

May 31, 1932.

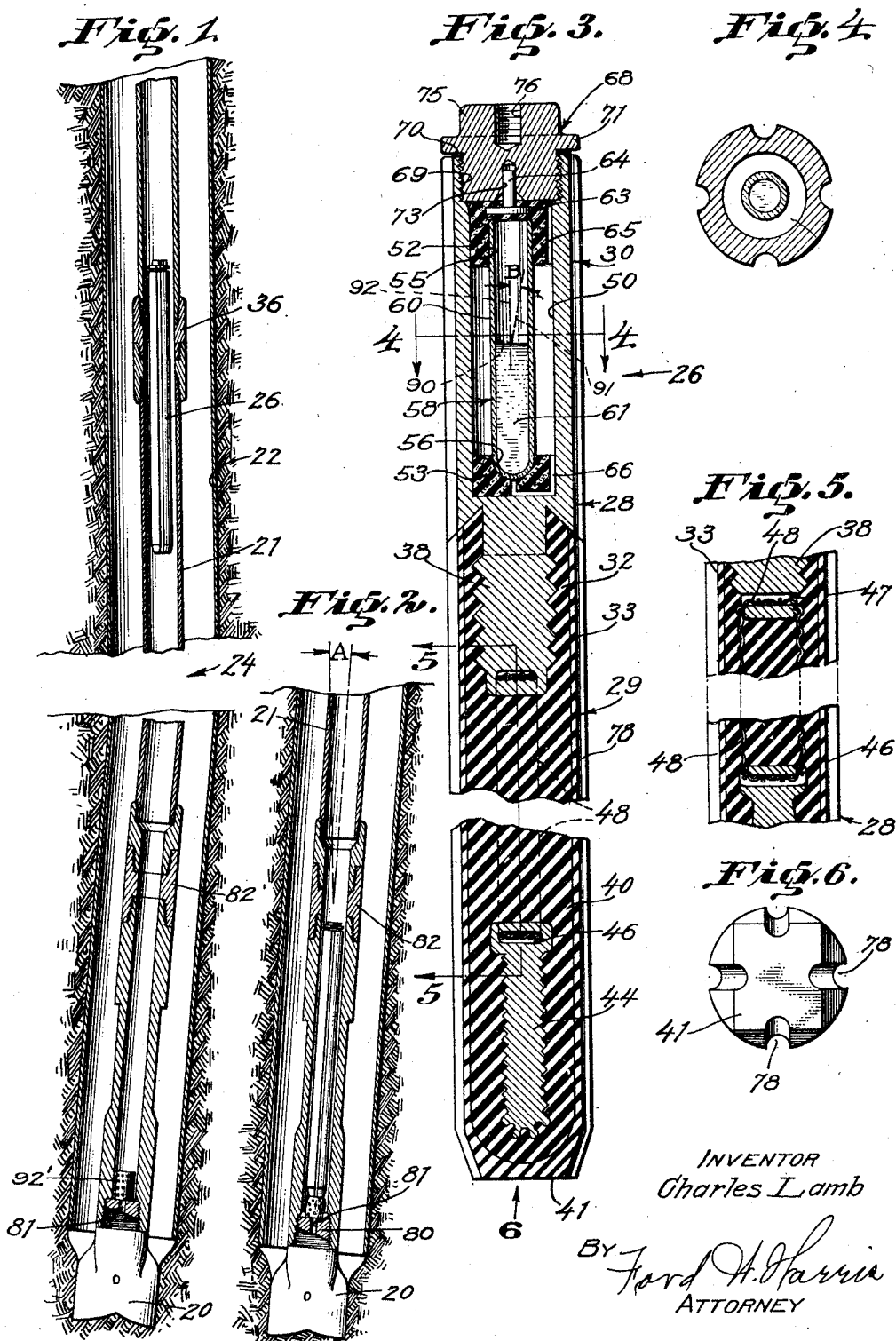
C. LAMB

1,860,932

PLUMBING TOOL FOR OIL WELLS

Filed Jan. 17, 1930

2 Sheets-Sheet 1



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Fig. 7.

