ABSTRACTS.

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OILFIELD EXPLORATION AND EXPLOITATION.

Geology.

1133. Palæontology and its Relation to Petroleum Geology. J. H. Johnson. *Oil Wkly*, 16.12.46, **124** (3), 36.—Palæontology provides widespread correlation of sedimentary rocks. In making such correlation stratigraphic, ecologic, and palæontological considerations are involved, for assemblages vary with environment as well as with time.

Studies of modern conditions and organisms enable the palæontologist to reconstruct former conditions.

Disconformities may be revealed by palæontological work.

Palæontology will be of great value in the discovery of stratigraphic traps.

G. D. H.

1134. Geological Group Develops Columnar Section of pre-Permian Formations Along Central Basin Platform. J. M. Barton. *Oil Gas J.*, 14.12.46, **45** (32), 106.—It is maintained that the rocks of the basement complex may be Middle or Lower Cambrian as well as pre-Cambrian, since the oldest fossiliferous beds are Upper Cambrian. The basement includes basic igneous rocks, metamorphosed sediments, and granite. Above the " Cambrian " sandstone, which may occur only in depressions on the pre-Cambrian surface, are the Ellenburger sandy dolomite and dolomitic sandstone. As used here the term may include some Cambrian and Ordovician. The Simpson group consists of the Joins, Oil Creek, McLish, Tulip Creek, and Bromide in ascending order. Then follows the Montoya limestone and chert. The Hunton group is of Silurian and Devonian age, being divided into Lower, Middle, and Upper Hunton. The position of the top of the Silurian is uncertain in this shale and limestone series. It is not known whether the Woodford shale is Devonian or Mississippian. The succeeding limestone is called the Mississippian limestone, although the age is uncertain. Pennsylvanian beds are present.

A columnar section is included. G. D. H.

1135. Pratt Sees Great Oil Potentialities on Continental Shelf Slope. C. J. Deegan. *Oil Gas J.*, 7.12.46, **45** (31), 62.—Pratt defined the continental shelf as being bounded by water over 600 ft deep. This also marks the outer limit of effective wave and current action on the sea-floor, and the maximum depth to which sunlight is able to penetrate. The continental edges are a great shelving marginal plain comprising about 10% of the earth's surface, the outer half being covered by the seas. Below the dry land half are the oil reservoirs which have provided the bulk of the oil produced, and which hold a large proportion of the proved reserves.

About 15,000,000 square miles of the land area is underlain by a favourable section for oil formation and accumulation. The average thickness is 1⅓ mile, giving 20,000,000 cubic miles of potential oil-bearing sediments on dry land. The continental shelf and slope down to 3000 ft sub-sea level cover 17,000,000 square miles, and the average thickness of these potentially oil-bearing sediments is such that the total volume of favourable underwater sediments is 50,000,000–55,000,000 cubic miles. G. D. H.

1136. Antilles Brings in New Pitch Lake Producer. Anon. *Oil Gas J.*, 14.12.46, **45** (32), 57.—A producer has recently been completed in the Tank Farm area north of the Brighton Field. The potential is 743 brl/day, and oil is obtained from the Nariva sand which has given six other wells at depths of 2600–2700 ft. G. D. H.

1137. Highlights of Gulf Coast Development. J. S. Critz. *Oil Wkly*, 16.9.46, **123** (3), 81.—The Gulf Coast has given 3,169,562,000 brl of oil, 2,082,236,000 brl having come from the Upper Texas Coast region.

The present daily output is 808,900 brl, of which the Upper Texas Coast provides 514,400 brl. The reserves are believed to total 4,395,000,000 brl. There are 396 oil, gas, and distillate fields ; five have produced over 100,000,000 brl each, and seventy-four have accounted for 81% of the cumulative production.

Producing formations range in age from Eocene to possible Plio-Pleistocene. The deepest production is 13,778 ft.

Subsequent to 1924 geophysics has played a part in Gulf Coast oil discoveries. It is estimated that 67% of the fields have been discovered by geophysics, and 12% by surface geology.

The principal producing zones are the Wilcox and Cockfield–Yegua (Eocene), the Marginula–Frio (Oligocene) and the Miocene.

Miocene sediments are 15,000–18,000 ft thick in South Louisiana.

There is a general monocline. Salt domes are numerous, and the top of the salt has been encountered at depths down to 12,608 ft. There are also stratigraphic traps, and faulted low relief anticlines.

A map shows the site of the largest Gulf Coast fields, and tables list the reserves and cumulative production of the largest fields, the producing horizons, the method of discovery of the fields, and their present status. G. D. H.

1138. Development Trends in Salt Dome Exploration. C. Hagen and R. Cantrell. *Oil Wkly*, 16.9.46, **123** (3), 87.—In the past five years some 340 million brl of oil have been added by salt dome development in the Gulf Coast. Vicksburg and basal Frio (Hackberry) production are probably new developments. Very young shallow sands are productive at Bayou Blue and Golden Meadows. Thick producing sands have been found at Weeks Island and Belle Isle.

Geophysics has proved of value in determining the lateral form of the domes. Some domes have proved to be irregular and ridge-like, and may have flank fault blocks. Electric logs and palæontology have revealed unconformities, and radioactive logs have shown passed-over production.

There are indications that some large domes have governed sedimentation in their neighbourhood. G. D. H.

1139. Greater Seminole Revived by Many Small Pools. W. P. Sterne. *Oil Wkly*, 9.12.46, **124** (2), 42.—During the past eighteen months about 100 discoveries or field extensions have been made in the Greater Seminole area. The Seminole pool was opened in 1925, and gradually activity spread over five countries. The Wilcox was the objective, and many promising Pennsylvanian horizons were ignored. Output began to decline and then the area was thoroughly examined by seismic crews and geologists. Almost all the recent discoveries are fault or stratigraphic traps in the Pennsylvanian–Booch (2500 ft), Cromwell (3000 ft), Senora (2000 ft), Calvin (1500 ft), and Gilcrease (2700 ft) sands.

Some of the more important pools in which the new developments have occurred are listed, and the outstanding points are discussed. A map shows the most active pools. G. D. H.

1140. Geological Survey Completes New Structure Map for Rangely Field. N. W. Bass. *Oil Gas J.*, 30.11.46, **45** (30), 86.—The Rangely pool produces from fracture zones in the Mancos shale at 500–1700 ft, and extensively from the Weber sandstone at 5500–6500 ft. One well produces from the Shinarump conglomerate. Initial yields range about 100–1000 brl/day, and mainly 250–500 brl/day.

The Weber is in the form of a large anticline with a steep south-west flank. The oil-water contact is 950 ft below the crest of the structure. In the southeast there are three normal faults, possibly trending northeast to southwest. The Weber sandstone is about 1200 ft thick, and includes some red shale beds, especially in the lower part. The oil-bearing horizons are in the upper 700 ft. Some of them are cross-bedded. The average porosity of the cored section is 8·9%, and the permeability 3·8 mD. However, some zones have a porosity of 20% and a permeability of 50 mD. There are prospective oil horizons below the Weber.

A stratum contour map of the Weber is given. G. D. H.

1141. Fourth Springhill Test is Located; No. 3 has High Gas–Oil Ratio Yield. Anon. *Oil Wkly*, 18.11.46, **123** (12), 15.—Springhill 3 was about 100 ft structurally higher than the discovery well, and has much gas with little oil. The latter has increased and may be 500 brl/day. A fourth test 1500 ft east of No. 3 has reached 3500 ft.

The producing horizon is now known to be of Cretaceous age. G. D. H.

1142. Umiat 1 Halts, May Quit. Anon. *Oil Wkly*, 18.11.46, **123** (12), 15.—Unofficially it is reported that Umiat 1 on Naval Petroleum Reserve No. 4 in Alaska will probably be abandoned at a little below 6000 ft. It has encountered at least five very tight sands with showings of oil or gas. The well is believed to be structurally low. G. D. H.

1143. Wildcatting Up Sharply. Anon. *Oil Wkly*, 28.10.46, **123** (9), 59.—428 exploratory wells were completed in U.S.A. in September 1946, and ninety-two were producers. During the first nine months 3446 exploratory wells were drilled and 689 were producers.

Tables summarize the results of exploratory drilling in U.S.A. in September and during the first nine months of 1946, according to States and districts. The September discoveries are listed with mention of salient points. G. D. H.

1144. October Wildcatting Sets High for Year. Anon. *Oil Wkly*, 25.11.46, **123** (13), 57.—480 exploratory tests were completed in U.S.A. in October, bringing the 1946 total to 3936. Eighty-two of the October tests were producers, while 771 of the tests during the first ten months were successful. The latter figure includes ninety-nine new gas pools and 158 distillate discoveries.

Tables summarize by States and districts, the results of exploratory drilling during October and the first ten months of 1946, and the October discoveries, are listed with data on salient points. G. D. H.

1145. Colombian Gulf Company's Test Reports Slight Show. Anon. *Oil Wkly*, 9.12.46, **124** (2), 31.—Sardinata 1 in the Middle Magdelena Valley has reached a depth of 7200 ft, and has found light oil shows in clayey, low-porosity sands from 6800 ft downwards. Impregnation is spotted. G. D. H.

1146. Wildcat in North Colombia may be Shallow Producer. Anon. *Oil Wkly*, 25.11.46, **123** (13), 29.—Tubara 1 in extreme northern Colombia has reached 5200 ft. In the section shallower than 3500 ft there are sands and sandy shale with few shale breaks, and these beds carry sufficient showings of oil and gas to indicate that a shallow producer is possible. G. D. H.

1147. Pemex Continues Hope for Big Oil Discoveries Despite Recent Failures. Anon. *Oil Wkly*, 11.11.46, **123** (11), 48.—Recently Tepezintla 1, 8 miles west of Cerro Azul, was abandoned at 6217 ft. Other tests have been drilled west of the Golden Lane, and in 1945 a well 10 miles west of Alama gave some oil. In the Castillo area mid-way between Soledad and Poza Rica two wildcats have been abandoned below 700 ft, showings being found in the Tamabra.

Las Norias 1 is being drilled on a structure southwest of the Mision field. Sarlat 23 on the Isthmus had a serious blow-out at 2454 ft. This wildcat is on a faulted structure. G. D. H.

1148. Texas Petroleum Company Test Opens First Field in Upper Magdalena Area. Anon. *Oil Wkly*, 9.12.46, **124** (2), 31; *Oil Gas J.*, 21.12.46, **45** (33), 47.—Velasquez 1 has been completed through casing perforations between 6900 and 7100 ft and is estimated to have a potential of 300–400 brl/day on a ¼-in choke. The G.O.R. in early tests was 400–600 cu. ft./brl. The oil is 27·2°. A test of 7265–7275 ft gave only 25 brl/day of 26° oil. Untested but favourable sands occur at 6300 ft and 6700 ft. The Tertiary was found to rest on the basement at about 8500 ft. Velasquez 2 is to be drilled 2275 ft to the south.

Tablon 1 is being drilled in the Department of Bolivar east of Monteria. G. D. H.

1149. Progress Made on Two New Colombian Wells. Anon. *Oil Gas J.*, 7.12.46, **45** (31), 64.—In the eleventh test 1 Velasquez has given a good oil show with a very small amount of gas. G. D. H.

1150. Atlantic Brings in New Venezuelan Producer. Anon. *Oil Gas J.*, 14.32.46, **45** (32), 57; *Oil Wkly*, 16.12.46, **124** (3), 29.—A well has been completed on the Pelayo concession in Anzoategui. A potential of 425 brl/day of 30·5° oil is indicated. Seven horizons have been tested. The total depth was 7488 ft. G. D. H.

1151. Central European Nations Depending on Oil to Finance Post-War Rehabilitation. H. David. *Oil Gas J.*, 30.11.46, **45** (30), 44.—Production in Austria and Hungary has risen sufficiently so that with Roumania's reduced output there is enough oil to supply those three countries, Italy, Greece, Yugoslavia, and Czechoslovakia. The fields are on the outer edge of the Carpathian arc. 98% of Roumania's output has come from an area 45 miles by 15 miles. Production is from Pliocene beds associated with faults, folds, and salt intrusions. Dacic production is spotted, but can be rich. A little oil is obtained in eastern Roumania from older beds on complex structures. The Upper Miocene yields dry gas on seven domes in the Transylvanian basin. Roumania's current output is about 100,000 brl/day.

In Hungary Budafapuszta and Lovaszi produce from the Pliocene, and each may have reserves in excess of 25,000,000 brl. Hahot produces from a Triassic dolomitic limestone. The first two fields are on anticlines, and Hahot is on a buried ridge. All are in a small Pliocene basin possibly connected with the large Pannonian basin to the east in which there has been wildcatting, giving north and west of Arad gas and condensate at Totkomlos and Korossegapati. The area has a thick Quaternary cover which masks structures.

Since 1913 Bitkow, a small field, is the only new field opened in Poland.

The Austrian output rose to 5000 brl/day in 1942. Oil occurs in the Eocene and Miocene of the Vienna basin along a faulted ridge. Accumulation seems to be related to fracture zones within a few hundred feet of the fault. G. D. H.

1152. Gas Producer near Vienna. Anon. *Oil Wkly*, 16.12.46, **124** (3), 29.—A 1,412,000 cu. ft./day gas well has been completed near Vienna. G. D. H.

1153. Hungary Reports Oil Find. Anon. *Oil Gas J.*, 14.12.46, **45** (32), 58.—The presence of oil in the Danube–Tiza basin, about 70 miles southeast of Budapest, has been reported. G. D. H.

1154. Gas Well in Poland. Anon. *Oil Wkly*, 16.12.46, **124** (3), 29.—Dembowiec 1, near Skoczow in extreme western Poland, flowed 3530 cu. ft. of gas/minute from a depth of 1300 ft. G. D. H.

Geophysics and Geochemical Prospecting.

1155. Electrical Logging : a Study of the Self-Potential Curve. C. C. White. *Oil Gas J.*, 14.12.46, **45** (32), 88.—The self-potential in electric logging is made up of the electro-chemical and electro-filtration potentials. The former is set up at the contact of two waters of different salinities, the formation and drilling mud waters. If the drilling mud has the lower salinity the potential is negative. The streaming potential is a function of the pressure differential, permeability, fluid viscosity, and resistivity. Mudding-off will affect the permeability.

Analysis of data from the South Albion field of Illinois indicates that in the Waltersburg sand 100 mV may be due to electro-chemical effects, and 29 mV to electro-filtration.

The amount of potential shown on the electric log is dependent on the tendency of the mud and the surrounding formations to carry it away, and also on the strength of the source of potential. There may be a small electro-chemical potential opposite shales, but electro-filtration potentials can be developed only where there is permeability.

It is suggested that the presence of high resistivities in itself does not cause diminution of self-potential. G. D. H.

1156. Structural Correlation of Micromagnetic and Reflection Data. W. P. Jenny. *Oil Wkly*, 16.12.46, **124** (3), 32.—Large domes may govern sedimentation in their vicinity, and this may be true in a more limited fashion with small domes. Hence there may be difficulty in correlating reflections over local structure.

Certain beds are sufficiently magnetized to serve as key-beds in micromagnetic surveys. These may be above, below, or the same as the reflecting beds.

A series of hypothetical cases are described in which magnetic data permit the resolution of structural features which cannot be ascertained by reflection data because the magnetic formation is more complete than the reflecting horizon. G. D. H.

