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OCTOBER–DECEMBER 1941

COMPILED BY

W. AYVAZOGLOU

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GEOPHYSICAL ABSTRACTS 107, OCTOBER–DECEMBER 1941

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1. GRAVITATIONAL METHODS

6249. Bruckshaw, J. M., Gravity meters: Phys. Soc. Proc., vol. 53, pt. 4, No. 298, pp. 449–467, London, 1941.

Bruckshaw compares the relative sensitivities of the torsion balance and gravity meter and the relative accuracies of these modern instruments and pendulums. For geophysical prospecting, the pendulum and torsion balance require a long time in which to complete an observation and are therefore less desirable than gravity meters. The author discusses two classes of gravity meters:

1. Direct instruments with magnification, including the Threlfall-Pollock quartz-thread gravity balance and the Hartley, Boliden, Gulf, and Haalck gravity meters.

2. Instruments operating near a position of instability, including the Thyssen and Ising-Urelius gravity meters and the Holweck-Lejay inverted pendulum.

From his review of modern instruments, selected and described in this article, he concludes that "it is apparent that under field conditions they are capable of measuring small changes in gravity with an accuracy somewhat better than the invariable pendulum under the same conditions, and in general the time of a single observation compares favorably with the time of pendulum measurements."—*W. A.*

6250. Klaus, H., Gravity interpretation by means of the second-derivative method: Internat. Oil, vol. 1, No. 2, pp. 59–62, July 1940.

Two extensive gravimetric campaigns in the United States are described. The first started with the introduction of the torsion balance into the Gulf coast about 1922; the second began a few years ago with widespread gravimeter surveys. Reasons for the success of the first campaign are discussed, and it is compared to the present one. In discussing the problem of gravity interpretation it is brought out that the torsion balance measures second derivatives of gravity force, which is a quantity that is in many cases more diagnostic of subsurface conditions than the direct gravity force measured by the gravimeter. The virtue of using the gravimeter for reconnaissance and semidetailing and the torsion balance for detailing is brought out. Various types of regional effects considered in interpretation are treated. Photos of field crews and a second-derivative contour map of the Billings area, Oklahoma, are given.—*D. W., Mines Mag., vol. 31, No. 7, 1941.*

6251. Minakami, Takesi, Geophysical studies of the Asama Volcano: 6th Pacific Sci. Cong., vol. 2, pp. 859–873, Berkeley and Los Angeles, Calif., 1940.

The author has investigated recent changes in the depth of the crater floor of Volcano Asama, explosive activities of the volcano, and tiltings of the earth's surface. Geophysical surveys of the volcano show that to obtain data on the underground structure from measurements of gravity and of terrestrial magnetism the surveys must be conducted not only with great accuracy but also at as many stations as possible. Besides, the magnetic anomaly is scarcely explainable until the permeability of the Asama lavas has been determined. In studying this permeability the author raised the question as to how these lavas, which at the time of their ejection had temperatures as high as 1,000° C., came to be magnetized during cooling.—*W. A.*

6252. Mott-Smith, L. M., The gravimeter in geophysical exploration: Internat. Oil, vol. 1, No. 2, pp. 66–88, July 1940.

The first practical field use of the gravimeter is credited to the Humble Oil & Refining Co. in 1931. It is estimated that there are now some 80–90 gravimeters in use throughout the world, in contrast to not more than 10 three years ago. The world-wide use of this instrument and its economy for reconnaissance surveys is brought out, as some 400 to 1,500 stations per month can be made with one gravimeter. Photographs of gravimeters are given, and the application of the method and its interpretation are discussed. It is estimated that about 1,200,000 square miles have been surveyed, which because of repeated coverage represents an area of about 600,000 square miles. This compares with approximately 3,000,000 square miles of area covered by other geophysical methods. It is noted that there are some 33,000,000 square miles of prospective oil territory in the world, which leaves a vast area for exploration.—*D. W., Mines Mag., vol. 31, No. 7, 1941.*

6253. Tsuboi, Chuji, and Yamaguti, Seiti, Relation between gravity anomalies and corresponding subterranean mass distribution, part 6: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 19, No. 1, pp. 26–38, 1941.

The present paper, which is the sixth of the series (for part 5 see Geophys. Abstracts 105, No. 6003), deals with that part of the Dutch East Indies belonging mostly to the Banda Sea and bounded by latitudes 0° and 10° S. and longitudes 118° E. and 132° E., with a dimension approximately 1,000 by 1,400 km. The gravity anomalies were measured by Vening Meinesz during his submarine expeditions. Assuming that the Airy theory of isotasy is approximately tenable in this area, the authors determine the thickness of the earth's crust by comparing the Fourier coefficients for the topographic relief and for the observed Bouguer gravity anomalies. They give tables.

They make the following interesting observation from their study: "It is likely that the regionality of the isostasy R is always approximately 2 to 3 times the thickness of the isostatic earth's crust d, irrespective of the thickness itself, as shown in the following table:

Place	d	R	R/d
	Kilometers	*Kilometers*	
Japan	50	85	1.9
United States of America	61	145	2.4
Dutch East Indies (west half)	36	60	1.7
Dutch East Indies (east half)	32	80	2.5

This noteworthy behavior of the earth's crust is likely to be connected with the empirical fact that there is an upper limit to the energy of an earthquake.—*W. A.*

6254. Two new geophysical instruments [editorial]: Oil and Gas Jour., vol. 38, No. 48, p. 70, Tulsa, Okla., 1940.

Photographs of a new gravity meter weighing 45 pounds, with tripod or suitable for truck mounting. Pictured also is a highly portable seismic equipment in five units. These are a four-channel amplifier, blaster, camera with batteries and timer, daylight developer, and phones and geophones. The above are manufactured by Heiland Research Corporation, Denver, Colo.—*D. W., Mines Mag., vol. 31, No. 7, 1941.*

6255. Welch, G. J., Galitzin-type gravity meter: Rev. Sci. Instruments, vol. 12, No. 4, pp. 179–182, Lancaster, Pa., 1941.

The general requirements involved in the design of a gravity meter are outlined. The construction and characteristics of a meter developed by the author are discussed. The probable error of a single reading of the instrument when used in the field is 0.06 milligal.—*Author's abstract.*

6256. Wilson, J. M., South Cotton Lake field, Chambers County, Tex.: Am. Assoc. Petroleum Geologists Bull., vol. 25, No. 10, pp. 1898–1920, Tulsa, Okla., 1941.

Torsion-balance work in 1934 indicated a large minimum which centered, after regional corrections were applied, slightly north of the present producing area. After 2 wells were drilled in the vicinity, both of which were abandoned after encouraging showings, the area was detailed with the reflection seismograph, using the continuous profile method. As the result of this work, the discovery well was located, and subsequent development of the field showed that the seismograph gave a remarkably accurate picture of the structure, a faulted dome elongate east and west. The three producing sands are the Marginulina sand with an average of 7½ feet of effective sand, the Frio No. 1 with 10 feet, and the Frio No. 2 with 5 feet. Each sand has a separate water level and oil-gas contact, and all occur within an interval of about 100 feet. The average total depth of wells is 6,500 feet. The maximum producing area is expected to be about 1,200 acres. One deep test in the field failed to find any promising deeper sands. There are now 51 oil wells and 2 gas wells here, and development is nearly complete. As of January 1, 1941, the field had produced 1,573,400 barrels.—*Author's abstract.*

2. MAGNETIC METHODS

6257. Benkova, N. P., and Kosuhia, O. Y., *K*-index according to the Union of Soviet Socialist Republics observations: Terres. Magn. and Atmos. Electr., vol. 46, No. 3, pp. 343–344, Baltimore, Md., 1941.

In accordance with a resolution of the Washington Assembly of the International Association of Terrestrial Magnetism and Electricity in September 1939, the Sloutzk Magnetic Observatory began to tabulate magnetic disturbances by means of the index *K*. This observatory adopted a *K*-scale by which the intervals with an amplitude greater than

600 gammas were gaged by the index *K*-9. Comparison of the Sloutzk and Niemegk occurrences of *K*-indices shows that the choice of such a scale was favorable. The writers tabulate the frequency distribution for eight observatories in the Union of Soviet Socialist Republics.—*W. A.*

6258. Elsasser, W. M., Statistical analysis of the earth's internal magnetic field [abstract]: Phys. Rev., vol. 60, No. 2, p. 159, Lancaster, Pa., 1941.

In order to represent the irregular (non-dipole) part of the internal magnetic field of the earth the following model is considered. A finite number of dipoles are distributed with random positions inside a spherical shell concentric with the earth. Probabilities are calculated for the amplitudes with which the higher spherical harmonics appear in the field thus produced. The results are statistically compared with the harmonic components of the observed field, of which 42 are numerically known, making a sufficiently large population to permit significant statistical inferences. The theory may be used to determine the outer radius of the spherical shell from the magnitude of the observed coefficients. This radius is found to be approximately 0.50 *R* (where *R* is the earth's radius), and it is definitely not in excess of 0.55 *R*, the radius of the earth's core. The result is independent of the number of dipoles used to represent the irregular field, provided the latter is not excessively large.

6259. Farnham, F. C., Description of the Missouri School of Mines Magnetic Observatory [abstract]: Missouri Acad. Sci. Proc., vol. 6, No. 4, pp. 91-92, Columbia, Mo., 1940.

Funds have been appropriated by the executive committee of the board of curators for the erection and equipment of a small magnetic observatory at Rolla. The observatory will consist of a set of three magnetic variometers, which will give a continuous record of the variations in the horizontal intensity, the vertical intensity, and the declination of the earth's magnetic field. These instruments will be housed in a variation building, which will be about 15 by 18 feet outside dimensions, well insulated thermally and of completely nonmagnetic construction. Also there will be an absolute building about 8 by 8 feet outside dimensions, of nonmagnetic construction and containing masonry piers on which instruments may be set for measuring the absolute value of the strength and the direction of the magnetic field. The foundation and pier footings for the variation building have been poured, and the variometers have been purchased. It is planned to construct the absolute building immediately, but funds are not now available for the absolute instruments.

6260. Gilchrist, Lachlan, Recent magnetic and electrical geophysical investigations on the surface and in drill holes in regions containing gas, oil, and other minerals, and the correlation of the results of the investigations: 9th Pennsylvania Min. Industries Conference Proc., Petroleum and Nat. Gas Sec., Bull. 30, 28 pp., Min. Industries Exper. Sta., State College, Pa., 1940.

The subject is discussed under the following main sections:

(1) Delineation of magnetic anomalies. Two classes of magnetic anomalies are distinguished: (*a*) Anomalies in which a large but finite

number of consequent poles exist in the material of the subsurface body and for which the body in whole or in part may be represented by a resultant equivalent magnet. Deposits that will provide this condition are mentioned, and deductions are made. (*b*) Anomalies due to a difference in permeability to the earth's magnetic field of subsurface massive bodies of homogeneous materials extending to a considerable distance in a direction at right angles to the magnetic meridian plane. A sedimentary deposit of massive crystalline dolomite containing one-fifth of its volume of oil or salt water is investigated as an example. The results of measurements are shown in graphs and tables.

(2) Delineation of electrical anomalies associated with deposits of gas, oil, and salt water. Electrical-resistivity measurements also were made. Current flow lines, equipotential surfaces, electrical set-up for determining subsurface resistance, and surface layout for electrical prospecting are discussed and shown graphically.

(3) Delineation of magnetic and electrical anomalies associated with a deposit of pyrite and pyrrhotite. Methods of procedure are described. The electrical set-up for determining subsurface resistance and the layout of a geophysical prospect in a mine are described and shown graphically. In spite of the effect that the massive ore body on the upper levels has on the resistivity measurements, the directions from the drill holes in which lower resistivities were indicated by the results of measurement corresponded in general to the directions in which the greater masses of ore were located. This may be seen by studying the tables. The results of a modified form of electrical drill-hole coring are presented in five graphs.

Finally, a useful method of investigating the resistivity of the material in the region between drill holes is indicated.—*W. A.*

6261. Jenny, W. P., Regional magnetic anomalies in central and southern United States: Oil Weekly, vol. 103, No. 3, pp. 17–22, Houston, Tex., 1941.

A map accompanying this article shows the regional magnetic anomalies of 16 of the Southern and Central States of the United States, together with some of the more important geologic interpretations. The writer discusses some of the main geologic features and their magnetic expression and emphasizes the great value of magnetic data for geologic investigations. In prospecting for oil, increasing emphasis is laid on stratigraphic traps.—*W. A.*

6262. Jenny, W. P., The magnetic method and its interpretation problems: Internat. Oil, vol. 1, No. 2, pp. 53–57, July 1940.

Renewed interest in the magnetometer is considered to be based on three factors, viz (1) improved instruments permitting an accuracy of 1 gamma (±), (2) a better understanding of the geologic problems involved in interpretation, and (3) the belief that magnetic surveys are a proper approach to finding prospects in many areas. Regional interpretation problems are considered for three cases: (1) Where the basement is the main cause of magnetic effects, (2) where the effects are due to magnetic beds in the sedimentary column, and (3) where the above two cases are combined. These factors are illustrated by a magnetic-gradient map for Illinois and its interpretation in terms

of regional geology. Numerous other examples are presented in the form of maps and profiles, which bring out the effect of the thickening and thinning of magnetic beds, the displacement between structure and magnetic anomalies, and estimates of the depth and amount of structural uplift. Four examples of high-accuracy (micromagnetic) surveys are given which cover the Hobbs oil field, Lea County, N. Mex.; a survey in Ravenna township, Mich.; a fault location in San Patricio County, Tex.; and structure mapping in Avoyelles Parish, La. The article well shows the possibilities of magnetic surveys in petroleum exploration.—*Author's abstract.*

6263. Johnston, H. F., Three-hour-range indices, *K*, for 12 magnetic observatories, July to December 1940, and summary for 1940: Terres. Magn. and Atmos. Electr., vol. 46, No. 3, pp. 301–308, Baltimore, Md., 1941.