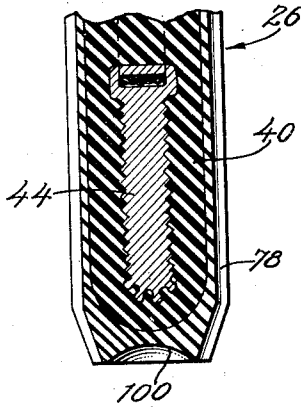


Fig. 12.

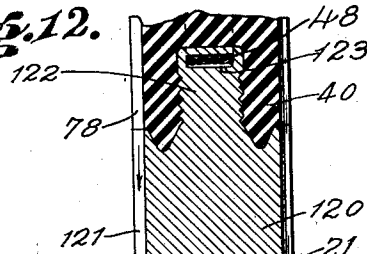


Fig. 8.

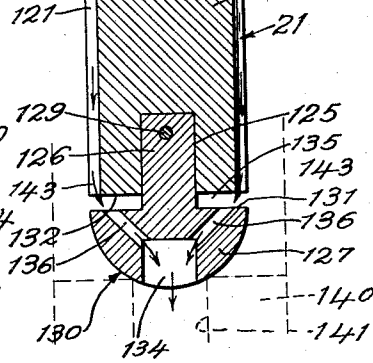
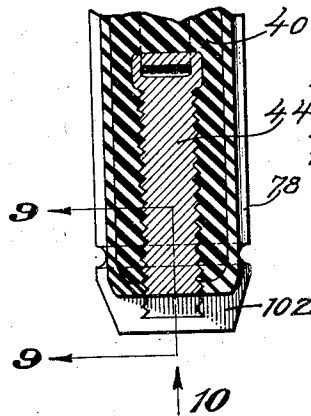


Fig. 9.

Fig. 10.

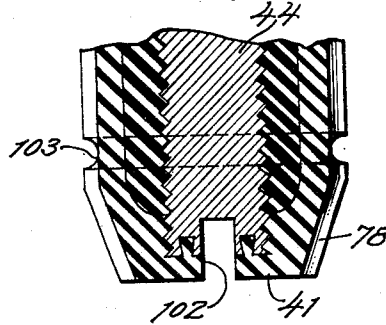
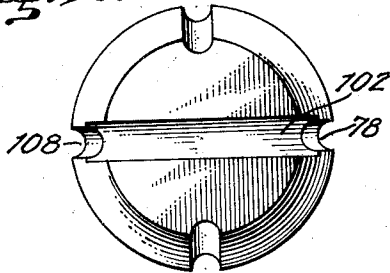


Fig. 13.

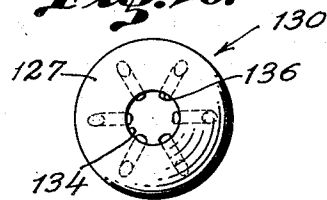
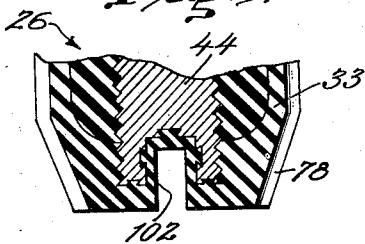


Fig. 11.



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PLUMBING TOOL FOR OIL-WELLS

Application filed January 17, 1930. Serial No. 421,401.

My invention relates to a novel type of plumbing tool which finds particular utility in the well-drilling industry where it is used to determine the verticality of the walls of the well.

In drilling oil-wells it is a common occurrence for the drill bit to become deflected so that the hole dug thereby is not vertical. A small amount of deflection is usually tolerated since it does not interfere with the drilling or subsequent operation of the well, but a large deflection may cause serious difficulties and must be corrected. This is usually accomplished by cementing in the hole and re-drilling.

I am aware of the fact that plumbing tools have been used before to determine the verticality of the well, but in using these tools it has been necessary to remove the drilling tools from the well and lower the plumbing tool therein. The time thus occupied in taking a reading with the plumbing tool is great enough to make it uneconomical to take a reading each time the drilling tools are withdrawn from the well and consequently a considerable length of crooked well is sometimes dug before it is ascertained that the bit has been deflected.

