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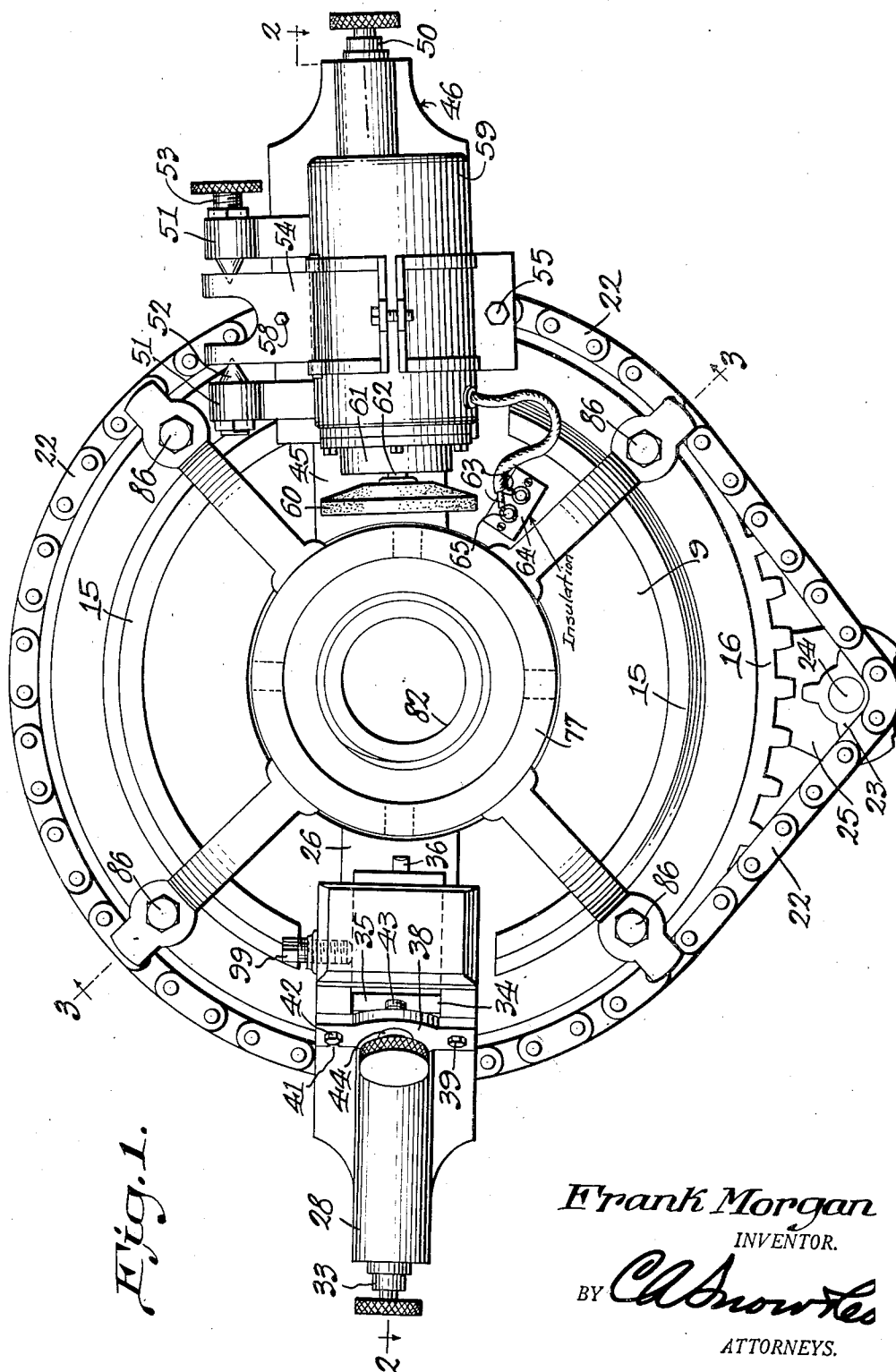
F. MORGAN

2,159,287

DEVICE FOR SHOULDERING WELL DRILL PIPES

Filed July 28, 1937

4 Sheets-Sheet 1



Frank Morgan
INVENTOR.
BY *Chas. H. Knowlton*
ATTORNEYS.

May 23, 1939.

