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COMPILED BY

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GEOPHYSICAL ABSTRACTS 91, OCTOBER-DECEMBER 1937

Compiled by W. AYVAZOGLOU

1. GRAVITATIONAL METHODS

3934. Andreev, B. A., Diagram for a more rapid calculation of the gradients U_{xz} and U_{yz} [in Russian]: Razvedva Nedr, vol. 7, no. 14, pp. 48–49, Moscow, 1937.

Mathematical discussion of the method is given. The diagram is recommended for parties working with the apparatus of Askania's type.—*W. A.*

3935. Andreev, B. A., On the possibility of shortening the time of observation in working with the gravitational variometer, type Z–40, manufactured by the "Askania Works" [in Russian]: Razvedva Nedr, vol. 7, no. 14, pp. 50–52, Moscow, 1937.

Practical possibility of shortening the time of observation in one azimuth from 40 minutes, as required at the present time, to 30 minutes by introduction of increased damping of torsional oscillations is proved by tests. The results of these tests are shown in tables and graphs for comparison. No lessening of the accuracy of observations was noticed.—*W. A.*

3936. Ansel, E. A., Zur Analyse von Schwereanomalien [Contribution to the analysis of gravity anomalies]: Beitr. angew. Geophysik, vol. 7, no. 1, pp. 21–38, Leipzig, 1937.

The results obtained from ignoring the earth's curvature and the errors caused by the substitution of an infinite prism for a finite one are studied. Profiles of gravity anomalies in a number of regions obtained from observation and calculation are compared, and it is proved that the influence of lower layers (dunite) in gravity anomalies is not observed to the extent expected under the assumed differences in density.—*Author's abstract, translated by W. A.*

3937. Gabriel, V. G., Some graphical solutions in torsion-balance prospecting: Beitr. angew. Geophysik, vol. 7, no. 1, pp. 39–49, Leipzig, 1937.

The article deals with the application of a graphical method for determining underground structures in torsion-balance prospecting. First, a historical outline of the method is given; then the influence of a subterranean body is computed mathematically and expressed diagrammatically through the use of cylindrical coordinate system. Finally, the analytical and graphical solutions are compared and evaluated.—*Author's abstract.*

3938. Gammon, William, Use of submarines suggested to seek structures in Gulf: Oil and Gas Journal, vol. 36, no. 14, pp. 29–30, Tulsa, 1937.

Submarine gravimetrical survey off the Texas and Louisiana shorelines is discussed. From a series of gravity readings the general contours of geologic structures could be plotted on a chart for the guidance of well drillers. Vening Meinesz apparatus perfected for use on submarines is suggested. The apparatus has five pendulums. Three swing in a vertical plane and are fitted with mirrors and prisms which pick up a beam of light and transmit it to a moving film. From the record on the film two ideal pendulums are derived. The two additional pendulums, similarly rigged with mirrors, record deviations from the normal, such as slight tilting of the submarine, and enable the observer to compute any factor of error and so reconcile the gravity findings. The apparatus is enclosed in a case mounted in a cradle and swung from gimbals like a ship's compass, the gimbals resting on a frame that is made fast to the submarine.—*W. A.*

3939. Lejay, Pierre, Nouvelles déterminations de la gravité en Europe et dans les états du Levant [New determinations of gravity in Europe and in states of the Levant]: Acad. sci. Paris Comptes rendus, vol. 205, no. 3, pp. 193–196, 1937.

Results of gravity measurements made with gravimeter no. 42 and the new Holweck's instrument no. 622 are shown in a table. The results agree well with the measurements made previously.—*W. A.*

3940. Lejay, Pierre, Caractères généraux de la gravité dans les états du Levant [General characteristics of gravity in the states of the Levant]: Acad. sci. Paris, Comptes rendus, vol. 205, no. 6, pp. 349–352, 1937.

A map of Bouguer's isanomalies drawn from the data obtained from measurements at about 50 stations in the Levant is examined, and the following conclusions are drawn: (1) In the northeastern part the influence of Taurus is evidenced by negative anomalies which increase toward the massif, reaching —96 milligals at Aïn Divar, on the Tigris, at the foot of the mountain, thus showing that the isostatic compensation of this chain is actual; (2) in the east, including the whole southern part of Djezireh in the valley of the Euphrates and on the Chamieh plateau, slightly negative anomalies are found distributed equally over large areas; (3) in the west, strong positive anomalies of the Mediterranean coast indicate an isostatic compensation in the sea near Bayreuth; (4) in the southeastern part of this mountainous zone the anomalies become more and more negative, attaining a value of —66 milligals at the foot of the Djebel Tenf; (5) in the north, the seismic region of Antioch does not follow the general law of isostasy, as the highest values of positive anomalies are found on the summits.

A comparison of the results of the observations with those obtained in other parts of the earth shows that the isostatic law holds in the regions of old massifs but that compensation of superficial masses in the regions of seismic and volcanic activities is not attained. This is explained as follows: The compensation proceeds, as a rule, during a very long period of time after the uplift, and the return to equilibrium in some areas meets the resistance of hard socles. These break under the vertical pressure of masses above them and may cause seismic disturbances. A study of the depths of earthquake focuses in these regions would be of great value.—*W. A.*

3941. Mihal, N., Über die Bestimmung der Geoidfigur aus den Anomalien des Horizontalgradienten der Erdschwere [On the determination of the figure of the geoid from the anomalies of the horizontal gradient of gravity]: Acad. Sci. U. R. S. S., Comptes rendus, vol. 16, no. 1, pp. 49–50, Moscow, 1937.

Formula is derived for the deviation of the geoid from the niveau-ellipsoid under the assumption that the anomalies of the horizontal gradients of gravity over the whole surface of the earth are known.—*W. A.*

3942. Mihal, N., Über die Bestimmung der Lotablenkung aus den Anomalien im Horizontalgradienten der Erdschwere [On the determination of the plumb-line deviation from the anomalies in the horizontal gradients of gravity]: Acad. Sci. U. R. S. S., Comptes rendus, vol. 16, no. 3, pp. 169–171, Moscow, 1937.

Using the data obtained in the previous article (see abstract 3941) formulas are derived for the calculation of the deviation of the plumb line.—*W. A.*

3943. Minakami, Takesi, Torsion-balance surveys on volcano Asama, part 1: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 1, pp. 50–66, 1937.

Second derivatives of the gravity potential around the volcano were measured, and attempt was made to detect any time variation in these quantities during volcanic activity. The instrument used was the Grosse Drehwaage no. 2021 made by Askania Werke. Instrumental and calculation formulas are given. Observations made at 26 stations, from April 16 to July 30, 1936, are recorded in tables. Graphical representation of Eötvös quantities is given. Measurements made at the same stations before and after the eruption showed a difference of 2 to 3 Eötvös-units in the values of the gravity gradient.—*W. A.*

3944. Schaffernicht, W., Horizontalpendelbeobachtungen über Lotschwankungen in Marburg [Horizontal pendulum observations on the changes of plumb lines at Marburg]: Annalen der Physik, vol. 29, no. 3–4, pp. 349–357, Leipzig, 1937.

Two horizontal pendulums of the Zöllner type were set up in the Marburg gravimeter cellar 15 m deep. The pendulums registered respectively the component curves for azimuths 63.26° and 145.91°. Photographic curves show, as a result of high sensitivity, effects due almost entirely to solar and particularly lunar forces. The observations are analyzed, expressed in the form of equations, and compared with corresponding equations for a perfectly rigid earth.—*C. E. A., Sci. Abstracts, vol. 40, no. 476, 1937.*

3945. Schleusener, A., Entwicklung der Messungen mit dem Thyssen-Gravimeter in den Jahren 1935–37 [Improvements in measurements with the Thyssen gravimeter made during the years 1935–37]: Oel und Kohle, vol. 13, no. 34, pp. 845–853, Berlin, 1937.

Weight, transportation, and mounting of the instrument are summarized. Improvements in obtaining a low temperature coefficient made the use of an ice-cap or an electrical temperature stabilizer unnecessary. The scale value is made at 3½ to 4 milligal per graduation. The diurnal variation is reduced considerably. The following mean errors in the accuracy of the instrument are obtained: (1) In making

regional measurements with stations 3 to 5 km apart the average error is from ± 0.25 to ± 0.3 milligal (distance from the base stations not over 30 km); (2) for special measurements made at stations 0.5 to 1.5 km apart the average error is about ±0.2 milligal (distance from the base station not over 10 km). Arrangements for making measurements are described, and measurements obtained by pendulum and gravimeter are compared.

As an example of this comparison, measurements carried out in Ricklinger Hoch with the Thyssen gravimeter and measurements made with the gravimeter and the torsion balance over a salt dome in northern Germany are discussed.

A list of literature concerning the Thyssen gravimeter is added.—*W. A.*

3946. Stenz, Edward, Measurements of gravimetrical gradients in the surroundings of the city of Truskawiec [in Polish]: Towarzystwa Geofizików w Warszawie Biuletyn 14, pp. 5–28, 1937.

Results of gravimetrical measurements carried out with the Eötvös-Schweidar torsion balance are described.

Chapters 1 and 2 deal with the theory of the torsion balance in general and chapter 3 with the torsion balance Askania Z 40, no. 589, which was used in the survey. In chapter 4 equations used for the calculation of the horizontal gradients of gravity U_{xz} and U_{yz} are given. The results obtained are shown in table 1. Measurements near Truskawiec are summarized in chapter 5. Chapters 6, 7, and 8 deal with topographic corrections; the results are shown in table 2. Regional corrections due to the influence of "skiba" (blocks thrust one upon the other in a definite order) of Boryslaw and the Carpathian Mountains are discussed in chapter 9. Values of resultant vectors and their directions are shown in table 3 and in a figure; they are explained by the presence of a large layer of greater density in the subsoil, inclined at an angle of about 25°. The horizontal thickness of this layer was calculated by applying Nikiforov's and Jung's formulas and is estimated to be about 110 m. The theoretical course of the gradient curve produced by this layer is shown in a figure.—*W. A.*

3947. von Thyssen, St., Spezialvermessung eines gravimetrisch gestörten Salzstockes [Special measurement of a salt dome disturbed gravimetrically]: Montanistische Rundschau, vol. 29, no. 15, pp. 6–8, Berlin, 1937.

Reprint of article published in Petroleum Zeitschrift, vol. 33, no. 22, pp. 34–36, 1937 (see Geophys. abstracts 90, no. 3816).—*W. A.*

3948. Tomaschek, R., Schwerkraftmessungen [Gravity measurements]: Naturwissenschaften, vol. 25, no. 12, pp. 177–185, Berlin, 1937.

After a brief introduction on the problems of gravitation in general, a discussion of the methods for determining gravity values and the instruments involved is given. Figures and descriptions of the following instruments are included: (1) Tomaschek and Schaffernicht's interference gravimeter; (2) Schmidt and Schweidar's bifilar gravimeter with electrostatic adjustment according to Tomaschek and Schaffernicht; (3) Tomaschek and Sorber's double-torsion gravimeter; (4) Haalck's statical gravity meter; (5) Eötvös' torsion balance. The necessity of using pendulums for obtaining absolute gravity measurements at basic stations 100 to 200 km apart and the correla-

tion of the data of the relative measurements obtained by other instruments at stations distributed at 3 to 4 km apart are emphasized.

The author examines the results of measurements and the reasons for the different values of the local distribution of gravity, which are attributed mostly to (1) the different distances from the center of the earth; (2) the centrifugal force of the rotation of the earth; and (3) different distribution of masses near the stations.

A few examples are given to show how conclusions on the structure of the earth may be drawn from gravity measurements carried out over large regions. Finally, the variations of gravity caused by secular and tidal phenomena are discussed.—*W. A.*

2. MAGNETIC METHODS

3949. Berezkin, A. M., and Virin, A. Y., Magnetic anomalies in the Shablykin area, western region [in Russian]: Western Regional Sci.-Research Inst. Geofizika, no. 4, pp. 15–83, Smolensk, 1936.

An area of 345 square kilometers was investigated with the Tieberg-Talen magnetometer and the deflection magnetometer. The elements of the magnetic field were measured at 986 stations. The results are shown in maps and tables. Three magnetic anomalies were determined and the possibility of more anomalies in this as well as adjoining areas is expected.—*W. A.*

3950. Berezkin, A. M., and Noskovskaia, E. A., Magnetic investigations in the vicinity of the city of Smolensk [in Russian]: Western Regional Sci.-Research Inst. Geofizika, no. 4, pp. 85–87, Smolensk, 1936.

The terrestrial magnetic field around Smolensk was found to be abnormal, the deviations of Z and H varying between ±0.07 cgs and ±0.05 cgs. These deviations may not characterize anomalies of industrial importance but they may serve for closer determination of the geologic structure of the area under investigation. A map is added.—*W. A.*

3951. Bossolasco, M., and Egedal, J., Our knowledge of the lunar-diurnal variation of magnetic declination and new results obtained from observations at Mogadiscio: Terres. Magn. and Atmos. Electr., vol. 42, no. 2, pp. 123–126, 1937.

For the best representation of the field of the lunar-diurnal variation coordinates depending also on the magnetic elements of the place of observation should be used. Until now it has not been possible to compare theories on lunar-diurnal magnetic variation with the observations in a complete manner, because data have not been sufficient; in the future the data from Mogadiscio (and Pará) will make knowledge of the variation in question more complete.—*Authors' abstract.*

3952. Bronstein, K. G., Application of a local magnetic constant for geological interpretation of magnetic anomalies [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 16–17, Leningrad, 1937.

From data on the Kursk magnetic anomaly the author concludes that the method of the "local magnetic constant" expressed by the formula

$$G=\sqrt{H^2+\frac{Z^2}{4}}$$

(in which H and Z are the values of the horizontal and vertical components at a certain point) may be used for geological interpretation of the local magnetic anomalies. Values of G were calculated for a few sections of the Kursk magnetic anomaly, and a good agreement with the known geological structure was established.

Detailed discussion of the method will be given in a future paper.—*W. A.*

3953. Eby, J. B., and Nicar, E. G., Magnetic investigations in southwest Alabama: Alabama Geol. Survey Bull. 43, 41 pp., 1936.

A magnetic survey of a large portion of southwest Alabama, approximately 7,000 square miles, made from September 1934 to January 1936, is described. Askania vertical variometer was used. The location of all observation stations is shown in a detailed magnetic map attached to this report.

After a brief discussion of the topography and the geology of the region, the work with the magnetometer is described. The locations of the two most outstanding magnetic anomalies are given. They are interpreted as representing deep-seated plugs of igneous rock.

From the standpoint of the petroleum geologist this magnetic investigation is considered to be successful only insofar as it points out several areas of interest in the southern portion of the area that warrant further and more detailed geophysical investigation.—*W. A.*

3954. Egedal, J., Lunar-diurnal variation in earth currents: Terres. Magn. and Atmos. Electr., vol. 42, no. 2, pp. 179–182, 1937.

It may be said that the existence of a lunar-diurnal variation in the earth-current potential-gradient is confirmed, and that in order to advance the study of this variation a closer examination of the observations and a comparison of results from different places are necessary.—*Author's abstract.*

3955. Fanselau, G., Die magnetische Störung vom 24 bis 28 April 1937 [Magnetic disturbance April 24 to 28, 1937]: Naturwissenschaften, vol. 25, no. 30, pp. 490–492, Berlin, 1937.

Details of the disturbance are discussed. Curves obtained at the Geophysical Institute at Niemegk show the course of the declination (D), horizontal intensity (H), and vertical intensity (Z) on the 5 days of the disturbance. The course is noteworthy, as the disturbances, especially those of D and H, were almost negligible during the first 4 days from 7 a. m. to 6 p. m. After this a sudden disturbance started with a maximum between 7 p. m. and 1 a. m., then died away gradually. Maximum amplitude of D reaching about 300γ was observed on April 24, but the maximum amplitudes of H and Z (400γ and 200γ, respectively) occurred only on April 26. It was noticed that the strongest deviations did not coincide with the time of the strongest activity of the sun, but there was about one day of difference between these two phenomena; this almost agrees with the time necessary for the corpuscles to travel from the sun to the earth.—*W. A.*

3956. Gusev, P. I., and Bronstein, K. G., Study of diurnal variations of magnetic field in the regions of anomalies [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 33–35, Leningrad, 1937.

Preliminary information on the results obtained from the comparison of simultaneous observations of horizontal intensity and declination at a series of points of the Kursk magnetic anomaly and at the Nijnedevitsk Observatory are given.

Changes of the relative values of H and D, depending on the value of the horizontal intensity, are shown in a diagram.—*W. A.*

3957. Hasegawa, Mankiti, On the progressive change of the field of diurnal variations of terrestrial magnetism: Imp. Acad. Japan Proc., vol. 12, no. 9, pp. 277–280, 1937.

