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GEOPHYSICAL ABSTRACTS 92

JANUARY-MARCH 1938

COMPILED BY
W. AYVAZOGLOU



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GEOPHYSICAL ABSTRACTS 92, JANUARY-MARCH 1938

Compiled by W. AYVAZOGLU

1. GRAVITATIONAL METHODS

4104. Benfield, A. E., Note on the variation of gravity with depth: *Zeitschr. Geophysik*, vol. 13, no. 4/5, pp. 157-158, Braunschweig, 1937.

A table and curve showing the value of g at different distances from the center of the earth have been computed from the latest density distribution data. Gravity is shown to be remarkably uniform over a large distance.—*Author's abstract.*

4105. Berroth, A., Gravitationsfeld und Oberflächengestalt der Erde und ihre geometrische Festlegung [Gravitational field and surface configuration of the earth and its geometrical definition]: *Zeitschr. Geophysik*, vol. 13, no. 4/5, pp. 133-156, Braunschweig, 1937.

The problem of determining the gravitational field may be divided into determining its geometrical form and determining its physical properties; the problem of determining the surface configuration of the earth consists of determining the form only. From the viewpoint of practical knowledge, physical and geometrical conceptions sometimes interfere one with another in a way which cannot be explained. In this paper geometrical and physical elements are determined; an improvement of a strictly geometrical procedure is given, and the various methods for making its application possible are examined. A way to avoid the objections raised against Clairaut's theorem is shown. Finally, the possibilities of an analytical determination of the surface are discussed.—*Author's abstract translated by W. A.*

4106. Boaga, G., Modello di campo gravitazionale generato da una massa sferica sotterranea su punti di particolari piani verticali interpretazione delle misure Eötvössiane [Determination of spherical bodies under the ground by measurements made with the Eötvös torsion balance]: *Com. Geod. e Geofis. Boll.*, vol. 7, pp. 1-17, 1937.

By Eötvös measurements along two axes, the mass, depth, and dimensions of a spherical disturbing body may be determined. The method can be extended to bodies of other geometrical forms. Gravimetric anomalies may be used to control results obtained by other methods.—*W. A. R., Sci. Abstracts, vol. 40, no. 479, 1937.*

4107. Boaga, G., Deviations of the vertical and gravimetric anomalies: *Accad. Lincei Atti*, vol. 25, pp. 714-719, June 20, 1937.

A mathematical paper in which is explained, starting from the relations found by Pizzetti, how it is possible to obtain simple and elegant formulas between the divergence of the ellipsoid of reference and the geoid (supposed of rotation), the deviations from the vertical in latitude, and the gravimetric anomalies.—*J. J. S., Sci. Abstracts, vol. 40, no. 479, 1937.*

4108. Browne, B. C., The measurement of gravity at sea: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 4, no. 3, pp. 271-279, London, 1937.

The problem of the measurement of gravity at sea is divided into two parts—(1) the measurement of the force acting on a body moving with the ship and (2) the question how to correct this measured value so as to obtain the value that would have been observed had the ship been at rest. In the first section of this paper, the second part of the problem is considered without reference to any particular type of gravimeter, and the results deduced are, therefore, quite general. It is shown that to obtain the true value of gravity from measurements made on board a moving ship, it is necessary to know at each instant not only the direction of the resultant acceleration but also the direction of the vertical with respect to the axis of the gravimeter. In the second section the Vening Meinesz apparatus is considered and it is pointed out that the conclusions reached by him are only approximate, but by applying two small corrections true values are obtained. The conclusion is reached that the values of gravity which have hitherto been obtained at sea are in general too high by several milligals. An estimate of the order of magnitude of this correction is made, and it is shown that under working conditions errors as great as 12.5 milligals might occur, but sufficient data are not available to enable a more exact estimate to be made.—*W. A.*

4109. Bryan, A. B., Gravimeter design and operation: Geophysics, vol. 2, no. 4, pp. 301-308, Houston, 1937.

An elementary general discussion of gravimeters and a brief comparison of gravimeter with torsion balance are given. Details as to construction, accuracy, speed of operation, and methods of making field observations are given for one type of instrument which is being widely used in geophysical exploration work.—*Author's abstract.*

4110. Closs, H., Ergebnisse regionaler Schwermessungen in Oberrheinthal mit Bemerkungen zur gravimetrischen Struktur Süddeutschlands [Results of regional gravity measurements in the upper Rhine Valley with remarks on the gravimetrical structure of south Germany]: Oel und Kohle, vol. 13, no. 44, pp. 1065-1073, Berlin, 1937.

Gravimetric measurements made with modern gravimeters (Thyssen gravimeter) by the commission in charge of the general geophysical exploration of Germany have revealed many previously unknown details in the upper Rhine Valley. The measurements were started in November 1936 and were completed in July 1937. The relative force of gravity was determined at 375 stations over an area of about 55,000 square km. The measurements, their representation and the description of the isogam map are discussed. A comparison of the measurements made by pendulums and gravimeters is given. The last part of the article deals with the regional consideration of the gravity map of the upper Rhine Valley.—*W. A.*

4111. Finsterwalder, R., Die Bestimmung von Lotabweichungen aus der trigonometrischen Höhenmessung [Determination of plumb-line deviations from trigonometrical measurement of heights]: Zeitsch. Vermessungswesen, vol. 66, no. 13, pp. 370-382, no. 14, pp. 402-416, and no. 15, pp. 472-492, 1937.

The influence of refraction upon the measurements of vertical angles must be determined with a higher precision in mountainous regions than

on the level country; trigonometrical measurements of heights can be used for determining approximate deviations of the plumb line. In the example given by the author (Nanga Parbat) the deviations of the plumb line are sufficiently great (up to 1') to make these measurements possible. Astronomic determinations of the deviation of the plumb line were used for checking the results. Trigonometrical determination of heights for obtaining determinations of plumb lines in mountainous regions may be successfully applied, especially when the measurements are made more systematically and accurately than was done in the Nanga Parbat region.—*Schmehl's abstract in Zentralbl. Geophys., Meteorol. u. Geod., vol. 1, no. 7, 1937, translated by W. A.*

4112. Jelstrup, H. S., Verschiedenes über die auf die Erde wirkenden Gravitationskräfte und die Form der Erde [Various matters concerning gravitational forces producing an effect on the earth, and the form of the earth; original in Norwegian]: *Norsk mat. Tidsskr., vol. 19, pp. 1-17, Oslo, 1937.*

Problem and difficulties of determining the form of the earth are discussed; Clairaut's theorem is derived; it is shown how the distance between the earth ellipsoid and the spheroid is determined; various methods of reduction of the force of gravity are examined; Hopfner's opinion with regard to these methods of reduction is mentioned; and a map by R. A. Hirvonen showing the course of the geoid undulations in various geographic longitudes is given.—*W. Heiskanen's abstract in Zentralbl. Geophys., Meteor. u. Geod., vol. 1, no. 7, 1937, translated by W. A.*

4113. Jung, Heinrich, Die Lotabweichungen in der Umgebung des Nanga Parbat und ein Versuch zu ihrer geophysikalischen Deutung [The plumb-line deviations in the neighborhood of Nanga Parbat and an attempt at their geophysical interpretation]: *Zeitschr. Geophysik., vol. 13, no. 6, pp. 205-222, Braunschweig, 1937.*

Closer investigation of plumb-line deviations measured during the German Himalaya expedition in 1934 shows that at some stations they can be explained by visible mountain relief. In other places they may possibly be interpreted by isostatic compensation below the Nanga Parbat massif, but it might be more advisable to assume here over compensation. The measured plumb-line deviations in the border regions are so great that their explanation by concealed mass irregularities (mass surplus below the border massifs, mass deficiency below the Indus Valley) is difficult unless very great differences in density are accepted.—*Author's abstract translated by W. A.*

4114. Lejay, Pierre, Mesures de gravité en Normandie et en Bretagne [Measurements of gravity in Normandy and in Brittany]: *Acad. Sci. Paris Comptes rendus, vol. 205, no. 9, pp. 429-432, 1937.*

The results of measurements of gravity obtained at 21 stations with two pendulums are given in a table. Determination of the temperature corrections was made with great precision before the work. 17.55 milligals of the variation of gravity correspond to 1° of the change of temperature.—*W. A.*

4115. Lettau, Heinz, Lotschwankungen unter dem Einfluss von Gezeitenkräften und atmosphärischen Kräften [Plumb line deviations under the influence

of tidal forces and atmospheric forces]: *Gerlands Beitr. Geophysik*, vol. 51, no. 2/3, pp. 250-259, Leipzig, 1937.

Principles of construction of a new type of horizontal double pendulum are given by which registrations of plumb-line deviations were made at the Geophysical Observatory of the University of Leipzig during 2 months showing a sensitivity of 0.0009'' per mm. The mean solar and lunar daily variations are investigated by harmonic analysis. The amplitude of the registered variations is a complex phenomenon of combined gravitational and atmospheric forces. A figure for measuring the influence of air pressure upon the earth's crust is derived by which a value for the rigidity of the continental shelf may be obtained with the aid of Darwin's theory. This value is ten times smaller than that usually accepted. Without the introduction of the Darwin theory, the air-pressure coefficient derived from observations made with the horizontal double pendulum on the basis of the barometric S_2 -wave may serve as an explanation of the results of observations made during 5 years by Schweydar on the S_2 -wave of the plumb-line deviation in Freiburg. Finally, Steinhauser's calculations on the deformation of the earth's crust caused by loads of snow in the Alps during the winter are examined and compared with the influence of air-pressure variations upon the earth's crust caused by weather.—*Author's abstract, translated by W. A.*

4116. Saltykov, B., Solution of N. Moisseiev's integral equation in the theory of the nonregular geoid figure: *Acad. Sci., U. R. S. S., Comptes rendus (Doklady)*, vol. 16, no. 3, pp. 133-140, Leningrad, 1937.

Reference is made to the equation previously derived to determine the figure of the geoid of an irregular earth. A solution of this equation is given, and values are tabulated for the necessary functions for values of ϕ ranging from 0° to 180° . A new form of Moisseiev's equation for the figure of the irregular geoid is derived and is called a quasi-Stokes equation.—*R. S. R., Sci. Abstracts, vol. 40, no. 479, 1937.*

4117. Smirnov, L., and Kurushin, A., Determination of the flattening of the earth from gravity observations in the U. S. S. R. [in Russian]: *Astron. Jour. Soviet Union*, no. 14, pp. 168-171, 1937.

The flattening of the earth is determined from the results of gravity measurements carried out in the U. S. S. R. in 1933, with the aid of Clairaut's theorem. Mountain stations were not taken into consideration; data from 1,829 stations were used. Free air and Bouguer's reductions of gravity values were applied, and the following values of flattening were obtained: $1:301.02 \pm 0.63$ and $1:301.5 \pm 0.63$. If the gravity values are summarized by regions (23 groups), a value of flattening almost equal to the first of the figures given above is obtained.—*Schmehl's abstract in Zentralbl. Geophys., Meteorol. u. Geod., vol. 1, no. 5, 1937, translated by W. A.*

4118. von Thyssen, St., Die Anwendungsmöglichkeiten des Thyssen gravimeters in deutschen Steinkohlengebieten [Possibilities of the application of the Thyssen gravimeter in the German coal regions]: *Kohle und Erz*, vol. 34, pp. 161-166, Kattowitz, 1937.

Brief report on some gravity measurements carried out in the Ruhr district and in the Aachen coal region. The results of measurements are compared with the course of coal strata; relationship could be partly

established.—*Schmehl's abstract in Zentralbl. Geophys., Meteorol. u. Geod., vol. 1, no. 5, 1937, translated by W. A.*

4119. Tsuboi, Chuji, and Fuchida, Takata, Relations between gravity values and corresponding subterranean mass distribution: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 3, pp. 636-649, 1937.

An attempt is made to solve the problem of finding the distribution of the subsurface densities that are responsible for changes of gravity values along a line at the earth's surface.—*W. A.*

4120. Tsuboi, Chuji, Deflections of the vertical undulation of the geoid and gravity anomalies: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 3, pp. 650-653, 1937.

Continuation of the mathematical discussion given in the previous paper (see abstract 4119).—*W. A.*

4121. Vening Meinesz, F. A., Determination of the earth's plasticity from the postglacial uplift of Scandinavia; Isostatic adjustment: K. Akad. Amsterdam, Proc., vol. 40, no. 8, pp. 654-662, 1937.

Reference is made to differences in the value of the coefficient of viscosity (η) obtained by Haskell and by van Bemmelen and Berlage from postglacial uplift after the removal of the ice load. Three sources of evidence are considered and, assuming equilibrium is not yet attained, η is found to be 3×10^{22} . The time of disappearance of the half depression is found, and from it data are obtained relating to the plasticity of the earth.—*R. S. R., Sci. Abstracts, vol. 41, no. 481, 1938.*

2. MAGNETIC METHODS

4122. Beyer, G., and Kühne, R., Einige Beobachtungen über das magnetische Verhalten der Doleritintrusionen im Karroo-System und neue magnetische Messungen am Witwatersrand [Some observations on the magnetic behavior of dolerite intrusions in the Karroo-system and new magnetic measurements on Witwatersrand]: Metall u. Erz, vol. 34, no. 18, pp. 471-475, Halle, 1937.

Magnetic measurements carried out in the region of Witwatersrand with the purpose of determining the extent of gold-bearing quartz conglomerates were successful. It was proved indirectly that it is possible to determine by measurements the presence of slates containing magnetite within the lower Witwatersrand system. The effect of dolerite intrusions which appear in the Witwatersrand layers covered by the Karroo layers had to be eliminated during the evaluation of measurements. The results of a series of such measurements made above the dolerite intrusions and the conclusions from the investigation of the samples are stated. From the results of magnetic measurements in the region of Ventersdorp it was possible to determine the existence of Witwatersrand layers below the overburden in the granite core of the north wing of the saddle of Krügersdorp-Klerkodorp. The prospect of new auriferous fields was increased greatly by this discovery.—*Author's abstract translated by W. A.*

4123. Chapman, S., The heating of the ionosphere by the electric currents associated with geomagnetic variations: Terres. Magn. and Atmos. Electr., vol. 42, no. 4, pp. 355-358, Baltimore, 1937.

A calculation is made of the heating effect in the ionosphere of the electric currents that are responsible for the solar daily magnetic varia-

tion. Contrary to a suggestion made long ago by Schuster, they are found to be quite insignificant. It seems possible, however, that the intense and concentrated electric currents that flow along the auroral zone during magnetic storms may appreciably heat the air there; but it is suggested that such heating is likely to be exceeded by more direct heating due to degradation into thermal energy of part of the kinetic energy of the incoming ionizing particles. These heating effects would produce convective motions that may possibly make an appreciable contribution to the electromotive forces responsible for the electric current system of polar magnetic disturbance.—*Author's abstract.*

4124. Egedal, J., The determination of the magnetic inclination with an earth inductor: *Terrestr. Magn. and Atmos. Electr.*, vol. 42, no. 4, pp. 367-370, Baltimore, 1937.

The method used at the Rude Skov Observatory to obtain more accurate determinations of the magnetic inclination is described, and the need in general of accurate determinations of the inclination is emphasized.—*Author's abstract.*

4125. Fanselau, G., Einige Bemerkungen zu der magnetischen Störung vom 24 bis 28 April 1937 [Some remarks on the magnetic disturbance from April 24 to 28, 1937]: *Zeitschr. Geophysik*, vol. 13, no. 4/5, pp. 191-192, Braunschweig, 1937.

Detailed description of this disturbance was given in "Naturwissenschaften," vol. 25, no. 30, p. 490, 1937 (see *Geophys. Abstracts* 91, no. 3955).

The daily delay in the beginning of this disturbance, as well as the temporal prolongation of the disturbance are both attributed to the rotation of the earth. World-wide disturbances, like that described in the article, affect the earth as a whole and the reason for the daily return of the disturbance may therefore probably be assigned to the various positions of the magnetic axis of the earth with respect to the corpuscular current from the sun.—*W. A.*

4126. Haalck, H., Zur Frage nach der Ursache des Erdmagnetismus [On the question concerning the cause of terrestrial magnetism]: *Zeitschr. Geophysik*, vol. 13, no. 4/5, pp. 192-197, Braunschweig, 1937.

