May 9, 1933. F. J. JESCHKE 1,908,252

GRINDING MECHANISM

Filed Jan. 19, 1928 2 Sheets-Sheet 1

Fig. 1

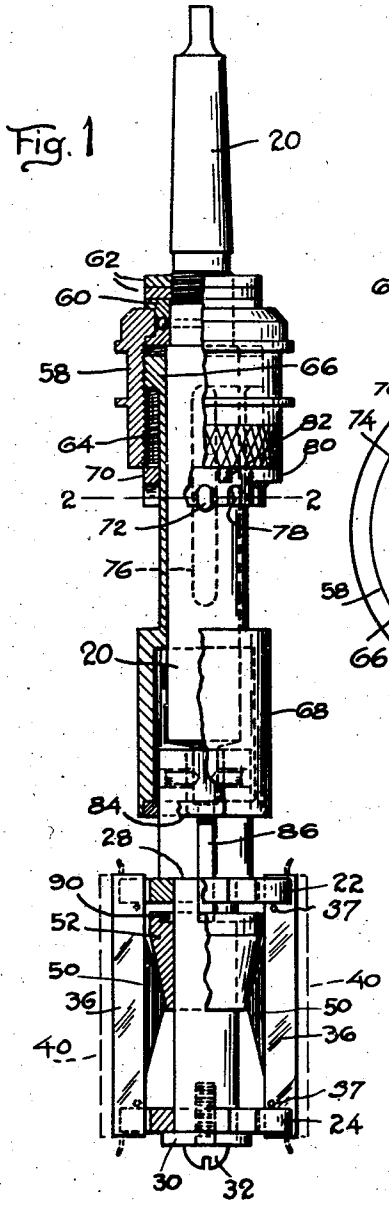


Fig. 7

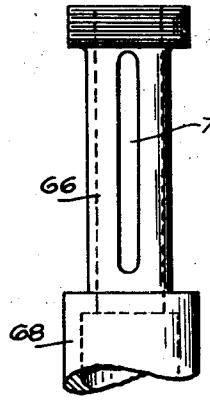
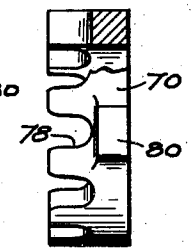


