J. L. GARNER.

PORTABLE CYLINDER GRINDER.

APPLICATION FILED SEPT. 8, 1919.

1,408,578.

Patented Mar. 7, 1922.

2 SHEETS—SHEET 1.

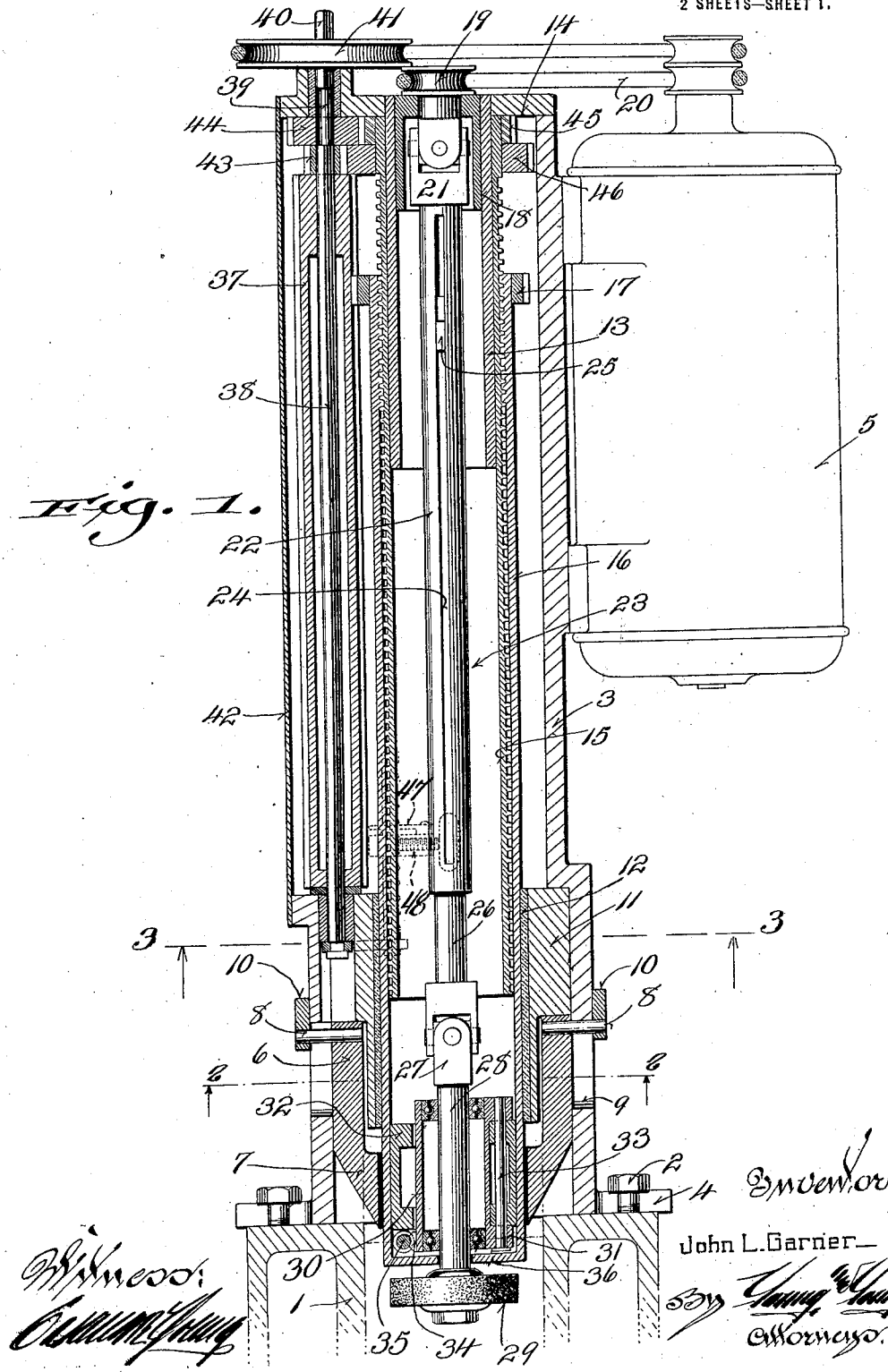


Fig. 1.

Witness:

Inventor:

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2 SHEETS—SHEET 2.

Fig. 2.

