April 12, 1927. 1,624,635

P. L. STARR

CYLINDER GRINDING TOOL

Filed Oct. 24, 1923 2 Sheets-Sheet 1

Fig. 1.

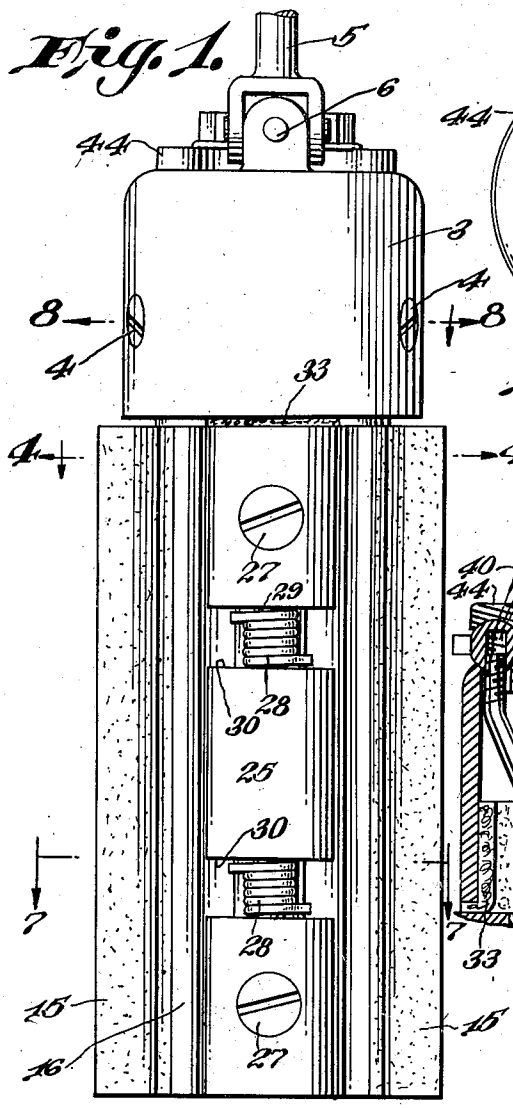


Fig. 9.

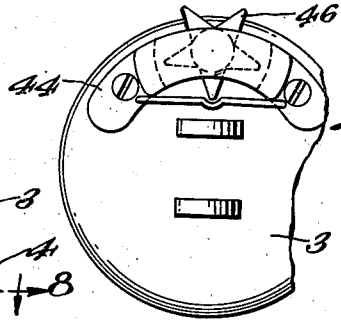


Fig. 3.

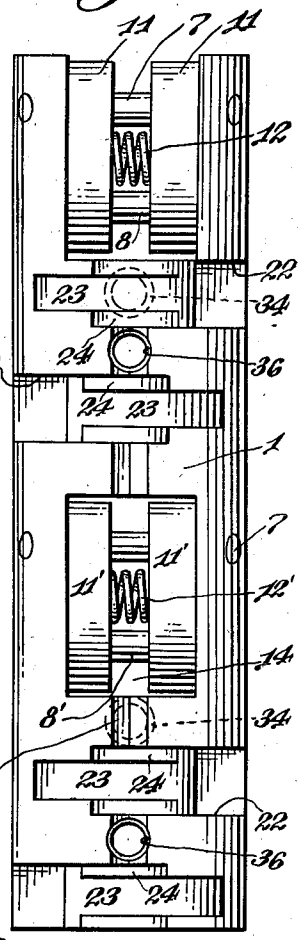


Fig. 10.

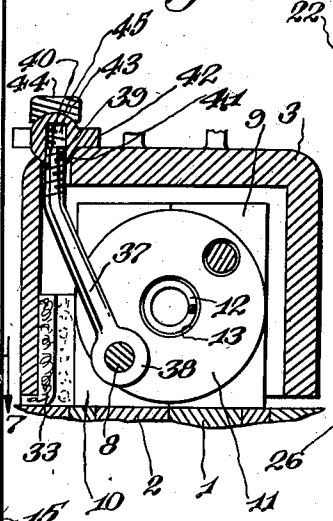


Fig. 8.

