Nov. 9, 1926. 1,606,000

H. D. TAYLOR

GRINDING MACHINE FOR CYLINDERS

Filed July 5, 1922 4 Sheets-Sheet 1

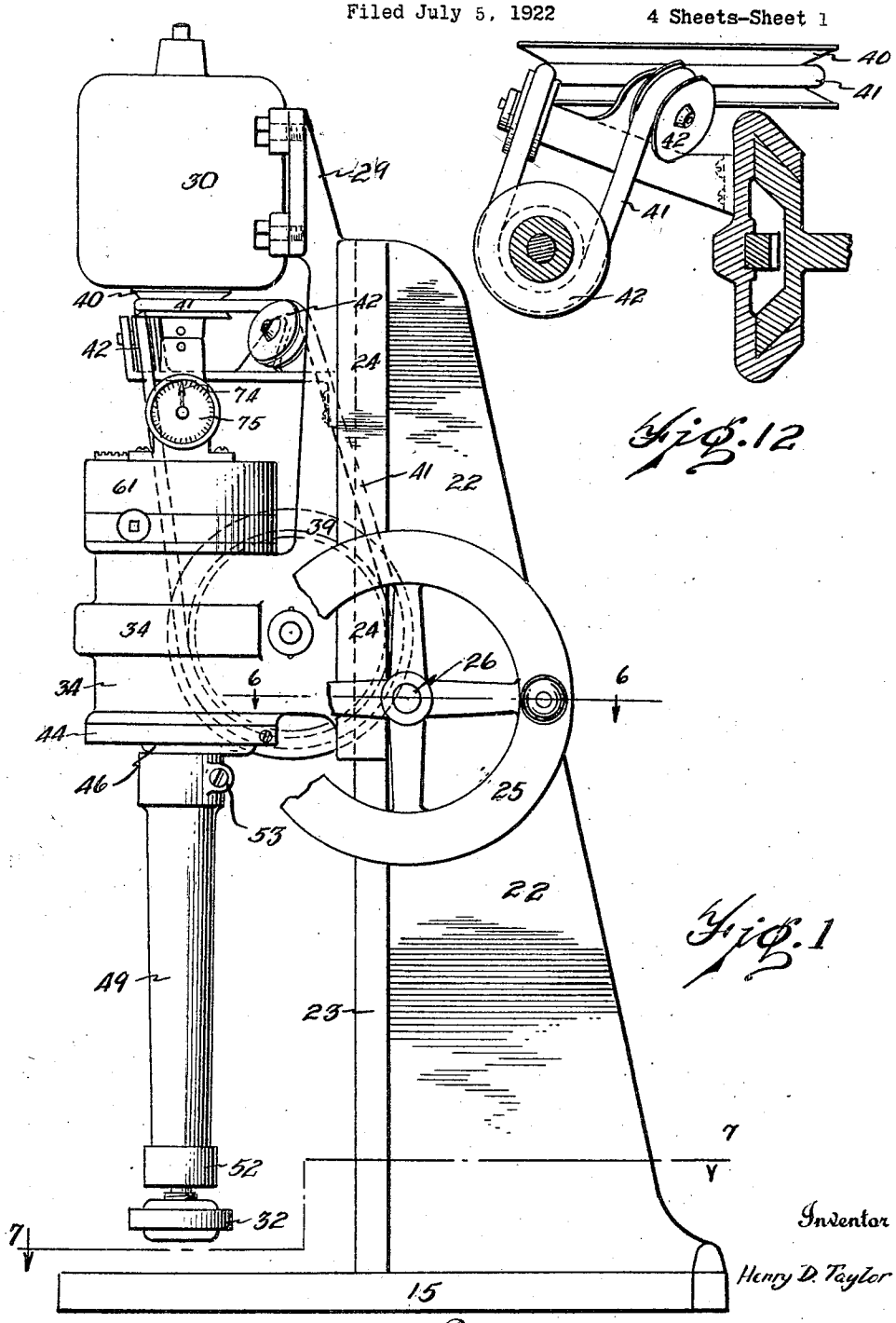


Fig. 12

Fig. 1

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