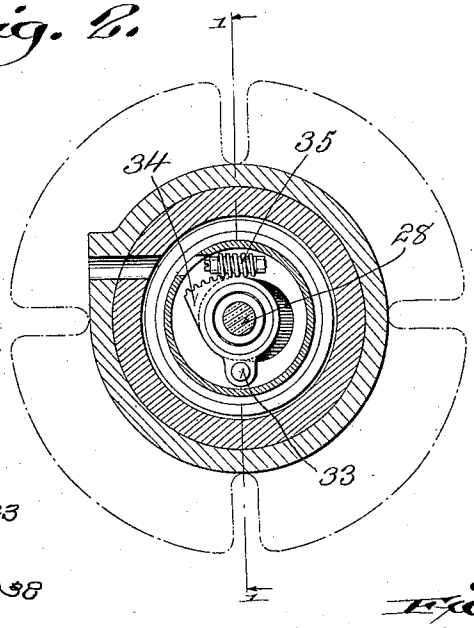


Fig. 5.

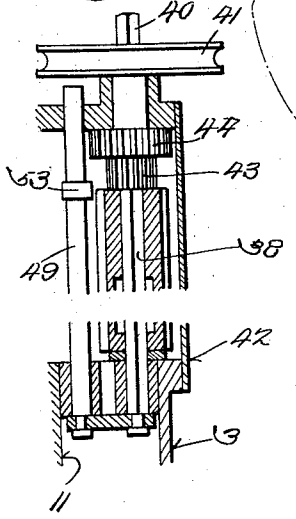


Fig. 4.

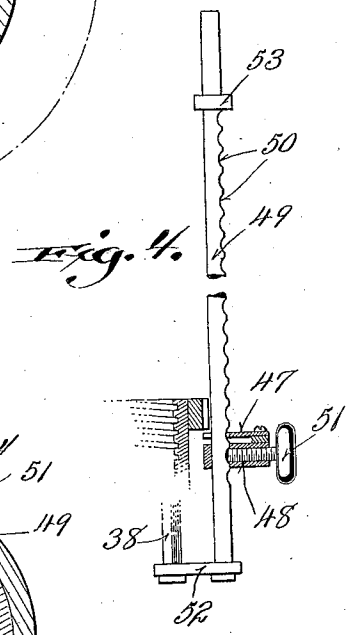
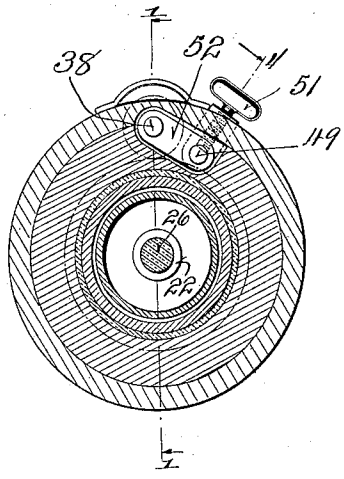


Fig. 3.



Witnesses:

Inventor:

John L. Garner—

By Young & Young

Attorneys

UNITED STATES PATENT OFFICE.

JOHN L. GARNER, OF MILWAUKEE, WISCONSIN.

PORTABLE CYLINDER GRINDER.

1,408,578. Specification of Letters Patent. Patented Mar. 7, 1922.

Application filed September 8, 1919. Serial No. 322,400.

To all whom it may concern:

Be it known that I, JOHN L. GARNER, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Portable Cylinder Grinders; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to new and useful improvements in grinders of a portable type adapted primarily for removing the surplus material from the inner walls of cylinders and similar tubular articles, but it relates particularly to machines for finishing the walls of the cylinders of internal combustion engines.

One of the important objects of the invention is to provide an improved arrangement whereby the normally high rotative speed of the electric motor or other driving unit may be stepped down so that the movement of the grinder wheel into and out of the cylinder will be relatively slow, thereby obviating the possibility of scoring the cylinder walls. In carrying out this object of the invention, the machine includes two threadedly engaged members, both of which are rotated in the same direction, but at different speeds, for instance when the member which carries the grinder wheel is rotated at a greater speed than the other or fixed member, it will be moved in a direction longitudinally of its axis to shift the grinder into a cylinder or the like. On the other hand when the fixed member is rotated at a greater speed than the other member, the latter will be moved outwardly or out of the cylinder.

With this and other objects in view, the invention consists in the novel features of construction, combination and arrangement of parts which will be hereinafter more particularly described and claimed.

Referring to the drawings in which similar reference characters designate like parts throughout the several views, Figure 1 represents a vertical sectional view taken substantially on the plane of the line 1—1 of Figure 2 or Figure 3.

