May 23, 1933. H. OSBORNE 1,910,631

GUIDE FOR DRILL PIPE

Filed Dec. 30, 1929

Fig. 1.

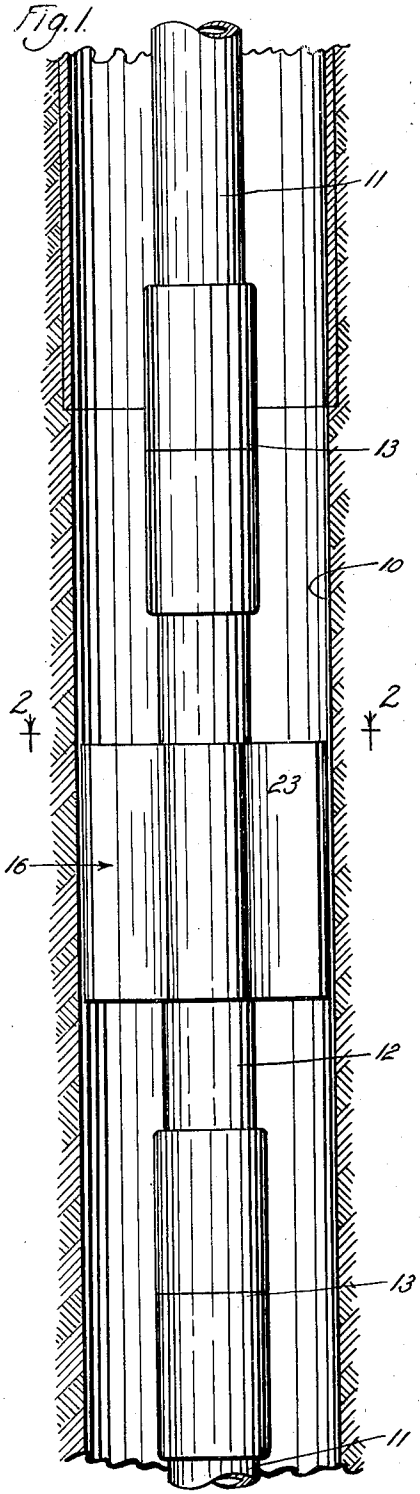


Fig. 2.

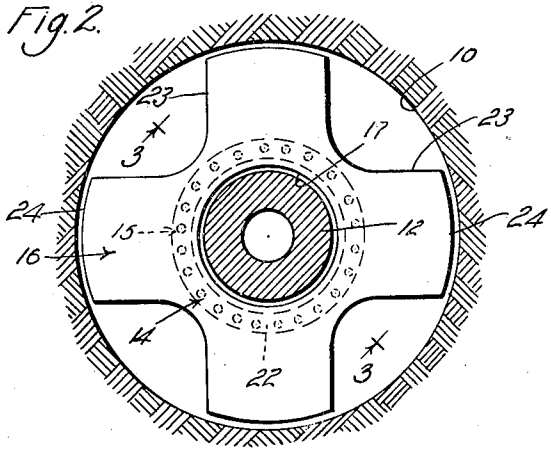


Fig. 3.

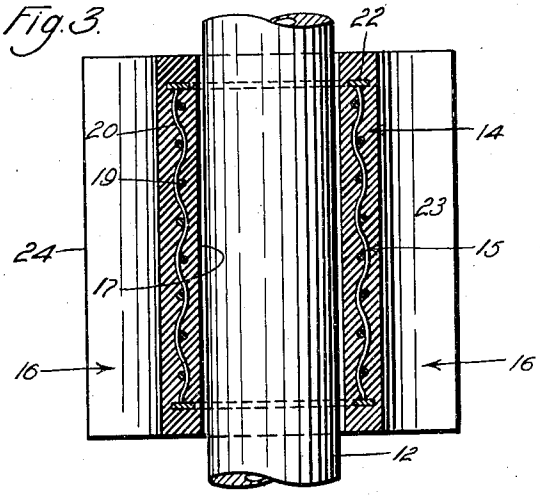
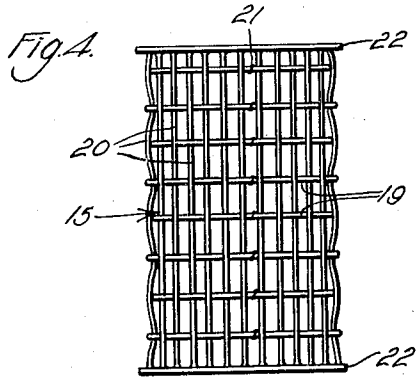


