Nov. 2, 1943. P. H. NAST 2,333,487

CENTRALIZER FOR ROCK DRILLS

Filed Sept. 22, 1942 3 Sheets-Sheet 1

Fig. 1.

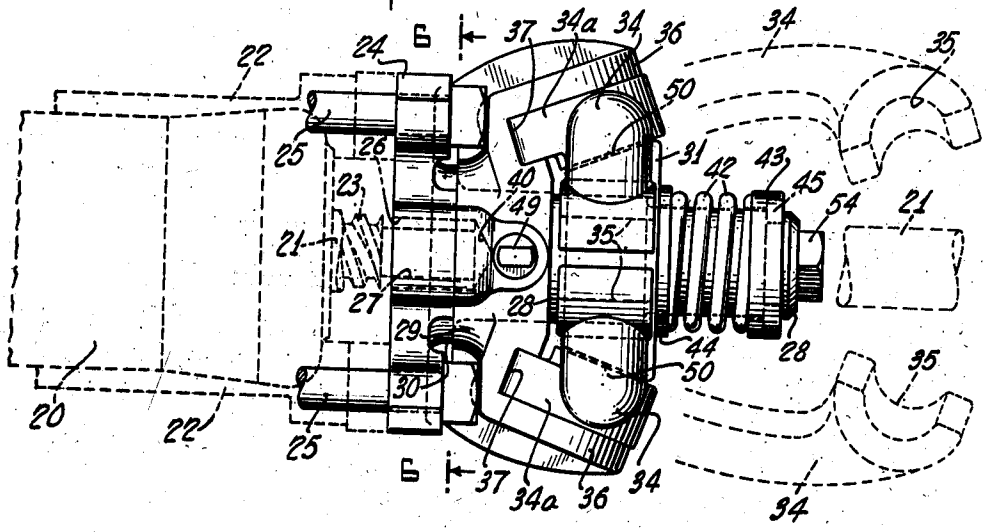


Fig. 2.

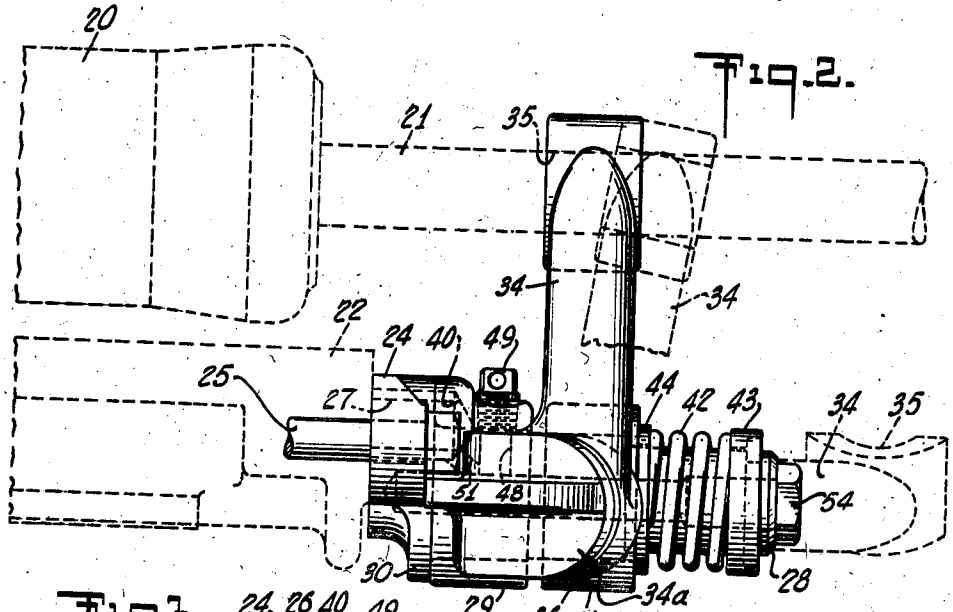
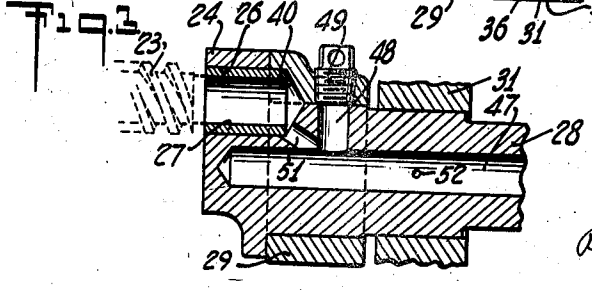


Fig. 3.