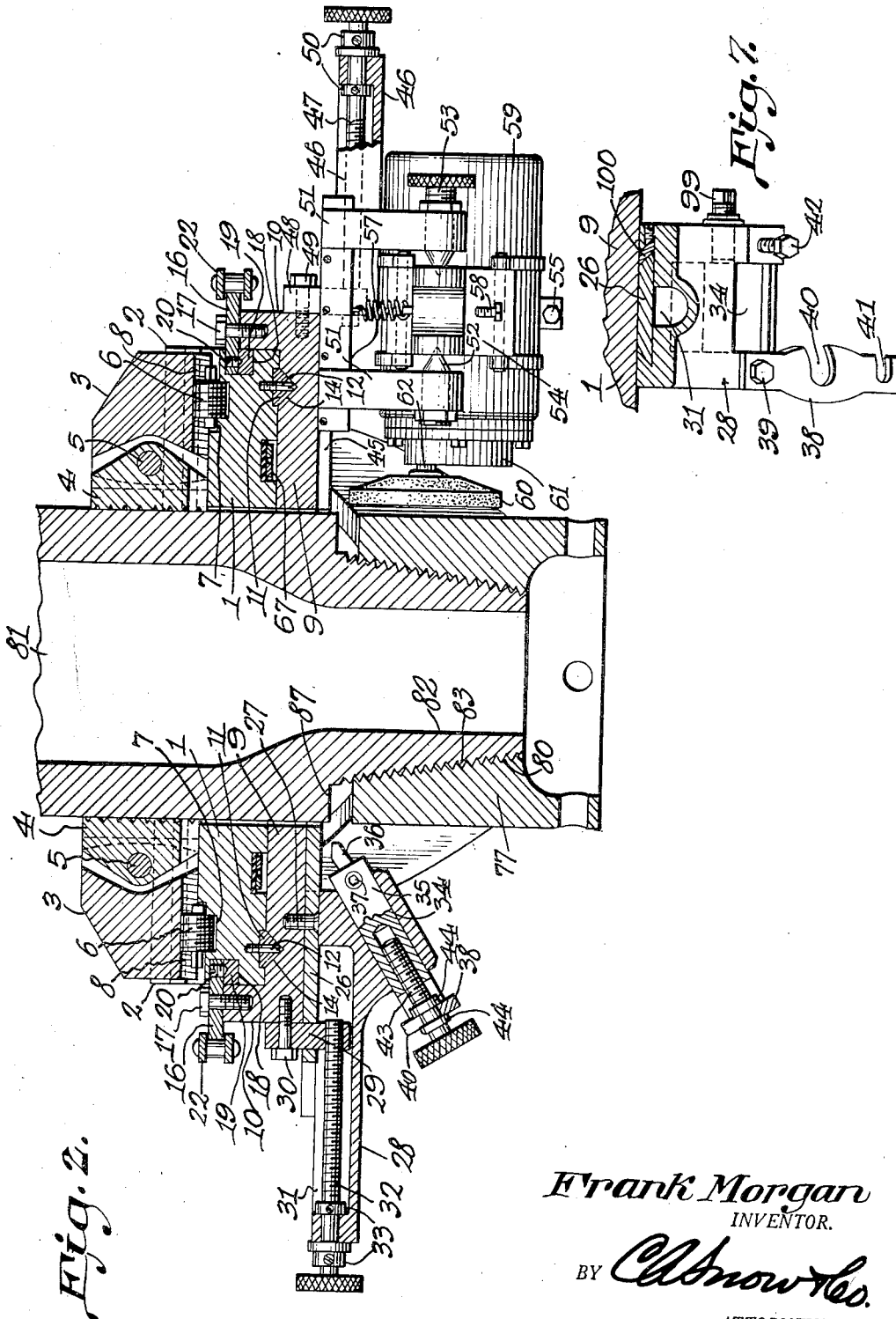
F. MORGAN

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DEVICE FOR SHOULDERING WELL DRILL PIPES

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4 Sheets-Sheet 2



Frank Morgan
INVENTOR.

BY *Chas. H. Brown*
ATTORNEYS.

