Aug. 28, 1934. O. HAMMER 1,971,561

PIN INSTALLATION FOR WELL REAMERS AND THE LIKE

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Fig. 1.

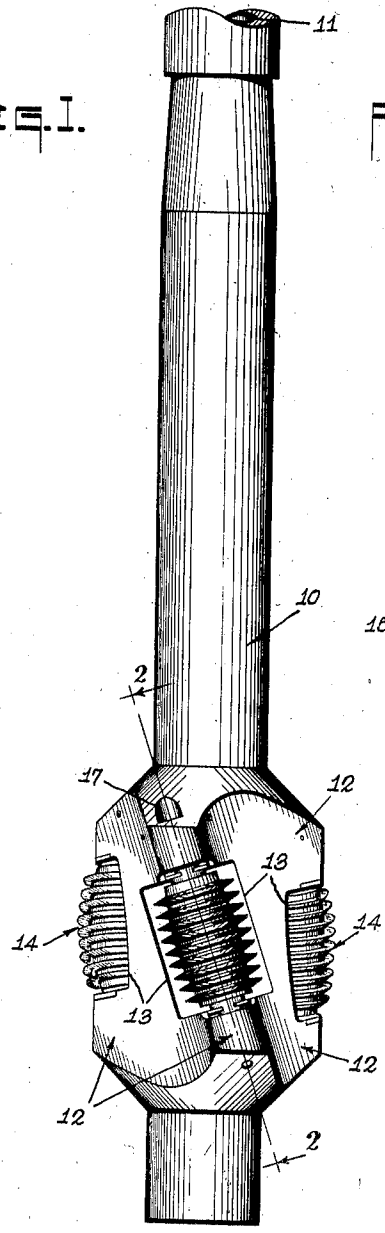
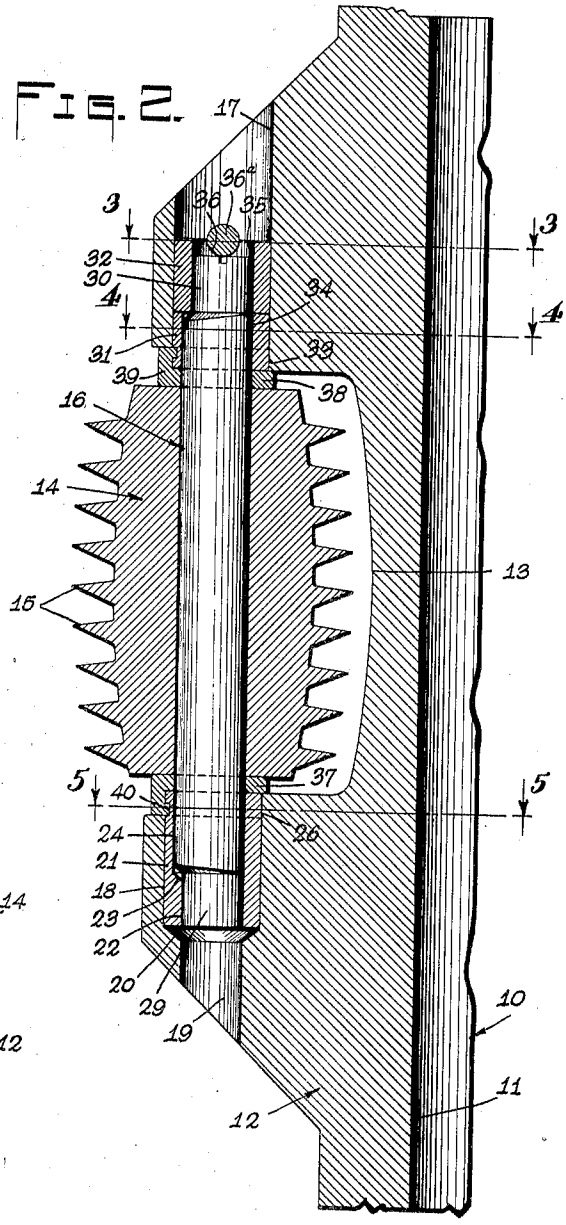


Fig. 2.



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Fig. 3.