A brief description of how the field of diurnal magnetic variations progressed with time round the world on the particular days under consideration. The horizontal vector diagrams of the diurnal magnetic variations on June 21 and 23, 1934, and September 23 and 24, 1933, are shown in figures.—*W. A.*

3958. Hasegawa, Mankiti, and Ōta, Masaziro: Analysis of the field diurnal variations of terrestrial magnetism of different types: Imp. Acad. Japan Proc., vol. 13, no. 3, pp. 65–68, 1937.

Values are taken from the potential charts in a previous article (see Geophys. Abstracts 89, no. 3682) for expansion in spherical harmonics. The external and internal coefficients of the main terms are tabulated and the total effect of all the terms is given in the charts of the equivalent electric currents. The principal center of circulation of the external electric current lies nearly at latitude 30° N., while that of the internal current is at about 45° N.—*W. A.*

3959. Hulburt, E. O., Terrestrial magnetic variations and aurorae: Rev. Modern Physics, vol. 9, no. 1, pp. 44–68, Lancaster, 1937.

A summary of the more important facts of magnetic variations and the several theories which have been advanced in explanation are presented. As aurora and magnetic disturbance are in general closely connected, a discussion is given of the facts and theories of the aurora.

All theories of terrestrial magnetic variations assume in common that the variations arise from the effects of electrical charges; they differ in their choice of effect and the situation of the charges. Three effects are recognized—dynamo action, diamagnetism, and gravitational magnetic drift currents. The more important theories place the charged particles in the upper atmosphere. Other theories, for the most part incomplete or discarded, place the charged particles at distances of several times the earth's radius from the earth; such particles are not truly in the upper atmosphere.—*W. A.*

3960. Johnson, E. A., and Steiner, W. F., An astatic magnetometer for measuring susceptibility: Rev. Sci. Instruments, vol. 8, pp. 236–238, 1937.

A rugged type of astatic magnetometer has been designed and built for use in the shop and laboratory to measure susceptibility of materials. The sensitivity may be adjusted from 2×10^{-8} to 1×10^{-6} electromagnetic cgs unit per scale division, allowing the measurement of volume susceptibility of practically any material.—*Author's abstract.*

3961. Kalinowska, Zofia, and Kalinowska, Ewa, Secular variations of the local magnetic constant (G) in Swider [near Warsaw, Poland] [in Polish]: Towarzystwa Geofizyków w Warszawie Biuletyn 14, pp. 46–51, 1937.

From the data collected at the magnetic observatory at Swider during the years 1921 to 1935 the authors derive the course of the secular change of G, defined by the equation

$$G=\sqrt{H^2+\frac{Z^2}{4}}$$

The course is compared with that established at several other observatories in Europe. Variations of G in Swider are comparable with those in Val-Joyeux, Nantes, and Seddin. The curves of these four observatories show a decrease of G towards a minimum after which an increase follows. The curves of observatories on higher latitudes (Eskdalemuir, Lerwick, Sodankylä, Pavlovsk) show a decrease only. No relationship of the phenomenon discussed in this article to the periodical variation of sun spots could be observed.—*W. A.*

3962. Lynton, E. D., Laboratory orientation of well cores by their magnetic polarity: Am. Assoc. Petroleum Geologists Bull., vol. 21, no. 5, pp. 580–615, 1937.

A practical laboratory method of orienting well cores by their magnetic polarity was first developed by the Standard Oil Co. of California's research department early in 1928. The procedure is designed to determine the original orientation in the ground of cores obtained in the ordinary rotary system of oil-well drilling by identifying the north and south sides of a core, after it has been brought to the surface, through residual magnetic polarity in the heavy minerals of the rock. The writer describes the theory and the various steps in developing this idea from the original experimental machine to the commercial one which is self-recording by photographing the deflection of a light beam.

In conjunction with this magnetic core orienter a deviation corrector was developed. Direction of dip obtained from samples cored from crooked holes were worked out as apparent dips and strikes. The instrument, known as deviation corrector, was designed to correct rapidly the apparent dip to the true dip, whenever the direction and degree of dip of the hole at the depth from which the core came are known. The instrument and mathematical computations are fully described in this paper.—*Author's abstract.*

3963. Malinina, N. E., and Orlov, V. P., Study of secular variation on the territory of the U. S. S. R. for the epoch 1930–35 [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 19–22, Leningrad, 1937.

Tables of the annual changes of declination, horizontal force, and inclination, based on data obtained from the general magnetic survey of the U. S. S. R. carried on since 1931, are given.—*W. A.*

3964. Malkin, N. R., On the principles of interpretation of magnetic data, especially for layers of ellipsoidal form, and on the relationship between the gravitational and magnetic anomalies [in Russian]: Information book on terrestrial magnetism ond electricity, no. 3, pp. 12–14, Leningrad, 1937.

The possibility of identifying uniformly magnetized bodies and of determining the direction of magnetization and the position of the center of gravity is discussed mathematically.—*W. A.*

3965. Maurain, Ch., Sur le rôle possible de vibrations mécaniques et des perturbations magnétiques dans les variations de la distribution du champ magnétique terrestre [On the possible influence of mechanical vibrations and magnetic disturbances upon the variations in the distribution of the terrestrial magnetic field]: Gerlands Beitr. Geophysik, vol. 50, no. 2–4, pp. 229–230, Leipzig, 1937.

Basing his conclusion on his own studies as well as on recent investigations on the instability of magnetization of basalts made by Thellier (Geophys, Abstracts 89, no. 3696), Maurain supports the view that mechanical vibrations, such as earthquakes, as well as magnetic disturbances, produce an effect by which the conditions of magnetization of rocks may change considerably.—*W. A.*

3966. McNish, A. G., and Ludy, A. K., Measure of magnetic activity of the earth: Terres. magn. and atmos. electr., vol. 42, no. 2, pp. 173–177, 1937.

The international character figure C as a measure of storminess is considered to contain the results of too many European observatories and is further objected to on the grounds of the diversity of the observers and the delay in publishing the results. By cooperation of various interested organizations in the U. S. A., an alternative figure denoted by C_A has been obtained from the results of seven American-operated observatories situated at the following places: Cheltenham (Maryland, U. S. A.), Honolulu (Hawaii), San Juan (Puerto Rico), Sitka (Alaska), Tucson (Arizona), Huancayo (Peru), and Watheroo (Australia). The collection and distribution of the data are effected by radiotelegraphy so that the information is not more than a week in arrears. Some graphs are given showing the comparison between the international and American character figures and the quality of transatlantic radio reception for selected periods.—*F. S. B., Sci. Abstracts, vol. 40, no. 477, 1937.*

3967. McNish, A. G., Electromagnetic method for testing rock samples: Terres. Magn. and Atmos. Electr., vol. 42, no. 3, pp. 283–284, 1937.

Intensive study of the remanent magnetization of rocks should reveal information of profound importance to investigators in terrestrial magnetism and geology. If magnetic precipitates are permitted to settle from a solution, the particles align themselves so that the sediment is magnetized in the direction of the prevailing magnetic field.

Similarly, a magnetic substance, when cooling, if its original temperature is above the Curie point for that substance, becomes magnetized in the direction of the prevailing field. For these reasons, both sedimentary and igneous rocks may be expected to assume a magnetic condition corresponding to the earth's magnetic field prevailing at the time and place of their formation. As it is likely that such magnetization is retained the rocks may supply a record of the earth's magnetic state in past geologic ages.

Measurements of such magnetization may be of great interest to magneticians, as they concern the history of the earth's magnetic field, also to geologists, as considerable information may be obtained from the magnetic properties of various rocks which may permit a rapid dating of rock-samples by correlating their magnetization with that of rocks of

known age. Experiments on methods of measurement conducted at the Department of Terrestrial Magnetism are briefly outlined.—*W. A.*

3968. McNish, A. G., Ultra-violet light theory of magnetic storms: Phys. Rev., vol. 52, no. 3, pp. 155–160, Aug. 1937.

The three notable solar flares in the western hemisphere in 1936 did not produce magnetic storms. It is inferred from terrestrial effects accompanying them that intense ultraviolet emission occurred at the same time. Study of the effects suggests that, when a flare of ultraviolet light increases the conductivity of the lower regions of the atmosphere, increased diurnal-variation currents flow. The current systems necessary to produce magnetic storms are of an entirely different type—hence the observed effects do not support the ultraviolet theory of magnetic storms.—*Author's abstract.*

3969. Mikov, D. S., Magnetometric work in the Urals [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 81–83, Leningrad, 1937.

General conclusions derived from practical application of magnetic methods in prospecting for minerals and from geologic mapping in the Urals are given.—*W. A.*

3970. Nagaoka, Hantaro, and Ikebe, Tsuneto, Magnetograph for examining sudden changes of magnetic field: Imp. Acad. Japan Proc., vol. 13, no. 2, pp. 30–33, 1937.

For recording rapid variation of terrestrial magnetic field the ordinary magnetograph is unsuitable, as the magnetic needle used in it does not respond immediately if the variation takes place within an interval which is much shorter than the period of the needle. For measuring the time rate $\frac{dH}{dt}$ of the magnetic force H, recourse is sought in the measurement of the induced electromotive force caused by the flux of induction. The flux can be increased if the varying field acts on a highly permeable material. Moreover, the flux over a large surface can be accumulated and made to pass through a permeable material of thin cross section. An apparatus is described in which a bundle of permalloy sheets was placed in a cylindrical coil and the terminals of the coil connected with a delicate d'Arsonval galvanometer of the author's construction. The novelty in the design was the addition of collectors at both ends of the bundle in contact with it.—*W. A.*

3971. Nagata, T., Dip variometer: Tokyo Imp. Univ., Earthquake Research Inst., vol. 15, no. 1, pp. 185–192, 1937.

After the discussion of the principles to be embodied in the design of the instrument, detailed descriptions of it and of its adjustment and calibration are given. Results of observations made in Tokyo during the hours when the electric trolley cars were not running are shown in records of dip variation obtained at the Earthquake Research Institute. Observations with the instrument are being made at the foot of Mount Asama and other volcanoes.—*W. A.*

3972. Norinder, Harold, Rapid variations in the magnetic field produced by lightning discharges: Phys. Soc. Proc., vol. 49, no. 273, pp. 364–375, 1937.

Measurements of the rapid variations in the magnetic field produced by lightning discharges are made by means of a frame aerial and a

kathode-ray oscillograph. The observations make it possible under certain conditions to calculate the current variations in lightning discharges, and maximal values up to 100 kA are derived. These are in good agreement with results obtained by other indirect methods. Conclusions as to the structure of the current variations in lightning discharges are drawn from the measurements.—*Author's abstract.*

3973. Orlov, V. P., The new net of magnetic repeat stations [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 22–31, Leningrad, 1937.

Gives a list of 381 permanent repeat stations, including their geographic coordinates; 80 of these are stations of the first rank where measurements are repeated every year. Most of the new stations are located in the Asiatic part of the U. S. S. R.—*W. A.*

3974. Penkevich, M. S., The universal magnetometer designed by the Central Institute of Terrestrial Magnetism [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 35-37, Leningrad, 1937.

A brief description of the universal magnetometer, called "combine," or CIM-type, is given. The instrument makes it possible to determine not only the three elements of the terrestrial magnetism, D, H, and I, but also ΔZ. The horizontal force may be determined by two methods—the electrical and the method of deflection; the inclination by Lamont's method, using rods of special steel; and the vertical force by the modified Schmidt's balance.—*W. A.*

3975. Poisson, Ch., Avantages de l'étude des anomalies locales du champ magnétique terrestre [Benefits of studying local anomalies of the terrestrial magnetic field]: Revues des Questions Scientifiques, vol. 56, no. 1, pp. 5–34, Louvain, 1937.

Brief historical outline of the evolution of the study of magnetism and reference to a few examples of local anomalies are given. Magnetic methods of prospecting and instruments used are discussed. The necessity of making up a list of magnetic rocks, which are of very many varieties and which differ greatly in the conditions of their formation and transformation, is indicated as a task for geophysicists in close cooperation with geologists.—*W. A.*

3976. Pushkin, N. F., A simplified method of calculating H [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 14–16, Leningrad, 1937.

The calculation of the horizontal magnetic force H based on a simplified formula derived by the Kazan Magnetic Observatory is discussed. A numerical example is given.—*W. A.*

3977. Rose, T. N., Regional magnetic anomalies of Ukraine and their connection with geotectonics [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 8–10, Leningrad, 1937.

Data collected by the General Magnetic Survey are compiled into a map of regional magnetic anomalies of Ukraine. Additions and corrections to the tectonics determined by previous surveys are made.—*W. A.*

3978. Rusakov, V. P., and Pogrebov, A. G., Magnetic investigations in the Bukharin area, western region [in Russian]: Western Regional Sci.-Research Institute Geofizika, no. 4, pp. 63–74, Smolensk, 1936.

While drilling for coal in this area it was found that the bore instruments became magnetic. The results of investigation by Tieberg-Talen magnetometer at 647 stations are shown in a table. Magnetic anomalies were not determined.—*W. A.*

3979. Solodukho, O. Y., Magnetic survey in the region of the Ensk iron-ore deposits [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 10–12, Leningrad, 1937.

Results of the magnetic survey made in 1935 in the southwestern part of the Kola Peninsula are briefly described. The presence of a local anomaly of great intensity was found.—*W. A.*

3980. Stenz, Edward, On the secular change of magnetic declination in Cracow [in Polish]: Towarzystwa geofizyków w Warszawie Biuletyn 13, pp. 5–17, 1937.

Previous measurements of magnetic declination made by Des Noyers (1546) and Chodkiewicz (1806–10) are revised and completed. The new data are given in a table. A curve of secular variation of magnetic declination in Cracow is drawn, and its course is compared with those obtained in Zurich and Paris. The three curves are similar. Magnetic disturbances produced by stray currents of the electric tramway in Cracow and their influence upon the points of observation ars discussed. The courses of magnetic declination in Cracow recorded on April 9, 1936, during the running of the tramways and at night are shown in figures. The disturbances are proved to be insignificant.—*W. A.*

3981. Stenz, E., and Olczak, T., On the secular variations of vertical intensity in Poland [in Polish]: Towarzystwa geofizyków w Warszawie Biuletyn 13, pp. 18–28, 1937.

According to H. Reich's paper on secular variations in Germany (Zur Säkularvariation der Verticalintensität in Deutschland für die Zeit von 1901 bis 1931: Beitr. angew. Geophysik, vol. 4, no. 3, 1934) the variation of the *Z*-component in Swider (Poland) shows a great discrepancy in comparison with other stations in Europe, attaining a figure of about $+660\ \gamma$. Changes of the *Z*-component during 1901 to 1928 are studied, and the results are summarized in a table and a figure from which the conclusion is drawn that the variation during these years was probably only about 100 gamma.—*W. A.*

3982. Trubiatchinsky, N. N., Secular variations of geomagnetic elements as a geophysical method for studying epirogenetic movements of the earth's crust [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 17–19, Leningrad, 1937.

Secular variations of magnetic elements in Slutsk and Tiflis are compared with the data of changes in level of the ground at Kronstadt and Baku, and the conclusion stated that the causes of secular variations are closely connected with the causes of the epirogenetic movements of the earth's crust.—*W. A.*

3983. Whetton, J. T., The physical aspect of magnetometric surveying: Mine and Quarry Engineering, vol. 2, no. 3, pp. 95–101, London, 1937.

A brief outline of the principles and elements of magnetism, followed by a description of the Hotchkiss superdip magnetometer and Watts' vertical magnetic force variometer, with a theoretical outline of the instruments.

Magnetic variations (secular, diurnal), magnetic storms, sun spots, permeability, and susceptibility of rocks (with figures showing the susceptibilities of certain rocks) are discussed.—*W. A.*

3984. Whetton, J. T., Practical applications of magnetometric surveying: Mine and Quarry Engineering, vol. 2, no. 4, pp. 144–151, London, 1937.

A number of cases, accompanied by diagrams, maps, profiles, etc., are presented in an effort to indicate the possibilities and limitations of the magnetometric method of prospecting and to show the large field of application of this method.—*W. A.*

3. SEISMIC METHODS

3985. Merlage, H. P., Jr. A provisional catalogue of deep-focus earthquakes in the Netherlands East Indies 1918–36: Gerlands Beitr. Geophysik, vol. 50, no. 1, pp. 7–17, Leipzig, 1937.

The catalogue is the result of a thorough study of all available evidence. For the years 1918–30 the author based his work on the epicenters and depths given in the International Seismological Summary. From 1931 on he relies on his own determinations made with the aid of Brunner's depth chart.—*W. A.*

3986. Bodle, R. R., Earth movements in the region of Boulder Dam [abstract of paper presented at 12th Annual Meeting of Eastern Section, Seismological Society of America, June 11–12, 1937]: Earthquake Notes, vol. 9, no. 1/2, pp. 10–11, 1937.

