R. E. ROSEBERRY.

PORTABLE MACHINE FOR REBORING ENGINE CYLINDERS.

APPLICATION FILED APR. 26, 1916.

1,210,843.

Patented Jan. 2, 1917.

3 SHEETS—SHEET 1.

Fig. 1.

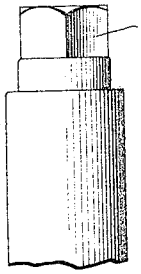
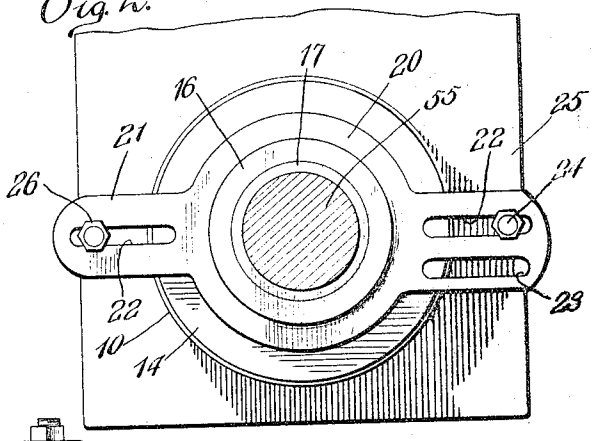


Fig. 2.



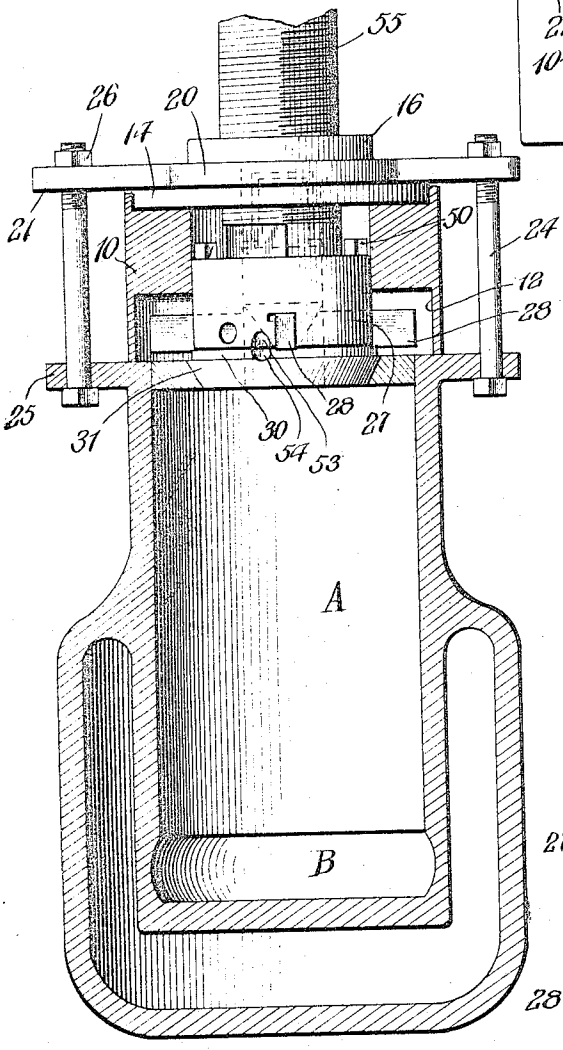
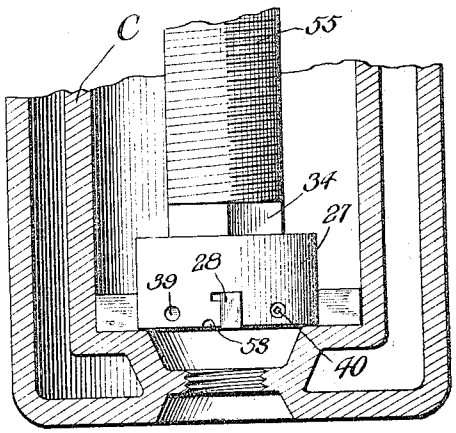


Fig. 7.