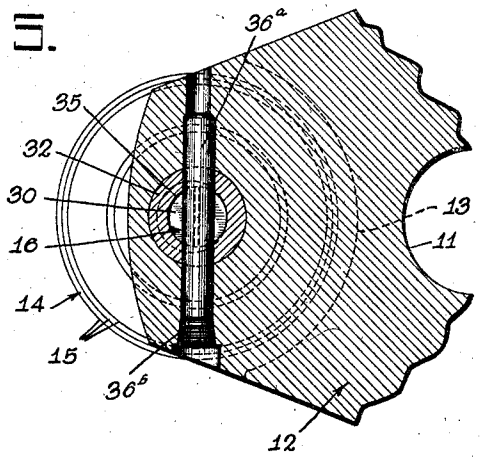


Fig. 4

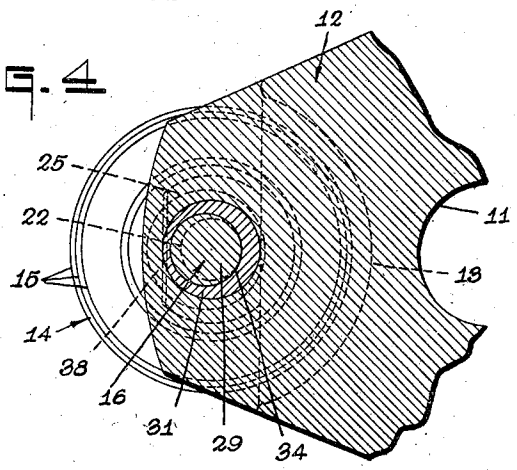


Fig. 5.

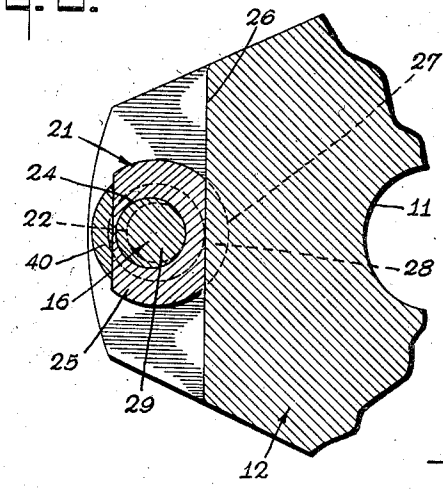
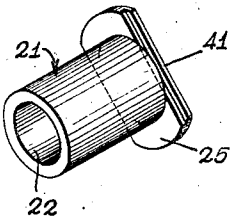


Fig. 6.



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UNITED STATES PATENT OFFICE

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PIN INSTALLATION FOR WELL REAMERS AND THE LIKE

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Application January 31, 1934, Serial No. 709,137

12 Claims. (Cl. 255—73)

This invention relates to a pin installation for use on well reamers and the like.

An object of the invention is to provide an improved pin installation, on which pin an article is designed to rotate and to provide a construction which will hold the pin against rotation so that the wear of the article rotating thereon will be distributed. In well reamers having rotary cutters which are rotatable on pins the stresses imposed on the cutters are extremely high. Consequently, it is important that the pin be locked against rotation, causing the cutters to rotate on the pins. It is readily apparent that if the pins rotate with the cutters all of the wear must take place on the small, projecting ends of the pins, whereas if the pins are held stationary and the cutters caused to rotate thereon a much larger bearing surface is available on which the wear will be distributed.

The improved pin installation has also for one of its objects to provide a simple construction which can be easily and cheaply manufactured and easily installed.

Another object of the invention is to provide a pin installation in which the pin is self-tightening in the bushings. In well reamers having pins which are locked in place by locking pins the wear and stresses are so severe that the cutter pins and the locking pins loosen. By the present construction any clearance between the pins and the bushings which may develop in the course of wear is automatically taken up and the cutter pins are thus self-tightening.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Fig. 1 is a view in side elevation of a well reamer employing the improved pin installation.

Fig. 2 is a sectional view taken substantially upon the line 2—2 upon Fig. 1 in the direction indicated.

Fig. 3 is a horizontal section taken upon the line 3—3 upon Fig. 2.

Fig. 4 is a section taken upon the line 4—4 of Fig. 2.

Fig. 5 is a section taken upon the line 5—5 upon Fig. 2.