A general description of the size of Lake Mead was given. Also a sketch with the precise level lines in the region was shown indicating what has been done to make possible a later determination of crustal flexure, if any.

The question of whether slight shocks which have occurred in the region are a result of the increased load was discussed. It was concluded that there is not sufficient evidence to decide definitely what was the cause. Suggestions were made relative to the locations for seismograph stations which might be expected to yield data necessary to locate earthquakes in the region so that more satisfactory conclusions could be drawn as to their cause.—*Author's abstract.*

3987. Bullen, K. E., The ellipticity correction to travel-times of *P* and *S* earthquake waves: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 4, no. 2, pp. 143–157, London, 1937.

Basing his study on the theoretical analysis of the general effect of the earth's ellipticity on the travel-times of earthquake waves made by Gutenberg and Richter (Gerlands Beitr. Geophys., vol. 40, pp. 380–389, 1933), and Jeffreys (Monthly Notices, Geophys. Suppl., vol. 3, pp. 271–274, 1935), Bullen examines in detail this effect on *P* and *S* waves.

The following tables are computed:

1. Corrections to travel-times of *P* waves due to the ellipticities of internal strata of equal velocity.

2. Corrections to travel-times of P waves due to departure of earth's surface from standard sphere.

3. Times to be subtracted from apparent travel-times for distances computed from geographic latitudes, to give times for distances as computed from geocentric latitudes.

4. Ellipticity corrections to travel-times of P waves.

5. Ellipticity corrections to travel-times of S waves.—*W. A.*

3988. Bullen, K. E., A suggested new "seismological" latitude: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 4, no. 2, pp. 158–164, London, 1937.

It is found that if epicentral distances in earthquakes be calculated using a special "seismological" latitude (β) defined by equation

$$\beta=1.1\beta_1-0.1\beta_2$$

(where β_1 and β_2 are respectively the geocentric and geographic latitudes of the same point of the earth's surface), then the ellipticity corrections for P and S waves can be put in the form of the formula

$$f\ (\Delta)\ (h_0+h_1)$$

(where h_0, h_1 are the heights of an epicenter and observatory above the standard sphere) to a high degree of accuracy.

Two tables give the appropriate values of $f\ (\Delta)$ for P and S.

For observatories which are situated appreciably above sea-level, h_1 of the formula is to be taken to represent a station's actual height above the standard sphere. In such cases the result found on using the tables should be increased by S times the station's height above sea-level, where S is 0.14 in the case of P waves and 0.25 with S.—*Author's abstract.*

3989. Bullen, K. E., Tables for reduction of apparent travel-times of P and S seismic waves: New Zealand Jour. Sci. Technology, vol. 19, no. 1, pp. 47–54, Wellington, 1937.

Tables are given for ellipticity corrections to travel-times of P and S waves, corresponding to the use of geographic latitudes in calculating epicentral distances. The corrections are to be added to observed readings to give results as for standard sphere.—*W. A.*

3990. Byerly, Perry, Earthquakes off the coast of northern California: Seismol. Soc. America Bull., vol. 27, no. 2, pp. 73–96, Berkeley, 1937.

The epicenters as located for the earthquakes of July 6, 1934, January 2, 1935, and June 3, 1936, indicate that earthquakes centering off the coast of Humboldt County do not originate on a linear extension of the San Andreas fault in Mendocino County. The epicenters of these shocks, as located by two methods, and also the epicenter of the earthquake of January 31, 1922, as located by Professor Macelwane, are shown in a figure.

On the basis of least square residuals alone, the epicenters located by assuming a straight-line travel-time curve for P_n to $\Delta=18°$ are better than those located by the Jeffreys-Bullen curves. But for the shock of June 3, 1935, the epicenter located by the first method is inconsistent with the S–P interval at Ferndale, whereas that obtained by the second method is consistent. For the other two shocks the epicenters located by the two methods are little different in position.

Whereas the July 6 shock shows a definite S_n travel-time curve with an intercept approximately equal to that of the P_n curve, the other two earthquakes show a marked wave preceding S_n and almost masking it at the coastal stations south of the epicenter. The travel-time curve of this wave has an intercept about 15 seconds below that of P_n. This wave is longitudinal and has a period of 4.35 km/sec. It is suggested that it is P in the sedimentary layer, although objections to such an interpretation are cited.

The travel-time curve of P for the July 6 shock between 26° and 40° indicates that it is composed of two nearly straight branches rather than the more smooth curve of Jeffreys and Bullen.—*Author's abstract.*

3991. Byerly, Perry, Northern California earthquakes, January 1, to December 31, 1936: Seismol. Soc. America Bull., vol. 27, no. 3, pp. 225–230, Berkeley, 1937.

Northern California earthquakes for the period January 1, 1936, to December 31, 1936, are listed in detail in the Bulletins of the Seismographic Stations of the University of California. Whenever possible, epicenters of those earthquakes have been located and plotted on maps. This article includes a table showing 51 epicenters and 64 earthquakes.—*W. A.*

3992. Caloi, P., Sur une onde longue oscillant dans le plan principal [On a long wave oscillating in the main plane]: Union Géodésique et Géophysique Internationale, ser. A, no. 15, pp. 93–106, Nogent-le Rotrou, 1937.

The existence of a wave of long period (about 50 sec.), which oscillates in the main plane, propagates with a velocity of 6.2 km/sec., and has the characteristics of a superficial wave, is mentioned. This wave was recorded during the earthquakes of normal depths by apparatus having periods over 20 seconds. The physical properties of the new wave are compared with the G-wave established by Gutenberg and Richter.—*W. A.*

3993. Collins, M. P., The New Hampshire earthquakes of November 9, 1936, and further data on New England travel times: Seismol. Soc. America Bull., vol. 27, no. 2, pp. 99–107, Berkeley, 1937.

Two earthquakes were reported felt in northern and central New Hampshire on the evening of November 9, 1936. These were the third and fourth reported from the State in 14 months. The epicenters of these two shocks have been determined as 43°33′ N., 71°26′ W., and 44°39′ N., 71°40′ W. The previous seismic history of the State and the relation of these earthquakes to the geology of the region are discussed.—*Author's abstract.*

3994. Davison, Charles, The distribution of deep-focus earthquakes: Geol. Mag., vol. 74, no. 877, pp. 316–324, London, 1937.

Deep-focus earthquakes observed during the years 1918 to 1931 in the whole world are divided into two groups (1) 191 at depths of 50 to 180 miles, and (2) 79 at depths of 205 to 380 miles. Their distribution is given on a map. With a few exceptions, the epicenters lie in seven regions—two continental and five insular—all of them along or near the margins of the Pacific. Details are given for each region.—*W. A.*

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3995. Delaney, J. P., A plausible seismometer and its performance [abstract of paper presented at 12th Annual Meeting of Eastern Section, Seismol. Soc. America, June 11–12, 1937]: Earthquake Notes, vol. 9, no. 112, p. 11, 1937.

Although horizontal seismometers have been developed successfully along many various lines, instruments so far contrived for measuring the vertical component of motion appear restricted to the one single pattern of the coiled-spring suspension. The Wiechert, Galitzin, and the latest Benioff vertical seismometers all follow the same general design, which involves several inherent imperfections, as Sohon, Irland, and many others have pointed out.

In his "Study of some seismometers" (see Geophys. Abstracts 72, no. 2406) Irland describes several types of shore-period vertical seismometers that are comparatively free of the coiled-spring defects. One of these is the so-called solenoid type, in which an iron plunger, as inertia mass, is suspended in the magnetic field of a vertical solenoid. The performance of this type was found to be excellent for short-period applications, but the method had to be abandoned because of the inconstancy of the battery current. The slightest change in temperature of the solenoid or of the battery voltage caused excessive shifting of the zero position and constants of the instrument. Instead of the solenoid, a contrivance has been tried in which a permanent bar magnet as inertia mass was enclosed in a chemical flask and floated vertically in oil. The upper end of the magnet was attracted slightly upward toward the iron core, which was connected to a galvanometer. The period of the magnet was about 3 seconds when quite heavily damped by the oil. The system was self-leveling, but it was found that no amount of shielding would correct its high sensitivity to stray magnetic fields. It turned out to be a sensitive magnetometer, recording every short-period magnetic disturbance in the neighborhood.—*Author's abstract.*

3996. Ewing, Maurice, Crary, A. P., and Rutherford, H. N., Geophysical investigations in the emerged and submerged Atlantic Coastal Plain, methods and results: Geol. Soc. America Bull., vol. 48, no. 6, pp. 753–802, 1937.

The paper describes the development and application of a seismic method for making studies of submarine geology. Refraction measurements were made on the Cape Henry section, Virginia; Woods Hole section, Massachusetts; and at Mathews, Virginia. Seismic reflection measurements were made also on land at Mathews and Hampton, Virginia, and at sea at stations shown on a map. The author summarizes as follows: The refraction seismograph and the reflection seismograph were successfully adapted for work at sea in depths up to 100 fathoms. Refraction measurements on land and at sea near Cape Henry and Woods Hole determined the configuration of the surface of the basement crystalline rocks from the foot of the Piedmont Plateau to the edge of the Continental Shelf. The thickness of unconsolidated and semiconsolidated material (velocity of longitudinal waves about 8,000 ft./sec.) near the edge of Continental Shelf was found to be about 12,000 feet.—*W. A.*

3997. Gabriel, V. G., Seismic prospecting in exploration for oil: Louisiana Conservation Review, vol. 5, no. 4, pp. 4–8, 1937.

A brief description of principles employed in seismic prospecting, with a table showing the velocity of propagation of elastic waves through different media.—*W. A.*

3998. Gassmann, F., Seismische Bestimmung einer reflektierenden Ebene [Seismic determination of a reflecting plane]: Beitr. angew. Geophysik, vol. 7, no. 1, pp. 17–20, Leipzig, 1937.

Assuming that the elastic waves proceeding from a point of explosion are reflected from a plane of unknown position, and that the velocity of propagation and the travel-times of these waves to the three suitably placed seismometers are known, a method is given for deducing the position of the plane that reflects these waves.—*Author's abstract, translated by W. A.*

3999. Gilmore, M. H., Earthquake investigations: Geophysics, vol. 2, no. 3, pp. 253–264, Houston, 1937.

Earthquakes are a menace to life and property, but they are also a source of important scientific knowledge, for they give us information about the interior of the earth which we can obtain in no other way. The United States Coast and Geodetic Survey has developed instruments for the recording of strong earth motions; has recorded tilt of large areas; has determined dominant periods of buildings, of water towers, of dams, and of the ground; and has made special studies of a statistical nature about these phenomena.—*Author's abstract.*

4000. Heiland, C. A., Note on reflections from steeply dipping beds: Geophysics, vol. 1, no. 2, pp. 257–270, 1936.

A brief report is given of some experimental work on known geologic conditions conducted by the Pioneer Company in southeastern Poland. This is a region of steep dips, severe folding, overthrusts, and step-faulting. The geologic conditions are first described, and this is followed by a discussion of the mathematical and physical aspects of the problem. It is pointed out that the problem is essentially one of three dimensions. Its solution ordinarily demands that the azimuth of shooting, in relation to strike, and the travel-time relations at right angles to the strike, be known. But for the steep dips encountered in mountainous country, this is not always possible. Then the time gradient is a convenient criterion of the dip component in the direction of shooting. The problem is reduced to one of finding the time gradient in the direction of maximum dip. Curves of the time gradients are given for horizontal and for dipping beds. The method is applied to selected records and found to work well. The conclusion is reached that, where shots in different azimuths are impossible, there is an optimum azimuth, just as there is an optimum spread; but it may take much experimentation to determine where this azimuth is.—*Author's abstract.*

4001. Hodgson, J. H., On the differential coefficients in Geiger's method of locating epicenters: Seismol. Soc. America Bull., vol. 27, no. 2, pp. 73–96, Berkeley, 1937.

In applying Geiger's least-square method to determine the position of an epicenter, a preliminary location having geocentric coordinates φ_c λ_c is chosen, and the most probable values of errors are deter-

mined. In the course of the computation, the partial derivatives $\frac{\partial \Delta}{\partial \varphi_e}$, $\frac{\partial \Delta}{\partial \lambda_e}$ are required for each station, Δ being the distance from the station to the preliminary epicenter. It is shown that the true value of the differential coefficients may be determined much more easily than by the method in general use suggested by Geiger, and it is also shown that the approximation by a ratio of increments is, in some critical cases, an extremely poor one.—*W. A.*

4002. Ishimoto, Mishio, and Iida, Kumizi, Determination of elastic constants of soils by means of vibration methods, part 2, Modules of rigidity and Poisson's ratio: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 1, pp. 67–85, 1937.

Elastic properties, such as the moduli of rigidity and Poisson's ratio for the same kinds of soils as those adopted in the previous paper (Geophys. Abstracts 89, no. 3709) are studied. The method is briefly examined. Two types of apparatus used are described and a schematic diagram of their arrangement is shown.—*W. A.*

4003. Jameson, M. H., Wave fronts encountered in weathering determinations: Mines Mag., vol. 27, no. 9, pp. 16–17, Denver, 1937.

A wave front is defined as a surface, usually curved, which a given phase of a seismic impulse occupies at any given time. A wave-front diagram is a drawing illustrating a series of wave fronts at successive occurrences. The purpose of the article is to illustrate the possibilities of wave-front diagrams as an aid in picturing these problems. The wave-front diagrams examined illustrate the relation existing between refracted and direct energy encountered in single and double layer problems. From such diagrams it is seen why breaks occur in travel-time curves as detected on the surface.—*W. A.*

4004. Jeffreys, Harold, The ellipticity correction to the P table: Royal Astron. Soc. Monthly Notices, Geophys. Suppl., vol. 4, no. 2, pp. 164–184, London, 1937.

The results given in Bullen's tables are discussed in detail, and shown to be probably as nearly accurate as present knowledge allows. These results show the earth to be much more symmetrical, at least for continental epicenters, than geological considerations would seem to imply. Further observations comparing travel times of continental and submarine earthquakes are specially desirable.—*C. A. S., Sci. Abstracts, vol. 40, no. 476, 1937.*

4005. Jeffreys, Harold, Reliability of Pacific seismological stations: Nature, vol. 140, no. 3536, pp. 237–238, London, 1937.

In a former paper (Royal Astron. Soc., Monthly Notices, Geophys. Suppl., vol. 3, April 1936; see Geophys. Abstracts, 87, no. 3329) Jeffreys gave a comparison of the accuracies of seismological stations based on the residuals for *P* in the International Seismological Summary.

A large number of epicenters of Pacific earthquakes are redetermined in the present article, taking into account the ellipticity of the earth, with the result of a great improvement in the reliability.—*W. A.*

4006. Jones, J. H., A seismic reflection survey in eastern England [abstract of paper presented at 2d Petroleum Congress, Paris, June 14–19, 1937]: Petroleum World, vol. 34, no. 442, p. 164, London, 1937.

In this paper an account is given of a seismic reflection traverse in an east-west direction across Nottinghamshire and Lincolnshire. The

purpose of the survey was to delineate the surface of the carboniferous limestone, the depth of which was known at one point. The reflection equipment was made by Marconi, and the geophones by the Cambridge Instrument Co. The charge of gelignite was usually exploded below the weathered layer in shot holes drilled to a depth of 50 to 60 feet with a portable rotary drill, while the geophones were placed at a mean distance of 2,000 feet from the explosion point. The paper outlines a method by which the depth and inclination of the reflecting surface can be determined directly from the data obtained from the reflection seismograms. The corelation of the reflections along the traverse indicates a good reflecting horizon at an average depth of 2,800 feet, which corresponds closely with the depth of the Carboniferous limestone, at the point where it is known. On this evidence the good reflecting horizon has been identified as the top of the Carboniferous limestone.

4007. Kinosita, Zyuniti, Some experiments on the generation and propagation of elastic waves: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 1, pp. 41–49, 1937.

Experiments are described on the generation and propagation of distortional waves along metallic wires loaded at equal intervals with pieces of wood in order to diminish the velocity of propagation. The following results were noted: (1) Energy of wave generated from the release of statical strain is equal to the energy of the statical strain then released; (2) forms of waves generated from the release of statical strains or by the action of the impulsive forces at a part of one dimensional medium were found. Special attention was paid to the mechanism by which waves of shock type were generated.—*W. A.*

4008. Köhler, Reinhard, Beitrag zur Deutung der verschiedenen Wellengruppen in Seismogramm von Sprengungen [Contribution to the interpretation of various groups of waves in seismograms produced by blasts]: Gesell. Wiss. Göttingen Nachr., Math.-Physical Kl., neue Folge, Fachgruppe 2, vol. 2, no. 13, pp. 145–165, 1936.

