April 18, 1933. J. J. LARKIN 1,904,317

WELL CASING SHOE

Filed Sept. 28, 1932

Fig. 1.

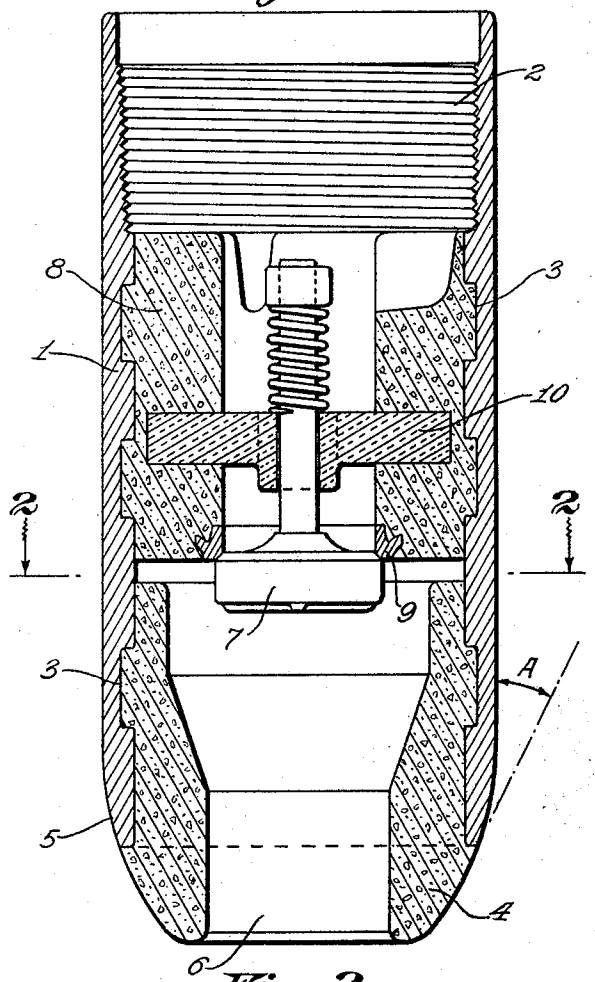
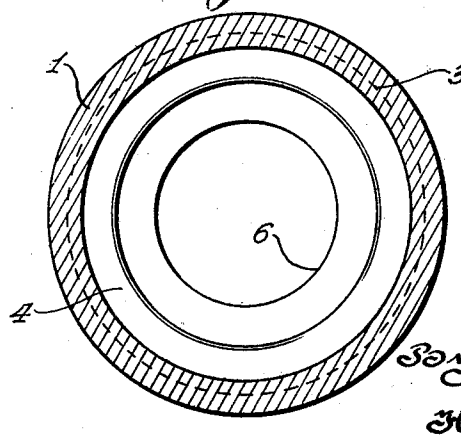


Fig. 2.



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WELL CASING SHOE

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This invention pertains to casing shoes, such as are used at the lower end of well casings to provide a guide to guide the casing as it is being lowered into the hole.

In the operation of sinking a well such as an oil well, it is necessary to lower the casing tube into a hole which may not be perfectly straight, and usually is quite crooked. It has been found necessary to equip the end of the casing with a re-enforcing shoe in the end of which a tapered guide is provided. The taper of such a guide enables it to find its way into the hole and to guide the casing as it is lowered. It has been found that a considerable amount of taper is necessary to guide the casing under all conditions. This is required for the reason that conditions are often encountered, where through caving of the inner wall of the well or otherwise, a very considerable amount of unevenness in the walls of the hole is produced. Under such conditions, a guide having a considerable taper so that its nose is much smaller than its maximum diameter is required in order that the tip may be guided along the uneven surface and back to the center of the hole.

After the casing has been lowered to its final depth it is usually cemented in place at its lower end, and when the cement has set, a drill is passed through the casing to drill out the cement and whatever else is within the casing so as to continue the hole therebeyond. Accordingly, that portion of a shoe guide which is within the bore diameter of the casing must be constructed of a material which is easily drilled out. It has been customary to use concrete for such a guide, and in order to provide a tapered nose, the concrete is usually cast into the end of the casing shoe to project therefrom in the form of a hemisphere so as to provide a round nose which will act as a guide. Such concrete guides, however, usually give trouble in lowering the casing because when they encounter a sharp edged ledge or the like they are liable to be chipped or broken and thereafter their guiding function is practically destroyed.

In accordance with the present invention, the guide is formed only partly of concrete which protrudes from the casing shoe only a short distance and has a blunt point. The lower end of the casing shoe itself is tapered and with a rounded taper which merges into the taper of the protruding concrete tip so that the end of the shoe and the concrete portion together form a rounded tapering guide.

It has been found that with this sort of a guide when the casing is lowered into a hole of average shape, about 90% of the guiding function is accomplished by the tapered tip of the casing shoe itself. That is the concrete end is not called into play as a guide except for about 10% more or less of the travel of the casing when a change of direction of more than ordinary extent is required. Accordingly, the concrete portion of the guide is relieved of the greater portion of the guiding function and consequently the abuse to which it is subjected is greatly reduced. Furthermore, on account of the fact that the extent to which the concrete protrudes from the end of a shoe is greatly reduced, the tip is proportionately stronger and when it is called upon to function, it is less liable to be broken.

One of the objects of this invention, therefore, is to provide a casing shoe and guide of simple construction and which will withstand the abuse to which it is subjected in service with less liability to breakage.