1157. Radioactivity Well Logs Interpretation and Application. V. J. Mercier. *Oil Wkly*, 14.9.46, **123** (7), 56.—Laboratory work has shown that among sediments limestones, sandstones, and dolomites are generally very low in radioactivity, while black and marine shales are high in radioactivity. A knowledge of local lithology is necessary, because sandstone, limestone, and dolomite cannot be distinguished on radioactive well logs by the logs alone. At times these rocks also are high in radioactivity. Accurate formation thickness measurements are possible from the logs, picks being made at the mid-points of transitions on the curves. Correlation is possible by means of these logs; cased-off formations and carnotite squeeze cement can be detected, and logging is possible in fluids which prevent the making of ordinary electric logs.

The neutron curves are obtained when the strata undergo neutron bombardment, and may be considered as "fluid content or hydrogen curves," since the amount of hydrogen greatly influences the curves. The instrument is made insensitive to natural gamma rays. Combined with the gamma-ray curve the neutron curve is valuable for detailed studies. The neutron curve, due to differences of instrument design, gives better definition of thin beds than does the gamma-ray log. It is excellent for locating porous horizons in beds. Shales contain hydrogen in connate water and in minerals.

An example of the interpretation of neutron and gamma-ray logs is given.
G. D. H.

1158. West Texas Modern Refraction Seismic Exploration. S. Harris. *Oil Wkly*, 14.10.46, **123** (7), 52.—Modern refraction technique has recently led to several oil discoveries in the Edwards Plateau area. Generally, the reflection method has not given satisfactory results in this area, due apparently to the presence of a thick layer of Edwards limestone at the surface. In the Permian Basin there are local areas where caliche interferes with clear recording of reflections.

The new refraction technique is not solely dependent on first arrivals, and gives greater penetration with less dynamite. The seismometers are spread, and correlation by character is used. The accuracy is, however, not so great as with reflection work, but changes in elevation of the refracting surface can be computed.

The cost of an average seismic refraction crew in the Edwards Plateau area is about $25,000 per month. In reconnaissance work about fifty sections can be covered each month; in detail control in rough terrain the output may be only ten to twelve per month.

In the Edwards Plateau area refractions as deep as the Ellenburger have been obtained. At pre-Permian levels closures of 200 ft are detectable, and in the Permian 100 ft. G. D. H.

Drilling.

1159. Modern Rotary Drilling. Parts 11–20. J. Zaba. *Oil Gas J.*, 15.3.47, **45** (45), 99; 22.3.47, **45** (46), 291; 29.3.47, **45** (47), 175; 5.4.47, **45** (48), 103; 12.4.47, **45** (49), 99; 19.4.47, **45** (50), 133; 26.4.47, **45** (51), 181; 3.5.47, **45** (52), 105; 10.5.47, **46** (1), 97; 17.5.47, **46** (2), 111.—These papers are a continuation of the series of brief articles on trends and developments in modern drilling practice. The sub-titles of parts 11–20 are as follows: (11) Portable Drilling Masts; (12) Erection and Dismantling of Portable Drilling Masts; (13) Load and Speed Conditions of the Hoisting Cycle; (14) Effect of Engine Characteristics; (15) Draw-Works—General; (16) Draw-Works—Auxiliary Brakes; (17) Auxiliary Draw-Works Brake—Hydraulic Type; (18) Capacities and Modern Arrangements of Hydraulic Type Draw-Works Brakes; (19) Electromagnetic Draw-Works Brakes; and (20) Draw-Works Clutch System.
R. B. S.

1160. The Application of the Principles of Clay Chemistry to Problems Encountered When Drilling in Trinidad Clays. H. C. H. Darley. *J. Inst. Petrol.*, 1947, **33**, 219.—Such properties of clays as affect drilling problems are discussed. It is shown that with clay-base muds, in order to maintain the characteristics necessary for drilling a high degree of dispersion of the clay particles is required, but that the dispersion agents react on the bit cuttings and formation to cause rapid rises in viscosity, "sticky" drilling with consequent low rates of penetration, and to promote caving. Attempts to mitigate these difficulties with clay-base muds are described. Alternatives to clay-base muds are discussed and the results of laboratory tests of starch muds containing flocculating agents are given. An account is given of the trial of a starch–aluminium sulphate drilling fluid, which gave a marked increase in the rate of penetration but developed excessive gel strengths. The properties of a starch–sodium chloride–sodium silicate drilling fluid, which appeared to offer a solution to the problems under discussion, are given. J. T.

Production.

1161. New Development in Producing Equipment. F. A. Street. *World Petrol.*, 1947, **18** (5), 76–77.—Engine design has been simplified and drilling equipment made more portable. Quality has been improved so that in certain fields drilling costs are down, in spite of a rise in wages. Light alloys and plastics are finding a more extensive use. Long-stroke pumping units are being developed, particularly for deep-well pumping. Work has been speeded by aids, such as a new device to prevent drill-pipe becoming stuck in key-seats when the pipe is being pulled, and a camera which will photograph the well bore, either continuously or at intervals. Television apparatus is being developed to give a view on the surface of the well bore. Radioactive markers and a gas meter which can be sunk and register the presence and extent of gas are in use. F. S. A.

1162. Gas-Condensate Reservoir Engineering. Part II. Fluid Properties and Flow Relationships in the Reservoir. C. K. Eilerts. *Oil Gas J.*, 8.2.47, **45** (40), 78.—In this part are discussed: (1) the recovery of hydrocarbon liquids associated with lean fluids in the reservoir, and (2) the recovery of rich gas-condensate fluids from reservoirs. Liquid precipitated in the reservoir from lean fluids will be held in the pores of the formation unless (*a*) it exceeds the residual liquid saturation in which case it will flow towards the producing wells with the gas, or (*b*) it is subsequently vaporized as the reservoir pressure declines: the possibilities of this occurring are remote. In the light of these facts the effects of fluid saturation and of the character of gas–liquid flow are further discussed.

The reservoir phase state of a rich fluid may be considerably different to that of a lean fluid owing to the fact that a rich fluid is more likely to exist in close proximity to the critical point. In this case, the properties of the separating gas and liquid phases have almost identical properties. The fact that the ratio of the viscosity of the gas phase to that of the liquid phase is almost unity leads to a somewhat anomalous behaviour, since the per cent liquid saturation of a sand required for flow of liquid (and thus the residual liquid saturation) is lowest when the gas and liquid phases are alike in properties. Ten references are appended. R. B. S.

1163. Gas Condensate Reservoir Engineering. Part III. Equilibrium Factors, Hydrates, and Corrosion. C. K. Eilerts. *Oil Gas J.*, 15.2.47, **45** (41), 100.—The following problems are explained: (1) the determination of equilibrium factors for use in the design of equipment employed in extracting specific hydrocarbons from gas-condensate fluids (2) the utilization and the development of data on natural gas hydrates to facilitate the operation of field collecting systems, gas pipelines and drying plants; and (3) the control of internal corrosion of flow strings, Christmas-tree fittings and collecting lines. Such corrosion is known to be serious in many gas-condensate fields. Sixteen references are appended.

This is the final part of a series of three papers which has included an excellent bibliography of a total of thirty-seven references. R. B. S.

1164. Apparatus for Analysis of Reservoir Fluids. P. G. Exline and H. J. Endean. *Oil Gas J.*, 15.3.47, **45** (45), 82. (*Paper presented at spring meeting, A.S.M.E., Tulsa.*) —A description is given of an apparatus designed to study the volumetric and viscosity behaviour of reservoir fluids. The complete pressure system can be described as being made up of three independent sections: (1) the analysis section in which both bottom-hole samples and recombined samples can be analysed—it consists of (*a*) a variable volume cell in which the volumetric test measurements are made, (*b*) a rolling ball viscometer for viscosity measurements, and (*c*) a magnetic pump for circulating the fluids and maintaining equilibrium between the phases; (2) the gas compression system used for the quantitative injection of gas into the analysis section for recombination with the separator liquid in the correct proportion; and (3) the pressure-indicating system for indicating the pressure within either of the other two systems during a test. Each of these sections is described and the calibration of the apparatus and method of procedure are explained. Ten references are appended. R. B. S.

1165. Packer Problems in West Texas. T. H. Dwyer. *Oil Gas J.*, 5.4.47, **45** (48), 92. (*Abridged version of paper presented before S.-W. District Division of Production, A.P.I., Fort Worth,* March 1947.)—This paper forms a discussion of both casing packer problems and open-hole packer problems, each of which are treated under the following sub-headings: (1) problems readily solved with available packer equipment; (2) problems solved with some difficulty using available packer equipment; (3) problems apparently solvable by packers if improved equipment were available; and (4) recommended practice for running, setting, and removing packers. R. B. S.

1166. Oil Production by Water. Part 15. Control of Per Interval Producing Rates. P. J. Jones. *Oil Gas J.*, 1.3.47, **45** (43), 67.—The producing characteristics of the multiple-pay reservoir studied in Part 14 (the R-2 reservoir) are used to show that the control of per-interval producing rates is a significant factor in production. Several conditions are investigated and it appears that control of producing rates depends primarily on isolating the production from the various pay intervals. The different effects of dual completions and separate completions to each zone are discussed from an economic standpoint. R. B. S.

1167. Oil Production by Water. Part 16. A Linear Reservoir. P. J. Jones. *Oil Gas J.*, 8.3.47, **45** (44), 62.—A hypothetical stratigraphic type reservoir—called the L-1 reservoir—is considered, and its characteristics are mapped out in detail. Various diagrammatical and graphical methods of illustrating (1) the distribution of pay zones, (2) pay thicknesses, and (3) acres of oil–water interface, are shown, thus enabling a clear picture of the productive limits of the reservoir to be formed. The need for so much detailed mapping is to be explained in succeeding parts. R. B. S.

1168. Oil Production by Water. Part 17. One Producing Unit. P. J. Jones. *Oil Gas J.*, 29.3.47, **45** (47), 147.—The initial producing capacity of the L-1 reservoir described in Part 16 was only 7000 brl/day relative to one oil–water interface. This rate is too slow to be economical, but it can be increased by drilling a row of injection wells other than those required along the normal water–oil contact. Such a row of up-dip injection wells gives two additional oil–water interfaces and therefore splits the original reservoir into three producing units. The factors which have to be considered in splitting reservoirs are discussed and a hypothetical example is given. R. B. S.

Oilfield Development.

1169. Completions Total Tops 1945 Period. Anon. *Oil Wkly*, 28.10.46, **123** (9), 57.—In the first nine months of 1946, U.S. well completions totalled 21,910. The total for the same period of 1945 was 19,115 wells. This year's completions include 11,713 oil wells and 2071 gas wells. 1516 service wells were drilled.

A table lists the September 1946 completions by States and districts, and according to type. G. D. H.

1170. Completions for Year to Approach 30,000. Anon. *Oil Wkly*, 25.11.46, **123** (13), 63.—During the first ten months of 1946, 25,474 wells were completed in U.S.A. The October completions numbered 2756. 13,298 of this year's completions have given oil, 172 distillate, and 2632 gas.

The October and January–October completions are summarized by States and districts. G. D. H.

1171. Canadian Oilfield Development in 1946. J. L. Irwin. *Petrol. Times*, 24.5.47, **51**, 482.—The development of the Albertan Oilfields in Western Canada is briefly reviewed and figures are presented of production by fields for 1945 and 1946. The total Albertan production in 1946 was 7,137,693 brl as compared to 8,055,440 brl in 1945—a decrease of 917,747 brl. However, many new structures are being explored and the recent trend towards increased production experienced towards the end of 1946 is expected to persist into 1947. R. B. S.

1172. Argentina's Production for Six Months Declines. Anon. *Oil Wkly*, 11.11.46, **123** (11), 48.—In the first half of 1946 the State-owned fields produced 6,996,875 brl of oil and the privately owned fields 3,324,506 brl. The corresponding figures for the first half of 1945 were 7,779,909 and 3,771,536 brl respectively. G. D. H.

1173. Continued Decline Shown in German Oil Production. Anon. *Oil Wkly*, 16.12.46, **124** (3), 29.—In the first ten months of 1946 3,833,473 brl of oil was produced in the British zone of Germany. 71% came from the Hanover–Braunschweig area, 11% from Schleswig–Holstein, 10% from Westphalen, 6% from Luneburg, and 2% from Olderburg–Ostfriesland.

The output each month is given. G. D. H.

1174. Russians are Successful in Developing Tuimazy Field. Anon. *Oil Wkly*, 25.11.46, **123** (13), 29.—Development of the Tuimazy field was delayed by the war until 1944 when a well found good production in the Devonian at 6560 ft.

Of 12,000,000 brl of oil produced in Bashkiria in 1939, 218,000 brl came from Tuimazy. G. D. H.

1175. Large Reserves Claimed by Magazine for Russia. Anon. *Oil Wkly*, 25.11.46, **123** (13), 29.—According to an article by Ivanov and Poznanskaya Russia had oil reserves of 46,300,000,000 brl in 1937.

The 1940 production was 225,000,000 brl, and the output is planned to reach 257,000,000 brl/year in the current five-year plan, with an objective of 435,000,000 brl in 1965. G. D. H.

1176. Iran Production May Top 1945 Mark by Five Million. Anon. *Oil Wkly*, 16.12.46, **124** (3), 29.—In August 1946 Iran produced 11,689,500 brl of oil, giving an aggregate of 96,270,000 brl for 1946. G. D. H.

REFINERY OPERATIONS.

Refineries and Auxiliary Refinery Plant.

1177. Cooling Tower Performance Evaluated for the Plant Operator. J. G. De Flon. *Pipe Line News*, April 1947, **19** (4), 15.—The factors necessary for consideration in designing cooling tower plant are discussed. The required tower size is a function of: (1) the cooling range (*i.e.* the hot water temperature minus the cold water temperature); (2) the approach to wet bulb temperature (*i.e.* the cold water temperature minus the wet bulb temperature); (3) the quantity of water to be cooled; (4) the wet bulb temperature; (5) the air velocity through the cell; and (6) the tower height. The design calculations can be simplified by the use of charts: the necessary charts are printed and their use is illustrated by several simple examples. Finally, cooling tower spray nozzles are very briefly discussed. R. B. S.

1178. Gas Turbine-Driven Centrifugal Compressors for Natural Gas Pipelines. E. T. P. Neubauer. *Oil Gas J.*, 3.5.47, **45** (52), 59.—The fundamental characteristics of the gas turbine as a source of power for natural-gas pipeline work are discussed.

The compression ratio and the characteristics of the gas being compressed determine the applicability of centrifugal plant.

Centrifugal compressors are adapted to automatic operation and until recently an economical prime mover has not been available. A large horse-power unit is required;

the electric motor is expensive to run, and the steam turbine presents difficulties particularly as regards water. The gas turbine, however, permits low maintenance and service costs, and can use gas from the pipeline as fuel.

Among other desirable characteristics of the gas turbine are its possession of rotating parts only, with speeds high enough to permit directly connected compressors; no necessity for water, and one unit, or at most two, could handle at each station a load of 250,000,000 cu. ft. gas per day. G. A. C.

1179. Reciprocating-Pump Data. Refiner's Notebook No. 143. W. L. Nelson. *Oil Gas J.*, 10.5.47, **46** (1), 99.—Data are presented in tabular form for the following types of pump: Triplex, Simplex, Boiler Simplex, Piston Duplex, and Plunger Duplex, sizes ranging from 1½ × 2 in, to 12 × 11 × 12 in, g.p.m. 2·75 to 756·0. Information includes rated working pressure (p.s.i.), pump speed (r.p.m.), piston speed (ft/min) discharge pressure, steam required at rated pressure (lb/hr) and approximate weight. W. M. H.