Were it economically possible to plumb the well each time the bit was removed, the deflection would be ascertained immediately after it occurs and it would obviously be much cheaper to correct the deflection at this time rather than after a considerable length of crooked well had been dug.

It is an object of my invention to provide a plumbing tool for use in the well-drilling industry in which the operation for testing the verticality of the well is simple enough and rapid enough to be economical for use each time the drilling tools are withdrawn from the well.

My invention comprehends a plumbing tool which may be dropped to the bottom of the well where it is held parallel to the walls thereof so as to indicate the verticality of the walls at the bottom of the well. In the practical use of my invention, the plumbing tool is dropped inside a string of drill pipe in the well, the plumbing tool threading its

way to the bottom of the drill pipe where it strikes a stop and is held by the walls of the drill pipe parallel to the axis of the drill pipe and hence parallel to the walls of the well since the drill pipe extends axially down the well.

It is, accordingly, an object of my invention to provide a plumbing tool which may be used in the well while the drilling tools are in the well.

Another object is to provide a plumbing tool of the above class having a flexible body for permitting the plumbing tool to thread its way downward inside the drill pipe without becoming caught on ledges formed by tool joints and other joints in the pipe.

The drill pipe is usually filled with rotary mud which is used to carry away the cuttings occasioned when drilling the well. When the rotary mud is thin, there is little resistance offered to the transition of the plumbing tool down the drill pipe, and the plumbing tool therefore gathers considerable speed. When the plumbing tool is brought to a sudden stop at the bottom of the well, due to striking the stop in the drill pipe, there is considerable impact, which impact would occasion damage to the plumbing tool and to an indicating means carried by the plumbing tool if a means were not provided to absorb the impact.

A further object is to provide a plumbing tool having an impact-absorbing means on the forward part of a body of the plumbing tool, which means absorbs the impact resulting when the plumbing tool strikes the stop in the drill pipe and reduces the impact transmitted to an indicating means carried by the body.

Another object is to provide a plumbing tool having a means for increasing the resistance to the passage of the plumbing tool through the rotary mud in the drill pipe so as to reduce the speed at which the plumbing tool passes downward in the drill pipe.

When the impact-absorbing means is compressed due to absorbing the impact, it tends to recoil or have a retroactive effect, this effect being sufficiently great in some cases to tear the body of the plumbing tool apart.

It is also an object to provide a plumbing tool having a means for checking the retro-active effect resulting from the impact and thus preventing damage to the plumbing tool.

In case the rotary mud is quite thick, it is possible that it may offer considerable resistance to the passage of the plumbing tool down the drill pipe, thus making it necessary to force the plumbing tool down the drill pipe.

A further object is to provide a plumbing tool in which the flexible body thereof is sufficiently strong and incompressible to permit forcing the plumbing tool down the drill pipe without the flexible body of the plumbing tool being compressed sufficiently so that it is squeezed outward against the walls of the drill pipe and thus shuts off the flow of the rotary mud past the plumbing tool.

When the plumbing tool is dropped to the bottom of the drill pipe, there is a possibility that it might stop the outlet opening from the drill pipe and thus prevent the rotary mud from draining out of the drill pipe when the drill pipe is withdrawn from the well. This produces a "wet" job, or a condition in which the drill pipe is full of rotary mud and after the sections of the drill pipe are unscrewed, the rotary mud flows out on the derrick floor.

Another object is to provide in a plumbing tool of the above class a fluid opening along the side of the plumbing tool so that the rotary mud may flow past the plumbing tool and thus prevent the plumbing tool from plugging up the opening in the drill pipe.

Another object is to provide a plumbing tool having a forward end of the body weighted so as to draw the forward end downward when the plumbing tool is dropped in the well.

It is also an object to provide in a plumbing tool of the above class, a novel method of supporting an indicating device in the body so as to further reduce the impact transmitted thereto.

Further objects and advantages will be made evident in the ensuing description of a preferred form of my invention.

In the drawings:

Figure 1 is a sectional view taken through a well showing a plumbing tool of my invention passing downward through a drill pipe in the well.

Fig. 2 is a sectional view taken the same as Fig. 1, showing the plumbing tool in a reading-taking position at the bottom of the well.

Fig. 3 is a sectional view taken on a central longitudinal plane through the plumbing tool.