Fig. 8



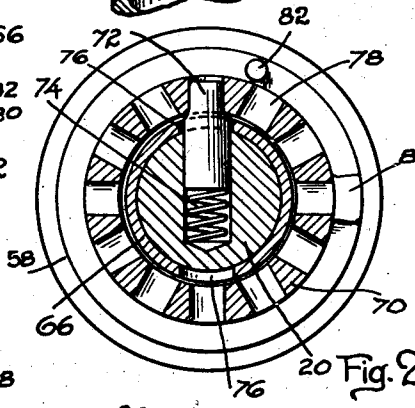


Fig. 2

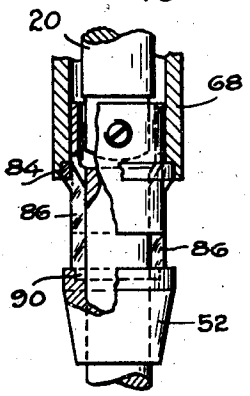


Fig. 9

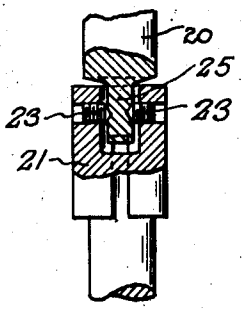


Fig. 10

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GRINDING MECHANISM

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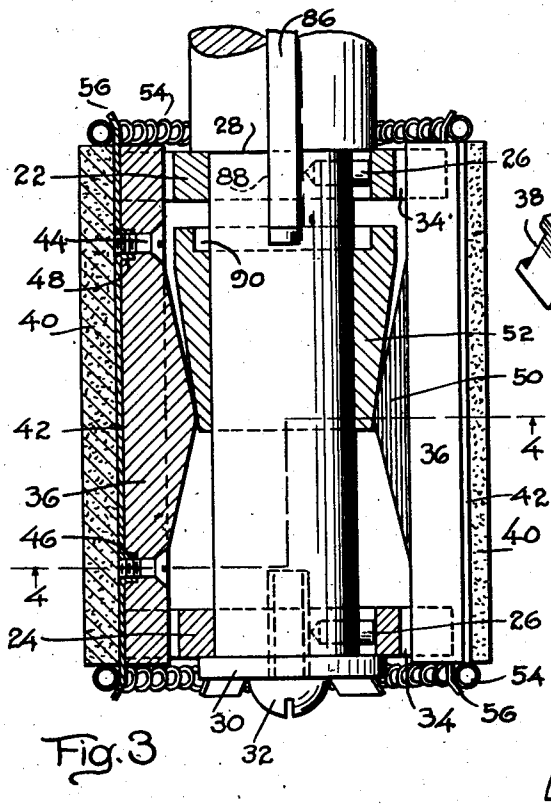

Fig. 3

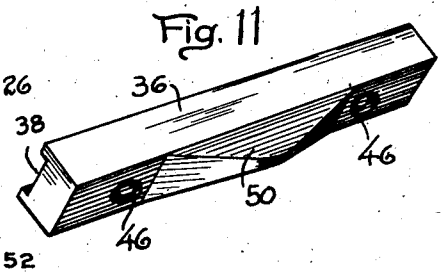

Fig. 11

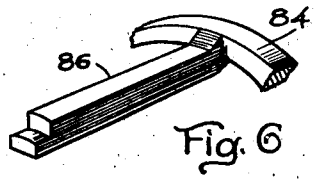

Fig. 6

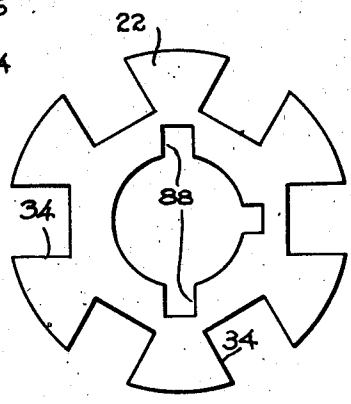

Fig. 5

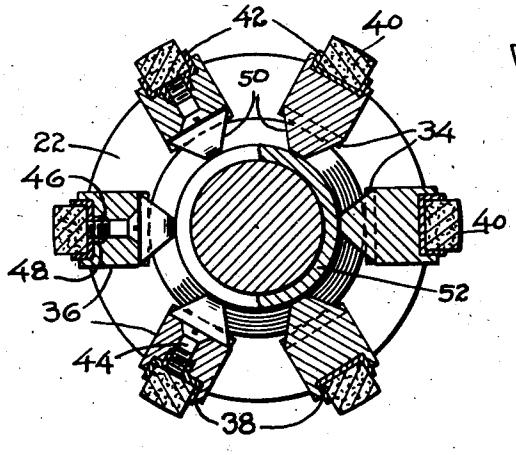

Fig. 4

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Patented May 9, 1933 1,908,252

UNITED STATES PATENT OFFICE

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GRINDING MECHANISM

Application filed January 19, 1928. Serial No. 247,785.

My invention relates to a grinding device adapted to grind a cylindrical passageway such as the bore of a cylinder.

It is intended primarily for use in a production capacity with new jobs, that is, it is not intended to be used as a service tool to true up the bores of worn cylinders but rather to impart a smooth finish and to line up minor inaccuracies of new cylinders through a grinding operation upon the bore which has theretofore been formed; and the construction is such that it may be set to remove a determined amount of material and it will remove such amount measured throughout the length of the bore.