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Filed Sept. 22, 1942 3 Sheets-Sheet 2

Fig. 4.

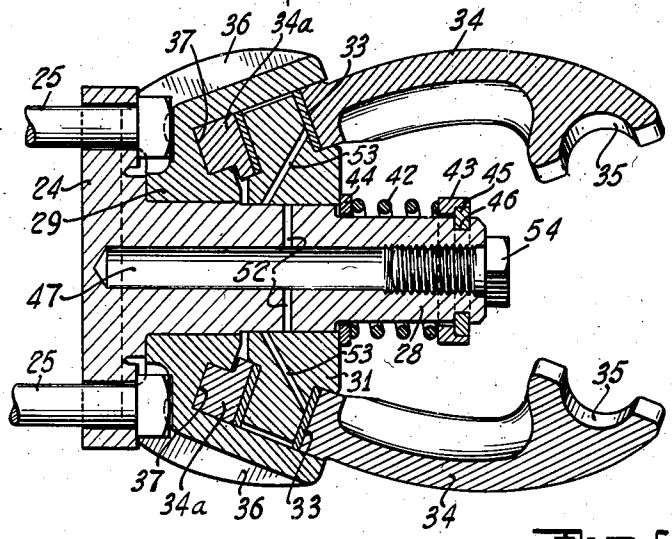


Fig. 5.

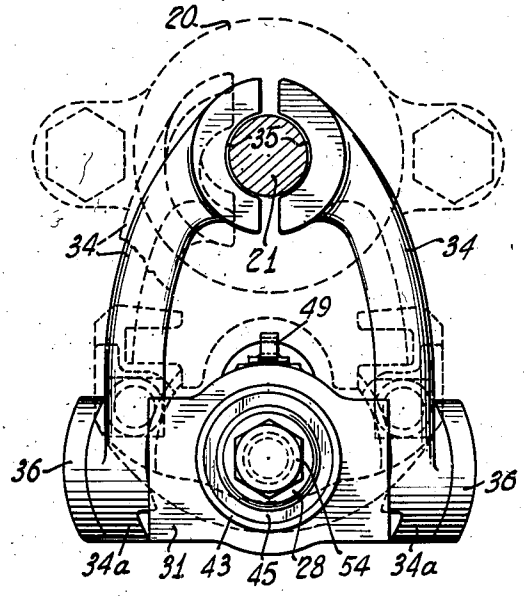


Fig. 6.

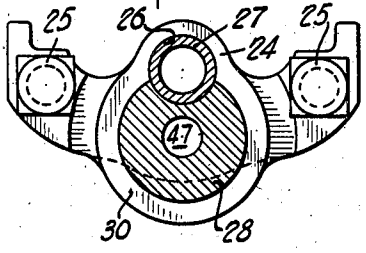
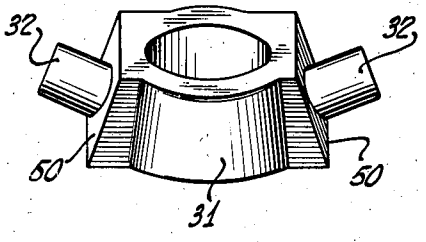


Fig. 7.



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CENTRALIZER FOR ROCK DRILLS

Filed Sept. 22, 1942 3 Sheets-Sheet 3

Fig. 8.

