April 18, 1933. J. SUNNEN 1,904,336

HONING DEVICE

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Fig. 1.

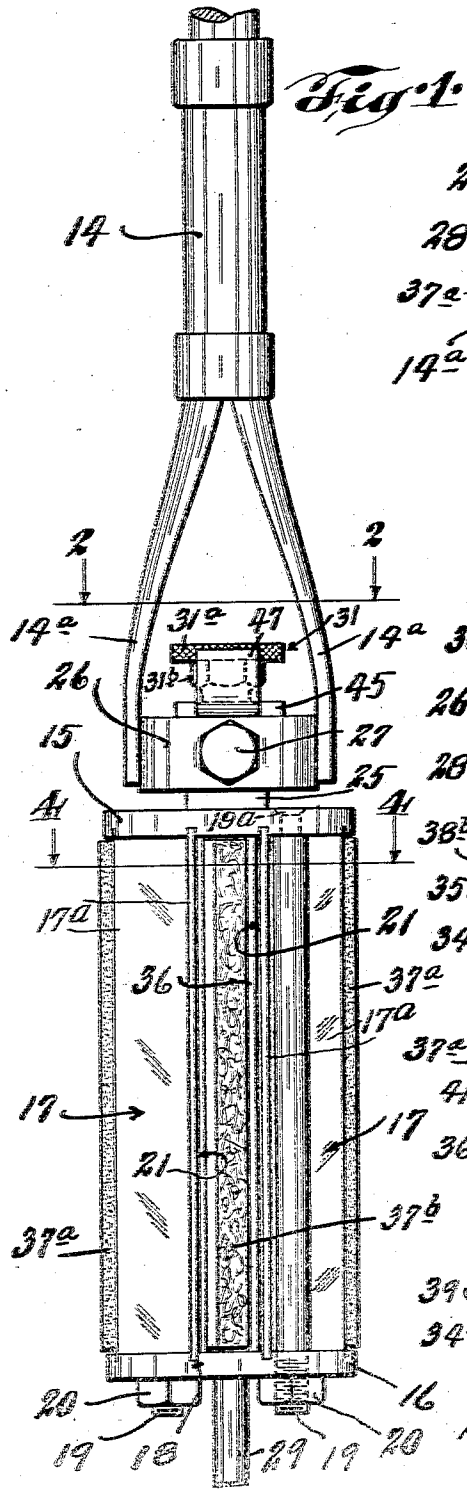


Fig. 2.

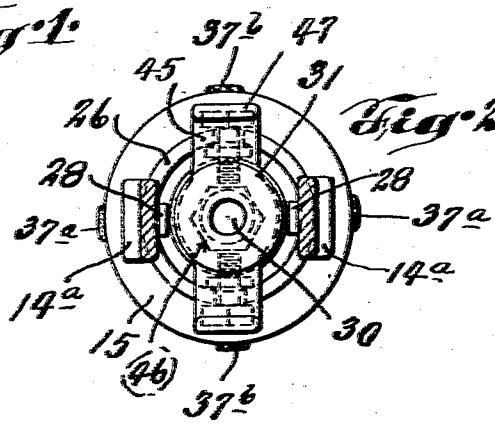
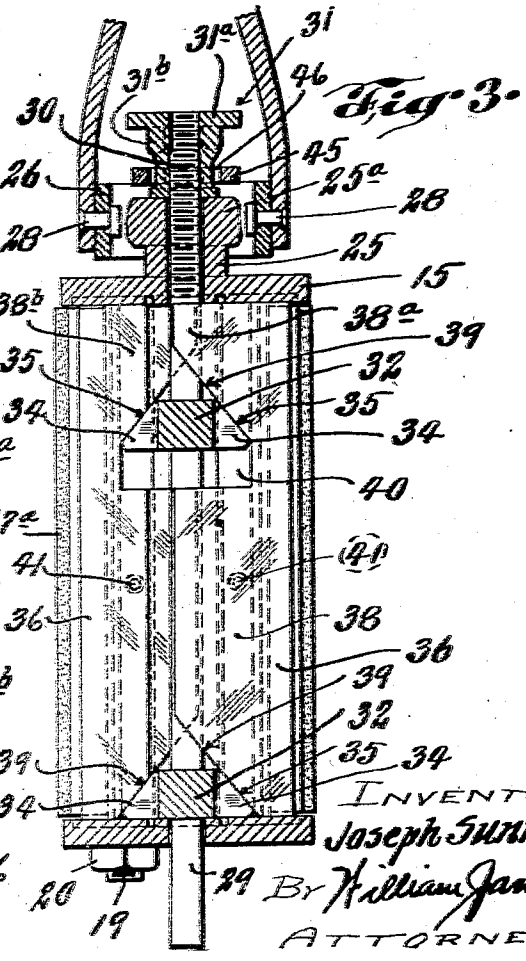


Fig. 3.