Groups of waves which appear on the seismographic records of blasts and which separate gradually with increasing distance are interpreted. Ten seismograms made in the valley of the Leine River near Göttingen with a Wiechert vertical vibration meter of 25,000 magnification and a free period of 1/14 second were used.—*W. A.*

4009. Leet, L. D., A plutonic phase in seismic prospecting: Seismol. Soc. America Bull., vol. 2, no. 2, pp. 97–98, Berkeley, 1937.

The phase *pP* has been well recorded from plutonic, or deep-focus earthquakes. The occurrence of this same phase has been observed in certain seismic prospecting operations. Records taken in a well at depths from 3,500 to 5,790 feet are shown.—*W. A.*

4010. Macelwane, J. B., and Dahm, C. G., Revised travel-time tables: Union géod. géophys. internat., Assoc. seismologie, ser. A, no. 15, pp. 87–92, 1937.

A comparison of the Dahm (Long Beach), Angenheister (Tonga-Samoa), Jeffreys-Bullen, and Macelwane time-distance curves with the Hodgson (Tango) curve is given in a figure.

Differences between the Mohorovičic travel-times and those of Hodgson and Jeffreys-Bullen in the range of 30°–80° are shown in a table. In another table are listed Angenheister's travel-times, the reduced

travel-times, and the difference between these latter and the times for the Tango earthquake as given by Hodgson. These differences are represented by a curve.

Both the Jeffrey-Bullen and Macelwane curves are shown to lie between the Angenheister (Pacific) curve and the Dahm (Long Beach-continental) curve. This seems to signify that the difference between the time-distance curves of individual earthquakes of the same focal depth but in different regions may be much greater than the differences between our present average curves. Therefore, concentration on the study of individual earthquakes by means of the actual records from all the good stations of the world is recommended.—*W. A.*

4011. McComb, H. E., and Ruge, A. C., Tests of earthquake accelerometers on a shaking table: Seismol. Soc. America Bull., vol. 27, no. 4, pp. 325–331, 1937.

In order to determine the degree of accuracy with which accelerograms of earthquake motions may be interpreted, the Massachusetts Institute of Technology and the United States Coast and Geodetic Survey are engaged in a cooperative investigation involving shaking-table experiments and subsequent interpretation of the records, which are similar in character to those recorded during an actual earthquake. This paper constitutes a report on the work done to date and attempts to outline the trend of the investigation. It may be matter of months before the final results are obtained, since the interpretation of the records involves a considerable amount of time, patience, and careful work, with only limited personnel available for the purpose. It is the hope of both of the organizations taking part in these investigations that the results will serve to enhance the engineering and scientific value of the Program of Investigation of Strong Seismic Motion.—*Author's abstract.*

4012. Miller, B. L., Geophysical investigations in the emerged and submerged Atlantic Coastal Plain, geological significance of the geophysical data: Geol. Soc. America Bull., vol. 48, no. 6, pp. 803–812, 1937.

This paper is concerned with the geological interpretation of results obtained in a geophysical investigation made by Ewing, Crary, and Rutherford (see abstract 3996). Ewing's paper indicates three different kinds of rocks composing the submerged portion of the Coastal Plain, in which the seismic vibrations have different speeds. The deepest rocks transmit the vibrations at the rate of 17,000 to 20,000 feet per second; above them is a zone of rocks in which the speed is 6,500 to 8,500 ft./sec.; in the upper zone the speed is 5,000 to 6,000 ft./sec. The following tentative geologic explanations are proposed: (1) The rocks with the greatest vibration speed are crystalline rocks of the type well exposed in the Piedmont Plateau. (2) The two zones of probable sediments overlying the basement crystallines represent two distinct geologic periods: the upper zone, with seismic-wave velocities of 5,000 to 6,000 ft./sec., is apparently composed of less consolidated and presumably, younger sediments than the underlying strata with seismic velocity of 6,500 to 8,500 ft./sec. The age of the strata of these two zones is problematical at this time. (3) It is suggested that at Camp Lee and Youngbloods store, where the velocities were 12,000 to 13,000 ft./sec., there may be an area of Triassic (Newark) rocks, now concealed by the Coastal Plain formations. (4) In addition to the

foregoing interpretations, these new geophysical observations supply data that can be used in the consideration of some of the more theoretical problems of North American geology. Among these is an explanation of the manner of disappearance of Appalachia. (5) The results of the geophysical observations also throw some light on the question of the submerged canyons of the Continental Shelf along the eastern side of North America.—*W. A.*

4013. Mitera, Z., Problems of application of seismic reflection methods in the Polish eastern Carpathian Mountains in the light of present investigagations [in Polish]: Polskiego Towarzystwa Geologicznego Rocznik, vol. 12, pp. 1–21, Krakow, 1936.

Velocities of elastic waves for most typical Carpathian formations are tabulated. The examination of these velocities indicates that, with exception of the Cretaceous beds, the strata do not show great differences in the magnitude of their velocities, thus making the conditions for the reflection work unfavorable. Another difficulty arises from the steep dips usually found in the geologic structure of the Carpathian Mountains. The results obtained are shown in the reflection profiles and seismograms of various regions.

Better conditions for the seismic reflection work were found in the Sub-Carpathian Depression, between the Carpathian Range and the Podolian Plateau, where in most places soft beds of clays, shales, and sand were found in contact with much harder formations. A typical reflection record from this area is given.—*W. A.*

4014. Mitera, Z., Studies on seismic methods of prospecting and their application in exploration for oil in Poland [abstract of paper presented at 2d Petroleum Congress, Paris, June 14–19, 1937]: Petroleum World, vol. 34, no. 442, p. 165, London, 1937.

Oil production in Poland has constantly decreased, and it has become necessary to try to discover new fields. Credit for the initial work belongs to the Pioneer Co., which has been foremost in introducing in the prospecting work the different methods, such as magnetic, seismic, gravimetric, and electrical. Utilization of these methods has shown that in some regions the seismic method gives the best results for the smaller features of the tectonics. Seismic research to the end of 1936 has yielded valuable results. The reflection method has not given satisfactory results in the Karpathic region. In the Tortonian region better results have been obtained, as in this geologic province there exists an excellent seismic stratum, which enables the prospectors to correlate a key bed. This seismic stratum has been studied over an area of about 11,000 kilometers. Characteristic examples are given of the working of the seismic reflective method in the Karpathians as well as in the Tortonian zone of the foreland.—*Abstract revised by W. A.*

4015. Mott-Smith, M., Adverse effects associated with variably compounded seismograph records: Geophysics, vol. 2, no. 3, pp. 265–294, Houston, 1937.

Although the method of variably compounded seismic reflection records in order to secure so-called "controlled directional sensitivity" has distinct advantages over the more generally used fixed compounding or so-called "multiple recording" and other methods, a simple graphic analysis shows that this "variable compounding" also involves the

introduction of adverse effects. Among these are a less directional sensitivity, the production of artificial "noise" which is added to that picked up from the ground, and the magnification of minor waves which the analyzer picks out at random. This graphic analysis shows that, if the two waves arrive simultaneously from different directions, they can be separated if they differ sufficiently in direction and not too much in amplitude. Exception is taken to the use of the term "diffraction" as applied to the wave scattered from the edge of a fault. The method is shown to be superior only in certain special cases, which are, perhaps, rather few.—*Author's abstract.*

4016. zur Mühlen, W. von, Über einige Probleme der angewandten Seismik [On some problems of applied seismics]: Oel und Kohle, vol. 13, no. 33, pp. 819–821, Berlin, 1937.

Experience obtained and problems involved in the application of seismic refraction work during the governmental geophysical survey of Germany are discussed. Tables showing the increase of the velocities of longitudinal waves with the increase of depth are given. Difficulties in representing seismic results in the form of lines of depth are examined.—*W. A.*

4017. Nasu, Nobuji, Hagiwara, Takahiro, and Omote, Syunitiro, Studies on the propagation of the artificial earthquake waves through superficial soil or sand layers and the elasticity of soil and sand [in Japanese]: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 1, pp. 87–89, 1937.

Comparison of the results of seismic prospecting with those of borings made at Sirakawa.

The travel-times of the waves sR_2 reflected from the surface of the bedrock, which is agglomerate in this case, are shown in a table. The depths of the bedrock determined by the seismic method at two places were 57 m and 51 m. The result of the boring shows that the depth of the bedrock is 51.5 m from the ground surface at a place near point one, but the ground where the boring was made is 2 to 3 m lower. The columnar section of the superficial layers determined by boring is shown in a figure.—*Author's English abstract.*

4018. Niethammer, T., Der Basler universal Seismograph [Basle universal seismograph]: Gerlands Beitr. Geophys., vol. 50, no. 2–4, pp. 307–317.

The mathematical theory of the universal seismograph with a modified Quervain-Piccard's construction installed in the seismological station of the University of Basle is given.—*W. A.*

4019. Oddone, Emilio, Sur les ondes qui, entre 30° et 80° de distance épicentrale, suivent immédiatement les P_n [Waves following P_n at 30° to 80° from epicenter]: Union géod. géophys. internat., Assoc. Séismologie, ser. A, no. 15, pp. 71–86, 1937.

Possible explanation of the retardation exhibited by the waves that follow P_n, as compared therewith, are discussed (*a*) on the theory that this is due to reflection and/or refraction of various layers of discontinuity with some suggestions as to where these are and (*b*) on the theory that they may be due to the time occupied in the movement of magma or the accompanying gases, the commencement of which caused the first shock.—*C. A. S., Sci. Abstracts, vol. 40, no. 478, 1937.*

4020. Pirson, S. J., The correlation method of seismographing for oil: Oil Weekly, vol. 87, no. 2, pp. 24–44, 1937.

In a previous article (see Geophys. Abstracts 90, no. 3856) concerning the dip-shooting method as applied to the survey of oil-bearing territories, the principles underlying the generation of elastic waves by the explosion of a charge of dynamite confined at the surface of the ground were described. For all practical purposes longitudinal waves are those used to date in the interpretation of seismographic data. The possibility of using transverse waves to determine the weathering correction and for study of porosity and degree of bed consolidation is considered. As the sedimentary formations in which the petroleum accumulations are found are commonly made up of alternating hard and soft formations which are laterally continuous, it is considered possible to obtain seismic records which will show a succession of reflected bursts of energy. The seismograms obtained by correlation shooting are comparable to driller's logs, which it is necessary to shift and line up according to their most probable correlation. In this article the author discusses field operation used in correlating seismograph work, propagation velocities, angularity correction, anisotropy correction, weathering corrections, elevation correction, ground roll, correlation of seismic records, and depth calculations. The article includes 14 figures and 5 tables.—*W. A.*

4021. Reich, H., Erfahrungen mit dem seismischen Refraktionsverfahren bei der geophysikalischen Reichsaufnahme [Seismic refraction methods in the geophysical survey of Germany]: Beitr. angew. Geophysik, vol. 7, no. 1, pp. 1–16, Leipzig, 1937.

A combination of dispersed and linear shots with refraction measurements was found to be the most suitable method in carrying on regional seismic investigations of Germany. Distinct relation was found between the velocity of propagation and depth in the upper chalk layers. The speed increased from 200 m./sec. near the surface to 4,000 m./sec. at depth of 1,200 m, the stratigraphic horizon remaining approximately without change. To represent the structures a time plan was adopted according to which the times taken to travel 4 km were recorded. Linear relation between these travel-times of 4 km and the depth of the upper chalk was found. The results are discussed in detail.—*Author's abstract, translated by W. A.*

4022. Ruge, A. C., and McComb, H. E., Preliminary report on a photoelectric pendulum control for recorder clocks: Seismol. Soc. America Bull., vol. 27, no. 4, pp. 331–336, 1937.

At seismograph stations where constant-frequency alternating current is not available, the recording drums of seismographs are generally driven by some kind of clock mechanism, powered by springs or falling weights. The time marks are placed on the records at intervals (usually 1 minute) by well-regulated pendulum clocks which may be checked frequently by radio time signals.

This paper describes a method for the elimination of irregularity of motion of rotation of photographic records. In this system a relay replaces the balance wheel and escapement of the driving clock. Power to operate the relay is obtained from a one-tube amplifier which is controlled by a photo tube. A slotted shield attached to a pendulum clock passes between the photo tube and a light source at

each oscillation of the pendulum. Any whole number of power impulses per pendulum cycle can be obtained by proper arrangement of the slots in the shield. With 4 to 6 cycles per second the resulting records seem to be quite satisfactory for a paper speed of 15 mm per second.—*Author's abstract.*

4023. Scherbatskoy, S. A., and Neufeld, J., Fundamental relations in seismometry: Geophysics, vol. 2, no. 3, pp. 188–212, Houston, 1937.

The equations for dynamical equilibrium of a geophone are derived by means of the Lagrange method and applied to the particular cases of a moving armature geophone, moving conductor, geophone, and electrostatic geophone. The galvanometer for seismic recording is usually of the moving coil type and its equations are similar to those of a moving conductor geophone.

The magnetic type geophone as well as the galvanometer consists essentially of two dynamical systems characterized by an asymmetric coupling—"the transducing resistance." A brief analysis is given of the problem of determining the response of a seismograph to a given earth motion.—*Author's abstract.*

4024. Scherbatskoy, S. A., and Neufeld, J., Equivalent electrical networks of some seismographs: Geophysics, vol. 2, no. 3, pp. 213–242, Houston, 1937.

The magnetic and electrostatic geophones are represented by means of "equivalent electrical circuits" which consist of linear networks, the characteristics of which are such as to give an external behavior identical to that of a geophone.

Various types of seismographs are considered from the standpoint of equivalent electrical networks, and a few typical cases are treated quantitatively.—*Authors' abstract.*

4025. Sezawa, Katsutada, and Kanai, Kiyoshi, Resonance phenomena and dissipation waves in the stationary vibrations of a semi-infinite body: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 1, pp. 1–12, 1937.

It is shown that, if certain periodic surface disturbances are distributed in a special way in a certain area of the surface of a semi-infinite body, they will excite a standing vibration of the body, at least within the area of disturbances, so long as the frequency of the disturbances is relatively low, in spite of the prevalent belief that the surface vibration of a semi-infinite body caused by usual disturbances of a local type is present only in the form of propagated waves.

A mathematical discussion is given.—*W. A.*

4026. Sezawa, Katsutada, and Kanai, Kiyoshi, Resonance phenomena and dissipation waves in the stationary vibration of the surface of a spherical cavity: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 5, no. 1, pp. 13–20, 1937.

In connection with the discussion of the possibility of resonance phenomena in the stationary vibration of a semi-infinite body (see abstract 4025) the question is considered whether or not such a resonance condition is possible also in the forced stationary vibration of the surface of a spherical cavity, and it is concluded that when the wave length of the standing vibration is very short compared with the radius of the

sphere a resonance condition is possible, as the problem is virtually the same as that for a semi-infinite body. The problem of a finite number of wave lengths of vibration along the spherical surface of the cavity, however, is different. In this case, the distance from one nodal surface of the vibration to the next increases with increase in radial distance from the cavity, the result being that the wave energy is likely to dissipate outward. From the mathematical examination it is shown that for a certain value of the frequency in the vibration there still exists a resonance-like condition such that the displacement of the movement becomes relatively large.—*W. A.*

4027. Sezawa, Katsutada, and Kanai, Kiyoshi, A method of minimizing the seismic vibrations of a structure: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 1, pp. 21–32, 1937.

Two practical ways of flattening the resonance curve of the vibration of a building are proposed, one being to render more effective the dissipation of vibrational energy into the ground, and the other to install a vibration damper within the building. The vibration damper proposed is a coupled oscillator with viscous damping. Theoretical characteristics of such an apparatus are discussed.—*W. A.*

4028. Sezawa, Katsutada, and Kanai, Kiyoshi, Further studies on the seismic vibrations of a gozyunoto [pagoda]: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 1, pp. 33–40, 1937.

The problem of the earthquake-proof properties of a gozyunoto discussed in a previous paper (see Geophys. abstracts 89, no. 3726) is reinvestigated. Numerical examples are given.—*W. A.*

4029. Sezawa, Katsutada, and Kanai, Kiyoshi, Elastic deformation of a stratified body subjected to vertical surface loads: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 2, pp. 359–369, 1937.

The deformation of a stratified body under vertical loads, distributed in whatever way, is virtually the same as the resultant in the superposition of different deformations each of which is caused by a point load. Since the problem of the deformation of a body of any stratification that is subject to a point load is the same as that of a semi-infinite body, the deformation due to any point load is always directed downward.

A mathematical discussion of the problem is given.—*W. A.*

4030. Sezawa, Katsutada, and Kanai, Kiyoshi, Energy dissipation in vibrations of a bridge, I: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 2, pp. 385–393, 1937.

