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APRIL–JUNE 1947

COMPILED BY
V. L. SKITSKY

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Compiled by V. L. Skitsky

FOREWORD

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other than orders for copies of Geophysical Abstracts should be addressed to the Director, Geological Survey, United States Department of the Interior, Washington 25, D. C.

1. GRAVITATIONAL METHODS

9139. Ballarin, S. Tabelle ausiliarie per il calcolo della riduzione topografica delle misure di gravita [Auxiliary tables for the calculation of the topograhic reduction of gravity measurements]: Riv. Geominer., vol. 3, no. 1, pp. 12–32, Milan, 1942.

The author makes use of simplified formulas to facilitate the calculation of the topographic correction of gravimetric measurements. For this purpose, he considers the earth as being spherical. Tables giving values of some functions appearing in the simplified formulas are presented. A few numerical examples illustrate the simplicity and rapidity of the calculations made with the use of these tables.—*Author's abstract.*

9140. Clark, G. L. The gravitational field of a rotating cohesive system: Cambridge Philos. Soc. Proc., vol. 43, no. 2, pp. 164–177, Cambridge, England, 1947.

In this paper a periodic solution of the gravitational equations is examined. The solution, which is valid throughout all space, is such that the internal and external fields and their derivatives are continuous at the boundary of a spheroid rotating about an axis other than that of symmetry. At great distances from the system the solution has the same form as the field, owing to a rotating rod, and can be applied to problems like the determination of the velocity of propagation of gravitational waves and the loss of energy of a rotating cohesive system.—*Author's abstract.*

9141. Graf, Anton. Gravimeter, Allgemeine Übersicht, 1–2 (Gravimeter, General review, parts 1–2): Arch. techn. Messen, nos. 141–142, Munich, 1943.

The construction of static gravimeters is discussed in the light of the requisite precision of measurements. Among the various principles applied, the use of springs is regarded as providing the most constant structural characteristics. Suitable alloy steels should be employed for the springs to ensure elastic and thermal stability. The temperature, which affects both the springs and other parts of the gravimeter, should be regulated by specially constructed thermostats rather than by liquids, considered inadequate for high precision. Amplification of the measured effects of gravity variations, usually achieved by mechanical or electrical means, requires particular attention and is related to questions of sensitivity, oscillation period, and stability of the apparatus. Other topics are discussed, such as handling gravimeters, packing for transportation, and procedures of measurement.—*V. S.* (A review appeared in Zentralb. Geophys., Meteorol. u. Geod., vol. 11, no. 2, pp. 67–68, Berlin, 1943.)

9142. Hammer, Sigmund. Gravimeter ties between gravity base stations in Washington, D. C.: Am. Geophys. Union Trans., vol. 28, no. 2, pp. 157–161, Washington, D. C., 1947.

Relative gravity observations in the United States and international gravity ties have been referred to several base stations in Washington,

D. C. Correlation of these data has been based on gravity differences between the base stations determined by pendulum observations, some of which date back to 1893. The results of recent gravitational ties between the principal gravity base stations in Washington, D. C., obtained by means of a modern high-precision gravimeter, are reported and discussed. The gravimeter results indicate that the previous pendulum connections between the base stations in Washington contain errors of about 2 milligals.—*Author's abstract.*

9143. Huelin, G. S. La gravimetria y su desarrollo actual [Gravimetry and its present development]: Rev. Geofis., vol. 4, pp. 17–44, Madrid, Jan.–Mar. 1945.

A brief account is given of the historical development and fundamental concepts of gravimetry. The methods of measuring gravity are classified into (1) dynamic methods making use of such phenomena as the fall of a body, pendulum oscillation, and liquid flow, and (2) static methods dealing with variations in the position of a body maintained in equilibrium by the action of opposing elastic pressures. The experimental arrangements relating to the static methods are described in some detail. A bibliography is appended.—*Cent. Nat. Rech. Sci., Bull. Anal., vol. 7, no. 6, pt. 1, p. 1052, Paris, 1946, translated by V. S.*

9144. Lambert, W. D. Deflections of the vertical from gravity anomalies: Am. Geophys. Union Trans., vol. 28, no. 2, pp. 153–156, Washington, D. C., 1947.

The geodetic concept of the deflection of the vertical is discussed, and a brief review is given of the recent work on geoid elevations and on deflections calculated from actual gravity anomalies. In geodesy at present, the usual deflection datum is essentially conventional and arbitrary, and nothing in nature is known to correspond with an absolute value of deflection at a given point. Such arbitrariness can be reduced, in part, by requiring that the center of the ellipsoid of reference coincide with the center of gravity of the earth, and that the axis of the ellipsoid coincide with the axis of rotation of the earth. These conditions and the related work of Hirvonen, Gulatee, Kazanskii, and Vening Meinesz form the main subject of the paper.—*V. S.*

9145. Logue, L. L. and Fisk, F. K. Exploration and the gravity meter: Oil and Gas Jour., vol. 45, no. 42, pp. 122–125, Tulsa, Okla., 1947.

The causes of gravity variation, corrections of measurements, principles of gravimeter construction, and applications to oil search are explained briefly and illustrated by drawings. Judgment in eliminating regional gravity effects to gain magnification of local anomalies is considered the key to successful interpretation of gravimeter data. The importance of such elimination is demonstrated by comparisons between initial maps of observed data and derived maps of regionally corrected data. These maps are drawn for certain common types of geology associated with oil fields, such as a structural nose, a normal fault, and a salt dome.—*V. S.*

9146. McCollum, E. V. The interpretation of gravity anomalies [abstract]: Tulsa Geol. Soc. Digest, vol. 13, 1944–45, pp. 53–54, Tulsa, Okla., 1945 (?).

The interpretation of gravity anomalies may be qualitative or quantitative. Qualitative or empirical interpretation is accomplished by analogy with mathematical examples or experimental surveys over known structures. Quantitative interpretation generally is not possible on the basis of gravity information alone, and additional geophysical or geological data must be available for calculating the distribution of masses. Quantitative interpretation ordinarily involves making a contour map corrected for topography, a regional correction, a map of residual gravity values, and a calculation in terms of residual values and other data. The gravity survey on the southwest flank of the Arbuckle Mountains is discussed as an example.—*V. S.*

9147. Miller, A. H. Gravimetric surveys of 1944 in New Brunswick: Ottawa Dept. of Mines and Res., Geol. Survey Bull. 6, 28 pp., Ottawa, Ontario, 1946.

An abstract appeared in the Royal Soc. Canada Trans., 3d ser., vol. 39, List and Minutes 1945, p. 145, Ottawa, Ontario, 1945. (*See* Geophys. Abstracts 126, no. 8654.)

9148. Morelli, Carlo. Sulla costante fondamentale della formula ellissoidica internazionale per la gravita normale [Concerning the fundamental constant of the ellipsoidal international formula for normal gravity]: Geofis. Pura e Appl., vol. 9, nos. 1–2, pp. 1–18, Milan, 1946.

The value of gravity, g_e, employed in the Bouguer and isostatic reduction systems, is determined on the basis of the numerous measurements of gravity made after 1930 and the new compensated values calculated for reference stations. Suitable hypotheses are applied for reducing the possible causes of error, and these causes are examined and discussed. The result obtained for gravity in terms of the Potsdam system is: g_e=978.043.—*V. S.*

9149. Nettleton, L. L. Geophysical history of typical Mississippi piercement salt domes: Geophysics, vol. 12, no. 1, pp. 30–42, Tulsa, Okla., 1947.

Maps and cross sections are given, showing the development of geophysical and geological knowledge of the New Home and D'Lo domes. Both are shallow, piercement domes in the northern part of the Mississippi salt dome basin. Both were first indicated by gravity surveys, the shallow cap rock was checked by refraction seismograph surveys, caprock depths were checked by drilling and further seismograph work, and drilling was then carried out to determine the position of the salt and the attitude of the sediments. The successive items of geophysical work and test drilling have led to a consistent and orderly development of information about these domes.

An additional note is included, with three pairs of gravity maps, showing how strong and definite, but very local, gravity expressions of shallow domes may be missed by reconnaissance surveys.—*Author's abstract.* (*See also* Geophys. Abstracts 126, no. 8655.)

9150. Niskanen, E. On the deformation of the earth's crust under the weight of a glacial ice-load and related phenomena: Isostat. Inst. Internat. Assoc. Geod., no. 12, 59 pp., Helsinki, 1943.

The upheaval of land in Fennoscandia generally is considered to be caused by the tendency of the earth's crust to resettle into the isostatic

equilibrium disturbed by the weight of the glacial ice cap. The author investigates this theory by employing spherical harmonic analysis, in analogy with the work of M. P. Rudzki (1899), but instead of assuming with Rudzki that the earth is an elastic sphere, he postulates the Airy-Heiskanen "floating hypothesis." The mathematical deductions presented start with the theory of Thomson and Tait concerning the deformation of an elastic sphere under the action of an outside force, and lead to results on Fennoscandia's sinking that are corroborated by geologic observations. It is found that the total sinking at the center during the glacial period approximates 700 meters where the ice crust's thickness is 2,400 to 3,000 meters. Other results are presented.—*V. S.*

9151. Pariisky, N. N. Accélération de la pesanteur dans le point gravimétrique principal de Transcaucasie à Tbilissi [Acceleration of gravity at the principal gravimetric point of Transcaucasia in Tbilissi]: Acad. Sci. U. R. S. S. Comptes rendus (Doklady), vol. 49, no. 1, pp. 28–30, Moscow, 1945.

Gravimetric exploration in Transcaucasia made it desirable to establish a local base station. For this purpose investigations of the acceleration of gravity were conducted at Tbilissi in 1903–09 and 1931–36, linking this station with the base stations of the U. S. S. R. and the Potsdam station. The recent calculation of all the established connections gives the value of gravity: $g=980.177_2$ gl$\pm 0.8_4$ mgl. This figure is compared with the previous and present basic values at Pulkovo, Kazan, Moscow, Poltava, Leningrad, and Potsdam and with the separate determinations at Tbilissi. The data are tabulated. It is noted that the Tbilissi value has not changed during the last 30 years.—*V. S.*

9152. Patzke, W. Gravimetrische Kleinvermessung mit dem statischen Schweremesser [Detailed gravity measurements with the static gravimeter]: Riv. Geominer., vol. 2, nos. 3–4, pp. 15–18, Milan, 1941.

The use of the static gravimeter in detailed measurements for geologic structure mapping implies an accuracy of 0.1 milligal. It is, therefore, necessary that the average error of the gravimetrical measurements should not exceed 0.035 milligal. Test measurements show that such accuracy is obtainable with the Askania gravimeter. Further, such measurements prove that in certain localities gravity may vary as much as 0.1 milligal under influences that lie mostly beyond the control of the investigator.—*Author's abstract.*

9153. Petrucci, G. Sulla possibilita di aumentare la sensibilita del gravimetro Ising [Concerning the possibilty of increasing the sensitivity of the Ising gravimeter): Beitr. angew. Geophysik, vol. 10, pp. 96–101, Leipzig, 1942.

An accessory instrumental system is offered for increasing the sensitivity of the Ising gravimeter. It is operated on either magnetic or electrical principles, achieving its purpose by exerting a force in the same drection as that of the force of gravity. The precision of readings is believed considerably improved. The device is described, and its practical advantages and technical possibilities are discussed. An indirect zero method of measurement is suggested.—*V. S.*

9154. Skeels, D. C. Ambiguity in gravity interpretation: Geophysics, vol. 12, no. 1, pp. 43–56, Tulsa, Okla., 1947.

It is shown that, contrary to what is stated and implied in much of the literature, gravity data cannot, of themselves, be interpreted uniquely. A two-dimensional example demonstrates that for a given anomaly and a given density contrast a wide range of possible interpretations can be made at various depths, and that whereas there is a maximum depth for the solution the minimum depth is zero. Other examples are given to show that depth rules based upon the assumption of geometrical shapes may give results very much in error when applied to actual anomalies. Nor does the method of interpretation by vertical gradients allow us to make an unique interpretation or to distinguish deep from shallow anomalies, as has been claimed. It is shown that we do not escape the ambiguity by using second derivative quantities such as gradient and curvature, and that, in fact, gravity and its derivatives are related by a corollary of Green's theorem. This theorem provides an analytical proof of ambiguity not only for the case of gravity data but for magnetic data as well.—*Author's abstract.*

Warren, P. R. Geophysical history of the Ville Platte oil field, Evangeline Parish, Louisiana: Geophysics, vol. 12, no. 2, pp. 176–180, Tulsa, Okla., 1947. *See* Geophys. Abstract 9220.

9155. Woollard, G. P., and Steenland, N. C. Gravity and magnetic survey of Cortlandt complex [abstract]: Geol. Soc. America Bull., vol. 57, no. 12, pt. 2, p. 1246, Baltimore, Md., 1946.

In June 1946, 100 gravity and magnetic observations were made over the norite intrusion near Peekskill, N. Y., known as the Cortlandt complex. Residual Bouguer gravity anomalies based on a density of 2.67 indicate a gravity "high" of about 35 milligals centered over the complex, with indications of two small local "highs" superimposed on the main one. A detached gravity "high" of about 15 milligals occurs in an adjacent area of Paleozoic limestone.

The results of the magnetic survey indicate a very complex field reflecting changes in magnetic susceptibility in the rocks in and off the complex, as well as polarization effects. Neither the gravity for the magnetic data indicate more than one main source for the intrusion.

9156. World Petroleum. Seven groups to search Bahamas for petroleum: Vol. 17, no. 11, pp. 44–46, New York, 1946; also Canadian Min. Met. Bull., no. 413, pp. 547–548, Montreal, Quebec, 1946.

Four British and three American oil companies recently have obtained concessions for exploration in the Bahamas. This British colony consists of a chain of islands, cays, and reefs scattered over an area of shallow submerged banks covering about 50,000 square miles. The Anglo-Bahamian group is developing a new type of observation platform for gravity measurements. The Superior Oil Corp. uses an airborne magnetometer. The Standard Oil Co. of New Jersey conducts gravimetric exploration with a diving chamber 6 feet high and weighing 4,000 pounds. Its survey ship is equipped with a radar screen, which enables the navigator to determine his position with respect to special targets carrying radar arrays that are set up over the explored areas. These targets may be picked up from as far as 18 miles.—*V. S.*

9157. Zhongolovich, I. D. Concerning reductions of the force of gravity [abstract, in Russian] : Akad. Nauk S. S. S. R., Otd. Fiz.-Mat., Referaty za 1943–44, p. 101, Moscow, 1945.

Reductions of the force of gravity are of paramount importance in problems concerning the form of the geoid and the structure of the earth's crust. However, no rules exist to regulate the application of these reductions. The author offers a tentative procedure for dealing with such questions in accordance with the type of solution employed. The principles of reduction are discussed, the basic reduction systems are summarized, and the grounds for applying them to observed data are explained. In the problem of the form of the geoid, the role of gravity reductions is treated in the light of Stokes' formula of 1849 and in relation to the method of unreduced data. In the problem of the inner structure of the earth's crust, consideration is given to the deviation of the geoid from the spheroid.—*Translated by V. S.*

2. MAGNETIC METHODS

9158. Bardill, J. D. Magnetic surveys in Clinton County, New York: U. S. Bur. Mines, Repts. Inv. 4002, 7 pp., 4003, 6 pp., 4008, 7 pp., Washington, D. C., January 1947.

In order to select sites for drilling projects in the magnetite districts of Clinton County, New York, the U. S. Bureau of Mines made three magnetic surveys—in the Dannemora district, in the Redford-Clayburg district, and in the Russia Station district. In each survey the dip needle was used for preliminary reconnaissance, with readings made at 25-foot and 50-foot intervals over grid lines spaced 200 to 400 feet apart. For the detailed work, dip-needle readings were taken at 10-foot and 25-foot intervals and dial-compass readings at 25-foot and 50-foot intervals over lines spaced 100 feet apart. Several anomalies were detected and mapped, and some of them were tested by drilling and metallurgical analysis. The results are discussed, and data and maps are presented.—*V. S.*

9159. Bishopp, D. W. The occurrence of nickel and magnetite in some Irish serpentines in conjunction with a magnetic survey: Royal Dublin Soc. Sci. Proc., vol. 24, nos. 12–17, pp. 125–133, Dublin, 1946.

In 1942–43 the Geological Survey of Ireland carried out an investigation of serpentine occurrences in Counties Sligo, Leitrim, and Mayo in search of nickel and magnetite ores. Samples were taken for analysis, and magnetic profiles were measured across some of the occurrences with a Watts vertical variometer.

The results pointed to five serpentine zones. These zones are described, and the chemical and magnetic characteristics of the serpentine are indicated. The Slishwood dyke registered a general anomaly of about 1,000 gammas. There were here also several very localized anomalies of extremely high intensity, some positive and some negative, related not to the quantity of magnetite present but to the orientation and polarity of the magnetic units scattered throughout the rock. The other serpentine zones likewise registered general anomalies but had no high local values. The local concentrations of nickel and magnetite are of no commercial value.—*V. S.* (*See also* Geophys. Abstract 9178.)

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9160. Brown, E. L. Prospecting in the Granville Lake mineral area, Manitoba: The Precambrian, vol. 20, no. 2, pp. 4–7, Winnipeg, Manitoba, 1947.

Surface prospecting in the Granville Lake area, Manitoba, began in 1927 and later was aided by magnetometer work. In 1940, A. McVeigh found a strong magnetic zone at Ralph Lake and a magnetic nickel-sulfide outcrop at nearby Lynn Lake. Further magnetometer prospecting in 1945 revealed a weak magnetic zone to the north of the Lynn Lake outcrop. When the anomalous zones were drilled, the strongly magnetic character of the Ralph zone was found to be caused by magnetite in quartzite, whereas the weakly magnetic Lynn zone yielded three extensive ore bodies averaging 1.18 percent of nickel and 0.60 percent of copper. These ore bodies had no outcrops.

The results showed that magnetometer surveys are helpful in this region. Their usefulness is limited, however, owing to the fact that strong anomalies are due to disseminated magnetite or barren pyrrhotite, whereas the anomalies caused by ore bodies are weak and vague in outline.—*V. S.*

9161. Čechura, F. Magnetická deklinace ve středním Povltaví [Magnetic declination in the region of the middle Moldau]; Královské České Společnosti Nauk Věstnik no. 18, 30 pp., Prague, 1939.

The mapping of magnetic declination in the region of the middle Moldau River, Czechoslovakia, was done by a special method using long, astronomically oriented polygons tied into the land-survey triangulation net for controls. The procedures of azimuth determination and calculation of magnetic anomalies are described. The angular error of polygons averaged +8.2″ and that of magnetic declination +0.8′.

A comparison of the resulting magnetic map with a geologic map showed that the declination anomalies reflect petrographic and geologic characteristics. The Algonkian and Cambrian sediments gave weaker anomalies than igneous rocks, and the metamorphic rocks gave stronger anomalies than basic rocks. Varieties of one and the same type of rock, distinguished by structure and color, gave anomalies of about the same intensity and sign. The northwestern and western boundaries of the Euler geologic complex formed a strongly anomalous zone marked by an abrupt change in declination values.—*V. S.*

9162. Federal Science Progress. Prospecting by air: U. S. Dept. Commerce, vol. 1, no. 2, pp. 42–45, Washington, D. C., 1947.