Johnston tabulates the frequency of occurrence of each of the *K* indices for the 12 observatories mentioned in this article, as well as for 7 mentioned in another article (see Geophys. Abstracts 105, No. 6017).—*W. A.*

6264. Kato, Yosio, Investigation of the magnetic properties of the rocks constituting the earth's crust—On the susceptibility of the rock, part 1: Tohoku Imp. Univ. Sci. Repts., vol. 29, No. 4, pp. 602–628, Sendai, 1941.

This article gives data on the measurements of the susceptibility of volcanic rocks in very weak magnetic fields, such as those of the earth. The writer measured volcanic rocks collected from Mt. Mihara, on the island of Oosima; from Mt. Komagadake, in Hokkaido; and from the mountains near Sendai. The susceptibility of the volcanic rocks of Mt. Mihara varies with the quantity of rock ejected in each epoch, whereas the susceptibility of the rocks of Mt. Komagadake is nearly equal to the quantity of all the rocks ejected in each epoch and depends on the amount of magnetite contained in the rock. From the results he concluded that the magnetite at Mt. Mihara was a solid solution in other materials, whereas that at Mt. Komagadake remained pure magnetite. He describes the method of measurement.—*W. A.*

6265. Kato, Yosio, Investigation of the magnetic properties of the rocks constituting the earth's crust—On the susceptibility of the rock, part 2: Tohoku Imp. Univ. Sci. Repts., vol. 29, No. 4, pp. 629–648, Sendai, 1941.

The author measured the susceptibility of volcanic rocks collected from Mt. Hakone and from the mountains in the Izu district by the alternating magnetic-field principle. The most interesting result is that the values of the susceptibilities of the rocks depend on the amount of magnetite contained in them regardless of its state; that is, whether it is present in the form of pure crystals or of solid solutions.—*Author's abstract.*

Minakami, Takesi, Geophysical studies of the Asama Volcano. *See* Geophys. Abstract 6251.

6266. Nagata, Takesi, The mode of causation of thermo-remanent magnetism in igneous rocks [preliminary note]: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 19, No. 1, pp. 49–81, 1941.

The author has examined experimentally the characteristics of thermo-remanent magnetism and magnetic susceptibility of rocks due to changes of temperature. In this article he discusses the causation of thermo-remanence as suggested by experimental studies with a few basic volcanic rocks.—*W. A.*

6267. Nakamura, S. T., Magnetic observation at Sendai in the second polar year from August 1932 to August 1933: Tohoku Imp. Univ. Sci. Repts., vol. 29, No. 4, pp. 562–601; Sendai, 1941.

Tables show the magnetic data at Sendai during the second polar year. The author discusses briefly the anomalous secular change in the first half of the polar year.—*W. A.*

6268. Photoelectric recording equipment, new type [editorial]: Internat. Oil, vol. 1, p. 84, April 1940.

An Askania photoelectric recorder is described for use with Askania magnetometers for recording magnetic daily variations. The equipment involves an automatic recording microammeter, which can be set up at a distance from the magnetometer and which can be read at any time. Pictures of the device are given.—*D. W., Mines Mag., vol. 31, No. 7, 1941.*

6269. Rayner, J. M., Magnetic prospecting of the Gulgong deep leads: New South Wales Geol. Survey Min. Resources, No. 38, pt. 2, pp. 135–160, Sydney, 1940.

An attempt has been made to point out the possibilities and limitations of the magnetic method of prospecting. The method was used to locate the position of stream channels in an old land surface now covered partly by basalt and extensively by alluvial deposits. It is impossible to predict whether or not the deep leads contain auriferous wash, although a study of such factors as the junctioning of enriching tributaries, the width of the lead, bends in its course, etc., may indicate the more favorable localities. The primary aim of the method is to indicate where boreholes and shafts may be sunk to the best advantage in the search for gold-bearing wash. Since the magnetic method gave well-marked indications above the known portions of the basalt-filled leads, the method was applied to the prospecting of the virgin ground with confidence. As a result, the trend of the deep leads in several areas was followed. The depth to the gutters would range up to about 200 feet. It should be possible for future mining ventures to test the auriferous contents of such leads at a minimum cost, since the sinking of shafts and boreholes can be confined to the deep channels. Before such work is undertaken at any point, all the available geological evidence as to the possibility of the lead being auriferous should be taken into consideration. It should also be remembered that shafts on these deep gutters must, as a rule, pass through considerable thickness of hard basalt, often of the order of 100 feet, and heavy water will be encountered on reaching the drifts.

Keeping in mind the limitations of the magnetic method, attention is called to several areas as appearing the more favorable for testing.—*Author's abstract.*

6270. Takahasi, Ryutaro, and Hirano, Kintaro, Changes in the vertical intensity of geomagnetism that accompanied the eruption of Miyake-zima in 1940: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 19, No. 1, pp. 82–103, 1941.

In the recent eruption of the volcanic island Miyake-zima on July 12, 1940, the authors made magnetic surveys of the island with a vertical-intensity magnetometer so as to detect changes in the vertical intensity of geomagnetism that usually accompany eruptions. They describe

the island briefly and show in diagrams and tables the results of the surveys and the interpretation.—*W. A.*

6271. Vannostrand, R. G., and Farnham, F. C., Some measurements of magnetic susceptibility of rocks [abstract]: Missouri Acad. Sci. Proc., vol. 6, No. 4, pp. 90–91, Columbia, Mo., 1940.

A method of measurement of the magnetic susceptibility of drill cores as used in the Geophysics Laboratory at Rolla is described, and some of the results of the measurements are given. The instrument used is patterned after those in use in the instrument shops of the Carnegie Institution at Washington and the U. S. Coast and Geodetic Survey for measuring the magnetic properties of materials used in magnetic measuring instruments. It is essentially an astatic magnetic system suspended so that samples to be tested may be brought very close to it. The instrument can be calibrated by noting the deflection caused by a sample of some salt whose susceptibility is known. The results obtained so far indicate that certain sedimentary beds occur in the geologic column in Missouri which have a very high magnetic susceptibility, and it is hoped that systematic study may make possible reasonably accurate interpretation of the map of vertical-intensity anomalies now being made of the entire State.

6272. Weinberg, B. P., Symmetry of the magnetic field in polar regions: Acad. sci. U. R. S. S. Comptes rendus [Doklady], vol. 31, No. 2, pp. 117–118, Moscow, 1941.

Charts of magnetic meridians in the Arctic and Antarctic show a marked symmetry in the distribution of meridians. Other magnetic charts of the Arctic representing the presumed distribution of such magnetic elements as are not associated with the geographic net show a similar symmetry. The writer illustrates this symmetry in a table in which he records the latitudes of intersections of several meridians. Similar lines of symmetry are recorded on the charts of Haussmann, Fisk, and on those prepared by the writer for the Polar Catalogue.—*W. A.*

3. SEISMIC METHODS

6273. Banta, H. E., A refraction theory adaptable to seismic weathering problems: Geophysics, vol. 6, No. 3, pp. 245–253, Menasha, Wis., 1941.

An exponential relation $V_y = C\ (y + A)^{1/n}$ between depth and velocity of propagation of seismic waves is postulated. The exponent is a number between zero and unity. Expressions for the time-distance relation, the depth-distance relation, the average vertical velocity, and the vertical- and horizontal-time relations are derived. Applications of the relations to seismic weathering problems are discussed.—*Author's abstract.*

6274. Bates, F. W., Geology of Eola oil field, Avoyelles Parish, La.: Am. Assoc. Petroleum Geologists Bull., vol. 25, No. 7, pp. 1363–1395, Tulsa, Okla., 1941.

Eola, located in the Louisiana Gulf coast area, in the south-central part of the State, was discovered by S. W. Richardson in January 1939. The location of the structure can be attributed solely to geophysics. (A reflection-seismograph structure map of Eola field is given.) Principal production is secured from sands at the top of the Sabine Wilcox of

the lower Eocene at a depth of about 8,500 feet; commercial oil sands have been logged in some wells in the Cockfield and Sparta. To date, 90 oil wells have been completed from the Wilcox and 3 from the Cockfield; 12 dry holes have been drilled on and adjacent to the field. Eola was the first field in the area to produce oil in commercial quantities from the Sabine Wilcox.

Structurally the field appears to be a large nose extending southeast from the Cheneyville salt dome, securing its northwest closure from a very complex system of normal faults. A total relief of about 400 feet on the top of the Wilcox has been established by the drill, with a maximum elevation of 300 feet of the producing sand above its water level. The field has produced 4,561,544 barrels of oil to December 1, 1940, from about 1,750 acres. The probable ultimate recovery is more than 60 million barrels, indicating Eola to be one of the major petroleum reserves in the area.—*Author's abstract.*

6275. Birkenhauer, H. F., The Illinois earthquake of November 23, 1939 [abstract]: Missouri Acad. Sci. Proc., vol. 6, No. 4, p. 91, Columbia, Mo., 1940.

Investigation of the earthquake of November 23, 1939, has shown that it was felt over a large area in Illinois, Missouri, and adjacent States. It was only slightly destructive of property even in the region of maximum intensity. The relation of the intensity distribution to local geologic structure is discussed.

6276. Blake, Archie, On the estimation of focal depth from macroseismic data. Seismol. Soc. America Bull., vol. 31, No. 3, pp. 225–232, Berkeley, Calif., 1941.

It has been known that deep earthquakes are felt more widely, for a given epicentral intensity, than shallow ones. Several attempts have been made to express this tendency in precise form for the estimation of focal depth. The purpose of this paper is to discuss the shortcomings of the formulas that have been tried and certain ways in which they may be improved. It is noteworthy that while the inverse square of the distance of the observer from the earthquake focus is insufficient to account for the falling off of the intensity, the introduction of an absorption coefficient is not a satisfactory method of dealing with the lack.—*Author's abstract.*

6277. Campbell, F. F., Deep correlation reflections near Hoskins Mound salt dome: Geophysics, vol. 6, No. 3, pp. 259–263, Menasha, Wis., 1941.

Seismograph records shot north of Hoskins Mound salt dome are presented which show correlatable reflections beyond 4 seconds. Faulting and a major unconformity are suggested to explain the observed data.—*Author's abstract.*

6278. Galanopulos, A., Gleichzeitige Erdbebentätigkeit im Ionischen und Ägäischen Gebiet [Coincident earthquake activity in the Ionian and Aegean regions]: Gerlands Beitr. Geophysik, vol. 57, No. 2, pp. 117–121, Leipzig, 1941.

Basing his belief on many macroseismic observations of simultaneous seismic action in the Ionian Sea and the Aegean Archipelago between 1859 and 1930, the author shows in a summary that the reason presented by N. Criticos for the absence of earthquakes in the Cyclades during the epoch of great quakes in the Ionian Sea cannot be sup-

ported. There is no proof that an equilibrium exists between the seismic forces appearing at the two sides of the Hellenic Peninsula. On the contrary, from comparison with the data collected in this article he shows that these forces appear independently in the Ionian Sea and in the Aegean Archipelago and are caused by movements of blocks the succession of which cannot be reduced to any law.—*Author's abstract, translated by W. A.*

6279. Gutenberg, Beno, and Richter, C. F., Seismicity of the earth: Geol. Soc. America, Special Paper No. 34, 131 pp., New York, 1941.

With the aid of maps the authors discuss the relative seismicity, for a limited period, of all parts of the earth. Their data are chiefly instrumental. They discuss mainly shallow shocks but include also new data on deep-focus shocks. A revised table lists 54 great shocks from 1904 to 1939, and another table lists all large shocks from 1926 to 1933 and epicenters for many others. The earth's surface consists of relatively inactive blocks separated by three active zones: (1) The circum-Pacific zone includes a large majority of shallow shocks, a still larger majority of shocks at intermediate depth, and all the very deep shocks; (2) the Mediterranean and trans-Asiatic zone, in which the epicenters fall along structural trend lines, includes the rest of the large shallow shocks and of the intermediate shocks; (3) narrow belts of shallow shocks extend (*a*) through the Arctic and Atlantic Oceans, following the mid-Atlantic ridge; (*b*) through the western Indian Ocean from Arabia into Antarctica, probably connecting with the south Antillean loop; and (*c*) (a similar but less active belt) along the African rift valleys. The Pacific basin (except in the Hawaiian Islands) and the continental nuclear shields are nearly inactive. Between the stable shields and the active belts are areas of minor to moderate activity, with occasional large shocks. Small shocks apparently occur everywhere. The authors discuss the relation of minor activity to the larger shocks by using southern California as an example. The annual average includes about one great shock, about 100 potentially destructive shocks, and about 1 million shocks potentially strong enough to be felt in a settled area. Seismic energy is released at a mean rate of about 10^7 kw., most of which is in the large shocks.

There is a regular association, with notable regional exceptions, of earthquakes at various depths with volcanoes, gravity anomalies, and oceanic troughs or foredeeps. The several phenomena are frequently found in successive adjoining belts in a particular unilateral order. The persistence of oceanic troughs and gravity anomalies, together with the occurrence of earthquakes, requires in these regions a continuously operating mechanism, such as would be provided by constant subcrustal flow.—*Authors' abstract, condensed by W. A.*

6280. Hayes, R. C., Earthquake origins in the New Zealand region: New Zealand Jour. Sci. Technology, vol. 22, No. 5b, pp. 225b–230b, Wellington, 1941.