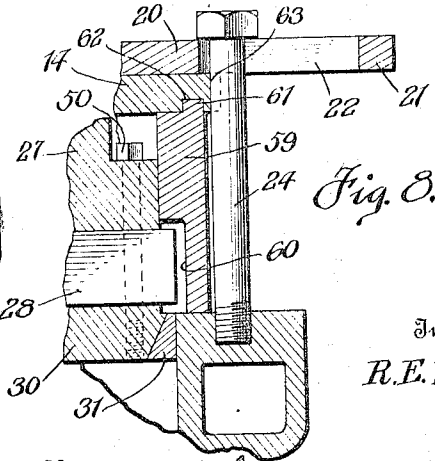


Fig. 8.

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3 SHEETS—SHEET 2.

Fig. 3.

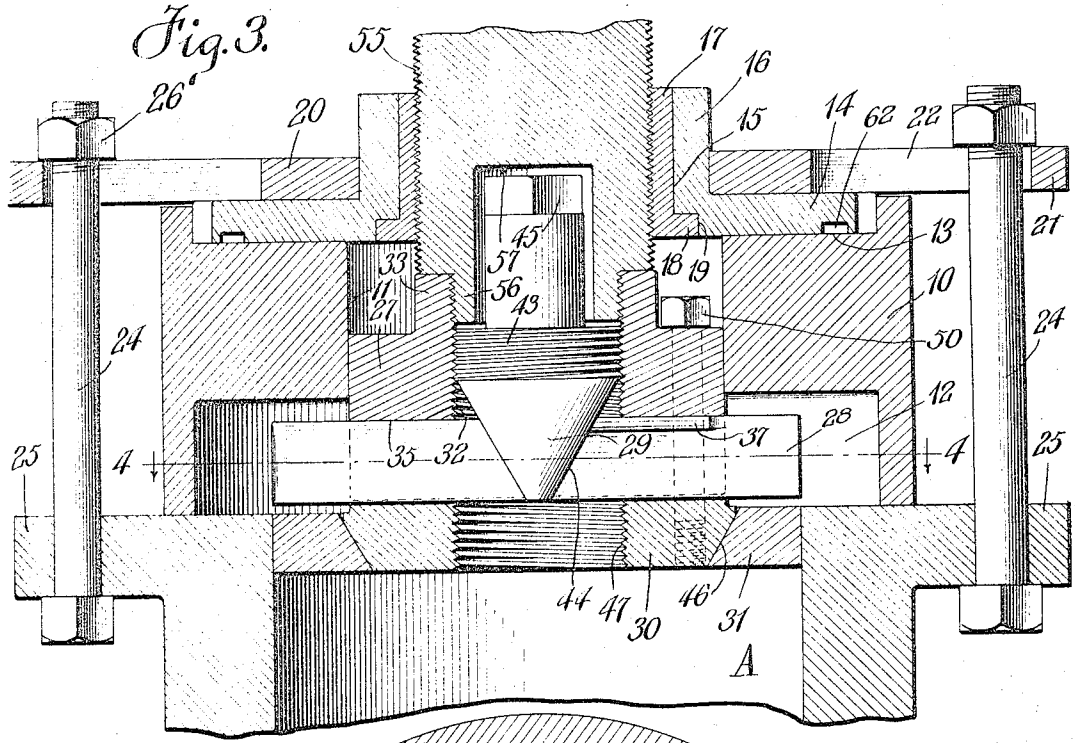
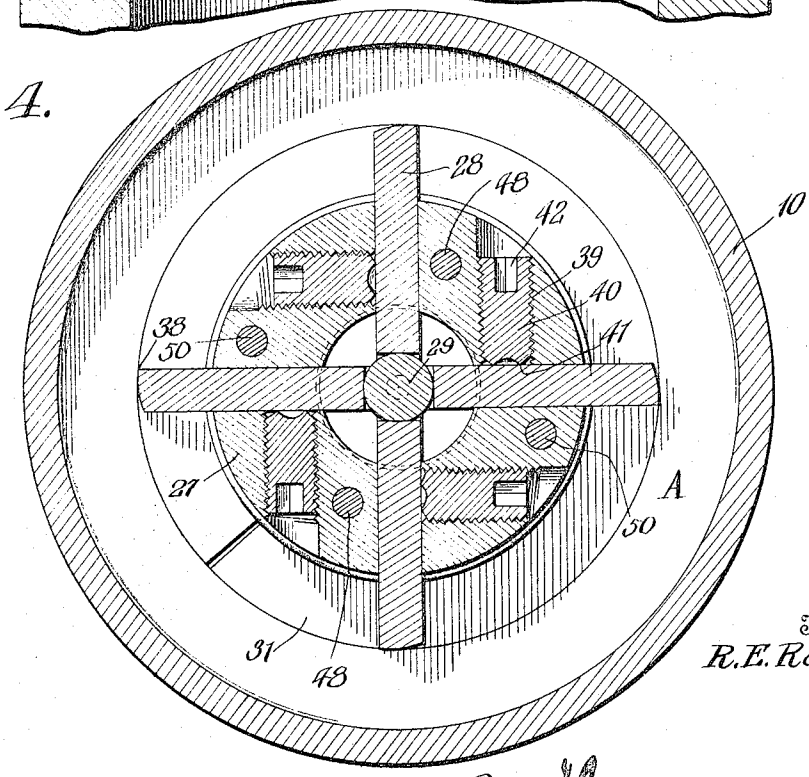