A possible explanation of the cause of terrestrial magnetism was discussed by me in some of my previous works (*Zeitsch. Geophysik*, vol. 12, no. 2/3, 1936, and *Zeitschr. Physik*, no. 1/2, 1937). It is clear that a theory, especially if it concerns physical foundations of geophysical research, has to pass critical examination of specialists before it is accepted. The rejection of my theory by Schlomka (*Zeitschr. Geophysik* vol. 13, no. 2/3; see *Geophys. Abstracts* 90, no. 3837) is considered by me to be unjustified. Therefore, an explanation is given again and the main points of the theory are more clearly formulated. Its limits are established and objections raised against it are discussed.—*Author's abstract translated by W. A.*

The article is an answer to Schlomka's arguments and is followed by two short notes in which both authors defend their viewpoints.—*W. A.*

4127. Heck, N. H., The magnetic survey of the United States: *Military Engineer*, vol. 30, no. 169, pp. 13-17, Washington, 1938.

The phenomenon of the earth's magnetism is discussed. The method of dealing with the problem of magnetic changes in the United States is described. The necessity of establishing magnetic observatories to

determine diurnal variation, magnetic storms, uses of terrestrial magnetism, and magnetic exploration is urged.—*W. A.*

4128. Klöss, M., Unterstützung bergbaulicher Aufschlussarbeiten durch magnetische Messungen [Assistance of mining prospecting work by magnetic measurements]: Deutsche phys. Gesell. Verhandlungen, vol. 18, no. 2, p. 65, Berlin, 1937.

Report on the magnetic measurement of a deposit of nickel and magnetic pyrites near Todtmoos (Schwarzwald), previously investigated from the direction of Klausthal. Measurements made with the Schmidt vertical field balance were decisive in mining work. The existence of a new part of the deposit was established.—*Author's abstract translated by W. A.*

4129. Krahmann, R., Die magnetometrischen Untersuchungen am Witwatersrand [Magnetometric investigations at Witwatersrand]: Deutsche geol. Gesell. Zeitschr., vol. 89, no. 2, pp. 79-87, Berlin, 1937.

Magnetic investigations were extended to the southwest of the Witwatersrand gold fields where the Main Reef horizon is covered with dolomite. The gold occurs over a known distance of 80 km in several conglomerate layers, the most important of which is called the Main Reef, interbedded in the thick mass of Witwatersrand sediments. In 1930 the author pointed out that the lower layers of the Witwatersrand beds contain certain iron-bearing slates that are magnetic, and later the magnetic anomalies of the lower Witwatersrand were determined. As the results of the magnetic measurements have been studied by 14 borings, the method appears to be an important means of investigating the Main Reef despite the thick cover of younger sediments.—*Abstract in Metall u. Erz, vol. 34, no. 21, 1937, translated by W. A.*

4130. Nagaoka, Hantaro, and Ikebe, Tsuneto, Sudden magnetic variations observed on the volcano Asamayama: Imp. Acad. Japan Proc., vol. 13, no. 3, pp. 62-64, Tokyo, 1937.

Observations of sudden magnetic variations on the Asamayama volcano were recorded by the magnetograph described in a previous paper (Geophys. Abstracts 91, no. 3970) and are shown in two figures. A magnetogram taken on a quiet day is given for comparison. A new kind of disturbance not hitherto noticed is shown in the second figure. The changes were very frequent, so that the magnetogram indicates a row of zig-zags about the mean line. This disturbance is attributed to the existence of a magnetic pool in the heart of the volcano.—*W. A.*

4131. Nagata, Takesi, A comparison of the results of magnetic surveys before and after the earthquake in Niisima, December 27, 1936 [in Japanese]: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 2, pp. 497-505, 1937.

After the earthquake of Niisima, one of Idu Islands, on December 27, 1936, magnetic dip angles were observed at 8 points on the island and the results were compared with the values obtained by S. Makamura in August 1928. The dip angles were compared with those at the same instant of Kakioka, the central magnetic observatory of Japan, in order to eliminate the general terrestrial magnetic disturbances from the observed values. The reduced results show that there is a certain anomalous variation of 9 minutes in the maximum value. The method of reduction

is discussed for general cases. Finally, the observation of dip angles at the 16 new stations are given.—*Author's English abstract.*

4132. Perassi, R., Center of earth's magnetism and directions of the secondary axes: *Com. Geod. e Geofis. Boll.*, vol. 7, pp. 32-42, Jan.-Apr. 1937.

Calculations are made for establishing the position of the center of magnetism and the directions of the secondary axes as they are defined by Maxwell for the case of terrestrial magnetism, making use of the numerical data of Neumayer. There are then determined the geographical coordinates on the earth's surface of the point determined by the joining of the terrestrial center with the center of magnetism, and of those determined from the secondary axes proceeding from the center of the earth. The center of terrestrial magnetism is situated at about 700 km from the center of the earth in the direction of the point of latitude 0° and longitude 170° E.—*J. J. S., Sci. Abstracts*, vol. 40, no. 479, 1937.

4133. Pollak, Alfred, Die Anwendung geophysikalischer Untersuchungsmethoden im Bereiche der Schwarzenberger Erzlagergruppe [Application of geophysical methods of investigation in the region of the Schwarzenberg group of iron-ore deposits]: *Deutsche geol. Gesell. Zeitschr.*, vol. 89, no. 6, pp. 326-327, Berlin, 1937.

The distribution of magnetic anomalies in the region of the Schwarzenberg iron-ore deposits was established by measurements of the vertical intensity, and partly also by measurements of the horizontal intensity. The measurements were made along a great number of profiles with stations close together. Minima too high for these latitudes, as well as the abnormal location of these minima to the south and southwest of the regions with positive disturbances make the mathematical and physical interpretation of the results of measurements difficult.—*W. A.*

4134. Schmidlin, Hans, Die Aufnahme der magnetischen Anomalien in der Breisgauer Bucht [Survey of magnetic anomalies in the Bay of Breisgau]: *Berichte Naturf. Gesellschaft Freiburg i. Br.*, vol. 35, pp. 127-133, 1937.

A survey was made in 1933 of the region south, west, and north of Freiburg i. Breisgau and of a small part of Kaiserstuhl with a universal variometer with fiber suspension of the magnet system (tungsten wire) constructed by Koenigsberger. Susceptibility of rock samples taken near the stations was investigated. The total number of stations was 400. Anomalies of about $+30\gamma$, were found in the Rhine Valley and of about -30γ in the direction toward the border of the Schwarzwald. Negative anomalies reaching values of several thousands of γ were observed in the region of Kaiserstuhl; these were explained by the predominance of ore bodies having an adverse remanent magnetization. A Z-map is given on which zones having various directions corresponding to the lines of disturbance of the Rhine Valley are shown by the course of anomalies and bendings of isogams.—*W. A.*

4135. Schmidt, K. H., Magnetometer has many uses in geophysical exploration: *Oil and Gas Jour.*, vol. 36, no. 29, pp. 15-16, Houston, 1937.

Limitations of various geophysical methods and combination of methods for the solution of any particular problem are discussed, considering the following factors: (1) Purpose of survey, (a) general reconnaissance, (b) geophysical detail; (2) Geology of the area; (3) Economic factors.

The magnetic method was found to be more suitable than the seismic method in an area such as the Edwards Plateau in west Texas, in which magnetic anomalies correspond very well with structure.

It is concluded that the magnetic method is worthy of consideration as a method that can be used for many purposes at small cost because of its speed and the ease with which the data may be interpreted.—*W. A.*

4136. Takahasi, Ryutaro, and Nagata, Takesi, Geophysical studies of volcano Mihara, Oosima Island; topographic survey of the crater of Mihara and the magnetic survey of Oosima: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 2, pp. 441-463, 1937.

The main object of the present study of the volcano Mihara was to make a comparison of it with the volcano Asama and to obtain data on which to base future studies of the volcano. Measurements were made of the three elements of terrestrial magnetism at 12 stations with the object of obtaining some clue to the relation between volcanic activity and magnetism. Tables showing the results of measurements are given.—*W. A.*

4137. Terada, K., On the possibility of estimating some physical constants of the earth's crust by magnetic observations on the surface of it [in Japanese]: Meteorol. Soc. Japan Jour., 2d ser., vol. 15, pp. 342-344, Tokyo, 1937

This is an extension of Chapman's theoretical calculation (The influence of electrically conducting material within the earth on various phenomena of terrestrial magnetism: Cambridge Philos. Soc. Trans., vol. 22, pp. 463-482), when the earth is made up of n concentric shells of different electric and magnetic properties. No numerical examples are given.—*Y. Kodaira's abstract in Zentralbl. Geophys., Meteor. u. Geod., vol. 1, no. 7, 1937.*

4138. Wiles, G. G., and Bahnemann, F., Magnetic anomalies near a semi-infinite line of poles: Beitr. angew. Geophysik, vol. 7, no. 2, pp. 178-188, Leipzig, 1937.

By an extension of Nippoldt's single-pole method for interpreting magnetic anomalies a semi-infinite line of poles is considered. It represents a buried magnetic stratum lying along the earth's field and terminating in a fault. Such strata are found in the Witwatersrand. Curves are computed for the anomalies above such a stratum situated at various depths with the fault at various distances. "Depth curves" and "pole-strength curves" are also given, which facilitate the plotting of the theoretical anomaly and enable the depth indicated by any given anomaly to be read directly.—*Authors' abstract.*

3. SEISMIC METHODS

4139. Adler, J. L., Unusual problems present in seismograph work abroad: Oil and Gas Journal, vol. 36, no. 33, pp. 75 and 302-303, Tulsa, 1937.

Practical problems of seismograph surveys in foreign countries differing greatly in geographic and cultural conditions from those in the United States are discussed. Difficulties connected with the choice of suitable equipment, special mountings, means of transportation, providing the party with food, water, housing, etc., are described.—*W. A.*

4140. Angenheister, G., Bodenschwingungen sinusförmiger Erregung [Ground oscillations produced by sinusoidal agitation]: *Sond.-Abdr. Göttingen Abh.*, vol. 3, no. 18, 18 pp., 1937.

The results of the great progress made in the investigation of the uppermost layers of the earth's crust by the production and detailed examination of sinusoidal agitation of the ground are discussed. By the use of oscillating machines such physical phenomena as oscillations, interferences, dampings, phase displacements, and natural vibrations at depth, can be measured and their relationship to stratification and to the composition of the ground may be interpreted. Various seismographs and machines for producing oscillations are described, and the methods used are explained for specially selected examples.—*Schmerwitz's abstract in Zeitsch. Geophysik, vol. 13, no. 6, 1937, translated by W. A.*

4141. Archer, J. A., On the direction of approach of microseisms: *Royal Astron. Soc. Monthly Notices, Geophys. Suppl.*, vol. 4, no. 3, pp. 185-196, London, 37.

The records of Wiechert's seismographs at Hamburg, Ivigtut, and Copenhagen, and of Galitzin's at Copenhagen, have been examined by A. W. Lee's method (*Royal Soc. London Proc.*, ser. A, vol. 149, no. 866, pp. 183-199, 1935; see *Geophys. Abstracts* 75, no. 2585) for five out of the six shocks selected by Lee. Six other shocks have been included and the corresponding Kew seismograms were also inspected so that a fuller comparison could be made. The data from Copenhagen and Ivigtut, like that from Kew, point to the Northern Atlantic and other northern seas as being the places where the recorded microseisms principally originate. The Ivigtut results, in particular, indicate the northeast section of the Atlantic. The evidence provided by the Ivigtut data is definitely adverse to the "surf" theory.—*W. A.*

4142. Bastings, L., Some seismological aspects of the Buller earthquake, singly and multiply reflected P waves: *New Zealand Jour. Sci. Technology*, vol. 19, no. 3, pp. 180-188, Wellington, 1937.

A detailed analysis is presented of the European records of the 1929 Buller [N. Z.] earthquake in respect to the multiply-reflected primary waves PP ----- P P P P P, both up toward and beyond 180°. Travel-time tables are deduced for all these phases, and a comparison made with similar tables by other authors.—*Author's summary.*

4143. Bastings, L., Some seismological aspects of the Buller earthquake, singly and multiply reflected S waves: *New Zealand Jour. Sci. Technology*, vol. 19, no. 4, pp. 256-261, Wellington, 1937.

Travel-time tables are presented for the phases SS, SSS, SSSS, PSSS, and SSSSS, for epicentral distances from about 145° up to, and in some cases beyond, 180°. These are derived from records of the Buller [N. Z.] earthquake of 1929, June 16-17. A comparison is made with similar tables by other authors.—*Author's summary.*

4144. Baughman, G. W., and Lee, Marvin, 1936 Kansas development, active exploration work resulted in discovery of 54 new fields: *Oil Weekly*, vol. 85, no. 3, pp. 67-72, Houston, 1937.

Development in the western Kansas oil region for 1936 is sketched. Seismographic surveys in connection with drilling were used extensively in discovery work.—*W. A.*

4145. Belluigi, A., Seismic-electric prospecting: Oil Weekly, vol. 87, no. 12, pp. 38-43, Houston, 1937.

If a direct current is sent into the ground by means of two electrodes, and if artificial seismic waves are produced by explosions or shocks of falling masses, the sensitivity of the soil during the period of arrival of vibrations has oscillatory values comparable to those of the "seismogram" within the limits of accuracy of the electrical measurements. The possible geophysical application of this correlation and the layout of the equipment and precautions to be taken are briefly discussed.—W. A.

4146. Bernhard, R. K., Geophysical study of soil dynamics: Am. Inst. Min. Met. Eng. Tech. Pub., no. 834, 21 pp., New York, 1937.

Fundamental principles of dynamic soil tests by applying artificial vibration excited by centrifugal forces resulting from eccentrically supported rotating masses are described.

The method of artificial vibration has been used successfully for the following soil investigations: (1) Qualification of soil for building purposes, highways, or railways; (2) dynamic constants (bedding value, natural frequency, damping) for foundations, especially when loaded with machines causing vibrations; (3) bearing capacity and depth of upper and lower beds; (4) densifying of soil, especially new fills; (5) required thickness of concrete highways; (6) checking all kinds of insulations against traffic vibrations or earthquake shocks.

The main advantages of the new method are: (1) Undisturbed soil, including any damage on the surface, even for investigations to considerable depth; (2) continuous profiles, foregoing the disadvantages of inadequate and expensive borings.—*Author's summary.*

4147. Bullen, K. E., The Hawkes Bay earthquake of 1921, June 29: New Zealand Jour. Sci. Technology, vol. 19, no. 3, pp. 199-205, Wellington, 1937.

An analysis has been made of the Hawkes Bay earthquake of 1921, June 29, using the data of the I. S. S. The most probable position of the epicenter has been found to be the point 39.3° S., 176.4° E., which is about 30 miles NW. of Napier, the origin time being 1921, June 28 d. 13 h. 58 m. 54 s. (G. M. C. T.). The epicenter is subject to a standard error of about 0.4° . A depth of focus of about 80 km is indicated, and this is confirmed by European observations of the phase P' (or PKP). The earthquake provides, in fact, an interesting series of observations of the latter phase and also the companion phase P'_2 . The macroseismic evidence has been examined and confirms the solution obtained, particularly in the existence of a focal depth greater than normal. The earthquake is specially interesting on account of the focal depth. It is possible that this earthquake contributed substantially towards an instability nearer the surface which resulted in the disastrous earthquake of 1931.—*Author's summary.*

4148. Bullen, K. E., and Bastings, L., Recent developments in seismology in New Zealand: Seismol. Soc. America Bull., vol. 27, no. 3, pp. 251-254, Berkeley, 1937.

The development of interest in seismological matters in New Zealand during the last few years was discussed at the biennial meeting of the Australian and New Zealand Association for the Advancement of Science, held in Auckland in January 1937, and resulted in the Association's setting up a Seismological Research Committee with the ob-

ject of promoting research and encouraging cooperation in seismology in Australia, New Zealand, and the southwest Pacific.

Summaries of the following papers presented at the meeting are given: Suggested new latitude for use in seismology, by K. E. Bullen.

Some features of microseisms recorded at Christchurch, by H. F. Baird.

Seismic surface waves as recorded at Christchurch, by H. F. Baird.

Recent progress in New Zealand seismology, by R. C. Hayes.

The development of seismology in the southwest Pacific, by L. Bastings.

The constitution of the earth, by K. E. Bullen.—*W. A.*

4149. Carder, D. S., Observed vibrations of bridges: *Seismol. Soc. America Bull.*, vol. 27, no. 4, pp. 267-304, Berkeley, 1937.

