Dec. 15, 1936. F. L. SCOTT 2,064,273

ROLLER BORING DRILL

Filed April 22, 1935

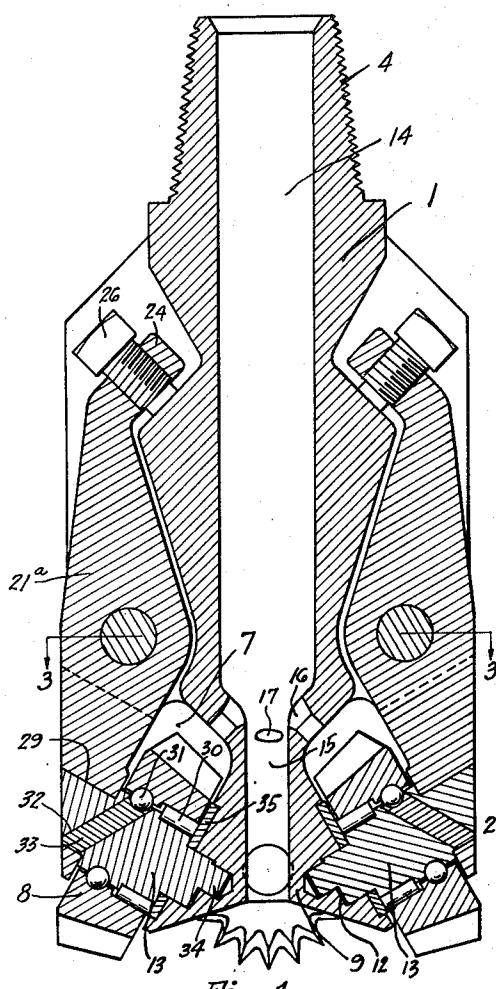


Fig. 1

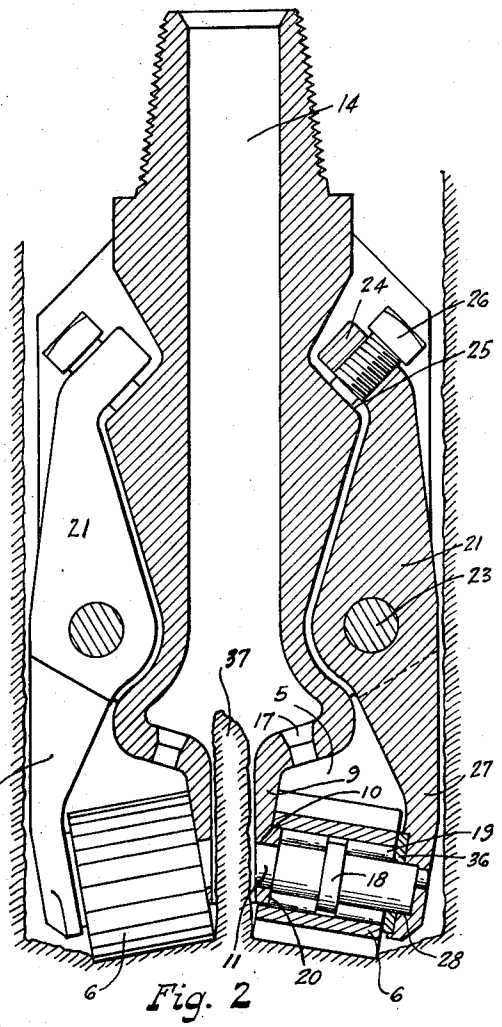


Fig. 2

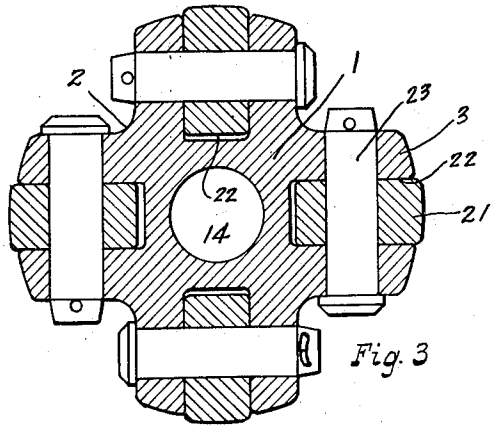


Fig. 3

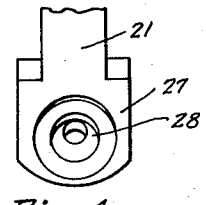


Fig. 4

Floyd L. Scott
INVENTOR

BY Jesse R. Stone
ATTORNEY

Patented Dec. 15, 1936 2,064,273

UNITED STATES PATENT OFFICE

2,064,273

ROLLER BORING DRILL

Floyd L. Scott, Houston, Tex., assignor to Hughes Tool Company, Houston, Tex., a corporation of Texas

