

March 8, 1932.

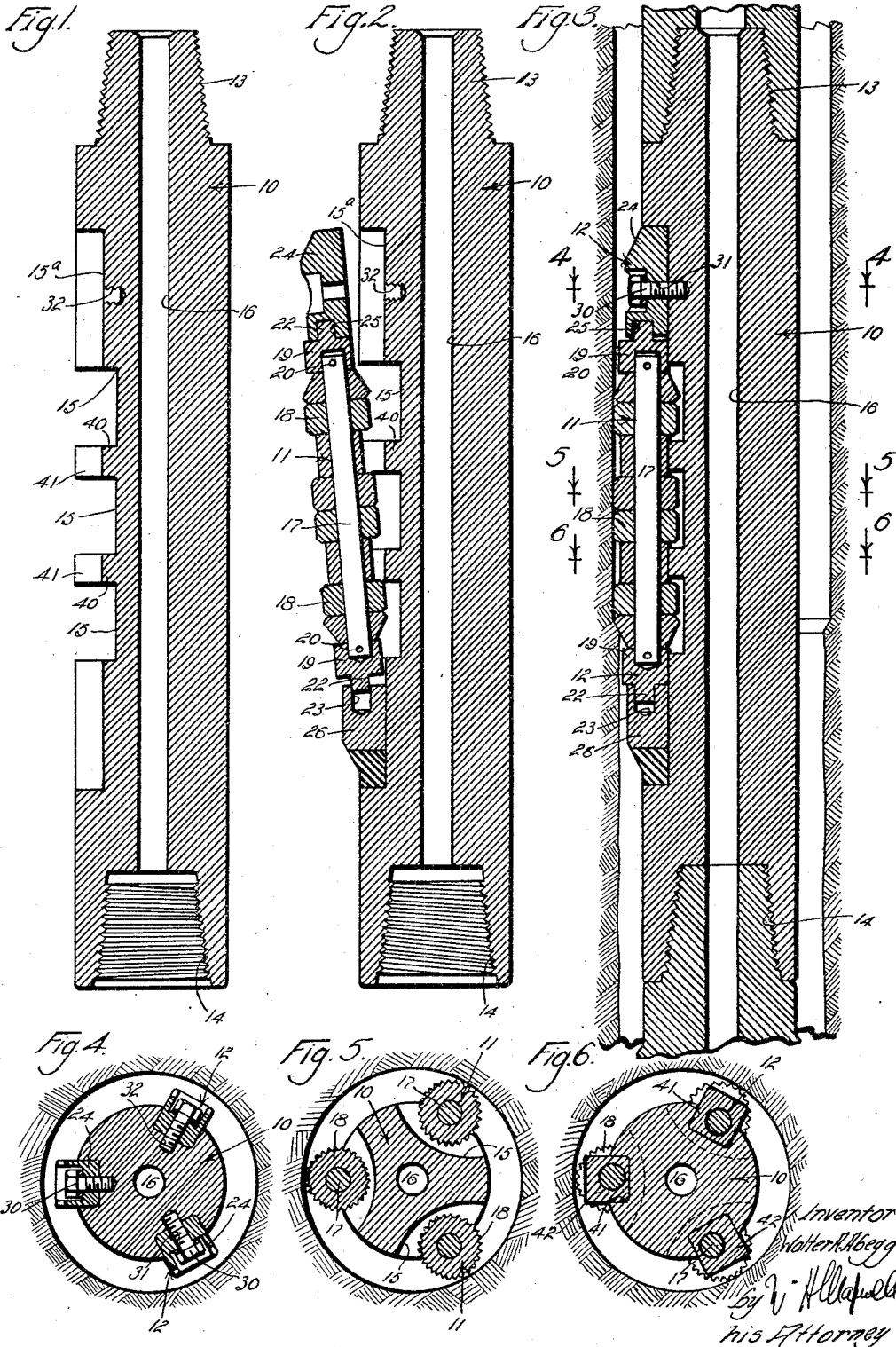
W. A. ABEGG

1,848,404

REAMER

Filed Sept. 18, 1929

2 Sheets-Sheet 1



March 8, 1932.

W. A. ABEGG

1,848,404

REAMER

Filed Sept. 18, 1929 2 Sheets-Sheet 2

Fig. 7.

