Dec. 4, 1934. J. SUNNEN 1,982,836

HONING DEVICE FOR CYLINDERS

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Fig. 1

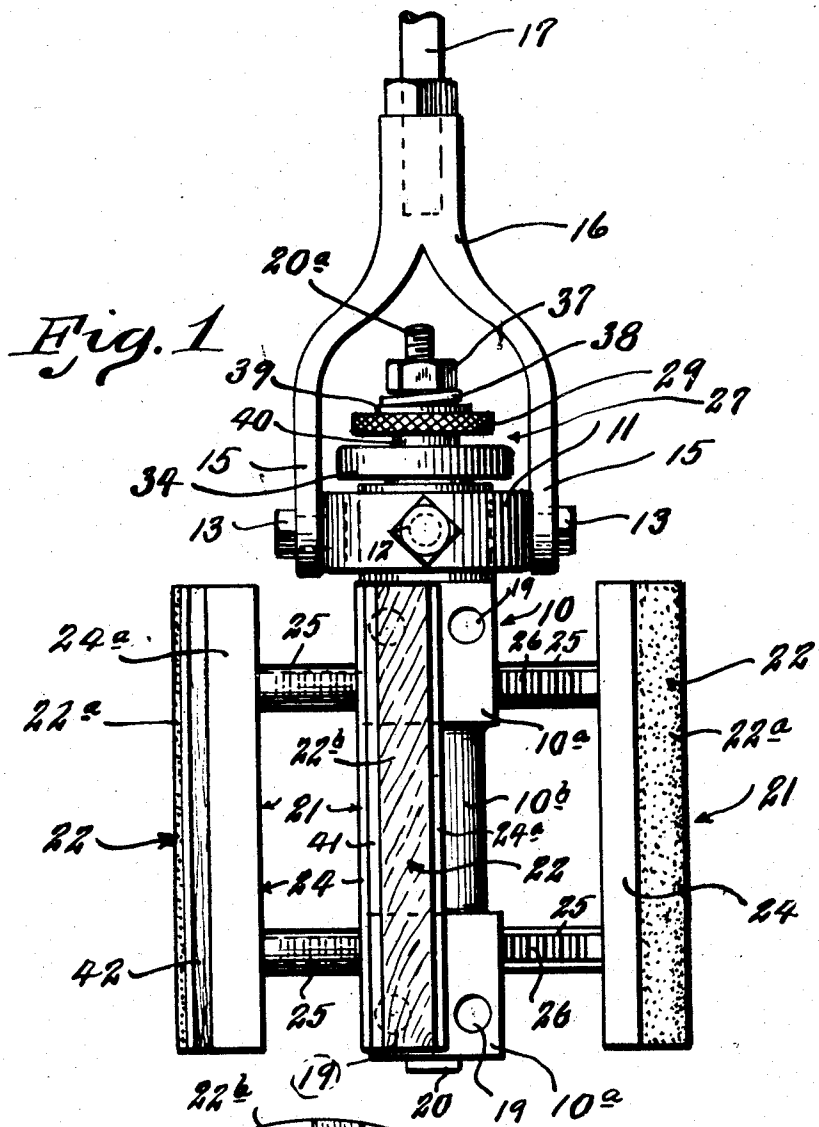
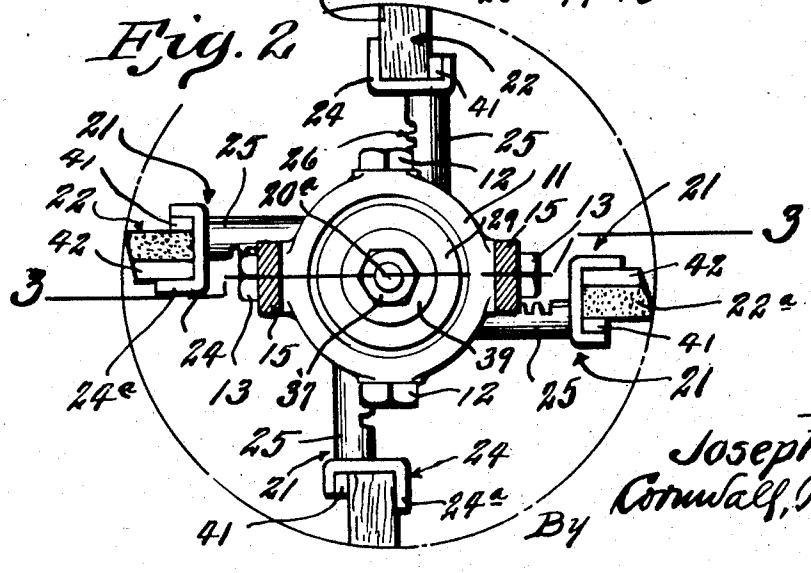