Fig. 4 is a sectional view taken through the device on a plane indicated by the line 4—4 of Fig. 3.

Fig. 5 is a fragmentary sectional view taken as indicated by the line 5—5 of Fig. 3, showing a tying means of my invention.

Fig. 6 is an elevational view taken of the forward end of the plumbing tool as indicated by arrow 6 in Fig. 3.

Fig. 7 is a fragmentary sectional view taken the same as Fig. 3 showing an alternative form of construction for the forward end of the plumbing tool.

Fig. 8 is a fragmentary sectional view taken the same as Fig. 7, showing another alternative form of construction.

Fig. 9 is a sectional view taken as indicated by the line 9—9 of Fig. 8.

Fig. 10 is an elevational view taken of the forward end of the plumbing tool as shown by the arrow 10 of Fig. 8.

Fig. 11 is a fragmentary sectional view taken the same as Fig. 9, showing still another alternative form of construction.

Fig. 12 is a fragmentary sectional view of the form of the invention provided with a metal nose and constructed so that mud circulation is provided for.

Fig. 13 is a bottom plan view of Fig. 12.

Referring to Figures 1 and 2, I show a bit 20 secured to the lower end of a string of drill pipe 21 for digging away the bottom of a well 22, the string of drill pipe 21 extending upward inside the well 22 and being rotated by a rotary table at the surface. Due to the bit 20 being deflected at a point 24, the lower portion of the well has been dug so that the walls thereof are inclined to the vertical, the lower end of the string of drill pipe 21 and bit 20 being also inclined to the vertical, due to the engagement of the drill pipe 21 with the walls of the well 22. In order to test the verticality of the lower end of the drill pipe 21, and hence, the verticality of the lower end of the well 22, I provide a plumbing tool 26 of my invention, which is adapted to be dropped downward inside the string of drill pipe 21, as shown in Figure 1, to assume a position in alignment with the lower end of the drill pipe 21, as shown in Fig. 2.

Referring to Figures 3 to 6, the plumbing tool 26 has a cylindrical body 28 which I prefer to divide into two portions, a forward or primary body member 29, and a rear or secondary body member 30. The forward body member 29 comprises the greater portion of the body 28, and has an inner core 32 which is preferably made of a semi-flexible, semi-resilient material, such as hard rubber. Around the core 32 is a shell 33 of a wear-resisting material, such as soft rubber. The hard rubber comprising the core 32 is sufficiently flexible to permit the plumbing tool 26 to bend when passing around tool joints 36, as shown in Fig. 1, or around a bend in the string of drill pipe 21, and is sufficiently compressible to permit it to absorb an im-

5 pact resulting from the plumbing tool 26 striking the stop at the bottom of the drill pipe 21. However, the hard rubber in the core 32 is sufficiently incompressible to prevent the forward body member from being compressed lengthwise and expanding side-

10 15 20 25 The rear body member 30 is preferably made of a rigid substance, such as metal, although it may be made of a molded composition such as bakelite, to reduce the weight of this member, if it is desired. The body members 29 and 30 are secured together by a pin 38 formed on the forward end of the rear body member 30, the pin 38 being secured to the forward body member 29 by molding the rubber of this member 29 so that it fills the roughened surface of the pin 38. The portion of the secondary body member 30 adjacent the pin 38 is inclined inwardly so that a compressive force between the body members 29 and 30 tends to wedge the portion of the primary body member 29 surrounding the pin 38 into more forcible contact with the secondary body member 30.

30 35 40 The nose 40, or forward end of the forward body member 29, is tapered to guide the plumbing tool 26 past the tool joints 36 in the drill pipe 21, and is provided with a flat forward surface 41 which provides a means for resisting the movement of the plumbing tool 26 through the rotary mud in the drill pipe 21. It is desirable that the nose 40 be heavier than the other parts of the plumbing tool 26 so that the nose 40 will draw the plumbing tool 26 down the drill pipe. This is secured by providing a weight 44 which may be molded in the nose 40, the weight 44 having a roughened surface to provide better contact with the rubber of the forward body member 29.