Fig. 6 is a perspective view of the lower bushing.

Referring to the accompanying drawings, wherein similar reference characters designate similar parts throughout, the improved pin installation is illustrated as having been applied to a well reamer of the general character illustrated in the patent to John A. Vertson, No. 1,809,258, although the use of the pin installation is in no way restricted thereto but may be employed on other types of well reamers having vertically disposed cutters or, for that matter, in any circumstances where it is desired to lock a pin against rotation with any article which may be rotatable on the pin. In the construction shown there is a vertically extending body 10 rotatable about its vertical central axis. This body preferably has a circulation passage 11 extending therethrough providing for the passage of circulation fluid. On the body there are formed three outwardly extending bosses 12, although the number may vary. These bosses are obliquely arranged and have formed in them cutter pockets 13. Rotatable cutters 14 are disposed within the cutter pockets, these cutters having circumferentially extending teeth 15. The general configuration of each cutter is somewhat barrel-shaped, as shown on Fig. 2, the purpose being to enable each cutter to bear against the walls of the well throughout its entire length regardless of the fact that the axis of rotation of each cutter is oblique with respect to the vertical. The pins on which the cutters are rotatable are generally designated at 16 and the means of mounting these pins so that they will be locked against rotation with the cutters 14 forms the present invention.

A cylindrical hole 17 is drilled or otherwise formed in the top of each boss 12 extending through the top of the boss to the cutter pocket 13. The axis of this hole is inclined corresponding to the oblique axis of rotation of the cutter. This hole 17 is extended as at 18 part way through the bottom of the boss which is disposed below the cutter pocket. Preferably, but not necessarily, a small hole 19 extends the balance of the distance through the bottom of the boss, thus defining a shoulder 20 in the portion of the boss which is below the cutter pocket.

Portion 18 is designed to receive a bushing 21 and in the bottom of this bushing there is drilled or otherwise formed a central aperture 22. This aperture, which is concentric with respect to the exterior surface of the bushing, extends only part way through the bushing and from shoulder 23 upwardly the bushing has its interior enlarged. This enlarged interior of the bushing indicated at 24 is also cylindrical but it is eccentric with respect to aperture 22. As is clearly apparent from Fig. 6, the top of the bushing is flanged as indicated at 25. This flange rests on the bot-

tom of the cutter pocket 13 and projects laterally beyond the sides of portion 18 of hole 17. The bottom of the cutter pocket 13 is stepped, as shown on Figs. 2 and 5, with the inner edge of flange 25 fitting against shoulder 26 on the bottom of the cutter pocket. This shoulder may be formed by machining a straight shoulder, as shown on Fig. 5, or a circular groove indicated by dotted lines at 27 on Fig. 5 may be milled into the boss. Where this arcuate groove is milled into the boss an arcuate piece of metal, indicated by portion 28 on Fig. 5, is formed to fit the groove and is welded in place to form shoulder 26, against which the back of flange 25 may fit. The fit between the back of flange 25 and shoulder 26 holds the bushing against rotation in aperture 18. Pin 16 has its body cylindrically formed throughout its length except for its extreme end portions. These end portions are indicated at 29 and 30. The end portions are also cylindrical but they are eccentric with respect to the body or offset with respect thereto. No portion of the end portions projects beyond the sides of the body but the centers of the end portions are spaced from the central axis of the body. The centers of the end portions also need not be in alignment but may be disaligned, which frequently is necessary in a proper design of a reamer having cutters rotatable about oblique axes. The lower end of the body of the pin fits in the enlarged interior 24 of the bushing while the eccentric or offset end portion 29 fits in aperture 22 in the bushing. In this way, inasmuch as the bushing is held against rotation and the pin presents two cylindrical surfaces which are eccentric with respect to each other and which fit in the same bushing, it is impossible to turn the pin in the bushing.

