G. M. BRANDT AND L. V. DAVIS.

CYLINDER GRINDING AND REAMING MACHINE.

APPLICATION FILED MAR. 25, 1921.

1,430,933.

Patented Oct. 3, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

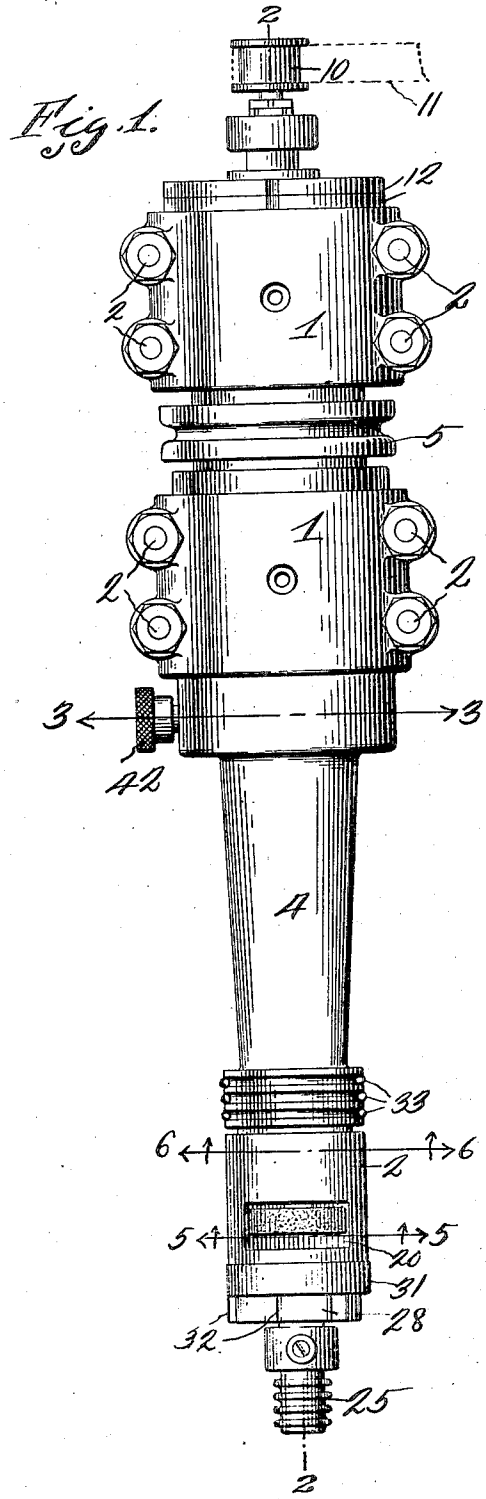
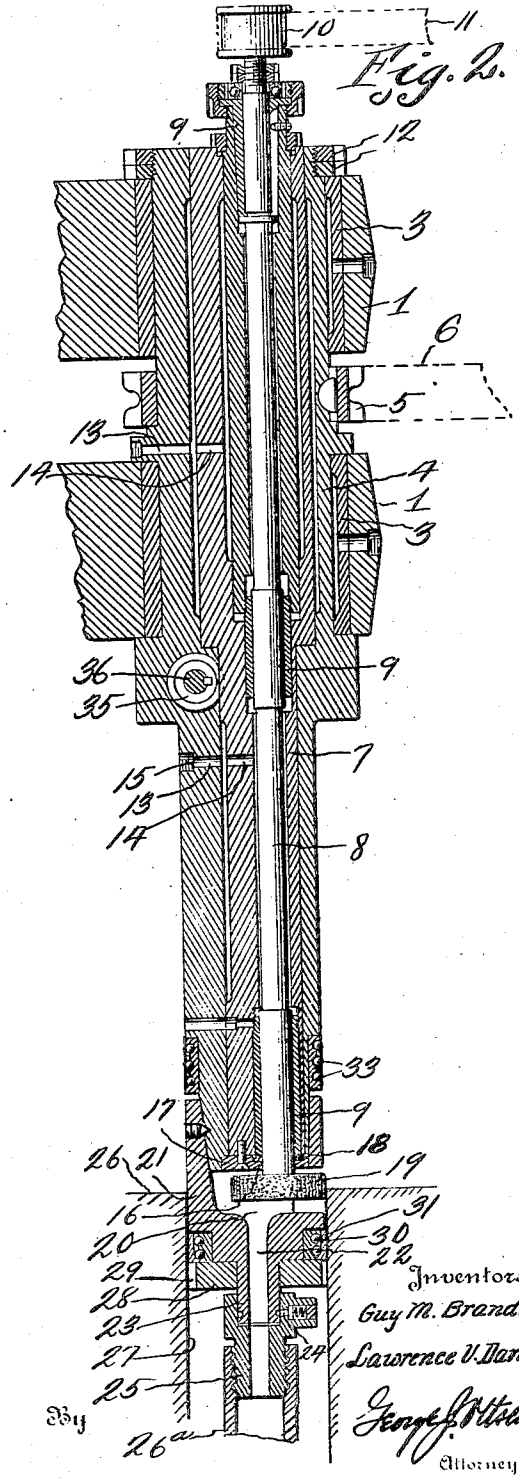