45 50 55 60 65 As has already been stated, the forward body member 29, being made of rubber, acts as an impact-absorbing means for absorbing the impact caused by the plumbing tool 26 striking the stop at the bottom of the drill pipe 21. The rebound or retroactive effect caused by the compression of the rubber is often sufficient to cause the body 28 to be torn in two. As clearly shown in Figs. 3 and 5, the upper end of the weight 44 and the lower end of the pin 38 are provided with slotted openings 46 and 47, through which a tying means 48 is passed so as to tie the weight 44 and the rear body member 30 together. The tying means 48 is preferably made of a material which will permit compression thereof, and thus allow compression of the forward body member 29, but which will resist a recoil of the rubber in the primary body member 29. In the practice of my invention, I make the tying means 48 of a strip of woven wire cloth which is woven

from a high tensile strength wire, such as piano wire, this strip being molded in the rubber of the primary body member 29 at the same time the weight 44 is molded therein.

70 75 80 85 90 The upper part of the rear body member 30 provides a central cavity 50, in the upper and lower ends of which are positioned an upper and a lower cushion 52 and 53 of an impact-absorbing material, such as soft rubber. The cushions 52 and 53 provide recesses 55 and 56 for holding an indicating device 58 which is operable to indicate the verticality of the body 28. The indicating device 58 which I prefer to use, comprises a glass vial 60 which contains an etching fluid 61, such as hydrofluoric acid. The upper cushion 52 acts as a cover for the vial 60 and a disk 63, secured to the lower end of a rod 64, is molded in the cushion 52 to act as a means for pressing the rubber of the cushion 52 tightly on top of the vial 60. The rod 64 also acts as a handle for removing the cushion 52 when it is desired to remove the vial 60. Channels 65 and 66 are provided along the sides of the upper and lower cushions 52 and 53 so that air may pass by the cushions 52 and 53 and permit easy withdrawal of the vial 60.

95 100 105 110 The cushions 52 and 53 and the indicating means 58 are held in the cavity 50 by a cap 68 threaded in a counterbore 69 of the cavity 50, a gasket 70 being placed between a flange 71 of the cap 68 and the upper end of the secondary body member 30 so as to prevent entrance of foreign matter into the cavity 50, and an opening 73 being also formed in the cap 68 to act as a guide means for the rod 64. The cap 68 has a square top 75 for applying a wrench thereto when it is desired to detach the cap 68 from the rear body member 30, and having a threaded opening 76 in which a rod or other device may be screwed to permit withdrawal of the plumbing tool 26 from the string of drill pipe 21.

115 In order to prevent the plumbing tool 26 from plugging the opening through the drill pipe 21, and to permit the ready passage of the rotary fluid in the drill pipe 21 past the plumbing tool 26, I provide longitudinal, fluted, fluid passages 78 on the surface of the plumbing tool 26, these passages or openings extending on the surface of the cap 68 and also on the tapered nose 40.

120 125 The plumbing tool 26 of my invention is particularly adapted to be used just prior to withdrawing the string of drill pipe 21 and the drill bit 20 from the well 22 so as to sharpen or replace the bit 20. At this time the etching fluid 61 is inserted in the vial 60. The vial 60 is then inserted in the cavity 50 between the cushions 52 and 53, and secured in place by screwing the cap 68 in the counterbore 69. The plumbing tool 26 is then introduced into the upper end of the drill pipe

21 and dropped. When the rotary mud in the drill pipe 21 is thin, the weight of the plumbing tool 26 carries it rapidly downward inside the string of drill pipe 21, the tapered nose 40 guiding the plumbing tool 26 past the tool joints 36 in the drill pipe 21, and the flat nose 41 acting to prevent a too rapid descent of the plumbing tool 26. The flexible body of the plumbing tool 26 permits the plumbing tool 26 to bend and pass around any projections such as are caused by the tool joint 36 or by a bend in the drill pipe 21, and the weighted nose 40 draws the plumbing tool 26 downward, due to its greater weight.

