June 15, 1937. L. BURKHALTER 2,083,685

GRINDING OR POLISHING DEVICE

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FIG. 1.

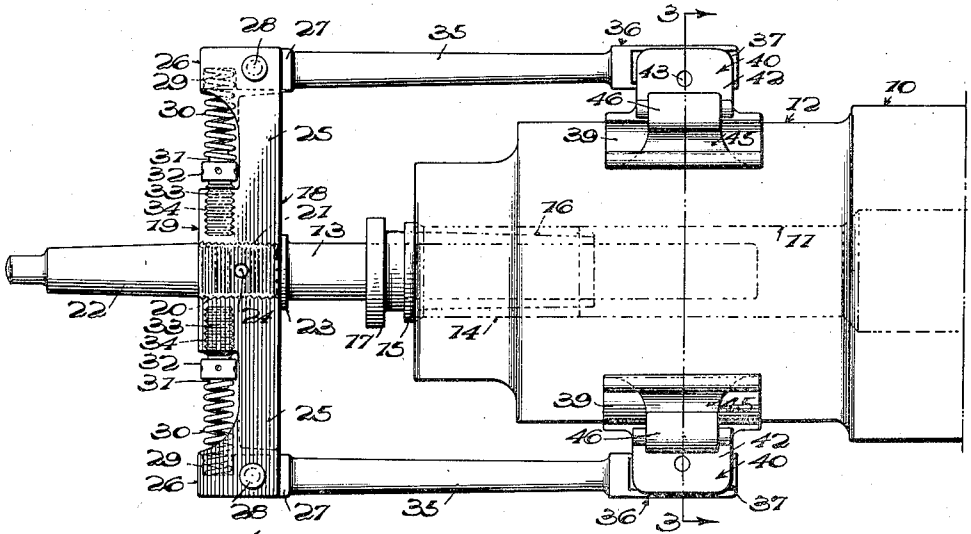


FIG. 2.

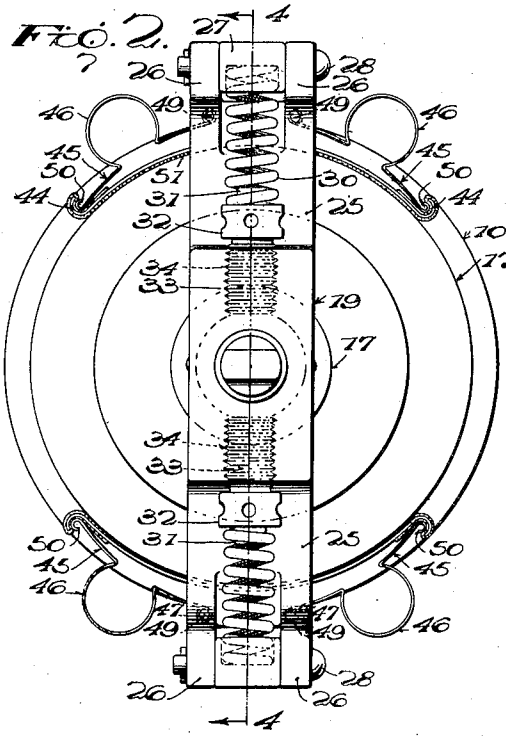
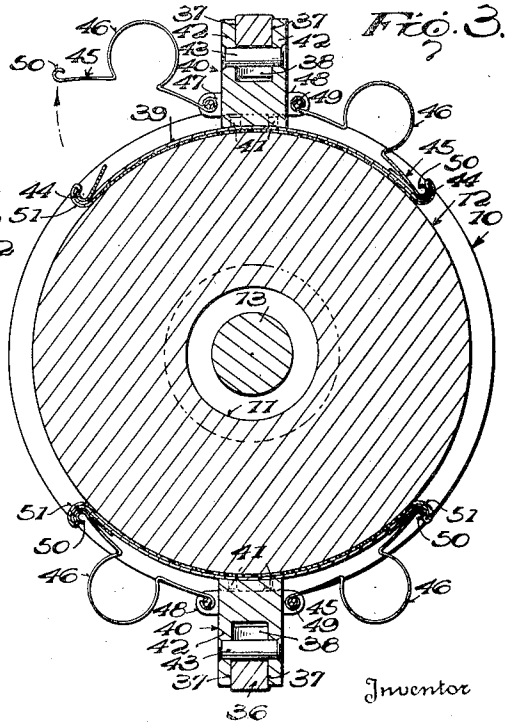


FIG. 3.



