



# UNITED STATES PATENT OFFICE.

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## GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 652,007, dated June 19, 1900.

Application filed December 22, 1899. Serial No. 741,238. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD RIVETT, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Grinding-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and numerals on the drawings representing like parts.

This invention has for its object the production of a novel grinding-machine having provision to overcome end shake or thrust of the spindle and also to insure the proper fit of the spindle in its bearing or surrounding box and to provide for lubrication of the same.

Figure 1 of the drawings represents in elevation a spindle contained in a box or sleeve embodying my invention, the said box or sleeve being in longitudinal section, together with the pulleys and detachable ends for carrying the grinding-tool. Fig. 2 represents in sectional detail the holder and one adjusting device for the bearing-section, the holder being in its extreme position to the left viewing Fig. 1. Fig. 3 represents the bearing-holder detached and in elevation. Fig. 4 is a cross-section of Fig. 3 in the dotted line *x*. Fig. 5 represents detached the contractile bearing-section which contacts with the spindle. Fig. 6 is an end view of Fig. 5. Fig. 7 shows one of the wedges detached. Fig. 8 is an end view thereof. Fig. 9 shows an end view of the quill and sleeve within it. Fig. 10 shows the holder and bearing-section in its contracted position. Fig. 11 shows the washer 5 detached.

Referring to Fig. 1, it showing one of my improved spindles and external bearing in one of the best forms now known to me, the dotted line *A* represents a suitable head, in which is located a quill *a*, said quill being held in said head in any usual manner, so that it may be readily withdrawn whenever desired. The quill has interior screw-threads *a'* at each end.

The spindle *B*, which may be that of a grinding-machine, lathe, or any other shaft or journal which it is desired to rotate at a high speed and obviate any injurious effects due to end shake or thrust, has, as represented, substantially midway its ends a fixed collar

*B'*, and said spindle has, as herein represented, two like shoulders 2, which receive against them the end of a suitable pulley *B*<sup>2</sup>, so that said spindle may be driven positively by two belts, one on each of said pulleys, one belt being crossed so that both belts may so apply their power as to drive the spindle in the same direction.

The extremities of the spindle *B* are represented as threaded, as at *B*<sup>3</sup> *B*<sup>4</sup>, to receive, respectively, suitable tool-carriers *B*<sup>5</sup> *B*<sup>6</sup>, said tool-carriers being represented as differently constructed as to length or size in order that any desired tool may be put upon said carriers—as, for instance, one carrier may be longer than the other to thus provide for grinding holes of varying depths—and said screw-threads are made the one a right-hand and the other a left-hand thread for the reason that at times the interior or exterior of the edge of the grinding-tool must contact with the work, and by the use of two wheels applied to the spindles by screw-threads of different hand it is possible to use the tool at either end of the spindle, according to the work to be done, and when desired the quill, as stated, may be readily detached from the head and turned the other end to, according to which tool it is desired to use.

I apply at each side of the collar *B'* a suitable antifriction-washer, as 3<sup>x</sup>, composed, preferably, of vulcanite fiber, and thereafter I insert in each end of the quill a sleeve *c*, having, as represented, at one end a head *c'*, provided with a hole to surround the spindle, said sleeve being threaded externally near its head end to enter threads *a'* of the quill, a suitable set-screw, as *a*<sup>2</sup>, holding the sleeve in the position which it is desired it shall occupy when the spindle is running, said sleeve being made adjustable by said screw-thread longitudinally in or with relation to the quill to compensate for any wear in the parts. The inner open end of each sleeve is milled to provide a shoulder 4 and form a counterbore to receive a washer 5, preferably of metal and preferably provided with a series of holes, (see Fig. 11,) said holes serving to retain oil. Before, however, applying the sleeves to the spindle I place inside each sleeve a holder *d*, cylindrical externally and having made through it centrally an opening to receive a

bearing-section or compressible box  $d'$ , (shown separately in Fig. 5,) said box contacting at its interior directly with the shaft, the box being provided with slits 6 7, cut into it from its opposite ends, said slits extending into the box for a distance far enough to enable the inner ends of the slits cut into one end of the box to pass the inner ends of the slits cut into the other end of the box, so that said box so slitted has a capacity when subjected to pressure of collapsing or contracting externally that it may be maintained substantially closely or with a running fit against the spindle. The box is represented as provided with a series of holes which are filled with a material—such, for instance, as described in United States Patent No. 608,916, dated August 9, 1898—capable of receiving and delivering up oil slowly to the spindle, as required. The holder  $d$  is also provided with a plurality of longitudinal grooves, herein represented as 3, each groove receiving a tapered key or adjusting device  $e$ , (shown detached in Fig. 7,) the tapered backs of said keys contacting with the holder, while the straight faces of the keys contact with the exterior of the box. The head end of each sleeve is provided with a stud-screw  $e'$ , having a collar  $e^2$  (see Fig. 1) and a head  $e^3$ , adapted to be engaged by a suitable key or wrench. The threaded end of said screw enters a threaded hole in the end of the holder, the outer end  $e^3$  of said screw passes through a hole made in the end of the sleeve, and the collar of said screw bears against the inner side of the head of the sleeve, so that by rotating said screw the holder may be slid longitudinally or drawn outwardly toward the ends of the spindle, while the large ends of the wedges rest against the inner sides of the heads of the sleeve, such movement of the holder causing the stationary wedges to clamp more firmly the bearing  $d'$ , this adjustment being made when for any reason it is desired to take up or provide for wear of the parts. After this adjustment of the holder shall have been made the holder may be secured in its adjusted position by means of suitable set-screws, as  $f$ , entering holes  $f'$ , the heads of said screws contacting with the outer side of the heads of the sleeves, the threaded parts of the screws entering threaded holes in the outer ends of the holders.