The airborne magnetometer is operated by the effects of the earth's magnetic field on three mutually perpendicular fluxgates enclosed in a plastic housing free to turn in all directions. Each fluxgate is a coil of wire containing a core of susceptible alloy, the magnetism of which is continuously reversed by an alternating current. Whatever the position of the magnetometer in space may be, one core is oriented in the direction of the earth's field, so that the resulting even harmonics appearing in the induced alternating current give an indication of the intensity of earth magnetism at the instant. In the circuit, a special filter is tuned only to the 2,000-cycle frequency used for measuring the earth's field, and the voltage at this frequency is amplified and rectified to give readings in gammas. The details of the apparatus and its operation are indicated.—*V. S.*

9163. Fleming, J. A. Summary of the year's work, to June 30, 1946, Department of Terrestial Magnetism, Carnegie Institution of Washington: Terres. Magn. and Atmos. Electr., vol. 51, no. 4, pp. 517–529. Baltimore, Md., 1946.

With the end of the war, the Department of Terrestrial Magnetism had the alternative of continuing its prewar activities or pursuing new objectives. The members of the scientific staff were invited to make reports on desirable reorganization in the fields of geomagnetism, terrestial electricity, ionosphere, laboratory and nuclear physics, and automatic calculation for geophysical analyses and reductions. These reports are considered briefly in the course of the review of the year's work. A summary of the Department's war activities for the period 1940–46 is included. The outline of geomagnetic investigations deals in part with aeromagnetic surveys and air-borne instruments.—*V. S.*

9164. Glebovskii, Iu. S. Concerning the cause of the East-Siberian continental anomaly of the geomagnetic field [in Russian]: Acad. Sci. U. R. S. S. Bull. (Izvestiia), Sér. Géog. et Géophys., vol. 10, no. 4, pp. 393–398, Moscow, 1946.

The magnetic field of the entire Eurasian continent is complicated by an extensive anomaly having its center at latitude 66°00′ N. and longitude 110°0′ E.; its boundaries are shown on a map. The author points out that this anomaly coincides with the region of the Siberian traps, which are the largest accumulation of highly magnetic rocks in the world. Direct measurements of these rocks show a high magnetic susceptibility. Apparently, the traps are intrusions of the magnetic substratum into the earth's crust over an area of more than 6,000,000 square miles and form, in effect, an additional magnetic pole of the earth. Such intrusions of the subgranitic shell may explain other peculiarities and anomalies of the geomagnetic field.—*V. S.*

9165. Gregg, E. C., Jr. An alternating current probe for measurement of magnetic fields: Rev. Sci. Instruments, vol. 18, no. 2, pp. 77–80, Lancaster, Pa., 1947.

A method of measuring magnetic field strength by making use of the incremental permeability of a small Permalloy core is described. Alternating-current excitation is employed, permitting amplification and a relatively high sensitivity and accuracy. A run of some thirty-odd points can be measured and plotted within an hour. During the war, magnetometers depending on this principle and its extensions were devised and used for detection and measurement of small changes in magnetic fields.—*V. S.*

9166. Heiland, C. A. Aeromagnetic prospecting [abstract]: Geol. Soc. America Bull., vol. 57, no. 12, pt. 2, p. 1201, Baltimore, Md., 1946.

Although submarine locators can be modified for prospecting, it has appeared preferable to the author to design equipment specifically for this purpose. The resulting improvements include reduction in size; wing-tip installation; compensation for changes in the ship's permanent and induced magnetism with course, roll, pitch, and yaw; synchronized registration of terrain photographs and magnetic readings; and position fixing by radar triangulation.

In the new equipment, the magnetic readings, radio altitude, radar fixes, record numbers, magnetic range, and time appear on a photo panel, which for abnormal gradients is supplemented with a continuous recorder. Operational procedure includes (1) the determination of approximate magnetic strike, parallel to which a base line is flown to fix magnetic and geodetic references, and (2) the flying of profiles oriented at right angles to strike and spaced according to strike variations in geologic detail.

Magnetic values, corrected for diurnal variation, base drift, and planetary changes and plotted against position fixes, are represented as contour maps or profile curves and are interpreted qualitatively or quantitatively by conventional analytical, graphical, or model techniques. Aeromagnetic reconnaissance has the advantages of speed, ability to cover inaccessible areas, attentuation of man-made and topographic effects, and gains in interpretation arising from flying at different altitudes.—*Condensed by V. S.*

9167. Jensen, Homer, and Balsley, J. R., Jr. Controlling plane position in aerial magnetic surveying: Eng. and Min. Jour., vol. 147, no. 8, pp. 94–95, 153–154, New York, 1946.

The methods currently employed for determining plane position in aerial magnetic surveys are described.

In flights over recognizable landmarks, the Sonne continuous-strip camera is used. To avoid a distortion of photographic records taken from high altitudes, the image is stabilized by means of mirrors and gyroscopes operated by an optical mechanism. One roll of film serves for a flight of more than 800 miles at an altitude of 1,000 feet. Correlation with the magnetic record is achieved by the use of edgemarks and serial numbers, the latter being photographed by a second lens and a shutter installed on the side of the camera.

In flights over featureless terrain and water-covered areas, Shoran is employed. A circular path is flown about a drift station with the aid of the pilot indicator, and intersections with discrete mile distances from the rate station are registered by the edgemark. The third dimension is continuously recorded by means of a modified APN–1 radio altimeter. As with the camera systems, correlation between Shoran records and magnetic records is obtained by serial numbers and edgemarks.—*V. S.*

9168. Kalashnikov, A. G. Magnetic field meter [in Russian]: Zhur. Teoret. Fiz., vol. 13, nos. 7–8, pp. 407–422, Moscow, 1943.

This paper describes the construction of an instrument effecting the vectorial measurement of a heterogeneous magnetic field by a determination of the current generated in a small rotating coil. Examples of the application of this "field meter" are given, the basic theory of the apparatus and the method of calculating its specifications are outlined, and evidence is presented in support of the view that magnetic field meters will be used in the laboratory for the measurement of the intensity of a magnetic field much as galvanometers are used for the measurement of electrical current.—*Author's abstract, translated by V. S.*

9169. Knoerr, A. W. The airborne magnetometer, a new aid to geophysics: Eng. and Min. Jour., vol. 147, no. 6, pp. 70–75, New York, 1946.

The war investigations and experiments in exploration that led to the development of airborne magnetometers are described. Consideration is given also to questions of equipment and to techniques of flying traverses and correcting for diurnal variation and instrument drift. One method of correction involves the flying of two base lines at right angles to a series of parallel survey traverses. The necessary corrections are made only for the base lines serving for the construction of datum lines, to which magnetometer readings recorded over the traverses are adjusted. The method is discussed and illustrated by drawings. Exploration with airborne magnetometers offers a possibility of measuring magnetic fields in space for determining the size and depth of ore deposits.—*V. S.*

9170. Koliubakin V. V. A magnetometer [abstract in Russian]: Akad. Nauk S. S. S. R., Otd. Fiz.-Mat., Referaty za 1943–44, p. 126, Moscow, 1945.

This magnetometer is a field instrument for precise and rapid determination of the vertical component of terrestrial magnetism. Construction is based on the polarization of a soft ferromagnetic material induced by the field of the earth. The distinctive structural feature consists in placing the registering pointer in the immediate proximity of the induced poles and supporting it by means of a very rigid thread. Such arrangements render the apparatus insensitive to shocks. An experimental model has been prepared. The research was done at the Institute of Theoretical Geophysics.—*Translated by V. S.*

9171. McMillan, W. D. Exploration of the Bourbon magnetic anomaly, Crawford County, Missouri: U. S. Bur. Mines, Rept. Inv. 3961, 9 pp., Washington, D. C., October 1946.

Magnetic surveys made by the Missouri Bureau of Geology and Mines in 1931–32 disclosed a large positive anomaly about a mile south of Bourbon, Mo. Subsequent electrical resistivity measurements by the Division of Geophysical Exploration of the Bureau of Mines indicated further that the source of this anomaly was in the pre-Cambrian rhyolite at a depth of more than 1,400 feet.

In order to determine the nature of the material causing the magnetic anomaly, which could be either a body of magnetite or a large intrusive of basic rock, the Bureau of Mines drilled four holes to depths of 1,800 to 2,300 feet. Magnetite in rhyolite porphyry was encountered at 1,600 to 2,000 feet. After grinding the ore to minus 100 mesh, a 66-percent iron concentrate with 7 percent of silica was obtained by flotation.—*Author's abstract, condensed by V. S.*

9172. Mercanton, P. L., and Wanner, E. L'anomalie magnétique du Jorat (Vaud)—La composante verticale [The magnetic anomaly of the Jorat, Vaud—The vertical component]: Soc. Vaudoise sci. natur. Bull., vol. 63, no. 264, pp. 35–48, Lausanne, 1945.

In 1943–44 the magnetic anomaly of Jorat Mountain near Lausanne, Switzerland, was surveyed with the zero balance of La Cour to determine the variation of the vertical magnet component. Because of considerable artificial interference in the area, the measurements made at

211 stations were checked by readings taken nearby. The normal magnetic field of reference was calculated by the formula $Z=40{,}637+5.51\Delta x-0.10\Delta y$ for the deviations of the latitudes x and longitudes y of the observation points from Payerne.

The results revealed two extensive anomalous regions—a positive anomaly with a maximum of more than 435 gammas, near Lausanne, and a negative anomaly with a maximum of 75 gammas, extending northward as far as the Lake of Neuchâtel. Comparison with a geologic map suggests that the anomalies are caused by a deep intrusion of basic igneous material rising through the Urgonian of the Hercynian chain and having a greater magnetic susceptibility than the surrounding rocks.—*V. S.*

9173. Morelli, Carlo. Campo magnetico normale per la declinazione in Italia secondo le determinazioni dell' Istituto Geografico Militare [The normal magnetic field of declination in Italy according to the determinations of the Military Geographical Institute]: Accad. d'Italia Sci. Fis., Mat. e Nat. Rend., vol. 5, nos. 1–4, pp. 1–35, Florence, 1943.

In 1932–37 the Italian Military Geographical Institute carried out a systematic magnetic survey of the entire area of Italy. The new magnetic network comprised 1,496 stations, with an average interval of about 20 kilometers between them, for measurement of the horizontal component, the vertical component, and the declination; 33 additional stations were occupied for declination alone. In the present paper, the results of calculations for declination are discussed with regard to the normal field and anomalies, the formulas and coefficients, and the latitude and longitude gradients. General conclusions are given.—*V. S.*

9174. Northern Miner. Local CIM hears talk on geophysics from the air: Vol. 32, no. 34, p. 22, Toronto, Ontario, 1946.

Hans Lundberg has reported on his extensive tests of the use of helicopters in magnetic surveying, conducted in Canada. The instrument employed consists of units for pickup, amplification, transmission, and recording, embodying the latest developments in electronics. The pickup unit is leveled automatically, both as to direction and dip, with the earth's magnetic field, giving an accuracy within half a degree, so that the magnetometer has a precision of ±5.0 gammas at any point.

In surveying, flights follow traverses marked on the ground by flags or flares, magnetic readings are recorded continuously, and the corresponding positions are pin-pointed on an aerial photograph of the locality. A survey from a helicopter at Clermont Township, Quebec, took 1 hour of flying, whereas the ground survey had required 2 months.

The tests seem to indicate that regional surveys on a large scale should be made preferably with the magnetic airborne detector (MAD) of the U. S. Navy but that detailed surveys of mining properties may succeed better with a helicopter.—*V. S.*

9175. Ogg, A. Periodicity of geomagnetic activity: Terres. Magn. and Atmos. Electr., vol. 51, no. 4, pp. 543–546, Baltimore, Md., 1946.

The existence of periods of geomagnetic activity equal to one-half and one-third of the solar rotation period was investigated on the basis of the daily sums of K-indices during 1940–46. J. Olsen's solar period of 26.875 days served for grouping the sums into sequences, and smoothed

curves of the indices versus days for 2-year groups were drawn and harmonically analyzed. The curves are presented and discussed, and the values of harmonic coefficients are tabulated. The results show that there were periods of geomagnetic activity equal to one-third and to one-half of the solar rotation period, as well as the full period, during the 6 years considered.—*V. S.*

9176. Sanford, R. L. Magnetic testing: Nat. Bur. Standards Circ. C456, 40 pp., Washington, D. C., November 1946.

This circular gives general information regarding magnetic quantities, the magnetic characteristics of materials, the principles employed in magnetic testing apparatus, and a brief discussion of the theory and application of magnetic analysis.—*Author's abstract.*

9177. Scott, W. E. American magnetic character-figure, C_A, three-hour-range indices, K, and mean K-indices, K_A, for July to September and October to December 1946, with summary for 1946: Terres. Magn. and Atmos. Electr., vol. 51, no. 4, pp. 505–508, 1946, and vol. 52, no. 1, pp. 15–24, 1947, Baltimore, Md.

Tables are given with explanatory text.—*V. S.*

9178. Seeds, W. E., and Poole, J. H. J. The magnetic properties of the serpentine deposits in the Slishwood Gap, County Sligo, Ireland: Royal Dublin Soc. Sci. Proc., vol. 24, nos. 12–17, pp. 135–148, Dublin, 1946.

The magnetic properties of oriented samples from the serpentine deposits of the Slishwood Gap, County Sligo, Ireland, were tested as an aid to a local magnetic survey (*see* Geophys. Abstract 9159). The apparatus used for determining the intensity and direction of the original permanent magnetization consisted of a simplified version of the Johnson and McNish instrument, with the addition of a current coil around the specimen holder. The experimental arrangements, calibration, measurements of magnetic susceptibility, and related tests are described.

The results showed that the magnetic properties of the serpentine are due to the presence of magnetite. The general magnetic anomaly detected by the survey is produced by the high susceptibility of the serpentine. The large local variations are due to the fairly strong permanent magnetization of certain portions of the serpentine. The differences in permanent magnetism must be attributed to the original polarizing magnetic field. Some other conclusions are given.—*V. S.*

9179. Texas Oil Journal. New era of oil exploration seen in use of "Flying Eye" to map oceans and jungle: Vol. 13, no. 2, pp. 8, 22, Longview, Tex., 1946.

The adaptation of the submarine-detecting airborne magnetometer to oil exploration promises to uncover deposits in hitherto inaccessible regions, such as oceans, jungle, and mountains. In preliminary surveys this apparatus has given continuous total-intensity profiles over the line of flight, making it possible to obtain a magnetic map over hundreds of miles of difficult terrain in a few hours. Of all the instruments of geophysical prospecting, it alone provides a complete uninterrupted record of the territory surveyed. It also offers practically the only means of mapping regions characterized by unstable magnetic surface influences that preclude ground surveying. To eliminate all magnetic interference the apparatus is trailed beneath the plane and is operated electronically.

Groups of geophysicists in the United States and Canada plan to use helicopters for exploration. The development of the airborne magnetometer by different American laboratories is outlined briefly.—*V. S.*

9180. U. S. Coast and Geodetic Survey. Magnetic observations in the American Republics, 1941–44: Serial 677, 94 pp., Washington, D. C., 1946.

This report covers the work of the American Republics Magnetic Program as carried out during 1941–44. Field observations of the three magnetic elements—declination, inclination, and horizontal intensity—were made at a total of 145 stations in southern Mexico, the West Indies, and Central and South America. In addition, at nine of the above stations located between 0° and 20° south latitude, special observations were made to determine the daily variation of declination and of horizontal intensity in the region of the magnetic equator.

The results are shown in a tabulated list giving the names and geographic positions of the stations and the mean observed values of the magnetic elements at them. The declination results have been utilized in the preparation of an isogonic chart covering the entire region of the survey. The report contains maps, diagrams, and reproductions of photographs.—*Preface, condensed by V. S.*

Woollard, G. P. and Steenland, N. C. Gravity and magnetic survey of Cortlandt complex: Geol. Soc. America Bull., vol. 57, no. 12, pt. 2, p. 1246, Baltimore, Md., 1946. *See* Geophys. Abstract 9155.

3. SEISMIC METHODS

9181. Agamennone, Giovanni. Studio macrosismico del terremoto del Cansiglio, Friuli, del 18 Ottobre 1936 [Macroseismic study of the earthquake of October 18, 1936, at Cansiglio, Friuli]: Geofis. Pura e Appl., vol. 9, nos. 1–2, pp. 19–29, Milan, 1946.

P. Caloi studied the earthquake of October 18, 1936, at Cansiglio, Italy, on the basis of seismographic data and obtained an epicentral depth of 18 kilometers. This value conflicts with the values of 37 to 51 kilometers calculated by similar methods for other shocks in this region. The author made a new determination by means of a macroseismic method and obtained an epicentral depth of only 4 to 5 kilometers. He also examined the method of Caloi and found his figure of 18 kilometers uncertain, particularly as it differs widely from Schmerwitz's figure of 43 kilometers likewise deduced from seismographic data. Other instances of noteworthy discrepancies between important seismic determinations are cited and discussed.—*V. S.*

9182. Berson, I. S. The interpretation of surface hodographs of reflected waves [in Russian]: Acad. Sci. U. R. S. S. Bull. (Izvestiia) Sér. Géog. et Géophys., vol. 10, no. 1, pp. 63–70, Moscow, 1946.

The interpretation of surface hodographs of reflected waves is considered for the case of one arbitrary boundary of separation and a known constant velocity in the overlying medium. The method offered determines the spatial positions of consecutive points on the reflecting surface from corresponding points on the hodographs. For this purpose, equations are deduced evaluating both the coordinates of points of reflection and the respective angles of inclination of the surface, so that the entire

reflecting boundary can be located. If the values of the arrival times and of the hodograph gradient are continuous functions of the coordinates, the reflecting boundary is continuous and has a continuously changing tangent plane. The case of a constant but unknown velocity also is considered.—*V. S.*

9183. Blake, Archie. Criteria for the reality of apparent periodicities and other regularities: Internat. Seismol. Assoc., Central Bur. Pub., Ser. A., Sci. Trans., no. 16, pp. 3–7, Strasbourg, 1946.

In a series of seismic or other data suspected of periodicity or some other departure from randomness, it is sometimes possible to detect the nature of the actual regularity by means of far fewer records than are required in the customary Fourier analysis and the Buys-Ballot scheme. This can be accomplished by taking account of the closeness with which the pairs of observations fit the periodicity condition. Some theoretical possibilities in this direction are considered in the light of the mathematical requirements of the problem. It is found that the greatest weight in choosing a method should be given to the suitability of statistics to the type of variations suspected in the data. So conceived, an examination is made of the relationships between two observations, further developed into an analysis of an infinite number of observations in pairs.—*V. S.*

9184. Bodle, R. R. United States earthquakes, 1944: U. S. Coast and Geod. Survey, Serial 682, 43 pp., Washington, D. C., 1946.

Earthquake activity in the United States and its possessions during the year 1944 is reviewed with regard to noninstrumental results for the various States, tidal disturbances of seismic origin, seismological observatory results, strong-motion seismograph results, tilt observations, and earthquake fluctuations in wells. The data are illustrated by maps and tracings.—*V. S.*

9185. Critikos, N. Rapport sur la sismicité de l'Attique [Report on the seismicity of Attica]: Internat. Seismol. Assoc., Central Bur. Pub., Ser. A, Sci. Trans., no. 16, pp. 24–27, Strasbourg, 1946.