Inventor

Lloyd Burkhalter

By B. D. Burkhalter

Attorney

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FIG. 4.

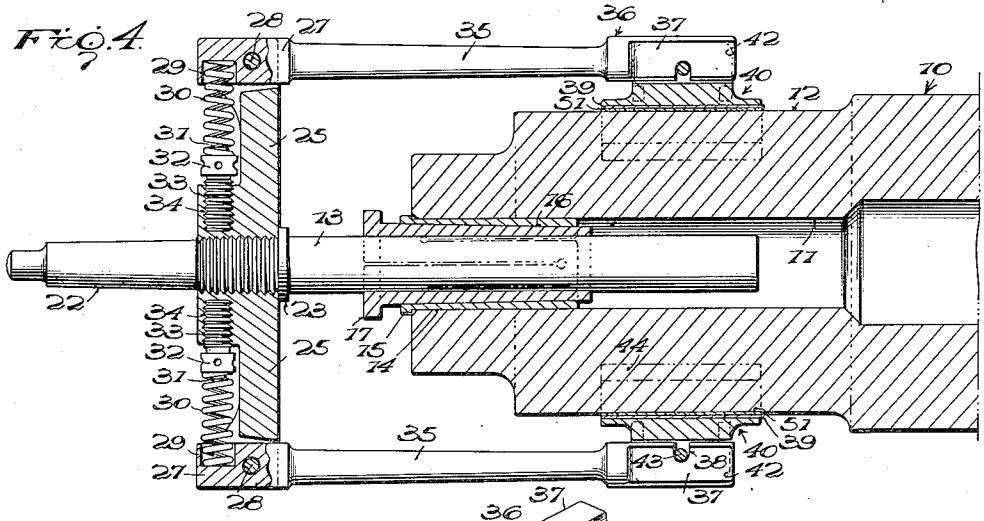


FIG. 5.

