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GEOPHYSICAL ABSTRACTS 111

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COMPILED BY

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GEOPHYSICAL ABSTRACTS 111, OCTOBER–DECEMBER 1942

Compiled by W. AYVAZOGLOU

1. GRAVITATIONAL METHODS

6697. Clewell, D. H., Problems in temperature control of gravimeters: Geophysics, vol. 7, No. 2, pp. 155–168, Menasha, Wis., 1942.

The theoretical considerations entering into the design of thermostatically controlled ovens for gravimeters are presented. The author points out that, to obtain the most uniform temperature distribution without the use of excessive amounts of material, plural thermostat control points on the heater element are desirable. To reduce long-time fluctuations, it is recommended that dual thermostating be employed in which an inner controlled shell is surrounded by an outer thermostated layer held at an approximately constant temperature several degrees lower than the temperature of the inner shell.—*Author's abstract.*

6698. Filmer, E. A., Spiral springs in gravity measurement—secondary twist of spiral springs in measurement of variations in value of acceleration of gravity: Pan-Am. Geologist, vol. 76, No. 1, pp. 27–28, Des Moines, Iowa, 1941.

Experiments by the author lead him to conclude that an advantage is gained in using the twist effect of a spiral spring in gravity measurements rather than the extension effect in such a spring because, by the twist effect, very minute angular displacements may be measured accurately by means of an optical lever. The arrangement is briefly described. Such factors as cross section of the wire (circular or rectangular), size of ribbon, thickness, number of turns, and nature of material are to be investigated more closely. The advantages of such an instrument would be its weight, portability, speed in taking readings, and low cost.—*W. A.*

6699. Lawson, A. C., Mississippi delta—a study in isostasy: Geol. Soc. America Bull., vol. 53, No. 8, pp. 1231–1254, Washington, D. C., 1942.

The work of Barton, Russell, and the Geological Survey of Louisiana has shown that the Mississippi delta is over 30,000 feet thick and that it has subsided *pari passu* with the deposit of sediment. They have considered isostasy as an explanation of this subsidence, and Barton has rejected the explanation. Russell and others have not satisfied themselves that this subsidence and the great thickness of the delta are due to the maintenance of an isostatic balance which was disturbed by sedimentary loading. The reason for the failure to establish the operation of the principle of isostasy is due to the fact that the load of water displaced by the delta has been ignored as a primary factor in the problem. No cognizance has been taken of the depth of the sea into which the delta was built. In the present paper it is shown that a delta like that of the Mississippi built out into deep water will subside under sedimentary load and will maintain isostatic balance through-

out its growth, up to a limit of thickness which is determined by the initial depth of water. Russell's view that the alteration of degradation and aggradation of the surface of the delta is due to the fall and rise of sea level caused by glaciation and deglaciation in Pleistocence time is accepted as proved.—*Author's abstract.*

6700. Siegert, A. J. F., A mechanical integrator for the computation of gravity anomalies: Geophysics, vol. 7, No. 4, pp. 353–366, Menasha, Wis., 1942.

With the instrument here described the gravity anomaly caused by an arbitrarily given finite body can be computed. The integrator is operated by tracing the contour lines representing the body in a manner similar to the operation of a planimeter. The instrument is useful mainly in the indirect method of interpretation of observed gravity anomalies, in the computation of terrain corrections, and in the evaluation of magnetic anomalies. Its design is based on a formula which expresses the gravity anomaly caused by an infinitely thin slab, bounded by a closed curve, as a line integral over this curve.—*Author's abstract.*

6701. Skeels, D. C., The value of quantitative interpretation of gravity data: Geophysics, vol. 7, No. 4, pp. 345–353, Menasha, Wis., 1942.

Although there is no unique interpretation of a given set of gravity data, there are many cases in which quantitative interpretation is decidedly worth while. This is especially true in cases where the gravity data are supplemented by a certain amount of geological data or where the gravity anomaly is of such a shape that the range of possible solutions can be rather closely limited. Three examples are given of interpretations of actual data.—*Author's abstract.*

2. MAGNETIC METHODS

6702. Observatorio Nacional de Tacubaya, Mexico: Universidad Nacional, Seccion Magnética, 1942.

Three isomagnetic maps on a scale of 1 : 5,000,000 show magnetic declination, inclination, and horizontal intensity, together with their changes calculated for the year 1942, and the lines of equal annual change (isopors).—*W. A.*

3. SEISMIC METHODS

6703. Byerly, Perry, Microseisms at Berkeley and surf on nearby coasts: Seismol. Soc. America Bull., vol. 32, No. 4, pp. 277–282, Berkeley, Calif., 1942.

The amplitudes of microseisms recorded at Berkeley correlate over 6-month and yearly periods with surf strength on nearby beaches quite as well as the observations of surf strength at adjacent stations correlate with each other, all the correlation ratios being between 0.53 and 0.58. During a winter month the correlation between microseisms and surf rose to 0.81. A consideration of energies leads to the conclusion that the energy of average large microseisms at Berkeley can be explained as due to surf on nearby beaches if about 10^{-7} of the potential energy of probable-sized deep-water waves is eventually transformed into elastic Rayleigh waves at the nearby beaches.

Not all microseisms at Berkeley are caused by nearby surf, but many may very well be. It is possible to pick periods when one is large and the other is not, and vice versa. It is also possible to find times when very

heavy seas and very large microseisms begin together in a most conspicuous fashion.—*Author's summary and conclusions.*

6704. Dobrin, M. B., An analytical method of making weathering corrections: Geophysics, vol. 7, No. 4, pp. 393–399, Menasha, Wis., 1942.

A method of weathering is described by which intercept times can be rapidly and accurately computed from first arrival times without the plotting of time-distance curves. The velocities are determined by a mechanical procedure, based on least-squares theory, which normally requires no exercise of judgment on the part of the computer. The application of the method to actual field set-ups is illustrated by sample calculations.—*Author's abstract.*

6705. Earthquakes in New Zealand: Dominion Observatory, Bull. S. 63, 4 pp., Wellington, 1942.

The first part of this article, prepared by J. Henderson, Director of the Geological Survey of New Zealand, deals with geologic considerations concerning earthquakes and volcanic activity in New Zealand.

The second part, written by R. C. Hayes, Acting Director of the Dominion Observatory, contains information on seismicity and distribution of earthquakes, deaths due to earthquakes, and investigations of earthquakes in New Zealand.—*W. A.*

6706. Eby, J. B., and Harkins, T. I., Geophysical history of Darrow dome, Ascension Parish, La.: Am. Inst. Min. Met. Eng. Tech. Pub. 1495, 8 pp., New York, 1942.

This paper outlines the geophysical investigation of the area covering the Darrow salt dome, Louisiana. Surveys with the refraction seismograph and torsion balance failed to disclose the dome, but reflection-dip shooting was successful and was confirmed by later drilling.—*Authors' abstract.*

6707. Faust, L. Y., Geophysics in the Mid-Continent: Geophysics, vol. 7, No. 3, pp. 272–274, Menasha, Wis., 1942.

The Mid-Continent has been the scene of the most effective use of geophysical methods, particularly of the reflection seismograph. By using Lahee's "Wildcat drilling in 1940" and his report for 1941 (Am. Assoc. Petroleum Geologists Bull., vol. 25, No. 6, pp. 997–1003, June 1941, and vol. 26, No. 6, pp. 969–982, June 1942), in which Lahee tabulated for each State the number of discoveries and dry holes credited to each method of exploration, Faust combines the figures for geology and geophysics, and thus he obtains the truest comparison among the States. His figures, averaged for 1940 and 1941, follow:

State:	*Ratio of dry holes to producers*
Oklahoma	2.4
Arkansas	3.3
Kansas	3.6
Louisiana	3.9
Illinois	4.4
Texas	5.2
California	7.0

Faust concludes that the territory offering probabilities for widespread geophysical activity in the Mid-Continent lies in Nebraska and the Dakotas. There are large regions where reflections of good quality can be obtained and where major oil fields probably exist.—*W. A.*

6708. Freeman, L. I., Geophysics in Canada: Geophysics, vol. 7, No. 3, pp. 274–275, Menasha, Wis., 1942.

This is an abstract of the paper presented at a joint session of the American Association of Petroleum Geologists and the Society of Exploration Geophysicists at the annual meeting, Denver, Colo., April 22, 1942.