A map is presented showing revised earthquake origins in the New Zealand region for the years 1931 and 1936–40, inclusive. The methods of determining epicenters and focal depths are briefly outlined. Attention is drawn to certain regions where shocks frequently originate at depths below normal, and in particular to a zone of deep-

focus shocks which traverses part of the North Island. Some aspects of the deep-focus zone are briefly referred to. The influence of focal depth on the surface effects of earthquakes is illustrated by two isoseismal maps.—*Author's abstract.*

6281. Hayes, R. C., Measurement of earthquake intensity: New Zealand Jour. Sci. Technology, vol. 22, No. 4b, pp. 202b–204b, Wellington, 1941.

The method of assessing the surface effects of earthquakes from noninstrumental reports, and its development in New Zealand, is briefly described. The necessity for using instrumental records for comparing the actual intensity, or magnitude of shocks, is explained. A method employed in southern California is applied to local shocks in New Zealand.—*Author's abstract.*

6282. Heinrich, R. R., A contribution to the seismic history of Missouri: Seismol. Soc. America Bull., vol. 31, No. 3, pp. 187–224, Berkeley, Calif., 1941.

This paper reflects somewhat the growth of interest in local tremors. Although the earthquakes, tabulated by years, showed an increase in the yearly average from 0.6 in 1911 to 4.0 for the years 1930–39, the latter figure seems more nearly correct and the former somewhat low owing to the incomplete data for the first half century following the New Madrid disaster. The earthquakes are listed by years, together with as many of the pertinent details as are available or as space permits. Nearly 85 percent of all seismic activity of Missouri origin comes from two seismic areas—about 60 percent from the New Madrid area and about 25 percent from the St. Marys fault region. A tabulation indicates that most of the earthquakes of strong intensities also come from the area of southeastern Missouri, although only about 7½ percent of the earthquakes recorded since 1816 have been strong enough to endanger life.—*Author's abstract, condensed by W. A.*

6283. Iida, Kumizi, Grands sismographs accélérométriques d'une tonne pour les composantes horizontales et verticales—leurs construction et leurs enregistrements [Large acceleration seismographs of 1 ton for horizontal and vertical components—their construction and their records]: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 18, No. 4, pp. 514–530, 1940.

Good records of weak shocks and of "after shocks" have not been obtained in most places by using small acceleration seismographs because of their relatively limited sensitivity. The author describes two 1-ton acceleration seismographs designed by himself for horizontal and vertical components, the sensitivity of which makes it possible to study more accurately weak shocks, their acceleration, the relation between acceleration and intensity of shocks, and the nature of weak shocks. He compares seismograms of the same earthquakes as recorded by large and small acceleration seismographs.—*W. A.*

6284. Iida, Kumizi, Sur les caractéristiques des ondes séismiques d'après nos observations à l'aide des grands sismographs accélérométriques d'une tonne [On the characteristics of seismic waves according to our observations made with the large 1-ton accelerometer seismographs]: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 18, No. 4, pp. 532–574, 1940.

The following characteristics of seismic waves were studied: (1) Acceleration of weak shocks; (2) maximum frequency of acceleration; (3) relation between the intensity scale and maximum acceleration;

(4) predominant periods of oscillation; (5) relation between the intensity or maximum acceleration and the period of the predominant oscillation; and (6) degree of the decrease of amplitude of acceleration within the shocks.

The results confirmed the following points: (1) Characteristics of weak shocks are, it seems, similar to those of moderately strong shocks, (2) maximum acceleration of weak shocks is less than 0.4 gal., (3) most earthquakes have a small acceleration, and (4) a constant relation is established between the number of shocks and the intensity scale.

From a study of the relation between the predominant periods and the intensity, the author determined that the periods of the predominant weak shocks are relatively short and that these periods have the tendency to increase in accordance with the increase of the distance and of the intensity. He is convinced that a relation exists between seismic shocks and the thickness of the various layers of the earth's crust.—*W. A.*

6285. Iida, Kumizi, On the elastic properties of soil, particularly in relation to its water content: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 18, No. 4, pp. 675–691, 1940.

Iida discusses the results of experimental studies on the elastic and viscous properties of rocks and soils. He obtained by means of the vibration method longitudinal and torsional wave velocities through rocks and soils collected from various places, and he found that the elastic properties were greatly affected by the water content. He established a certain relation between the critical value of water and the amount of clay particles of the soil and derived empirical formulas to express this relation. He investigated 68 samples collected from various localities; tabulates the results as to size of soil particles, density, water content, critical water volume, elastic wave velocity, Poisson's ratio, and locality; and briefly describes an apparatus for accurately measuring the volume of the sample. He also investigated the variation of wave velocity with increase in water content and tabulates the results.—*W. A.*

6286. Kanai, Kiyoshi, and Sezawa, Katsutada, On the problem of instabilities of higher orders in a seismometer: Tokyo Imp. Univ., Earthquake Research Inst., Bull., pt. 1, vol. 18, No. 4, pp. 483–496, 1940, and pt. 2, vol. 19, No. 1, pp. 9–13, 1941.

In part 1 the writers ascertain both mathematically and experimentally the various vibrational frequencies at which a seismometer becomes unstable. They show that if the damping of a seismometer is great, the instability of any order is unlikely to occur unless the vibration amplitude of the ground is extremely large. They restrict the problem to that condition in which a seismometer becomes unstable and are not concerned with the vibrational state, whether in the stable or the unstable condition. They made experimental investigations by using a vibration table constructed by themselves, the general arrangement of which they describe. They compare the experimental and mathematical results and give graphs to show the vibration amplitudes at various vibration frequencies.

In part 2 they investigate the damping coefficient of a seismometer for both stable and unstable conditions when the ground moved at right angles to the direction of the pendulum oscillation. The results of the mathematical investigations agreed well with the experimental

ones. The writers conclude that although the instability of a seismometer can be prevented by merely changing its damping, the same sensitivity cannot be kept invariably if the ground moves as mentioned above.—*W. A.*

6287. Kishinouye, Fuyuhiko, A supplement to A. W. Lee's paper "A world-wide survey of microseismic disturbances recorded during January 1930": Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 18, No. 4, pp. 507–513, 1940.

The writer compares the amplitudes and periods of the microseisms given by Lee for other parts of the world (see Geophys. Abstracts 77, No. 2702) with those observed during the same time at the Seismological Institute and with those recorded at the Central Meteorological Observatory, both in Tokyo. He tabulates the microseisms and shows graphically the diurnal variations of the microseisms.—*W. A.*

6288. Lufcy, Carroll, The construction and operation of the Wood-Anderson seismograph [abstract]: Missouri Acad. Sci. Proc., vol. 6, No. 4, p. 90, Columbia, Mo., 1940.

The Wood-Anderson torsion seismometer was developed for the registration of short-period local earth disturbances. It is of the horizontal pendulum type, in which the inertia mass is attached eccentrically to a taut suspension. The suspension system is magnetically damped. The inertia mass, a cylinder 2½ cm. long and 2 mm. in diameter, hangs in the field of a permanent magnet. Photographic registration is employed, giving a magnification of about 2,500. The recording surface consists of a sheet of photographic paper, 92 cm. by 30 cm., wrapped around a revolving drum which is driven by a weight of about 180 pounds, controlled by a ball governor.

6289. Nakamura, S. T., On the period and damping of seismometers: Tohoku Imp. Univ. Sci. Repts., vol. 29, No. 4, pp. 542–561, Sendai, Japan, 1941.

The writer discusses what period and damping of seismometer are to be used to obtain the best reliable records. He emphasizes the lag of time on record. The "best reliable record," as defined in this paper, means that (1) there is no sensible difference of sensibility for the earth's movements having different periods within certain limits; (2) there is no sensible lag of time, or sensible difference of lag of time, for the same earth's movements; and (3) the sensibility is markedly lowered for other earth's movements having periods beyond the limits within which the seismometer is safely available.—*Author's abstract.*

6290. Olson, W. S., Seismic-velocity variations in San Joaquin Valley, Calif.: Am. Assoc. Petroleum Geologists Bull., vol. 25, No. 7, pp. 1343–1362, Tulsa, Okla., 1941.

Velocity data have been obtained in approximately 80 wells in the San Joaquin Valley, largely due to the efforts of the Cooperative Well Velocity Surveying Group, organized in July 1938. Analysis of these data has revealed the existence of rapid lateral changes in velocity which fit into a regional pattern. The causes of the variations are discussed, also their effect on seismic-reflection mapping. Some methods for correcting reflection-survey data are considered.—*Author's abstract.*

6291. Prescott, H. R., Seismic receptors: Geophysics, vol. 6, No. 3, pp. 221–244, Menasha, Wis., 1941.

Development of equations of seismic receptor for both the steady-state and dynamic case is given, illustrated by curves of steady-state lag and steady-state response for various degrees of damping and also illustrated by graphs of response to transient impulses. A simple method of accurately obtaining the steady-state displacement response and degree of damping is given.—*Author's abstract.*

6292. Ricker, Norman, A note on the determination of the viscosity of shale from the measurement of wavelet breadth: Geophysics, vol. 6, No. 3, pp. 254–258, Menasha, Wis., 1941.

From the breadth of a wavelet for a given traveltime, it is possible to calculate the viscosity of the formation through which the seismic disturbance has passed. This calculation has been carried out for the Cretaceous shale of eastern Colorado, and the value thus found ranges from 2.7×10^7 to 4.9×10^7, with a mean value of 3.8×10^7 grams per centimeter per second.—*Author's abstract.*

6293. Seismological data from India [editorial]: Nature, vol. 148, No. 3745, p. 164, London, 1941.

Valuable seismological data for the period January–March 1940 are contained in the Seismological Bulletin of the Government of India Meteorological Department, published under the direction of Dr. C. W. B. Normand. Interpretations of the seismograms obtained at the observatories of Agra, Bombay, Calcutta, Colombo, Dehra Dun, Hyderabad, and Kodaikanal are given in detail. At the Upper Air Observatory at Agra 94 earthquakes and tremors were recorded instrumentally during the quarter, and for each one the type of wave with its arrival time, occasionally its period and amplitude, and the estimated epicentral distance and depth of focus are given.—*Condensed by W. A.*

6294. Sezawa, Katsutada, and Kanai, Kiyoshi, A fault surface or a block absorbs seismic-wave energy: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 18, No. 4, pp. 465–482, 1940.

The writers discuss mathematically first a case in which elastic waves are transmitted normally to the discontinuity, then one involving two discontinuities, and finally one in which waves are transmitted obliquely to the discontinuity. They give a general summary of the results.—*W. A.*

6295. Sezawa, Katsutada, and Kanai, Kiyoshi, Viscosity distribution within the earth, Part 2, On the shadow zone for seismic waves: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 19, No. 1, pp. 14–25, 1941.

In investigating the origin of the shadow zone for seismic waves at an epicentral distance near 10° of arc, the writers considered two conditions of the crust—the critical state of the refracting angle of the waves, and the viscosity distribution within the earth. They examined actual seismic records of various epicentral distances with these conditions in mind. It appears that the viscosity in the layer shallower than 70 km. is less than 10^{10} C. G. S., whereas that in the layer between 70 km. and 100 km. is of the order between 10^{10} and and 10^{11} C. G. S. The increase in viscosity is probably due to a change of rock state from crystalline to vitreous. At depths greater than 100

km. the viscosity is much less than 10^{10} C. G. S. The viscosity in the layer that is deeper than 100 km. decreases with increasing depth and finally tends to 10^{5} C. G. S. at a great depth, say 1,000 or 2,000 km.—*Authors' abstract, condensed by W. A.*

6296. Sulkowski, E. L., The use of the thyratron in an earthquake-alarm system: Seismol. Soc. America Bull., vol. 31, No. 3, pp. 239–244, Berkeley, Calif., 1941.

Described in this paper is a unit designed to give some form of earthquake alarm. This unit is particularly useful where photographic recording methods are used, since the seismologist ordinarily does not know of the occurrence of seismic activity until he develops his records, and thus his knowledge of the occurrence of an earthquake may be nearly 24 hours late. Of particular interest is the fact that this system gives an alarm only if the earthquake shows well-developed preliminary seismic phases, thus eliminating the possibility of useless changing of records for earthquakes which may show only strong surface waves but little else. Further work is being done in the calibration of the instrument. It is of interest to know the actual amount of energy necessary to activate the mechanism.—*Author's abstract.*

6297. Taylor, F., Detailed exploration finds new fields in Oklahoma: Oil Weekly, vol. 101, No. 2, pp. 26–29, Houston, Tex., 1941.

Seismic exploratory work has been undertaken in areas in Creek, western Okmulgee, northern Hughes, eastern Seminole, and Okfuskee Counties, Okla., and, although the areas had been previously explored by the drill, 17 new fields were found. Other areas in Oklahoma appear to merit reexamination. The logs of old wells were examined and their indications tested by the reflection seismograph, with 12 geophone locations between shot points one-fourth mile apart. The seismic method has given a high percentage of discoveries in central Oklahoma in the past few years.—*W. A.*

Two new geophysical instruments [editorial]: *See* Geophys. Abstract 6254.

Wilson, J. M., South Cotton Lake field, Chambers County, Tex. *See* Geophys. Abstract 6256.

6298. Wood, H. O., Seismic activity in the Imperial Valley, Calif.: Seismol. Soc. America Bull., vol. 31, No. 3, pp. 245–254, Berkeley, Calif., 1941.

Following a brief résumé of the historical record of the occupation of the Imperial Valley by people, and of the earthquakes reported felt, there are given estimates of the number of such shocks which are judged to pertain to the immediate region for the intervals (*a*) 1769 to June 10, 1902, and (*b*) June 10, 1902, through May 1940; also the number of such shocks instrumentally recorded but not reported felt during the interval October 1926 through May 1940, with a few brief interruptions. These lists make it clear that the Valley region has long been markedly active, but not so greatly so as some similar districts elsewhere. Dates and brief descriptions are given for a number of the more important shocks, and the effect of the May 18, 1940, shock is appraised briefly.—*Author's abstract.*

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4. ELECTRICAL METHODS

Gilchrist, Lachlan, Recent magnetic and electrical geophysical investigations on the surface and in drill holes in regions containing gas, oil, and other minerals, and the correlation of the results of the investigations. *See* Geophys. Abstract 6260.

