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METHOD OF INVESTIGATING THE NATURE OF SUBTERRANEAN STRATA

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Fig. 1.

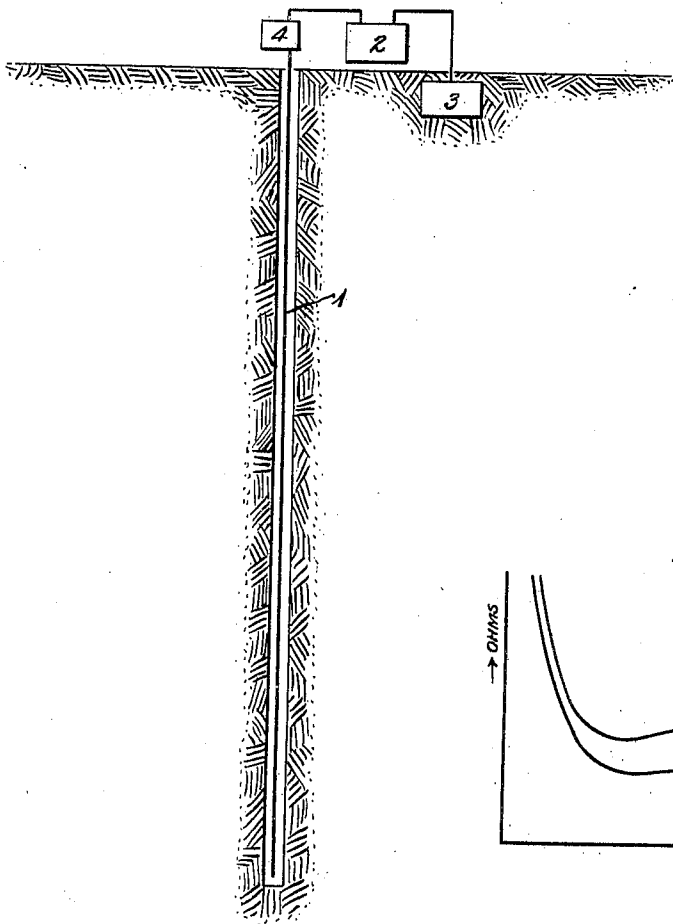
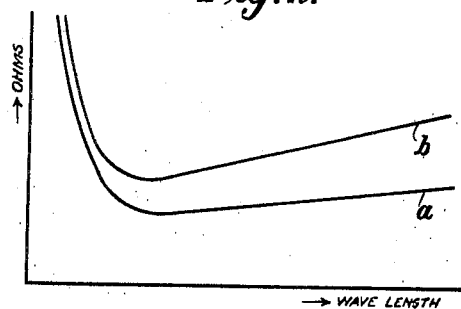


Fig. 2.



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METHOD OF INVESTIGATING THE NATURE OF SUBTERRANEAN STRATA.

Application filed December 7, 1926. Serial No. 153,195.

My invention relates to the art of investigating the nature of subterranean strata by electrical means and without direct exploration.

The object of my invention is to improve the procedure, particularly in cases where one or more drill holes, or other means of gaining access to an underground location are available.

It is a common experience in the art of exploring subterranean strata by drilling, to miss valuable deposits of ore, oil, etc. by a few feet or even inches, without finding the slightest trace to indicate the proximity of such deposits. My invention makes use of abortive drill holes of this kind in exploring the region around the holes; but any natural or artificial passage leading from the surface to a point beneath ground, or connecting two points beneath the surface, may be employed.

My invention consists in inserting an antenna wire in a drill hole or the like, setting up high frequency oscillations in the antenna, varying the frequency of the oscillations, and observing and comparing the resistance characteristic of the antenna for each frequency used. The ground surrounding the hole constitutes the dielectric of the antenna system and the value of the dielectric varies according to the conductivity of the materials of which the ground is composed. Thus, the presence of a body of ore or other material having a higher or different conductivity than the clay, sand, rock or other common strata prevailing in a given region, will be indicated by changes in the resistance characteristic of the antenna system.

I am aware of United States patent to Lowy, No. 1,092,065, which describes a method of exploring strata by setting up an oscillating antenna underground and ascertaining the natural wave-length, capacity and damping factor of the antenna. My improvement over this patented method consists in imposing a range of forced oscillations upon the antenna and charting and comparing the variations of the resistance

characteristic corresponding to the changes of frequency. By this means the indications of ore-bodies or the like are rendered more accurate and, hence, more illuminative, as regards location, character and extent of the deposits. The additional factor of calculation introduced by the employment of a range of different frequencies depends upon the fact that the resistance characteristic varies with the frequency and that this variation in turn is modified by departures from uniformity in the surrounding strata.

In carrying out the invention it is desirable to establish a standard of comparison by ascertaining the variations of resistance over a given range of frequencies applied to an antenna which is inserted in ground of known composition. With the readings thus obtained the results of similar operations in neighboring holes may be combined and compared. Those skilled in the art will be enabled to ascertain from data of this kind the existence of valuable deposits and approximately the location thereof.

In the accompanying drawings, Fig. 1 is a diagrammatic illustration of an antenna system applied to a drill hole in carrying out my invention; and Fig. 2 is a chart showing two curves representing resistance characteristics of an antenna.

In Fig. 1, an antenna 1 is inserted in a drill hole as shown and the upper end of the antenna is connected to ground, preferably through a counterpoise 3. In the antenna circuit are a dynamo 2 or other source of high frequency oscillations and a measuring instrument 4 for indicating the resistance of the antenna system. The manner in which this arrangement is utilized has been sufficiently set forth above.

In Fig. 2, the curves *a*, *b* show the values in ohms of the resistance characteristic of an antenna through the indicated range of wave-lengths or frequencies. Curve *a* was obtained in a very dry and uniform limestone region; curve *b* was obtained from the same antenna in a neighboring drill hole which was near an ore-body. The difference in the

curves is manifest and, to those practiced in the art, is significant of the proximity of the ore-body.

I claim:

- 5 The method of investigating subterranean strata which consists in setting up an antenna in a drill hole or the like, causing high frequency oscillations in said antenna, varying the frequency of the oscillations, and as-

certaining the resistance characteristic of the antenna for each frequency employed, as a basis for deducing the nature of the strata surrounding the hole. 10

The foregoing specification signed at New York city, New York, this 21st day of August, 1925. 15

THEODOR ZUSCHLAG.