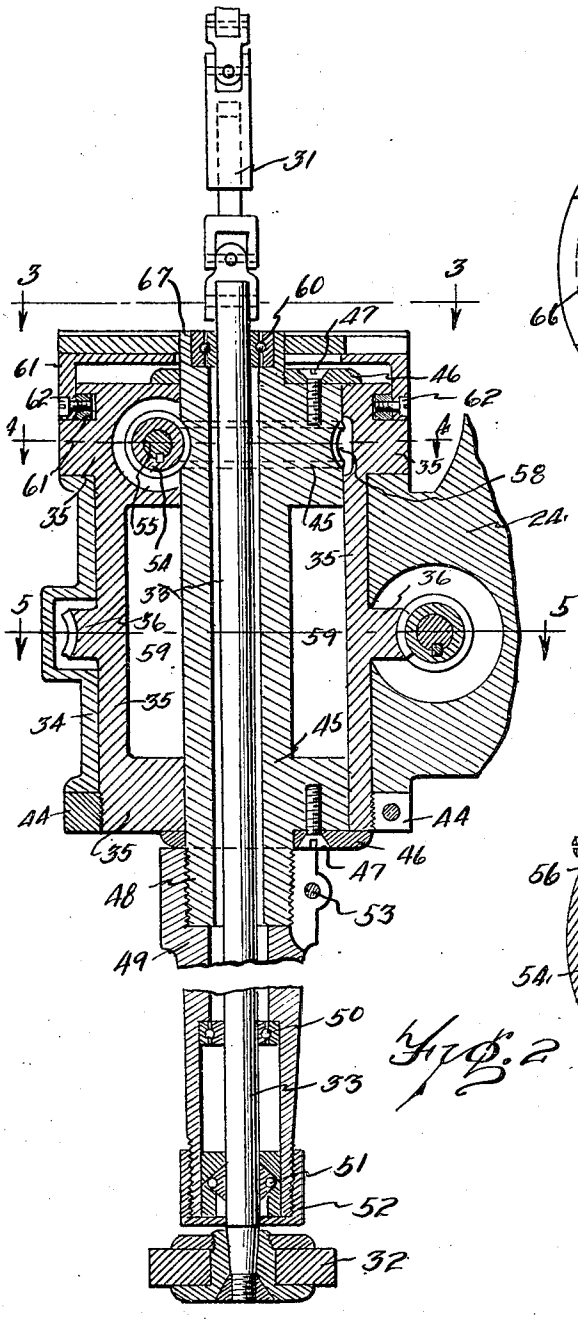


Fig. 2

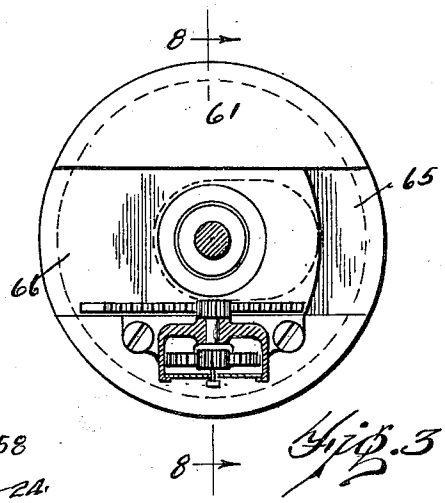


Fig. 3

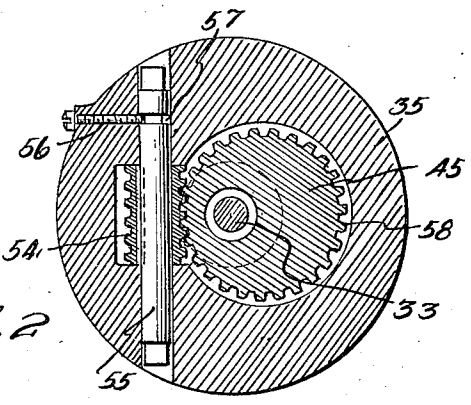


Fig. 4

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GRINDING MACHINE FOR CYLINDERS