When the plumbing tool 26 reaches the lower end of the drill pipe 21, as shown in Fig. 2, the nose 40 thereof encounters a stop 80 which may be a wall around a restricted opening 81 in the drill pipe 21, or in a tool joint 82 above the drill bit 20, and is abruptly stopped. Since the speed attained by the plumbing tool 26 in falling down the string of drill pipe 21 may be quite great, there is considerable impact when the plumbing tool 26 strikes the stop 80. The forward body member 29 acts as an impact-absorbing means to absorb this impact, since it is made of rubber which is sufficiently compressible to absorb this impact. This compression is not resisted by the tying means 48, due to the woven construction thereof which permits compression. The compression of the rubber in the forward body member 29 reduces the shock transmitted to the rear body member 30. This shock is further reduced by the cushions 52 and 53 which also act as impact-absorbing means, with the result that the shock transmitted to the vial 60 is not sufficient to break it. After the rubber in the forward body member 29 is compressed, the resiliency thereof causes it to rebound so as to return to a normal position. Ordinarily, if no tying means 48 were provided, there would be an over-travel of the rebound of the rubber, which might cause sufficient elongation of the forward member 29 to cause separation thereof. The tying means 48 prevents this by tying the nose 40 to the rear body member 30 so that they cannot be separated. The woven construction of the tying member 48 also provides a certain amount of resiliency which is sufficient so that the rebound of the rubber is not stopped abruptly enough to cause breakage of the tying means 48.

Being now at the bottom of the string of drill pipe 21, the plumbing tool 26 is held by the walls of the drill pipe 21 parallel to the axis of the drill pipe, as shown in Fig. 2. The plumbing tool 26 is now in a reading-taking position in which it is operable to determine the verticality of the drill pipe 21 and hence of the walls of the well 22. The plumbing tool 26 and drill pipe 21 are allowed to remain in a stationary position for

a predetermined length of time, during which time the surface of the etching fluid 61 assumes a horizontal position, due to the action of gravity, and etches the portion of the vial 60 with which it is in contact, the strength of the etching fluid being such that its energy is spent after a few minutes' contact with the walls of the vial 60.

In case the walls of the well 22 are vertical, the plumbing tool 26 and the vial 60 are held in a vertical position and the division line between the etched portion and the unetched portion of the vial 60 is a circle whose axis coincides with the axis of the vial 60. In case the lower end of the well 22 is inclined at an angle A to the vertical, as shown in Fig. 2, the lower end of the drill pipe 21, the plumbing tool 26 and the vial 60 are also inclined to the vertical. As shown in Fig. 3, in this case the division line 90 between the etched and unetched portions of the vial 60 is a circle whose axis 91 is at an angle B to the axis 92 of the vial 60, the angle B being equal to the angle A.

At the expiration of the predetermined time, the energy of the etching fluid 61 has been spent and the drill pipe 21 is withdrawn from the well 22 in a well known manner. When the joints of the drill pipe 21 are unscrewed, the plumbing tool may be removed from the tool joint 82 by screwing a rod or other suitable device in the threaded opening 76 in the plumbing tool 26 and withdrawing the plumbing tool 26 from the drill pipe 21. By removing the cap 68 from the body 28 and withdrawing the vial 60, the operator can then ascertain the angle of inclination relative to the vertical of the lower end of the well 22 by means of the inclination of the division lines 90, as already explained. In case this inclination is greater than the amount tolerated, it is necessary to cement in the lower end of the well 22 and redrill the well in the manner already described.

When the plumbing tool 26 is in position at the bottom of the drill pipe 21, there is a possibility that it may plug the restricted opening 81 at the bottom of the well, and I therefore provide an inverted cup-shaped member 92' having perforated sides. The member 92' may be dropped inside the drill pipe 21 previous to the insertion of the plumbing tool 26 therein, the member 92' being allowed to assume a position at the bottom of the drill pipe, as shown in Figs. 1 and 2. When the plumbing tool 26 is dropped inside the drill pipe 21, it engages the member 92' and is thus prevented from plugging the restricted opening, since the rotary mud may flow past the fluid opening 78 in the plumbing tool 26, through the perforations in the sides of the member 92' and outward through the restricted opening when the drill pipe 21 is withdrawn from the well 22.

