Sept. 6, 1932. T. F. QUIGLEY 1,876,468

CYLINDER HONE OR LAPPING TOOL

Original Filed Nov. 19, 1926 2 Sheets-Sheet 1

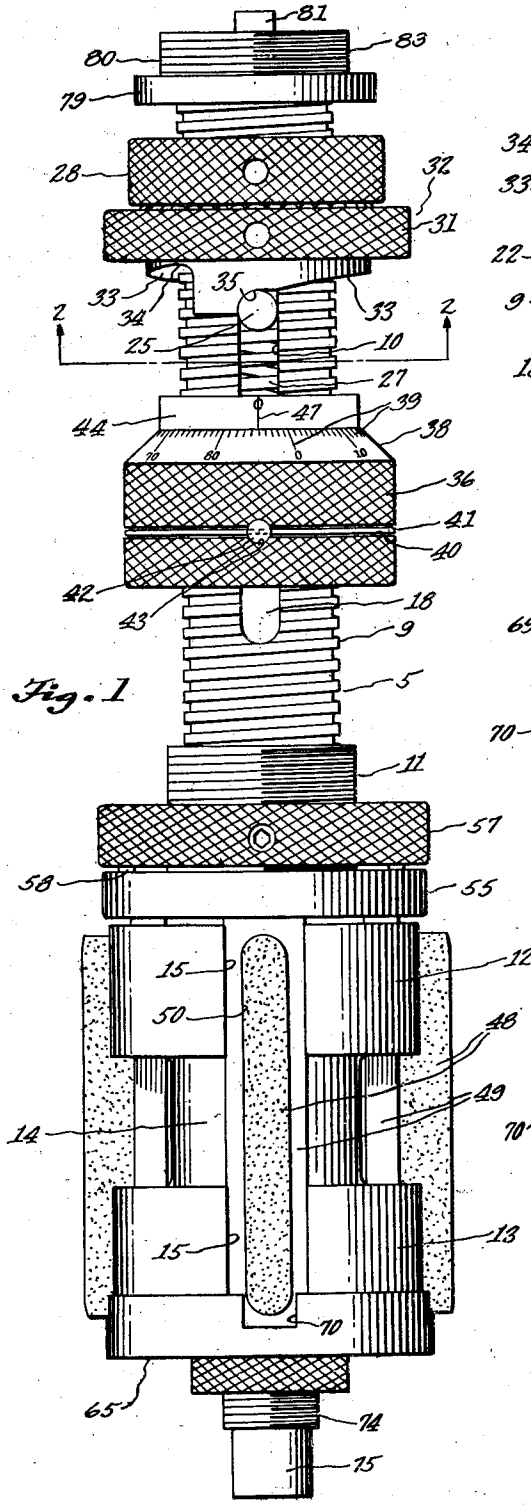


Fig. 1

Fig. 2

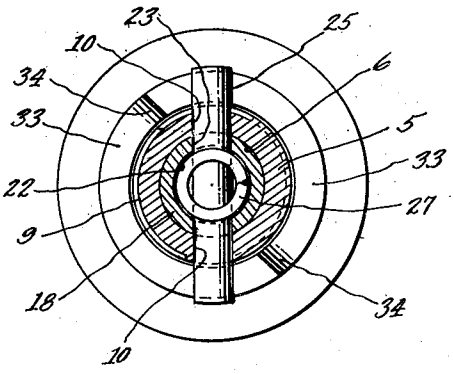


Fig. 3

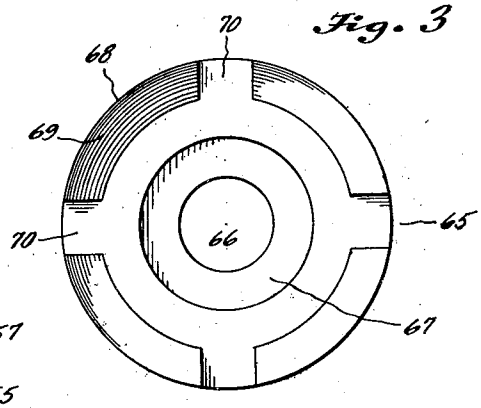
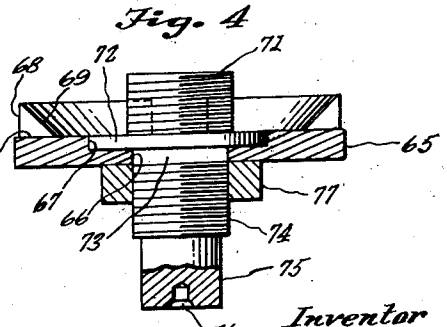


