

April 3, 1928.

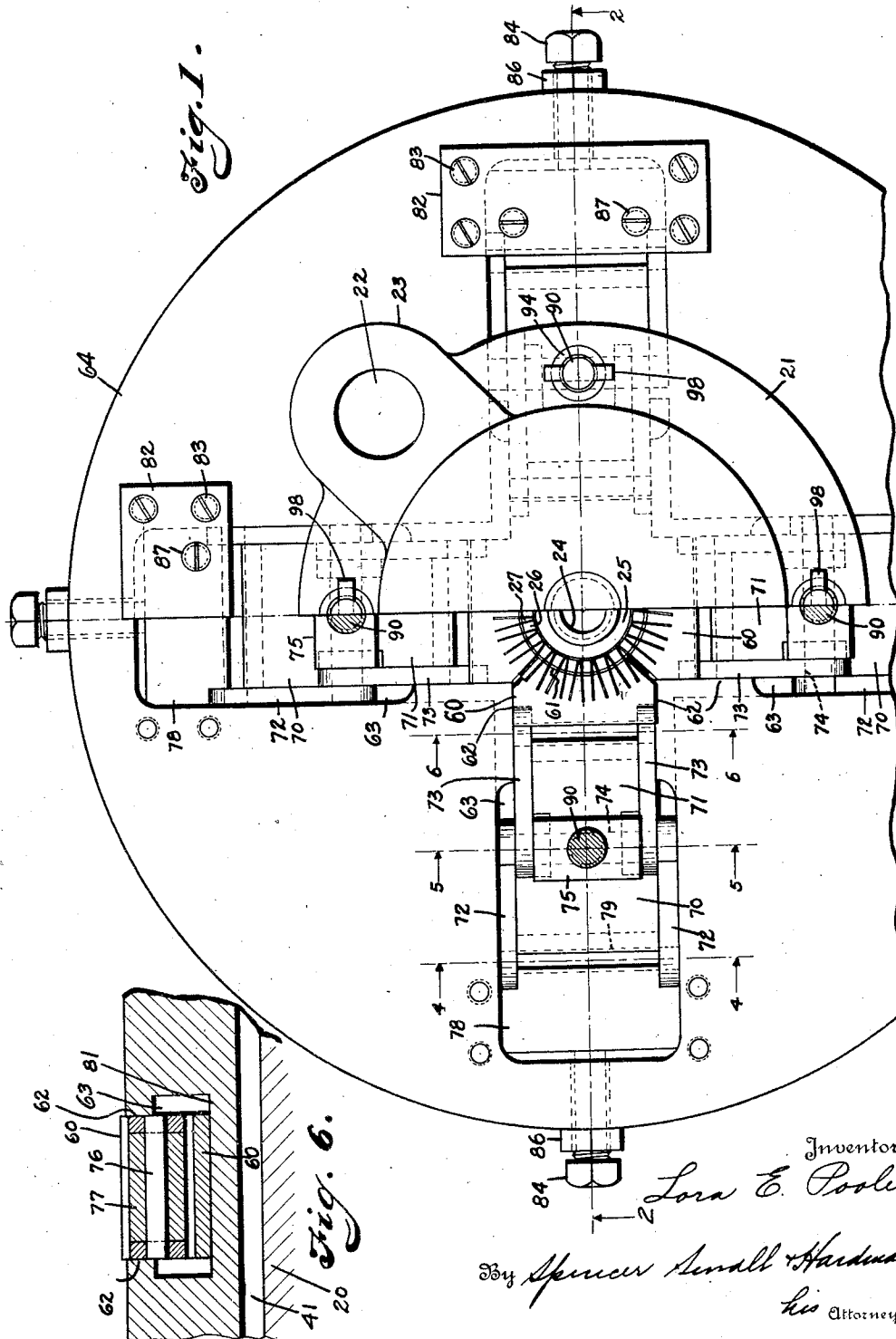
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L. E. POOLE

