ABSTRACTS.

AUTHOR INDEX.

The numbers refer to Abstract Numbers.

Oilfield Exploration and Exploitation.

Geology.

1720. Bacterial Release of Oil-Bearing Materials. C. E. Zobell. *World Oil*, 25.8.47, **126** (13), 36; *Oil Gas J.*, 2.8.47, **46** (13), 62.—In experimental work bacteria have been observed to release mineral oil from sea sand and other solids on which the oil had been adsorbed. Oil has also been released from Athabaska tar sands covered with nutrient solution supporting sulphate-reducing bacteria. Some at least of the oil released from the Athabaska tar sands was less dense than the original tar. In some cases the oil was emulsified, and there is evidence of its modification or destruction. These effects were stronger with mixed cultures.

Bacteria has been found to release oil from oily shales. There is no evidence, however, to show that bacteria can convert the bituminous matter of oil shale to crude. No oil was released from natural rock asphalt. Oil has been released bacterially from oil-sand cores.

Many bacterial species dissolve carbonates by producing organic acids. This may aid in freeing oil. Tiny bubbles of CO_2 have a buoyant effect on oil droplets. Bacterially produced methane or hydrogen would act similarly. Some bacteria have strong affinity for solids and are able to push off films of oil or grease. Bacteria may produce surface tension depressants, and surface-active substances may play a part in liberating oil from solids.

Bacterial decay may set free oil from organic tissue. Bacteria may also synthesize or destroy oil.

The characteristics of sulphate-reducing bacteria are described, and the possibility of introducing bacteria into formations in order to liberate oil is discussed briefly. It is noted that further investigation of this point is required. G. D. H.

1721. Relation of Clay Mineralogy to Origin and Recovery of Petroleum. R. E. Grim. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1491–1499.—The clay-mineral concept of the nature of clays and shales is briefly discussed in its relation to problems of the origin and recovery of oil and gas. Clay minerals that make up a sediment are to a considerable degree the result of diagenetic changes in the environment of accumulation. Diagenetic changes suggested by present available data are considered. The relations of various clay minerals in certain conditions are the key factor in the transition of organic matter to petroleum.

The properties of clay minerals are considered as a basis for analysing the effect of water with dissolved electrolytes, moving through a sand, on a clay in the sand. The characteristics of the clay minerals are believed to be significant factors in the recovery of oil. E. N. T.

1722. Evaluation of Oil Exploratory Methods. J. J. Zunino. *World Oil*, 7.7.47, **126** (6), 13 (*International Section*).—In searching for oil it is desirable to determine whether (*a*) sedimentary rocks are present; (*b*) porous and permeable rocks are within reach of the drill; (*c*) a cap rock exists; (*d*) source rocks are present; (*e*) metamorphism has not destroyed the oil; (*f*) there is a suitable trapping structure; (*g*) an accumulation has been subjected to flushing by circulating waters. The significance of each of the above points is discussed, and the means whereby each point can be answered are described. G. D. H.

1723. Contouring Fault Planes. W. A. Reiter. *World Oil*, 14.7.47, **126** (7), 34.—A fault plane can be defined by a system of contours which will display its form. The gap in a formation broken by an included fault can be shown when fault contours are used, and altogether they provide a fuller picture than sections. G. D. H.

1724. Oil; Its Origin, Accumulation. F. M. Van Tuyl and B. H. Parker. *World Oil*, 14.7.47, **126** (7), 39; 21.7.47, **126** (8), 48.—The oil source beds in most pools are not known with a reasonable measure of certainty. Marine shales are believed to be the commonest source, but at times a profusion of skeletal material in limestone and the presence of much organic matter may clearly point to the rock having been a source rock. The close relationship of the Chattanooga and Cherokee dark shales to some oil reservoirs seems significant, but not all black shales are potential source rocks. In some cases the oil may be indigenous to the reservoir rock, and some reef and delta deposits may be of this type. Some of the oil and gas pools in the Wasatch in the Rocky Mountain area have been formed in lakes. Oil in lenses is best explained by a local source. Multiple sand accumulations may or may not have derived from a single source, depending on conditions.

Oily substances and waxy materials containing hydrocarbons occur in organisms and in modern sediments, but no undoubted petroleum has been found. Ancestral crude might be thick like a residuum.

Tight beds round oil reservoirs may have suffered post-accumulation cementation. Late accumulation does not necessarily mean late generation of oil. Concentration at more than one epoch seems possible.

Faulting allows readjustment and even dissipation of oil accumulations. Oil in fractured shales as at Florence seems likely to have been generated after the initial compaction required to permit fracturing.

Extensive lateral or vertical migration is not necessarily needed to form oil accumulations. Most lateral movement is along permeable beds, and is possibly towards the borders of basins. The characteristics of barren and productive structures should be compared. In some cases barren structures have greater thicknesses of beds.

In the Rocky Mountain area barren structures on the borders of basins have less saline waters than those producing deeper in the basins.

Asphalt may be washed out to sea and deposited in near-shore sands or limestones.

G. D. H.

1725. Terminology for Insoluble Residues. H. A. Ireland and others. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1479–1490.—The development of the use of insoluble residues for correlation since 1940 has resulted in a diverse terminology which needs standardization. A group of geologists familiar with residue work have agreed upon terminology and definitions, and developed the outline included in this article. The contents of the outline are based on description rather than on genesis, since the genesis of many constituents of residues is not known or is controversial. The outline and its contents are submitted as a guide to new workers and as a common source of agreement among those most familiar with correlation and identification using insoluble residues.

E. N. T.

1726. Exploratory Drilling in 1946. F. H. Lahee. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 917–930.—During 1946, 5752 exploratory holes were drilled in the United States. Of these 3125 were new-field wildcats, 1270 were new-pool tests (including new-pool wildcats, deeper-pool tests, and shallower-pool tests), and 1357 were outposts. Among the new-field wildcats, 333 were successful; among the new-pool tests, 380 were successful; and among the outposts, 424 were successful.

The total exploratory footage drilled was 22,167,561 ft in the 5752 holes, or 3854 ft per hole. These figures are comparable with 23,030,266 ft drilled in 5613 exploratory holes, with an average depth of 4103 ft, in 1945.

E. N. T.

1727. Independents' Rôle in Finding Reserves. L. J. Logan. *Oil Wkly*, 23.6.47, **126** (4), 54.—During 1946 two-thirds of the successful exploratory wells in the U.S.A. were drilled by the smaller companies and independents. Relatively they had more failures than the majors and middle-sized concerns. The results were generally similar in 1945. It should be noted that through co-operation in financing the majors actually make possible many discoveries which are attributed to independents, and eventually the former acquire ownership of a relatively large proportion of the proven reserves. Thus at the beginning of 1946, 32 companies held 81·5% of the proven U.S. reserves.

Tables summarize the exploratory well results of 37 large U.S. companies, and of all other companies in the U.S. in 1946.

G. D. H.

1728. Developments in California in 1946. G. B. Moody. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 931–946.—366 exploratory wells were completed in 1946, a total exploratory distance of 1,584,647 ft or 300 miles. The total number of completions, total footage, and percentage of success for the different types of exploratory wells were as follows :

	No. of wells.	Footage.	Percentage wells successful.	Percentage footage successful.
New-field wildcats . .	211	950,855	8·5	11·1
New-pool wildcats . .	47	230,720	27·7	26·8
Deeper-pool test . . .	29	78,695	10·3	6·8
Shallower-pool tests . .	4	19,585	75·0	78·3
Outposts	75	304,792	44·0	38·6

All exploratory wells were 19·1% successful as to number and 19·4% successful as to footage; the analogous figures for 1945 were 21·0% successful as to number of wells and 17·5% successful as to footage.

30 oil pools and fields and 7 gas pools and fields were discovered in 1946. New pools, new fields, and successful outpost wells added about 132,000,000 brl to oil reserves and about 110,000,000 M.c.f. to dry gas-field gas reserves. None of the new pools or fields can be rated as major discoveries. Production in 1946 was approximately 317,500,000 brl (including condensate) and 528,000,000 M.c.f. of gas. There were 57 active exploratory wells at the close of 1946. E. N. T.

1729. Palæozoic and Mesozoic Stratigraphy of Northern Gros Ventre Mountains and Mount Leidy Highlands, Teton County, Wyoming. H. L. Foster. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1537–1593.—This area was a shelf zone bordering a deeper part of the Rocky Mountain geosyncline during the Palæozoic and Mesozoic eras. Sediments deposited are relatively thin as compared with those on the west and southwest of the northern Gros Ventre Mountains and Mount Leidy Highlands. The rocks range from pre-Cambrian to Tertiary in age, with all of the systems present, excepting the Silurian. The Palæozoic strata are about 3500 ft thick, and the Mesoic about 12,000 ft. E. N. T.

1730. Geological Features of the Rocky Mountain Oil Region. C. E. Dobbin. *Oil Wkly*, 3.2.47, **124** (10), 22.—Oil has been produced in Mississippian to Oligocene beds in the Rocky Mountain region, and there are pre-Mississippian shows. The old oils tend to be heavier than young oils. Almost all the traps were formed in the Laramide revolution, and the Sweetgrass Arch is the only important area with oil and gas directly related to pre-Laramide folding. About 57% of the oil and gas is associated with domes and anticlines with little faulting ; 14% occurs on terraces and monoclines, and 26% is connected with structures with important faults.

There are many promising structures which contain non-commercial amounts of oil and gas, and those which produce are rarely filled to the limit. It is believed that there has been extensive flushing, and oil has been preserved only in the more favourably placed traps.

The discussion covers the origin of the oil- and gas-traps, the age and character of the producing zones and types of traps. A number of structural maps are included.

There are considerable accumulations of gas rich in carbon dioxide. A number of gases yield helium (up to 7%) and nitrogen (up to 81%). Extensive deposits of oil shale occur, and it is estimated that if 60% of the total shale in northwest Colorado in beds of 3 ft or more thick, and giving at least 15 gal of oil per ton on distillation, was retorted the crude shale oil would amount to 40,640,000,000 brl. G. D. H.

1731. Upper Montana Group, Golden Area, Jefferson County, Colorado. J. D. Moody. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1454–1471.—Examination of the Montana group in the vicinity of Golden and Morrison, Jefferson County, has revealed a series of beds more than 1200 ft thick containing a well developed and varied Fox Hills fauna. The base of the Fox Hills sandstone, as restricted by the U.S. Geological Survey, lies more than 1000 ft above the typical Fox Hills fauna in the section.

The basal members of the overlying Laramie formation rest on different zones of the upper Montana at different localities within the area. The Montana shales below the restricted Fox Hills are readily divisible into upper, middle, and lower Pierre, as has been established in Colorado. E. N. T.

1732. Devonian System in Central and Northwestern Montana. L. L. Sloss and W. M. Laird. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1404–1430.—The Devonian strata of central and northwestern Montana are confined to an Upper Devonian age. In central Montana these rocks are divided, in order of increasing age, into the Three Forks formation, predominantly shale; the Jefferson formation, composed of an upper dolomite member and unnamed basal unit of shale and shaly dolomite which bears a transgressive relationship to the underlying Ordovician and Cambrian. In northwestern Montana these terms are not applicable and the Devonian is divided in descending order, into arbitrary units, A, B, and C. Unit A is dolomite and anhydrite, or evaporite-solution breccia, unit B is dense limestone, and unit C is a red shale and shaly dolomite sequence resting on the channelled surface of the Upper Cambrian.

Oil is produced from the Devonian of south-central Alberta and gas has been found in it in Montana. Petroleum possibilities appear to be confined to the dolomite of the Jefferson formation and unit A, and it is suggested that these possibilities may have been enhanced by favourable depositional environments and post-depositional effects. E. N. T.

1733. Oregon Basin Field, Park County, Wyoming. P. T. Walton. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1431–1452.—The Oregon Basin oil and gas field is in north-central Wyoming on the western margin of the Big Horn basin, a closed Tertiary-filled structural basin. Adjacent to the synclinal axis of the asymmetrical Big Horn basin, the Oregon Basin is a large anticline having 1600 ft of closure. Transverse tensional and shear faulting is present along the axis, both in the surface and subsurface strata. The oil and gas accumulation is present primarily because of this structural trap.

The most highly developed and important production is black, 20–22°-gravity oil from the Permian Embar limestone and the Pennsylvanian Tensleep sandstone. This productive area occupies only 40% of the total area within the closing contour. Black, 18°-gravity oil is also produced from the Mississippian Madison limestone. Commercial amounts of gas occur in the Cretaceous Frontier and Cloverly sandstones and the Triassic Chugwater sandstones, and both separately and in association with the oil in the Embar limestone. The Oregon Basin is one of the more important reserves of black oil in Wyoming, having an estimated ultimate production in excess of 150,000,000 brl.

A non-commercial showing of light paraffin-base oil was found in the basal Cambrian Flathead sandstone. E. N. T.

1734. Upper Ordivician Shales in Central Kansas. H. Taylor. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1594–1607.—Shales approximately equivalent in age to Maquoketa beds in Iowa and to Sylvan strata in Oklahoma form the topmost Ordovician over most of Central Kansas. They consist of two members: (1) an upper dolomitic gray shale, which is siliceous and cherty in some areas, and (2) a lower soft flaky shale. These beds are thickest in the central part of the Salina basin and also in a belt extending north–south through western Harvey County. They disappear on the flanks of the Nemaha arch and of the Central Kansas uplift, probably because of truncation, and also thin and disappear in the region of northern Sedgwick County, probably because of non-deposition in places, coupled also with some truncation. Possible sources of the shaly material include the Central Kansas uplift, Ozarck dome, and volcanic dust dropped by winds into the muddy upper Ordovician seas. E. N. T.

1735. Buried Pre-Cambrian Hills in Central Kansas. R. F. Walters. *World Oil*, 4.8.47, **126** (10), 28.—See Abstract No. 20 (1947).

1736. Developments in North Mid-Continent in 1946. E. A. Koester and V. B. Cole. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 999–1005.—Wildcat discoveries located in Kingman, Barber, Harvey, and Ellis counties of Kansas promise prolific production or indicate a pool of more than average size.

Kansas produced 98,193,272 brl of crude oil and casing-head gasoline in 1946, slightly less than the production for 1945. Gas production amounted to 122,600,000,000 cu. ft. Development of the huge Hugoton gas field in the southwestern part of the State continues, but the increased runs from that field have not made up for declines elsewhere.

Return to closer spacing in the development of Kansas fields is shown by the dry-hole percentage of 32·2% compared with the figure of 41·5% for 1945 and 50·5% for 1944, when nearly all wells were located on a 40-acre basis. E. N. T.

1737. Developments in Illinois and Indiana in 1946. A. H. Bell and R. E. Esarey. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 979–987.—Drilling in Illinois and Indiana increased by 42% in 1946 as compared with 1945 and production increased by 2½%. There was little deep testing and nearly all of the new wells produced from sandstones and limestones of the Mississippian system.

The rate of drilling in 1947 will probably decline from the high level of 1946, but be higher than that of 1945. Drilling is anticipated in the pre-Mississippian strata, especially of the Silurian in the western marginal area of the Illinois basin.

E. N. T.

1738. Developments in Michigan in 1946. H. J. Hardenberg. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 988–998.—Of the 259 wildcats drilled during 1946, 26 were completed as producing wells. 12 oilfields and 6 gas fields were discovered, 5 oilfields and 2 gas fields were extended and a new pay zone was found in one field. Well completions totalled 822 compared with the 801 of the previous year. 45% of the wells were productive at an average rate of 651 brl per well and an average initial production of gas wells was 7,371,000 cu. ft. per well. Total footage drilled was 1,705,694 ft, approximately 15% less than in 1945. Wildcat footage was 608,839 ft.

Oil production declined approximately 1% to a rate of 17,074,518 brl. Gas production showed an increase of 2% at a rate of 23,774,495,000 cu. ft.

Permits were issued for 186 geological tests, of which 60% were used in western Michigan. Two secondary recovery projects were started in Michigan in 1946.

E. N. T.

1739. Developments in Oklahoma in 1946. R. J. Cullen. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1006–1014.—Oklahoma produced 136,807,000 brl of crude oil in 1946, a decline of 2,420,000 brl from 1945. Reserves reported are 898,186,000 brl, or 8,347,000 above last year. More than 3000 wells were drilled. Exploration accounted for 588 wells, discovering 71 oil pools, 22 gas pools, 18 extensions, and 3 new producing formations in old pools.

The most promising discovery was the Southwest Antioch pool in Garvin County, discovered by Globe–Vickers' Gibson No. 1. E. N. T.

1740. Shoreline Trend May Develop Oklahoma Golden Horse-Shoe. A. Gibbon. *Oil Wkly*, 19.5.47, **125** (12), 39.—There is a potential shoreline reservoir along the western arc of the Pauls Valley uplift in McClain and Garvin counties, Oklahoma. The production is from the Pennsylvanian, and may cover a strip 20 miles long and about 2 miles wide, with reserves of 50–100 million brl. The Deese and Gibson sands probably wedge out on the western flank of the uplift along an arc giving continuous production. The Hunton and Bromide also produce.

The pools are North and East Lindsay (Pennsylvanian, Hunton, and Bromide production), Southwest Wayne (Pennsylvanian and Hunton), Southwest Maysville (Bromide), Southwest Antioch (Pennsylvanian), Northeast Elmore and Katie (Pennsylvanian), and Eola (Bromide). East Lindsay has folding and faulting possibly lying on the extension of the Pauls Valley uplift. Eola is a further structural prospect.

Seismic work has shown the form of the Ordovician. The development of the pools belonging to this stratigraphic trap belt is briefly described. Producing depths exceed 6000 ft. Wells cost $90,000–$360,000 each.

A map and cross-section are included. G. D. H.

1741. Coring in Burgess Sandstone. C. A. Moore. *Oil Wkly*, 16.6.47, **126** (3), 38.—The South Moore pool of Cleveland County, Oklahoma, was opened in 1944, with production from the second Wilcox (Bromide sandstone) at 8833 ft. A later well was completed in the Burgess sand at 7742–7772 ft. The Burgess sandstone (Lower Pennsylvanian) is about 400 ft below the Oswego and 150 ft above the Mayes (Mississippian) limestone. The same formation is productive at West Moore. Burgess sandstone zone samples show hard quartzitic sandstones, often cherty, with alternating detrital limestones and hard shales. There are very few porous sands. Wire-line coring gave good recoveries, and loose sand beds were found in the upper part; these give the main producing zone, and liein the topmost 30 ft with a 10-ftcap of hard quartzitic sandstone.

Below occur limestone, sandstone, and shale with staining, further limestone, underlain by shale and quartzitic, oil-streaked sandy limestone, siliceous limestone and sandy shale with limestone. Gamma-ray and neutron logs have been made through the cored section as well as electric logs, and comparisons have been made with the cores.

The detailed core descriptions and the various types of logs are included.

