Dec. 15, 1925. 1,565,980

G. W. HUGHSON ET AL

CYLINDER BORING TOOL

Filed June 12, 1920

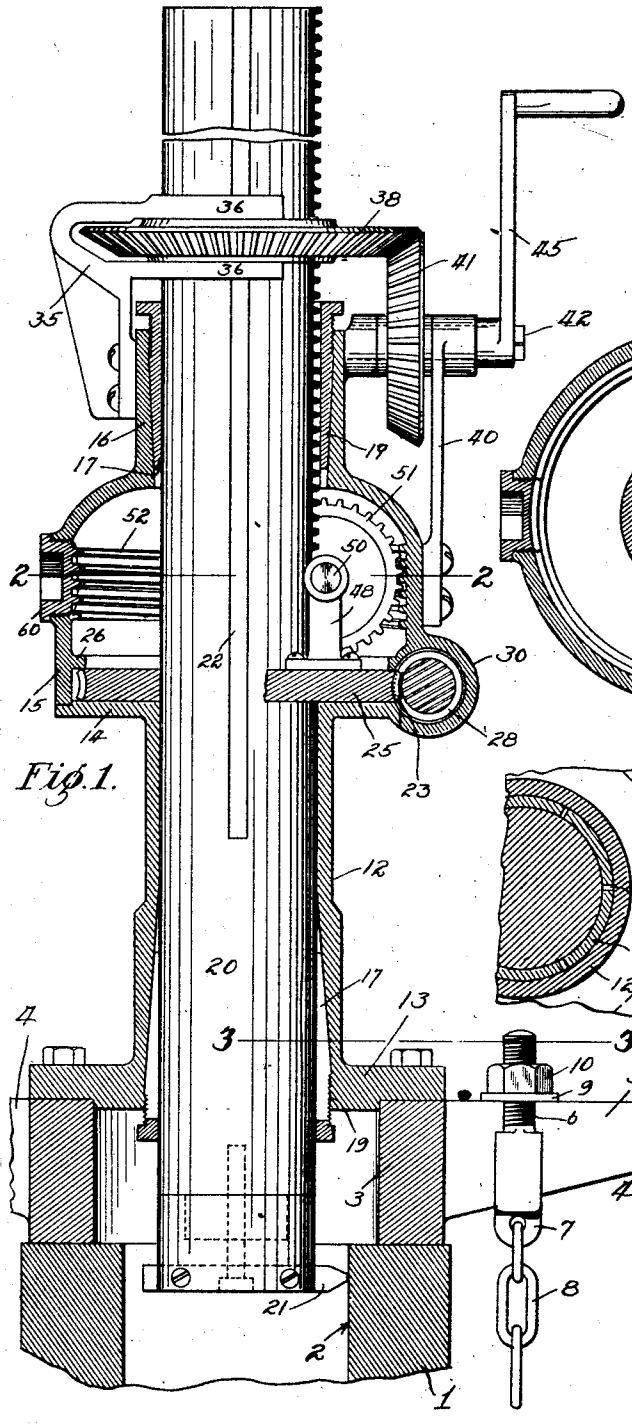


Fig. 1.

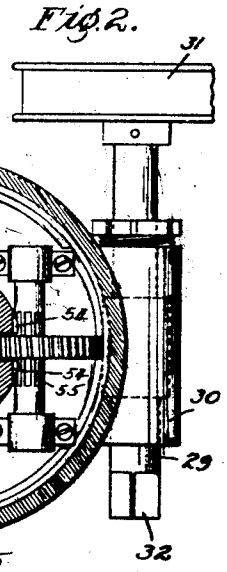


Fig. 2.

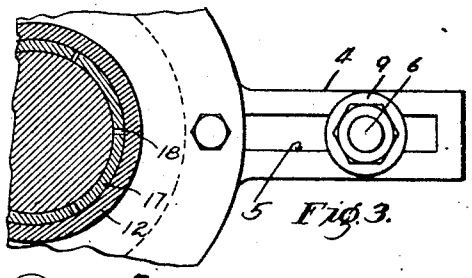


Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE W. HUGHSON AND ARTHUR STANLEY BACON, OF OAKLAND, CALIFORNIA.

CYLINDER-BORING TOOL.

Application filed June 12, 1920. Serial No. 388,609.

To all whom it may concern:

Be it known that we, GEORGE W. HUGHSON and ARTHUR STANLEY BACON, citizens of the United States, residing at the city of Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Cylinder-Boring Tools, of which the following is a specification.

This invention relates to machines for boring cylindrical openings and more particularly for reboring the interior of vertical engine cylinders.