COMMUTATOR RIVETING MACHINE

Filed July 22, 1926

3 Sheets-Sheet 1



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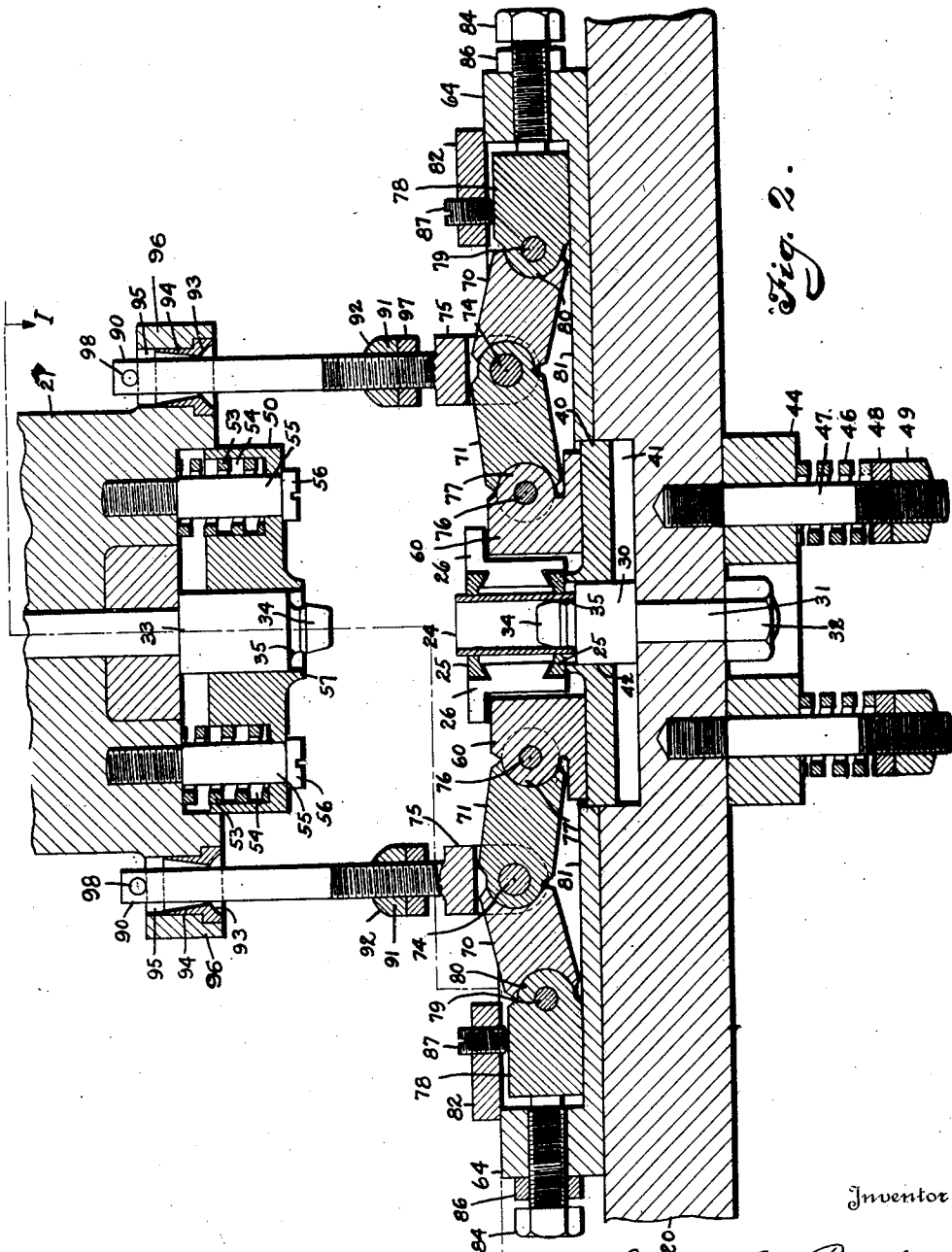