Data and comments concerning natural vibrations of the San Francisco-Oakland Bay bridge and the Golden Gate bridge during construction and in their present completed form are presented.—*W. A.*

4150. Gees, R. H., Die Wellenausbreitung der Erdbeben vom 20 November 1932 (Nordbrabant) und 7 Juni 1931 (Doggerbank) [Propagation of waves of earthquakes of November 20, 1932 (North Brabant) and of June 7, 1931 (Doggerbank)]: *Zeitschr. Geophysik*, vol. 13, no. 4/5, pp. 159-179, Braunschweig, 1937.

Travel-time curves were determined for two earthquakes: (1) for the North-Brabant earthquake of November 20, 1932, based on the author's interpretation of the data obtained at 27 stations and on his own determination of the focus; (2) for the Doggerbank earthquake of June 7, 1931, with the aid of the reports obtained from a number of earthquake stations and from the International Summary. Velocities of the three pairs of waves: \bar{P} and \bar{S} , P^+ and S^+ , and P_n and S_n are determined for the North Brabant earthquake. These velocities differ from the determinations made so far for other earthquakes, especially from those the foci of which were in the Alpine region. This indicates a different structure of the upper earth's crust. Two travel time curves P'_n and P''_n traveling parallel to the P_n waves were also found. These are probably waves which traveled partly in the longitudinal and partly in the transverse direction. They furnished a method for determining the thicknesses of the \bar{P} and P^+ layers. Travel time curves of P_n and S_n waves were determined from various profiles for the Doggerbank earthquake. The velocity was 8.4 km/sec. in the northeast direction, and 7.9 km/sec. in the southeast direction. These are evidently apparent velocities caused by the inclination of the layer along which the P_n waves were traveling.—*Author's abstract translated by W. A.*

4151. Gutenberg, B., and Richter, C. F., Materials for the study of deep-focus earthquakes [second paper]: *Seismol. Soc. America Bull.*, vol. 27, no. 3, pp. 157-184, Berkeley, 1937.

The present paper is supplementary to a previous publication under the same title (see *Geophys. Abstracts* 88, no. 3573). A list of errata in the previous paper is included. A more detailed account of the calculation of certain travel times given and a new table is added giving epicentral distance as a function of the travel time of P and the focal depth. Further methods for locating the epicenters of deep shocks are discussed.—*W. A.*

4152. Gutenberg, B., On supposed regional variations in travel times: *Seismol. Soc. America Bull.*, vol. 27, no. 4, pp. 337-348, Berkeley, 1937.

An investigation of the Tango earthquake of March 7, 1927, shows that travel times for P observed in that shock agree within the limits of error of 1 or 2 seconds with the travel times found for other earthquakes and that thus far there is no indication of differences beyond the limits of observational errors between the travel time curves of earthquakes in different regions. This statement, however, does not include the travel times to short epicentral distances of a few degrees found in various regions, which are influenced by the local structures in those regions, and especially not to the travel times found from waves which have traversed only the uppermost parts under the Pacific Ocean.—*Author's abstract.*

4153. Hayes, R. C., The effects of pressure changes on the occurrence of earthquakes in the New Zealand region: *New Zealand Jour. Sci. Technology*, vol. 19, no. 4, pp. 253-255, Wellington, 1937.

Investigations into atmospheric-pressure changes over the epicenters of about two hundred earthquakes in the vicinity of New Zealand during the years 1931-36 show that in certain regions earthquakes nearly always originate after either a rise or a fall of pressure. The results are considered to give some indication of the crustal movements connected with the occurrence of the earthquakes during the period under review.—*Author's summary.*

4154. Heinrich, R. R., Seismic activity in the Saint Mary's fault region since 1910 [abstract]: *Missouri Acad. Sci. Proc.*, vol. 3, no. 4, p. 131, St. Louis, 1937.

The paper is concerned with the earthquakes which have occurred since 1910 in Saint Mary's fault region, one of the four active seismic areas of Missouri. Microseismic and macroseismic evidence obtained by a study of original seismograms, newspaper accounts, bulletins, and government reports verified the location of the earthquakes in the fault region. The distribution of these earthquakes within the area itself is shown, and a possible relation of the most intense earthquake to the fault trend is indicated.

4155. Iida, Kumizi, Determination of the elastic constants of superficial soil and base rock at Maru-no-uti, Tokyo [in Japanese]: *Tokyo Imp. Univ., Earthquake Research Inst., Bull.*, vol. 15, no. 3, pp. 828-836, 1937.

The elastic constants of soil in the upper superficial layer and base rock in the subjacent medium at Maru-no-uti, Tokyo, were investigated. The superficial soil and base rock were obtained in their natural state from depths of about 8 m and 20.5 m, respectively, from the ground surface by means of borings. The transverse wave velocities, as well as the longitudinal wave velocities in the superficial layer and the subjacent medium were obtained by means of the vibration methods shown in previous papers (see *Geophys. Abstracts* 89, no. 3709; 91, no. 4002) after which their moduli of rigidity, Young's moduli, Poisson's ratios, bulk moduli, cubic compressibilities, and solid viscosity coefficients were computed. The solid viscosity coefficient of the base rocks is of the order of 10^6 to 10^6 (C. G. S.), their elastic constants of the order 10^9 (C. G. S.), their cubic compressibilities of the order of 10^{-10} (C. G. S.), their Poisson's ratios are 0.31 to 0.33, their densities are 1.91, and longitudinal and transversal wave velocities in the layer of the base rock are about 450 m/sec. and 235 m/sec. respectively. Let ρ^1 , E^1 , μ^1 , V_p^1 , V_s^1 , ρ , E , μ , V_p , V_s be the densities, elastic constants, longitudinal and transversal wave velocities

of the upper superficial layer and the subjacent medium, respectively. The ratios of the elastic constants of the upper superficial layer to those of the subjacent medium are then as follows:

$$\frac{\rho^1}{\rho} = 0.81, \quad \frac{E^1}{E} = \frac{1}{43} \text{ to } \frac{1}{1.6}, \quad \frac{\mu^1}{\mu} = \frac{1}{47} \text{ to } \frac{1}{1.3},$$

$$\frac{V_p^1}{V_p} = \frac{1}{3.6} \text{ to } \frac{1}{1.2}, \quad \frac{V_s^1}{V_s} = \frac{1}{6} \text{ to } \frac{1}{1.1}, \quad \frac{V_p^1}{V_p} = 3.3 \text{ to } 1.6,$$

$$\frac{V_p^1}{V_p} = 1.99 \text{ to } 1.91. \text{—Author's English abstract.}$$

4156. Ishimoto, Mishio, Observations sur des secousses d'une petite amplitude [Observations on shocks of small amplitude]: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 3, pp. 697-705, 1937.

The slight vibrations of 0.3 sec. period observed at Tokyo during the daytime were found to be of artificial origin (movements of vehicles, etc.). The period depends on the nature of the surface soil. No increase in amplitude was observed before an earthquake. A specially sensitive seismograph is described which has a pendulum period of oscillation 0.25 to 1.25 sec., constructed according to the Wood-Anderson type, and is suitable for observing these vibrations.—W. A.

4157. Jeffreys, Harold, Further study of near earthquakes: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 4, no. 3, pp. 196-225, London, 1937.

The same earthquakes (Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 3, pp. 131-156, 1933) and the Oppau explosion are further discussed on the basis of records at nine observatories. The results, with some deduced from earthquakes in California, Japan, and New Zealand, imply that the crustal structure inferred from European near earthquakes is probably not general. They are in definite disagreement with the usual hypothesis of uniform layers separated by smooth horizontal interfaces. The chief differences in distribution of amplitudes are explicable on the hypothesis of diffuse refraction by irregular interfaces, while the dying out of near-earthquake pulses is explained by scattering of structural irregularities within the layers; though the final conclusion is that the crust consists of approximately uniform layers separated by transitions through depths of not more than a few kilometers.—C. A. S., *Sci. Abstracts*, vol. 40, no. 478, 1937.

4158. Jeffreys, Harold, Further corrections to P, S, and SKS tables: Royal Astron. Soc. Monthly Notices, Geophys. Suppl. vol. 4, no. 3, pp. 225-250, London, 1937.

These further corrections, in particular those due to ellipticity of the earth for S and SKS, are based on observations of some 30 earthquakes, each at a number of different stations. They are discussed in great detail and tables are given.—C. A. S., *Sci. Abstracts*, vol. 40, no. 478, 1937.

4159. Jeffreys, Harold, Southern earthquakes and the core waves: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 4, no. 4, pp. 281-308, London, 1938.

Observations on a number of earthquakes in the southern hemisphere are discussed and the reliability of the observations determined. The P times in Pacific earthquakes appear to differ significantly from continental ones. The difference does not agree with what would be expected

from either systematic error of observation or slight focal depth; it is possibly due to the effect of greater cooling below the oceans. The core waves are discussed and observations of PKP and SKS found satisfactory. The Z phenomenon is striking, especially in Pacific earthquakes; in most cases it can be attributed to slight focal depth. Additional stations in the Pacific, especially one between New Zealand and South America, are recommended, without which the investigation of the problems of the structure of the upper layers will remain difficult.—*W. A.*

4160. Krasnow, Shelley, Discovering underground conditions: Constructor, pp. 21-23, Washington, October 1937.

In a previous article (see Geophys. Abstracts 91, no. 4041) the author described the electrical resistivity method for determining conditions underground prior to drilling or excavating. In this article the seismic method, serving the same purpose, is examined. The principles of the seismic method are briefly discussed and a comparison of the two methods is made.—*W. A.*

4161. Lee, A. W., On the travel of seismic waves from the Baffin Bay earthquake of November 20, 1933: Great Britain, Meteorol. Office, Geophys. mem., vol. 9, no. 74, pp. 1-21, London, 1937.

The earthquake has an interest of its own, no other large shock having been observed previously in the Baffin Bay region. It was chosen for a study of the recorded phases because a large number of seismological stations are situated at moderate distances from the epicenter. The records of 99 stations were used. The epicenter 73.3° N. and 70.2° W. and the time $t=23^{\text{h}}21^{\text{m}}38^{\text{s}}$ were determined by means of the times of P of 14 selected stations at distances from 27° to 92° ; the Jeffreys-Bullen tables were used. The earthquake seemed to be normal, the surface waves being large. An onset read about 4 sec. after P was taken to be sP and the focal depth determined accordingly to about 10 km. The times of all well-defined onsets were measured; they are tabulated as well as plotted against epicentral distance. P , sP , PP and S were identified, but a great many other onsets were read. Some records have been reproduced with indications of the onsets read. The P residuals are small, those of S larger and more scattered; two groups of PP waves seem to occur. All P and S residuals were distributed according to epicentral distance and azimuth. Most of the observations are for distances between 25° and 50° . They indicate systematic deviations from the tables that cannot be removed by a change of epicenter. P is about 1 sec. early from 30° to 35° ; S is early from 25° to 35° and late from 40° to 50° . Comparison was also made with Macelwane's 1933 tables, with Wadati and Oki's tables, and with those of Gutenberg and Richter. For P , Gutenberg and Richter's tables gave a good fit and the best fit for S was obtained with the times resulting from multiplication of their P transmission times by 1.8.—*I. Lehman, Zentralbl. Geophys., Meteorol. u. Geod., vol. 1, no. 5, 1937.*

4162. Lehman, I., Seismic time curves and depth determination: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 4, no. 3, pp. 250-271, London, 1937.

It has been shown that the slow gradual increase of velocity which is likely to occur in uniform sedimentary layers gives rise to straight time curves such as are usually obtained in prospecting. When depth is determined from straight time curves on the assumption that the

velocity is constant within the layers, a good approximation to actual depths is obtained, provided the increase of the velocity in the layers is small and the separate layers are not very deep. If the velocity increases strongly within a layer we may again obtain straight time curves, but if such time curves are interpreted on the assumption of constant velocity within separate layers, serious departures from true conditions will be involved. It may be possible to detect a strong gradual increase of velocity by means of amplitude observations, but depth determination remains uncertain.—*Author's abstract.*

4163. Macelwane, J. B., Roots of mountains or roots of continents: *Seismol. Soc. America Bull.*, vol. 27, no. 1, pp. 29-33, Berkeley, 1937.

In two figures are given: (1) Comparison of travel-time curves for the central Pacific Ocean and for the North American continent with the Hodgson curve for Japan at near distances; (2) Comparison of the velocity of P as a function of depth as calculated by Dahm for his Long Beach travel times with that calculated by him for the Macelwane P curve of 1933.

From these comparisons it is suggested that not only the mountains have roots, as hypothesized by Lawson, but also that whole continents have deep downward extensions which may be called roots.—*W. A.*

4164. Macelwane, J. B., Seismic prospecting [abstract]: *Missouri Acad. Sci. Proc.*, vol. 3, no. 4, p. 133, St. Louis, 1937.

The successes and limitations of the refraction method of seismic prospecting are briefly described. The rapid development of the reflection method was made possible by modern radio research. Some form of electrical seismograph is practically necessary in order to record side by side on one strip of photographic paper the vibrations from a number of widely spaced seismographs and to manipulate the separate intensities so that the reflections are not masked by the direct waves. The equipment and personnel of a modern seismic prospecting party is described and illustrated. The essential features of reflection prospecting methods at present in use are outlined and appraised.

4165. Meisser, O., Die Empfindlichkeit und Frequenzcharakteristik von seismischen Messinstrumenten [Sensitiveness and characteristic frequency of seismic measuring instruments]: *Physikal. Zeitschr.*, vol. 38, no. 17, pp. 668-671, Leipzig, 1937.

The relations between the natural period of vibration, damping, and magnification are discussed, and the connection of these with sensitiveness for 20 different seismometers.—*C. A. S., Sci. Abstracts, vol. 40, no. 478, 1937.*

4166. Muskat, Morris, A note on the propagation of seismic waves: *Geophysics*, vol. 2, no. 4, pp. 319-328, Houston, 1937.

It is suggested that in the computation of theoretical time-distance curves for seismic wave propagation a more tractable form of analysis is obtained if the depth is expressed as a power series in the velocity than when the converse but more conventional method is used. Several illustrations of this procedure are given.—*Author's abstract.*

4167. Nishimura, G., On the elastic waves due to pressure variation on the inner surface of a spherical cavity in an elastic solid: *Tokyo Imp. Univ., Earthquake Research Inst., Bull.*, vol. 15, no. 3, pp. 614-635, 1937.

A mathematical contribution to the dynamical theory of earthquakes.—*W. A.*

4168. Nishimura, G., and Takayama, T., The vibration due to obliquely incident waves of a surface stratum adhering closely to the subjacent medium, and the properties of its resonance condition: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 2, pp. 394-440, 1937.

The present paper deals mathematically with a dilatational wave of harmonic type and infinite extent obliquely incident on the bottom surface of the surface layer with an angle of incidence of 45° . A number of facts helpful in studying the forced stationary vibrations of a particle in the surface layer of the earth's crust are obtained.—*W. A.*

4169. Perret, F. A., An experimental seismeter: Am. Jour. Sci., vol. 34, no. 204, pp. 469-474, New Haven, 1937.

A simple, robust, and inexpensive instrument has been devised for recording the accumulated magnitude of ground movements in regions of considerable seismic activity. The device consists essentially of three ordinary pedometers mounted in three mutually perpendicular planes. Some results obtained in the vicinity of Montserrat (British West Indies) are presented and a suggestion for an improved seismeter is given.—*Author's abstract.*

4170. Pirson, S. J., Problèmes spéciaux en prospection sismique [Special problems in seismic prospecting]: Rev. pétrolière, no. 759, pp. 1581-1582, Paris, Nov. 12, 1937.

The difficulties in applying the seismic reflection method in regions such as the large geosyncline of the Anadarko Basin, extending over northwestern Oklahoma, southwestern Kansas, a part of the Texas Panhandle, and southeastern Colorado are outlined. They appear to be due to the formation of subterranean caverns and superficial derangements. There is a possibility that the resulting errors may be corrected by applying the dip-shooting method, as discussed by the author in his paper "The correlation method of seismographing for oil" (see Geophys. Abstracts 91, no. 4020). In the last part the author discusses the details of the method of correlation dip-shooting (see Geophys. Abstracts 90, no. 3856).—*W. A.*

4171. Ramirez, J. E., Microbarographic oscillations [abstract]: Missouri Acad. Sci. Proc., vol. 3, no. 4, p. 132, St. Louis, 1937.

