July 25, 1939. W. I. BETTIS 2,166,937

DRILL-PIPE BUFFER

Filed Feb. 4, 1938

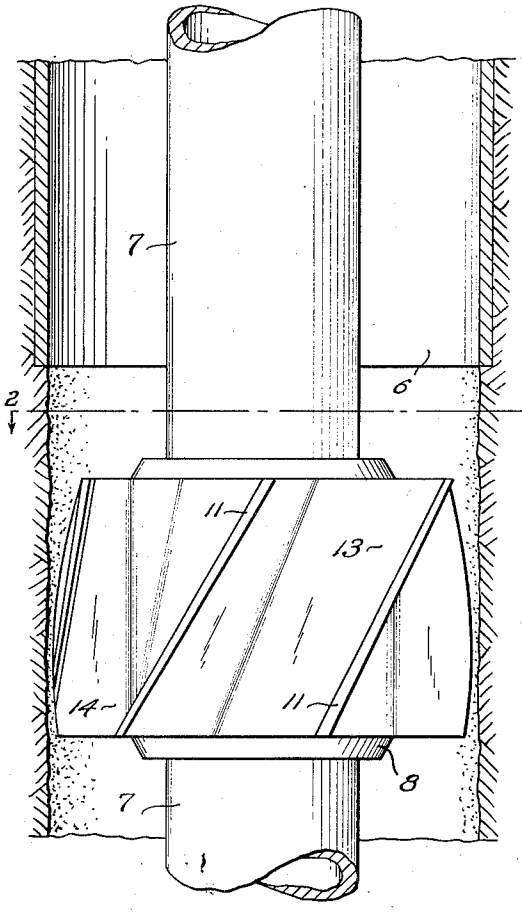

Fig. 1.

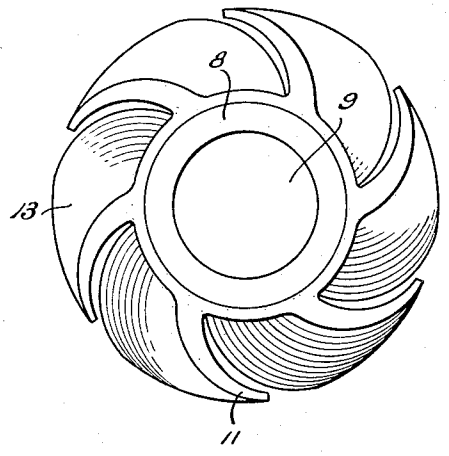

Fig. 3.

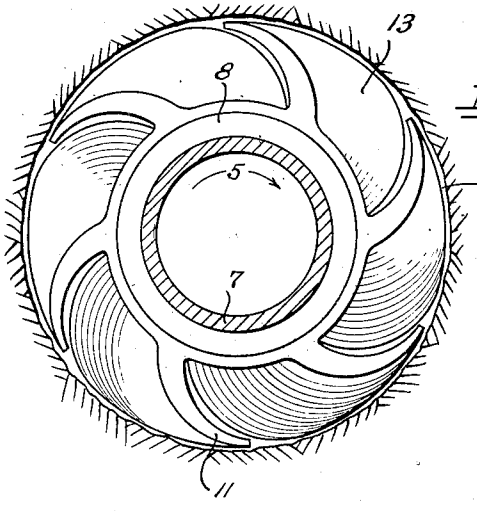

Fig. 2.

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Patented July 25, 1939 2,166,937

UNITED STATES PATENT OFFICE

2,166,937

DRILL-PIPE BUFFER

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Application February 4, 1938, Serial No. 188,682

8 Claims. (Cl. 255—28)

My invention relates to drill-pipe buffers, and particularly to types thereof which are adapted for use in deep well drilling operations below the well casings. Among the more important objects of the invention are; first, to further advance the art of obtaining straight drill holes; second, to furnish means for preventing injury to the walls of uncased drill holes as the result of vibrations in suspended drill strings; third, to furnish practical mechanical means for mud-plastering uncased drill hole walls; fourth, to supply further improved means for reducing the over-all flow resistance of circulating fluid in deep well drilling; and, fifth, to accomplish all the stated objects concurrenty, by means of a simple and relatively inexpensive device.