Fig. 2



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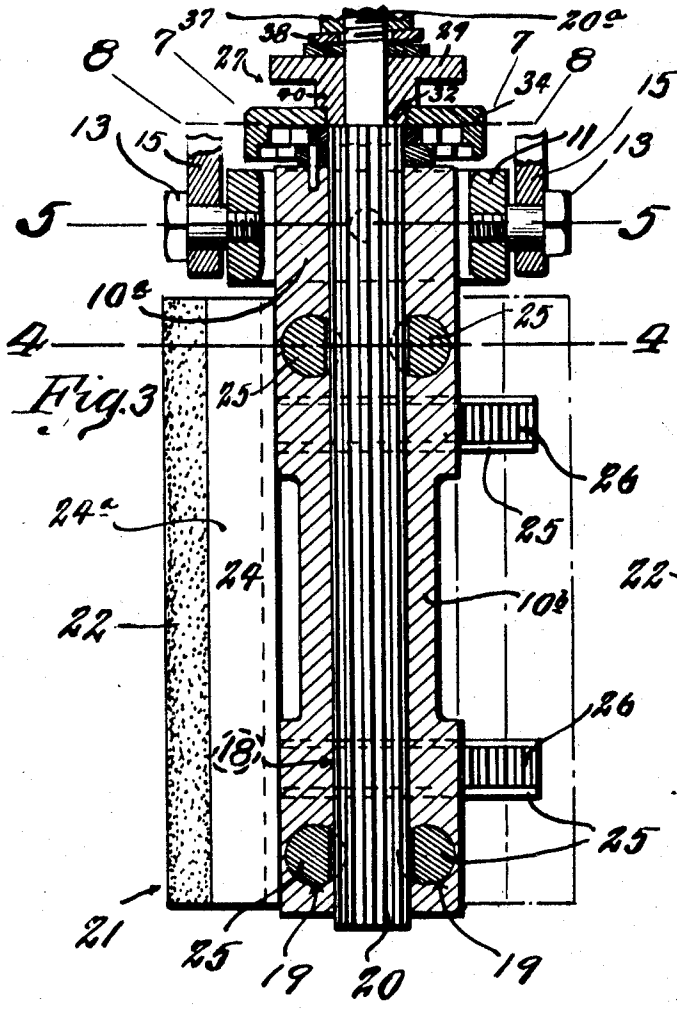