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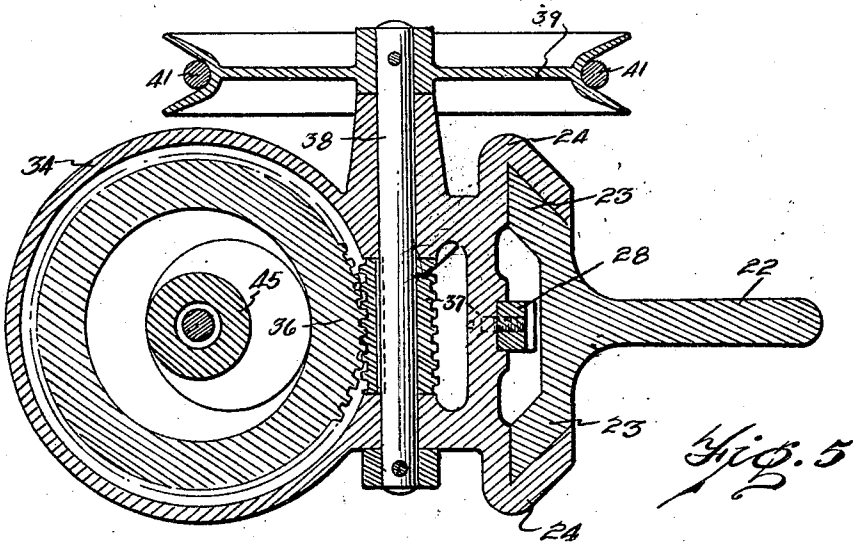


Fig. 5

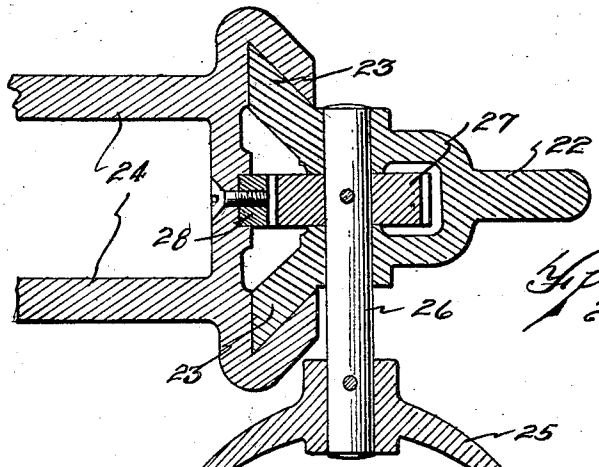


Fig. 6

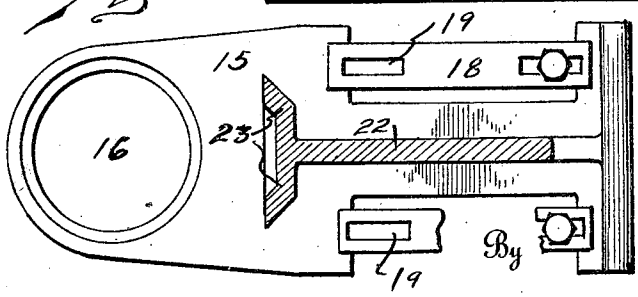


Fig. 7

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GRINDING MACHINE FOR CYLINDERS

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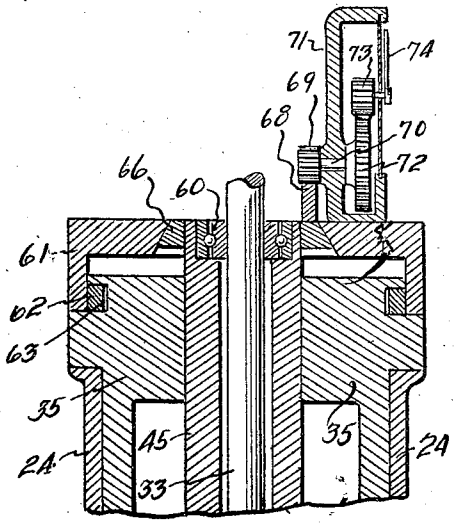