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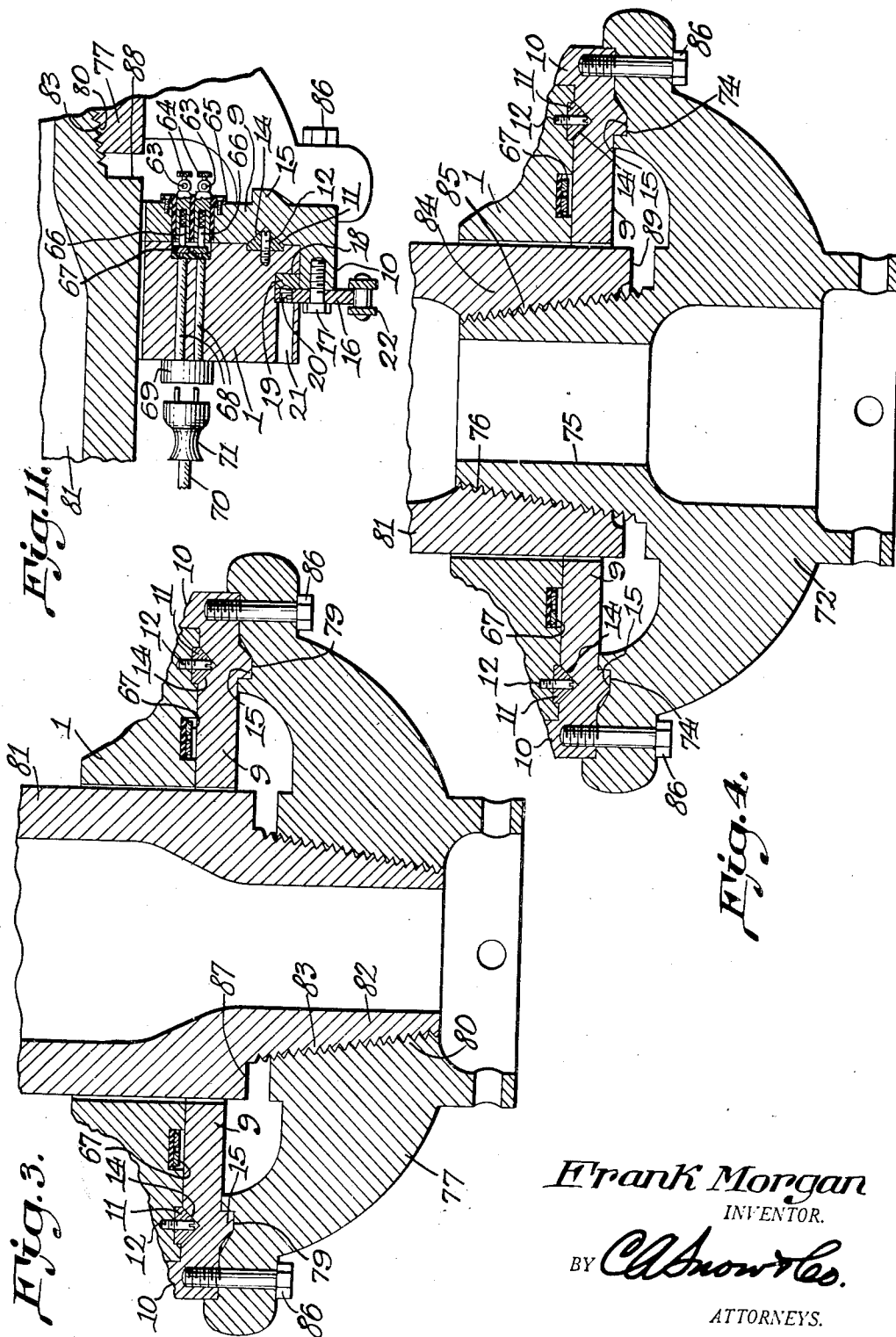
F. MORGAN

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DEVICE FOR SHOULDERING WELL DRILL PIPES