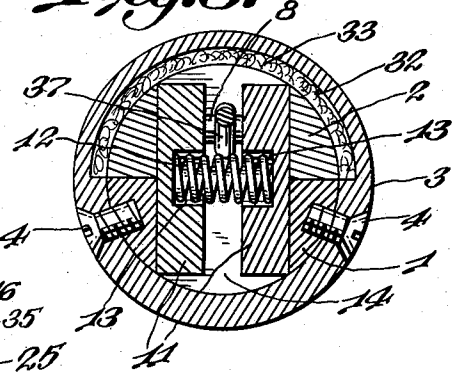
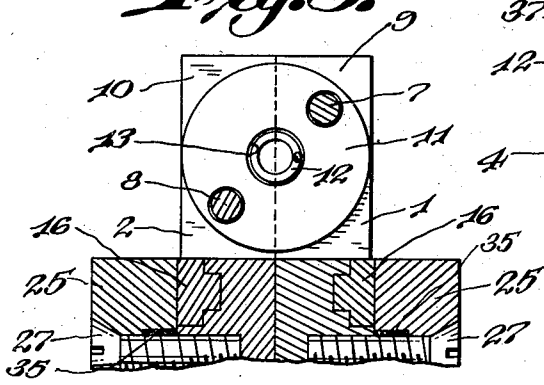


Fig. 5.



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CYLINDER GRINDING TOOL

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Fig. 2.

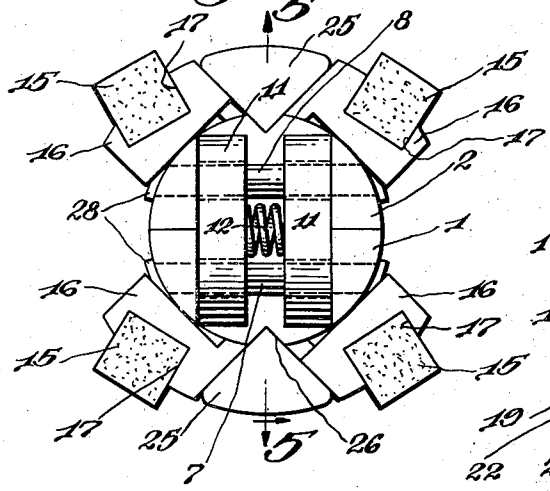


Fig. 4.

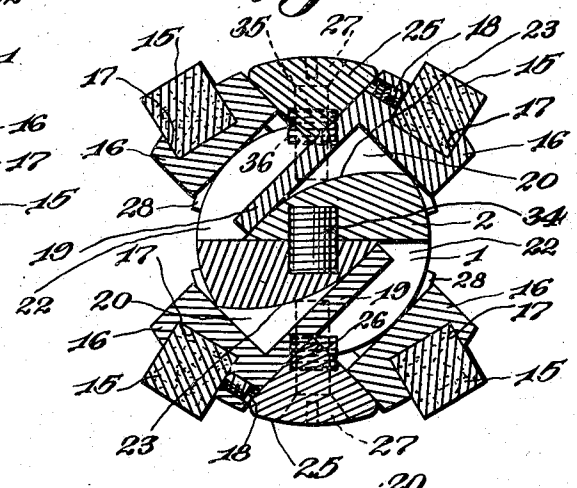


Fig. 11.

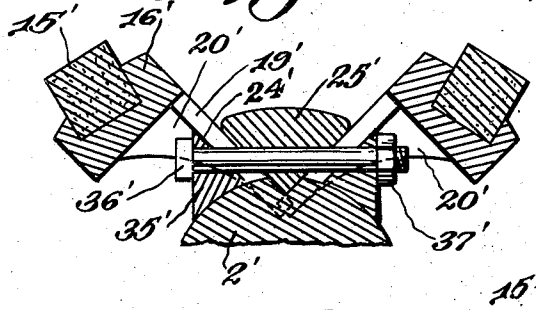


Fig. 6.