A case is considered in which the position of the exciting force is fixed exactly at the middle point of a bridge span, by means of which it is still possible to ascertain the qualitative nature of the energy dissipation. A mathematical theory is derived and a numerical example and its interpretation are given.—*W. A.*

4031. Takahasi, K., On the effect of the block structure of the earth's crust on the propagation of seismic waves [in Japanese]: Meteorol. Soc. Japan Jour., vol. 15, pp. 118–133, Tokyo, 1937.

From the standpoint that the earth's crust is made up of blocks, the author has obtained the following results: (1) From the deviation of the so-called Omori's coefficient (ratio of the epicentral distance to

the travel-time) from its mean value, the size of blocks is found to be 10 to 40 km in shallower layers of the crust and 400 to 1,000 km in deeper layers. (2) The anisotropic property of the crust found from the above standpoint explains the anomalous propagation of seismic waves: (3) From the dispersive nature of the crust the equation for the propagation of seismic waves in one dimension becomes the telegraphic equation, the equation for visco-elastic medium, or the like, according to the special assumptions made. (4) The propagation of the seismic energy cannot fully be explained by the block structure of the crust alone, and its visco-elastic property must also be taken into account. (5) The equation for the propagation of seismic energy is the same in form as that for the conduction of heat, and it can explain fairly well the decrease of energy of seismic waves with the time and the decrease of amplitudes of pulsation with the distance from the disturbing center.—*Y. Kodaira, Zentralblatt Geoph., Meteor., u. Geod., vol. 1, no. 4, 1937.*

4032. Trappe, Fr., Beiträge zur Anwendung der Reflexionsmethode in Deutschland [Contributions to the application of the reflection method in Germany]: Oel und Kohle, vol. 13, no. 30, pp. 757–758, Berlin, 1937.

A brief outline on the various problems occurring in connection with the investigation of the subsoil in Germany by the reflection method is given. Successful application of the method is considered to be possible only if suitable problems are chosen and measurements are made carefully.

Cooperation of geologists and geophysicists is important.—*W. A.*

4033. Wanner, E., Zur Statistik der Erdeben, I and II [Earthquake statistics, parts 1 and 2]: Gerlands Beitr. Geophysik, vol. 50, nos. 1 and 2–4, pp. 85–99 and 223–228, Leipzig, 1937.

Earthquakes contained in the Oxford Catalogue of Earthquakes, 1925–30, are investigated and it is shown that if the after shocks are eliminated the earthquakes are independent of one another. No phenomenon is apparent which can start earthquakes simultaneously over the whole globe, and the occurrence of "relay-earthquakes" is unimportant. This lack of interrelationship, which appears to be clearly established for the earth as a whole, is not so certain over smaller areas, such as for the closely spaced earthquakes of central Europe, and more investigations in such regions are needed.

Tables showing the time intervals between the phenomena succeeding one another and tables showing the difference in calculated and observed values are given.—*W. A.*

4034. Washburn, H. W., Experimental determination of the transient characteristics of seismograph apparatus: Geophysics, vol. 2, no. 3, pp. 243–252, Houston, 1937.

A method of experimentally determining the transient response of seismometer, amplifier, and oscillograph is described. In the apparatus employed the earth motion is replaced by a transient wave generator and the seismometer by an equivalent electrical circuit.

Comparison of these laboratory data with field records has shown that accurate predictions can be made from laboratory tests.—*Author's abstract.*

4035. Yamaguti, Seiti, World distribution of "deep" earthquakes: Tokyo Imp. Univ., Earthquake Research Inst., Bull., vol. 15, no. 1, pp. 170–178, 1937.

Investigations are made to ascertain the vertical distribution of foci of "deep" earthquakes. Contour lines are drawn for focal depths $h \geqq 700$ km, 500–700 km, 300–500 km, and 100–300 km. Hypocentral "transfer" in vertical direction is discussed (1) for the world's "deep" earthquakes and (2) for the "felt" earthquakes in the Kwanto district. Finally, the periodicity of the world's "deep" earthquakes is investigated.—*W. A.*

4. ELECTRICAL METHODS

4036. Dostovalov, B. N., Measurements of dielectric constant (ϵ) and specific resistance (ρ) of rocks [in Russian]: Acad. Sci. U. R. S. S., Inst. Petrog., Travaux, no. 10, pp. 161–168, Moscow, 1937.

Petrovsky's theoretical foundation for deriving formulas (see abstract 4042) is used. The method of measurement is described and a schematical design of the apparatus is given. The results of measurements of ϵ and ρ of 67 samples of rocks are summarized in a table.—*W. A.*

4037. Fritsch, Volker, Neuere Forschungen auf dem Gebiete der Funkgeologie [Recent investigations on radiogeology]: Montan. Rundschau, vol. 29, no. 13, pp. 6–8, Berlin, 1937.

Reprint of article published in Petroleum Zeitschrift, vol. 33, no. 13, pp. 14–16, 1937 (see Geophys. abstracts 90, no. 3875).—*W. A.*

4038. Fritsch, Volker, Funkgeologie [Radiogeology]: Montan. Rundschau, vol. 29, no. 17, p. 20, Berlin, 1937.

A brief note on the application of radiogeology in practice (1) as a means of communication in mines when the telegraph lines are destroyed by accidents, (2) for radioprospecting (capacity method and absorption method).—*W. A.*

4039. Fritsch, Volker, Beiträge zur Funkgeologie, 5, Einige Untersuchungen über die Anwendung der Funkmutung nach dem sog. Kapazitätsverfahren [Contribution to radiogeology, 5, Investigations on the application of radioprospecting according to the so-called capacity method]: Beitr. angew. Geophysik, vol. 7, no. 1, pp. 53–67, Leipzig, 1937.

A number of measurements were carried out in the neighborhood of the Kotterbach mines in Western Slovakia. The so-called capacity method applied has been fully explained in previous papers. This paper describes a suitable measuring equipment. Some sources of error and means of avoiding them are pointed out. The influence of the weather upon the results is discussed, and the modes of correcting it are indicated. Designs of aerials based on experiments are described. Finally, a number of new curves and *C*-lines (places of equivalent capacity of the antenna) are given.—*Author's abstract.*

4040. Fritsch, Volker, Mitteilung über die Ergebnisse der in den Jahren 1930–36 auf der Donau durchgeführten Funkversuche [Information on the results of radio experiments carried out on the Danube in 1930–36]: Gerlands Beitr. Geophysik, vol. 51, no. 1, pp. 1–28, 1937.

In experiments on the Danube, between Passau in Bavaria and Russe in Bulgaria, conditions of propagation of radio waves of different

lengths along the river were examined in detail. The radiation diagram of a sender may be deformed by the course of a river or the existence of underground water. Special interest is attached to the distribution of radio fields in the narrow openings of the Danube in Schlögen (upper Austria) and Struden (frontier of upper and lower Austria) and in the cataracts near Turn Severin in Roumania. According to the experiments short waves were damped less intensively at these places than the long waves.—*W. A.*

4041. Krasnow, Shelley, Discovering underground conditions: The Constructor, pp. 16–19, August 1937.

The usefulness of geophysical methods of prospecting for discovering underground conditions prior to excavation work is stressed. The earth resistivity method, which, according to the author, lends itself best to this purpose is described briefly.—*W. A.*

4042. Petrovsky, A. A., Calculation of dielectric constant and specific resistivity from measurements of effective capacity and resistance [in Russian]: Acad. Sci. U. R. S. S., Inst. Petrog., Travaux, no. 10, pp. 153–160, Moscow, 1937.

The author describes a method of calculating the dielectric constant and specific resistivity of solid substances by means of high frequency apparatus. Displacement currents in the measuring condenser are considered without the samples and with the samples included. The equations derived for these two cases are combined. The solution of these equations gives formulas for effective resistance and capacity from which the dielectric constant ϵ and specific resistivity ρ may be calculated. A schematic diagram of the apparatus is given.—*W. A.*

4043. Rodionov, P. F., On the technique of the work applied to the method of a charged body and the method of isolines by using direct current [in Russian]: Razvedka Nedr, vol. 7, no. 14, pp. 42–48, Moscow, 1937.

The method of a charged body is based on the principle that the ore found in the ground by boring, or in a similar way, serves as the central electrode, the second electrode being put into the ground at a distance sufficiently great to avoid the interference of the ore body. The grounding of the electrodes and the making of observations is briefly described and the results of the survey made by this method are shown by an example. The method of isolines by using direct current is demonstrated in a second example.—*W. A.*

4044. Rudnev, V. N., Electrical coring in the oil-bearing region of southern Emba [in Russian]: Neftianoe Khoziaistvo, vol. 18, no. 7, pp. 64–69, Moscow, 1937.

Since 1934 electrical coring has been used in the region of southern Emba on a large scale. The general character of the structure of the ground is determined by electrical coring with sufficient accuracy. Data obtained at various places are briefly examined. The usefulness of electrical coring and its further application for studying the resistance of rocks of the region as well as for geological investigations is emphasized.—*W. A.*

4045. Smith, H. J., Geophysical survey of Sierra Vista mine, Eldorado County: California Min. Jour., vol. 6, no. 11, p. 4, Auburn, 1937.

A preliminary geophysical survey to determine whether or not the property contained other mineral deposits of any size or extent that

would warrant development and also to eliminate from a detailed survey any part that was barren or devoid of mineral. Natural current and self-potential methods were used. Two unknown mineralized areas were disclosed. Two very good veins were located and traced throughout their entire length of approximately 1,000 feet. Another vein system having a northwest-southeast trend with four separate veins was located and traced. At one location the depth to the ore body (140 feet) was determined by resistivity survey and proved by boring.—*W. A.*

4046. Thomeer, J. H. M., The application of Schlumberger electrical logging in oil-field operations [abstract of paper presented at the 2d Petroleum Congress, Paris, June 14–19, 1937]: Petroleum World, vol. 34, no. 442, p. 164, London, 1937.

The electrical well surveying method, developed by the Schlumberger brothers about 1928, has gradually taken its place as a part of regular routine operations in virtually all oil fields of the world. As far as the Royal Dutch Shell Group is concerned, the growing interest taken in this method during the last few years is briefly reviewed. In 1936 the number of runs performed had already risen to 1,264 in normal wells. The main advantage derived from Schlumberger logging has to be sought in the greatly improved possibilities of correct correlation and in the better structural interpretations resulting therefrom. In addition, valuable indications may also be obtained in regard to the productive prospects of reservoir rocks. Interpretations of this nature should, however, be made with caution and only by experienced subsurface engineers having a thorough knowledge of local field conditions. The interpretation of Schlumberger logs should belong to the routine work of the exploitation engineering staff, cooperating to this end with the Schlumberger Co.'s experts. Schlumberger surveys have now become an inseparable part of modern oil-field exploitation.

4047. Tölke, F., Die geophysikalische Baugrunduntersuchung unter besonderer Berücksichtigung der geoelektrischen Aufschlussverfahren [Geophysical investigation of building ground with special consideration of geoelectrical methods of prospecting]: Bauingenieur, vol. 18, pp. 271–294, 1937.

Most important of the geophysical methods used in testing ground for buildings are the electrical methods. Theoretical and practical bases for applying them are discussed. Knowledge obtained by practice is supplemented by the author's own mathematical calculations of electrical fields for special tectonic areas.—*W. A.*

4048. Walter, A. J. P., The probe electrode: Min. Mag., vol. 57, no. 3, pp. 148–157. London, 1937.

The probe electrode was devised and substituted for the usual stake electrode when encountering deep overburden in order to minimize or eliminate the effect produced by the overburden upon the stake or spike electrodes. The new electrode consists of a drawn steel tube, ⅜ inch in diameter and 10 to 12 feet in length. The tube is insulated by layers of insulating tape soaked in shellac. The tube is shod at both ends for a length of 5 to 6 inches with solid rounded iron points that screw into the tube. One end of the electrode is connected to its lead from the instrument in use, while the other end makes contact with the earth. The shoes are thickened for a length of 2½ to 3

inches to give about 1/10 inch clearance to the body of the insulated tube. In order that the electrode may penetrate the soil with ease, holes are previously "jumped down" by mild-steel probes of exactly the same shape as the electrode but of a slightly greater diameter, in order to give the necessary clearance, 1/16 inch being found sufficient. The electrode and probe are shown in figures.

Tests with probe electrodes in earth-sensitivity measurements are reviewed, and it is shown that an electrical survey becomes possible with the probes where it might be useless with the stake electrodes.—*W. A.*

4049. Whetton, J. T., The resistivity method applied to mining problems: Mine and Quarry Engineering, vol. 2, no. 1, pp. 24–28, London, 1937.

The application of the resistivity method is shown by a series of tests made by various scientists in (1) the 90-fathom fault at Marden, Northumberland; (2) Southern Rhodesia for investigation of underground water supplies; (3) Bridge River Tunnel exploration; (4) Sarran's dam site; (5) Oklahoma for electrical correlations between two wells, and (6) Estevelles (France) for determining the location of coal seams.

The potential ratio method is mentioned briefly. The conclusion is reached that the earth-resistivity method in geophysical surveying has justified its application and rendered appreciable service in a wide and varied field.—*W. A.*

5. RADIOACTIVE METHODS

4050. Chukovenkov, P. D., and Gavriusev, I. I., Radioactivity of soil air [in Russian]: Western Regional Sci.-Research Inst. Geofizika, no. 4, pp. 89–98, Smolensk, 1936.

Elster and Geitel's method of taking samples of soil air was used, and 26 observations were made. The content of emanation per liter of soil air is given in a table. The concentration of the emanation increased with the depth and was twice as great at the depth of 2 m as at 1 m. The dependence of the content of emanation upon atmospheric pressure, velocity of wind, and temperature of the atmosphere and of the soil was established and is shown graphically.—*W. A.*

4051. Chukovenkov, P. D., Radioactivity of fertilizer ores [in Russian]: Western Regional Sci.-Research Inst. Geofizika, no. 4, pp. 99–110, Smolensk, 1936.

Taking into consideration the important influence of radioactivity emanation on organisms, an investigation of the content of radium in a series of minerals was made. A list of 98 samples showing the location of the ore, characteristics of the mineral, and the content of radium is given. Radioactivity ranged from 0 to 68×10^{-10} percent, depending on the type of the mineral and its location. Phosphorites and apatites were found to have the highest radioactivity while the content of radioactive materials in chalk and marl was, as a rule, less than 10^{-13} grams of radium per gram of ore.—*W. A.*

4052. Garrigue, Hubert, Mesure de la radioactivité de l'air inclus dans la couche de neige, au voisinage du sol, en montague [Measurement of the radioactivity of the air enclosed inside of a snow layer near the ground in mountains]: Acad. sci. Paris, Comptes rendus, vol. 205, no. 8, pp. 420–422, 1937.

From the observations made by the author previously at the observatory of Pic-du-Midi it was established that the air close under

the layer of snow at the summit may contain up to 10^{-9} curie of radon per liter at normal pressure (see Geophys. Abstracts 88, no. 3618). In order to verify this phenomenon further observations were conducted at various places, and the results of a series of measurements made from May 3 to 9, 1937, in the region of Lake Bleu at the Pic-du-Midi are presented in a table.

The hypothesis that the action of winds produces the highest effect on the circulation of radon and of the accumulation of it below the snow in the mountains is confirmed by the new data given in the table; the content of radon in the air enclosed in the snow layer near the soil on the top of the mountain, a defile, or a peak, increases when the wind blows against the most abrupt face (least covered with snow) of the mountain. The interpretation of the results of measurements made in valleys and on slopes of mountains is uncertain.—*W. A.*

4053. Merkulova, E. S., Emanation of radium from the ground according to observations made in Slutsk [in Russian]: Information book on terrestrial magnetism and electricity, no. 3, pp. 52–54, Leningrad, 1937.

Tables are given showing the results of tests made in Slutsk on radium emanation from the ground under the following conditions: (1) On the surface of the snow; (2) in a hole made in the snow before the test; (3) on a surface of the ground free of snow during the whole winter; (4) on the surface of the ground frozen after the thawing of the snow. Other tests were made during the summer: (1) On the surface of ground covered with grass; (2) on the surface of ground free of vegetation; and (3) on a walk covered with rubble. The great influence of grass, snow, and humidity on the emanation was established. In spring, when snow was thawing, there was no emanation.—*W. A.*

4054. Priebsch, J. A., Radinger, G., and Dymek, P. L., Untersuchungen über den Radiumemanationsgehalt der Freiluft in Innsbruck und auf dem Hafelekar (2,300 m) [Investigation of the content of radium emanation in the free air in Innsbruck and on the Hafelekar (2,300 m)]: Gerlands Beitr. Geophysik, vol. 50, no. 1, pp. 55–77, Leipzig, 1937.

