Oct. 28, 1952 M. W. IVES 2,615,353

SEMIAUTOMATIC ROTARY CABLE TOOL DRESSER

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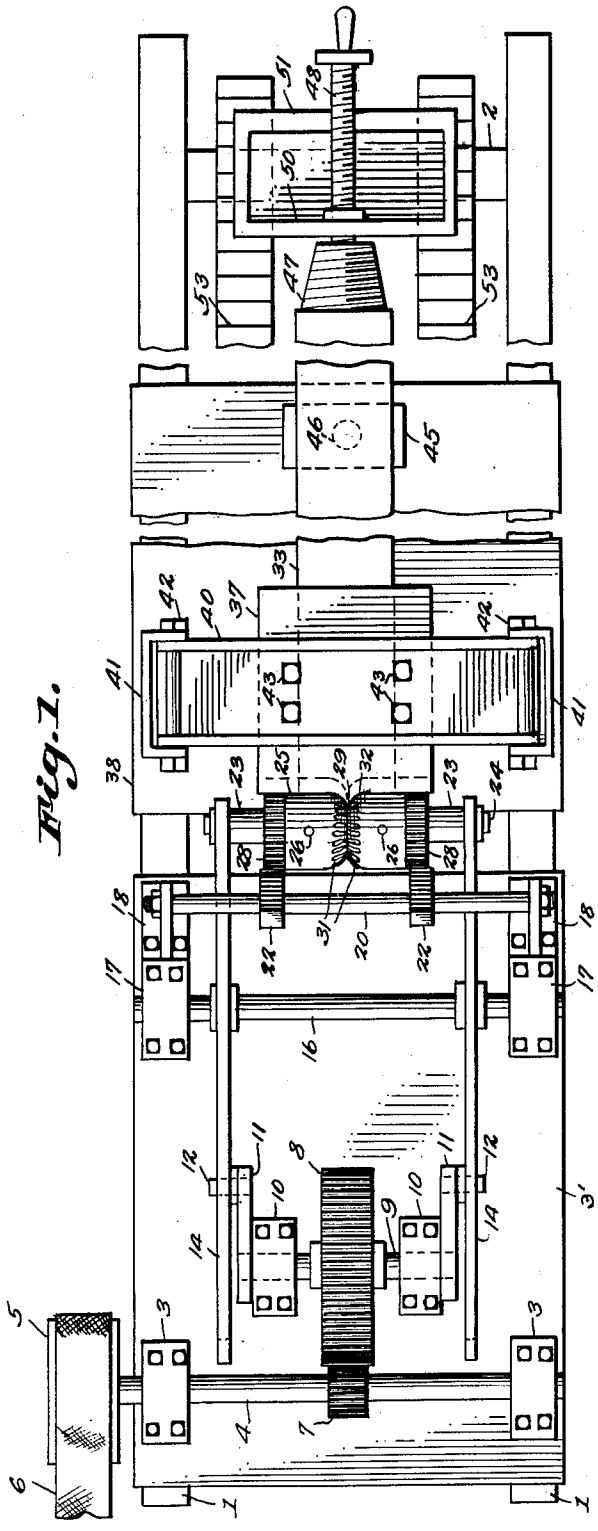


Fig. 1.