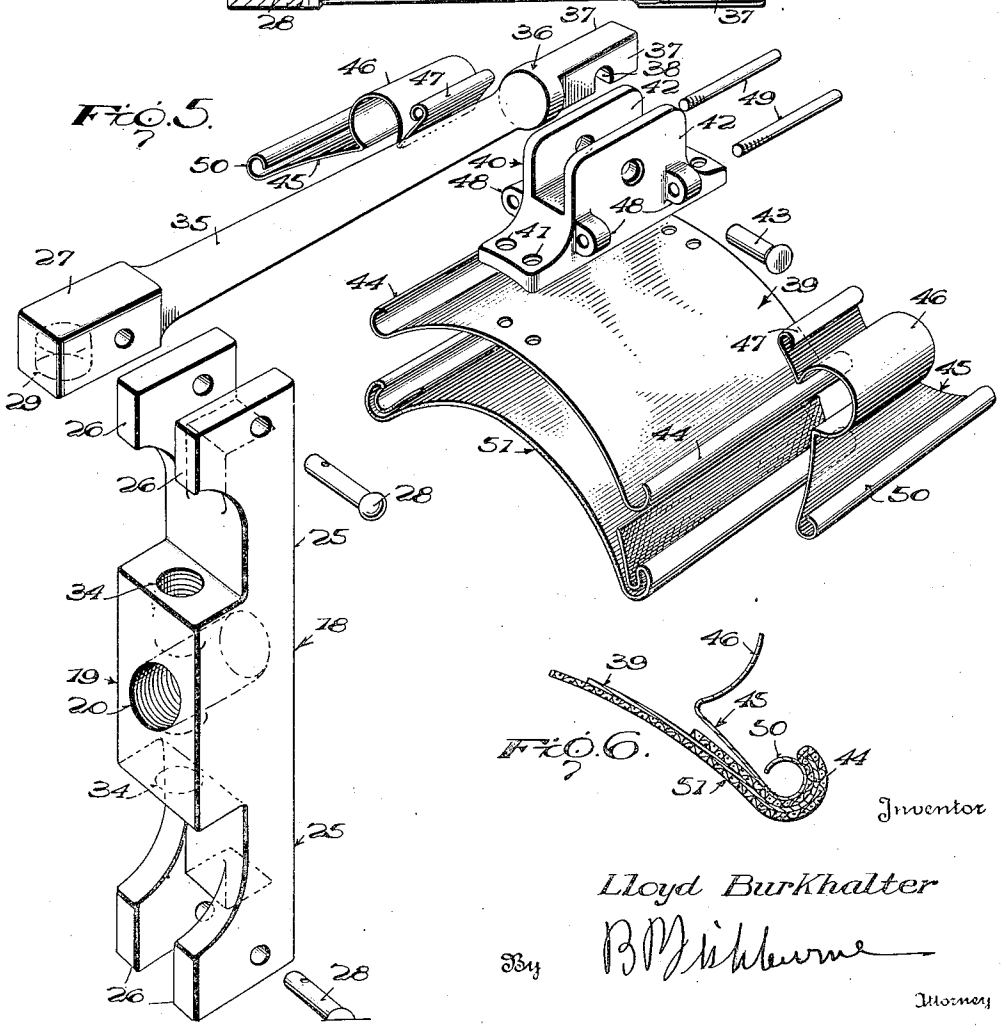


FIG. 6.

Inventor

Lloyd Burkhalter

By B. P. Richardson

Attorney

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UNITED STATES PATENT OFFICE

2,083,685

GRINDING OR POLISHING DEVICE

Lloyd Burkhalter, Columbus, Ohio, assignor of one-fourth to Ray Edgar Falkinburg and one-fourth to Maynard Lee Davis, both of Columbus, Ohio

Application July 27, 1936, Serial No. 92,919

24 Claims. (Cl. 51—185)

My invention relates to a device for grinding or polishing bearing surfaces.

An important object of the invention is to provide a device of the above mentioned character which is readily portable and may be quickly and easily applied to the element having the bearing surface to be ground or polished.

A further object of the invention is to provide a device of the above mentioned character adapted to be applied to a tubular bearing pin or element, for grinding the bearing surface thereof, and which may be power driven.

A further object of the invention is to provide a device of the above mentioned character which is adjustable within limits for treating bearing surfaces of elements of different diameters.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this application and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a side elevation of a grinding or polishing device embodying my invention,

Figure 2 is an end elevation of the same,

Figure 3 is a transverse section taken on line 3—3 of Figure 1,

Figure 4 is a central vertical longitudinal section through the device,

Figure 5 is an exploded perspective view of the rotary carrier and one grinding or polishing unit, and

Figure 6 is an edge elevation of the resilient strip or shoe and associated elements, parts broken away.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention, the numeral 10 designates a crank pin of a railway locomotive or the like, which is tubular and has a cylindrical bore 11. This crank pin has a cylindrical bearing surface 12 to be ground or polished.

My grinding or polishing device comprises a cylindrical arbor or shaft 13, adapted for insertion within the bore 11. A split expansible steel bushing 14, having an outer cylindrical surface and a flange 15 at its end, is inserted in the bore 11. This expansible steel bushing has its bore 16 tapered, increasing in diameter outwardly toward the flange 15. Adapated for insertion within the expansible bushing 14 is a split bronze bushing 17, the outer surface of which is tapered and decreases in diameter inwardly. It is thus seen that the inner bushing 17 may be driven into the outer bushing 14, and these bushings will have a clamping engagement within the bore 11, to be rigidly held therein. The mandrel or shaft 13 is slidable within the inner bushing 17, to turn therein and to be shifted longitudinally of the same.

The numeral 18 designates a rotary carrier, provided at its center with a hub 19, having a cylindrical screw-threaded opening 20, to receive a cylindrical screw-threaded portion 21 of a shank 22, formed integral with the arbor or shaft 13. The screw-threaded portion 21 has a slightly larger diameter than the inner large end of the tapered portion of the shank 22, so that the tapered portion of the shank 22 may be first passed through the opening 20, without screw-threaded engagement therewith, and the screw-threaded portion 21 brought into screw-threaded opening 20. At the inner end of the screw-threaded portion 21, there is a clamping flange or ring 23, integral with the arbor or shaft 13. The carrier is clamped to the arbor or shaft by a set screw 24 or the like. The carrier is therefore rigidly mounted upon the arbor or shaft 13, to rotate therewith, while the arbor is rotated by the shank 22, which is connected with and driven by a prime mover, such as an electric motor, compressed air motor, or the like.

The carrier 18 comprises radially disposed arms 25, having pairs of spaced knuckles 26, receiving therebetween heads or blocks 27. Each pair of knuckles 26 is pivotally connected with its head or block 27, arranged between them by a pin or pivot element 28. Each head or block 27 is provided upon its inner side with a recess 29, receiving the outer end of a compressible coil spring 30, the inner end of which receives a trunnion or lug 31, formed upon the head 32 of an adjusting screw 33, operating within a screw-threaded opening 34, formed in the hub 19. By turning the adjusting screw 33, the tension of the spring 30 may be varied or regulated. Each head 27 is preferably formed integral with a rigid arm 35, carrying a head 36, which is formed integral therewith, at its free end. This head has flat parallel oppositely arranged faces 37, and a notch 38 in its lower face.