6299. Jensen, W. J., Some possibilities and limitations of ore locators [abstract]: Missouri Acad. Sci. Proc., vol. 6, No. 4, p. 91, Columbia, Mo., 1940.

Several different types of metal locators or "treasure finders" are described, and their possibilities and limitations are discussed. It is pointed out that the response to an electromagnetic impulse is a function of the absolute conductivity of the conducting body and varies inversely as about the cube of the ratio of depth to size of the body. Therefore, in practice it is necessary to have a metallic conductor so situated that it can be approached within a few feet before it can be located with the so-called treasure finder. When it is remembered that only a few ores are metallic conductors, it becomes apparent that the use of such devices in any general prospecting program can hardly be justified.

6300. Kelly, S. F., Geological studies of vanadium-uranium deposits by geophysical-exploration methods: Mining Cong. Jour., vol. 27, No. 8, pp. 27–35, Washington, D. C., 1941.

Kelly describes the successful application of resistivity methods, supplemented by radioactive measurements, to the delineation of certain structural features with which vanadium-uranium ores are associated in an area in southwestern Colorado, near the confluence of the Dolores and San Miguel Rivers. Electrical profiles illustrate the results of the resistivity survey. The writer used a Geiger-Müller counter for the radioactive tests.—*W. A.*

6301. Petrowsky, A. A., and Dostovalov, B. N., The method of horizontal antenna as applied to the measurement of the glacier cover: Acad. sci. U. R. S. S. Comptes rendus (Doklady), vol. 31, No. 3, pp. 255–257, Moscow, 1941.

As early as 1929 the German physicist Stern reported a wave-length method for measuring the thickness of ice (see Geophys. Abstracts 10, p. 15). Petrowsky and Dostovalov describe the experiments made by them in 1939–40, in which they used the method suggested by Stern. They show the results of their observations in tables and diagrams. They use these results as a basis for the special design of a device to be named the "capacitative measurer of soil freezing," the purpose of which is to determine the thickness of the frozen upper layer of ground without breaking its continuity.—*W. A.*

6302. Roman, Irwin, Superposition in the interpretation of two-layer earth-resistivity curves: U. S. Geol. Survey Bull, 927–A, 18 pp., Washington, D. C., 1941.

A method is presented for the interpretation of data on electrical resistivity by the superposition of standard reference curves on those obtained from field observations. This method is applicable where bedrock whose average resistivity is essentially uniform is overlain by overburden whose average resistivity is also uniform but markedly distinct. Instructions for using this method are so given that the routine

work may be done by persons not trained in geophysics or advanced mathematics. These instructions are followed by a discussion of the applicability of the method, whose reliability is affected by many factors. Bedrock and overburden, for example, may each comprise many different layers that do not materially affect the homogeneity and isotropism of the formations as a whole; on the other hand, individual layers may affect so large a part of the resistivity curve that the method cannot be applied. In spite of such conditions, however, partial superposition may give valuable qualitative results. If the resistivity curve is unique, the superposition method should give essentially exact results; if several curves are very similar, or if a curve has a very slight degree of curvature, the results of superposition will be correspondingly indefinite.—*Author's abstract.*

6303. Simmons, H. F., Applying formation logging through mud analysis: Oil and Gas Jour., vol. 40, No. 21, pp. 33–37, Tulsa, Okla., 1941.

The mud-logging procedure has two major applications, the locating of possible pay zones and the obtaining of information that will aid the operator in selecting the proper completion procedure. J. T. Hayward has described the method and instruments (see Geophys. Abstracts 104, No. 5942, and 106, No. 6178). The writer gives examples of several logs showing the data of formations.—*W. A.*

6304. Way, H. J. R., Geophysical prospecting for water in Uganda: Mining Mag., vol. 65, No. 2, pp. 63–69, London, 1941.

The writer describes an application of the resistivity method to the selection of a site for water boring and shows how the field curves may be interpreted theoretically. In prospecting for water in Uganda the criteria of apparent resistivity curves, which are useful in helping to decide the relative merits of sites, are as follows: (1) The position of the minimum, that is, the value of the apparent resistivity at the minimum and its depth from the surface; and (2) the shape of the minimum which, of course, depends on the average gradients on both sides of the minimum. The writer is continuing his work, and when sufficient statistics are available he will show the results of his work and will give resistivity data so that the hypotheses presented in this article may be substantiated.—*W. A.*

5. RADIOACTIVE METHODS

6305. Pontecorvo, Bruno, Neutron well logging—A new geological method based on nuclear physics: Oil and Gas Jour., vol. 40, No. 18, pp. 32-33, Tulsa, Okla., 1941.

This article gives a preliminary discussion of a new well-logging process adapted for use in cased and uncased wells. The process involves a neutron source and an ionization chamber. The logs show remarkable detail, and the neutron curve adds information that makes it possible to distinguish many types of strata not hitherto recognizable. The writer hopes that the new curve will (1) distinguish limestones from sandstones, and shales from the various rock formations that consist of other materials mingled with shale, and (2) enable investigators to find new and useful correlation horizons in shales and to gather comparative information that will help in the problem of the fluid content. The equipment is similar to that used for well logging by radioactivity.—*W. A.*

6306. Russell, W. L., Well logging by radioactivity: Am. Assoc. Petroleum Geologists Bull., vol. 25, No. 9, pp. 1768–1788, Tulsa., Okla., 1941.

Radioactivity logging is the only known method of making accurate lithologic records through the casing and cement. The radioactivity of the strata is determined by measuring the variations in conductivity produced by gamma rays in the gas in an ionization chamber contained in the subsurface instrument. It has been found that each formation tends to produce a curve of characteristic shape on the radioactivity logs and that some of these characteristic curves are highly persistent laterally. At present the radioactivity logs are used chiefly to determine the position of the producing sands behind the casing in order that the pipe may be perforated to drain them most effectively, and the process has been highly successful in this use. Other applications consist in determining the amount of sample lag, making correlations and cross sections, mapping subsurface structure for deeper drilling, and surveying potash deposits. A similar process may be used in making radioactivity surveys at the surface and in mines. A method has also been developed for determining the radioactivities of cores and samples, which has proved its value in interpreting the logs and in solving problems of sedimentation.—*Author's abstract.*

6307. Urry, W. D., and Piggot, C. S., Apparatus for determination of small quantities of radium: Am. Jour. Sci., vol. 239, No. 9, pp. 633–657, New Haven, Conn., 1941.

The apparatus here described incorporates the best features of previous designs and has demonstrated its ability to evaluate 1×10^{-14} gram of radium within an observational period of 20 hours. Its advantages include high precision, elimination of fluxes and chemical manipulation, automatic compensation of extraneous ionizations, automatic calibration every hour, and continuous recording over any desired number of hours. The permanent record is made on motion-picture film on which are also recorded all the scales necessary for subsequent calculations. This important feature eliminates the necessity for the use of any external measurement and makes evaluation a mere matter of counting.—*Authors' abstract.*

6. GEOTHERMAL METHODS

6308. Tasman, C. E., Temperature measurements in wells in southeastern Turkey: Am. Assoc. Petroleum Geologists Bull., vol. 25, No. 10, p. 1937, Tulsa, Okla., 1941.

A table gives the temperature measurements obtained in the three Ramandag wells in southeastern Turkey, which, on account of the abnormally high gradients indicated, are worth recording.

	R_1	R_2	R_3
Depth.....meters..	1,000	1,111	1,052
Time.....minutes..	20	15	20
Surface temperature.....°C..	9.6	12.6	24
Average of two thermometers.....do....	72.4	78.3	74.7
Average annual temperature of region.....do....	16	16	16
Temperature gradient.....meters per °C..	17.20	17.35	17.58
Do.....feet per °F..	31.3	31.6	32.0

The average rise in temperature of 1° per 31.6 feet may be compared with the table presented by C. E. Van Ostrand in "Problems of petroleum

geology" (see Am. Assoc. Petroleum Geologists Bull., 1934, p. 1021, table III), in which he gives the temperature gradients in 670 wells in 23 States. In his table the steepest gradient recorded is 1° F. per 20.4 feet; the lowest, a gradient of 1° F. per 251.0 feet. The results from nearly 700 wells show only 40 records of a temperature gradient less than 1° F. per 31.6 feet.—*Author's note, condensed by W. A.*

7. GEOCHEMICAL METHODS

6309. Ransone, W. R., Geochemical well logging: Geophysics, vol. 6, No. 3, pp. 287–293, Menasha, Wis., 1941.

The collection of well cuttings and their analysis and subsequent plotting as a geochemical well log are briefly discussed. Numerous and varied examples of actual chemlogs are presented. These illustrate specific applications and also may be employed to form an opinion of the usefulness of the method.—*Author's abstract.*

8. UNCLASSIFIED METHODS

6310. Born, W. T., The future of geophysics: Geophysics, vol. 6, No. 3, pp. 213–220, Menasha, Wis., 1941.

The writer gives a brief review both of the present exploratory activities of geophysics in the petroleum industry and of the future possibilities of geophysics. He discusses the development and experimental work in the field of geophysical prospecting, especially by seismic, gravimetric, and electrical methods, and mentions the development of a direct method of locating oil by geochemical methods, but he states that no conclusive results are available yet. He considers that the electrical logging of boreholes and the recent introduction of radioactivity logs of boreholes are valuable contributions of geophysicists to the oil industry. In conclusion he expresses a hope that the disturbed world conditions will not be allowed to interfere with the development of the geophysical arts as applied in the oil industry.—*W. A.*

6311. Emery, K. O., and Dietz, R. S., Gravity coring instrument and mechanics of sediment coring: Geol. Soc. America Bull., vol. 52, No. 10, pp. 1685–1714, Washington, D. C., 1941.

A gravity-type coring apparatus, which is used on the research vessel *E. W. Scripps* of the Scripps Institution of Oceanography for taking sediment samples of the ocean floor, is described. With this instrument more than 200 cores have been taken in many types of sediment. The 174 mud cores have an average length of 6 ft. 3 in. and a maximum length of 16 ft. 9 in. Data from a number of experiments and from field coring operations were analysed in order to improve the design of the device and to permit proper interpretation of core samples. A detailed study was made to explain the observation that the length of the cores average about 50 percent of the depth of penetration of the core barrel. Laboratory coring experiments using mud of uniform water content show that, as the core barrel penetrates the mud, progressively smaller increments of core are added throughout the entire depth of penetration. However, studies of cores taken on a tidal flat and others obtained in field operations show that the size of core increments per unit of penetration remains practically constant with increasing penetration.—*Authors' abstract.*

6312. Graff, A., Barometric altimeter as an aid to geophysical prospecting: Internat. Oil, vol. 1, No. 2, pp. 69–71, July 1940.

A recently developed barometric altimeter useful for measuring differences in elevation between well-surveyed stations is described. The instrument is similar in principle to a mercury barometer but uses a liquid similar to alcohol, which permits a sensitivity about 10 times that obtainable with mercury. The instrument weighs some 16 lbs. and is well insulated from temperature changes and carries a thermostat-controlled heating element to keep the temperature constant. Elevations with an accuracy within 1 ft. are obtainable if operations are within 2 miles of a base station and the base is not left for a longer time than 30 min. The use of a base-station instrument for daily barometric changes is recommended for very high accuracy work. The application of the instrument is discussed, and pictures and diagrams of it are given.—*D. W., Mines Mag., vol 31, No. 7, 1941.*

6313. Howard, W. V., Many sciences called into use in oil exploration: Oil and Gas Jour., vol. 38, No. 44, pp. 24–26, Tulsa, Okla., 1940.

The first of a series of articles relative to oil exploration and development, showing the importance and the tying in of various new scientific inventions and discoveries to oil work. Specifically, the recent gamma-ray well logging and the possibilities of use of the mass spectograph are discussed. The writer shows the ever-increasing complexity of science and the degree of specialization that has taken place in certain branches of geology.—*D. W., Mines Mag., vol. 31, No. 7, 1941.*

6314. Jenny, W. P., Geological and geophysical profiles through the Eola field, Louisiana: Oil and Gas Jour., vol. 40, No. 18, pp. 42–44, Tulsa, Okla., 1941.

It is generally known that large unconformities may occur between the Wilcox and Cockfield formations on structures along the Sparta-Wilcox trend of Texas and Louisiana. Yet the idea still prevails that Cockfield wells, drilled within the general area of a geophysical prospect, should somehow be of significance in judging the correctness of the geophysical information or that the apparent regularity of scattered Cockfield wells should offer sufficient proof of similar conditions in the lower beds. Results of a study described in this article show that although extremely high or low structure in Cockfield wells may have some bearing on Wilcox structures, too much weight should not be placed on Cockfield wells in appraising deeper structures.—*W. A.*

6315. Piggot, C. S., Factors involved in submarine core sampling: Geol. Soc. America Bull., vol. 52, No. 10, pp. 1513–1524, Washington, D. C., 1941.

The unconsolidated condition of deep ocean-bottom sediments and their remoteness from the operator place definite limitations upon the design of apparatus and the technique of obtaining core samples of them. The varved clays of glacial lake bottoms, while not identical with deep-ocean sediments, are sufficiently similar to warrant some comparisons and provide a means of estimating the factors affecting the validity of a core taken from the ocean bottom. Tests indicate that cores are not so long as the instrument penetration but that they contain material from depths greater than the core length. Relationships have been established that indicate the corrections that must be applied to an ocean-botton core and require only the measurement of the core itself.—*Author's abstract.*

6316. Sezawa, Katsutada, and Kanai, Kiyoshi, Thermodynamical origin of the earth's core, part 2: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 19, No. 1, pp. 1–8, 1941.

