Feb. 19, 1924. 1,484,353

I. R. KIDWELL

HONING DEVICE FOR BORES OF INTERNAL COMBUSTION ENGINES

Filed Oct. 5, 1922 2 Sheets-Sheet 1

Fig. 1.

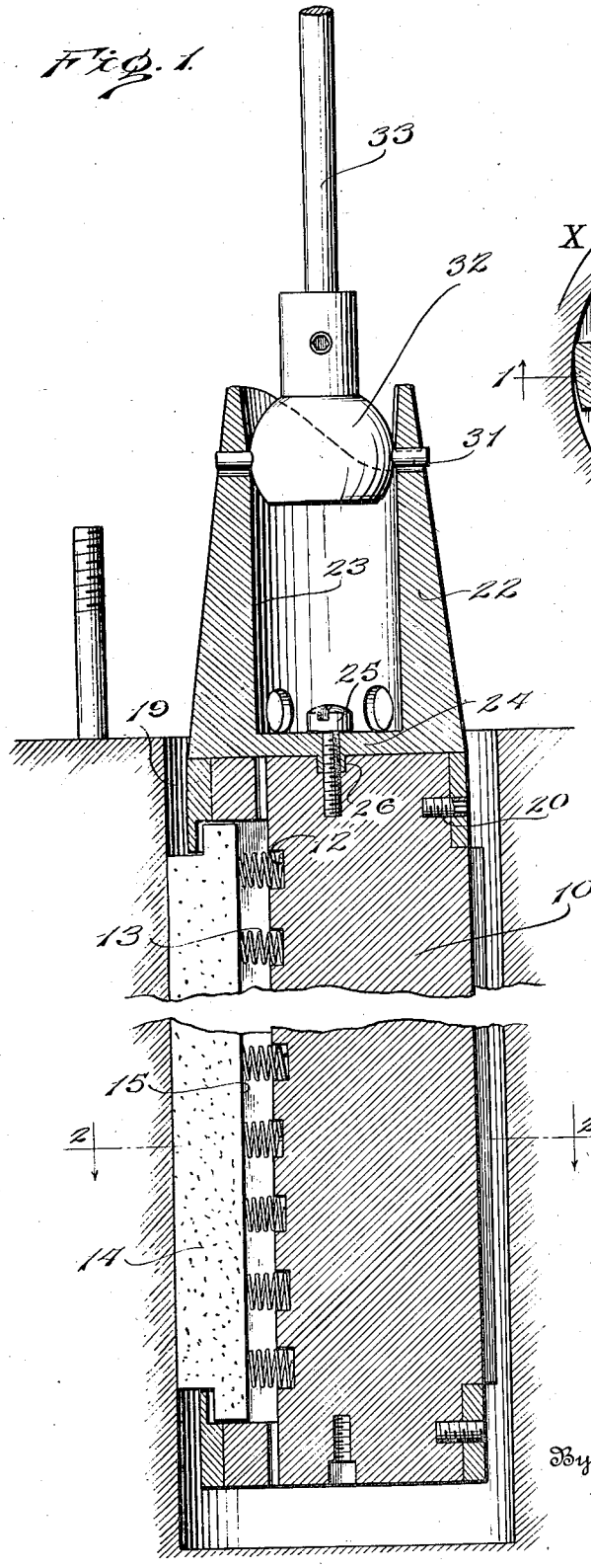


Fig. 2.

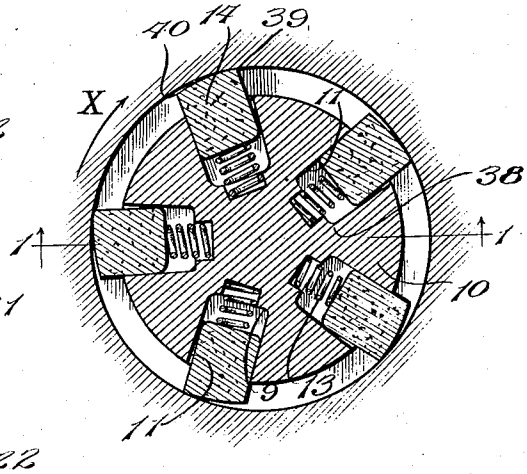
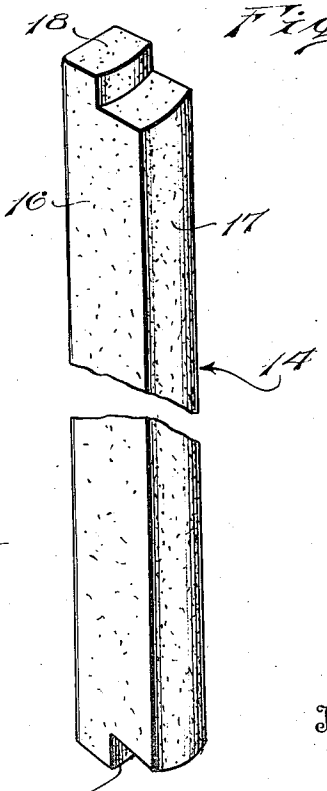