Fig. 3

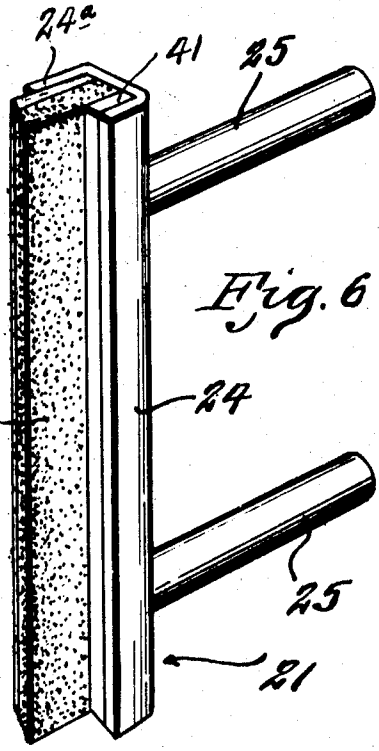


Fig. 6

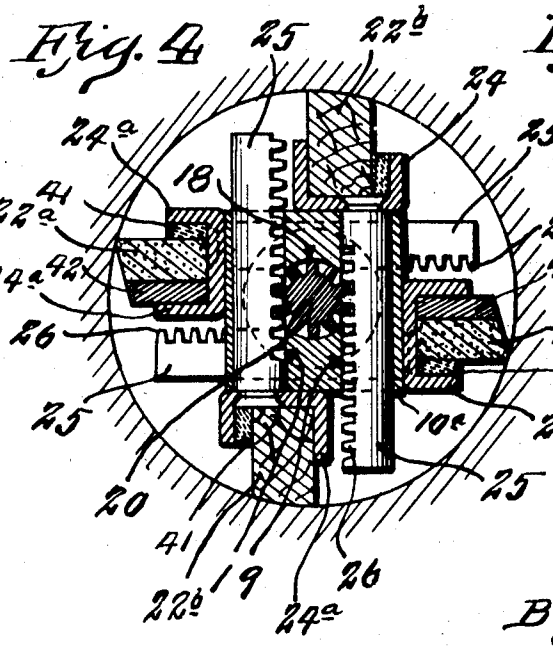


Fig. 4

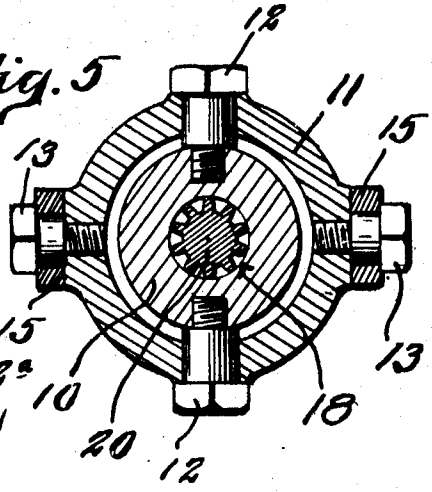


Fig. 5

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HONING DEVICE FOR CYLINDERS

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Fig. 7

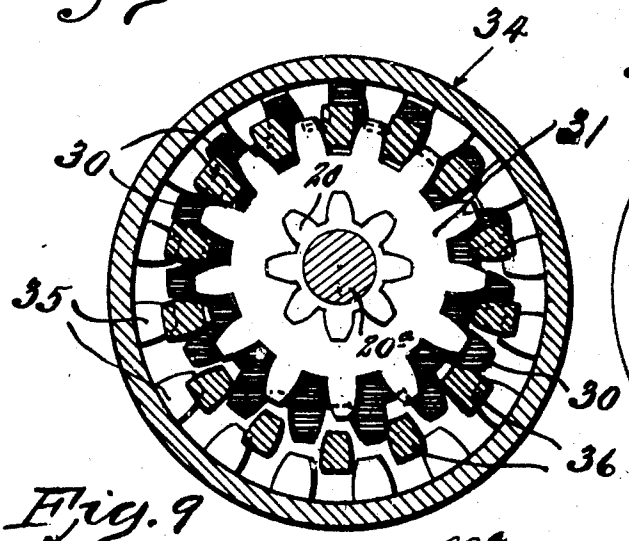


Fig. 8

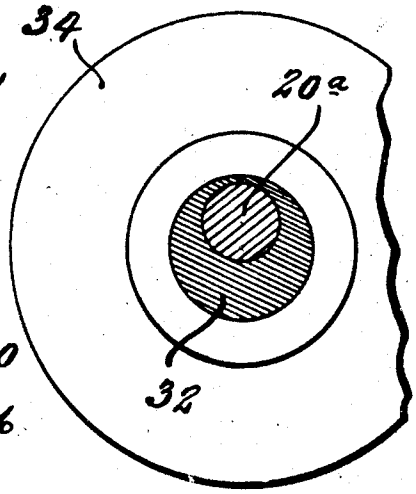


Fig. 9

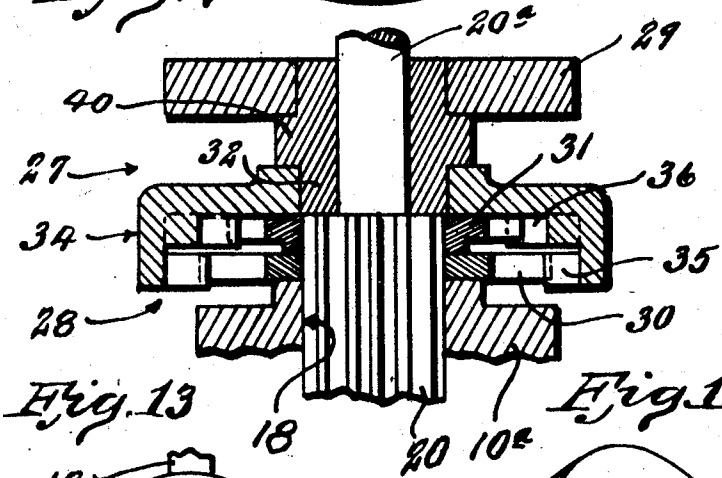


Fig. 10

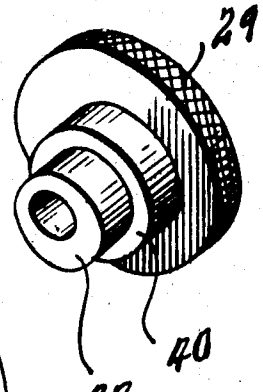


Fig. 13

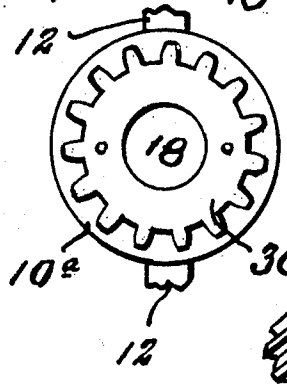


Fig. 11

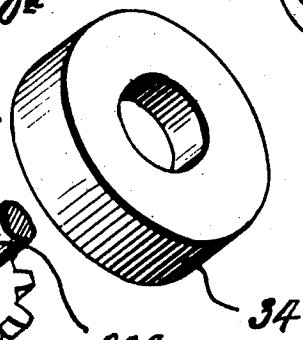
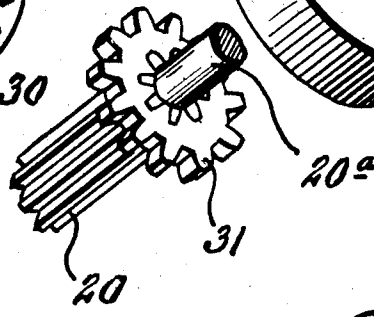


Fig. 12



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UNITED STATES PATENT OFFICE

1,982,836

HONING DEVICE FOR CYLINDERS

Joseph Sunnen, St. Louis, Mo.

Application November 17, 1927, Serial No. 233,788

4 Claims. (Cl. 51—184.1)

This invention relates to new and useful improvements in honing devices for cylinders, the objects of the invention being the provision of a device which is compact in size, of simple and durable construction and can be easily operated.

Further objects of the invention are to provide a device to be used in finishing cylinders of internal combustion engines and which is so constructed that it has a wide range of adjustment, whereby practically all automobile engines now in use can be operated upon by my device, thereby obviating the necessity of having honing devices of more than one size to take care of different sized cylinders.

Other objects of the invention are to provide improved means for mounting the cylinder engaging elements and providing adjustment for said elements so that the latter can be retracted or extended as required.

Still other objects of the invention are to provide an efficient and compact mechanism cooperating with the mounts for the abrading elements for adjusting the latter radially, said mechanism being self-locking to prevent retractile movements of said mounts and the elements carried thereby.

Additional objects of the invention are to generally improve upon and simplify the construction of the apparatus of the class described, and to provide a honing tool which will perform its intended functions in an efficient manner and which can be economically manufactured and operated.