For part 1, see Geophysical Abstracts 105, No. 6071.

On the assumption that the earth's core is gaseous, the polytropic condition of the gaseous part is investigated mathematically. From the conditions of density, pressure, and longitudinal waves in the core it is likely that the polytropic index of the gas is nearly $n = 0.3$. On the other hand, the condensation of the primitive gaseous ball of the earth was considered separately, from which it was ascertained that the polytropic index of the ball should also be $n = 0.3$. It was concluded that in the beginning stage of the earth the gaseous part that was not condensed was sealed near the central region of the ball and pressed from outside, the temperature of the gaseous part having increased with increasing pressure. However, this condition may be an idealized case of the state shown by Lynch, that is, the state of a gas heavily occluded by a metal.—*Authors' abstract.*

6317. Thompson, C. L., The evolution of geophysics on the Louisiana Gulf coast: Oil, vol. 1, No. 7, pp. 16–18, New Orleans, La., 1941.

A brief outline, illustrated by diagrams, is given of the geophysical methods of prospecting by the refraction seismograph, torsion balance, reflection seismograph, magnetometer, and soil testing.—*W. A.*

6318. Willis, Bailey, and Willis, Robin, Eruptivity and mountain building: Geol. Soc. America Bull., vol. 52, No. 10, pp. 1643–1684, Washington, D. C., 1941.

The following paper presents the concept that the terrestrial globe has hot spots where melting follows upon gradual heating by radioactive energy and that in connection with such spots orogenic disturbances may develop. It is suggested that the growth of a molten body produces uplift; uplift results in unbalanced load; unbalanced load tends to cause lateral creep; heat from the molten body initiates expansion in the cover and also reduces strength of rock; creep becomes plastic flow by intimate, low-angle shearing; when shearing progresses to displacements on structure planes of crystal lattices atoms are forced out of balanced positions and jump into new ones; crystals are thus elongated and the crystalline rock mass is expanded accordingly; a very powerful thrust is thus set up and the opposing rock mass is sheared on a level at or near the top of the molten body; the magma transmits hydrostatically the pressure exerted upon it by the wall at the deep level of its bottom; relatively great pressure causes it to intrude the major shear at the base of the expanding segment and to lubricate it; the dynamic elongation of the cover and the lifting power of the magma combine to thrust the segment forward and upward, and it appears at the surface as a mountain uplift, characterized by sheared and folded rocks in association with intrusives. Emphasis is laid upon the fact that the rate of heat generation is extremely slow and the cycle of an orogeny should comprise the stages of initiation, gestation, upthrust, and decadence, that is, the time lapse of millions of years from peneplain to peneplain, but not the succeeding period of stability.—*Authors' abstract.*

6319. Woollard, G. P., Geophysical methods of exploration and their application to geological problems in New Jersey: New Jersey Dept. Cons. Devel., Geol. ser., Bull. 54, 89 pp., Trenton, 1941.

The report is divided into three parts. Part 1 defines the term geophysics, describes its applications, its particular use in geologic work, as well as the relative cost of different types of geophysical work; part 2 is a brief summary of the various methods of geophysical examination that are now being applied to geologic problems; and part 3 describes the actual investigations that have been made in New Jersey.

In summarizing the geophysical investigations that have been conducted in New Jersey the author concludes that (1) geophysics has a real role in geologic investigations; (2) certain methods have more value than others in obtaining data on different types of geologic problems; (3) marked advantages are gained in having more than one type of geophysical data for the same area; (4) definite advantages are gained in combining geophysical knowledge with what is known of geology; and (5) a knowledge of geology is necessary in understanding many physical phenomena.—*W. A.*

9. NEW PUBLICATIONS

6320. DeVries, Louis, French-English science dictionary, 546 pp., New York and London, McGraw-Hill Book Co., Inc., 1940. Price, $3.50.

This dictionary of 43,000 entries is designed for students in agricultural, biological, and physical sciences.—*W. A.*

6321. Lambert, W. D., Report on earth tides: U. S. Coast and Geod. Survey, Special Pub. 223, 24 pp., Washington, D. C., 1940.

Recent work on tides in the solid earth is classified and discussed under the following heads: Deflections of the vertical referred to the adjacent ground (measured geodetically), deflections referred to the earth's axis (measured astronomically), and tidal variations in gravity at a given station. Tides in wells remote from the sea are also discussed as manifestations of earth tides, and an appendix suggests the use of a dilatometer for observing similar effects. Instrumental and theoretical advances are described. The author concludes that the main obstacle to further advance is still the difficulty of interpreting the available results in terms of the earth as a whole and of the local geologic structure.—*A. H., Sci. Abstracts, vol. 44, No. 523, 1941.*

6322. Lane, A. C., Report of the committee on the measurement of geologic time, 1940–41: Nat. Research Council Bull., 121 pp., Washington, D. C., September 1941.

This report, which was read by A. C. Lane, chairman of the committee, at the annual meeting of the Division of Geology and Geography, National Research Council, discusses the work of A. O. Nier, W. Wahl, E. Gleditsch, N. B. Keevil, E. S. Larsen, C. S. Piggot, W. D. Urry, and the Massachusetts Institute of Technology; contains a supplementary report by the chairman, as well as a report by the vice chairman, J. P. Marble, and by J. M. Lopez de Azcona; presents geothermal data; gives the condensed minutes of committee meetings held during the year; and lists an annotated bibliography of articles about geologic time.—*W. A.*

6323. Leven, D. D., Done in oil, 1084 pp., illus., maps, tables, New York, Ranger Press, Inc., 1941. Price, $10.

This book contains the following six main sections: (1) The cavalcade of oil; (2) Finding and producing oil; (3) Transporting, refining, and marketing oil; (4) Financing the oil industry; (5) The oil royalty business; and (6) Regulation of securities and markets. Geophysical methods of prospecting are discussed briefly in section 2. A glossary of terms used in the petroleum industry occupies 42 pages. A bibliography and an index to text complete the book.—*W. A.*

6324. National Research Council, Transactions of the American Geophysical Union, 22d annual meeting, April 30–May 3, 1940.

Part 2 contains the following reports and papers:

Section of Geodesy: The international association of geodesy, by W. D. Lambert; A determination of astronomical refraction from physical data, by J. E. Willis; The readjustment of the first-order leveling in the alluvial valley of the Mississippi River, by C. J. Clifford; Organization of geodetic and precise data for National defense, by W. F. Barck; Recent progress in geodetic surveys of the United States Coast and Geodetic Survey, by H. W. Hemple; On the strength of figures used in triangulation reconnaissance, by Ching-Hai Li; A transcontinental gravitational traverse and its relation to regional geology, by G. P. Woollard; Gravity and magnetic studies along the Paleozoic-Triassic contact in eastern Pennsylvania, by J. B. Hersey; A gravity profile across the central Appalachians, Buckhannon, W. Va., to Swift Run Gap, Va., by Sigmund Hammer and E. T. Heck; and Barco geodetic survey, Santander del Norte, Colombia, South America, by F. W. Hough.

Section of Seismology: Seismology in the United States—a retrospect, by J. B. Macelwane; The international situation as it concerns seismology, by N. H. Heck; Progress report, Canadian seismological stations, by W. W. Doxsee; The Sprengnether vertical seismograph, by J. B. Macelwane and W. F. Sprengnether, Jr.; A comparison of *P*-phases as registered by high- and low-magnification seismographs, by H. E. McComb; Fluctuations of water level in wells in the Los Angeles Basin, Calif., during five strong earthquakes, 1933–40, by G. A. LaRocque, Jr.; Earthquake records of epicentral distance of about 20°, by Daniel Linehan; The possibility of seismic measurement of the rotation of the earth's core, by Archie Blake; The propagation of an *SH*-pulse in a layered medium, by C. L. Pekeris; and Progress report on seismological activities of the United States Coast and Geodetic Survey, April 1, 1940, to March 31, 1941, by R. R. Bodle.

Eastern Section, Seismological Society of America and Section of Seismology, joint meeting: Rock-burst research at Lake Shore mines, Kirkland Lake, Ontario, by E. A. Hodgson; The analysis of the El Centro record of the Imperial Valley earthquake of May 18, 1940, by Frank Neumann; Amateur seismology, by Joseph Lynch; Earthquakes of the northeastern section of the United States and eastern Canada during the years 1938, 1939, and 1940, by Daniel Linehan and L. D. Leet; The Moodus earthquakes and the cause of earthquakes in New England, by E. L. Perry; Instrumental study of the New Hampshire earthquakes of December 1940, by L. D. Leet and Daniel Linehan; Macroseismic study of the New Hampshire earthquakes of December 1940, by J. Devlin, L. C. Langguth, and R. L. Arringdale; The North Carolina earthquake of

December 25, 1940, by V. C. Stechschulte; Traveltime tables for near earthquakes in east-central North America, by E. J. Walter and H. F. Birkenhaver; Surface waves in heterogeneous media, by J. T. Wilson; Trials of galvanometers of various periods with electromagnetic seismometers, by W. A. Lynch; Progress report on periodicity and time series, by Archie Blake; and Report of committee on methods and operations, Eastern Section, Geological Society of America, 1940, E. L. Perry, chairman.

Section of Meteorology: Meteorology in the 1941 Yearbook of Agriculture, by Gove Hambridge; The zonal index and solar activity, by H. H. Clayton; Optics of atmospheric haze, by E. O. Hulburt; Atmospheric-pressure waves near Pasadena, by Beno Gutenberg and H. Benioff; Apparent rate of progress as affected by changing intensity of hurricane San Felipe while crossing Puerto Rico, by C. F. Brooks; Foreshadowing Montana's winter precipitation (verification), by I. I. Schell; The chemical-absorption hygrometer as a meteorological instrument, by C. W. Thornthwaite; Errors in measurements of condensation nuclei, by O. H. Gish and M. L. Phillips; Status of ozone measurements at New York City, by L. Carstensen, C. Hall and A. F. Spilhaus; and Comments on the Weather Bureau's experiment in 5-day weather forecasting, by C. J. Rossby.

Section of Terrestrial Magnetism and Electricity: The reduction of magnetic observations to the mean of the year, by E. H. Vestine; Improvements and modifications to a la-Cour magnetograph, by J. H. Nelson and A. K. Ludy; A computation of the average depth to the bottom of the earth's magnetic crust, based on a statistical study of local magnetic anomalies, by Victor Vacquier and James Affleck; A comparison of two sets of transcontinental magnetic data, by G. P. Woollard; Geomagnetism and the aurora, by C. W. Gartlein; Ionosphere—observations at the 1940 eclipse in Brazil, by T. R. Gilliland; Diurnal variation in electrical resistance of the vertical column of the atmosphere at Watheroo, Western Australia, by G. R. Wait and O. W. Torreson; The production of neutrons by cosmic radiation, by S. A. Korff; An attempt to identify the solar *M*-regions, by R. S. Richardson; Diurnal and seasonal variations in radio reception at broadcast frequencies during the last sunspot cycle, by H. T. Stetson; Magnetic studies by the Geophysical Section of the United States Geological Survey, by F. W. Lee; Researches in terrestrial magnetism and electricity at the Department of Terrestrial Magnetism, Carnegie Institution of Washington, for year April 1940 to March 1941, by J. A. Fleming; and Magnetic work of the United States Coast and Geodetic Survey from April 1940 through March 1941, by N. H. Heck.

Section of Oceanography: Oceanographic activities of the United States Coast and Geodetic Survey, by L. O. Colbert; Recent oceanographic work by the Hydrographic Office of the United States Navy, by G. S. Bryan; Oceanographic work of the United States Coast Guard in the western North Atlantic in 1940 and plans for 1941, by R. R. Waesche; Fine structure of the edge of the Gulf Stream, by A. F. Spilhaus; The summer-time vertical humidity-gradient over the cold water of the San Juan Archipelago, by P. E. Church; Research within physical oceanography and submarine geology at the Scripps Institution of Oceanography during April 1940 to April 1941, by H. U. Sverdrup and staff; and Summary of some results of internal-wave investigations in the North Atlantic, by H. R. Seiwell.

Section of Volcanology: Helium retentivities of minerals, by N. B. Keevil; The effect of pressure on acidity in water solutions, by R. E. Gibson and O. H. Loeffler; Solubility, transport, and crystallization by means of a vapor phase, by Earl Ingerson and G. W. Morey; The velocity of the Big Obsidian Flow, Bend, Oreg., by R. L. Nichols; Atmospheric oxygen and volcanic gases, by R. L. Nichols; Elongate intrusions in eastern Connecticut, by David Keppel; Alkaline and carbonate intrusives in the vicinity of Bancroft, Ontario, by Felix Chayes; Origin of New Jersey magnetite ores, by M. Fraser; Geomagnetic survey of the volcanic areas of Guatemala, by A. G. McNish; Gravity measurements in Guatemala, by F. E. Wright; Volcanic activity at Santa Maria in 1940, by E. G. Zies.

Section of Tectonophysics: Deformation of marble under tension at high pressure, by J. R. Balsley; Ice deformation in the flow of the glaciers, by Max Demorest; An experimental approach to dynamic metamorphism, by David Griggs; Some quantitative experiments on a fluid salt-dome model and their geologic implications, by M. B. Dobrin; The effects of simple compression and wetting on the thermal conductivity of rocks, by Harry Clark; The radioactivity of rocks, by Clark Goodman and R. D. Evans; Cooling of the earth, by L. B. Slichter; Cyclic convection currents, by Harvey Brooks; Concluding remarks relative to the thermal history of the earth, by L. H. Adams; The problem of identifying the crustal layer, by Francis Birch; Wave analysis as a clue to the mechanics of earthquakes, by L. D. Leet; and Tectonic processes now in action, by Beno Gutenberg.

Part 3 contains papers relating to the Section of Hydrology, as well as indexes of names and subjects.