Figure 2 is a horizontal transverse section taken substantially on the plane of the line 2—2 of Figure 1.

Figure 3 is a similar view taken approximately on the line 3—3 of Figure 1.

Figure 4 is a detail vertical sectional view on the line 4—4 of Figure 3, and Figure 5 is a vertical sectional view taken substantially at right angles to the plane of Figure 1.

One form of my invention is illustrated in the accompanying drawings mounted upon the top of a cylinder 1 of an internal combustion engine, the usual screw sockets in the top thereof being utilized, in connection with bolts 2, to secure a supporting housing 3 thereto. This housing is substantially cylindrical and its attaching and ordinarily bottom end, is provided with slotted attaching feet 4, the same receiving the shanks of said bolts 2. A driving electric motor 5 is secured to one side of the housing 3 and has its axis extending in the same direction and substantially parallel to the center line thereof.

Substantially all of the operating mechanism of the invention is normally slidably or journally mounted within the housing 3, and since it is essential that the parts which are movable outwardly of said housing be properly centered with respect to the bore of the cylinder 1, provision is made for centering the housing so that its center line will coincide with that of said cylinder. Therefore after the feet have been engaged with the end of the cylinder and the bolts 2 screwed into their sockets a sufficient extent to slightly engage the feet 4, a centering sleeve 6, which is of a diameter to slidably engage in the bore of the housing, is moved outwardly thereof to dispose its conical end 7 within the wall of the cylinder 1. When this engagement takes place the feet 4 will be shifted a sufficient extent in any direction to align the housing 3 and the cylinder 1. Actuation of the sleeve is readily procured exteriorly of the housing 3 by the provision of a plurality of laterally and outwardly extending pins 8 working in slots 9 cut in said housing wall, and a collar 10, the pins being projected a sufficient distance to seat in apertures in said collar, which slides on the outer surface of the said housing. By this arrangement the centering sleeve can be moved into or out of operative position by shifting the collar.

In the housing 3 adjacent the centering sleeve 7 is a main bearing 11, the same being provided with a bushing 12, the axis of the opening of which is aligned with a bearing sleeve 13 extending inwardly from the closed end 14 of the housing.

An inner feed cylinder 15 is designed to rotate on the bearing sleeve 13 and has

screw-threads on its outer periphery which extend throughout its length for engagement with similar threads on the wall of the bore of an outer feed cylinder 16. The threads of this cylinder extend only a portion of its length and at its upper end, said end also having an outer feed gear 17 fixed thereto.

Within the bearing sleeve 13 adjacent its top is a bearing 18 in which is journaled a pulley 19, the latter being disposed externally of the closed end 14 of the casing and having a pulley on the armature shaft of the motor 5 belted thereto as at 20. The shaft section which carries the pulley 19 is connected by the universal joint 21 to one end of the female member 22 of a telescoping drive shaft 23, said member having a longitudinal slot 24 which slidably receives a key 25 on the male member 26 of said shaft 23. The outer end of the member 26 of the drive shaft is connected by a universal joint 27 with a grinder shaft 28, the latter having a customary type of grinder wheel 29 removably secured to the free end thereof.

This drive shaft 23 extends longitudinally of the cylinders 15 and 16, the grinder shaft on the lower end thereof being journaled in the bearings of a swinging bearing frame 30. This bearing frame is designed for transverse movement with respect to the axis of the shaft 23, it being pivoted by its ears 31 to flanges of a hinge collar 32 by means of a pintle 33. The frame 30 carries a segmental worm gear 34, the teeth of which mesh with teeth of a worm 35. The frame 30 and the other mechanism above set forth are enclosed within the lower end of the outer feed cylinder, said end being closed as at 36 except for an arcuate slot receiving the grinder shaft 28. Access to the worm 35 is readily had through the walls of the various elements enclosing the same as indicated in Figure 2 of the drawings.

As hereinbefore mentioned the outer feed cylinder is provided with an outer feed gear 17, the same being adapted to slidably mesh with the longitudinally extending teeth of an elongated drive pistou 37, the latter being mounted on a slidable feed drive shaft 38 which is preferably polygonal in cross section throughout its length except at 39, which portion is cylindrical and is spaced from the end 40 of the shaft which projects through the end wall 14. That portion 40 of the shaft 38 between said cylindrical part 39 and the adjacent end, receives a drive pulley 41, the same being connected to the armature shaft of the motor 5, similarly to the attachment between the armature shaft and said pulley 19. The opposite end of the feed drive shaft 38 is slidable in a bearing carried by the main bearing 11. Normally the elongated drive pinion 37 is partially enclosed within the housing 3 and its exposed portion is covered by a closure plate 42 whereby access may be readily had thereto.