G. D. H.

1742. Southern Oklahoma Oil. F. Gouin. *Oil Wkly,* 23.6.47, **126** (4), 34.—The Wheeler field of southern Oklahoma was opened in 1904, followed possibly by the Cruce gas field in 1912. Healdton was discovered in 1913, and thence forward a succession of finds were made.

Southern Oklahoma was part of a geosynclinal trough until early Pennsylvanian time, and there is a good development of Cambrian to Lower Pennsylvanian beds. At the end of the Lower Pennsylvanian the main Wichita uplift occurred and created northwest–southeast folds in addition to the Wichita mountains. The Arbuckle uplift took place at the end of the Pennsylvanian, and was followed by much denudation on the highs. The Permian was marked by Red bed deposition. Elevation in Triassic and Jurassic times was followed by Cretaceous submergence. The formations are briefly described and producing horizons are noted.

The Permian rocks tend to be arched over old highs, and most fields in southern Oklahoma have been discovered by some form of geological work. Seeps are important. The oil and gas fields are grouped in a tabulation, according to age of producing horizons, and these range Permian to Cambrian. Brief notes are given on production. The fields are long-lived. Proved reserves may be 715,000,000 brl in post-Mississippian beds.

A map and section are included. G. D. H.

1743. Developments in Atlantic Coast States between New Jersey and North Carolina in 1946. H. G. Richards. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1106–1108.—7 wells were drilled during 1946, all dry. A test drilled at Cape Hatteras reached a depth of 10,054 ft, with " basement " at 9878 ft. 5 wells were drilled near Merrimon, all of which reached " basement " at about 4000 ft. Standard also drilled a dry hole near Ocean City which was abandoned at 7710 ft in the Cretaceous. The Rose Hill oilfield of Lee County continued to produce. E. N. T.

1744. Developments in Appalachian Area in 1946. Appalachian Geological Society. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 959–978.—*New York.* In the Oriskany gas area 26 wells were completed or drilling in 1946 as compared with 36 in 1945. There were no new discoveries. Three producers were drilled in the South Addison pool with a total open flow of 9927 M.c.f. 15 wells were drilled to the Medina sand, the producers making about 2000 M.c.f. In the oil-producing area completions increased from 1349 in 1945 to 1739 in 1946 and the daily average production increased from 12,402 brl per day in 1945 to 12,828 brl per day in 1946.

Pennsylvania. A decline of 8% occurred in the total number of wells completed in the shallow-sand territory of western Pennsylvania (Upper Devonian or higher) during 1946, as compared with 1945. The greatest drilling activity was at the Coryville oil pool in northeastern McKean County, discovered in 1945. Production increased 4·3% as compared with 1945 in the Bradford field. Extensions were made to the small Gordon sand oil pool in North Strabane Township, Washington County. Oil production in the middle and southwestern districts of Pennsylvania increased 6% as compared with 1945. The Haskell sand gas pool was the most active. 14 deep wells were completed in 1946. 6 of these were gas wells, 1 was drilled for gas storage, and 7 were dry holes. 3 opened new pools.

Ohio. 1293 wells were listed in Ohio, of these 408 or 31½% were dry, 547 were gas wells, and 338 were oil wells. 203 wells tested the sands above the Berea, 281 penetrated the Berea, 14 were drilled into the Ohio shale of Devonian age, 40 were drilled as Oriskany tests, and 695 were drilled through the Clinton sand. 132 wells were drilled in the Canton Clinton gas field, with an average flow of 2500 M.c.f.

The Oriskany sand activity centred in Columbiana County. Open flows exceeded 2000 M.c.f. with rock pressures of over 1700 lb, the rapid depletion and the encroachment of water is discouraging. 18 wells were drilled in the Trenton fields in northwestern Ohio, where 6 oil wells, 3 gas wells, and 9 dry holes were completed.

There were 5 sub-Trenton tests drilled in the State; 4 were in Lorain County, of which 3 were dry, 1 making 67 M.c.f. of gas from the St. Peter horizon at 4125 ft. The other sub-Trenton test encountered a small flow of gas from dolomite at 6558 ft, but drilled water at 6704 ft.

West Virginia. Natural gas development in Wyoming and Nicholas counties continues, and a second well producing gas in the Huntersville chert and Oriskany sand was completed in Tucker County.

Rate of drilling is somewhat less than 1945, but rate of abandonments of both oil and gas wells has increased. No new gas pools have been discovered except the single completion in Preston County.

Kentucky. Exploratory drilling in Kentucky in 1946 involved the testing of beds from Pennsylvanian to Cambrian. Successful new-field wildcats were confined to the Mississippian of western Kentucky and the Upper and Middle Ordovician of south-central Kentucky. There were 4 Knox tests of note, one of which penetrated the Cambrian and stopped in porphyritic rhyolite. E. N. T.

1745. Thrust–Shatter Theory of Oil Accumulation. W. R. Jillson. *World Oil*, 4.8.47, **126** (10), 40.—The Powell Valley anticline runs northeast–southwest for 65–70 miles and has a structural height of 500–1000 ft. It is crossed by the Cumberland overthrust block, 125 miles long and 25 miles wide, and bounded on the northwest by the Pine Mountain fault and by the St. Paul fault on the southeast. The thrusting took place in late Palæozoic time and some 15,000 ft of Palæozoic beds were thrust 7–10 miles northwest across the Powell Valley anticline on a shear plane cutting across from Cambrian to Devonian. Erosion has removed all but a few hundred feet of Lower Ordovician and Upper Cambrian beds, and in places streams cut through these to expose Silurian and Ordovician. The first drilling at Rose Hill, Lee County, Virginia, was in 1922, and now 50 wells have been drilled. This fold was largely formed before the thrust and there are thick deposits of fine fault breccia just below the thrust.

At Rose Hill a little oil has been found in the Clinton sandstone at shallow depths, but the main production is from the Trenton, with minor amounts deeper in the Ordovician. The paraffin base oil is obtained at 50–200 brl/day per well initially. The Trenton is of low porosity, and therefore production is believed to be from fissured zones. The shattering in the crestal zone of the Powell Valley anticline is considered to be due to the shearing stresses set up by the thrusting of the overthrust sheet across it. In extreme cases this shattering may extend 3000–3500 ft below the thrust, and commonly it is found down to 1200–1700 ft. Shaly beds still act as seals. It is thought that the zone of most intense shattering is confined mainly to the truncated crest of the subsurface structure. G. D. H.

1746. Virginia Field Confirms Fenster Production. B. H. Pearse. *World Oil*, 8.9.47, **127** (2), 50.—Virginia's only oilfield, Rose Hill, in Lee County, was discovered in 1942. A dozen successful completions have been made with outputs ranging 5–50 brl/day initially. All are in the Trenton at depths of 1000–2000 ft, and in "windows" where rocks beneath an overthrust are exposed. The oil is 45°-gravity, amber-coloured and paraffin-base.

The Rose Hill field is the first field in the Appalachian folds. Similar structures occur elsewhere. The first well in Lee County was drilled in 1910, about 8 miles southeast of Rose Hill. Some oil was found in wells drilled later, and their findings are described. Rose Hill lies on the Powell Valley anticline. G. D. H.

1747. Developments in Arizona, Western New Mexico, and Northern New Mexico in 1946. R. L. Bates. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1039–1044.—At the Barker Creek dome 2 additional deep gas wells were completed and a desulphurizing plant was built. 15 gas wells completed in the Fulcher Basin field established its continuity with the Kutz Canyon field. The Estancia Valley carbon dioxide field was abandoned, but development in the Bueyeros area was started. 2 dry holes were completed in Arizona and 10 in northern New Mexico of which 5 reached the pre-Cambrian. E. N. T.

1748. Occurrence of Comanche Rocks in Black River Valley, New Mexico. W. B. Lang. *Bull. Amer. Ass. Petrol Geol.*, 1947, **31**, 1472–1478.—The discovery of Comanche fossils in Black River Valley provides a means for more accurately defining the position of the Comanche shorelines in southeastern New Mexico. An explanation is offered for the anomalous occurrence of these fossils and one which may help to clarify previous misconceptions of the geology of the area. Reference is made to related early geologic explorations in the region. E. N. T.

1749. Equilibrium of Form and Forces in Tidal Basins of Texas and Louisiana Coast. W. A. Price. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**. 1619–1663.—The study of 31 oval, enclosed tidal basins of a variety of sizes in soft sediments shows approximate dynamic equilibrium, regardless of basin origin, between average width and maximum depth, scour and fill, fetch (width), and wave base to the maximum observed depth of 16·5 ft. On the humid eastern coast, basins are commonly wide, shallow, and directly alluviated by rivers. The equation of straight line average where y = depth in ft, and x = width in miles, is $y = 0{\cdot}41x + 3{\cdot}0$. On the non-humid southwestern coast, basins are proportionately narrower; straight line average is $y = x$, or a ratio of 1 : 1. Here most elongate water bodies have become segmented to oval form by spits, bars, tidal deltas, and wash-over fans. Alluviation commonly overcomes disposal in inner segments entered by rivers, filling them while leaving outer segments in equilibrium. Depths in tidal channels are not used. Water bodies for which data are incomplete, those with very irregular outlines, and unsegmented parts of coastal lagoons are excluded.

Maximum departure from average depth during the record period has been 2–3 ft, *i.e.*, 30%, essentially within the range of incidental scour and fill and secular sea-level change. A shallowing of most basins since early surveys by 0·5–1·5 ft is believed to show mainly silting due to man's activities. Heavier silting and segmentation are caused by ship-channel excavation across the basins. Segmentation, artificial or natural, tends to restore equilibrium, following or being followed by bottom filling. Modification of form is most evident after great storms or major engineering works.

In spite of postulated eustatic sea-level rise during the present century, the tidal basins have maintained width–depth ratios, in some cases actual depths, during equilibrium conditions in the cartographic period. Some bays sank more than 10 ft in recent centuries, but now have equilibrium of form. E. N. T.

1750. Developments in East Texas in 1946. T. C. Cash and G. J. Loetterle. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1059–1070.—8 new oil-producing areas and 4 new gas-producing areas were discovered during 1946. 3 of the oil discoveries produce from the Woodbine formation; these are North Gallatin and William Wise in Cherokee County and Norman Paul in Wood County. Oil production in the sub-Clarksville sand of the upper Eagle Ford also occurs in the Norman Paul field. Production in the South Flynn field in Leon County is considered to be from an undifferentiated Woodbine–Eagle Ford section.

Two of the new oil discoveries produce from the Paluxy formation; these are Boynton and Mt. Sylvan. 2 new fields are in the Travis Peak formation, *i.e.*, Elysian Fields and Lassater.

4 new gas-producing areas are Pine Hill and South Henderson in Rusk County, which produce from the Travis Peak; Flower Acres in Bowie County, produces from the Smackover, and Huxley in the Shelby County produces from the Pettit zone of the lower Gelen Rose. 6 older fields revealed new producing zones. E. N. T.

1751. Developments in North and West-Central Texas in 1946. J. F. Gibbs and C. D. Smith. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1045–1051.—102 discoveries were made in the north and west-central Texas district in 1946, including 21 outposts, 2 shallower-pool tests, 4 deeper-pool tests, 1 field-development well, 28 new-pool wildcats, and 45 new-field wildcats. These are comparable with a total of 125 discoveries in 1945.

3007 wells were drilled, of which 653 were exploratory, comparable with 2240 wells drilled in 1945, including 468 wildcats; increased drilling activity being 26%. 57,840,000 brl of oil were produced during 1946, compared with 54,283,000 in 1945, an increase of 3,557,000 brl. Other discoveries: (1) the Manning O'Connor, "Caddo" limestone in southwestern Stephens County; (2) reflection seismograph discovery of fields in Throckmorton County; (3) Strawn production in east-central Haskell County; (4) Eskota field producing from a Canyon reef; (5) explorational activity in district west of the axis of the Bend Arch. E. N. T.

1752. Developments in Texas Panhandle in 1946. P. A. Grant and A. W. Doshier. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1015–1017.—There was a marked decrease in drilling operations in the Texas Panhandle in 1946 compared with 1945. In all, 317 wells were drilled: 149 were completed as oil wells, 123 as gas wells, and 45 as dry holes.

Slightly less than 30 million brl of oil were produced, more than a million less brl than in 1945. More than 881 billion cu. ft. of gas were produced in 1946 which is 85 million cu. ft. less than the previous year.

Only one of the exploratory holes drilled in the Panhandle in 1946 was successful. The Texas Company's M.S. Bills No. 1 in Wheeler County, drilled as an extension to the East Shamrock pool was completed as a 29-brl pumper. 2 exploratory holes were drilled in the Anadarko basin in 1946. The British American Oil Company's Buzzard No. 1 in Ochiltree County, and O. P. Flynn's Hoover–Patton No. 1 were both dry and abandoned. E. N. T.

1753. Developments in South Texas in 1946. B. Scrafford. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1052–1058.—A decline occurred in the rate of wildcat developments in 1946 as well as a decrease in the rate of new discoveries. The 15,384 oil wells in the South Texas district produced 137,934,170 brl, approximately 5% of the world's production, 8% of the United States production, or 18% of the annual oil production of Texas. The 1085 gas wells tendered to gas lines 510,399,785 M.c.f. of gas during 1946. Over 54% of all developments took place in the Frio–Vicksburg trend which supplies 76% of the production of the district. E. N. T.

1754. Developments in Upper Gulf Coast of Texas in 1946. A. P. Allison and C. B. Claypool. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1071–1077.—In 1946, 679 wells of all classifications were drilled in the Upper Gulf Coast of Texas, of which 320 were exploratory and 359 oilfield development wells. Of the exploratory wells, 121 were new-field wildcats of which 14 were successful and 107 failures; 112 were new-pool wildcats of which 40 were successful and 72 were failures; 83 were extension wells or outposts, of which 39 were successful and 44 were failures.

679 drilling operations were undertaken, compared with 911 during 1945. New-field discoveries decreased from 26 in 1945 to 14 in 1946, while new sand discoveries in proved fields increased from 72 in 1945 to 80 in 1946. The new-field discovery rate was 1 out of 8·6 wildcat wells as compared with 1 out of 5 in 1945.

Of the 14 fields discovered in 1946, 6 were gas-condensate producers and 8 were oilfields. At the end of the year 1 was abandoned and 8 were still in the 1-well stage. Production remained at approximately 183 million brl.

The Edwards limestone of Lower Cretaceous age was found to be a producing formation, and 2 fields and 1 new pool, all producing gas and condensate were discovered. E. N. T.

1755. Developments in West Texas and Southeastern New Mexico in 1946. R. L. Boss and W. J. Hilseweck. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1018–1038.—There were 2219 wells completed in 1946 in the area of West Texas and southeastern New Mexico; 1843 were in West Texas including 335 exploratory holes of which 123 were successful and 376 were in southeastern New Mexico including 67 exploratory holes, 15 of which were successful.

Pipeline runs in West Texas were 191·27 million brl in 1946, an increase of 9% over 1945. Pipeline runs in southeastern New Mexico were 36·34 million brl in 1946, a decrease of 1·5% from 1945.

Oil and gas production was discovered in Pennsylvanian limestone on the eastern platform and in the Midland basin; Mississippian limestone oil in the Midland basin, and Ellenburger oil on the eastern platform. Oil was also discovered in Lower Permian beds below 10,000 ft in the Delaware basin

The exploitation of the shallow Bowers sand reservoir of the Hobbs field, extensions to the Paddock and Drinkard Permian Pools, and the steady growth of the pre-Permian Brunson pool are the most outstanding developments. E. N. T.

1756. Unconformities to Play Major Rôle in Arkansas–North Louisiana Discoveries. M. T. Halbouty and C. Hardin. *Oil Wkly*, 31.3.47, **125** (5), 32; 7.4.47, **125** (6), 42; 14.4.47, **125** (7), 40.—East Texas and Delhi are due to truncation and overlap, and fields of this type are likely to be found in Arkansas and North Louisiana. The Tuscaloosa and Paluxy are truncated on the south flank of the Monroe uplift, and they are overlapped by the Clayton gas rock and the Midway shales to give the trap at Delhi and the associated fields. Delhi was discovered in 1944, and was followed by West Delhi and Big Creek. In the first two the basal Tuscaloosa and the Paluxy give the main oil. Big Creek produces from lenses higher in the marine Tuscaloosa. The three have a producing area about 15 miles long and 2 miles wide, with reserves exceeding 250,000,000 brl. Production is found at depths of 2900–3300 ft.

The truncated edge of the Tuscaloosa and Paluxy runs east from Delhi round the southeast flank of the Monroe uplift and the Sharkey Platform into Mississippi, and wildcatting has taken place along this trend. In this area truncation is from the Annona chalk down to the top of the Cotton Valley formation. There has also been wildcatting north and south of the Delhi area, and lenticular sand production has been found at southwest Delhi, South Big Creek, and Lamar.

Approximate Woodbine equivalents occur on the southeast flank of the Sabine uplift, and truncation may have given oil traps.

In Arkansas the Lower Cretaceous and Jurassic beds have been truncated along northwest–southwest lines and they are covered mainly by Upper Cretaceous. These deposits change in character to the south and southwest. The Smackover oolites and Cotton Valley sands may produce where truncated and possessing lateral closure provided by nosing. The Smackover has produced south of a major fault zone in southern Arkansas, and at Midway north of the faults. The Paluxy, Rodessa, and Sligo offer possibilities of commercial oil production in this area of South Arkansas and North Louisiana.

Much of the production from the south and west of the Caddo-Pine Island uplift comes from truncated Paluxy sands. Similar production may be found on the north and east flanks.

Maps and cross-sections are included. G. D. H.

1757. Developments in Louisiana Gulf Coast in 1946. G. F. Shepherd. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1078–1083.—The 684 completions in 1946 in South Louisiana showed an increase of 11·54% over 1945. 79 were wildcats, 15 of which discovered new fields, including Queen Bess Island, Jefferson Parish. Of the new fields, 8 are oil, 2 are dry gas, and 5 are gas-condensate.

On old producing structures, 513 new wells were completed and 92 old wells were plugged back from other formations or drilled deeper. 75 of the new wells were drilled as field wildcats, 22 resulted in the discovery of new sands or field extensions. 75% of the development wells were successful, with 113 dry and abandoned.

The Week's Island field was reclassified from a gas-distillate field to an oilfield. A major westward extension of Tuscaloosa sand production resulted from the Union Producing Company's Belgard No. 1 completion in Big Island field. World's record for deep production was established in Week's Island field through completion of Smith No. 1 at 13,763–13,778 ft. E. N. T.

1758. Oil Possibilities on the Gulf Coast Continental Shelf. J. S. Critz. *Oil Wkly*, 6.1.47, **124** (6), 17.—The continental shelf margin occurs where the depth of water is about 600 ft, and throughout the world the shelf area is about 10,000,000 square miles.

The shelf area off the Gulf Coast covers 56,000 square miles and extends as much as 125 miles out to sea. The commonest of the Gulf Coast oil structures are non-piercing salt domes. Some 30 structures have been indicated in geophysical studies of 5000 square miles of shelf with less than 30 ft of water.