An object is to provide a device of this character wherein, for self alignment with reference to inwardly concave walls of a work unit, the grinding or abrasive elements have a permitted tiltable movement of pressure equalization with respect to a rigid support which determines the relatively fixed grinding diameter thereof, and whereby the grinding tool will not produce out of round conditions at any place in the bore.

A further object is to provide such a grinding device having easily operable adjusting mechanism which can be employed by the operator during the running of the tool to adjust the grinding abrasives within predetermined limits to remove the desired amount of material, said device including parts which can likewise be employed to produce a radial contraction of the abrasives to permit removal of the grinding head from the bore.

An additional meritorious feature pertaining to the adjusting mechanism resides in the provision of means whereby the predetermined extent of adjustment may be varied.

Other objects, advantages and meritorious features of my invention will more fully appear from the following description of the illustrative embodiment shown in the drawings and as defined in the appended claims.

In the drawings:

Fig. 1 is an elevation partly broken away of a device embodying my invention.

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

Fig. 3 is a longitudinal sectional view taken through the grinding head shown in Fig. 1.

Fig. 4 is a horizontal sectional view taken on line 4—4 of Fig. 3.

Fig. 5 is a plan of one of the supports.

Fig. 6 is a fragmentary perspective of a portion of the adjusting mechanism.

Fig. 7 is an elevation of a fragment of an adjusting coupling.

Fig. 8 is an elevation partly broken away of the adjusting ring.

Fig. 9 is an elevation partly broken away of the adjusting mechanism.

Fig. 10 is an elevation partly broken away of the connection between the grinding head and the shank.

Fig. 11 is a perspective of one of the abrasive holders.

My improved device comprises a body which carries a grinding head provided with abrasives which are readily adjustable to vary the grinding diameter and the body has a rotatable and reciprocable drive shank which is indicated as 20. The grinding head is preferably pivoted, as shown in Fig. 10, to this shank wherein the body 21 of the head is secured by pins 23 to an end extension 25 of the shank 20 for swinging movement while held to rotate therewith. I have accordingly referred to the shank as flexibly connected to a spindle 21, and as constituting therewith the "body" of the device.

Supports 22 and 24 are secured upon the body in some suitable manner as by pins 26 to rotate therewith. The support 22 abuts against a shoulder 28 and the support 24 is held in place by a collar 30 and a threaded member 32. These supports are provided with notches 34 which are shown as radial and as adapted to serve as seats for abrasive elements that extend axially of the spindle body and are held by the notches to rotate with the body.

I have shown each abrasive element as comprising a holder 36 having a channel 38 within which is positioned a stone 40. I have shown these stones as provided with channel

metal base plates 42 and screws 44 extend through openings 46 in the holder, engaging in nipples 48, formed in the metal back plates 42 of the stones holding them in place. Each holder is provided with a beveled intermediate portion 50, serving as a cam-engageable central enlargement.

There is a conical support 52 slidably supported upon the body for axial movement thereover which forms the radial support for the abrasive elements and engages their beveled portions 50 so that the axial movement of this conical support serves, in the manner of a central and internal cam wedge, to impart radial adjustment to establish the grinding diameter of the abrasives while permitting a pressure-equalizing tilt thereof.

This tilt is made possible in view of the difference between the slope of the conical support 32 and that of the beveled portion 50 which effects a point or line contact therebetween. This conical support, serving also as a radial expanding element, is connected with adjusting mechanism mounted upon the spindle body above the head to be actuated thereby during the operation of the tool. The abrasives are held radially upon this conical support by single or separate resilient contracting means such as garter springs 54 which engage over lugs 56 on the ends of the abrasives. These abrasives are held against longitudinal movement between the supports 22 and 24, except as is necessary to permit them to tiltably function, by pins 37 which project on opposite sides thereof in proximity to their ends as indicated in Fig. 1.