Further objects will appear from the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a longitudinal section of a casing shoe and guide embodying this invention, and

Figure 2 is a section on line 2—2 of Figure 1.

Referring to the drawing 1 designates a casing shoe of the usual construction provided with threads 2 for attachment to the casing. The shoe may be provided with internal grooves or recesses 3, adapted to anchor concrete when cast therein.

Cast in the lower end of the shoe 1, is a guide 4. This guide may be of any suitable disintegrable material. In the drawing, it is shown as concrete, but other disintegrable light materials such as materials embodying a phenol condensation product and even

aluminum may be used for the purpose. The end of the shoe 1 is tapered as indicated at 5, preferably with a rounded taper, and the guide 4 is also tapered preferably with a similar rounded taper merging with that of the shoe so as to form a continuously rounded tip for the end of the shoe. The guide 4 terminates only a short distance beyond the end of the shoe 1 in order that a relatively small amount of material may be exposed beyond the end of the shoe. This has been found to strengthen the guide because the extent to which the concrete protrudes beyond the shoe is relatively small and is, therefore, better able to withstand shocks or blows. The interior of the guide may be cored out to provide a passage 6 as is usual in such guides.

The taper 5 may be carried to such a degree that the angle of taper indicated at A may be as much as twenty-five degrees. The distance that the guide 4 extends beyond the end of the shoe may be one-third of the diameter of the shoe itself, more or less.

The interior of the shoe 1 may be provided with a float valve 7. In accordance with the construction shown, the body 8 of concrete or the like is cast into the shoe 1 and a valve seat 9 and a valve stem guide 10 may be secured in the concrete as indicated in the drawing. The valve seat 9 may be made of aluminum and the valve 7 and the guide 10 of material embodying a phenol condensation product. This combination has been found to give very satisfactory service. All of these materials are disintegrable and of low specific gravity so that after cementing they may be drilled out and the drilling operation will reduce them to small light fragments such as may easily be carried in suspension in the drilling fluid or mud and removed from the well.

It will be seen that this invention provides a casing shoe and guide of simple and rugged contruction. The taper of the steel shoe 1 provides that it may assume part of the guiding function and in fact, it has been found to assume the major portion of that function. The guide 4 continues the taper a short distance beyond the end of the shoe 1 so that the tip is small enough to form an effective guide, even when the casing assumes a considerable degree of angularity with reference to the hole. The shape is such as to form an effective guide, and as the amount of concrete exposed beyond the end of a shoe is reduced to a minimum, its strength to resist impact is greatly increased.

While this invention has been described as forming a complete unitary casing shoe, it will be understood, of course, that individual features and sub-combinations thereof may be useful of themselves without reference to other features or the complete combination. It is understood, therefore, that the employment of such individual features or sub-combinations is contemplated by this invention and within the scope of the appended claims. It is obvious that various changes may be made, within the scope of the appended claims, in the details of construction without departing from the spirit of this invention; it is to be understood, therefore, that this invention is not limited to the specific details shown and/or described.

Having thus described the invention, what is claimed is:

1. A shoe adapted for attachment to a casing and free of obstruction against passage of a drill therethrough, said shoe having its lower end tapered, and a part of disintegrable material extending beyond the lower end of said shoe, said part having a taper in continuation of the taper of the shoe to provide therewith a guide.

2. A shoe adapted for attachment to a casing and free of obstruction against passage of a drill therethrough, said shoe having its lower end tapered at a gradually increasing angle, and a part of disintegrable material extending beyond the lower end of said shoe, said part having a taper in continuation of the taper of the shoe to provide therewith a guide.

3. A shoe adapted for attachment to a casing and free of obstruction against passage of a drill therethrough, said shoe having its lower end tapered at a gradually increasing angle up to substantially twenty-five degrees with the shoe axis, and a part of disintegrable material extending beyond the lower end of said shoe, said part having a taper in continuation of the taper of the shoe to provide therewith a guide.

4. A shoe adapted for attachment to a casing and free of obstruction against passage of a drill therethrough, said shoe having its lower end tapered, and a part of disintegrable material extending beyond the lower end of said shoe, said part having a taper in continuation of the taper of the shoe and forming a blunt point adapted to provide therewith a guide.

5. A shoe adapted for attachment to a casing and free of obstruction against passage of a drill therethrough, said shoe having its lower end tapered, and a part of cementitious material extending beyond the lower end of said shoe, said part having a taper in continuation of the taper of the shoe to provide therewith a guide.

6. A shoe adapted for attachment to a casing and free of obstruction against passage of a drill therethrough, said shoe having its lower end tapered, and a part of cement extending beyond the lower end of said shoe, said part having a taper in continuation of the taper of the shoe and forming a blunt point adapted to provide therewith a guide.

7. A shoe adapted for attachment to a casing and free of obstruction against passage

of a drill therethrough, said shoe having its lower end tapered, and a part of a material embodying a phenol condensation product extending beyond the lower end of said shoe, said part having a taper in continuation of the taper of the shoe to provide therewith a guide.

8. A shoe adapted for attachment to a casing and free of obstruction against passage of a drill therethrough, said shoe having its lower end tapered, and a part of aluminum extending beyond the lower end of said shoe, said part having a taper in continuation of the taper of the shoe to provide therewith a guide.

In testimony whereof, I affix my signature this 3rd day of September, 1932.

JOHN J. LARKIN.