The Gulf Coast salt is believed to be of early Upper Jurassic age. Plugs may occur out as far as the edge of the continental shelf.

The 4 main oil-bearing sedimentary groups are the Sparta–Wilcox (Eocene), Cockfield–Yegua (Eocene), Marginulina–Frio (Oligocene), and the Miocene. The most productive belt for each group is generally farther south the younger the age. Coastwards each group changes from fresh water to marine in facies, and best conditions for oil occurrence seem to be where fresh water and marine beds interfinger.

The Creole field, opened in 1938, is a mile offshore, and produces from the Miocene at depths of 5100 ft in water up to 25 ft deep. It has 7 wells and was located by seismograph. A salt dome has been confirmed by drilling at Coon Point. Similar confirmation was obtained at McFaddin Beach.

The small Sabine Pass field was discovered 9000 ft offshore.

Offshore leasing is discussed. Maps show the depth of water offshore and the producing areas near the coast.

A generalized cross-section is given, and a list of tests drilled in the Gulf of Mexico.

G. D. H.

1759. Gilbertown : Oil Outpost. W. B. Jones and W. McGlamery. *World Oil*, 1.9.47, **127** (1), 42.—Gilbertown lies on the northern flank of the Hatchetigbee anticline, and is Alabama's first oilfield. The field, discovered in 1944, is about 10 miles long and one to three locations wide. Eocene beds occur down to 2000 ft, and good sand bodies in the Wilcox group carry water.

The Upper Cretaceous comprises Selma, Eutaw, and Tuscaloosa. The Selma, 1100 ft thick, consists of chalk and marl. The Eutaw is composed of 450 ft of sandstones and sandy shales. It may be an oil source, and is productive. The 1100 ft of Tuscaloosa is divided into Upper Tuscaloosa (sandstones and shales), Marine section (glauconitic shales and sandstones), and Massive sand (sandstone with shale breaks).

There are two roughly parallel faults along most of the field, both downthrown to the north. The non-porous Selma is thrown against Eutaw sandstones. Faulting probably went on during deposition.

Wells produce from fracture zones in the Selma chalk and from the Eutaw at depths of 2500–3570 ft. The Eutaw has a porosity of about 32% and permeability of 100–178 mD. The oil gravity is 17°. West Gilbertown had produced 560,986 brl to the end of 1946, the East Gilbertown 58,292 brl. The total output of both fields to the end of May 1947 was 777,575 brl.

Tables list the wells in the Gilbertown fields, and contour maps show the structure.

G. D. H.

1760. Developments in Canada in 1946. F. L. Fournier. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 947–958.—The Viking–Kinsella gas field was considerably enlarged during 1946 and 3 new gas fields were discovered at Provost, Elk Point, and Pendant d'Oreille. The Lloydminster heavy-oil field was considerably extended with 3 new pool discoveries. This resulted in Saskatchewan moving into third place as an oil producer, following Alberta and Northwest Territories. A new oil pool of unknown extent was found in the South Princess area on the central Alberta plains.

A large area of semi-solid bitumen and richly impregnated bituminous sand was discovered in the Mildred–Ruth lakes area of the Athabaska district by the Dominion Government Department of Mines and Resources. A new oil and gas field was discovered during the year near Wallaceburg, Ontario. E. N. T.

1761. Dominion's Liquid Bitumen Find of Great Importance. C. O. Nickle. *Oil Wkly*, 3.2.47, **124** (10), 23 (*International Section*).—It is estimated that 400–500 million brl of liquid bitumen occur on the west side of the Mildred–Ruth lakes area in northern Alberta. The overburden is thin. About 2 square miles have been explored by boring on a ⅛th-mile grid, and a greater area on ½-mile spacing. The thickness of bituminous sands ranges up to 220 ft. Interfingering with clay and shale occurs. 12–18% of bitumen is found in the sands. Interstratified with the sands are beds of liquid bitumen a few in to 21 ft in thickness. A Lower Cretaceous origin is suggested for the bitumen, and it is believed to have been deposited with the sediments. There are some bitumen seeps. G. D. H.

1762. Extensive Exploration Programme Seen Following Imperial's Leduc Discovery. C. O. Nickle. *Oil Wkly*, 5.5.47, **125** (10), 36 (*International Section*).—Leduc 1, Canada, completed in February 1947 flowed 950 brl/day of 39°-gravity oil from the Devonian at 5029–5066 ft. Wetaskiwin 1, about 32 miles to the southeast, was abandoned in the Devonian at 6502 ft. 3 other wells are under way in the Leduc area.

The Leduc has led to leasing activity. The leasing changes are noted. Battle Lake 1, lsd 16 12-46-3 w5th, about 35 miles southwest of Leduc, has been spudded. G. D. H.

1763. Leduc Discovery Encourages Canada. Anon. *World Petrol.*, Sept. 1947, **18** (9), 70.—5700 acres have been proved at Leduc, and ultimate recoveries of about 10,000 brl/acre are predicted. Alberta produced 6,276,654 brl of oil in 1946, but the oil requirements of the three prairie provinces is about 15,000,000 brl/yr.

Leduc No. 1 obtained oil-saturated cores at 5029 ft in a porous part of the Devonian limestone, and the well " blew in " in February 1947. The second well found a second porous horizon at 5375–5415 ft, with water at the bottom. No. 3 found the producing horizon of No. 1 less attractive, and a good gas flow at 5176 ft; it was completed at 5313 ft, flowing by heads. No. 4 was completed in the deeper horizon. A fifth well was brought in in July.

All the wells are restricted to 175–200 brl/day because of transport difficulties.

Tests of buried Devonian strata are to be made at Looma, 20 miles east of Leduc, Morinville, 18 miles north of Edmonton, Pigeon Lake (southwest of Leduc), and Paddle River No. 1, 65 miles northwest of Edmonton. G. D. H.

1764. Major Canadian Development Seen in the Lloydminster Area. F. H. Edmunds. *Oil Wkly*, 6.1.47, **124** (6), 16 (*International Section*).—Between 1933 and 1940 18 wells (8 oil, 1 gas) were drilled in the Lloydminster area. 4 found oil in the Colony sand, but did not produce. In 1943 Sparky 1, 4 miles west of Lloydminster town, found oil, and a further 8 oil wells, 2 gas wells, and 1 dry hole were completed. 19 wells were drilled in 1945 (13 oil, 1 gas) and 45 in 1946 to mid-November (24 oil producers).

Production comes from the Lower Cretaceous at about 1850 ft. There is a broad north-northwest–south-southeast anticline. The Lower Cretaceous sands are alluvial plain deposits including sands and silts. There are three mains sands. 3 wells have entered the Devonian. The scattered proved areas total 1600 acres. Allowing a sand porosity of 20%, 10% of connate water, and a recovery factor of 25%, the reserves are placed at 11,200,000 brl.

The drilling is summarized in a table and there are brief notes on the field operations, oil, and markets. A map shows the structure. G. D. H.

1765. Alberta Spotlight on North Pinhorn Gas Field. G. M. Wilson. *Oil Wkly*, 3.2.47, **124** (10), 20 (*International Section*).—Producing depths at North Pinhorn, 20 miles southeast of Foremost, are 2000–2200 ft. 4 good dry gas wells have been completed in the Bow Island (Upper Cretaceous) sand in an area some 10 miles by 3 miles. The output is about 70,000 M.c.f./day. The discovery well, 8 miles south and a little west of Lake Pakowki, had an initial open-flow potential of 48,000 M.c.f./day. 2 dry wells have been drilled between North Pinhorn and Foremost, but a connexion between the two fields may exist. Gas shows occur in a 200-ft fine-grained sand in the Colorado marine shales and the best production comes from the top. The trap is thought to be stratigraphic rather than anticlinal.

Medicine Hat has a gas reserve of 150,000–300,000 million cu. ft. It covers 60,000 acres and was opened in 1890. Bow Island may have 20,000,000 M.c.f. There are several other gas-producing areas. Bow Island produces from the Bow Island sand. Medicine Hat from a higher sand in the Colorado group.

Viking and Kinsella appear to belong to a single reservoir covering about 300,000 acres. In the Brooks–Princess area a 23,000,000 cu. ft. gas well was completed in 1946.

Alberta's total gas reserves are believed to exceed 2,500,000,000 M.c.f.

G. D. H.

1766. Mississippian Rocks Along Alcan Highway. L. R. Laudon and C. J. Chronic. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1608–1618.—Mississippian rocks are exposed at many places along the Alcan Highway in northern British Columbia from Mile 381 along the Tetsa River northwestward beyond the Liard River crossing. They consist of gray, slabby, silty limestone beds rhythmically interbedded with soft silty calcareous shales. The upper part of the section becomes thin-bedded and on weathered exposures appears as dark green chert. Maximum sections approach 350 ft in thickness. Analysis of the fauna shows the abundant occurrence of *Dictyoclostus inflatus* var. *coloradoensis*, *Spirifer arkansanus*, *Marginifera adairensis*, *Leiorhynchus carboniferum*, and *Deltopecten batesvillensis*. This fauna is early Meramec in age and can be directly correlated with some part of the Calico Bluff section in Alaska and with the Moorefield formation of the Arkansas Ozark section. No faunas of Kinderhook or Osage age occur along the Alcan Highway. E. N. T.

1767. Gaspé Peninsula Wildcat Test Prepares to Spud. Anon. *World Oil*, 4.8.47, **126** (10), 28 (*International Section*).—Venture No. 1 was drilled on the crest of the Galt anticline. It is 2424 ft deep and had a show of oil at 1587 ft. No. 2 is to be drilled 2600 ft south-southeast of No. 1. 5 miles north of No. 1 a live oil seep occurs 350 ft below the top of a limestone which should occur at depth in the Galt anticline. G. D. H.

1768. Sun Abandons Second Test in Nova Scotia. Anon. *Oil Gas J.*, 13.9.47, **46** (19), 76.—A test 5 miles south of Amherst, Cumberland County, Nova Scotia, has been abandoned at 11,504 ft. G. D. H.

1769. Standard's West Taber Area Due for Activity. Anon. *Oil Wkly*, 5.5.47, **125** (10), 36 (*International Section*).—Taber Province, Canada, 63-15A SW lsd 6 15-9-17 w4th, initially produced 159 brl/day of 22–23°-gravity oil on a $\frac{10}{64}$-in choke with a G.O.R. of about 500. It lies $\frac{1}{4}$ mile south of No. 65-15A. G. D. H.

1770. La Salina Area Old Colombia Prospect Now Being Revived. G. O. Ives. *Oil Wkly*, 3.2.47, **124** (10), 3 (*International Section*).—On the Las Monas prospect a number of wells have been drilled over a period of about 20 years. Last year La Salina 1 was completed for 75-brl/day. There are impressive active seeps in this area, which has a steeply folded northeast plunging faulted anticline. Cretaceous, Oligocene, and Miocene beds are exposed, the Cretaceous being upthrust.

The results of some of the early wells are briefly described. La Salina 1 produced from the Eocene. A second well is testing. G. D. H.

1771. Interesting Wildcat Developments Reported from Areas in Colombia. Anon. *Oil Wkly*, 23.6.47, **126** (4), 31.—49-K at Tibu found oil showings in the La Luna member of the Cretaceous. The La Luna was met at 7400 ft.

El Tablon 1 has Tertiary oil possibilities at about 7800 ft; a drill-stem test of a sand at 7095–7115 ft had given gas at 18,000 M.c.f./day. This well is believed to be on a faulted anticline.

Floresanto 10 is said to be still in Oligocene at 10,276 ft. G. D. H.

1772. Two Peru Wildcats Tests on Ucayali River Spudded. Anon. *World Oil*, 4.8.47, **126** (10), 27 (*International Section*).—A test at Puerto Oriente near Contamana is 800 ft deep. Another test has been spudded at Santa Clara, near Orellana. During the first half of 1947 Agua Caliente produced 52,626 brl/oil; the 1946 total was 89,236 brl. G. D. H.

1773. Colon Company Opens New Western Venezuela Field. Anon. *World Oil*, 7.7.47, **126** (6), 24 (*International Section*).—West Tarra 2 has been completed near the Colombian border. Production of 1500 ft/day of 41°-gravity oil on a $\frac{1}{2}$-in choke has been obtained from 8810–9173 ft. Later wells will test a Cretaceous limestone horizon at about 6800 ft, from which high-gravity oil flowed at 2000 brl/day. G. D. H.

1774. D'Arcy Crews Continue Great Britain's Oil Search. E. N. Tiratsoo. *Oil Wkly*, 3.2.47, **124** (10), 13 (*International Section*).—At the beginning of 1946 Britain had about 230 producing wells in the Eakring, Dukes Wood, Kelham Hills, and Caunton fields. During 1945 and 1946 some licences were granted and others were abandoned. The Easter Pardovan 1 well was abandoned in the Lower Carboniferous at 3183 ft. Ellenthorpe 1 was drilled to 3598 ft on a concealed Carboniferous anticline. Whittington 1 was abandoned in Lower Carboniferous limestone at 3369 ft. Kirkleatham 2 and Hayton 1 were abandoned in Upper Carboniferous beds at 3091 ft and 3882 ft, respectively.

Chaldon Down 2 was completed in 1946 at 1793 ft, not having found oil or gas.

Considerable amounts of geophysical work were done in various areas in 1946.

G. D. H.

1775. Deep Production Sought as D'Arcy Continues Work in United Kingdom. Anon. *World Oil*, 7.7.47, **126** (6), 36 (*International Section*).—Drilling of Formby No. 1 has been resumed and 6494 ft has been reached. A test is under way at Perlethorpe, 6 miles north of Eakring. A new well is being drilled on the north flank of the Cousland anticline to test the gas reserves. G. D. H.

1776. Exploration Denmark Shows Little Oil. Anon. *Oil Wkly*, 6.1.47, **124** (6), 35 (*International Section*).—A well on the Island of Mors, Limfjord, has had some oil shows. G. D. H.

1777. Geology of Denmark. Anon. *World Oil*, 7.7.47, **126** (6), 23 (*International Section*).—Some 33,000 shallow water wells have been drilled in Denmark, and these provide geological data in this largely drift-covered country. A major fault crosses Bornholm and extends into Sweden. The throw may be 15,000–20,000 ft down to the southwest. Near the fault an oil show has recently been found at 6000 ft in a well at Falsterbo, Sweden.

Shallow domes occur in North Jutland. A test is to be made on a deep structure near Herning. G. D. H.

1778. France's Drilling Programme Rigs Busy in Southern Area. E. D. Lynton. *Oil Wkly*, 3.2.47, **124** (10), 16 (*International Section*).—A gas field has been opened at St. Marcet, and 1 well has pumped a little oil from a Jurassic dolomitic limestone at about 6000 ft. There are indications of a gas field on the Proupiary structure east of St. Marcet.

14 wells have been drilled at St. Marcet, and 11 are capable of production from a Cenomanian breccia at about 4920 ft. About 3,500,000 M.c.f. was produced in 1946. Wells have been sunk at St. Martory, Richou, Aurignac, and Plagne and Puymaurin.

In southwest France there has been drilling at Audignon (20 miles south of Mont-de-Marson), Bastennes–Gaujacq (15½ miles east of Dax), Garlin (20 miles north of Pau), and Tresiers (15½ miles east of Pamiers). Evidence of oil or bitumen was found at Bastennes–Guajacq and Garlin. In South France in the Montpelier area La Gardiole 1, 9½ miles southwest of Montpelier, has had slight gas shows; La Vaunage 1, 6 miles west of Nîmes, had small gas shows. Wells are also being drilled at Quissac (25 miles north of Montpelier) and Durfort (6½ miles north of Quissac). The Durfort wells have shown gas.

Gabian, 12½ miles north of Beziers, is on a small anticline. 5 out of 60 wells produce from depths of about 490 ft. The field has given 186,250 brl of oil in 20 years, and now it gives about 90 brl/month with much fresh water. Production is from the Muschelkalk. G. D. H.

1779. German Field Reitbrook, Almost Ruined During War. J. B. Eby. *Oil Wkly*, 7.4.47, **125** (6), 15 (*International Section*).—The Reitbrook field, 10 miles southeast of Hamburg, is associated with a salt mass, the beds overlying which are much folded and faulted. In 1910 a water well encountered gas in the Lower Oligocene, and several other gas wells were drilled. After geophysical work a commercial oil well was completed in an Upper Cretaceous limestone in 1937.

Miocene to Cretaceous beds are present and the salt overhangs. The oil is 21·3° gravity. There are 45 flowing wells and 15 on artificial lift. The limestone porosity is about 25%, and the permeability 2 mD. The peak output was 2,500,078 brl in 1940; the output was 240,800 brl in 1945. Overproduction depleted the gas cap and caused premature water invasion. Repressuring was begun 1942, and the water-table was flattened out.

A Lower Eocene sand is now being developed.

A map shows the Reitbrook structure and a cross-section shows the complex faulting. An electric log and columnar section are included, and curves show the drilling and production history. G. D. H.

1780. Oil-Reserve Provinces of Middle East and Southern Soviet Russia. F. J. Fohs. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1372–1383.—The Persian Gulf geosyncline is the result of the pushing southwest of the Alpine arc of the Tauros–Zagros Mountains against the Arabian lobe of the Gondwanda shield, a stable block creating a great foredeep with more than 30,000 ft of sediments of Carboniferous to Recent beds, principally Cretaceous, Tertiary, and Pliocene in age. In this basin are numerous oil pools, principally in the Asmari limestone. There are 20 developed oil pools with 150 wells capable of an annual production of 1,600,000 brl, and much gas; in 1946 production was 720,000 brl. Northeast of the Zagros mountains and south of the Elburz mountains are one second-class and three third-class basins with undeveloped oil possibilities.

In southern U.S.S.R. is the Caspian Sea province consisting of three great east–west synclinal basins with beds from Devonian to Recent, but principally of Permian to Tertiary strata. The basins with extensions westward into Russian-controlled Balkan States and other undeveloped basins, with older beds, at the north, give Russia extensive oil reserves. However, 1946 production here was only 555,000 brl.

The Middle East has 975,000 square miles of oil-gas basins, two-thirds promising for first-class pools. Southern U.S.S.R., inclusive of Balkan areas, has 1,048,000 square miles of primary areas, and 93,000 square miles of secondary areas. Ultimate oil reserves of the Middle East and Russia may be estimated at 100 billion brl, and those of the U.S.A. at 50 billion brl. E. N. T.

1781. Oil Search in Palestine. E. Aschner. *World Petrol.*, Feb. 1947, **18** (2), 50.—Geological and geophysical work has indicated conditions favourable for oil occurrence in Negev, the Gaza sub-district, and the region round Jebel Uzdum. It is said that twenty-three more or less promising structures have been mapped in western Palestine, covering 1000 square miles, and of this area 300 square miles is promising for oil and gas occurrence, and 100 square miles especially promising.