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

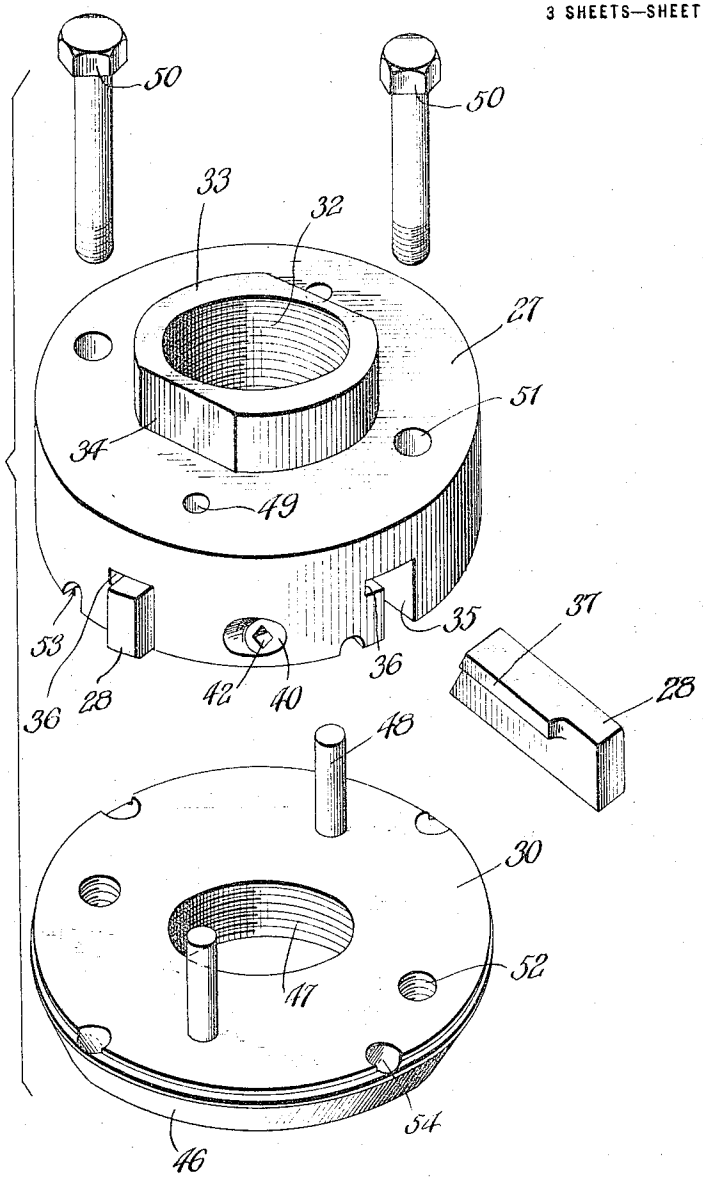
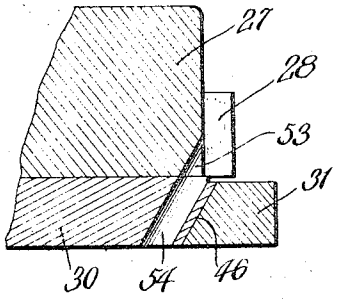


Fig. 6.



