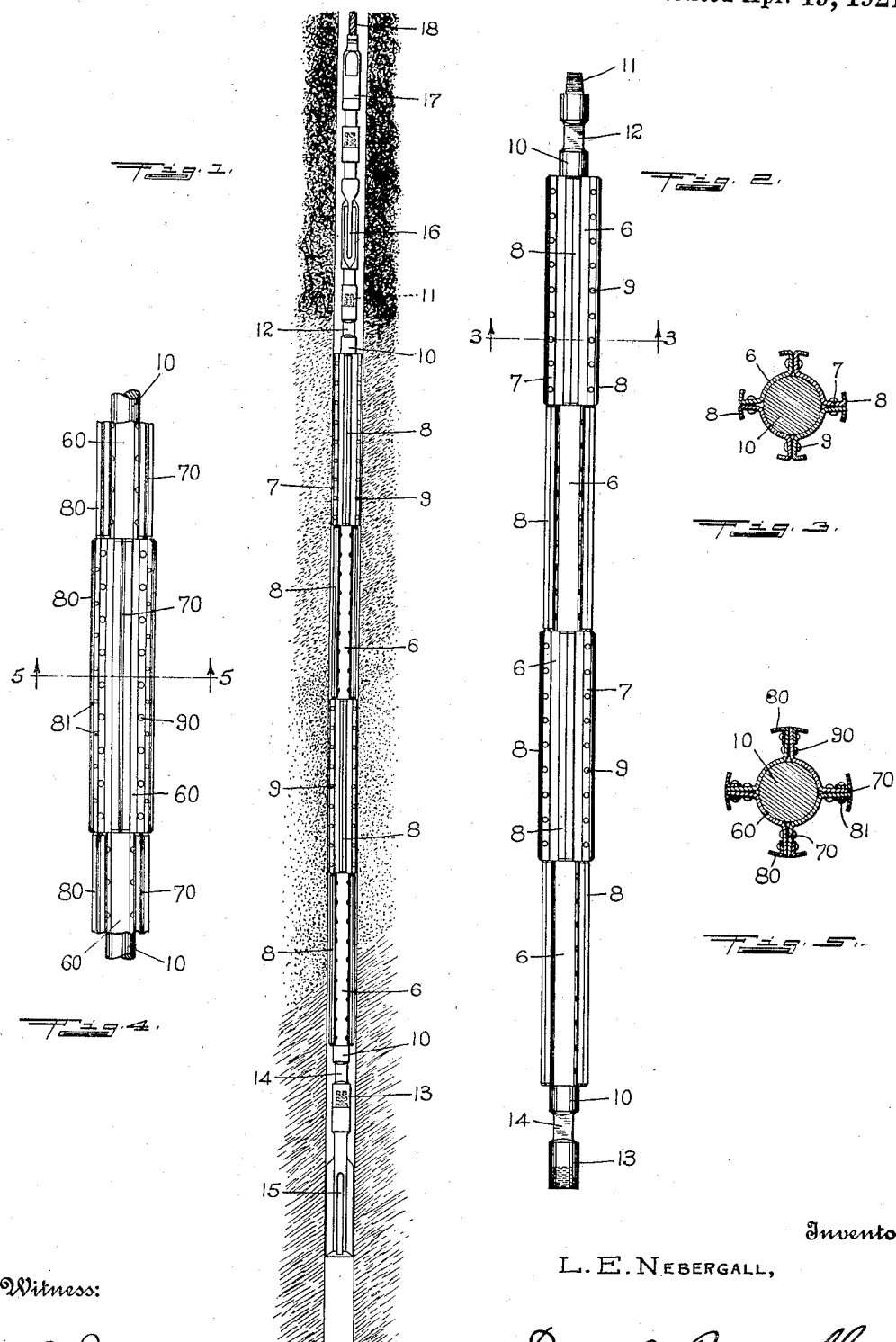


L. E. NEBERGALL.
DEEP WELL DRILLING DEVICE.
APPLICATION FILED APR. 28, 1919.

1,374,946.

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LORAN E. NEBERGALL, OF OMAHA, NEBRASKA.

DEEP-WELL-DRILLING DEVICE.

1,374,946.

Specification of Letters Patent. Patented Apr. 19, 1921.

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To all whom it may concern:

Be it known that I, LORAN E. NEBERGALL, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Deep-Well-Drilling Devices, of which the following is a specification.

My invention relates to tools and appliances for boring Artesian and oil wells. It is the object of my invention to provide an auger-stem or drill-bar such that the use thereof will insure the production of a straight vertical hole in broken or slanting formations, or under any circumstances such that there would ordinarily be a tendency to deflect the drill or bit and produce a slanting or non-vertical hole. A further object of my invention is to provide for forming an auger-stem having the foregoing characteristics, by means of members attachable to stems or drill-bars of the ordinary and common form, whereby a stem of the improved form may be produced without waste or loss of the stems now in use with standard deep-well boring equipment.