Fig. 4.



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UNITED STATES PATENT OFFICE

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GUIDE FOR DRILL PIPE

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This invention relates to a device for use in connection with the drilling of wells and relates more particularly to a guide for rotary drill pipe, casing, or other parts, that may be operated in a well during drilling operations.

In the drilling of a well with the rotary method it is desirable to guide a drilling string in the open well bore below the end of the casing so that the drilling tool operated at the lower end of the drilling string operates to drill a straight hole. It is a general object of the invention to provide an effective and practical device for guiding a string of drill pipe, or the like, within a well bore.

Another object of the invention is to provide a guide for a part operating in a well bore that is of unitary and simple construction and that is particularly adapted to guide or to center the part in the open well bore in which casing has not been set.

Another object of the invention is to provide a device of the character mentioned that may be freely mounted on a drill pipe, or the like, so that it is not forced to rotate with the pipe and may be freely movable longitudinally of the pipe between spaced projecting parts, such as spaced couplings, tool joints, or the like.

Another object of the invention is to provide a guiding device of the character mentioned that does not materially interfere with the free circulation of fluid through the well bore.

Another object of the invention is to provide a device of the character mentioned that is formed of a rubber composition, or the like, that is readily slidable on the mudded walls of the bore and is lubricated by the lubrication fluid.

Another object of the invention is to provide a guide of the character mentioned that embodies an improved form of substantially rigid reinforcing core or center for the body of the device.

A further object of the invention is to provide a guide for drill pipe, or the like, that is particularly simple of construction and inexpensive of manufacture.

Other 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 drawing, in which:

Fig. 1 is a sectional view of a portion of a well bore illustrating a drilling string extending through it and showing the device provided by this invention in operating position on the drilling string in the open portion of the well bore below the lower end of the casing. Fig. 2 is an enlarged top or plan view of the device provided by this invention, being a view taken as indicated by line 2—2 on Fig. 1. Fig. 3 is a vertical detailed sectional view taken as indicated by line 3—3 on Fig. 2. Fig. 4 is a side elevation of the reinforcing core embodied in the present invention illustrating it apart from the other parts of the device before being embodied in the body of the device.

The guide provided by this invention is intended primarily to be arranged on the portion of a drilling string that normally operates below the lower end of the set casing. When employed in this position or situation, it operates to center or guide the drilling string so that the tool at the lower end of the well bore is centered and held in a position to drill a straight hole. It will be obvious that the device may be used on drill pipe, casing, or any other part, that may be operated within a well and may be located at various points within the well. Further, any desired number of devices or guides, may be spaced or arranged on the drilling string or other operating part, as desired. In the following detailed description I will describe a single guide and will describe a simple method of retaining it on a rotary drilling string. It is to be understood, however, that the invention is not to be considered as restricted to this particular application or to be considered as limited to the particular form of the invention about to be described.

In the drawing, I have illustrated a rotary drilling string extending through a well bore 10 and I have shown a portion of the string as consisting of two lengths of drill

pipe 11 and a sub 12 arranged between the two sections of pipe 11. A sub 12 may be of substantially the same diameter as the drill pipe sections 11 and may be mounted in the drilling string in any desired manner. In the particular case illustrated in the drawing, I have shown the sub 12 attached to the sections of pipe 11 by the usual tool joints 13. In accordance with the general practice, the drilling string delivers circulation fluid to the bottom of the well and the sub 12 is, of course, provided with a fluid passage.