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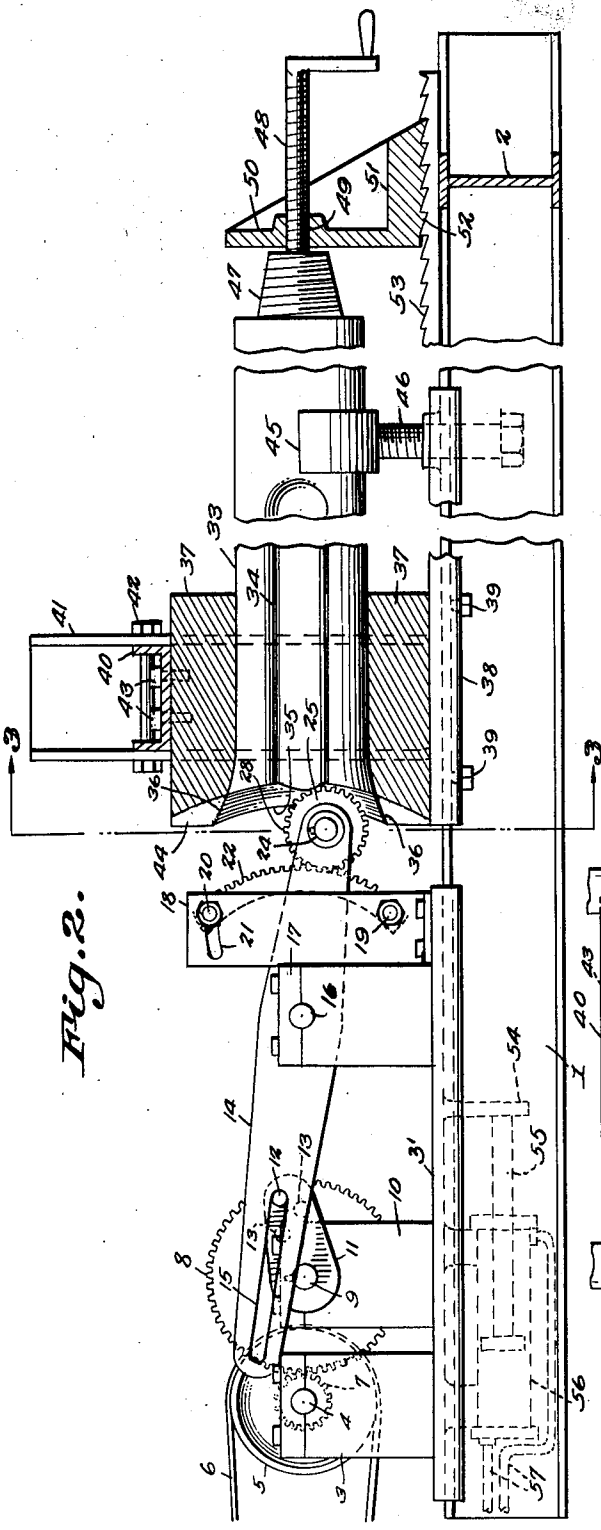


Fig. 2.

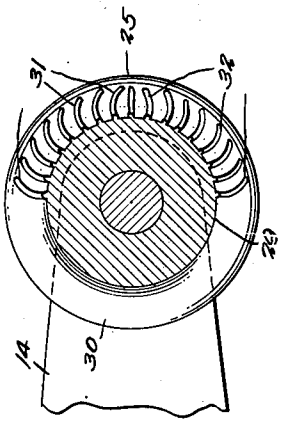


Fig. 4.

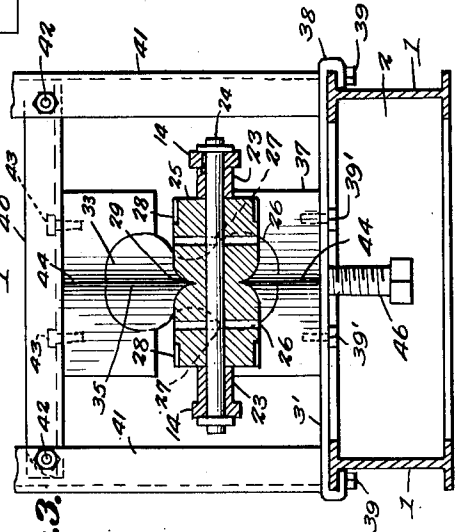


Fig. 3.

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2,615,353

## SEMIAUTOMATIC ROTARY CABLE TOOL DRESSER

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8 Claims. (Cl. 76—5)

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This invention relates to a semi-automatic rotary cable tool dresser, that is, semi-automatic apparatus adapted to dress or reshape cable tools such as large diameter rock drill bits, said apparatus conditioning the bit by means of a rotary action.

A bit of the type stated is quite large in size, being generally approximately six feet long and of a diameter of approximately six inches, in the case of a widely used size of bit of the general type. However, these bits very frequently are of still greater diameter and length, and it will be appreciated that when the penetrating edge of such a bit becomes dulled and the ends of said edge become worn off, renewing of the bit represents a real problem.