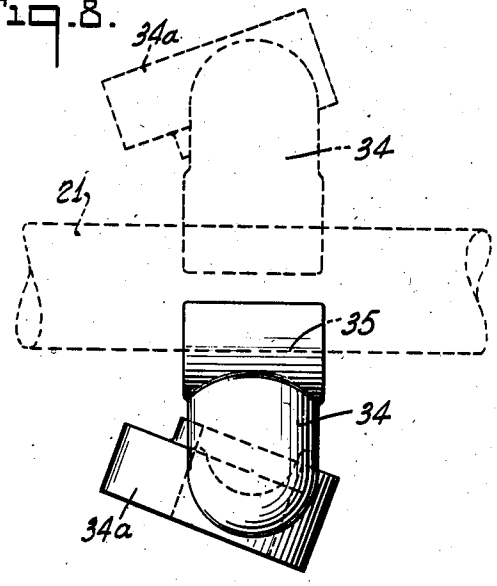


Fig. 10.

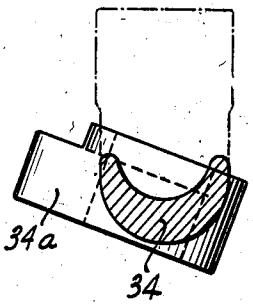


Fig. 9.

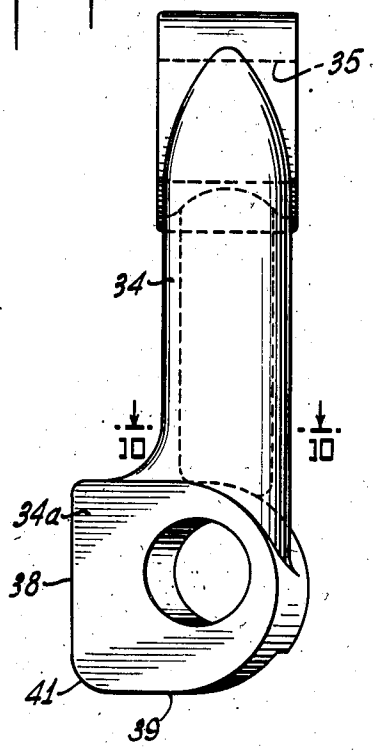
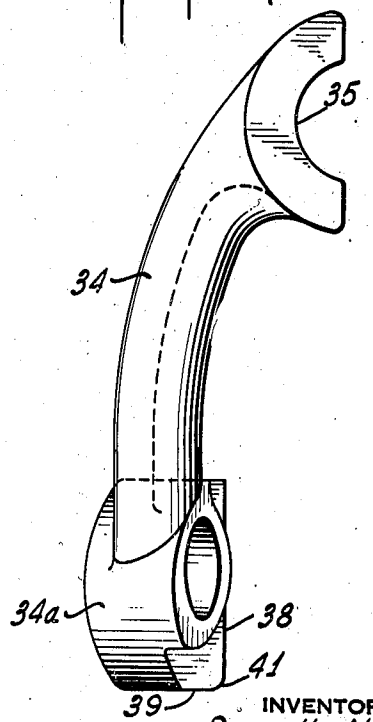


Fig. 11.



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UNITED STATES PATENT OFFICE

2,333,487

CENTRALIZER FOR ROCK DRILLS

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Application September 22, 1942, Serial No. 459,259

13 Claims. (Cl. 255—51)

This invention relates to centralizer apparatus of the kind provided in rock drills of the drifter type to guide the drill steel when starting a hole.

In a drifter the drill is supported on a shell mount and advances relatively thereto as it drives the working steel through the rock. The steel ordinarily is supported and guided only by the chuck parts of the drill. This does not make for an alignment sufficiently rigid to prevent the steel from being deflected out of its proper course when starting a hole in an irregular surface. As a result it is the practice to attach to the front of the shell an auxiliary guide means or centralizer which furnishes a bearing for the steel in advance of the drill. According to the preferred construction of a centralizer it comprises essentially a pair of guide arms supported on a body portion for pivotal movement to and from a position in which they combine substantially to surround the drill steel with a close fit. Movement of the centralizer arms from effective position is necessary in order not to restrict the advance of the drill and is generally accomplished by the drill itself which rocks the arms out of its path after a travel sufficient to start the steel along the desired course in the rock. Detent means hold the arms yieldingly in each position of adjustment.