At the top of the pin there is provided a similar bushing. This bushing, however, is made of two parts, one part being indicated at 31 and the other part being indicated at 32. Part 31 is an exact counterpart of bushing 21 above shoulder 23. Its flange fits against shoulder 33 at the top of cutter pocket 13. The upper end of the body of the pin fits in the cylindrical aperture 34 in this part of the bushing, which aperture is disposed eccentrically with respect to the exterior of part 31 and also eccentrically with respect to the center of hole 17. The upper part 32 has a concentric aperture 35 which receives and snugly fits portion 30 at the top of the pin. A diametrical groove 36 is formed in the top of part 32 of the upper bushing and a pin 36*a* extends transversely through this diametrical groove and into the upper boss on both sides thereof, as shown on Fig. 3. This pin is locked in place by a screw plug 36*b* which is recessed in the side of boss 12. Washers are provided, these being indicated at 37 and 38. These washers are exact counterparts of each other and each has a laterally extending flange 39 which is hooked as at 40 over the rebated outer or forward edge 41 of flange 25.

The method of assembly of the improved pin construction is as follows:

The lower bushing 21 is dropped into part 18 of the hole 17 and so positioned that the back of its flange 25 abuts against shoulder 26. The lower washer 37 is then applied and positioned so that its hook 40 extends into the rebated edge 41. The lower part 31 of the upper bushing is then inserted in the bottom of hole 17 and positioned so that the back of its flange abuts shoulder 33. The upper washer 38 is then applied thereto. Cutter 14 is then installed in the cutter pocket 13 between the two washers 37 and 38. The pin 16 is then dropped through hole 17, through aperture 34, through washer 38, through cutter 14, washer 37, and into bushing 21 and is turned until its offset end portion 29 has entered aperture 22 in the bushing. With the construction thus assembled the upper portion 32 of the upper bushing is dropped into hole 17 and pin 36*a* is then inserted laterally through the top of the boss to lock the upper portion against rotation. Plug 36*b* is then screwed in place.

In this manner the pin is firmly locked against rotation at both its top and bottom so that it is impossible for it to turn sympathetically with the cutter 14. The cutter 14 is, therefore, forced to turn on the pin with the result that all of the extreme wear due to the heavy stresses is distributed over the entire length of the pin between washers 37 and 38.

If there is any clearance between the cutter pins and the bushings this clearance is automatically taken up. In other words, if the fit between the cutter pin and the bushings is the least bit loose rotation of the cutter pin sympathetically with the cutter in the bushings causes the eccentric end portions to move against the sides of the bushings in such a way as to tighten. In this way the cutter pins always remain tight while the well reamer is in operation.

The purpose of the flanges 39 on the washers is to hold the washers against rotation relatively to the bushings so that no wear will take place on the ends of the bushings. In some instances the ends of the cutters wear and the faces of the washers engaged by the cutters also wear. This results in a loose fit of the cutter and the washers between the bushings. In aggravated circumstances where the wear is extreme, washer 38 might drop down on the cutter pin and rotate sympathetically with the cutter. The hooked end 40 connects washer 38 to the upper bushing so that it is impossible for it to drop down. Consequently, under no circumstances can the flange or lug 39 turn into a position wherein it might lock the rotary cutter against rotation.

It will be appreciated from the above description of the construction that the improved pin installation is of simple and durable construction and may be easily and quickly installed. This is of great importance in well reamers of this character where it is necessary to replace cutters relatively frequently. The invention is in no way limited to use upon well reamers having inclined cutters but may be used on all types of well reamers employing rotary cutters. Furthermore, the invention is in no way restricted to use on well reamers but may be used wherever it is desirable to install a pin and lock it against sympathetic rotation with whatever may be rotatably mounted on the pin.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined in the appended claims.

I claim:

1. A pin installation on which a device is adapted to rotate comprising a pin having offset ends and bushings on the ends having portions fitting both the body of the pin and the offset ends, and means for holding the bushings against rotation and thereby holding the pin against rotation.

2. A pin installation on which a device is

adapted to rotate comprising a pin having offset ends and bushings on the ends having portions fitting both the body of the pin and the offset ends, and means for holding the bushings against rotation and thereby holding the pin against rotation, one of the bushings being made of two parts, one part being formed to fit the body of the pin and the other being formed to fit the offset end.

3. A pin installation on which a device is adapted to rotate comprising a pin having offset ends and bushings on the ends having portions fitting both the body of the pin and the offset ends, and means for holding the bushings against rotation and thereby holding the pin against rotation, and washers on the pin having portions engageable with the bushings to hold the washers against rotation.