In the light of the author's investigations, Attica is a seismic region. Its earthquakes generally have been characterized by the following features. (1) The principal shock is never preceded by a preliminary disturbance but is always followed by several other shocks. (2) Seismic disturbances are easily propagated along the tectonic lines intercrossing in the region of the epicenter and produce isoseismic contours traceable to differences in local geology and particularly mountains of more ancient rock. (3) In Athens the initial arrivals on seismograms invariably are dilatation waves, indicating that the sudden vertical movement is always of the same sign. (4) The form of longitudinal waves, and also the relatively large amplitude of the first longitudinal and superficial waves, seem to characterize the degree of static resistance encountered by the disturbance. The bearing of these observations on the nature of the local earthquakes is discussed briefly.—*V. S.*

9186. Dix, C. H., Fu, C. Y., and McLemore, E. W. Rayleigh waves and free surface reflections: Quart. Appl. Math., vol. 3, pp. 151–156, Providence, R. I., July 1945.

Numerical and graphical results are given relating to the reflection of a plane compressional wave at a free surface. The results are of value in the seismic method of oil exploration, where Rayleigh waves are important.—*L. S. G., Physics Abstracts, vol. 49, no. 581, pp. 138–139, London, 1946.*

9187. Due Rojo, A. La teoria de la emigracion de epicentros y la distribucion geografica y cronologica de los sismos en el S y SE de la Peninsula Iberica [The theory of epicentral migration and the geographic and chronological distribution of seisms in the south and southeast of the Iberian Peninsula]: Rev. Geofis., vol. 4, pp. 473–479, Madrid, 1945.

A brief analysis of the statistical data covering seismic activity during several centuries shows that the distribution of seisms in the investigated regions varies with time. Such variation appears to indicate the actual migration of epicenters.—*Cent. Nat. Rech. Sci., Bull. Anal., vol. 7, no. 9, pt. 1, p. 1569, Paris, 1946, translated by V. S.*

9188. Erickson, E. L. Geophysical history of the Wasco oil field, Kern County, California: Geophysics, vol. 12, no. 2, pp. 169–175, Tulsa, Okla., 1947.

The reflection seismograph surveys which led to the discovery of the Wasco oil field were started in 1934. Some additional work was done to outline the structure in 1935. Subsequent to discovery in 1938, a detailed reflection seismograph survey was made for the purposes of aiding development and securing type seismograph data.—*Author's abstract.*

9189. Ewing, M., Woollard, G., Vine, A., and Worzel, J. Recent results in submarine geophysics: Geol. Soc. America Bull., vol. 57, no. 10, pp. 909–934, Baltimore, Md., 1946.

Investigations of submarine geology conducted during 1938–45 by means of seismic refraction surveys, under-water photography, acoustic sounding, bathymetry, and bottom sampling are reported.

Shallow-water seismic measurements were made at various locations along the western margins of the Atlantic Ocean. The depths to basement obtained stood in reasonable agreement with well data, where the latter were available. Observations showed a frequency dispersion which may serve to determine the properties of the bottom to a depth approximating the water depth.

Deep-water seismic measurements were carried out at two stations occupied in 1,500 fathoms and one in 2,600 fathoms. They showed the sound velocity in the surface layer of the bottom to be approximately the same as that in the weathered surface layer on land. Sediments were more than 600, 1,200, and 1,500 feet thick, respectively, at these stations.

Long-range sound transmission was found to take place in the natural sound channel of the oceans. By such means the sound from a 6-pound TNT bomb was heard at distances as great as 3,100 miles. Other methods of submarine investigation are described.—*V. S.* (*See also* Geophys. Abstracts 126, no. 8741.)

9190. Federal Science Progress. The seismograph; Earthquake engineering: U. S. Dept. Commerce, vol. 1, no. 2, pp. 3, 28, Washington, D. C., 1947.

Brief accounts are given of the investigation of earthquakes and vibrations in structures. About 500 major earthquakes are recorded during an average year, almost entirely within two seismic belts. One belt starts in the vicinity of Spain, extends through southern Europe and central Asia, and then breaks off into two branches almost encircling the Pacific Ocean; the other belt runs through the middle of the Atlantic Ocean and probably includes the Laurentian Basin. The work of the U. S. Coast and Geodetic Survey on the prediction of earthquakes and the development of shock-proof structures is outlined.—*V. S.*

9191. Fu, C. Y. Studies on seismic waves, III, Propagation of elastic waves in the neighborhood of a free boundary: Geophysics, vol. 12, no. 1, pp. 57–71, Tulsa, Okla., 1947.

Continuous and spherical harmonic waves are generated at an internal point of the medium. By use of the classical method of Sommerfeld the different modes of propagation near a free surface after the arrival of the waves are examined. From the approximate evaluations of the integrals it is found that in addition to the ordinary types of body and surface waves there are also inhomogeneous waves and surface waves which are not of the Rayleigh type. The amplitude factors of the latter waves vary inversely as the square instead of as the square root of the epicentral distance. Altogether, there are not less than five different types of waves, and they are obtained from integrations in the neighborhood of the singularities of the integrals.—*Author's abstract.* (For parts I and II *see* Geophys, Abstracts 124, nos. 8368–8369.)

9192. Gamburtsev, G. A. Contribution to the theory of multiple reflections [abstract, in Russian]: Akad. Nauk S. S. S. R., Otd. Fiz.-Mat., Referaty za 1943–44, p. 120, Moscow, 1945.

An analysis is made of one of the simplest cases of the propagation of plane seismic waves in a heterogeneous medium, of considerable interest in the problem of the relative intensity of multiple reflections. The solution is effected by methods formerly employed by the author in the study of sea chroma and diffusion of luminescence. Application can be made particularly in cases of deep seismic sounding and in the analysis of certain features of seismic data under various geologic conditions. The study was conducted at the Institute of Theoretical Geophysics, Moscow.—*Translated by V. S.*

9193. Gamburtsev, G. A. On the representation of seismic fields [in Russian]: Acad. Sci. U. R. S. S. Bull. (Izvestiia) Sér. Géog. et Géophys., vol. 10, no. 1, pp. 11–18, Moscow, 1946.

Prospecting data obtained by methods of seismic refraction and reflection consist of different elements, qualitative and quantitative, simple and complex, kinematic and dynamic. As a result, the complete field of these elements is multidimensional and multiform. To reduce the number of dimensions in practice, it is generally necessary to confine measurements and representation to incomplete fields, such as cross sections in one plane. The extent of necessary restriction depends upon the nature of each element. Equations for reducing a four-dimensional field of simple elements to a two-dimensional field and its representation

by rectangular coordinates are discussed. Consideration is also given to a number of other particular cases and examples. The analysis is made with a view to aiding exploration by the methods of correlation-refraction and combined reflection-refraction.—*V. S.*

9194. Gardner, L. W. Vertical velocities from reflection shooting: Geophysics, vol. 12, no. 2, pp. 221–228, Tulsa, Okla., 1947.

Reflection seismograph observations supply a means of determining the average vertical velocity of seismic waves from the ground surface to the depth of any good reflecting horizon, through measurements of "angularity corrections." Specially grouped arrangements of shot points and detectors are illustrated and described, which minimize error in making these measurements. Reflection seismograph observations using these arrangements were made at four locations where well velocity surveys were available. Comparison of results indicates that average vertical velocities good to within 3 percent can be obtained by this method under favorable conditions.—*Author's abstract.* (*See also* Geophys. Abstracts 125, no. 8527.)

9195. Gogoladze, V. G. Motion of seismic energy in different media: Acad. Sci. U. R. S. S. Comptes Rendus (Doklady), vol. 49, no. 8, pp. 554–555, Moscow, 1945.

An analysis is made of the problem of two different elastic media meeting along a plane OXZ, in which the vectors of stress and displacement are continuous. It is assumed that the velocities of the longitudinal waves a and c and of the transverse waves b and d satisfy the inequality: $d<b<a<c$. The solution is effected by means of the equations of the potentials of reflected and refracted waves, which serve to deduce expressions of the energy trajectory and the energy flux $\vec{S}(S_x,S_y)$, for a complex refracted longitudinal wave; the derivations are presented. It is found that the component S_x of the energy flux does not change its direction, whereas the component S_y reverses itself in the course of time. The expressions of the trajectory and flow for homogeneous waves can be deduced similarly and lead to analogous results.—*V. S.*

9196. Grenet, G. Sur l'étalonnage des seismographs électromagnétiques [On the standardization of electromagnetic seismographs]: Internat. Seismol. Assoc., Central Bur. Pub., Ser. A, Sci. Trans., no. 16, pp. 28–33, Strasbourg, 1946.

An electrical tapping test is described for the calibration of seismographs of any type and the standardization of Galitzin instruments. It replaces the tapping with a hammer on the pendulum by the equivalent action of the brisk passage of electric current in the circuit of the pendulum. A Wheatstone bridge makes it possible to put an electric charge through the pendulum circuit without affecting the circuit of the galvanometer. The application of this method to different seismographs is illustrated by examples.

In the case of modern electromagnetic seismographs using a coil circuit for damping, a tapping test is difficult to apply and will serve for calibration only when the instrument has given consistent performance. Generally, calibration will require a separate determination of the constants of the pendulum and the galvanometer.—*V. S.*

9197. Gutenberg, B. Interpretation of records obtained from the New Mexico atomic bomb test, July 16, 1945: Seismol. Soc. America Bull., vol. 36, no. 4, pp. 327–329, Berkeley, Calif., 1946.

The ground and air waves produced by the New Mexico atomic bomb test were studied on the basis of records from 10 seismological stations situated at distances of 437 to 1,136 kilometers from the explosion. The data obtained furnished information on the *Pn*, *P*, and *S* ground waves and on several distinct groups of sound waves; in the calculations, the time of explosion was known within ±15 seconds. The results showed that the apparent velocity of *Pn* practically coincided with the value of 8.06 km./sec. determined for southern California earthquakes; the origin time calculated from *Pn* and $\overline{P}$ agreed closely. The travel times of *S* ranged from 2:05 to 5:11 min: sec., corresponding to those of *SySy*, *Sy*, or $\overline{S}$ in earthquakes. No unusual waves were apparent. Some results on sound waves also are given.—*V. S.*

9198. Gutenberg, B., and Richter, C. F. Seismic waves from atomic bomb tests: Am. Geophys. Union Trans., vol. 27, no. 6, p. 776, Washington, D. C., 1946.

The seismograms of the atomic bomb tests at Bikini on July 24, 1946, showed only longitudinal waves *P*. No transverse waves or surface waves were detected. The results for the eight stations employed are tabulated with brief remarks. Rough calculation of travel times confirms the previous results for the New Mexico test of 1945.—*V. S.*

9199. Hollingsworth, W. E. Geophysical history of the East Field, Jim Hogg County, Texas: Geophysics, vol. 12, no. 2, pp. 200-207, Tulsa, Okla., 1947.

The geophysical work which led to the discovery of the East Field in Jim Hogg County, Texas, was started in 1934, when a single line of torsion balance stations was run across the area. Core drilling followed in 1938 and 1939. Reflection seismograph work was done in 1942 and outlined the field. The discovery wells were drilled in 1942 and 1943.—*Author's abstract.*

9200. Housner, G. W. Characteristics of strong-motion earthquakes: Seismol. Soc. America Bull., vol. 37, no. 1, pp. 19–31, Berkeley, Calif., 1947.

Since the only common feature of all strong-motion earthquakes is their randomness, the development of shock-proof construction requires investigation of the characteristics of random earthquakes. The present study shows that it is immaterial from a structural viewpoint whether the acceleration pulses of earthquake records are random in direction, magnitude, or time, and it gives an analysis of a mathematical model of an earthquake registering pulses random in time. Spectra of the maximum values of the resultant amplitude-vectors computed from records of ten different earthquakes are compared with various averaged spectra and found to satisfy the statistical criteria of randomness. Thereupon, the properties of these records are studied to determine the seismic characteristics of random earthquakes.—*V. S.*

9201. Kirnos, D. P. A horizontal seismograph for epicentral zones [abstract, in Russian]: Akad. Nauk. S. S. S. R., Otd. Fiz.-Mat., Referaty za 1943–44, p. 91, Moscow, 1945.

In 1944 a horizontal seismograph was designed for observations in epicentral zones, in connection with research on earthquakes and shockproof construction. Its distinctive features comprise a horizontal pendulum with a relatively long hand, electromagnetic damping, and optical registration devoid of mechanical levers. By virtue of the construction, considerable accelerations and brisk shocks have no effect on performance, and resonance interference can be controlled by adjusting the damping. A reduced scale of recording is employed, with a subsequent enlargement of the sections chosen for study. The research was done at the Seismological Institute, Moscow.—*V. S.*

9202. Ludeke, C. A. An experimental investigation of forced vibrations in a mechanical system having a nonlinear restoring force: Jour. Appl. Physics, vol. 17, pp. 603–609, Lancaster, Pa., 1946.

A mechanical apparatus was used for generating and recording forced vibrations in a system having a nonlinear restoring force. The experimental wave forms were compared with the theoretical results given by three graphic methods.

In all experimental results, it was noted that even though the restoring force was distinctly nonlinear, the wave forms of the resulting motion were nearly sinusoidal as long as the frequency of the observed motion was the same as the frequency of the disturbing force. However, steady oscillations could be maintained for which the observed frequency was a submultiple of the disturbing frequency. Two such subharmonics were recorded, and the experimental wave forms are shown.—*Physics Abstracts, vol. 50, no. 590, p. 36, London, 1947.*

9203. McCarver, Holland, and West, L. G. The geology and geophysics of the Odem oil field, San Patricio County, Texas: Geophysics, vol. 12, no. 1, pp. 13–29, Tulsa, Okla., 1947.

The Odem field, located in southern San Patricio County, Texas, was discovered in the latter part of 1939. Prior to 1933 the Odem area received a limited amount of geological and geophysical exploration, and several test wells were drilled. These wells were dry, and the area apparently was condemned until a reflection seismograph survey indicated structure. Subsequent drilling confirmed the presence of a structure containing oil at several horizons. The proven limits of production conformed closely to the contours of the original seismograph map.—*Authors' abstract.* (*See also* Geophys. Abstracts 125, no. 8536.)

9204. Macelwane, J. B. Origin of microseisms: Science, new ser., vol. 104, no. 2700, pp. 300–301, Lancaster, Pa., 1946.

Recent research has revealed that group microseisms, as defined by Gherzi, originate in the ocean bottom under the center of hurricanes or other atmospheric disturbances. The author advances an explanation of the mechanism of such generation. The air vortex of a hurricane exerts a frictional torque on the water surface, producing a water vortex. The latter extends to the bottom, acquiring at the same time an oscillatory motion owing to the differential effects of temperature, pressure, and salinity on water density. Vortex oscillation delivers to the ocean bed a series of blows, causing the ground to vibrate and radiate elastic waves. Mathematical calculation is presented showing

that such a mechanism would give the right order of magnitude for the quantities involved.—*V. S.*

9205. Martin, Hans. Schwingungstechnische Probleme des Erdinnern [Technical problems of vibration in the interior of the earth]: Forsch. und Fortschr., vol. 18, pp. 351–352, Berlin, 1942.

Two earthquakes were registered simultaneously from a distance of some 10,000 kilometers by means of two OW horizontal seismographs and one vertical seismograph. As with other measurements by such instruments, the results showed that the vertical component of the *S* wave either does not register at all or registers very faintly in comparison with the horizontal component. Yet the two components should be about equally strong at such a distance from the focus. Certain other unresolved problems of the records are indicated. The author traces the apparent conflicts in the evidence to an erroneous interpretation of some wave characteristics in seismograms.—*V. S.* (A review appeared in Zentralb. Geophys., Meteorol. u. Geod., vol. 11, no. 2, pp. 76–77, Berlin, 1943.)

9206. Masarskii, S. I. On the question of selecting hodographs of adequate length [in Russian, with English summary]: Seismol. Inst. Trudy no. 117, pp. 24–33, Moscow, 1945.

The errors made in interpreting seismic hodographs of reflected and refracted waves are examined with a view to improving precision. A criterion is offered for a preliminary computation of the number and the distribution of hodograph points that would ensure a predetermined accuracy in estimating velocities and initial periods. Moreover, the equations customarily employed for calculating the data by means of least squares are used for deducing formulas expressing the relationships existing between the unknowns of these equations, the number of the equations, the interval between observation points, and the average distance from the shot point. Some concrete results are tabulated. The mathematical expressions obtained for the different variables also can serve for a graphic estimation of the precision of interpretation.—*V. S.*

9207. Mercanton, P. L. Le nouveau sismograph vertical Kreis-Wanner de l'Observatoire Sismologique Fédéral à Zurich [The new vertical seismograph Kreis-Wanner of the Federal Seismological Observatory at Zurich]: Internat. Seismol. Assoc., Central Bur. Pub., Ser. A, Sci. Trans., no. 16, pp. 46–51, Strasbourg, 1946.

The new vertical seismograph of the Seismological Observatory at Zurich was built by Kreis and Wanner with a view to improving registration of superficial waves of long period from distant earthquakes. It consists of a prismatic metal frame measuring 3.5 meters in height and 1.0 square meter in cross section supporting a stationary weight of 1,100 kilograms by means of four springs. The oscillation period of the apparatus, when amplified by an astatizing device, can attain 25 seconds, but ordinarily does not exceed 8 to 10 seconds. The effects of temperature variation on the elasticity of the supporting springs are compensated by equal effects on a special balancing spring, a principle previously used by Kreis in his universal seismograph. Construction is illustrated by drawings and plates.—*V. S.*

9208. Munk, W. H. Increase in the period of waves traveling over large distances, with applications to tsunamis, swell, and seismic surface waves: Am. Geophys. Union Trans., vol. 28, no. 2, pp. 198–217, Washington, D. C., 1947.

An expression is derived from very general assumptions for the increase in wave period during long-distance propagation. To illustrate the general nature of the solution, application is made to three different geophysical phenomena: First, to the tsunami from the Aleutian earthquake of April 1, 1946; second, to the long forerunners of the swell recorded at the wave station in Pendeen, England; and, finally, to the seismic surface waves from the Montana earthquake of June 28, 1925, and a smaller Mexican shock in 1943. In the case of the tsunami and the swell, observations and theory are in good agreement. For the seismic surface waves, the theory gives at least the right order of magnitude. Application of the theory to the period increase of swell seems furthermore to provide a simple, rational basis for locating and tracking storms at sea by means of swell observations and may therefore be of interest in weather forecasting.—*Author's abstract.*

Nettleton, L. L. Geophysical history of typical Mississippi piercement salt domes: Geophysics, vol. 12, no. 1, pp. 30–42, Tulsa, Okla., 1947. *See* Geophys. Abstract 9149.

9209. Riznichenko, Iu. V. Method for transforming media in geometrical seismics [abstract, in Russian]: Akad. Nauk S. S. S. R., Otd. Fiz.-Mat., Referaty za 1943–44, pp. 122–123, Moscow, 1945.

Most problems of geometrical seismics relating to stratified media can be solved by the method of temporal fields through a reduction to several particular cases of continuous media. With homogeneous and isotropic media the solutions have been worked out in detail, but heterogeneous and anisotropic media create complications that render solutions impracticable.