The present invention contemplates a centralizer construction which is broadly new although retaining the essential elements and general mode of operation of prior art devices.

One object of the invention is to make possible a more positive control of the centralizer arms.

Another object is to simplify the structure of the centralizer unit through a reduction in the number of parts, while making use of a construction lending ruggedness and long life to the unit.

A further object of the invention is to embody in the centralizer an oil reservoir and ports leading therefrom to friction bearing surfaces in the unit, for purposes of lubrication.

In carrying out these objects a drill steel centralizer has resulted which comprises a body having a projecting stub shaft and a bore constituting an oil reservoir, a guide plate and a trunnion plate slidably mounted on the shaft, centralizer arms pivotally mounted on angularly disposed trunnions on the trunnion plate, reaction surfaces on the guide plate against which the arms bear in pivoting on the trunnion plate, cams effecting a separating movement of the plates in response to pivotal movement of the arms, and a single coil spring surrounding the stub shaft for returning the plates as the arms are moved into a selected position of adjustment.

Other objects and structural details of the invention will be apparent from the following description when read in conjunction with the accompanying drawings, wherein:

Fig. 1 is a plan view of the centralizer apparatus mounted on the front of a rock drill, showing the arms in full lines as they appear when closed to effective position and in dotted lines as they appear when opened to ineffective position;

Fig. 2 is a view like Fig. 1 but in side elevation;

Fig. 3 is a fragmentary vertical longitudinal section taken through the body portion, showing the oil reservoir and communicating ports;

Fig. 4 is a horizontal longitudinal section of the centralizer unit, showing the arms swung outward to open position;

Fig. 5 is a front end view of the unit;

Fig. 6 is a view, in cross-section, taken along the line 6—6 of Fig. 1;

Fig. 7 is a detail view, in perspective, of the trunnion plate; and

Figs. 8 to 11 are detail views of one of the centralizer arms, Fig. 10 being in cross-section taken along the line 10—10 of Fig. 9.

Referring to Figs. 1 and 2, fragmentary portions of the drill, the working steel, and the shell mount are indicated respectively at 20, 21 and 22. Also shown is a part of the feed screw 23, this being a rotatable screw threaded shaft extending lengthwise of the shell and operatively engaged with the drill to advance and retract it toward and from the work.

Conventionally the front of the shell 22 is closed by an end plate providing a bearing for the front of the feed screw 23. In the present instance, this plate is embodied in an element 24 which serves also as the support or body portion of the drill steel centralizer. The body 24 is fastened to the shell by through side rods 25, and, midway between the rods at a point above its central axis, is formed with a bore 26 adapted to receive the end of the feed screw 23 (see Figs. 3 and 6). A bushing 27 in the bore forms the bearing surface within which the screw rotates.

Projecting forwardly from the body portion 24 is an integrally formed stub shaft 28. Surmounting the stub shaft are control elements of the centralizer assembly, including a combination guide and reaction plate 29 and a trunnion plate 31. The plate 29 occupies the inside position on the shaft 28 abutting a boss 30 on the front face of the body 24. In order to position the guide plate rotatively, a recess 40 is formed therein adapted to register with the bore 26 in the body 24. As shown in Fig. 3, the recess 40