Copies of Transactions may be purchased by nonmembers of the Union, as follows: Orders, with check payable to the American Geophysical Union, should be addressed to the General Secretary, American Geophysical Union, 5241 Broad Branch Road, NW., Washington, D. C. Price, part 2, $2.50; part 3, $3.

6325. Pacific Science Association, Proceedings of the 6th Pacific Science Congress, vol. 1, 450 pp., Berkeley and Los Angeles, Calif., Univ. California Press, 1940. Price, $3.50.

The 6th Pacific Science Congress was held at Berkeley, San Francisco, and Stanford University, July 24 to August 12, 1939. This volume contains the following papers on geophysics and geology: (1) Magnetic secular variation in the Pacific area, by E. H. Vestine; (2) Geomagnetism in the Pacific, by J. A. Fleming; (3) The magnetic survey of the United States Coast and Geodetic Survey as applied to the structure of the Pacific area, by N. H. Heck and J. W. Joyce; (4) The earth's magnetic field and its disturbances, measured by cosmic rays, by J. Clay; (5) The ionization balance on the ocean, by J. Clay; (6) Offshore hydrographic surveys of the Pacific coast and their accuracy, by R. R. Lukens; (7) The crustal structure of the New Zealand region as inferred from studies of earthquake waves, by K. E. Bullen; (8) Earthquake epicenters and structure of the Pacific region of North America (northern part), by Perry Byerly; (9) Earthquake epicenters and structure of the Pacific region of North America (southern part), by C. F. Richter; (10) Some problems relating to the initial motion of earthquakes, by H. Kawasumi; (11) Remarques sur quelques enregistrements d'ondes à très courte periode au cours de tremblements de terre éloignée a l'obser-

vatoire du Faière, Papeete, Tahiti, by J. Ravet; (12) The deep-focus earthquakes on the southwest Pacific, by R. C. Hayes; (13) One hundred deep-focus earthquakes in the Netherlands Indies, by H. P. Berlage, Jr.; (14) Deep-focus earthquakes in Japan and its vicinity, by K. Wadati; (15) Deep-focus earthquakes in America, by Beno Gutenberg and C. F. Richter; (16) A summary of the results of studies made in Japan during the period 1933–38 on deformations of the earth's crust, by N. Miyabe; (17) Recent geodetic work of interest to the Pacific Science Congress, by R. B. Lukens; (18) Gravity research in the Pacific, by F. A. Vening Meinesz; (19) On the isostatic equilibrium of the earth's crust, by W. Heiskanen; (20) Observations on the evolution of the Pacific Ocean, by A. L. duToit; (21) The Philippine Archipelago; an illustration of continental growth, by Bailey Willis; (22) The structure of the Pacific Basin, by E. C. Andrews; (23) Études sur les éléments magnétiques dans les possessions françaises du Pacifique, by Madame Salles-Homery; (24) Deviation de la foire de Zi Ka Wei de 1933 a 1939, by R. P. P. LeJay; (26) Pre-Tertiary history of the Sierra Madre Occidentale of Sonora and Chihuahua and some adjacent parts of central Sonora, by R. E. King; (27) Pre-Tertiary intrusives of the Okanogan Valley near the 49th parallel, by K. Krauskopf; (28) The Malay Archipelago in pre-Tertiary time, by J. L. Smit Sibinga; (29) The eastward opening of the Himalayan geosyncline into the Pacific Ocean, by Birbal Sahni; (30) Sedimentation in the Cordilleran geosyncline in Alberta and British Columbia, by P. S. Warren; (31) Pre-Tertiary diastrophism and Plutonism in southern California and Baja California, by A. O. Woodford; (32) The Shuswap rocks of southern British Columbia, by C. A. Cairnes; (33) Paleozoic section in the southern Klamath Mountains, Calif., by N. E. A. Hinds; (34) Pre-Cambrian formations in western North America, by N. E. A. Hinds; (35) Pre-Cambrian in Manchuria and Korea, by S. Nakamura and S. Matsushita; (36) Pre-Cambrian of Arizona basin ranges, by E. D. Wilson; (37) The Cambrian of Manchukuo, by Ruiji Endo; (38) Das Palaeozoikum in Südamerica, by Hans Gerth; (39) The geologic history of the younger Paleozoics in southern Manchukuo, by Mituo Noda; (40) Cambrian deposits in relation to the Pacific Ocean, by C. E. Resser; (41) Permian volcanism in western North America, by H. E. Wheeler; (42) Paleozoic formations of the Japanese Islands, by H. Yabe; (43) Cretaceous sedimentary succession in California and Oregon, by F. M. Anderson; (44) Pre-Tertiary metasomatic processes in the southeastern portion of the Wallowa Mountains of Oregon, by C. E. Goodspeed; (45) Possible interoceanic connections across Mexico during the Jurassic and Cretaceous periods, by R. W. Imlay; (46) Pre-Tertiary correlation in the Pacific Basin with special reference to Oregon and the Philippines, by W. D. Smith; (47) The age of the Coast Range composite batholith of British Columbia, by S. J. Schofield.

6326. Rothé, Edmond, Comptes rendus des séances de la 7e conférence réunie à Washington, D. C., du 4 au 15 Septembre 1939 [Proceedings of the 7th conference, held in Washington, D. C., September 4–15, 1939]: Union géod. géophys. internat., Assoc. séismologie, 359 pp., Toulouse, 1940.

This volume is issued in two languages, English and French. Papers discussed during the seven sessions of the International Geodetic and Geophysical Union are briefly reviewed. In the presidential address, the text of which is given in the appendix, Capt. N. H. Heck notes that

a careful review of reports and of the seismological literature indicates that for the earth as a whole the outstanding improvements and developments in seismology during the past 3 years have not equaled those of some earlier periods. This he explains by the unsettled conditions throughout the world in recent years. He further discusses the trends, present problems, and future needs, both of seismology in general and of the Association.—*W. A.*

6327. Temperature, its measurement and control in science and industry. Papers presented at a symposium held in New York City, November 1939, under the auspices of the American Institute of Physics with the cooperation of the National Bureau of Standards and the National Research Council, 1,362 pp., New York, Reinhold Publishing Corporation, 1941. Price, $11.

A review of this book, which consists of 13 chapters, embracing 130 separate papers by different authors, has been given by R. C. Wells (Am. Assoc. Petroleum Geologists Bull., vol. 25, No. 7, 1941, pp. 1416–1418). He summarizes chapter 11, which is devoted to the oil industry, as follows: "W. D. Mounce discusses in a general way the problems attending temperature measurements in oil wells, and M. C. Terry and J. H. Burney describe thermal prospecting. C. E. Van Orstrand describes his apparatus, shows temperature contours in typical fields, gives the gradients observed in 128 oil fields, and discusses certain theoretical aspects of earth temperatures. He concludes that temperatures in oil fields are dependent largely on four factors: (1) Configuration of the strata; (2) thermal conductivities; (3) depths of basement rocks; and (4) sequence of geological events. Radioactivity may cause a small part of the temperature observed in sediments arched over granite ridges. R. W. French also discusses temperatures in oil wells and M. T. Halbouty the effect of temperatures on drilling, production, cementing operations, and the deposition of paraffine. Halbouty gives thermal gradients in the Texas and Louisiana fields. The last three papers, like most of the other papers in this volume, are followed by fairly complete bibliographies."—*W. A.*

10. PATENTS

6328. Wave-synthesizing network; Paul W. Klipsch, Samuel S. West, Solomon Bilinsky, and Weldon G. McLarry, Houston, Tex.; U. S. patent 2,230,803, issued February 4, 1941.

This invention relates to an apparatus for electrical prospecting comprising means for causing current impulses to flow in the earth; means for indicating the wave form of a potential derived from said current; means for generating another wave form for the purpose of comparison with said potential wave form comprising an impulse generator; means for dividing the potential output of said generator into at least two portions; means for applying each or at least two of said portions to two different time-constant circuits of the reactance-resistance type; and means for taking off a voltage across the resistance of one of said time-constant circuits and a voltage across the reactance of another of said time-constant circuits and combining them to form an output voltage for comparison purposes. Claims allowed, 5.

6329. Optical system; John McDonald Ide, Houston, Tex., assignor to Shell Development Co., San Francisco, Calif., a corporation of Delaware: U. S. patent 2,232,177, issued February 18, 1941.

In an optical system for observing the angular deflection of a movable member of a measuring apparatus, a partially transparent and a totally reflecting mirror normally substantially parallel to each other, one mirror being fixed and one being attached to said movable member; a light source; means for directing a collimated beam of light through said transparent mirror to said totally reflecting mirror in a direction substantially perpendicular to the plane of said mirrors; means for bringing said beam to a focus at a focal plane after its reflection from said mirrors, said focal plane being located on the same side of said mirrors as the light source; and a screen positioned in said focal plane whereby a series of images of the light source is formed on said screen at said focal plane by the interreflections occurring between the mirrors when said mirrors are moved out of parallelism upon an angular displacement of the member supporting one of said mirrors. Claims allowed, 4.

6330. Method of and apparatus for measuring depths in wells; Otto F. Ritzmann, Aspinwall, Pa., assignor to Gulf Research & Development Co., Pittsburgh, Pa., a corporation of Delaware: U. S. patent 2,232,476, issued February 18, 1941.

This invention relates to a method of determining depths in well bores containing liquid partially filling the bore and containing tubing coupled at spaced intervals and extending down to the liquid, comprising the steps of sending down the space between the tubing and the bore a high-frequency explosive sound pulse, a substantial proportion of whose energy is in the form of high-frequency vibrations of frequency higher than 40 cycles; receiving at a point in sound-receiving relationship to the top of the well high-frequency sound vibrations of frequency at least 40 cycles and being several times the frequency of echoes received from the spaced tubing couplings; and recording said high-frequency vibrations, whereby tubing-coupling reflections are individually discernible in the sound-vibration record. Claims allowed, 4.

6331. Exploration with electric impulses; Solomon Bilinsky, Houston, Tex., assignor to E. E. Rosaire, Houston, Tex.: U. S. patent 2,234,956, issued March 18, 1941.

This invention relates to the method of electrical prospecting, which comprises arranging an electric-current source and two electrodes embedded in the earth connected by substantially straight conductors, termed a primary circuit; arranging two other electrodes embedded in the earth connected by substantially straight conductors to a potential indicating instrument constituting a secondary circuit so that its array makes substantially a right angle to the array of primary circuit; causing current from the primary circuit to flow in the earth; detecting the potential produced in the secondary circuit; and observing transmission variation with respect to frequency between primary and secondary circuits. Claims allowed, 3.

6332. Determination of densities of fluids in wells; Raymond T. Cloud, Tulsa, Okla., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,235,064, issued March 18, 1941.

This invention relates to a device for determining well-fluid density, which comprises a weight suspended in said well fluid; a spring opposing the force exerted by gravity on said weight; means responsive to the position of said weight under the influence of gravity; means for raising and lowering the foregoing elements within a well; and means associated with said responsive means for forming an indication corresponding to the position of said weight. Claims allowed, 7.

6333. Equalizer; Paul W. Klipsch, Houston, Tex., assignor to Esme E. Rosaire, Houston, Tex.; U. S. patent 2,238,023, issued April 8, 1941.

This invention relates to an adjustable attenuation equalizer for independently adjusting the transmission loss over a plurality of ranges within a frequency spectrum, said equalizer comprising a base-loss network having a given finite loss and a given image impedance; a plurality of impedances in shunt with each other and with an arm of the base-loss network, each of said impedances comprising reactance in series with a variable resistor; a second plurality of impedances in series with each other and with another arm of said base-loss network, said second impedances each comprising reactance in parallel with a registor which is variable in inverse relation to the resistors contained in the first-mentioned impedances, said second impedances being inverse to said first impedances, said first and second impedances and said base-loss network being arranged to exhibit a constant image impedance in both directions of transmissions for all values of adjustments of the variable resistors. Claims allowed, 9.

6334. Method and apparatus for producing constant amplitude motion; Dunford A. Kelly, Tulsa, Okla., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,238,116, issued April 15, 1941.

This invention relates to a device adapted to produce vibrations of substantially sinusoidal form having an amplitude substantially independent of frequency comprising a relatively large mass; means for resiliently supporting said mass whereby said mass has a relatively low natural frequency of vibration along a given coordinate; a pendulum mounted on said relatively large mass; a relatively small eccentric mass adapted to rotate about an axis parallel to the axis of oscillation of said pendulum and passing through the center of percussion of said pendulum; and means for rotating said relatively small mass. Claims allowed, 7.

6335. Method and apparatus for alternating-current investigation of uncased drill holes; John Jay Jakosky, Los Angeles, Calif., assigner to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware: U. S. patent 2,038,046 (original No.), issued April 21, 1936; re. 21,797, issued May 13, 1941.

This invention relates to a method for determining variations in earth formations penetrated by a drill hole, which comprises lowering a system of electrodes and a source of alternating current in a drill hole; moving said electrodes and source to different depths within said drill hole; supplying alternating current from said source to said

electrodes at different depths; and measuring the electrical impedance of an elementary portion of the penetrated earth formation included in the path of the current flowing between said electrodes at each of said depths, produced by the flow of the alternating current therethrough. Claims allowed, 21.

6336. Method for analysis of seismographic records; Lacoste G. Ellis, Beaumont, Tex., assignor to Sun Oil Co., Philadelphia, Pa., a corporation of New Jersey: U. S. patent 2,243,729, issued May 27, 1941.

This invention relates to a method of seismographic survey comprising creating at a localized source a disturbance in the earth; producing simultaneous variable amplitude records with respect to time, side by side on a strip member, of the vibrations resulting from said disturbance at a plurality of points differently located relative to said source in such fashion that portions of the records alined transversely of the strip are simultaneously formed; and producing a record showing variations with respect to time of the algebraic sum of the instantaneous amplitude values of said records which were produced at predetermined time relationships varying with respect to the time of their production after the occurrence of the disturbance at the source, said composite record being formed by variably scanning portions of the records not alined in the fashion of simultaneously formed portions of the records. Claims allowed, 2.