1180. Pumping Cost. W. L. Nelson. *Oil Gas J.*, 7.6.47, **46** (5), 103.—This No. 145 in the *Refiner's Notebook* series replaces No. 145 issued May 24, 1947, which is withdrawn. Hydraulic horse-power, brake horse-power, power cost per pumping month (U.S.A. dollars), pump efficiency in per cent, and water rate (lb per brake h.p.-hr) are related on one chart. G. A. C.

1181. Adequate Maintenance and Sound Operating Methods Assure Efficiency of Steam Power Plants. R. B. Tuttle. *Oil Gas J.*, 10.5.47, **46** (1), 72.—Case histories show that detailed records of performance, made and studied during the early life of a plant, may lead to increased efficiency and a cut in production costs. Many boiler plants suffer from inadequate instrumentation, and a plentiful supply of cheap fuel may also lead to inefficient running, particularly in gas-fired boilers. Automatic control of mixed-gas combustion is practicable, and will cut operating costs.

Two Mid-Continent refineries are cited as examples of efficient running. Each operates at an average overall efficiency of 75%, with average cost of steam production at $0·1805 per 1000 lb, exclusive of depreciation. 5·66% of total production cost is made up of maintenance labour and material. Neither refinery has been forced to shut down for steam-generating plant repair for many years. Instrumentation is above average, for the provision of operating information. A summary of expense items is shown.

Efficiency of other plants in the same area varies greatly, but an average operating cost for nine of these is 11·3% higher than that of the two plants described; and in some the operating efficiency is as low as 55–65%, with a cost of $0·2248 per 1000 lb, excluding depreciation. These plants possess no accessories for improvement of boiler efficiency, and instrumentation is so poor that no accurate production data are available, but operating conditions indicate that plant efficiencies could be increased if water treating procedures were improved. W. M. H.

1182. English Petrochemical Plant Taking Shape Near Manchester. Anon. *Oil Gas J.*, 7.6.47, **46** (5), 44.—An outline is given of the plants to be erected by Petrochemicals Ltd. at Partington, Manchester, England. The site has an area of about 800 acres, fifty of which are adjacent to the Manchester Ship Canal.

The Catarole process is to be used; a fraction of boiling range 225–500° F obtained by straight distillation is catalytically cracked in the gaseous phase with the production of olefinic gases and aromatics or polycyclic aromatics.

Prospective users of Catarole products may erect plant within the site; and steam, electricity, and water may be provided from a central plant.

Construction has already commenced. Primary plant will consist of five cracking furnaces, gas purification plant, gas separation, and distillation units.

The olefinic gases, such as ethylene and butadiene, will be separated and obtained in great purity through compression, refrigeration, and fractional distillation processes in the secondary plant.

Throughput is planned at 50,000 tons/annum, but plant design is such that this may be increased to about 120,000 tons/annum. G. A. C.

1183. New Plants for the N.V. de Bataafsche Petroleum Maatschappij in Holland. Anon. *De Ingenieur*, 6.6.47, (23), 205–209.—A brief review of two new plants and one enlarged plant is given together with schematic diagrams of the two new plants :—

(1) A plant to increase the production of fixed nitrogen from air from 16,000 tons/annum to 51,000 tons/annum.

(2) A plant for the production of a synthetic detergent from cracked paraffins. The rated capacity is 25,000 tons/annum and should be in production by the end of 1948.

(3) A plant for the production of P.V.C. plastics of rated capacity of 2000 tons/annum. N. C.

Distillation.

1184. Calculation of Distillation Columns Having no Side-Stream. V. Chibaeff. *Rev. Inst. Franç. Pétrole,* 1947, **2**, 25–37, 99–107.—A study of continuous columns yielding overhead and residue products only. The method of calculation is based on the relative volatility of the two main components of the feed and enables a rapid calculation to be made of the theoretical number of concentration and stripping plates needed to give a distillate and residue of required composition at a determined reflux ratio. The method avoids successive equilibrium calculations for each plate by introducing a term for minimum reflux ratio into the calculation. The calculation is described in detail and a method for a graphical solution is also given. A knowledge of the relative volatilities of the components to be distilled is essential. V. B.

1185. Twenty Centuries of Distillation. R. T. Forbes. *De Ingenieur,* 13.6.47, (24), M.15–21.—The process of distillation is traced from the earliest known procedure, the Coptic method, to the patenting of the Heckmann column. The article is well illustrated with photographs of early apparatus. N. C.

Cracking.

1186. Factors Affecting Yields in Thermal Cracking of Residue Oils to Liquid Residues. G. Armistead, Jr. *Oil Gas J.*, 17.5.47, **46** (2), 103.—The most important factors affecting yields in thermal cracking are viscosity breaking, gravity of feed and fuel oil, cracked gas oil withdrawn, and gasoline end-point produced.

Viscosity breaking reduces viscosity of heavy stocks and lowers the boiling range and pour-point. Its effect on gas-oil production and viscosity of residue is shown in graphical form. Operations are designed to produce lowest viscosity fuel oil with the minimum sacrifice in gasoline yield. Heavy tars may be cut back with lighter cracking-stock fractions.

The effect of process characteristics and operating conditions varies greatly, and must be evaluated for every specific process, though it may be said generally that processes involving gas-oil cracking above 1050° give low gasoline yields, and that gasoline yields are increased by selectivity and by viscosity breaking.

Gasoline yield is correlated with ° A.P.I. of feed and fuel oil in a series of curves.

Withdrawal of gas oil reduces gasoline and fuel oil yields by the amount obtainable from the cracking of such withdrawn quantities. This is illustrated by a table showing potential gasoline yields related to properties of gas oil withdrawn.

The effect of cracked-gasoline end-point charge on gasoline and fuel oil yield follows a linear relationship, and, for gasoline, is about 3% volume. Charge on basis of gasoline yield for each 10° charge above and below 400° end-point.

Six references are given. W. M. H.

1187. Effect of Temperature in Thermofor Catalytic Cracking. H. D. Noll, R. E. Bland, and G. Kelso. *Oil Gas J.*, 10.5.47, **46** (1), 64.—Data are presented for effect of reaction temperature on yields and octane ratings, A.S.T.M. and Research, of gasoline produced in once-through T.C.C. cracking of East Texas heavy gas oil. An economic analysis is included, since highest octane numbers do not correspond with highest gasoline yield.

Stock was processed in single-pass operations over synthetic bead catalyst, with reactor temperatures of 775° to 960° F and conversions of 40–70% by volume. Basic data, such as characteristics of stock, operating data, yields, octane numbers, and earnings, are expressed in a series of curves and tables.

An increase in the average reactor temperature results in increase in (*a*) yield of propylene and butylene, (*b*) yield of dry-gas, (*c*) octane number measured by both A.S.T.M. and Research methods, though the gain in the A.S.T.M. value is lost or minimized on adding T.E.L.

An increase in temperature leads to a decrease in (*a*) gasoline yield ; (*b*) C_{4+} liquid recovery. W. H. M.

Isomerization.

1188. Autoxidation of Olefins : Formation of Unsaturated Alcohols from Olefins by the Action of Organic Peracids. W. J. Hickinbottom. *Nature*, 1947, **159**, 844.—The unsaturated alcohols obtained by the reaction of peracetic acid with α- and β-di*iso*butylenes is formed from the isomerization of the epoxide which is an intermediate in the reaction. Thus 2 : 4 : 4-trimethylpentan-2 : 3-epoxide and acetic acid, with a trace of sulphuric acid, gives 2 : 4 : 4-trimethylpenten-1-ol-3 (I), the monoacetate of 2 : 4 : 4-trimethylpentan-2 : 3-diol (II), and a substituted dioxane (III). The yield of I and II is approximately the same, and that of III rather less.

These experiments substantiate the hypothesis that the preliminary phase of the peroxidation of olefins by oxygen is the formation of a moloxide (similar in structure to the epoxide) followed by hydroperoxide formation due to the opening of the moloxide ring and change in position of the double bond. The opening of the ring system may be accompanied by the formation of bimolecular oxygenated and carbonyl compounds. H. C. E.

1189. Converted U.O.P. Isomerization Unit Now Makes Polymer Gasoline. L. C. Brown. *Oil Gas J.*, 17.5.47, **46** (2), 91.—Co-operative Refinery Association at Coffeyville, Kans., have converted their butane isomerization unit to a U.O.P. polymerization plant producing 150 brl, of high-grade motor gasoline daily. Cost of conversion was $18,000, time taken being three weeks.

The polymer gasoline has an A.S.T.M. clear octane rating of 82, Research clear octane rating of 95, and R.V.P. 10 lb.

Hot oil from the thermal cracking unit is used to preheat the combined poly feed and to supply heat to the depropanizer reboiler, the feed being obtained as liquid from the cracked gasoline stabilizer. The aluminium chloride saturates are used as caustic- and water-wash columns for pretreatment, and the hydrogen chloride recovery column has become a surge column for handling combined recycle and fresh feed. The isomerization reactor was adapted in installing in the column two catalyst beds filled with solid phosphoric acid catalyst over crushed fire brick. The combined feed is discharged above the first bed, and a distribution ring between the two beds brings about rapid mixing of quench and first bed effluent. The alkylation motor-driven gland-seal pump is used to pump the charge, and the aluminium chloride column now serves as gasoline stabilizer.

Flow through the plant is described, and a flow-sheet included, together with tables of yields and properties. Production of gasoline to date has been 117 gal per lb of catalyst, and catalyst life will probably approach 150 gal, a result of very complete instrumentation and recognition of reactant variables. W. M. H.

1190. Dehydrogenation of Aliphatic-Cyclic Hydrocarbons to Substances Capable of Polymerization, and the Laws Governing these Reactions. A. A. Balandin and G. M. Marukjan. *Compt. Rend.* (*Doklady*) *Acad. Sci. URSS.*, 1947, **55**, 121 (in English).—Several previous papers by the authors on the preparation of arylolefins from aliphatic-cyclic hydrocarbons by catalytic dehydrogenation over a copper–chromium catalyst at 625° C are reviewed. The yields obtained for a single pass at a liquid feed rate of 450 ml/litre/hr are compared with the yield of styrene from ethylbenzene as a standard, and reduced to a fixed catalyst activity. Yield data are given for thirteen hydrocarbons, including ethane, cumene, *sec.*-butylbenzene, *o*-, *m*-, *p*-diethylbenzenes, *p*-di-*iso*propylbenzene, *p*-di*sec*.butylbenzene, 1 : 1-diphenylethane, 1 : 2-diphenylethane, and tetralin. The results are used to deduce four rules governing the effect of structural changes on the ease of dehydrogenation of alkylbenzenes and aryl-substituted ethanes. G. H. B.

1191. Comparative Velocity of the Catalytic Dehydrogenation of Monoalkylbenzenes and Dialkylbenzenes. A. A. Balandin and E. M. Marukjan. *Compt. Rend. (Doklady) Acad. Sci. URSS*, 1947, **55**, 215 (in English).—The authors had previously shown that mono- and dialkyl-benzenes were dehydrogenated at the same rate over a copper–chromium catalyst at 625° C and the subject has been examined in greater detail. With a freshly regenerated catalyst the dehydrogenation rate was actually greater for ethylbenzene than for *p*-diethylbenzene, but the difference rapidly disappeared as the catalyst deteriorated. A similar effect was found in progressive experiments with *iso*propylbenzene and *p*-di*iso*propylbenzene passed alternatively over a single batch of catalyst. Analysis of the reaction products from diethylbenzene showed that both ethyl groups were dehydrogenated simultaneously to divinylbenzene, and that *p*-ethylstyrene was not formed as an intermediate product. The dehydrogenation rates were also equal for mono- and dialkyl-benzenes at other temperatures indicating that both types of compound have practically equal activation energies of dehydrogenation. An explanation is advanced for the experimental findings, based on the view that on the particular catalyst used, the alkyl groups of both mono- and dialkyl-benzenes are suitably disposed about the centre of adsorption to dehydrogenate independently at equal rates. G. H. B.

Chemical and Physical Refining.

1192. Catalytic Desulphurization of Cracked and Straight-run Gasolines. R. C. Amero and W. H. Wood. *Oil Gas J.*, 24.5.47, **46** (3), 82.—The relative merits of clays and bauxites as desulphurization catalysts for various types of cracked gasolines are investigated and discussed.

The investigation was carried out in three steps: (1) a space velocity–temperature study to determine optimum operating conditions; (2) runs on a cracked gasoline to determine the relative catalytic activities of clays and bauxites; and (3) a study of the catalytic effect of fuller's earth and bauxite on several cracked and straight-run gasolines.

No general conclusions regarding the relative efficiency of fuller's earth and bauxite as desulphurization catalysts could be arrived at as results are influenced by the nature of the stock.

Maximum yields of mercaptan-free gasoline were obtained with operating conditions of a space velocity of one—one volume of liquid charge per hour—and temperature of 750° F, these processes permitting of elimination of the sweetening step.

With 3 ml of T.E.L. octane ratings were raised up to 12 or higher for research ratings, estimates of 6–15 cents per brl of gasoline are reached; a saving in T.E.L. of 15 cents per brl shows a net gain of 7·5 cents on the complete process.

Six figures and four tables illustrate the article. G. A. C.

1193. The Phenosolvan Process. Lowenstein-Lom, Schnabel, and Kejla. *Petroleum*, April 1947, **10**, 82.—In 1939 and subsequently during the war, German scientists developed a method for extracting phenols from gasworks ammoniacal liquor and other sources by the use of aliphatic esters as extracting agents. The use of a mixture of esters consisting mainly of butyl acetate proved satisfactory and a pilot plant and three full-scale extraction plants were erected during the war for this process.

The possibility of alternative solvents to butyl acetate was investigated by the authors especially in view of the unsatisfactory supply situation for this material.

The main industrial processes for phenol recovery include extraction with benzol or other hydrocarbon solvents, combined with a caustic wash of the saturated solvent, sodium phosphate extraction followed by solvent recovery by distillation of the phenolic extract, and Kopper's recirculated steam distillation.

Where the solvent is actually produced on the plant or in gasworks and coke plants, hydrocarbon extraction is usually given preference. Difficulties are met with in coal hydrogenation plants because their phenolic liquors contain large quantities of alkali-soluble non-phenolic substances (fatty acids) and polyhydric phenols.

The phenosolvan process differs from other methods mainly in that (1) the solvent has a lower boiling point than the extracted phenols, (2) a mixture of phenols is obtained by simple distillation of the solvent and not by chemical treatment, (3) solvent is recovered from extracted liquors by evaporation and from the phenolic extract by distillation.

The properties of the solvent are dictated by the unit processes of which the extraction is made up. To reduce loss of extracting agent to a minimum the solvent should be a little soluble in water. At the boiling point of the mixture solubility should be almost zero. The solvent should not react chemically with the substances present in phenolic liquors. In this connection esters are easily saponified and butyl acetate cannot be used if free ammonia exceeds 3 g/litre in the liquor.

As many solvents form azeotropes with water, the proportion of solvent in the azeotrope should be as high as possible, the latent heat and boiling point of the pure solvent should be low. Flash-point should be high and toxicity low. A high distribution ratio—concentration of phenol in the solvent to concentration in the extracted liquor at equilibrium—is required.