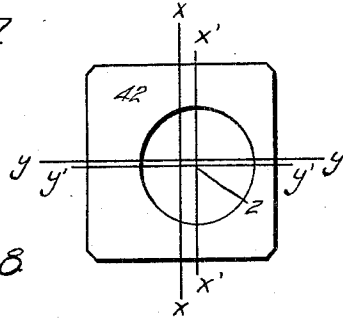


Fig. 8.

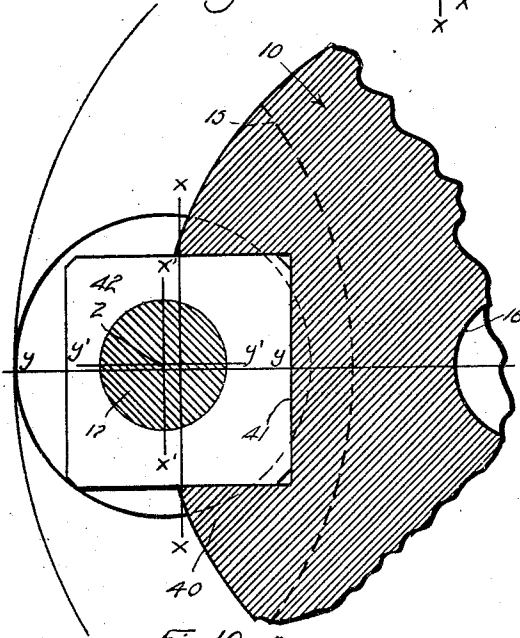


Fig. 9.

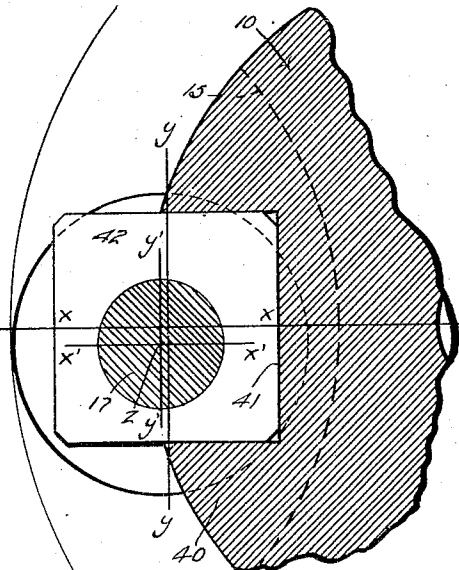


Fig. 10.

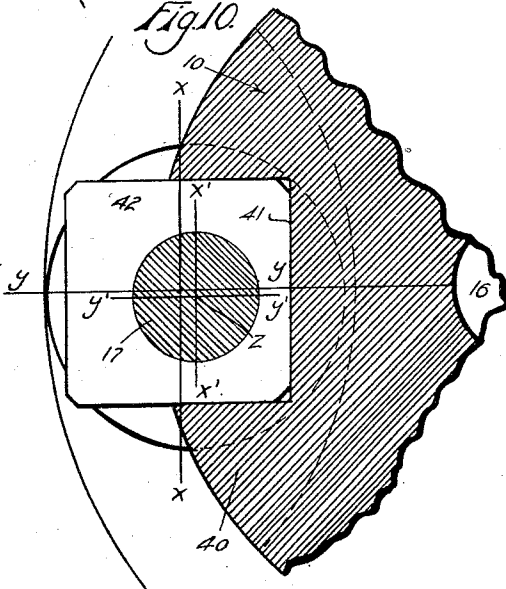
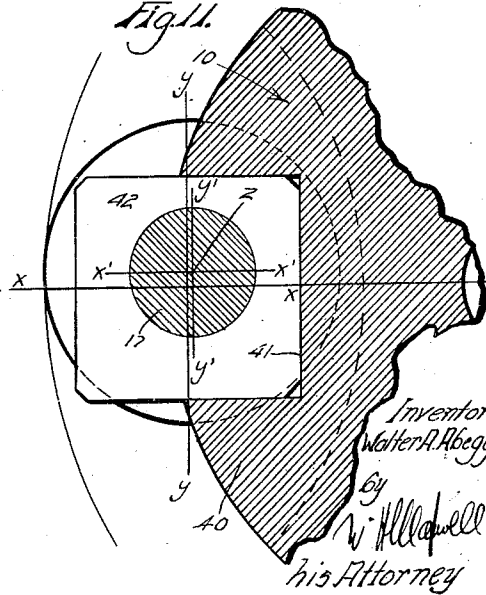


Fig. 11.