Fig. 2.




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2 SHEETS—SHEET 2.

Fig. 3.

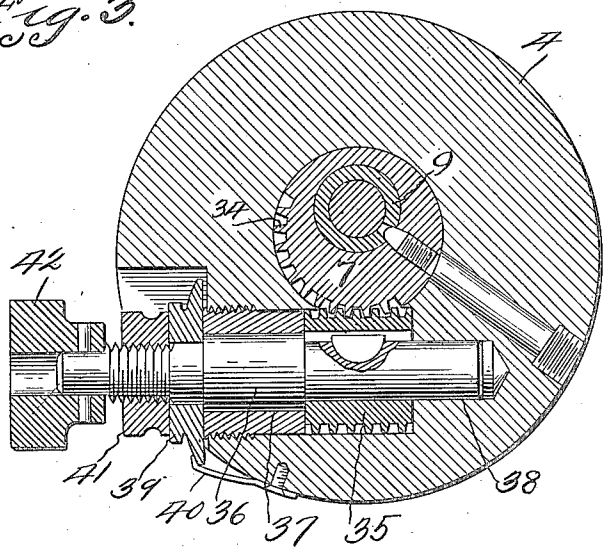
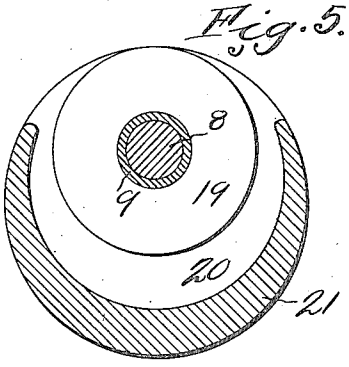



Fig. 5.



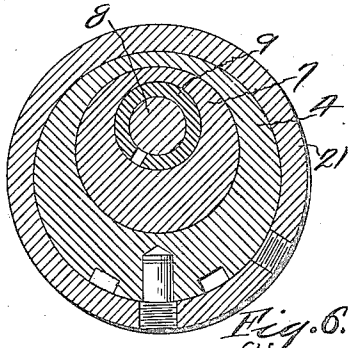




Fig. 6.