Theoretically, the ideal solvent would be polar, possess a high dielectric constant, and be non-ionising. Halogenated solvents are unsuitable because of their unfavourable distribution coefficients. A sulphur atom generally unduly raises the boiling point.

Experimental work is described to assess the possibilities of the use in the extraction process of numbers of alcohols, esters, ketones, and ethers.

Their physical properties relevant to the discussion are tabulated.

It is concluded that certain compounds, as, for example, methyl butyl ketone, methyl *iso*-butyl ketone, dibutyl ether, di*iso*propyl ether, and the butyl and amyl acetates can all be used. F. W. H. M.

Special Processes.

1194. Total Gasification of Fuels by the Koppers Process. J. Barral. *Chim. et Ind.*, 1947, **57**, 441–443.—The Koppers process is designed to convert low-grade solid fuels (*e.g.* lignite) into a synthesis gas suitable as feed to a Fischer–Tropsch plant. A simplified flow diagram of the process is given, as well as analysis of the fuel, gas, and of the costs involved. The process is applicable to fuels having an ash content as high as 20%. V. B.

1195. Methane. A Reagent for Hydrocarbon Synthesis. M. Prettre. *Rev. Inst. Franç. Pétrole*, 1947, **2**, 131–140, 195–200.—Two aspects of the kinetics of contact catalysis are examined, adsorption and reactions in the adsorbed phase. By interrupting a normal catalytic reaction, cooling the catalyst zone in the presence of the reactants and transferring the cold catalyst, with exclusion of air, to a special apparatus (not described) it is possible to study the gases given off on desorption as the temperature rises, the most loosely adsorbed products being evolved first. A study of the catalyst in the course of catalytic cracking with hydrogenation showed a high concentration of methane to be present, although none of this material was present in the feed and only a small amount in the product. It is therefore concluded that the adsorbed phase has a high concentration of CH_3, CH_2, and CH radicals; the isomerization process can thus be considered as being one of methylation. In seeking to find a reaction in which the rôle of methane could be experimentally demonstrated, thermodynamic considerations pointed to the Fischer–Tropsch synthesis as being one in which this effect ought to be evident at atmospheric pressure. Experimental addition of methane to synthesis gas shows it to participate in the reaction. The use of methane decreases the induction period of the Fischer–Tropsch catalyst (during which large quantities of methane are normally produced); a similar effect is obtained by the dilution of the synthesis gas with an inert material such as nitrogen. It is considered that the large initial formation of methane normally observed is due to the heating up of fresh catalyst; if the temperature is kept low then condensable aliphatic hydrocarbons can be obtained almost immediately. V. B.

Metering and Control.

1196. Reciprocating—Pump Calculations—Part I. Refiners' Notebook, No. 144. W. L. Nelson. *Oil Gas J.*, 17.5.47, **46** (2), 113.—A very brief account is given of the method of operation of steam-driven reciprocating pumps, together with an explanation of the following terms: double-acting, simplex; duplex; outside end-packed plunger; head volumetric efficiency; hydraulic efficiency; mechanical efficiency;

piston speed; discharge pressure. A table of piston speeds and mechanical efficiencies is included for strokes of 3–36 in. W. M. H.

1197. A General Pressure–Volume–Temperature Correlation—for Mixtures of California Oils and Greases. M. B. Standing. *Oil Gas J.*, 17.5.47, **46** (2), 95.—The paper presents correlations between physical properties measured in the field and those necessary for solution of reservoir performance problems. The gas–oil ratios, gas gravities, oil gravities, and formation volumes given here are laboratory values, and are obtained from a two-stage flash separation at 100° F. The first stage is in the pressure range 250–450 p.s.i., the second stage at atmospheric pressure; the procedure approximates the average California field practice. Graphs are presented for prediction of bubble-point pressures, formation volume of bubble-point liquid, and formation volume of gas plus liquid phases; equations show the effect of the several variables on bubble-point pressure. Four references are given. W. M. H.

Safety Precautions.

1198. Benzene Solvents and Industrial Hygiene. A. Vallaud. *Chim. et Ind.*, 1947, **57**, 391–394.—A brief review of the dangers of benzol poisoning in the industries connected with rubber solutions, rubber manufacture, dry cleaning, printing, and paint manufacture. The intoxication threshold for benzene vapours is considered to be 0·1 g/m^3. Risks of benzol poisoning increased in France during the war due to shortage of low aromatic content petroleum solvents and the re-introduction of these latter is recommended. V. B.

1199. Fires and Explosions at Oil Installations. E. P. Lancashire. *J. Inst. Petrol.*, 1947, **33**, 131.—Detailed accounts of twelve major oil fires during the years 1940 to 1945 are given, and items such as protection measures, application of foam, and salvaging are discussed. J. T.

1200. Fires in Open Tanks of Petroleum Products: Some Fundamental Aspects. J. H. Burgoyne and L. L. Katan. *J. Inst. Petrol.*, 1947, **33**, 158.—Observations have been made upon the behaviour of a representative selection of petroleum products when burnt in open-topped cylindrical vessels. It has been shown that many refined oils burn in such a way that virtually all the fractions are removed layer by layer leaving little or no residue of any kind, and the bulk of the oil, apart from a comparatively shallow layer near the surface, is not at all affected by the fire. Crude and residual oils, and motor spirits have, however, been found to burn in such a way that only the lighter fractions are removed layer by layer and a hot residue steadily accumulates, floating on the unaffected oil.

The hot residue, especially if its temperature exceeds 100° C (as it does with crudes and fuel oils), constitutes a hazard particularly when extinction of the fire by the use of water in some form is attempted. It is suggested that in these circumstances the body of the cold oil below may be used to cool the hot residue and thus remove the hazard. Some ways of doing this are examined and it is shown that the method not only removes much of the danger but may be extended, within limitations that are defined, to the complete extinction of the fire without the use of auxiliary measures, both in oils that do and do not form the hot residue during the burning. J. T.

1201. Experiments on the Rate of Foam Application on Petrol Fires. N. O. Clark, E. Thornton, and J. A. Lewis. *J. Inst. Petrol.*, 1947, **33**, 192.—The nature of the relationship between application rate of foam and control of the fire and the effect of expansion factor on this relationship are investigated. Each foam on a given fire exhibits a critical rate of delivery below which no progress towards extinction is made. The most desirable expansion factor for the *foam compound solution used* appears to lie in the region of ten. The consumption of extinguishing materials is independent of the expansion factor up to the point of control being obtained over the fire. It may probably be wiser to specify application rate in terms of water delivery, than to follow the existing practice of foam rate specification, as this would be made less dependent on the efficiency of the apparatus. Experiments indicate very little dependence on the linear velocity of application, and an increase in the critical rate arising from lengthier initial burning.

All bottom injection experiments failed to control the fire, not because the foam was destroyed, but presumably because it lifted the petrol. J. T.

Refining Patents.

1202. Patents on Refining Processes and Products. American Cyanamid Co. B.P. 588,090, 29.5.47. Production of lub. oil compositions and of additives.

B. L. P. Anthony. B.P. 588,283, 29.5.47. Sulphur containing lubricants.

Carbide and Carbon Chemical Corpn. B.P. 588,143, 29.5.47. Polymerization of ethylene.

L. C. Moore & Co. Inc. B.P. 588,105, 29.5.47. Oil-well masts.

Shell Development Co. B.P. 588,099, 29.5.47. Catalytic production of phenolic compounds.

Standard Oil Development Co. and J. C. Arnold. B.P. 588,037, 29.5.47. Process for the separation of C_5 diolefins from hydrocarbon mixtures.

Anglo-Iranian Oil Co. Ltd., W. A. Partridge, and H. J. Alty. B.P. 588,455, 4.6.47. Motor fuels.

E. P. Newton (S.O.C. California). B.P. 588,461, 4.6.47. Multicylinder engine detonation measurement.

J. C. Arnold (S.O. Dev. Co.). B.P. 588,466, 4.6.47. Manufacture of solidified mineral oils.

C. Arnold (S.O. Dev. Co.). B.P. 587,790, 21.5.47. Catalytic conversion of hydrocarbons.

J. C. Arnold (S.O. Dev. Co.). B.P. 587,813, 21.5.47. Production of aviation gasoline.

J. C. Arnold (S.O. Dev. Co.). B.P. 587,955, 21.5.47. Lubricating grease compositions.

J. C. Arnold (S.O. Dev. Co.). B.P. 587,977, 21.5.47. Production of polymers.

H. G. C. Fairweather (Cities Service Oil Co.). B.P. 587,934, 21.5.47. Gas analysers.

Manchester Oil Refinery Ltd. and F. C. Hill. B.P. 587,787, 21.5.47. Homogenizing apparatus.

Shell Development Co. B.P. 587,914, 21.5.47. Production of phenolic resins.

Socony-Vacuum Oil Co. Inc. B.P. 587,969, 21.5.47. Manufacture of halogenated hydrocarbons.

J. C. Arnold (S.O. Dev. Co.). B.P. 588,565, 11.6.47. Anti-corrosion mineral oil compositions.

R. Gallia. B.P. 588,571, 11.6.47. Burners for liquid fuels.

J. C. Arnold (S.O. Dev. Co.). B.P. 588,684, 11.6.47. Solidified or gelled mineral oils.

Standard Oil Development Co. B.P. 588,760, 18.6.47. Apparatus for catalytic chemical reactions.

C. Arnold (S.O. Dev. Co.). B.P. 588,823, 18.6.47. Production of artificial fogs.

J. C. Arnold (S.O. Dev. Co.). B.P. 588,824, 18.6.47. Production of co-polymers.

C. C. Wakefield & Co., Ltd., E. A. Evans, and J. S. Elliott. B.P. 588,864, 18.6.47. Lub. oils having anti-corrosive properties.

Anglo-Iranian Oil Co., Ltd., L. C. Strang, and J. Owen. B.P. 588,976, 18.6.47. Refining of hydrocarbons.

J. C. Arnold (S.O. Dev. Co.). B.P. 588,835, 18.6.47. Combined alkylation and polymerization processes.

Standard Oil Development Co. B.P. 589,072, 25.6.47. Production of ethylbenzene.

Standard Oil Development Co. B.P. 589,073, 25.6.47. Vulcanized compositions.

Standard Oil Development Co. B.P. 589,130, 25.6.47. Catalytic conversion of hydrocarbons.

J. C. Arnold (S.O. Dev. Co.). B.P. 589,233, 25.6.47. Lub. oil compositions.

J. C. Arnold (S.O. Dev. Co.). B.P. 589,045, 25.6.47. Low temperature polymerization of olefines.

J. C. Arnold (S.O. Dev. Co.). B.P. 589,054, 25.6.47. Contacting divided solids and gaseous fluids.

C. Arnold (S.O. Dev. Co.). B.P. 589,058, 25.6.47. Catalytic isomerization of paraffin hydrocarbons.

J. C. Arnold (S.O. Dev. Co.). B.P. 589,248, 25.6.47. Preparation of synthetic rubber-like materials.

Lobitos Oilfields Ltd., and J. C. Wood-Mallock. B.P. 589,149–50, 25.6.47. Manufacture of electrical insulating oils.

Gulf Research and Development Co. B.P. 589,070, 25.6.47. Alkylation of phenols.

C. L. Thomas and V. Haensel, assrs to U.O.P. Co. U.S.P. 2,410,111, 29.10.46. An alkylated aromatic is obtained by reacting an olefine and an aromatic in the presence of a silica–zirconia catalyst.

J. D. Danforth, assr to U.O.P. Co. U.S.P. 2,410,151, 29.10.46. An aromatic is alkylated with an olefine in the presence of $AlCl_3$ catalyst.

T. B. Kimball, assr to Sinclair Refining Co. U.S.P. 2,410,166, 29.10.46. The toluene cut of a gasoline is extracted with liquid SO_2 and the extract + liquid SO_2 is washed with a paraffin fraction to concentrate the toluene in the extract.

H. R. Legatski, assr to Phillips Petroleum Co. U.S.P. 2,410,223, 29.10.46. Removal of moisture and hydrogen sulphide from low-boiling hydrocarbons by a combination of fractionation and caustic soda treatment.

T. P. Simpson, J. W. Payne, and J. A. Crowley, Jr., assrs to Socony Vacuum Oil Co., Inc. U.S.P. 2,410,309, 29.10.46. A catalytic cracking process on the Thermofor principle.

E. O. Sowerwine, Jr., assr to Socony Vacuum Oil Co., Inc. U.S.P. 2,410,314–5, 29.10.46. An apparatus for preparing formed gels.

C. L. Thomas, assr to U.O.P. Co. U.S.P. 2,410,316, 29.10.46. High octane motor fuel is obtained by catalytic reforming of the cracked gasoline from a thermal cracking operation.

J. F. Hyde, assr to Corning Glass Works. U.S.P. 2,410,346, 29.10.46. A liquid polymeric organo-siloxane is used as a lubricant.

V. N. Jenkins, assr to Union Oil Co. U.S.P. 2,410,381, 29.10.46. Manufacture of a syntholub. from paraffin wax by processes involving chlorination, dichlorination, catalytic polymerization, and propane extraction.

S. A. Lonkomsky and C. R. Stock, assrs to American Cyanamid Co. U.S.P. 2,410,385, 29.10.46. A spinning cup viscometer.

F. J. Ewing, assr to Filtrol Corpn. U.S.P. 2,410,436, 5.11.46. Manufacture of an aluminated acid leached montmorillonite clay for use as a cracking catalyst.

V. N. Ipatieff and H. Pines, assrs to U.O.P. Co. U.S.P. 2,410,445, 5.11.46. A diolefine is obtained by reacting an alcohol and an acetylene in the presence of an oxide catalyst.

E. M. Dons and O. G. Mauso, assrs to Mid-Continent Petroleum Corpn. U.S.P. 2,410,483, 5.11.46. Apparatus for preparing uniform wax crystals in a solvent dewaxing process.

H. J. Hepp, assr to Phillips Petroleum Co. U.S.P. 2,410,498, 5.11.46. Production of di*iso*propyl by the reaction between *iso*butane and ethylene in the presence of an $AlCl_3$ catalyst.

L. Schmerling and V. N. Ipatieff, assrs to U.O.P. Co. U.S.P. 2,410,553, 5.11.46. A zinc chloride catalyst is used in the reaction between a ketone and an aromatic to produce an alkyl aromatic.

H. Pines and V. N. Ipatieff, assrs to U.O.P. Co. U.S.P. 2,410,554, 5.11.46. An alkylaromatic is obtained by the reaction between an aromatic and an aliphatic unsaturated ketone in the presence of hydrofluoric acid.

G. M. Webb and M. A. Smith, assrs to U.O.P. Co. U.S.P. 2,410,558, 5.11.46. A method of preparing an alumina–metal oxide catalyst.

J. J. Giammaria, assr to Socony Vacuum Oil Co., Inc. U.S.P. 2,410,578, 5.11.46. A lignin ester of an aliphatic acid is used as a lub. oil additive.

A. J. L. Hutchinson, assr to The Fluor Corpn. U.S.P. 2,410,583, 5.11.46. A method of separating hydrate forming components of gaseous mixtures using water and CCl_4.

J. D. Morgan, assr to Cities Service Oil Co. U.S.P. 2,410,608, 5.11.46. Trialkyl phosphate containing a corrosion-resisting agent and a pour-point depressant is used as a hydraulic liquid which is characterized by a small change of viscosity with temperature.