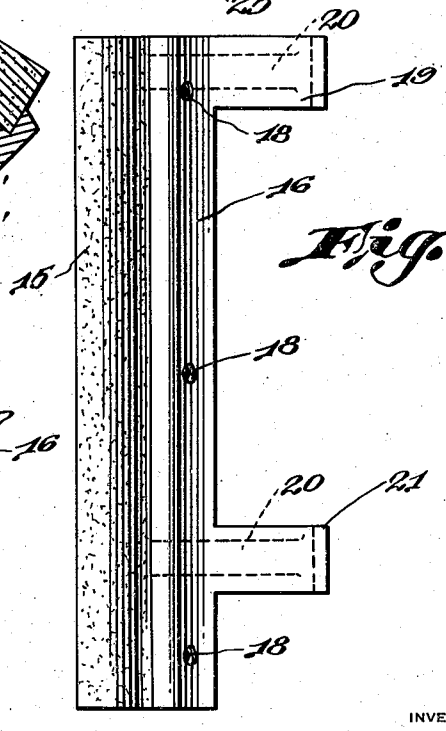
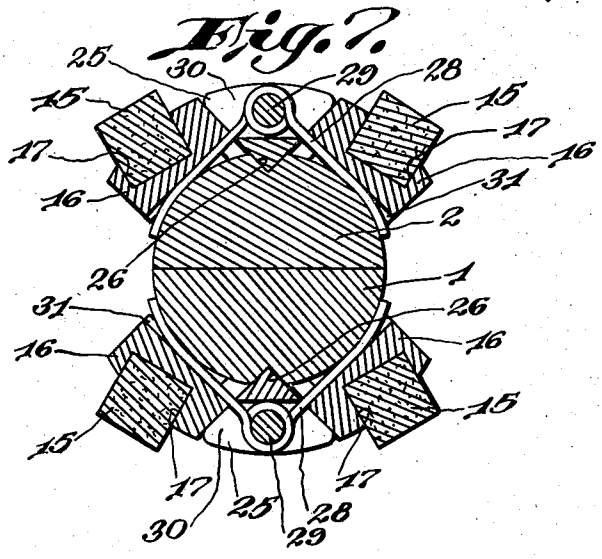


Fig. 7.



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Perl Lee Starr

Patented Apr. 12, 1927. 1,624,635

UNITED STATES PATENT OFFICE.

PERL LEE STARR, OF CHICAGO, ILLINOIS.

CYLINDER-GRINDING TOOL.

Application filed October 24, 1923. Serial No. 670,441.

This invention relates to new and useful improvements in grinding tools and more particularly to grinding tools which are especially adapted for use in grinding motor vehicle cylinders and other cylindrical surfaces of this type. The main object of my invention is the provision of a cylinder grinding tool wherein the grinding elements are supported for adjustment so that they may be readily positioned for contact with the inner surfaces of a motor vehicle cylinder or other surfaces of this character.

Another object of my invention is the provision of a grinding tool wherein the grinding elements are mounted in such a manner as to be quickly and readily adjusted radially with respect to the support so that the grinding members during their revolution will describe circles of various sizes so as to be readily fitted into motor vehicle cylinders of various size bores.

A still further object of my invention is the provision of a grinding tool, including separable sections carrying grinding elements and including means whereby the sections may be urged apart upon an angle with respect to each other, and includes additional means for normally urging the grinding elements into contact with the interior surface of a motor vehicle cylinder so that during the grinding away of the surface of the cylinder, the grinding elements will continue to move away from each other upon an angle so as to carry out a varied grinding movement over the interior of the cylinder surface.