Obviously, a bit of this type should cut with speed and efficiency and should drill a straight, uniform hole. If the bit is not shaped accurately and efficiently, these results will not obtain, and too often the result is a material decrease in the amount of productive drilling that might otherwise be possible within a specified period of time, with attendant loss of time and increase in expense. This undesirable result occurs because a poorly shaped bit too often becomes stuck, or may cause a hole to be lost, or may itself have to be "fished" for.

Heretofore, it has been customary to dress a bit of the general type by hand in many instances, and this has been highly unsatisfactory because of the fact that it has not been possible to obtain uniformly accurate penetrating edges on hand-dressed bits, it being very difficult and time-consuming to obtain by hand a reshaping of the penetrating edge of a bit in a manner to cause said edge to be properly concaved and to have sharp forwardly projected ends or corners.

Machine dressing of tools of the type stated is also quite common, and has the advantage over hand dressing of producing controlled accurate shapes wherein the machine-dressed bit will have properly shaped, sharp penetrating edges for chipping the bottom of the hole, long reaming edges (the outer edge or circumference of the bit) for cutting the hole to a proper roundness and smoothness, and large area crushing faces to pulverize the chips after they have been produced by the action of the diametrically disposed penetrating edge. However, such apparatus as has heretofore been provided for the purpose of machine dressing tool bits is believed to be too complex, heavy, and expensive. Conventionally, apparatus of this type reshapes the bit by use of a horizontal ram and radial hammer.

The main object of the present invention is to provide apparatus specifically adapted to resharpen and reshape a bit of the type stated, by means of an oscillated rotary forming die or roller.

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Another important object is to provide apparatus as described that will be relatively light, inexpensive, and of simple construction.

Still another object is to provide apparatus as described adjustable for reshaping or reconditioning bits of different diameters, and adapted for interchangeability of forming dies so as to reshape bits of various types or shapes.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel details of construction and combinations of parts, hereinafter more fully described and pointed out in the claims, it being understood that changes may be made in the construction and arrangement of parts without departing from the spirit of the invention as claimed.

Referring to the drawings

Fig. 1 is a top plan view of the apparatus, portions being broken away, a bit being shown in position to be dressed.

Fig. 2 is a side elevation, portions being broken away, and other portions being shown in longitudinal section.

Fig. 3 is a section on line 3—3 of Fig. 2, portions being broken away.

Fig. 4 is an enlarged section taken transversely across the rotary forming die.

Referring to the drawings in detail, the entire apparatus is adapted to be mounted upon a pair of spaced parallel I-beams 1, which may be cross braced wherever desired by one or more cross members 2, which may also be I-beams.

The I-beams define a supporting frame having a trackway constituted by the top flanges of the I-beams 1, and mounted slidably upon said trackway, for shifting longitudinally of the supporting frame, is a supporting plate 3' the opposite longitudinal edges of which are flanged to engage the respective I-beams 1 (see Fig. 3), said supporting plate 3' being disposed transversely across the supporting frame.

Mounted upon and upstanding from the supporting plate 3' at one end thereof are the upstanding bearings 3, in which are journaled opposite end portions of a transversely disposed shaft 4 rotated by the pulley 5 that is secured to one end of the shaft 4, the pulley 5 being driven by a belt 6 extending from a suitable source of power, not shown.

Secured to the center portion of the shaft 4 for rotation therewith is a pinion 7 in mesh with the driven gear 8, that is secured to and rotates the crank shaft 9 journaled at opposite ends in the bearings 10 that are secured to and are upstanding from the medial portion of the plate 3'.

The ends of the crank shaft 9 are provided with the crank arms 11, that are keyed to the ends of said shaft 9, the crank arms 11 being provided at their other ends with the outwardly

and laterally extended crank pins 12. The crank arms 11 may be formed, if desired, with any number of openings 13, and the crank pins 12 can be positioned in any selected opening 13, the openings 13 being different distances from the center of the shaft 9 and this would be for the purpose of adjusting the throw of a lever 14 having at one end the elongated slot 15 through which the crank pin 12 extends. The lever 14 is fulcrumed intermediate its ends upon the transversely disposed pivot shaft 16 journaled in the brackets or bearings 17.

