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Aug. 25, 1925. 1,550,807

H. C. HEON

MEANS FOR GRINDING CYLINDERS

Filed Nov. 27, 1922 2 Sheets-Sheet 1

Fig. 1.

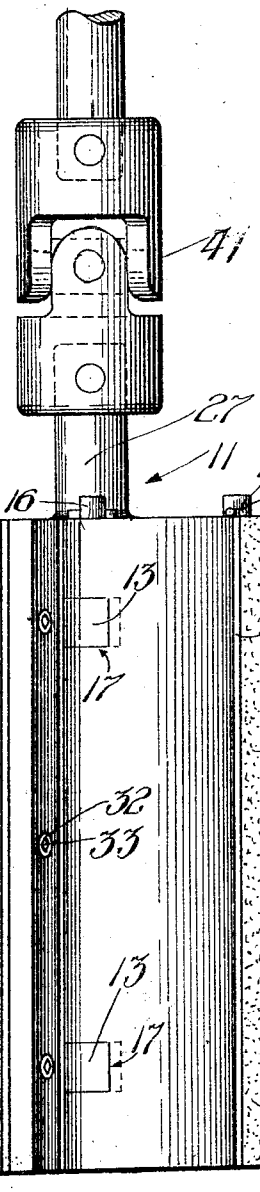


Fig. 3.

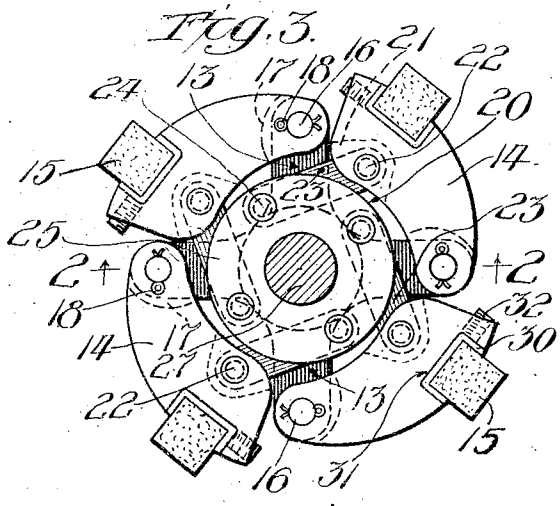
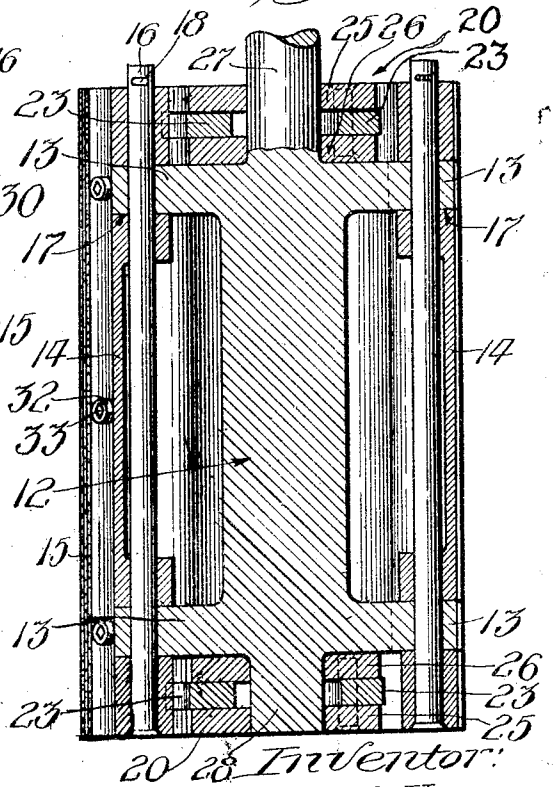


Fig. 2.



Witness:
Harry S. Gaither

Inventor:
Horace C. Heon.
by Rector & Gibbons Davis & Lucas
Attys

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H. C. HEON

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Fig. 5.