An outline of the abstract follows: Geophysical methods, chiefly the reflection seismograph but also some gravity-meter work, are being used from the "foothills" area in western Alberta through the plains of Alberta and Saskatchewan and as far east as Prince Edward Island. Most of the work is in the "plains" area of Alberta and western Saskatchewan. The foothills area, including Turner Valley and other localities close to the mountains, is more difficult to shoot. Because of prolific production of oil and gas in Turner Valley, exploration doubtless will continue in the foothills area, although the cost per acre is high. In the large area of possible "plains" structures many field crews probably will be active during 1942. During 1941, at least six major operating companies from the United States had nine seismograph crews and three gravity-meter crews in Alberta and Saskatchewan. One seismograph crew worked in Prince Edward Island.—*W. A.*

6709. Gillin, J. A., Shock, Lorenz, and Alcock, E. D., An application of seismic surveying to the location of bauxite in Arkansas: Geophysics, vol. 7, No. 4, pp. 400–405, Menasha, Wis., 1942.

The exploration for bauxite has been greatly stimulated by the increased demand for aluminum. The geology of the formation of bauxite in Arkansas is closely related to the syenite exposures of the old land surface at the end of Midway time. A refraction seismic survey mapped the attitude of the high-velocity formations identified as syenite or Paleozoic rocks. By combining this map with a map of the Midway from scattered boreholes, a map of the old land surface at the end of Midway time was obtained. By interpreting this map, future explorations by core drills can be guided to the most favorable locations.—*Authors' abstract.*

6710. Gutenberg, Beno, and Richter, C. F., Earthquake magnitude, intensity, energy, and acceleration: Seismol. Soc. America Bull., vol. 32, No. 3, pp. 163–191, Berkeley, Calif., 1942.

In this paper the writers develop and investigate (1) the relation of the magnitude to the energy released in an earthquake, and (2) the relation of intensity on the Modified Mercalli Scale of 1931 to instrumentally determined acceleration. They also investigate the connection of both magnitude and intensity with other physical elements of an earthquake, largely with the help of an empirical equation connecting magnitude with acceleration at the epicenter. They discuss the effect of focal depth on all the quantities.—*W. A.*

6711. Hodgson, E. A., Velocity of elastic waves and structure of the crust in the vicinity of Ottawa, Canada: Seismol. Soc. America Bull., vol. 32, No. 4, pp. 249–256, Berkeley, Calif., 1942.

Ten seismograms of rock bursts at Lake Shore mines, Kirkland Lake, Ontario, were recorded on a Benioff seismograph at Ottawa, 279 miles away. Though the bursts were within a few feet of one another, for the purpose of preparing traveltime tables they are considered to have occurred at a single point at the surface. Six phases were registered

on each seismogram. Five of these are well defined on nearly all the records. It is thus possible to deduce a set of arrival times at a distance of 279 miles for a burst occurring at the surface. As all the readings may be combined, this set of times is known with fair precision. The distance is determined within 1 part in 7,000, the depth within 2,000 feet, and the traveltimes within an error of ±5 seconds.

The records obtained will afford a means of deducing the earth structure and velocities in the vicinity of Ottawa and will permit the construction of tables for rock bursts and blasts in that area up to 10° (690 miles). These tables will be prepared and issued with corrections so that they may be used for local earthquakes with finite focal depth.—*Author's summary, condensed by W. A.*

6712. Jeffreys, Harold, The times of *sP* and *sPKP:* Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 5, No. 2, pp. 31–32, London, 1942.

By an oversight these two phases were omitted from the calculation of traveltimes by Bullen and myself. (See Geophys. Abstracts 99 and 101, Nos. 5199, 5200, 5201, 5493, and 5494.) The calculation presents no special complications. In the present tables, I give first the interval between *P* and *sP*, and then the depth allowance, which is the difference between the times of *sP* for the actual depth and for a surface focus; the latter is the same as that of *P* for a surface focus. It varies much less with distance for a given focal depth and is therefore easier to interpolate. Since the effect of depth on *PKP* has already been given in the form of depth allowances, I give that on *sPKP* also in this form alone. The interval *sPKP–PKP* will then be obtained by adding the allowances without regard to sign. The column for 15 km. refers to a focus at the base of the upper layer, for $h/R=0.00$ to one at the base of the intermediate layer as usual.—*Author's abstract.*

6713. Jeffreys, Harold, The deep earthquake of 1934, June 29: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 5, No. 2, pp. 33–36, London, 1942.

The data for this earthquake given in the I. S. S. do not support the depth of $0.011R$ that has been attributed to it. The *pP–P* and *sS–s* in intervals are too inconsistent to give a good determination of depth in this case, though they have usually been found valuable in others. A solution from *P*, *S*, and *SKS* together indicates that the focal depth was $0.0969R \pm 0.0007R$ and that the epicenter was about 0.8° south of the position given by Berlage and reproduced in the I. S. S. There were numerous observations of *PKP* on the receiving branch (*PKIKP*), which provide a check on the earthquake used to provide empirical times for this branch. It is suggested that the present times need an increase of about a second.—*Author's abstract.*

6714. Leypoldt, Harry, and McHenry, J. R., Block pattern of crustal movements in Long Beach: Seismol. Soc. America Bull., vol. 32, No. 4, pp. 269–276, Berkeley, Calif., 1942.

Earth movements in the Los Angeles-Long Beach Harbor area have been noted since 1923. The periodical rise and fall of the crust in the vicinity of tide gages has been continuously recorded for Los Angeles Harbor on standard gages of the United States Coast and Geodetic Survey since 1926. This paper discloses that the movements in Long Beach occur in blocks that tilt independently of one another.—*W. A.*

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6715. Salvatori, Henry, Geophysics on the Pacific coast: Geophysics, vol. 7, No. 3, pp. 268–270, Menasha, Wis., 1942.

An average of only 40 million barrels of oil a year have been discovered in California during the past 3 years. To meet the demand for oil in this strategically important State during the war, it is estimated that about 300 million barrels of new oil a year must be discovered. Salvatori examines the steps and direction of the near-future exploratory efforts to increase the discovery of new oil reserves and concludes that, as there are now no methods of exploration in sight that may be more effective than the reflection-seismograph method, to which the geophysical work in California has been largely confined, the geophysicists must do more with the methods already known.—*W. A.*

6716. Swan, B. G., Local areal distribution of velocities in the Texas Gulf coast: Geophysics, vol. 7, No. 4, pp. 367–392, Menasha, Wis., 1942.

This paper presents velocity data, obtained from long reversed-profile surface shooting on three Texas Gulf coast projects. Velocity determinations were distributed areally in sufficient detail to permit construction of "Isotime" contour maps representing velocities to a time datum. Maps are presented showing the resulting corrected seismic structure. Also presented are time-depth curves of two profiles with curves of nearby well-velocity surveys. Two comparisons are made of velocities at common points determined by the long velocity profiles and by time Δt analysis of shorter spreads.

Data presented show that velocities determined in the manner described are quite variable over local areas but can be contoured into fairly regular patterns and that if applied to the ordinary seismic data profound changes in structural interpretation are effected; that major discontinuities in velocity stratification may be detected; that in the two examples described, velocities obtained from 5,400-foot reversed reflection profiles are higher than those obtained by time Δt analysis of 1,800-foot reversed profiles; and that velocity anomalies determined from surface profile shooting may be associated with faulting in the subsurface beds.—*Author's abstract.*

6717. Ulrich, F. P., Progress report of seismological work by the United States Coast and Geodetic Survey in the western United States during 1941: Seismol. Soc. America Bull., vol. 32, No. 4, pp. 283–296, Berkeley, Calif., 1942.