Disposed on the feed drive shaft 38 between the upper end of the pinion 37 and the end 14 of the housing is a down feed pinion 43 and an up feed pinion 44, the latter being larger in diameter than the former and meshed with an up feed gear 45 fixed to the upper end of the inner feed cylinder 15. The teeth of the pinion 43 are meshed with those of a down feed gear 46 also fixed to the inner feed cylinder 15. Any suitable means may be provided for supporting the cylinder 15 against longitudinal movement on the bearing sleeve 13. In the present structure however such longitudinal movement will be prevented by the fact that the gear 46 overlaps the elongated gear 37. With the parts arranged as in Figure 1, the pinion 43 is keyed to the drive shaft 38, whereas the other pinion 44 is loose thereon, being located on the cylindrical portion 39 of said shaft. However, upon shifting the feed drive shaft 38 downwardly the polygonal portion thereof will be engaged with the up feed pinion 44 and the down feed pinion 43 will be loose on the shaft because of the cylindrical portion 39 thereof.

The feed drive shaft is automatically shifted longitudinally of its length to connect or disconnect the pinions 43 and 44 therewith by the engagement of the outer feed gear 17 with the spring finger 47 of a trip 48, the same being adjustably mounted upon a feed reverse rod 49. This rod is provided with a plurality of seats 50 along one longitudinal edge to selectively receive the end of a set screw 51 which forms a part of the trip 48. This rod 49 is located within the housing 3 and has its lower end linked as at 52 to said shaft 38. The upper end of the rod 49 is also provided with a trip stop 53 with which the gear gear 17 is engageable when moved upwardly a predetermined distance. From Figure 3 it will be noted that the head of the set screw 51 is positioned outwardly of the housing 3 so that adjustment of the trip 48 is readily procurable exteriorly of the latter.

The operation of the invention is substantially as follows: After a grinder wheel 29 of a proper diameter has been secured to the end of the grinder shaft 28, the machine is mounted on the end of the cylinder, the inner wall of which is to be finished. Ordinarily a grinder is used which is of a size to readily move inwardly of the housing 3 and through the opening in the centering sleeve 6, and is enclosed when the machine is not in operation. When, however, it is necessary to use a grinder of a diameter

greater than the opening in said centering sleeve 6, the grinder carrying mechanism must be moved outwardly of the housing 3 to expose the outer end of the shaft 28. The smaller grinder can thus be readily replaced by a larger one and the operation started after the various adjustments have been made.

In order to center the housing 3 with the cylinder 1, the centering sleeve 6 is used as hereinbefore mentioned, the feet 4 being engaged with the end of the cylinder and the retaining bolts 2 partially screwed into their sockets in the slots of the feet, whereupon the centering collar 10 is grasped and the centering sleeve moved downwardly toward the cylinder until its conical end 7 seats directly within the bore, the wall of which is to be ground. While so seated the bolts 2 are tightened and the housing 3 rigidly secured to the cylinder.

The centering sleeve is then raised to its initial retracted position and the swinging bearing frame 30 adjusted by means of the worm 35, whereby the grinder 29 is shifted a required distance to remove a predetermined amount of material from the cylinder wall when rotation is started. It will be appreciated that owing to the substantially planetary action of the grinder wheel with respect to the inner surface of the cylinder 1, only a slight shifting of the bearing frame 30 is necessary to procure a required cut.

Assuming that the necessary adjustments of the frame 30 and the trip 48 have been made and that the feed drive shaft 38 is connected with the pinion 43 and disconnected from the pinion 44, the motor 5 is started, thereby simultaneously rotating the main or telescopic drive shaft 23 and the feed drive shaft 38. Rotation of the first mentioned shaft revolves the grinder 29, whereas a rotary movement of the shaft 38 drives the elongated pinion 37 and the down feed pinion 43 in the same direction. Since the outer feed gear 17 and the down feed gear 46 are respectively meshed with the elongated pinion 37 and the down feed pinion 43, and as these gears are keyed to the outer feed cylinder 16 and inner feed cylinder 15 respectively, the latter will be rotated in the same direction but at different speeds. That is to say the outer feed cylinder will be revolved faster than the inner feed cylinder owing to the differences in the size of the gears 17 and 46, 43 and 47 the result of this variation being that the outer feed cylinder 16 and the parts carried thereby are moved outwardly of the housing 3 and into the cylinder 1 very slowly. The normally high rotative speed of the motor shaft is thus stepped down to a proper speed for feeding the grinder inwardly of the cylinder, all possibility of scoring of the cylinder wall being thus eliminated.