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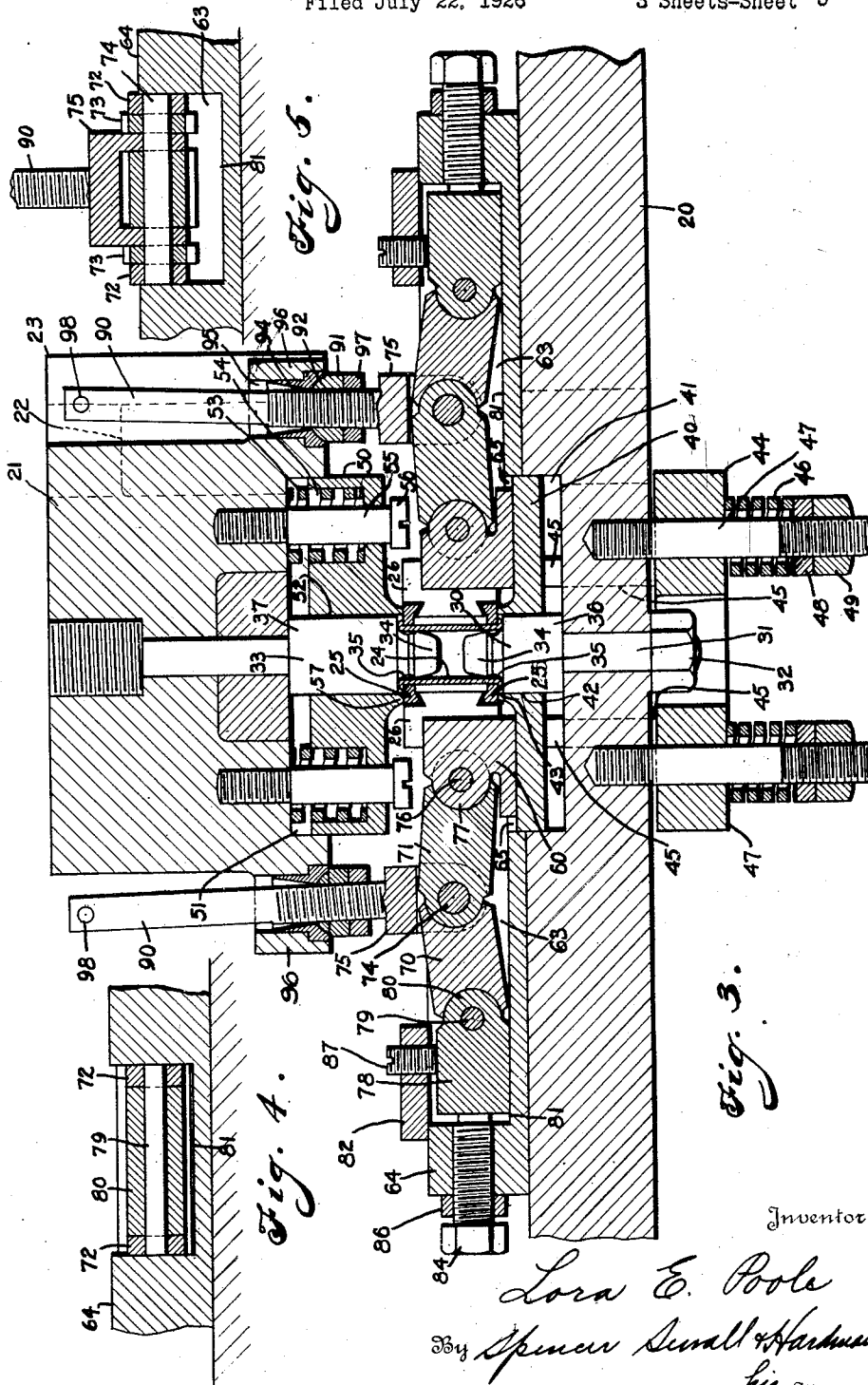
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UNITED STATES PATENT OFFICE.