A still further object of my invention is the provision of a grinding tool wherein the grinding elements are so mounted with respect to each other that during their grinding operation they will always describe a perfect circle; thus when applied for the purpose of grinding motor vehicle cylinders their grinding action will produce a perfectly cylindrical bore.

A still further object of my invention is the provision of a grinding tool, including supporting members for the grinding elements whereby said grinding elements may be simultaneously adjusted with respect to the supporting members so that the grinding elements will at all times describe a perfect circle during the revolution of the supporting members.

A still further object of my invention is the provision of a grinding tool whereby the grinding elements are mounted upon a rotary support in such a manner as to not only be adjusted simultaneously, but independently adjusted to compensate for the wear upon the various grinding elements in case one of said grinding elements should have a tendency to wear away its grinding surface considerably faster than the remaining grinding elements whereby all of the grinding elements may be normally maintained in contact with the interior of the surface being operated upon.

With the above and other objects in view the invention consists in the novel features of construction, the combination and arrangement of parts hereinafter more fully set forth, pointed out in the claims and shown in the accompanying drawings in which:

Fig. 1, is a side elevation of a grinding tool constructed in accordance with my invention.

Fig. 2, is a top plan view with portions of the device removed therefrom.

Fig. 3, is a side elevation of the supporting member, the grinding elements being removed.

Fig. 4, is a transverse sectional view taken on line 4—4 of Fig. 1.

Fig. 5, is a detail sectional view taken on line 5—5 of Fig. 2.

Fig. 6, is a side elevation of one of the grinding elements and its support.

Fig. 7, is a transverse sectional view taken on line 7—7 of Fig. 1.

Fig. 8, is a transverse section taken on line 8—8 of Fig 1.

Fig. 9, is a detail top plan view.

Fig. 10, is a detail vertical sectional view through the cap member, and

Fig. 11, is a detail sectional view of a modified form, illustrating the manner of supporting the grinding elements in an extended position.

In carrying out my invention I provide a sectional supporting member which includes the sections 1 and 2. These sections 1 and 2 have one end fittted into a cap 3 which is connected to the section 1 by means of screws 4, although it will be apparent that any similar type of fastening means may be used to form the connection between the cap 3 and the section 1. The cap 3 is attached to the driving shaft 5 through the medium of a universal joint 6 whereby the grinding tool supported by the cap 3

may be readily positioned at various angles with respect to the driving shaft 5.

In view of the above, it will be noted that the section 1 is secured to the cap 3 against movement with respect to the cap, but the section 2 is free for movement with respect to the cap and the section 1 and in order to connect the two sections so that the sections may be readily moved at various angles with respect to each other, suitable connecting pins 7 and 8 are provided, the pins 7 extending transversely across the recessed portion 9, formed in the section 1 at one end. The pins 8 extend transversely across the recess 10, formed in one end of the section 2 as illustrated in Fig. 5. The pins 7 and 8 are disposed in a common plane at an oblique angle to the axis of the tool, and loosely mounted upon these pins are the disks 11 which are disposed upon the opposite sides of the recessed portions 9 and 10 to form a parallel ruler connection between the two sections whereby during the movement of said sections it will have a tendency to move them away from each other or toward each other at an oblique angle. These two disks 11 are normally maintained in a frictional contact with the sections 1 and 2 by means of the coil spring 12 which is disposed between the disks with its ends fitting into central recesses 13 formed in the disks to prevent lateral movement on the part of the spring.

From this it will be apparent that the operation of the spring 12 will tend to normally maintain the disks 11 into tight engagement with the sections 1 and 2 to eliminate lateral play on the part of the sections with respect to each other.