The principal object of our invention is to provide a simple machine by which engine cylinders may be rebored without dismantling the engine or removing it from its operating situation.

Another object of the invention is to provide an improved form of drive and power feed for the cutting tool, and a still further object is to arrange simple means whereby the power feed may be rendered inoperative.

With these and other objects in view our invention consists of certain novel features of construction, form and arrangements of parts, one embodiment of which is herein illustrated, and the novel features of which are more specifically pointed out in the appended claims.

Reference being had to the accompanying drawing forming a part of the specification:

Figure 1 is a view in vertical section of our improved boring tool.

Figure 2 is a horizontal sectional view on the line 2—2 Figure 1.

Figure 3 is a view in section on the line 3—3 Figure 1.

Referring to corresponding parts in the several views by the same numerals of reference, 1 denotes the upper end of an engine cylinder having the bore 2. This cylinder is provided with a head which is removed when the cylinder is to be rebored.

Our tool comprises a housing having a base 3 with diametrically disposed pair of arms 4. In the slot 5 between the arms is a bolt 6 having a square shank to prevent the bolt from turning. The lower end of the bolt is provided with an eye 7 to which is attached one end of a chain 8. The lower end of this chain may be attached in any preferred manner to some part of the engine cylinder or frame, or it may be passed under the engine and engaged with the corresponding chain from the opposite arm. The upper end of the bolt is screw threaded, and engaged thereon is a washer 9 and nut 10, the operation of the nut serving to place a tensional strain on the chain and thus bind the base to the upper surface of the cylinder.

Above the base is a cylindrical sleeve 12 having a flanged base 13 by which it is bolted to the base 3. The upper end of the sleeve is provided with a radially extending flange 14 to which is attached a feed housing 15. The latter is provided on its upper end with a sleeve 16 and this as well as the lower end of sleeve 12 are provided with tapered counterbores for bushings 17. These bushings are slotted or split as shown at 18 and threaded as at 19 to engage corresponding treads in the counterbore.

Revolvably mounted in these bushings is the boring-bar 20, the lower end of which is provided with means for attaching the cutting tool 21, and the upper end of which is provided with the key-way 22. Within the gear housing is a flat circular disc 25 having on its outer edge a worm gear 23. The disc has a bore which fits the outside of bar 20 and a key 24 which loosely engages the key-way 22. This disc is held against axial movement by the side surfaces engaging the flange 14 and an annular rib 26 formed on the inside of the housing.

The worm gear is driven by a worm 28 which is cut on the shaft 29, the latter being revolvably mounted in an extension 30 on the side of the housing. This shaft may be provided with a pulley 31 or squared end 32 for power driving. To the end 32 may be conveniently attached the end of a flexible motor driven shaft or other driving means.

In addition to the power drive just described we provide a hand drive for use where other driving power is not available. The handle drive comprises a bracket 35 removably attached to the sleeve 16 and having a forked end 36 which partially embraces the bar 20. Slidably mounted on bar 20 between the forked end 36 is a toothed

bevel gear 38. This gear like the worm gear is provided with a key for engaging the keyway 22.

From the housing there also extends a bracket 40 in the upper end of which is revolvably mounted a shaft 42 to which is keyed a toothed bevel gear 41 for engagement with gear 38. The shaft 42 may be provided with an operating crank 45.

Our device is also provided with an automatic feed which will now be described. Attached to the upper face of gear 23 are two bearings 48 in which is journalled a short shaft 50. Attached to this shaft centrally between the journals is a toothed spiral gear 51, which engages corresponding threads 52 cut on the inner surface of the housing. The boring bar is recessed as shown at 53 to provide room for the spiral gear and on each side of this recess are rack teeth 54. The latter are engaged by pinions 55 cut directlly in the shaft 50.

In one side of the housing is an opening which is closed by a screw threaded plug 60. The inside surface of this plug is formed continuous with that of the housing and has a portion of the threads 52 cut thereon. The size of the plug is such that if it is removed the gear 51 cannot engage any threads when it is positioned directly opposite this point and hence the self-feed will not operate. By referring to Fig. 1, it will be seen that the boring bar is raised or lowered by means of the spiral thread 52, the gear 51, the pinion 55 and the rack teeth 54 formed on the bar, that is during rotation of the bar turning movement is transmitted to the gears 51 and 55 due to engagement of the gear 51 with the spiral thread 52. If at the commencement or end of a cut it is desired to quickly raise or lower the boring bar, it is accomplished by turning the plug 60 until the threads formed on the inner face thereof are sufficiently retracted to prevent engagement with the teeth on the gear 51. The boring bar is then turned until the gear 51 aligns with the plug 60 and as no engagement is made with the threads thereon, it is obvious that the boring bar can be quickly raised or lowered to any position desired. After the adjustment has been completed, it is obvious that the plug is screwed back into place so that the threads thereon will form a continuation of the threads 52 and thereby permit the automatic feed to again operate.