The first well is located in the Gaza district. G. D. H.

1782. Tunisia Exploration. Anon. *Oil Wkly*, 7.4.47, **125** (6), 39 (*International Section*).—From 1931 to 1944 11 wildcats, totally 34,440 ft, were drilled on seven structures in Tunisia. G. D. H.

1783. Japanese Report Major Oil Discovery. Anon. *Oil Gas J.*, 20.9.47, **46** (2), 161.—A discovery, claimed to be Japan's largest oilfield, has been made near Teshio on the northwest coast of Hokkaido. Previous production was on a small scale. G. D. H.

1784. Search for Oil in Nigeria. E. N. Tiratsoo. *Oil Wkly*, 3.2.47, **124** (10), 24 (*International Section*).—The west and central two-thirds of Nigeria consists of igneous rocks. The oldest known sediments are Cretaceous marine sandstones and shales, north, east, and south of the igneous rocks. Their thickness is about 15,000 ft, and they are folded. Tertiary marine clays and sands occur in the northwest and south.

Most exploratory work for oil has been in southern Nigeria, but no suitable structures have been described. Tar sands and oil seeps are found along the coast east of Lagos. G. D. H.

1785. Gold Coast Oil Prospects. E. N. Tiratsoo. *Oil Wkly*, 5.5.47, **125** (10), 24 (*International Section*).—Exploratory work is reported in the Gold Coast area, and during the past 40 years about a dozen tests have been drilled, frequently without adequate geological work. Traces of gas and oil were found.

Much of the Gold Coast territory consists of Archaean, but there is a belt of sediments about 20 miles wide on the coast, and this includes Devonian, Carboniferous, Cretaceous, and Tertiary beds. The Cretaceous comprises over 4000 ft of sandy and clayey deposits, with occasional limestone bands. A geological map shows the distribution of the formations. G. D. H.

1786. Search for Oil in Northwest India. E. N. Tiratsoo. *Oil Wkly*, 5.5.47, **125** (10), 10 (*International Section*).—The first tests for oil in the Punjab were drilled in 1866. At times up to 1915 small amounts of oil were found, but that year gave the first important discovery at Khaur. The Dhulian field was brought into full production only in 1937. Other structures have been tested including Khabakhi, Gobhir, Jhatla, and Chorlakki.

The Upper Tertiary beds are wholly freshwater, but the Eocene, below an unconformity, is largely marine. All oil found thus far has been in the Miocene Murree sandstones or in Middle Eocene limestones. It is believed that the source rocks are in the Eocene.

The folds run roughly east–west and are tight and long. Seepages occur in the foothills of the Margala and Kala Chitta ranges, on the north flank of the Salt Range and at Khaur. The Khaur fold is slightly asymmetric and trends east-northeast–west-southwest. The productive area is about 100 acres. Some 350 wells have been drilled. Production was obtained in very shallow horizons in the Murree and later in the Eocene. The peak output was 500,000 brl in 1929. Dhulian is 10 miles southwest of Khaur, and is broader with the north flank steeper than the south flank. The field covers 900 acres, and there are 35 flowing wells. 36·8° oil comes from the Eocene at depths of about 7000 ft. The present output is 700 brl/day. Joya Mair lies 25 miles south of Khaur and the fold has a steep south flank. Heavy oil was found at a depth of 6896 ft in Eocene limestone in 1944, and a flow of 9000 brl/day followed. Carboniferous has been met below the Eocene, and this shows oil. Joya Mair's potentialities are not yet determined. 12 miles west of Joya Mair is Balkassar, and there oil was found in 1946 in Eocene limestone at a depth of 8200 ft. The initial production was 350 brl/day. Further testing is needed. Maps and cross-sections are included.

G. D. H.

1787. Japan's Production Decline. Anon. *World Oil*, 1.9.47, **127** (1), 18 (*International Section*).—During the 1946–47 fiscal year Japan's oil production was 1,322,441 brl; the previous year's output was 1,482,578 brl. The country's proved and developed reserve is now slightly over 15,000,000 brl, and its cumulative production about 90,000,000 brl.

Recent studies in northwestern Honshu suggest that reserves in the sedimentary basins containing the Niigata and Akita oilfields may be 88,000,000 brl, with possible additional reserves in the basal Miocene below the present producing horizons. In the Hokkaido fields, which are virtually non-commercial, no tests have been made in the Paleocene and Cretaceous, which formations are oil-bearing at outcrop. Seeps occur in a large Tertiary basin in eastern Hokkaido, and there are Tertiary embayments on the Pacific coast of Honshu. Petroleum exploration in Japan has been found to be rather backward in development.

The history of oilfield development in Japan is briefly described. The output peak was between 2,830,500 brl and 2,956,300 brl/year in the period 1915 to 1917. About 76 fields are known, about half being abandoned. None is more than 1000 acres in extent or had reserves exceeding 18,000,000 brl. 10,272 wells have been drilled. Most fields seem to be of gas-depletion type, but Ishinazaka may be under strong water-drive. Less than 1% of the wells are flowing.

Brief notes are given on the more important areas, and there are comments on potential producing areas.

G. D. H.

1788. Petroleum Exploration and Production in Western Pacific During World War II. L. W. Stach. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1384–1403.—Production from Japanese concessions in North Sakhalin ceased at the Katangli field in 1939 and at the Okha field in 1943. Exploration practically stopped in Japan proper and Formosa during World War II, but was maintained in Manchuria. Exploration in both South and North Sakhalin ceased just prior to World War II. Intensive drilling and lack of exploration in Japan proper during World War II has left Japan with few undrilled reserves in sight; the Natural Resources Section of the Allied Powers has assisted the Japanese Government to develop a large exploration programme to find new reserves.

E. N. T.

1789. Geology of Roma District. F. Reeves. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1341–1371.—Since 1900, 40 wells have been drilled in southeastern Queensland, Australia. Basement rocks in the vicinity of Roma underlay the surface at depths of 2000–4100 ft; oil and gas showings were found slightly above the basement rocks in non-marine formations thought to be Jurassic. In 1934 and 1935 geological work and exploratory drilling was undertaken and two or three promising structures were outlined. Three deep tests in the area were located on pronounced anticlines located 60–85 miles north of Roma. Gas was struck in two of the wells, but only slight showings of oil were encountered.

Geological investigations showed: (1) Well defined anticlinal folds in outcropping Permian strata 80–120 miles north of Roma. Slight unconformity exists between the Permian and Triassic, and a marked unconformity occurs at the base of the Upper Triassic; the folds in the Permian can be traced southeast in the mild folds of the Triassic, but disappear in the gently southerly tilt of the Jurassic strata; (2) The combined thickness of the Jurassic and Triassic is only 3500–5500 ft, and not 12,000 ft as formerly estimated. The Permian strata at the outcrop are only 5100–7000 ft thick; (3) The principal oil and gas showings at Roma were found in sandstones and grits of Triassic, not Jurassic age; (4) None of the 40 wells drilled in the region was located on an appreciable fold; (5) Gas encountered in the Triassic near Roma and in the Permian at Arcadia probably originated from Permian Carbonaceous strata. Oil at Roma may come from marine strata that occur in the middle and lower Bowen series of Permian age. All strata below the thin mantle of Cretaceous in the vicinity of Roma are non-marine in origin. E. N. T.

Geophysics and Geochemical Prospecting.

1790. Modern Developments in Geophysical Prospecting. A. Van Weelden. *J. Inst. Petrol.*, 1947, **33**, 344–352. (*Inst. Petrol. Meeting, London*, Mar. 1947.)—No new methods have achieved prominence. Detection of oil by means of soil analyses, from telluric earth currents or by electronic devices has been tried, but all these methods require further research. Improvements have been made in established methods and in their application. The accuracy and ease of handling of gravimeters have been improved. In seismic recording apparatus automatic volume control enables an accurate record to be obtained with the first shot, also better quality and packing of explosives give max speeds of detonation.

Aerial magnetometer surveys render negligible the small local variations due to, say, a little magnetic sand or scattered pieces of metal which affect surface surveys, and in addition when carried out at varying heights permit the separation of shallow and deep anomalies by comparison. The techniques used in submarine gravity meter and seismic explorations are discussed. A. R. W. B.

1791. Geophysical Principles for Determining Subsurface Conditions. R. M. Tripp. *Oil Wkly*, 9.6.47, **126** (2), 34.—Suppose that methane saturated with water vapour migrates through the crust along the path of maximum thermal gradient and maximum pressure gradient, and that it obeys Boyle's laws. The movement is probably described approximately by a modification of D'Arcy's equation :—

$$Q = \frac{KA}{\eta(1 + m)L} P_1^{1+m} - P_n^{1+m}),$$

where Q = flow in cc/sec; K = permeability (darcies); A = cross-section of area of flow (mm²); η = gas viscosity (poises); m = ratio of specific heats of gas at constant volume and constant temperature; P_1 = reservoir pressure (atmos); P_n = partial pressure of gas at surface. For a rock cover of 4500 ft with a permeability of 10^{-7} darcy, a reservoir under hydrostatic pressure and $m = 0{\cdot}86$, $Q = 4000$ moles/acre/year.

It has been estimated that in passage to the surface the net vaporization per mole of methane is $3{\cdot}92 \times 10^{-3}$ lb of water. Much of the loss of 25,000 cu. ft. of water vapour/acre/year is deemed to take place in the zone within 25 ft of the surface, and so may give rise to features not present in surrounding areas. Thus precipitation of slightly soluble substances might occur, and radioactive substances belong to this category Moreover, radioactive compounds cause changes in escaping hydrocarbon gases, giving paraffinic liquids and solids.

Thus the examination of soils for radioactivity and mineral wax may be a guide to oil discovery, especially if anomalies in the occurrence of both types of material coincide. G. D. H.

1792. Recent Trends in Geological–Geophysical Exploration and Methods of Improving Use of Geophysical Data. R. D. Coffin. *Petrol. Engr Reference Annual*, 1947, **18** (10), 47.—See Abstract No. 328 (1947).

1793. Geothermal Gradients in Mid-Continent and Gulf Coast Oilfields. E. A. Nichols. *Petrol. Engr Reference Annual*, 1947, **18** (10), 64.—See Abstract No. 941 (1947).

1794. Five Companies Join in Extensive Magnetometer Survey of the Bahamas. Anon. *Oil Wkly*, 21.4.47, **125** (8), 35.—50,000–80,000 square miles of the Bahamas banks are to be surveyed by airborne magnetometer in 8 months, for a cost of about $750,000. Location will be aided by Shoran, and should help in correcting maps rendered inaccurate, where based on astronomical observations, because of the presence of numerous gravity anomalies. G. D. H.

1795. Results Obtained by the Helicopter-Borne Magnetometer. H. Lundberg. *Canad. Min. metall. Bull.*, 1947, **50**, 592–600.—See Abstract No. 1381 (1947).

1796. Radar Proves Useful Tool in Marine Surveying. W. H. Wilson. *World Petrol.*, May 1947, **18** (5), 71.—Speed is essential in marine surveying for geophysical work, but this type of surveying need not attain the same degree of accuracy as is required for well locations. Triangulation from a base line on shore is commonly used for locating a point offshore. Questions of visibility put a limit on the range that can be reasonably reached by this visual method. Steps of 10–15 miles outwards might be possible by establishing subsidiary marine stations, but this technique would be costly.

Radar can be applied in marine surveying. Some equipment has a range accuracy with a probable error of ± 20 yd. Elevated targets and antenna will be necessary to cover relatively great distances. In stepping outwards with the radar technique, existing channel buoys or lighthouses can be used as intermediate points or temporary buoys may be anchored. In this case using a pair of targets distances only need to be measured. For this purpose radar equipment designed as a navigational aid for shipping can be employed. Shoran has also been successfully applied in marine surveying, and again an accuracy of the order of ± 20 yd in range has been claimed. The sextant and wire line prove valuable in making measurements over shorter distances, as between buoys marking subsidiary stations. Wire line measurements of a distance three miles in length probably had an accuracy of ± 60 yd. The wire can be paid-out or taken-in at speeds up to 9 m.p.h. G. D. H.

1797. Radiographic Methods of Geophysical Exploration. M. A. Blackburn. *World Oil*, 11.8.47, **126** (11), 43.—The radiographic method of geophysical surveying depends on measuring radio field intensities by automatic recording. These records can be made in a car travelling at speeds up to about 50 m.p.h. and iso-intensity contour maps can be constructed. Faults can be detected and the direction of the axis of a structure has been determined, together with a measure of the relief, but not the depth.

A special sensitive radio receiver was connected to an Esterline–Angus recording meter and intensity measurements were made on standard broadcasting stations.

Observations can be substantially duplicated. It has been possible to correlate radiographic anomalies with known subsurface anomalies, and they could be explained by secondary fields interfering with the primary field, reflection and refraction of the primary field.

Near-surface sediments overlying oilfields have measurably different physical and chemical properties from equivalent beds away from the producing area. These differences may modify radio intensities. G. D. H.

1798. Modern Seismic Techniques Applied to Geophysical Exploration in West Texas. S. Harris. *Oil Gas J.*, 19.7.47, **46** (11), 60.—See Abstract No. 1158 (1947).

1799. Torsion Balance Surveys of Inundated Areas. K. H. Hasselmann. *World Oil*, 21.7.47, **126** (8), 38.—A tripod is employed to support the torsion balance, and this is surrounded by a float which prevents waves striking the tripod, and also carries equipment and personnel. The float is anchored.

The stations are previously marked and surveyed. The move from one station to another required about 1½ hr; the reading period was 8 hr. Water 5–50 ft in depth was suitable for using this equipment. Generally no terrain corrections were needed. G. D. H.

1800. Some Practical Considerations of Radioactivity Well Logging. J. M. Walker and S. W. McGaha. *Oil Wkly*, 6.1.47, **124** (6), 33.—Equipment must be provided to suspend the logging equipment over the well head. A lubricator is necessary where high pressures occur. The casing programme should be known and also the metal in the casing. Similarly it is essential to know if plastic has been used for cementing. Enlarged holes due to shooting affect the logs.

Standard logs are 2 in to 100 ft, but 5 in to 100 ft can be made. G. D. H.

Drilling.

1801. Standard Equipment in Squeeze Cementing at Record Depth. H. David. *Oil Gas J.*, 27.9.47, **46** (21), 94.—The equipment used and details of operation of a squeeze cementing job at 16,274 ft are fully described. The bottom-hole conditions and pertinent facts of other cementing jobs at various depths by the same method, are given. C. G. W.

1802. Prefabricated Offshore Drilling Platform Set Up in Record Time. E. H. Short, Jr. *Oil Gas J.*, 9.8.47, **46** (14), 82.—The drilling structure consists of 6 templates. These were towed on barges and set on the ocean floor. Piles are driven through the hollow vertical members after the frame has been located. Time taken was only 9 days compared with a period of several months for completing platforms of conventional type; also the prefabricated templates cross-braced from top to bottom gives a platform of greater rigidity than the old method, where the structure was braced only above water. C. G. W.

1803. Drilling Equipment Records. M. Hart. *Petrol. Engr Reference Annual*, 1947, **18** (10), 68.—Various methods of keeping drilling equipment records are described. R. B. S.

1804. Rolling Heavy Rigs on Wheels. G. Weber. *Oil Gas J.*, 2.8.47, **46** (13), 58.—The rig is highly unitized for rapid movement in several loads. The engine unit, mounted on two heavy water drums is skidded away from the derrick and wheeled as a single load. Draw-works and engine shed are guyed to the derrick and then moved intact. The rig-moving equipment consists of 4 four-wheeled dollies placed under the derrick corners or engine unit supports. Estimated time saving on moving to a new location is 2 days. C. G. W.

1805. Deep Cable-Tool Drilling in Appalachian Area. H. W. Haupt. *Petrol. Engr Reference Annual*, 1947, **18** (10), 72.—The methods of overcoming the hazards involved in cable-tool drilling in the Appalachian area are discussed. R. B. S.

1806. Deep Rotary Drilling Applied to Appalachians. B. R. Miller. *Petrol. Engr Reference Annual*, 1947, **18** (10), 75.—See Abstract No. 1030 (1946).

1807. Separate Cooling on Drilling Rigs. Anon. *Oil Gas J.*, 13.9.47, **46** (19), 99.—The advantages of remote-type jacket water coolers over engine mounted radiators, are outlined. Such advantages are (1) Power saving in fan loads. (2) Removal of heat from the rig. (3) Reduction in noise near the rig. The principal disadvantage is that the coolers constitute a separate piece of equipment to be moved with the drilling rig. Also the overall cost of coolers is a factor to be considered. C. G. W.

1808. True Resistivity Determinations from the Electric Log. H. G. Doll, J. C. LeGrand, and E. F. Stratton. *Oil Gas J.*, 20.9.47, **46** (20), 297.—The electric log gives two electrical parameters of geological formations—spontaneous, potential, and resistivity. Electrode devices in common use and general procedure are discussed. The general case for a resistivity measurement is that of three media, well fluid, invaded formation, and virgin formation, the resistivities being *Rm*, *Ri*, and *Rr* respectively. The apparent resistivity *Ra* as measured, is a function of these three resistivities and electrode spacing. Equations for these resistivities and diagrams showing the variation of apparent resistivity with electrode spacing given for both two and three media cases. In order to correlate between apparent and true resistivities resistivity departure curves have been established for the two media cases. These are plots of the ratio Ra/Rm against electrode spacing/well diameter for various values of the ratio Rr/Rm. These curves extrapolate to an asymptote at a value $Ra/Rm = Rr/Rm$. In the three media case, groups of curves are plotted representing the value of Ra/Rm for different electrode spacings. Each plot corresponds to a certain value of the ratio Ri/Rm, each group consisting of several curves corresponding to different diameters of contamination for a given ratio Rt/Rm. Mud invasion tends to decrease the range of variation of apparent resistivities measured opposite beds of different true resistivities. Knowing true resistivity, hole diameter, electrode spacings, and apparent resistivities for several electrode devices, a section of curve can be plotted on the chart representing the resistivity departure curves. The true resistivity is then obtained by interpolation. It is necessary to have at least two and preferably three apparent resistivity values where invasion is suspected. Examples of the application of true resistivity determinations in log analysis are given. C. G. W.

1809. Testing of Drilling Fluids. G. R. Gray. *Petrol. Engr Reference Annual*, 1947, **18** (10), 100. (*Paper presented at Drilling Fluids Conference, Texas, A. and M. College, College Station, Texas*, May 1946.)—The tests that are normally used in determining the physical properties of a drilling mud are discussed. The instruments described in this connexion are: (1) the Mudwate Hydrometer; (2) the Mud Balance; (3) the Marsh Funnel Viscosimeter; (4) the Stormer Viscosimeter; (5) the Shearometer; (6) the Filter Press; and (7) the Glass-Electrode pH Meter; methods of testing for sand content, salt content, soap hardness, and pH by colorimetric means are also described. Ten references are appended. R. B. S.