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UNITED STATES PATENT OFFICE.

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PORTABLE MACHINE FOR REBORING ENGINE-CYLINDERS.

1,210,843. Specification of Letters Patent. Patented Jan. 2, 1917.

Application filed April 26, 1916. Serial No. 93,716.

To all whom it may concern:

Be it known that I, ROBERT E. ROSEBERRY, a citizen of the United States, residing in the city of Baltimore and State of Maryland, have invented certain new and useful Improvements in Portable Machines for Reboring Engine-Cylinders, of which the following is a specification.

My invention relates to new and useful improvements in portable machines for reboring engine cylinders, the primary object of my invention being the provision of a machine which can accurately and uniformly re-bore an engine cylinder throughout the entire length of the cylinder.

While some engine cylinders have their bore somewhat increased at their heads to provide an enlarged compression and combustion chamber, the majority of cylinders are of uniform diameter throughout their length. With the re-boring machines now in common use, the cutters are so supported in the cutter head that the head of the machine will engage the cylinder head before the cutters have advanced to the extreme end of the cylinder. When employing such machines, the boring of the cylinders must either be finished by the employment of an additional tool or the extreme head end of the cylinder must be left in its original condition. My machine overcomes this difficulty.

A further object of my invention consists in the provision of an improved form of main supporting and centering ring adapted to be clamped against the open end of a cylinder being bored and to properly center the cutting head of the machine until the cutting blades have fully entered into the cylinder.

Another object which I have in view is the provision of an improved form of clamping plate for securing this supporting ring in place. Also, in this connection, I construct the clamping plate in such a manner that it may effectively secure a modified form of supporting ring which I employ in re-boring the cylinders of Ford engines.

My improved cutting head comprises a cutter holding portion and beveled head portion detachably connected and an expanding guide ring coöperating with the beveled head.

A further object which I have in view is to so construct the beveled head and guide ring with respect to each other and the cutter head that beveled heads and guide rings of different sizes may be employed with the same cutter head proper in order that the same machine may be employed in boring cylinders of different diameters.

Another object of great importance which I accomplish is an improved method of mounting the cutters within the cutter head proper so that the beveled head and expanding guide ring may be removed from the machine without any loosening of the cutters in the cutter head proper.

With these and other objects in view, my invention will be more fully described, illustrated in the accompanying drawings, and then specifically pointed out in the claims which are attached to and form a part of this application.

In the drawings: Figure 1 is an elevation, partially in section, of my improved machine in use; Fig. 2 is a top plan view, showing the manner of securing the machine to the cylinder being bored; Fig. 3 is an enlarged vertical and central sectional view of my machine in use; Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 3; Fig. 5 is a perspective view of the cutter head as a whole, showing the parts in unassembled position; Fig. 6 is a fragmentary sectional view, showing the means by which the shavings escape; Fig. 7 is a fragmentary view, partially in section showing how the extreme head end of the cylinder is bored; Fig. 8 is a fragmentary vertical section of my machine with a modified form of supporting ring.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

My machine primarily includes a supporting and centering mechanism and a cutter mechanism. The supporting mechanism includes a main supporting ring 10, of steel or other suitable metal, of an external diameter greater than the diameter of the bore of any cylinder with which the machine is to be employed. This ring is formed with a central bore or passage 11 equal in diameter to the external diameter of the cutter head, as will be later apparent, and at its lower end is counterbored or recessed to provide an annular chamber 12 which will at least equal in diameter the diameter of the bore of the engine cylinder. At its upper end, the main ring 10 is correspondingly recessed to pro-

vide an annular seat 13 for the feed plate or disk 14. This disk is of such thickness as to project slightly above the ring when engaged in the seat 13 and is formed centrally with a bore 15 surrounded by an upstanding annular flange 16. An internally threaded bushing or nut 17 fits within the bore 15 and flange 16 and at its lower end is formed with an annular shoulder 18 engaging in a suitably formed seat 19 in the lower face of the disk 14.