In use the base is clamped to the engine cylinder as previously described with the center thereof disposed centrally with respect to the bore of the cylinder. The tool 21 is then set and the upper part of the device bolted to the base.

Power is then applied to shaft 29 which through the worm drives the gear 23 and the latter through the key drives the boring bar. As the gear 23 turns it carries with it the shaft 50 and gear 51 so that the latter rotates through a small angle depending on the pitch of the screw threads 52. The rotation of shaft 50 in turn causes the pinions 55 to operate on the rack teeth and thus to move the boring bar longitudinally within the sleeves.

If power is not available the hand operated drive is employed, in which case the worm 28 is removed. The self feed in that case will operate as previously described.

We claim as new and wish to cover by Letters Patent:

1. In a cylinder boring tool, a housing, a boring bar mounted in the housing, a gear on the bar and splined thereto, means for rotating the gear and bar, and means for transmitting a longitudinal movement to the bar during rotation of the bar, including a device carried by said gear and coacting with the interior wall of said housing.

2. A cylinder boring tool comprising a housing, means for attaching said housing to the cylinder, a tool holding bar revolvably and axially movable in said housing, means for rotating said bar, a toothed rack formed on said bar, a toothed pinion engaging said rack and revolvable with said bar, and means operable by the rotation of said bar for driving said pinion.

3. A cylinder boring tool comprising a housing having a cylindrical bore, a tool bar revolvably and axially movable in said bore, means for rotating said bar, a disc revolvable with said bar and held against axial movement, a shaft revolvably supported on the face of said disc, gear teeth carried by said shaft cooperating rack teeth on said bar, a spirally toothed gear attached to said shaft, and helical threads formed on the inside of said housing for engagement with said spirally toothed gear.

4. A cylinder boring tool comprising a housing adapted to be attached to a cylinder, a boring bar revolvably and axially movable in said housing, a disc splined to said boring bar, means for holding said disc against axial movement, a shaft revolvably mounted on said disc with its axis of rotation at right angles to that of said boring bar, a pinion carried by said shaft, a toothed rack on said boring bar adapted to be engaged by said pinion, and means operable by the movement of said shaft and pinion about the axis of said boring bar for rotating the shaft.

5. A cylinder boring tool, comprising a housing, a boring bar extending through the housing, a gear on the bar and splined thereto, means for imparting a rotary movement to the gear and the bar, and means confined within the housing and carried in part by the gear for imparting a longitudinal movement to the bar during rotation thereof.

6. A cylinder boring tool, comprising a housing, a boring bar extending through the housing, a gear on the bar and splined thereto, means for imparting a rotary movement to the gear and bar, and means for imparting a longitudinal movement to the bar during rotation thereof, including a gearing mechanism, one element of which is carried by the aforesaid gear above the latter.

7. A cylinder boring tool comprising a housing having a cylindrical bore, a boring bar revolvably and axially movable in said bore, means for rotating said bar, a gear rotatable with the bar and splined thereto, but held against axial movement, a shaft rotatably supported on said gear, a gear carried by said shaft, teeth on the boring bar with which said gear engages, a second gear carried by said shaft, a helical thread formed in the inside of the housing and intermeshing with the last named gear, and a member supported by the housing and radially movable with relation thereto, said member having threads formed on its inner face forming a continuation of the helical threads.

8. A cylinder boring tool comprising a housing having a cylindrical bore, a boring bar revolvably and axially movable in said bore, means for rotating said bar, a gear rotatable with the bar and splined thereto, but held against axial movement, a shaft rotatably supported on said gear, a gear carried by said shaft, teeth on the boring bar with which said gear engages, a second gear carried by said shaft, a helical thread formed on the inside of the housing intermeshing with the last named gear, and a screw plug mounted in the housing in alignment with the helical threads, said screw plug having threads formed on its inner end forming a continuation of said helical threads.

9. A cylinder boring tool, comprising a housing, a boring bar extending through the housing, a gear on the bar and splined thereto, means for imparting a rotary movement to the gear and bar, means for imparting a longitudinal movement to the bar during rotation thereof, including a gearing mechanism, one element of which is carried by the aforesaid gear above the latter, and means for rendering said gearing mechanism inoperable.