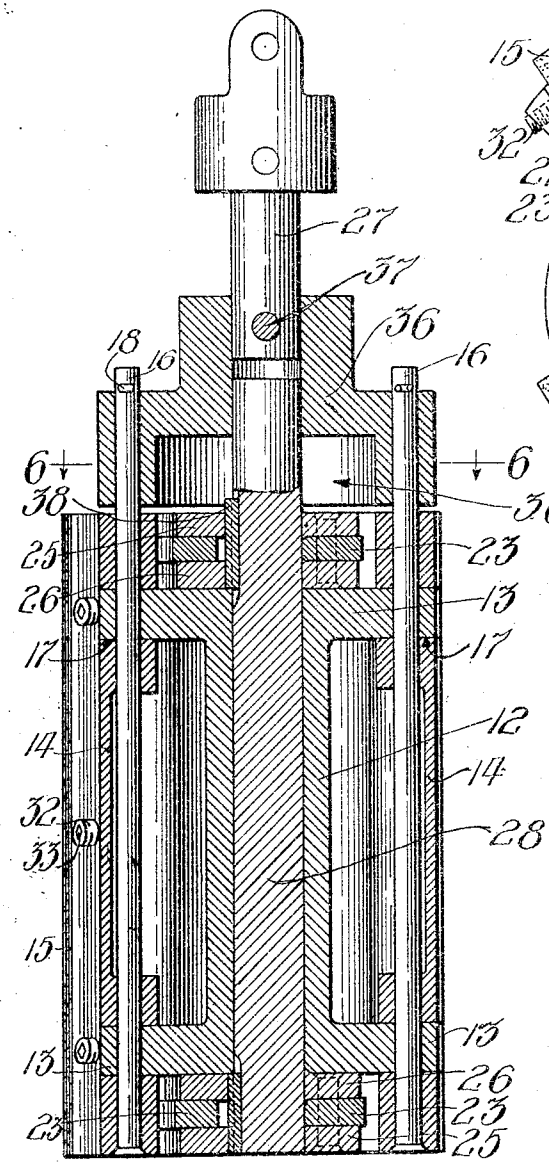


Fig. 4.

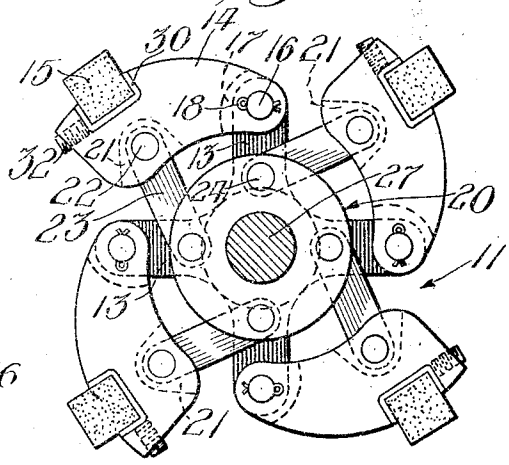


Fig. 6.

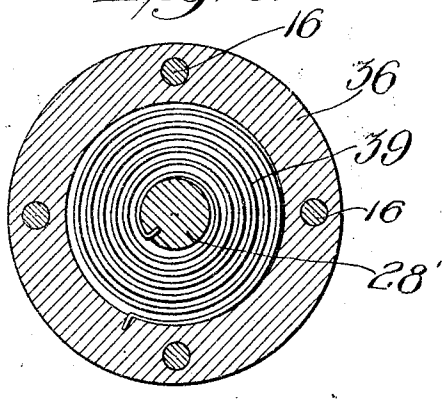
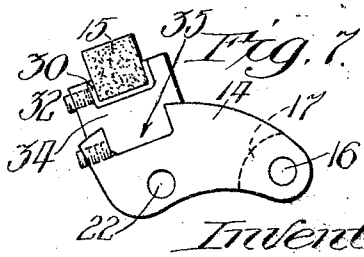


Fig. 7.