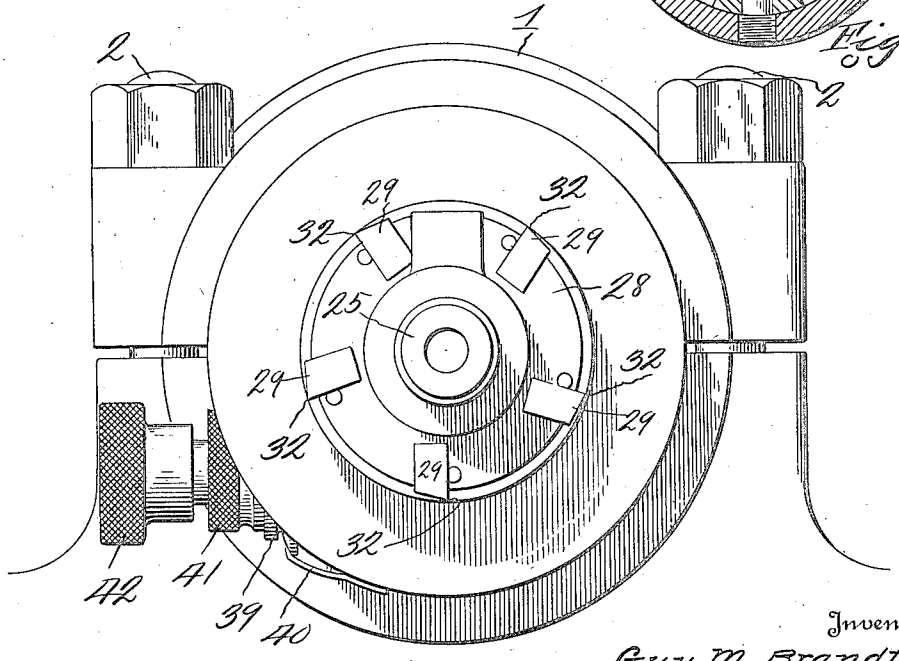



Fig. 4.

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# UNITED STATES PATENT OFFICE.

GUY M. BRANDT AND LAWRENCE V. DAVIS, OF SOUTH BEND, INDIANA.

## CYLINDER GRINDING AND REAMING MACHINE.

Application filed March 25, 1921. Serial No. 455,412.

*To all whom it may concern:*

Be it known that we, GUY M. BRANDT and LAWRENCE V. DAVIS, citizens of the United States, residing at South Bend, in the county of St. Joseph and State of Indiana, have invented certain new and useful Improvements in Cylinder Grinding and Reaming Machines, of which the following is a specification.

The invention relates to cylinder grinding and reaming machines and has for its object to provide a device of this character for finishing cylinders after they have been rough bored or cast nearly to size.

A further object is to provide a cylinder reaming and grinding machine comprising a rotative spindle eccentrically and rotatively mounted in an eccentrically disposed sleeve in a spindle housing, the lower end of said spindle being provided with an emery wheel horizontally disposed and adapted to grind the wall of a bore of a cylinder. Also means is provided for rotating the spindle and the housing simultaneously but at different speeds.

A further object is to provide adjusting means whereby the eccentrically mounted sleeve may be rotated within the spindle housing and held at various adjusted positions for adjusting the periphery of the emery wheel incident to taking up wear or properly aligning the same.

A further object is to provide the lower end of the spindle housing with a downwardly extending removable housing having a chamber therein for the reception of the emery wheel to the lower end of which downwardly extending housing a suction hose may be attached for removing the ground particles from the chamber in which the emery wheel is disposed.

A further object is to provide the downwardly extending removable housing with a cutter, which cutter as the machine as a whole enters the bore of the cylinder will take a cut from the bore in advance of the emery wheel, which emery wheel finishes the bore to size.

A further object is to provide pilot ball bearings, one of which ball bearings is carried by the emery wheel housing immediately above the cutter and below the emery wheel, the other pilot ball bearing being disposed on the spindle housing and located above the emery wheel, said pilot ball bearings forming means for guiding the cylinder block as it is moved upwardly and downwardly on a vertical movable feed table, not shown. However the cylinder block being free or allowed to float on the feed table so that the spindle as a whole will self-center in the cutting and grinding operation, the cylinder having previously been rough bored or cast nearly to size.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings:—

Figure 1 is front elevation of the cutting and grinding machine.

Figure 2 is a vertical sectional view taken on line 2—2 of Figure 1.

Figure 3 is a horizontal sectional view taken on line 3—3 of Figure 1.