A. D. Pickett, assr to Phillips Petroleum Co. U.S.P. 2,410,610, 5.11.46. A grease gun lubricant is made from a 3 to 1 mixture of aluminium and lead soaps dissolved in sufficient solvent.

R. F. Ruthruff. U.S.P. 2,410,613, 5.11.46. A mixture of lub. oil and a suitable fraction of a catalytically reformed heavy naphtha is used as a flushing oil.

A. Farkas and A. F. Stribley, Jr., assrs to Union Oil Co. U.S.P. 2,410,642, 5.11.46. A process for the oxidation of naphthene hydrocarbons.

J. J. Giammaria, assr to Socony-Vavuum Oil Co., Inc. U.S.P. 2,410,650, 5.11.46. A detergent and anti-corrosive lub. oil additive consisting of an oil miscible metal salt of a wax-phenyl substituted thio acid of phosphorus.

J. R. Griffin, Jr., and P. R. Van Ess, assrs to Shell Dev. Co. U.S.P. 2,410,652, 5.11.46. An oil miscible metal salt of the condensation product of an aldehyde and an aromatic hydroxy compound is added to a lub. oil to give high temperature detergent properties.

D. B. Luten, Jr., assr to Shell Dev. Co. U.S.P. 2,410,829, 12.11.46. A mononuclear aromatic amine is added to a gasoline to reduce knock. The gasoline is stabilized by the addition of a 2 : 4-dialkyl phenol.

F. S. Rostler, V. M. Wilson, and H. I. du Pont, assrs to Wilmington Chemical Corpn. U.S.P. 2,410,839, 12.11.46. Unsaturated hydrocarbons are separated from paraffins by double solvent extraction with heptane-furfural.

E. L. Walters, assr to Shell Dev. Co. U.S.P. 2,410,846–7, 12.11.46. Phenol derivatives and alkyl aromatic amines are used as stabilizers and anti-knock agents respectively for gasoline.

E. Lieber, assr to S.O. Dev. Co. U.S.P. 2,410,885, 12.11.46. A Friedal–Crafts recondensation product is used as a pour-point depressant.

R. B. Mason, assr to S.O. Dev. Co. U.S.P. 2,410,890, 12.11.46. Manufacture of a sulphide catalyst for use in the reduction of nitroaromatic compounds.

R. N. Meinert and P. H. Holt, assrs to S.O. Dev. Co. U.S.P. 2,410,891, 12.11.46. Catalytic reforming of naphtha employing fluid catalyst.

C. W. Montgomery, assr to Gulf Research and Dev. Co. U.S.P. 2,410,894, 12.11.46. Isomerization of *n*-butane using a dissolved aluminium halide catalyst.

E. W. Thiele, G. E. Schmitkins, and C. M. Hull, assrs to S.O.C. Indiana. U.S.P. 2,410,908, 12.11.46. A naphtha from thermal cracking is subjected to *iso*-forming to raise its O.N.

J. I. Wasson and W. M. Smith, assrs to S.O. Dev. Co. U.S.P. 2,410,911, 12.11.46. A method of making a solution of a condensed organic amino compound in lub. oil.

C. A. Coghlan, assr to The Texas Co. U.S.P. 2,411,025, 12.11.46. Polyethylene glycol is used to extract butadiene from hydrocarbon mixtures.

E. F. Engelke and W. W. Odell, assrs to Lion Oil Co. U.S.P. 2,411,032, 12.11.46. A phosphorized mixture of a soap and a higher molecular monohydric alcohol is used as an anti-oxidant in lub. oil.

C. B. Linn and V. N. Ipatieff, assrs to U.O.P. Co. U.S.P. 2,411,047, 12.11.46. Boron trifluoride and an acid fluoride are used in the catalytic alkylation of aromatics.

O. L. Davis and A. C. Nixon, assrs to Shell Dev. Co. U.S.P. 2,411,083, 12.11.46. The addition of an alkyl amine to caustic soda reduces its tendency to form emulsions in the treatment of hydrocarbons.

A. C. Nixon and D. L. Yabroff, assrs to Shell Dev. Co. U.S.P. 2,411,105, 12.11.46. A salt of a naphthenic acid is used to break emulsions obtained in the caustic soda treatment of hydrocarbons.

T. A. Petry and G. L. Payne, assrs to Socony-Vacuum Oil Co. U.S.P. 2,411,106, 12.11.46. Styrene is separated from ethylbenzene by azeotropic distillation with ethylene glycol mono-ethyl ether.

C. E. Adams, assr to S.O.C. Indiana. U.S.P. 2,411,141 and with C. D. Kelso, U.S.P. 2,411,142, 19.11.46. Preparation of amine resins.

H. C. Evans and D. W. Young, assrs to S.O. Dev. Co. U.S.P. 2,411,150, 19.11.46. A non-volatile oxy-ester is added to a thickened lub. oil to reduce the viscosity at 100° F.

E. W. Fuller, H. G. Berger, and R. H. Williams, assrs to Socony-Vacuum Oil Co., Inc. U.S.P. 2,411,153, 19.11.46. The reaction product of phosphorus pentasulphide and oleyl alcohol is used as a lub. oil additive. G. R. N.

PRODUCTS.

Chemistry and Physics.

1203. Explosive Decomposition of Ethene. H. I. Waterman, W. J. Hessels, and J. Van Steenis. *J. Inst. Petrol.*, 1947, **33**, 254.—An explosion may occur when ethene is being polymerized with aluminium chloride as a catalyst in the presence of finely divided nickel as promoting agent at room temperature and about 60 atm pressure. Some solvents for the aluminium chloride also promote the polymerization of olefins in which case also an explosion may occur with a starting pressure of 40 atm at temperatures as low as 0° C. A lower starting pressure of ethene (20 atm) also gives rise to a vigorous reaction. Four examples describing the reactions are given. J. T.

1204. Separation of a Two-Component Mixture by Distillation in the Presence of a Carrier. J. P. Zwilling. *Chim. et Ind.*, 1947, **57**, 336–340.—The vaporization of a two-component non-azeotropic mixture in the presence of a third, immiscible, component is examined by the aid of triangular diagrams; the representation can be simplified to a rectangular diagram on which are plotted merely the relative concentrations of the miscible products. A typical calculation of column dimensions for continuous distillation in such circumstances is given, together with a simplified flow diagram. The use of graphic rather than tedious arithmetical solutions is to be preferred. The vapour composition is expressed in terms of fictitious percentage units, which are equivalent as regards their heats of vaporization. V. B.

1205. On Turbulent Flow in Rough Tubes. V. G. Nevzgljadov. *Compt. Rend. (Doklady) Acad. Sci. URSS*, 1947, **55**, 103 (in English).—The author's phenomenological theory of turbulence is applied to an earlier treatment of flow in smooth-walled circular tubes to provide a solution of the problem of flow in tubes with rough walls. The equations obtained, one of which contains a universal function of viscosity previously considered by Stanton and Karman, are compared with experimental data obtained by Nikuradse. The curves calculated from the author's equations are in excellent agreement with the experimental points. G. H. B.

1206. Power Laws of Latent Heat, Orthobaric Density, Surface Tension, and Viscosity of Liquids. W. J. Jones and S. T. Bowden. *Phil. Mag.*, 1946, **37**, 480.—The results are given of a survey of the region extending about 200° downwards from the critical temperature for all the liquids for which data are available. Good agreement with experimental values has been obtained by equations of the following types :—

$$\begin{aligned}
\lambda &= \lambda_0(1 - T/T_C)^{m_0}, \\
l &= l_0(1 - T/T_C)^{n_0}, \\
\lambda &= \lambda_1(D - d)^{m_1}, \\
l &= l_1(D - d)^{n_1}, \\
\lambda &= \lambda^1\sigma^{m^1}, \\
l &= l^1\sigma^{n^1}, \\
\lambda &= \lambda^{11}(\eta - \eta_c)^{m^{11}}, \\
l &= l^{11}(\eta - \eta_c)^{n^{11}}, \\
\sigma &= \sigma^1(\eta - \eta_c)^{r^1},
\end{aligned}$$

where λ and l represent the internal and total latent heat, and D and d are the liquid and vapour orthobaric density respectively. The absolute temperature is represented by T, viscosity by η, absolute critical temperature by T_C, and empirical constants for each substance and relation by the remaining symbols. J. T.

1207. Infra-Red and Raman Spectrum of *cyclo*-Octatetraene. M. St. C. Flett, W. T. Cave, E. E. Vago, and H. W. Thompson. *Nature*, 1947, **159**, 739.—The Raman spectrum of liquid *cyclo*-octatetraene, and the infra-red spectrum between 2 and 20 μ of the liquid and vapour have been measured. A list of Raman displacements and infra-red bands is given. Results agree in general with previous measurements, but some discrepancies were noted.

The infra-red spectrum of the solid polymer formed from *cyclo*-octatetraene on standing suggests that hydroxyl groups are present in this compound. H. C. E.

1208. Infra-Red Spectrum of C_nD_{2n+2} and the "Long Chain Frequency" in Paraffins. N. Sheppard and G. B. B. M. Sutherland. *Nature*, 1947, **159**, 739.—The most characteristic feature of the infra-red spectrum of a long-chain paraffin is a strong band near the wave-length 14 μ, which has been shown to be associated with the group $-(CH_2)_nCH_3$ ($n \geqslant 3$), but for which no satisfactory explanation has been given. It is found that this band is shifted to longer wave-lengths by approximately $\sqrt{2}$ in the spectrum of C_nD_{2n+2}, indicating that it is caused by a vibration associated with the hydrogen atoms. H. C. E.

1209. Study of Some Organographitic Substances by X-Ray Diffraction. H. A. Sack and J. J. Trillat. *Compt. Rend.*, 1947, **224**, 1502.—Thermal decomposition of an organic compound results in the formation of substances with some of the properties of graphite, but still related to specific organic compounds by elementary composition and chemical reactivity. These substances are designated organographites, and possess the characteristic lack of solubility and extremely low vapour pressure of graphite itself, and also show the X-ray diffraction features of graphite typical of the "turbostratic" state defined by Biscoe and Warren. Each of the lamella which constitute the individual crystalline units form a macromolecule almost entirely composed of hexagonal rings of carbon atoms to which the atoms of other elements present are attached at the periphery. The characteristic X-ray feature of the organographites is a large diffuse central plateau of constant intensity.

The X-ray diffraction patterns, obtained with copper Kα radiation and a sodium chloride monochromator, of Micronex carbon-black, the discontinuous (pitch) phase of coal-tar, and a bitumen separated from Mexican petroleum by electrophoresis in nitrobenzene solution have been obtained. The results reveal a similarity in structure for the carbon-black and the coal-tar pitch. The petroleum bitumen gives the characteristic organographitic plateau and 3·35 Å graphite spacing found in the other two specimens, but also a diffuse ring at 4·35 Å resembling a liquid diffraction pattern and two spacings at 2·88 and 2·37 Å which do not belong to the organographitic system. It is concluded, in opposition to Nellensteyn, that petroleum bitumen cannot be identified on the basis of X-ray diffraction evidence as a graphite or organographite.

G. H. B.

1210. Viscosity as a Function of Temperature. A. H. Stuart. *Petroleum*, April 1947, **10**, 74.—Various formulæ have been suggested for expressing the relationship between viscosity and temperature, but these have been entirely arbitrary. As an example, mention may be made of the well-known A.S.T.M. Viscosity Formula :

$$\log . \log .(v + 0{\cdot}8) = A \log . T + B$$

where v is the viscosity and T the absolute temperature, A and B are constants for any one oil. This formula has proved of great use for Viscosity Index determinations, but it is quite an arbitrary relationship and has no mathematical or physical basis.

With a view to establishing a more fundamental relationship the writer examined a number of viscosity–temperature curves relating to lubricants and other oils. In no case could an equation be found to fit the curve.

Attention was therefore turned to viscosity measurements of pure chemical compounds commencing with water. The viscosity–temperature curve for water suggests an equation of the type $y = ae^{bx}$, and viscosity, v, would be expected to be expressed in terms of temperature, t, by $v = ae^{-bt}$ yet no such equation was found to fit the curve. Success was achieved by the use of an equation of the type $t = ae^{-bv}$, which more conveniently arranged would be $v = A - B \log . t$, where A and B are constants.

The relationship between viscosity and temperature for water may then be expressed by $v = 2{\cdot}34 - 1{\cdot}04 \log . t$, where v = viscosity in centipoises, t = temperature in ° C, and the logarithms are to the base 10. Close agreement was obtained between observed values and those obtained from the graph of the equation given. While the Centigrade scale of temperature has a direct reference to the physical properties of water it is completely arbitrary when applied to anything else. In the case of ethyl alcohol, therefore, a simple mathematical relationship between viscosity and this arbitrary scale of temperature would hardly be expected. A scale of temperature was therefore sought which would bear the same relationship to alcohol as the Centigrade scale to water. This is done by taking the zero of the scale at the melting point of alcohol, viz. $-$ 117·3° C, the Centigrade degrees being taken as the graduation. Using this scale of temperature a similar equation to that obtained for water is derived, thus $v = 4{\cdot}2 - 1{\cdot}16 \log . t$.

Similarly, equations of the same type for Lead, Mercury, Hexane, Heptane, Octane, Ethyl Ether, and Aniline are derived of the type $v = A - B \log . t$.

An equation for Benzene could be derived if $-$ 15° C were taken as the solidification point (and hence the temperature scale zero), but not if the usual melting point (5·48° C) is taken.

Acetone, which has a melting point of $-$ 95° C, follows an equation of $v = 2{\cdot}51 - 1{\cdot}07 \log . t$ over a temperature range of $-$ 13° C to 20° C ; from 30° C to 40° C, however, the results fall out of line. Acetone does not behave normally at temperatures approaching its boiling point (56·5° C). Sulphur also presents a notable example of anomalous viscosity.

In all cases quoted, agreement between observed values for viscosity and those indicated by the equations is as close as one normally obtains with experimental values, and there can be little doubt that a mathematical relationship exists.

Since lubricating oils have no fixed melting points attempts to establish this relationship have failed.

Before it is possible to extend this type of mathematical analysis to lubricating oils it will be necessary to have more precise knowledge of their chemical constituents.

F. W. H. M.

Analysis and Testing.

1211. Infra-Red Absorption Analysis of Gases and Vapours (2). 2. General Features of Limited Radiation Analysers. R. Quarendon. *Petroleum*, April 1947, **10**, 78.—In this second article some general features of design of limited radiation analysers are considered. They consist of five chief parts, usually in the following order :—

(1) The source of radiation and focusing device.

(2) Absorption cell containing the gas.

(3) The arrangement for dispersing the radiant beam and selecting the appropriate wave-length for measurement, known as the monochromator.

(4) The detector which receives the residual radiant energy after absorption, and transforms it into a form suitable for measurement.

(5) The measuring apparatus for indicating or recording the output of the detector with or without the help of some form of amplifier.

These are described in detail. Alternative types of the various apparatus used in analyser construction are described and their characteristics discussed.