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4 Sheets-Sheet 3



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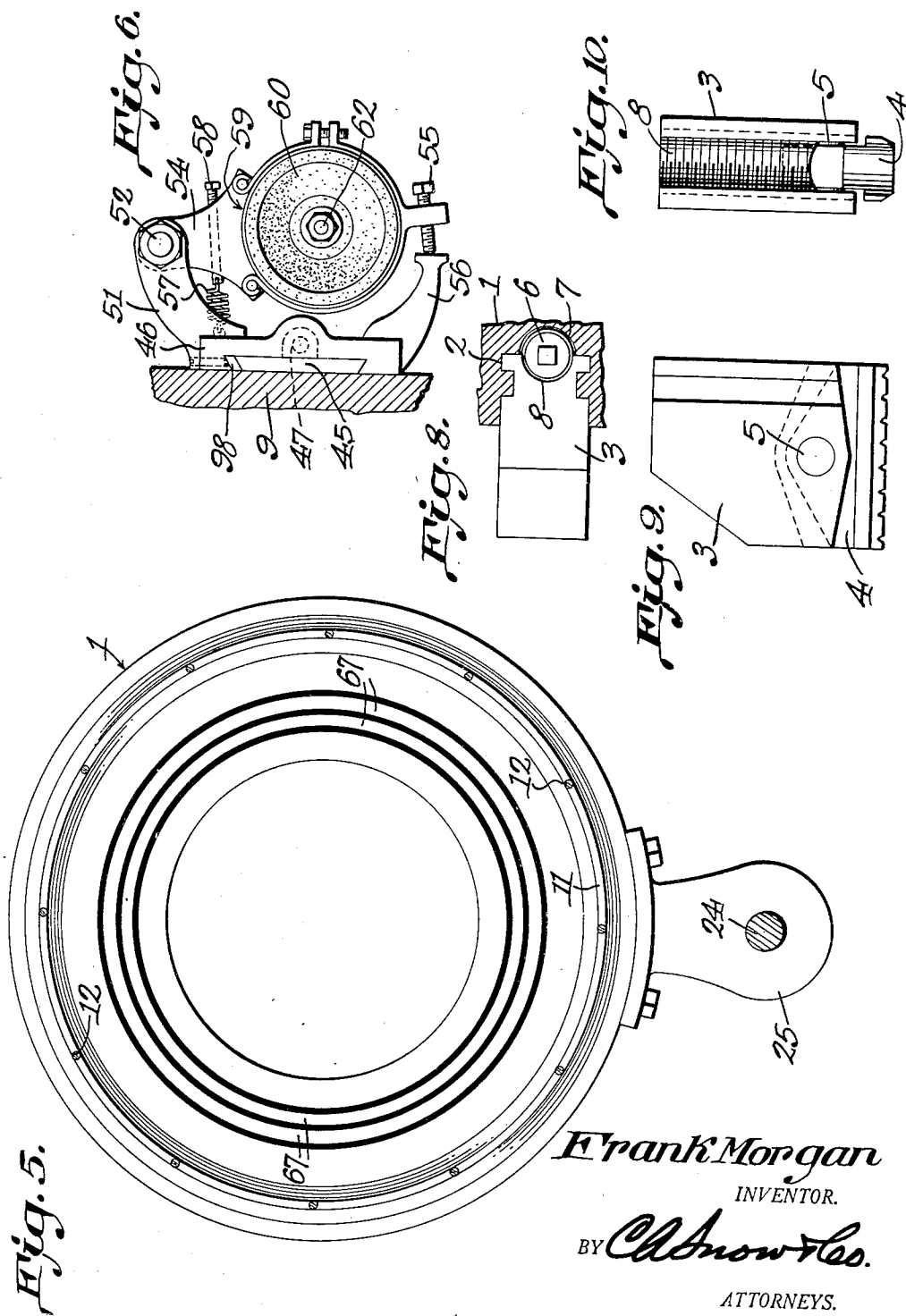
F. MORGAN

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DEVICE FOR SHOULDERING WELL DRILL PIPES

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4 Sheets-Sheet 4



Frank Morgan
INVENTOR.
BY *Chas. Snow & Co.*
ATTORNEYS.

UNITED STATES PATENT OFFICE

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DEVICE FOR SHOULDERING WELL DRILL
PIPES

Frank Morgan, Healdton, Okla.

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7 Claims. (Cl. 51—241)

Rotatable drill pipe is made up of sections usually 40 to 44 feet in length, eight inches or so in diameter, and of great weight, one end of each section having a tapered pin and the opposite end of each section having a flared box into which the pin of an adjoining section is adapted to be threaded, the pipe sections having transverse shoulders (varying in width as desired), the threads of the pin end of the box coming to a jam at the time the shoulders come into engagement. In operation, the drill pipe is rotated, usually at moderately high speed, liquid being pumped in at the top of the pipe and escaping at the bottom, through outlets in the drill proper, the liquid rising between the drill pipe and the wall of the well.