Inventor
Walter A. Abegg
By
W. H. Hall
his Attorney

UNITED STATES PATENT OFFICE

WALTER A. ABEGG, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-HALF TO B. REINHOLD, OF LOS ANGELES, CALIFORNIA

REAMER

Application filed September 18, 1929. Serial No. 393,439.

This invention has to do with a drilling tool for use in drilling wells and has particular reference to features of construction particularly suited for embodiment in reamers.

5 It is a general object of the present invention to provide a simple, effective and practical construction for a well reamer, or the like.

10 It is a further object of the present invention to provide an improved cutter unit or assembly for a drilling tool. The cutter assembly provided by the invention is simple and inexpensive of manufacture, can be handled easily and conveniently, and is particularly effective and practical as applied to a
15 reamer.

Another object of this invention is to provide a simple, practical and secure construction for mounting a cutter unit in a reamer, or the like.

20 A further object of the present invention is to provide a simple, convenient and practical reamer construction whereby the cutter unit can be mounted various distances from the axis of the tool so that it will operate to
25 ream a well bore to different sizes, as desired.

The various objects and features of my invention will be best and more fully understood from the following detailed description of a typical form and application of the invention, throughout which description reference is had to the accompanying drawings, in which:

30 Fig. 1 is a longitudinal detailed sectional view of the body of the reamer construction provided by the invention showing the cutter unit and cutter mounting removed. Fig. 2 is a longitudinal detailed sectional view of the reamer showing the cutter unit being assembled with the body. Fig. 3 is a view similar to Fig. 2 showing the cutter unit in operating position in the body. Figs. 4, 5 and 6 are
40 detailed transverse sectional views of the construction taken on lines 4—4, 5—5 and 6—6, respectively, on Fig. 3. Fig. 7 is an end view of one of the pin supporting collars, and Figs. 8 to 11 inclusive are more or less diagrammatic views illustrating various settings of the collar.

45 The construction provided by this invention being particularly applicable to a well

reamer, such, for example, as is usually operated above or in connection with a drilling bit, I will confine the present disclosure to a reamer of this type, it being understood that the broader principles of the invention are not to be considered limited to the details disclosed.

The construction provided by the invention includes, generally, a body 10, a cutter assembly or unit 11, and means 12 for detachably
55 connecting the body 10 and cutter unit 11 so that the cutting parts of the unit project from the body 10 in a manner to engage the formation through which the tool is operated.

60 In the case of a well reamer such as is illustrated in the drawings, the body 10 is an elongate member, preferably a unitary member, provided at its upper and lower ends with screw-threaded parts 13 and 14 respectively, adapted to facilitate connection with adjoining parts such as the parts of a well drilling string. In the case illustrated the part 13 at one end of the body is in the form of a tapered screw-threaded pin projection while the part 14 at the other end of the body is in the nature of a tapered screw-threaded socket adapted to receive a pin projection. Where the reamer is to be operated with the usual rotary method of drilling a central longitudinal circulation opening 16 may extend through the body from one end to the other as clearly shown in Figs. 1, 2 and 3 of the drawings. In accordance with the present invention the side wall of the body is provided with one or more recesses 15 to receive
75 cutter units. In the usual reamer I provide a plurality of cutter-carrying recesses 15, it being obvious that the recesses may be arranged in various manners, for instance, they may be spaced or located in various positions longitudinally of the body and may be located in various positions around the body. In the particular case illustrated there are three recesses 15 in the same location longitudinally of the body and spaced apart
80 around the body so that the body is symmetrical in cross section as is clearly shown in Fig. 5 of the drawings.

A cutter unit 11 embodying the present invention includes, generally, a pin 17, one or
85 100

more cutters 18 rotatably carried by the pin, and heads 19 fixed on the ends of the pin to hold the cutters against displacement. In the particular case shown there is a plurality of cutters 18 on the pin 17, the end cutters, that is, the cutters adjacent the heads 19, being bevelled as clearly shown in Figs. 2 and 3 of the drawings. The cutters 18 may be toothed roller cutters of the type ordinarily employed in hard rock drills. The heads 19 may be fixed on the ends of the pin in any suitable manner, for instance, they may be secured in place by transverse pins or keys 20. The keys 20 may be fitted so that they can be driven into and out of place when it is desired to remove the cutters from the pin 17. The heads 19 fit the recess so that they are held against rotation. The heads may be polygonal in cross sectional configuration, for instance, square, and they may be seated in correspondingly shaped parts of the recess. It is to be understood, of course, that the pin 17 and the cutters supported by the pin are proportioned so that the cutter unit is of such length and diameter as to be properly accommodated by the body recess 15.