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Fig. 4.

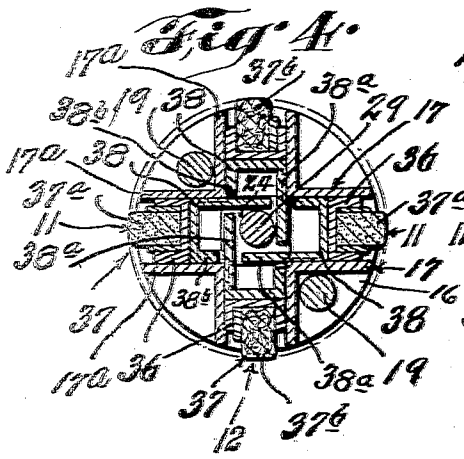


Fig. 5.

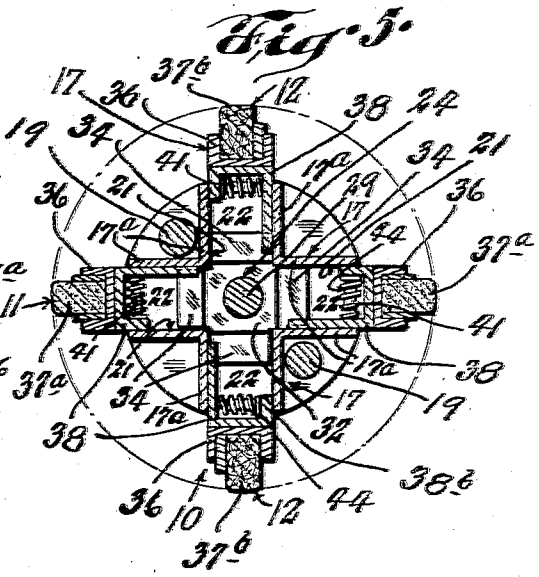


Fig. 6.

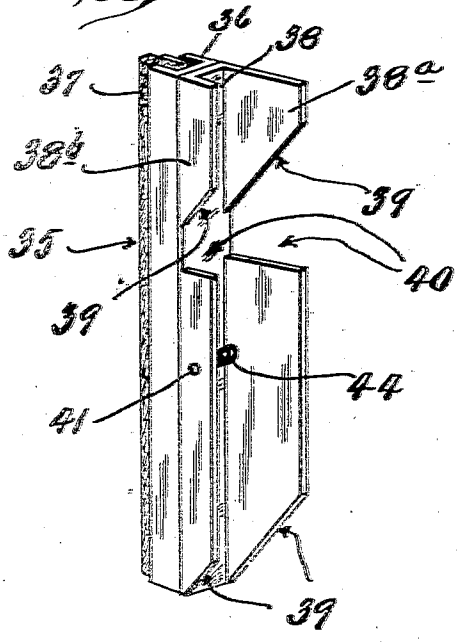
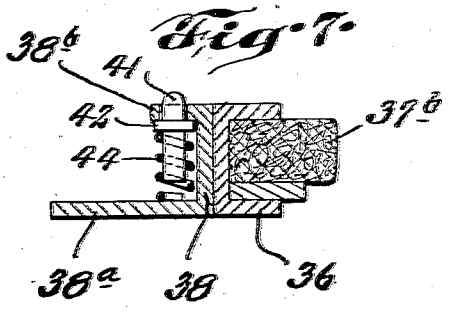


Fig. 7.



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UNITED STATES PATENT OFFICE

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HONING DEVICE

Application filed September 2, 1930. Serial No. 479,188.

This invention relates to new and useful improvements in honing devices or cylinder grinders of the type employing a plurality of cylinder engaging elements or sticks which are radially movable into expanded or contracted positions.

