beveled pinion P, through which the shaft O operates vertically, the beveled pinion P intermeshing with a small bevel-pinion P', mounted on a sleeve *p*, rotating on a spindle projecting at right angles from the side of the sleeve *m*. On the outer end of the sleeve *p* small tight and loose pulleys Q and Q' are secured, from which a small belt Q<sup>3</sup> runs to a groove in the

end of one of the cylinders H. A small brace *q*, secured to the carriage M, also forms a bearing for the outside of the sleeve *p* to retain it and the sleeve *m* in proper position. A small crank R is also secured to the tight pulley Q', by means whereof it can be rotated by hand without the use of the belt Q<sup>2</sup>, if desired.

From the bearing *n'* arms S extend downward, in the lower end of which is fulcrumed a lever S', coupled to the end of a vertical sleeve T, secured to and turning upward the lower end of the vertical shaft O, whereby the same can be raised and lowered at the pleasure of the operator.

The upper end of the vertical shaft O is a removable cup or socket T', adapted to receive a ball T', to be turned or polished, or a valve-seat U, into which it is desired to grind a ball O'.

My improved machine is shown and described as a double machine having two complete sets of grinding and polishing mechanism. It is obvious, however, that it can be made with a single set of grinding and polishing mechanism with equal facility.

In operation a cup T' is secured to the upper end of the vertical shaft O, of suitable size to receive the particular-sized ball desired to be turned, ground, or polished. The cylinders H H are then moved toward or away from each other to a sufficient distance, so that when the ball is raised up it will not quite pass between them. The operator then grasps the handles of the levers S' and forces the ball up against the cylinders H H, which operate to turn it in the socket T', the sharp edges of which cut off the inequalities of the ball, the direction of the rotation of the ball being frequently changed during the operation by lowering it away from the cylinders H H and turning the shaft O partially around by means of the crank R or the operation of the belt Q<sup>2</sup>, and then raising the ball again against the rotating cylinders H H, this operation being repeated from time to time until the ball is substantially perfectly spherical. The operation of polishing the ball or grinding it into a valve-seat is substantially the same, except that in grinding it into a valve-seat a valve-seat U is placed in the cup T' and the ball O' ground into that by the same process.

Having described my invention so as to enable others to construct and use the same,

what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination, in a machine for grinding, turning, and polishing spherical bodies, of two cylinders running parallel to each other, with an adjustable rotary ball-holder adapted to force a ball between said cylinders, substantially as and for the purpose set forth.

2. The combination, in a machine for turning, grinding, and polishing spherical bodies, of two parallel cylinders mounted on carriages adapted to be moved toward and from each other, with a rotary ball-holder having a cup thereon adapted to hold a ball, lever mechanism for moving the ball-holder toward and from said cylinder, and gearing for rotating said ball-holder, substantially as and for the purpose set forth.

3. The combination, in a machine for turning, grinding, and polishing spherical bodies, of a screw-threaded standard A, a vertically-adjustable carriage M thereon, and a bed B, having ways or gibs *b b* thereon, with adjustable carriages D D thereon, parallel shafts *e e*, mounted in said carriages and having driving-pulleys F F and cylinders H H thereon, and a vertically-adjustable ball-holder O' T', mounted and adapted to rotate in bearings on the carriage M, substantially as and for the purpose set forth.

4. The combination, in the ball-holding mechanism of a machine for turning, grinding, and polishing spherical bodies, of the vertically-adjustable carriage M, the vertically-movable shaft O, mounted in bearings *n n'* in said carriage and having a cup or socket T' thereon for holding a ball, with lever mechanism S' T for raising and lowering the shaft O, and bevel-gear mechanism P P' for rotating said shaft, substantially as and for the purpose set forth.

5. The combination, in a machine for turning, grinding, and polishing spherical bodies, of the adjustable cylinders H H, rotating in a plane parallel to each other, with the vertically-adjustable rotary ball-holder O' T', substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

RUDOLPH CONRADER.

Witnesses:

C. J. STURGEON,  
WM. P. HAYES.