Fig. 4.



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Fig. 5.

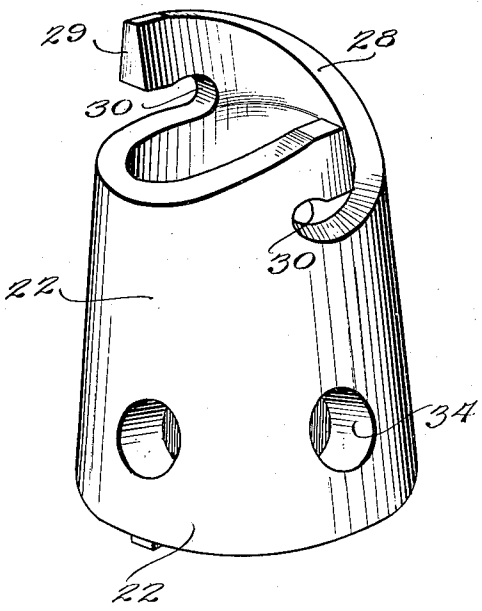


Fig. 3.

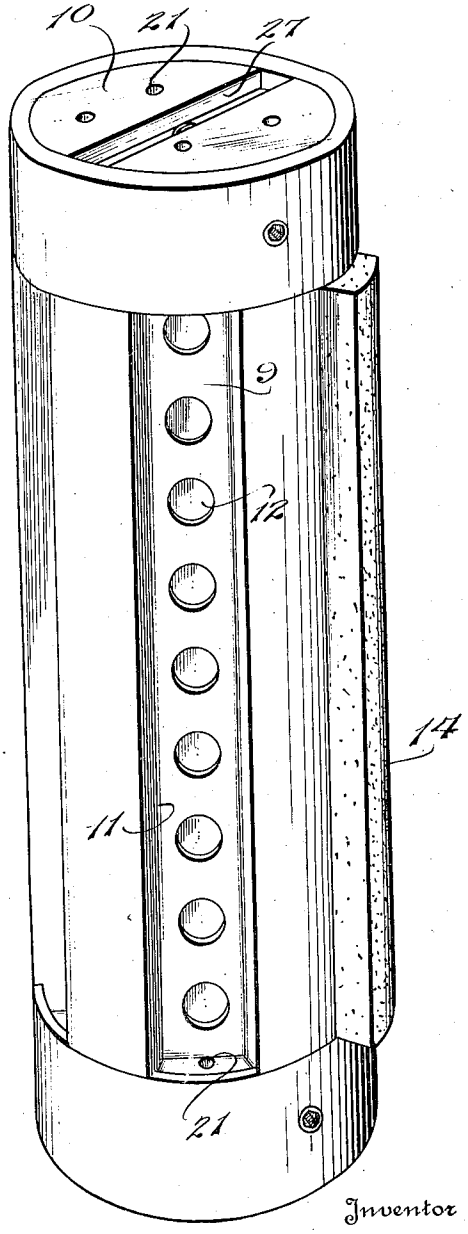
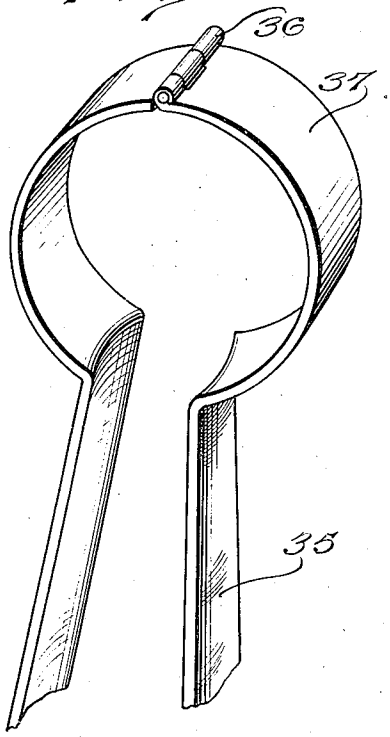


Fig. 6.