In case the rotary mud in the drill pipe 21

is sufficiently heavy, the flat surface 41 of the nose 40 may offer too great a resistance to the passage of the plumbing tool 26 downward in the drill pipe 21, and it may therefore be necessary to press against the top of the plumbing tool 26 by means of a string of drill rods in the drill pipe 22, in order to force the plumbing tool 26 to the bottom of the drill pipe 21. In case the forward body member 29 were made sufficiently soft, there is a possibility that the resistance offered by the rotary mud and the pressure exerted by the drill rod on the top of the plumbing tool 26, might cause sufficient compression in the plumbing tool 26 to cause the forward body member to be expanded outward so that it would fill the drill pipe 21 and tend to shut off the flow of rotary mud past the plumbing tool 26. I therefore prefer to make the rubber in the core 32 of the forward body member 29 sufficiently hard so that it is relatively compressible under the amount of force exerted by the drill rods on the top of the plumbing tool 26.

In Figures 7 to 11 I show a number of alternative forms of construction for the lower end of the plumbing tool 26. Referring to Fig. 7, it will be noted that the nose 40 is made similar to that in the preferred form of my invention, with the exception that the flat face 41 is replaced with a concave surface 100, this construction being provided where the rotary mud used in the drill pipe is exceedingly thin and it is desired to have a considerable amount of resistance offered to the passage of the plumbing tool 26 downward in the drill pipe 21.

In Figs. 8 to 10 I show a form of construction which is particularly adapted for use when the rotary mud is thick, and it is not practical to use the member 92'. It will be noted that the alternative form of construction shown in these figures is similar to that in the preferred form, with the exception that the weight 44 is affixed down very close to the flat surface 41. The flat surface 41 is also provided with a transverse fluid opening 102, which opening 102 communicates with the fluid openings 78 on the body 28 of the plumbing tool 26. The nose 40 of the plumbing tool 26 is also provided with an annular fluid opening 103 which passes circumferentially around the plumbing tool 26 just above the tapered portion of the nose 40. It will be noted that in this form of the device the weight 44 is larger and very little resilient material is provided between the lower end of the plumbing tool 26 and the weight 44. The plumbing tool 26 is therefore adapted to pass more readily through the rotary mud due to its own weight, but since the speed of the descent is relatively slow, it is not adapted to absorb as much impact as the form of my device shown in Figs. 3 to 6. By providing the fluid openings 102 and 103, I also pro-

vide a means for preventing the restricted opening 81 in the drill pipe 21 from being stopped up by the plumbing tool 26, thus making it unnecessary to use the member 92'.

In Fig. 11 I show an alternative form of construction from the form shown in Figs. 8 to 10, the form of construction shown in Fig. 11 having the soft rubber comprising the shell 33 passing entirely around the lower end of the weight 44 and into the fluid opening 102. This construction provides a rubber covering for the entire lower portion of the plumbing tool 26 and therefore no joints are provided between the rubber shell 33 and the weight 44, in which joints a fluid might enter and cause the rubber to become detached from the weight 44.

The form of my invention shown in Fig. 12 has a lower metal body 120 which is of the same diameter as the rubber body 40, and is provided with longitudinal grooves or flutes 121, which are in alignment with and act as continuations of the grooves or flutes 78. The upper portion of the metal body is provided with a projection 122 having a slot 123 through which the flexible tying means 48 is extended for tying the metal body 120 to the pin 38.

The lower end of the metal body 120 is provided with a cylindrical opening 125 which is concentrically formed in the lower end thereof and adapted to receive a cylindrical pin 126 of a hard metal nose 127. The cylindrical pin 126 is held in place by a locking bar or pin 129. The hard metal nose 127 has a nearly spherical lower face 130 and a flat upper face 131 which is spaced a distance below the flat lower face 132 of the metal body 120. Formed in the hard metal nose 127 and connecting to the lower end thereof is a cavity 134. The cavity 134 is in communication with the space 135 formed between the faces 131 and 132 by a plurality of small passages 136. When the plumbing tool arrives at the bottom of the string of drill pipe the metal nose 127 may rest on the upper portion of the bit which is represented by dotted lines 140 and may close the mud passage 141 thereof. In order to prevent sanding up in the well and for other reasons it is highly desirable to maintain a circulation downward through the drill pipe and upward through the well. In this form of the invention the rotary mud may be circulated through the channels 121, the space 135, the openings 136, and the cavity 134, as indicated by arrows 143.