A special type of microbarograph has been designed and constructed in the Department of Geophysics of St. Louis University for recording small air-pressure oscillations. Some investigations have been carried out on the qualitative part of the microbarograph records and its relation to ground oscillations of the microseismic type. The work done so far appears to indicate the lines along which further research should be made—co-relation between microbarometric pressure oscillations and microseismic ground oscillations.

4172. Rieber, Frank, Complex elastic wave patterns in the earth and their directional analysis [abstract]: Acoust. Soc. America Jour., vol. 9, no. 1, p. 75, Menasha, Wisconsin, 1937.

Geophysical prospecting by the so-called reflection shooting method encounters many difficulties in certain regions, owing to the fact that the impulse from an explosion near the surface may be returned as a complex group of reflected waves, arriving from various directions at the same time. A new method for recording and analyzing such complex wave groups is described. It consists in detecting the arriving waves at a

number of points on the earth's surface by a properly placed group of pick-up devices. The vibrations at each of these pick-up points are recorded as a sound track, ten such tracks being conveniently placed side-by-side on a single piece of motion picture film. This sound track record may then be passed through a photoelectric analyzer which is adapted to select and separate the waves arriving from different directions. The analyzing apparatus records its findings in the form of an ink record on paper which may then be used as a basis for constructing the geophysical section. By the use of this new method work has been carried on with great success in many regions where the confusion in wave patterns was so great as to preclude the use of other types of reflection equipment.

4173. Rothé, Edmond, Direction of vibrations: *Union géod. Géophys. internat., Assoc. seismologie, ser. A, no. 15, pp. 107-113, 1937.*

The results obtained and likely to be obtained by the method of reconstituting the motion of a point in an earthquake from sets of seismograms recording the movements thereof in three mutually perpendicular planes are discussed with special reference to (a) known phases necessarily resulting from the laws of elasticity; (b) hypothetical phases based on assumed discontinuities in the earth; and (c) long waves.—*C. A. S., Sci. Abstracts, vol. 40, no. 478, 1937.*

4174. Rothé, Edmond, and Peterschmitt, Elie, Sur le mode de production des séismes, repartition des compressions et dilatations [On the nature of producing shocks, distribution of compressions and dilatations]: *Acad. Sci. Paris Comptes rendus, vol. 205, no. 19, pp. 870-871, 1937.*

The nature of waves produced at the same epicenter and recorded at various stations is compared on the basis of statistics of compressions and dilatations collected by seismologists in their respective countries. There was almost complete agreement: out of 163 quakes investigated, only 3 disagreements were established, of which 2 were due to error of interpretation, and the remaining one was attributed to an anomaly.

The conclusion is drawn that in a given region the nature of producing shocks is, as a rule, the same, and the direction of the acting forces is definitely related to the geology of that region, particularly to the direction of large folds.—*W. A.*

4175. Robertson, F., The Missouri-Tennessee earthquake of January 30, 1937 [abstract]: *Missouri Acad. Sci. Proc., vol. 3, no. 4, p. 131, St. Louis, 1937.*

This paper is a report of the survey made of a slight earthquake which occurred in southeastern Missouri on January 30, 1937, 2 h. 57 m., a. m., central standard time. The epicenter, as determined on the basis of microseismic observations, together with macroseismic data, is given as 36.2° N. and 89.7° W., less than 5 miles WNW. of Caruthersville, Missouri. Although only of intensity III on the Wood-Neumann scale, this earthquake is of interest inasmuch as it occurred during the height of the flood of the Ohio River. An attempt is made to correlate this particular shock with that of May 12, 1929, which occurred under similar conditions and was given an almost identical epicenter. So little is known of the pre-Tertiary geology of the region that the probable cause for the earthquake cannot be definitely stated. However, it is suggested that the added load of the flood waters may have acted as the necessary "trigger force" to release the previously accumulated strains.

4176. Robertson, F., The bearing of the deep earthquake of November 19, 1936, on the crustal structure of Missouri [abstract]: Missouri Acad. Sci. Proc., vol. 3, no. 4, p. 132, St. Louis, 1937.

An attempt is made to determine the crustal structure underlying the Florissant Seismological Observatory by a study of the secondary seismic waves, the existence of which has been theoretically shown by L. B. Slichter and J. A. Sharpe. The earthquake chosen for this purpose occurred in Guatemala on November 19, 1936, at 3:10 p. m., C. S. T. The depth of focus was about 100 km. Insofar as possible, the phases were read from the seismograms, and the time interval between the secondaries and the normal P (primary) wave were obtained. Using the velocities calculated on the basis of a two-layered crust, the thickness of the layers was determined as approximately 29 km for the granitic layer and 7 km for the basalt. The probability of error in determining the time intervals between the various phases is so great that these results, while indicative, cannot be considered conclusive. A more detailed study using the seismograms of a number of earthquakes should present a more accurate picture.

4177. Robertson, Florence, Evidences from deep-focus earthquakes for the crustal structure of Missouri: Seismol. Soc. America Bull., vol. 27, no. 3, pp. 241-244, Berkeley, 1937.

A study is made of the time intervals between the original P wave and the secondary waves produced by the internal reflections and refractions of an original compressional wave within the layers of the crust in an attempt to learn the thicknesses of the crustal layers beneath the Florissant Seismological Observatory. The time intervals as read from the seismograms are given. The values obtained were 13 km for the thickness of the basaltic layer and 16 km for the granitic layer.—*W.A.*

4178. Salvatori, Henry, Mapping faults by the reflection method: Geophysics, vol. 2, no. 4, pp. 342-356, Houston, 1937.

In regions where reflections can be correlated from point to point the mapping of faults presents little difficulty, and the hade as well as the throw of a fault can be generally determined. Two records secured across a fault are reproduced and a cross section derived from these records is shown. A description is given of a method of profiling which permits correlation of records in areas where the ordinary correlation method cannot be successfully applied. The application of this method in the determination of faults is outlined.—*Author's abstract.*

4179. Schulze, G. A., Ortung einer Maschine durch ihre Bodenschwingungen [Location of a machine by means of the ground oscillations produced by it]: Zeitschr. Geophys., vol. 13, no. 2/3, pp. 119-123, Braunschweig, 1937.

Under the assumption that oscillations produced by a machine are propagated in a circular or spherical form from the place of incidence, a method is given by which the place of incidence can be determined from measurements of phases along profiles selected at random. If, for example, two profiles originate from a common base point, then the central perpendicular on the line connecting the points of equal phase difference with respect to the base point passes through the place of incidence. A second direction toward the place of incidence can be obtained by a perpendicular erected on a profile passing through another base point. The point of intersection of the two central perpendicular lines determines the place of incidence. If, incidentally, one of the

selected profiles lies so that it intersects twice the circle of equal phase on the surface of the earth, then the direction toward the place of incidence may be determined by this profile alone. A hyperbola results if the phase difference with respect to the base station is drawn as a function of the distance from this station. The direction toward the place of incidence will be determined by the perpendicular line erected on the profile at the vertex of the hyperbola. The application of the method in two practical cases resulted in the determination of the place of incidence with errors of 5 to 15 percent of its distance from the base point.—*A. Ramspeck's abstract in Zentralbl. Geophys., Meteorol. u. Geod., vol. 1, no. 5, 1937, translated by W. A.*

4180. Sezawa, Katsutada, and Kanai, Kiyoshi, On the free vibrations of a surface layer due to an obliquely incident disturbance: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 2, pp. 377-383, 1937.

Mathematical discussion of the problem.—*W. A.*

4181. Sezawa, Katsutada and Kanai, Kiyoshi, Relations between the thickness of a surface layer and the amplitudes of Love waves: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 3, pp. 577-581, 1937.

Mathematical expressions are obtained for Love waves generated from a source in a surface layer and in the subjacent medium, and the solutions are applied to a layer of 480 km thickness. In interpreting the results, it is shown that the greater the depth of origin, the greater the increase in the amplitudes of Love waves for every vibrational frequency. The most important fact is that the amplitude of Love waves of a given wave length assumes a maximum value for a certain thickness η of the layer. The amplitude of the same waves diminishes in the layer of a thickness that is either greater or less than the one mentioned. The value of $k\eta$ at which the amplitude of Love waves is maximum tends to increase as the depth of the seismic origin decreases.—*W. A.*

4182. Sezawa, Katsutada, On the plastic properties of the earth's core: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 3, pp. 582-588, 1937.

Formulas are derived for the equilibrium of the elastic shell of the earth, the plastic core, and for the possible slip planes in the plastic core. The expressions are applied to a numerical solution and its interpretation. Although the result conforms well with the properties of a general plastic body and the nature of seismic core waves, there is still some doubt as to whether the state of the earth changes from elastic to plastic just at the boundary of the core.—*W. A.*

4183. Sezawa, Katsutada, and Kanai, Kiyoshi, Energy dissipation in vibrations of a bridge, part 2: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 3, pp. 590-596, 1937.

This paper considers a case in which the exciting force is at any point in the same span. (For part 1, see Geophys. Abstracts 91, no. 4030). A numerical example with its interpretation is given.—*W. A.*

4184. Sezawa, Katsutada, and Kanai, Kiyoshi, Model experiment confirmations of a dynamic method of minimizing the seismic vibrations of a structure: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 3, pp. 598-613, 1937.

In a previous paper (see Geophys. Abstracts 91, no. 4030) a dynamic method of minimizing seismic vibrations of a structure was suggested.

The present paper confirms this theory by means of model experiments. From experimental as well as mathematical investigations, it is shown that by a suitable choice of the mass and of elastic and damping resistances of the damper, the amplitudes of the seismic vibrations are strongly damped for any vibrational frequency, including those under resonance conditions. The ratio of the damper mass to that of the structure should be of the order of one-tenth. A practical arrangement in a building is discussed.—*W. A.*

4185. Takahasi, Ryutaro, and Minakami, Takesi, Tilt observations during the recent activities of volcano Asama: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 2, pp. 463-491, 1937.

Tilts of the ground during the active periods of the volcano Asama were observed in 1936 at three stations, 4, 5, and 12 km from the crater. A marked variation in the tilts was indicated 7 to 30 days in advance of each eruption, differing according to the nature of the underground structure and the topography of the respective stations. After the explosions the tilts gradually decreased.

The dates and severity of all the eruptions that occurred in 1936, daily observations of change in tilt, and daily records of the temperature of the air are given in a table.—*W. A.*

4186. Tanabashi, Rio, On the resistance of structures to earthquake shakes: Kyoto Imp. Univ., Coll. Eng., Mem., vol. 9, no. 4, pp. 191-205, 1937.

The author questions whether buildings designed according to the old theory are safe against heavy earthquakes and whether the damage inflicted by an earthquake is proportional to its acceleration. He concludes that the present practice of Japanese structural engineers in designing buildings to resist 0.1 g of earthquake acceleration is not adequate and proposes that the structures be calculated to resist at least 0.4 g of earthquake acceleration. The construction material chosen must be plastic ductile material such as steel or good reinforced concrete or wood in preference to brittle material such as concrete or bricks.—*W. A.*

4187. Thoenen, J. R., and Windes, S. L., The measurement of ordinary house vibrations: Am. Inst. Min. Met. Eng., Contr., no. 108, 7 pp., New York, 1937.

The amplitudes and frequencies of vibrations of a four-story dwelling were measured by specially developed seismometers. Sources of vibration include an electric motor with unbalanced pulley, truck traffic in the street, and a weight dropped from different heights. The vibrations induced by these sources on the walls and floors of the dwelling were recorded and are compared to a number of previous records of vibrations from quarry blasts. No index for destructive effect is submitted, but it is noted that the vibrations from ordinary causes, such as truck traffic, are comparable to those recorded from quarry blasts, and that in no test did any damage occur to the building under observation.—*Authors' abstract.*

4188. Ulrich, F. P., Progress report for 1936 of the seismological field survey of the United States Coast and Geodetic Survey: Seismol. Soc. America Bull., vol. 27, no. 4, pp. 313-324, Berkeley, 1937.

Strong-motion work: In the western United States the Coast and Geodetic Survey now operates 37 accelerographs, 6 displacement meters, 11

Weed strong-motion seismographs, and 4 sensitive seismographs. The distribution of all seismographs in the western United States is shown on a map. A list of strong-motion records obtained during 1936 is given.

Questionnaire work: During 1936 there were received 897 questionnaire cards relating to 82 earthquakes.

Tiltmeter work: The four tiltmeters at the University of California have been kept in operation during the past year.

Vibration work: A number of observations of buildings, bridges, and the ground was made.

Instrumental work: A set of Benioff's portable seismographs was completed and used in the field, and a portable oscillator was designed and constructed at Stanford University under the direction of L. S. Jacobsen. This oscillator was successfully used for setting low buildings into oscillation in order to determine the periods of vibration.

Other work: A special party of the Coast and Geodetic Survey has started experimental work in the field to try out various methods and instruments for obtaining ground periods. An experimental instrument of high magnification, designed and built by Frank Neumann, has proved to be supersensitive and rather too fragile for field work. Using the Neumann instrument as a guide, Capt. R. V. La Barre designed and constructed a vibrometer which has given excellent results. A brief description of the instrument is given.—*W. A.*

4189. Wada, H., On the proper oscillations of the surface layer and the area of abnormal intensity [in Japanese]: *Meteorol. Soc. Japan Jour.*, 2d ser., vol. 15, pp. 380-385, Tokyo, 1937.

By applying Takahasi's method the author analyses the proper oscillation of the surface layer in Tokyo. Moreover, he analyses the coda X, which appears in case of the deep-seated earthquake, and discusses the reflection waves from the discontinuous layer. If assumed that the seismic waves travel perpendicularly to the discontinuous layer, there shall occur several reflection waves, and the interval T of their waves is given by the following relation

$$T = \frac{2H}{V}$$

where H is the depth of the discontinuous layer, V the velocity of S wave. From this relation, the depth of the layer is calculated and the approximate value of 45 km is obtained; it is found that the depth of the discontinuous layer in the region of abnormal intensity seems smaller than that in the normal region. From this relation the several characteristics of the area of abnormal intensity are explained quantitatively.

—*Author's abstract.*

4190. Whetton, J. T., The seismic method of geophysical surveying: *Mine and Quarry Engineering*, vol. 2, no. 8, pp. 305-311, London, 1937.

Principles of seismic reflection and refraction methods of surveying are examined and examples of their application are given. Apparatus and field procedure is discussed. The conclusions are drawn that the field for the application of seismographic surveying is world wide and that the method affords a valuable means of tracing buried features such as faults, fissures, dikes, anticlines, and synclines connected with mineral deposits where geologic evidence is limited.—*W. A.*

4191. Wolf, Alfred, The reflection of elastic waves from transition layers of variable velocity: *Geophysics*, vol. 2, no. 4, pp. 357-363, Houston, 1937.

Elastic waves are reflected not only from discontinuities in the medium in which they are propagated but also from transition layers in which the elastic constants are continuous functions of position; the coefficient of reflection is then a function of wave length. Section one of this paper gives explicit formulas for the coefficient of reflection of continuous waves from such a layer, at vertical incidence. In section 2, the manner of variation of the coefficient of reflection with the angle of incidence is discussed qualitatively. Finally, in section 3, the shape of a pulse reflected from a transition layer is determined.—*Author's abstract.*

4192. Wood, H. O., The Terwilliger Valley earthquake of March 25, 1937: *Seismol. Soc. America*, vol. 27, no. 4, pp. 305-312, Berkeley, 1937.

On March 25, 1937, a moderately large, moderately strong local earthquake—magnitude 6, maximum ascertained intensity VI of the 1931 scale—occurred in southern California. The origin was very nearly equidistant from the stations at (1) La Jolla and Riverside, (2) Mount Wilson and Pasadena, and (3) Santa Barbara and Haiwee, with epicenter at $\phi=33^{\circ}28'$ N. lat., $\lambda=116^{\circ}35'$ W. long., and origin time $0=08^{\text{h}}49^{\text{m}}04^{\text{s}}$, a. m., P. S. T. ($16^{\text{h}}49^{\text{m}}04^{\text{s}}$, G. C. T.). The source is very close to the surface outcrop of the San Jacinto fault zone. The origin was in the midst of a large tract of arid, mountainous country, and no significant damage resulted. The shock was large enough and strong enough, however, to have caused damage had its source been in or near a thickly populated district.—*Author's abstract.*

4. ELECTRICAL METHODS

4193. Asahina, T., Kadowaki, T., The change of the electrical resistance of soil by freezing [in Japanese]: *Meteorol. Soc. Japan, Jour.*, 2d ser., vol. 15, pp. 320-330, Tokyo, 1937.