4. A pin installation on which a device is adapted to rotate comprising a pin having offset ends and bushings on the ends having portions fitting both the body of the pin and the offset ends, and means for holding the bushings against rotation and thereby holding the pin against rotation, and washers on the pin having portions engageable with the bushings to hold the washers against rotation, said portions of the washers being connected to the bushings so as to prevent their moving longitudinally on the pin away from the bushings.

5. A pin installation on which a device is adapted to rotate comprising a pin presenting at at least one end two cylindrical surfaces which are eccentric with respect to each other, and a bushing fitting the end of the pin having portions which fit both cylindrical surfaces, and means for holding the bushing against rotation, thereby holding the pin against rotation.

6. A pin installation on which a device is adapted to rotate comprising a pin presenting at at least one end two cylindrical surfaces which are eccentric with respect to each other, and a bushing fitting the end of the pin having portions which fit both cylindrical surfaces, and means for holding the bushing against rotation, thereby holding the pin against rotation, said bushing being made of two parts, one of which fits one cylindrical surface and the other of which fits the other cylindrical surface.

7. A pin installation on which a device is adapted to rotate comprising a cylindrical pin having an offset cylindrical end portion of smaller diameter than the pin and which is located within the circumference of the body of the pin, and a bushing into which the end of the pin extends having portions fitting both the body of the pin and the offset cylindrical end portion, and means for holding the bushing against rotation so as to thereby hold the pin against rotation.

8. A pin installation on which a device is adapted to rotate comprising a cylindrical pin having an offset cylindrical end portion of smaller diameter than the pin and which is located within the circumference of the body of the pin, and a bushing into which the end of the pin extends having portions fitting both the body of the pin and the offset cylindrical end portion, and means for holding the bushing against rotation so as to thereby hold the pin against rotation, said bushing being made of two parts, one of which fits the body of the pin and the other of which fits the offset cylindrical end portion.

9. A pin installation on which a device is adapted to rotate comprising a cylindrical pin having an offset cylindrical end portion of smaller diameter than the pin and which is located within the circumference of the body of the pin, and a bushing into which the end of the pin extends having portions fitting both the body of the pin and the offset cylindrical end portion, and means for holding the bushing against rotation so as to thereby hold the pin against rotation, said bushing being made of two parts, one of which fits the body of the pin and the other of which fits the offset cylindrical end portion, said means for holding the bushing against rotation serving to hold both parts of the bushing against rotation.

10. A pin installation for well reamers and the like comprising a reamer body having a cutter pocket at the top and bottom of which there are bosses, there being apertures in the bosses, bushings in the apertures having portions fitting the body to hold the bushings against rotation relatively thereto, a cutter in the cutter pocket, and a pin extending through the cutter and into the bushings, the end portions of the body of the pin fitting the bushings and having offset ends which also fit the bushings whereby the pin will be held against rotation relatively to the bushings.

11. A pin installation for well reamers and the like comprising a reamer body having a cutter pocket at the top and bottom of which there are bosses, there being apertures in the bosses, bushings in the apertures having portions fitting the body to hold the bushings against rotation relatively thereto, a cutter in the cutter pocket, and a pin extending through the cutter and into the bushings, the end portions of the body of the pin fitting the bushings and having offset ends which also fit the bushings whereby the pin will be held against rotation relatively to the bushings, and washers on the pin between the cutter and the bushings, said washers being connected to the bushings so as to prevent their rotation relatively to the bushings.

12. A pin installation for well reamers and the like comprising a reamer body having a cutter pocket at the top and bottom of which there are bosses, there being apertures in the bosses, a cutter in the cutter pocket, a pin extending through the cutter and into the apertures in the bosses and on which the cutter rotates, said pin having a cylindrical body and cylindrical end portions which are eccentric with respect to the body but which are located within the circumference of the body of the pin, a bushing in one of the apertures fitting both the end of the cylindrical body of the pin and its offset end portion, said bushing fitting the reamer body so as to be held against rotation relatively thereto, and a two part bushing in the other aperture, one of the parts fitting the cylindrical body of the pin and the reamer body so as to be held against rotation relatively thereto and enabling the pin to be inserted bodily therethrough into the cutter pocket, the other part of the latter bushing fitting the offset end only, and means holding said other part against rotation relatively to the reamer body.

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