A clamping plate 20 is formed centrally with an opening to snugly receive the flange 16 in order that the plate may rest upon the feed disk 14 and this plate, as best shown in Fig. 2, is provided with diametrically extending ears 21 formed with alined slots 22. One of the ears is further provided with an offset slot 23 extending parallel to its slot 22. When the machine is in use, bolts 24 are passed through bolt receiving openings in the cylinder flanges 25 and through the slots of the clamping plate and secured by nuts 26. By the provision of two slots in one of the ears, it is possible to always clamp the main supporting ring 10 against the end of the cylinder in such a manner that it is concentrically disposed with respect to the cylinder bore.

The cutter mechanism of my machine consists primarily of a cutter head proper 27 in which are secured cutters 28, an expander 29 for centering the cutters, a beveled head 30 and an expanding guide ring 31. The cutter head proper 27 is cylindrical in shape and is formed centrally and throughout its height with a threaded bore 32 and about the upper end of the bore with an annular collar or shoulder 33 internally threaded to form a continuation of the bore and externally formed with plane faces 34. The lower end of the cutter head proper 27 is formed with radial slots 35 extending at right angles to each other to receive the cutters 28. These slots open at their inner ends into the bore of the cutter head and also open through the bottom of the cutter head. Each slot along its upper edge is formed with a lateral extension or keyway 36 to receive the longitudinal fin or shoulder 37 formed upon the side of the cutter and terminating short of its cutting end, as shown in Fig. 5. By means of these fins, the cutters, when mounted in the slots or seats, are held against all but radial movement. The outer end of each cutter is formed with a cutting edge 38 which is its forward edge with respect to the direction of rotation of the cutter head and is beveled or rounded rearwardly from such edge, as shown in Fig. 4, to suitably clear the freshly cut surface of the cylinder bore.

Tapped bores 39 are formed horizontally through the cutter head communicating with the slots and at right angles to the cutters to receive set screws 40 by which the cutters are anchored against radial movement. The inner ends of the set screws 40 are beveled and centrally concave to form annular cutting edges 41 in order that they may more firmly engage the cutters and the outer ends are formed with angular sockets 42 to receive a wrench.

The expander 29 includes a cylindrical externally threaded body 43 for threaded engagement within the bore 32 of the cutter head proper and terminating at one end in a conical expander head portion adapted to engage the inner ends of the cutters which are beveled, as shown at 44, for this purpose. The expander 29, at its upper end, is provided with a shank having an angularly formed terminal 45 by means of which it may be turned to force the cutters outwardly to a greater or less extent.

Co-acting with the cutter head proper, above described, is the beveled head 30. This is in the form of a disk having its peripheral edge beveled, as shown at 46 to incline downwardly and inwardly. The disk is further provided with a threaded bore 47 forming a continuation of the bore 32 of the cutter head. Pins 48 extend upwardly from the beveled head 30, preferably at diametrically opposite points, and project into bores 49 formed in the cutter head to centralize the beveled head with respect thereto. Bolts 50 are passed through bores 51 formed in the cutter head and are threaded into tapped bores 52 formed in the beveled head to secure the two heads together. The cutter head, in advance of each cutter, has its lower edge notched as shown at 53, in Fig. 6, to communicate with a diagonally formed passage 54 in the beveled head and provide for the escape of shavings. The expanding guide ring 31, previously mentioned, is substantially equal in thickness to the beveled head 30, is cylindrical in shape to fit within the bore of a cylinder and has its inner face beveled to engage against the beveled face 46 of the beveled head 30. This expanding ring is split in order that it may expand under pressure exerted against it by the beveled head 30 to engage snugly within the cylinder bore.