The bearings or brackets 17 are mounted upon the forward portion of the plate 3' at opposite sides of said plate, and immediately in advance of the bearings 17, there are mounted upon the plate 3' the vertically disposed plates 18. Extending between and secured at opposite ends to the lower portions of the respective plates 18 is a lower rack-supporting bar 19, and extending between the upper end portions of the supporting plates is the upper rack-supporting bar 20, the ends of the upper bar 20 extend through arcuate slots 21 formed in the plates 18.

Secured at their upper and lower ends to the respective bars 19 and 20 are the spaced vertically disposed arcuate racks 22. It will be seen that by adjusting the rack-supporting bar 20 to the left in Fig. 2, that is, to the other end of the slots 21, the racks 22 will be swung rearwardly, to an inoperative position to be described in greater detail hereinafter. When the bar 20 is swung forwardly, that is, to the position in which it is illustrated in Fig. 2, the racks 22 are operatively positioned to engage with a rotary forming die or roller.

The spaced parallel lever arms 14 have at their front ends inwardly extended spacer sleeves 23 (see Fig. 3), and keyed to said sleeves 23 are the opposite ends of a shaft 24. Mounted rotatably upon the shaft 24 and held in a central position by the sleeves 23 is a rotary forming die or roller 25, and while this is normally rotatable upon the shaft 24, it can be held against rotation relative to the shaft by being pinned thereto, the rotary forming die having transverse passages 26 adapted to coincide with openings 27 formed in the shaft 24, to receive cross pins, not shown, whenever it is desired to hold the forming die or roller against rotation relative to the shaft.

At its opposite ends, the roller 25 is provided with the circumferential series of gear teeth 28, which may be cast directly in the surface of the roller, or which may alternatively comprise a pair of ring gears fitted over the opposite ends of the roller. In any event, the teeth 28 are in mesh with the teeth of the racks 22, and it will thus be seen that when the roller is carried upwardly by the levers 14, the racks 22, meshing with the teeth 28, will cause the roller to rotate counter-clockwise when viewed as in Fig. 2. When the roller is swung downwardly with the levers or rocker arms 14, the racks 22 impart clockwise rotation thereto.

Intermediate its ends, the roller 25 is formed with the deep cut annular groove 29 here shown as being of V-shaped cross sectional configuration (see Fig. 3), with convexed side walls. With respect to the side walls of said groove 29, it will be noted from Fig. 4 that for perhaps half of the circumference of the roller, said side walls are smooth surfaced as at 30 (Fig. 4), and for the other half of the circumference of the roller, are formed with spaced-apart, curving scraping ribs 31 and 32 respectively. The scraping ribs 31 curve in a clockwise direction, while the scraping ribs 32 curve counter-clockwise.

A bit to be reconditioned is designated 33, and conventionally, is formed for a greater part of its length with the longitudinally extended oppositely disposed water courses 34. At its cutting end, such a bit is provided with the diametrically disposed penetrating edge 35, which is shaped complementarily to the annular groove 29, that is, with concave side walls. It may be further noted from Fig. 2 that the penetrating edge 35 is concaved longitudinally, that is from end to end thereof, and at opposite ends has the forwardly disposed sharpened end portions 36.

When the bit 33 is to be reshaped after having been dulled and worn through use, it is usually the case that the forwardly disposed sharpened ends 36 are completely worn off, since these are the portions of the penetrating edge that penetrate the rock formation first, and which do a major part of the work of cutting said rock formation. Additionally, the sharp cutting edge of the penetrating edge 35 is dulled from end to end of said penetrating edge, and additionally, the clutching face of the bit, disposed on opposite sides of the penetrating edge, may be worn away to a considerable extent and the reaming edge, comprising the circumference of the bit, may also be worn considerably.

Actually, the reconditioning of the bit 33 cannot be provided for merely by sharpening of the penetrating edge, and it is necessary for the purpose of truly reconditioning the bit so that it will perform with full efficiency once again, to form the sharp forwardly disposed ends 36 on the penetrating edge. This must be done by reforming of the bit in proper dies, and by pressing the metal of which the bit is formed outwardly and forwardly so as to provide material for the sharp ends 36 to replace that which has been worn off.