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COMMUTATOR-RIVETING MACHINE.

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This invention relates to the manufacture of commutators for dynamo electric machines and particularly to commutators comprising an annulus of metal segments separated by 5 pieces of sheet insulation, the segments and the insulating pieces having dove-tail shanks which are permanently clamped between metal V-rings held together by a hollow core or tubular rivet, the end edges of which are 10 flared or swaged against the outer faces of the V-rings.

One of the objects of the present invention is to provide a commutator riveting machine having means for applying lateral pressure upon the segments, means for applying axial 15 pressure upon the V-rings and other means for exerting pressure upon the ends of the tubular core or hollow rivet to flare the edges of the rivet against the V-rings while pressure is being applied radially to the segments 20 and axially to the V-rings.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view partly in section of a 30 commutator riveting machine constructed in accordance with the present invention, the section being taken on line 1—1 of Fig. 2.

Figs. 2 and 3 are vertical sectional views showing the apparatus of Fig. 1 in two positions of operation, the section being taken 35 on line 2—2 of Fig. 1.

Figs. 4, 5 and 6 are fragmentary sectional views taken, respectively, on lines 4—4, 5—5 and 6—6 of Fig. 1.

Referring to the drawings, 20 designates a 40 base which is adapted to be supported upon the bed of a punch press, not shown. 21 designates a pressure head which is adapted to be attached to the plunger of a punch 45 press. The head 21 is guided during its vertical movement and is maintained in a vertical alignment with parts carried by the base 20 by two vertical posts or pilots 22 attached at their lower ends to the base 20 50 and extending through holes provided in lugs 23 provided by the head 21, said holes being parallel to the axis of the head.

The means for applying pressure endwise upon the tubular core or hollow rivet member 24, in order to flare or swedge the ends of 55

the rivet against the clamping V-rings 25 of a commutator having metal segments 26 and non-conducting spacers 27 as shown in Fig. 1, comprises a lower riveting member 30 having a threaded shank 31 which extends 60 through the base 20 and receives a nut 32 by which the member 30 is secured to the base; and comprises an upper riveting member 33 which is detachably secured to the head 21 in any suitable manner. As shown in Figs. 65 2 and 3 each of these riveting members includes a tapered portion 34 which may readily enter the commutator core 24 and a fillet portion 35 which flares the end edge of the rivet 24 against the V-ring 25. 70

The means for applying pressure axially to the V-rings 25 includes a lower pressure pad 40 of circular contour and slidable vertically within a recess 41 provided by the base 20. Pad 40 is provided with a central aperture 75 42 which receives the cylindrical portion 36 of the riveting member 30. This portion 36 serves to guide the pressure pad 40. The pad 40 includes an annular boss 43 surrounding the aperture 42 and adapted to 80 engage the lower V-ring 25 of the commutator. The pressure pad 40 is connected with a ring 44 located below the base 20 by a plurality of rods 45 and extend through 85 suitable holes in said base. The ring 44 is yieldingly maintained in the position shown in Fig. 2 by a plurality of springs 46 each surrounding a stud 47 having its upper end 90 threadedly connected with the base 20, each passing through a suitable hole in the ring 44, each passing through a washer 48 and each threadedly engaged by a nut 49. The means for applying axial pressure to the V-rings 25 includes also an upper pressure pad 50 which 95 is circular in contour and is slidable within a circular recess 51 provided by the head 21. The pad 50 has a central aperture 52 which receives the cylindrical portion 37 of the upper riveting member 33. The portion 37 100 guides the pad 50. The pad 50 is yieldingly urged away from the upper wall of the recess 51 by a plurality of springs 53 each received by a recess 54 provided by the pad 50 and each bearing against the pad and the head 21. Downward movement of the pad 105 50 relative to the head 21 is limited by a plurality of screws 55 each having a head 56 arranged to receive the lower surface of the pad 50, each passing through the pad and a spring 53, and each threadedly engaged by 110

the head 21. The pad 50 includes an annular boss 57 surrounding the aperture 52 and adapted to engage the upper V-ring 25 of the commutator. It will be noted that the boss 43 of the pad 40 extends above the riveting fillet surface 35 of the rivet member 30, and that the boss 57 extends below the riveting fillet surface 35 of the riveting member 33. Therefore pressure will be applied to the V-rings 25 before the riveting operation begins.