The sections 1 and 2 are provided adjacent to the central portions thereof with transversely aligned openings in which the disks 11′ are positioned, said disks being loosely mounted upon the transverse pins 7′ and 8′ which are carried by the sections 1 and 2 respectively and extend transversely through the openings 14 and through the disks 11′, said pins being disposed upon opposite sides of the center of the disks and arranged in a plane at an angle with respect to the axis of the tool or in the same position as described for pins 7 and 8 whereby the movement of said sections with respect to each other will be on an oblique line. The disks 11′ are retained in frictional contact with the side walls of opening 14 so as to securely eliminate any lateral play on the part of sections 1 and 2 by means of the coil spring 12′. It will be apparent that disks 11′ co-operate with the disks 11 in eliminating the lateral movement of the sections.

The grinding elements 15 are supported by means of longitudinal bars 16 which are concave or recessed as at 17 to receive the grinding elements 15. The grinding elements 15 are retained against movement within the recesses 17 through the medium of the set screws 18 which extend through one wall of the recesses and contact with one face of the grinding elements. The bars 16 which support the grinding elements are each provided at one end with an arm 19 which extends at substantially right angles with respect to the bars 16 and is provided upon its inner face with a supporting web or bracket 20. The bars 16 are additionally provided with supporting arms 21 arranged in spaced relation with the arms 19 and preferably disposed at a point adjacent to the other end of the bar as clearly illustrated in Fig. 6. These arms 21 are also provided with the supporting webs or brackets 20 which are disposed within the angle between the arms and the supporting bars.

In order to mount the grinding element supports in their respective positions upon the supporting members, each of the sections 1 and 2 is provided with spaced recessed portions 22, arranged in pairs at remote points on the outer faces of the sections. These recesses 22 are further provided with a central recessed portion 23, forming bearing shoulders 24 which are disposed upon opposite sides of the recesses 23.

From the above it will be apparent that in placing the grinding elements in position with respect to the sections 1 and 2 so that the ends of the grinding elements will all be disposed upon the same horizontal plane, the arms 19 of certain of the supporting bars 16 will be disposed in one of the uppermost recesses in each of the sections, while the arms 21 will be disposed in the uppermost recesses of the pair of recesses at one end of the section. Other of the supporting bars will have their positions reversed so that the supporting arms 19 will be fitted into the lowermost recesses with the arms 21 fitting into the lowermost recesses of the upper pair of recesses. This arrangement of fitting the arms of the bars 16 into the recesses will bring all of the ends of the grinding elements 15 into the same horizontal plane. In fitting the arms 19 and 21 into the recesses formed in the sections 1 and 2, it will be apparent that the arms will ride over the spaced bearing shoulders 24 and the web or supporting brackets 20 will be fitted into the recessed portions 23. From this it will be apparent that the grinding elements may be adjusted toward and away from the sections 1 and 2 by moving the arms 19 and 21 into and out of the recesses formed in the sections and be supported in their proper relative positions by having the arms contacting with the bearing shoulders 24.

In order to retain the arms 19 and 21 into a tight fitting engagement with the bearing shoulders 24, suitable clamping

means is provided for retaining the arms 19 and 21 in various adjusted positions with respect to the sections 1 and 2, said clamping means comprising V shaped bars 25 which are positioned between the bars 16 so that the faces of the clamping bars 25 upon opposite sides of the apex thereof will engage the opposing supports for the grinding elements.

Attention is directed to the fact that the clamping bars 25 have a flat engaging contact with the sides of the bars 16 upon which the arms 19 and 21 are formed so that the engaging surfaces of the bars 25 will be brought into direct contact with the arms 19 and 21 so as to positively force them into a secure bearing engagement with the shoulders 24; thus retaining the bars 6 in various adjusted positions with respect to the sections upon which they are mounted. The apexes of the bars 25 are fitted into V shaped grooves 26 formed in the outer surfaces of the sections 1 and 2, and in order to retain the clamping bars 25 in their operative positions, fastening screws 27 are provided which extend through the clamping bars 25 and engage with the body portions of the sections 1 and 2. From this arrangement it will be apparent that when it is desired to adjust the grinding elements 15, with respect to the sections 1 and 2, the fastening screws 27 are loosened so as to permit outward movement on the part of the clamping bars 25 which will release the supporting members of the grinding elements and permit them to be adjusted readily with respect to the sections 1 and 2. As soon as the supports for the grinding elements are released through the medium of the clamping bars 25, they are urged outwardly by means of the springs 28, the ends of which engage with the inner faces of the bars 16, while the intermediate portions are wound upon suitable pins 29 which are fitted within the recesses 30 formed at spaced intervals within the bars 25, said pins extending transversely across the recesses with the ends of the spring extending in opposite directions at each side of the recesses and projecting into the grooves 31 upon the inner faces of the bars 16 whereby to permit the bars 16 to be brought into direct contact with the exterior surface of the sections 1 and 2.