During 1941 the Coast and Geodetic Survey continued its regular seismological program in the Western States (see Geophys. Abstracts 108, No. 6409). This program consists in operating a network of sensitive seismograph stations, operating a large number of strong-motion seismograph stations, gathering and preparing for publication all available information on felt earthquakes, and a limited amount of instrumental development and vibration work.

This report, containing the results of the work done during 1941, is summarized under the following headings: (1) Questionnaire program; (2) important earthquakes of 1941; (3) seismic field investigations; (4) sensitive seismograph work; (5) strong-motion work; (6) tiltmeter work; (7) vibration work; and (8) instrumental work.

The Washington Office issued the annual report, United States Earthquakes, 1939, and a revision of Serial 609, Earthquake history of the United States, Part 2, California and western Nevada. A special report,

Analysis of the El Centro accelerograph record of the Imperial Valley earthquake of May 8, 1940, was also issued.—*W. A.*

6718. Wadsworth, J., The Wiechert vertical seismograph—an improved design: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 5, No. 2, pp. 48–53, London, 1942.

After describing the seismograph in its original form, the author discusses the improvements and modifications of the instrument and tabulates the constants of the vertical seismograph at Apia at various stages of its history.—*W. A.*

6719. Wilson, J. T., Surface waves in a heterogeneous medium: Seismol. Soc. America Bull., vol. 32, No. 4, pp. 297–304, Berkeley, Calif., 1942.

Although several studies have been made of the propagation of surface waves in mediums in which elastic constants are a function of depth, most of the solutions to the problems are either complex or only approximate. It is still laborious to calculate the dispersion curves. The author discusses mathematically ways in which to obtain solutions for the propagation of Love and Raleigh waves in a medium in which the elastic properties are exponential functions of the depth.—*W. A.*

6720. Wood, H. O., Earthquakes and disturbances to leveling in the Imperial Valley, 1930–31: Seismol. Soc. America Bull., vol. 32, No. 4, pp. 257–268, Berkeley, Calif., 1942.

Comparison in 1931 of the findings of field investigations in 1930 of the earthquakes of February 25 and March 1 of that year in the Imperial Valley, Calif., with disturbances to leveling found in the 1931 retracement of precise leveling surveyed in 1926–27 and 1928 by the United States Coast and Geodetic Survey led to the conclusion that there was no discernible correlation except in one instance, and that doubtful. Occurrence of the 1940 earthquake, with the disclosure of a surface-fault offset, necessitates review and reconsideration. The revised conclusion is that two of the disturbances to leveling found in 1931 may probably be correlated with activity on this fault zone, but that the disturbances are quite as likely due to secondary effects caused by shaking as to primary surface warping or tilting and probably more so.

The necessity of frequently repeated precise surveys is emphasized.—*Author's abstract.*

4. ELECTRICAL METHODS

6721. Fritsch, Volker, Der Einfluss des Wassergehaltes geologischer Leiter auf deren elektrische Eigenschaften [Influence of the water content of geologic conductors upon their electrical properties]: Schweizer. min. pet. Mitt., vol. 19, No. 1, 1939, pp. 224–250.

1. Saturation exerts a definite influence on the electrical properties of geologic conductors.

2. Small traces of moisture in geologic conductors can be determined electrically with more accuracy than by weighing.

3. The change of the electrical properties in connection with saturation is often characteristic of a given geologic conductor.

4. Methods developed for determining the electrical properties of a geologic conductor as a function of saturation are described.—*Author's abstract, translated by W. A.*

6722. Fritsch, Volker, Geoelectric constitution of the subsoil and lightning protection: Naturwissenschaften, vol. 29, pp. 397–403, Berlin, July 4, 1941.

The importance of the geoelectric features of the subsoil in relation to the likelihood of lightning strokes in a specified area is stressed. The determination of the probability of danger and the protective range of lightning conductors is discussed with the aid of diagrams. The establishment of test fields in open country is recommended; a field at Abroth is briefly described.—*H. G. S., Sci. Abstracts, vol. 45, No. 535, 1942.*

6723. Way, H. J. R., An analysis of the results of prospecting for water in Uganda by the resistivity method: Inst. Min. Metallurgy Bull. 455, pp. 1–26, London, 1942.

It has been shown how most of the sites selected geophysically and drilled in the underground water-supply development in Uganda have been over acid igneous and metamorphic rocks with the peculiar local development of a pseudostratification at the surface of laterite, decomposed rock, and solid rock. It has therefore been possible to assemble and correlate geologic and resistivity data for an analysis. Types of resistivity curves have been classified into five groups, and the significance of each type of curve has been interpreted.

The overlapping of values from the adequate and inadequate sites has been described, and the extent of the overlapping may be taken as an indication of the reliability of the various criteria.

The conclusion is drawn that, although it is impossible to guarantee an adequate water supply at any particular site chosen by the methods and under the described geologic conditions, the chances of success are of the order of 80 percent.—*Author's summary, condensed by W. A.*

6724. Wolf, Alfred, The impedance of a grounded wire: Geophysics, vol. 7, No. 4, pp. 414–418, Menasha, Wis., 1942.

The impedance of an insulated wire stretched along the surface of the earth, regarded as a homogeneous conductor, is a function of frequency and of the conductivity of the earth. Formulas are given for the inductance and the resistance of such a wire which are applicable under conditions met with in geophysical prospecting.—*Author's abstract.*

6725. Zinzer, R. H., The use of electrode spacing in well logging [abstract]: Oil and Gas Jour., vol. 41, No. 24, p. 48, Tulsa, Okla., 1942.

An effort has been made to establish an empirical correlation between formation resistivity for a series of electric-log curves and water saturation and oil productivity of sand. Electric logs were obtained by recording with 10 different electrode spacings through the same intervals of a well. In the analysis of these curves all factors except two, a dependent and independent variable, were held constant. The interval studied had been cored, and a large number of samples were analyzed in the core laboratory in order to compare the values of permeability and saturation with the measured values of formation resistivity. Results of this analysis indicate, first, the depth to which mud filtrate enters a sand body; second, a correlation between permeability and sand resistivity for shallow penetration depths; and third, that the water saturation for an oil sand can be determined from the measured sand resistivity after making suitable corrections for sand thickness. The procedure in the last method depends on a thickness-factor correction and a theoretical

curve. The accuracy of the theoretical curve is now being tested in the laboratory.

5. RADIOACTIVE METHODS

6726. Bullard, E. C., Radioactive heat generation in rocks: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 5, No. 2, pp. 41–47, London, 1942.

The heat generation of Ra, Th, and K is considered. It is concluded that the best values are:

7.0×10^{-2} cal./sec. gm. Ra (0.72 cal./gm. U yr., 2.20×10^{6} cal./gm. Ra yr.)

6.3×10^{-9} cal./sec. gm. Th (0.200 cal./gm. Th yr.)

2.5×10^{-13} cal./sec. gm. K (8×10^{-6} cal./gm. K yr.)

The results for Ra and Th should be correct within 2 or 3 percent, but that for K might be in error by 50 percent. The value for potassium is considerably less than those previously accepted, and only 5 to 10 percent of the heat generated by radioactivity in a rock is produced by potassium. It seems unlikely therefore that the radioactivity of potassium has any important geological consequences.—*Author's abstract.*

6727. Conclin, G. M., Gamma-ray well logging in Trinidad: Inst. Petroleum jour., vol. 28, No. 223, pp. 141–145, London, 1942.