The author shows that the latter problems also are reducible to simple, known cases. He demonstrates how the media characterized by known complex variations of the velocities used for determining the surfaces of separation can be transformed from heterogeneous anisotropic to homogeneous isotropic. Since such transformations are not always practicable in terms of the customary Euclidean geometry, criteria are given for identifying the types of velocity variation which are not solvable by that geometry, such as the condition that the Riemann-Christoffel tensor equals zero. The particular case of a heterogeneous isotropic medium also is considered. In seismic prospecting the described method of transformation can be applied graphically. The study was conducted at the Institute of Theoretical Geophysics, Moscow.—*V. S.*

9210. Rothé, E. Sur l'utilisation du reseau de pendules á grande masse [On the utilization of the network of heavy pendulums]: Internat. Seismol. Assoc., Central Bur. Pub., Ser. A, Sci. Trans., no. 16, pp. 83–86, Strasbourg, 1946.

In the Alps, the Jura, and the Vosges Mountains numerous weak seismic distrubances occur that are classed as hysteresis shocks. In order to record and locate them a network of heavy-pendulum installations has been operated since 1922–25 at Zurich, Neuchâtel, Bâle, Coire, Sion, Jena, Göttingen, and Strasbourg on the initiative of A. de

Quervain. The pendulums at Jena and Göttingen weigh 15 and 17 tons, respectively. The author outlines briefly the results of the observations made through 1925–35 and gives a tabulation of the data at Strasbourg. In all, the heavy pendulums have registered during this period 370 seisms not recorded by ordinary instruments. The Strasbourg seismograms show evidence of some of the complex phases indicated by A. Mohorovicic.—*V. S.*

9211. Savarenskii, E. F. Concerning the principles of interpretation of seismic observations [abstract, in Russian]: Akad. Nauk S. S. S. R., Otd. Fiz.-Mat., Referaty za 1943–44, p. 95, Moscow, 1945.

An inquiry is made into the foundations of the interpretation of seismic observations. It deals with the historical development of seismology, the physical basis and mathematical methods of seismic theory, the contribution of Fermat, Hamilton, Richter, Galitzin, Sobolev, and others, and the nature and limitations of the principle of minimum time in seismological practice. The treatment of the subject matter makes it suitable for a textbook.—*V. S.*

9212. Scholte, J. G. On the relation between sea waves and microseisms [in Dutch]: Akad. Wet. Amsterdam, Afd. Natuurk., Versl., vol. 52, no. 10, pp. 669–683, Amsterdam, 1943.

It is shown that any disturbance of the sea generates two systems of waves: (a) Gravitational, surface waves, independent of compressibility, with amplitude decreasing exponentially with depth, and (b) compressional waves, independent of gravity, with amplitude independent of depth.

Assuming constant depth of the ocean, infinite surface and elastic bottom, and neglecting viscosity, the equations of motion for free oscillations without external pressure are discussed, and the two wave solutions are obtained. The case of normal periodic pressure is dealt with, the vibrations of the sea bottom are computed, and it is shown that vibrations of the order of magnitude of recorded microseisms are possible.—*J. A. W., Physics Abstracts, vol. 49, no. 586, p. 295, London, 1946, condensed by V. S.*

9213. Short, E. H., Jr. Improved marine equipment facilitates distant offshore exploration: Oil and Gas Jour., vol. 45, no. 35, pp. 63–65, Tulsa, Okla., 1947.

The workable seismograph territory in the Gulf of Mexico has been extended during the last 3 years from inland bays and shore lines to points more than 26 miles offshore in unprotected waters. In part, such progress is due to improvements in the ships used by the companies. Innovations are illustrated by the specially designed fleet operated by the Superior Oil Co., which includes (1) a recording boat, cruiser type, 100-horsepower marine engine; (2) a survey boat, cruiser type, twin-screw 2-200 horsepower marine engine; (3) a backsight boat, logger type, 100-horsepower marine engine; and (4) two shooting boats, logger type, 100-horsepower full Diesel. All boats have a 23-ton displacement and are equipped with two-way FM short-wave radio sets. To house the crews, a special quarters boat accommodating 31 people is anchored at the base of operations.—*V. S.*

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9214. Sloat, John. Geophysical history of Raisin City field, California: Geophysics, vol. 12, no. 2, pp. 181–190, Tulsa, Okla., 1947.

The discovery history of Raisin City field is described because it demonstrates the ability of the seismograph to locate low-relief structures, where closure is present only in certain zones, even in areas where records are of mediocre quality. The seismic map which led to leasing is shown, along with detail maps made several years later. Gravimeter maps and maps from well locations are also presented.—*Author's abstract.*

9215. Sterne, W. P. Traveling towns solve seismo crew's housing problems: Oil Weekly, vol. 125, no. 9, pp. 38–39, Houston, Tex., 1947.

Seismic crews exploring in terrain difficult of access are housed in trailer towns by the Carter Oil Co. Each trailer measures 23 by 7.5 by 6 feet and accommodates 6 men. A trailer town consists of several sleepers, an office trailer, and a kitchen trailer. It has its own water supply, electricity, heating, plumbing, and health facilities, as well as three regulation tents. Trailer towns can be set up in localities without roads, allowing much saving in time and in wear to the crews and the geophysical equipment.—*V. S.*

9216. Swan, B. G. Geophysical history of East Lance Creek and Little Buck Creek fields, Niobrara County, Wyoming: Geophysics, vol. 12, no. 2, pp. 153–158, Tulsa, Okla., 1947.

A seismograph survey in 1936 by the Continental Oil Co. eastward from Lance Creek field, along a projected surface extension of this fold, led to the discovery of East Lance Creek and Little Buck Creek fields. Maps are presented showing the results of this work and the structure as revealed by drilling wells and surface geology at early and later stages of development. Substantial agreement between the structures as mapped by subsurface work and by seismograph is noted.—*Author's abstract.*

9217. Tvaltvadze, G. Some data on the structure of the earth's crust in the region of Abastumani-Tsnisi-Moktsevi, eastern Georgia [in Russian]: Acad, Sci. U. R. S. S. Bull. (Izvestiia), Sér. Géog. et Géophys., vol. 9, no. 1, pp. 36–39, Moscow, 1945.

In 1941 a seismic test was made in eastern Georgia, U. S. S. R., over terrain underlain by granitic and basaltic rocks. Two explosions were set off on the same day at an interval of 5.5 hours, one at Tsnisi with 220 tons of explosives and the other at Moktsevi with 40 tons. The seismograms recorded by field seismographs and by instruments of three seismic stations located at distances of 6 to 142 kilometers from the shot points indicated the following velocities: (1) In the upper sedimentary layer, 3.3 kilometers thick, V_{p_1}=4.4 km./sec., V_{t_1}=2.6 km./sec.; (2) in the next granitic layer, 20.7 kilometers thick, V_{p_2}=5.6 km./sec., V_{t_2}=3.2 km./sec.; and (3) in the lower basaltic layer beginning at a depth of 24 kilometers, V_{p_3}=6.7 km./sec., V_{t_3}=4.0 km./sec. Reflections of seismic waves took place at a boundary tentatively located at a depth of 50 kilometers. Clear arrivals were registered by a surface wave with a period of 1.54 seconds, a length of 3,000 meters, and a velocity of 2.2 km./sec.—*V. S.*

9218. Valle, P. E. On the relation between the coefficient of absorption and the period of seismic wages [in Italian]: Ric. Sci. Ricostruz., vol. 16, pp. 322–325, Rome, Mar.–Apr. 1946.

Generally, the period of seismic waves is observed to increase with distance from the epicentre, but there are exceptions. Since the coefficient of absorption increases with frequency, the wave length of the impulse might be expected to increase progressively with the distance from the epicentre, owing to the greater absorption of short period components. It is shown, however, by considering the Fourier spectral density of the frequencies, that this may not always be the case. This fact may provide an explanation of the exceptions.—*V. C. A. F., Physics Abstracts, vol. 50, no. 590, p. 62, London, 1947.*

9219. Vecchia, O. Determinazione della velocita nelle prospezioni geosismiche [Determination of velocity in seismic prospecting]: Riv. Geominer., vol. 5, nos. 1–4, pp. 12–32, Milan, 1944.

After briefly reviewing the geologic factors which determine seismic velocities in rocks, such as petrographic composition, porosity, age, depth, tectonics, etc., the author discusses the different field methods used for the direct and indirect measurement of these velocities. Graphic and analytical methods based on refraction travel-time curves and reflection methods utilizing vertical travel-times measured in boreholes are considered. Attention also is devoted to corrections for weathering and lateral velocity changes of a regional scope. Finally, the fundamentals of practical measurements of sustained vibrations by means of mechanical vibrographs are recalled.—*Author's abstract.*

9220. Warren, P. R. Geophysical history of the Ville Platte oil field, Evangeline Parish, Louisiana: Geophysics, vol. 12, no. 2, pp. 176–180, Tulsa, Okla., 1947.

The brief pre-discovery geophysical activity by the Continental Oil Co. in the area of the Ville Platte field consumed 25 working days and consisted of a reflection seismograph survey employing symmetrical setups far removed from the shot points. After discovery a gravity meter survey revealed a gravity minimum almost coinciding with the seismograph structure and the productive area.—*Author's abstract.*

4. ELECTRICAL METHODS

9221. Belluigi, A. Sui nuovi indirizzi di prospezione geoelettrica—Sondaggi elettrochimici, metodo Eltran [On new developments in electrical prospecting—Electro-chemical sounding, Eltran method]: Riv. Geominer., vol. 2, nos. 3–4, pp. 56–61, Milan, 1941.

In previous publications the author has discussed Max Müller's electrochemical effect in the ground and has shown the actual meaning of measurements made of this effect with Müller's instruments. Doubts were expressed as to whether it is really possible to isolate such an effect, always closely associated with other phenomena, and experimental results were presented on the measurement of one of the associated effects, the deconcentration voltage of nonpolarizable electrodes. Since that time Müller admittedly has obtained remarkably interesting results. However, the author still doubts the efficacy of the instruments employed

and suggests a solution of the difficulty. Moreover, he considers that the new Eltran techniques may be a valuable addition to the electrochemical method. Experiments will be made to test these techniques, opening an entirely new field for electrical surveys.—*Author's abstract, condensed by V. S.*

9222. Bower, T. H. Log map, new type of subsurface map: Am. Assoc. Petroleum Geologists Bull., vol. 31, no. 2, pp. 340–349, Tulsa, Okla., 1947.

This paper describes what is believed to be a new type of subsurface map. It is essentially a structure-contour map on which variations in the lithologic succession of a formation, member, or small unit are depicted by a series of electric or other logs. The name "log map" is conveniently applied to this type of map. With the addition of appropriate data, the map is a useful tool in the analysis of subsurface geology, as a location plan or a reservoir map upon which the development of reservoirs can be planned and followed.—*Author's abstract, condensed by V. S.*

9223. Davis, C. E. Interpretation of electrical well logs in the midcontinent area [abstract]: Tulsa Geol. Soc. Digest, vol. 13, 1944–45, pp. 69–71, Tulsa, Okla., 1945 (?).

A pressing need exists for a clarification of the theory underlying the interpretation of electrical logs, and some advances have been made in this respect in the past few years. The self-potential curve, appearing on the left of the log strip, is thought to be produced by osmosis and infiltration of drilling fluid into the formation. Recent experiments have indicated that the reactions resulting in the potential changes shown on logs are largely electrochemical. The single point impedance curve obtained by two electrodes reflects changes in the resistivity of the formation within an area of approximately 10 times the diameter of the measuring electrode lowered into the well. This curve and the short-spaced two-electrode normal resistivity curve practically have the same value in the midcontinent area. Lateral resistivity or impedance curves commonly called third and fourth curves, show the differences in electrical potential existing between two potential-measuring electrodes in an induced field. Some particulars of the flow of current registered in the various electric curves are indicated.—*V. S.*

9224. Evjen, H. M., and Lewis, W. B. Further experimental proofs of working depths for low-frequency commutated currents [abstract]: Geophysics, vol. 11, no. 3, p. 422, Tulsa, Okla., 1946.

Measurements of the potential existing during the current gap interval were made at four frequencies and with three electrode spreads. The electrode pattern was a Wenner spread with electrode separations of 500, 1,000, and 1,500 feet for successive runs. The midpoint of the three spreads was the same. For each spread, readings were taken at 0.32, 0.64, 1.28, and 2.56 cycles per second. The commutator was adjusted to allow current to flow for 72 degrees and to measure the potential during a 72-degree interval (*see* Geophys. Abstracts 121, no. 7994). Direct current measurements were also made at each separation. The depth to the interface responsible for the main perturbation potential was computed for the direct current measurements, and a shallowest

depth to the interface responsible for the gap-potential measurements was determined.

At two locations, one on and one off production, measurements were made at 24 frequencies between 0.32 and 2.56 cycles per second. These data were fitted with theoretical curves based on three reflecting horizons. The effect from the horizon corresponding to the depth to present production is seen to be chiefly responsible for the difference in response at the two stations.

9225. Gabriel, V. G. Electrical methods of oil exploration: Petroleum Engineer, vol. 18, no. 1, pp. 216–220, Dallas, Tex., 1946.

The dependence of the electrical properties of subsurface rocks upon lithologic, stratigraphic, and structural factors, degree of cementation and mineralization, porosity, water content, and temperature is discussed in its relation to electrical prospecting. Inasmuch as electrical properties reflect the sum total of all these influences, it is considered unjustifiable to interpret them exclusively in terms of geologic units, as is often done. In the light of these considerations, the purposes of electrical prospecting are classified as the direct detection of oil, the detection of favorable structures and conditions, the detection of associated phenomena, such as gas and oil leaks and surface mineralization, and the study of general geology. The techniques suitable for each purpose are indicated, and the relations between their diagnostic principles and oil accumulations are appraised. A bibliography is appended.—*V. S.*

9226. Gogoladze, V. G. On the propagation of electromagnetic waves in different media in contact along a plane [in Russian]: Acad. Sci. U. R. S. S. Bull. (Izvestiia), Sér. Géogr. et Géophys., vol. 10, no. 1, pp. 115–120, Moscow, 1946.

In developing the theory of radio waves, I. Zenneck, A. Sommerfeld, and other writers studied electromagnetic waves propagated in the plane of contact between two media. The question of the existence of such waves led them to investigate the roots of certain algebraic functions satisfying the specified conditions. The author shows that in the case of two different homogeneous media in contact along a plane the equation for the velocity of electromagnetic surface waves has no roots in the first leaf of the Riemann surface. Accordingly, the Maxwell equation for electromagnetic fields is not solvable, and no electromagnetic waves exist in the boundary surface in this case.—*V. S.*

9227. Happ, S. C. Electrical-resistivity investigations of levee foundations near Kansas City [abstract]: Geol. Soc. America Bull., vol. 57, no. 12, pt. 2, p. 1200, Baltimore, Md., 1946.

Electrical-resistivity surveys have been made for investigation of foundations for two levee units of the Kansas City flood protection project, located in the alluvial flood plains of the Kansas and Missouri Rivers. Specific resistivity measurements on 270 subsurface samples, obtained by drilling, show general agreement with the accepted principle that resistivity increases with grain size, but the variation in resistivity of materials of similar textural classification is greater than the average difference in resistivity for different standard textural

classes. The resistivity of sand from below the water table is also much less than that of finer materials from above the water table.

"Vertical resistivity profiles" measured at 24 drill holes give reliable indications of the depth of contact of surficial sands on fine-grained impermeable strata, but are not reliable for determining the contact of these impermeable strata on underlying sands, or for tracing the extent of individual clay layers within a variable complex of silty and sandy beds. Equally consistent interpretations are obtained by comparison with Wetzel's theoretical three-layer curves or by the tangent method described by Moore.

Faster "step-traverse" surveys are apparently reliable for verifying the continuity of surficial fine-grained impermeable strata overlying sands, but drilling is necessary to determine the thickness of the impermeable strata and for interpretation of resistivity variations. Neither the methods of survey nor of interpretation gave consistent results where measurements were made on existing levees, including heterogeneous industrial waste materials resting on alluvial sands.

9228. Marshall, D. L., and Oliver, L. R. Some uses and limitations of model studies in cycling [digest]: Oil Weekly, vol. 125, no. 3, p. 52, Houston, Tex., 1947.

Recently electrical models have been used to predict invasion patterns in reservoir cycling, and an improved apparatus for potentiometric model studies has been developed. In the present paper several model studies made with the use of a chronocartograph are discussed. It is found that the accuracy with which models can predict the course of cycling in any reservoir is limited by the knowledge available on such factors as the reservoir's configuration, pay thickness, porosity, interstitial water, permeability, fluid content, production, and injection. Each reservoir offers an individual problem, and the models aimed at individual solutions offer much aid in cycling operations.—*V. S.*

9229. Migaux, Léon. Une méthode nouvelle de géophysique appliquée—La prospection par courants telluriques [A new method of applied geophysics—Prospecting by telluric currents]: Ann. Géophys., vol. 2, pp. 131–146, Paris, 1946.

In 1939 M. Schlumberger proposed the use of telluric currents for surface prospecting. Such surveys have been made commercially in France since 1941, and numerous structures were discovered or mapped in Aquitaine and Languedoc. The principles of the method and its applications to different types of geology are discussed by the author in the light of the accumulated evidence.

Telluric currents appear to be a reflection of electric phenomena in the upper atmosphere directly related to solar radiations. Over surface areas of 100 square kilometers these currents would be essentially parallel for a homogeneous earth's crust, whereas geologic structures or other heterogeneities would produce anomalies. If the telluric variations at a base station are so selected that they lie on a circle of unit radius, then the corresponding variations at the observation point can be shown to lie on an ellipse which is completely determined by four constants satisfying the conditions for a rotation of axes. The underlying mathematics is presented, and a graphic method of ellipse

construction for the interpretation of telluric anomalies is described. Telluric prospecting is considered particularly suitable for oil search.—*V. S.* (A review appeared in Geophysics, vol. 12, no. 1, pp. 120–121, Tulsa, Okla., 1947.)

9230. Prange, F. A. The agents, basic causes, control, and prevention of corrosion: Oil and Gas Jour., vol. 45, no. 18, pp. 88–93, Tulsa, Okla., 1946.

A discussion is given of corrosive agents and metals affected by them. The corrosive process, produced by their interaction, can be chemical or electrolytic. The latter, more frequent, type involves electric currents and electrically conductive solutions, and depends upon electric voltage, amperage, resistance, area, and other local characteristics. Examples of electrolytic corrosion are the action of acids, rusting, bimetallic corrosion, and pitting. The development of corrosion of any type is affected by certain inhibiting and accelerating factors, temperature, liquid flow velocity, concentration, action of acids, and electrochemical agents; the latter comprise the formation of simple galvanic cells, metal-ion concentration cells, or oxygen concentration cells. The effects of each factor are considered.—*V. S.*

9231. Slichter, L. B. Geophysical prospecting for ores: Min. Cong. Jour., vol. 33, no. 2, pp. 47–51, Washington, D. C., 1947; excerpts in South African Min. Eng. Jour., vol. 57, pt. 2, no. 2814, p. 575, Johannesburg, 1947.

Progress in geophysical prospecting for ores can be achieved by broadening both scientific research and the participation of mining companies in the work of geophysical consultants, in analogy with practices in the oil industry. Research already has improved ore-finding techniques by introducing airborne magnetometers, modern gravimeters, and electrical logging and pospecting equipment.