It is in the development of sensitive and stable receivers for detecting the energy of the dispersed beam, and of the rugged and robust apparatus for measuring it that the most spectacular advances have been made in recent years. Nowadays, very sensitive and stable systems incorporating either a vacuum thermocouple or a bolometer are available. Modern vacuum thermocouples can generate 100 microvolts for 1° C rise in temperature and have a uniform response over the wave-length range 0·3 to 35 microns. The Schwarz thermopile, which consists of these thermocouples, has a sensitivity of 60 microvolts per microwatt of energy, and is designed to permit of easy fitting to the analyser. The power in the dispersed beam available under average conditions of analysis is only about one-tenth of a microwatt, or only a small fraction of this under unfavourable conditions.

To achieve the desired accuracy of analysis under average conditions a change in thermocouple output of 0·05 microvolt must be detectable and possibly one-hundredth of this amount under unfavourable conditions. With the most sensitive thermopile these figures can perhaps be multiplied by 5.

Various methods of amplification can be employed to obtain this sensitivity of measurement, for instance, the energy detector may be connected to a primary galvanometer whose deflection may be amplified by a photo-electric amplifier and measured on a second galvanometer. Thermocouple-amplifier systems have been designed to detect variations as small as 0·0005 microvolt.

Little published information is available regarding bolometer systems, but they are concerned with similar small amounts of energy.

The precise means adopted depends largely on the nature of the analysis and the amount of energy available for measurement. Arrangements employed by various users and manufacturers are described and their relative merits discussed.

F. W. H. M.

1212. Ballistic Viscosimetry. F. Charron. *Compt. Rend.*, 1947, **224**, 1472.—A theoretical treatment is developed for the following system. A capillary tube is attached to a cylinder closed by a sliding piston, the whole being filled with a viscous liquid. A ballistic pendulum is used to apply a shock load to the piston, the kinetic energy of the pendulum being defined by its dimensions and initial angular displacement. The development of the shock load can be regulated with respect to time by, *e.g.*, inserting a device with variable frictional characteristics between the piston and pendulum. An equation is derived for the viscosity of the liquid in the cylinder under these conditions which does not require the experimental measurement of short time intervals or rapidly changing velocities but only the final displacement of the piston. It is thus possible to study the increase in viscosity of the liquid under high pressures of very short duration. The technique is being applied to the behaviour of lubricant films under conditions of shock loading.

G. H. B.

Crude Oils.

1213. Crude Oil of England. J. S. Parker. *J. Inst. Petrol.*, 1947, **33**, 230.—The article takes up the history of indigenous crude oil from the field rail sidings of a previous article (Southwell, C. A. P., *J. Inst. Petrol.*, 1945, **31**, 27) and covers its progress through to the finished products.

The period covered is 1942 to 1945 when the main requirements, for war purposes, were lubricating oils and waxes. The stress of the article is thus on the refining of indigenous crude oil for these products.

The quality of the crude oil from the main producing fields for lubricating oil manufacture is first covered. This shows that the crude oils are all of the same general waxy type. Within this general type there are two distinct groups :—

(1) Paraffin base with low sulphur and asphaltene content and containing lubricating oils of high viscosity index.

(2) Intermediate base with high sulphur and asphaltene content and containing lubricating oils of medium viscosity index.

Group (1) comprised the major production during the years covered.

Reference is made to similar crudes produced in France and Germany.

The initial laboratory research work on indigenous crude oil, as guidance for the later practical scale operations, is given in detail. This is followed by complete detail of all the practical scale operations involved, together with the qualities of the resultant products. General information is given on the total tonnage of the products manufactured and their destination. J. T.

Engine Fuels.

1214. Turbine Fuels and Oils. C. G. Williams. *Flight*, 26.6.47, **51**, 600.—At present combustion is largely influenced by mechanical and aerodynamic factors. However, many factors are known which influence the choice of fuel. Regarding the addition of lubricating oil to inhibit water, it is confidently expected that neither kerosine nor gasoline will require added lubricant. Ice clogging can be delayed by the use of a filter or eliminated by 10% of an alcohol anti-freeze agent. As to availabilities, the author suggests the use of a distillate fuel of low viscosity and high volatility offering advantages in atomization, cold starting, blow-out, and carbon deposition. This could be made available in large quantities. I. G. B.

Gas Oil and Fuel Oil.

1215. Jet-Heet Furnace. C. MacCracken. *Fuel Oil and Oil Heat*, Feb. 1947, **5** (10), 66.—A new type of domestic heating furnace has recently been developed in America, utilizing the principles of jet propulsion.

The motor-driven blower fan distributes both combustion air and circulating air, the latter passing over a heat-exchange system. Air for combustion, considerably in excess of that needed, passes to a small combustion chamber which is fitted with an automatic type spark plug for initial ignition. An electronic " eye " control is used to automatically stop the fuel oil flow if the flame accidentally goes out or the mixture is not ignited on starting. The fuel used is catalytically cracked fuel-oil, which is filtered before reaching the pump. Exhaust gases are cooled by passing through the heat exchanger (in which layers of circulating air and combustion gases alternate), and are expelled through an exhaust tube.

A humidifier controls the humidity of the heated circulating air, which then passes into ducts for room heating. Before reaching the room, the temperature and the speed of the heating air can be reduced by introducing external air into the system.

These furnaces are made in two capacities, one utilizing a ⅓ h.-p. motor, and having a fuel consumption of ½-gal/hr with an output of 65,000 B.Th.U.'s/hr. The other type has double this output. C. D. B.

Lubricants.

1216. Steam Turbine Lubrication Problems and Their Solutions. 3(4) Turbine Oil Demulsibility and its Practical Significance. A. Wolf. *Petroleum*, April 1947, **10**, 76.—The characteristics of turbine oils are discussed with special reference to demulsibility and oxidation stability.

Prior to the publication in 1933 of the first B.S.S. turbine oil specification, no general standards were laid down for the oxidation stability of turbine oils. The average consumer was therefore under the impression that demulsibility was the most important property of a turbine oil provided it satisfied viscosity requirements.

The introduction of solvent-refining and the development of modern turbines have shown this impression to be fallacious, since serious troubles can now arise by neglecting the oxidation stability factor. That is, while demulsibility is still important, it must be accompanied by resistance to oxidation under service conditions.

Before the introduction of solvent refined oils, Penna turbine oils were the best because of their greater inherent oxidation resistance than any other (non-solvent refined) lub. oil. They could be refined to a high demulsibility, which property ran roughly parallel with chemical stability under oxidation inducing conditions.

The requirements of modern turbines and the development of solvent-refined oils have made it desirable to use, in some cases, anti-foaming and corrosion-inhibiting additives. These substances, however, may adversely affect the demulsibility of the original oil. This leads to the question as to whether the very low steam emulsion test numbers (S.E. numbers) demanded for high-class new turbine oils are really necessary. The conclusion is reached that they are not.

Demulsibility is enormously influenced by traces of emulsifiers entering the oil; it is therefore not surprising that the S.E. number of a turbine oil usually increases greatly after only a few hours in a normally clean lubrication system. The practical advantage of insisting on a very low initial S.E. number is therefore questionable. The demulsibility after periods of use in the lubrication system should be obtained and compared with that of the original oil.

Penna oils have often been known to acquire very high S.E. numbers without any sign of lubrication troubles attributable to lack of demulsibility.

Solvent-refined, oxidation-inhibited turbine oils usually show a minimum increase in S.E. number with use.

Considerations of maximum permissible S.E. numbers is discussed from a practical point of view.

Theoretically, an S.E. number of 360 to 480 should suffice for large modern turbines. It is found in practice that the S.E. number of solvent-refined turbine oils rarely exceeds 300 to 400, even after several months' use.

Whereas the old-type Penna oils, after severe oxidation, showed poor demulsibility, with solvent-refined oils the reverse is often the case, in fact the S.E. number may actually fall as oxidation progresses. In this latter case, a low demulsibility alone should not be taken as the criterion of the condition of the oil, but it should be coupled with low acidity to be assumed in good condition.

Oils refined by acid and soda treatment commonly show poor demulsibility, the worst being heavily acid and soda treated naphthenic or asphalt-base type. These possess high specific gravities—0·930 to 0·940 at 60° F—whereas solvent refined oils seldom exceed 0·910.

Detergent additives in H.D. oils, used to lubricate high-performance diesel generators, are bad emulsifiers. Increasing use in modern turbo-driven ships of these generators leads to the risk of contamination of the turbine oil by the H.D. oil thus impairing its demulsibility characteristics. Painting of the interiors of turbine oil reservoirs has often been followed by serious troubles. F. W. H. M.

Bitumen, Asphalt, and Tar.

1217. Specifications for Bitumens for Use in Road Work. R. Ariano. *Ricerca sci e ricostruz.*, 1947, **17** (2–3), 165–180.—A review is given of the specifications, including tests, proposed by the "Commission for Study of Road Problems" of the Italian National Research Council in 1943. D. H. McL.

Special Hydrocarbon Products.

1218. Petroleum Products in Agriculture : The Rôle of Petroleum in Plant Protection. L. W. Leyland Cole. *J. Inst. Petrol.*, 1947, **33**, 203.—The immense loss of food crops, due to weed competition and to the activity of insects and fungi in the field and in the warehouse, is being reduced by the development of new and more effective methods of plant protection.

Petroleum oil has been used for a long time in the form of oil–water emulsions for application to deciduous and to citrus fruit, and in recent years chemicals derived from petroleum have found many applications in agricultural pest control. The base oils of horticultural sprays have certain accepted characteristics, but more work by the biochemist and plant physiologist is required before the perfect spray oil can be evolved. In practice, dilute oil emulsions of various types are sprayed on the tree both in winter and in summer, care being taken to combine maximum insecticidal effect with minimum phytotoxicity. Oil is an excellent insecticide in itself, but it is also an important carrier for other insecticides and for fungicides. Certain petroleum fractions possess weed-killing properties and are useful both as selective and non-selective herbicides.

Important chemicals derived from petroleum and used in pest control are ester salts, methallyl chloride, and a mixture of dichloropropene and dichloropropane (D-D), the latter being a very successful soil fumigant. J. T.

ENGINES AND AUTOMOTIVE EQUIPMENT.

1219. Fedden Power Units. Anon. *Flight*, 26.6.47, **51**, 600a.—Orders for two engines, the flat-six and the Cotswold airscrew turbine, have been cancelled, but details of the designs are made known. The gas turbine consists of an 11-stage axial compressor (5·75 : 1), seven combustion chambers of divergent shape (fuel injected upstream—loss factor 4%) and a 2-stage turbine. The reduction gear ratio is 14·785 : 1.

The 5·3 litre flat-six was designed to be completely submerged in a wing. Detonation free running has been obtained at an 8 : 1 C.R. on 90-octane fuel. I. G. B.

1220. Application to Engines of Temperature Measurement by Resistance Thermometers. R. Vichnievsky, R. Guyot, G. Monnot, and M. du Parquet. *Rev. Inst. Franç. Pétrole*, 1947, **2**, 67–80, 155–158, 201–211.—Temperatures within the cylinder of an I.C. engine can be measured by means of a special plug carrying a spiral of 0·01–0·04 mm dia tungsten wire and forming one arm of a Wheatstone bridge operating on 1000 c.p.s. current. Alternatively the resistance thermometer can be incorporated in an oscillating circuit. In either case the indications are transmitted to a cathode-ray oscillograph, whose readings are recorded photographically. The procedure used for calibrating the plug is described in some detail; the calibration is more difficult when an oscillating circuit is used, but the sensitivity of this is greater than that of the Wheatstone bridge circuit. A study was made of the delay between the attainment of max temperature in the engine and its registration by the instrument. Test results are given showing the temperature on compression in a diesel engine and also the temperatures attained in the combustion space of a spark ignition engine prior to ignition; the latter results form part of a series of experiments on cold starting. For this purpose one spark plug of a multicylinder engine was replaced by the temperature measuring plug. Measurement of temperature on compression, with and without the introduction of fuel, enabled the richness of the vapour in the combustion space to be determined. A method for measuring the temperature of surfaces within an engine by means of a resistance thermometer consisting of a fine film of gold on aluminium oxide is also described. V. B.

1221. New Petter–Fielding Horizontal Engine. Anon. *Gas Oil Pwr.*, 1947, **42**, 172.—This four-stroke engine has a single cylinder of 8½-in bore and 13¾-in stroke, and develops 40 b.h.p. at 500 r.p.m. A direct injection open-chamber combustion system has been adopted.

The camshaft, driving, and governor equipment are assembled in a single gearcase and mounted as a unit. Lubrication is from a plunger-type cam-operated pump. Fuel consumption is given as 0·42 lb per b.h.p. hr., and lub. oil as about 1% of this value. The weight of the engine, with standard flange-mounted fly-wheel, is 1·9 tons. H. C. E.

1222. Metrovick Progress. Anon. *Flight*, 1947, **51**, 552.—Details are given of endurance tests on the F2 series 4-jet engine. Two units have been made for the Saunders–Roe SR/A1, rated at 3300 lb per engine. Two more will power a modified Meteor with more than 7000 lb thrust. The endurance tests show up the combustion chambers as being the most quickly expendable component. I. G. B.

1223. Gas Turbine Combustion. E. A. Watson and J. S. Clarke. *Flight*, 1947, **51**, 552.—This is a review of the "can" type combustion chambers as developed by Messrs. Joseph Lucas and relates to the engineering problems rather than to the chemical. Comparisons are made with other oil-burning appliances and the development of the high heat-release chambers is traced. The aspects covered include entry swirl, swirl atomizers, torch ignition, fuels, and flame-tube temperature. I. G. B.

1224. General Survey of Gas Turbine Problems. M. Serruys. *Energie*, April 1947, **33**, 83–89.—A theoretical study of the thermodynamic aspects of the gas turbine. G. P. K.

1225. Marine Gas Turbines. A. Meyer. *Motor Ship*, July 1947, **28**, 146.—The article is Dr. Meyer's reply to questions raised in a previous lecture. He gives further details of the "comprex"; deals with the range of power of the open-cycle process; compares the steam and air turbines; the time of starting up a gas turbine and the power necessary; ceramic blades; D.C. versus A.C.; electric heating; materials.

On the subject of combustion he describes the Brown Boveri refractory-lined chamber, with the following distinctive features: (*a*) Removable refractory element; (*b*) Air supply control in the secondary zone; (*c*) Stub pipes for good mixing; (*d*) vertical firing with good expansion arrangements; (*e*) Springing to reduce vibration stresses in main ducting joints. I. G. B.

1226. An Internal-Combustion Unit and Gas Turbine. R. B. Neilson. *Gas Oil Pwr.*, 1947, **42**, 173–178.—A proposed new engine consists of a reciprocating unit in which the gas after combustion is not allowed to expand until it reaches a gas turbine. The combustion piston is held stationary in the cylinder until combustion is complete, and the exhaust gases then pass to the turbine by movement of a control piston operating in the same cylinder.

Compressed air at 300 p.s.i., directed into the turbine, is used for starting, and subsequent operations are as follows: With the main shaft rotating, air is delivered to the cylinder and compressed by the combustion piston, which remains stationary at the top of its travel whilst fuel is injected and combustion occurs. The control piston then recedes from the combustion piston to uncover the delivery ports, and the burning gases are delivered through an orifice, which defines the combustion volume, until the control piston returns to its original position, closing the delivery ports and cutting off the fuel supply. At this point the combustion piston recedes to admit scavenging air and to fill the cylinder with air for the next cycle.

The fuel valves are open during approximately 200° of shaft angle, so more fuel is consumed per cycle of operation than with an ordinary I.C. engine, and more power can be developed in a unit of given size.