When the drill becomes dull or ceases to cut, the drill pipe is withdrawn and unjointed, a new bit is put on, the drill pipe is returned to the hole, and drilling is resumed. The repeated unjointing and rejoining of the drill pipe, in addition to vibration in the well, wears the joints. Owing to the diameter at the joints, the joints are subjected to heavy wear, the joint-forming elements becoming grooved, flattened or greatly worn, to a taper. Hardening often takes place along the entire face of the joint shoulder or along a part only of the shoulder, or sometimes in spots, the degree of hardness being such that no lathe cutter can work upon them unless annealed.

A constant wearing of the threads of the pin and of the box takes place, and since there may be little or no wear on the shoulders, the threads fail to make a perfect fit and all the strain is thrown on the shoulders, with a strong tendency to draw the threads.

Experience has taught that by dressing back the shoulders and by using a master jig or gauge, the life of the drill joint is practically doubled. The shoulders must be in planes exactly at right angles to the axis of the pipe sections. Owing to conditions arising out of wear and to the warped or crooked condition of the pipe, chucking in a lathe is not practical and is almost an impossibility.

In view of the foregoing, the present invention aims to provide a simple tool for dressing down the shoulders, whether hard or soft, and doing so on the job, as distinguished from hauling the pipe sections to a remote place, with corresponding loss of time and with haulage expense.

It is within the province of the disclosure to improve generally and to enhance the utility of

devices of that type to which the present invention appertains.

With the above and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed, may be made within the scope of what is claimed, without departing from the spirit of the invention.

In the drawings:

Fig. 1 shows in front elevation, a tool constructed in accordance with the invention;

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1;

Fig. 3 is a transverse section on the line 3—3 of Fig. 1, the view showing the pin end of the pipe in place;

Fig. 4 is a transverse section similar to Fig. 3 but showing the box end of the pipe in place;

Fig. 5 is a front elevation of the chuck-supporting body;

Fig. 6 is a sectional view showing the grinding wheel, the motor and attendant parts;

Fig. 7 is a sectional view illustrating the means whereby the tool slide is releasably held in place;

Fig. 8 is a sectional view showing the mounting of the chuck carrier on the chuck-supporting body;

Fig. 9 is a side elevation of the chuck carrier;

Fig. 10 is an elevation wherein the chuck carrier is viewed edgewise;

Fig. 11 is a sectional view showing the means whereby the motor that operates the grinding wheel is coupled up electrically.

The device forming the subject-matter of this application comprises an annular chuck-supporting body 1, shown in elevation in Fig. 5, and in cross section in Fig. 2. The body 1 is provided with any desired number of radial guides 2, wherein chuck carriers 3 are mounted for right line reciprocation. Toothed chucks 4 are pivotally mounted at 5 on the inner ends of the chuck carriers 3 and because of their pivotal mounting, the chucks will grip a pipe properly, as shown in Fig. 2, regardless of irregularities in the pipe.

Feed screws 6 are mounted rotatably, but against endwise movement, in seats 7 formed in the body 1. The feed screws 6 engage in threaded trough-shaped recesses 8 formed in the chuck carriers 3, and by rotating the feed screws, the chuck carriers 3 and the chucks 4 may be adjusted in and out, radially of the body 1.

The body 1 is received partially within an annular tool carrier 9 having a rim 10 extended about the clutch body 1. An annular centering guide 11, made of special bearing metal, is secured at 12 to the body 1 and is received in an annular groove 14 formed in the tool carrier 9. That side of the tool carrier 9 which is opposite to the groove 14 is provided with an annular rib 15, the function of which will be made manifest hereinafter.

A sprocket wheel 16, made in two pieces, is attached by securing elements 17 to the edge of the rib 10 of the rotatable tool carrier 9 and extends into an annular groove 18 formed in the periphery of the body 1, the construction being such that, by means of the sprocket wheel, the tool carrier 9 is connected to the body 1 for rotation with respect thereto. A wear ring 19 is located in the groove 18, within the rim 10 of the tool carrier 9 and beneath the sprocket wheel 16. The ring 19 may be advanced to take up wear, by means of screws 20, threaded into the inner portion of the sprocket wheel 16. Figure 11 shows that the body 1 has an opening 21. By rotating the sprocket wheel 16 with respect to the body 1, the screws 20 can be brought one at a time into alignment with the opening 21, and then a screw driver can be inserted into the opening to advance the screws 20, one after another, and to advance the ring 19 to take up wear.