Witness:
Harry S. Gauthier

Inventor:
Horace C. Heon.

By Rector, Hibben & Davis & Macauley
Attys

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Draftsman
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Patented Aug. 25, 1925. 1,550,807

UNITED STATES PATENT OFFICE.

HORACE C. HEON, OF CHICAGO, ILLINOIS, ASSIGNOR TO FREDERICK G. WACKER, OF CHICAGO, ILLINOIS.

MEANS FOR GRINDING CYLINDERS.

Application filed November 27, 1922. Serial No. 603,695.

To all whom it may concern:

Be it known that I, HORACE C. HEON, a subject of the King of Great Britain, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Means for Grinding Cylinders, of which the following is a specification.

My invention relates to the grinding of cylinders, such as the cylinders of engines, pumps and the like, to present a true and highly finished surface to the co-acting piston.

A general object of my invention is to provide a novel and advantageous grinding tool of construction suitable to be operated at relatively high speed of rotation so that its long, slender abrading stones may be centrifugally pressed against the cylinder surface to be ground, and with the several stones so arranged and carried as to operate with uniformity and with minimized liability to breakage, to undue wear or to other detriment to the tool or the cylinder surface. A further object of my invention is to provide in a tool novel and advantageous construction insuring operation thereof to grind out irregularities preexistent in the work-surface, whether in the nature of taper or out-of-roundness, and in efficient and rapid fashion to produce a true and highly finished or polished cylinder surface. Another object is to provide an organized apparatus embodying a tool or tools so characterized, advantageously adapted for automatic finishing of new work wherein the cylinder-bores closely approximate true contour and need only uniform finishing operation to be brought actually to desired dimensions and surface finish. Another object of my invention is to provide a tool structure which will be simple, effective, durable, very easily handled, inexpensive and self-adjusting.

For the attainment of these, and other objects which will become apparent to those skilled in the art, from the following description, taken in conjunction with the accompanying drawings, my invention consists in the means for and method of grinding, hereinafter set forth, and particularly in the combinations, arrangements, features of construction and method hereinafter claimed.

In the drawings Fig. 1 is a side elevation of a grinding tool embodying features of my invention; Fig. 2 is a vertical section therethrough taken on line 2—2 of Fig. 3; Fig. 3 is a plan view of the tool with its gates or wings in folded line; Fig. 4 is a similar view with the gates or wings spread; Fig. 5 is a view similar to Fig. 2 showing a modified tool structure; Fig. 6 is a detail section, taken at the position indicated by line 6—6 of Fig. 5, showing a further modification, and Fig. 7 is a detail of a stone-carrying gate equipped with an extension shoe.

Referring particularly to Figs. 1 to 4, 11 indicates the tool comprising a carrier 12 of suitable longitudinal extent from which extend the bearing members 13, shown as four pairs of radial arms, the arms of each pair being in longitudinal alignment and spaced apart longitudinally, near opposite ends of the carrier body, so that each pair of arms may give adequate support to a pivoted gate or wing 14. Each such gate carries near its free edge an outwardly facing abrading element or stone 15, and near its opposite edge is pivoted to a rod 16 mounted in the spaced arms 13 constituting one pair of bearing members. The pivoted or inner edges of the gates are of course recessed as at 17 to receive the arms 13 and the bearing rods 16 may be demountably secured in place by cotter pins 18. I illustrate the stone-carrying gates as four in number, because I prefer that the stones shall work against diametrically opposed portions of the cylinder surface to be ground, but it will be understood that in some of its aspects my invention is not limited to precise number of stones employed. Also, I prefer that each grinding stone shall extend the full effective length of its gate, so that if need be the tool may be used in grinding to a shoulder or cylinder head, without interference by any portion of the tool extending beyond the abrasive surface at at least one end thereof.