Attention is directed to the fact that when the securing bars 25 are loosened through the medium of the screws 27, the tension of the ends of the springs 28 will urge the grinding element supports in a radial direction away from sections 1 and 2 and the grinding elements may be readily adjusted in various positions through the movements of the securing bars 25. It will also be apparent that upon loosening the securing bars 25 the proper distance, the spring members 23 will urge all of the grinding elements 15 into direct contact with the inner surfaces of the cylinder and the contact of the grinding elements with the cylindrical wall of the cylinder will bring the body portion of the tool in a central position with respect to the cylindrical wall of the cylinder whereby all of the grinding elements will be maintained in direct contact with the walls of the cylinder during the grinding operation.

Attention is directed to the fact that one side of the cap member 3 is cut away to form an annular recess 32 to accommodate the movement of the section 2 with respect to the section 1 and arranged within this recess 32 is a suitable compressible packing 33 which will readily permit the section 2 to be adjusted within the recess 32, and at the same time prevent any of the loosened particles from the grinding elements or wall of the cylinder from entering the cap.

When the grining tool is positioned within a cylinder or other cylindrical article, the two sections 1 and 2 are brought tightly together as shown in Fig. 7 and may be maintained in this position in any suitable manner while being inserted within the cylinder, and after being correctly positioned within the cylinder they may be released to permit the grinding elements 15 to come in direct contact with the inner wall of the cylinder. In order to urge the sections 1 and 2 away from each other, suitable coil springs 34 are provided, said coil springs having their ends fitted into opposing recesses, formed in the inner faces of the sections 1 and 2 whereby upon releasing the sections the tensions of the springs 34 will urge the sections away from each other, and in view of the fact that these sections are connected through the diagonally arranged pins 7, 8, 7′ and 8′ the sections will have a tendency to be moved at an oblique angle with respect to each other, and during the grinding of the interior surface of the cylinder the same movement will be continued throughout the grinding operation whereby the grinding elements which are carried by one of the sections will have moved longitudinally with respect to the grinding elements carried by the other section, so that a continuous varied grinding action will be produced which will eliminate any grooving or unevenness upon the inner surface of the cylinder.

In all of the cylinder grinding tools in use at the present time, as far as I know, the grinding elements are so arranged that grinding action upon the inner face of the cylinder is carried out in a horizontal plane, thus causing in a great many instances the grooving of the surface of a cylinder particularly due to the type of grinding stones which are used, and it is the main object of my invention to provide a grinding tool which will eliminate any grooving or unevenness

in the grinding movement so that a perfectly smooth and even surface will be provided with the particular grinding action set forth above in the description of my tool.

I wish to also direct attention to the fact that the longitudinal grooves which are formed in the bars 16 are positioned at a slight angle with respect to the main portion of the bars whereby the grinding stones or elements 15 may be interchanged and also reversed in accordance to their position within the grooves in the bars 16 to compensate for any unevenness of the stones during the grinding action, and from this construction it will be apparent that the major portion of the stones may be utilized for carrying out the grinding action.

In order to loosen the bars 16 from their wedging position between the grinding element supports, suitable coil springs 35 are fitted into suitable recesses 36, formed at the bottom of the grooves 26 and have a tendency to urge the bars 25 outwardly when the screws 27 are loosened.