The illustrated adjustment mechanism comprises a sleeve 58 supported for rotation upon a ball race 60 carried by the body and held in place thereon by nuts 62. This sleeve is internally threaded as at 64 and a tubular part 66 is threaded at one end within the sleeve and terminates at the other end in an enlarged tubular portion 68 surrounding the joint between shank 20 and the spindle body.

The shank 20 carries a pin 72 held outwardly by a spring 74 to project through a slot 76 formed in the part 66 and adapted to engage in the notches 78 formed in a castellated stop ring 70 to hold such ring to rotate with the body while permitting depression of the pin 72 to enable the ring to be rotated to different adjustable positions with respect to the body.

The ring carries a radially projecting lug 80 adapted to engage a pin 82 carried by the sleeve to limit the rotatable adjustment of the sleeve about the body and the adjustment of the ring through depression of the pin 72 permits the variation of this extent of adjustment of the sleeve.

At the lower end of the member 66 there is shown a ring 84 which encircles the body and carries prongs or forks 86 which extend through passageways 88 formed in the upper rigid support 22 and the lower ends of which may seat within an annular groove 90 if such is formed in the upper portion of the conical support 52 so that when the sleeve 58, or a like part of an adjusting head extending over the tubular element 66, is rotated with respect to the body (which may be accomplished during the driving of the device by a direct manual gripping or braking of the rotation of the sleeve as produced by said body) the member 66, including its enlarged portion 68, hereinafter referred to as an intermediate head, travels axially over the body and determines the position of the conical support 52.

In the direction of expansion, the cam wedge 52 is urged positively over the body; but in the movement of contraction the pressure of garter springs or the pressure exerted exteriorly upon the abrasives urges the conical support 52 through the permitted clearance provided by rearward or outward longitudinal travel of the member 66 as produced by rotation of the sleeve.

In the operation of the device the adjusting ring 70 may be set to provide a determined extend of movement before the stop 80 engages the stop 82 which extent of movement measures the amount of excess of material that it is desired to remove from the bore and through the adjustment of the ring as positioned by the pin 72, this distance may be gauged in thousandths of an inch as desired.

The sleeve 58 is initially adjusted to permit the abrasives to contract to the minimum diameter for insertion of the grinding head into the bore and rotation of the sleeve during the operation of the tool projects these abrasives outwardly until they reach the maximum diameter as determined by the engagement of the stops 80 and 82.

I claim:

1. A grinding device having a body provided with axially spaced apart supports and an axially adjustable wedge-shaped support arranged between the spaced apart supports, a plurality of abrasive elements tiltably supported radially upon said wedge shaped support and engaged with the spaced apart supports to rotate with the body, said wedge shaped support so engaged with the abrasive elements that axial adjustment thereof varies the grinding diameter of the abrasive elements and means for axially adjusting said support.

2. A grinding device having a body provided with a pair of end supports and an intermediate support positioned therebetween, a plurality of abrasives engaged with the end supports to rotate with the body and tiltably mounted upon the intermediate support to be held to a relatively fixed grinding diameter thereby and to be expanded upon relative axial advancement thereof, said in-

termediate support being axially adjustable with respect to the abrasives to vary their grinding diameter.

3. A grinding device having a body provided with three axially spaced apart supports for abrasives, abrasives carried thereupon and engaged with the end supports to rotate with the body and held by the intermediate support to a relatively fixed grinding diameter, said abrasives being tiltable upon said intermediate support within limits established by the end supports.

4. A grinding device having a body provided with three axially spaced apart supports for abrasives, abrasives carried thereupon and engaged with the end supports to rotate with the body and held by the intermediate support to a relatively fixed grinding diameter, said abrasives being individually automatically tiltable upon said intermediate support upon pressure applied thereto within limits established by the end supports, said intermediate support being axially adjustable to vary the grinding diameter of the abrasives.