It will be observed that if the carrier be set in rapid rotation (in clock-wise direction Fig. 3) centrifugal action will tend to throw the stone-carrying gates or wings to expanded position as shown in Fig. 4, each gate being drawn forward in the direction of rotation after its bearing member or pair of arms 13, and that the stated pivotal mounting of the gates, together with their

construction in the manner shown, carrying the respective stones near their thickened and weighted free edges, is conducive to their easy and active response to such centrifugal effect.

To insure that under all conditions the gates will move in harmony, presenting the stones at equal radial distance from the axis of the carrier, such gates are interconnected by an equalizing structure 20, preferably duplicated in the construction so that the equalizing system affects each end of the gates, it being understood that the structure 20′, shown at the bottom of Fig. 2 is identical in design with that shown at 20 at the top of Fig. 2. Each gate or wing is recessed as at 21 on its inner side near its free edge and in such recess there is pivoted as at 22 the outer end of horizontal link 23 the inner end of which is pivoted as at 24 between two collars or common-connectors 25, 26. These collars are mounted with respect to the carrier 12 for relative freedom of rotation, thereby leaving the gates free for swinging displacement but interconnected for mutual restraint. Each link preferably runs from its pivot point 22 to the connector-collars in a direction away from its pivot rod 16, so that if any wing be impelled toward open position its link 23 pulls the collar in clockwise direction (Fig 3) and the linkage acts on the other wings, pressing them out to an extent equalling the movement of the first-mentioned wing. The collars surround and may be stabilized in position by central bearing members 27 and 28 at opposite ends of the tool, bearing member 27 as shown in Fig. 1 constituting a portion of the tool drive-shaft rigidly connected with the carrier body and slidingly engaged by the collars 25 and 26. By providing a pair of such equalizer structures at opposite ends of the tool, and mounting each wing in widely-spaced bearings, free, non-cramping action is effectively assured.

The stones 15 protrude from the outer side faces of the wings or gates far enough to assure their contact with a cylinder wall in any position of the wings from closed to open, and they are supported in their gates in rigid fashion preferably with provision to minimize their breakage by equalized and snug support. The inner side of each stone is invested in a channeled holder 30 in which the stone is cemented, and the holder is seated in a pocket 31 in the carrier in which it neatly fits and is secured against any displacement by suitable set screws 32 contacting with the base portion of the holder and inserted through the end of the carrier, these set screws having suitable provision for operation as by the formation of wrench sockets 33 in their free ends, as shown in Figs. 1 and 2. By this construction the stones are very rigidly held with such freedom from excess strain at any point of screw engagement that the chance of stone breakage is minimized.

Where it is desired to grind the cylinder of diameter greater than that to which the stones may spread when directly mounted in the wings, extension shoes 34 may be employed as shown in Fig. 7 each such shoe providing pocket and screw equipment like that of the wing, and a tongue 35 to fit in the pocket of the wing and be secured by the set screws of the wing.

In Fig. 5 I have shown a modified construction wherein a head 36 intervenes between the drive shaft section 27′ and the carrier member 12′, this head being fixed as by pin 37 to the shaft section 27′ and the head engaging the elongated pivot rods 16′. With this arrangement the body 12′ of the carrier may be made as a sleeve, rotatable on a shaft section 28′ to which the collars 25′ and 26′, at the top and bottom of the tool, are keyed as at 38, such shaft member 28′ preferably also finding bearing for rotation in the head 36. Of course with this construction the drive from shaft 27′ is through the rods 16′ to the carrier instead of through the carrier to the rods, but the relative rotatability of the carrier body and common connectors or collars is not affected, and the operation of the device remains unchanged in general effect.

I have found it practical and for some purposes desirable to dispense entirely with springs in the construction and operation of tools of the character above described, but sometimes, in connection with the use of coarse stones and for rapid work, it may be deemed desirable to supplement centrifugally imposed pressure with a definite spring pressure. The arrangement of a head 36 as above described facilitates the provision of a recess 36′ in the head around the shaft 28′ that connects the upper and lower equalizers, and if desired a long spring 39, wound like a clock spring, may be inserted in such recess with its opposite ends engaging, as shown in Fig. 6, the shaft member 28′ and the head 36, the spring working to turn the shaft 28′ clockwise with respect to the head. Such provision with a long spring may be made to give a substantially uniform perfectly predetermined pressure throughout the entire range of movement of the stone-carrying wings, since the rotative movement between the equalizer collars and the body of the carrier is very short in any event.