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UNITED STATES PATENT OFFICE.

IRA R. KIDWELL, OF PONTIAC, MICHIGAN.

HONING DEVICE FOR BORES OF INTERNAL-COMBUSTION ENGINES.

Application filed October 5, 1922. Serial No. 592,639.

To all whom it may concern:

Be it known that I, IRA R. KIDWELL, a citizen of the United States, residing at Pontiac, in the county of Oakland and State of Michigan, have invented certain new and useful Improvements in Honing Devices for Bores of Internal-Combustion Engines, of which the following is a specification.

The present invention relates to a tool intended for honing cylindrical bores such as the chambers of internal combustion engines.

This tool is used for obtaining smooth surfaces in the cylinders after having been bored or for removing tool marks and scoring from the cylinders.

The device is designed principally for factory and garage work and the motive power may be either an electric or air drill, and even a carpenter's auger brace will give very satisfactory results. In order to get the very best results, however, the tool should travel at a speed of 150 revolutions a minute, while simultaneously executing 10 to 15 length strokes in the cylinder preferably with kerosene oil running on the honing tool. In this manner a depth of 3/1000 of an inch can easily be removed from the cylindrical wall in less than 5 minutes.

The condition of the cylindrical walls after being honed by means of this tool is vastly superior to their condition after having been reamed or rolled or lapped, because piston rings will fit themselves in such honed cylindrical walls in 1/10 of the time after having been finished in this manner. Furthermore this method of honing the cylindrical walls is also superior because it gives life to them.

This honing method enables an automobile manufacture to turn out an engine having cylindrical walls equal in appearance to that of grinding but superior to the latter because the piston rings will fit themselves much quicker and better than in the latter case.

Another advantage of the use of this tool is that it is considerably cheaper than grinding and does not require a special machine to do the work. It also enables an automobile repair man to hone out scored cylinders and fit in oversized pistons without removing the engine from the automobile and does away with the slow method of lapping-in the pistons.

It might here be stated that the honing tool forming the subject matter of the present invention, has been thoroughly tested and perfected within the last twelve months and is not a theoretical proposition, but the result of extensive practical experiments.

In the accompanying drawings one embodiment of the invention is illustrated, and

Fig. 1 shows an axial section of the tool inserted in a bore of a cylinder;

Fig. 2 is a section along line 2—2 of Fig. 1;

Fig. 3 is a perspective view of the tool, some of the details having been removed;

Fig. 4 is a perspective view of one of the hone stones used in connection with the tool;

Fig. 5 is a perspective view of a driving socket for the tool, and

Fig. 6 is a perspective view of an implement used in assembling.

In the figures reference numeral 10 represents the body of the tool which is of cylindrical cross section and provided with narrow channels 9 running in the length direction of the body, five of which channels have been shown in the drawings. It is obvious that a smaller or greater number of these channels may be used in accordance with the diameter of the bore to be honed.

The side walls 11 of the channels are preferably slightly inclined to the central radial plane of the channels, an inclination of about 2° having been found most suitable, the channels being wider at their outer ends than at their inner ones. Along the bottom of each channel is provided a number of cylindrical recesses 12, which are intended to seat compression springs 13.

Reference numeral 14 represents one of the hone stones used in connection with this tool, which is of substantially rectangular cross section with a flat bottom 15 and flat parallel sides 16. The outer surface 17, however, is curved to a radius approximately the same as that of the bore of the cylinder to be honed. At each end of the hone stone is provided a short projecting tongue 18 adapted to engage under retaining collars 19, one at each end of the body 10, said collars fitting tightly on the ends of the body and projecting inwardly over the channels 9, in such a manner that they will engage with the projecting tongues 18 of the hone stones and in this manner retain them in place. These collars 19 are secured in position by means of so-called Allen set

screws 20, the outer ends of which are made flush with the outer surfaces of the collars 19 so as to form no obstructions during the use of the tool.