The change of electrical resistance with the lowering of temperature is observed on several specimens of soil. With a sample contained in a wide glass tube, two concentric copper tubes and a thermometer are inserted and kept in a freezing mixture. The resistance is measured by a d. c. ohm-meter. The freezing point is estimated dilatometrically on another sample of the same specimen. Some of the specimens show an abrupt increase of resistance upon freezing while others do not reveal the same tendency. The phenomenon is mainly attributed to the sudden decrease of mobile electrolyte ions upon freezing. Soils containing much saline matter show freezing when cooled in the dilatometer, but the electrical resistance does not change considerably upon freezing. The result may be applied to the estimation of the depth of the frozen soil without turning up the ground.—*Authors' English abstract.*

4194. Farnham, F. C., Some earth resistivity measurements in northwest Missouri [abstract]: *Missouri Acad. Sci. Proc.*, vol. 3, no. 4, p. 132, St. Louis, 1937.

The Missouri Geological Survey has made preliminary tests of the use of earth resistivity measurements in mapping oil and gas structures in northwestern Missouri. The results of these tests on three structures indicate that, with added experience and refinement of technique, the method should give reliable results on this problem.

4195. Fritsch, Volker, Neuere Ergebnisse der Funkgeologie und ihre Bedeutung für die Funkmutung [New results of radio geology and their importance for radio prospecting]: Internat. Kong. Kurzwellen, Kongressband, pp. 159-163, Vienna, 1937.

Two methods are possible: (1) Measurement of the field of a sender and of the disturbances produced by the geologic conductors; (2) connecting the geologic conductor with a known circuit. In using the first method conclusions may be made, although with great difficulty, on the order of the layers, that is, the change of conducting and dielectrical layers. The second (resistance) method may be applied when the depth of prospecting does not exceed one part of the wave length used. Influence of weather in radio prospecting is very great.—*Riewe's abstract in Zeitschr. Geophysik, vol. 13, no. 6, 1937, translated by W. A.*

4196. Fritsch, Volker, Die elektrischen Eigenschaften der geologischen Leiter und ihre Bedeutung für die geoelektrischen Aufschlussmethoden [Electrical properties of geologic conductors and their importance in electrical methods of prospecting]: Montan. Rundschau, vol. 30, no. 1, 2 pp., Vienna, 1938.

As the presence and nature of solutions considerably change the properties of geologic conductors, many difficulties arise in using these conductors in electrical prospecting. Factors influencing these changes must be taken into consideration before the data obtained by observations may be properly interpreted. These difficulties and means of understanding them are discussed.—*W. A.*

4197. Hare, D. G. C., A new source of damped wave trains suitable for the testing of geophysical apparatus: Geophysics, vol. 2, no. 4, pp. 309-318, Houston, 1937.

A newly developed electric circuit is described, by means of which electrical transients of nearly any desired characteristics may be conveniently produced. The circuit is particularly adapted for use with a cathode ray oscilloscope, in that no auxiliary synchronization is necessary. A typical use in the testing of geophysical circuit elements is illustrated, and a novel method of making rough phase-shift measurements is described.—*Author's abstract.*

4198. Hatakeyama, H., Observation of the electrical resistance of frozen and moist soil [in Japanese]: Meteorol. Soc. Japan Jour., 2d ser., vol. 15, pp. 316-320, Tokyo, 1937.

The author observed the change of the electrical resistance of soil when it froze in the natural state, at Toyohara, Karahuto (Sakhalien), by a simple method. Pairs of electrodes consisting of stretched twisted copper wires of 0.5 m length, had been buried horizontally at the depths 0.0, 0.1, 0.3, 0.6, 0.9, 1.2, 1.5, and 1.8 m from the surface of the earth. One end of a leading wire of every set was soldered to each of the electrodes and the other end was brought into the room. The intensity of the electric current was observed by a milliammeter when the current was supplied from a dry cell of known voltage in the circuit consisting of the dry cell, milliammeter, leading wire, electrode, earth, electrode, leading wire. The effective resistivity was calculated as (voltage of the dry cell) ÷ (intensity of the current). General aspects of the change of resistivity

in the cold season (Nov. 1932 to May 1933) are shown in a figure. The possibility of finding the depth of frozen soil without turning up the ground is suggested from the figure. Similar observations were tried in case of heavy rainfall of August 6-7, 1933. Results of them are shown, from which we can find to what depth the rain water percolated at any time.—*Author's English abstract.*

4199. Martiensen, O., Gebirgsschichten-Prüfung im Bohrloch mit Hochfrequenzströmen [Examination of layers of rocks in boreholes by means of high frequency currents]: Oel und Kohle, vol. 13, no. 37, pp. 913-915, Berlin, 1937.

By moving a generator of high-frequency oscillations and a radiator of high-frequency field of force through a bore hole to expose successively each geologic stratum to the field of force produced by the radiator and by transmitting these electric forces to the point of observation characteristic differences between the strata may be observed. The apparatus and its operation is described, and the results of measurements made in a number of bore holes are graphically represented.—*W. A.*

4200. Müller, Max, Bericht über die bei Lebong Donok ausgeführten geophysikalischen Vermessungsmethoden [Report on the geophysical methods of measurement carried out near Lebong Donok]: Rapp. betr. geol. on derz. in opdr. v. d. Directie der Mijnb. Mij. Redjang-Lebong uitgev. op hare concessie terreinen in de res. Benkoelen, pp. 5-6, 8 figs., and a translation into Dutch, pp. 7-8, Batavia, 1936.

The region investigated is located within the zone of the gold- and silver-bearing rocks of the Lebong Donok, in the mining district of the "Redjang Lebong" Company (Residence in Benkulen, Southwest Sumatra). The purpose of the investigations was to determine whether there is a quartz reef near the dacite pillar situated on the southwest side of the Lebong Donok. A new geophysical method was introduced based on the artificial generation of electrolytic processes in the grounds. A brief description of the method is given. A "decreasing dielectric dispersion" was found for the rocks under consideration in the following succession: andesite, slate, dacite, and quartz. This made it possible to determine them with sufficient accuracy. Quartz was not found at the place tested, therefore no ore could be expected; the decline of the western part of the dacite body towards the east was established.—*F. Musper's abstract in Neues Jahrb., Referate II, Heft no. 4, 1937, translated by W. A.*

4201. Rose, R. B., Science answers the prospector's plea: California Min. Jour., vol. 7, no. 5, p. 5, Auburn, 1938.

The operating technique of a metal-finding instrument, called the MT-scope ore finder, for searching mineral deposits within 25 feet of the surface is briefly described.—*W. A.*

4202. Rose, R. B., Individual exploration of substrata deposits: Min. Jour., vol. 21, no. 16, pp. 5-6, Phoenix, 1938.

The operation of the MT-scope (metallscope) in the search for ore deposits is described. Accompanying graphs show the field data and interpretations of them. The relative degree of dip registered by coil varies inversely with the depth or thickness of overburden.—*W. A.*

4203. Semenov, A. S., Method of "one-electrode" coring for studying the influx of water into permeable horizons [in Russian]: *Razvedka Nedr*, vol. 8, no. 18, pp. 39-41, Moscow, 1937.

The method is based on the difference in resistivity of water flowing into a horizon and that contained in the borehole. The greater the difference in mineralization of these two waters the better they can be distinguished by the diagrams recording the resistances or electrical conductivities. A schematic design for mounting the apparatus is given, and the result of tests are shown in two diagrams.—*W. A.*

4204. Southworth, G. C., New experimental method applicable to ultrashort waves: *Jour. Applied Physics*, vol. 8, no. 10, pp. 660-665, Lancaster, 1937.

The present paper describes some of the early steps which have been taken at the Bell Telephone Laboratories in the application of principles underlying wave guide transmission, a novel form of electrical transmission, to high-frequency electric measurement in the hope of extending the range materially beyond the present rather indefinite frontier of about 10^9 cycles per second. The methods outlined represent the first steps in a relatively new field of electrical measurements. Work is now in progress directed at measurements of electric intensity and power and accordingly of characteristic impedance and attenuation. The work already accomplished seems to point toward a simplification of measurements that, according to the older methods, were becoming increasingly more difficult as the frequency was raised. Various component parts of a laboratory set-up used for transmitting waves over a wave guide 380 meters in length are shown in a figure.—*From author's introduction and conclusion.*

4205. Stevens, O., Die Anwendung eines elektrischen Verfahrens für die Untersuchung von Grundwasserströmungen [Use of electrical methods for investigating the course of underground waters; original in Dutch]: *Ingenieur*, vol. 52, B 17-B 18, Haag, 1937.

The flow at the bottom of a river bed the perviousness of which differs from place to place is assumed to be analogous to an electric current passing through a flat conductor, the conductivity of which differs from place to place. On this assumption the mechanical conditions of the flow may be translated into electrical ones in a model test. Two similar models (measuring conduits of paraffin filled with a solution of sodium chloride) are connected to the opposite branches of an alternating-current bridge. The equipotential lines in the conduits are determined by means of two probes. For the improvement of the tone minimum the bridge is provided with a phase-shifting device. The adaptability of the method to streams of various kinds and their translation into electrical conditions is examined.—*J. Kühne's abstract in Zentralbl. Geophys., Meteorol. u. Geod., vol. 1, no. 5, 1937, translated by W. A.*

4206. Wetzel, W. W., and McMurry, H. V., A set of curves to assist in the interpretation of the three-layer resistivity problem: *Geophysics*, vol. 2, no. 4, pp. 329-341, Houston, 1937.

A set of apparent resistivity curves for the Wenner electrode configuration is given. This set covers a wide range of variations of layer thickness and resistivity for the three-layer earth. A method for interpretation of field data is outlined.—*Authors' abstract.*

5. RADIOACTIVE METHODS

4207. Aidarkin, B. S., and Pevsner, A. S., An experiment of applying emanation method to vein deposits of thorium [in Russian]: Central Geol. and Prosp. Inst. Materials, Geophysic, no. 4, pp. 3-13, Leningrad, 1937.

The method and apparatus are described and tables showing the content of emanations are given. Radiometric profiles and veins of alkaline syenite discovered by the tests are presented on a schematic plane.

The following conclusions are given: (1) The emanation method is a sensitive and reliable method of prospecting for dikes containing thorium compounds having sufficient emanating power; (2) Simultaneous increase of radon and thoron content is almost always an indication of the presence of dikes; (3) The location of thorium-bearing dikes covered by alluvium up to 2 m in thickness is possible.

The application of the method for greater depths may be increased by taking soil air as deep as possible. The simplicity and rapidity of the method allow tests to be made at 15 to 20 stations a day.—W. A.

4208. Grammakov, A., Starovатов, N., and Tverskoy, P., Method of determining radioactivity of ores and rocks by the ionization effect of β radiation [in Russian]: Central Geol. and Prosp. Inst. Materials, Geophysic, no. 4, pp. 14-31, Leningrad, 1937.

A brief description of the method and a schematic design of the apparatus are given. The results are summarized briefly as follows: (1) Waxed paper 3×10^{-3} cm thick may be successfully applied as filter absorbing the α -rays; (2) Formula is derived for the absorption of β -radiation in the radiating substances according to the data obtained for the uranium ores (density 1.3) and its compounds with chalk or lead oxide (densities of compounds 0.7 and 1.7); (3) The thickness of the radiating layer in the sample to be measured and the standard must correspond to the thickness of the so-called saturated layer, because in this case the ionization effect of β -radiation will be the greatest and, besides that, certain inaccuracy in the thickness of the layer will cause a minor effect on the results of determinations when using thin radiating layers; (4) In order to eliminate errors connected with different intensity of absorption in samples of different densities in the determination of radioactivity in ores and rocks by β -radiation, it is necessary to have a set of standards of different density in order to compare the standard the density of which would differ but little from the density of the sample to be measured; (5) Since the magnitude of the ionization effect depends on the area of the radiation layer, it is necessary that the areas of the radiating surfaces of the sample and of the standard be equal; (6) It is also necessary to place the standard and the sample at equal distances from the filter of the chamber; (7) For measurements of radioactivity of ores and rocks (the thickness of the radiating layer being 5-7 mm) chambers having a height of 12-14 cm may be used; (8) Chamber constructed by the Geological Committee may be used; (9) By the method described in the article, the activity in samples with concentration not less than 0.01 percent of U_3O_8 may be determined. More sensitive electrometers and electron counters are to be applied in case of lesser activity of samples.—

Authors' summary.

4209. Grammakov, A., The behavior of radon in soil capillaries near the surface of the earth [in Russian]: Central Geol. and Prosp. Inst. Materials, Geophysic, no. 4, pp. 32-40, Leningrad, 1937.

Data of observations on the variations in the activity of soil air at small depths (5, 10, 20, 30, and 50 cm) from the surface of the earth are given. From the data obtained a general regular rate of changes in the activity of soil air was established; the greatest content of radon concentration was observed in April and is explained by increased moisture during this time. It is concluded that soil air selected for determining radon profiles should be taken, as a rule, from depths of 20 to 30 cm.—*W. A.*

4210. Surugue, Jean, Contribution à l'étude des rayonnements β et γ des corps radioactifs [Contribution to the study of β and γ radiation of radioactive bodies]: Annales de Physique, vol. 8, pp. 484-554, Paris, Dec. 1937.

The deposit of active thorium and bodies containing actinium were investigated with the view of determining the energy of the secondary β rays and consequently that of the primary γ radiations produced during the successive transformations. Diagrams of the intensity of nuclear energy for each of them are given.

The method consisted of deflecting and focussing the β rays of the internal conversion in a uniform magnetic field. This was accomplished by using a very large permanent magnet constructed for the purpose, the description of which is given. Measurements of the magnetic field were made in absolute values to which all the calculations of the energy of studied radiations were related.—*Author's abstract translated by W. A.*

4211. Tandberg, J., Optimum counting time for measuring the intensity of a radioactive source: Physical Soc. London Proc., vol. 50, no. 277, pp. 87-89, Jan. 1, 1938.

When the intensity of a radioactive source is measured by means of a Geiger-Müller counter, maximum accuracy is obtained by continuing the counting for a finite time which depends on the average life of the radioactive source and on the intensity of the background interference.—*Author's abstract.*

6. GEOTHERMAL METHODS

4212. Van Orstrand, C. E., Temperatures in the lava beds of east-central and south-central Oregon: Am. Jour. Sci., vol. 35, no. 205, pp. 22-46, New Haven, 1938.

Temperature records of seven springs, seven flowing wells, and nine non-flowing wells are discussed briefly with reference to the hydrology and volcanology of the area.

The flat segments that appear on a number of the depth-temperature curves are supposed to be due to convection of water. In general, the source of the heat is attributed to the lava beds themselves, but the extraordinarily high temperatures at Lakeview may be due in addition to heat from the mountain mass or to an intrusive that penetrates the lava beds up to rather shallow depths from the surface of the ground.—*Author's abstract.*

7. UNCLASSIFIED METHODS

4213. Barsch, O., Der Wert Geophysikalischer Untersuchungen für die Abgrenzung der Erdölkonzessionen [Importance of geophysical investigations for demarcation of oil concessions]: Oel und Kohle, vol. 13, no. 46, pp. 1213-1216, Berlin, 1937.

The importance, from the economic viewpoint, of a more equitable distribution of oil fields among persons asking for concessions suggests the desirability of applying geophysical methods of prospecting in new fields to determine oil-bearing and structural conditions underground before concessions are granted. Means for the demarcation of the concessions to distribute the risk more evenly are shown by a few maps of oil-bearing regions in Germany.—*W. A.*

4214. Bellugi, A., Geophysical prospecting for gold: Com. Geod. e Geofis. Boll., vol. 7, pp. 85-94, Jan.-Apr., 1937.

Some examples of methods of geophysical prospecting applied to auriferous deposits are described to show the utility of making systematic researches in Italian Africa.—*W. A.*

4215. Berroth, A., Die Bedeutung der angewandten Geophysik für Ausbildung und Praxis der Vermessungsingenieure, Markscheider und anderer Ingenieure [The importance of applied geophysics to the education and practical training of engineers making surveys of land surfaces, mines, as well as to other engineers]: Allg. Vermessungsnachr., vol. 49, no. 22, pp. 372-374, Berlin, 1937.