The author briefly describes the phenomenon of radioactivity methods of measurement by gamma-ray well logging and the possible uses of the gamma-ray log. With regard to this kind of well logging in Trinidad, he makes the following conclusions: "Since, in many cases, oil and water are not radioactive to the extent necessary to influence the logging instrument, the gamma-ray unit does not differentiate between oil- and water-sands. In Trinidad, however, it is evident in many cases that the oil-sands show more deflection on the log than do the water-sands. This can be due to at least two causes: First, there may be less porosity of, or more clay in, the oil-sand; second, the oil may be radioactive because of the presence of radon. It is known that radon is absorbed much more readily by oil than by water; hence, if the oil were radioactive and the porosity of the oil and water horizons the same, then the oil-sand would show more deflection than the water-sand. Since a complete knowledge of porosity would be needed to prove or disprove this premise, it is practically impossible at this time to make any positive statement."

Illustrations for this paper are published in vol. 28, No. 224, pp. 172–175 of the journal.—*W. A.*

6728. Keevil, N. B., Jolliffe, A. W., and Larson, E. S., The distribution of helium and radioactivity in rocks—helium-age investigations of diabase and granodiorites from Yellowknife, Northwest Territory, Canada: Am. Jour. Sci., vol. 240, No. 12, pp. 831–846, New Haven, Conn., 1942.

Helium indices of a diabase and its constituent minerals (1000, 120, 1640, 810, 4800) were found to be generally higher than those for the granodiorites that are cut by the diabase (369, 147, 154, 585, 117, 90, 264), showing that the results are unreliable for purposes of correlation.

The date for granitic rocks are comparable with these for Algoman intrusives elsewhere, so that the diabase and later faulting and min-

eralization are probably post-Algoman. The spurious results for samples derived from diabase are thought to be due to contamination by magmatic helium, either during crystallization or in deuteric processes. The value 16,700 found by substituting experimental data for magnetite in the simple age equation suggests that caution must be exercised in using this mineral in helium-age investigations.—*Authors' abstract.*

6729. Piggot, C. S., and Urry, W. D., Time relations in ocean sediments: Geol. Soc. America Bull., vol. 53, No. 8, pp. 1187–1210, Washington, D. C., 1942.

Dates are given for geologic events in the North Atlantic based on the studies of cores of the sediments under this ocean. The radium in a core of red clay from the Pacific Ocean was determined with the object of throwing light on the high concentration of radium in the surface of red clays in general and of studying the rates of deposition of red clay. The rates of deposition, both past and present, are given for all the core samples studied. The rates for the upper parts of the cores probably are nearly correct, but those for the lower parts may not be. Today deposition is probably as rapid as, if not more rapid than, at any time during the period represented by the cores studied.—*W. A.*

6730. Radioactivity logging proves help in reworking old wells [editorial]: Oil and Gas Jour., vol. 41, No. 7, p. 140, Tulsa, Okla., 1942.

Radioactivity logging has made possible a greater degree of precision in the location of possible oil-bearing formations that may be cemented off behind casing in old holes. The method tells nothing about the porosity, permeability, or fluid content of the porous formation. It merely shows the position of sandstones or limestones and shales. Logs may be made in cased or uncased holes. The gamma rays emitted by elements in the formations are detected by use of an ionization chamber, the gas in which is a nonconductor, except when rendered conducting by the action of the gamma rays. The current passing through the gas is amplified and recorded continuously at the surface. Sands and limestones generally have feeble radioactive properties, but shale beds have stronger radioactive properties. Salt has low radioactivity, and anhydrite even less.

Radioactivity surveys have been used mainly for correlation and for the development of new production from cased-off sands. The surveys have also shown unknown faults, wedging beds, and that some wells have not been drilled deep enough. They are useful in checking depth measurements, in setting casing, and in detecting the position of cement if the cement contains a little radioactive material.—*G. D. H., Inst. Petroleum Jour., vol. 28, No. 224, 1942.*

6731. Sawdon, W. A., Locating cased-off productive zones: Petroleum Eng., vol. 13, No. 8, p. 55, Dallas, Tex., 1942.

There is much economically recoverable oil cased off in various fields in the United States of America, and probably all of it can be made recoverable without the use of new casing. The cheapness of the recovery will depend on how readily the cased-off oil zones can be located. In some cases data obtained during drilling will facilitate the location of these cased-off horizons, but in many older wells there are no reliable logs, so that radioactivity logging is of value in locating

these horizons. Radioactivity logs will provide general geologic information, and they can be made in cased holes. The intensity of the rays is decreased by steel casing and cement, but logs have been made through five strings of cemented casing. An ionization chamber with an amplifier is run in the well, and a continuous record is made at the surface. The sensitivity is adjusted to meet the conditions encountered. A high-amplitude log gives a sharper definition of minor changes in the character of the formations.

Electrical logs, when available, facilitate the interpretation of the radioactivity logs. In California the shales are generally much more radioactive than the sands, although there are difficult areas.

A number of radioactivity logs are included with electrical logs for comparison, and examples are given of the application of radioactivity surveys.—*G. D. H., Inst. Petroleum Jour., vol. 28, No. 224, 1942.*

6732. Stick, J. C., Jr., Radioactivity logging in California [abstract]: Oil and Gas Jour., vol. 41, No. 24, pp. 46–48, Tulsa, Okla., 1942.

Radioactivity logging in California has offered the widest scope for investigation yet encountered, both from the standpoint of the geological complexity and the variety of formations experienced. Recent experimental efforts have been directed toward the development of a curve which will record through casing the amount of fluid contained within formations. The result of these investigations has been the recent introduction of the neutron curve. The neutron curve responds primarily to the amount of hydrogen within the zone of measurement. It is accomplished by bombarding the formation with a strong source of neutrons. The neutron is one of seven fundamental particles of matter. Its mass is about 1,800 times that of the more familiar electron. Due to the nearly equivalent mass of the neutron and hydrogen nuclei, the latter has the particular ability to slow down the neutrons to a far greater extent than any other common element of substance. Bombardment of the formation by neutrons results in the emission of hard gamma rays from the solid portion of the rock. A portion of these gamma rays, in turn, reaches the measuring instrument which, as in the case of the gamma-ray curve, is an ionization chamber. Results so far obtained indicate that the gamma-ray curve can be utilized to advantage in defining formations through casing in the majority of California fields. The use of the neutron curve for stratigraphic studies has been of material benefit in areas indicating unusual gamma-ray characteristics. The neutron curve also opens up a new field of investigation for the study of formation porosity.

6. GEOTHERMAL METHODS

NOTE.—No abstracts on geothermal methods in this quarterly number.

7. GEOCHEMICAL METHODS

NOTE.—No abstracts on geochemical methods in this quarterly number.

8. UNCLASSIFIED METHODS AND TOPICS RELATED TO GEOPHYSICS

6733. Hoover, Herbert, Jr., Contribution of geophysics to national effort: Geophysics, vol. 7, No. 3, pp. 276–280, Menasha, Wis., 1942.

Responsibilities facing applied geophysics in connection with the war are discussed, and the importance of maintaining qualified and experi-

enced geologists and geophysicists for carrying forward research and development of geophysical exploration is emphasized.—*W. A.*

6734. McKee, J. P., Application of time logs to porosity studies in central Kansas wells: Oil and Gas Jour., vol. 41, No. 17, pp. 56–66, Tulsa, Okla., 1942.

Time, electric, radioactivity, and sample logs have been used advantageously in studies of areas thought to have Lansing-Kansas City limestone prospects. Each method of logging a well may contribute valuable information not available in the other methods. Using all the data promotes better understanding of operators' problems and frequently helps to solve them. Diagrams of the time log, the potential curve of an electric log, and the radioactivity log are similar.—*W. A.*

6735. Peacock, H. B., How can geophysicists best serve?: Geophysics, vol. 7, No. 3, pp. 259–267, Menasha, Wis., 1942, and Am. Assoc. Petroleum Geologists Bull., vol. 26, No. 7, pp. 1200–1206, Tulsa, Okla., 1942.