One of the objects of the present invention is to provide a honing device or cylinder grinder of the class described so constructed as to permit the contraction of said elements within a comparatively small diameter in order to enable the use of the device in cylinders of small sizes.

Other objects of the invention are to provide a honing device or cylinder grinder having a carrier in which is axially arranged an adjusting member movable longitudinally and having a plurality of mounts carrying cylinder engaging elements, each of said mounts having an inwardly extending cam portion engaging said adjusting member and movable thereby radially into expanded position, the cam portion of each mount being arranged to one side of said adjusting member to enable said cam when in retracted position to move past said adjusting member, thereby permitting the cylinder engaging elements to be contracted within a comparatively small radius.

Further objects of the invention are to provide a carrier for honing devices of the class described, said carrier comprising end members and angularly shaped longitudinal members or spacers secured to said end members in properly spaced relation to provide radially disposed peripherally opening pockets for receiving the radially movable cylinder engaging elements.

In the drawings—

Figure 1 is a side elevational view of my improved honing device with the operating spindle broken away.

Figure 2 is a horizontal cross section taken on line 2—2 of Figure 1.

Figure 3 is a vertical cross section through the honing device.

Figure 4 is a horizontal cross section taken on line 4—4 of Figure 1 and showing the radially movable elements in contracted position.

Figure 5 is a similar view but showing the radially movable elements in expanded positions.

Figure 6 is a perspective detail view of one of the radially movable elements or mounts.

Figure 7 is an enlarged detail cross section through one of the mounts.

The type of honing device to which my invention appertains contains expansible sticks or elements for engaging the cylinder surface for honing or refininishing purposes. This type of device is particularly useful for operating upon cylinders of internal combustion engines, pumps, compressors, and the like. The present invention is especially adapted for use in cylinders of comparatively small diameters, the device being so constructed as to permit the contraction of the elements or mounts within a comparatively small radius.

Referring by numerals to the accompanying drawings, 10 indicates the carrier member, 11 the abrasive sticks or elements, 12 the non-abrasive sticks or cylinder engaging elements, and 14 the spindle of the honing device.

The carrier 10 consists of an upper end member 15, lower end member 16, and longitudinally disposed members 17. As shown herein, the end members 15 and 16 are circular in shape and are provided in their opposed or inner faces with grooves or seats 18 for receiving the corresponding ends of members 17. The latter are preferably formed of right angle shaped members having flanges 17*a*, the apices of the angle being spaced suitable distances from the axis of the carrier.

Tie bolts 19 have their upper ends 19*a* countersunk or otherwise seated in the upper end member 15 and extend downwardly below the apertures formed in the lower end member 16. The lower projecting ends of said bolts 19 are screw-threaded and receive nuts 20 by means of which the end members are drawn together against the ends of angle members 17, thereby tying said parts together.

The inner faces 21 of each flange 17*a* are

vertically disposed parallel with the opposed faces of the adjacent angle members, thereby providing vertically disposed outwardly opening slots or pockets 22, the top and bottom of which are formed by end members 15 and 16, respectively. The spacing of the apices of the angle members from the axis of the carrier provides a central chamber 24 with which all of said slots 22 communicate.

The upper end member 15 is provided with an axial extension 25 which projects upwardly a suitable distance and terminates in an annular flange 25*a*. A ring 26 encloses and is spaced from said flange and is pivotally secured thereto by a pair of screws 27 which are arranged at diametrically opposed points and are screw-seated in flange 25*a*. The lower end of shank 14 is bifurcated as indicated at 14*a* and said bifurcated ends are pivotally connected by pins 28 to ring 26 at diametrically opposed points and at right angle to bolts 27. Thus a flexible connection is provided between the carrier and the shank so that said parts can occupy slight angular positions relatively to each other.

A rod 29 extends axially through the carrier, members 15 and 16 being provided with axial apertures for this purpose. The upper end of this rod is provided with a screw thread, as indicated at 30, and extends upwardly above the flanged end 25*a* of extention 25. A manually adjustable screw 31 is screw-threaded on the threaded end 30 and is adapted when actuated to impart longitudinal movement to rod 29.