5. A grinding device having a body provided with a pair of spaced apart supports having correspondingly arranged seats for abrasives, a plurality of abrasives arranged on said seats to rotate with the body, a third support positioned between said spaced apart supports and axially adjustable therebetween with respect to the body, said third support engaged with the abrasives to hold them at a relatively fixed grinding diameter and adapted upon its axial adjustment to vary said diameter and means for adjusting said third support, said abrasives being so mounted upon said third support as to tilt individually thereon.

6. A grinding device having a shank provided at one end with a body comprising a pair of fixed spaced apart supports having correspondingly arranged seats for abrasives, a third support slidably mounted upon the body for axial adjustment thereover between the fixed supports, a plurality of abrasives supported radially upon said adjustable third support to a relatively fixed grinding diameter and mounted within the seats of the fixed supports to rotate with the body, and means holding said abrasives radially upon the third support, said means yieldable to permit tiltable movement of the abrasives upon said third support.

7. A grinding device comprising a body, a cone support mounted thereon for adjustable axial travel thereover, a pair of fixed supports arranged thereon beyond the ends of the cone support and provided with correspondingly circumferentially arranged notches, a plurality of abrasives arranged within said notches to rotate with the body, each abrasive having a beveled intermediate portion seated upon the cone support to determine the radial grinding position of the abrasive while permitting tiltable movement thereof upon the cone support as limited by the notches in the fixed supports, resilient means holding said abrasives yieldably upon said cone support, means engaging the cone support to move it axially over the body to vary the grinding diameter of the abrasives.

8. A grinding device comprising, in combination, a body, a conical support carried thereby and axially adjustable thereover, a pair of rigid supports on the body beyond the ends of the conical support, a plurality of abrasives having intermediate beveled portions seated upon the conical support for radial movement thereby to determine their grinding diameter and engaged with the rigid supports to rotate with the body and tiltable upon the conical support, said body provided with a relatively rotatably supported member disposed above the rigid supports and coupled with the movable support to axially adjust the same.

9. A grinding device comprising, in combination, a body, a conical support carried thereby and adjustable axially thereof, rigid supports on the body, a plurality of abrasives having intermediate beveled portions seated upon the conical support for radial movement thereby to determine their grinding diameter, said abrasives engaged with the rigid supports to rotate with the body and mounted loosely therein to tilt upon the conical support as limited by said rigid supports, an adjusting sleeve relatively rotatably supported upon the body above the rigid supports, and means connecting the sleeve with the conical support to advance it axially upon rotation of the sleeve in a given direction relative to the body.

10. A grinding device comprising, in combination, a body, rigid supports on the body, a movable support carried by the body and axially adjustable thereover, a plurality of abrasives having intermediate beveled portions seated upon the movable support for tiltable radial support thereby to determine their grinding diameter and engaged with the rigid supports to rotate with the body, said body provided with a relatively rotatably supported sleeve, means threadedly engaging the sleeve to be axially actuated thereby upon rotation of the sleeve over the body and coupled with the movable support to determine its relative axial position on the body, and mechanism adjustably operable to determine the extent of such axial adjustment.

11. A grinding device comprising, in combination, a body, a conical support carried thereby and axially adjustable thereover, a plurality of abrasives carried by the body to rotate therewith having intermediate beveled portions seated upon the conical support for radial support thereby to determine their

grinding diameter, said body provided with a relatively rotatably supported sleeve, means threadedly engaging the sleeve and coupled with the conical support to determine its relative axial position on the body, said sleeve and body provided with cooperating stops adapted to limit the adjustable rotation of the sleeve which stops are themselves relatively adjustable to vary said permitted rotatable adjustment of the sleeve.

12. A grinding device comprising a body having an axially movable conical support at one end and a pair of rigid supports on the body beyond the ends of the movable support, a plurality of abrasives having intermediate beveled portions seated upon the conical support for radial support thereby to determine their grinding diameter and engaged with the rigid supports to rotate with the body, an adjustable sleeve rotatably supported upon the body and spaced above the rigid supports, a part surrounding the body and threadedly connected with the sleeve to be axially advanced over the body upon rotation of the sleeve, said part coupled with the conical support to determine its axial position upon the body, a second part supported upon the body and releasably locked thereto to rotate therewith, said part having a portion operable to engage a portion on the sleeve to determine the extent of rotatable adjustment of the sleeve with respect to the body, said second part being itself relatively rotatably adjustable with respect to the body to vary the permitted rotatable adjustment of the sleeve.