In this connection, during the operation of reshaping and sharpening the bit, the bit 33 is in a highly heated state, this being customary in all apparatus heretofore devised for the purpose of reshaping and sharpening said bits. In any event, when the bit has been heated to a sufficient extent, it is positioned between a pair of stationary forming dies 37, which, as seen from Fig. 3, are provided with opposed approximately semi-circular recesses receiving the diametrically opposite portions of the bit, so as to clamp the bit securely against movement. At one end, as seen from Fig. 2, the recesses flare outwardly to accommodate the flared construction of the bit 33, the illustrated bit being one having a flared front end, to provide an angle of clearance when the bit is being used in drilling operations. Additionally, it may be noted that these dies are mounted upon a flange plate 38 mounted to slide longitudinally of the I-beams 1, said plate 38 being secured in selected positions to which it is shifted longitudinally of the frame 1 by means of the bolts 39.

The lower die 37 is removably secured to said plate 38 by means of bolts 39', while the upper die 37 underlies a cross head 40 extending between and supported by the upstanding channel members 41, to which said cross head 40 is secured by means of the connecting bolts 42. Screws or bolts 43 secure the upper die 37 removably to said cross head 40. It will be understood that a plurality of vertically spaced openings would be provided in the channel members 41, for vertical adjustment of the cross head 40 to accommodate dies 37 of different thicknesses. This adjustable

construction would be valuable for adjusting the location of the dies 37 according to the needs of the particular situation, as for example, where a bit 33 of a particularly large diameter is to be reconditioned or reshaped.

The front faces of the respective dies 37 are formed with the sharp ribs 44 aligned with the penetrating edge 35, as may be readily seen from Fig. 3, and of importance in this connection is the fact that the ends of the ribs 44 are so shaped as to provide abutments against which the back or end surfaces of the penetrating edge 35 are forced when the forwardly disposed sharpened ends 36 are to be formed upon said penetrating edge.

As will be noted the front portion of the bit 33 is secured between the dies 37, and the back portion of the bit is supported in a saddle 45 adjustable upwardly or downwardly by the threaded foot 46 threaded in the plate 38. At its back end, a bit 33 is conventionally formed with the tapered threaded end 47, and to press the bit forwardly I provide the upstanding plate 50 having the base 51 formed integrally therewith, the base 51 being provided with a plurality of transversely disposed teeth 52 engageable in the toothed racks 53 stationarily mounted upon the cross member 2. A threaded opening 49 is formed in the plate 50, and a crank 48 is threaded is said threaded opening.

In view of the necessity of acting upon the bit 33 while it is still in a highly heated state, it may be noted that ordinarily, the upper die 37 would be removed, and the bit 33 would be positioned upon the lower die 37. The upper die 37 would immediately be dropped into place and secured, and the plate 50 would be shifted against the end 47 of the bit, the base 51 slipping over the teeth 53 when said plate is shifted to the left in Fig. 2. This swiftly provides a rear abutment for the bit 33, and the hand crank 48 is now operated to be forced against the rear end surface of said bit, thus to force the bit under considerable pressure into the groove 29 and against the surface of the roller 25.

The apparatus is now set into motion, and it will be seen that operation of the power means will cause the gear 8 to be driven, thus causing rotation of the crank pin 12, and thereby rocking the rocker arms 14 vertically. This swings or oscillates the roller 25 upwardly and downwardly through an arcuate path, and when the roller 25 swings upwardly, the racks 22 give counter-clockwise movement thereto over the face of the bit. From the center portion of the bit on up to the top end of the bit as seen in Fig. 2, the ribs 32 would be presented to the penetrating edge and crushing face of the bit, and this will cause the malleable metal of the heated bit end to be, in effect, molded or pressed upwardly against the abutment defined by the end of the rib 44 of the upper die 37.