According to recent figures compiled by the American Petroleum Institute, the estimated reserves of oil in the United States as of January 1, 1942, were 19,586,296,000 barrels. Production for 1941 amounted to 1,404,182,000 barrels. In giving these figures, Peacock points out that owing to the greatly increased demand for oil during the war the known reserves must naturally be greatly increased; thus, new discoveries must be made. He discusses the opportunities offered by the proved geophysical methods of prospecting. In answering the question, "How can geophysicists best serve?" he concludes that any reduction of geophysical activity or of its efficiency cannot be permitted at this time; that every effort should be made to increase the effectiveness of the known geophysical methods of oil finding and to search for new methods; and that the specialized training of geophysicists must be used to its fullest capacity wherever they serve.—*W. A.*

6736. Wilson, J. H., Geophysics in the Permian Basin: Geophysics, vol. 7, No. 3, pp. 270–271, Menasha, Wis., 1942.

The application of geophysics in the Permian Basin to war and postwar problems is largely one of location of new oil reserves. After a brief discussion of the methods of geophysical prospecting applied in this basin (seismic, gravity-meter, torsion-balance, magnetic, electrical, and soil-analysis surveys) Wilson concludes that "the prerequisites for successful prosecution of geophysical exploration and development of new reserves in the Permian Basin are financial incentive, necessary supplies, continued improvement in procedure and equipment, regional coverage, multiple geophysical methods, closer correlation between geology and geophysics, and some amelioration of the permit situation."—*W. A.*

6737. Wood, J. T., Geology and development of the Paloma field, Kern County, Calif.: Am. Inst. Min. Met. Eng. Tech. Pub. 1471, 7 pp., New York, 1942.

Stratigraphy, structure, and closure of the Paloma field are discussed, with some details regarding the present state of development. The Paloma anticline—a large dome modified by faults—is the largest single closed dome in the southern San Joaquin Valley without surface outcrop or topographic expression. It owes its discovery to geophysics. Of nine wells drilled to the Stevens sand, seven are productive. The ultimate productive area may approximate 3,000 acres when the limits of the field are determined.—*Author's abstract.*

9. NEW PUBLICATIONS

6738. Byerly, Perry, Seismology, 256 pp., 58 illus., New York, Prentice-Hall, Inc., 1942. Price, $3.50.

The book is divided into two parts. Part 1 sets forth theories and speculations as to the immediate and underlying causes of earthquakes and describes the effects of earthquakes. Part 2 covers instrumental and wave theory, instrumental observations, and interpretations.—*W. A.*

6739. Centeno-Graü, M., Estudios Sismologicos [Seismological studies], 555 pp., 2 maps, 5 tables, Caracas, Venezuela, Litografia del Comercio, 1940.

Includes a complete catalog of all earthquakes occurring in Venezuela from 1530 to 1939; the relation of these to the geology and geography of Venezuela; studies of the general phenomena of earthquakes peculiar to these tropical regions; a study of the most effective "earthquake-proof" construction, together with a presentation of the author's "electrotectonic" hypothesis for the cause of earthquakes and his "laws of coincidences" for predicting future periods of danger.—*B. B., Econ. Geology, vol. 37, No. 5, 1942.*

6740. Neumann, Frank, United States earthquakes, 1940, 74 pp., illus., U. S. Coast and Geodetic Survey, Serial 647, Washington, D. C., 1942. Price, 15 cents.

The author summarizes earthquake activity in the United States and the regions under its jurisdiction for the calendar year 1940. He includes no earthquakes of volcanic origin in the Hawaiian and Philippine Islands, and only the stronger shocks in the Philippine Islands. He discusses: (1) Noninstrumental results of the earthquakes; (2) seismological-observatory results; (3) strong-motion seismograph results; and (4) tilt observations. He analyzes the El Centro accelerograph record of the Imperial Valley earthquake of May 8, 1940, and includes a revised analysis of the Helena, Mont., accelerogram of October 31, 1935.—*W. A.*

6741. Table of sine and cosine integrals for arguments from 10 to 100, prepared by the Federal Works Agency, Work Projects Administration, for the city of New York, 185 pp., 1942.

This volume includes a foreword, graphs of Si (x) and Ci (x), an introduction, a bibliography, and a table of Si (x) and Ci (x) integrals for the range of x between 10 and 100, at intervals of 0.01. This table is an extension of volumes 1 and 2 of sine, cosine, and exponential integrals published previously (see Geophys. Abstracts 105, No. 6085, and Geophys. Abstracts 106, No. 6207).—*W. A.*

10. PATENTS

6742. Method of and apparatus for electrically exploring earth formations; Frederic W. Huber, deceased, late of Riverside, Calif., by Schlumberger Well Surveying Corporation, Houston, Tex., assignee: U. S. patent Re-21,832, issued June 17, 1941. Original patent (2,072,950) issued March 9, 1937 (see Geophys. Abstracts 80, No. 2785).

The six claims of the original patent are completed in this reissue by additional claims 7 to 11, inclusive. The invention relates to the

method of exploring, for different depths, earth formations traversed by a drill hole by passing current into the formations surrounding the drill hole and simultaneously measuring and comparing the effects of the flow of that current in the part of the formations through one depth relatively close to the drill hole and in the part of the formations through a greater depth than that mentioned. Claims allowed, 11.

6743. Method of determining the petroleum-oil content of earth samples; John G. Campbell, Houston, Tex., assignor to Ralph H. Fash, trustee, Fort Worth, Tex.: U. S. patent 2,227,438, issued January 7, 1941.

A method for determining the oil content of earth samples. It consists in first preparing a series of relatively uniform-sized spots of standard samples of oil of known concentration but of different oil content and then in preparing spots of substantially the same size from oil of unknown concentration extracted from an earth sample. The latter spots are compared and the fluorescence is noted; then the oil content of spots prepared from oil extracted from the earth sample is computed on the basis of the known concentration of the standard spot having approximately corresponding fluorescence. Claims allowed, 6.

6744. Method of determining the petroleum-oil content of earth samples; John G. Campbell, Houston, Tex., assignor to Ralph H. Fash, trustee, Fort Worth, Tex.: U. S. patent Re-22,081, issued April 28, 1942.

This reissue of the original patent 2,227,438 is completed by the following seventh claim: "The method of exploring for subterranean oil deposits by analysis of earth samples, which consists in preparing a measured quantity of each sample; subjecting each measured sample to treatment by a measured quantity of a fluid to extract from said sample the petroleum-oil content therein; subjecting the fluid, following each extraction step, to ultra-violet light to produce a fluorescent effect by the action of the ultra-violet light on the petroleum oil in the fluid; noting the intensity of the fluorescent effect; and determining the petroleum-oil content of the fluid and thus its respective earth sample on the basis that the intensity of the fluorescent effect will be in direct proportion to the oil content. Claims allowed, 7.

6745. Gain control for seismometer amplifiers; John P. Minton, Dallas, Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, a corporation of New York: U. S. patent 2,265,538, issued December 9, 1941.

An electric seismograph detects seismic waves at a number of stations, created in the earth's surface by a detonation of a charge of explosives, by generating electrical signals corresponding to the seismic waves. The seismometer includes independent thermionic devices for amplifying the electrical signals that have been generated by each detector and means for recording the amplified signals on separate traces in coordination with time in the form of a seismogram. The improvement comprises linear gain controls in each amplifier, through which the amplifier of the signals passing through can be controlled. Each of the linear gain controls comprises a series of resistances whose values increase logarithmically; these resistances may be selectively placed in the control grid circuit of at least one of the thermionic amplifying means in each amplifier. The improvement also includes means for linearly adjusting the gain controls of each amplifier according to the variations in ampli-

tude of traces representing the recorded signals, whereby (after inspection of a single record) the gain controls can with one adjustment be set to produce a record having traces on which corresponding signals will have substantially equal amplitude. Claims allowed, 3.

6746. Apparatus for surveying deep wells; William Stanley Knouse, Hollywood, Calif., assignor, by direct and mesne assignments, of one-half to National Lead Co., New York, N. Y., a corporation of New Jersey: U. S. patent 2,268,256, issued December 30, 1941.