The means 12, provided by the present invention for detachably connecting the cutter unit with the body so that it is positioned in the body recess 15 and projects from the body in the desired manner, includes, generally, lugs or projections 22 extending from the outer ends of the heads 19 of the cutter unit, a socket 23 in one end of the body recess 15, and a retaining block 24 detachably connected to the body at the other end of the recess and provided with a socket 25 to receive the projection at the other end of the cutter unit. The projections 22 are made sufficiently long and heavy to effectively hold the cutter unit in the body. In the arrangement shown the socket 23 is at the lower end of the recess 15, and to facilitate manufacture the socket is formed in a block of material 26 which is formed with the socket and then welded or otherwise permanently united with the body to become solid or substantially integral therewith.

The retaining block 24 is located at the upper end of the recess 15 and is preferably in the nature of an elongate block adapted to seat in an extension 15^a of the recess 15, as clearly shown throughout the drawings. The socket 25 is in the lower end of the block 24. In practice various means may be provided for detachably connecting the block 24 with the body 10. In the form of the invention illustrated the block is held in position by screw means, for instance, a cap screw 30 is arranged through an opening 31 in the block and screw threads into an opening 32 in the bottom of the recess extension 15^a. In the construction just described the cutter unit or assembly is first positioned so that the projection 22 at its lower end enters the socket 23 at the lower

end of the recess 15. While the upper end portion of the cutter unit is tilted outwardly or away from the body, the retaining block 24 is applied to the cutter unit so that the projection 22 on the upper end of the cutter unit projects into the socket 25. The cutter unit with the retaining block 24 can then be swung into operating position so that the retaining block 24 seats in the recess extension 15^a. With the block thus positioned, the cap screw 30 is arranged in place to secure the block against displacement from the recess 15^a. It will be obvious that the cap screw may be provided with suitable lock washers or locking means so that it will not work loose and that the head of the screw may be countersunk in the block so that it does not project in a manner to interfere with the action of the tool.

In the preferred form of the invention the cutter unit is supported intermediate its ends, for instance, ribs 40 are provided across the recess 15 at points intermediate the ends of the recess and openings or notches 41 are provided in the ribs to receive collars 42 on the pin of the cutter unit. The collars 42 are arranged on the pin between the cutters and operate as spacers to divide the cutters into spaced groups, as shown throughout the drawings. The exteriors of the collars preferably correspond in shape to the heads 19, for instance, they may be square. The collars are adapted to fit into correspondingly shaped notches 41 in the ribs 40 and are thus held against rotation. The configuration of the collars and the manner in which they fit the notches in the ribs 40 is clearly illustrated throughout the drawings.

In accordance with the present invention, the construction above described has the parts related so that the cutter unit can be mounted in various positions with reference to the body, for instance, at various distances from the central axis of the body. In the form of the invention illustrated the pin receiving openings in the heads are offset or eccentric to the exteriors of the heads while the projections 22 are concentric with the exteriors of the heads. With this construction, by setting the heads in different rotative positions in the body recess, the pin 17 is supported in different positions or different distances from the central axis of the body. When this feature is embodied in the construction, the collars 42 are constructed so that the pin carrying openings are eccentric to the exteriors of the collars. When the heads and collars are square the pin receiving holes are preferably located so that the pins can be set four different distances from the center of the body.

In Figs. 7 to 11, inclusive, of the drawings, I illustrate the features of this invention just described. The relationing of parts of the heads being the same as in the collars I will make detailed reference to the collars only.

The pin receiving hole is positioned with reference to the exterior of this collar so that its axis is offset or removed different distances from lines drawn at right angles to the exterior surfaces of the collar to intersect at the center of this collar. In the drawings, lines $x-x$ and $y-y$ are drawn at right angles to the exterior surfaces of this collar and intersect at the center of the collar. The point z designates the center of the pin receiving hole. Lines x^1-x^1 and y^1-y^1 are drawn parallel with the lines $x-x$ and $y-y$ respectively and intersect at the point z . The difference in spacing of lines $x-x$ and x^1-x^1 and lines $y-y$ and y^1-y^1 illustrates the relation of the point z with relation to the center of the collar.