With these and other objects in view, my invention consists in certain novel features of construction and arrangements of parts hereinafter more fully described and claimed, and illustrated in the drawings, in which—

Figure 1 is a side elevational view of my apparatus showing the cylinder engaging elements thereof in extended positions.

Figure 2 is a top plan view thereof.

Figure 3 is an enlarged vertical cross section taken on line 3—3 of Figure 2.

Figure 4 is a horizontal cross section taken on line 4—4 of Figure 3.

Figure 5 is a horizontal cross section taken on line 5—5 of Figure 3.

Figure 6 is an enlarged perspective detail view of one of the mounts showing a cylinder engaging element carried thereby.

Figure 7 is an enlarged horizontal section taken on line 7—7 of Figure 3, and showing the differential gearing utilized in my device for adjusting the cylinder engaging elements.

Figure 8 is an enlarged horizontal cross section taken on line 8—8 of Figure 3.

Figure 9 is an enlarged vertical cross section of the adjusting mechanism.

Figure 10 is a perspective detail view of the manually operable adjusting disk or handle wheel, and showing the eccentric portion thereof.

Figure 11 is a perspective detail view of one of the members of the adjusting disk.

Figure 12 is a perspective fragmental detail view of the revoluble member of said differential gearing.

Figure 13 is a top plan view of the rotatable carrier and showing the fixed gear member of said differential gearing.

The device herein disclosed is particularly designed for honing or finishing the cylinders of internal combustion engines for automobiles, but can be equally as well used for operating upon or finishing the cylinders of all kinds of machinery, such as pumps, fluid compressors, and the like.

The device is adapted to be secured to an electric hand drill (not shown) which imparts rotary motion to said device and by means of which said device is moved in and out of the cylinder to be operated upon.

Referring by numerals to the accompanying drawings, 10 indicates a carrier having mounted at one of its ends a ring 11 which is pivotally connected thereto by screws 12. This ring is pivotally supported at points disposed at right angles to screws 12 by screws 13, which are carried by depending spaced ends 15 of a bifurcated member 16. The opposite or upper end of member 16 is secured to the lower end of a spindle 17 which is adapted to be detachably fixed to a suitable actuating mechanism, such as an electric hand drill (not shown) which allows the device to be handled with ease. The carrier 10 comprises an elongated member having enlarged ends 10*a* and a reduced intermediate portion 10*b*. A bore 18 is disposed centrally and longitudinally through said carrier 10, while a series of transverse bores 19 are arranged in each end 10*a* of the carrier in spaced relation with each other and with bore 18, each of said bores 19 intersecting said longitudinal bore 18. When carrier 10 occupies vertical position, transverse bores 19 are disposed horizontally at right angles to bore 18. Bores 19 are arranged in pairs, one bore of each pair being disposed in each end 10*a* with the axes of the bores of each pair disposed in the same vertical plane.

An elongated pinion or revoluble member 20 is

loosely disposed in bore 18 and its teeth operate through bores 19 where the latter intersect bore 18. A plurality of mounts 21 is carried by carrier 10 and are movable transversely relative thereto. A cylinder engaging element 22 is secured to each mount 21 and is disposed longitudinally of carrier 10 and adapted to engage the inner surface of the cylinder into which the device is inserted.

Each mount 21 comprises a channel member 24 arranged longitudinally of and adjacent to carrier 10 and a pair of transversely disposed bars 25 movably arranged in the corresponding pair of bores 19, and having their outer ends secured to channel member 24 near the ends thereof. The inner ends of bars 25 are formed with rack portions 26, the teeth of which mesh with the teeth of pinion or revoluble member 20.

In the instant case, carrier 10 is provided with four mounts 21 disposed at right angles to each other with the cylinder engaging elements 22 arranged equi-distant about the axis of revoluble member 20.

Thus, when member 20 is rotated in one direction, mounts 21 are moved into extended positions and, when member 20 is moved in opposite direction, said mounts are retracted against carrier 10. In this manner, the cylinder engaging elements 22 can be adjusted radially with respect to the axis of the device, and the range of adjustment of said elements is governed by the length of bars 25. The ends 10*a* of carrier 10, which are preferably rectangular in cross section, are of sufficient thickness to provide the necessary bearing for bars 25 so that the latter are securely mounted and have no play or loose movement in said bearings, thereby maintaining cylinder engaging elements 22, at all times, in proper alignment with each other and with the axis of the device.