Fig. 4



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Fig. 5

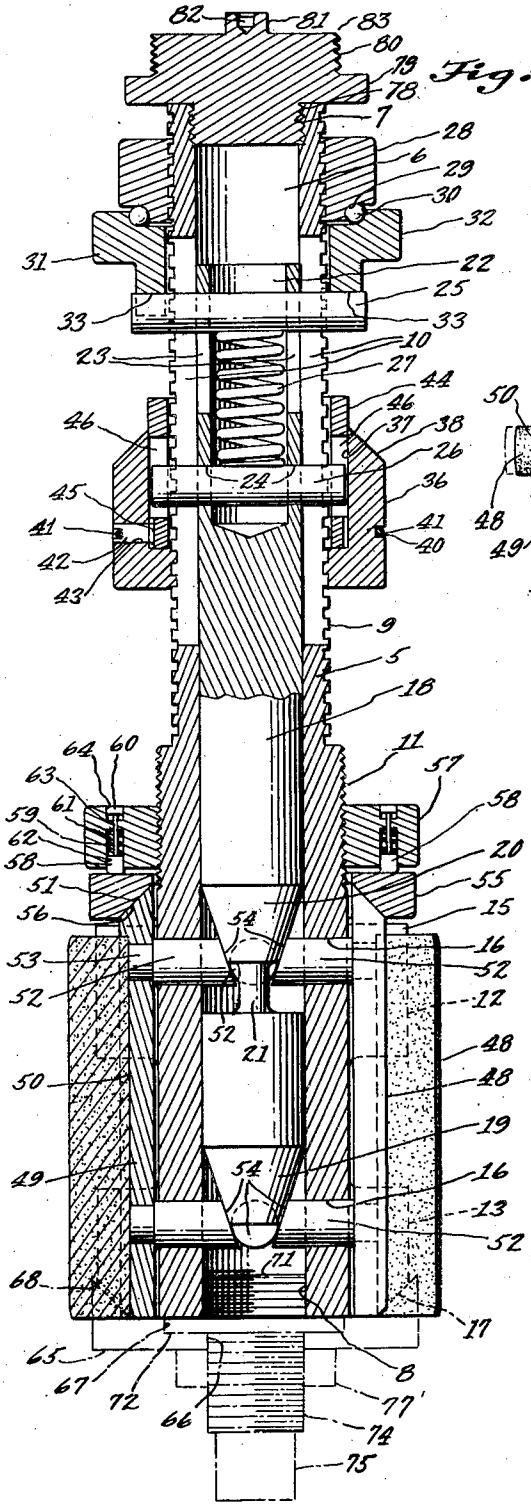
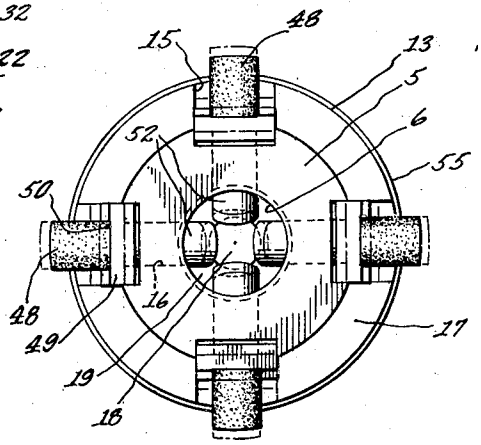


Fig. 6



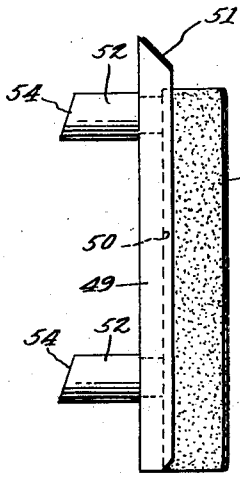


Fig. 7

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UNITED STATES PATENT OFFICE

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CYLINDER HONE OR LAPPING TOOL

Application filed November 19, 1926, Serial No. 149,382. Renewed December 6, 1928.

This invention relates to new and useful improvements in cylinder hones or lapping tools for quickly and accurately honing small cylinder bores varying slightly in size or diameter, providing simple means for quickly adjusting the radially expandible abrasive stones for insertion of the hone into cylinder bores, means for quickly adjusting the abrasive stones to cylinder walls of variable diameter for the start of the cut, means for setting the hone to cut a predetermined depth into cylinder walls of variable diameter, means to quickly apply yielding pressure against the stones for the cut, means for adjustably limiting radial expansion of the stone shoes during the cut, and means for quickly relieving the cutting pressure on the stones to allow them to be resiliently retracted and the hone to be quickly withdrawn from the cylinder bore after the honing operation.