closes the bore 26 at the point where it breaks through the body 24, and receives the inner end of bushing 27 which thus acts as a dowel pin. The trunnion plate 31 lies in front of the plate 29 and, as shown in Figs. 5 and 7, has flat side surfaces 50 inclining rearward and inward toward the axis of the shaft 28. Oppositely disposed trunnions 32 extend at right angles from the surfaces 50 and therefore at an oblique angle with respect to each other and to the longitudinal axis of the trunnion plate. Referring to Fig. 4 the trunnions 32 are surrounded by bushings 33 and provide a pivotal mounting for centralizer arms 34. As shown also in Figs. 8 to 11 the centralizer arms curve upward and inward from their base portions 34a toward the axis of the drill steel and terminate in concave surfaces 35. Together the concave surfaces 35 of the separate arms provide a restricted passage for the drill steel, preventing its departure from the longitudinal line defined by the axis of the drill. The base portions 34a are embraced by angular jaws 36 on the plate 29, and, in cross-section, have a rectangular shape, the sides thereof paralleling the respective sloping surfaces 50 of the trunnion plate 31. The jaws 35 prevent the centralizer arms from slipping off the trunnions 32 and further are of aid in holding the arms firmly against the drill steel. In the plate 29 at the base of each jaw 36 is formed a groove 37 in which the edge of the associated centralizer arm is engaged to prevent rotary movement of the trunnion plate. The bottom of the groove is flat and complementary surfaces are formed on the edge of the centralizer arm (see Fig. 9), these surfaces being indicated at 38 and 39 connected by a rounded area 41.

The centralizer arms are rocked to effective and ineffective positions about the trunnions 32, their movement to open or ineffective position being accomplished by turning the arms outward to the dotted line position of Fig. 1. As shown, this movement effects a separating motion of the arms out of engagement with the drill steel and drops the arms out of the path of the drill. In the upright closed or effective position of the arms the surfaces 38 thereon are presented to the guide plate 29 while movement to ineffective position brings the surfaces 39 to cooperative relation with the guide plate, with the area 41 acting as a cam on the plate to enforce an axial movement of the trunnion plate 31. The plate 29 thus acts as a reaction element against which the centralizer arms bear as they are set to pivotal positions of adjustment.

The parts are controlled and held with the arms 34 in closed or open positions by a spring assembly surrounding the shaft 28 in front of the trunnion plate 31. The assembly comprises a single spring 42 interposed between respective front and rear washers 43 and 44. The washer 43 functions as a base for the assembly, being held against axial movement along the shaft by a two-piece ring 45 placed in a circumferential groove 46 in the outer end of the shaft 28. The washer 44 presses directly upon the trunnion plate 31 in a direction to maintain the centralizer arms in contact with the guide or reaction plate 29. Thus, in rocking about their pivots to and from drill guiding position, the centralizer arms are opposed by the spring 42. The spring yields as the trunnion plate 31 is cammed forward in response to the turning of the arms and then presses the parts back to normal as the rounded areas 41 pass the midpoint of their motion along the reaction plate. The spring 42 acts yieldingly to maintain the arms in their effective or ineffective positions. It is thought that the use of one large spring for positioning the centralizer arms is an improved construction, as compared with the small spring plungers and detents ordinarily used for this purpose.

The construction of the centralizer apparatus permits self-lubrication of the friction bearing surfaces therein. To this end a central bore 47 is formed in the shaft 28 of the centralizer body, which bore functions as an oil reservoir. Lubricating oil is introduced into the reservoir through a filler port 48 (see Fig. 3), normally closed by a registering plug screw 49 in the plate 29. A port 51 conducts oil from the reservoir to the bore 26 and recess 40 where the end of feed screw 23 is journaled. A series of ports 52 (see also Fig. 4) radiate from the reservoir and open to the exterior of the shaft at a point surrounded by the trunnion plate 31. The bearing surface upon which the trunnion plate slides is thus subject to continuous lubrication and the movement of the centralizer arms to and from effective position is unhindered. The surfaces of the trunnions 32 receive oil through passages 53 in the trunnion plate, which passages register with the ports 52 at one point of the arm travel from closed to open positions.