Rod 29 has fixed thereon at points intermediate said end members 15 and 16 a pair of blocks 32 which are spaced from each other. Each of said blocks is provided with a radially extending projection 34, the upper face of which is inclined upwardly and inwardly, as indicated at 35. The number of projections 34 corresponds to the number of pockets 22 and said projections extend a suitable distance thereinto and each is substantially of the same width as the width of the pocket, thereby serving to hold the rod against rotative movement.

Each pocket or slot 22 receives a mount 35. The width and the length of each mount are substantially the same as the width and length of the corresponding pocket so that said mounts are free to move radially in said pockets but are held in proper operative positions.

The outer end of each mount is provided with an outwardly presented longitudinally disposed channel member 36 into which is received a stick or cylinder engaging element 37. This stick, which may be either of abrasive material, such as at 37*a*, or non-abrasive material, such as at 37*b*, is securely fixed in the channel and projects a suitable distance outwardly therefrom. The rear end of each mount is also channel shape as indicated at 38, the channel in this instance being presented inwardly. One of the side walls 38*a* of the channel is extended rearwardly a suitable distance beyond the other side wall 38*b*, so that when the mounts occupy maximum extended positions said side wall remains in operative engagement with the corresponding portions of the blocks 32.

This operating engagement is effected by forming side walls 38*a* and 38*b* with upwardly and inwardly inclined faces 39, the angle of inclination of each face being equivalent to the angle of inclination of the faces 35 of projections 34. These inclined faces are formed by cutting out or notching portions of said walls as indicated at 40 and by cutting the lower ends of said side walls.

Side walls 38*a* and 38*b* are disposed to each side of the center of the mount and the width between said side walls is greater than the diameter of rod 29 so that the deep side wall or flange 38*a* operates in a vertical plane disposed to one side of said rod. The other side wall 38*b* is comparatively shallow so that when the mount is in retracted or innermost position, said side wall terminates short of the side wall 38*a* of the adjacent mount, which latter side wall operates, in the present instance, in a vertical plane disposed at right angles to the vertical plane of said side wall 38*b*, as shown in Figures 4 and 5. This particular disposal of the side walls with respect to each other and with respect to rod 29 permits the contraction of mounts 35 within a comparatively small diameter, thereby enabling the use of the honing device in cylinders of small diameters.

In order to prevent displacement of the mounts when they occupy expanded positions, such as shown in Figure 5, in which position the shallow side wall 38*b* has comparatively small surface contact with the corresponding wall 21 of the body member 17, a spring-pressed friction member 41 is provided in said side wall 38*b* for engaging face 21. In the present instance, this friction member consists of a plunger extending through an aperture formed in each wall 38*b*. This plunger is provided adjacent to the inner side of flange 38*b* with a collar 42 against which bears one end of a coiled spring 44, the other end of which bears against the inner side of flange 38*a*. Thus collar 42 provides a bearing for the spring and also limits the outward movement of plunger 41. When the mount occupies position within the pocket, plunger 41 is depressed, thereby compressing spring 42 and increasing friction engagement between the side wall 38*b* and the corresponding wall 21 of member 17. However, other forms of springs or friction members can be used to hold the mount against accidental displacement.

The knurled portion 31*a* of screw 31 is of

comparatively small diameter on account of the bifurcated ends 14*a*. In order to facilitate manipulation of member 31 and expand the mounts 35 with greater ease, a wrench 45 is provided. This wrench is formed with a central opening 46 which is non-circular and is adapted to engage the non-circular portion 31*b* of member 31 when said wrench is moved into raised position. Integral extensions 47 provide suitable handles for operating the wrench. When the wrench is disengaged the non-circular opening thereof is moved away from the non-circular portion 31*b* and said wrench is free to rotate on member 31. The handles 47 are of greater length than the span between the bifurcated ends 14*a*. Therefore, in using the wrench in combination with member 31, only a partial rotative movement can be obtained and the wrench has to be dropped and disengaged from member 31 at the end of each operation and moved in opposite direction while disengaged from said member. In other words, member 31 is used for quick adjustment where little pressure is required, and wrench 45 is used when more power is required to expand the mounts. Members 27 and 28 in combination with ring 26 provide a flexible joint between operating spindle and the carrier and are so arranged as to bring this flexible connection in close proximity to the carrier.