Figure 4 is a bottom plan view of the machine.

Figure 5 is a horizontal sectional view taken on line 5—5 of Figure 1.

Figure 6 is a horizontal sectional view taken on line 6—6 of Figure 1.

Referring to the drawings, the numeral 1 designates spaced horizontally disposed supporting bearings, which bearings are secured to any kind of a support by means of bolts 2. The bearings 1 are provided with bearing sleeves 3, in which bearing sleeves is rotatably mounted a spindle housing 4, which spindle housing at a point between the bearing sleeves 3 and the bearings 1 is provided with a sprocket 5, and around said sprocket 5 a chain belt 6 extends which may lead to any source of power, and by means of which the spindle housing may be rotated. The speed of rotation of the spindle housing 4 is preferably about 35 R. P. M., the reason for which will presently appear. Eccentrically disposed within the spindle housing is an eccentric sleeve 7, which sleeve has rotatably mounted and eccentrically disposed therein a spindle 8. The spindle 8 is rotatably mounted in bearing sleeves 9 carried by the eccentric sleeve 7, by means of which bearing sleeves the spindle 8 will be maintained in accurate vertical position and at the same time the friction reduced to a minimum. The upper end of the spindle 8

is provided with a pulley 10 and around which pulley a belt 11 extends, which belt may lead to any suitable source of power, however the spindle is preferably rotated at approximately 3000 revolutions per minute, the purpose of which will presently appear. The spindle housing 4 has threaded on its upper end adjusting nuts 12, which nuts prevent axial movement of the housing sleeve 4 in its bearings, and also form means whereby wear and the like may be taken up. The spindle housing and the eccentric sleeve 7 are provided with apertures 13 and 14, through which apertures lubricant may be applied to the various bearings within the housing and eccentric sleeve, there being screw closures 15 for normally closing the apertures 13.

The lower end of the spindle 8 extends through an aperture 16, and a removable plate 17 carried by the lower end of the eccentric sleeve, and interposed in a recess of the removable plate 17 is an annular packing 18, which packing prevents loss of lubricant. Secured to the lower end of the spindle 8 is a grinding wheel 19, which wheel is located below the plate 17 and in the chamber 20 of a removable housing 21, which housing is detachably secured to the lower end of the spindle housing 4. Extending downwardly and axially through the detachable housing 21 is a passage 22 which extends through an extension 23 of the housing, and to which extension is pivotally connected by means of a spring pressed lug 24, a suction hose coupling 25 to which coupling the suction hose $26^a$ is secured. During the grinding operation when the cylinder block 26 as a whole is being moved upwardly and downwardly on a feed table for feeding the grinding element 19 into the bore 27 of the cylinder, the abraded material which may collect around the grinding element within the chamber 20 will be sucked through the passage 22, the hose coupling 25 and hose $26^a$, thereby preventing clogging and insuring uniform grinding of the bore 27. Secured to the lower end of the removable housing 21 is a cutter disc 28, which disc is provided with a plurality of cuttters 29 which cutters on an upward movement of the cylinder block 26 takes a cut from the bore 27, it being understood that the bore has been previously rough bored or cast nearly to size. It has been found however, that to insure the proper and uniform reaming of the bore 27 by the cutters 29 that it is necessary to provide pilot ball bearings 30 disposed immediately above the cutters 29, said pilot ball bearings having the periphery of its outer ring 31 substantially in registration with the cutting edges 32 of the cutters as shown in Figure 4, therefore it will be seen that as the cylinder block moves upwardly and the cutters 29 enter the upper end of the bore 27 and after the bore has been reamed sufficiently for the cutters to be above the lower end thereof, the ring 31 of the ball bearings 30 will engage the periphery of the reamed portion of the bore 27 and guide the cylinder block during further upward movement thereof and self center the same on the feed table, not shown. After the cylinder block as a whole has moved upwardly sufficiently for the ball bearings 30 to have passed well into the bore 27 of the cylinder block, the grinding wheel 19 will engage and grind the bore 27 to its finished diameter, and as the cylinder block continues in its upward movement the ball bearings 33 enter the upper end of the bore 27 and additionally guide and center the cylinder block on its table. Ball bearings 33 also form guiding means for properly centering and guiding the grinding element as it passes out of the lower end of the cylinder bore 27 thereby allowing the cylinder bore to be accurately ground for its entire length.