When the roller 25 is swung downwardly after reaching the upper end of the throw of the rocker arms 14, it will be noted that as it passes the center and is swung on downwardly to the lower end of the penetrating edge 35 as seen in Fig. 2, the ribs 31 will be presented to the penetrating edge, and these will act in the same way as the ribs 32, that is, they will mold or force the malleable metal of the heated bit against the end surfaces of the ribs 44 so as to form once again forwardly disposed sharpened ends 36 upon the penetrating edge.

At the same time, the concave configuration which the penetrating edge 35 has when considered longitudinally thereof is imparted thereto by the arcuate travel of the rotary forming die or roller 25.

In this connection, it will be noted that the racks 22 give rotary motion to the forming dies in a direction opposite to that which the forming die would rotate if it were not engaged by the racks 22, and were simply being rotated by the penetrating edge 35 over which it is swung. This reverse direction of rotation of the forming die produces a more efficient molding action of the penetrating edge, which molding action is even further brought about by means of the curved raised ribs 31 and 32, that curve in the direction of rotation of the rotary forming die.

However, under many circumstances it may be desired to present a portion of the forming die to the penetrating edge which does not have the ribs 31 and 32, and in this event, the rotary die is swung around upon the shaft 24 so as to present the smooth-surfaced portion 30 to the surface of the penetrating edge. This, for example, might be desirable at the conclusion of the bit reshaping operation. In any event, in such an instance, the racks 22 can be left in engagement with the forming die, or alternatively, the racks 22 can be disengaged from the teeth 28, by being swung rearwardly at their upper ends, to the other ends of the slots 21. When this is done, the rotary forming die 25 will be rotated by the penetrating edge 35, in directions opposite to those in which it was rotated by the racks 22.

Still another possibility is to pin the roller or forming die 25 directly to the shaft 24, which as previously noted, is keyed to the levers or rocker arms 14. In such an instance, the racks 22 would of course be swung to their inoperative or disengaged positions, and pins would be dropped through the passages 26 and 27, in which event up and down swinging of the rocker arms 14 would not cause rotation of the roller 25. Rather, the roller 25 would be held stationary and would wipe over the face of the penetrating edge 35 with an abrasive action.

Of course, other bits may be of different designs, and in this instance, it is necessary merely to remove the particular rotary forming die 25 which has been here illustrated, and substitute a forming die having an annular groove 29 of different cross sectional configuration, that is, of a cross sectional configuration formed so as to be complementary to the specific shape of the bit to be reconditioned. Additionally, the stationary dies 37 are interchangeable, and other dies can be provided, to accommodate bits 33 of different diameters and cross sectional shapes.

Assuming that a bit of larger diameter is to be reshaped, it will be desired that the roller 25 be given a longer throw. In this connection, the location of the crank pin 12 in a selected opening 13 will determine the extent of vertical travel of the roller 25, and it will be noted that since in the present instance the crank pin 12 is located at its maximum distance from the center of the shaft 9, the roller 25 in the illustrated example is illustrated as it would appear when traversing a long penetrating edge 35 on a bit of large diameter. If the bit is of small diameter, the crank pin 12 is moved inwardly to one of the openings 13 that is disposed more nearly to the center shaft 9, and this shortens the throw of the roller 25. In every instance, however, it is desired that the roller 25 be swung upwardly or downwardly a distance beyond the upper and

lower ends of the penetrating edge 35, so as to force the bit material against the ribs 44 and thus form forwardly disposed sharpened ends 36 upon the penetrating edge 35.

I believe that other means may be provided for adjusting the extent of throw of the roller 25, as for example, the center pivot 16 of the rocker arms 14 may be shiftable to other locations intermediate the ends of the rocker arms, or some other equivalent means may be provided for adjusting the throw of the rocker arms.

Means can be provided for forcing the plate 3' and the parts supported thereby under heavy pressure against the face of the drill bit, and preferably such means embodies a hydraulic ram and cylinder arrangement such as shown in dotted lines in Fig. 2. It will be seen that I have here illustrated, by way of example, a plate 54 extending downwardly from the slidable plate 3'. Secured to said plate 54 is a ram or piston 55 extending from a hydraulic cylinder 56 mounted upon the supporting frame defined by the I-beams 1. Tubing 57 extends from said cylinder and is adapted to control the supply of fluid to the cylinder, for the purpose of operating the piston. It will be seen that in this manner, the plate 3' can be forced under heavy presure in the direction of the drill bit face, for the purpose of pressing the forming die or roller against said bit face, thus to impart the desired configuration to the bit face on repeated traversing thereof by said die.