The sections 1 and 2 are brought into close abutting relation as shown in Fig. 8 and retained in this position through suitable means, carried by the cap 3 and connected to one of the sections, said means also being utilized to impart movement to the sections to move them at various angles to each other. This means includes a rod 37, the inner end of which is provided with a collar 38 to embrace the pin 8 carried by the section 2 as clearly shown in Fig. 10. The upper end of the rod 37 is threaded as at 39 and extends into an opening 40 in the top of the cap 3.

The top of the cap 3 surrounding the opening 40 is formed with a seat 41 upon which is normally seated the oval shaped cap or nut 42, said nut having a threaded bore 43 to receive the upper threaded end of the rod 37 whereby turning movement of the nut 42 will impart movement to the rod for moving the sections 1 and 2 toward or away from each other.

The nut 42 is retained in a normally seated position by means of a retaining strap 44, the ends of which are secured to the cap 3 upon opposite sides of the nut 42 and its intermediate portion provided with a concave recess 45 to receive the upper portion of the nut. From this it will be apparent that the nut 42 while being normally maintained upon its seat will be free to rotate to adjust the rod 37. To facilitate the turning of the nut, radially projecting points 46 are formed on the nut and the nut so positioned with respect to the cap 3 that the points may project beyond the side wall of the cap to be readily engaged for turning the nut.

It is usually the case in worn cylinders, which are in need of regrinding, that the bore of the cylinder is larger at the top than at the bottom and in placing the tool within the cylinder, the grinding elements are adjusted for grinding contact with the smaller portion of the bore and as soon as this is ground off and further grinding is required, the sections may be moved away from each other on an angle by having the operator engage their finger with the points 46 of the nut and impart a slight turn to the nut which will impart a movement of the sections through the medium of the rod 37, the movement of the sections away from each other throughout their length being assured by the coil springs 34. From this it will be apparent that the uneven wall of the bore of a cylinder may be ground off until it presents a true cylindrical surface throughout the length of the cylinder. The nut 42 may be readily adjusted during the rotary movement of the tool as the points 46 of the nut extend beyond the side wall of the cap 3 so that they may be readily engaged by the finger of the operator to properly adjust the sections and the grinding elements carried thereby.

In Fig. 11 I have illustrated a slightly modified form of the invention wherein I provided suitable supporting members for the arms 19′ and 21′ so that the grinding elements 15′ may be readily adjusted to the farthest extent and the arms 19′ and 21′ be readily supported for retaining the grinding elements in direct contact with the inner surfaces of the cylinder. This supporting means comprises substantially triangular shaped bars 35′, having one side thereof concave to conform to the contour of the outer surfaces of the sections 1′ and 2′, the other side of each of said bars being provided with spaced recesses to receive portions of the web members 20′ whereby the arms 19′ and 21′ will be brought into direct bearing contact with one face of the bars to support them in their proper relative positions with respect to the sections 1′ and 2. In order to retain the bars 35′ in contact with the outer surface of the sections 1′ and 2′ and with the arms 19′ and 21′, securing bolts 36′ are extended through portions of the bars 35′ and are provided with nuts 37′ to clamp the bars 35′ between the heads of the bolts and the nuts. In adjusting the bars 16 radially with respect to the sections 1′ and 2′, should they be adjusted outwardly to a certain distance, there will not be sufficient bearing surface on the shoulders 24 to support the bars 16 in their proper relative positions, and it is therefore the object of providing the bars 35′ to support the arms 19′ and 21′ in their extended positions. Through this arrangement the grinding elements may be adjusted radially with respect to the sections 1′ and 2′ so that they may be readily

brought in contact with the largest sized bore of the ordinary motor cylinder in use at the present time.