Application April 22, 1935, Serial No. 17,684

10 Claims. (Cl. 255—71)

My invention relates to roller boring drills for use in drilling deep wells for oil, gas, and the like.

Objects of the invention are as follows:

(1) To provide a drill with a plurality of rolling cutters thereon, the body of which is of comparatively light weight.

(2) To provide a drill having a central support for the inner ends of a plurality of bearing pins for the cutters.

(3) To form a drill of symmetrical structure, in which the cutters and shafts are removably mounted for assembly in such a manner that the parts subject to wear are easily replaceable.

(4) To secure the cutters upon the bearing pins by anti-friction means easily removed when the bit is disassembled.

In the drawing Fig. 1 is a central longitudinal section through a well drill equipped according to my invention.

Fig. 2 is a similar section taken at 90° from that shown in Fig. 1.

Fig. 3 is a transverse section on the plane 3—3 of Fig. 1.

Fig. 4 is a detail of the lower end of a cutter support.

The drill head 1 is of a generally cylindrical form with longitudinal flutes or grooves 2 therein. Between said flutes are four channels 22 having side walls 3 thereon extending longitudinally of the head. The head has an upper tapered shank 4 for attachment to the drill collar, not shown.

The lower end of the head has four recesses or pockets formed therein. Two opposite recesses 5 open outwardly and downwardly to receive cutters 6 therein. Two other opposed recesses 7 open in a similar manner to receive cutters 8 which are rotatably mounted therein. There is a central post or support 9 between these four cutter pockets which has openings 10 to receive cutter pins or shafts 11 therein. It has also two opposite recesses 12 to support the inner ends of cutter shafts 13.

The head has a central fluid channel 14 which is reduced in diameter at 15 between the cutter pockets. This allows free flow of flushing fluid and materially reduces the weight of the bit head. Openings 16 lead from the lower end of the large passage to the cutter pockets 7, and openings 17 lead to the pockets 5.

The cutters 6 may be cylindrical in shape and mounted on the bearing pins 11 which are also cylindrical in form, with a radial flange 18 to space apart the two rows of roller bearings 19. The inner wall of each recess 5 has a boss 20 around the cutter pin receiving opening 10, forming a portion of the cutter bearing and strengthening the pin support.

The outer end of each bearing pin 11 is supported in a removable arm 21 which has its upper portion, above the outer side of the cutter recess 5, flattened to fit within the longitudinal channel 22, one of which is formed between each of the side walls 3. A transverse pin 23 extending through the walls and arm secures the said arm pivotally in the channel. The arm is tapered in width upwardly and outwardly on its inner side and the upper end is bent inwardly at 24, adjacent a shoulder 25 in said channel. A set screw 26 through the bent end bears against the shoulder 25 to force the upper end of the arm outwardly as desired. The lower end of the arm 21 is widened laterally to form a head 27 partly closing the outer side of the cutter recess 5. The cutter pin 11 is received within a recess 28 in the lower inner face of the arm.

The cutters 8 are mounted on shafts or pins 13, the outer ends of which are supported in openings 29 in the lower ends of arms 21a, similar to arms 21 just described. The central portion of the shaft 13 is enlarged to support the cutters, and the cutters 8 have antifriction bearings, including a row of rollers 30 and a row of balls 31 set in races in the shaft and cutter. The balls are inserted into their raceways when the cutters are on the shafts, through diagonal passages 32 in the shafts 13, said openings being then closed by a plug 33. The inner end of the pin or shaft 13 has an offset reduced member 34 fitting in the recess 12 which prevents rotation of the shaft. The cutters 8 have bearing thrust washers 35 on the inner walls of the recesses 7 and the cutters 6 having similar washers 36 on the outer wall formed by the head 27 of the supporting arm.