While I have herein described in some detail particular constructions for embodiment of my invention, it will be understood by those skilled in the art that this is for purposes of full disclosure and that many changes in construction and arrangement

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of parts may be made without departure from the spirit of my invention and within the scope of the appended claims.

And it will be further understood that while I particularly refer to "grinding" and the use of abrasive "stones", the active elements so described, carried by the wings, may be surfacing or lapping elements of any suitable material.

I claim:

1. In a tool of the character described, the combination of a carrier member and an equalizer member, one mounted on the other and rotatably movable with respect to the other; a plurality of outwardly spreadable wings each pivoted adjacent its inner edge to the carrier member, stones carried by the outer, displaceable portions of said wings and respective links each pivoted at its inner end to the equalizer member and at its outer end pivoted to the respective wing at a point between the inner and outer edges of such wing.

2. In a tool of the character described, the combination of a rotatable carrier member having laterally extending bearing portions and above the latter an axial shaft portion; a plurality of outwardly spreadable wings each pivoted adjacent its inner edge to a respective bearing portion of the carrier member; abrasive stones carried by the outer, displaceable portions of said wings, an equalizer member encircling said shaft portion of the carrier and rotarily movable thereon, and equalizer links respectively pivoted at their inner ends to said equalizer member and at their outer ends pivoted to the respective wings between the inner and outer edges of said wings.

3. In a tool of the character described, the combination of a carrier member comprising a body portion, bearing portions laterally extending therefrom at longitudinally separated points, and a shaft portion at one end thereof beyond the bearing portion; a plurality of wings each pivoted adjacent its inner edge to said bearing portions of the carrier and each having adjacent its outer edge provision to receive an outwardly presented abrading stone; a collar surrounding and rotarily movable with respect to the shaft portion of said carrier, and a plurality of links each pivoted at its inner end to a respective suitable point of said collar and each pivoted at its outer end to a respective wing at a point on said wing between the inner and outer edges of the latter.

4. In a tool of the character described, the combination of a rotatable carrier member comprising a body having longitudinally spaced laterally extending bearing members and beyond said bearing members having shaft portions; equalizer collars surrounding the opposite shaft portions of said carrier; wings pivoted adjacent their inner edges to said bearing members and adjacent their outer edges having provision to receive outwardly presented abrading stones, and equalizer links arranged in pairs, corresponding to the opposite equalizer collars, each such link having its inner ends pivoted to its corresponding equalizer collar and its outer end pivoted to a respective wing at a point on said wing between the inner and outer edges of the latter.

5. In a tool of the character described, the combination of a carrier member having in longitudinally spaced relation laterally projecting bearing arms arranged in pairs, wings each pivoted adjacent its inner edge to a pair of said arms and outwardly displaceable from folded position wherein the wing lies in the space between peripherally successive arms; a link pivoted at its outer end to each wing respectively at a point beween the inner and outer edges of the wing, an equalizer member to which the inner ends of said links are pivoted, said equalizer member being rotatively movable with respect to the carrier, and abrasive stones carried by said wings near the outer edges thereof for outward displacement as the wings unfold.

6. In a tool of the character described, a rotatable carrier, wings pivoted thereon each having an outwardly-facing pocket near its free edge, abrading stones to be held in said pockets, a channel-shaped metallic holder for each abrading stone investing its inner edge portion and seated in the pocket of the corresponding wing, and a set screw on each wing extending through its side wall of the pocket and engaging said holder adjacent the bottom thereof to exert its pressure substantially parallel with the bottom of the channel and against the side wall of the channel to hold it and its stone in the pocket, while the holder protects the stone against fracture.

HORACE C. HEON.