In electrical prospecting, further improvements can be attained by using drill holes, which provide the opportunity of adding the third dimension to electrical maps and of supplying electrical current at the most favorable location, either in the ore or near it. Surface potential mapping of ore pierced by drill holes may make it possible to delineate the deposit to depths about equal to the length of the ore body, and under favorable circumstances to still greater depths. In addition to drill holes, the interpretation of prospecting results also is aided by experimentation with geometrical scale models and by the use of large computing machines. A more extensive application of electrical methods in connection with drilling and underground workings is advocated.—*V. S.*

9232. Stefanescu, S. S. La theorie du plan conducteur et les etats electromagnétiques transitoires [Theory of the conducting plane and transient electromagnetic states]: Riv. Geominer., vol. 4, no. 1, pp. 3–9, Milan, 1943.

It is shown that by using extremely restrictive hypotheses it is possible to give a very clear physical interpretation to the theory of transient fields existing in the presence of a conducting plane. Moreover, the solution of the problem of the transient state proves to be definitely simpler than that of the alternating state, a rare case in mathematical physics.—*Author's abstract translated by V. S.*

9233. Tarkhov, A. G. Regarding the geo-electrical field of filtration [in Russian]: Acad. Sci. U. R. S. S. Bull. (Izvestiia), Sér. Géogr. et Géophys., vol. 10, no. 5, pp. 463–468, Moscow, 1946

A field of natural electrical potential may be generated in the subsoil by the filtration of rain water through sediments. Such a case was observed in 1945 by an expedition of the U. S. S. R. Institute of Exploration Geophysics (VIRG) in the area of the Shagali-Eliar copper deposit in Transcaucasia. From the local geology, low values of natural potential were expected in the area of this deposit, but actually negative values as large as —200 to —250 millivolts were detected. These values fluctuated according to conditions of the weather but independently of the presence of ore. Investigation revealed that the determining factor was rainfall. It is concluded that electric fields due to rain-water filtration may interfere with measurements of natural potential in prospecting for ore deposits and oil-bearing structures.—*V. S.*

9234. Technifax Service. How to build electric treasure finder: Construction Pattern Series, folders 1, 5, 7, 8 pp. each, Chicago, 1940.

Technifax Service, Chicago, has been publishing a Construction Pattern Series furnishing information, specifications, and blueprints to aid in the building and use of scientific instruments. The folders put out under the general title of "How to build electric treasure finder" deal with equipment employed in electrical prospecting, such as the "Radiofiector Pilot," the "Variable Inductance Monitor," and the "Radiodyne Prospector." In each case, a general introduction on the nature of valuable deposits and on electrical methods of exploration is followed by construction data, plates, a list of parts, and a blueprint.—*V. S.*

9235. Tikhonov, A. N. On the transient due to an electric pulse in a homogeneous conductive half-sphere [in Russian, with English summary]: Acad. Sci. U. R. S. S. Bull. (Izvestiia), Sér. Géog. et Géophys., vol. 10, no. 3, pp. 213–231, Moscow, 1946.

A mathematical analysis is made of the problem of a wire connecting two points situated on the boundary $z=0$ of a homogeneous conductive half-space $z>0$ (earth). An electric pulse of given intensity passes through the wire at the moment t_0. The solution is achieved by an application of Maxwell's equations and is expressed in terms of elementary functions and quadratures, being fully accessible to quantitative and qualitative study. Especially simple is the case $z=0$, when the time during which the pulse reaches equilibrium has a value of the order t_0. This circumstance indicates that it is possible to apply the analysis of the transients to geophysical prospecting.—*Author's abstract, condensed by V. S.*

9236. White, C. C. Electrical well logging, a study of the self-potential curve: Oil and Gas Jour., vol. 45, no. 32, pp. 88–90, Tulsa, Okla., 1946.

The self potential measured in electrical well logging is known to consist of two distinct voltages, electrochemical potential and electrofiltration potential. The author examines the causes and the mathematical expression of these components and endeavors to separate and evaluate them for the particular case of logging in the South Albion field, Edwards County, Ill.

The salinities at various depths which produce the electrochemical potential are plotted, as measured from samples, and the corresponding electrical resistivities for these waters are shown. It is found that the curve of the electrochemical potential is very similar to the curve of self potential, which indicates that the major portion of the self potential in this case was due to electrochemical sources. The normal component of electrofiltration, on the other hand, is calculated to be equal to about 13 percent at a depth of 2,353 to 2,370 feet, slightly more at greater depths, and less at shallower depths. The various factors affecting potentials in wells are discussed.—*V. S.*

5. RADIOACTIVE METHODS

9237. Bulashevich, Iu. P. Concerning the theory of interpretation of radioactive anomalies [in Russian]: Acad. Sci. U. R. S. S. Bull. (Izvestiia), Sér. Géog. et Géophys., vol. 10, no. 5, pp. 469–481, Moscow, 1946.

The emanation given off by subterranean radioactive sources has a concentration distributed on the surface according to the laws of diffusion. Accordingly, the theory of the interpretation of radioactive anomalies may be furthered by the application of the mathematical equations of diffusion. The author considers this problem separately for a point source, a linear source of infinite length, and a band of infinite length located under a homogeneous layer of alluvium. The solutions are effected by means of Dirac's delta-function and by series of Bessel functions, employed to express the subterranean source and the surface concentration, respectively. Geologically, a linear source can be a vertical or inclined fissure, and a band source in most cases is a pegmatite vein.—*V. S.*

9238. Garrigue, H. Campagne de mesures de radioactivité dans les Vosges [Survey of radioactivity in the Vosges Mountains]: Inst. Phys. Globe, Ann. 1936, new ser., vol. 1, pt. 3, pp. 3–6, Mende, France, 1939.

An investigation made in the Pyrenees during 1937 revealed that the radium emanation from subsoil rocks accumulates on the surface under the mountain snow. The air between the ground and the snow had a content of $10{,}000\times10^{-13}$ curie, whereas the average content of the free air in Paris was 1.0×10^{-13} curie. Apparently the snow layer acts as an impermeable shield preventing the diffusion of emanations. A factor contributing to the concentration seemed to be the action of the wind, by means of which the emanation over the uncovered areas was swept in the direction of the snow-covered areas and forced under the layer of snow.

A similar investigation in the less elevated and less steep Vosges Mountains in 1938 confirmed these findings. It showed that the accumulated emanation content varies proportionally to wind intensity and depends upon the nature of the relief and the subsoil. The maximum emanation-content here was less than in the Pyrenees. The daily readings are listed.—*V. S.*

9239. Graves, A. Modern Geiger-Müller counters: Electronics, vol. 20, no. 1, pp 80–83, New York, 1947.

When radioactive sources of low intensity are measured, it is necessary to ensure that the increase of count observed above the background count is real and not a probability variation. Inasmuch as the probable error depends roughly on the square root of the number of counts taken, one requirement of a good Geiger-Müller tube is a low background count. An advantage in this respect is gained by having a small effective area and a window whenever the solid angle of radiation is limited. By such means, background counts as low as 10, or even 5, per minute can be obtained.

Another requirement of a good tube is the signaling of the passage of all particles by the production of pulses of the shortest possible duration and smallest amplitude. Good tubes can register a response to particles separated by intervals of the order of 10^{-5} second. The circuit of a new combined mechanical counter and electronic integrator that satisfies these and related requirements is described and illustrated by a diagram, and its use and applications are discussed.—*V. S.*

9240. Hess, V. F. On the ionization produced by the gamma rays from Quincy granite: Am. Geophys. Union Trans., vol. 27, no. 5, pp. 670–676, Washington, D. C., 1946.

With an ionization meter devised by O. H. Gish and the author, experiments were carried out to determine the average ionization produced by the penetrating rays from uranium-radium and thorium products as well as by the gamma rays from potassium contained in a very homogeneous sort of granite quarried at Quincy, Mass. The uranium-radium and thorium content of this sort of granite was determined very carefully by Evans and Goodman in 1941. The potassium content was estimated at 3 percent.

The ionization measurements performed in the quarry in August 1945 by the author and F. A. Benedetto and later experiments carried out with 400 pounds of crushed Quincy granite at Fordham University show that the ionization actually observed above a plane surface of granite amounts to almost 6 ionization, while the value computed from the known uranium-radium, thorium, and potassium content is only slightly above 2 ionization. Similar discrepancies were found in the laboratory experiments. These discrepancies cannot be explained by assuming that part of the excess ionization is due to secondary radiation produced by cosmic rays impinging on the surface. It must be concluded either that the reported values for the uranium-radium and thorium content are much too low, which is unlikely, or that a hitherto unknown penetrating radiation is given off by the granite.—*Author's abstract.*

9241. Muehlhause, C. O., and Friedman, H. Measurement of high intensities with the Geiger-Mueller counter: Rev. Sci. Instruments, vol. 17, no. 11, pp. 506–510, Lancaster, Pa., 1946.

With sufficient amplification of the pulses from a Geiger-Mueller counter, it was observed that the dead time decreased as the counting rate increased. The maximum counting rate of a tube could be advanced to 100,000 counts per second, although its apparent resolving power at low rates did not exceed 10,000 per second. Above 10,000 counts per second the resolving power increased almost in proportion to the counting rate.—*Authors' abstract.*

9242. Rose, R. B. Radioactive exploration: Mining World, vol. 8, no. 9, pp. 46–48, San Francisco, Calif., 1946.

The application of radioactive methods to prospecting for minerals is discussed in the light of recent advances in gamma-ray measuring instruments. As long as the electroscope was employed for recording alpha and beta rays little progress could be made, but present-day ionization chambers and Geiger-Mueller discharge counters measuring the more penetrating gamma rays make possible both ore exploration and structural geologic mapping.

The "Ra-Tektor" gamma-ray recording instrument is described as the newest example of suitable portable units. It responds to one-millionth of a gram of radium at a distance of more than 1 foot. With such sensitivity, radioactive intensity determinations can be made on the surface, underground, and in diamond-drill holes. The field techniques of prospecting and mapping are discussed. A special detector unit has been devised for diamond-drill hole logging.—*V. S.*

9243. Wickman, F. E. A graph for the calculation of the age of minerals according to the lead method: Sveriges geol. undersökning, vol. 37, no. 7, pp. 3–6, Stockholm, 1943.

An equation linear in $Pb/(U+Th)$ and $U/(U+Th)$ for constant time-values is deduced from a disintegration formula for lead written from the geologic viewpoint. It is assumed in derivation that no other disintegration series gives lead as a stable end product. The linear relationship obtained is then expressed in two graphs for calculating the age of minerals by the lead method. The graph for ages over 100 MY has the ordinate drawn in logarithmic scale and the abscissa age-values chosen with intervals sufficiently small to permit readings with maximum errors of 1 percent. The graph for ages between 0 and 100 MY is plotted separately, as it would have been too large in logarithmic scale; the variables here are interchanged, so that age is set off along the ordinate axis, and the $U/(U+Th)$ values along the axis of abscissas. Two examples illustrate the use of the graphs. Calculations are as simple as those required with the 0.36 formula.—*V. S.*

6. GEOTHERMAL METHODS

9244. Beach, F. K. Pressure-temperature-gravity relations in wells producing oil and gas: Oil Weekly, vol. 124, no. 12, pp. 18–23, Houston, Tex., 1947.

During the past 8 years pressure-recording gages carrying maximum thermometers have been used at regular intervals in Turner Valley in about 300 oil wells and in a number of other Alberta fields occasionally. As a result, numerous readings of bottom-hole temperature were accumulated, but almost no readings were obtained sufficiently far removed from a gas-producing horizon to assure a reliable geothermal gradient. Subsequently these temperature data were studied, and a geothermal gradient fitting the pressure gradient was assumed.

The results show that the temperature changes linearly with depth as follows: 3,000 feet, 90° F.; 4,000 feet, 101° F.; 5,000 feet, 113° F.; 6,000 feet, 126° F.; 7,000 feet, 139° F.; 8,000 feet, 147° F.; and 8,500 feet, 148° F. Questions of geothermal gradient, temperature varia-

tions, thermal conductivity, temperature measurements, and interpretation of observations are discussed.—*V. S.*

9245. Guyod, Hubert. Temperature well logging—Wells in thermal equilibrium: Oil Weekly, vol. 123, no. 11, pp. 50–53, Houston, Tex., 1946.

When the fluids in oil wells are in thermal equilibrium with the adjacent formations, the temperature in the wells is dependent almost exclusively upon the temperature of the formations and can be used to explore the latter. The wells in thermal equilibrium comprise cable-tool wells, rotary holes idle for a few months, and producing wells shut down for an appreciable time.

Measurements in such wells and experiments with electrolytic scale models conducted by the author have shown that the heat conductivity of sediments varies from bed to bed, and that there is a change of geothermal gradient at each formation boundary. The results are discussed with regard to typical temperature logs, geothermal gradient curves, and depth-temperature graphs and are illustrated by examples. They indicate that continuous-temperature measurements can be used to log even cased wells in thermal equilibrium; the effect of casing is negligible. However, radioactive logs give more detail in cased holes, and electrical logs give more precise data in open holes.—*V. S.*

9246. Guyod, Hubert. Temperature well logging—Wells not in thermal equilibrium, rotary holes: Oil Weekly, vol. 124, no. 1, pp. 26–34, Houston, Tex., 1946.

The mud temperature in a rotary hole, after circulation has ceased, varies not only with time but also with the hole size. Inasmuch as the degree of caving depends to some extent upon the nature of the formation drilled, a temperature log made under such conditions exhibits variations that are correlated with the beds penetrated by the drill. Observations made of usual thermal conditions in rotary holes are reported. It is found that in uncased rotary holes transitional temperature logs have almost no practical value if other types of logs are available; in cased rotary holes they are very useful in several instances, particularly if abnormal caving exists above petroleum reservoirs.—*Author's abstract.*

9247. Mersman, W. A., Berggren, W. P., and Boelter, L. M. K. The conduction of heat in composite infinite solids: California Univ. Pub. in Eng., vol. 5, no. 1, pp. 1–22, Berkeley, Calif., 1942.

Analytical and graphical solutions are given for temperature as a function of position and time in a dissimilar pair of semiinfinite solids placed in "imperfect" contact on a plane interface. Some engineering applications of these solutions are discussed.—*India, Central Board Irr. Abstracts, no. 79, p. 3 Simla, S. W., 1946, condensed by V. S.*

7. GEOCHEMICAL METHODS

9248. DeMent, Jack. Fluorescent techniques in petroleum exploration: Geophysics, vol. 12, no. 1, pp. 72–98, Tulsa, Okla., 1947.

New methods of petroleum location, detection, and analysis, based on the fluorescence shown by all crude oils are described. A brief

review is given of the available techniques and instruments used in fluorochemical analysis, and emphasis is placed on fluorographic exploration by means of subsurface soil samples, as well as the fluorologging of wells. The author has not limited himself to a review of the field but has also pointed out, on the basis of the existing data of fluorochemistry, the approaches to problems in the petroleum field which have proved successful in other branches of radiation science. The paper contains 43 references and 7 illustrations.—*Author's abstract.*

Grishin, G. L., and Levitskii, P. I. Summary of oil search in 1945 and program for 1946 [in Russian]: Neftianoe Khoziaistvo, vol. 24, no. 1, pp. 1–7, Moscow, 1946. *See* Geophys. Abstract 9258.

9249. Pirson, S. J. Laboratory of Applied Geophysics and Geochemistry: Mineral Industries, vol. 16, no. 3, p. 1, State College, Pa., 1946.

The Laboratory of Applied Geophysics and Geochemistry, recently established at the Pennsylvania State College, will give a course in the theoretical foundations and exploratory applications of geochemistry, an innovation in college curricula. Geochemistry is to be viewed as the study of the origin, occurrence, association, migration, distribution, dispersion, and accumulation of atomic elements within the geosphere. An understanding of the principles of these processes should help to conceive and develop new technological means for prospecting and delineating hidden mineral resources, as well as for making long-range forecasts of future reserves of essential industrial elements. The program of practical studies covers methods of exploration for petroleum and for ore deposits.—*V. S.*

9250. Rankama, Kalervo. What is geochemistry?: Am. Jour. Sci., vol. 245, no. 7, pp. 458–461, New Haven, Conn., 1947.

The evolution of the concept of geochemistry is scanned, and the different definitions are discussed with special reference to that given by V. M. Goldschmidt and now commonly used in Europe.—*Author's abstract.*

9251. Sergeev, E. A. Analysis of waters as a method of prospecting for polymetal deposits [in Russian]: Razvedka Nedr, vol. 12, no. 2, pp. 51–55, Moscow, 1946.

In 1941 field experiments were made in the Altai Mountains, Siberia, to test the analysis of the waters of streams as a means of prospecting for polymetal deposits. This method became practicable because of the rapid and highly differentiative hydrochemical tests for Cu, Zn, Cd, Pb, and Co developed by A. A. Reznikov. Exploration consists of extracting these metals from large amounts of water sampled at successive points along a stream from the mouth to the source. The underlying theory holds that vadose waters passing through oxidizing ore deposits carry away with them the soluble products of oxidation and deliver them to the surface streams.

Two surveys, which gave indications of ore, are discussed. It is found that three conditions are essential to the efficacy of the method: Solubility of products of ore oxidation, high differentiation of local topography, and emergence of vadose waters to the surface.—*V. S.*

8. UNCLASSIFIED GEOPHYSICAL SUBJECTS

9252. Bateman, H. Some integral equations of potential theory: Jour. Appl. Physics, vol. 17, pp. 91–102, Lancaster, Pa., 1946.

In exploration, the value of a geophysical quantity measurable at the surface of the earth frequently may be computed by integrating the product of a physical property of the various portions of the subsurface by some weighting function over a certain subsurface volume, area, or line. The author points out that if, instead of knowing the variation of a physical property and computing the values of the geophysical quantity, one deals with the inverse problem of determining the variation of the physical property of the subsurface from measurements of the geophysical quantities at the surface, these integrals become integral equations. For example, the distribution of mass at a given depth, which will produce a certain gravity pattern at the surface, is given by the solution of a particular integral equation.—*V. S.* (A review appeared in Geophysics, vol. 12, no. 1, pp. 122–123, Tulsa, Okla., 1947.)

9253. Beers, R. F. The Committee on Geophysical Sciences of the Joint Research and Development Board [abstract]: Oil and Gas Jour., vol. 45, no. 47, p. 123, Tulsa, Okla., 1947.

The Committee on Geophysical Sciences of the Joint Research and Development Board of the U. S. Army and Navy has been organized as an agency of the board, in order that the charter of the board may be implemented in the field of geophysical sciences. The fundamental purpose of the committee comprises the continuing study, evaluation, improvement, and allocation of research and development plans, and progress in the field of geophysical sciences in relation both to the overall aims of the national-defense effort and to the available and potential store of scientific information, personnel, and facilities, leading to the formulation of an integrated program in this field.—*Condensed by V. S.*

9254. Cantos, J. Los metodos geofisicos segun R. M. Noya en su aplicacion a los problemas de aguas subterraneas [Geophysical methods according to R. M. Noya in their application to problems of subterraneous waters]: Rev. Geofis., vol. 4, pp. 285–291, Madrid, Apr.–June 1945.

The methods of geophysical exploration of the subsurface are reviewed briefly with respect to their use in the search for ground waters, and closer attention is devoted to various horizontal and vertical methods of electrical prospecting. The problems examined include the role of water, geologic interpretation of the results, and electrical coring. Consideration also is given to the possibilities of the seismic method, of the radioactivity of layers in a borehole, and of geothermal information.—*Cent. Nat. Rech. Sci., Bull. Anat., vol. 7, no. 6, pt. 1, p. 1053, Paris, 1946, translated by V. S.*

9255. Carnegie Institution of Washington. Year Book No. 44, July 1, 1944–June 30, 1945, 196 pp., Washington, D. C., 1945.