The means for applying pressure radially to the segments and insulating pieces comprises a plurality of slidable clamping blocks 60 each having a cylindrical recess 61 adapted to engage with a portion of the annulus of segments and insulation pieces. Each clamping block 60 is slidably supported by the pressure pad 40 and is movable with this pad. Each block 60 is provided with opposite parallel sides which are guided by surfaces 62 which define a groove 63 provided in a guide block 64 which is secured to the base 20. The guide block 64 is provided with a central aperture 65 in alignment with the recess 41 of the base 20. This central aperture 65 receives the guide blocks 60 so that they may be permitted to move downwardly with the pressure pad 40.

The blocks 60 are moved laterally by pressure applied through intermediate toggle blocks 70 and 71 and pairs of toggle links 72 and 73. A pin 74 passes through all of these members and a bifurcated member 75 having its branches located between the toggle blocks 71 and the toggle links 73. The links 73 are connected with the blocks 60 by a pin 76. The block 71 is provided with a cylindrical recess for receiving the cylindrical portion 77 of the block 60 which is concentric with the pin 76. Hence a cylindrical socket joint is provided between the toggle block 71 and the clamping block 60. The links 72 are connected with a stationary block 78 by a pin 79. The toggle block 70 is provided with a cylindrical recess for receiving the cylindrical portion 80 of the block 78, said portion being concentric with the pin 79. Thus a cylindrical socket joint is provided between the toggle block 70 and the stationary block 78. The block 78 is slidable along the bottom surface 81 of the groove 63 in the guide plate 64 and is retained vertically by a plate 82 extending over the recess 63 and attached to the plate 64 by screws 83. The block 78 is adjusted along the groove 63 by a screw 84 passing threadedly through a wall of the plate 64 defining the end of the groove 63. The screw 84 may be secured in adjusted position by lock nut 86. The block 78 may be clamped in adjusted position by one or more set screws 87 threadedly engaging the plate 82. By adjusting the block 78 the clamping pressure exerted upon the commutator seg-

ments and insulating pieces may be varied.

Each fork member 75 is connected with a threaded shank 90 which receives a nut 91 having a spherical upper end 92 adapted to be received by a spherical recess 93 of a bushing or bearing member 94 which is press-fitted within a hole 95 provided in the flange 96 of the head 21. The nut 92 may be secured in adjusted position relative to the threaded shank 90 by a lock nut 97. The shank 90 extends through the bushing 94 and flange 96 and carries near its upper end a pin 98.

The operation of the riveting machine is as follows: The head 21 may be reciprocated by any suitable mechanism, but the embodiment of the invention illustrated herein is particularly adapted for attachment to and operation by a punch press. As stated before the base 20 is preferably mounted upon the horizontal support of a punch press and the head 21 is operated by the punch press plunger. When the mechanism is in the position shown in Fig. 2, the commutator to be riveted is placed as shown in position between the clamping blocks 60 and upon the annular boss 43 of plate 40. The clutch, not shown, of the punch press is operated by a suitable pedal in order to cause the head 21 to descend. At about the instant of engagement of the annular boss 57 of plate 50 with the upper clamping ring 25, the spherical upper ends 92 of the nuts 91 which surround the rods 90 will be engaged by the spherical recesses 93 of bushings 94 which are carried by the flange 96 integral with the head 21. Further downward movement of the head 21 will cause the clamping bosses 43 and 57 to press firmly against the commutator clamping rings 25, and will cause the blocks 60 to move into clamping engagement with the commutator segments, due to the operation of the toggle mechanisms operated by rods 90. Before the flaring or deforming of the ends of the tubular rivet or core 24 of the commutator begins, substantial clamping pressure will be exerted laterally and axially upon the commutator in order to hold its parts firmly in assembled relation during the rivet flaring operation. Further downward movement of the head 21 will cause the ends of the commutator core or rivet 24 to be flared against the exterior faces of the clamping ring 25 as shown in Fig. 3. As the riveting operation progresses the clamping pressure which is exerted laterally upon the commutator will increase due to the inward movement of the blocks 60.