6337. Resistance thermometer; Whitman D. Mounce, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2,245,700, issued June 17, 1941.

This invention relates to a device for measuring temperature in a borehole filled with fluid comprising an uninsulated electrical conductor arranged for free-heat exchange with the fluid in the borehole and having a resistance which is small compared to that of the fluid in the borehole and which is variable with temperature; means for moving the conductor along the borehole; means for supplying alternating current to said conductor; and means for measuring changes in the impedance of the conductor. Claims allowed, 10.

6338. Electrical logging; Daniel Silverman and Robert W. Stuart, Tulsa, Okla., assignors to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. patent 2,247,417, issued July 1, 1941.

This invention relates to an apparatus for logging a well in the course of the drilling thereof, comprising at least one insulated electrode associated with the drill stem used in drilling said well; a contactor adapted to be inserted into and lowered through said drill stem to a point in the vicinity of said electrode; and means for connecting and disconnecting said contactor from said electrode at will from the top of said well. Claims allowed, 15.

6339. Method and apparatus for investigating subterranean strata; Ralph W. Lohman, South Pasadena, Calif., assignor by mesne assignments to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware: U. S. patent 2,248,101, issued July 8, 1941.

This invention relates to the method of investigating the magnetic flux-density of subterranean formations adjacent to a borehole, which includes lowering a conductive coil into said borehole upon an axis which is in substantially fixed predetermined relation to the plane of

the earth's magnetic field; mechanically applying a substantially constant torque to said coil biasing the plane of the coil away from the plane of the earth's field; applying electric current to said coil so as to react against said mechanically applied torque; and measuring the current required to maintain the plane of said coil in predetermined relation with the plane of the earth's field during variations in the flux density as the coil passes the different strata. Claims allowed, 3.

6340. Method and apparatus for determining the character and points of ingress of well fluids; John B. Gillbergh, Pasadena, Calif.: U. S. patent 2,248,982, issued July 15, 1941.

This invention relates to a method of determining the points of ingress of formation fluids in a borehole, including the steps of filling a test zone of the borehole with a conditioning fluid at pressure sufficiently above formation pressure to prevent flow of formation fluids there into; temporarily lowering the pressure of said conditioning fluid long enough to permit representative bodies of formation fluids to enter the borehole, but not long enough to cause substantial displacement or substantial flow of the bodies; and recording fluid character continuously and simultaneously at a plurality of spaced points in said test zone to reveal progressive diffusion from said bodies as centers. Claims allowed, 27.

6341. Means for analyzing and determining geologic strata; Roland F. Beers, Dallas, Tex.: U. S. patent 2,249,108, issued July 15, 1941.

This invention relates to an apparatus for determining characteristic differences between different geologic strata traversed by a well bore, including an electrical sound generator for continuously generating and transmitting sound into subsurface strata; a pair of vertically spaced sound receivers arranged to be lowered through the bore for receiving seismic waves; and a cathode-ray oscillograph electrically connected with the two receivers for recording difference in the arrival times of sound waves at the receivers, whereby the characteristics of the formation between the receivers may be ascertained. Claims allowed, 4.

6342. Arrangement for measuring temperatures at a distance, particularly in boreholes; Henri Georges Doll, Paris, France, assignor by mesne assignments to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware: U. S. patent 2,249,751, issued July 22, 1941.

This invention relates to an arrangement for measuring temperatures at a distance, particularly in boreholes, comprising a thermometric element of which the resistance varies as a result of temperature variations, the element being lowered into the mud of the borehole; three resistances electrically connected together and to the said element to form a Wheatstone bridge; at least one of the corners of the Wheatstone bridge being lowered into the borehole to the immediate vicinity of the thermometric element; a source of current electrically connected to two opposite corners of the Wheatstone bridge; a plurality of instruments for measuring potential differences; and means for electrically connecting the said instruments at will each to two out of a group of points previously chosen on the Wheatstone bridge resistances, the said instruments being arranged to measure separately

the potential differences subsisting between the points to which they are respectively connected. Claims allowed, 6.

6343. Electrical system for exploring drill holes; Eugene G. Leonardon, Houston, Tex., assignor to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware: U. S. patent 2,249,769, issued July 22, 1941.

This invention relates to a drilling bit having an electrode affixed thereto and forming a part thereof but electrically insulated therefrom. Claims allowed, 11.

6344. Apparatus for testing and sampling well fluids; George Henry Ennis, Long Beach, Calif., assignor of one half to Robert V. Funk, Long Beach, Calif.: U. S. patent 2,249,815, issued July 22, 1941.

In a device adapted to be lowered into a well for obtaining information of a condition therein, the combination of an observation element having indicating means at the top of the well for giving evidence of an observation made of fluid in a zone in the well; a wall forming a sample-receiving chamber; means operative to admit a sample of fluid into said chamber from said zone; and means having operative connection between said sample-receiving chamber and the top of the well for indicating the admission of fluid from said zone into said sample-receiving chamber. Claims allowed, 13.

6345. Method of determining underground structures; John Jay Jakosky, Los Angeles, Calif.: U. S. patent 2,250,024, issued July 22, 1941.

This invention relates to a method of electrical exploration of the subsurface, which comprises establishing a predetermined potential through the earth between a pair of spaced potential electrodes by passing current through the earth between a pair of spaced current electrodes having a known spatial relationship with respect to said potential electrodes and spaced therefrom; repeating this operation with at least one of the current electrodes disposed successively in different portions so as to cause the current to flow through the earth successively in different paths, while controlling the current so as to maintain a regular predetermined relationship in the values of said potential for the different paths of current flow; and measuring the current passed between said current electrodes through each of a plurality of said different current paths. Claims allowed, 19.

6346. Apparatus for locating casing seats; Wilbur J. Crites and William C. Rodgers, Bartlesville, Okla., assignors to Phillips Petroleum Co., a corporation of Delaware: U. S. patent 2,250,703, issued July 29, 1941.

This invention relates to an apparatus for electrically exploring a well bore, comprising an electromagnetic device; a source of electrical potential connected across the device; means for moving the device through the well bore; means for indicating the instant the device is moved to the juncture of regions of different magnetic permeability in the well bore; and a measuring line connected to the device for ascertaining the depth of the device in the well bore. Claims allowed, 2.

6347. Electrical-transient prospecting; Gifford E. White, Fredericksburg, Tex., assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2,251,537, issued August 5, 1941.

This invention relates to the method of determining underground structure, which comprises instituting a difference in direct-current

voltage between spaced points in the ground whereby a transient is initiated in the earth; instituting a change in the direct-current voltage across an electrical network having adjustable constants whereby a transient is initiated in said network; receiving both transients, and adjusting the constants of said electrical network until its transient corresponds, at least in part, to the earth transient. Claims allowed, 14.

6348. Mixing circuit for electrical prospecting; Paul W. Klipsch, Houston, Tex., assignor to E. E. Rosaire, Houston, Tex.: U. S. patent 2,251,549, issued August 5, 1941.

This invention relates to the method of prospecting with varying electrical current, which comprises causing current to flow in the earth's crust; detecting the potential in a region subject to such current; mixing in a line as passive network the detected potential, before amplification thereof, with a synthetic potential; indicating the wave form of the mixed potentials; and maintaining the synthetic potential in synchronism with the generated potential by controlling the generation thereof with the amplified detected potential. Claims allowed, 12.

6349. Means for shooting oil wells; Orland C. Mays, Kermit, Tex.: U. S. patent 2,251,712, issued August 5, 1941.

This invention relates to a bomb for shooting oil wells formed through strata of predetermined contrasting characteristics, said bomb comprising a plurality of containers of dimensions permitting them to be freely lowered into the well to be shot, said containers being mounted for suspension one below another in position to dispose the containers in operative relation to the stratas when the bomb is lowered into the well, said containers being of substantially equal capacity and containing an explosive of a predetermined strength according to the strata to be shattered thereby when an explosion occurs, and a detonator in cooperating relation to each container and being of sufficient strength to detonate the respective charges at their maximum rates of explosion. Claims allowed, 1.

6350. Method of borehole logging; Lawrence F. Athy and Harold R. Prescott, Ponca City, Okla., assignors to Continental Oil Co., Ponca City, Okla., a corporation of Delaware: U. S. patent 2,251,817, issued August 5, 1941.

This invention relates to a method of logging boreholes including the steps of generating an alternating potential; impressing said alternating potential upon a vibratory means; lowering said vibratory means into a borehole, the log of which is being made in predetermined fixed relation to means responsive to vibratory energy; receiving vibratory energy at said energy-responsive means; varying the frequency of said alternating potential; noting the extreme of variation of energy received at said receiving means; and plotting extremes of energy received at said receiving means against depth to obtain the desired borehole log. Claims allowed, 3.

6351. Well surveying; Bernard S. Smith, Galveston, Tex., assignor of 50 percent to J. J. Kane, Galveston, Tex.: U. S. patent 2,251,900, issued August 5, 1941.

This invention relates to a method of determining the nature of the earth formations penetrated by a borehole, comprising passing an electric current through a conductor within the borehole; subjecting the conductor and the surrounding formation to a magnetic flux; and ascer-

taining the effect upon such current of the magnetic field set up in the formation and the conductor. Claims allowed, 23.

6352. Seismic-exploration method; Philip S. Williams, Tulsa, Okla., assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2,253,358, issued August 19, 1941.

This invention relates to a receiving apparatus for seismic waves, comprising a plurality of seismic pickups for converting seismic waves into electrical oscillations; means for algebraically combining the oscillations of said seismic pickups in pairs; means for converting said combined oscillations into unidirectional impulses; and means for recording said impulses. Claims allowed, 6.

6353. 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 2,253,472, issued August 19, 1941.

This invention relates to a remote-controlled apparatus for submarine geophysical prospecting, comprising in combination a submersible supporting container adapted to rest stationary on the floor of bodies of water; a geophysical instrument within the container; adjustable means for supporting the instrument at various inclinations in the container; driving means adapted on operation to move the instrument-supporting means with respect to the container, to level the instrument; electrical level-respective means located in fixed relation to the instrument; electrical level-exhibiting means in electrical connection with the level-responsive means; electrical power means connected to the driving means for operation thereof; and control means for said power means. Claims allowed, 3.

6354. Electrical-prospecting method and apparatus; Charles B. Bazzoni, Wallingford, and Joseph Razek, Llanerch, Pa., assignors to Sperry-Sun Well Surveying Co., Philadelphia, Pa., a corporation of Delaware: U. S. patent 2,253,485, issued August 19, 1941.

This invention relates to means for determining the location and character of formations penetrated by a borehole, comprising an exploring unit, said exploring unit including a generator of high frequency oscillations; means for establishing thereby an electromagnetic field penetrating formations in the vicinity of the borehole, said last-named means forming a part of a tuned portion of the generator circuit; means responsive to variations in operation of the generator circuit due to change of impedance of the field-establishing means resulting from different materials in the vicinity thereof, said responsive means including a tuned wave-meter circuit containing an indicating device and coupled to the generator circuit; and means for supporting said unit for movement within and lengthwise of the borehole. Claims allowed, 22.

6355. Multiple-record electrologging of wells; Lowell C. Beers, Los Angeles, Calif., assignor to Lane-Wells Co., Los Angeles, Calif., a corporation of Delaware: U. S. patent 2,255,754, issued September 16, 1941.

This invention relates to a method of measuring a plurality of electrical characteristics of formation confronting a well bore and transmitting the same to the top of the well bore, characterized by establishing by an input circuit an electrical field in the formation

between a pair of electrodes; measuring in the input circuit the electrical properties of the formation in proximity to said electrodes; sampling the current in the electrical field of said formation more remote from said electrodes; converting the current as sampled to a current distinguishable from the current of said input circuit; feeding said converted current through said input circuit to a measuring means; periodically interrupting the supply of said input circuit and said electrical field; and measuring the natural potential present at said electrodes when said electrical field is interrupted. Claims allowed, 3.

6356. Gravity meter; Dayton H. Clewell and Henry A. Maeder, Dallas, Tex., assignors by mesne assignments to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York: U. S. patent 2,255,876, issued September 16, 1941.

This invention relates to an instrument for measuring gravitational force or variations in gravitational force, which comprises in combination a support; a torsion-head base secured to said support; a V-block torsion head mounted on the torsion-head base, said V-block torsion head having bearing grooves therein of substantially V-shaped cross section; chucks disposed in said grooves; self-equalizing and adjusting means for firmly holding the chucks in the grooves; torsion elements having one of their ends secured to the chucks; and a mass secured to and supported by the free ends of the torsion elements whereby a rotation of the chucks to set up torsional forces in the torsion elements will adjust the sensitivity of the mass to vertical components of gravitational force acting upon it. Claims allowed, 14.

6357. Electrical exploration of the subsurface; John Jay Jakosky, Los Angeles, Calif.: U. S. patent 2,256,742, issued September 23, 1941.

An apparatus for the electrical exploration of the subsurface, a combination which comprises more than two electrodes placed in the earth at points spaced from one another substantially along a line; an electrode device adapted to be moved over the surface of the earth to establish successively electrical contact with each of a plurality of such electrodes each located at one of such points spaced from one another along the earth's surface while being in contact with one of said electrodes at all times; comprising a plurality of separate contact members each provided with means for detachably connecting it to any one of said electrodes; a terminal member common to all of said contact members; a plurality of flexible-conducting connecting members connecting the respective contact members to the common terminal member, said flexible connecting members being of sufficient length to provide for simultaneous connection of two of said contact members to two adjacent ones of said spaced electrodes during movement of said electrode device over the surface of the earth; and an electrical conductor connected to said common terminal member and extending to a portion removed from said electrode device for connection to one terminal of an electric circuit. Claims allowed, 1.