The pulleys  $B^2$  and the carriers  $B^5$   $B^6$  may be applied to the spindle after the spindle with the parts described have been inserted in the quill and the quill put into working position in the head.

From the foregoing description it will be understood that the washers 5, connected with the ends of the sleeve, may in practice always bear uniformly against the antifric-tion-washers 3, backed up by the collar  $B'$ , carried by the spindle, and the collar acted upon at each face by such washers is prevented from end shake or thrust in the quill, and consequently accuracy of grinding may be provided for.

The wedges  $e$  are of a length to at one end substantially touch the inner sides of the washers 5, located in the countersinks at the ends of the sleeves, while their outer ends contact with the inner sides of the heads of the sleeves, and said wedges in operation do not slide at all; but they are made effective in tightening up the bearing  $d'$  by moving the holder, and the holder is provided with means whereby it may be retained in exactly its proper adjusted position, and in this adjustment of the holder its inner end may retire from contact with the washer 5; but the adjustment of the holder may be made without adjusting the sleeve; but if for any reason the washer should wear the screw  $a^2$  may be loosened and the sleeve turned to insure the proper working fit between the washers 5 and 3.

The bearing will preferably be composed of brass or of a metal differing from that of the spindle.

By providing the spindle with a plurality of sheaves or driving-pulleys, each to receive its own driving-belt, the spindle may be rotated from a plurality of sources at the same speed, and by driving the spindle at opposite ends of the quill a steadier motion is obtained, and the carriers connected with the spindle may be provided with any suitable emery or other wheels or tools to be used. The tapered wedges or keys constitute adjusting devices for the bearing, and any tendency to end shake or thrust may be taken up or compensated for by adjusting the sleeves within the quill.

The bearing or bearing-section  $d'$  is provided (see Fig. 5) with a keyway 8, which receives a pin or projection extended from the inner face of one of the tapered wedges or adjusting devices, said key and projection preventing any possibility of the rotation of the bearing-section in the holder. The screws  $e'$  and  $f$  prevent any rotation of the holder in the sleeves fixed in the quill.

Oil applied to the hub may be inclosed therein air-tight and will last for a long period of time.

It will be seen from the drawings that the holder is cut out centrally, as at 14, and presents inturned portions at its ends, said holder being bored to receive the slitted bearing-section, the exterior of which when first applied to the holder being of such diameter as to be inserted easily through the bore of the holder, and practically it is best that the exterior of the bearing-section does not contact with the holder. It is, however, necessary that the straight faces of the wedges contact with the exterior of the slitted bearing-section, and by a relative change of position of the holder and wedges it will be obvious that the wedges will be moved uniformly toward the center of rotation of the spindle and in such movement will so compress the bearing-section as to contract its inner diameter to fit the spindle.

Figs. 1, 3, and 4 show the holder at the left-hand end of the quill, supposedly in its original position, and the bearing-section of full diameter; but Figs. 2 and 10 show the holder adjusted to contract the bearing.

Each carrier B<sup>5</sup> and B<sup>6</sup> is shown as provided at its end with a threaded hole, and these holes will receive suitable set-screws to attach to the carrier in working position emery-wheels or other tools to be used.

If the spindle is rotating in what is called a "right-hand" direction and the tool is to grind the inner side of a bore, then to maintain the tool-carrier fixedly upon the spindle the thread joining the carrier with the spindle must be a right-hand; but under the same conditions should the grinding-tool be used to grind the exterior of a cylinder then the carrier, owing to the friction exerted by the tool upon the thing being ground, would be unscrewed from the spindle. Hence with a right-hand rotating spindle to grind an article externally the thread uniting the carrier to the spindle must be a left-hand thread, the object being in all conditions to enable the strain exerted upon the periphery of the tool in use to be applied to the carrier in such a direction as would tend to turn or screw the carrier farther upon the end of the spindle to which it is attached.

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

1. In an apparatus of the class described, a spindle having a collar, a surrounding quill having at its opposite ends sleeves, containing each a washer, said washers cooperating with the opposite sides of said collar to prevent end shake of the spindle.