It should be noted that it is very desirable to have the length of the rigid portion of the plumbing tool 26 as short as possible so that the body 28 is flexible throughout its length. In practice, I make the length of the rear body member 30 sufficiently short so that the small amount of rigidity imposed by this member is not sufficient to cause the

body 28 to catch on the drill pipe 21. For practical purposes the body 28 may, therefore, be considered as being flexible throughout its length. It should be noted that I am not limited to the use of a rigid member in the body 28, as the body 28 may be made entirely of flexible material, if desired. The use of a flexible forward portion, or a flexible nose, on the body 28 is also an important feature of my invention, since it permits guiding the body 28 around the tool joints 36 and other obstructions in the drill pipe 21, and provides a means for absorbing the impact caused by the plumbing tool 26 striking the stop 80.

The use of a tying means 48, which permits compression but prevents elongation of the rubber in the forward body member 29, is also very important. The tying means 48 may be broadly considered as tying together the ends of the exible body 28 in a manner to allow compression of the body but resist elongation thereof. The tying means 48 also acts as a means to check the retroactive effect produced by the impact, which impact causes the rubber in the body 28 to be compressed, and thus prevents the body 28 from being torn in two.

I claim as my invention:

1. As an article of manufacture, a plumbing tool, comprising: a flexible rubber-like body; an indicating device carried by said body and operable to indicate the verticality thereof; and pliable tying means secured by said body for tying together the opposite ends thereof.

2. As an article of manufacture, a plumbing tool, comprising: a flexible body; an indicating device carried by said body and operable to indicate the verticality thereof; and tying means extending longitudinally of said body for tying together the opposite ends thereof so as to allow compression of said body, but resist elongation thereof.

3. As an article of manufacture, a plumbing tool, comprising: a flexible body; an indicating device carried by said body and operable to indicate the verticality thereof; an impact-absorbing nose on said body; and tying means tying said nose to said body so as to allow said nose to be compressed relative to said body, but prevent said nose from being separated therefrom.

4. As an article of manufacture, a plumbing tool, comprising: a body composed of a primary flexible body member of rubber-like material secured to a secondary rigid body member; an indicating device carried by said secondary body member and operable to indicate the verticality of said body; a weight carried by said primary body member in an end thereof opposite said secondary body member; and tying means for tying said secondary body member and said weight together, said tying means permitting a compression

of said body member but preventing an elongation thereof due to recoil.

5. As an article of manufacture, a plumbing tool, comprising: a body composed of a primary flexible body member secured to a secondary rigid body member; an indicating device carried by said secondary body member and operable to indicate the verticality of said body; a flexible nose on an end of said primary body member opposite said secondary body member; a weight carried by said nose; and tying means for tying said secondary body member and said weight together.

6. In a plumbing tool for testing the verticality of a well containing a fluid, the combination of: a body adapted to be dropped to the bottom of said well where it is held parallel to the walls thereof; an indicating device carried by said body and operable to indicate the verticality thereof; and a concave forward surface on said body shaped to create a resistance to the passage of said body through said fluid.

7. In a plumbing tool adapted to be dropped into a well for recording the inclination thereof, the combination of: a relatively long resilient body having shock-absorbing qualities; an indicating device carried thereby; and means in said body for permitting a compression thereof but preventing an elongation thereof.

8. In a plumbing tool adapted to be dropped into a well for recording the inclination thereof, the combination of: a relatively long resilient body having shock-absorbing qualities; an indicating device carried at one end of said body; a non-compressible nose carried at the other end of said body; and pliable means connected to said indicating device and said non-compressible nose, said pliable means being embedded in said resilient body.

9. In a device of the class described, the combination of: a relatively long rubber-like body; an acid-bottle; a container therefor, said container being connected to said body; and a pliable member secured to said container and molded in said body for securing said container to said body.

10. In a device of the class described, the combination of: a relatively long rubber-like body; an acid-bottle; a container therefor, said container being connected to said body; and a woven wire member secured to said container and molded in said body for securing said container to said body.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 11th day of January, 1930.

CHARLES LAMB.