The necessity of a knowledge of geophysics in various branches of engineering is stressed.—*W. A.*

4216. Chapman, S., The heating of the earth and oceans by induced electric currents: Terrestr. Magn. and Atmosph. Electr., vol. 42, no. 4, pp. 359-360, Baltimore, 1937.

Estimates are made of the heating effect of the electric currents induced in the earth and in the oceans by the transient variations of the earth's magnetic field; the effect is found to be quite insignificant.—*Author's abstract.*

4217. Dieterichs, H., Ein mechanisch registrierendes Vertikalaneometer und seine Verwendung im Gelände [A mechanically recording vertical anemometer and its application in the field]: Zeitschr. Geophysik, vol. 13, no. 4/5, pp. 179-190, Braunschweig, 1937.

An electrical anemometer with mechanical registration was developed in which two perpendicular wires are used. The apparatus thus records the components of the wind vector separately. A current around a hill was measured with this apparatus, the region around the obstacle being divided into three zones that differ greatly in the direction, force, and variability of the wind:

1. The undisturbed field of velocity at the top of the hindrance.
2. The dead air region in which calm prevails but is interrupted by occasional blasts of wind, which makes this zone very squally.

3. The convergence zone, where the influence of the obstacle again disappears. The current reunites behind the hill (two dimensional currents). Constant whirls with horizontal or vertical axis were not observed at velocities below 10 m/sec.—*Author's abstract, translated by W. A.*

4218. Fleming, J. A., Annual report of the director of the Department of Terrestrial Magnetism: Carnegie Inst. Washington Yearbook, no. 36, pp. 1-62, 1937.

During the report year (July 1, 1936, to June 30, 1937), the program of the department has been devoted not only to experimental investigation but also to the coordination and integration of isolated researches.

The association of a special type of magnetic disturbance and sharp fade-outs of high-frequency radio-wave reflections with bright eruptions in the solar chromosphere was conclusively proved by the work of this department in cooperation with Mount Wilson Observatory and other organizations. This constitutes the major advance in terrestrial magnetic research in recent years. Close relation between the ionization of the outer atmosphere and sun-spot activity has been shown. Information concerning the nature of the electrified particles in the lower ionosphere has been obtained. An aspect of correlation of terrestrial-magnetic with cosmic-ray phenomena was shown. The effect of the moon on variations of the earth's magnetism was demonstrated. Attention was directed to the origin of the earth's permanent magnetic field. Preliminary experiments were made on electromagnetic testing of rock samples to determine direction and intensity of their residual magnetization. Continuous records of the rate of formation of the fast-moving ions in the atmosphere have provided evidence pointing to the existence of an unsuspected factor in the atmosphere, tending to control its electric conductivity. Continuing the laboratory investigations of magnetism as relating to the basic structure and properties of matter, further measurements in the "new" physical force, which serves to bind together the protons and neutrons making up the nuclei of all atoms, confirmed and extended the first observations and measurements announced in the report of last year. The construction of an atomic-physics observatory, which will contain a generator and vacuum tube capable of reaching potentials in excess of 5,000,000 volts with precision control, was begun in May 1937. An early resumption of the magnetic survey of the oceans through the proposed operations of the nonmagnetic vessel "Research" under construction by the British Admiralty is expected.—*From author's summary, by W. A.*

4219. Geophysics to the fore [editorial note]: Chemical Eng. and Min. Rev., vol. 29, no. 348, Melbourne, 1937.

The necessity of broad application of geophysical methods of prospecting, which so far have been almost entirely neglected in Australia, is emphasized. The editorial approves the recommendation of the Australasian Institute of Mining and Metallurgy that geophysics be taught in Australian universities.—*W. A.*

4220. Jeffreys, Harold, Modern geophysics and Gerlands Beiträge zur Geophysik: Gerlands Beitr. Geophysik, vol. 51, no. 2/3, pp. 1-8, Leipzig, 1937.

This is an appreciation of the important work of the Beiträge since its foundation in 1887. The task of collecting geophysical data from work carried on in a great number of countries, thus improving our knowledge of the earth as a whole, is considered to have been well done.—*W. A.*

4221. Jones, O. T., The explorations of the earth's crust: Geol. Soc. London Quart. Jour., vol. 93, pp. 51-92, 1937.

Methods available for the exploration of the crust of the earth, both at and below the surface, are briefly reviewed, and the results that have

been obtained or may be expected to accrue from their application are indicated.

The following items are discussed: (a) The relief of the earth's surface; (b) Geological exploration; (c) Geophysical exploration: measurements of gravity (absolute determinations, comparative determinations, determination of variations of gravity); and (d) Seismic investigations.

A list of 73 references is added.—*W. A.*

4222. Gockel, Heinrich, Die Fehler bei der Aufnahme der drahtlosen Zeitsignale und Vorschläge zur Verbesserung [Errors in registration of wireless time signals and methods for improvement]: *Zeitschr. Geophysik*, vol. 13, no. 6, pp. 222-234, Braunschweig, 1937.

To increase the accuracy of wireless time signals it is necessary to reduce errors of recording and registration. These errors are discussed and their amount is estimated. Improvements proposed are the use of a special strip filter and an apparatus inserted between the receiver and the registering device by which the disturbance is prevented. A detailed description of the apparatus is given, and the improvement is illustrated by a series of signal receptions.—*Author's abstract translated by W. A.*

4223. Grier, A. J., Geophysics—the great eliminator: *Mining Jour.*, vol. 21, no. 15, p. 5, Phoenix, 1937.

Discusses the contribution of geophysics to rehabilitation of the mining industry, both in the discovery of ore deposits and in the elimination of undesirable prospects.—*W. A.*

4224. Gunn, Ross, An improved inductor compass: *Terrestr. Magn. and Atmos. Electr.*, vol. 42, no. 4, pp. 363-366, Baltimore, 1937.

A rugged type inductor compass having a period of less than a second is described. A gravitationally oriented magnet is so arranged adjacent to an inductor turning about a fixed axis that the induced potentials, due to the existence of a vertical component of the earth's magnetic field, are neutralized. A new type of commutator particularly suitable for very low potentials and currents is described. The compass is particularly valuable for steering aircraft or small boats.—*Author's abstract.*

4225. Kelly, F., Geophysical prospecting: *Mining and Metallurgy*, vol. 19, no. 373, pp. 15-17, New York, 1937.

In the search for petroleum in the United States, seismic methods continue to remain most important. There are 120 parties operating in the Gulf Coast, west Texas, and New Mexico; 30 in Arkansas, northern Louisiana, and eastern Texas; 35 in Kansas, Oklahoma, and Colorado; 28 in California. In addition to the use of seismic methods in the Gulf Coast, west Texas, and New Mexico, 27 parties are using the torsion balance; 25 are employing gravimeters; 9, electrical methods; and 7, magnetic methods. Forty-five new oil fields (actual or potential) were, according to Karcher, discovered in the Gulf Coast region in 1937 by geophysical methods.

The development by Rieber of a novel method of recording seismic surveys by an apparatus called the sonograph is considered especially helpful in separating waves arriving from more than one direction.

The economy of using magnetic methods and a further development of Jakosky's electrical methods are mentioned.

The greatest activity in geophysical exploration for metallic minerals seems to center in Canada, where important work is being carried out by Lundberg and Geophysical Explorations Ltd.—*W. A.*

4226. Krejci-Graf, Karl, *Neuzeitliche Verfahren zum Aufsuchen von Erzlagern* [Recent methods for discovering ore deposits]: *Stahl und Eisen*, vol. 57, no. 43, pp. 1225-1226, Düsseldorf, 1937.

A brief review of the following methods of prospecting for ore deposits is given: (1) geochemistry; (2) aerial mapping; (3) geophysical methods, (a) magnetic, (b) gravimetric, (c) seismic, and (d) electric; and (4) diamond drilling.

Comparative cost of the various methods is given in German marks as follows: (2) Aerial mapping: In Sweden, scale 1:20,000, 16.40 RM/km²; scale 1:10,000, 19.50 RM/km². (3, a) Magnetic measurements with the Tiber balance: In Sweden, stations 20 m apart on parallel lines 100 m apart, 26.50 RM/km² or 0.06 RM per station (an average of 0.22 RM/station was attained by Boliden Gruvaktienbolag during 1924 to 1936); in Russia, with 2,400 stations per km², 2270 RM/km², or 0.95 RM/station. Magnetic measurements with Schmidt's balance: In Sweden, stations 25 m apart, 2.10 RM/station; in Germany, 10 stations per day, 5.50 RM/station; in Russia, with 1,200 stations per km², 2.36 RM/station. (3, b) Gravimetric measurements with torsion balance: In Sweden, 19 RM/station or with high accuracy of 31.50 RM/station; in Russia, 200 stations per instrument and month from 16.50 to 23.00 RM, depending on the terrain. With gravimeter: 63 to 95 RM/station for stations 1 km apart. (3, d) electric measurements: Equipotential line measurements, in Sweden, about 315 RM/km²; in Russia, 380 to 470 RM/km². Electromagnetic measurements: 420 to 500 RM/km² (average of measurements made by the Boliden Gruvaktienbolag in Sweden, 1040 RM/km²; in Russia, 520 to 1660 RM/km²). (4) Diamond drilling: In Sweden, 25 to 50 RM/m.

From information on the cost of prospecting for ore in Skelleftefeld, North Sweden, it is assumed that under similar conditions the cost will be from 600 to 1000 RM/km², distributed as follows: for geologic work, 15 percent; geophysical work, 35 percent; digging, 40 to 45 percent; various additional expenses, 5 to 10 percent.—*W. A.*

4227. Louderback, G. D., *Characteristics of active faults in the central coast ranges of California, with application to the safety of dams*: *Seismol. Soc. America Bull.*, vol. 27, no. 1, pp. 1-27, Berkeley, 1937.

The feasibility of the erection of dams across active fault-line valleys is discussed. The magnitudes of the horizontal and vertical components of the fault movements and of the normal tensional or compressional displacements caused by the observed earthquakes show that provision against a direct horizontal offset of 15 feet and relative motion over a breadth of 20 feet, a vertical displacement of 10 feet, and a final open fissure of 12-18 inches should be a reasonable safety precaution. In connection with the proposed dam across the Coyote River, 25 miles southeast of San Jose on the shear zone of the coalescing Hayward and Calaveras faults, a study of the seismologically active San Andreas, Hayward, and Calaveras faults showed that the motion due to the 1906 earthquake resolved itself chiefly into a horizontal offset in nearly all

cases less than 16 feet and distributed over a breadth of approximately 20 feet, and in some cases a vertical displacement of a few inches to 3 feet. The dam erected was, therefore, nonrigid, of rolled earth, and of generous width to allow for horizontal displacement, while a spillway with a 5-foot freeboard allows for the possibility of differential vertical movement.—*Brant's abstract in Zentralbl. Geophys., Meteorol. u. Geod. vol. 1, no. 7, 1937.*

4228. Lundberg, Hans, Recent advances in geophysical prospecting: Canadian Min. Met. Bull., no. 308, pp. 758–788, Montreal, 1937.

After a brief outline of the history of geophysical prospecting, a description is given of (1) Terrestrial conditions governing geophysical surveys, with tables showing (a) pore volume of soil materials and rocks, (b) water capacity of soils, (c) resistance factors of rocks and soils, and (d) magnetic susceptibility of minerals and rocks, (2) Problems that may be solved by geophysical methods; (3) Preliminary organization and routine.

A map of Canada showing the locations where geophysical surveys were made during 1936 and 1937 is given. The 81 surveys that were completed covered an area of 63,783 acres; 6,328,020 feet of profile lines were surveyed electrically, and 4,627,320 feet of lines were investigated magnetically.

Examples accompanied by illustrations deal with geophysical determinations of (1) contacts; (2) quartz veins and acid dikes; (3) ore bodies and zones of mineralization; and (4) depth determinations.

Magnetic and electrical methods, only, are considered.—*W. A.*

4229. Milstein, M., Geophysics and the search for oil: Chemical Eng. and Min. Rev., vol. 30, no. 349, Melbourne, 1937.

In supporting the editorial note on the necessity for application of geophysics in Australia (see abstract 4219), the author points out, as an example, two definitely petroliferous regions in which combined geological and geophysical investigations would be of great value to the oil industry. The value of geophysical methods as an aid in solving many problems in civil engineering is mentioned.—*W. A.*

4230. Penndorf, R., Neue Ergebnisse der Ionosphärenforschung und ihre Bedeutung für die Geophysik [New results of ionosphere investigations and their importance in geophysics]: Naturwissenschaften, vol. 25, no. 48, pp. 774–779, Berlin, Nov. 26, 1937.

The results obtained in various investigations of the properties of the ionosphere are discussed with special reference to the correlation between the observed variations of layer height, ion content of layers, etc., and variations of geophysical quantities, such as atmospheric electricity, the aurora, and the earth's magnetic field.—*A. W., Sci. Abstracts, vol. 41, no. 481, 1938.*

4231. Schmerwitz, G., Coupling effect due to damping: Annalen der Physik, vol. 30, no. 3, pp. 209–223, Leipzig, 1937.

From geophysics it is noted that a coupling due to damping is possible, as such an effect is produced by a seismograph coupled to a galvanometer. The general theory is worked out and is applied to certain special cases, e. g., when the frequencies and the damping factors of the separate systems are respectively the same. Experimental examples are given to show how the resultant frequencies vary with the original frequencies,

the damping, and the tightness of coupling. It is found that, in contrast to acceleration coupling, the resultant frequencies do not alter, but that the degree of damping of the system becomes considerably less as the coupling is increased. It is suggested that the effect of this type of coupling is important in electrical circuits in which two such damped instruments are used for measuring currents and voltages, and also in many technical cases.—*H. M. B., Sci. Abstracts, vol. 40, 479, 1937.*

4232. Schoene, H. J., Ueber die Bestimmung geomechanischer Eigenschaften an Bohrkernen im Laboratorium [On the determination of geomechanical properties of bore cores in laboratory]: *Oel und Kohle*, vol. 13, no. 44, pp. 1079-1082, Berlin, 1937.

Determinations of the elastic properties, velocities of longitudinal waves, total weight, specific weight, and of the "real" and "apparent" porosity of sedimentary rocks were made. The samples were taken mainly from the Upper Cretaceous strata at a depth of 1,845 m or less, and 160 cores were investigated. The results of investigations are shown in a graph and five tables.—*W. A.*

4233. Tams, E., Der gegenwärtige Stand der Geophysik [The present state of geophysics]: *Petermanns Mitteilungen*, vol. 83, nos. 10, pp. 273-277, and no. 11, pp. 315-319, Gotha, 1937.

The discussion is limited to problems concerning the earth's crust: (1) Knowledge of the distribution of gravity on the surface of the earth; (2) structure of the earth's crust; (3) important results obtained by Vening Meinesz's gravimetric measurements at sea; (4) van Bemelen's undulation theory; (5) isostatic distribution of masses of the earth's crust and their foundations; (6) earthquakes and their geographic distribution; and (7) knowledge of the depth of the focus.

Reference is made to 30 articles published since 1915.—*W. A.*

8. GEOLOGY

4234. Dorn, Paul, Unsere Kenntnisse von Aufbau und Zusammensetzung der Erdkruste [Our knowledge of the structure and composition of the earth's crust]: *Chem.-Zeitung*, vol. 61, no. 71, pp. 713-715, Köthen, 1937.

Summary of recent information on the composition and structure of the earth and of the earth's crust acquired through geochemistry and geophysics (seismics). According to this information the nickel-iron core is supposed to be at a depth below 2,900 km; above it is the iron-core schist (Goldschmidt's sulphide-oxide layer), which at a depth of 1,000 to 1,200 km changes gradually into the dunite (peridotite) schist, the uppermost 20 km of which is developed into the eclogite sphere (Eskola). The earth's crust begins at a depth of 50 km, that is, its basic lower zone, which has perhaps a basaltic composition. The uppermost 20 to 30 km form the granitic upper crust (which is not everywhere present, at least to such a thickness). This upper crust is very heterogeneous. At the approximate depth of granite gneiss it contains basic intrusions and about 5 percent of sediments.—*Schwinner's abstract in Zentralb. Geophys., Meteorol. u. Geodäsie, vol. 1, no. 7, 1937, translated by W. A.*

4235. Field, R. M., Structure of continents and ocean basins:

Washington Acad. Sci. Jour., vol. 27, no. 5, pp. 181-195, 1937.