In an apparatus of the character described a barrel-like casing; three or more upright supports perimetrically arranged in said casing, each of said supports having permanently sensitive energy-sensitive means distributed therealong; energy-radiating energizing means for said sensitive means adapted to energize the same in accordance with the amount thereof exposed to its influence; a masking liquid in said casing interposed between said sensitive means and said energizing means, said liquid maintaining its level in the casing and masking different portions of said supports from said energizing means in accordance with the inclination of said casing; energy circuits from said sensitive means leading to the ground surface; and indicating means actuated by one or more of said circuits to indicate the response of said sensitive means. Claims allowed, 3.

6747. Recording device; Jack Ostins Davis, Portland, England, assignor to Henry Hughes & Son, Ltd., London, England, a corporation of Great Britain: U. S. patent 2,268,808, issued January 8, 1942.

An echo-sounding recording device, including a stylus; a recording surface; a drive operable to effect relative cyclic movement between the stylus and the recording surface; a device for signaling, including an actuable element; means operated by the drive of actuating the element in timed relation with respect to a predetermined point in the cyclic movement; provision for changing the drive from one constant speed to another; and means operatively associated with the last-named device for effecting a time correction relative to the predetermined point in the operating relation between the actuable element and the actuating device when the constant rate of speed of the drive is changed. Claims allowed, 8.

6748. Multiple-recording galvanometer; John P. Woods, Houston, Tex., assignor to Shell Development Co., San Francisco, Calif., a corporation of Delaware: U. S. patent 2,269,414, issued January 6, 1942.

In a multiple-recording galvanometer system, comprising a source of light, a plurality of reflecting galvanometer elements spaced along a substantially straight horizontal line, and a photographic record receiver, light train means to direct light beams from said source to said elements and from said elements to said record receiver, said means comprising an elongated lens having a cylindrical face, the longitudinal axis of said elongated lens being parallel to the line of the reflecting elements in a horizontal plane, said lens having a segment to one side of said plane positioned in the path of the beams traveling from the source of light to the reflecting elements and a segment to the other side of said plane positioned in the path of the beams traveling from the reflecting elements to the record receiver, whereby said beams are caused to travel along substantially parallel, vertically spaced paths on that side of the lens which is away from the reflecting elements. Claims allowed, 2.

6749. Adjustable measuring wheel; Adelbert Barry, Houston, Tex.; assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2,269,573, issued January 13, 1942.

This invention relates to a measuring wheel comprising a rim adapted to be expanded or contracted, a hub located substantially in the center of said wheel, a plurality of spokes, each spoke being longer than the distance between the hub and the rim, measured along the radius of the wheel, and attached to both the hub and the rim so that radii passing through corresponding ends of said spokes make angles with these spokes, the other ends of said spokes being spaced away from said radii in the same direction along the circumference of the wheel. Claims allowed, 3.

6750. Limiting amplifier; Murray G. Crosby, Riverhead, N. Y., assignor to Radio Corporation of America, a corporation of Delaware: U. S. patent 2,276,565, issued March 17, 1942.

This invention relates to a limiting amplifier comprising a pair of thermionic discharge tubes, each having an anode, a grid, and a cathode, said cathodes being so coupled together that a variation in the discharge current of one of said tubes varies the discharge current of the other of said tubes; means for applying a signal to the grid of one of said tubes sufficient to swing said grid beyond cut-off; and an output circuit coupled to the anode of the other of said tubes, the remaining grid and plate being maintained at a zero signal potential. Claims allowed, 13.

6751. Method and apparatus for measuring thickness; Donald G. C. Hare, Houston, Tex., assignor, by mesne assignments, to the Texas Co., New York, N. Y., a corporation of Delaware: U. S. patent 2,277,756, issued March 31, 1942.

This invention relates to the method of measuring the thickness of a wall from one side thereof, which comprises directing a beam of penetrative radiation into said wall from one side thereof and determining from the same side of said wall the amount of radiation scattered in the material of the wall and returned outwardly of said side. Claims allowed, 10.

6752. Oscillograph; William H. Mayne, San Antonio, Tex., assignor to Olive S. Petty, San Antonio, Tex.: U. S. patent 2,279,124, issued April 7, 1942.

This invention relates to improvements in oscillographs, especially instruments of the multiple-string time, comprising the combination, with a plurality of parallel oscillograph strings defining a common plane, of means establishing a magnetic field transversely of the strings, said means including opposed pole pieces having parallel faces disposed at an acute angle to the plane of the strings, said pole faces being offset in the direction of a normal to said strings lying in said plane. Claims allowed, 6.

6753. Detection of gas in drilling fluids; John T. Hayward, Tulsa, Okla.: U. S. patent 2,280,075, issued April 21, 1942.

This invention relates to the method of detecting gas in well-drilling mud containing gas introduced therein solely from the drill cuttings, which comprises subjecting said well-drilling mud to a change in pressure from substantially atmospheric to subatmospheric and observing the resulting change in volume thereof. Claims allowed, 5.

6754. Gas detection; John T. Hayward, Tulsa, Okla.: U. S. patent 2,280,086, issued April 21, 1942.

This invention relates to the method of measuring gas in gas-containing liquids, which comprises subjecting a gas-containing liquid to two different pressures, at least one of which is subatmospheric; measuring the electrical specific resistivities of said liquid at said pressures; and determining the gas content of said liquid from the difference in said specific resistivities. Claims allowed, 18.

6755. Galvanometer; William W. Miller, Pasadena, Calif., assignor to William Miller Corporation, a corporation of California: U. S. patent 2,282,590, issued May 12, 1942.

This invention has for a purpose the provision of an improved d'Arsonval-type of multiple galvanometer, which is adapted for general usage as well as especially suited to the making of photographic seismographic and oscillographic recordings in that it is characterized by greater ruggedness, compactness, and reliability of performance than heretofore attained owing to the manner of combining a plurality of coil assemblies or elements as separate units with a single magnet and to the provision for readily and easily removing and replacing such elements, as well as to features of construction and arrangement, whereby the coil elements are effectively damped against transverse and other nongalvanometric or extraneous vibrations and made more rugged and compact without sacrificing sensitivity, uniformity, and accuracy of operation. Claims allowed, 3.

6756. Apparatus for determining fluid contents of solids; William L. Horner, Dallas, Tex., assignor to Core Laboratories, Inc., Dallas, Tex., a corporation of Delaware: U. S. patent 2,282,654, issued May 12, 1942.

The present invention relates to a method and apparatus for distilling liquids from the pores of porous rock or sand, such as comprise core samples taken during the drilling of an oil or gas well, for the purpose of making quantitative determination of the liquids present. Claims allowed, 10.

6757. Method and apparatus for subsurface mining; John William Flude, New Orleans, La.: U. S. patent 2,283,200, issued May 19, 1942.

This invention relates to locating and mining subsurface mineral bodies. It is particularly concerned with a method of making seismic geophysical observations for the purpose of determining the location and nature of mineral-bearing or petroliferous underwater geologic formations, an apparatus for use in making such observations, and a method by which geologic formations so identified may be practicably mined. Claims allowed, 11.

6758. Method of and apparatus for determining the location of water strata in wells; George H. Ennis, Long Beach, Calif., assignor of one-half to Robert V. Funk, Long Beach, Calif.: U. S. patent 2,283,429, issued May 26, 1942.

In a method of determining points of entrance of a fluid into a well, the steps of (1) distributing a charging material of predetermined light-transmitting qualities in a selected portion of said well; (2) causing a leakage of fluid into said well to occur; (3) determining the light-transmitting qualities in a selected portion of said well; and (4) deter-

mining the light-transmitting qualities of the material at spaced points along said selected portion of said well. Claims allowed, 11.

6759. Magnetic logging; James C. Arnold, Los Angeles, Calif., assignor to Lane-Wells Co., Los Angeles, Calif., a corporation of Delaware: U. S. patent 2,288,876, issued July 7, 1942.