1810. Selection of Mud Fluid for Completion of Wells. H. E. Radford. *World Oil*, 14.7.47, **126** (7), 36. (*Paper presented before Pacific Coast District Division of Production, A.P.I., Los Angeles*, May 1947.)—See Abstract No. 1400 (1947).

1811. Free Pump Speeds Drilling and Seating. G. M. Wilson. *World Oil*, 28.7.47, **126** (9), 81.—A description is given of a new hydraulic type of pumping unit, known as the free pump. The free pump is similar to a conventional type of hydraulic pump, the main differences in this type of unit being in the method of installation and in the arrangement of tubing macaroni strings in the well. The free-pump type of installation enables the pumping unit to be seated in the well and brought back to the surface by hydraulic pressure, thus eliminating the necessity of installing conventional pulling equipment and other tools. R. B. S.

Production.

1812. Marble Shooting. J. G. Burch. *Petrol. Engr Reference Annual*, 1947, **18** (10), 114.—See Abstract No. 34 (1946).

1813. Decline Curves. E. R. Lloyd. *World Oil*, 21.7.47, **126** (8), 34.—The author discusses the decline curve equations developed by the late T. H. Olds and compares them with other decline curve equations. Olds' equation was a hyperbolic one, so that the rate–time curve plotted on log–log paper had a constant slope (*i.e.*, was a straight line). The following equations for rate of production and ultimate recovery can be developed from Olds' equation:

$$y = \left(\frac{C}{x}\right)^{1/n} \qquad A = \frac{Cn}{1-n}y^{(1-n)}$$

where y = rate of production at any time x in years of the well's life, and A = future production (as between the time when the rate of production is equal to y and the time when the rate of production reaches zero. The values of n and C are constant for a given rate–time decline curve. The equation for future production from a given rate to an assumed economic limit is

$$A - A_{EL} = ky^{(1-n)} - ky_{EL}^{(1-n)}$$

when $k = \frac{Cn}{1-n}$ and A_{EL}, y_{EL} are values corresponding to the economic limit of production rate. An equation can be developed for cumulative production at any time in a similar manner by calculating the gross future corresponding to the initial rate of production, and the future corresponding to the rate at the given time.

In comparing Olds' equations with those developed by J. J. Arps, the author shows that they are fundamentally the same as Arps' equations. The exponential type of curve developed by several other technologists is simpler to handle, but is also less accurate under certain conditions. With decrease in the value of n in Olds' curves the hyperbolic type approach the exponential type : for values of n less than 0·10 there would be little error involved in using exponential curves. In general the use of exponential curves gives estimates of future production that are too low.

Three references are appended. R. B. S.

1814. Determination of Stresses in Oil-Well Casing in Place. C. H. Oberg and R. W. Masters. *Petrol. Engr*, June 1947, **18** (9), 149.—A description is given of a method for determining the changes in stress in oil-well casing after being placed in the well and whilst being affected by the varying temperatures and pressures encountered during drilling and producing operations. The results of field tests are discussed, and the importance of using the proper casing landing tension is stressed. R. B. S.

1815. Remedial Work on Dually Completed Wells. R. Williams. *Oil Gas J.*, 13.9.47, **46** (19), 101.—Recently the necessity for killing wells and pulling tubing and packers has been avoided. In one case, the upper of two producing formations had ceased to flow because of water intrusion and it was decided to produce the upper formation by gas lift. In most dually completed wells the upper zone is produced through an annulus of tubing and casing with a packer sealing the annulus between producing zones. The lower zone flows through the tubing. A string of 1-in pipe with a packer is run inside the 2-in tubing and gas injected from the annulus of 1-in and 2-in strings into the annulus of tubing and casing through an orifice button in the tubing wall above the packer. The lower zone is produced through the 1-in string. In another case, it was apparent that there was a leak between zones, and it was decided to test for a tubing leak before killing the well and pulling tubing and packer. To test the tubing, a plug was placed at packer depth and with casing closed in at the surface the build-up of pressure in the tubing indicated a leak in the string. To locate the tubing leak an Otis extractor tool was placed directly above packer level. The casing was then opened and the well flowed at a high rate to lower the pressure in the annulus which lowers the pressure in the tubing, causing the extractor tool to be pushed up to the tubing leak by flow from the lower zone. A measuring line is run to give the location of the leak. The leak was sealed by an 8-ft length of 1-in pipe with sealing cups at top and bottom. C. G. W.

1816. Corrosion and Preventative Methods in Katy Field. R. C. Buchan. *Petrol. Engr Reference Annual*, 1947, **18** (10), 159.—See Abstract No. 346 (1947).

1817. Economics of Cycling. Part I. W. H. Woods. *Oil Gas J.*, 16.8.47, **46** (15), 89.—Cycling is defined as a method of producing gas-condensate reservoirs for their liquid content. The characteristics of such reservoirs and the development of cycling are discussed. The evaluation of capacities of gas condensate reservoirs by (1) a volumetric method, (2) a pressure decline method is outlined. C. G. W.

1818. Economics of Cycling. Part II. W. H. Woods. *Oil Gas J.*, 23.8.47, **46** (16), 99.—Recovery from gas-condensate reservoirs depends on the type of drive. Water-drive theoretically gives 100% recovery, but in practice a small pressure drop occurs causing loss by retrograde condensation. In the case of gas drive the remaining gas has to expand to replace gas and condensate produced. Losses by retrograde condensation depend on the pressure drop between virgin pressure and final pressure and may be calculated from a plot of condensate yield a *v* reservoir pressure. In cycling operations loss of liquids is a function of pressure drop, which is due to (1) shrinkage or extraction loss; (2) fuel requirements; (3) deviation factor difference between reservoir gas and dry gas. Injection rates may be maintained by make-up gas. Losses during cycling are due to retrograde condensation and by-passing of wet gas. By-passing may be due to (1) inefficiency in cycling pattern; (2) variation in permeability throughout the reservoir. Evaluation of by-pass losses is discussed and a comparison of recovery by straight production and by cycling made. Recoveries are estimated at 27·7% for condensate and 35% for crude by straight recovery as against 81·8% and 50% by cycling. C. G. W.

1819. Pseudo-Critical Temperature of Gases. J. C. Calhoun. *Oil Gas J.*, 4.10.47, **46** (22), 103.—No. 302 in the *Engineering Fundamentals* series shows that there is no single value for critical temperature and pressure for a mixture of gases; pseudo-critical temperature and pressure figures being calculated for such mixtures. Two figures and a table are provided and an example worked out. G. A. C.

1820. Gas Condensate Reservoirs. O. F. Thornton. *Petrol. Engr Reference Annual*, 1947, **18** (10), 124.—See Abstract No. 370 (1947).

1821. Phantom Pumper Enables Remote Control of Wells and Tanks from a Centralized Panel. L. S. McCaslin. *Oil Gas J.*, 2.8.47, **46** (13), 60.—The remote-control system enables the operator to (1) open or close any one tank in a battery of tanks; (2) open or shut-in any one or all wells supplying oil to a chosen tank; (3) determine which tank is receiving oil at any time; (4) read the number of brl of oil delivered to a chosen tank; (5) keep a record of total production into a battery of tanks; (6) discern fluid levels in each tank; (7) automatic topping out of tanks at pre-selected levels.

A number of safety features are incorporated to prevent mishaps or loss of oil. Flow of oil is controlled by a gas diaphragm-operated valve. The supply of gas to the diaphragm is controlled by a three-way electrically operated gas valve. Liquid level gauging is done by a liquid level meter body connected to an indicator on the central control panel. C. G. W.

1822. Motors and Controls for Beam-Well Pumping. W. G. Taylor. *Oil Gas J.*, 13.9.47, **46** (19), 86.—Squirrel cage, three-phase induction motors are widely used for beam-well pumping. The three types are the normal torque, high-starting torque, and high-slip types. The factors governing selection and the conditions under which each type of motor is least used are discussed. The control unit includes a fused line switch, motor starting magnetic switch, an automatic time switch, a selector switch, and under-voltage and temperature overload relays. Time-cycle pumping is used where production is prorated or where the well is pumped for only a few hours a day. The motor is started and shut off at predetermined intervals by the automatic time switch. C. G. W.

1823. Nitrogen as Repressuring Agent for Secondary Recovery. L. S. McCaslin, Jr. *Oil Gas J.*, 27.9.47, **46** (21), T2.—Nitrogen is used in the Silica field of Kansas because of the absence of cheap natural gas, and the large quantities of water produced preclude the use of air. The nitrogen is generated by burning filtered crude oil and scrubbing and compressing the combustion products to 1000 p.s.i. Details of the generator are given. The project is regarded as an experiment in reservoir mechanics and tests will be made measuring nitrogen used, and oil and water production of the wells in the area. C. G. W.

1824. Pumping Equipment Selection for Secondary Recovery Developments. E. N. Kemler. *Petrol. Engr Reference Annual*, 1947, **18** (10), 155.—See Abstract No. 357 (1947).

1825. Slime and Algæ Control in Oilfield Flood-Water. Anon. *World Oil*, 28.7.47, **126** (9), 88.—The fundamentals of detection and prevention of algæ formation are briefly discussed. R. B. S.

1826. Free Pumping Used in Hydraulic Drives. H. David. *Oil Gas J.*, 16.8.47, **46** (15), 94.—The free pump is an adaptation of the conventional hydraulic pump. Modifications are (1) a nose assembly carrying rubber packers to raise and lower the pump; (2) a four-way valve containing a catcher-head assembly installed at the surface. The purpose of this valve is to control the direction of circulation of fluid; (3) the shoe is modified to facilitate the pump seating above the standing valve. Two tubing strings, one for power oil and one for production, are connected at the well bottom by a shoe housing containing a standing valve. When the pump is inserted and the catcher-head assembly in position power oil is forced into the power tubing pushing the pump down. At bottom, the pump seats and seals in the valve shoe. During pumping operations the standing valve is held off its seat by a permanent magnet. To surface the pump it is only necessary to reverse the direction of circulation. When the pump reaches the surface it latches in the catcher-head assembly. Running and pulling time, paraffin control, and operating costs are also discussed. C. G. W.

Oilfield Development.

1827. Oil Weekly 1947 World Oil Atlas. Anon. *Oil Wkly*, 30.6.47, **126** (5), Section 2, 1–376.—In addition to information on oilfield development in countries throughout the world, many maps are presented for countries other than U.S.A., and data are given on demand and supply, petroleum possibilities, production and reserves, producing wells, completions and footage, refining facilities, and the principal oil companies outside the U.S.A. G. D. H.

1828. Small Firms Loom Big in Company Drilling. Anon. *World Oil*, 28.7.47, **126** (9), 72.—In the first half of 1947, 37 of the larger companies in the U.S.A. completed 27·7% of the new wells and 23·4% of the exploratory wells. These companies had 32·4% of the productive exploratory wells. The larger companies drilled 21·2% of the strict wildcats and gained 22·9% of the new field discoveries.

A table summarizes the results of the drilling in the first half of 1947 for some of the larger companies and for the rest of the industry. G. D. H.

1829. Shortages Hold Drilling to Moderate Increase. Anon. *World Oil*, 28.7.47, **126** (9), 65.—The drilling outlook in the principal producing States is briefly reviewed, and the outstanding features of the first half of 1947 are noted. G. D. H.

1830. History of Reserves and Production of Natural Gas and Natural Gas Liquids in Texas. P. Olcott. *Petrol. Engr Reference Annual*, 1947, **18** (10), 118.—See Abstract No. 80 (1947).

1831. Shell in Canada. Anon. *Oil Wkly*, 16.6.47, **126** (3), 29.—Stony Creek, New Brunswick, produced 28,584 brl of oil in 1946. Its oil reserves may be 150,000 brl and gas reserves 4,000,000 M.c.f. Shell exploration New Brunswick has acquired an interest in this area. G. D. H.

1832. Alberta–Saskatchewan Output Climbs after Five-year Drop. Anon. *World Oil*, 1.9.47, **127** (1), 34 (*International Section*).—A peak production of 29,770 brl/day was reached in Alberta–Saskatchewan in February 1942, Turner Valley giving 29,495 brl/day. During 1946 the daily average was 19,932 brl, with Turner Valley averaging 17,456 brl. In March 1947 the corresponding daily figures were 18,159 brl and 15,643 brl; in June they were 19,608 brl and 14,689 brl respectively. The Lloydminster–Lone Rock area is primarily responsible for the rise, the output in June being 2355 brl/day, and in 1946 584 brl/day. Leduc averaged 585 brl/day in June. Figures are given for other fields. G. D. H.

1833. Alberta Oil Industry in the Half Year. J. L. Irwin. *Petrol. Times*, 27.9.47, **51**, 950.—Details are given of oil production from the various Albertan oilfields during the first half of 1947. R. B. S.

1834. Barco Concession Colombia. G. O. Ives. *Oil Wkly*, 5.5.47, **125** (10), 4 (*International Section*).—Oil was found at Rio de Oro in the northeast of the Barco concession in 1920. Later Petrolea was opened and then Tibu. At the end of 1946 Tibu was giving 11,220 brl/day and the entire concession 20,769 brl/day. The concession has produced over 30,000,000 brl of oil.

Communications with this area are difficult. The history of the concession is briefly described. A 265-mile pipeline runs to the coast, and it has a capacity of 28,000 brl/day.

Rio de Oro has 13 wells, 8 being producers, but it has never been operated commercially. Petrolea is an asymmetrical anticline with 128 producers. There are 6 shallow Cretaceous producing horizons. The field covers 4250 acres. Gas/oil ratios average 375 cu. ft./brl. The oil gravity is 47° A.P.I. Cumulative production to March 1947 was 24,247,472 brl.

Tibu and Socuavo are domes on a single fold. The Tibu dome is now known as Tres Bocas. Most oil is obtained from the Tertiary. The sands are lenticular. 3 wells produce from the Cretaceous. Tertiary production is from depths of 4900–5400 ft. The Cretaceous production comes from the Tibu member of the Uribante just above the basement. Total closure may cover 30,000 acres, but the developed area at present is about 3000 acres. G. D. H.

1835. Peru Looks to Extensive Oil Development. J. E. Rasmuss. *World Petrol.*, Aug. 1947, **18** (8), 52.—Peru produced 12,468,126 brl of crude oil in 1946. Natural gasoline production was 1,041,407 brl. Peru's oil consumption is about 5,000,000 brl/yr. Relatively little of Peru's potential oil-bearing area has been developed.

A new oil law is being prepared and points in this are briefly noted. G. D. H.

1836. Venezuela's 1946 Production Reflects Rising World Demand. A. M. Sutton. *World Petrol.*, Jan. 1947, **18** (1), 44.—Venezuela produced 323,361,000 brl of oil in 1945, and the 1946 output is estimated to have been 391,482,000 brl. In 1946 Western Venezuela gave 269,655,000 brl (Bolivar Coastal fields 228,542,000 brl). The Jusepin–Santa Barbara–Travieso area produced 44,362,000 brl and Guara gave 31,435,000 brl. Details on the production by fields and companies are given for 1946, together with the cumulative production.

510 wells were drilled in the first 10 months of 1946, 304 being in Eastern Venezuela. 457 of the completions gave oil and 2 gas. Of 48 wildcats 8 were successful. Brief notes are given on the activities of the various companies during 1946. G. D. H.

1837. Venezuela Consolidates Production Position. G. O. Ives. *Oil Wkly*, 6.1.47, **124** (6), 3 (*International Section*).—During October 1946, Venezuela's output averaged 1,120,709 brl/day, and for the first 10 months of 1946 the total was 321,219,308 brl.

Recent drilling is reported to have added 100–200 million brl of recoverable reserves at Quiriquire. Eocene production has been found. The Nipa producing section is similar to that at West Guara and Guico. The Pelayo discovery is east of the Leona field.

Production from the Tucupita field has begun. The Mercedes field has 18 closed-in wells. Cretaceous production has been opened at La Paz and Mara. At West Tarra Cretaceous production of 2000 brl/day has been obtained.

Venezuelan oil output is approaching the limit of existing transport facilities. Additional pipelines are planned. Pressure maintenance is being undertaken or planned, in some areas in Eastern Venezuela. Plans have been made for the construction of a number of refineries. A new road is being constructed in central Guarico.
G. D. H.

1838. Socony Expanding Venezuelan Operations. Anon. *World Petrol.*, Aug. 1947, **18** (8), 54.—Socony-Vacuum has built a 103-mile pipeline from West Guico to Guanta to handle increased oil output. The initial capacity is about 45,000 brl/day, but the addition of further pumps will raise it to 70,000 brl/day.

Socony opened the Guario field in 1940, and in 1946 the company's output was 8,108,000 brl. Guario has 18 producing wells on a single structure on the San Joaquin uplift. There are 13 oil sands and most wells are dual completions. Production is at depths of 5500–9500 ft. The oil is 43–44° A.P.I.

The Guico field (Guico, South Guico, West Guico, and West Nipa) produces 24,000 brl/day. The fields are much faulted. Production is under combined gas and water drive, and the 31 sands are at depths of 5500–7600 ft. The upper sands give oil of gravity above 40°, and the lower sands have oils down to 18° A.P.I. on gravity.

A little production has been found at Anaco in a well drilled to 11,294 ft. Gas has been found in a wildcat at Tascabana. G. D. H.

1839. Austrian Production Up But Still Under Pre-War. Anon. *Oil Wkly*, 14.4.47, **125** (7), 37.—Austria's oil outputs in 1944, 1945, and 1946 were respectively 8,219,288 brl, 3,076,304 brl, and 5,732,496 brl. G. D. H.

1840. Search Continues in Britain. E. L. Lomax. *World Petrol.*, Sept. 1947, **18** (9), 76.—The history of the search for oil in Britain is briefly described, and a short account is given of the general Eakring area, including drilling and completion, reservoir characteristics, analyses of the crudes, and the types of products obtained. Some indication of the areas still being investigated is given. G. D. H.

1841. Czechoslovakia Adopts Two-Year Plan in Effort to Meet Petroleum Needs. Anon. *Oil Wkly*, 6.1.47, **124** (6), 24 (*International Section*).—Currently the Czechoslovakian oil production is 16,248 brl/month. Miocene production has been found at Gross-Bilowitz near Breclav (Lundeburg). The initial flow was 50 brl/day from a depth of 3500 ft.

Gbely in western Slovakia was opened in 1913 and produces from shallow sand lenses in the Sarmatian at depths of 550–800 ft on a faulted structure. The faulted Hodonin anticline in south Moravia was discovered in 1919.

Tests are being drilled at Sekule, Malacky, and Bersky Svaty Jan in western Slovakia. Natural gas is being produced from wells in the Ostrava district, and there is a shallow gas pool at Vacenovice, Moravia.

A table gives the Czechoslovakian crude output monthly during the first 7 months of 1946. G. D. H.

1842. Czechoslovakia Output. Anon. *Oil Wkly*, 19.5.47, **125** (12), 29.—During 1946 Czechoslovakia produced 155,710 brl of oil. G. D. H.