It is suggested that suitable metals would include nickel–iron for the cylinder liner and nickel-chrome steel for the turbine wheels, which would have blades of stainless steel. The surfaces would be lubricated by compounded oils and colloidal graphite.

It is claimed that the advantages of this engine are: (1) The power–weight ratio is high; (2) High speeds can be produced with a turbine of relatively small space; (3) Thermal efficiency should be high; (4) Starting can be accomplished easier than on a conventional oil engine.

The text is illustrated by four figures. H. C. E.

1227. Bearing Studies. Anon. *Rev. Inst. Franç. Pétrole*, 1947, **2**, 108–122.—This is the first report of a sub-committee, appointed by the Automotive Engine Committee of the National Centre for Scientific Research to make a study of the strength of main and connecting rod bearings. The report covers the enumeration of the various parameters concerned in this problem, the definition (with photographs) of terms used to indicate engine-bearing faults, and the establishment of a method for determining the limiting wear factor, particularly in the case of connecting-rod bearings. The expression $\sqrt{pV^3}$ is considered as being the most suitable form of wear factor (p = mean pressure, V = sliding velocity of the bearing with respect to the shaft). A method for the calculation of this factor is described and typical values for various types of machines are listed. A comprehensive specimen data sheet for bearings is included and the co-operation of automobile engineers both in France and abroad is asked in the compilation and return of such sheets. V. B.

1228. Thornton Aero Engine Research Laboratory. Anon. *Engineer*, 1947, **183**, 360–362.—To keep fuel and oil quality in step with rapid war-time development in aero engines, the Thornton Aero Engine Research Laboratory was built during the war at Thornton-le-Moors, Cheshire. The laboratory was on loan to the Ministry of

Aircraft Production from 1942 until recently, when it was returned to the control of the company which built and operated it. The equipment includes nine full-scale single-cylinder test cells, and five test rooms for smaller engines. The cold room at − 40° can accommodate a complete main engine. Extensive sound-proofing results in a very low noise level. The photographic section includes an Arditron lamp, permitting photographs to be taken with an exposure down to half-a-millionth of a second, and used in gas turbine studies.

War-time research included investigations in improving the power, range, altitude performance, and reliability of military aircraft. Ring-sticking, sludge formation, cold starting, and gas-turbine combustion were all subjects of study, some still under investigation. Nickel–aluminium–cobalt coating for exhaust valves was found effective against high concentrations of tetra-ethyl lead in the fuel. Additive-type lubricating oils are tested in a standardized J.A.P. 250-c.c. air-cooled single-cylinder engine, which reduces the cost of testing considerably from that involved in the use of a "Hercules" single-cylinder unit. The article is illustrated with engravings of the main building, test beds, and photographic equipment. A. C.

MISCELLANEOUS.

1229. Emulsifiers. F. Appell. *Chim. et Ind.*, 1947, **57**, 341–346 (see Abstract No. 876/47).—This illustrated survey of industrial emulsifying equipment is concluded by an account of homogenizers, both valve and other types, impact emulsifiers and emulsifiers in which use is made of both shear and impact action. The article includes short lists of the main manufacturers of emulsifiers, the principal French patents covering this field and a brief bibliography. V. B.

1230. Farm Manure Gas. I. Carré. *Chim. et Ind.*, 1947, **57**, 448–452.—Gas (containing 52–58% methane) is yielded by fermentation at 35–40° C and pH = 7·5 of mixed vegetable and animal matter. Useful gas yields are obtained from fermentation vats after an incubation period lasting from eight days to a month; the whole fermentation cycle lasting three months. The average total yield is 50–60 m^3 of gas (cal. val. 5500–6000/m^3) per ton of manure; this is equivalent to about 50 litres of petrol. Analyses are given of gases from various types of manure; the design of suitable fermentation vats and the costs of production are also discussed. V. B.

1231. L.P.G.—Supply and Demand Outlook. G. F. Benz. *Oil Gas J.*, 24.5.47, **46** (3), 92.—A review is given of the supply position for liquefied petroleum gas, together with the demand by gas utility companies and household purchasers.

Sales increased from 465,000 gal in 1926 to an estimated 1,425,000,000 gal in 1946, increase on 1945 being 33%.

As for supply position it is estimated that there are 14,400,000,000 gal per year of C_3 and C_4 hydrocarbons potentially available at gasoline and cycling plants and at refineries. Modified Fischer–Tropsch plants should add to the supply.

Transportation of the products in bulk is by tank-car, transport truck, pipeline, barge, or tanker. 4000 pressure tank-cars are already in service, more are being built and a 6700 ton dry-cargo ship is being converted for use. It is estimated that some twelve months will elapse before transport facilities are adequate.

Butane should command a higher price than propane, especially during the winter. Three figures illustrate the article. G. A. C.

1232. Oil Storage Depots on the G.W.R. Anon. *Engineer*, 1947, **183**, 388.—The Great Western Railway Co. has put into service the first of fourteen new oil storage plants, in connection with fuelling the locomotives now being converted to burn oil. This depot is at Swindon and consists of three 30 ft × 9 ft dia tanks, which can be filled from rail-cars, and discharged to locomotives, at 40 tons per hr. A stand-pipe and swing-arm are used for loading, the swing-arm being counterbalanced so that oil drains away from the mouth of the filling line when not in use. A. C.

1233. United Kingdom Petroleum Trade in 1947 (Details for April and the Four Months). Anon. *Petrol. Times*, 7.6.47, **51**, 535.—Details are presented of U.K. imports and exports of crude oil and refined products for April and the first four months of 1947. Comparable details for 1946 are also presented. R. B. S.

1234. Revival of Europe's Petroleum Imports. Anon. *Pet. Press. Service*, May, 1947, **14** (5), 101.—The article gives a survey of the petroleum imports of fourteen European countries for 1938 and 1946. Total imports for 1946 have dropped 17% below those for 1938 which is mainly due to the large decrease in Germany's imports. Detailed information on the imports of crude oil, gasoline, kerosine, lubricants, gas oil, and fuel oil for the individual countries is given together with reasons for the various trends noted. In general, imports of crude oil have dropped for those countries which were affected by the war and suffered damage to refinery installations, etc. The increased use of vaporizing oil for mechanized farming, the extensive consumption of diesel oil in road vehicles and coastal shipping and the rationing of petrol all have produced marked effects on the petroleum needs of the countries concerned. It is suggested that the European market for the petroleum industry should soon top the pre-war level and will continue to expand indefinitely. G. P. K.

1235. Petroleum's Place in Sweden's Post-War Economy. L. P. Stockman. *World Petrol.*, May 1947, **18** (5), 64–66.—Sweden is converting her economy from wood and coal to oil. During the war she was only able to import 1 million brl/year of oil, and wood was extensively used as fuel. Domestic coal production is 430,000 tons/year and pre-war imports were 8 million tons/year. The British coal position has caused this to be reduced. Oil-shale deposits are considerable, but poor in quality (5–6% hydrocarbon). This industry is being developed. Uranium is present in the deposits. In 1946 petroleum imports were 14 million brl against an average of 10 million for each of the three pre-war years when only one refinery was operating in Sweden. Another was completed last year and three more are envisaged. One of these will be erected quickly as the components (U.S. surplus) are already fabricated. It will consist of two distillation units (7200 brl/day charging stock) and two naphtha reformers (3000 brl/day charging stock). A catalytic cracker is also contemplated. F. S. A.

1236. German and Japanese Rockets. Anon. *Aeroplane*, 1947, **72**, 622.—Two types are discussed :—

(1) *DFS* 228*v*-1. Power plant—one Walter HWK 109–509 bi-fuel, liquid-cooled rocket motor, mounted in the fuselage. Power output : max. thrust 3300 lb at S.L. : 3630 lb at 40,000 ft. Spec. fuel consumption 182 lb/lb thrust.

(2) *Fuji Kokuki Oka.* 3-Type 4 MK 1 Model XX rocket motors mounted in the rear section of the fuselage. No figures given on thrust power. I. G. B.

BOOKS RECEIVED.

When the Oil Wells Run Dry. Walter M. Fuchs. Dover, New Hampshire: Industrial Research Service, 1946. Pp. 447 + xiv. $3.75.

The object of this volume is to present an integrated picture of the subject of oil, giving social, political, and scientific facts, and to serve as a handy reference book to the past, the present, and the future.

The Petroleum Almanac. New York: National Industrial Conference Board, 1946. Pp. 420 + vii.

A compilation of statistical data relating to petroleum, its production, transport, refining, marketing, and distribution, its utilization, finance, labour, and its taxation, price, value, and other data. While the numerous tables relate mainly to the United States, there is much data on world production, etc.

British Petroleum Equipment. London: Council of British Manufacturers of Petroleum Equipment, 1947. Pp. 402 + xlvii. 10*s.* 6*d.*

One of the principal objects of the Council of British Manufacturers of Petroleum Equipment is to make known the fact that there is a large section of British industry engaged in manufacturing equipment for the oil industry. The present publication is devoted to this object and is in two sections. The first of these deals with membership of the Council, the firms being listed alphabetically and also classified in accordance with their products. The second, or catalogue, section is made up of announcements of individual firms, giving illustrations and information regarding specific pieces of plant or equipment.

L'Epopee du Petrole (The Epic of Petroleum). Pierre M. Edmond Schmitz. Paris: R. Pichon and R. Durand-Auzias, 1947. Pp. 223 + x.

Intended to give a comprehensive picture of the petroleum industry from 1859 to 1918, the book includes chapters on :—

The Industry prior to 1880;
Refining Processes;
The Chemistry of Petroleum;
and the work of Gustav-Adolphe Hirn and Joseph-Achille Le Bel.

The author is mainly interested in the development of the industry in Europe. He concludes with a chapter on the general aspect of the industry, and foresees that a far closer alliance between the refining and chemical industries is necessary before any real progress can be made.

La Economia del Petroleo en Colombia. A. E. Ospina-Racines. Bogota: Editorial Antena Ltda, 1947. Pp. 191.

This book is largely composed of articles previously published over the last few years, some in a South American financial journal. It covers legal, economic, and technical aspects of the petroleum industry in Colombia, the sequence being somewhat disjointed. The accent is on production and its value to the country, and a considerable amount of statistical information is presented. The last chapter, for no apparent reason, is devoted to O.N.

A. C.

Bulletin de la Société des Naturalistes de Moscou. Nouvelle Série, Tome LI, Section Géologique, Tome XXI, (1946).

This volume (in six parts), devoted entirely to geological articles, includes the following: "The Devonian in Bashkiria and the Prospect of Oil Occurrence Therein" and "Tectonics of Salt Uplifts in the Dnieper–Donetz Depression." The papers are in Russian, but each has a summary, of some length, in French or English.

V. B.

Voprosui Geologii i Razrabotki Neftyanuikh Mestorozhdenii Srednego Povolzh'ya. (Problems of the Geology and Development of Petroleum Deposits of the Middle Volga Region.) By V. G. Vasil'ev. Moscow–Leningrad, 1946. Pp. 172. 10 rubles.

This is a compilation of results, hitherto unpublished, obtained in 1940–41. After a short introductory section dealing with the geology and development of the region, the remainder of the book is devoted to an account of petroleum production in the area under discussion and the problems associated therewith. V. B.

Geologiya i Neftenosnost' Russkoi Platformui i Embui. (The Geology and Occurrence of Petroleum in the Russian Shelf and the Emba Region.) Moscow–Leningrad, 1946. Pp. 248. 12 rubles 50 kopeks.

This publication consists of a collection of twelve articles, by various authors dealing with work carried out during and immediately preceding the war. The book has been compiled by the All-Union Scientific Research Institute for Petroleum Geology and Development, an account of whose work during the war years forms the subject of the first article. The remainder deal with the petroleum geology of the regions mentioned and with petroleum production in this area. V. B.

APPLICATIONS FOR MEMBERSHIP OR TRANSFER.

AUGUST, 1947.

The following have applied for admission or transfer to the Institute. In accordance with the By-laws, the proposals will not be considered until the lapse of at least one month after the publication of this *Journal*, during which time any Fellow, Member, or Associate Member may communicate by letter to the Secretary, for the confidential information of the Council, any particulars he may possess respecting the qualifications or suitability of the candidate.

The object of this information is to assist the Council in grading the candidate according to the class of membership.

The names of candidates' proposers and seconders are given in parenthesis.

Applications for Membership.

ASTLEY, Robert Arthur, Mechanical Engineer, Cia Petrolera, Lobitos, Peru. (*K. M. Dobmer ; R. A. Baldry*).

BLACKMORE, David Stuart, Technical Salesman, The Shell Company of China Ltd. (*G. D. Thacker ; J. S. Jackson*).

COOPER, Harry Cyril, Manager and Chief Chemist, Messrs. Geo. Cooper & Son, Canal St. Wharf, Sheffield, 4. (*J. R. Smellie ; S. S. Bush*).

DODD, Robert Henry, Chemical Engineer, Representative of The Lummus Company, London. (*C. W. Knighton ; E. G. Thorn*).

DUTTON, Thomas Edward, Captain, R.A.S.C. (*G. Kinner ; J. W. S. Farmery*).

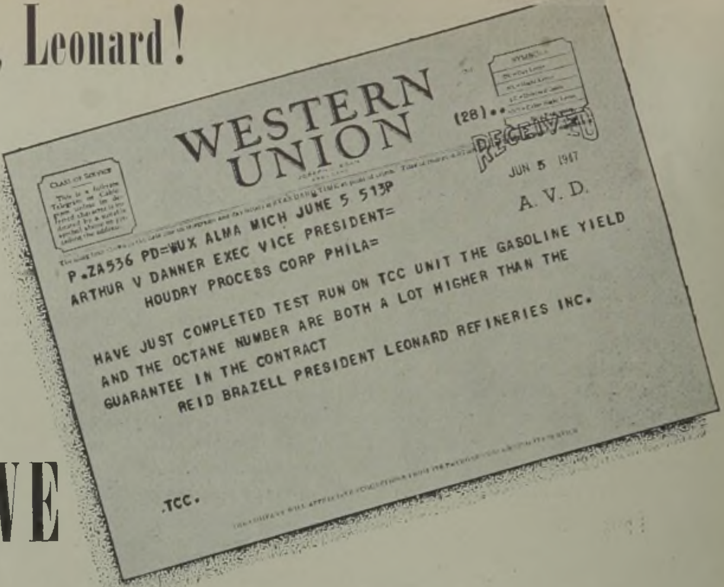
PAPWORTH, Sidney John, Assistant District Operator, Petroleum Board. (*H. M. Burgess ; P. I. Holmes*).

SINCLAIR, Leonard, Marketing Director, Anglo-American Oil Co. Ltd. (*C. Chilvers ; D. S. Paul*).

VICKERS, George Alexander Thomas, D/Assistant Manager, Engineering Department, Anglo-American Oil Co. Ltd. (*J. E. Jenkin ; E. Evan-Jones*).

WATSON, Edwin Sutton, Pipeline Superintendent, U.B.O.T. Ltd., Trinidad. (*J. E. Smith ; F. C. Hamilton*).

Thank you, Leonard!