Fig. 8

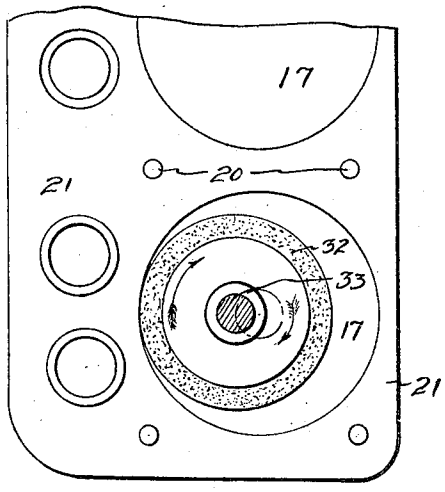


Fig. 11

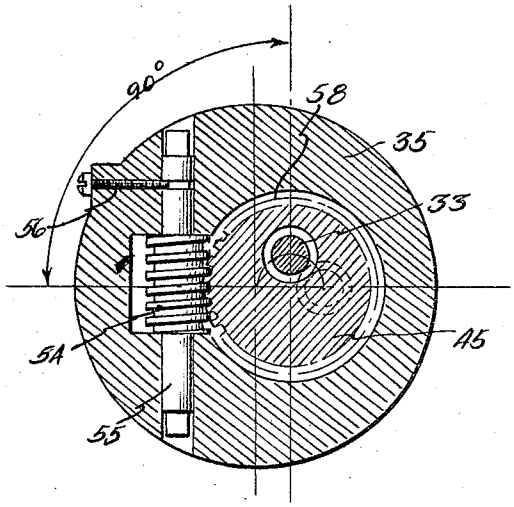


Fig. 9

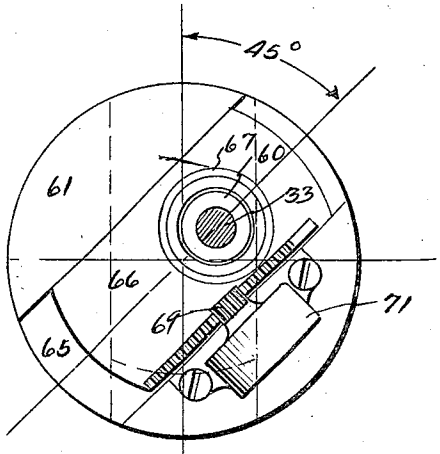


Fig. 10

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Patented Nov. 9, 1926. 1,606,000

UNITED STATES PATENT OFFICE.

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GRINDING MACHINE FOR CYLINDERS.

Application filed July 5, 1922. Serial No. 572,920.

My invention relates to an improved grinding machine for cylinders. In the truing up of a worn cylinder bore, many prefer to grind rather than rebore the same. My improved machine is designed to meet this use. It is adapted to easily, quickly and effectively grind a worn cylinder bore to a true predetermined diameter. Through the use of this machine it is possible to remove a predetermined excess of metal to true up the cylinder bore to a desired diameter, a gage and reading dial being provided in connection therewith.

I have provided a machine which it is possible to set to remove a predetermined amount of material from the cylinder bore and then grind the bore to remove this predetermined material. This operation may be repeated until the bore is of the desired diameter. Without this indicating device, it is only possible to measure and ream and measure again, and grinding becomes very largely a matter of guess, the result of which is dependent upon the judgment of the operator. In using my improved machine, the operator determines the amount of metal necessary to be removed from the cylinder bore, and the point from which such metal must be removed, to arrive at the diameter desired, sets the machine and reads the setting on the dial, and then the machine is operated to remove such excess of material. By means of the reading dial which is operated in connection with the movement of the setting operation, it is possible to know exactly the amount of material which will be removed by the machine when set for a grinding operation, and the diameter of the bore is cut this predetermined amount.

The above and other objects, together with details of construction and operation will more fully appear from the following description, appended claims and accompanying drawings, in which:

Fig. 1 is a side elevation of a complete machine.

Fig. 2 is a longitudinal sectional view partly broken away.

Fig. 3 is a view taken on line 3—3 of Fig. 2.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 2.

Fig. 6 is a sectional view through the supporting standard and the carriage, partly broken away, on line 6—6 of Fig. 1.

Fig. 7 is a view, partly in section and partly in plan, taken on line 7—7 of Fig. 1.

Fig. 8 is a fragmentary sectional view taken on line 8—8 of Fig. 3.

Fig. 9 is a sectional view taken on the same line as Fig. 4, with the sleeve rotated through an arc of 90 degrees adjustment.

Fig. 10 is a plan view taken on the same line as the view in Fig. 3 except that the sleeve has been rotated 135 degrees from the position there indicated, or forty-five degrees from the position shown in Fig. 9.