In assembling the centralizer, the body portion 24 first is secured to the front of the shell mount 22 by the side rods 25, with the end of the feed screw 23 resting in the bore 26. Then the plate 29 is slipped over the stub shaft 28 and moved rearward thereon. The recess 40 is aligned with the bore 26 and is fitted on to the combination bushing and dowel pin 27 as the guide plate engages the boss 30. The trunnion plate 31, with the two arms 34 in place on the trunnions 32, follows the guide plate on the shaft 28, and the lower edges of the centralizer arms are inserted in the grooves 37. The spring assembly comprising spring 42 and washers 43 and 44 is then mounted on the outer end of the body and locked in place by the ring 45. The pressure of the spring, as exerted through the trunnion plate 31, holds the centralizer arms engaged in the grooves 37 and resists turning movement of the arms around the trunnions 32. A cap screw 54 closes the front of the reservoir bore 47, and may be used in conjunction with a suitable yoke to compress the spring 42 to permit removal of the ring 45.

Preparatory to starting a drilling operation the arms 34 are adjusted to their upright or closed position where they guide the drill steel as it begins formation of the hole. As drilling progresses the drill advances relatively to the shell and the centralizer and, when the centralizer arms have accomplished their function of directing the steel through the desired course in the work, they are contacted by the drill and rocked outward to open or ineffective position. Following retraction of the drill the arms may be returned to upright position by hand and so rendered effective again to guide the drill steel.

What is claimed is:

1. A drill steel centralizer for a rock drill adapted to advance longitudinally during operation, comprising a body portion, a trunnion plate supported by said body for movement relative thereto, means causing the movement of said trunnion plate to occur in a direction substantially parallel with the longitudinal axis of said

drill, centralizer arms pivotally mounted on said plate, reaction means against which said arms bear in pivoting on said plate, and spring means urging said plate in said parallel direction to press said arms against said reaction means.

2. A drill steel centralizer for a rock drill adapted to advance longitudinally during operation, comprising a body portion having a projecting stub shaft disposed in substantial parallelism with said drill, a trunnion plate slidable on said shaft, centralizer arms pivotally mounted on said trunnion plate, reaction means surrounding said stub shaft between said body portion and said trunnion plate and against which means said arms bear in pivoting on said plate, and spring means urging said trunnion plate in a direction substantially parallel with the longitudinal axis of said drill in order to press said arms against said reaction means.

3. A drill steel centralizer according to claim 2, characterized in that said spring means comprises a coil spring surrounding said stub shaft exteriorly of the trunnion plate.

4. A drill steel centralizer, comprising a body portion having a projecting stub shaft, a plate slidable on said shaft, trunnions on said plate angularly disposed with respect to each other and to said shaft, centralizer arms pivotally mounted on said trunnions, stationary angled jaws serving to guide said arms and having reaction surfaces against which said arms bear in pivoting on said trunnions, a plurality of angular faces on said arms brought selectively into cooperative relation with said reaction surfaces by pivotal movement of said arms, spring means urging said trunnion plate in a direction to press said arms into said angled jaws and thereby maintain said arms yieldingly in any selected position of adjustment, and cam means on said arms moving said trunnion plate against the pressure of said spring in response to the pivoting of said arms from one pivotal position to another.

5. A drill steel centralizer, comprising a body portion having a projecting stub shaft, a plate slidable on said shaft, trunnions on said plate angularly disposed with respect to each other and to said shaft, centralizer arms pivotally mounted on said trunnions, stationary angled jaws serving to guide said arms, spring means acting on said plate to press said arms into said jaws, and reaction surfaces on said jaws against which said arms bear in pivoting on said trunnions.

6. A drill steel centralizer for a rock drill adapted to advance longitudinally during operation, comprising a body portion having a projecting stub shaft disposed in substantial parallelism with said drill, trunnions supported by said body portion and axially located in a plane spaced from, but substantially parallel to, the longitudinal axis of said drill, centralizer arms pivotally mounted on said trunnions, a reaction plate surrounding said stub shaft and against which said arms bear in pivoting on said trunnions, said reaction plate and said arms being capable of relative sliding movement determined by said stub shaft, complementary angled surfaces on said arms and said reaction plate brought selectively into cooperative relation by pivotal movement of said arms, and a spring surrounding said stub shaft exteriorly of the reaction plate and effecting a yielding engagement between said arms and said reaction plate.