As a means for simultaneously rotating and advancing the cutter head, I provide a thread bar or fed screw 55 which threads through the bushing or nut 17 and which has a reduced threaded terminal 56 engaging within the collar 33 of the cutter head. The reduced end of this feed screw is formed centrally with a socket 57 to receive the shank of the expander 29 and the opposite end of the feed screw is reduced and formed with angularly disposed faces 58 to receive a suitable type of double handed wrench, not shown.

In employing the above described ma-

chine for re-boring an engine cylinder, cutter blades are positioned within the cutter head and the expander 29 is turned to extend the cutters so that the cutting edges of diametric cutters are spaced a distance equal to the desired bore of the cylinder when the cutters are secured by the set screws 40. This setting of the cutters may be properly gaged by the employment of vernier calipers or other suitable instrument. A beveled head of suitable size is then secured to the cutter head and an expanding guide ring of proper internal diameter to coöperate with the beveled head employed and of such external diameter, as to fit snugly within the bore of the cylinder when in unexpanded position is applied to the beveled head. The parts so assembled are then applied to the cylinder, as shown in Fig. 3, and the supporting ring 10 positioned about the cutter mechanism. The feed screw 55 is then applied to the cutter head and the feed plate 14 threaded downwardly upon the screw to engage in the seat 13. The clamping plate 20 is then applied and secured by the bolts 24 and nuts 26. The cylinder may now be re-bored by a continuous and uniform turning of the feed screw 55 to simultaneously rotate and advance the cutter head, the expanding guide ring 31, together with the supporting ring 10, serving to properly centralize and guide the cutter head as the cutters are being brought into engagement with the wall of the cylinder. This movement of course forces the expanding ring 31 downwardly and its engagement by the beveled head 30 causes it to expand and fit snugly within the cylinder to guide the cutter head and centralize it throughout the entire re-boring operation. The provision of the enlarged seat 13 for the feed plate 14 and the fact that the clamping plate engages the feed plate and not the supporting ring 10 insures a maintaining of the supporting ring 10 and nut 17 in absolute axial alinement with the cylinder bore and a consequent true boring of the cylinder.

With a cylinder of the type shown at A in Fig. 1 in which the bore is enlarged at the cylinder head to provide a combustion chamber B, the cylinder may be bored throughout its entire length at a single operation, the ring 31 and beveled head 30 seating in the chamber B while the cutters engage the extreme end of the cylinder bore. There are many cylinders, however, of the type shown at C, in Fig. 7, in which the entire bore of the cylinder is uniform throughout its length. When re-boring such a cylinder, with my machine, the cylinder is bored in the manner described until the beveled head engages the cylinder head. The boring machine is then removed from the cylinder and its expanding guide ring and beveled head removed. The machine is then re-mounted upon the cylinder and the cutter head, in the condition shown in Fig. 7, is lowered into the cylinder bore to the point where the previous re-boring had stopped. The feed screw is then further rotated to finish the boring of the cylinder. Because of the extreme accuracy with which my boring machine is centralized and the firmness with which it is supported, it is possible to resume the boring operation with exactness and without any danger of leaving a fin or ridge in the surface of the bore. This is a great advantage as sometimes it is necessary, after the boring operation has commenced, to remove the machine in order that a dulled or broken cutter may be repaired or replaced.

The housings or bodies of the cylinders of Ford engines are so small that the use of a supporting ring of the size best adapted for employment in re-boring other engine cylinders is impossible. For this reason, I provide a modified form of supporting ring, best shown in Fig. 8. This ring includes a body 59 corresponding to the ring 10 and of the same internal diameter to snugly receive the cutter head. The external diameter of this body is, however, but slightly greater than the bore of a Ford engine cylinder in order that the bolts 24 when passed through the flange of such a cylinder may just clear the ring. The body of the ring, at its lower end, is cut-away to provide a relatively narrow annular chamber 60 to receive the extended ends of the cutters and the upper end of the ring is counterbored to provide an annular shoulder 61 adapted to seat in an annular channel 62 formed in the lower face of the feed plate 14. Furthermore, the peripheral edge of this feed plate, at diametrically opposite points, is cut-away, as shown at 63, to form seats for the passage of the bolts 24. Aside from this the machine employed for boring the cylinders of Ford engines is identical with that shown in the main views of the drawings and previously described and its operation is, of course, the same.