This invention relates to a method of magnetically logging well bores, characterized by rotating an inductor coil simultaneously about two right angularly disposed axes while moving said inductor coil along a well bore; and recording (with respect to the location of said inductor coil in said well bore) the current fluctuations induced in said inductor coil from the magnetic field traversed by the well bore. Claims allowed, 3.

6760. Electrical logging in oil-filled wells; Merle C. Bowsky, Los Angeles, Calif., assignor to Lane-Wells Co., Los Angeles, Calif., a corporation of Delaware: U. S. patent 2,288,884, issued July 7, 1942.

This invention relates to an apparatus for electrical logging of oil-filled well bores, comprising an input circuit and a probe circuit, each including at least one continuously movable contactor physically engaging the walls of said well bore, the input circuit being adapted to establish an electrical field in the formation confronting said well bore and said probe circuit being adapted to sample said electrical field; and an electrical coupling between said input and probe circuits (including means in said input circuit for balancing the voltage in said probe circuit) said means being so located in said input circuit with respect to said input contactor that the balancing voltage of said means varies directly with the total resistance of said input circuit, including the contact resistance of said input contactor and means tending to maintain a constant flow in said input circuit. Claims allowed, 5.

6761. Well-survey method and apparatus; Jacob Neufeld and Elihu Henry Cooley, Tulsa, Okla., assignors to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,288,973, issued July 7, 1942.

This invention relates to a method of geophysical exploration that comprises (1) establishing a plurality of electrical-current fields between an electrode in a well bore and a plurality of spaced electrodes on the surface of the earth, and (2) measuring the potential of points on the earth's surface in the vicinity of the surface electrodes as indications of the configuration of the current fields and hence of the arrangement of the subsurface strata. Claims allowed, 5.

6762. Method and apparatus for logging wells; Robert W. Stuart, Tulsa, Okla.; assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,289,687, issued July 14, 1942.

This invention relates to the method of logging the subsurface formations encountered in a well during a drilling operation employing a circulating stream of drilling fluid, which comprises substantially simultaneously and separately measuring variations in the electrical conductivity and the hydrogen-ion concentration of at least a portion of said drilling fluid returning from the bottom of said well to provide a basis for distinguishing between substances encountered in said drilling operation which possess relatively high electrical conductivity and which are substantially neutral and substances which also possess relatively

high electrical conductivity but which are not substantially neutral. Claims allowed, 9.

6763. Well-survey method and apparatus; Jacob Neufeld, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,289,926, issued July 14, 1942.

This invention relates to a method of geophysical prospecting that comprises measuring the radioactive radiations naturally emitted from a formation about which information is desired; measuring the radioactive radiations from the same formation while irradiating said formation with radiations from an external source; and combining said measurements to obtain an indication of the effect of said external source of radiations upon the radiations from said formation. Claims allowed, 8.

6764. Thermal process and device for surveying the beds traversed by drill holes; Marcel Schlumberger, Paris, France, assignor, by mesne assignments, to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware: U. S. patent 2,290,075, issued July 14, 1942.

This invention relates to a method of determining the nature of earth formations traversed by a borehole, which comprises the steps of (1) generating heat uniformly and simultaneously along an extended portion of the borehole, and (2) obtaining indications of the rate of transmission of the generated heat through the formations surrounding the borehole in said portion, whereby their relative thermal properties may be ascertained. Claims allowed, 8.

6765. Geophysical-instrument mounting; Robert H. Ray, Houston, Tex., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,290,354, issued July 21, 1942.

In apparatus for mounting and transporting a geophysical instrument, including a vehicle and means for supporting said geophysical instrument when in use in fixed and accurately leveled position within said vehicle, the improved combination which comprises a head assembly on said instrument comprising a pulley member (including a pulley), said pulley member being adapted to carry the weight of said instrument and means projecting perpendicular to the faces of said pulley on each side of said pulley member; means cooperating with said pulley for raising said instrument from said supporting means and lowering it thereon; and a pair of resiliently mounted hooks adopted to cooperate with said projecting means to hold said instrument in raised position independently of said pulley. Claims allowed, 2.

6766. Exploration of boreholes; Wilbur J. Crites, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Delaware: U. S. patent 2,290,408, issued July 21, 1942.

An apparatus for exploring a well bore while drilling a well, the combination comprising means for circulating a drilling fluid through the well bore and means for indicating variations in the difference between the volume of drilling fluid that is introduced into the well bore and the volume of fluid withdrawn from the well bore. Claims allowed, 6.

6767. Gravity-meter; Dayton H. Clewell, Dallas, Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York: U. S. patent 2,290,740, issued July 21, 1942.

In an apparatus for geophysical prospecting by the gravimetric method that comprises gravity responsive means; a support; means for pivotally mounting said gravity responsive means on said support; elastic means for maintaining said gravity responsive means in a state of equilibrium; means for indicating variations in vertical displacement of the gravity responsive means due to variations in the force of gravity acting upon the gravity responsive means; and means for nulling said system, said nulling means comprising additional elastic means acting longitudinally of and directly upon the first elastic means to effect minor displacements of the gravity responsive means, means for varying the stresses in a portion of said first elastic means while decreasing the stresses in the remainder of said first elastic means, and means for indicating the amount of variation of said stresses necessary to bring the mass to a predetermined position to null the system. Claims allowed, 5.

6768. Electric seismograph; Earley M. Shook and Robert W. Olson, Dallas, Tex., assignors, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York: U. S. patent 2,290,773, issued July 21, 1942.

This invention relates to an apparatus for receiving and recording, in a distinguishable manner, a time break that is of higher amplitude than voice signals and other disturbing currents by means of an electric seismograph, comprising in combination a radio receiving set having a single detecting stage; two amplifying channels, connected in parallel, that are adapted to receive signals from the detecting stage; at least one vacuum tube in one of the amplifying channels, adapted to amplify all signals from the detecting stage; a speaker unit connected to the output of said amplifying channel, whereby voice communication signals can be received, at least one amplifying tube in the second channel; means for biasing said tube to a point beyond cut-off, said bias being high enough to suppress signals of amplitudes lower than the amplitude level of the time-break signal; and means actuable by the output signal of said tube for recording the output signal, whereby the high-amplitude time-break signal can be recorded free of other signals, such as static and voice communication signals. Claims allowed, 3.

6769. Geophysical prospecting; Gifford E. White, Fredericksburg, Tex., assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2,291,596, issued July 28, 1942.

In a method of geophysical prospecting in which a charge of current is impressed in the earth at one point and the resulting voltage is received at a remote point, the step of using as the charge a pulse of direct current of substantial magnitude having a duration not substantially in excess of one-thousandth of a second. Claims allowed, 3.

6770. Apparatus for relative gravity measurements; Gustaf Adolf Ising, Djursholm, Sweden: U. S. patent 2,291,628, issued August 4, 1942.

The present invention relates to a static gravimeter comprising, in combination, a conductive pendulum suspended in such manner as to be able to turn about a horizontal axis; stops restricting the movement of said pendulum to small deflections from a horizontal position, optical means for observing the displacements of the pendulum; a stationary conductor disposed near said pendulum; an evacuated receptacle her-

metically enclosing said conductors; and means highly insulating one of said conductors so as to enable it to retain a substantially invariable electrostatic charge, the electrostatic field of which constitutes substantially the whole compensating force counterbalancing the weight of the pendulum so that successive observations at different places may be carried out without recharging. Claims allowed, 1.

6771. Magnetic logging; Raymond T. Cloud, Tulsa, Okla., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,291,692, issued August 4, 1942.

This invention relates to an apparatus for exploring the geologic formations traversed by a borehole, comprising a magnetization coil adapted to be lowered into said borehole and, when energized, to set up magnetic lines of force in said borehole and surrounding strata; means for energizing said magnetization coil (including means for passing a direct current through said magnetization coil and means for reversing said current); an expression coil substantially vertically spaced from said magnetization coil; means for rotating one of said coils to cause said exploration coil to cut said magnetic lines of force; means for measuring a fraction of the electromotive force generated in said exploration coil; and means for changing the level of said coils within said borehole while maintaining their spacing. Claims allowed, 4.