The coiled springs 13 positioned in their seats 12 in the body 10 and between the same and each of the hone stones 14, tend to press the latter outwardly in radial direction. It should now be noted that the width of the hone stones 14, is slightly less than the smallest width of the channels 11 and that the flat sides 16 of the hone stones are parallel. It will thus be seen that the hone stones will be held floating in the channels and on account of the inclined side walls of the latter may obtain a rocking motion therein in the circumferential direction of the tool.

In the end walls of the channels are provided small apertures 21 about 1/8 of an inch in diameter leading out therefrom to each end of the body 10, this for the purpose of permitting oil and grit to pass out from the tool.

Reference numeral 22 represents a driving socket, the base of which has the same diameter as the collars 19 but the side walls of which are tapering outwardly to a much smaller diameter. This socket has a cylindrical recess 23 terminating at the thin bottom 24 of the socket. The latter is secured by means of a central screw 25 to the body 10 and is prevented from turning therein by means of a solid key 26 engaging in the corresponding key slot 27 furnished at each end of the body 10. It will thus be seen that the tool may be reversed or in other words that the socket 22 can be attached to either end of the body 10.

The outer end of the socket terminates with a pair of oppositely situated helical end faces 28 preferably right handed. Each of these faces 28 extending at the lower end a distance below the free end 29 of each top of the socket. In other words these ends are undercut and enlarged as seen at 30, in order to provide a firm grip for the pivots 31 of the driving head 32, which is spherical and firmly secured on a driving shaft 33. In order to facilitate the assembling of the driving head in the socket 22 the recess 23 tapers outwardly from the bottom of the undercut 30. Accordingly there will be no stiff connection between the shaft 33 and the tool, but the latter becomes completely guided in the bore, as the shaft is permitted a slight oscillation with regard to the axis of the tool.

At the bottom of the recess 23 in the socket 22 are drilled five radial apertures 34 about 3/4 of an inch in diameter and on a level with the bottom of the recess in order to permit the outlet of kerosene oil from the socket and also for the purpose of slightly lightening the latter.

In Fig. 6 is shown an implement intended for use in assembling the honing tool in the bore of a cylinder and this implement consists of a pair of shanks 35 hinged as at 36 and each formed with a half cylindrical band or gripping portion 37 of approximately the same diameter as the bore to be honed. By slipping this implement over the honing tool the hone stones may be squeezed together to permit the easy entering of the tool into the bore to be honed. Similarly when the honing has been finished and the tool is to be removed, this implement is applied in the same manner. It will also be useful in assembling the pistons in the cylinders, as the piston rings may be squeezed together sufficiently to permit the pistons to slip easily into the cylinder.

The body 10 of this tool is preferably made of aluminum or any other suitable light material and its diameter is about 5/32 of an inch smaller than that of the cylinder bore in which it is to be used. The collars 19 made of brass or bronze may be slightly tapered to insure that they will not strike the walls of the cylinder when the tool is in use.

The corners along the bottoms of the channels 9 are not sharp but preferably rounded or beveled as at 38 to reenforce and provide greater strength to the body.

The hone stones 14 are preferably made of carborundum and when in use each hone stone will lean against the rear wall of its channel as seen in Fig. 2 when the tool is in use. In this figure the tool is supposed to revolve in the direction of arrow X and in consequence the forward outer edge 39 of each hone stone will contact with the inner surface of the bore in the cylinder, while the rear edge of each hone stone stands away slightly from said wall, so as to provide a small space 40 between the same and the hone stone. The forward edge 39 of the hone stone thus performs the honing and will accordingly be exposed to greater wear than the rear edge thereof. When the forward edge 39 has been worn down, the hone stone may be reversed in its channel or the entire tool turned end for end by attaching the socket 22 at the opposite end of the body 10. In this manner the edge of the hone stone that before was the rear edge will now become the cutting edge of each hone stone. Accordingly the hone stones really are grinding themselves sharp while being used and no other sharpening of them will be necessary.

In tools for large bores the body 10 may be hollowed out or grooved for lightening the same provided in the sectors between the channels and similarly the socket 22 may also be lightened considerably.