What is claimed is:

1. Apparatus for conditioning a drill bit comprising a supporting frame; means on said frame adapted to grip a drill bit to be conditioned; a rocker arm mounted for oscillating movement upon said supporting frame; a rotary forming die mounted upon said arm and adapted to traverse the face of the drill bit on oscillation of the arm; and a rack mounted upon the supporting frame and engaging said rotary forming die to rotate the same when the die is oscillated with said arm.

2. Apparatus for conditioning a drill bit comprising a supporting frame; a rocker arm mounted for oscillating movement upon said frame; means on said frame adapted to grip and hold stationary a drill bit to be conditioned; an arcuate rack mounted upon said supporting frame; a rotary forming die having gear teeth and mounted upon one end of said rocker arm to oscillate with said rocker arm and wipe across the face of a drill bit to be reshaped, said rack engaging the teeth of the rotary forming die on oscillation of said die to impart rotation to said die during oscillating movement; and means for adjusting said rack to operative and inoperative positions in which, respectively, it engages and is disengaged from said die.

3. Apparatus for conditioning a drill bit comprising a supporting frame having a slideway; a plate mounted for slidable movement upon said slideway; a second plate mounted for slidable movement upon said slideway, said second plate being adapted as a bit supporting plate; a pair of bit-engaging dies mounted upon said second plate and adapted to clamp between them a drill bit to be conditioned, the front faces of said dies being ribbed and said ribs constituting extensions of the penetrating edge of a drill bit clamped between the dies; means for adjusting said second plate toward and away from the first plate; rocker arms mounted upon the first plate for joint oscillating movement; a rotary forming die mounted upon one end of and between said rocker arms, said rotary forming die having an annular medially disposed groove for receiving the penetrating edge of a drill bit to be conditioned; a pair of racks mounted upon said first-named plate, said racks being of arcuate configuration and said rotary die having gear teeth at opposite ends meshing with said racks, to impart rotation to the die opposite to the normal direction of rotation of said die when wiped across the face of the drill bit; and means for forcing said first-named plate under pressure in the direction of said drill bit.

4. Apparatus as in claim 3, and wherein said groove of the rotary forming die is formed with a plurality of raised ribs on its side walls adapted to press the material of which the drill bit is composed outwardly toward the ends of the penetrating edges of said drill bit for reshaping of said ends.

5. Apparatus as in claim 3, and wherein the side walls of the annular groove of the rotary die are smooth for a portion of the circumference of the groove, the remaining portion of said circumference being formed with adjacent series of raised ribs, the ribs of one series being curved in one direction and the ribs of the other series being curved in an opposite direction.

6. Bit dressing apparatus which includes means for holding an elongated bit stationarily, a roller mounted adjacent the drill bit holding means for oscillation across and in contact with an adjacent end of a drill bit held in said holder to reshape said end of the drill bit, means mounted adjacent the drill bit holder and operatively connected to the roller for imparting oscillatory movement to said roller, and means mounted adjacent the drill bit holding means and engaging the roller for positively rotating the roller as it oscillates.

7. Apparatus for dressing a tool bit comprising means for holding stationary a tool bit to be dressed, an arm mounted to rock in a vertical arcuate path adjacent the bit holding means, a roller mounted on the arm for movement therewith across one end of a tool bit held in the holder, and means mounted between the arm mounting and the bit holding means for engaging the roller and rotating it as it is moved by the arm.

8. Apparatus for conditioning a bit comprising a supporting frame, means on said frame adapted to grip a drill bit for conditioning, a plate slidable on the frame toward and away from said bit gripping means, an arm mounted upon said plate to oscillate in an arcuate path, a rotary bit shaping die mounted upon said arm for movement therewith, said die being positioned to traverse and shape the face of the bit when the arm is oscillated, means carried by the plate and connected to the arm for oscillating said arm, and means carried by the plate and operatively connected to the bit shaping die for positively rotating said die as it oscillates with the arm.

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