The device provided by this invention includes, generally, a body 14 adapted to be arranged on the sub 12, a rigid reinforcing core 15 embedded in the body 14, and projecting bearing or bore engaging parts 16.

The body 14 is preferably an integral part formed of a resilient material such as, a rubber composition. The body 14 is tubular, having a central opening 17 passing the sub 12. The body is preferably elongated and the opening 17 is sufficiently large to freely pass the sub 12 so that there is a certain amount of clearance. The outside diameter of the body 14 is preferably materially less than that of the well bore 10 and the upper and lower ends of the body may be made flat or finished, as desired. It is preferred that the body be somewhat shorter than the sub 12 or other part upon which it is mounted. The body, being proportioned in this manner, is free to move between the ends of the spaced tool joints 13 and is not forced or caused to rotate with the drilling string when in operation. It is to be understood that the manner of mounting the body 14 mentioned above is not to be taken as restricting the invention. The guide may be mounted on a length of drill pipe such as length 11 and may be mounted between any spaced projecting parts on a drilling string. Further, the device may be mounted between the spaced parts so as to be held against longitudinal movement if desired.

In accordance with the preferred form of the invention, the body 14 is provided with a suitable reinforcing or strengthening means. Any suitable form of reinforcement may be embodied in the body 14; however, the invention provides the simple and improved rigid core 15. It is preferred to embed or mould the core 15 completely within the body so that it does not project from the body at any point. In accordance with the invention, the core 15 is formed of coarse mesh metal or wire screen and may be a single part or unit. Core 15 is tubular and is concentrically arranged in the body. Core 15 is shorter than the body 14 so that it does not extend to the ends of the body and is embedded in the body between the exterior of the body and the wall of the opening 17. The core 15 may be formed of a single section or piece of screen which has been shaped or curved so that its longitudinal edges are brought into abutment. It is preferred that the core be formed so that it has substantially circumferentially extending strands or wires 19 and so that it has substantially axially extending wires 20. By forming or shaping the screen of which the core is formed, as described above, the opposite ends of the several circumferentially extending wires 15 are brought into abutment. These ends of the wires 19 may be secured together in any desired manner; for example, they may be welded together, as shown at 21 in Fig. 4 of the drawing. The opposite ends of the core 15 are preferably strengthened by rigid rings 22. The rings 22 are of substantially the same diameter as the core 15 and may have radially extending flattened sides. The ends of the various axial wires 20 of the core may be secured to the rings 22 by welding. From the above, it will be seen that the core 15 is particularly simple of formation and is extremely sturdy.

The formation engaging parts 16 are provided to engage the walls of the well bore 10 so that the drilling string is maintained in a substantially concentric position relative to the vertical axis of the well bore. There may be any desired number of parts 16 provided on the body, and in the preferred form of the invention the parts 16 are formed integral with the body. In the particular case illustrated in the drawing, there are four bearing or formation engaging parts 16 symmetrically arranged about the central axis of the body. The parts 16 extend longitudinally of the body and may extend the entire length of the body. The parts 16 are preferably formed comparatively heavy, being comparatively thick and are preferably provided with straight parallel sides 23. The parts 16 are spaced and proportioned so that there is sufficient space between the sides 23 of the adjacent parts 16 to allow for the free passage of circulation fluid through the well bore. The outer ends or edges 24 of the parts 16 are formed equi-distant from the center of the body and are preferably curved about the central axis of the body. The edges 24 are preferably made smooth and parallel to the central axis of the body so as to evenly engage the walls of the well bore 10. In the preferred construction the parts 16 are proportioned so as to allow very little lateral movement of the drilling string within the well bore.