6358. Method for locating hydrocarbon deposits in the earth; Lynn G. Howell, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2,257,170, issued September 30, 1941.

In the method of prospecting for petroleum deposits, in which a sample of soil gas is obtained and examined for hydrocarbons higher than methane, the steps of obtaining a sample, which comprises suck-

ing gas from the soil; passing a predetermined quantity of the gas through a liquid having a high absorption power for low-molecular-weight hydrocarbons as compared to its absorption power for other constituents of soil gas; and recovering said hydrocarbons from said liquid. Claims allowed, 3.

6359. Seismic surveying; John E. Owen, Tulsa, Okla., assignor to Geophysical Research Corporation, New York, N. Y., a corporation of New Jersey: U. S. patent 2,257,187, issued September 30, 1941.

This invention relates to an apparatus for receiving and recording artificial seismic waves, comprising a pair of electrical geophones arranged so as to be substantially simultaneously actuated by earth motion, one of said geophones being responsive only to horizontal earth motion and the other geophone being responsive only to vertical earth motion and the electrical output of one geophone being the time derivative of the electrical output of the other geophone; a recorder; connections between both geophones and said recorder; and means in said connections for adjusting the amplitude of one geophone output relative to the amplitude of the other geophone output. Claims allowed, 3.

6360. Gun perforator for well casings; Ira J. McCullough, Los Angeles, Calif.; U. S. patent 2,257,270, issued September 30, 1941.

In a perforating gun of the character described, the combination of a gun body having a plurality of gun bores spaced longitudinally thereof; a plurality of firing-charge chambers longitudinally spaced therein and having operative connection with said gun bores; passage means serially connecting said firing-charge chambers, there being side openings connecting said passage means with the exterior through the side wall of said gun body; firing charges in said firing-charge chambers; projectiles in said gun bores; means for firing at least one of said firing charges; and restraining means inserted in said passage means through said openings. Claims allowed, 19.

6361. Perforating gun with serial firing means; Ira J. McCullough, Los Angeles, Calif.: U. S. patent, 2,257,271, issued September 30, 1941.

In a perforating gun of the character described, the combination of a body having gun bores therein to receive projectiles; a plurality of powder chambers and passage means serially connecting said chambers so that ignition will be transmitted serially from one chamber to another; a powder charge in each of said chambers; means for setting off one of said powder charges; and check valves in said passage means to prevent reverse flows of gas therethrough. Claims allowed, 12.

6362. Perforating gun and projectile therefor; Waldo S. Reynolds, Los Angeles, Calif., assignor to Ira J. McCullough, Los Angeles, Calif.: U. S. patent 2,257,276, issued September 30, 1941.

In a projectile and barrel assembly for a casing perforator having a body with an opening leading inward from a face thereof, said opening comprising a counterbore with an outwardly faced shoulder at the inner end thereof and a pressure chamber inward of said shoulder, the combination of: A barrel securable in said counterbore and having an inner end face confronting said shoulder and having a bore flared at its inner end; and a projectile having a flange

projecting radially from its inner end so as to be gripped between said shoulder and said end face of said barrel with the portion thereof which lies forward of said flange extending within said bore, at least one radial face of said flange having a coating of relatively soft material thereon, a portion of said relatively soft material forming a conoidal enlargement to occupy the flared portion of said bore. Claims allowed, 4.

6363. Determining the velocity of elastic waves in the ground; Johan David Malmquist, Boliden, Sweden, assignor to Bolidens Gruvaktiebolag, Stockholm, Sweden, a limited joint-stock company of Sweden: U. S. patent 2,257,423, issued September 30, 1941.

This invention relates to that method of measuring the velocity of propagation of seismic impulses through the ground which consists in producing a cathode ray; causing said ray to oscillate under the influence of a sine-curved alternating current of definite frequency; causing the production of a seismic shock in the ground and thereby imposing for an instant a second electric current on the sine-curved current to vary the oscillation and distort the path of the cathode ray; causing said shock to impose again for an instant the second current on the sine-curved current from a point in the ground spaced at a known distance from the point of origin of the shock whereby to vary again the oscillation and distort the path of the ray oscillations rendering the ray oscillations visible; and determining the distance between the two distortions and therefrom determining the velocity of propagation. Claims allowed, 2.

6364. Method and apparatus for modifying the characteristics of a seismograph amplifier; F. J. Cleveland, Socony-Vacuum Oil Co., Inc.: British patent 536,747, issued June 5, 1941.

This invention relates to a method of recording seismic waves that have been generated in the earth's surface by the detonation of a charge of explosives, that comprises the steps of detecting the seismic waves which have traveled through divers paths from the point of their creation to detecting stations; amplifying the signals being generated by the detector that correspond to the seismic waves; and recording the amplified signals on a moving photographic film of sensitized paper, characterized by the novel step of gradually varying the degree of amplification imparted to the signals. Claims allowed, 30.

6365. Soil-gas sampling device and method; J. G. Fife, Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij: British patent 536,982, issued June 18, 1941.

This invention relates to a method for obtaining soil-gas samples from the ground, comprising confining a sample zone in contact with the ground; maintaining said zone at a pressure below that of the atmosphere; confining and interposing a second zone between the sampling zone and the atmosphere; and maintaining the pressure in said zone at a value lower than that of the sampling zone. A device for carrying out the method, comprising an open-bottomed container adapted to be forced into the ground with its lower edge and a hood partly surrounding the container and having its open end directed toward the same side as the container, evacuating conduits being connected to the inner side of the container and to the space situated between the latter and the hood. Claims allowed, 11.

6366. Container for storing gas samples; J. G. Fife, Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij: British patent 537,380, issued July 2, 1940.

This invention relates to a container in which samples of gas may be stored, characterized by the provision of an inner and an outer gas-tight wall, at least the inner one of which is made of flexible material, said walls forming an inner and an outer chamber, each of which is provided with a connection for charging or discharging the chamber. Claims allowed, 4.

6367. Electrical method and apparatus for analyzing gaseous mixtures; J. G. Fife, Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij: British patent 537,486, issued July 9, 1941.

This invention relates to a method for analyzing a gas mixture, comprising maintaining an electrolytic liquid capable of reacting with said gas mixture in a space comprising a reaction zone and a measurement zone in liquid communication with each other; passing said gas mixture solely through said reaction zone and causing it to react completely with the solution within said zone; continuously circulating said solution through the two zones; passing an electric current through said solution along a path confined solely within the measurement zone; and observing the changes in the specific conductivity of the solution caused by the reaction. Claims allowed, 9.

6368. Geophysical-prospecting apparatus; Standard Oil Development Co., Linden, N. J., assignee of Louis Statham, Houston, Tex., both in the United States of America: Canadian patent 397,853, issued July 8, 1941.

This invention relates to the method and apparatus for the determination of earth substructures, which comprises arranging at least two pairs of electrodes in longitudinal alinement and in spaced relation on the earth's surface; arranging a receiver of earth currents between adjacent pairs of electrodes and in alinement therewith; simultaneously initiating the same difference in potential between the electrodes of each pair, said difference in potential being in opposite directions in adjacent pairs of electrodes of each pair and the transients of adjacent pairs are in opposite directions; receiving the transients of adjacent pairs of electrodes in said receiving means; and observing a resultant of said transients. Claims allowed, 19.

6369. Oil well-logging method; Standard Oil Development Co., Linden, N. J., assignee of Ludwig W. Blau and Louis Statham, both of Houston, Tex., both in the United States of America: Canadian patent 397,854, issued July 8, 1941.

This invention relates to the method of logging a well having a metallic casing and disposed in earth strata of different electrical properties from each other between the terminals of an exploring circuit, which comprises disposing one of the terminals in the well and grounding the other terminal at a distance from the well; passing an electric current through the circuit including the casing and the earth strata whereby a transient is obtained having high frequencies modified by the passage of the current through the strata; and exhibiting an indication of the high frequencies upon an indicating instrument arranged in the circuit. Claims allowed, 16.

6370. Geophysical-prospecting method; Standard Oil Development Co., Linden, N. J., assignee of Ludwig W. Blau and Louis Statham, both of Houston, Tex., both in the United States of America: Canadian patent 397,855, issued July 8, 1941.

This invention relates to the method for the determination of electrical properties of matter, which comprises passing an electric current between spaced electrodes in the matter whereby a plurality of transients are obtained, thereby producing transient potentials outside of the electrodes, the time constants of which are functions of the distances of the transient potentials from the electrodes and the electrical properties of the matter; separately receiving some of the transient potentials; combining the transient potentials; and exhibiting the effects of the combination of the transient potentials. Claims allowed, 9.

6371. Electrical well-logging system; Shell Development Co., San Francisco, Calif., assignee of Haakon Muus Evjen, Houston, Tex., both in the United States of America: Canadian patent 398,173, issued July 22, 1941.

In a method for electrically logging formations traversed by a borehole filled with a fluid, the steps of maintaining a plurality of electrodes in contact with the borehole fluid and the ground in a region comprising said borehole; a first zone adjacent said borehole and permeated with the borehole fluid and a second zone adjacent the first zone and separated from the borehole by said first zone; passing an interrupted reversing direct current between two of said electrodes; passing an alternating current between two other electrodes; and simultaneously determining the sensitivity of the formation in said second zone as a function of the potential generated between said second two electrodes by the flow of the reversing direct current, the sensitivity of the formation in said first zone as a function of the impedance opposing the flow of said alternating current, and the spontaneous potential existing between said second two electrodes during the interruptions in the flow of the reversing direct current. Claims allowed, 4.

6372. Electrical well-logging system; Shell Development Co., San Francisco, Calif., assignee of Haakon Muus Evjen, Houston, Tex., both in the United States of America: Canadian patent 398,487, issued August 5, 1941.

In a method for electrically logging formations traversed by a borehole filled with a fluid, the steps of maintaining a plurality of electrodes in contact with the borehole fluid and the ground in a region, comprising said borehole and zone surrounding said borehole; passing an alternating current between a first pair of electrodes; detecting the spontaneous potential existing between said first electrodes; separating the direct current due to said spontaneous potential from said alternating current and separately indicating said spontaneous potential and the potential and intensity of said alternating current; rectifying a portion of said alternating current; detecting between a second pair of electrodes the alternating potential generated therebetween by the flow of the alternating current between the first electrodes; rectifying said detected alternating potential; and indicating said rectified alternating potential by balancing it against a

potential derived from the rectified portion of the alternating current flowing between the first electrodes. Claims allowed, 3.

6373. Well logging by radioactivity; Well Surveys, Inc., assignee of Serge Alexander Scherbatskoy, both of Tulsa, Okla., United States of America: Canadian patent 398,503, issued August 5, 1941.

This invention relates to a method of obtaining geophysical data that comprises impressing a constant potential across spaced electrodes in an atmosphere of inert gas under superatmospheric pressure; continuously lowering said electrodes into an opening in the earth; obtaining from the electrode circuit a substantially continuous electrical output current, the voltage of which corresponds to the current flow in the electrode circuit; converting said output current to a pulsating signal; amplifying said signal; continuously recording the amplified signal; continuously measuring the depth at which the electrodes are positioned in the earth; and continuously recording said measurements in correlation with the record of said current. Claims allowed, 13.

6374. Microbiological method of ground exploration; Shell Development Co., San Francisco, assignee of Gerald L. Hassler, Berkeley, both in California, United States of America: Canadian patent 398,635, issued August 12, 1941.

This invention relates to a method of exploration for deposits of hydrocarbon matter, the steps consisting of collecting a sample of soil and analyzing said sample for the presence therein of hydrocarbon-consuming bacteria. In an apparatus for analyzing a soil sample for the presence therein of hydrocarbon-consuming bacteria, a container adapted to receive said sample; means hermetically sealing said container against the atmosphere; a passageway adapted to put the inside of said container in communication with the outside; means for opening and for closing said passageway; a tube having one end in register with said passageway; a closed vessel partially filled with liquid, the other end of said tube being inserted in said vessel and submerged below the surface of said liquid; means for applying a gaseous pressure to the surface of the liquid within said vessel; and means for observing the pressure within the sample container by observing the value of the gaseous pressure which must be applied to the surface of the liquid within the vessel to cause the liquid within said tube to reach a desired level. Claims allowed, 15.

6375. Electrical-prospecting apparatus; Engineering Research Corporation, assignee of William M. Barret, both of Shreveport, La., United States of America: Canadian patent 399,014, issued September 2, 1941.

In an electromagnetic means for prospecting, an apparatus comprising a generator of electromagnetic waves, said generator being provided with an antenna; a means for maintaining substantially constant the energy radiated by said antenna; a meter associated with said antenna whereby said energy radiated by said antenna is indicated, said generator combined with a receiver of electromagnetic waves in rigid structure, said receiver being provided with a meter, the reading of which is proportional to the radiofrequency input to said receiver. Claims allowed, 11.

6376. Drill-hole surveying apparatus; Lane-Wells Co., Los Angeles, assignee of Raymond Davis Elliott, Long Beach, both in California, United States of America: Canadian patent 399,358, issued September 16, 1941.

This invention relates to an apparatus for exploring the formation traversed by a drill hole containing conducting fluid, comprising a cable containing a pair of insulated conductors terminating in a pair of spaced-apart electrodes; means for moving said cable through the drill hole; means for producing a current through one of said conductors and from the electrode connected thereto into the surrounding formation; means connected to the other electrode through the conductor connected thereto for measuring potential variations in the other electrode as the cable is moved through the drill hole; and means for superimposing on the potential applied from said other electrode to said measuring means a substantially constant potential to increase the potential supplied to said measuring means to a predetermined average level higher than the average level of the potential variations of said other electrode. Claims allowed, 20.

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