My objects are attained in the manner illustrated in the accompanying drawing, in which—

Figure 1 is a central sectional elevation of a deep well, at and just below the well casing; showing, in elevation, a portion of a drill pipe therein, and my improved buffer mounted upon the drill pipe;

Figure 2 is a cross-section of the well and drill pipe, taken on the plane 2—2 of Fig. 1; and

Figure 3 is a plan view of the particular buffer shown in Figs. 1 and 2, before it is applied to a drill pipe.

Similar reference numerals refer to similar things throughout the several views.

It will be appreciated that, in view of this disclosure, my invention may assume a number of specific forms. Consequently I do not limit my claims to the particular embodiment herein shown and described.

In two presently pending applications for U. S. patents (Ser. No. 178,297 and Ser. No. 178,298), I discussed the desirability of utilizing cased bores of deep wells as guides for keeping drill pipes centered therein; for the dual purposes of securing straighter drill holes, and reducing damaging vibrations in suspended drill pipes. The present invention extends such art by making it possible to utilize the uncased bore of the well in a similar manner.

Neither U. S. Patent No. 1,573,031, issued to Leroy H. Perry and myself jointly; nor U. S. Patent No. 1,863,740 issued to me alone; disclose devices which can function, in certain respects, in the manner of the invention described and shown herein.

In the accompanying drawing, it is assumed that the drilling rotation will be clockwise when looking downwardly, as indicated by arrow 5. A section of the lower end of a well casing is shown at 6; and drill pipe within the well is indicated at 7.

The present invention, in the embodiment selected for this disclosure, comprises a cylindrical annulus 8 of resilient material, such as suitably compounded vulcanized rubber. The characteristics and dimensions of this annulus are such that it can be stretched around the drill pipe with which it is to be used, as shown in Figs. 1 and 2; and such that, when so positioned, it will grip the pipe very tightly, and be practically immovable thereon under service stresses. The unstretched annulus is shown in Fig. 3, and it will be noted that the diameter of its bore 9 is materially less than the outside diameter of drill pipe 7.

Around the periphery of the annulus are a number of impeller-shaped, and quasi-helical, vanes 11. The dimensions and shapes of these do not change materially by stretching the annulus, except possibly as to longitudinal pitch. When the device is stretched upon a drill pipe and used in a deep well, for which it is adapted in both cases; the outer diameter of the device, over the vanes, will be such as to fit the bore of the well with small clearance, as shown at 12. The resistance of vanes 11 to radially inward mechanical stresses, is made such that the drill pipe may be kept closely centered in the well at all times by this means. The vanes, however, by reason of their resilient nature, due to shaping and material used, can yield somewhat under radial stress; and thus the centering function of the vanes may be utilized either in cased or uncased drill holes. The maximum straightness of drilling, with present knowledge in the art, is obtainable in this manner. The slight clearance between the vanes and the walls of the well, either cased or uncased, prevents objectionable vibration of the drill pipe.

A utility of my invention, which hitherto has been unattainable, is the mechanical mud-plastering of the walls of uncased drill holes which it is adapted to perform. This is particularly desirable when drilling in open formations; and it is accomplished by the troweling action of impeller-shaped vanes 11, when the device is revolved in the direction of arrow 5. The plastering material, of course, normally consists of the heavy mud present in the circulating fluid; but the device is perfectly capable of utilizing other plastering material, introduced into the well through the bore of the drill string or otherwise. When thus plastered, the uncased wall of the well will be both smooth and tight; and it will remain tight,

since the internal hydraulic pressure always is, or may be made to be, greater than that in the surrounding ground.