It is believed that the utility of the guide provided by this invention will be readily apparent from the foregoing detailed description. The guide, being formed in the manner above described, is particularly effective in properly centering the drilling string 11 in the well bore. As the device is formed of rubber, or like material, the bore engaging parts 16 are readily slidable on the mudded walls of the well bore. Further, it

is characteristic of rubber, that water, or like fluid, is particularly effective as a lubricant when in contact with the rubber. The device, being freely mounted on the sub 12, or like part of the drilling string, is free to shift longitudinally of the string and is not forced or positively caused to rotate with the drilling string. In this manner, the parts 16 will not be caused to track or operate at, or on, a limited part of the well bore.

The guide is proportioned so that it will not pass over the tool joints or couplings on the drilling string. The reinforcement is substantially rigid so that the guide is positively prevented from passing over a tool joint or coupling. The guide is therefore retained on the length or pipe on which it is arranged and is prevented from shifting an excessive distance longitudinally of the string.

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. A guide for a tool operating member within a well bore including, a body of resilient material adapted to be slidably mounted between projecting parts on the operating member and having projecting formation engaging parts to prevent lateral movement of the operating member, and a continuous circumferential reinforcing core in the body for preventing radial expansion of the body and formed of wire netting having circumferentially extending wires, the ends of which are joined.

2. A guide for a tool operating member within a well bore including, a body of resilient material adapted to be slidably mounted between projecting parts on the operating member and having projecting formation engaging parts to prevent lateral movement of the operating member, and a continuous circumferential reinforcing core in the body for preventing radial expansion of the body and formed of wire netting having a circumferentially extending wire joined at its ends and a rigid ring attached to the end of the core.

3. A guide for a tool operating member within a well bore including, a tubular body of resilient material adapted to be slidably mounted between projecting parts on the operating member and having projecting formation engaging parts to prevent lateral movement of the operating member, and a continuous tubular reinforcing core completely embedded concentrically in the body for preventing radial expansion of the body and, the core including netting having substantially concentric annular strands, and axially extending strands.

4. A guide for a tool operating member within a well bore including, a tubular body of resilient material adapted to be slidably mounted between projecting parts on the operating member and having projecting formation engaging parts to prevent lateral movement of the operating member, and a continuous tubular reinforcing core embedded concentrically in the body for preventing radial expansion of the body and, the core including tubular netting having continuous annular strands concentric with the axis of the body, axially extending strands, and a rigid ring attached to the end of the core.

5. A guide for a tool operating member within a well bore including, an integral tubular body of rubber adapted to be mounted on the operating member and having projecting formation engaging parts to prevent lateral movement of the member, and a continuous tubular foraminous metal reinforcing core embedded within the body for preventing radial expansion of the body and extending longitudinally of the body through the greater portion of the body, the said parts being symmetrically spaced about the axis of the member and having concentrically curved outer edges.

6. A guide for a tool operating member within a well bore including, an integral tubular body of rubber adapted to be mounted on the operating member and having circumferentially spaced radially projecting formation engaging parts to prevent lateral movement of the member, and a tubular foraminous metal reinforcing core molded within the body for preventing radial expansion of the body concentric with the longitudinal axis of the body and extending through the greater portion of the body, the said parts extending axially of the body and having concentrically curved outer edges.

7. A guide for an operating member within a well bore including, a tubular body of rubber adapted to be mounted on the operating member and having projecting formation engaging parts to prevent lateral movement of the member in the well, and a continuous tubular foraminous metal reinforcing core embedded within the body and extending throughout substantially the entire length of the body to prevent radial expansion of the body.

8. A guide for a tool operating member within a well bore including, an integral tubular body of rubber adapted to be mounted on the operating member and having projecting formation engaging parts to prevent lateral movement of the member, and a continuous tubular foraminous metal reinforcing core concentrically embedded in the body and extending substantially the entire

length of the body to prevent radial expansion of the body.

9. A guide for a tool operating member within a well bore including, an integral tubular body of resilient material adapted to be mounted on the operating member and having projecting formation engaging parts to prevent lateral movement of the member, and a continuous tubular metal wire netting reinforcing core completely embedded in the body to prevent radial expansion of the body.

In witness that I claim the foregoing I have hereunto subscribed my name this 4th day of December, 1929.

HERBERT OSBORNE.