1. The attempt has been made to review the growth of ideas, theories, and hypotheses on continental and oceanic structure, especially in relation to their effect on future trends in geophysical-geological research.

2. From the geological point of view, the epitome of the problem is paleogeography, especially the paleogeography of the pre-Mesozoic history of the earth.

3. Emphasis has been placed on the lack of physiographic and structural data on the suboceanic lithosphere and the importance of acquiring these data.

4. It has been suggested that further data on the topography and structure of the suboceanic lithosphere will throw important light on such major questions as isostasy, geosynclines, and continental drift.

5. Available data on the suboceanic lithosphere suggest that diastrophism, or the major deformation process, is relatively independent of transference of surficial load, such as takes place under the conditions of erosion and deposition.

6. Fortunately, geophysical techniques are already, or soon will be, available for making a geophysical survey of ocean basins. These techniques, to date, include exact positions and sounding, and determination of gravity and seismic methods, all equivalent in accuracy to those now used on the continents. Further, the techniques are sufficiently varied so that they can be used to support or check each other.—*Author's summary.*

4236. Reynolds, J. H., Constitution of the earth: Nature, vol. 139, no. 3512, pp. 314-316, London, 1937.

According to H. Jeffreys, the earth's interior may be conceived of as a mechanically solid shell reaching down to 3,000 km depth and a central molten core. Since the fusion point increases with depth more rapidly than the temperature, solidification must have taken place from below upwards, and a core of metals, of lower fusion temperature than the basic silicates of the outer shell, remained molten without great loss of heat, while the outer shell solidified. Since a layer of granite 20 km thick could supply the total heat lost from the earth by conduction, as large a proportion of radioactive elements exists in the granitic layer (upper 10 ± 3 km) as in all the rest of the solid shell, thereby possibly supplying the heat for volcanoes and near-surface igneous activity.—*Brant's abstract in Zentralbl. Geophys. Meteorol u. Geod., vol. 1, no. 7, 1937.*

4237. Riedel, Leonhard, Ueber Bewegungen Hannoverscher Salzstöcke [On the movements of the Hanover salt domes]: Oel und Kohle, vol. 13, no. 44, pp. 1073-1079, Berlin, 1937.

1. The time of intrusion of a number of salt stocks is more accurately determined (shown in a table). Most salt domes in the Braunschweig bay rose during the Upper Cretaceous period and received essentially their present form at that time.

2. The formation of the true salt stocks coincides partly with orogenic phases, but partly it does not.

3. Unconformities in the vicinity of salt domes do not furnish in general any information on the actual time of movement.

4. The formation of the true salt stocks is episodic, although the possibility of a continuous intrusion before the true formation of salt domes (and perhaps also after) cannot be rejected, but it is in no way proved.

5. The disturbances at the borders of the salt domes are often limited to very narrow zones.

6. The existence of narrow graben zones at the borders of salt domes indicates that the intrusion of salt stocks occurred in zones of tension graben.

7. Determination of the course of the movements near salt domes requires an exact determination of the ages of the surrounding layers by means of paleontologic-stratigraphic methods.

8. Generalized conclusions cannot be drawn from the information available at present.—*Author's abstract translated by W. A.*

4238. Trask, P. D., Studies of source beds in Oklahoma and Kansas: Am. Assoc. Petroleum Geologists, Bull., vol. 21, no. 11, pp. 1377-1402, Chicago, 1937.

Some of eight properties of sediments from different parts of the United States that have been investigated as a possible means of recognizing source of beds of petroleum appear to be of value in the recognition of source rocks in Oklahoma and Kansas. As a basis for study, sediments near oil zones have been assumed, in general, to be relatively rich in source material in comparison with those far from oil zones. For the purpose of averaging out the effect of anomalies caused by exceptions to this generalization, an unusually large number of samples—may thousands of samples—from many areas in the United States have been analyzed. The four properties named below were observed to be approximately the same in sediments near and far from oil zones and hence seem to be of little value as indices of source beds: (1) The total quantity of organic matter in the sediments; (2) the color of the sediments; (3) the reducing power, which is a measure of the quantity of chromic acid the sediment can reduce; and (4) the oxidation factor, which is a measure of the state of oxidation of sediments, specifically is the ratio of the carbon content to the reducing power of the sediments. The following properties were noted to be slightly greater in sediments near oil zones than in those far from oil zones and, therefore, apparently offer fair promise as indices of source beds: (5) The ratio of carbon to nitrogen in the sediments; (6) the quantity of volatile materials; and (7) the degree of volatility, which is a measure of the relative volatility of the organic constituents of sediments and specifically is the ratio of the volatility to the reducing power. The eighth property, the nitrogen-reduction ratio, which is the ratio of the nitrogen content to the reducing power, was found to be distinctly lower in sediments near oil zones than far from oil zones, and consequently, seems to be particularly encouraging in the study of source beds. In fact, in several oil areas in Oklahoma and Kansas, it seems to be 65 to 75 percent effective as a means of recognizing source beds.—*Author's abstract.*

4239. Wasson, Theron, Recent oil discoveries in southeastern Illinois: Am. Assoc. Petroleum Geologists Bull., vol. 22, no. 1, pp. 71-78, Chicago, 1938.

The new fields of southeastern Illinois are within 30 miles of the old fields of Crawford and Lawrence Counties. Discoveries have been made in Wayne, Clay, and Rockland Counties in a belt about 20 miles long.

Studies of information furnished by old shallow tests, followed by torsion balance and reflection seismograph surveys, led to the drilling of the discovery wells. The anticlinal ridge on which the new fields are developing is an extension southwest of the Oakland anticline of Edgar and Clark Counties. Oil is produced from the McClosky, an oölitic "pay" in the St. Genevieve limestone of Lower Mississippian age. The McClosky is the principal producing horizon in the south end of the oil fields of Lawrence County.

Two sands above the St. Genevieve in the lower Chester have shown oil, but since all wells so far have been drilled to the McClosky, these sands have not been tested to any extent.—*Author's abstract.*

9. NEW BOOKS

4240. Balk, Robert, Structural behavior of igneous rocks: Geol. Soc. America Mem. 5, 177 pp., 38 figs., 24 plates, New York, 1937.

Part 1, Description of primary structures: (a) Primary flow structures; and (b) primary fracture systems. Part 2, Structure patterns in igneous rocks: (a) Flow structures, (1) in dikes, (2) in massifs, (3) in steep-walled intrusives, (4) in funnel-shaped intrusives; and (b) fracture systems, (1) in dikes, (2) in massifs, (3) in stocks and plugs, (4) in sills and intrusive sheets. Part 3, Related problems: (a) Structural data and mechanics of intrusion; and (b) controversial problems. Part 4, Application of principles, covers suggestions for structural field work on igneous rocks. Part 5, Appendix, gives a selected list of references.—*W. A.*

4241. Beringer, C. C., Geologisches Wörterbuch [Geological dictionary; in German], 118 pp., 51 figs., Verlag Ferdinand Enke, Stuttgart, Germany, 1937. Price, R.M. 5; bound, R.M. 6.

The most important geologic terms are given in alphabetical order, with their meanings. The book contains also terms used in petrography and geophysics.

4242. Earthquake Notes, R. R. Bodle, editor, vol. 9, nos. 1 and 2, 16 pp., Seismol. Soc. America, Eastern section, Washington, 1937.

This issue contains the following notes: (1) Unusual Mexican records; (2) Institute for geophysics; (3) New book (reference is made to Imanura's "Theoretical and applied seismology", see Geophys. Abstracts.91, no. 4077); (4) N. H. Heck visits the Western States; (5) Central Alaska shaken; (6) Reliability of Pacific seismological stations; (7) Los Angeles County supports quake studies; (8) Brisbane seismological station; (9) Eastern Section committees, 1937-38; (10) Epicenters; (11) Proceedings of the St. Louis meeting; Minutes of the 12th annual meeting of the Eastern Section, Seismological Society of America; (12) Abstracts of papers presented at 12th annual meeting, June 11-12, 1937 (a) Earth movements in the region of Boulder Dam, by R. R. Bodle; (b) A plausible seismometer and its performance, by J. P. Delaney; (c) Recent seismic activity in the Departamento de Narino, Colombia, South America, August 1935-August 1936, by J. E. Ramirez (title only); (d) Tests of earthquake accelerometers on a shaking table, by H. E. McComb and A. C. Ruge; (e) Comments on isoseismal maps, by F. Neumann (title only); (f) Microbarographic oscillations, by J. E. Ramirez; (g) Note on the earthquake of February 7, 1936, by R. R. Bodle; (h) Subsurface structure of northern Louisiana, by Albert Frank (title only); (i) Pre-

liminary report on a photoelectric pendulum control for recorder clocks, by A. C. Ruge and H. E. McComb; (*k*) Two recent earthquakes in the New Madrid region, by Florence Robertson (title only); (*l*) Seismic activity in the St. Marys (Missouri) fault region since 1910, by R. R. Heinrich (title only); (*m*) Progress report: Timiskaming earthquake research, by Ernest A. Hodgson; (*n*) Two problems in the theory of the seismograph, by Archie Blake; (*o*) A microseismic study of the Ohio earthquake of March 2, 1937, by A. J. Westland (title only); (*p*) Seismic laboratory equipment, by Daniel Linehan; (*q*) Evidences from deep-focus earthquakes for the crustal structure of Missouri, by Florence Robertson (title only); (*r*) Concerning the forced variations of a layered medium and some related problems, by L. B. Slichter (title only); (*s*) East Texas basin structure, by J. A. Ries; (*t*) The status of seismology in geophysical exploration, by J. B. Eby and R. P. Clark; (*u*) Some unsolved or partially solved earthquake problems, by N. H. Heck (title only).

4243. International Geodetic and Geophysical Union, Edinburgh meeting, September 17-24, 1936, Transactions, edited by D. La Cour, in collaboration with J. Bartels and M. Bruun de Neergaard: Internat. Geod. and Geophys. Union Bull., no. 10, 458 pp., Copenhagen, 1937. Price, £ 1.50.

This volume contains transactions of the International Association of Terrestrial Magnetism and Electricity including the following articles:

Part 1, Agenda and minutes, pp. 1-42.

Part 2, Statutes, pp. 43-50.

Part 3, National reports, pp. 51-162: Australia—Report on researches in atmospheric electricity during 1933-36, by D. F. Martyn; Azores—Rapport sur l'activité du service météorologique des Azores dans le domaine du magnétisme terrestre depuis Octobre 1933, by J. Agostinho; Denmark—Rapport sur les travaux magnétiques du Danemark 1933-36, by D. La Cour; Finland—Progress of work in terrestrial magnetism and electricity in 1934-36, by J. Keränen, and Report regarding research work at the Geophysical Observatory Sodankylä, 1933-36, by E. Sucksdorff; France—Rapport sur les travaux de la Section de Magnétisme et Électricité Terrestres depuis le Congrès de Lisbonne, by E. Mathias; Germany—Report on work in terrestrial magnetism in Germany; Great Britain—Report of the British National Committee; Holland—Rapport sur les travaux magnétiques, 1933-36, by G. van Dijk; Japan—National report of the Japanese Committee of Terrestrial Magnetism and Electricity, by A. Tanakadate, and Observations of terrestrial magnetism, atmospheric electricity, and earth currents by the Central Meteorological Observatory of Japan, by T. Okada; Norway—(1) Report on my geophysical work in the period 1932-36, from the meeting in Lisbon to the meeting in Edinburgh, by Carl Störmer, (2) Short report on geophysical researches at the Auralor Observatory, Tromsø, by Leiv Harang, (3) Report regarding the work at the magnetic bureau, Bergen, by B. Trumpy; Poland—Travaux de l'Observatoire Magnétique de Swider, 1933-36, by St. Kalinowski; Sweden—(1) Report on work in terrestrial magnetism and atmospheric electricity in Sweden since the Lisbon Assembly, by Harald Norinder, (2) Magnetic work, carried out by the Hydrographic Service of Sweden in 1934 and 1935, by E. Bouveng, (3) Studies of cosmic ultra-radiation in northern Sweden, by Axel Corlin, (4) Observations at Sveagruvan during the polar year 1932-33, by F. Lindholm, (5) Report of the magnetic survey work of the mainland of Sweden carried out by the Geological Survey of Sweden, by

Kurt Molin, (6) Report of investigations of atmospheric electric discharges performed at the Institute of High Tension Research of the University of Upsala since the Lisbon Assembly, by Harald Norinder, (7) Extracts from the annual reports of the Abisco Observatory, 1934-35, by J. Ostman; United States—(1) Report of the American Section of Terrestrial Magnetism and Electricity, 1933-36, by E. O. Hulburt, (2) Report by the Department of Terrestrial Magnetism, Carnegie Institution of Washington, to the Edinburgh Assembly on work done since the Lisbon Assembly, by J. A. Fleming, (3) Progress of work in terrestrial magnetism of the United States Coast and Geodetic Survey, July 1, 1933, to June 30, 1936, by N. H. Heck, (4) Averages of critical frequencies and virtual heights of the ionosphere observed by the National Bureau of Standards, Washington, D. C., 1934-36.

Part 4, Special reports, pp. 163-240: (1) Rapport sur la publication du caractere magnétique numérique des jours, by G. van Dijk; (2) Report of committee to consider existing and desirable distribution of magnetic and electric observatories and the better coordination of work and publications of existing observatories, by J. A. Fleming; (3) Report on sudden commencement of magnetic storms in Japan, by A. Tanakadate; (4) Report to the president of the committee on sudden commencements, by Louis Rodés, S. J.; (5) Report for the Auroral Committee, by J. M. Stagg; (6) Report on numerical character-figures, by A. Crichton Mitchell; (7) Report of the committee for study of relation between solar activity and terrestrial magnetism, by J. A. Fleming; (8) Report of special committee on magnetic secular variation, by N. H. Heck; (9) Report of the committee for the study of electrical characterization of days, by O. H. Gish; (10) Report on international collaboration to advance the study of the moon's effect upon geophysical phenomena, by S. Chapman; (11) Report on errors arising in ion-count work, by G. R. Wait; (12) Rapport sur la publication des caractères magnétiques pendant l'année polaire 1932-33, by G. van Dijk; (13) Note by the Secretary of the Commission: On the appointment of a board charged with an international service of comparisons of magnetic instruments, made with instruments circulated by mail, by D. La Cour; (14) Progress: Report of the joint committee of the commission and the association on methods and codes to adequately describe magnetic disturbances and perturbations, by J. A. Fleming; (15) Report on uniform convention regarding the sense of earth-current components, by O. H. Gish; (16) Report on international magnetic classification of Greenwich days prior to 1906, by E. van Everdingen; (17) Report to the International Commission of Terrestrial Magnetism and Atmospheric Electricity presented by their subcommission on the uniformity of magnetic charts, by J. Keränen, G. S. Ljungdahl, and N. Rose.

Part 5, Communications, pp. 241-422: (1) Intercomparison of magnetic standards and control of standards, by J. A. Fleming; (2) Results of international comparisons of magnetic horizontal intensity with C. I. W. sine-galvanometer 1, by S. E. Forbush and E. A. Johnson; (3) Trials made with the QHM by the Danish Meteorological Institute; (4) Short-period magnetic pulsations at the Watheroo Magnetic Observatory, by H. F. Johnston; (5) Concerning non-cyclic change, by A. G. McNish; (6) Progress of research in magnetic diurnal variations at the Department of Terrestrial Magnetism, Carnegie Institution of Washington, by A. G. McNish; (7) The new C. I. W. vertical intensity induction variometer, by A. G. McNish; (8) Investigation of magnetic bays, by

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Part 7, Resolutions, committees and reporters, pp. 453-458.

4244. Fritzsche, Gerhard, Untersuchungen über die von Maschinen, Fahrzeugen, und Wind hervorgerufenen Boden-Gebäudeerschütterungen nach Registrierung eines Benioff-Vertical-Seismographen [Investigations on oscillations of the ground and buildings produced by machines, vehicles, and wind from the records obtained by a Benioff vertical seismograph]: Univ. Leipzig, Geophys. Inst. Veröff., vol. 10, suppl. 1, 81 pp., 34 figs., Leipzig, 1937.

