May 7, 1929. E. KOPPL 1,711,797

METHOD OF SAMPLING EARTH FORMATIONS

Filed Oct. 3, 1927

Fig. 1

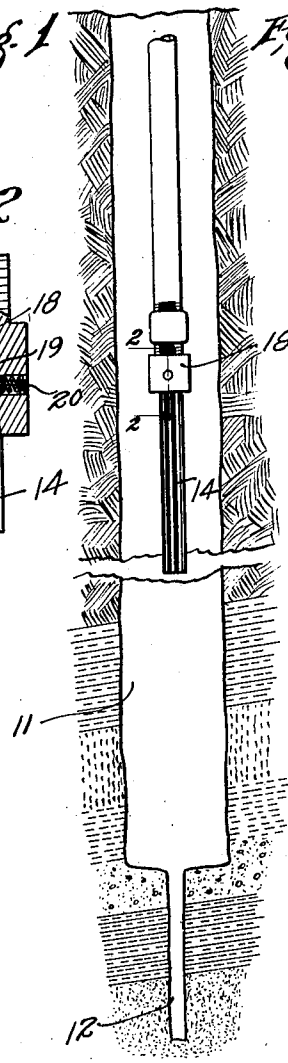


Fig. 2

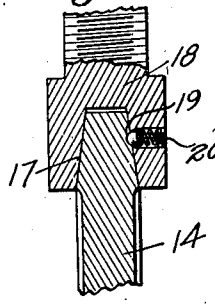


Fig. 3

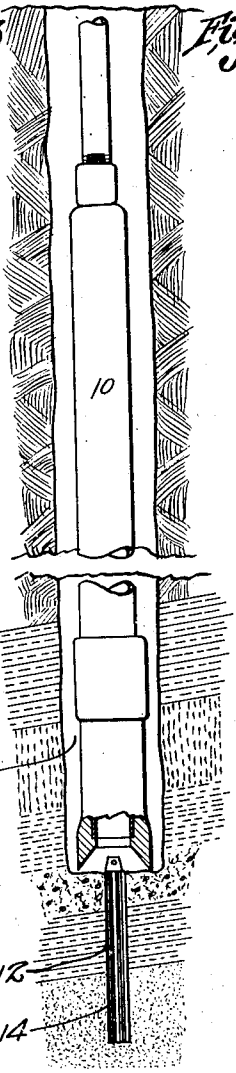


Fig. 4

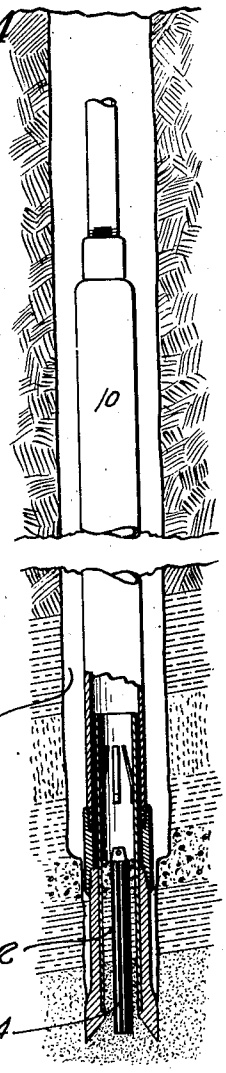


Fig. 5

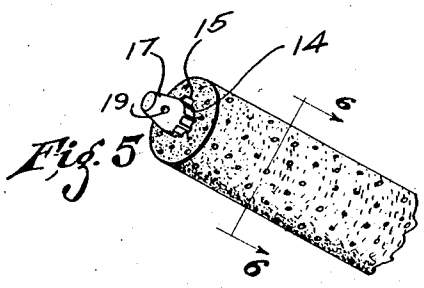
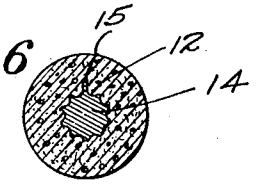


Fig. 6



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METHOD OF SAMPLING EARTH FORMATIONS.

Application filed October 3, 1927. Serial No. 223,644.

This invention relates to a method of sampling earth formations whereby a log of the strata is obtainable in three directions. It is the present practice to bore in the earth, cut and remove a sample therefrom in the form of a plug of sufficient length so that the strata samples are extracted and retained in their proper relative vertical positions. A specific application of such sampling operations is in the drilling of oil wells, and, as illustrative of the invention, its embodiment in such an operation will be described. It is current practice to cut and capture samples of the earth formations at the bottom of the well holes as the drilling of the holes is advanced. To this end, a core bit is employed. The latter is rotated to cut a core, which core is captured by an associated core barrel and removed for inspection and examination. These cores during their cutting and removal may be unintentionally turned so that their original position with respect to the cardinal points of the compass is not indicated. For obvious reasons, it is desirable to know the position of a core with respect to these points so that the direction of slope or inclination of the strata may be determined.

The present invention has for its primary object the provision of a method whereby samples of earth formations, about to be taken are marked with a direction indication transverse to the length of the sample. It is another object of this invention to insert a direction marker in the formation about to be captured. A further object of this invention is to insert a marker in the formation which reenforces the sample.