I claim:

1. A honing device comprising a revoluble carrier provided in its periphery with a plurality of spaced radially and vertically disposed pockets intersecting each other to form a central chamber, a rod extending axially through said chamber, a block fixed on said rod and provided with a plurality of radial projections extending into said pockets, each of said projections having an upwardly and inwardly inclined face, a mount movably arranged in each pocket, the forward end of each mount being provided with a longitudinally and vertically disposed channel for receiving a cylinder engaging element, the rear end of each mount having a pair of spaced parallel walls slidably engaging the walls of the respective pocket, the walls of said mount being provided with inclined portions for engaging corresponding faces of said projections whereby said mounts can be moved radially into expanded positions when said rod and block are moved longitudinally in one direction.

2. A honing device comprising a revoluble carrier, provided with a plurality of spaced radially and vertically disposed pockets intersecting each other to form a central chamber within said carrier, a rod disposed axially in said carrier and slidably mounted in the ends thereof, a block fixed on said rod and provided with a plurality of radial projections extending into said pockets, each of said projections being formed with an upwardly and inwardly inclined face, a mount movably arranged in each pocket and having its forward end provided with a seat for receiving a cylinder engaging element and having its rear end formed with a pair of spaced parallel walls slidably engaging the opposed walls of the respective pocket, the walls of said mount being provided with inclined faces for engagement with the inclined face of the respective radial projection whereby said mounts can be moved outwardly by the longitudinal movement of said rod and said block in one direction, the rearwardly extending walls of each mount being spaced from each other to clear said rod when said mounts occupy retracted positions, one of said walls being shorter than the other to permit inward movement of the longer wall beyond the edge of the shorter wall of the adjacent mount.

3. A honing device comprising a revoluble carrier provided with a plurality of spaced radially and vertically disposed pockets intersecting each other to form a central chamber within said carrier, a rod disposed axially in said carrier and slidably mounted in the ends thereof, a block fixed on said rod and provided with a plurality of radial projections extending into said pockets, each of said projections being formed with an upwardly and inwardly inclined face, a mount movably arranged in each pocket and having its forward end provided with a seat for receiving a cylinder engaging element and having its rear end formed with a pair of spaced parallel walls slidably engaging the opposed walls of the respective pocket, the walls of said mount being provided with inclined faces for engagement with the inclined face of the respective radial projection whereby said mounts can be moved outwardly by the longitudinal movement of said rod and said block in one direction, the rearwardly extending walls of said mount being spaced from each other to clear said rod when said mounts occupy retracted positions, one of said walls being shorter than the other to permit inward movement of the longer wall beyond the edge of the shorter wall of the adjacent mount, and tensioned means slidably interengaging one of the walls of each mount with said carrier to prevent accidental displacement of said mount.

4. A honing device comprising a revoluble carrier provided with a plurality of spaced radially and vertically disposed pockets intersecting each other to form a central chamber within said carrier, a rod disposed axially in said carrier and slidably mounted in the ends thereof, a block fixed on said rod and provided with a plurality of radial projections thereof, a block fixed on said rod and projections being formed with an upwardly and inwardly inclined face, a mount movably arranged in each pocket and having its forward end provided with a seat for receiving a cyl-

inder engaging element and having its rear end formed with a pair of spaced parallel walls slidably engaging the opposed walls of the respective pocket, the walls of each mount being provided with inclined faces for engagement with the inclined face of said radial projection whereby said mounts can be moved outwardly by the longitudinal movement of said rod and said block in one direction, the rearwardly extending walls of each mount being spaced from each other to clear said rod when said mount occupies retracted position, one of said walls being shorter than the other to permit inward movement of the longer wall beyond the edge of the shorter wall of the adjacent mount, and a spring-pressed member arranged in each mount and resiliently and slidably engaging said carrier to increase the friction therebetween and prevent accidental displacement of the mount.

5. A honing device comprising in combination a revoluble carrier having radially and vertically disposed outwardly opening pockets, a rod extending axially and slidably through said carrier, a block fixed on said rod and provided with radial projections extending into said pockets, each projection being provided with an upwardly and inwardly inclined face, stick carrying mounts disposed slidably in said pockets and movable into expanded and retracted positions, the rear portion of each mount being provided with parallel spaced faces slidably engaging the walls of said pocket for maintaining said mount in proper position, each of said mounts being provided with an extension having an upwardly and inwardly inclined face operatively engaging the inclined face of the corresponding projection whereby the longitudinal movement of said rod and said block in one direction causes outward movement of said mounts, said extension being arranged to one side of said mount to clear said rod and permit extreme inward movement of said mount and the inward movement of said extension tangentially of said rod.