Channel members 24 are disposed to one side of the axis of each bar 25. This offsetting of the channels 24 and elements 22 is designed to place said elements 22 rearwardly of the axis of bars 25 with respect to the direction of rotation of the device, in order to provide uniform engagement between said elements and the cylinder surfaces and prevent wedging of binding action therebetween.

In order to insure smooth operation of the device, and prevent binding or chattering of the cylinder engaging elements, I form one pair of the diametrically opposed elements of abrasive material, such as carborundum, as indicated at 22*a*, while the other pair of elements, disposed at right angles to the first pair, is formed preferably of wood of suitable hardness, such as maple, as indicated at 22*b*. This arrangement not only steadies the device and prevents chattering, but insures even operation of the device and elements 22*b* serve to polish the surfaces operated upon by elements 22*a*.

In using the device, it is highly desirable to provide fine and accurate adjustment of the elements and to lock said elements in adjusted positions against accidental movement during operation of the device. This adjustment is accomplished by means of an adjusting mechanism 27 located adjacent to the upper end 10*a* of member 10 and manually operable for actuating at a greatly reduced rate of speed revoluble member 20, which actuates arms 25. In the present instance, this adjusting mechanism 27 comprises a train of gears 28 operable by an adjusting member 29. This train of gears consists of a stationary gear 30 disposed adjacent to the upper end 10*a*, coaxially therewith and secured thereto. An aperture is formed in said gear 30 in alignment with and of the same diameter as bore 18 for receiving revoluble member 20. A driven gear 31 is fixed to revoluble member 20 and is arranged against the opposite face of gear 30. Member 20 is provided with a reduced axial extension 20*a* which projects upwardly beyond the driven gear 31 and loosely mounted on said extension is said adjusting member or hand wheel 29 which is provided with an eccentric portion 32 on which is mounted a compound gear member 34. This gear member 34 loosely rests on driven gear 31 and is provided with a comparatively large ring gear 35 which meshes with stationary gear 30 and is further provided with a smaller ring gear 36, which meshes with driven gear 31. Stationary gear 30 is of larger diameter than the driven gear 31 and, as shown in the drawings, contains fifteen (15) teeth while said driven gear has only thirteen (13) teeth. Large ring or internal gear 35, which meshes with gear 30, has sixteen (16) teeth, while small ring or internal gear 36 meshing with driven gear 31, has fourteen (14) teeth.

Member 34 is eccentrically disposed relative to the axes of member 10 and gears 30 and 31, and is eccentrically operated or gyrated by means of eccentric 32 when the adjusting wheel 29 is actuated, thereby causing driven gear 31 and member 20, to which it is conjoined, to be actuated at a comparatively low rate of speed by virtue of the interengagement of ring gears 35 and 36 with gears 30 and 31, respectively.

Adjusting member 29 is held in position on extension 20*a* by means of a nut 37 which is screw-seated on the threaded extremity of said extension and bears against a spring washer 38 which rests on a washer 39 disposed on adjusting member 29. Thus a suitable degree of pressure is exerted against said adjusting member 29 which causes said adjusting member 29 and gear member 34 to remain at all times in proper operative positions. Adjusting member 29 is provided with a shoulder portion 40 which is disposed above eccentric portion 32 and rests against gear member 34, and maintains it in proper operative position. While the arms 25 are freely movable in and out of member 10 by the actuation of adjusting member 29, said arms are locked against inward movement under the radial pressure applied to the cylinder engaging elements, so that no accidental displacement of said elements can take place and the device will remain in its adjusted position at all times. The location of the adjusting mechanism is such that it can be readily reached by the operator, and it is not necessary to either remove the device from the hand drill to which it is connected, or to move the device away from the job for purposes of adjustment, as such adjustment can be readily made on the job. The cylinder engaging elements 22 are removably disposed in channels 24 and can be easily replaced when worn. As shown in the drawings, the width of channel members 24 is greater than the width of the elements 22 and that side of the channel member located rearwardly of the element 22 with respect to the direction of rotation is substantially deeper than the forward side as indicated at 24*a* in order to reenforce element 22. Each of the elements is held in position in channel member 24 by any suitable means. In the present instance a strip of lead or aluminum 41 is forced between the