A comparison based on observations made in 1935 and 1936, in Innsbruck (580 m above sea level) and on the Hafelekar (2,300 m), of the radioactive conditions of free air during the colder season of the year.—*W. A.*

4055. Rothé, Edmond, and Kopcewicz, Th., Comparaison de la radioactivité de roches d' Alsace par la méthode des tubes compteurs [Comparison of radioactivity of rocks of Alsace by the method of tube counters]: Acad. Sci. Paris, Comptes rendus, vol. 205, no. 2, pp. 165–167, 1937.

A Geiger-Muller counter is used for comparing the radioactivity of rocks in laboratories, the samples of which are taken from various places. The arrangement in which the counter is protected from parasitic radiation by Pb screens is briefly described. The ratio of the radioactivities of granite from Brifosse and of rhyolite from Rosskopf was determined to be 1.48. Comparison with standard amounts of radiferous $BaCl_2$ shows the actual content of radioactive matter in the granite and rhyolite to be equivalent to 32.9×10^{-12} and 22.1×10^{-12} grams of radium respectively.—*W. A.*

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4056. Shpak, V. A., Une nouvelle méthode de différencier les roches du sondage à l'aide du compteur des gamma-impulsions [A new method for differentiating the rocks in boreholes by means of a gamma-impulse counter]: Acad. Sci. U. R. S. S., Comptes Rendus, vol. 16, no. 2, pp. 109–112, 1937.

Basing his experiments on the fact that radioactive elements enter into the composition of all the rocks of the earth's crust the author developed a method of "radioactive coring" or "gamma coring." This method may be applied in addition to the electric coring, as by the latter only the electrical properties of rocks can be determined. A Geiger-Muller counter is used. A description of the apparatus and a schematic design of it are given. The method was successfully tested in the boreholes of the Syzran oil-bearing region.—*W. A.*

6. GEOTHERMAL METHODS

4057. Koenigsberger, J. G., Goethermische Messungen in Bergwerken und Übersicht über die Ergebnisse der Geothermik [Geothermal measurements in mines and a review of the results in geothermics]: Beitr. angew. Geophysik, vol. 7, no. 1, pp. 68–83, Leipzig, 1937.

A brief review of the results of geothermal measurements since 1910 is given. Values of the geothermal gradient range from 130 to 0.01 m/1° F. but are distributed casually. The relationship of the geothermal gradient to the heat conductivity of rocks is examined. In considering the recent geothermal measurements carried out by Quiring in ironstone mines and ore mines of the Rhine Mountains (Geophys. Abstracts 83, no. 3072) the question is raised how far these measurements may be used for determining the geothermal gradient. As the rocks in mines have been cooled by ventilation for many years, the values observed in mines are higher than those in boreholes measured under the same conditions; also, as the values of the geothermal gradients differ greatly, correct appraisal of them is not possible. Measurements in boreholes 1 km to 2 km distant from the mines are therefore recommended for comparison.—*W. A.*

4058. Lang, W. B., Geologic significance of a geothermal gradient curve: Am. Assoc. Petroleum Geologists Bull., vol. 21, no. 9, pp. 1193–1205, 1937.

The Getty-Dooley Well No. 7 in Eddy County, New Mexico, was drilled to a depth of 6,683 feet and passed through a thick section of Permian rocks, including the Rustler, Salado, Carlsbad, Capitan, Delaware Mountain, and into the top of the Bone Spring limestone. This stratigraphic section is divisible into three lithologic units—the Rustler-Salado, the Carlsbad-Capitan, and the Delaware Mountain unit. The subnormal geothermal-gradient curve for this well is also divisible into three parts and these subordinate gradients coincide with the lithologic divisions. Other possible factors that might cause the fundamental variations in the geothermal-gradient curve, such as water, heat reactions from solution, igneous intrusions, and radioactivity, are wanting to explain the character of the curve. The radioactive heat of potassium is also found insufficient to affect the gradients of the Permian basin. It is therefore concluded that this subnormal geothermal gradient curve owes its form to the different conductivities of the successive layers of rock.—*Author's abstract.*

4059. Van Orstrand, C. E., On the estimation of temperatures at moderate depths in the crust of the earth: Am. Geophysical Union, 18th Ann. Meeting, Trans., pp. 21–33, 1937.

In the introduction to the article the author writes: "The modern deep well makes it possible to determine the temperatures of the rocks to depths exceeding 2 miles, and the rock samples obtained at these great depths enable the geologist to estimate the depths to the deeply-buried basement rocks to a rather high degree of precision. The latter estimates are now being supplemented to a certain extent by the precision-measurements of the geophysicist, so that reliable data seem to be assured even in those areas in which the basement rocks are not reached by the drill. With these two sources of information at our disposal—accurate temperature measurements and reliable estimates of measurements of depths to bed rock—it should be possible to construct a rather accurate subsurface map showing the temperatures on the boundary surface between the sedimentaries and the basement floor. In this paper it is proposed chiefly to outline the method of procedure by making some rough calculations of the temperatures at great depths for a few locations in the United States and for one location near Carnarvon, Cape Province, South Africa."

Observed temperatures in some wells of great depth, reciprocal geothermal gradients in New York, Pennsylvania, and West Virginia, summary of temperature data, and estimated temperatures and differences between means, are given in four tables; depth-temperature curves, geothermal and contour maps, and isogeothermal surfaces of the locations investigated are shown in a series of diagrams.—*W. A.*

7. UNCLASSIFIED METHODS

4060. Barsch, O., Der Aufbau der geophysikalischen Reichsaufnahme [Organization of the geophysical survey of Germany]: Oel und Kohle, vol. 13, no. 25, pp. 641–644, Berlin, 1937.

The need for a geophysical survey of Germany is stated. The methods of investigation and their applicability to the problems involved are discussed. Essential laboratory work is considered. The necessity of cooperation with the geophysical organizations of the country and the steps to be taken for the utilization of data obtained by private geophysical work are stressed. The procedure for the field work is outlined, including spacing of stations, scope of work, and interpretation of results.—*W. A.*

4061. Barton, D. C., The state of geologic research in the oil industry: Am. Assoc. Petroleum Geologists Bull., vol. 21, no. 5, pp. 665–674, 1937.

The geological research done in connection with the oil industry is classified into the following four groups: (1) Organized research, mainly by the oil companies, but also by schools, State and Federal surveys, and bureaus that serve the oil business; (2) routine work that partakes in considerable part of the nature of research; (3) research of individuals on their own initiative; (4) symposia.

Geophysical prospecting, the main research problem of which is in connection with instrument design and methods, discussed in (1), has led to the contribution of powerful tools to the geologist and has enabled some of the research geophysicists and physicists to make important contribution to pure geology.—*W. A.*

4062. Boyer, Jacques, Le développement actuel des prospections géophysiques dans le monde [Actual development of geophysical prospecting in the world]: La Nature, no. 3007, pp. 145–149, Paris, Aug. 15, 1937.

After a brief discussion on geophysical methods of prospecting in general, with a more detailed examination of the electrical methods as developed by Schlumberger (potentiometer, electrical coring), the progress of geophysical prospecting is shown on a map of the world which indicates the distribution of the crews.—*W. A.*

4063. Edwards, M. G., Discoveries in California in 1936; Am. Assoc. Petroleum Geologists Bull., vol. 21, no. 8, pp. 977–985, 1937.

Discoveries of supplies of oil and gas in California during 1936 exceeded those of any previous year since 1931. Excluding deep-zone developments, which were an important source of new supply in 1931, discoveries of fields in 1936 exceeded in importance those of any year since 1928, the year in which the Kettleman Hills-North Dome and Elwood fields were discovered. Five new oil fields, two new gas fields, and a number of extensions to known fields are credited to the year 1936. The first oil-field discoveries in California by geophysical methods occurred in this year.—*Author's abstract.*

4064. Heald, K. C., The technique of exploration: Nat. Resources Comm., Technological Trends and National Policy, pp. 148–151, Washington, 1937.

Geophysical methods of exploration and their contribution to geological discoveries are briefly discussed.—*W. A.*

4065. Kelly, S. F., Geophysical exploration, its place in prospecting: Canadian Min. Manual, 1937.

The paramount role of geophysical exploration by the spontaneous polarization method and magnetic methods in the search for sulphide deposits is mentioned, and the two methods are discussed in detail.—*W. A.*

4066. Kosygin, A. I., Geophysical work in western Turkmenistan from 1930 to 1936 [in Russian]: Neftianoe Khoziaistvo, vol. 18, no. 6, pp. 71–74, Moscow, 1937.

A brief outline of seismic, gravimetric, magnetic, and electrical prospecting work, and of gas survey made in western Turkmenistan is given. Velocities and corresponding depths of 5 horizons were determined by seismic refraction methods as follows:

Velocity (meters) per second)	*Depth (meters)*
100–1,400	Less than 250.
1,500–1,800	Do.
2,100–2,250	250–550.
2,600–2,650	550–1,300.
3,900–4,100	1,400–1,500.

Regions of negative anomalies of gravity were determined in the Trans-Caspian lowland, especially near Nebitdag, by pendulum observations. The magnetic method was used for determining 1,400 stations 25 m to 100 m distant one from another. In most cases the isodynamic lines of the vertical component agreed well with the results obtained from pendulum observations. No satisfactory results were obtained from electrical prospecting work carried out on the Nebitdag. Increased content of methane was found by the gas survey made near the

Kalitzky volcano. These reconnaissance surveys show that under the conditions existing in the region, seismic and gravimetric methods are the ones most suitable for use in making further investigations.—*W. A.*

4067. Stipe, C. G., and Kelly, S. F., Geophysical methods aid construction work: Civil Eng., vol. 7, no. 4, pp. 264–268, 1937.

Although geophysical methods for predicting the position and nature of subsurface formations are not entirely new in America, their application to the service of civil engineers is rather recent—a matter of less than 10 years. In the interim development has gone on apace, so that now, although it is still young, this field of exploration is well established and used in a variety of construction work. Both seismic and electrical methods are briefly explained in this paper, and then some notable projects are cited. These relate to the location of rock surfaces for dam, tunnel, harbor, and highway construction; the determination of water-bearing strata, including something of the potability of the water; the prediction of soundness in rock formations; and even the location of sand and gravel deposits. Test pits of borings have checked the accuracy of the findings in many instances. These methods are convenient, owing to the lightness and mobility of the apparatus; also they are rapid and hence economical because they are carried out on the surface. These advantages must commend them to the consideration of civil engineers.—*Author's abstract.*

4068. Tirapolski, W., Géophysique [Geophysics]: Rev. Petrolifère, no. 740, p. 952, Paris, 1937.

A brief summary of geophysical methods of prospecting and the results attained by geophysics, from the report delivered by Migaux at the 2d Petroleum World Congress, Paris, June 14–19, 1937.—*W. A.*

4069. Vacquier, Victor, Ultimate precision of barometric surveying: Am. Assoc. Petroleum Geologists Bull., vol. 21, no. 9, pp. 1168–1181, 1937.

An improvement in determining altitudes of the points at which observations are taken, especially in gravimetric and seismic surveys, is expected from the construction at the Gulf Research and Development Co. laboratories of two experimental aneroid barometers of entirely new design, with particular desire to increase sensitivity and precision. The barometers can be compared with an instrumental precision equivalent to 0.3 foot difference in altitude and it is possible to obtain a measure of the errors of barometric surveying which originate solely from atmospheric disturbances. It has been found that in fairly level country, under average weather conditions, the contribution of atmospheric disturbance to the probable error of a single altitude observation is 0.96 foot when two aneroids are 3 miles apart. Practical applications and methods of carrying out altitude surveys are discussed.—*W. A.*

8. GEOLOGY

4070. Barsch, O., Über die Entstehung der Salzaufbrüche und die Möglichkeit der Erdölführung [On the origin of salt domes and the possibility of migration of oil]: Oel und Kohle, vol. 13, no. 28, pp. 711–715, Berlin, 1937.

Mechanical processes involved in the origin of salt domes and the migration of oil connected with these processes are discussed. Geophysics may serve as a means for determining the tectonics and its relation to the migration.—*W. A.*

4071. De Lury, J. S., Origin and movements of magma in a strong earth: Am. Jour. Sci., vol. 34, no. 201, pp. 222–234, 1937.

Assumptions that a "crust" overlies a continuous shell of weakness in the earth and that magma is under hydrostatic or isostatic control, have led to the commonly held views that magma is a passive participant in earth movements and is potentially available in belts of deformation. The writer holds contrary views that the evidence is opposed to the existence of a weak shell and favors the concept of a strong earth. An attempt is made, therefore, to indicate magma sources and the forces which lead to its migration and intrusion. Accordingly, conclusions are drawn that magma is formed in horizontally disposed sheets in environments which decree its forceful migration, growth, and eventual forceful intrusion into belts of deformation. Forces are indicated which are adequate for the greater earth movements and deformations. Geologic effects are predicted.—*Author's abstract.*

4072. Gunn, Ross, Quantitative study of mountain building on an unsymmetrical earth: Franklin Inst. Jour., vol. 224, no. 1, pp. 19–53, 1937.

The principle of isostatic equilibrium of the earth's crust is discussed and restated in a useful form which takes account of superposed vertical stresses. A quantitative study of the deformations produced in the earth's elastic crust by tangential compressional forces is made. The calculated physical properties of a suboceanic compressional downfold agree well with those observed in certain long and narrow ocean deeps. The properties of a downfault in continental regions are similarly deduced and it is shown that such a deformation evolves ultimately into a great sedimentary prism of geosyncline. The processes which fold and ultimately uplift the prism to form a mountain chain are quantitatively considered. A quantitative theory of mountain building leads to a law of mountain heights in good agreement with observation. The considered mechanisms are consistent with the principle of isostasy and with the author's earlier estimates concerning the concentration of stresses at the boundaries of the great continents. It is concluded that the circum-Pacific mountain chains could only have been generated on an unsymmetrical earth produced probably by a fission process much like that suggested in the author's binary star theory of the origin of the solar system.—*Author's abstract.*

4073. MacCarthy, G. R., The Carolina bays: Geol. Soc. America Bull., vol. 48, no. 9, pp. 1211–1226, 1937.

After brief mention of the various theories suggested for the explanation of the Carolina bays and a more detailed discussion of the theory based on the meteoritic hypothesis, the following conclusions are stated: (1) The Carolina bays were formed by the shock waves accompanying a shower of large meteorites and not directly by the impact of the meteorites upon the earth. (2) The bays are much larger than the meteorites that produced them. (3) The great Siberian meteorite of 1908 produced effects similar to one of the Carolina bays, and had a shower of such meteorites fallen a series of bay-like depressions would have resulted. (4) It is probable that the meteorites were largely or wholly volatilized by the heat developed when their motion was checked. (5) The magnetic highs associated with the bays are caused by the presence underground of meteoritic material. This material may be,

in part, actual fragments, or may be condensations from the vapor formed when the meteorites volatilized. (6) The underground courses of the meteorites were not straight lines but curved in such a fashion as to be, in horizontal projection, concave toward the southwest. The deflective effect of the earth's rotation furnishes a qualitative, but perhaps not a quantitative, explanation of this curvature.—*Author's conclusions.*

4074. Shepard, F. P., "Salt" domes related to Mississippi submarine trough: Geol. Soc. America Bull., vol. 48, no. 9, pp. 1349–1362, 1937.

The large trough-shaped submarine valley penetrating 20 miles into the Gulf Coast Continental Shelf is off the main delta of the Mississippi River, well to the southwest of the outer "Bird Foot" delta. This suggests that if the valley is of subaerial origin, it is probably older than this outer delta. The flat floor of the submarine valley, which is in contrast to the V-shape of most submarine canyons, is explained on the basis of a great mud fill from the Mississippi River. The steep walls of the trough are thought to be due to salt domes which, perhaps because of their cap rock, resisted the erosion of the low sea-level stage when the submarine valleys were cut. It seems reasonable that if it had not been for these bordering salt domes the walls of the valley would have slumped until only gentle slopes were left.

The salt domes are not only related to the outer portion of the Mississippi submarine trough, but they are found also all along the outer edge of the Continental Shelf for at least 180 miles west of the Mississippi passes. It is thought that their concentration in this narrow belt may be the result of upward migration of the salt along a fault zone. The great relief of these domes, which is in contrast to those found on the Gulf coast, may be due partly to the failure of erosive processes to interfere with the bulging of the bottom and partly to the removal of fine sediments from around them during the time when the submarine valleys were being cut into the shelf margin.—*Author's abstract.*

9. NEW BOOKS

4075. Geophysical Studies, 1932–36: Colorado School of Mines Quarterly, vol. 32, no. 1, January 1937, 264 pp., 130 figs.

This fourth quarterly on geophysics contains papers that have not been published in technical journals. Abstracts of the following nine papers are given (in both English and German) in the Announcement of Colorado School of Mines Quarterly 32 (1) January 1937: (1) Geologic, magnetic, reflection work, and drilling at the Duvernay-Brosseau structure, Alberta, Canada, by C. A. Heiland; (2) Characteristics of seismic reflections, by J. D. Marr; (3) Two new planimetric methods for torsion-balance terrain corrections, by K. G. Ku; (4) A comparison of geophysical surveys and the results of operations at the Roscoe placer of the Humphreys Gold Corporation, Jefferson County, Colorado, by Dart Wantland; (5) The application of electrical resistivity prospecting to ground-water problems by C. M. Tattam; (6) Model-tank experiments and methods for interpretation of resistivity curves, by T. A. Manhard; (7) The effect of dipping strata on earth-resistivity determinations, by R. F. Aldredge; (8) A theoretical and experimental

examination of the potential-drop ratio method, by Z. Mitera; (9) The Sundberg inductive method of electrical prospecting, by Charles M. Focken.