In the drawing forming a part of this specification, certain instrumentalities are illustrated for carrying out the steps of the method. It will of course be understood that these instrumentalities are shown for illustrative purposes only, and to better disclose the invention the instrumentalities shown are of the simplest form.

Fig. 1 is a vertical section through a well hole, intermediate portions being broken away, showing a pilot or rat hole at the bottom and a string of drill pipe with a marker in elevation and in position about to be inserted in the formation; Fig. 2 is a vertical section on an enlarged scale showing a fragment of the marker and the head for attaching it to the string; Fig. 3 is a vertical section through the well hole showing the marker in position and a core bit and barrel about to cut a sample, the lower end of the core barrel being shown in section; Fig. 4 is a view similar to Fig. 3 showing the position of the core bit after cutting has begun; Fig. 5 is a perspective view of a sample or core with the marker therein; and Fig. 6 is a section as seen upon the line 6—6 of Fig. 5.

Referring with more particularity to the drawing, a well hole is shown and at the bottom thereof strata inclined with respect to the horizontal, of different thicknesses and of different characteristics. During the progress of drilling cores are taken to provide samples of the formation. Any suitable coring tool may be employed, and in Figs. 3 and 4 such a tool is indicated by 10. The coring tool is rotated and according to current practice there is no means of marking the core to indicate cardinal directions. In the present instance, the well hole indicated by 11 has a pilot hole, commonly termed a rat hole, extending beyond the bottom of the well hole. This rat hole provides an opening to receive a marker for the sample about to be taken. The marker may comprise a rod 14 of substantially the same diameter as the rat hole. However, in order to obtain a firm grip upon the sides of the rat hole so as to prevent the rod from turning it is preferably corrugated as best shown in Figs. 5 and 6. In order to indicate direction, a rib 15 projects a greater distance than the other ribs. The marker is preferably a metallic rod, and is lowered into the rat hole and forced thereinto so that it is tightly gripped. In order to be sure of the direction in which the rib 15 points, the relation of the marker to the string of drill pipe 16 should be known. The upper end 17 of the marker may be tapered and smooth to provide a slip-on joint for a head 18. The head is secured to the end of the single pipe. A recess 19 is provided in the tapered end and a spring detent 20 in the head cooperates with the recess. The construction is such that the marker may be slipped into position in the head so that it is properly located and yieldably held. The string is then lowered and the marker forced into the rat hole, the direction indication of the marker being noted from the drill pipe markings such as a line scribed thereon. An upward pull upon the string will release the marker and leave it in position as shown in Figs. 3 and 4. The position of the pointing rib 15 will have been noted.

Cutting and capturing of the core or sam-

ple may then be performed by any one of the well known core bits and barrels indicated by 10. It will be noted from an inspection of Fig. 4 that a core will be obtained with the marker disposed substantially at the center thereof. The marker being a rod, will aid in reinforcing the core. Some of the strata are of soft formation and readily crumble. However, with my improved marker, in position the core is reinforced. The core after being divided or cut from the formation is separated and elevated. Fig. 5 shows a core and it will be noted that the pointer rib 15 indicates a horizontal direction so that the direction of slope or inclination of the strata may be determined therefrom.

It will be obvious that various other instrumentalities may be employed for marking the direction. Furthermore the means of dividing the sample from the formation and of capturing the same may be varied without departing from the scope of the invention. The rat hole 12 may be formed with an indication requiring no independent marker. For illustration the rat hole may be elongated transversely in one direction.

What I claim is:

1. The method of sampling earth formations at the bottom of a well hole comprising orientating and attaching to the bottom of the hole a direction marker, and taking a core including said direction marker.

2. The method of sampling earth formations at the bottom of a well hole comprising orientating and embedding in the bottom of the hole a direction marker rod, and taking a core including said direction marker rod.

3. The method of sampling earth formations at the bottom of a well hole comprising producing a rat hole at the bottom, orientating and inserting a direction marker in said rat hole, and taking a core including said direction marker.

4. The method of sampling earth formations at the bottom of a well hole comprising producing a rat hole at the bottom of said well hole, orientating and inserting a direction marker rod in said hole, and taking from the formation a core including said rod.

5. The method of sampling earth formations which comprises making a hole through the formation to be sampled, orientating and fixing in said hole a marker to indicate the cardinal points of the compass, and cutting a sample from the formation having the marker fixed therein.

6. The method of sampling earth formations which comprises making a hole through the formation to be sampled, fixing a marker rod to a lowering string, orientating said string and rod to indicate the cardinal points of the compass, fixing said marker rod in said hole and taking a core from the formation including said marker rod fixed in said hole.

7. The method of sampling earth formations which comprises making a hole through the formation to be sampled, fixing a marker rod to a lowering string, orientating said string and rod, embedding said marker rod in said hole, releasing said rod from said string while the rod is embedded in said hole, and taking a core from the formation including said rod.

In witness that I claim the foregoing I have hereunto subscribed my name this 21st day of September, 1927.

ERNEST KOPPL.