From the foregoing description it will be apparent that I have provided a reamer construction which is extremely simple and inexpensive of manufacture, convenient to handle and operate, and efficient and dependable. The cutter units can be applied to or detached from the body easily and quickly and the various parts of the construction are simple and inexpensive of manufacture making the tool practical and suitable for general use. It will be obvious that the cutter units, mounted as provided by this invention, are securely and firmly held in the body, and it will be apparent that the adjustability of the cutter units with reference to the body gives the tool a decided feature or advantage over ordinary reamer constructions. The cutter carrying pin being supported at points intermediate its ends may be comparatively small in diameter and is effectively held against bending.

Having described only a typical, preferred form of my invention, I do not wish to limit myself to the specific details set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims:

Having described my invention, I claim:

1. In a tool of the character described, a body having a socket, a cutter unit including heads at its ends to engage the body and lugs projecting from the heads, one of the lugs extending into the socket, and a member detachably connected with the body having an opening holding the other lug.

2. In a tool of the character described, a body having a socket, a cutter unit including a pin, a cutter carried by the pin, heads at the ends of the pin, and lugs projecting from the heads, one of the lugs extending into the socket, and a member detachably connected with the body and having an opening holding the other lug.

3. In a tool of the character described, a body having notches with flat walls, a cutter unit including a cutter carrying pin, square heads on the pin fitting the notches, and

means detachably connecting the unit with the body with the heads rigidly held in the notches, the pin being eccentric to the heads.

4. In a tool of the character described, a body having rectangular notches, a cutter unit including a cutter carrying pin, heads on the pin square in cross section and adapted to fit said notches, the axis of the pin being eccentric to the heads, and means connecting the unit with the body with the heads rigidly held in the notches, said means including lugs projecting from the heads, and a block for holding one of the lugs and adapted to be connected with the body.

5. In a tool of the character described, a body having rectangular notches, a cutter unit including a cutter carrying pin, heads on the pin square in cross section and adapted to fit said notches, means connecting the unit with the body with the heads rigidly held in the notches, and means supporting the unit intermediate its ends including blocks on the pin square in cross section and fitting rectangular notches in the body, the pin being eccentric to the heads and blocks.

6. In a tool of the character described, a body having notches, a cutter unit including a cutter carrying pin, heads on the pin, means detachably connecting the unit with the body with the heads stationarily held in the notches, and means supporting the unit intermediate its ends including blocks on the pin removably fitting notches in ribs on the body.

7. A well tool of the character described including, a body having notches with flattened walls, a cutter unit including a pin, and a cutter on the pin, and means whereby the cutter unit may be rigidly mounted at different distances from the center of the body, including heads having flattened sides to fit in said notches and having openings receiving the ends of the pin eccentric to their exteriors.

8. A well tool of the character described including, a body having notches, a cutter unit including a pin and a cutter carried by the pin, and means whereby the cutter unit may be mounted at different distances from the center of the body, including heads fitting the notches so that they are held against movement, and having openings eccentric to their exteriors receiving the ends of the pin.

9. A well reamer including, an elongated body, a cutter unit including a pin, and a cutter rotatable on the pin, means for mounting one end of the pin on the body, and means for mounting the other end of the pin on the body for adjustment radially of the body or circumferentially of the body.

10. A well reamer including, an elongated body, a cutter unit including a pin, and a cutter rotatable on the pin, means for mounting one end of the pin on the body, and means for mounting the other end of the pin on the body for adjustment radially of the body or circumferentially of the body including, a

rectangular notch in the body, and means for detachably holding the block in the notch, the longitudinal axis of the pin being eccentric to the block.

- 5 11. In a tool of the character described, a body having notches of rectangular transverse cross section, a cutter unit including a cutter carrying pin, heads on the pin, the heads being of square cross section and being
10 adapted to fit the notches, and means detachably connecting the unit with the body with the heads rigidly held in the notches, the longitudinal axis of the pin being eccentric to the heads and located unequal distances from ad-
15 joining sides of the notches.

In witness that I claim the foregoing I have hereunto subscribed my name this 24th day of July, 1929.

WALTER A. ABEGG.

20

25

30

35

40

45

50

55

60

65