2. In an apparatus of the class described, a spindle having a collar, a surrounding quill having at its opposite ends a sleeve containing each a washer having a series of perforations to carry oil, said washers cooperating with the opposite sides of said collar to prevent end shake of the spindle.

3. In an apparatus of the class described, a spindle having a collar, an antifriction-washer applied to said spindle at each side of said collar, a surrounding quill having at its opposite ends sleeves containing each a washer, the washers of the sleeves contacting with said antifriction-washers.

4. In an apparatus of the class described, a spindle having a collar, a surrounding quill having at its opposite ends adjustable sleeves containing each a washer, said washers cooperating with the opposite sides of said collar to prevent end shake of the spindle.

5. In an apparatus of the class described, a spindle having a collar, antifriction-washers applied to said spindle at each side of said washer, a surrounding quill having at its opposite ends adjustable sleeves, and containing each a washer at its inner end, the washers of the sleeves contacting with the anti-

friction-washers resting against the outer sides of the collar.

6. A cylindrical bearing-section having a series of slits cut in the same from its opposite ends, said slits extending one beyond the other, a holder in which said bearing-section is fitted, and a series of wedges mounted loosely in said holder, means to adjust the holder longitudinally with relation to said bearing-section and longitudinally of the wedges, causing said wedges to be moved toward the longitudinal center of said bearing-section to contract the diameter about and compensate for wear.

7. A cylindrical bearing-section having a series of slits cut into the same from its opposite ends, said slits extending one beyond the other, said section being provided with a series of holes and non-metallic material plugging said holes, and a holder for said bearing-section, and adjusting means cooperating with the exterior of the bearing-section to contract the diameter of the opening in the bearing to compensate for wear.

8. In an apparatus of the class described, a spindle, a surrounding quill having applied within its end a sleeve, a holder contained within said sleeve, a series of wedges also guided in said holder, a slitted bearing-section also contained within said holder, the exterior of said section contacting with one side of said wedges, and means to adjust said holder in or with relation to the sleeve and also with relation to the wedges whereby the latter may act to decrease the inner working diameter of the bearing-section to compensate for wear.

9. A revolving spindle having a collar, a quill surrounding said spindle and having applied adjustably in its opposite ends a sleeve, each sleeve having at its inner end a washer cooperating with a collar, a series of wedges located within each of said sleeves, a holder also located within each of said sleeves and guiding said wedges, slitted bearing-sections contained within said holders and provided with a series of slits extended inwardly from its opposite ends, said bearing-section being acted upon externally by said wedges, means to adjust said holders within said sleeves to effect the movement of the wedges toward the center of rotation of the spindle, the sleeves and the washers at their ends remaining in their operative position while the holder is adjusted to effect the decrease of the inner diameter of the bearing-section.

10. In an apparatus of the class described, a quill having applied to it a sleeve having a head at one end, a washer located in the opposite end of said sleeve, a holder contained in said sleeve and provided with a series of wedges, a slitted bearing-section applied within said holder loosely, a series of wedges also carried by said holder and contacting with the exterior of said slitted bearing-section, said section and one of said wedges being united by or through a suitable projection to

prevent the rotation of the slitted section in the holder.

11. In an apparatus of the class described, a quill, sleeves secured in the opposite ends of said quill, a holder located within each of said sleeves, a series of wedges guided by said holder, a slitted bearing carried by each of said holders, a screw carried by said holder and having its head exposed at the end of the sleeve, the rotation of said screw effecting the longitudinal movement of the holder toward the closed end of the sleeve sliding the holder over the said wedges and thereby causing the acting faces of the wedges in contact with the slitted bearing-section to effect a decrease in the diameter of the inner surface of said bearing-section.

12. In an apparatus of the class described, a quill, sleeves secured in the opposite ends of said quill, a holder located within each of said sleeves, a series of wedges guided by said holder, a slitted bearing carried by each of said holders, a screw carried by said holder and having its head exposed at the end of the sleeve, the rotation of said screw effecting the longitudinal movement of the holder toward the closed end of the sleeve, sliding the holder over the said wedges and thereby causing the acting faces of the wedges to contact with the

slitted bearing-section to effect a decrease in the diameter of the inner surface of said bearing-section, and suitable means to lock the sleeve and holder in their adjusted position.

13. In an apparatus of the class described, a spindle, means to sustain said spindle in its rotation and prevent end shake thereof, said spindle having threaded portions at its opposite ends of reverse hand, whereby a tool-carrier may be applied to both the right and left hand threaded end and enable the spindle in its rotation, and revolving the tool, to obviate loosening the tool-carrier with relation to the spindle.

14. In a machine of the class described, a quill containing an adjustable bearing, and provided at one extremity with a right and at its opposite extremity with a left hand thread, each end of the spindle having a shoulder, combined with two belt-pulleys applied to said spindle, and tool-carriers applied to the threaded ends of the spindle.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD RIVETT.

Witnesses:

GEO. W. GREGORY,  
MARGARET A. DUNN.