A shoe is provided to hold the grinding or polishing medium in contact with the surface to be ground or polished, comprising a circularly curved resilient strip or plate 39 formed of spring steel or the like. At a point equi-distantly spaced from the ends of the resilient strip, such strip is attached to a coupling 40, by rivets 41, or the like. This coupling includes a pair of parallel

spaced knuckles 42, to receive the head 36 therebetween. The knuckles 42 are connected by a transverse pin 43, and this pin is adapted to engage within the notch 38. Each coupling is therefore detachably secured to the head 36 and has a limited pivotal movement longitudinally of the head, and the faces 37 have a substantially sliding fit between the knuckles 42. There are two of these shoes, diametrically oppositely arranged, and carried by the arms 35. At its opposite ends, each resilient strip 39 is bent or rolled into substantially semi-cylindrical sockets or beads 44.

Coacting with each resilient strip 39 is a pair of resilient clips 45, having circularly curved intermediate portions 46, to render the same longitudinally resilient or extensible. At their inner ends, the clips 45 are bent to produce knuckles 47, and these knuckles are arranged between pairs of knuckles 48, disposed upon opposite sides of the coupling 40, and preferably formed integral therewith. The knuckles 47 and 48 are pivotally connected by means of pintles 49. The clips 45 are longitudinally tapered and increase in width outwardly, and have their large outer ends bent to provide beads 50, which are circularly curved in cross-section and adapted for insertion within the sockets 44. The beads 50 are adapted to hold the ends of a polishing medium, such as a sheet of emery cloth, or the like, within the sockets 44, such emery cloth engaging the lower concave surfaces of the resilient strip or shoe 39, and conforming to the curvature thereof.

In the use of the device, the bushings 14 and 17 are first arranged within the bore 11 of the crank pin 10. The shoes 39, having the emery cloth 51, or other grinding or polishing medium applied to its concave surfaces are now applied to the convex surface 12 to be ground, and these shoes are moved with respect to the arms 35 so that the heads 36 pass between the knuckles 40, and the pins 43 enter the notches 38, the arms 35 being capable of swinging outwardly with respect to the carrier 18, within limits. When the couplings 40 are thus connected with the arms 35, the springs 30 will act upon the arms 35, which in turn will yieldingly press the shoes in engagement with the curved surface 12. The longitudinally resilient and longitudinally extensible clips 45 not only hold the emery cloth in place, but force the free ends of the resilient strip or shoe 39 inwardly toward the surface 12, so that the strip 39 conforms to the curvature of the surface 12, and the emery cloth will engage therewith throughout its length. The entire device may be longitudinally adjusted upon the crank pin 10, by sliding the mandrel or shaft 13 within the bushing 17. The device is operated when applied to the crank pin by rotating the tapered shank 22. This causes the carrier 18 to rotate, and the arms 38 travel in circular paths about the work 10, causing the shoes to revolve about the surface 12.

It is to be understood that the form of my invention herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In a machine of the character described, a rotary carrier, generally circumferentially extending pins mounted upon the rotary carrier near its outer portions, arms having generally circumferentially extending openings to receive the pins so that the arms are pivotally mounted upon the carrier, the pins holding the arms against radial movements at the pins, grinding or polishing devices connected with the free ends of the arms, springs separate from the pins and carried by the rotary carrier and engaging the ends of the arms at points spaced from the pins and upon the opposite side of the pins with respect to the free ends of the arms, the springs serving as the means to turn the arms upon their pins to swing the free ends of the same inwardly toward the work, and separate means to adjust the tension of each spring.

2. In a machine for grinding or polishing the exterior curved surface of work having a bore, a rotary mandrel held within the bore of the work so that the mandrel is free to rotate and move longitudinally with respect to the work without separation from the work and having means whereby it may be rotated, a carrier mounted upon the mandrel for rotation therewith, an arm mounted upon the carrier and extending toward the work to be arranged near the exterior curved surface of the work, and a tool carried by the arm to act upon the exterior curved surface, the arrangement being such that the machine is entirely supported from the work.