1843. Pechelbronn Production Doubles Output of 1945. Anon. *Oil Wkly*, 14.4.47, **125** (7), 37.—During 1946 Pechelbronn produced 231,294 brl of oil. The 1945 figure was 105,644 brl.

21 producers, 6 dry holes, and 4 dry wildcats were completed on the Pechelbronn concession in 1940, and at the end of the year there were 707 producers. G. D. H.

1844. Exploitation of Natural Gas in the South of France. H. M. Ballande. *World Petrol.*, 1947, **18** (11), 40–41.—Production of natural gas is rising in spite of difficulties. At St. Marcet gasoline is stripped from the gas by gas oil. Fractionation of the hydrocarbons removed produces propane and butanes for bottling, motor fuel, and heavier fractions. An American plant (capacity 42×10^6 cu. ft/day, operating pressure 60 kg/cm^2) is to be erected to meet an expected demand of 25×10^6 cu. ft./day in 1948. Delivery of gas is by a pipeline supplying Pau and Toulouse and with a proposed extension to Bordeaux. Total length of existing lines is 136 miles. Electrolytic corrosion, due to the proximity of electric railways, is being combated by cathodic protection. E. B.

1845. Pressure at St. Marcet Field Given at 2000 p.s.i. Anon. *Oil Wkly*, 7.4.47, **125** (6), 36 (*International Section*).—2 oil wells, 9 gas wells, and 3 dry holes were completed in the St. Marcet (France) field in 1946. 1946 gas production was 3,880,000 M.c.f. and oil production 930 brl. G. D. H.

1846. Schoonebeek Field in the Netherlands. Anon. *Oil Wkly* ,2.6.47, **126** (1), 5 (*International Section*).—Schoonebeek (Coevorden) produces 2350 brl/day. It was discovered in 1943. The 1946 output was 435,420 brl, giving a cumulative production of 489,791 brl to January 1, 1947. G. D. H.

1847. Extended Operations Due West of Coevorden Field. Anon. *World Oil*, 21.7.47, **126** (8), 31.—At present Coevorden (Holland) produces about 3500 brl/day from 45 wells. The 1946 output was 436,000 brl. Drilling to the west and in the Wadden Islands is planned. G. D. H.

1848. Hungary 1946 Production Gains Slightly Over 1945. Anon. *Oil Wkly*, 7.4.47, **125** (6), 39.—In 1946 Hungary produced 5,145,342 brl of oil; the 1945 output was 5,020,695 brl. In 1946 Lovassi gave 3,029,931 brl, Budfapuszta 1,561,712 brl, and Hahot 552,699 brl. G. D. H.

1849. Roumania Hopes to Hike Monthly Oil Production. Anon. *World Oil*, 4.8.47, **126** (10), 24 (*International Section*).—Roumania's oil output averaged 2,600,000 brl/month in 1946 and 2,300,000 brl/month in the first quarter of 1947. A target of 3,286,750 brl/month has been set.

Promising discoveries are reported in the Semlak–Varjosul area near Arad, Transylvania, and elsewhere. G. D. H.

1850. Roumanian Oil Developments. E. A. Bell. *Petrol. Times*, 27.9.47, **51**, 949.—The post-war development of Roumanian oil production is briefly discussed: figures are also given for Roumanian petroleum exports in 1946. R. B. S.

1851. French Morocco Production Slightly Under 1945 Mark. Anon. *Oil Wkly*, 7.4.47, **125** (6), 39 (*International Section*).—French Morocco produced 19,700 brl of oil in 1946, and 23,603 brl in 1945. Tselfat gave 4500 brl in 1946, Ain-Hamra 8200 brl, and Bou Draa 7000 brl. 16 dry wildcats were completed in 1946, the total footage being 40,340 ft. G. D. H.

1852. Kuwait's 1946 Output. Anon. *Oil Wkly*, 7.4.47, **125** (6), 39 (*International Section*).—In 1946 Kuwait produced 5,931,000 brl of oil. G. D. H.

1853. Kansu Production Reported 1500 Gallons. Anon. *Oil Wkly*, 21.4.47, **125** (8), 35.—The Kansu province, China, production in 1946 averaged about 1500 gal/day. G. D. H.

1854. Yumen Completes 3 Wells, Taiwan 4, During 1946. Anon. *Oil Wkly*, 5.5.47, **125** (10), 38 (*International Section*).—During 1946 the Yumen field of China produced 512,810 brl of oil, together with 506,900 M.c.f. of gas. Szechuan gave 249,100 M.c.f. of gas and Taiwan 16,000 brl of oil and 1,370,000 M.c.f. of gas. G. D. H.

1855. Japan's Production Shows Decline 1946 Against 1945. Anon. *Oil Wkly*, 2.6.47, **126** (1), 26 (*International Section*).—Japan produced 1,543,893 brl of oil in 1945 and 1,342,229 brl in 1946. 95 wells (35 oil, 6 gas, 54 dry) were completed in 1946. G. D. H.

1856. Netherlands East Indies Fields Are Making Slow Progress Towards Recovery. Anon. *World Oil*, 4.8.47, **126** (10), 32 (*International Section*).—From 1943 to the end of the war the Japanese obtained over 30,000,000 brl/year from the Dutch East Indies and Borneo. During 1946 Borneo produced 2,010,000 brl and Java 90,000 brl. During 1947 the Dutch reoccupied territory has averaged about 192,000 brl/month.

Kroeka is again producing after extensive rehabilitation. Pangkalan, Brandan, Djambi, and Palembang in Sumatra and Tjepoe in Java are still in the hands of the Republic.

Early in 1947 the British Borneo output reached 41,000 brl/day. Seria (Brunei) and Miri (Sarawak) produced 2,100,000 brl in 1946. G. D. H.

1857. Tarakan's 1946 Production Tops Two Million Brl. Anon. *Oil Wkly*, 5.5.47, **125** (10), 40 (*International Section*).—In 1945 160,200 brl of oil and in 1946 2,312,300 brl was produced from Tarakan Island and Balikpapan, Borneo. G. D. H.

Transport and Storage.

1858. Automatic Control on the Portland–Montreal Pipeline. C. D. Batchelder and R. A. Rockwell. *World Petrol.*, 1947, **18** (11), 52–55.—The 236-mile pipeline with its 8 pumping stations, handling crudes sent 2000 miles by sea prior to 1941, is now under an automatic control system based on series operation of the suction and discharge controllers. As the interlocking controllers operate the same valve, and because of the difficulty of skilled instrument service, they are without reset. The system is fully described and its advantages discussed. E. B.

1859. Pipeline Patrolling Now Made at 100 Miles per Hour. G. F. Leamon. *Pipe Line News*, June 1947, **19** (6), 17.—The author makes the following points : (1) There is a definite contrast between pipeline and surroundings and trained personnel have no difficulty in pin-pointing the line. (2) At an altitude of 300–400 ft no difficulty was experienced in locating and reporting troubles at speeds from 90 to 100 m.p.h. (3) The only delays encountered are occasioned by very poor visibility and ceilings, and are so infrequent as to be negligible. (3) Ground patrol checks show aerial patrols to be 90% accurate in locating leaks. (5) Aerial patrol covers a wider area on either side of the pipeline than a ground patrol. (6) Cost of an air patrol is approximately $16.20 per mile. Cost of a ground patrol is approximately $1 per mile. C. G. W.

1860. Use of Variable Capacity Plunger Pumps with Electric Motors for Pipelines. B. F. Thompson. *Pipe Line News*, May 1947, **19** (5), 10.—The pump, an Aldrich Goff variable stroke pump, is essentially a vertical triplex plunger pump. The crank shaft is connected to the plunger correcting-rods through an extra link and an extra cross-head. The extra cross-head is curved and may be tilted back and forth by an hydraulic piston. By varying the tilt any range of pump deliveries from zero to full capacity may be obtained.

Oil pressure to operate the hydraulic piston is provided by the lubricating oil-pump. High-pressure oil is admitted to either end of the piston through a 4-way valve which may be operated by a control device. Efficiencies of operation are high, approximately 85% at full plunger stroke, to 80% at half stroke and falling only to 65% at 25% of full stroke. Overall efficiencies of from 65% at half load to 78% at full load may be obtained.

This pump appears to have the flexibility of capacity and constant pressure of centrifugal pumps, and the high efficiency and low maintenance expense of reciprocating pumps. Sizes vary from 2 in to 6 in stroke and 10 h.p. to 100 h.p. maximum load. Pressures may vary from 15000 p.s.i., 500 p.s.i. being the lowest economical pressure. The largest unit gives a maximum delivery of 8500 brl/day at 565 p.s.i. The article gives the records of several installations of such pumps. C. G. W.

1861. Plantation Pipeline. Anon. *Pipe Line News*, July 1947, **19** (7), 9.—This all-electric system is 1261-miles long with 31 pumping stations and 17 delivery points. Total power required for all purposes is 55,000 h.p. Each station has 2 900-h.p. 2300-v explosion-proof motors connected to centrifugal pumps—3-stage on 12-in line, 4-stage on the 10-in line. Pumps operate at 3600 r.p.m. at 85% efficiency. Throughput is 100,000 brl/day of gasoline on 12-in line, 67,000 brl/day on 10-in line. Stations are designed for one-man control by means of electric and pneumatic controls. Switch from gasoline to tractor oil is made twice monthly. Many safety features are incorporated. All products are metered by rotocycle meters. C. G. W.

Refinery Operations.

Refineries and Auxiliary Refinery Plant.

1862. Shell's Electric Dehydration Plant. Anon. *World Petrol.*, 1947, **18** (11), 47.—Operation of Shell's Petreco emulsion treating plant (24 units) at Lagunillas, Venezuela, is described. An A.C. (60 c.p.s.) field of 33,000 V, reduces the water content of crude oil (maintained at *ca.* 165° F) from 35% to 2%. Plant capacity is 6000 m^3 oil/day. E. B.

1863. Cooling Tower Performance Evaluated for the Plant Operator. II. J. G. Deflour. *Pipe Line News*, May 1947, **19** (5), 13.—Calculation of tower size merely entails obtaining the correct water concentration for one of chosen height which will operate under a certain wind velocity and wet bulb temperature. Area of a given height tower may be calculated by dividing gal/min by the concentration factor. Concentration required to produce desired cooling depends on: temperature range; approach to wet bulb temperature; tower height; wind velocity; and wet bulb temperature. The required concentration for a certain range and a certain approach to wet bulb temperature may be obtained from a chart and corrections applied from other charts for (1) tower height, (2) wind velocity, (3) wet bulb temperature.

The following formula may be used to calculate size of atmospheric cooling tower of effective width of 12 ft.

$$L = \frac{G.P.M. \times W}{C \times 12 \times Cw \times Ch}$$

where L = length of tower feet; $G.P.M.$ = gal of water/min; W = wind velocity correction; C = concentration of water/ft² of cooling tower area; Cw = wet bulb correction factor; Ch = tower height correction factor; several example calculations are presented. C. G. W.

1864. Heat Transfer at Low Temperatures Between Tube Walls and Gases in Turbulent Flow. T. A. Hall and P. H. Taso. *J. Roy. Soc. Arts*, 26.9.47, **191**, 6.—An apparatus was designed on the counter-flow system to study heat transfer between tube walls and gases at low temperatures in a region in which careful measurements had not been previously made. The apparatus consists of a counter-current heat exchanger insulated by a vacuum-jacketed copper tube, and fed with cold gas which is produced by boiling the liquid in a 7 gal steel generator. The effective length of the heat exchanger is 9 ft 3 in.

Oxygen, nitrogen, and carbon dioxide were used, covering a temperature range from +45° to −167° C, pressures up to 11 atm, and Reynolds numbers from 3000 to 60,000.

Results were correlated by the use of dimensionless groups and a general equation obtained, independent of the nature of the gas and applicable over the whole range of experiments. With Reynolds numbers evaluated at mean film temperatures, the coefficient in the equation was found to be 5% lower than that obtained from measurements made at normal and high temperatures. This is regarded as justifying the extension of the ordinary equation to low-temperature regions. Tables give the heat-transfer data on oxygen, nitrogen, and carbon dioxide.

Determinations on friction accompanying heat transfer with gases in turbulent flow at low temperatures showed that the effect of heat transfer on the friction factor was small. G. A. C.

1865. Design of a Barrel-Drying Plant. P. H. Moore. *Petrol. Times*, 27.9.47, **51**. 946.—Details are given of the design and construction of a small barrel-drying plant which is of especial value in reconditioning previously used drums. R. B. S.

Cracking.

1866. Suspensoid Catalytic Cracking at Imperial Oil's Sarnia Refinery. C. H. Caesar, *Oil Gas J.*, 6.9.47, **46** (18), 69.—Suspenoid catalytic cracking operations over 6–7 years at Sarnia refinery has proved it to be a simple flexible and low cost process, very suitable for present day requirements, and particularly for small refineries. Its fundamental features are the very small amount of catalyst required (2–3 lb/brl feed), and as it is used in the form of a slurry with the feed stock, a conventional thermal cracking chamber can be used instead of a special reactor. The spent catalyst is separated from the product tars by filtering and may be regenerated. Used natural or activated clays from lub oil contacting are quite suitable and form inexpensive catalysts. Any type of feed stock, from naphtha to heavy gas oils can be processed in a single refinery unit, provided complete vaporization is attained in the heating coil. When operating with the heavier feed stocks it is better to add a carrying agent, *e.g.*, water, propane butane, or naphtha. With naphtha the total yields are higher than would be obtained by separate operations, *i.e.*, gas oil by suspensoid cracking, and the naphtha by thermal reforming. Some data on refinery operations are given, which includes : (*a*) a comparison of thermal reforming with suspensoid cracking under normal and severe conditions, showing the yields without and including polymer gasoline production ; and (*b*) suspensoid cracking of various source feed stocks. At coil temperatures of 1045–1055° F, and 350–450 p.s.i.g., an increase in feed rates, over former thermal cracking rates, still gives octane value of 8 A.S.T.M. (M.M.), and 11 C.R.F. (R.M), above those obtained by thermal operating. Maximum production of butylenes were obtained at 1080–1090° F with slightly lower feed rates, and the gasoline produced had higher octane numbers. If polymer gasoline is included in the scheme increased yields above those from thermal cracking are obtained of gasoline having octane numbers by the two methods, 9–12 and 12–16 points greater. Suspensoid cracking of feed stocks from four different crudes, in order of decreasing paraffinicity, at constant conversion of dry gas, shows that despite the wide distillation range the octane numbers of unleaded gasolines produced increased in the order of decreasing paraffinicity as measured by the characterization factor. Pilot plant operations with synthetic catalysts, and the effect of the feed source on refinery operations are discussed. Fresh 3-A catalysts compared with regenerated 3-A catalyst gave products with octane values only two points higher than with the regenerated catalyst, but the latter gave higher yields.

W. H. C.

Polymerization.

1867. Decomposition of Benzoyl Peroxide. I. The Kinetics and Stoicheiometry in Benzene. B. Barnett and W. E. Vaughan. *J. phys. & coll. Chem.*, 1947, **51**, 926.—The kinetics of the decomposition of benzoyl peroxide, which is used as a polymerization catalyst, is strictly first order only at infinite dilution. At all finite concentrations, the first order course is accompanied by a formally second order reaction. The system is studied particularly at 80° C when the second order reaction becomes the major decomposition path at initial peroxide concentration greater than 1·09 mol per kg of solution. Values of reaction velocity and activation energies for the two reactions are compared.

At 80° C the overall stoichiometry of the first order reaction consists chiefly of the formation of biphenyl and carbon dioxide, whereas that of the second order reaction moves according to the concentration of the peroxide. D. F. J.

1868. Decomposition of Benzoyl Peroxide. II. The Rates of Decomposition in Various Solvents. B. Barnett and W. E. Vaughan. *J. phys. & coll. Chem.*, 1947, **51**, 942.—At low concentrations, the decomposition of benzoyl peroxide in twenty-three different solvents is basically first order. The experimental result that the presence of 20% by volume of polymerizing styrene has little effect upon the rate of decomposition in benzene at temperatures up to 80° C, weakens the assumption of the existence of an equilibrium between benzoyl peroxide and benzoate radicals. There are indications that with many solvents, higher order reactions accompany a basic first order reaction, and that these solvents form hydroperoxides with benzoyl peroxide on decomposition in air or oxygen. D. F. J.

Chemical and Physical Refining.

1869. Aromatics from Petroleum. H. Steiner. *J. Inst. Petrol.*, 1947, **33**, 410.—Some general principles governing the formation of aromatics based on thermodynamics and quantum theory are reviewed. The formation of aromatics by dehydrogenation, cyclization, and isomerization is discussed. The hydroforming process makes use of all these reactions to produce toluene, xylenes, and generally high octane spirits. An alternative way of producing aromatics from petroleum is by cracking at high temperatures. The chemical reactions occurring in these processes are outlined, and a process recently developed in Great Britain to produce aromatics together with low molecular weight olefins, such as ethylene and propylene, is described. A. R. W. B.

Special Processes.

1870. Hydrocarbon Synthesis in the Presence of Cobalt Catalysts at Medium Pressures. C. C. Hall and S. L. Smith. *J. Inst. Petrol.*, 1947, **33**, 439.—An account of the more important laboratory-scale experiments carried out to study the performance of the active cobalt–thoria–magnesia catalysts in the Fischer–Tropsch synthesis at pressures of the order of 10 atm. A. R. W. B.

1871. Development of Hydrogenation and Fischer–Tropsch Processes in Germany. K. Gordon. *J. Inst. Petrol.*, 1947, **33**, 469.—Industrial methods for the production of synthesis gas, the hydrogenation of bituminous coals and coal-tars, and the operation of Fischer–Tropsch processes are reviewed. A. R. W. B.

1872. Chemicals from Petroleum and Natural Gas. G. Egloff. *Oil Gas J.*, 30.8.47, **46** (17), 88.—In the U.S.A., by 1942, 23% of all organic chemicals were derived from petroleum, amounting to 3,800,000,000 lb produced annually by some fifty manufacturers.

Hydrocarbons available for chemical processing range from methane to high molecular weight compounds obtained from natural gases, cracked gases, and liquid petroleum fractions.

Alkylation produces compounds suitable for chemical manufacture, as does catalytic dehydrogenation. Polymerization of olefins in cracked gas gives products from dimers to solid multipolymers, G.R.-S rubber being an example of the latter.

Oxygen, halogen, sulphur, and nitrogen compounds add to the number of products obtained from petroleum. 10,000,000 lb of cresols were produced in 1945 and three times as much naphthenic acids.

Oxidation of petroleum gases, liquids, and wax produces alcohols, aldehydes, ketones, and acids.

The Fischer–Tropsch process is being adapted to the production of hydrocarbons and oxygenated compounds from natural gas, and is estimated to produce 152,000,000 lb of alcohols, acids, ketones, and aldehydes annually.

Synthetic edible fats are produced from waxes.