As the riveting operation progresses the core will decrease in length. Hence there will be relative movement between plate 40 and the riveting member 30, and between the plate 50 and the riveting member 33. The springs 46 which are supported by the

base 20 and directly support the plate 40 will be compressed as the plate 40 moves downwardly relative to the riveting device 30. Similarly the springs 53 which transmit pressure from the head 21 to the plate 50, will be compressed as the riveting member 33 moves downwardly relative to the plate 50. As these springs are compressed beyond their initial state of compression the clamping pressure exerted upon the commutator rings 25 will be gradually increased. The degree of clamping pressure which is exerted upon the clamping rings may be varied by turning the nuts 49 which engage the studs 47.

Thus the commutator segments will be firmly wedged together in a lateral direction by lateral pressure exerted by the blocks 60 during the riveting operation; and the clamping rings will be yieldingly urged against the tangs of the commutator by pressure which is applied independent of the pressure which is exerted to produce the commutator-core-flaring operation. Consequently, when pressure applied directly to the ends of the commutator core 24 is relieved after the riveting operation, there will be substantially no movement or springing out of the parts which have been clamped between the rings 25.

The means for riveting over the ends of the commutator core is not required to serve as the means for exerting clamping pressure upon the commutator clamping rings since other means are provided for this purpose. Therefore all of the pressure which is exerted upon the ends of the commutator core 24 by the flaring fillets 35 is utilized or concentrated entirely upon the end of the core. Therefore a substantial amount of material of the commutator core 24 will be flared against each clamping ring in order to hold the clamping rings 25 securely after clamping pressure has been released.

During the riveting operation the plates 40 and 50 which carry the annular bosses 43 and 57 for engaging the lower and upper commutator clamping rings, respectively, may move relative to the base 20 and the head 21, respectively, and thus adjust the annulus of the commutator segments relative to the commutator core 24. Thus the core 24 will be automatically centered with respect to the clamping rings 25 so that each end of the core 24 will project substantially the same distance outside each clamping ring, by the time the riveting operation is completed.

The clamping pressure exerted by the block 60 may be varied in two ways: first, by turning the nuts 91 so as to vary the distance between the nuts 91 and the socket members 94 when in uppermost position. If the nuts 91 are moved upwardly along the rods 90, said nuts will be engaged sooner by the socket members 94 than if said nuts

were initially further away from the members 94 when in uppermost position. Therefore the motion of the toggle link rods 74 will be greater, the blocks 60 will be moved a greater distance inwardly toward the commutator, and the clamping pressure will be greater. The second manner of adjusting the degree of pressure exerted by the clamping block 60 is by turning the screws 84 inwardly in order to move the block 78 in the same direction, the lock nuts 86 and set screws 87 being first loosened.

The riveting machine may be adjusted for use with commutators having different diameters. The riveting members 30 and 33 may be removed and others substituted in order to operate upon commutator cores of different diameters. Other blocks similar in function to the blocks 60 may be substituted in order that the commutator engaging surfaces of the blocks will have the desired curvature. If commutators of larger diameter than that illustrated are to be operated upon the nuts 86 and set screws 87 may be released in order that the screws 84 may be turned outwardly to permit adjusting the blocks 78 and toggle links along the grooves 63. The nuts 91 may be adjusted along the rods 90 in order that the required movement of the clamping blocks 60 may be obtained.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, means for applying lateral pressure to the segments, means for applying axial pressure upon the clamping rings, other means for deforming the rivet to cause it to hold the rings in clamping engagement with the segments, and mechanism for operating said means.