3. In a machine for grinding or polishing the convex surface of tubular work having a bore, a rotary mandrel, adjustable means to mount the rotary mandrel within the bore, a carrier mounted upon the rotary mandrel, rigid arms pivotally mounted upon the mandrel and provided near their pivots with recesses, compressible coil springs extending radially of the carrier and having their outer ends held within the recesses, adjustable elements having screw-threaded engagement with the carrier and holding engagement with the inner ends of the springs, and shoes carried by the arms for holding a grinding or polishing medium.

4. In a machine of the character described, a rotary support, means to mount the rotary support upon the work so that the rotary support is supported by the work and may be rotated with relation to the work, an elongated resilient longitudinally curved shoe carried by the rotary support and having its longitudinal axis arranged substantially parallel with the plane of rotation of the rotary support, and a flexible abrasive or polishing sheet secured to the shoe and extending longitudinally thereof over its concave face.

5. In a machine for grinding or polishing curved surfaces, a curved resilient shoe to be moved in a circular path and having a substantial length extending in the plane of rotation of the shoe, said shoe carrying a flexible grinding or polishing medium, a rotary support for the shoe attached to the shoe between its ends, and resilient clips permanently attached to the rotary support and having detachable engagement with the opposite ends of the shoe, said resilient clips serving to hold said medium upon the shoe and serving to force the ends of the shoe toward the curved surface.

6. In a machine for grinding or polishing curved surfaces, a curved resilient shoe provided at its ends with sockets, said shoe to be moved in a circular path and having a substantial length extending in the plane of rotation of the shoe, a rotary support connected with the shoe at a point between the sockets, and longitudinally resilient clips having their inner ends pivotally mounted

upon the support and having their outer ends adapted for removable insertion within the sockets to hold a flexible grinding or polishing medium upon the resilient shoe and to also force the end portions of the shoe toward the curved surface.

7. In a machine for grinding or polishing curved surfaces, a resilient shoe, a coupling secured to the shoe at a point substantially equidistantly spaced from the ends of the same, said coupling having a socket, an arm having an end detachably mounted within the socket, and a rotary carrier to which the arm is secured.

8. In a machine for grinding or polishing curved surfaces, a resilient shoe, a coupling secured to the shoe and having spaced knuckles and a pin connecting the knuckles, an arm having a head for insertion between the knuckles, said head having a notch to receive the pin, and a rotary carrier to which the arm is secured.

9. In a machine for grinding or polishing curved surfaces, a shoe, a coupling secured to the shoe and having spaced sides and a pin connecting the sides, an arm having its end portion projecting between the sides and provided upon its inner edge with a notch to receive the pin, a rotary carrier upon which the arm is pivoted, and a spring to move the pivoted arm in one direction so that its notched end moves inwardly toward the pin.

10. In a machine for grinding or polishing curved surfaces, a rotary carrier, means for supporting the rotary carrier so that it may be rotated, an elongated resilient shoe which is curved longitudinally and has its longitudinal axis arranged substantially parallel with the plane of rotation of the carrier, an arm carrying the shoe and mounted upon the carrier, the resilient shoe being adapted for holding a flexible abrasive or polishing sheet, and resilient means to press the ends of the resilient shoe toward the work.

11. In a machine for grinding or polishing the exterior curved surface of work having a bore, a rotary mandrel held within the bore of the tubular work and having means so that it may be rotated therein, a carrier mounted upon the mandrel for rotation therewith, spring pressed pivoted arms mounted upon the carrier and extending longitudinally of the mandrel in the direction of the work, and tools carried by the arms for acting upon the curved surfaces.

12. In a machine for grinding or polishing the exterior curved surface of work having a bore, a rotary mandrel held within the bore of the tubular work and having means whereby it may be rotated therein, a carrier mounted upon the mandrel for rotation therewith, arms mounted upon the carrier and extending longitudinally of the mandrel in the direction of the work to be arranged near the exterior curved surface of the work, and tools carried by the arms to act upon the exterior curved surface.

13. In a machine for grinding or polishing curved surfaces, a shoe, a polishing or grinding medium mounted upon the shoe, a coupling secured to the shoe and having a socket, a rotary carrier, and an elongated arm secured to the rotary carrier and extending longitudinally of the axis of rotation of the rotary carrier and having its free end portion held within the socket.

14. In a machine for grinding or polishing curved surfaces, a shoe, a grinding or polishing medium mounted upon one side of the shoe, a coupling secured to the opposite side of the shoe and having a socket and a pin extending through the socket, a rotary carrier, and an elongated arm secured to the rotary carrier and extending longitudinally of the axis of rotation of the carrier and having its free end portion inserted within the socket and provided with an opening to receive the pin.