Halogenation of petroleum products gives carbon tetrachloride, difluorodichloromethane, and ethyl chloride. Vinyl chloride (for plastics), thiokol rubber, and glycol are other typical products.

Glycerine can be produced from propylene; a $7,000,000 plant with an annual capacity of 35,000,000 lb is expected to start in 1948.

Many new insecticides are petroleum-derived halogen compounds. Pure sulphur is produced, one plant yielding 75,000 tons; and ammonia is synthesized from the hydrogen obtained from high-temperature cracking processes and nitrogen from liquid air fractionation.

Aliphatic nitriles are obtained from the direct reaction of olefins and ammonia.

Tables show yields of petrochemicals annually, composition of natural and cracked gases, and quantities of alcohols, aldehydes, acids, and ketones anticipated from the Fischer–Tropsch process. G. A. C.

Metering and Control.

1873. Capacitative Commutator. S. A. Scherbatskoy, T. H. Gilmartin, and G. Swift. *Rev. sci. Instrum.*, 1947, **18** (6), 415–421.—This instrument has been developed to detect ionizing radiations in oil-well logging, but it can be adapted for measurement of minute currents in a high impedance circuit, such as occur in ionization chambers. The underlying principle is to shift the bands of frequencies representing the signal to a higher frequency region where the noise produced by the commutator itself is small, at the same time raising the energy level so that ordinary vacuum tubes of rugged design can be used to amplify the signal. To accomplish this, a D.C. signal is inverted into an A.C. signal by means of a vibrating condenser, which is formed by a fixed rigid plate and a reed caused to vibrate harmonically at fixed frequency by a magnetic driving circuit. Stability is obtained by the use of negative feedback, when the output current becomes almost independent of the amplification of the commutator and vacuum tube circuits, and response to rapid variations of the input is improved.

H. C. E.

1874. Instruments in Process Control. E. D. Mattix. *Oil Gas J.*, 23.8.47, **46** (16), 83.—Debutanizer design and performance and the different requirements of a debutanizer and a stabilizing column are discussed. Two groups of curves are shown which indicate liquid composition, and temperatures for each tray above and below the feed inlet, under three conditions of overhead rates when feed quality and rate are kept constant. These are supplemented by curves showing the effect of temperature on product composition on debutanizer tower: (1) overheads, and (2) bottoms; and a temperature–composition diagram for a *n*-butane and *n*-pentane system. From these data the functioning of debutanizers is discussed as to points at which control instruments are undesirable or useless, and those which provide the best performance. The control points and hook-up of debutanizers are shown in diagrams and are discussed, including a method of tying in the feed and temperature control to regulate the overhead product. The heart of this proportioning ratio system is a pneumatic multiplier. In operation any action by the temperature controller varies the multiplying factor in the relay which in turn changes the air pressure to the product–flow–controller index. Changes, either up or down, in product flow as demanded by the temperature instrument correct the temperature in the direction indicated because of the change in tray composition resulting from changes in product flow. W. H. C.

1875. Recorders and Controllers Shown at the Physical Society's Exhibition. K. M. Greenland. *J. sci. Instrum.*, 1947, **24** (6), 146–148.—Improved scales for thermal instruments are noted, and a brief description is given of a continuous-chart recorder for current indication. The friction between pen and paper is eliminated in a new electric barograph, and a visible yet photographic recorder used in conjunction with a galvanometer is mentioned.

Recorders for varying ranges of recording speed are referred to, some involving electronic amplification and cathode-ray tubes. Miscellaneous radio and electrical recording gear is noted, and ciné-camera applications are depicted. The utility and nature of various telemetering devices is described, and in some cases radio transmission is employed.

Advances in control technique are given, the accuracy and response being suited to a very wide range of plant and laboratory conditions, while several applications of the Magslip system for remote control or transmission of mechanical movement are detailed. C. N. T.

1876. A Sensitive Recording Calorimetric Mass Flowmeter. A. F. Brown and H. Kronberger. *J. Sci. Instrum.*, 1947, **24** (6), 151–155.—A recording calorimetric flowmeter making use of the thermal capacity of the gas is described and its theory given. Using a commercial pyrometric recorder, the flow corresponding to a full-scale deflection is about 5×10^{-6} g of hydrogen per sec. The instrument is, however, still linear to about twenty times the above value, the higher ranges being obtained by reducing the sensitivity of the recording instrument. The instrument is independent of pressure and, within limits, of temperature. The accuracy and stability is about ½%. The only part of the flowmeter in contact with the gas is a metal tube. (Authors' abstract.)
C. N. T.

Products.

Chemistry and Physics.

1877. A Relation Between Bond Order and Covalent Bond Distance. H. J. Bernstein. *J. Chem. Phys.*, 1947, **15**, 284–289.—The well known concept of bond order *p*, where *p* is zero for a single bond, one for a double bond, and two for a triple bond, is related to covalent bond distance. The relation is checked with experimental data including that on C–C, C–N, and C–O. The agreement is within the limits of experimental error. D. F. J.

1878. Infra-Red Spectra of Monomeric Formic Acid and Its Deuterated Forms. I. High Frequency Region. V. Z. Williams. *J. Chem. Phys.*, 1947, **15**, 232–242.—By replacing an atom in a molecule by its isotope, molecular dimensions are not appreciably changed, but new data pertaining to the same structure can be obtained. On this principle the hydrogen and deuterium stretching vibrations of HCOOH, HCOOD, DCOOH, and DCOOD have been studied with a high resolution echelette—grating infra-red spectrometer. A brief account of the experimental technique, and direct photographic records of the absorption characteristics in the region 4000–2000 cm^{-1} are given. From previous data, assumptions of the hydrogen bond distances, molecular planarity and parameters calculated from the rotational structure of the bands, interatomic distances and angles are derived. D. F. J.

1879. Infra-Red Spectra of Monomeric Formic Acid and Its Deuterated Forms. II. Low Frequency Region. V. Z. Williams. *J. Chem. Phys.*, 1947, **15**, 243–251.—High resolution studies have been made of monomeric HCOOH, HCOOD, DCOOH, and DCOOD in the region 2200–800 cm^{-1}. The bands observed are not sufficiently regular in appearance or absorption frequency to permit assignment of vibrational modes, without further knowledge of the spectra. D. F. J.

1880. Dependence of Bond Order and Bond Energy Upon Bond Length. W. Gordy. *J. Chem. Phys.*, 1947, **15**, 305–310.—A simple inverse square relation of the form $N = aR^{-2} + b$, where N is the bond order, R the bond length, and a and b constants characteristic of the given pair of atoms, has been tested for several atomic pairs including C–C, C–O, C–N, and CB, and has given satisfactory agreement.

An equation of the form $E = lR^{-2} + m$, where E is the bond energy, and l and m constants, has been proposed, but because of the incompleteness and uncertainties in the available data on bond energies, no satisfactory test was possible. D. F. J.

1881. C–H Bond Energy in Toluene and Xylenes. M. Szwarc. *Nature*, 1947, **160** (4064), 403.—The pyrolysis of toluene and the three xylenes are shown to be homogeneous first order gas reactions, and the gaseous products are solely hydrogen and methane, except for slight amounts of ethane and ethylene in the case of *o*-xylene. The ratio of hydrogen to methane is the same under all conditions. The activation energies are *ca.* 76 k.-cal and the frequency factors of the order 10^{13}. On the basis of these observations the pyrolysis can be explained by a mechanism involving free radicals.

Assuming that the observed activation energy corresponds to the C–H bond strength, and taking the C–H bond strength in methane to be 102 k.-cal, the resonance energies of the benzyl and xylyl radicals can be calculated. They are considerably higher than the figure obtained for toluene from theoretical considerations. H. C. E.

1882. Dispersions in Non-Aqueous Media. J. L. Van Der Minne. *Ingenieur*, 17.10.47, **59** (42), Mk 83–88.—It is suggested that non-aqueous media can be divided into two groups : (*a*) methyl alcohol, ethyl alcohol, acetone, nitro benzene, and nitriles ; (*b*) hydrocarbons, mineral oils, fatty oils, chlorinated hydrocarbons, and carbon disulphide.

The article is then divided into the following : (1) Coagulation and Peptization (*e.g.*, the use of calcium di*iso*propyl salicylate to peptize the " lacquer " formed by the oxidation of mineral oils used in motor engines) ; (2) Water as the Coagulant ; (3) Sedimentation ; (4) Bitumen, treated as a colloid consisting of a disperse phase of asphaltenes dispersed by maltenes ; (5) Grease, consisting mainly of micro-crystalline soaps in mineral oil, and possessing plasticity and, to a small extent, elasticity. The rheological properties of greases are similar to those of lubricating oils possessing high molecular weights ; (6) Suspension (*e.g.*, drilling mud).

The article is well illustrated with micro-photographs and it is the author's opinion that there is much fruitful work to be done in the colloidal chemistry of systems in non-aqueous media. D. H. J.

1883. Geometrical Configuration of Dialkyl Naphthenes. S. F. Birch and W. J. Oldham. *Nature*, 1947, **160** (4063), 368.—The only isomer of 1 : 3-dimethyl*cyclo*pentane (I) reported in the literature has been assigned the *trans*-configuration by analogy with 1 : 3-dimethyl*cyclo*hexane obtained by an asymmetric synthesis. Preparation of I from 1 : 3 : 5-xylenol gave rise, not to a mixture of *cis* and *trans* forms, but to a hydrocarbon with properties similar to those of the known isomer of I.

Attempted synthesis of the *cis* form of I, starting from *cyclo*pentane-*cis*-1 : 3-dicarboxylic acid, gave rise to the known form of I, and no evidence for the existence of a second isomer was found. This result is obtained either because at some stage in the synthesis isomerization to the *trans* form occurs, or because the known form of I is in fact the *cis* form. In view of these facts synthesis of I from *cyclo*pentane-*trans*-1 : 3-dicarboxylic acid is being attempted. H. C. E.

1884. Application of a New Notation to Petroleum Hydrocarbons. G. M. Dyson. *J. Inst. Petrol.*, 1947, **33**, 356–362.—Details of a cipher system of nomenclature with particular reference to petroleum hydrocarbons are explained. Acyclic and alicyclic hydrocarbons are all delineated in terms of six symbols; chief advantages claimed for the system are that enumeration for each structure is defined in a unique fashion and that the notation is easily applicable to punched card manipulation. A number of examples are given. A. R. W. B.

1885. Naphthenic Acids : Boiling Points and Distribution in Gas Oil Distillates. K. F. Coles. *J. Inst. Petrol.*, 1947, **33**, 325–329.—The fractionation of a Trinidad gas oil at reduced pressure has enabled the distribution of naphthenic acids to be studied. It has been found that naphthenic acids with acid values 350 to 250 boil 60–40° C above the boiling points of the gas oil fractions in which they are found. The vapour pressure/temperature relationship for some naphthenic acid fractions is also presented. A. R. W. B.

1886. Oxidation of Olefins by Chromic Acid. A. Byers and W. J. Hickinbottom. *Nature*, 1947, **160** (4064), 402.—Oxidation by chromium trioxide in acetic anhydride of 2 : 4 : 4-trimethylpentene-1 (I) and 2 : 4 : 4-trimethylpentene-2 (II) yield large amounts of the epoxides, together with smaller amounts of the saturated ketones, aldehydes, and di-ols. The first stage in the reaction is the formation of the epoxide, which then produces the other compounds by further partial reaction. This mechansim explains the formation of 2 : 4 : 4-trimethyl pentanoic acid during the oxidation of I by chromic acid in aqueous sulphuric acid, since it is found that the epoxide, with aqueous sulphuric acid, rearranges to form the aldehyde, which is subsequently oxidized to the corresponding acid. Similarly, 2 : 2 : 3 : 3-tetramethyl butanoic acid has been detected in the oxidation products of technical di*iso*butylene, which contains about 20% of II.

The mechanism also explains certain anomalies recorded for the oxidation of olefins by chromic acid, notably that of acetic acid from ethylene, and saturated acids from di*neo*pentylethylene and octene. (See also Abstract No. 1188 (1947)). H. C. E.

1887. Entropy of Solution of Molecules of Different Size. J. H. Hildebrand. *J. Chem. Phys.*, 1947, **15**, 225–228.—The solutions considered are those of molecules of different size, whose shape is not specified, and which mix without heat effect and with maximum randomness. The entropy of mixing two liquids to make such a solution is expressed in terms which avoid the assumption of a lattice as an artificial frame of reference, and which is not limited to polymers. The equation is reduced to a similar form to that derived for linear polymers in a lattice frame of reference. D. F. J.

1888. Absorption Spectra of Benzene Derivatives in the Vacuum Ultra-Violet. I. W. C. Price and A. D. Walsh. *J. Roy. Soc. Arts*, 26.9.47, **191** 22.—New photographs of the far ultra-violet spectrum of benzene are presented. The absorption from 2000 to 1800 A. (λ max., *ca.* 1980 A) is regarded not as a part of the much stronger absorption of peak at 1790 A but as due to a separate transition. Sharp bands lying at 1790 A represent the first member of a previously reported Rydberg series.

The spectra of toluene, xylene, monochloro- and *o*-dichlorobenzene, bromobenzene, iodobenzene, and pyridine are briefly described, and the shifts relative to benzene are discussed. Two Rydberg series were observed for toluene, converging to a first ionization potential of $8{\cdot}77 \pm 0{\cdot}05$ V. G. A. C.

1889. Absorption Spectra of Benzene Derivatives in the Vacuum Ultra-Violet. II. A. D. Walsh. *J. Roy. Soc. Arts*, 26.9.47, **191**, 32.—The far ultra-violet spectra of styrene, α-methyl styrene, phenyl acetylene, phenyl cyanide, and phenyl *iso*cyanate are described. Many of the observed regions of absorption are correlated with those of the benzene spectrum. The important fact emerges that, with increasing conjugation of the side chain with the ring, the benzene 1980 A absorption moves much farther to long wavelengths than do the benzene 2600 and 1790 A absorption. α-Methyl styrene shows a shift to the violet of certain regions of its spectrum relative to styrene. Phenyl *iso*cyanate has a spectrum much closer to that of benzene than have the other molecules discussed. G. A. C.

1890. Behaviour of Pure Substances Near the Critical Point. O. K. Rice. *J. Chem. Phys.*, 1947, **15**, 314–332.—There is evidence that the vapour–liquid region on the pressure–volume diagram of a pure substance is not bounded, as van der Waal's theory shows, by a parabola, but that it has a finite horizontal (const press) portion at the top. This upper limit is the highest temp, Tm, at which a meniscus can exist, and is assumed to be the temp at which the surface tension vanishes at the same time that the condition for equilibrium between liq and vap is fulfilled. The isotherms of ethylene have been plotted both with and without finite constant press sections above Tm, each diagram agreeing with the experimental results within experimental error. It is shown, however, that the latter is the correct interpretation, and that the critical temp should be defined as being identical with Tm.

The theory of condensation is developed by considering the vapour as a system in which molecules are associating into clusters, these obeying the ordinary laws of equilibrium. The liquid is considered as a system in which bubbles of vapour are forming. The conclusions are compared with those obtained using the statistical theory of Mayer and Harrison. D. F. J.

1891. Intermolecular Forces and Energies of Vaporization of Liquids. S. W. Benson. *J. Chem. Phys.*, 1947, **15**, 367–373.—It is calculated that the energy of vaporization of a liquid should be equal to the difference in configurational energies of the liquid and gas. The latter are expressed as functions of a single parameter, the density, and the equation simplified by assuming the density of a saturated gas to be small compared with the density of the liquid. The simplified equation is compared with experimental results for various compounds, including hydrocarbons, and good agreement obtained. D. F. J.

1892. Rheological Behaviour and Classification. F. H. Garner and A. H. Nissan. *Nature*, 1947, **160** (4062), 329.—The viscosity of a solution of aluminium stearate in petrol was determined at temperatures between 20 and 30° C : (*a*) by the falling sphere method, and (*b*) by means of B.S.I. U-tubes of different diameter. It was found that : (1) The viscosity by method (*b*) was smaller when a narrower tube was used ; (2) The viscosity by method (*a*) was the same when balls of different diameter were used ; (3) The viscosity by method (*a*) was greater than that determined by method (*b*). According to accepted nomenclature the system as studied by method (*a*) is Newtonian, and by method (*b*) is non-Newtonian.

It is proposed that rheological behaviour should be classified according to " regimes " rather than " ideal bodies," and this would also clarify properties such as yield values of materials under widely differing conditions of stress. The dangers of determining constants of systems by one method of measurement alone is also pointed out.

H. C. E.

Analysis and Testing.

1893. The Chemical Aspects of the Petroleum Acts. S. G. Burgess. *J. Inst. Petrol.*, 1947, **33**, 363–387.—The author maintains that the Petroleum (Consolidation) Act of 1928 is an important contribution towards public safety, and traces the development of the present legislation and the parallel development of the flash-point apparatus from the first Act of 1862. The definitions and chemical aspects of the current Act are discussed together with the problems that arise from different interpretations. The general types and possible composition of statutory samples are enumerated, *e.g.*, cellulose lacquers, paint removers, and methods suggested for the separation of the petroleum, if any, from other substances that may be present. These methods are critically examined and attention is drawn to the difficulties of the interpretation of analytical data obtained in connexion with the examination and certification of samples taken under the Act. Complete details of the method recommended for the certification of a typical sample containing saturated petroleum, namely, a cellulose spraying lacquer (Petroleum Mixture) are given as a conclusion to this critical examination of methods. A. R. W. B.

1894. Optical and Allied Instruments Shown at the Physical Society's Exhibition. J. L. Houghton. *J. sci. Instrum.*, 1947, **24** (6), 142–143.—Recent commercial equipment for phase-contrast-microscopy, an experimental projection microscope, a Schmidt camera and telescopes embodying the same principles, together with photographic equipment are described.

Surveying equipment, particularly the Williamson–Ross mapping system, is mentioned, emphasis being placed upon space conservation and speed of map preparation. Some notable attachments for visual education apparatus are referred to.

A modified Lovibond–Schofield colorimeter, adapted for colour measurements of cathode-ray screens and heterogeneously coloured samples, is mentioned, as are an optical surface-finish comparator and various stroboscopic lamps.

Two improved refractometers are noted, one a modified Pulfrich instrument, the other being of the Abbe type, with achromatizing prisms omitted, and an angular scale; measurements of refractive indices at a variety of wavelengths are therefore possible.

Besides a number of travelling microscopes, mention is also made of a combination of an infra-red spectroscope and cathode-ray tube whereby rapid delineations of infra-red absorption spectra are produced on the screen of the tube. Other items of miscellaneous interest are mentioned briefly. C. N. T.