Copies of the Quarterly may be obtained from the Director of Publication, Colorado School of Mines, Golden, Colorado. Price, $2.

4076. Handwörterbuch der Naturwissenschaften [Dictionary of natural sciences], Verlag von Gustav Fischer, Jena, Germany.

The second edition of this book is advertised. In an article entitled "The Earth," given on pp. 762–774, the following items are discussed: (1) Structure of the earth; (2) Density and mass of the earth; (3) Pressure within the earth; (4) Gravity, deviations of plumb line, isostasy; (5) Elasticity; (6) Compressibilities; (8) Viscosity and resistance to flow (Fliesswiderstand); (9) Cooling and temperature of the earth; (10) Forces within the earth; (11) Movements of single parts of the earth.

The book will consist of 95 parts, each about 125 pages, compiled into 10 volumes. Available by subscription at the price of RM. 6, for each part. Single parts or volumes will not be sold.—*W. A.*

4077. Imamura, Akitune, Theoretical and applied seismology, 358 pp., 160 figs., Maruzen Co., Tokyo, 1937.

The book is written in English.

4078. National Research Council, Transactions of the American Geophysical Union, 18th annual meeting, June 21–26, 1937.

Part 1 (pp. 1–264): Introduction by J. A. Fleming, pp. 3–5; General assembly, pp. 8–57; Business session and resolutions adopted; Reports; Symposium on theoretical and observational considerations of importance to further studies of the depths of the earth: (1) On the estimation of temperatures at moderate depths in the crust of the earth, by C. E. Van Orstrand; (2) The external gravity field and the interior of the earth, by W. D. Lambert; (3) Deep-focus earthquakes and their implications, by J. B. Macelwane; (4) the earth's interior as inferred from terrestrial magnetism, by A. G. McNish; (5) The behavior of matter under extreme conditions, by P. W. Bridgeman.

Section of geodesy, pp. 58–108, Reports and papers: (1) The Edinburgh meeting of the International Association of Geodesy, by W. D. Lambert; (2) Establishing harbor-line control of geodetic triangulation, by N. J. Ogilvie; (3) Cooperation of the United States Coast and Geodetic Survey and the Works Progress Administration in the conduct of geodetic control surveys by H. W. Hemple; (4) Gravity measurements on the U. S. S. Barracuda, by Maurice Ewing; (5) Geological interpretation of the data collected on cruise of the U. S. S. Barracuda in the West Indies, preliminary report, by H. H. Hess; (6) Crystal-chronometer time in gravity surveys, by A. J. Hoskinson; (7) Recent gravity work in the United States Coast and Geodetic Survey, by C. I. Aslakson; (8) Geodetic work executed in the Republic of Mexico in 1936, by Manuel Medina; (9) Geodetic control along Central American boundaries, by S. H. Birdseye; (10) Annual report of progress of the geodetic work of the Coast and Geodetic Survey, by C. L. Garner; (11) An illustration of the utility of State plane-coordinate systems, by Philip Kissam; (12) Gravity anomalies and geologic structure, by G. P. Woolard; (13) Accuracy of modern gravimeter measurements, by D. C. Barton and W. T. White.

Section of seismology, pp. 109–124, reports and papers: (1) Current geophysical activity in Texas, Louisiana, and the midcontinent, by D. C. Barton; (2) Seismic refraction methods as applied to shallow subsurface exploration, by E. R. Shepard; (3) Seismology and the geological exploration of ocean basins, by R. M. Field; (4) Progress report in seismology for the United States Coast and Geodetic Survey and cooperating stations, by E. W. Eickelberg; (5) A preliminary report on the Ohio earthquakes of March 2 and 9, 1937, by V. C. Stechschulte; (6) Timiskaming earthquake data and time-distance curves for dilatational waves, by Ernest A. Hodgson; (7) Intensities of earthquake-noises, by H. Landsberg; (8) On the estimation of focal depth from macroseismic data, by Archie Blake; (9) A note on land tilt, by J. P. Delaney; (10) A low-cost seismograph and recording drum, by H. Rutherford and R. L. Alkire; (11) The torsion-pendulum analyser as a double integrator, by Frank Neumann; (12) A new theory of the earth's core, by Joseph Lynch.

Section of meteorology, pp. 125–148, Reports and papers: (1) Report on the sessions of the Meteorological Association of the International Union of Geodesy and Geophysics held at Edinburgh, September 17–26, 1936, by R. H. Weightman; (2) Absorption of radiation by water vapor as determined by Hettner and by Weber and Randall, by H. Wexler; (3) Some outgoing-radiation and surface-temperature measurements at Fargo, North Dakota, by J. C. Ballard; (4) Further studies in American air-mass properties, by A. K. Showalter; (5) Aerological evidence of large-scale mixing in the atmosphere, by C. G. Roosby and collaborators; (6) The use of 16-inch balloons for the determination of upper-air winds, by L. A. Stevens; (7) Contributions to the development of the radio-meteorograph by the United States Weather Bureau, by D. M. Little; (8) A series of 31 radio soundings at Cambridge, Massachusetts, in February and March 1937, by K. O. Lange, C. Harmantas, C. B. Pear, Jr., and D. P. Kelly; (9) A 5-year program of research and instruction in aerology and aeronautical meteorology, by C. F. Brooks; (10) Determinations of sky-blue, by H. Landsberg and H. Jobbins; (11) The areal frequency of tornadoes in the United States by counties, 1880–1931, by C. W. Brown and W. O. J. Roberts; (12) Results obtained from the analysis of northern-hemisphere weather maps for 1936–37, by H. C. Willett.

Section of terrestrial magnetism and electricity, pp. 149–191, Reports and papers: (1) The 23-, 46-, and 92-year cycles in solar and terrestrial phenomena, by C. G. Abbot; (2) Radio-balloon measurements of the cosmic radiation, by T. H. Johnson; (3) Geographic asymmetries of cosmic rays as related to the earth's magnetization, by M. S. Vallarta and W. P. Jesse; (4) Report of committee on dissemination of magnetic data of American-operated magnetic observatories, by E. O. Hulburt, S. S. Kirby, A. K. Ludy, and A. G. McNish; (5) Earth-current variations with periods longer than one day, by W. J. Rooney; (6) An astatic magnetometer for measuring the susceptibility of materials for magnetic instruments, by E. A. Johnson and W. F. Steiner; (7) A zero distribution-coefficient for horizontal-intensity magnetometers, by Geo. Hartnell; (8) On the ionization of the F_2-region, by W. M. Goodall; (9) A study of sudden disturbances of the ionosphere, by J. H. Dellinger; (10) An investigation of the relation between bright chromospheric eruptions and fade-outs of high-frequency radio transmission, by R. S. Rich-

ardson; (11) Radio fade-outs associated with bright chromospheric eruptions, by L. V. Berkner and H. W. Wells; (12) Terrestrial effects associated with bright chromospheric eruptions, by A. G. McNish; (13) World-wide changes in potential gradient, by G. R. Wait and J. W. Mauchly; (14) A new approach to the study of terrestrial-solar relationships, by J. W. Mauchly; (15) Instruments and technique for continuous triangulation upon a sounding-balloon, by Brian O'Brien and H. S. Stewart, Jr.; (16) Magnetic work of the United States Coast and Geodetic Survey, April 1936 to March 1937, by R. S. Patton; (17) Ionosphere researches of the National Bureau of Standards, by J. H. Dellinger; (18) Report on research in terrestrial magnetism by the Department of Geology of the University of North Carolina, by W. F. Prouty; (19) Report on stratosphere research at the University of Rochester, by Brian O'Brien; (20) Report on auroral research at the University of Alaska, by E. H. Bramhall; (21) Magnetic work of the Dominion Observatory, Ottawa, during 1936, by R. M. Stewart; (22) Report on cosmic terrestrial studies, by H. T. Stetson; (23) Report of the secretary to the 18th annual meeting of the Section of Terrestrial Magnetism and Electricity, by E. O. Hulburt; (24) Progress-report on researches in terrestrial magnetism and electricity at Department of Terrestrial Magnetism, Carnegie Institution of Washington, for year April 1936 to March 1937, by J. A. Fleming.

Section of oceanography, pp. 193–234, Reports and papers: (1) The oceanographic work of the Hydrographic Office and the United States Navy from April 1936 to April 1937 by H. E. Kays; (2) Oceanographic activities of the United States Coast and Geodetic Survey, by P. A. Smith; (3) The oceanographic work of the United States Coast Guard in 1936 and plans for 1937, by R. R. Waesche, with appendix A, The oceanographic work of the United States Coast Guard during 1936, by E. H. Smith and F. M. Soule; (4) Oceanographic research at the Scripps Institution of Oceanography during April 1936 to April 1937, by H. U. Sverdrup; (5) Current-measurements in the Georges Bank canyons, by H. C. Stetson; (6) Short-period variations of oceanographic characteristics in the western North Atlantic, by H. R. Seiwell; (7) The new plans for the cooperative investigation of the North Atlantic's circulation, by Columbus Iselin; (8) Preliminary report on the North Atlantic deep-sea cores taken by the Geophysical Laboratory, Carnegie Institution, by W. H. Bradley, M. N. Bramlette, J. A. Cushman, L. G. Henbest, K. E. Lohman, and P. D. Trask; (9) Investigation of submarine topography during the past year, by F. P. Shepard; (10) Report on dynamic studies off the Canadian Pacific Coast, 1936, by J. P. Tully; (11) Oceanography in British Columbia in 1936, by C. M. Fraser.

Section of volcanology, pp. 235–263, Reports and papers: (1) Tuffs and other volcanic deposits of Katmai and Yellowstone Park, by C. N. Fenner; (2) Amygdales in Columbia River lavas near Freedom, Idaho, by John C. Reed; (3) Extraordinary topaz-replacement body in the Brewer Mine, South Carolina, by Jewell J. Glass; (4) Silicate-water systems: "Osmotic-pressure" phenomena and their bearing in some problems of igneous activity, by Roy W. Goranson; (5) A primary ultramafic magma, by H. H. Hess; (6) Basic rocks in the Eastern Pennsylvania highlands, by Donald M. Fraser; (7) A sphenolith in the Terlingua District, Texas, by Clyde P. Ross; (8) Mode of igneous intrusion in La Plata Mountains, Colorado, by Edwin B. Eckel; (9)

The problem of the Chelmsford, Massachusetts, granite, by L. W. Currier; (10) The hydrated calcium silicates, by E. P. Flint and Lansing S. Wells; (11) The volcanic dome of Santa Maria, Guatemala, by E. G. Zies; (12) Crystallization of melts of nepheline and albite with fayalite, by N. L. Bowen; (13) Temperatures in a sinking xenolith, by T. S. Lovering; (14) Mode of emplacement of the post-Paleozoic intrusives of the Tucson quadrangle, Arizona, by B. N. Moore; (15) The volcanic sequence in the Bull Valley region in southwestern Utah, by F. G. Wells.

Part 2 (pp. 265–664), Section of Hydrology, Reports and papers at Washington: Annual reports of permanent research committees for 1936–37, pp. 269–345. Papers: (1) Preliminary report on a determination of comparative infiltration rates on some major soil types, by G. W. Musgrave and G. R. Free; (2) Rainfall and relative losses in various forms, by G. W. Musgrave and O. R. Neal; (3) Water intake of saturated soils, by W. C. Lowdermilk; (4) The rate of infiltration of water in irrigation practice, by M. R. Lewis; (5) Direct accretions to ground water from rainfall, by S. T. Harding; (6) Determination of infiltration capacity for large drainage basins, by R. E. Horton; (7) The value of geophysical methods in ground-water studies, by O. E. Meinzer; (8) Resistivity studies of some salt-water boundaries in the Hawaiian Islands, by J. H. Swartz; (9) The use of resistivity methods in the location of salt-water bodies in the El Paso, Texas, area, by A. N. Sayre and E. L. Stephenson; (10) Results to be expected from resistivity measurements, by B. E. Jones; (11) Search for ground waters by the electrical resistivity method, by L. E. Workman and M. M. Leighton; (12) Prospecting for water with geophysical methods, by C. A. Heiland; (13) Maximum stream flow with reference to flood formulas, by C. S. Jarvis; (14) An analysis of stream-flow data for Iowa, by F. T. Mavis and Edward Soucek; (15) Progress report on investigations of the relation between rainfall and stream flow, by R. T. Zoch; (16) The anticipated effects of the flood-control and water-conservation reservoirs of the Muskingum Watershed Conservancy District on the low flow of the streams of the watershed, by W. E. Smith; (17) A graphic method of routing floods through reservoirs, by R. S. Goodridge; (18) Natural stream channel-storage, by R. E. Horton; (19) Bed-load transportation and the stable-channel problem, by Samuel Shulits and W. E. Corfitzen; (20) The vertical distribution of velocity in wide rivers, by M. P. O'Brien; (21) A comprehensive study of the rainfall on the Susquehanna Valley, by C. F. Merriam; (22) The reliability of rainfall intensity-frequency determinations, by C. W. Thornthwaite; (23) Use of aerological soundings in determining the sources of moisture for precipitation, by Benjamin Holzman; (24) The mutual interference of artesian wells on Long Island, New York, by R. M. Leggette; (25) Ground-water levels in Pennsylvania in 1936, by S. W. Lohman; (26) Water pumped from the mines of the anthracite region of northeastern Pennsylvania, by D. C. Ashmead; (27) Solubility of limestone, by C. S. Adams and A. C. Swinnerton; (28) Snowfall and runoff in the Canadian Columbia Basin, a study to determine the ideal locations for snow-survey stations, by R. C. Farrow.

Reports and papers at Denver: (1) Objectives of the Section of Hydrology by J. E. Church; (2) Hydrology as a science, by L. K. Sherman; (3) Hydrology in the American Geophysical Union and in

the International Union of Geodesy and Geophysics, by N. H. Heck; (4) Hydrologic aspects of flood forecasting, by Merrill Bernard; (5) The National Research Council Interdivisional Committee on Density-currents, by H. N. Eaton; (6) European hydrologic activities, by Samuel Shulits; (7) Water temperatures in reservoirs, by I. E. Houk; (8) Return flow, by M. E. Bunger; (9) Valley consumptive use, by E. B. Debler; (10) Ground water in Utah, by G. H. Taylor; (11) Floods of 1935 in the Republican River, by Robert Follansbee; (12) Floods in Texas, by Robert Lowry; (13) Lunar rainfall relationships, an inquiry into a weather-forecasting method, by R. M. Copeland; (14) The problem of forecasting sleet for highway and industrial purposes, by Salvatore Pagluica; (15) The hydraulic-model studies for the design of the Imperial Dam, by J. E. Warnock; (16) Rates of silting in representative reservoirs throughout the United States, by C. B. Brown; (17) Some observations on well characteristics, by W. E. Code; (18) Amount of ground-water recharge in the southern High Plains, by C. V. Theis; (19) Specific water-conductivity of an artesian aquifer, by O. W. Israelsen and E. R. Morgan; (20) Prospecting for water with geophysical methods, by C. A. Heiland; (21) Apparatus for studying water relations in potted plants, by L. A. Richards and M. B. Russell; (22) Some interrelationship of rainfall- and infiltration-intensities, by R. S. Goodridge; (23) Characteristics of floods in the southern Rocky Mountain region, by R. J. Tipton; (24) The economic and social value of watershed management, by C. A. Lory; (25) Natural vegetation as a factor in the losses and yields of water, by Joseph Kittredge, Jr.; (26) Laboratory measurements of evapo-transpiration losses, by R. L. Parshall; (27) A new epicycle of erosion, by R. W. Bailey; (28) Land-use patterns needed in watershed management to control erosion and stabilize stream flow, by W. C. Lowdermilk; (29) Precipitation and runoff in relation to altitude in the Rocky Mountain region, by F. C. Hart; (30) Stabilizing stream-flow as viewed by a forester, by E. L. Forsling; (31) Hydrologic aspects of stream-flow stabilization, by R. E. Horton; (32) Tree rings versus runoff in the South Platte River Basin, by H. L. Potts.