15. In a machine for grinding or polishing the exterior curved surface of work having a part provided with a bore, a mandrel having a portion extending into the bore for a substantial distance to be held therein so that the mandrel may rotate and move longitudinally with respect to the bore without separation from the work, a carrier mounted upon the mandrel for rotation therewith, an arm mounted upon the carrier and extending longitudinally of the mandrel toward the work, and a tool carried by the arm for acting upon the curved surface.

16. In a machine for grinding or polishing work having curved surfaces, a rotary carrier, means to support the rotary carrier in proximity to the work so that the carrier may be rotated, an arm mounted upon the carrier to rotate therewith and being movable with relation to the carrier toward the work, said arm being provided upon its side next to the work with a notch, a shoe for supporting a grinding or polishing medium upon its side next to the work, a coupling mounted upon the opposite side of the shoe remote from the work, said coupling including a pair of spaced sides forming a socket for receiving the notched portion of the arm, a pin connected with the sides of the coupling and extending across the socket for engagement within the notch of the arm, and means to move the arm toward the coupling to retain the pin within the notch.

17. In a machine for grinding or polishing work having a curved surface, a carrier, means to support the carrier near the work so that the carrier may be rotated, an arm pivotally mounted upon the carrier so that its free end may be swung toward and from the work, a spring acting upon the pivoted arm to move its free end toward the work, the arm having its free end provided upon its side next to the work with a notch, a shoe having its face next to the work adapted to receive and support a grinding or polishing medium, a coupling attached to the opposite face of the shoe remote from the work, said coupling including spaced sides forming a socket, a pin secured to the spaced sides and extending across the socket, said pin being adapted to enter the notch of the arm.

18. In a machine for grinding or polishing work having a curved surface, a carrier, means for supporting the carrier near the work so that the carrier may be rotated, an arm pivotally mounted upon the carrier so that its free end may be moved toward and from the work, a shoe carried by the free end of the arm for holding a grinding or polishing medium, a generally radial compressible coil spring arranged upon the opposite side of the pivot of the arm with respect to the shoe and engaging the opposite end of the arm with respect to the free end of the arm, and a generally radially adjusting screw engaging the carrier and the inner end of the generally radial spring to regulate the tension of the spring.

19. In a machine for grinding the outer curved surface of elongated work having a part provided with a longitudinal bore, a mandrel mounted in the bore to turn therein and also move longitudinally within the bore independently of the turning movement without separating the

mandrel from the work, a carrier mounted upon the mandrel, yielding means mounted upon the carrier and extending longitudinally of the mandrel toward the work, and a grinding or polishing element carried by the yielding means to engage the outer curved surface.

20. In a machine for grinding the curved surface of elongated work, a mandrel, means to mount the mandrel upon the work so that the mandrel is free to turn and move longitudinally with relation to the work and be supported by the work during these movements, yielding means connected with the mandrel to move therewith and extending toward the work, and a grinding or polishing element carried by the yielding means to engage the curved surface.

21. In a machine for grinding the curved surface of work, a mandrel, means for mounting the mandrel upon the work so that it may turn and move longitudinally with respect to the work and be supported by the work during these movements, a carrier mounted upon the mandrel, yielding means mounted upon the carrier and extending toward the work, and a yielding grinding or polishing element carried by the yielding means to engage the curved surface.

22. A machine for grinding the curved surface of work, a mandrel, means to mount the mandrel upon the work so that the mandrel may be turned and moved longitudinally with relation to the work and be supported by the work during these movements, a carrier, an arm pivoted upon the carrier and extending longitudinally of the mandrel toward the work, yielding means to move the pivoted arm toward the work, and a grinding or polishing element carried by the arm to engage the curved surface.

23. A machine for grinding the curved surface of work, a mandrel, means to mount the mandrel upon the work so that the mandrel may be turned and moved longitudinally with relation to the work, a carrier connected with the mandrel, an arm pivoted upon the carrier and extending longitudinally of the mandrel toward the work, yielding means to swing the arm upon its pivot toward the work, a resilient shoe carried by the arm, and a flexible grinding or polishing medium carried by the shoe to engage the curved surface.

24. In a machine of the character described, a rotary carrier, a generally circumferentially extending pin mounted upon the rotary carrier, an arm having a generally circumferentially extending opening to receive the pin, a grinding or polishing device mounted upon the arm, a spring separate from the pin to turn the arm upon the pin, and adjustable means to compress the spring.

LLOYD BURKHALTER.