A further object of the invention is to provide separate means for clamping, centering and setting up the hone on a lathe for dressing of the abrasive stones when worn with a suitable device such as a diamond.

Other objects and features of the invention will be hereinafter pointed out and described.

In the drawings:

Fig. 1 is a side view of the hone ready to be inserted into a cylinder bore with the abrasive stones contracted.

Fig. 2 is a sectional view on line 2—2 of Fig. 1.

Fig. 3 is an inside view of the end hone shoe retainer.

Fig. 4 is a sectional view thereof with the adaptor and retaining nut.

Fig. 5 is a longitudinal sectional view of the hone.

Fig. 6 is a hone end view.

Fig. 7 is a detail view of a hone shoe.

Referring specifically to the drawings, 5 indicates generally the hone body in the form of a tubular element having a central bore 6 screw threaded at the ends thereof as at 7 and 8. An upper or shank portion of the body 5 is externally square threaded as at 9 and provided with oppositely disposed slots 10. The intermediate portion of the body is externally V-threaded as at 11. To provide a rotatable cutter head organization the lower portion of the body is formed with spaced enlarged portions 12 and 13 with an intermediate annular groove 14 and a plurality of oppositely disposed longitudinal shoe grooves 15 with openings 16 in the enlarged portions 12 and 13, the end of portion 13 being beveled inwardly as at 17.

A plunger 18, slidably disposed within body bore 6, has a cone shaped lower end 19 and a cone shaped intermediate portion 20 connected by a reduced neck 21 to the lower portion of the plunger. The upper part of the plunger has a central bore 22 with oppositely disposed slots 23 through which extend transversely, a rod 25 of round cross section. The bore 22 has lower oppositely disposed opening 24 through which a rod 26 extends to act as a stop part. A helical compression spring 27 is disposed in bore 22 between rods 25 and 26. This serves as resilient means for advancing plunger 18.

A knurled round tension nut 28, threaded on body square threads 9 has a ball bearing race 29 holding ball bearings 30 which retain a tension cam collar 31 having an enlarged knurled portion 32 and oppositely disposed cam faces 33 adapted to engage the ends of rod 25.

A knurled stop nut 36, threaded on body square threads 9, has the upper inner part thereof annularly recessed as at 37 and the top bevelled as at 38 with spaced indicating marks 39 thereon. A wire spring 41, disposed and secured within an annular groove 40 in nut 36, passes through a ratchet dog 42 mounted in an opening 43 in the nut. An annular stop bushing 44 disposed within annular nut recess 37 over threads 9, is provided with ratchet teeth 45 cooperating with said dog to provide a yieldable connection, and provided also with oppositely disposed slots 46 into which extend the ends of rod 26, adapting it to serve as an index means, slidable on the threaded shank by collar 36. The bushing has a center mark 47.

The hone stones 48, of suitable abrasive material such as carborundum, are formed with

the outer cutting faces slightly rounded and relieved at the ends which are rounded. Each stone 48 is set into the recess 50 of a shoe 49 having the upper end thereof beveled as at 51, to provide an outwardly facing cam part; pressure-receiving parts in the form of steel pins 52, having the reduced portions 53 thereof welded into openings in the shoe, are beveled at the inwardly facing ends thereof, as at 54, at an angle the same as resiliently advanced plunger cones 19 and 20. The shoes 49 are set into body grooves 15 with the pins 52 extending through and slidably fitting in circular and radial or other guide openings 16 and the bevelled pin ends 54 engaging the cooperating surfaces of plunger cones 19 and 20. The stone shoes 49 are shown as restrained by a collar 55 having an inwardly beveled face 56 engaging over shoe beveled ends 51. A knurled retaining nut or collar 57 screw threaded externally on body intermediate threads 11 carries oppositely disposed plungers 58 set in nut sockets 62 with helical compression springs 61 behind. The plungers 58 have shanks 59 extending through nut openings 63 with the ends provided with retaining collars 60 received in recesses 64. The plungers of the nut are adapted to engage and retain or resiliently to advance the collar 55,—thereby retracting shoes 49.

A retaining collar 65 is provided for retaining for dressing the hone stones comprising a rear wall having a central opening 66 with a countersunk portion 67 and an outer flange 68 inwardly beveled as at 69 and notched as at 70. The collar is positioned and centered by means of plug 71 adapted to screw thread into body bore threads 8, the plug having a flange 72 fitting into collar recess 67 and a short reduced portion 73 fitting within collar opening 66. The plug is screw threaded as at 74 below portion 73 to receive a nut 77 and is further extended as at 75 with the end thereof center holed as at 76.