13. A grinding device comprising, in combination: a body provided with a plurality of radially adjustable abrasives and with a slidable cam wedge so engaging said abrasive elements as to permit self-alignment thereof; means operable to vary the radial adjustment of the abrasives, said means including a manipulable sleeve rotatably supported for adjustment relatively to said body and also means coupling said sleeve with said wedge to translate the adjustable rotation of the sleeve into radial adjustment of the abrasives; and means adjustable with respect to the body adapted to limit the permitted rotatable adjustment of said sleeve.

14. A grinding device comprising, in combination: a body provided with a plurality of radially adjustable abrasives and with a slidable cam wedge so engaging said abrasive elements as to permit self-alignment thereof; means operable to vary the radial adjustment of the abrasives, said means including a manipulable sleeve rotatably supported for adjustment relatively to said body and also means connecting said wedge with the sleeve for adjustment thereby upon adjustable rotation of the sleeve,—a part carried by the body being adapted to limit the rotatable adjustment of said sleeve and said part being itself adjustable to vary the permitted adjustment of said sleeve.

15. A grinding device comprising, in combination: a body provided with a plurality of radially adjustable abrasives; means operable to vary the radial adjustment of the abrasives while permitting a self-alignment thereof by tilting said means including a manipulable sleeve rotatably supported for adjustment upon the body, and a ring encircling the body and having a part adapted to determine the permitted adjustable rotation of the sleeve,—said ring being itself rotatably adjustable to vary the permitted adjustable rotation of the sleeve.

16. A grinding device comprising, in combination: a body provided with grinding elements tiltably mounted and radially adjustable to vary their grinding diameter; means including a wedge longitudinally slidable on the body, operable to vary the radial adjustment of said elements while permitting a tilting thereof,—said means comprising a sleeve adjustably rotatable upon the body, means connecting said sleeve with said wedge to vary the grinding diameter of said elements upon adjustable rotation of the sleeve; and a stop to limit the adjustable rotation of the sleeve,—said stop being adjustable upon the body to vary the adjustable rotation of the sleeve.

17. A grinding device comprising, in combination, a body provided with grinding elements adjustable to vary their grinding diameter, means carried by the body operable to vary the radial adjustment of said elements while permitting a tilting thereof,—said means comprising also a sleeve adjustably rotatable upon the body, means connecting said sleeve with said wedge to vary the grinding diameter of said elements upon adjustable rotation of the sleeve; a ring carried by the body provided with a stop adapted to limit the adjustable rotation of the sleeve, said ring being adjustably and rotatably supported upon the body to vary the position of said stop whereby the permitted adjustable rotation of the sleeve is varied; and a spring-urged latch normally holding said ring at its adjusted position.

18. A grinding device comprising, in combination: a rotatable and reciprocable drive shank; a tubular part longitudinally adjustable thereon; a spindle flexibly coupled with said shank; a grinding head, on said spindle, provided with radially expansible abrasive elements supported to permit a pressure-equalizing tilting self-alignment thereof; internal wedge means axially slidable relatively to said spindle and so engaging said abrasive elements as to permit said tilting adjustment thereof; and means coupling said tubular part with said wedge means.

19. A grinding device comprising: a rotatable drive shank element; a spindle ele-

ment rotatable by said shank element; a grinding head provided with abrading elements movable radially of said spindle, cam means slidable longitudinally of said spindle for expanding said abrading elements; a tubular element movable longitudinally of one of said rotatable elements; adjusting means including a threaded part extending over said tubular element for effecting a longitudinal movement thereof relatively to said rotatable element; and means engaging said tubular part and extending within said head for transmitting a motion of adjustment to said cam means during rotation of said shank.