What I claim is:

1. A grinding tool comprising independent sections, means connecting the sections to compel a relatively axial movement thereof during any movement of the sections toward and from each other, a cap fitting one end of the sections, means for connecting one of the sections to the cap, abrading elements carried by and projecting outwardly beyond the sections, and means whereby the cap may be connected to a driving element for simultaneously rotating the sections without interfering with their relative movement.

2. A grinding tool comprising independent sections, means connecting the sections to compel a relatively axial movement thereof during any movement of the sections toward and from each other, and means to compel a relative movement of the sections from each other with incidental axial movement.

3. A grinding tool comprising independent sections, means connecting the sections to compel a relatively axial movement therefor during any movement of the sections toward and from each other, said means including adjacent pins on the respective sections disposed on a plane at an angle to both the horizontal and vertical planes of the sections and rigid connectors engaging said pins, a cap to which one of the sections is secured and in which the other of said sections is mounted for relative movement, and a member connected to one of said pins and movable through the cap, the relative longitudinal movement of said member compelling a relative movement of the sections.

4. A grinding tool comprising independent sections, means connecting the sections to compel a relatively axial movement therefor during any movement of the sections toward and from each other, abrading element carrying bars removably seated in recesses formed in the sections, and clamping bars adjustable relative to the sections and adapted to engage and hold adjacent abrading element carrying bars in fixed relation to the sections.

5. A grinding tool comprising independent sections, means connecting the sections to compel a relatively axial movement therefor during any movement of the sections toward and from each other, abrading element carrying bars removably seated in recesses formed in the sections, clamping bars adjustable relative to the sections and adapted to engage and hold adjacent abrading element carrying bars in fixed relation to the sections, and springs carried by the clamping bars to engage and operate the element carrying bars when permitted by the adjustment of the clamping bars.

6. A grinding tool comprising independent semi-circular sections, connecting means between the sections comprising a pin projecting from each section, the said pins being arranged in a plane at an oblique angle to the axis of the tool, a rigid connector loosely engaging said pins to thereby compel a relative axial movement of the sections during any tendency of the sections to move toward or from each other, a cap receiving the ends of the sections and connected to one while free of connection with the other, a rod connected to the pin projecting from the free section, said rod extending through the cap and threaded, and a nut engaging the threaded end of the rod beyond the cap, whereby the sections may be set in a predetermined spaced relation at will.

7. A grinding tool comprising independent sections, means connecting the sections to compel a relatively axial movement therefor during any movement of the sections toward and from each other, the outer surface of each section being formed with a recess and with a reduced channel at each end of the recess, the recesses of one section being horizontally offset with the recesses of the other section, abrading element carrying members having lateral bars to seat in said recesses and engage in the channels, the bars of the members being so disposed relative to the ends of the members that with the members reversed in the channels of the respective sections the terminals of the members will be aligned horizontally of the sections, and a single means for clamping the members of any one section in place.

8. A grinding tool comprising independent sections, means connecting the sections to compel a relatively axial movement therefor during any movement of the sections toward and from each other, each of the sections being formed with recesses opening through the outer surface thereof, members adapted to be seated in said recesses, clamping bars adapted to bear against relatively adjacent surfaces of the members secured in the recesses of one section, means for securing the clamping bars to the sections to permit said bars to be adjusted relative to the sections, and springs carried by the clamping bars to engage said members to cause the members to follow the adjusted movement of the clamping bars, and abrading elements carried by the members.

9. A grinding tool comprising independent sections, means connecting the sections to compel a relatively axial movement therefor during any movement of the sections toward and from each other, each of the sections being formed with recesses opening through the outer surface, abrading element carrying members adapted to bear on

the outer surface of the sections, said members having projecting portions to seat in said recesses, a clamping bar adjustable relative to each section and adapted to engage and hold a plurality of members in fixed relation to the sections, and springs carried by the clamping bars and underlying said members to compel a movement of the members from the section when permitted by the adjustment of the clamping bar.

In witness whereof, I hereunto subscribe my name this 22nd day of October A. D., 1923.

PERL LEE STARR.