Fig. 11 is a plan of the cylinder block broken away, showing the outline of a grinding wheel in a cylinder bore.

Fig. 12 is a fragmentary view showing the pulley drive from the motor.

My improved machine comprises a base 15 having a circular opening 16 which is adapted to be aligned concentrically with the bore 17 of a cylinder to be ground. Clamping means 18 are provided through the elongated openings 19 of which screw bolts are fastened into provided openings 20, in a cylinder block 21, to secure the base in aligned relationship with the bore of the cylinder in such block, when it is desired to grind the same.

This base is provided with an upright standard 22, having a beveled vertical guide way or track 23 for a travelling carriage 24. This carriage serves as a mounting for a grinding machine, and through the reciprocation of the carriage, the grinding element is made to traverse vertically the bore of a cylinder. This carriage may be operated as desired by means of a hand wheel 25 mounted upon a shaft 26, which has a bearing in the standard 22 and upon which shaft is mounted a pinion 27 disposed within the upright standard 22, which pinion meshes with a rack 28, secured as shown to the carriage. The carriage is formed as shown with overlapping edges to engage opposite beveled sides of the guide 23 so as to have a guided travel therealong.

As shown the carriage is provided with an upwardly extending bracket 29, to which is secured a driving motor 30, which motor is adapted to drive through a universal connection 31, a grinding wheel 32, which wheel is suitably detachably supported at the

lower end of a grinding wheel spindle 33, hereinafter more fully described. In addition to rotating the grinding wheel at a high rate of speed, the motor also revolves the grinding spindle, consequently the grinding wheel, about an axis which may or may not coincide with its independent axis of rotation, but which in the general operation of the machine will not so coincide, and it is this eccentric displacement of the grinding wheel from a position concentric with the aligned bore of the cylinder which is recorded on the reading dial in the manner hereinafter described, and which is a major feature of this machine.

The travelling carriage 24 is provided with a laterally directed arm having a circular opening therethrough aligned with the opening through the base so that it may serve as a bearing support 34 for a rotatably journalled hollow body member 35. This body member has a peripheral worm gear 36 which is enmeshed with a driving worm 37, which worm is carried by a shaft 38 which shaft is mounted in the carriage as shown in Fig. 5, and is driven by a pulley 39, itself driven from the motor pulley 40 by means of a pulley belt 41 travelling over idlers 42. This rotatable body member has an overhanging shoulder which rests upon the bearing 34, and a split bearing ring 44 is threaded on the projecting lower end of the body member to hold the same within the bearing 34 for rotation. Due to the position of the bearing member 34 relative to the opening through the base, the body member is so supported relative to the opening 16 that its axis of rotation coincides with the projection of the axis of the cylinder bore to be ground when the opening 16 is aligned with such bore.

Journalled eccentrically within the body member for rotatable adjustment is an arbor or sleeve 45, held in place by means of upper and lower end plates 46 fastened to the sleeve by means of screws 47, and which end plates bear against the ends of the body as shown in Fig. 2, to support the sleeve for rotatable adjustment therein. This sleeve extends above the upper end plate for a purpose hereinafter described, and also below the lower end plate. The extension below the lower end plate is threaded as at 48 to receive a split threaded casing 49, through which casing, the grinding spindle extends, and which spindle has a bearing therein at 50 and 51 as indicated. Over the lower end of the casing is threaded a perforated cap 52. A tightening screw 53 may be provided to bind the split casing securely around the threaded portion 48 of the sleeve.