South Continental Divide Snow-survey Conference, Reports and papers: (1) The present status of snow surveying and irrigation water-supply forecasting in the West, by J. C. Marr; (2) Further improvement of snow-survey apparatus, by J. E. Church and J. C. Marr; (3) Establishing snow courses for representativeness, permanence, and continuity of record, by G. D. Clyde; (4) Snowfall and runoff in the Canadian Columbia Basin, a study to determine the ideal locations for snow-survey stations, by R. C. Farrow; (5) Statistical analysis of sampling of snow courses, by C. A. Connaughton; (6) Accuracy of an individual sample of a snow course, by C. E. Hunter and G. W. Devore; (7) Possible research projects in snow surveying and stream-flow forecasting in the Western States, by Carl Elges; (8) Weight versus melting-method for determining density of snow, by J. J. McNutt and W. B. Alcorn; (9) Application of snow-survey data by the Bureau of Reclamation, by O. C. Reedy; (10) Snow surveys and runoff forecasting from photographs, by H. L. Potts; (11) Luncheon conference and round-table presentation of experiences and problems in snow surveying, by R. L. Parshall, presiding.

Copies of Transactions may be purchased by nonmembers of the Union as follows: Orders, with checks payable to American Geophysical Union, should be addressed to the General Secretary, American Geophysical Union, 5241 Broad Branch Road, NW., Washington, D. C., U. S. A. Price, part 1, $1.75; part 2, $2.25.

4079. Rothé, Edmond, Comptes Rendus des Séances de la 6e Conférence réunie à Edimbourg du 14 au 26 Septembre 1936 [Proceedings of the 6th conference, held in Edinburgh, September 14–26, 1936]: Union géod. géophys. internat., Assoc. Séismologie, 303 pp., Toulouse, 1937.

Papers discussed during the eight sessions of the International Geodetic and Geophysical Union are briefly reviewed (pp. 1–148). The five annexes contain the following items: Annex 1, Project of the order of the day, pages 149–162; annex 2, Summarization of conditions of seismological work in Chile, United States, France, Great Britain, Hungary, Italy, Japan, New Zealand, Poland, Portugal, Sweden, Switzerland, Czechoslovakia, and Yugoslavia, pages 163–224; annex 3, Report on the circular letter containing an inquiry by Ishimoto concerning the mechanism of earthquake occurrence from seismographic observations, pages 225–234; annex 4, Enlargement of the international library (a list of works added to the Central Bureau since the Lisbon conference), pages 235–294; annex 5, French translation of the note on the Structural problems of oceanic and continental areas, pages 295–298.

4080. Stočes, Bohuslav, and White, C. H., Structural geology, with special reference to economic deposits, D. Van Nostrand Co., 250 Fourth Avenue, New York, 460 pp., 664 illus, 1935. Price, $9.

Contents: Acknowledgements; Introduction; Definition of subject; Classification of deposits; The primary structure and arrangement of sedimentary rocks; The structure of igneous rocks and of associated mineral deposits; Induced or secondary structures due to orogenic movements in the earth's crust; Causes of movement; Folding; Faulting; Joints; Veins; Conformable, unconformable, and disconformable beds; Subsidence and emergence; Transgression and regression; Principal types of structures in folded and faulted regions; Relation of folding to igneous activity and mineralization; Surveying and mapping geologic structure; Geophysical methods; Geological maps and sections; Influence of structure on mining practice; Glossary; Divisions of geologic time; Bibliography; Index.

10. PATENTS

4081. Method of making weathering corrections in seismic surveying; Henri Salvatori, Hollywood, and Dean Walling, Bakersfield, Calif., assignors to Western Geophysical Co., Tulsa, Okla., a corporation of Delaware: U. S. patent 2087120, issued July 13, 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, a spread of at least two seismometers being placed between and roughly in line with said shot holes, the seismometer spread occupying most of the distance between 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 instant of generation of said vibrations, 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 shot 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, 6.

4082. Method and means for recording terrestrial waves; Leo J. Peters, Pittsburgh, Pa., assignor to Gulf Research & Development Co., Pittsburgh, Pa., a corporation of Delaware: U. S. patent 2087702, issued July 20, 1937.

This invention relates to an apparatus for detecting and recording certain desired terrestrial wave vibrations while suppressing disturbing undesired wave vibrations of a plurality of frequencies coming in another direction, said apparatus comprising recording means and two detecting elements connected electrically in phase opposition and connected to the recorder, the detecting elements being located in the ground both substantially upon the same equal travel-time surface for a disturbing wave which it is desired to eliminate and lying on different equal travel-time surfaces for the wave which it is desired to record, so that the desired wave is recorded and the undesired wave is suppressed. Claims allowed, 9.

4083. System of geological explorations; Oscar E. Dudley, Hyattsville, Md., assignor to Submarine Signal Co., Boston, Mass., a corporation of Maine: U. S. patent 2088588, issued August 3, 1937.

This invention relates to a system for observing geological formations of the type described, comprising a sound-projector unit, a plurality of pick-up units for picking up the sound transmitted to the projector and reflected from reflecting surfaces that are being observed, a recording device for recording, and reflections and means operated in conjunction with the operation of said recording device for controlling the operation of said sound projector. Claims allowed, 12.

4084. Suspension for Eötvös balance: Hermann Imhof, Berlin-Friedenau, Germany, assignor to Askania-Werke Aktiengesellschaft, vormals Centralwerkstatt Dessau und Carl Bamberg Friedenau, Berlin-Friedenau, Germany, a corporation of Germany: U. S. Patent 2089164, issued August 3, 1937.

This invention relates to a suspension for balance beams, more particularly of the inclined type, for torsion balances, comprising, in combination, a torsion thread; bright, light-ray reflecting means; carrying means for the latter suspended from said torsion thread; a member secured to said carrying means in parallelism with a balance beam; and two flexible members connected to said first-named member and to the balance beam being spaced from each other and said points of connection with said balance beam being located substantially on the main inertia axis of the latter. Claims allowed, 7.

4085. Apparatus for orienting cores; Edward D. Lynton, Glendale, Calif., assignor to Standard Oil Co. of California, San Francisco, Calif., a corporation of Delaware: U. S. patent 2089216, issued August 10, 1937.

This invention relates to an apparatus for representing a bore hole and a plane defined by a substratum in the earth intersecting said bore hole, comprising a base, directional orienting means carried by said base, an elongated member supported by said base, said member adapted to be adjustably positioned with regard to said directional orienting means to assume the deviation degree and direction of a bore hole, means carried by said member forming a flat surface adapted to be positioned with regard to the axis of said member and the directional orienting means of said base to reproduce the apparent degree and strike of direc-

tion of dip of a substratum intersecting said bore hole, and means cooperating with said directional orienting means for measuring the true degree and strike or direction of dip of said flat surface means. Claims allowed, 8.

4086. Gravity instrument; Anton Graf, Berlin-Wilmersdorf, Germany: U. S. patent 2089745, issued August 10, 1937.

This invention relates to a device for measuring gravity, comprising, in combination, a pendulum mass having its center of gravity above the fictitious pivotal point; supporting means; and resilient means for suspending said pendulum mass from said supporting means. Claims allowed, 7.

4087. Method and means of geophysical prospecting; Norman H. Ricker, Houston, Tex.: U. S. patent 2089983, issued August 17, 1937.

This invention relates to a method of prospecting for buried mineral deposits comprising setting up an elastic wave system which would possess symmetry about a vertical axis were the earth homogeneous, making observations at a series of correlated points of the position in space of the plane of the vibration ellipse of the resulting earth's vibration, and correlating the data so obtained. Determining the plane of the vibration ellipse of the elliptically polarized elastic vector displacement due to an elastic wave system passing through the earth. Claims allowed, 27.

4088. Gravity measuring device; Harold A. Wilson, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware: U. S. patent 2090713, issued August 24, 1937.

This invention relates to an apparatus for gravitational prospecting, comprising pendulous means mounted to swing, a source of a beam of light, means for reflecting the beam of light from the pendulous means whereby the beam describes a circular or elliptical path, means for breaking the path of the beam into increments, means for creating successive pulsations of electric energy corresponding to the increments, and means for indicating the pulsations. Claims allowed, 24.

4089. Electrical prospecting method; The Swedish American Prospecting Corporation, assignee of Theodor Zuschlag, both of New York City, New York, U. S. A.: Canadian patent 351571, issued July 9, 1935.

This invention relates to a method of electrical prospecting, the steps of which comprise setting up an electric ground field in a tract to be investigated, producing a current flow in two parallel circuits each of which has at least one variable resistance by the ground field intensities of different portions of said tract, setting the variable resistance of one of said circuits at an arbitrary value, balancing the circuits by suitably adjusting the variable resistance in the other circuit until the same current flows through both circuits, noting the values of the variable resistances, altering the variable resistance of one of said circuits to another arbitrary value to produce a different current flow there through, again balancing said two circuits by suitably adjusting the variable resistance in the other circuit until the same current flows through both circuits, and noting the new values of the variable resistances. Claims allowed, 12.

4090. Electrical prospecting apparatus; The Swedish American Prospecting Corporation, assignee of Theodor Zuschlag, both of New York City, New York, U. S. A.: Canadian patent 352235, issued August 6, 1935.

This invention relates to an apparatus for electrical prospecting, the combination comprising a conductive net-work provided with two circuits in parallel when employed in conjunction with a tract to be investigated and each circuit being provided with at least one variable resistance connected in series with a stator of a variometer, said circuits being provided with a common branch. Claims allowed. 12.

4091. Force of gravity measuring method; Axel Rudolf Lindblad, Stockholm, Sweden: Canadian patent 360734, issued September 22, 1936.

This invention relates to measuring the force of gravity or variations in the same by the aid of a movable body, the weight of which has been counterbalanced or biased out by means of a spring device, an electric or magnetic field, or in other manner, that method that said movable body, in its end position, or in other positions during its movements, has an opportunity of closing or opening an electrical contact, for the purpose of indicating by this means one or several of these positions. The method is characterized in that the movable body acting as an indicator is operated by means of an electric field, and in that the position of the movable body acting as an indicator is shifted and operated by the aid of a magnetic field. Claims allowed, 3.

4092. Force of gravity measuring method; Axel Rudolf Lindblad, Stockholm, Sweden: Canadian patent 360735, issued September 22, 1936.

This invention relates to measuring the force of gravity or variations in the same by the aid of a movable body, the weight of which has been counterbalanced or biased out by means of a spring device or in other manner and which during its movements is permitted to influence an electric or magnetic field in such a manner that the position of said body may be exactly determined by observing the alterations in this field, that method that the movable body is returned, at suitable intervals, for instance after each observation, to an arbitrarily chosen neutral or initial position. The method characterized in that the movable body is returned to the fixed neutral position by means of electric influence in such a manner that the electric energy requisite for this purpose may constitute a relative expression for the magnitude of the force of gravity or for the variations in the same. Claims allowed, 2.

4093. Gravity pendulum; De Bataafsche Petroleum Mij., the Hague, Holland, assignee of the Shell Development Co., San Francisco, Calif., U. S. A., assignee of Ferdinand Holweck, Paris, France: Canadian patent 361364, issued October 27, 1936.

This invention relates to a gravity pendulum instrument, an elastic member having a mortised base with parallel faces. A process for regulating the elastic strip of a gravity pendulum so that its position of rest is vertical and the maximum of its periods of vibration coincide with this position of rest comprising varying two parameters of the instrument, one in such a way that the rest position of the strip coincides with the fixed reference point of the instrument and with the maximum of the characteristic for a definite orientation of the instrument and the other in such a way that this orientation shall be such that the strip is vertical in its rest position. Claims allowed, 18.

4094. Electrical prospecting apparatus; Hans T. F. Lundberg, Montreal, Quebec, Canada, assignee of Theodor Zuschlag, West Englewood, New Jersey, U. S. A.: Canadian patent 363051, issued December 29, 1936.

This invention relates to an apparatus for electrical prospecting, including means for establishing an electric ground field and a measuring network adapted for the generation therein of a current flow due to the character of the ground field, means for determining the ratio of the electromotive forces existing in different parts of said ground field, comprising the combination of a balancing network and an indicator circuit, said network including at least one potentiometer for the purpose of determining the numerical value of the said ratio and said circuit including at least one potentiometer for the purpose of compensating phase displacement between the electromotive forces. Claims allowed, 15.

4095. Force of gravity measuring method; Axel Rudolf Lindblad, Stockholm, Sweden: Canadian patent 363280, issued January 5, 1937.

This invention relates to a method of measuring the force of gravity or variations in the same (for instance for the purpose of detecting and determining the position of metalliferous or other mineral deposits) by the aid of a movable body the weight of which has been counterbalanced by means of a spring device, an electromagnetic field or in another manner, characterized thereby that said body, as it moves, is caused to influence an electric or magnetic field in such a manner that the position of the body can be exactly determined by observing the variations of this field. The method as claimed, characterized by the fact that the movable body in shifting its position is caused to inductively or capacitively influence one or several resistances connected up to form a Wheatstone bridge. Claims allowed, 2.

4096. Geophysical measurement-making apparatus; The Salt Dome Oil Corporation, assignee of Geophysicists Incorporated, assignee of Karl F. Hasselmann, all of Houston, Tex., U. S. A.: Canadian patent 364924, issued March 23, 1937.

This invention relates to a process of making geophysical measurements which comprises submerging a geophysical instrument of selected type in a body of water covering a portion of the earth's surface, stably positioning said submerged instrument with respect to the earth under said body of water and in operating relation thereto, and preventing the water from interfering with the operation of said instrument. Claims allowed, 23.

4097. Prospecting method; Atsushi Matsubara, Kamikyo-Ku, Kyoto, Kyoto-Prefecture, Japan: Canadian patent 366759, issued June 15, 1937.

This invention relates to the method of prospecting underground ore bodies, comprising the steps of comparing the back potential of the various different portions of the searched ore body by polarizing the latter with an intermittent direct current of a constant intensity as indicated by an ammeter flowing through a transported electrode earthed at various different points on the ground surface in turn and a fixed electrode, and measuring the potential difference between two non-polarizable electrodes, one of which is earthed in the vicinity of the point at which the transported, transmitting electrode is earthed, the measurement being accomplished by the aid of a rotating interrupter,

which is connected in the transmitting circuit and rotates with a definite velocity. Claims allowed, 1.

4098. Seismic method of prospecting by means of reflected waves; G. A. Gamburtsev: Russian patent 50338, issued August 31, 1936.

This invention relates to the reflection seismic method of prospecting. Records of a group of seismographs are obtained on a common film simultaneously. High frequencies are separated during the recording and a photoelectric device is used for the investigation of the records. Claims allowed, 1.

4099. Method of geophysical prospecting; N. I. Sofronov, A. P. Solovov, and E. A. Sergeev: Russian patent 50635, issued March 31, 1937.

This invention relates to geophysical prospecting by measuring the differences of the polarization potential of one pair of electrodes placed into the ground or lowered into a bore hole. The method is characterized by selecting the electrodes so as to make the potential between them depend on the square of the amount of the concentration of iones in the ground. Claims allowed, 1.

4100. Device for registering the marks made on the cable used in coring; V. Tkachenko: Russian patent 50637, issued March 31, 1937.

This invention relates to a device for registering the marks on the cable used during the electrical coring of boreholes. It is characterized by mounting at the mouth of the borehole a transformer having a hole for passing through it the cable and serving for feeding a device assigned for registering the passing of iron marks secured to the cable. Claims allowed, 1.

4101. Device for determining the anomalies of a magnetic field; L. A. Goncharski and E. A. Rumiantsev: Russian patent 50639, issued March 31, 1937.

This invention relates to a device for determining the anomalies of a magnetic field and is characterized by inserting into two frames, rotating about one axis and mounted in parallel planes, a phase-relay with the purpose of obtaining the records of the relay during the change of the phase of the resultant electromotive force in the frames produced, for example, by the existence of ferromagnetic bodies. Claims allowed, 1.

4102. Method of geophysical prospecting; K. K. Korovin: Russian patent 50683, issued March 31, 1937.

This invention relates to a method characterized by the fact that in presence of any object situated nonsymmetrically with respect to two equivalent electrodes buried in the ground, the electrical conductivity in the circuit of the electrodes may be determined, and that from the character of the change in this conductivity and from the results of additional measurements made with previously known materials the geological nature of the object under investigation may be established. Claims allowed, 1.

4103. Electrode for geophysical prospecting; E. A. Sergeev: Russian patent 50867, issued April 30, 1937.

This invention relates to an electrode for geophysical prospecting having the form of a spherical segment. The metallic electrode is fixed on the curved surface of an insulating (for example ebonite) shed and is protected by a welt. Claims allowed, 1.

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