An adaptor plug 83, provided for the upper hone end, has a threaded portion 78 adapted to screw thread into the upper body bore threads 7 and a flange 79, threaded portion 80 and extension 81 with a center hole 82.

In operation the hone is connected to the drive shaft by a suitable coupling preferably a double universal joint to eliminate slap of the hone in the cylinder bore. Before inserting the hone in the bore, the abrasive stones 48 are contracted by turning and backing off tension nut 28, shifting the cams 33 and relieving the compression of spring 27 against pins 25 and 26. The stop nut 36 is also turned toward the upper hone end, the nut 36 raising bushing 44 the bottoms of slots 46 therein engaging and raising pin 26 with plunger 18 and cones 19 and 20 allowing the pins 52 and stone shoes to be pushed in enough to allow the hone to enter the cylinder bore. After the hone has been inserted in the cylinder bore, the abrasive stones 48 are moved into light engagement with the bore wall by turning tension nut 28 downward with the shallow parts 34 of cams 33 engaging rod 25 which pushes spring 27, rod 26 or equivalent stop means carried by plunger 18, and thereby the cones 19 and 20, downwardly,—the cones engaging against the beveled pin ends forcing the pins, shoes and stones outwardly. The nut or collars 36 is then turned toward the upper hone end enough to engage the lower end of bushing slot 46 lightly against pin 26. The beveled face 56 of collar 55 is engaged with beveled shoe ends 51 by plungers 58 of nut 57 which is turned down to within a sixteenth of an inch of collar 55. Next, the hone is set to cut to the desired depth in thousandths of an inch from the cylinder wall by turning the nut 36 downward or to the left the number of thousandths indicated by spaced marks 39. Translatory or longitudinal advance of pin 26 being thus limited, cutting pressure is applied to the stones 48 by turning cams 33 to the right, the raised portions 35 of the cams forcing pin 25 downward compressing spring 27 against pin 26 and plunger 18 with cones 19 and 20 engaging shoe pins 52.

During the honing operation, the downward thrust of plunger cones 19 and 20 against the beveled pin ends 54 yieldingly forces the stones radially outward as they cut into the cylinder wall. As the shoes 49 expand, the beveled ends 51 thereof force collar 55 upward against plungers 58 and springs 61, allowing expansion of the stones,—to the limit predetermined by adjustment of collar 36.

After completion of the honing operation the stones may be sufficiently contracted and the hone quickly removed from the cylinder bore by turning cams 33 to the left allowing the pin 25 to rise into the shallow cam portions 34 relieving the compression of spring 27.

To dress the hone insuring even cutting of the stones 48 the shoes are contracted on the plunger and secured by collar 55 and nut 57 and the separate dressing plug 71 is threaded into lower body bore threads 8 with the shoulder flange 72 butting against body 5. Retaining collar 65 is applied with the beveled flange faces 69 thereof engaging and clamping the lower shoe ends by means of a retaining nut 77′ threaded on threads 74 the flange notches 70 providing clearance for the stone ends. The hone is now ready to be mounted on a lathe for turning and dressing the outer stone faces with a diamond, the plugs 71 and 83 centering the hone.

I claim:

1. In a lapping tool, the combination of a tubular body, a conical plunger working therein, shoes guided radially on the body and actuated by the plunger to expand the

shoes, a cam collar loosely mounted on the body and having an operating connection to the plunger including a compressible spring, a nut threaded on the body and bearing against the collar to advance the same, and a setable stop collar threaded on the body, the plunger being provided with a projection engageable with said stop collar to limit the advancing movement of the plunger.

2. In a lapping tool, the combination of a tubular threaded body having longitudinal slots and radial guides, expansible shoes movable in said guides, a conical plunger movable within the body to advance said shoes, upper and lower cross pins carried by the plunger and extending thru said slots, the plunger having slots thru which the upper cross pin extends, a cam collar loosely mounted on the body and bearing against the upper cross pin, an adjusting nut screwed on the body and bearing against the collar, a compressible spring between the upper and lower cross pins, and a stop collar screwed on the body in position to be engaged by the lower cross pin.

3. In a lapping tool, the combination of a body, a set of radially expanding shoes carried thereby, means to expand the shoes, and an indicating stop device to limit the expansion of the shoes, said device comprising a collar threaded on the body, a non-rotatable ring loosely carried by the collar and extending around the body and engageable with said means, and a yieldable connection between the ring and the collar.