The sprocket wheel 16 is engaged by a sprocket chain 22 cooperating with a small driving sprocket wheel 23 (Fig. 1) secured to a shaft 24 mounted to rotate in an offset bracket 25 attached to the edge of the body 1, as Fig. 5 will disclose. The shaft 24 may be rotated by any suitable means not shown in the drawings but accessible at the place of use.

An under-cut guide plate 26 (Figs. 2 and 7) is secured at 27 to the rotatable tool carrier 9, and on the guide plate 26 a tool carriage 28 is mounted for right line adjustment, radially of the tool carrier 9, a gib 100 being located in the carriage, in contact with one edge of the guide plate. A post 29 extends through the guide plate 26 (Fig. 2) and is secured at 30 to the rotatable tool carrier 9. The post 29 extends downwardly into an elongated recess 31 into the tool carriage 28. A feed screw 32 is located in the recess 31, the inner end of the feed screw being threaded into the post 29 on the rotatable tool carrier 9, the feed screw being journaled in the outer end wall of the tool carriage 28 and being held against longitudinal movement by collars 33 attached to the feed screw.

The tool carriage 28 has a guideway 34 wherein is mounted for longitudinal adjustment a tool slide 35, the slide being disposed at an acute angle to the axis of the feed screw 32. A set screw 39, threaded into the carriage 28, holds the slide in any position to which the slide may have been moved longitudinally. A dressing tool 36 is held by an Allen screw 37 in the inner end of the slide 36. A yoke 38 (Fig. 7) is connected by a pivot element 39 to that part of the tool carriage 28 wherein the slide 35 is mounted. Intermediate its ends, the yoke 38 is provided with a notch 40, and at its free end, the yoke has a notch 41 adapted to receive a headed holding screw 42 threaded into the outer part of the tool carriage 28. A feed screw 43 is threaded at its inner end into the slide 35 and has fixed collars 44, located on opposite sides of the yoke 38. By rotating the feed screw 43, the slide 35 and the

tool 36 can be adjusted to vary the depth of the cut, as will be described hereinafter. The yoke 38 can be swung down to the position of Fig. 7, thus enabling the slide 35 to be taken out and be replaced by another slide, carrying a different tool, a quick interchange of tools being brought about, without loosening the screw 37 and exchanging tools in a single slide.

At a point diametrically opposite to the guide plate 26, the tool carrier 9 is provided with a radial guide plate 45 (Figs. 6 and 2), on which a slide 46 is mounted for right line reciprocation, after the manner of the tool carriage 28, the gib within the slide being marked by the numeral 98. The slide 46 is moved in and out by a feed screw 47 threaded into a post 48 attached at 49 to the rotatable tool carrier 9. The feed screw 47 is journaled in the outer end of the slide 46 and is held against longitudinal movement by collars 50.

The slide 46 has projecting arms 51 into which are threaded a fixed pivot screw 52, and a pivot screw 53 under the control of an operator. One end of a motor carrier 54 is mounted to swing on the pivot screws 52 and 53, and the opposite end of the motor carrier is provided with an adjustable stop or screw 55 (Fig. 6) adapted to engage an abutment arm 56 on the slide 46. One end of a pull spring 57 is attached to the slide 46, and the opposite end of the pull spring is connected to an adjusting screw 58 threaded into the motor carrier 54.

An electric motor 59 is secured in the motor carrier 54. A speed-increase gearing 61 is secured to the inner end of the housing of the motor 59 and includes a shaft 62 carrying a grinding wheel 60 operating parallel to the axis of rotation of the rotatable tool carrier 9. The conductors 63 for the motor 59 (Fig. 1) are connected to binding posts 64 on an insulating member 65 secured to the rotatable tool carrier 9. Spring-pressed contacts 66 in the binding posts 64 engage conducting tracks 67 secured in a recess in the body 1, but insulated therefrom. From the tracks 67, conductors 68 lead through the body 1 to a socket 69 on the body, it being possible to connect current supplying means 70 with the socket 69, by means of a plug 71.

The numeral 72 in Fig. 4 marks a setting jig having seats 74 adapted to receive the rib 15 on the rotatable tool carrier 9. The setting jig 72 is provided with a tapered hub 75 which has external threads 76. In Fig. 3 there is shown a setting jig 77 provided with seats 79 adapted to receive the rib 15 on the rotatable tool carrier 9. The jig 77 has a central tapered bore, provided with internal threads 80.