The account of the departmental activities of the Carnegie Institution for the year ended June 30, 1945, includes two reports on geophysical work.

Geophysical Laboratory, by L. H. Adams. The continuation of war work prevented a resumption of normal activities. Progress on some of the projects under military contracts is indicated.

Department of Terrestrial Magnetism, by J. A. Fleming. Practically the entire staff was engaged in war work. Still, considerable progress was made in certain basic investigations, and some previous studies were completed. The year's activities in geomagnetism, terrestrial electricity, ionosphere, nuclear physics, observatory studies, and field work are reviewed.—*V. S.*

9256. Coffin, R. C. Recent trends in geological-geophysical exploration and methods of improving use of geophysical data: Am. Assoc. Petroleum Geologists Bull., vol. 30, no. 12, pp. 2013–2033, Tulsa, Okla., 1946.

An abstract appeared in the Oil and Gas Journal, vol. 44, no. 48, p. 91, Tulsa, Okla., 1946. (*See* Geophys. Abstracts 125, no. 8578.)

9257. Comité National Français de Géodesie et Géophysique. Comptes Rendus, Années 1939–40, 1941–42, 1943, 1944 [French National Committee of Geodesy and Geophysics. Transactions 1939–40, 1941–42, 1943, 1944], Secretariat General du Comité, Paris.

These transactions contain brief reports of the Sections of Geodesy, Seismology, Magnetism and Atmospheric Electricity, Meteorology, Physical Oceanography, Volcanology, and Scientific Hydrology. The work of the members of the sections and of affiliated institutions is listed, and bibliographies of the publications issued by them are appended.—*V. S.*

9258. Grishin, G. L., and Levitskii, P. I. Summary of oil search in 1945 and program for 1946 [in Russian]: Neftianoe Khoziaistvo, vol. 24, no. 1, pp. 1–7, Moscow, 1946.

Geologic exploration in the U. S. S. R. is partly conducted by offices of the Government Oil Industry. The work done during 1945 and proposed for 1946 is reported, with brief references to geophysical surveys. In 1945 geochemical prospecting was advanced by the development of a new apparatus, TF–1 of Turkeltaub and Fainberg, which permits soil sampling and analysis in the field. The results become known during the field work and furnish a basis for planning further exploration. Seismic reflection prospecting for oil revealed a favorable domal structure near Shendzhii in the Krasnodar region and an anticline in the Bininsk district near the Caspian Sea. In 1946 it is proposed to increase the number of the field crews of the State Geophysical Trust to 133 and to establish additional laboratories for the construction of geophysical instruments.—*V. S.*

9259. Hendricks, T. A. Proposed Continental Shelf program, U. S. Geological Survey [abstract]: Geol. Soc. America Bull., vol. 57, no. 12, pt. 2, p. 1202, Baltimore, Md., 1946.

The U. S. Geological Survey is preparing plans for a 15-year program of study of the Continental Shelf of the United States and Alaska. Work for the first 5 years will be largely concentrated in the Gulf of Mexico because of the likelihood of extensive petroleum reserves there.

Investigations will be both geological and geophysical. Geological work will be divided into two parts—subsurface studies of the outer belt

of the Coastal Plain and collection and study of bottom and water samples and cores of the sea floor. These studies will supply basic data and aid in interpretation of geophysical data.

Standard geophysical methods will be adapted for the geophysical work. Complete gravimetric and magnetic surveys will be made. Seismic work will consist of profiles carried from the shore to the edge of the Continental Shelf. Both reflection and refraction shooting will be done, with the choice of the method being determined by local and regional geologic factors. Most of the geophysical work will be done on contract.

The work will be conducted so as to provide data of regional scope and will serve as a basis for more detailed studies as desired.

9260. Inglada, V., and Garcia-Serrano. Conferencias acerca de las cuestiones primordiales de la geofisica moderna [Lectures on the basic problems of modern geophysics]: Rev. Geofis., vol. 4, pp. 267–284, Madrid, Apr.–June 1945.

An outline is given of 15 lectures on geophysics dealing with the formation, size, dimensions, and geologic composition of the earth, the geoid as determined by triangulation, and the ellipsoid of reference.—*Cent. Nat. Rech. Sci., Bull. Anal., vol. 7, no. 6, pt. 1, pp. 1051–1052, Paris, 1946, translated by V. S.*

9261. MacNeil, D. J. Searching for petroleum in the Maritimes: Eng. Jour., vol. 29, no. 10, pp. 573–575, 578, Montreal, Quebec, 1946.

Canada produces only 15 percent of her requirements of crude oil, and exploration is under way in the Maritimes to find additional reserves. The search consists of deep drilling and of surveys by geological and geophysical methods, considerably complicated by the highly folded and faulted character of the strata. The difficulties of exploration are discussed from a mechanical and engineering standpoint in the light of local geology, and brief remarks are made on the principles of the gravitational, magnetic, and seismic methods.—*V. S.*

9262. Oil Weekly. Geophysical and core drilling activity during 1946: vol. 124, no. 11, p. 240, Houston, Tex., 1947.

A total of 419 geophysical and core-drilling crews were known to be active in the United States at the end of 1946, according to an incomplete report of the Interstate Oil Compact Commission. Of the total number, 369 were geophysical crews, and 50 were core drillers. Most of the geophysical work was done by seismic crews, which totaled 251. Next in order were gravity crews numbering 95 and magnetometer crews numbering 23. The break-down of figures for 21 States is tabulated.—*V. S.*

9263. Pirson, S. J. An evaluation of present-day geophysical exploration for oil: Oil Weekly, vol. 125, no. 2, pp. 45–53, no. 3, pp. 39–48, no. 5, pp. 37–48, no. 6, pp. 45–50, Houston, Tex., 1947.

An attempt is made to present the various methods of geophysical prospecting for oil and gas in a manner different from the usual cataloging process. The problem and objective are indicated by outlining the classification of oil and gas reservoirs, which includes the three main classes—stratigraphic, combined, and structural. The various direct and

indirect approaches of surface and borehole exploration are discussed at some length. It is found that, inasmuch as geophysical and geochemical exploration makes use of methods requiring measurements of small differences at the threshold of sensitivity and reproducibility, future advances in instrumentation, in fundamental discoveries, and in geologic interpretation should bring about a gradual receding of such a threshold and a fuller knowledge of the earth's interior.—*Author's abstract, condensed by V. S.*

9264. Rayner, J. M. Recent developments in geophysical prospecting [digest]: Chem. Eng. Min. Rev., vol. 39, no. 2, pp. 43–45, Melbourne, Australia, 1946.

Recent progress in geophysical prospecting, particularly in the United States and Australia, is reviewed with regard to equipment and methods. Attention is given to both petroleum and ore exploration. It is found that gravity surveys detect coal in Australia; magnetic surveys increasingly employ airborne magnetometers; and the seismic reflection method is gaining in precision through the use of the latest complex equipment unit mounted on four trucks. Electrical surveys have lead to the discovery of the three-million-ton deposit of lead-zinc ore in Newfoundland and of a seven-million-ton deposit of copper-gold ore in Sweden. The Geiger-Müller counter is estimated to be about one thousand times more sensitive than the electroscope in the search for uranium and thorium minerals. Other particulars are given.—*V. S.*

9265. Rieber, Frank. Uses of the vibration in geophysics [abstract]: Geophysics, vol. 11, no. 3, p. 416, Tulsa, Okla., 1946.

The Vibroton is a continuously and sharply tunable mechanical resonant system. Used as the controlled element in an oscillator, it provides a compact and precise time standard and can be used in place of a tuning fork. As a means for translating minute displacements into changes in frequency, it may be used for a large number of applications where quantities measured in one place are to be registered or indicated at a distant place. Applications to refraction seismography, to barometric leveling, and to the measurement of pressures and temperatures in boreholes are discussed.

9266. Sayers, R. R. Bureau of Mines' geophysical explorations: Ann. Rept. of Secretary [U. S. Dept. Interior], 1946, pp. 167–168, Washington, D. C., 1946.

During the war geophysical methods were applied in the search for strategic and critical war minerals including copper, zinc, manganese, iron ores, lead, and fluorspar. These methods also served in exploring for additional oil reserves. Magnetic surveys of the Florida Peninsula and in Washington County, Alabama, outlined regions favorable for oil deposition.

Since the end of hostilities, exploration has centered mainly on the Continental Shelf bordering the United States and Alaska. Preliminary work indicates a large potential oil reserve in the shelf bordering the Gulf of Mexico and good promise of oil on the Arctic coast and on the western coast of the United States.—*V. S.*

[in Russian]: Razvedka Nedr, vol. 12, no. 1, pp. 25–27, Moscow, 1946.

9267. Solovov, A. P. Current problems of the Geophysical Division of the Geological Committee attached to the Council of Ministers, U. S. S. R.

In the U. S. S. R. the Government administration of geophysical prospecting is partly centered in the Geophysical Division of the Geological Committee attached to the Council of Ministers. This division has seven field stations distributed over European Russia and Siberia and is second only to the State Geophysical Trust of the Oil Industry in the scope of its work (*see* Geophys. Abstract 9258). The related research is conducted by the All-Union Institute of Exploration Geophysics (VIRG) in Leningrad, founded in 1945, and by associated laboratories. The instruments are constructed by a specialized factory of the Geological Committee. Current problems of prospecting for various deposits in different regions and the developing of advanced geophysical methods are discussed.—*V. S.*

NOTE.—On June 13, 1946, the Geological Committee was reorganized into the Ministry of Geology of the U. S. S. R. (Razvedka Nedr., vol. 12, no. 4, pp. 1–4, Moscow, 1946).—*V. S.*

9268. Thomas, J. E. Argentina's oil industry during the war years: Oil Weekly, vol. 120, no. 10, Internat. Sec., pp. 3–10, Houston, Tex., 1946.

During 1945 the Argentine Administration of Government Oil Fields (Y. P. F.) carried out geophysical and geological exploration in 15 provinces. Seven gravity parties, 2 magnetometer parties, 9 seismic parties, and 8 geological parties worked in the field. Up to the end of 1944 the largest areas explored geophysically were 55.2 million acres by torsion balance and 40.6 million acres by gravity meter.—*V. S.*

9269. Thomsen, H. L., and Burton, G. A. Winter operation of geophysical equipment in the Rocky Mountain area [abstract]: Oil and Gas Jour., vol. 45, no. 47, p. 123, Tulsa, Okla., 1947.

A large increase in geophysical activity in the Rocky Mountain area has occurred during the last few years. In the past, most of the activity has been seasonal because of adverse weather conditions during the winter months. However, growing competition has resulted in a tendency for geophysical crews to carry on operations throughout the winter. The authors review the performance of several crews which have had experience in winter work, summarize problems connected with winter operations, and discuss methods which have been developed to improve efficiency under these conditions.

9270. Tiratsoo, E. N. D'Arcy crews continue Great Britain's oil search: Oil Weekly, vol. 124, no. 10, Internat. Sec., pp. 13–14, Houston, Tex., 1947.

Since the end of the war, the D'Arcy Co. has conducted a systematic and intensive search for oil in Great Britain that has included geological and geophysical surveys and test drilling. Gravimeter and magnetometer reconnaissance of a large area of Gloucestershire, Somerset, Wiltshire, Oxfordshire, and Berkshire was in progress during 1946 and is continuing. Detailed gravimeter surveys were made over some limited areas. A magnetic survey was carried out in the Market Drayton area. Seismic refraction was employed for detailed exploration of the struc-

ture of the Permian magnesian limestone in the Kirkleatham area and also for mapping the Market Drayton area.—*V. S.*

9271. Vening Meinesz, F. A. Shear patterns of the earth's crust: Am. Geophys. Union Trans., vol. 28, no. 1, pp. 1–61, Washington, D. C., 1947.

There is much evidence of the existence of a system of shear planes in most of the earth's crust, and it seems likely that some planetary cause must have brought it about. Two possible causes are investigated here: (1) The decrease of the earth's flattening because of the slowing down of its rotation by tidal friction, and (2) a change of the axis of the flattening because of a movement of the earth's rotation axis with regard to the crust. Only the latter phenomenon gives a good explanation of the existing system of shear planes. A good correlation is obtained with the earth's topography, with the distribution of volcanoes, with the gravity fields in several areas, and with most of the evidence about shear planes brought out by the "lineament" tectonicians Hobbs, Sederholm, Daubrée, Sonder, and others.

The hypothesis is not in harmony with the continental drift theory of Wegener. At the end of the paper some tentative conclusions are drawn about the origin of the continents.—*Author's abstract.*

9272. Wong, Wen-Hao. Geophysical work of the National Geological Survey of China and of the Institute of Physics of the National Academy of Peiping of China: Terres. Magn. and Atmos. Electr., vol. 52, no. 1, pp. 77–79, Baltimore, Md., 1947.

Brief notes are given on geophysical work in China during 1929–44. The account covers academic research of a gravitational, seismic, and magnetic character, and geophysical prospecting conducted by the National Geological Survey and the Institute of Physics. In prospecting, the gravitational, magnetic, and electrical methods were employed for the exploration of hematite, magnetite, iron, lead-silver, lead-zinc, placer gold, lignite, pyrite, and copper deposits.—*V. S.*

9273. Yacimientos Petroliferos Fiscales [Argentina]. Memoria correspondiente al año 1945 [Annual report of the Argentine Administration of Government Oil Fields for 1945]: Bol. Inform. Petrol., vol. 23, no. 267, pp. 325–390, Buenos Aires, 1946.

The annual report of the Argentine Administration of Government Oil Fields (Y. P. F.) for 1945 includes a section on geological and geophysical exploration. Geophysical work was done in the provinces of Buenos Aires, San Juan, Córdoba, La Rioja, Catamarca, Santiago del Estero, Santa Fe, San Luis, and Mendoza, as well as in the territories of Rio Negro, Chaco, Neuquén, Chubut, and Santa Cruz. It covered a total area of 210,000 square kilometers in 1945, as against 154,587 square kilometers in 1944. Gravimetric, magnetic, and seismic reflection and refraction methods were employed, and attention was devoted both to previously investigated regions and to new areas, particularly, in Neuquén, Chubut, and Santa Cruz. The localities surveyed, methods employed, acreage covered, and geologic particulars are described. The material is organized by provinces and territories.—*V. S.*

9. RELATED NONGEOPHYSICAL SUBJECTS

9274. Adkins, J. N. Training the geologist for geophysical work [abstract]: Geol. Soc. America Bull., vol. 57, no. 12, pt. 2, p. 1277, Baltimore, Md., 1946.

It seems essential that the training of a modern geologist include study in applied geophysics. However, in many cases the geology student is unable to profit from courses in geophysics because he has had insufficient training in fundamental mathematics and physics. This need must be anticipated early, and it is not easy to require more course work of a student who already has a crowded schedule. Nevertheless, it is recommended strongly that a reasonable amount of work in mathematics and physics be included in the undergraduate training in geology.

9275. Allcock, H. J., and Jones, J. R. The nomogram, London, I. Pitman & Sons, Ltd., 1946.

This book presents a study of the general theory, with practical directions for the construction and use of all classes of computation charts having scientific or industrial applications.—*India Central Board Irr. Abstracts, no. 77, p. 1, Simla S. W., 1946.*

9276. Barstow, O. E., and Bryant, C. M. Deep-well camera: Oil and Gas. Jour., vol. 45, no. 45, pp. 74–75, 92–93, Tulsa, Okla., 1947; also Oil Weekly, vol. 125, no. 10, pp. 33–39, Houston, Tex., 1947.

An improved deep-well camera has been developed recently for the visual examination of boreholes, as an aid in studies of subsurface formations. It is lowered into the well on an electric cable, which provides the power for remote control from the surface. Attached to the outside of the camera is a spring, which pushes the picture window against wall of the well, minimizing the thickness of well fluid through which the picture must be taken. The apparatus and field technique are described, and examples of photographs taken in a well in west Texas are shown.—*V. S.*

9277. Brundall, Laurence. Photogeology aids oil exploration: Oil Weekly, vol. 124, no. 1, pp. 18–23, no. 2, pp. 32–35, Houston, Tex., 1946.

Photogeological exploration is conducted by means of surface mapping, which has recently been improved by advances in aerial photography. It serves best for speedy reconnaissance of large areas and is particularly advantageous for inaccessible terrain. The methods of photogeological interpretation aim at delineating bedding, structure, and outcrops; determining dips and strikes; identifying lithologic units, such as shales, sandstones, lava, granite, and other rocks; and utilizing the clues of weathering, topography, vegetation, and soil texture. Evaluation of extensive features often proves to be easier by means of photographs than by examination on the ground. In familiar areas systems of "key textures" can be developed. The different types of maps based on photogeological study, techniques of aerial photography, problems of scale, types of cameras, stereoscopy, and photogrammetry are discussed.—*V. S.*

9278. Chance, Britton. The interconnection of dead-reckoning and radar data for precision navigation and prediction: Jour. Franklin Inst., vol. 242, no. 5, pp. 355–372, Lancaster, Pa., 1946.

A simplified method for the interconnection of radar and dead-reckoning data is presented and used to illustrate the application of this principle to ship and aircraft navigation problems. This interconnection facilitates the interpretation of radar data and increases the accuracy of the dead-reckoning data. Furthermore, the prediction of time of arrival of a craft at a stationary or moving object is readily computed.—*Author's abstract.*

9279. Deegan, C. J. Pratt sees great oil potentialities on continental shelf [and] slope: Oil and Gas Jour., vol. 45, no. 31, pp. 62–63, Tulsa, Okla, 1946.

W. E. Pratt estimates that there is two and one-half times as much oil to be found beneath the continental shelves and continental slopes of the world as there is under the dry-land surface. The dry-land area of the world contains about 15,000,000 square miles of surface under which the sedimentary section is favorable to the formation and accumulation of oil; considering the average thickness of the sedimentary section to be about 1.33 miles, this represents 20,000,000 cubic miles of potential oil-bearing sediments. The continental shelves and continental slopes have about 17,000,000 square miles of favorable sediments with an average thickness of about 3 miles; this represents about 50,000,000 to 55,000,000 cubic miles of potential oil-bearing sediments. The data on the area and depth of the continental shelves of the world are tabulated. The continental shelf is defined as being limited to a 600-foot water depth and the continental slope to a 3,000-foot water depth.—*V. S.*

9280. De Golyer, E. Oil exploration in the Middle East: Mines Mag., vol. 36, no. 11, pp. 493–495, 575, Denver, Colo., 1946.

The known oil fields of the Middle East are located in the eastern horn of the great crescent-shaped trough extending from the mouth of the Persian Gulf to northern Iraq. This trough contains sediments as much as 50,000 to 60,000 feet thick in the Arabian section and somewhat less in the Iran and Iraq section. The reservoir rocks are mostly limestones, and the oil fields occur in structural traps. Exploration on the Arabian side of the Gulf has varied from drilling on geologic indications to seismic reflection surveys. In Iraq and Iran the fields were found mostly by surface study; a special type of refraction-arc shooting has been successful. The geology of the producing oil fields is described briefly.—*V. S.*

9281. Dobbin, C. E. Geological features of the Rocky Mountain oil region: Oil Weekly, vol. 124, no. 10, pp. 23–30, 32, Houston, Texas., 1947.