6772. Geophysical apparatus and method; William Robertson Welty, San Antonio, Tex., assignor to Olive S. Petty, San Antonio, Tex.: U. S. patent 2,291,779, issued August 4, 1942.

In apparatus for use in seismic surveying, the combination with a plurality of seismometers, each including a casing; means within said casing for converting seismic impulses to electrical-wave-form signal energy and for establishing a field varying with said energy externally of said casing; amplifying and recording apparatus; and a conductor, delivering energy to said last-named means, said conductor being looped about the several casings successively for energization solely by the several fields. Claims allowed, 2.

6773. Photochemical exploration method; Robert O. Smith, Fort Worth, Tex.: U. S. patent 2,292,300, issued August 4, 1942.

In the art of geophysical exploration for hydrocarbon deposits, the method of detecting concentrations of hydrocarbons over buried deposits by the determination of the saline products in the soil, comprising systematically selecting soil samples over the area; dissolving out the alkaline content of the said samples in pure water; adding a silver nitrate solution to the said alkaline solution; subjecting the mixture to ultraviolet rays for a predetermined period; and measuring the hydrocarbon content by resultant color and tint variations. Claims allowed, 3.

6774. Method and apparatus for imparting directional magnetic properties to core samples; Philip H. Jones, Redondo Beach, Calif., assignor to Union Oil Co., of California, Los Angeles, Calif., a corporation of California: U. S. patent 2,292,838, issued August 11, 1942.

This invention relates to a method of imparting magnetic properties to formation core samples comprising the steps of drilling a borehole to the formation to be cored; drilling a pilot hole of smaller diameter than

the core to be taken at the end of said borehole; positively displacing drilling mud from said pilot hole by positively injecting a wash liquid thereinto; positively displacing said wash liquid from said pilot hole by positively injecting a magnetic cementitious material thereinto and allowing it to remain undisturbed until set; and coring ahead and removing a core sample of said formation containing a portion of said injected magnetic cementitious material. Claims allowed, 6.

6775. Method of electrical prospecting; Paul W. Klipsch, Houston, Tex.; assignor to Esme E. Rosaire, Houston, Tex.: U. S. patent 2,293,024, issued August 11, 1942.

This invention relates to the method of geoelectric prospecting in which the electrical-transmission properties of the earth are measured, comprising the steps of causing an alternating current of known amplitude to flow in a region of the earth's crust; detecting and measuring the magnitude of a potential between points subjected to the flow of current; and varying the frequency of the current between such limits that the detecting and measuring step reveals the frequency range within which the slope of the curve of mutual impedance with respect to frequency is negative. Claims allowed, 12.

6776. Apparatus for determining permeability; George S. Bays, Tulsa, Okla., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,293,488, issued August 18, 1942.

This invention relates to an apparatus for determining the permeability of an earth formation comprising a sample-receiving chamber; means for introducing a liquid into said chamber; means for shutting off communication between said chamber and the atmosphere; means for subjecting said liquid to a constant elevated pressure; and means for measuring the time required to introduce a predetermined volume of said liquid into said chamber at said elevated pressure. Claims allowed, 7.

6777. Apparatus for submarine geophysical prospecting; Theodore B. Pepper, Oakmont, Pa., assignor to Gulf Research & Development Co., Pittsburgh, Pa., a corporation of Delaware: U. S. patent 2,294,201, issued August 25, 1942.

This invention relates to an apparatus for submarine geophysical prospecting, comprising in combination a casing adapted to rest stationary on the floor of bodies of water; a geophysical instrument in said casing; mounting means for the instrument so constituted as to permit tilting of the instrument with respect to the casing through an angular range adequate to permit leveling the instrument; level-responsive means in fixed relation to the instrument responsive to departure of the instrument from level in at least two angularly different planes; at least two power-operated instrument-tilting means within the casing, adapted, on actuation thereof, to tilt the instrument toward level in at least two angularly different planes; at least two control means each associated with said power-operated tilting means and with said level-responsive means and so constituted as to cause operation of the tilting means upon departure of the level-responsive means from level in any of the planes to the level in which it responds and to render the tilting means inoperative on attainment of level in all planes. Claims allowed, 6.

6778. Apparatus for submarine geophysical prospecting; Theodore B. Pepper, Oakmont, Pa., assignor to Gulf Research & Development Co., Pittsburgh, Pa., a corporation of Delaware: U. S. patent 2,294,202, issued August 25, 1942.

In apparatus for performing measurements at the floor of bodies of water, a submersible watertight container adapted to contain a measuring instrument; cable means attached to the container for lowering it to the floor; a concave base for the container constructed and arranged to define therebelow a space between the base and the floor; a suction pump associated with the container, having an inlet communicating with said space and an outlet delivering to the water outside the container; and power means for driving the pump. Claims allowed, 4.

6779. Oscillograph; Otto F. Ritzmann, Aspinwall, Pa., assignor to Gulf Research & Development Co., Pittsburgh, Pa., a corporation of Delaware: U. S. patent 2,294,320, issued August 25, 1942.

This invention relates to a frequency-selective oscillograph comprising in combination an electrically actuable pair of vibratory bodies having different resonant vibratory frequencies and arranged to vibrate upon application of an oscillating electrical signal; circuit means for applying an oscillating electrical signal thereto, whereby one body is caused to vibrate with amplitude having a maximum at some one frequency and the other body is caused to vibrate with amplitude having a maximum at a different frequency; a deflectable light-reflecting means attached to the two bodies in such a manner that the reflecting means is subject to deflection by both bodies; a source of light-directing light toward the reflecting means; and a surface receiving a beam of light reflected from the reflecting means whereby the deflection of said beam of light at any instant is combined with the deflections of said two bodies at that instant. Claims allowed, 9.

6780. Method and apparatus for making geological explorations; Knute H. Evjen, Coudersport, Pa., assignor to Nordel Corporation: U. S. patent 2,294,395, issued September 1, 1942.

This invention relates to the method of electrical prospecting which comprises passing a current having predetermined frequency through the earth; picking up the potential difference between two other points adjacent the earth's surface and lying within the field of influence of said earth current; deriving from said potential difference a measure of the electrical characteristics of the earth in the area under investigation; and repeating the measurement at different selected frequencies below about 20 cycles per second to obtain a spectrum of the potential representing variations in characteristics of the earth's strata at various depths below the surface. Claims allowed, 17.

6781. Geomicrobiological prospecting; Robert Thomas Sanderson, Sierra Madre, Calif., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,294,425, issued September 1, 1942.

This invention relates to a method of prospecting, comprising analyzing earth components taken from spaced survey stations for at least one indicator substance selected from the group consisting of hydrocarbons, hydrogen, and carbon monoxide; examining samples from substantially the same survey stations for at least one micro-organism

capable of producing said indicator substance; and comparing the results of such analysis and examination. Claims allowed, 4.

6782. Seismic surveying; Josephus O. Parr, Jr., San Antonio, Tex., assignor to Olive S. Petty, San Antonio, Tex.: U. S. patent 2,294,627, issued September 1, 1942.

In a system for use in seismic surveying, the combination with a plurality of seismometers of separate signal-amplifying means for each seismometer; conductors for signal energy extending between each seismometer and the amplifying means therefor; means disposed adjacent to each of said amplifying means and acting between the associated conductors for regulating the potential difference between said conductors resulting from unwanted alternating-current flow in said conductors; and means connecting the regulating means for different amplifiers, said last-named means including phase-shifting means. Claims allowed, 6.

6783. Well-survey method and apparatus; Jacob Neufeld, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,296,176, issued September 15, 1942.

This invention relates to a method of geophysical prospecting that comprises separately simultaneously measuring the intensity of radioactive radiations of a plurality of frequency ranges coming from a formation about which information is desired, and dividing one of said measurements by another in such a manner as to give a measurement indicative of the frequency distribution of said radiations. Claims allowed, 16.

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