The grinding wheel 19 is preferably an emery wheel and consequently becomes worn, therefore it is necessary to adjust the same laterally to take up the wear and also to properly position the wheel periphery so that it will as it is revolved by the spindle 8 and by the rotation simultaneously with the spindle 8 and the spindle housing grind to finished diameter the cylinder bore 27. To accomplish this lateral adjustment the eccentric sleeve 7 is provided with teeth 34, which teeth mesh with worm 35 secured to a shaft 36, which is rotatably mounted in a bearing of a removable sleeve 37 carried by the spindle housing 4 and a bearing 38 in the spindle housing. Mounted on the outer end of the shaft 36 is a collar 39, which collar and the shaft 36 is prevented from axial movement by means of a detent spring 40 which engages over the flange of the collar. Collar 39 is additionally held against displacement by means of a lock nut 41. It will be seen that when the operator grasps the knob 42 carried by the shaft 36 and rotates the same, that the worm 35 carried by shaft 36 will be rotated and consequently the eccentric sleeve 7 will be rotated in its bearing, which action will move laterally the eccentrically mounted spindle 8 carried therein, therefore it will be seen that the grinding wheel 19 will be moved outwardly and inwardly as desired, for adjusting the grinding wheel incident to wear or to the finished diameter of the bore 27 of the cylinder.

From the above it will be seen that a cylinder reaming and grinding machine is provided, wherein the reaming element and the grinding element may during the vertical movement of the cylinder block ream the bore of the cylinder and then grind the same

to a finished diameter. It will also be seen that all particles of material which accumulate incident to grinding will be sucked and removed from adjacent the grinding wheel, and that the device will be self centering incident to the movement of the ball bearings through the bore 27.

The invention having been set forth what is claimed as new and useful is:—

1. The combination with a cylinder grinding machine comprising a rotatable housing and a rotatable spindle mounted therein and provided with a grinding element, of a housing carried by the rotatable housing and provided with a chamber for the reception of the grinding element, an axially disposed passage in communication with the chamber of the housing, means whereby the hose connection may be made with the housing in communication with the axially disposed passage, cutting elements carried by the housing at a point below the grinding element, a pilot bearing carried by the housing and interposed between the cutting element and the grinding element and a second pilot bearing carried by the rotatable housing and disposed above the grinding element.

2. The combination with a cylinder grinding machine comprising a rotatable housing and a rotatable spindle mounted therein and provided with a grinding element housed in the lower end of the rotatable housing, of pilot bearings located above and below the grinding element and adapted to engage the wall of the cylinder bore for guiding the machine during a boring operation, and a cutting element located below the lower pivot bearing.

3. The combination with a cylinder reaming and grinding machine comprising a rotatable spindle housing having a rotatable spindle mounted therein and provided with a grinding element housed in the lower end of the rotatable housing and a reaming element carried adjacent the lower end of the rotatable spindle housing, of pilot bearings carried by the rotatable spindle housing and forming means for guiding and centering the machine during a cylinder reaming and boring operation.

4. The combination with a cylinder reaming and grinding machine, said machine having a reaming element and a grinding element adjacent its lower end, of a pilot bearing disposed above the reaming element and adapted to center the machine during a reaming operation.

5. The combination with a cylinder reaming and grinding machine, said machine having a reaming element and a grinding element adjacent the lower end thereof of a pilot bearing disposed adjacent the reaming element and a pilot bearing disposed above the grinding element.

In testimony whereof we affix our signatures.

GUY M. BRANDT.
LAWRENCE V. DAVIS.