20. A grinding device comprising: a rotatable drive shank element; a spindle element rotatable by said shank element; a grinding head provided with abrading elements movable radially of said spindle, cam means slidable longitudinally of said spindle for expanding said abrading elements; a tubular element movable longitudinally of one of said rotatable elements; adjusting means including a threaded part extending over said tubular element for effecting a longitudinal movement thereof relatively to said rotatable element; and means engaging said tubular part and extending within said head for transmitting a motion of adjustment to said cam means during rotation of said shank,—said threaded part being disposed for a direct manual gripping thereof, during such rotation.

21. A grinding device comprising: a rotatable drive shank element; a spindle element rotatable by said shank element; a grinding head provided with abrading elements movable radially of said spindle and with cam means slidable longitudinally of said spindle for expanding said abrading element; a tubular element movable longitudinally of one of said rotatable elements; adjusting means including a threaded part extending over said tubular element for effecting a longitudinal movement thereof relatively to said rotatable element; and means engaging said tubular part and extending within said head for transmitting a motion of adjustment to said cam means during rotation of said shaft,—said threaded part being provided with means for adjustably predetermining a limit of movement thereof.

22. A grinding device comprising: a drive shank carrying an adjusting head; a spindle having a flexible connection with said shank and carrying an expansible grinding head which includes a slidable cam element and abrasive elements radially movable thereby; an intermediate head; and means for transmitting longitudinal movement between said adjusting head and said intermediate head, and between said intermediate head and said cam element respectively.

23. A honing tool including, in combination, an adjustable head and a plurality of abrading elements provided with adjacent sloping surfaces, a support for said elements and a member provided with a conical surface for actuating said elements radially through the engagement between said sloping surface and said conical portion, said surfaces sloping at different relative angles to provide a point engagement therebetween.

24. A honing tool including, in combination, an adjustable head and a plurality of abrading elements having adjacent sloping surfaces, a support for said elements, and a member provided with sloping surfaces for actuating said elements radially through the engagement between said beveled surfaces and said sloping surfaces, said surfaces sloping at different relative angles to provide a line engagement therebetween.

25. A honing tool including, in combination, an adjustable head and a plurality of abrading elements having adjacent beveled surfaces, a support for said elements, a member provided with a conical surface for actuating said elements radially through the engagement between said bevel surface and said conical surface, said surfaces sloping at different relative angles to provide a point engagement therebetween, the relative slope being such that a force applied to the abrading elements is incapable of moving the conical member longitudinally of the tool.

26. A honing tool including, in combination, a plurality of abrading elements, slotted means for retaining said elements in predetermined relation on said tool, means for expanding said elements relative to said tool, biasing means for actuating said expanding means and a member having a plurality of fingers extending through said slotted means for transferring a force from said biasing means to said expanding means.

27. A honing tool including, in combination, a plurality of abrading elements, slotted means for retaining said elements in predetermined relation to each other, a support for said slotted means, means slidable on said support for expanding said elements, biasing means for actuating said expanding means and a member exterior of said support provided with a plurality of fingers which are interposed between said biasing means and said expanding means when extending through said slotted means.

In testimony whereof, I, FRANK J. JESCHKE, sign this specification.

FRANK J. JESCHKE.

CERTIFICATE OF CORRECTION.

Patent No. 1,908,252. May 9, 1933.

FRANK J. JESCHKE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, line 74, for "readily" read "readially"; page 4, line 98, claim 17, after the syllable "bination" strike out the comma and insert a colon; line 99, after "elements" insert the words "tiltably mounted and radially"; and line 100, for ", means carried by the body" read "; means including a wedge longitudinally slidable on the body,"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of July, A. D. 1933.

M. J. Moore.

Acting Commissioner of Patents.

(Seal)