The Rocky Mountain region of the United States so far has produced a relatively small amount of oil, but the local strata from pre-Mississippian to Oligocene are considered promising. The author discusses the origin and types of local traps, the age and character of petroliferous zones, the quality of oil and gas, and the distribution of oil shale. The limited information available shows the existence of rejuvenated traps,

Tertiary igneous intrusions, thrust-fault traps, and subordinate varieties of traps. About 57 percent of the oil and gas fields are on anticlines and domes thereon, and 26 percent are on faulted anticlines and domes or fault blocks. Oil and gas occur in almost all known types of traps. The appended maps show the oil and gas fields and the main structural features of the region.—*V. S.*

9282. Gunn, Ross. Quantitative aspects of juxtaposed ocean deeps, mountain chains, and volcanic ranges: Geophysics, vol. 12, no. 2, pp. 238–255, Tulsa, Okla., 1947.

Continuing earlier explorations of the geologic consequences of a strong elastic lithosphere supported on a weak magma, the mechanical characteristics of a shear thrust fault are examined. Owing principally to the differential cooling of the continental and oceanic areas and the higher altitude of the former, continental boundaries are regions of potential weakness, and the lithosphere there is subject to shear failure, with resultant overthrusting of the continental sector when sufficiently compressed by horizontal forces.

The deformations of such a compressed and fractured lithosphere and the fiber stress distribution therein are quantitatively worked out, permitting the determination of maximum depths, heights, widths, figures, gravity anomalies, and fiber stresses. These estimated quantities are found to be strikingly similar to the properties of a geologic area on the western coast of Mexico that exhibits juxtaposed ocean deeps and mountain and volcanic chains.—*Author's abstract, condensed by V. S.*

9283. Johnson, G. R. Offshore surveying with radar [abstract]: Oil and Gas Jour., vol. 45, no. 47, p. 123, Tulsa, Okla., 1947.

A method of using radar for offshore surveying is outlined. The limitations of range are discussed by developing the fundamental radar equation as modified by the curved reflecting surface of the sea. Certain conclusions are reached as to the most suitable type of equipment for offshore work. A short analysis is made of the errors involved in the radar system, with examples of how they are determined by comparison with chained distances.

9284. Kalitskii, K. P. Scientific foundations of oil search [in Russian], 244 pp., Moscow, Gostoptekhizdat, 1944.

In this textbook petroleum geology is discussed as a guide to surface exploration for oil. Consideration is devoted to petroleum genesis, migration, and accumulation; to oil-bearing structures, stratigraphic traps, and facies; and to horizontal distribution of deposits. Existing views on many subjects are criticized and the role of geologic exploration in oil search is stressed.—*V. S.*

9285. Kosygin, Iu. A. The mechanism of salt-dome formation [in Russian]: Soc. naturalistes Moscou Bull., Sér. Géol., vol. 20, nos. 5–6, pp. 3–29, Moscow, 1945.

The general principles of the formation and development of salt-dome structures are formulated on the basis of theoretical considerations and factual material about the domes of Emba, Ukraine, and the United States. Principal attention is devoted to establishing the laws

of the uninterrupted, accelerated growth of domes in changeless geologic conditions, to questions of the realtionship between salt tectonogenesis and fold-forming oscillatory movements, to phenomena of secondary salt tectonogenesis, and to the clarification of general geologic conditions leading to the creation and development of salt tectonics.—*Author's abstract, translated by V. S.*

9286. Legraye, Michel. Origine et formation des gisements d'or [Origin and formation of gold deposits], 192 pp., Paris, Masson & Co., 1942.

Gold deposits of magmatic origin are discussed with regard to their place in mineral paragenesis. At first, the mechanism of the major phases of paragenesis is described for magmatic differentiations, and then attention is devoted to gold deposits of different origin, such as orthomagmatic, transitional orthomagmatic-pneumatolytic, pneumatolytic, hydrothermal, and secondary. Special consideration is given to the Witwatersrand deposits.—*V. S.*

9287. Lokman, Kemal. Kürzot Petrol Madeni ve Havalisi [Kurzot Oil]: Maden Tetkik ve Arama, no. 1/35, pp. 95–101, Ankara, 1946 [Turkish text, with English summary.]

The Kurzot oil seepage near the boundary of eastern Turkey and Iran and the exploration work of the Mining Research Institute of Turkey during 1937–45 are described. The average daily petroleum output of the tunnel system was only 7.5 kilograms. Exploratory drilling and geological and geophysical surveys revealed structurally complex conditions, with large areas of igneous and metamorphic rocks. The drilling of deep wells in this area is not recommended.—*Am. Assoc. Petroleum Geologists Bull., vol. 31, no. 2, p. 400, Tulsa, Okla., 1947.*

9288. Nugent, L. E., Jr. Aerial photographs in structural mapping of sedimentary formations: Am. Assoc. Petroleum Geologists Bull., vol. 31, no. 3, pp. 478–494, Tulsa, Okla., 1947.

Factors that control the use of aerial photographs in structural mapping are discussed; the anticipated horizontal and vertical photogrammetric precision is indicated; and geomorphic and structural relationships are correlated with photogrammetric procedures that most economically produce structural maps of various tolerances.—*Author's abstract.*

9289. Petraglia, F. A., editor. The electronic engineering master index, 209 pp., New York, Macmillan Co., 1946.

This is a special edition of part II of The electronic engineering master index covering the period from 1935 to 1945. It contains approximately 10,000 entries, the larger part of which are listings of all technical articles that have appeared in leading electronic periodicals. The entries are grouped under electronic subject headings, alphabetically arranged and cross-indexed, and an index of subjects is appended.—*V. S.*

9290. Pinfold, E. E. Prospecting in the Punjab and Northwest Frontier Provinces: Petroleum Times, vol. 51, no. 1292, pp. 119–122, London, 1947.

Oil prospecting in northwest India has been extensive and costly. Including the earlier tests, no less than 20 separate areas have been

tested by machine-drilled wells; of these, only 4—Khaur, Dhulian, Joya Mair, and Balkassar—have so far yielded production on a scale to justify transport and refining. The total unproductive footage drilled to date in the search for additional oil pools is approximately 88,000 feet, exclusive of outer test wells on the established fields, which would increase the total unproductive test footage to about 140,000 feet. Exploration has also included extensive geological and geophysical prospecting, mainly by the Burma Oil Co. in Baluchistan and Sind. The test wells drilled here so far have been without success.—*Author's abstract, amplified by V. S.*

9291. Pratt, W. E. Petroleum on the continental shelves [editorial]: Econ. Geology, vol. 42, no. 1, pp. 83–85, Lancaster, Pa., 1947.

The petroleum potentialities of the continental shelves are examined in the light of the geologic characteristics known to be typical of oil-bearing regions. Great oil fields usually are located in the deep downwarps of the mobile segments of the earth's crust, and particularly in the younger rocks. The continental shelves satisfy these requirements because they constitute the areas where most of the crustal adjustments and compensations take place. Differential uplift, subsidence, upwelling currents, and related processes produce here strong erosion and deposition of thick sediments while the muds and oozes including practically the entire organic residue of marine life gather in the stagnant waters of the closed basins. The resulting great complex of discontinuous natural reservoirs is most favorable to the generation and accumulation of petroleum. Moreover, the younger rocks are present on the shelves in greater proportion than in land areas, and the volume of unmetamorphosed sediments here is roughly estimated to be three times as great as in the entire dry-land area.—*V. S.*

9292. Sheppard, C. W., and Whitehead, W. L. Formation of hydrocarbons from fatty acids by alpha-particle bombardment: Am. Assoc. Petroleum Geologists Bull., vol. 30, no. 1, pp. 32–51, Tulsa, Okla., 1946.

In the experiments described, four members of the saturated fatty acid series are bombarded by the alpha particles from radon and its active deposit. The energy from the radiation causes several chemical reactions, the principal one of which results in the formation of carbon dioxide and the paraffine hydrocarbon corresponding with the long chain of the fatty acid bombarded. The reactions are described, an explanation of the underlying mechanism is offered, and quantitative studies are made. On the basis of the yield of hydrocarbon during bombardment, the figures of other workers on free saturated fatty acids in marine bottom muds, and the radioactivity of the Antrim shale in Michigan, calculation is made of the possible contribution to petroleum from hydrocarbons formed from fatty acids by alpha particles in 10 million years.—*Authors' abstract, condensed by V. S.*

9293. Vanderwilt, J. W. A review of fluorescence as applied to minerals, with special reference to scheelite: Min. Technology, vol. 10, no. 2, Tech. Paper 1967, 14 pp., New York, 1946.

Studies have shown that the fluorescent color of a mineral may vary with the kind and quantity of trace element, as well as with the particu-

lar wave length of ultraviolet energy used. The wave length is dependent on the generating equipment and on the filter employed to remove the visible light. A number of ultraviolet lamps and filters are described.

Scheelite fluoresces brilliantly with wave lengths of 2,200 to about 3,000 A. but not with longer wave lengths. The most convenient sources of ultraviolet light are the portable and laboratory units designed particularly for scheelite fluorescence. Certain minerals fluoresce in a manner similar to scheelite, so that checks by means of characteristic properties are essential.—*Author's abstract, condensed by V. S.*

9294. ZoBell, C. E. Marine microbiology, 240 pp., Chronica Bontanica Co., Waltham, Mass., and G. E. Stechert & Co., New York, 1946.

This monograph brings together present-day knowledge on the biochemical factors in petroleum genesis. Its contents cover the history of the subject; nature of marine environment; factors influencing the abundance, distribution, and characteristics of bacteria in free water and in sediments; bacterial transformation of compounds; salinity; and other subjects. The various methods of the biochemical approach are described. Investigation has shown that bacteria can be recovered in small numbers from the deepest sea cores yet taken. It appears that their habitat is sediment, formed sometimes as early as the Pleistocene. Such pervasiveness supports observations that bacteria have a role in petroleum generation. The book contains 600 references and a comprehensive index.—*V. S.* (Reviews appeared in Am. Jour. Sci., vol. 244, no. 7, pp. 534–535, New Haven, Conn., 1946, and Mines Mag., vol. 36, no. 5, p. 201, Denver, Colo., 1946.)

10. PATENTS

[The figure in parentheses indicates the classification of the entry; see table of contents]

9295. (1) Fremgangsmaade till bestemmelse af aendringer i tyngdegraftens horizontalkomposanter med maalinger af relative lodangivelser [Method of determining variations in the horizontal component of the force of gravity by measurements of relative plumb-line indications]. Bolidens Gruvaktiebolag, Stockholm: Danish patent 58,229, issued Dec. 9, 1940.

The angle between the plumb-suspending cables of two plumb lines in the same apparatus is determined by measuring the capacity of two condensers. This capacity depends upon the width of the air space intermediate between two flattened surfaces on the plumb weights and two metal surfaces on the frame of the apparatus, and it is measured by means of a connection with a fine micrometer. The variations in the horizontal component of gravity thus determined can serve for the discovery and determination of the extent and the concentration of ore and other mineral deposits. Claims allowed, 4.

9296. (2) Flux valve. M. C. Depp, Hempstead, and C. F. Fragola, Brooklyn, N. Y., assignors to Sperry Gyroscope Co. Inc., a corporation of New York: U. S. patent 2,403,347, issued July 2, 1946.

In a device sensitive to an external magnetic field and adapted to supply signal voltage outputs dependent in magnitude upon the position thereof relative to the direction of said field, a core of permeable magnetic material, means for producing periodically varying exciting fluxes flowing in opposite directions for any instantaneous value thereof in said core, a pick-up winding associated with said core, and common means extending into closely spaced relation to the pick-up winding in a central zone substantially midway between its ends for controlling the linking of the exciting fluxes with said pick-up winding. Claims allowed, 17.

9297. (2) Demagnetizing apparatus. Theodore Zuschlag, West Englewood, N. J., assignor to Magnetic Analysis Corp., Long Island City, N. Y., a corporation of New York: U. S. patent 2,403,424, issued July 2, 1946.

In apparatus for demagnetizing a magnetic body movable with respect to said apparatus, the combination which includes a demagnetizing coil connectible to a source of alternating current, said coil being disposable in inductive relation to said body, a neutralizing coil inductively related to said demagnetizing coil and disposable in inductive relation to said body, a rectifier tube having an anode, a control grid and a cathode, said coils being positioned to be in inductive relation simultaneously to the same portion of said body as said body moves with respect to said coils, a rectifier circuit for producing unidirectional neutralizing current in said neutralizing coil, said circuit including said neutralizing coil and half-wave rectifier including the anode and cathode of said tube, said circuit being coupled to said source only by means of said inductive relation to said demagnetizing coil, whereby changes in the magnitude of alternating current in said demagnetizing coil resulting from variations in the magnetic effect of said body on said demagnetizing coil as said body passes through the field thereof automatically produce corresponding changes in said unidirectional current in said neutralizing coil, a second rectifier, a resistor connected in series with said second rectifier across said source, connections from the cathode and control grid of said half-wave rectifier tube to said resistor, whereby a bias potential derived from the second rectifier is impressed on said control grid, and means for adjusting said bias potential. Claims allowed, 4.

9298. (2) Inductor compass. E. J. Martin, Pleasant Ridge, and C. E. Grinstead, Detroit, Mich., assignors to General Motors Corp., Detroit, Mich., a corporation of Delaware: U. S. patent 2,403,669, issued July 9, 1946.

In direction-sensitive means for use in the earth's magnetic field, an elongated core member of high permeability mounted in the earth's field, induction magnetizing means for creating equal and opposite fields mounted on said core, induction pick-up means also mounted on said member, amplifying means connected to the pick-up means, a pair of inversely connected electron tubes alternatively controlled by the amplifier, and synchronized interrupter means in the induction magnetizing supply and in the input to the electron tubes. Claims allowed, 7.

9299. (2) Submarine detector. H. A. D. Lindsey, United States Army, Hickam Field, Honolulu, Territory of Hawaii: U. S. patent 2,404,806 issued July 30, 1946.

In a submarine detecting apparatus adapted to cooperate with a variable magnetic field created immediately above the surface of a body of water by the electrical equipment of a submarine submerged beneath such surface, the combination of a towing plane, a miniature scanning plane attached to the towing plane and adapted to be drawn through said magnetic field in scanning relation with respect to the surface of said body of water, a pick-up unit in connection with said scanning plane, said unit including a magnetic induction device and an amplifying system provided with input and output circuits, said induction device comprising two pairs of relatively stationary coils, the coils of each pair thereof being series connected and adapted to be linked to the same magnetic circuit, the respective pairs of coils being arranged in planes normal to each other and connected in electrical opposition to the input of said amplifying system whereby no current flow occurs in the coils of said device during its passage through a uniform magnetic field, but when said device is drawn through a variable magnetic field, the current induced in its coils by the variations of the magnetic field and the spaced position therein of said coils, will produce a current flow in the input and output circuits of said amplifying system, and an indicator carried by said towing plane and in electrical relation with the output circuit of said amplifying system, said indicator being responsive to the current flow in said output circuit to indicate the presence of said submarine under conditions precluding the transmission thereto of detectable impulses. Claims allowed, 5.

9300. (2) Compass transmitter. A. T. Sinks, deceased, late of Beach Bluff, Mass., by A. C. Sinks, administratrix, Beach Bluff, Mass., assignor to General Electric Co., a corporation of New York: U. S. patent 2,414,128, issued Jan. 14, 1947.

An electromagnetic device for producing signal voltages variable in accordance with the orientation of said device in a magnetic field comprising an annular core of permeable magnetic material, said core being provided with a plurality of spaced-apart perforations around the periphery thereof to provide a closed magnetic circuit having alternate large and small cross-sectional areas, and winding means on said core. Claims allowed, 7.

9301. (2) Well surveying device. G. A. Smith, Philadelphia, Pa., assignor to Sperry-Sun Well Surveying Co., Philadelphia, Pa., a corporation of Delaware: U. S. patent 2,414,702, issued Jan. 21, 1947.

A well-surveying instrument comprising a casing adapted to enter a borehole, means for supporting a record member within the casing, a pendulum located on one side of said record member, a magnetic compass located on the opposite side of said record member, a pair of electrically energized means for producing simultaneously on said record member records of the positions of said pendulum and said compass, respectively, and separate power supplies for the respective means for the recording of the pendulum and compass positions located on opposite sides of said record member and compass so that current-carrying leads do not extend past the level of said magnetic compass. Claims allowed, 2.

9302. (2) Detection of large magnetic bodies. O. E. Buckley, Maplewood, N. J., assignor to Bell Telephone Laboratories, Inc., New York, N. Y., a corporation of New York: U. S. patent 2,415,808, issued Feb. 18, 1947.

In a system for detecting concealed bodies of magnetic material, two identical induction coils each having a saturable magnetic core, means supporting said coils spaced apart from each other by a substantial fixed distance, an equivalent output circuit comprising a capacitor and a resistor in series connected across each coil and so designed in combination with the coil to produce sharply peaked voltage pulses when the latter is suitably energized, means to apply to each coil synchronized alternating current waves of the same frequency and of sufficient amplitude to drive it well beyond its saturation point, thereby producing in the output circuit for each coil a series of sharp voltage pulses with the same time spacings therebetween, each pulse having a duration which is less than one-half that of a half cycle of the exciting wave, each of said coils being magnetically polarized through its magnetic core in accordance with the strength and shape of the earth's magnetic field at substantially the coil location, the equal polarizations of the two coils when said field is uniform causing the corresponding pulses generated by the two coils to be in phase, the relatively unequal polarizations of the two coils when said field is distorted by a sufficiently large magnetic body in closer proximity to one coil than to the other causing corresponding pulses generated by the two coils to be shifted proportionally in phase with respect to each other, the resistors in the output circuits of the two coils being connected in differential opposing relation so that the voltage drops produced therein by the generated pulses are effectively subtracted from each other, and means to indicate the direction and amount of any instantaneous voltage differences resulting from such subtraction. Claims allowed, 1.

9303. (3) Explosive cartridge assembly. T. F. Bennett, Joplin, Mo., assignor to Hercules Powder Co., Wilmington, Del., a corporation of Delaware: U. S. patent 2,403,488, issued July 9, 1946.

A threaded explosive assembly comprising a plurality of threaded explosive cartridges held in end-to-end abutting relationship by a plurality of threaded sleeves in end-to-end abutting relationship, and at least one friction thread disposed on each cartridge and extending throughout the length of the cartridge in frictional engagement with the interior surface of each sleeve in threaded engagement with said cartridge. Claims allowed, 4.

9304. (3) Acoustic device. L. G. Bostwick, Chatham, N. J., assignor to Bell Telephone Laboratories, Inc., New York, N. Y., a corporation of New York: U. S. patent 2,404,784, issued July 30, 1946.

A submarine sound receiver comprising a structure including magnetic means having a center pole, and a plate pole spaced therefrom to define an annular air gap, a diaphragm of thin nonmagnetic metal having a central, outwardly convex dome portion and a resilient supporting flange portion secured to said plate pole, a sound current coil secured to the diaphragm and positioned in the air gap, an outwardly convex stop member secured to said center pole, spaced from the dome portion of the diaphragm and defining therewith a chamber, a ring of rubberlike

material secured to said structure and to the convex side of the diaphragm, intermediate the center and the supporting flange thereof, to limit a portion only of the diaphragm dome to external pressure, a portion each of the ring, the structure and the diaphragm defining a second chamber, behind said ring and outside of the diaphragm, the portion of the diaphragm between the ring and flange containing perforations through which said chambers are interconnected, and acoustic resistance material secured to the diaphragm over said perforations. Claims allowed, 10.