The quasi-helical shape of vanes 11 enables them to impart a strong upward flow impulse to the circulating fluid; and their spacing provides upward flow passages therefor.

In the drawing, an embodiment having six impelling vanes is shown. Leading surfaces of these vanes are indicated at 13, and a trailing surface at 14.

It will be obvious that any desired entrance and discharging angles may be given to vanes 11 for impelling purposes; and that the rearward curvature, to provide the troweling action, may be made as appears to be most desirable. The device may be positioned upon a drill pipe by means other than gripping as the result of resilient stretching, in many ways that are known in the drilling and other mechanical arts. It will also be apparent that material other than rubber may be utilized for the device, when and as material which is suitable for the purpose is developed and becomes commercially available.

Finally I call attention to the fact, that the rearward curvature of vanes 11 strongly tends to center the device in service, by means of the radially outward pressures they exert upon the fluid in the well.

Having thus fully disclosed my invention, I claim:

1. A device of the character described, comprising; an annulus adapted for mounting upon a co-axial drill pipe, and having quasi-helical vanes extending outwardly from its periphery; said vanes being curved rearwardly with respect to the intended direction of rotation when the device is so mounted, and being adapted to impel circulating fluid upwardly when the device is rotated within a co-axial cylindrical bore which it fits with small clearance.

2. A device of the character described, comprising; an annulus adapted for mounting upon a co-axial drill pipe, and having quasi-helical vanes extending outwardly from its periphery; said vanes being curved rearwardly with respect to the intended direction of rotation when the device is so mounted; and, when the device is rotated within a co-axial cylindrical bore which it fits with small clearance, the vanes being adapted to impel circulating fluid upwardly, and also to exert a troweling effect upon the surrounding wall.

3. A device of the character described, comprising; a cylindrical annulus adapted for mounting upon a co-axial drill pipe, and having resilient quasi-helical vanes extending outwardly from its cylindrical periphery and rearwardly with respect to the intended direction of rotation when the device is so mounted.

4. A device of the character described, comprising; a cylindrical annulus adapted for mounting upon a coaxial drill pipe, and having quasi-helical vanes extending outwardly from its cylindrical periphery and rearwardly with respect to the intended direction of rotation when the device is so mounted; said vanes being resilient and adapted to serve as a buffer between the drill pipe and the wall of a co-axial cylindrical bore which the device fits with small clearance.

5. A device of the character described, comprising; an annulus of resilient material, adapted for being stretched around a drill pipe to grip it; the annulus having quasi-helical resilient vanes extending outwardly from its circular periphery; and said vanes being directed rearwardly with respect to the intended direction of rotation when the device is so mounted.

6. A device of the character described, comprising; a cylindrical annulus of resilient material, adapted for being stretched around a drill pipe to grip it; the annulus having quasi-helical resilient vanes, extending outwardly from its cylindrical periphery, and rearwardly with respect to the intended direction of rotation when the device is so mounted; and the vanes being adapted to serve as impellers for circulating fluid when the device is rotated in a cylindrical bore which it fits with small clearance.

7. A device of the character described, comprising; a cylindrical annulus of resilient material, adapted for being stretched around a drill pipe to grip it; the annulus having quasi-helical vanes, extending outwardly from its cylindrical periphery, and rearwardly with respect to the intended direction of rotation when the device is so mounted; and the vanes being adapted to exert a troweling effect upon the wall of a co-axial cylindrical bore which the device fits with small clearance.

8. A device of the character described, comprising; a cylindrical annulus of resilient material, adapted for being stretched around a drill pipe to grip it; the annulus having quasi-helical resilient vanes, extending outwardly from its cylindrical periphery, and rearwardly with respect to the intended direction of rotation when the device is so mounted; and the vanes being adapted to serve as buffers between the drill pipe and the wall of a co-axial cylindrical bore which the device fits with small clearance.

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