The cylindrical recesses 12 furnished along the bottom of each channel have pref-

erably different depths. For instance, the two end recesses and the middle one in each channel may be drilled to a depth of ¼ of an inch, while the others may vary in depth from this dimension to 1/8 of an inch. The reason for this variation in the depth of the recesses 12 is this, that when the hones 14 are new and accordingly highest, they are assembled with only three springs, that is to say, one in the middle and one at each end. As the outer surface of each hone is worn away the compression springs in the recesses will naturally expand more and for this reason will give less pressure against the hone, thereby diminishing the pressure of each hone against the cylinder surface. At this time additional springs are inserted and as the hones are gradually worn away, more springs are inserted in the others of the recesses. In this manner the pressure will be maintained approximately constant. It will readily be seen, that by this arrangement a uniform, initial strength of the coiled compression springs is possible and that no variation in the length of the springs will be required to maintain the constant pressure of the hones.

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

1. A honing tool for cylindrical bores comprising a body member, provided with longitudinal channels opening along the outer periphery thereof, the sides of said channels converging towards the bottom of the channel, a honing element of substantially rectangular cross section inserted in each of said channels, compression springs between the bottom of the channel and said honing element, said element having a projecting tongue at each end and a collar at each end of said body member provided with an annular ledge engaging over said tongues.

2. A honing tool for cylindrical bores comprising a body member, provided with longitudinal channels opening along the outer periphery thereof, the sides of said channels converging towards the bottom of the channel, a honing element of substantially rectangular cross section inserted in each of said channels, compression springs between the bottom of the channel and said honing element, said element having a projecting tongue at each end, a collar at each end of said body member provided with an annular ledge engaging over said tongues, a driving socket having rigid engagement with the end of said body and a driving head detachably engaging said driving socket.

3. A reversible honing tool for cylindrical bores comprising a body member, provided with longitudinal channels opening along the outer periphery thereof, the sides of said channels converging towards the bottom of the channel, a honing element of substantially rectangular cross section inserted in each of said channels and adapted to oscillate in circumferential direction therein, compression springs between the bottom of the channel and said honing element, said element having a projecting tongue at each end, a collar at each end of said body member provided with an annular ledge engaging over said tongues, a driving socket adapted to have rigid engagement with either one of the ends of said body and a driving head detachably engaging said driving socket; whereby upon the tool being reversed sharp cutting edges being presented at the forward edges of said honing element.

4. A reversible honing tool for cylindrical bores comprising a body member, provided with longitudinal channels opening along the outer periphery thereof, the sides of said channels converging towards the bottom of the channel, a honing element of substantially rectangular cross section inserted in each of said channels, compression springs between the bottom of the channel and said honing element, said element having a projecting tongue at each end, a collar at each end of said body member provided with an annular ledge engaging over said tongues, a driving socket adapted to have rigid engagement with either one of the ends of said body, the ends of said body having openings communicating with said channels, whereby oil and grit collecting in the channels may pass out from said channels.

5. A reversible honing tool for cylindrical bores comprising a body member, provided with longitudinal channels opening along the outer periphery thereof, the sides of said channels converging towards the bottom of the channel, a honing element of substantially rectangular cross section inserted in each of said channels, compression springs between the bottom of the channel and said honing element, said element having a projecting tongue at each end, a collar at each end of said body member provided with an annular ledge engaging over said tongues, a driving socket, a transverse keyway being provided at each end of said body and said socket having a corresponding key adapted to engage selectively in either one of said keyways and a screw threaded in said body and engaging with said socket for rigidly securing the latter on said body.

6. A honing tool for cylindrical bores comprising a body member, provided with longitudinal channels opening along the outer periphery thereof, the sides of said channels converging towards the bottom of the channel, a honing element of substantially rectangular cross section inserted in each of said channels and adapted to oscil-

late in circumferential direction therein, compression springs between the bottom of the channel and said honing element, said element having a projecting tongue at each end, a collar at each end of said body member provided with an annular ledge engaging over said tongues, seats being provided in the bottom of each channel for said springs, said seats being of different depths; whereby adjustment of the radial pressure against the honing elements is possible.

7. A honing tool for cylindrical bores comprising a body member, provided with longitudinal channels opening along the outer periphery thereof, the sides of said channels converging towards the bottom of the channel, a honing element of substantially rectangular cross section inserted in each of said channels and adapted to oscillate in circumferential direction therein, yieldable means between the bottom of the channel and said honing element, said honing element having a projecting tongue at each end, and a collar at each end of said body member engaging over said tongues, said yieldable means being adjustable for exerting selectively variable pressure against said honing elements.

In testimony whereof I affix my signature.

IRA R. KIDWELL. [L. S.]