9305. (3) Separation of blasting circuit leads. J. O. Parr, Jr., San Antonio, Tex., assignor to O. S. Petty, San Antonio, Tex.: U. S. patent 2,407,442, issued Sept. 10, 1946.

In electric shot-firing apparatus of the type described, comprising an electric purcussion cap having a bridge wire, a source of current for firing said cap, recording apparatus for making a record of the instant of firing the cap as indicated by the breaking of the bridge wire therein, and conductors leading from the said source to the recording apparatus, the combination with conductors leading from the source to the cap in a shot hole, of a severing device mounted at the top of the shot hole and positioned to be moved by the force of the explosion, said device being arranged to sever both cap conductors when so moved. Claims allowed, 7.

9306. (3) Blasting unit and short-circuiting device. J. V. Hammond, Spangler, and D. J. Keenan, Barnesboro, Pa., said Keenan assignor to said Hammond: U. S. patent 2,407,605, issued Sept. 10, 1946.

A blasting unit comprising a battery housing, including a top wall formed with a pair of apertures, a slide carried by said top wall having a pair of apertures adapted to register with the aperture of said top wall, a pair of batteries in said housing having terminals confronting the apertures of said end wall, and a contact member including a body member, a pair of spaced apart contact members carried by said body member engageable in the apertures of said slide and said top wall for contact with said battery terminals, and normally engaged contact shorting members engaging said contact members, said shorting members being so constructed and arranged that one of said shorting members will be moved to disengaged position with respect to the other of said shorting members when said contact members are disposed in contact with the battery terminals. Claims allowed, 5.

9307. (3) Gain-control system for seismic amplifiers. E. J. Shimek and W. B. Hemphill, Dallas, Tex., assignors, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York: U. S. patent 2,408,001, issued Sept. 24, 1946.

In a seismic prospecting system having means for producing electrical signals representative of seismic waves, an amplifier for said signals, and a recorder for recording said signals, the combination of an electric valve having an input circuit responsive to said signals and an output circuit including a load resistor, a filter having resistance and capacitance, a second electric valve in shunt with said filter to form a variable resistance, said second valve having a cathode, an anode and a control electrode, means including said filter for varying the bias

between said cathode and said grid to change the resistance of said second valve so as to maintain constant the potential difference produced across that valve, and means for applying said potential difference to said amplifier to control the gain thereof. Claims allowed, 9.

9308. (3) Means for safeguarding electric igniters of blasting detonators against accidental firing. H. J. Rolfes, Melrose, Johannesburg, Transvaal, Union of South Africa: U. S. patent 2,408,124, issued Sept. 24, 1946.

An electric igniter of a blasting detonator in a combination with means by which it is safeguarded against accidental firing by electric shock or spark discharges produced respectively in, or in the vicinity of, the firing means of the igniter by atmospheric electricity, comprising a coherer mass which is in electrical cooperation with insulated conductive branches connected with each lead of the igniter, said branches having bared parts surrounded by the coherer mass, a conductive grounded casing conductively connected to a conductive shell of the igniter, the coherer mass including a metal powder offering a substantially complete resistance to voltages of the magnitude used for firing the igniter and which, on being subjected to voltages substantially higher than said firing voltages, becomes locally conductive through coherer action along a path permitting the passage of the high voltage charge. Claims allowed, 4.

9309. (3) Means for safeguarding electric igniters of blasting detonators against accidental firing. H. J. Rolfes, Melrose, Johannesburg, Transvaal, Union of South Africa: U. S. patent 2,408,125, issued Sept. 24, 1946.

Means for safeguarding the firing means of blasting detonators against static charges, including a safeguarding material of a nature to provide high resistance against current voltages for intentional firing and low resistance to higher voltages of a static charge, means for grounding said safeguarding means, electric leads for the firing means, said leads having bared parts surrounded by the safeguarding material at a distance from the firing means, and discharge points in electrical continuity with said bared parts of such leads to thereby increase the static voltage discharge through said material. Claims allowed, 15.

9310. (3) Waterproof explosive cartridge. A. W. Baker, Lookout Mountain, Tenn., assignor to Hercules Powder Co., Wilmington, Del., a corporation of Delaware: U. S. patent 2,408,189, issued Sept. 24, 1946.

A rigid blasting cartridge comprising a substantially cylindrical explosive charge of a water-soluble material and a substantially rigid water-resistant tubular envelope therefor and having water-resistant crimped end closures; the tubular envelope comprising a tube of a waterproof laminated paper sealed to itself and overlapping itself at opposed edges, a paper lining for said laminated tube and sealed thereto, a paper covering for said laminated tube and sealed thereto; the tubular envelope having a cardboard disc at each end interiorly thereof and having an end section crimped over each disc, and a seal for each end section comprising an adhesive waxlike material disposed on each side of the crimped end section forming upper and lower layers and having a contiguous central portion passing through the crimped end section thus joining the two layers. Claims allowed, 2.

9311. (3) Acoustical apparatus. Elias Klein, Washington, D. C.: U. S. patent 2,416,324, issued Feb. 25, 1947.

A housing adapted for use in a fluid medium and for inclosing an acoustical instrumentality adapted to transmit ultrasonic compressional wave energy through said fluid medium, said housing comprising a fluid impervious inclosure at least one face of which is of a material non-absorbent to ultrasonic wave energy having an acoustical impedance substantially equal to that of the fluid medium in contact therewith. Claims allowed, 22.

9312. (4) Well logging. W. M. Rust, Jr., Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2,414,899, issued Jan. 28, 1947.

Apparatus for investigating simultaneously a plurality of different electrical characteristics of earth formations traversed by a borehole, comprising, means at the surface for generating an alternating current of a given frequency and a substantially constant value, an electrode for passing said alternating current through the earth formations surrounding the borehole, a first filter adapted to pass direct current and alternating current of said given frequency and to block alternating current of other frequencies, electrically connected to the electrode, a single electrical circuit connecting said generating means with said filter, a pickup circuit disposed in the borehole for picking up in the borehole alternating current potentials produced by the flow of the generated alternating current through the formations, frequency converting means in the pickup circuit for converting the alternating current potentials picked up into alternating current of a frequency different from said generated current, a second filter in said pickup circuit for blocking the generated current and for passing only the frequency of the output of the converting means, electrical connections between the second filter and the single electrical circuit for introducing therein the alternating current passed by the second filter, indicating means connected to said single electrical circuit at the surface for obtaining an indication of said last-named alternating current values, an indication of the potential of the generated alternating current and an indication of direct current potentials. Claims allowed, 2.

9313. (4) Method and apparatus for logging wells. E. A. Johnson, Park Ridge, Ill., assignor to Standard Oil Co., Chicago, Ill., a corporation of Indiana: U. S. patent 2,415,636, issued Feb. 11, 1947.

In a well-surveying device adapted to be passed within a borehole containing well fluids, an apparatus comprising an electrical circuit including a pair of relatively movable electrodes exposed to the well fluid, movable means adapted to follow the contour of the wall of the borehole and for moving at least one of said electrodes relative to the other proportional to the well diameter, electrically operated indicating means at the surface, said electric circuit including said electrodes and said indicating means whereby the relative spacing of the electrodes modifies the electrical balance within the circuit to indicate the variations in the diameter of the borehole. Claims allowed, 5.

9314. (4) Position locating system. J. C. Schelleng, Interlaken, N. J., assignor to Bell Telephone Laboratories, Inc., New York, N. Y., a corporation of New York: U. S. patent 2,416,351, issued Feb. 25, 1947.

The method of determining the distances of a plurality of objects which includes generating an oscillatory current, varying the frequency of said current over successive bands of variable width, radiating a wave produced by said current to said objects, receiving waves reflected by said objects, combining the currents due to said received waves with a current due to a directly transmitted wave, detecting said currents to produce a difference frequency current, controlling the intensity of an electronic beam by the output of said detection and controlling the position of said beam synchronously with the variations in said oscillatory current. Claims allowed, 4.

9315. (4) Electronic commutator. D. S. Muzzey, Jr., Alexandria, Va., and R. D. Miller, Washington, D. C., assignors to Shell Development Co., San Francisco, Calif., a corporation of Delaware: U. S. patent 2,417,609, issued March 18, 1947.

In a system for passing a low-frequency continuous reversing substantially square wave-form current between two output terminals, a commutator circuit comprising two groups each having an equal even number of arc discharge tubes, parallel inductive means for biasing the grids of one group of said tubes in a positive direction in response to a rise in the intensity of the current flowing through said inductive means, and for biasing the grids of the other group of said tubes in a positive direction in response to a fall in the intensity of the current flowing through said inductive means, a plurality of connector means each between the cathode of a tube of the first group and the anode of a tube of the second group, all of said tubes being thus connected in pairs, condenser means connected between said connector means, output terminals connected in parallel with said condenser means between said connector means, a source of direct current, means connecting the positive terminal of said source to the anodes of one-half of the tubes in each of said groups, means for connecting the negative terminal of said source to the cathodes of the other half of the tubes in each of said groups, means for supplying intermittent unidirectional voltage pulses to said parallel inductive means, whereby said two groups of tubes are alternately ignited by the biasing action of said inductive means and extinguished by the action of said condenser means and a low-frequency continuous reversing substantially square-form current is produced between said output terminals. Claims allowed, 1.

9316. (4) Werkwijze voor het onderzoek van aardlagen, die doorsneden worden door een boorgat [Method of studying earth strata traversed by a borehole]. Société de Prospection Electrique, Procédés Schlumberger, Paris: Dutch patent 50,712, issued Aug. 15, 1941.

To survey the formations traversed by a borehole, an electric current is conducted through the earth at different levels by means of two electrodes and a source of current between them. One of the electrodes is placed in the borehole, has a length at least twice the diameter of the borehole, and is far removed from the second electrode. The purpose

of this arrangement is to measure the electric resistance of the earth strata surrounding the electrode in the borehole. Claims allowed, 1.

9317. (5) Measuring apparatus. W. E. Shoupp, Pittsburgh, Pa., assignor to Westinghouse Electric Corp., East Pittsburgh, Pa., a corporation of Pennsylvania: U. S. patent 2,408,230, issued Sept. 24, 1946.

In a counter for indicating neutron particles, a counter tube including a pair of discharge electrodes in a gaseous atmosphere, material capable of atomic fission under neutron bombardment, thereby liberating radiation causing ionization of said atmosphere, associated with one of said electrodes, and an ionization responsive circuit connected between said electrodes. Claims allowed, 11.

9318. (5) Radiant energy detecting and control apparatus. Laurens Hammond, Chicago, Ill.: U. S. patent 2,413,870, issued Jan. 7, 1947.

In a scanning apparatus for detecting discontinuities in intensity of radiation in different portions of the field scanned, the combination of a pair of radiation responsive elements, means to concentrate radiation from contiguous vertically elongated areas of the field respectively upon said elements, and scanning mechanism connected to said means for moving said elongated areas laterally to traverse a generally rectangular horizontal field. Claims allowed, 19.

9319. (6) Werkwijze en inrichting voor het onderzoeken van aangeboorde aardlagen volgens haar calorische eigenschappen [Method of studying earth strata in a borehole by means of their caloric properties]. Société de Prospection Electrique, Procédé Schlumberger, Paris: Dutch patent 51,271, issued Oct. 15, 1941.

The liquid in a borehole is heated simultaneously and with possible uniformity over all, or part, of the borehole depth, and its temperature variation is measured. The heating device consists of an insulated electric wire bent into a loop at its lower end and connected with a source of current at its upper end. The connection is made by means of two heavy, insulated conductors, wound on a reel and exposed only where they leave the reel and enter the current source. This connection is effected when the heating wire is lowered down the borehole to desired depth. In another model of the device, the heating wire is connected by means of a single conductor with one pole of the current source, and by means of a tubular metal body with the casing of the borehole, in turn connected with the current source by bristlelike metal bars. The purpose of the device is to determine the heat conductivity of the strata adjacent to the borehole. Claims allowed, 4.

9320. (7) Apparatus for undisturbed overburden sampling. H. L. Johnson, Denison, Tex.: U. S. patent 2,403,002, issued July 2, 1946.

An undisturbed-soil sampling apparatus comprising a drill barrel, a drill head at one end of the barrel and a drilling shoe at the other, a core barrel within the drill barrel, said barrel including a displaceable liner for facilitating removal of the core adapted to be formed in said liner, means associated with the core and drill barrels for hydraulically removing drill cuttings and loose material from the operating zone of the drilling shoe, means connecting the barrels so as to permit the drill barrel to be rotated relative to the core barrel, said means including

a passage establishing communication between the interior of the core barrel and conduits formed in the drill head and opening to its exterior, valve means within the upper portion of the core barrel, said valve means being normally closed but operable to effect communication between the space below said valve means and the lower end of said passage, whereby fluid entrapped in the core barrel will be vented to the exterior of the drill barrel without exposure to the pressure of the circulating drill fluid, means in connection with said barrel head for simultaneously imparting movement to the drill barrel and a downward soil penetrating movement to the core barrel, and means in connection with the lower end of the core barrel and coacting with said barrel to seal the interior of the barrel against the entrance of the drilling fluid. Claims allowed, 1.

9321. (7) Well tester. L. E. Brown, Greggton, and O. W. Williams, Mount Enterprise, Tex.: U. S. patent 2,404,825, issued July 30, 1946.

A well tester comprising a tubular string of pipe adapted to be lowered into a well and having separate openings through the wall thereof, sleeve valves normally closing said openings, and expansible packer around the string enclosing one of said openings and having an inflow channel extending through the wall of the packer and opening outwardly of the packer at one end thereof and which continues on to, and communicates with, the other opening at its other end, a sample receiver adapted to be lowered through the string and having a sample receiving chamber therein and also having means to seat in the valves and close the central bores thereof, in succession to entrap liquid therebetween, and movable, to move said valves to open position to permit the liquid entrapped between the valve moving means to pass into the packer to expand the same against the walls of the well to form a sealed off area of the wall stratum and to permit the inflow of a fluid sample through said channel, and means for communicating said channel with the chamber to allow the entrance of the sample into the chamber. Claims allowed, 5.

9322. (7) Soil gas prospecting. P. S. Williams, Tulsa, Okla., assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2,414,913, issued Jan. 28, 1947.

In a method for prospecting for subterranean petroliferous deposits in which sampling holes are drilled to a depth of several feet at spaced intervals over the area to be investigated and soil gas samples are recovered from a point adjacent to the bottom of said holes and analyzed for their content of a significant constituent, the steps which comprise passing a fluid through portions of the earth surrounding the hole, representative of the layer overlying the sampling point, measuring the rate of travel of said fluid through said portions under a known pressure whereby values are obtained from which the average permeability of the layer over the sampling point may be determined and variations of this permeability over the area may be applied to the determinations of the significant constituent as a correction factor. Claims allowed, 3.

9323. (8) Apparatus for use in logging wells. J. T. Hayward, Tulsa, Okla.: U. S. patent 2,404,132, issued July 16, 1946.

Apparatus for measuring and recording volumes of well-drilling fluid circulating down a drill string and upwardly outside thereof, compris-

ing, a fluid flow meter, a recorder having cooperating elements one of which is synchronized with the drill string, and a variable gear ratio for driving the other element of said recorder from the flow meter. Claims allowed, 11.

9324. (9) Amphibian vehicle. B. A. Swennes, Rockford, Ill., assignor to Borg-Warner Corp., Chicago, Ill., a corporation of Illinois.: U. S. patent 2,413,850, issued Jan 7, 1947.

An amphibian vehicle comprising in combination, a substantially water-tight body, a pair of tracks movably disposed on opposite sides of said body and adapted to propel the vehicle either over land or through the water, said tracks extending for only a portion of the length of the body and being disposed adjacent to an end of the body, and an auxiliary body supporting means relatively movable with respect to the body and disposed adjacent to its opposite end and functioning with the tracks to support the body when the vehicle is propelled over land. Claims allowed, 15.

9325. (9) Electrical system for use with recording meters. N. A. Hassler, Duncan, Okla., assignor to Halliburton Oil Well Cementing Co., Duncan, Okla.: U. S. patent 2,415,880, issued Feb. 18, 1947.

An electrical system comprising a source of direct current having a variable voltage, two meters connected to said source, said meters having a different sensitivity but both being responsive to variations in the voltage of said source, a recorder associated with said meters having means for moving photosensitive material with respect to said meters and optical means for each meter for directing a beam of light from each toward said material and for moving each of said beams as a function of the voltage of said source, the optical means for each meter being so disposed relatively that the beams of light strike said material alternately, one being an on-scale beam and the other an off-scale beam, a single lamp providing a source of light for the optical means of both of said meters and an arrangement for causing said lamp to emit light substantially in proportion to the relative speed between said photosensitive material and either of the beams of light directed thereon by said optical means, said arrangement including a thermionic amplifier network for supplying energy to said lamp, means for impressing a variable regulating bias on said network proportional to the rate of change of voltage of said source, means for modifying the variable regulating bias automatically when the off-scale beam moves onto said material and the on-scale beam moves off thereof, a photo-electric feed-back circuit for modifying the variable regulating bias impressed on said network in accordance with the light output of said lamp, and means for further modifying the variable regulating bias impresed on said network in accordance with the speed of said photo-sensitive material through said recorder. Claims allowed, 11.

9326. (9) Cartridge. Marcel Schlumberger, Saint Gaudens, Haute Garonne, France; vested in the Attorney General of the United States: U. S. patent 2,419,371, issued Apr. 22, 1947.

In a cartridge for a sequentially dischargeable cartridge train, the combination of a tubular casing, means forming a closure having an electrically conductive portion at one end of said casing, means forming

a second closure at the other end of said casing, an explosive charge in the casing, means for igniting said explosive charge, means forming in said electrically conductive closure portion a conduit having a restricted portion, an electrical contact element mounted in said conduit, frangible insulating material insulating said contact element from the walls of said conduit, said contact element having an external portion adapted to cooperate with a preceding cartridge in a cartridge train to form a firing circuit component, and having an internal portion of such shape that it cannot pass through the restricted portion of said conduit, whereby the explosion of said charge will cause the internal portion of said contact element to destroy said frangible insulating material and to be moved into engagement with the walls of said conduit. Claims allowed, 5.

9327. (9) Distance indicating detection system. L. A. de Rosa, Staten Island, N. Y., assignor to Federal Telephone & Radio Corp., Newark, N. J., a corporation of Delaware: U. S. patent 2,419,541, issued Apr. 29, 1947.

A combination radio detection and signaling system comprising means for transmitting recurring impulses, means to detect and indicate echo pulses caused by the presence of obstacles, means to select an echo pulse corresponding to a particular obstacle, means to measure the elapsed time between transmission of an impulse and reception of the corresponding echo pulse from said particular obstacle, and means to thereafter signal the distance of said particular obstacle by causing the transmitting means to operate at an impulse producing rate proportional to said elapsed time. Claims allowed, 8.

9328. (9) Navigation system. R. B. Roe, West Hempstead, and J. B. Gray, Garden City, N. Y., assignors to Sperry Gyroscope Co., Inc., a corporation of New York: U. S. Patent 2,419,970, issued May 6, 1947.

In a navigation system, direction finding means, means responsive thereto for detecting variations from a norm in the bearing of a steerable craft relative to a source of radiant energy, steering means responsive to said variations for directing said craft toward said norm, and means responsive to the distance between said craft and said source of radiant energy for lessening the ratio of responsiveness of said steering means to said bearing angular variations as said source is approached. Claims allowed, 18.

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