It will be noted that the cutter shafts 11 are inclined downwardly and outwardly while the cutter shafts 13 are inclined upwardly and outwardly, thus adapting the cutters together to cut the full bottom of the hole, except for a small central portion indicated at 37 in Fig. 2. This uncut portion is broken off by the vibration of the drill and washed away by the flushing mud.

In a drill constructed as described, the cutters may be mounted upon their shafts and inserted in position with their shafts fitting in the recesses in the central support 9. The

cutters 8 are locked on their pins by the balls 31, and the plugs 33 filling the openings through which they were inserted are held against removal by the walls of the openings 29 in the supporting arms. The arms are inserted over the ends of the cutter shafts and are supported by the pins 23 in the head. The cutter shafts are then tightened and held against removal by screwing up the set screws 26.

By this construction I am enabled to provide a mounting for the drill cutters which is easily assembled or disassembled without special tools and in a minimum amount of time. Further, the cutters are all strongly supported and not liable to break in use. The head of the bit, while strong, is light in weight and has the advantage of being easily handled and is economical of material. The parts subject to wear are detachable and may be sent to the shop for repair without including the bit head.

What I claim as new is:

1. A well drill including a body, opposed radial channels longitudinally thereof, a plurality of outwardly and downwardly opening pockets in the lower end of said body, a central post on said body between said pockets, cutter shafts in said pockets, the inner ends thereof being supported in said post, supporting arms pivotally supported in said channels, means to limit pivotal movement of said arms, heads on the lower ends of said arms forming an outer wall for each of said pockets, supports in said heads for said shafts and cutters rotatable on said shafts.

2. A well drill including a body, four uniformly spaced channels extending longitudinally on said body, four pockets formed in the forward end of said body, one below each of said channels, arms pivotally mounted in said channels, means to limit pivotal movement of said arms, heads on said arms closing the outer sides of said pockets, a central integral post on said body between said pockets, a cutter shaft in each of said pockets supported at one end in said post and at its outer end in one of said heads, bearings on said shafts and cutters on said bearings, said cutters and shafts being removable with said arms from said body.

3. A well drill constructed as set out in claim 2 which has a comparatively large water passage axially of said body and post.

4. A well drill as set out in claim 2 in which there are branch openings from said passage to each of said pockets.

5. A well drill including a drill body, a central integral post extending forwardly from the lower end thereof, two pairs of oppositely arranged pockets in the forward end of said body and at the sides of said post, cutter shafts in one pair of pockets extending upwardly and outwardly and supported at their inner ends in said post, a pair of cutter shafts supported at their inner ends in the other pair of pockets and extending downwardly and outwardly, removable supports in said body for the outer ends of said shafts, bearings on said shafts in said pockets and cutters rotatable on said bearings.

6. A drill bit construction as recited in claim 5 in which the removable supports hold said cutter shafts in position in said post and are adjustable to exert pressure longitudinally of said shafts.

7. A drill bit construction as recited in claim 5 in which the said body is made light in weight by a comparatively large axial water course extending through said body and post.

8. A drill bit including a body, a forwardly projecting post on said body, oppositely disposed pairs of pockets in said body at the sides of said post, cutter shafts in said pockets supported in said post at one of their ends, and removable supports in said head for the other ends of said shafts said supports being radially adjustable to clamp said shafts in said head, means to prevent rotation of said shafts, and cutters on said shafts.

9. A drill bit including a body, a forwardly projecting post on said body, oppositely disposed pairs of pockets in said body at the sides of said post, cutter shafts in said pockets supported in said post at one of their ends, and removable supports in said head for the other ends of said shafts said supports being radially adjustable to clamp said shafts in said head, means to prevent rotation of said shafts, and cutters on said shafts, the cutters in one pair of pockets being positioned to cut the outer portion of the hole and the other pair of cutters positioned to cut the inner portion of the hole.

10. A drill bit including a body, a tubular post axially of said body, two pairs of pockets in said body at the sides of said post, cutter shafts in said pockets supported at one of their ends in said post, laterally adjustable supports in said head at the outer ends of said shafts and cutters on said shafts.

FLOYD L. SCOTT.