This eccentrically journalled sleeve is adapted for rotatable adjustment by means of a worm 54, which is keyed to the shaft 55, the ends of which shaft are adapted as shown in Fig. 4 to be engaged for adjustable rotation. The shaft itself is held from falling out of its bearing in the body by means of a pin 56 which seats in a groove 57 formed in the shaft. This worm engages a worm gear 58 formed on the sleeve. This sleeve may be cored out intermediate its ends as shown in Fig. 2 at 59. The sleeve is provided with an eccentric passageway through which extends the grinding spindle 33, having a bearing 60 in the upper end of the sleeve and lower bearings as heretofore described. In one of the positions of rotatable adjustment of the sleeve 45, the grinding wheel spindle is positioned concentric the body and consequently the bore of the cylinder with which it is aligned. In all other positions of adjustment of the sleeve the spindle is positioned eccentrically the bore of the cylinder. The concentric position is shown in Figs. 2, 3 and 4; positions of varying eccentricity in Figs 9 and 10, the spindle arriving at its position of greatest eccentricity when it has been revolved through an arc of 180 degrees as the sleeve is so rotated by the worm 54. Through the adjustable rotation therefore of the sleeve 45 it is possible to position the offset spindle 33 at varying positions relative the bore of the cylinder to be bored and by measuring the travel therefore of the spindle, or the travel of its concentric supporting bearing, formed by the extended end of the sleeve in terms of the chord of the arc of travel it is possible to read in terms of the diameter or radius of the cylinder bore, the offset displacement or radial movement of the grinding wheel.

A cap 61 is rotatably mounted upon the body, held for rotation thereon by means of a ring 62, which ring is disposed for rotation within a provided groove 63 formed in the body, and supported by the cap through the use of screws 64. The cap is diametrically recessed to provide a guide-way 65, within which guide-way is disposed a sliding plate 66, within which plate is freely disposed the projecting end of the sleeve 67. As this projecting end of the sleeve is concentric with the grinding wheel spindle 33 and therefore eccentric to the axis of rotation of the sleeve, adjustable rotation of the sleeve to offset the grinding wheel, is measured by the longitudinal travel of the sliding plate 66 in the way 65, which travel is produced by the torque exerted thereon by the rotation of sleeve, permitted by the free rotatability of the cap 61. The plate 66 carries a rack 68, which is engaged by a pinion 69, mounted upon a shaft 70, which shaft has a bearing in a dial casing 71, and upon the opposite end of the shaft is mounted a gear 72, enmeshed with a gear 73, which operates a hand 74, which indicates upon the dial face 75, the travel of the

plate and consequently the radial movement of the grinding wheel. The graduations of the dial are predetermined, and may preferably be made to read in inches in thousandths.

If in the truing up of a cylinder it were necessary to remove ten one-thousandths of an inch, the grinding wheel might be set over two one-thousandths at a time, which distance could be read on the dial, and this amount removed, and the operation then repeated. It is possible therefore through the use of this mechanism to determine the exact amount the grinding wheel will remove when offset from the axis of the bore. The grinding wheel can be made to traverse the bore of the cylinder during the grinding operation as desired.

What I claim is:

1. In a cylinder grinding machine, in combination, a support, a body member journalled for rotation within said support, a sleeve journalled eccentrically within said body for rotatable adjustment relative thereof, a grinding wheel spindle journalled for independent rotation eccentrically within said sleeve, said parts so relatively positioned that in one position of the sleeve relative to the body the axis of independent rotation of the said spindle coincides with the axis of rotation of the body and at all other positions to which the sleeve may be rotatably adjusted relative to the body the axis of independent rotation of the said spindle is offset from the axis of the body, a cap carried by the body rotatable thereon, said cap having a diametrical guideway for a plate, a plate disposed within said guideway journaled about a portion of the sleeve concentric with the grinding wheel spindle and movable upon rotation of the sleeve relative the body to measure the eccentricity of movement of the grinding spindle produced by such rotation of the sleeve.

2. In a cylinder grinding machine, in combination, a support capable of attachment to a cylinder block in alignment with the bore of a cylinder, a body member rotatably journalled within said support and capable of vertical travel therein, means for rotating the body member, means for reciprocating the same vertically, a sleeve journalled eccentrically within said body and capable of rotatable adjustment relative thereof, a grinding wheel spindle journalled eccentrically within said sleeve for independent rotation coincident with the rotation of the body member and at an advanced rate of speed, the axis of said spindle adapted to register in one position of the sleeve relative to the body with the axis of the body and having a plurality of positions eccentric to the body member produced by adjustable rotation of the sleeve within the body member, a cap carried by the body member and rotatable relative thereof, said cap having a diametric guideway, a plate disposed within said guideway, said sleeve having a portion concentric with the spindle and coupled with the plate to actuate the same to measure the eccentric movement of the spindle relative the body member produced by the rotation of the sleeve.

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