The numeral 81 marks a pipe provided at one end with a tapered pin 82 having external threads 83. At its opposite end, the pipe 81 has what is commonly known in the art as a tapered box 84 provided with internal threads 85, the threads 85 on the box 84 of one pipe being adapted to cooperate with the threads 83 on the pin end of the next adjoining pipe section, a shoulder 87 around the pin 82 being adapted to abut against a shoulder 89 at the end of the box 84, simultaneously with the grip of the pin threads 83 with the box threads 85, if the said threads 83 and 85 are in good condition; but they do not remain so, and the function of this device is to dress off the shoulders 89 and 87 so that they will come into abutment at the same time that the threads 85 and 83 come into mutual gripping relation, thereby obtaining a more secure joint 75

than would be possible otherwise, and to do this on the job, rather than by hauling the pipes to a remote place.

Assuming that the pin end 82 of the pipe 81 is to be worked upon, as in Figs. 3 and 2, the pipe is laid down horizontally, as in Fig. 11 on horses (not shown). The body 1 and the rotatable member or tool carrier 9 are slipped over the pipe. The pin 82 of the pipe is threaded into the jig 77. The jig 77 is connected to the tool carrier 9 by attaching elements 86, the rib 15 of the tool carrier 9 being received in the seats 79 in the jig 77. Thus the rotatable member 9 and the body 7 are centered with respect to the pipe 81. By means of the feed screws 6 of Fig. 2, the chuck carriers 6 and the chucks 4 are advanced until the chucks grip the pipe 81. Thus the body 1 is coupled to the pipe 81 and the jig 77 can be taken off, by removing the attaching elements 86 and rotating the jig 77.

The jig 72, the jig 77 and parts which cooperate with them, form members of a work-positioning instrumentality not capable of being claimed herein and forming the subject matter of my copending application Ser. No. 219,901, filed July 18, 1938.

Rotation then is imparted to the member 9 by way of the sprocket wheel 16, the sprocket chain 22, the sprocket wheel 23 and the power-driven shaft 24. As the member 9 is rotated, the tool 36 moves around in an orbit and dresses off the shoulder 87 in the pipe 81 at the inner end of the pin 82. In order to move the tool 36 in and out, that is transversely of the axis of the pipe 81, the carriage 28 is moved in and out by means of the feed screw 32. The depth of the cut, measured parallel to the axis of the pipe 81, is regulated by moving the tool slide 35 in and out, through the instrumentality of the feed screw 43.

If the material is too hard to be worked upon by the tool 36, the grinding wheel 60 may be employed, the motor 59 being swung by the spring 57 to urge the grinding wheel to its work. The position of the grinding wheel 60 with respect to the work, and the depth of the cut, may be regulated by means of the screw 55 of Fig. 6, and by means of that screw the wheel 60 can be held away from the work if it is desired to use the tool 36 alone. The slide 46, carrying the motor 59 and the driving wheel 60, can be moved in and out by the feed screw 47, the result attained being like that produced by the operation of the feed screw 32 of Fig. 2 on the tool carriage 28.

When the box end of the pipe is to be operated upon, the jig 72 of Fig. 4 may be employed, it being unnecessary to trace out the mounting of the jig 72, in view of what has been stated hereinbefore with respect to the jig 77.

As to the current supply for the motor 59, it is derived from the conductors 70 of Fig. 11, the plug 71, the socket 69, the conductors 68, the conducting tracks 67, the contacts 66, the binding posts 64, and the conductors 63 of Fig. 1.

Having thus described the invention, what is claimed is:

1. In a device for dressing an external transverse shoulder on a member, an annular body having circumferentially spaced guides, chuck carriers mounted on the guides for movement toward and from the axis of the body, means under the control of an operator for moving the chuck carriers toward and away from the axis of the body, work-engaging chucks, means for mounting the chucks pivotally on the inner ends of

the chuck carriers, an annular tool carrier mounted to rotate on the body, about said axis, means for rotating the tool carrier, a tool carriage mounted on the tool carrier for movement toward and away from the axis of the body, means under the control of an operator for moving the tool carriage as aforesaid, a tool slide mounted on the tool carriage for movement toward and away from the axis of the body, at an acute angle to the axis of the body, with the inner end of the tool slide nearer to the tool carrier than the outer end thereof, a shoulder dressing tool mounted on the inner end of the tool slide, and means under the control of an operator for moving the tool slide toward and away from the axis of the body, at said angle.