7. A drill steel centralizer for a rock drill adapted to advance longitudinally during operation, comprising a body portion having a projecting stub shaft disposed in substantial parallelism with said drill, a trunnion plate on said stub shaft, centralizer arms pivotally mounted on said trunnion plate, a reaction plate on said stub shaft disposed adjacent to the trunnion plate and against which said arms bear in pivoting on said trunnion plate, one of said plates being slidable along said shaft relative to the other, and a spring surrounding said shaft exteriorly of both of said plates and pressing upon said movable plate to resist sliding movement thereof and to maintain said arms and said reaction plate in yielding engagement.

8. A drill steel centralizer for a rock drill adapted to advance longitudinally during operation, comprising a body portion having a projecting stub shaft disposed in substantial parallelism with said drill, a trunnion plate on said stub shaft having two spaced trunnions fixed thereon, the trunnions on said plate being angularly disposed with respect to each other and to said shaft but axially disposed in a common plane substantially parallel to the longitudinal axis of said drill, centralizer arms pivotally mounted on said trunnion plate, a guide plate on said shaft and having angled jaws to receive said arms, one of said plates being slidable along said shaft relative to the other, complementary angular surfaces on said arms and said guide plate brought selectively into cooperative relation by pivotal movement of said arms, and spring means acting on said movable plate to engage said arms in said jaws and to maintain said arms yieldingly in a selected position of adjustment.

9. A drill steel centralizer, comprising a body portion having a projecting stub shaft, a guide plate slidably mounted on said shaft, a trunnion plate slidably mounted on said shaft, centralizer arms pivotally mounted on said trunnion plate, grooved portions in said guide plate to receive said arms, means including a spring pressing said plates together to maintain said arms in said grooved portions, reaction surfaces on said guide plate against which said arms bear in pivoting on said trunnion plate, and a plurality of angular surfaces on said arms brought selectively into cooperative relation with said reaction surfaces by pivotal movement of said arms and held in yielding contact with said surfaces by said spring.

10. A drill steel centralizer for a rock drill adapted to advance longitudinally during operation, comprising a body portion having a projecting stub shaft disposed in substantial parallelism with said drill, a guide plate slidably mounted on said shaft, a trunnion plate slidably mounted on said shaft exteriorly of said guide plate, centralizer arms pivotally mounted on said trunnion plate, reaction surfaces on said guide plate against which said arms bear in pivoting on said trunnion plate, cam means effecting a separating movement of said plates in response to pivotal movement of said arms, and spring means exteriorly of said guide and trunnion plates for returning said elements as said arms are moved into a selected position of adjustment.

11. A drill steel centralizer, comprising a body portion having a projecting stub shaft, adjustable centralizer arms supported by said body portion, a centralizer arm control plate slidably mounted on said stub shaft and movable thereon in response to adjustment of said arms, a reservoir in said body portion containing lubricating oil, and ports leading from said reservoir to the exterior of said shaft at points within the bear-

ing surface defined by the movement of said control plate.

12. A drill steel centralizer, comprising a body portion having a projecting stub shaft, a trunnion plate slidably mounted on said stub shaft, centralizer arms pivotally mounted on said trunnion plate, means effecting a sliding movement of said trunnion plate along said shaft in response to pivotal movement of said arms, a reservoir in said body portion containing lubricating oil, ports leading from said reservoir to the exterior of said shaft at points within the bearing surface defined by the movement of said trunnion plate, and ports in said trunnion plate leading from the inner periphery thereof to the exterior of the trunnions thereon and arranged to coincide with the ports in said stub shaft at one point of the travel of said plate.

13. In a rock drill assembly comprising a drill, a shell mount therefor, and a feed screw operable to advance and retract the drill, a drill steel centralizer comprising a body portion secured to the shell mount and having a recess providing a bearing surface for one end of the feed screw, centralizer apparatus supported on said body portion and including elements movable relatively thereto on friction bearing surfaces, a reservoir in said body portion containing lubricating oil, and fluid conducting ports leading from said reservoir to said bearing recess and to said friction bearing surfaces.

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