The telescoping drive shaft 23 permits a very extended movement of the grinder 29, which movement carries the same inwardly of the cylinder until the outer feed gear 17 comes into contact with the spring finger 47 of the trip 48. As hereinbefore mentioned contact between these parts shifts the feed drive shaft 38 downwardly and successively disconnects the pinion 43 therefrom and connects the pinion 44 thereto. The slight free movement of the spring finger 47 is adapted to permit the end 40 of the shaft 38 to properly seat within the polygonal aperture in the pinion 44. The result of these changes is to cause the inner feed cylinder 15 to rotate at a greater speed than the outer feed cylinder 16, and since these cylinders are revolving in the same direction, the intermeshing threads thereon will cause the outer cylinder to move inwardly of the casing at a relatively slow speed. The grinder 29 is also retracted at the same time, but while still revolving as before. The feed is again reversed and caused to operate as first set forth by the engagement of the outer feed gear 17 with the trip stop 53, such engagement causing the return of the feed drive shaft 38 to the position indicated in Figure 1. After a sufficient amount of material has been removed from the cylinder wall, the machine is readily taken from the cylinder by loosening and removing the bolts 2 as is obvious.

From the foregoing description taken in connection with the accompanying drawing, it will be appreciated that I have invented a very simple machine for boring or refinishing cylinder walls, the actions of which during the actual grinding operations, are entirely automatic. With such machine extreme accuracy is readily procurable in addition to quickness and thoroughness of operation. Various changes and modifications may be made in the several parts of the machine without departing from or sacrificing any of the principles or advantages as set forth above and claimed in the following claims.

I claim:

1. A machine of the class described comprising a pair of rotatable threadedly engaged elements, one being held against movement longitudinally of its axis, the other being loosely mounted, a rotary member carried by the loosely mounted element, means for rotating the member, and means for rotating the elements in the same direction at different speeds to procure a relatively slow longitudinal movement of the loosely mounted element.

2. A machine of the class described comprising a pair of rotatable threadedly engaged elements, one being held against move-

ment longitudinally of its axis, the other being loosely mounted, a rotary member carried by the loosely mounted element, means for rotating the member, a feed drive shaft, a driving connection between the shaft and one of the elements, and a selective speed transmission mechanism between the shaft and the other element.

3. A machine of the class described comprising a pair of rotatable threadedly engaged elements, one being held against movement longitudinally of its axis, the other being loosely mounted, a rotary member carried by the loosely mounted element, means for rotating the member, a feed drive shaft, a driving connection between the shaft and one of the elements, a pair of gears of different sizes fixed to the other element, a pair of pinions on the shaft and meshed with the respective gears, and means for connecting either of the pinions to the shaft for rotation therewith.

4. A machine of the class described comprising a pair of rotatable threadedly engaged elements, one being held against movement longitudinally of its axis, the other being loosely mounted, a rotary member carried by the loosely mounted element, means for rotating the member, a feed drive shaft, a driving connection between the shaft and one of the elements, a pair of gears of different sizes fixed to the other element, a pair of pinions on the shaft and meshed with the respective gears, and means operable by the movement of said loosely mounted element to connect either of said pinions to the shaft.

5. A machine of the class described comprising a pair of rotatable threadedly engaged elements, one being held against movement longitudinally of its axis, the other being loosely mounted, a rotary member carried by the loosely mounted element, means for rotating the member, a longitudinally shiftable feed drive shaft, a driving connection between the shaft and one of the elements, a pair of gears of different sizes fixed to the other element, a pair of pinions on the shaft and meshed with the respective gears, and means operable by a member on the loosely mounted element for shifting the shaft to key either of said pinions thereto.

6. A machine of the class described comprising an exteriorly threaded element rotatably mounted but held against longitudinal movement, a loosely mounted element threaded onto the said first named element, an independently rotatable member carried by said loosely mounted element, and means for rotating said elements at different speeds to procure a relatively slow longitudinal movement of the loosely mounted element.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee, in the county of Milwaukee and State of Wisconsin.

JOHN L. GARNER.