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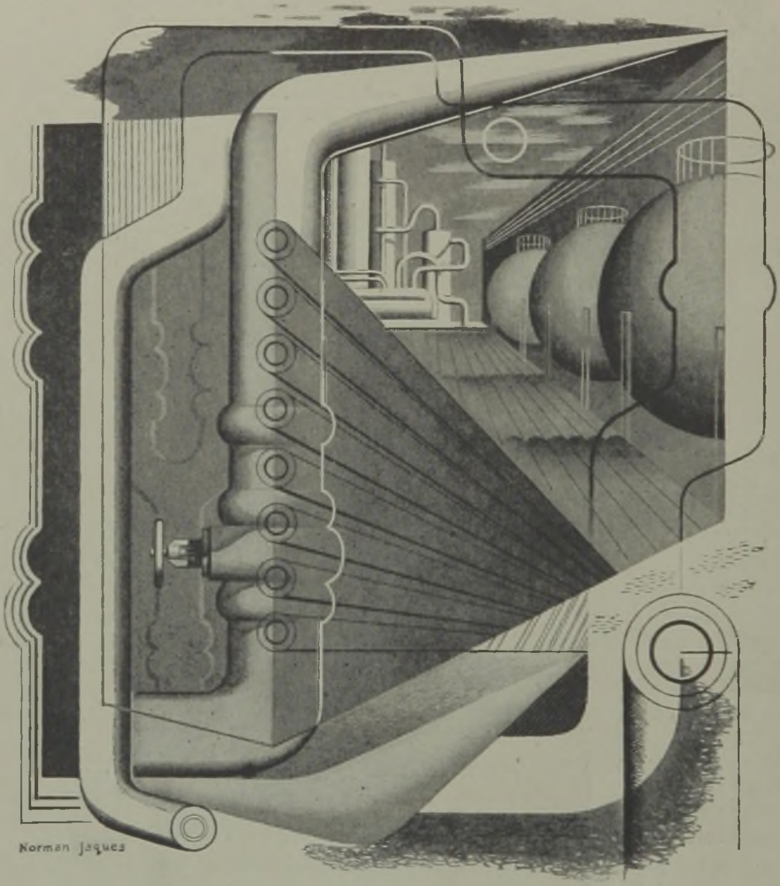
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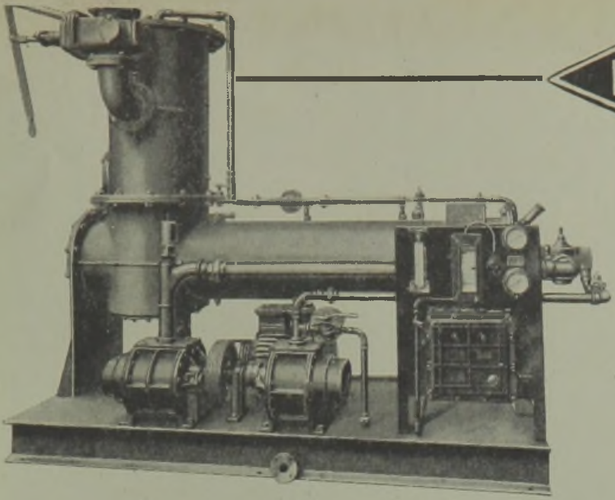

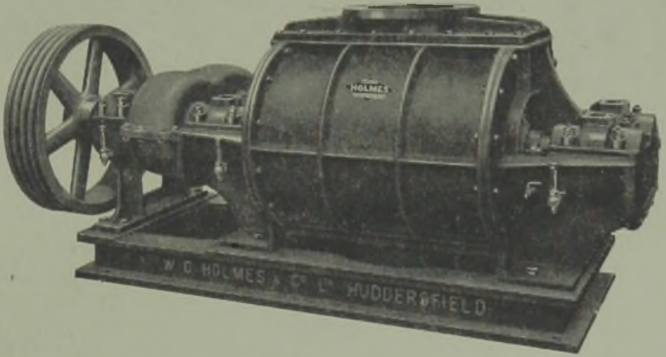
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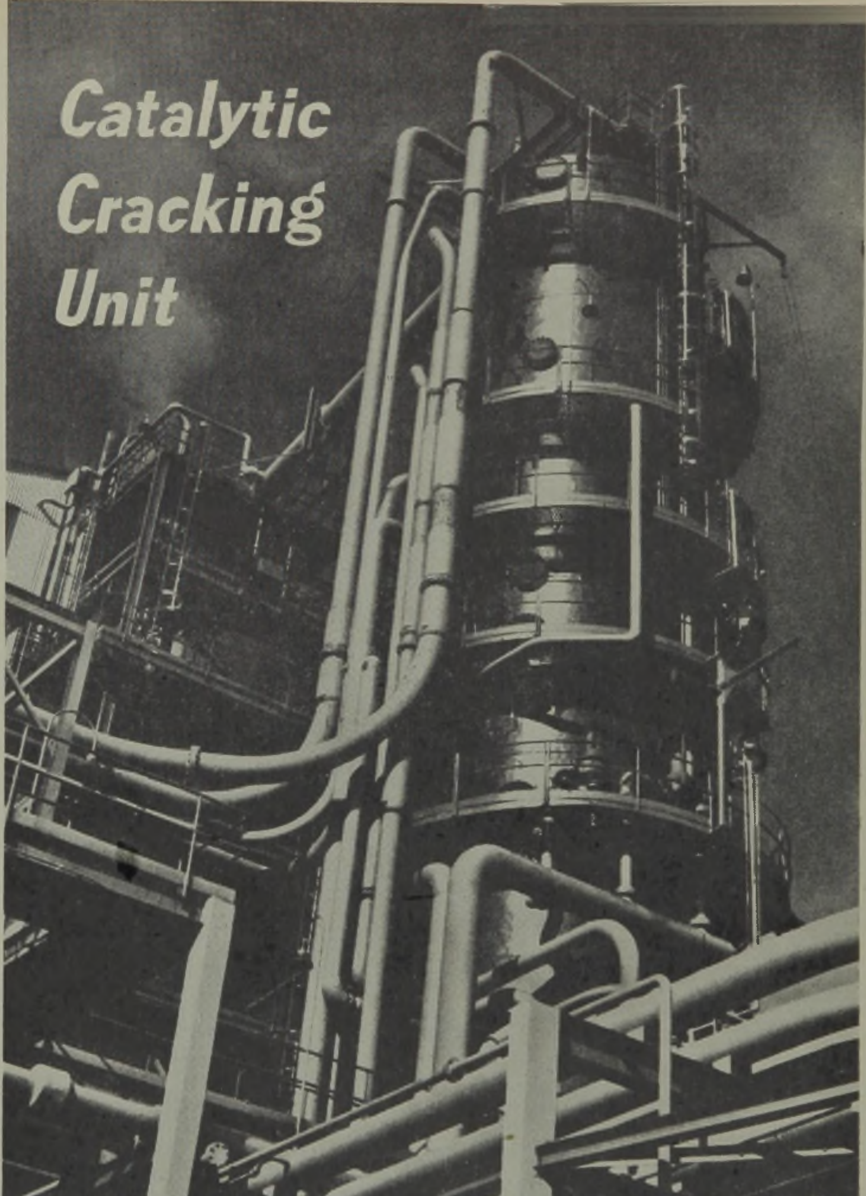
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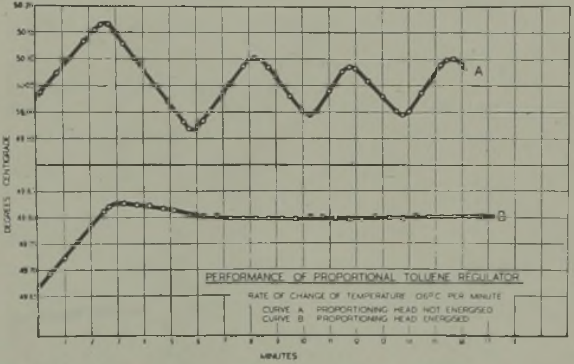
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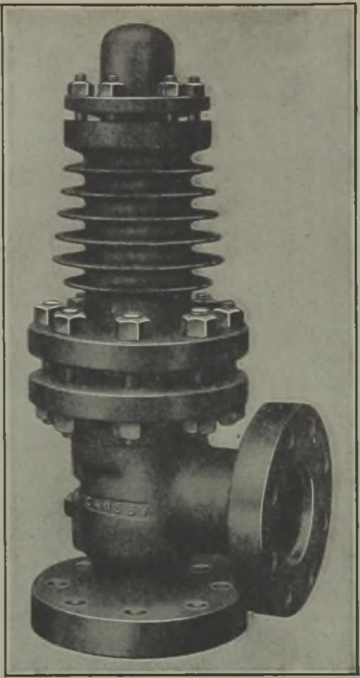
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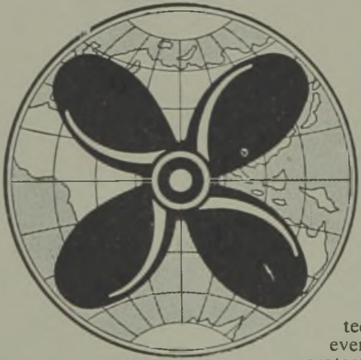

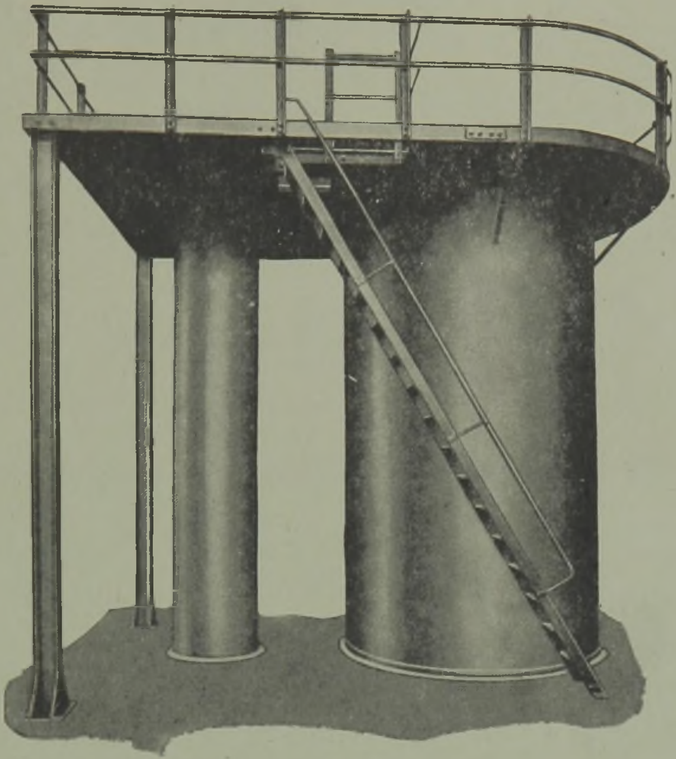

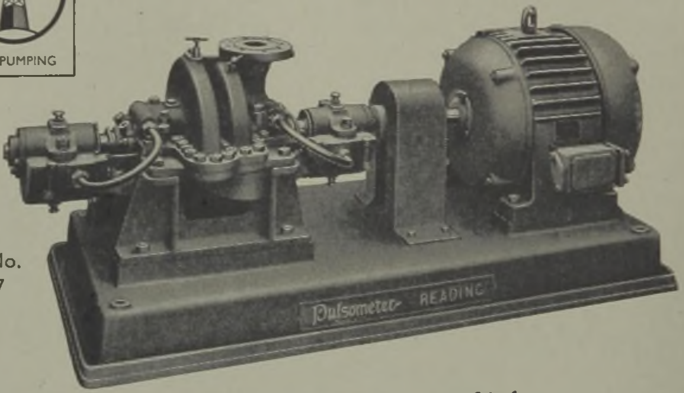

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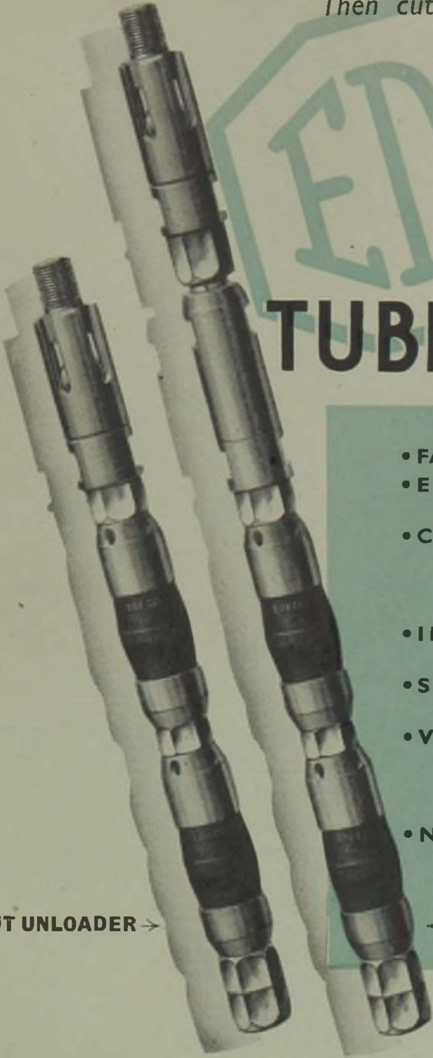

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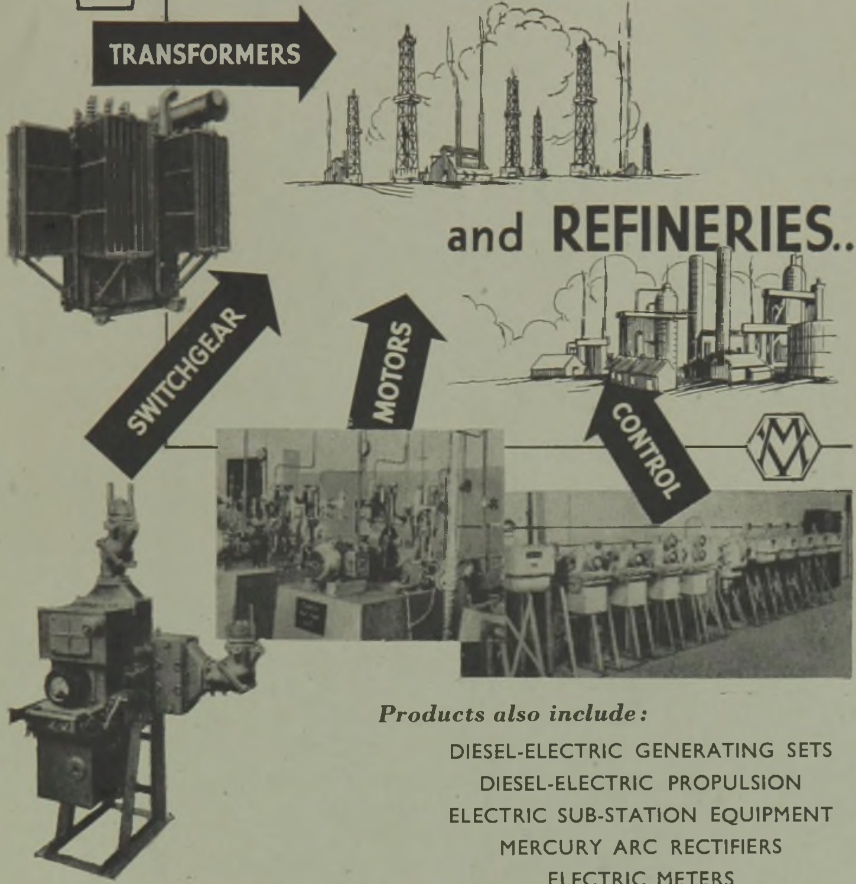

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