2. A riveting machine according to claim 1 in which the mechanism causes the lateral-pressure means and the axial-pressure means to operate upon the commutator before the rivet-deforming means operates upon the commutator, and causes the lateral and axial pressure to be maintained upon the commutator while the rivet is being deformed.

3. A riveting machine according to claim 1 in which the mechanism causes the lateral-pressure means and the axial-pressure means to operate upon the commutator before the rivet deforming operation begins, and causes the lateral and axial pressure to be increased as the rivet-deforming operation progresses.

4. A riveting machine according to claim

1. and having provisions for adjusting the degree of pressure exerted upon the commutator by the lateral-pressure means.

5 5. A riveting machine according to claim 1 and having provisions for adjusting the degree of pressure exerted upon the commutator by the axial-pressure means.

6. A riveting machine according to claim 1 and having provisions for adapting the lateral-pressure means and its operating mechanism to commutators of different diameters.

7. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination a base for supporting the commutator, a head movable relative to the base, a device carried by the head for deforming an end of the tubular rivet, a member supported by the head and adapted to engage a clamping ring of the commutator, clamping blocks supported by the base and adapted to apply lateral pressure to the commutator segments, springs for transmitting motion from the head to the member which engages the clamping ring, and mechanism operated by the head for advancing and retracting the clamping blocks relative to the commutator.

8. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a base for supporting the commutator, a head movable relative to the base for applying pressure axially to the commutator, a device carried by the base for deforming an end of the tubular rivet, a member movable relative to the base and adapted to engage a clamping ring of the commutator, clamping blocks supported by the base and adapted to apply lateral pressure to the commutator segments, springs supported by the base and supporting the member which engages said commutator clamping ring, and mechanism operated by the head for advancing and retracting the clamping blocks relative to the commutator.

9. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a base, a head movable relative to the base, aligned rivet-end deforming members supported by the head and base respectively, members adapted to engage the clamping rings and supported by the head and the base respectively, so as to engage the clamp-

ing rings before the deforming operation begins, springs for transmitting pressure from the head to the ring engaging member carried thereby, springs supported by the base and directly supporting the other clamping ring engaging member, clamping blocks for applying lateral pressure to the commutator segments and movable with the ring engaging members, and mechanism operated by the head for advancing and retracting the clamping blocks relative to the commutator.

10. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a base, a head movable relative to the base, aligned rivet-end deforming members supported by the head and base respectively, said deforming members having aligned cylindrical shanks spacing the deforming portions thereof from the head and base respectively, plates supported respectively by the head and base and guided by said shanks and each having an annular boss for engaging a commutator clamping ring, springs for transmitting pressure from the head to the plate carried thereby, springs supported by the base and directly supporting the other plate, clamping blocks slidably supported by the plate associated with the base, and mechanism operated by the head for advancing and retracting the clamping blocks relative to the commutator.

11. A riveting machine for a commutator comprising an annulus of insulated segments, clamping rings for engaging the segments, and a tubular rivet for holding the rings in spaced relation, which comprises in combination, a base member for supporting the commutator, a head member movable relative to the base, a device carried by one of said members for deforming an end of the rivet, slidable clamping blocks movable radially of the commutator, and mechanism operated by the head for moving each of the blocks, said mechanism including a stationary block, a pair of connected toggle links, each link being connected with one of the blocks, and means for transmitting pressure from the head to the joint of the pair of links.

12. A riveting machine according to claim 11 in which the stationary blocks are adjustable laterally with respect to the commutator, and means are provided for securing the blocks in adjusted position.

In testimony whereof I hereto affix my signature.

LORA E. POOLE.