In the accompanying drawings Figure 1 is a vertical sectional view showing in use a typical string of drilling tools including an auger-stem constructed in accordance with my invention, Fig. 2 is a side view, on a larger scale, of the auger-stem alone, Fig. 3 is a horizontal section of the stem on the line 3—3 of Fig. 2, Fig. 4 is a side view of a portion of the stem, showing a slightly modified form of the wings, and Fig. 5 is a transverse section on the line 5—5 of Fig. 4.

In carrying out my invention I provide an auger-stem having a plurality of ribs or wings which extend out radially therefrom and are continued substantially throughout the length thereof, said wings having at their outer edges flanges which extend concentrically with the main body of the stem and provide a wide guiding surface for engaging the sides of the hole in which the stem is used.

In the construction shown in Figs. 1, 2 and 3, I provide metal plates having intermediate transversely curved portions 6, with integral wings 7 at each longitudinal edge thereof extending approximately radial to the axis of curvature of the portions 6, and flanges 8 extending toward each other from the outer edges of said wings, said flanges

having a slight curvature so as to be substantially concentric with the portions 6. The plate-portions 6 are of such lateral extent that a determined number thereof, four in the structure shown, will nearly surround the cylindrical main body 10 of the auger-stem to which they are applied. The pairs of wings 7 which are adjacent to each other when the plates are assembled on the stem, are connected by rivets 9, the wings being drawn together during the riveting operation so that the curved portions 6 are pressed in upon and clamped securely to the stem 10. The wing-plates are preferably made up in sections of limited length, such that a plurality of the sections are required to equal the entire length of the stem, and the wings are disposed in alternating or staggered relation to each other in the adjoining sections, or so that the wings of any section are at circumferential positions intermediate the wings of the adjoining sections.

In the modified structure shown in Figs. 4 and 5, the curved plates 60 have radially extending wings 70 which are secured together by means of rivets 90 or the like, and the plates thus held upon the stem. At the outer edges of the wings 70 angle-bars 80 are secured thereto by means of rivets 81, the outer flanges of the angle-bars being slightly curved so as to extend concentrically with the stem, similarly to the flanges 8 in the form first described.

Aside from the added wing-sections above described, the auger stem may be of the usual form used for deep-well drilling, being provided at the upper end with a threaded pin 11 and an adjacent wrench-square 12, and at the lower end having the usual internally threaded box 13 and wrench-square 14.

In the use of the winged stem for ordinary drilling operations, a suitable drill or bit 15 is connected with the lower end of the stem, and to the upper end thereof is connected the usual accessory tools, such as the jars 16, shown in Fig. 1. At the upper end of the string of tools a rope-socket 17 is provided, from which the drill-rope 18 extends up to the usual operating mechanism. It will be seen that, as the stem and bit are rigidly connected with each other, and the flanged outer portions of the wings on the stem have a bearing on the sides of the hole for a great distance above the bit, the stem will serve as a guide for the bit and will prevent lateral deflection thereof when ir-

regular, broken or slanting formations are encountered. Thus the hole, having once been started on a true vertical axis, will continue to be produced along a vertical line, and the bit cannot be turned aside by any irregularities of the strata or formations through which the hole is made. Obviously the production of a straight hole greatly facilitates the subsequent operation of sinking the casing or tubing within the well. The winged stem may be used advantageously in connection with an under-reamer, when placing the pipe or casing within the hole, the reamer being operated below the lower end of the pipe in such proximity thereto that a large portion of the stem will be within the pipe and guided thereby.

The outside diameter of the winged stem should, of course, be substantially the same as that of the hole which is produced, or, when used with an under-reamer, the stem should be of such diameter as to fit slidably within the pipe.

Besides guiding the bit and preventing lateral deflection thereof at the bottom of the hole, the winged stem provided by my invention serves to churn and agitate the debris in the hole, keeping the same in a fluid condition and preventing the formation of "mud-rings".

The wing-forming plates attached to the auger-stem may have a slight twist or incline, so as to extend helically about the axis of the stem, like the wings of the integral stem shown in United States Letters

Patent No. 1,188,982, issued to me June 27, 1916, and when so formed, the effect thereof will be to produce the rotary or whirling movement of the tools described in said patent, as well as the other effects herein noted. The principal advantage of the present structure over that shown in my above mentioned patent, lies in the facility and economy with which ordinary auger-stems may be converted into winged stems for use in any size of hole, by attaching to said ordinary stems the plates for forming the wings. It will be noted, further, that the wings provided by the structure herein disclosed, and having the flanges 8 or 80 at the outer edges thereof, form a more extended bearing surface, for engagement with the sides of the hole, than can be produced with wings formed integrally with the stem, unless the latter be made of excessive weight.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

In a deep-well auger-stem having a long body-portion, and terminal portions adapted for rigid connection with a bit and other tools of a string, wing-forming members disposed upon the body of the stem in sections, each section of said members having a plurality of parts extending out radially of the stem-body and continued longitudinally thereof, and the radially extending parts being circumferentially interspaced in adjoining sections.

L. E. NEBERGALL.