forward edge of member 24 and element 22 and serves to secure the latter in position. In the case of abrasive elements 22*a*, a strip of wood or backing 42 is interposed between each element and edge 24*a* to form a backing for each abrasive element.

The gyratory movement of compound gear member 34 causes rotation of member 20 at a considerable reduced speed, the rate of the speed being governed by the relative sizes of the gears and the throw of the eccentric.

In the present instance, sixteen (16) revolutions of adjusting wheel 29 causes one complete revolution and an additional movement of two teeth of the compound gear member 34 with respect to the driven gear member 31, thereby causing the retardation of said driven gear two teeth, that is, causing said driven gear to move two teeth back with respect to stationary gear 30.

In the operation of my device, spindle 17 is moved in a vertical plane so as to bring the cylinder engaging elements in contact with the entire surface of the cylinder, thereby insuring even finish of the cylinder. The use of elements 22*b* of non-abrasive material arranged between abrasive elements 22*a* steadies the device and eliminates chattering. This greatly increases accuracy and smooth operation of the device. My honing device is of compact durable construction, has a wide and sensitive range of adjustments and can be easily manipulated.

While I have shown and described the preferred form of my invention, it is obvious that the invention may be embodied in other specific forms without departing from the spirit thereof.

I claim:

1. An apparatus of the class described comprising a carrier, an actuating spindle having a flexible operative connection with one end of said carrier for rotating the same, mounts disposed equi-distant about said carrier and having transverse rack extensions movably mounted therein, abrading elements carried by said mounts, an elongated pinion loosely and longitudinally arranged in said carrier and meshing with the rack portions of said extensions for actuating said mounts and moving said elements radially of said carrier, an adjusting hand wheel loosely mounted on said elongated pinion adjacent to one end of said carrier, and differential gearing interconnecting said hand wheel with said elongated pinion for positioning said mounts and elements at a comparatively low rate of speed.

2. An apparatus of the class described comprising a rotatable carrier, arms mounted in said carrier and movable transversely thereof, cylinder engaging elements carried by the outer ends of said arms, a revoluble member longitudinally disposed in said carrier and operable to actuate said arms, a pair of coaxial gears one of which is relatively stationary and the other is fixed to said revoluble member, and a pair of coaxial conjoined ring gears eccentrically operable to gyrate about the common axis of the first pair of gears and having gyratory meshing engagement with said first pair of gears for actuating said revoluble member.

3. A device of the class described comprising a rotatable carrier, mounts slidably arranged in said carrier and movable transversely thereof, cylinder engaging elements carried by said mounts, a revoluble member extending centrally and longitudinally through said carrier and operatively engaging said mounts for actuating the same, a pair of coaxial gears one of which is fixed to said revoluble member and the other is held stationary on said carrier, a compound gear member having a pair of conjoined ring gears for cooperating with the first pair of gears, and an actuating member rotatable about the axis of said revoluble member and having an eccentric engagement with said compound gear member for causing gyratory meshing of said conjoined ring gears with said stationary and said revoluble gears for operating said revoluble member at a predetermined rate of speed.

4. A cylinder honing apparatus comprising a carrier, an actuating spindle having operative connection with one end of said carrier for rotating the same, mounts disposed about said carrier and having transverse rack extensions movably mounted therein, abrading elements carried by said mounts, an elongated pinion rotatably and longitudinally arranged in said carrier and meshing with the rack portions of said extensions for actuating the mounts and abrading elements radially of said carrier, an adjusting hand wheel mounted on said pinion adjacent to one end of the carrier, and differential gearing interconnecting the hand wheel with the elongated pinion for adjusting the radial position of said mounts and elements.

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