6. A honing device comprising in combination a revoluble carrier provided with a plurality of longitudinally and radially disposed slots, the inner ends of which form a central chamber, a rod extending axially through said carrier and slidable longitudinally therein, a stick carrying mount slidably arranged in each slot and movable radially therein into expanded and retracted positions, a block fixed on said rod and having a plurality of radially and upwardly and inwardly inclined faces, an inward extension on each mount having an inclined face engaging the corresponding inclined face of said block whereby the longitudinal movement of said rod and said block causes outward movement of said mounts, each of said inward projections being arranged to one side of the mount to permit the disposition of said extension tangentially of said rod when said mount occupies retracted position.

7. A honing device comprising in combination a revoluble carrier provided with a plurality of longitudinally and radially disposed slots, the inner ends of which form a central chamber, a rod extending axially through said carrier and slidable longitudinally therein, a stick carrying mount slidably arranged in each slot and movable radially therein into expanded and retracted positions, a block fixed on said rod and having a plurality of radially and upwardly and inwardly inclined faces, an inward extension on each mount having an inclined face engaging the corresponding inclined face of said block whereby the longitudinal movement of said rod and said block causes outward movement of said mounts, each of said inward projections being arranged to one side of the mount to permit the disposition of said extension tangentially of said rod when said mount occupies retracted position, and manually operable means for engaging one end of said rod for adjusting said rod longitudinally.

8. In a honing device of the class described, a stick carrying mount having parallel vertical sides adapted to have slidable contact with the walls of a suitable carrier, the forward end of said mount being provided with a longitudinally disposed channel for receiving a suitable cylinder engaging stick, said mount being provided with a rearward extension having an upwardly and inwardly inclined face, said rearward extension being disposed to one side of the center of said mount.

9. In a honing device, the combination with a revoluble carrier and a longitudinally movable member axially arranged therein, said movable member having an upwardly and inwardly inclined face, of a mount slidably and radially mounted in said carrier and provided at its inner end with a cylinder engaging element, said mount having parallel side walls engaging said carrier and forming bearing surfaces for said mount, one of said walls having a rearward extension provided with an upwardly and inwardly inclined edge for engagement with the inclined face of said longitudinally movable member.

10. A cylinder grinder comprising a carrier having longitudinally disposed and radially intersecting channels, an abrasive receiving member mounted in each of said channels, a rod extending through said carrier on the longitudinal axis thereof, a wedge block on said rod and having an inclined face extending into each of said channels for engagement with the receiving member therein, a wedge cooperating element extending inwardly from each of said members for engagement with the corresponding wedge face, and means for moving said wedge block along its

longitudinal axis to effect adjustment of said abrasive receiving members.

11. A cylinder grinder comprising a carrier having longitudinally disposed and radially intersecting channels, an abrasive receiving member mounted in each of said channels, a rod extending through said carrier on the longitudinal axis thereof, a wedge block on said rod and having an inclined face extending into each of said channels for engagement with the receiving member therein, a wedge cooperating element extending inwardly from each of said members for engagement with the corresponding wedge face, said wedge cooperating elements adapted to be nested in overlapping relation around said rod, and means for moving said wedge block along its longitudinal axis to effect radial extension of the abrasive receiving members.

12. In a cylinder grinder, an abrasive receiving mount, said mount having longitudinally extending side walls adapted for sliding contact with the walls of a suitable carrier and forming an outwardly presented channel for an abrasive stick, and an inwardly extending flange having a wedge receiving notch with an inclined wedge-cooperating surface.

13. In a cylinder grinder, the combination with a suitable carrier having an outwardly presented longitudinally extending channel, an abrasive receiving mount adapted to be slidably disposed in said channel, an abrasive stick in said mount, said mount having an inwardly extending flange provided with a wedge receiving notch, a wedge supported in the carrier and disposed in said notch, said notch having a wedge-cooperating surface, and means for actuating the wedge to effect radial extension of the mount, while confined in said channel.

In testimony whereof I hereunto affix my signature this 29th day of August, 1930.

JOSEPH SUNNEN.