4. In a lapping tool, the combination with a slotted body, radially expanding shoes carried thereby, a plunger in the body to expand the shoes, the plunger being provided with a cross pin extending thru slots in the body, a stop collar screwed on the body, a ring loosely carried by the collar and extending around the body and having slots into which the ends of the pin project, and a pawl and ratchet connection between the collar and the ring.

5. In a lapping tool of the class described, the combination, with a main body member, of a set of radially expanding shoes carried thereby, means to expand the shoes and an indicating stop device engageable with said means to limit the expansion of the shoes, said last named device comprising a collar rotatable on the main body member, a non-rotatable ring loosely carried by the collar and cooperating therewith, and connection means between the collar and body member whereby rotation of the collar may cause translation of the ring for varying the limit of expansion of the shoes.

6. In a lapping tool of the class described, the combination with a main body member, of radially expanding shoes carried thereby, abrading elements carried by said radially expanding shoes, means for expanding the shoes, an indicating stop device on the body operatively connected with the expanding means to limit movement of the latter, said device comprising a collar threaded on the body and non-rotatable means loosely carried by the collar and extending around the body and means for interlocking the collar and the non-rotatable means.

7. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying stop and pressure applying parts and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; separately adjustable collars on said shank; one of which, regulates the bias applied to said plunger, the other of which limits the movement of said plunger.

8. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying a stop part and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; separately adjustable collars on said shank; one of which engages said stop part to limit the plunger travel, means for biasing said plunger adjustable by the other of said collars, and means on said collar for releasing said bias independently of said adjustment.

9. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying a stop member and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; separately adjustable collars on said shank; one of which is engageable with said stop member for limiting the plunger travel, and means for applying an advancing bias to said plunger adjustable by said other collar.

10. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying a stop member and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; separately adjustable collars on said shank; one of which adjustably applies a pressure to advance said

plunger, the other of which limits said advance by engagement with said stop member.

11. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying a stop member longitudinally movable within said shank and slidably engaging said pressure-receiving parts; a biasing element associated with said plunger; separately adjustable collars on said shank; one of which regulates the bias applied to said plunger, the other of which limits the advance of said plunger by engagement with said stop member.

12. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying stop parts and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; separately adjustable collars on said shank; and means restrained by said collars, resiliently to advance said plunger and variably to predetermine a limit to such advance by engagement with said stop parts,—said shank being externally threaded, and the collar of said limit-predetermining means being rotatable thereon and provided with index means slidable upon said shank.

13. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying stop parts and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; separately adjustable collars on said shank; and means restrained by said collars, resiliently to advance said plunger and variably to predetermine a limit to such advance by engagement with said stop parts,—said shank being externally threaded, and the collar of said limit-predetermining means being rotatable thereon and provided with index means slidable upon said shank and slotted to receive a stop element on said plunger.

14. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying stop parts and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; separately adjustable collars on said shank; and means restrained by said collars, resiliently to advance said plunger and variably to predetermine a limit to such advance by engagement with said stop parts,—said shank being externally threaded and the collar of thread limit predetermining means being correspondingly threaded and provided with a non-rotary stop means for engagement by the mentioned stop parts on said plunger.

15. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying advancing and stop members and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; biasing means between said members; separately adjustable collars on said shank; one of which is engageable with said advancing member, the other of which is engageable with said stop member.

16. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying stop parts and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; separately adjustable collars on said shank; and means restrained by said collars, resiliently to advance said plunger and variably to predetermine a limit to such advance by engagement with said stop parts,—said tubular element including an intermediate portion provided with adjustable resilient means, and said head being provided with a beveled collar, movable by said resilient means, to retract said shoes.

17. In means for perfecting bores: a tubular element including an externally threaded shank provided, near one end thereof, with a cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying a stop part and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; biasing means for said plunger; separately adjustable collars on said shank; one of which regulates said bias, the other of which limits the advance of said plunger, and additional biasing means tending to retract said shoes.

18. In means for perfecting bores: a tubular element including an externally threaded shank provided near one end thereof, with a

cutter head carrying movable shoes and having openings for the guidance of pressure-receiving parts of said shoes; expanding means for said shoes including a plunger carrying a stop part and longitudinally movable within said shank and slidably engaging said pressure-receiving parts; separately adjustable collars on said shank for applying a bias to said plunger and for limiting the plunger's advance through the engagement of said stop part, the ends of said tubular element being interiorly threaded, and means attachable to said end of the tubular member through the medium of said threads for centering said head during a dressing of said shoes.

In testimony whereof, I do affix my signature.

THOMAS F. QUIGLEY.