2. In a device for dressing an external transverse shoulder on a member, an annular body having circumferentially spaced guides, chuck carriers mounted on the guides for movement toward and away from the axis of the body, means under the control of an operator for moving the chuck carriers toward and away from the axis of the body, work-engaging chucks mounted on the inner ends of the chuck carriers, an annular tool carrier mounted to rotate on the body, about said axis, means for rotating the tool carrier, a tool carriage mounted on the tool carrier for movement toward and away from the axis of the body, means under the control of an operator for moving the tool carriage as aforesaid, a motor, means for mounting the motor on the tool carriage, for swinging adjustment in a direction parallel to the axis of the body, means for regulating the swinging adjustment of the motor, and a grinding wheel carried by and driven by the motor, the grinding wheel operating in a plane parallel to the axis of the body.

3. In a device for dressing an external transverse shoulder on a member, an annular body having circumferentially spaced guides, chuck carriers mounted on the guides for movement toward and away from the axis of the body, means under the control of an operator for moving the chuck carriers toward and away from the axis of the body, work-engaging chucks mounted on the inner ends of the chuck carriers, an annular tool carrier mounted to rotate on the body, about said axis, means for rotating the tool carrier, a tool carriage mounted on the tool carrier for movement toward and away from the axis of the body, means under the control of an operator for moving the tool carriage as aforesaid, a slide mounted on the tool carriage for movement toward and away from the axis of the body, at an acute angle to the axis of the body, with the inner end of the tool slide nearer to the tool carrier than the outer end thereof, a shoulder dressing tool mounted on the inner end of the tool slide, and means under the control of an operator for moving the tool slide toward and from the axis of the body, at said angle.

4. In a device for dressing an external transverse shoulder on a member, an annular body, work holding means carried by the body, means under the control of an operator for adjusting the work holding means with respect to the axis of the body, an annular tool carrier mounted to rotate on the body, about said axis, means for rotating the tool carrier, a tool carriage mounted on the tool carrier for movement toward and away from the axis of the body, means under the control of an operator for moving the tool carriage as aforesaid, a tool slide mounted on the tool carriage for movement toward and away

from the axis of the body, at an acute angle to the axis of the body, with the inner end of the tool slide nearer to the tool carrier than the outer end thereof, a shoulder dressing tool mounted on the inner end of the tool slide, means under the control of an operator for moving the tool slide toward and away from the axis of the body, at said angle, the last-specified means comprising a releasable part enabling the tool slide and the tool to be removed as one piece.

5. In a device for dressing an external transverse shoulder on a member, an annular body having work holding means, the body having an external circumferential groove, a rotatable tool carrier journaled on the body and having a rim extended about the body, an annular driving member extended into the groove, to hold the carrier on the body for rotation, detachable means for holding the driving member on one end of the rim, a wear ring in the groove, between the driving member and the base of the groove, means carried by the driving member for adjusting the ring toward the base of the groove, to take up wear, and shoulder forming means supported by the tool carrier.

6. In a device for dressing an external shoulder on a member, an annular body having work holding means, the body having an external circumferential groove disposed in a plane substantially at right angles to the axis of the body, the body having an opening disposed approxi-

mately parallel to the axis of the body and leading to the groove, an annular tool carrier journaled on the body, an annular driving member extended into the groove, to hold the carrier on the body for rotation, a wear ring in the groove, between the driving member and the base of the groove, a plurality of circumferentially spaced pressure devices on the driving member, for adjusting the wear ring toward the base of the groove, to take up wear, the driving member being adjustably rotatable to bring each of said pressure devices, one after another, into registration with the opening in the body, for manipulation, detachable means for securing the driving member to the carrier, and a shoulder forming means supported by the carrier.

7. In a device for dressing an external transverse shoulder on a member, an annular body having work holding means, a rotatable tool carrier journaled within the body, means for rotating the carrier, concentric conducting tracks on the inside of the body, conductor retainers extended through the carrier and engaged resiliently with the tracks, means on the body for bringing the tracks accessibly into a circuit, from a point external to the body, a motor, means for mounting the motor on the carrier, for adjustment toward and away from the work to be shouldered, and conductors connected to the motor and to the retainers.

FRANK MORGAN.