The seismograph used is described. This is a vertical seismograph having its mass of 100 kg suspended by means of a cylindrical spring. A soft iron rod is secured to the lower part of the mass; the rod moves above two coils, the latter enclosing the ends of a horseshoe magnet placed on a bed plate. The intensity of the magnetic field changes during the oscillations of the mass, and an induction current produced in the coil is recorded by means of a mirror galvanometer. The sensitiveness of the seismograph can be varied by changing the distance between the iron rod and the magnet. Oil damping is provided. The recording of oscillations is made in the usual way. Natural frequency depends on the distance of the iron rod from the pole of the magnet. The determination of constants is discussed in detail. The constants are determined before each measurement, thus making possible the reduction of errors. In operating the seismograph in the observatory, a disturbance occurring at certain intervals is observed, producing deflections up to 2 mm and 150 oscillations per minute. The disturbance is attributed to a machine stationed at 7.45 km distance, and phenomena of oscillations observed occasionally are attributed to the running of another machine at 5 km distance.

Mass pressures of the machines are calculated according to Mintrop's method, and the distribution of the amplitudes of the ground is determined in accordance with the nature of the subsoil. Records were taken at 36 stations showing a good picture of the distribution of the amplitudes around the machines. The absorption coefficient is calculated for each station, and the picture of its distribution is given. The kind of distribution is explained by the geologic conditions of the region under investigation. Phenomena of oscillations similar to those described by G. A. Schulze are observed during the starting and stopping of the machine. Curves showing the periodic frequencies of ground oscillations produced

by streetcars and railroad trains are given, and from them conclusions are drawn on the oscillations of the layers. Oscillations of buildings caused by the machines and wind are examined, and it is determined that natural vibrations are excited.—*A. Ramspeck's abstract in Zentralbl. Geophys., Meteorol. u. Geod., vol. 1, no. 5, 1937, translated by W. A.*

4245. Maurain, Ch., *Magnétisme et électricité terrestre* [Terrestrial magnetism and electricity], Part 1, Terrestrial magnetism, 63 pp. Paris, Hermann. Price, 15 fr.

After a brief outline of the general knowledge of terrestrial magnetism, the author studies secular variations, aurora borealis, and telluric currents. Numerous experimental data collected during the last 30 years are given. Various theories on the relations existing between the activity of the sun and the amplitude of magnetic variations, telluric currents, and aurora borealis are examined.—*W. A.*

4246. Neumann, Frank, *United States Earthquakes, 1935: U. S. Coast and Geodetic Survey, serial no. 600, 91 pp., 34 illus., Washington, 1937.* Price, 15 cents.

This publication is a summary of earthquake activity in the United States and the regions under its jurisdiction for the calendar year 1935. Contents: (1) Introduction; (2) Noninstrumental results; (3) Miscellaneous activities; (4) The Helena, Mont., earthquakes of October and November, 1935; (5) Seismological observatory results; (6) Strong-motion seismograph results; (7) Tilt observations; (8) Additions and corrections to previous publications.

4247. *Petroleum Technology in 1936*, F. H. Garner, general editor, 326 pp., 8 illus. Institution of Petroleum Technologists, London, 1937. Price, 7/6.

The chapter on "Geophysics" was contributed by H. Shaw, and offers a general review of progress in field applications of geophysics in various parts of the world, notably in the United States, Central and South America, Australia, England, and various localities in Europe, Africa, and the Near East.—*W. A.*

4248. Stille, H., and Lotze, Fr., *Geotektonische Forschungen* [Geotectonic investigations], Part 1: *Zur germano-typen Tektonik* [On the tectonics of German types, contributions by H. Stille, Fr. Lotze, E. Lemke, H. J. Martini], 123 pp., 36 figs., 8 tables, Verlag Borntraeger, Berlin, 1937. Price, RM. 16.

The problem of "Geotectonics" includes, according to the definition of the editors, general "knowledge on the structure of the earth's crust and its origin." The first part deals with the tectonics of Saxony.

10. PATENTS

4249. *Earth resistivity measurement*; Arnold Everet Bowen, Red Bank, New Jersey, assignor to American Telephone & Telegraph Co., a corporation of New York: U. S. patent 2094116, issued September 28, 1937.

This invention relates to a combination of geophysical measurements comprising an exciter circuit and an exploring circuit, a direct-current source of fluctuating amplitude periodically, reversibly connected in said exciter circuit, a potentiometer, means for deriving from said source a balancing voltage for said potentiometer, and means for alternatively applying to said potentiometer unidirectional voltages proportional

respectively to the current in said exciter circuit and the voltage induced in said exploring circuit. Claims allowed, 6.

4250. Method of making geological explorations; Harold R. Prescott, Ponca City, Oklahoma, assignor to Continental Oil Co., Ponca City, Oklahoma, a corporation of Delaware. U. S. patent 2095676, issued October 12, 1937.

This invention relates to a method of making geophysical explorations in which a seismic wave is generated at or near the earth's surface for reflection from a subsurface stratum, the stop of receiving vibrations at or near the earth's surface over an extended and substantially continuous area, converting said vibrations into an electric current of varying voltage controlling said current as a function of the integral of all vibrations received over said extended area at any instant, said substantially continuous area being such that the incidental vibrations in the near surface layers are substantially annulled by interference, while reflected vibrations from a subsurface stratum have a cumulative effect, and recording the resultant current fluctuations. Claims allowed, 2.

4251. Depth sounding apparatus; Robert Longfellow Williams, Newton, Massachusetts, assignor to Submarine Signal Co., Boston, Massachusetts, a corporation of Maine: U. S. patent 2096017, issued October 19, 1937.

The present invention relates to the art of depth sounding and in particular to the method in which a compressional wave signal is emitted when a rotating indicator is in a zero position and the wave reflected from the object whose distance is to be measured is received on a receiver and made to operate the indicator. Claims allowed, 2.

4252. Apparatus for subsurface surveying; David G. Hawthorn, Tulsa, Oklahoma, assignor to Geophysical Research Corporation, New York, New York, a corporation of New Jersey: U. S. patent 2096359, issued October 19, 1937.

This invention relates to a drill stem section comprising a length of pipe, a conduit fixed to the inner periphery thereof, male and female threaded connectors at opposite ends of said pipe, a metal annulus rigidly supported to one connector, a metallic helical member supported in the other connector and terminating in a second annulus, said first annulus and said helical member being coated with electrical insulation except for an edge of each annulus, the annulus of each connector being effective to be engaged by an annulus in a connector of the opposite type upon union of said connectors, and an insulated electrical conductor passing through said conduit and having its ends connected to said contacts. Claims allowed, 3.

4253. Gravity pendulum; Fernand Holweck, Paris, France, assignor to Shell Development Co., San Francisco, California, a corporation of Delaware: U. S. patent 2097156, issued October 26, 1937.

This invention relates to a gravity pendulum instrument having an elastic strip, a pendulum shaft attached to said strip, means for clamping the pendulum to its frame when not in use comprising a fixed support for the free end of said pendulum rigidly attached to said frame, a second support for the attached end of said pendulum, said latter support being fastened to said frame by a member whose change in length due to a temperature change is the same as the change in length of the pendulum whereby said support remains in fixed position with relation to the lower end of said pendulum. Claims allowed, 6.

4254. Method and apparatus for seismic prospecting; Serge Alexander Scherbatkoy and Jacob Neufeld, Tulsa, Oklahoma, assignors to Engineering Laboratories, Inc., Tulsa, Oklahoma, a corporation of Oklahoma: U. S. patent 2099536, issued November 16, 1937.

This invention relates to the method of seismic surveying which comprises creating a disturbance below the earth's surface, receiving the several waves thus formed, translating these waves into electrical vibrations, applying the electrical vibrations to an element responsive to their magnitude and their derivative, recording the output of the said element. Claims allowed, 64.

4255. Seismic reflection method; Ludwig W. Blau, Houston, Texas, assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2099837, issued November 23, 1937.

In geophysical prospecting, the steps which comprise creating a source of seismic waves at the surface of the earth, detecting the arrival of direct and reflected waves at spaced points along the surface of the earth substantially aligned with the source, and spacing the detectors vertically in the earth in positions determined by the horizontal distances between the detectors, by the distance from the shot point, and by the depth and dip of the reflecting layer until they detect the arrival of the reflected waves from a given subsurface stratum simultaneously. Claims allowed, 7.

4256. Seismic surveying method; David Saville Muzzey, Jr., Houston, Texas, assignor to Shell Development Co., San Francisco, California, a corporation of Delaware: U. S. patent 2101408, issued December 7, 1937.

This invention relates to a seismic surveying system comprising a plurality of detectors electrically connected to a plurality of galvanometers, the steps of generating a disturbance in the ground, converting said disturbance into electrical impulses at each of the detectors, transmitting the impulses from all detectors to each of the galvanometers through lines having different electrical time lags for each galvanometer, and simultaneously recording the indications of all galvanometers. Claims allowed, 9.

4257. Method of geophysical prospecting by the comparison of steady state potentials; Louis Statham and Ludwig W. Blau, Houston, Texas, assignors to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2104440, issued January 4, 1938.

This invention relates to the method of determining variations in electrical properties of the earth, which comprises passing an alternating current through two or more sets of primary electrodes in the ground whereby an electromotive force is caused to exist between two secondary electrodes in the ground, and comparing the various phase relations which exist between the current in each set of primary electrodes and its induced electromotive force at the secondary electrodes. Claims allowed, 5.

4258. Method of correlating subsurface strata; Henry H. Herrick, Berkeley, California, assignor to Standard Oil Co. of California, San Francisco, California, a corporation of Delaware: U. S. patent 2104743, issued January 11, 1938.

This invention relates to the method of correlating subsurface strata which comprises the steps of measuring the magnetic properties of

samples from a series of otherwise unidentifiable strata and comparing the values thus found with values of magnetic properties of samples from a second series of strata so that strata common to both series may be identified. Claims allowed, 4.

4259. Gravitation measuring instrument; Hans Haalck, Potsdam, Germany, assignor to Askania Werke A.-G. vormals Centralwerkstatt, Dessau, und Carl Bamberg, Friedenau, a corporation of Germany: U. S. patent 2105146, issued January 11, 1938.

This invention relates to a gravity responsive instrument comprising, in combination, two vertically spaced first vessels; a charge of gas in each first vessel; a first conduit connecting said vessels; a first mercury column in said first conduit, thereby tending to vary the expansion and compression of the gas in the upper and lower first vessels, respectively, when the instrument is subjected to variations in gravitational force; two vertically spaced second vessels; a charge of gas in each second vessel, a second conduit connecting said second vessels; a second mercury column in said second conduit, thereby tending to vary the expansion and compression of the gas in the upper and lower second vessels, respectively, when the instrument is subjected to variations in gravitational force; and indicating means responsive to a pressure differential in the lower first and upper second vessel, the differential pressure being a function of the gravitational force acting on said mercury columns. Claims allowed, 8.

4260. Method and apparatus for electrical exploration of the subsurface; John Jay Jakosky, Los Angeles, California: U. S. patent 2105247, issued January 11, 1938.

This invention relates to the method of electrical exploration of the subsurface which comprises: maintaining a pair of electrodes in continuous contact with the earth while moving at least one of said electrodes along the surface of the earth to vary the distance there between; passing electric current through the earth between said electrodes as the distance there between is varied, so as to vary the depth of penetration of said current within the earth; and measuring variations in a quantity influenced by the flow of said current and by the electrical characteristics of the earth traversed thereby, as the distance between said electrodes is so varied. Claims allowed, 23.

4261. Improvements in and relating to apparatus for gravity determinations; William Warren Triggs, a member of the firm of Marks & Clerk, of 57 and 58, Lincoln's Inn Fields, London, W. C. 2: British patent 466080, issued May 21, 1937.

This invention relates to an arrangement for carrying out determinations of the force of gravity or variations in the same with the aid of a movably mounted body, the weight of which is balanced by means of a spring arrangement, an electric or magnetic field, or in some other way, characterized by the feature that the movable body is surrounded by or enclosed in two or more Dewars vessels, one surrounding the other, and that in the interspace (or interspaces) between the same an automatically acting temperature regulator, for instance an electric temperature regulator or heating element is disposed. Claims allowed, 3.

4262. Means for surveying boreholes and strata revealed thereby; Frank Humphreys, of Old Town, Klerksdorp, Transvaal Province, Union of South Africa: British patent 467130, issued June 11, 1937.

This invention relates to a bore-hole surveying instrument including a compass scale arranged to maintain a horizontal plane for varying positions of the instrument, a pendulum arranged to hang vertically over the compass scale for varying positions of the instrument, and means for making a directionally indicative mark on a piece of bore-core in situ in the bore-hole. Claims allowed, 12.

4263. Seismic surveying method; The Western Geophysical Co., Los Angeles, California, assignee to Henry Salvatori, California, and Dean Walling, Dallas, Texas., co-inventors, both in the United States America: Canadian patent 370415, issued Dec. 7, 1937.

This invention relates to a method of seismic surveying comprising drilling two spaced shot holes in the earth to depths at least as low as the bottom of the weathered formation, placing at least two seismometers near the surface of the earth, said seismometers being placed between and roughly in line with said shot holes, generating vibrations of the earth in one of said shot holes at a point at least as low as the bottom of the weathered formation, recording the arrivals of the refracted waves and waves reflected from subsurface formations at said seismometers, and repeating the operation using the second of said holes without altering the positions of said seismometers, whereby the weathering correction and the dip of said subsurface formations can be determined accurately. Claims allowed, 9.

4264. Zählrohr für die Strahlungsmessung, insbesondere zur Messung der Kaliumstrahlung [Counter tube for measuring emanation, especially for measuring emanation of potassium]; Werner Kolhörster of Berlin Zehlendorf: German patent 634259, issued August 21, 1936.

This invention relates to a counter tube for measuring emanation, especially for measuring emanation of potassium, consisting of a metal tube, or a tube made of any other conducting material, along the axis of which a counting wire is stretched by means of two insulating plugs. The counting wire is of tantalum and the tube is filled with a mixture of argon and air. Claims allowed, 2.

4265. Verfahren zum Aufsuchen von Erdöllagerstätten [Method of discovering oil-bearing deposits]; Askania Werke A.-G. vormals Centralwerkstatt Dessau und Carl Bamberg-Friedenau of Berlin-Friedenau: German patent 642599, issued March 10, 1937.

This invention relates to a method of discovering oil-bearing deposits consisting of taking samples of soil gas from bore-holes distributed systematically and of examining the hydrocarbons or oil derivatives contained in them by means of catalytic burning on a glowing platinum wire. In this method the soil air samples are obtained by extracting gas from the cores taken from the bore-holes, for example, by means of sucking off in vacuum by heating. Claim allowed, 1.

4266. Vorrichtung zum Abschliessen von Geschossen in Bohrlöchern [Arrangement for discharging shells within bore-holes]; Société de Prospection Électrique Procédés Schlumberger of Paris: German patent 647914, issued July 19, 1937.

This invention relates to an arrangement for discharging shells within bore-holes, especially for taking rock samples or for perforating the

tube inserted into the hole, from an explosion chamber situated laterally to the axis of the shell. The arrangement is characterized by the fact that the explosion chamber is fixed in the form of a circle surrounding the barrel of the gun or the shell itself. Claims allowed, 2.

4267. Method of seismic prospecting for ore; N. I. Sofronov: Russian patent 51177, issued June 30, 1937.

This invention relates to the seismic method; it consists of producing artificial explosions in the region of investigation and in the registration of the elements of the acoustic waves. For detecting deposits of small size, seismographs are distributed at equal distances from the center of the explosion, the energy of the arriving waves is registered, and the existence of the deposit, its size and position, is determined from the coefficient of absorption of the energy of the waves. Claim allowed, 1.

4268. Regulator of amplitudes for seismic prospecting; A. F. Vulfius, and G. A. Gamburtzev: Russian patent 51483, issued Aug. 31, 1937.

This invention relates to the amplitude regulator used in seismic prospecting. The purpose of the regulator consists of automatic equalization of the amplitudes of the waves reflected from horizons of various depths by means of automatic change of the force of the current according to previously determined law, by which the electromagnet of the oscillograph is magnetized; the regulator is made in the form of a rheostat with movable contact driven by a spring motor starting automatically at the moment of explosion, having the winding inserted into the circuit of the electromagnet of the oscillograph and wound on a framework according to a certain law, for example according to the equation $y = K \frac{1}{v^2} \frac{di}{dx}$, in which i is the force of the current of magnetization, and K a certain coefficient depending on the velocity of the movement of the movable contact, the resistance of the winding of the electromagnet, etc. Claim allowed, 1.

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