It will, of course, be apparent that my cylinder re-boring machine may be operated by hand or machine power or may be placed in a drill press and driven by the press.

Having thus described the invention, what is claimed as new is:

1. A machine for re-boring engine cylinders including supporting means adapted to be clamped in axial alinement with the cylinder bore, a feed plate carried by the supporting means, a feed screw threaded through the plate, a cutter head carried by the feed screw, and cutters adjustably clamped in the head with their cutting edges vertically disposed and extending to the plane of the lower face of the head.

2. A machine for re-boring engine cylinders including supporting means adapted to be clamped in axial alinement with the cylinder bore, a feed plate carried by the supporting means, a feed screw threaded through the plate, a cutter head carried by the feed screw, cutters adjustably clamped in the head with their cutting edges vertically disposed and extending to the plane of the lower face of the head, a beveled head detachably secured to the lower face of the cutter head, and an expanding guide ring engaging the beveled head and expansible through such engagement.

3. A machine for re-boring engine cylinders including supporting means adapted to be clamped in axial alinement with the cylinder bore, a feed plate carried by the supporting means, a feed screw threaded through the plate, a cylindrical cutter head carried by the feed screw and formed with an axial bore and in its lower face with radial slots laterally extended at their upper ends, cutters mounted in the slots and having ribs engaging in the lateral extensions thereof, an expander movable in the bore and engageable with the inner ends of the cutters to move them outwardly, and means for locking the cutters against longitudinal movement.

4. A machine for re-boring engine cylinders including a supporting ring adapted to engage against the open end of a cylinder and counterbored at its outer end to form a seat, a feed plate engageable in the seat, a feed screw threaded through the plate and extending axially of the supporting ring, a cutter head carrying radial cutters mounted upon the feed screw, the lower end of the supporting ring being counterbored to form a chamber to receive the cutter blades when the upper portion of the cutter head is guided by the intermediate portion of the ring, a clamping plate apertured for passage of the feed screw and adapted to project beyond the ring, the projecting portions of the plate being formed with slots, and clamping means adapted to pass through bolt openings in a cylinder flange and the slots of the clamping plate to clamp the ring against the flange.

5. In a machine for re-boring engine cylinders, a cylindrical cutter head formed with a central bore and in one end with radial slots opening into the bore and through the sides of the head, the slots being wider at their inner than their outer sides, cutters fitting snugly in the slots and so held against movement other than longitudinally of the slots, set screws threaded into the cutter head at right angles to and engaging the cutters, and means mounted in the bore of the cutter head for simultaneously extending the cutters and for supporting them in extended position.

6. In a machine for re-boring engine cylinders, a cylindrical cutter head formed with a central threaded bore and in one face with radial slots opening into the bore and through the sides of the head, the slots being wider at their inner than their outer sides, cutters fitting snugly in the slots and so held against movement other than longitudinally of the slots, set screws threaded into the cutter head at right angles to and engaging the cutters, and means mounted in the bore of the cutter head for simultaneously extending the cutters and for supporting them in extended position, said means including a body having threaded engagement in the bore of the cutter head and formed at one end with a shank having angular faces and at its opposite end with a conical terminal to engage the inner ends of the cutters, the inner ends of the cutters being beveled to evenly engage such terminal.

7. A machine for re-boring engine cylinders including a supporting ring adapted to engage against the open end of a cylinder, a feed plate having its lower face formed with an annular channel to seat the upper edge of the ring, means for clamping the plate against the ring to hold the ring against the cylinder, a feed screw threaded through the plate, and a cutter mechanism carried by the feed screw.

8. A machine for re-boring engine cylinders including a support adapted to be clamped against a cylinder, a feed screw carried by the support, a cutter head mounted upon the feed screw, and an expanding guide ring carried by the cutter head and adapted to be expanded by pressure exerted against it by the head.

9. In an engine cylinder re-boring machine, a cutter head carrying radial cutters, a beveled head secured to the cutter head, and an expansible guide ring detachably engaging the beveled head.

In testimony whereof I affix my signature.

ROBERT E. ROSEBERRY. [L. S.]