10. A cylinder boring tool, comprising a housing having a cylindrical bore, a boring bar revolubly and axially movable in said bore and having gear teeth thereon, means whereby to rotate said bar, and a gear mounted in the housing in mesh with the gear teeth on said bar and operable to impart a longitudinal movement to the bar during rotation of the bar.

11. A cylinder boring tool comprising a housing having a cylindrical bore and also provided on its inner wall with gear teeth, a boring bar revolubly and axially movable in said bore and having gear teeth thereon, means whereby to rotate said bar, a gear mounted in the housing in mesh with the gear teeth on said bar, and a gear having operative connection with the last mentioned gear and also having mesh with the gear teeth on the inner wall of the housing, whereby to impart a longitudinal movement to the bar during rotation of the latter.

12. A cylinder boring tool comprising a housing having a cylindrical bore and a helical thread formed on the inner wall thereof, a member supported by the housing and radially movable with relation thereto and having threads on its inner face coacting with the helical thread on the inner wall of the housing to form a continuation of the latter, a boring bar revolubly and axially movable in said bore, means whereby to rotate said bar, the bar having rack teeth thereon, a pinion in the housing having mesh with said rack teeth, and a gear having cooperative connection with the pinion and with the helical thread on the inner wall of the housing to impart a longitudinal movement to the bar during rotation thereof.

13. A cylinder boring tool comprising a housing having a cylindrical bore and a helical thread formed on the inner wall thereof, a member supported by the housing and radially movable with relation thereto and having threads on its inner face coacting with the helical thread on the inner wall of the housing to form a continuation of the latter, a boring bar revolubly and axially movable in said bore, means whereby to rotate said bar, the bar having rack teeth thereon, a pinion in the housing having mesh with said rack teeth, and a gear having cooperative connection with the pinion and with the helical thread on the inner wall of the housing to impart a longitudinal movement to the bar during rotation thereof, said radially movable member being adjustable to render the cooperative connection between said spiral thread and said gear inoperable.

14. In a boring tool, a feed bar journalled for rotation, a member exterior of said bar, feed mechanism adapted to rotate with the bar and coupled therewith and with the exterior member so as to advance the bar upon its rotation.

15. In a reboring tool, in combination, an exterior stationary member, a feed bar journalled for rotation, and feed mechanism coupling said bar with said exterior stationary member to advance said bar lengthwise relative said stationary member upon rotation of the bar.

16. In a reboring tool, a rack feed bar journalled for rotation, a stationary threaded member surrounding said bar, feed mech-

anism coupled with the rack teeth of said bar and the thread of said stationary member in such a manner as to advance the bar upon its rotation.

17. In a reboring tool, a rack feed bar mounted for rotation, means for rotating said bar, a stationary threaded member encircling said bar, feed mechanism coupled with the bar to rotate therewith, said feed mechanism engaged with the rack teeth of the bar and the thread of the stationary member in such a manner as to advance the bar when rotated.

18. In a boring tool, a feed bar journalled for rotation, a stationary threaded member surrounding said bar, feed mechanism engaged with the bar and with the stationary threaded member in such a manner as to advance the bar when the same is rotated, said feed mechanism adapted to be disengaged from its driving couple.

19. In a boring tool, a feed bar journalled for rotation, a stationary threaded member surrounding said bar, feed mechanism carried by the bar so as to rotate therewith, said feed mechanism engaged with the bar and with the stationary member in such a manner as to advance the bar as the bar is rotated.

20. In a reboring tool, in combination, a rack feed spindle journalled for rotation, a stationary threaded member encircling said spindle, feed mechanism comprising a series of gears coupled with the rack teeth of the spindle and the thread of the stationary member so as to advance the spindle upon its rotation, and means for disengaging said gears from the driving relationship.

21. In combination with a rack spindle, means for advancing such spindle comprising an internally threaded housing within which the spindle is journalled for rotation, feed mechanism coupled with the spindle so as to revolve therewith, such feed mechanism provided with a gear engaged with the thread in the housing and a pinion engaged with the rack on the spindle and means connecting such gear and pinion so that as the gear is revolved in the thread of the housing the pinion is rotated to advance the spindle.

22. In combination with a driven rack spindle, means for feeding the same comprising an internally threaded housing through which the spindle extends and means coupling the rack of the spindle with the thread of the housing so the spindle will feed through the housing as the spindle is rotated.

23. In a reboring tool, in combination, a rack spindle journalled for rotatable advancement, an exterior member surrounding such spindle having a spiral rib, feed mechanism mounted to rotate with the spindle and engaging the rack of the spindle to feed the same and engaging the spiral rib to be driven thereby as the spindle is rotated.

In testimony whereof we affix our signatures.

ARTHUR STANLEY BACON.
GEORGE W. HUGHSON.