1895. Thermal and Mechanical Instruments Shown at the Physical Society's Exhibition. C. R. Barber. *J. sci. Instrum.*, 1947, **24** (6), 144–145.—Various pyrometric instruments are described in some detail, including those for colour and brightness measurements for temperatures up to 650° C, an improved modified mercury-in-steel thermometer, and a high sensitivity recording resistance thermometer instrument. High temperature laboratory furnaces of two types are mentioned, and also an infra-red gas analyser, and various improvements in the hot-wire anemometer technique for the measurement of low air-speeds. Miscellaneous meteorological apparatus is noted.

A micromanometer and a newly developed flowmeter are mentioned, and reference is made to a modified quartz tube dilatometer; electrical strain gauges and various metrological instruments (*e.g.*, for measuring small diameters) are listed. C. N. T.

1896. Electrical and Acoustical Instruments Shown at the Physical Society's Exhibition. T. B. Rymer. *J. sci. Instrum.*, 1947, **24** (6), 148–151.—Although there are few or no fundamentally new instruments or techniques in this group, considerable improvement in detail is noted, giving rise to greater precision and finish. Centi- and deci-metric wave equipment, radio-equipment, moving coil meters, acoustic instruments, medical apparatus, and miscellaneous magnetometric instruments are described; pH-meters of the potentiometric and direct-reading types are noted and also a high-precision dielectric constant measuring instrument. C. N. T.

1897. Photoelectric Intensity of Raman Spectra. Jen-Yuan Chien and P. Bender. *J. Chem. Phys.*, 1947, **15**, 376–382.—The precision obtained with the apparatus described is tested by eight recorded spectrograms of $CHCl_3$, and the average deviation found to be $\pm 5\%$. When the ordinary photographic method is used the precision is about $\pm 14\%$.

Results are given for CCl_4, $CHCl_3$, CH_2Cl_2, and C_6H_6, and the intensity ratios of anti-Stokes to Stokes lines found to be in agreement with the theoretical values. Approximate values of the change of the bond polarizability of the C–C bond in CCl_4 and the C–H bond in C_6H_6 caused by valence vibrations are calculated from intensity data. D. F. J.

1898. A Raman Apparatus for Quantitative Polarization Measurements. B. L. Crawford, Jr. and W. Horwitz. *J. Chem. Phys.*, 1947, **15**, 268–274.—The description, data on the performance, and defects of an apparatus for quantitative measurement of the depolarization factors of Raman lines are given. Edsall and Wilson's method is modified by using polaroid cylinders, and by the incorporation of eight exciting lamps to shorten the exposure times. Results on the lines of CCl_4 are compared with those of other workers and additional results on $CHCl_3$ and C_6H_6 given. D. F. J.

1899. Studies of Aluminium Soaps. VIII. Water Sorption and Moisture Content. C. W. Shreve, H. H. Pomeroy, and K. J. Mysels. *J. phys. & coll. Chem.*, 1947, **51**, 963.—The aluminium disoaps obtained by acetone extraction of the dried precipitate from the double decomposition of potassium laurate and aluminium chloride are slightly hygroscopic, and traces of moisture have considerable effect upon the properties of the soap, especially its dispersion in hydrocarbons. The Karl Fischer Reagent should not be used for the moisture determination as water is formed either by reaction between fatty acids and basic aluminium soaps or from hydroxyl groups. The soap may readily be dried by evacuation, and then takes up only about 1% moisture in air at moderate humidities. D. F. J.

1900. The Mass Spectrometer and What it Does. C. J. Deegan. *Oil Gas J.*, 6.9.47, **46** (18), 64.—In this paper the author has recorded his concept of what takes place in a mass spectrometer, and the kind of record a hydrocarbon molecule gives. Mass spectrometer diagrams are given for methane, ethane, propane, *n*-butane, *iso*-butane, *n*-pentane, and *iso*-pentane. These show the various mass fragments into which the hydrocarbon molecule disintegrates when subjected to electronic bombardment as indicated by the height of the units (peaks) in μ divisions on the mass scale. The analysis of an unknown gas mixture from a mass spectrometer recording is illustrated in five diagrams, and shows the peaks for masses 15 upwards. In these are shown: (1) a peak at mass 72 which proves that pentanes are present; (2) after removal of proportionate units of other masses accounted for, first *iso*-pentane, and (3) *n*-pentane, units of 58 mass yet remain, proving butanes to be present. Repeating the process of removing proportionate units of masses 41 through to 58, (4) for first *iso*-butane, and then (5) *n*-butane, leaves a pattern that can only be due to pure propane. Statistical data from the analysis is given in tables: (1) Mixture spectrum and contributions thereto of each component; and (2) Partial mass spectra—arbitrary divisions per micron partial pressure. From the data and the patterns of pure unmixed molecules, the percentage of each kind of molecule present in a sample can be computed by simple algebra. Three illustrations of the Model 21-102, Consolidated Mass Spectrometer are given. W. H. C

Engine Fuels.

1901. Cold-Starting Abilities of Various Substitute Motor Fuels. R. E. Streets. *Bur. Stand. J. Res. Wash.*, July 1947, **39** (1), 39–47.—Tests have been carried out on minimum starting temperatures and warming-up characteristics of the following non-hydrocarbon fuels: 200-proof ethyl alcohol, commercial grade; 190-proof ethyl alcohol commercial grade; diethyl ether; *iso*octane; acetone; and other reference fuels.

The test engine was a reconditioned 1939 Ford V8, and the method used was " C.F.R. Procedure for Testing the Starting and Warming-up Characteristics of Fuels," C.R.C. designation F-6-1943. The complete unit was placed in a refrigerated altitude chamber.

Results show that operation on ethyl alcohol is possible over a wide temperature range if small percentages of more volatile compounds are added. The most effective additive was diethyl ether. Warming-up with ethyl alcohol and its blends is much slower, and does not produce temperatures high enough for good distribution and vaporization.

Tests under altitude conditions are evaluated.

The text is illustrated by a number of graphs, and a table shows the blends necessary to provide adequate starting at various temperatures at sea-level. A list of six references is appended. W. M. H.

1902. Quality Trends in Motor Fuels—Central United States, 1929–1946. H. M. Trimble, L. A. McReynolds, and W. H. Dunaway. *Oil Gas J.*, 4.10.47, **46** (22), 61.—A comprehensive survey of volatility trends of central United States motor fuels has been previously reported for the years 1929 to 1934. The present paper extends that report to 1946. The volatility increased rapidly from 1931 to 1942, but decreased during the the next three war years, pre-war standards again being reached in 1946.

Housebrand and premium gasolines showed seasonal control at the 50 and 90% evaporated temperatures throughout most of the period covered, although there was some loss of control at the 90% point during the war years. Antiknock values increased, volatility increased, and vice-versa.

Volatility spread between the most volatile 20% and the least volatile 20% of housebrand gasolines is greater than that between average premium and average third-rate gasolines. Premium gasolines continued to lead the three grades in overall volatility, but the lead decreased beginning with the war years.

Winter gasolines marketed in the central United States showed a higher volatility than those marketed in the country as a whole, particularly at the 10 and 50% evaporated points. Such regional variation was not evident for the summer gasolines.

Seven figures illustrate the various trends. G. A. C.

1903. Fuels and Lubricants for Aero Gas Turbines. C. G. Williams. *J. Inst. Petrol.*, 1947, **33**, 267–306. (*Inst. Petrol. & Roy. aero. Soc., London*, Feb. 1947.)—Maintenance of fuel flow in aero gas turbines may be impeded by freezing of, or corrosion by water in the fuel, or by high viscosity or freezing of the fuel at low temperatures. It is suggested that the water solubility of fuels of a given molecular type will increase with decreasing mol. wt. and that generally it will increase with aromatic content of the fuel. Details of an apparatus built to study the question of filter clogging by this water are given. Clogging by ice was entirely eliminated by adding 0·5–1% of *iso*-propyl alcohol to the fuel and it was found that the conventional cloud-point might be used to indicate the temperature at which serious interference with fuel flow is likely. Four principal methods of determining combustion efficiency are discussed. Of these an advantage of the gas analysis method lies in its application to a continuous recording apparatus, the principle being that if a gas containing CO_2 is bubbled through a dil solution of Na bicarbonate the solution acquires a definite pH which is determined by the partial pressure of the CO_2 in the gas. Thus by reading a pH meter the CO_2 content can be recorded, an accuracy of 2% is claimed for this. It is deduced that the factors controlling combustion efficiency with different fuels under most conditions depend on the physical properties of the fuels. A formula has been developed to show the relation between carbon deposition, C : H ratio and the 10% distillation temperature of the fuel, carbon deposition tending to increase with the C : H ratio and with increasing 10% temperature. Carbon deposition is a contributory cause to the buckling of flame tubes under excessive temperature gradients. Relative fire safety of fuels is discussed and flash-points and self-ignition temperatures of some are listed, together with results of empirical experiments on ignition above heated flat surfaces.

A turbine engine has to be motored at 1500 r.p.m. during starting so reduction of friction torque demands a low viscosity oil with as high a V.I. as possible.

A. R. W. B.

Lubricants.

1904. Interpretation of Electron Diffraction Patterns from Hydrocarbon Films. J. Karle and L. O. Brockway. *J. Chem. Phys.*, 1947, **15**, 213–225.—Liquid films absorbed on metals are very important in relation to lubrication and corrosion inhibition problems. Theoretical scattering functions, previously determined by making simplifying assumptions, are used to construct intensity contour maps of patterns corresponding to five different cases of molecular orientation. Experimental patterns for cerotic and stearic acids on different metals are shown and analysed for molecular orientation by means of the contour maps previously derived. D. F. J.

1905. Some New Aspects of Pour-Depressant Treated Oils. C. E. Hodges and D. T. Rogers. *Oil Gas J.*, 4.10.47, **46** (22), 89.—A number of winter field tests have been carried out at several northern localities in North America. From the results obtained, improved laboratory tests and pour point depressants have been developed. The effect of type of climate and of incorporating bright stock in motor oil blends on pour stability has been studied and also the effects of extent of dewaxing, amount of depressant, and increase of pour depressant in high cloud motor oils.

Points of practical interest to compounders of winter grade motor oils are stressed. The A.S.T.M. pour test is useful as a control test and for measuring the amount of pour depressant to be used, but it cannot be relied upon to predict the top temperature at which an oil may solidify. Certain oils go solid in the field at temperatures above their A.S.T.M. pour point, others remain fluid well below it.

The test devised by the Standard Oil Development Co. predicts the field performance of winter grade motor oils with precision. It is stated that as a result of these stability studies, improved pour-point depressants have been in use during the last two winters.

G. A. C.

Derived Chemical Products.

1906. Petroleum Chemicals Reviewed. R. F. Goldstein. *Petrol. Times*, 30.8.47, **51**, 843; 13.9.47, **51**, 892.—Some of the more recent developments in the petroleum chemicals field are reviewed. The American Hydrocol Process, which is an adaptation of the Fischer–Tropsch reaction, and the new field of fluorine petroleum chemicals are the chief topics of discussion.

R. B. S.

Coal, Shale, and Peat.

1907. Recovery of Benzol Forerunnings from Gas Works Crudes. Anon. *Industr. Chem.*, 1947, **23**, 665–672.—" Wild Gas " (5% of the total intake of crude benzol) is recovered for blending with motor spirit, being continuously absorbed in light solvent (b.p. 140–160° C). The " crude rich solvent " is agitated with ammonium polysulphide to remove CS_2, which is subsequently recovered from the aqueous solution by distillation. CS_2 recovery and reagent regeneration are simultaneously performed by collecting the distillate of CS_2 under water. An upper aqueous layer of ammonium sulphide is formed to which is added the sulphur left in the distillation residue. The process described (covered by B.P. 419,312 and 575,553) is operated by Midland Tar Distillers Ltd.

E. B.

1908. Regeneration of Spent Wash Oils Without Distillation. J. Carabasse. *Chim. et Ind.*, 1947, **58**, 228–233.—A chemical method of regenerating wash oil used in stripping benzol from coke-oven gas has been developed by the by-products division of the French Coal Board. A proportion of the oil is withdrawn from service, the benzol removed by steaming and the hot oil then strongly agitated with concentrated NaOH solution. The mixture is separated into two layers either by settling or centrifuging, the upper regenerated oil is returned to the absorption plant whilst the emulsified aqueous layer is diluted with water and separated into a viscous asphalt and a caustic solution containing appreciable amounts of phenols.

V. B.

1909. Pulverized Fuel. T. F. Huxley. *Nature*, 1947, **160** (4062), 318–320.—The advantages of pulverized coal, obtained by grinding until 80% will pass a 200 B.S. sieve, are that it can be carried and burned in suspension, and that low grade coals can be utilized. The disadvantages are concerned with the presence of incombustible matter and the removal and disposal of ash.

With modern equipment the fuel is ground and dried as required. The nature of the grinding mills depends on the type of installation, and the amount of moisture left in the coal should be within 1% of its inherent value. The combustion chambers are large so that the temperature of the ash particles is reduced below fusion point before the convection heating surfaces are reached. 70–80% of the ash is carried out of the boiler, and whilst this assists in the maintenance of the installation the ash must be removed from the flue gases. This can best be done by a centrifugal separator, involving a number of small cyclones, in series with an electrostatic precipitator.

Although coal is the fuel most used in pulverized form in Great Britain, hard pitch and brown coal can also be burned in this way. It is concluded that although ways may be found of improving the methods now employed, pulverized fuel will not compete with oil, which has all the advantages and few of the disadvantages of pulverized fuel.

H. C. E.

Miscellaneous Products.

1910. Aluminium Dilaurate as Association Colloid in Benzene. J. W. McBain and E. B. Working. *J. phys. & coll. Chem.*, 1947, **51**, 974.—The theory that aluminium dilaurate in benzene is an association colloid is based upon measurements of osmotic pressure and viscosity. The osmotic pressure measurements are made at 20° C and 50° C and use cellophane membranes. The osmotic pressure divided by concentration decreases very rapidly with concentration, whereas for polymeric colloids the same ratio increases with concentration. The viscosities, which are measured at 20° C and 40° C by means of an Ostwald viscometer, show an increase with increase of temperature whereas those of polymeric colloids are independent of temperature. D. F. J.

1911. Preparation of Butadiene from Mixtures of Alcohol and Acetaldehyde. R. Rigamonti. *Chim. e Industria*, 1947, **29** (7), 172.—The preparation of butadiene is a problem of great importance for the preparation of synthetic rubber. One process which showed promise at the time of the First World War is that of Ostromysslenski, employing the reaction in blends of alcohol and acetaldehyde wtih alumina as catalyst. In the recent war, the process was further perfected by workers at the Carbide and Chemicals Corpn, using as catalyst tantalum and zirconium oxides on a silica base. Work is described in this paper in which alumina, with and without promoters, and a silica–magnesia mixture are used as catalysts. D. H. McL.

1912. Bouveault Reduction of Some Natural Glycerides. G. Jacini and P. Chiesa. *Chim. e Industria*, 1947, **29** (7), 172.—The reduction with sodium and butyl alcohol of olive, linseed, and castor oils is described. The corresponding alcohols obtained all show an iodine number equal to that of the original glycerides. D. H. McL.

1913. Heavy Metal Soaps of Wool-Wax Acids. E. S. Lower. *Industr. Chem.*, 1947, **23**, 645–651.—Paint driers have been produced in Germany by reacting wool-wax acids with salts of Co, Mn, Pb, or Zn. Naphthenic or fatty acids can be used jointly with the wool-wax acids. Heavy metal salts of wool-wax acids can be used as hydrogenation catalysts, whilst mixtures of such soaps with waxy materials are suitable for grease manufacture. A tough plastic material (for roofing felts) is made by heating the Al soap with bitumen. Zinc soaps of the acids can be used as pour depressants; the Ca soaps are suitable for hot neck and "Stauffer" greases. The interaction of wool-wax acids with P_2S_5 at 150–400° F, followed by saponification of the phosphorized product with a suitable base (*e.g.*, $Ba(OH)_2$), yields materials claimed to have E.P. properties. Such substances are also reported to have oxidation-inhibiting, corrosion-reducing, and anti-ring-sticking properties as well as being oiliness improvers and pour depressants. Tabulated results are given showing the effect of the metal soaps of the phosphorized wool-wax products on bearing corrosion (Underwood test), Lawson varnish test, ring-sticking, and pour point. E. B.

Engines and Automotive Equipment.

1914. Calculated Performance of Dynamically Loaded Sleeve Bearings. J. T. Burwell. *J. app. Mech.*, 1947, **14**, A231–A245.—From the equations of Harrison and Swift, a theory is developed analysing any dynamically loaded bearing whose polar load diagram is known. The method is applied to the bearings of a diesel-engine connecting-rod and a radial-aircraft-engine master-rod, and it is shown that the results can be generalized and applied to bearings under all other operating conditions. D. F. J.

1915. Filter Aspect of Engine Wear. Anon. *Gas Oil Pwr*, 1947, **42** (504), 265.—In testing a well-known make of filter, an 8-h.p. 4-cylinder petrol engine was run in the laboratory for an equivalent of 2500 miles in an atmosphere containing 0·5–1·0 g dust per 1000 cu. ft. of air. The following table gives the wear, in thousandths of an inch, of the cylinder assembly :

	No filter.	Air filter.	Air and oil filter.
Piston wear	2·5–5	1	1
Cylinder wear	9–13	4	0·33

Measurements on piston ring, valve stem, valve guides, main bearing, big-end bearing, and crankshaft showed that the wear was reduced by an average of 65% when an air filter was used, and by a further 20% when both air and oil filters were employed.

The air filter caused a pressure drop which eventually became constant at about 2·4 in of water.

Fuel and oil consumption were appreciably reduced by the use of filters. With an air filter alone the oil consumption was reduced by 53%; with air and oil filters this figure was 75%. Collaterally, the deposits from piston crown and combustion chamber were reduced by 27% with air filter, and 48% with air and oil filters. Analysis of the lubricating oil after use also showed general improvements when filters were employed, although the acidity of the oil was increased. H. C. E.

1916. Introduction to an Analysis of Gas Vibrations in Engine Manifolds. R. C. Binder and A. S. Hall, Jr. *J. app. Mech.*, 1947, **14**, A183–A187.—The performance of an I.C. engine may be influenced by the vibration of gas in the manifold. An introduction is provided to the analytical techniques of calculating the vibrational characteristics. The theory is outlined and then applied to the problem of a simple engine induction system. Possible ways of extending the system into more complicated fields are given. D. F. J.

1917. C.A.V.-Ricardo Pintaux Nozzle. Anon. *Gas Oil Pwr*, 1947, **42** (504), 279–281.—This nozzle has been designed to ensure easy starting from cold with the well-known Ricardo Comet type of cylinder-head. In previous patterns of the latter, a heater plug was fitted to the spherical chamber to heat the compressed air sufficiently to ignite the fuel spray readily.

With the normal type of pintle nozzle the hottest zone of the chamber under starting conditions is outside the spray path, which is so placed that the optimum degree of air-swirl is created. The Pintaux nozzle directs the bulk of the fuel spray through an auxiliary ignition hole to the hot zone, but when ignition occurs and the engine speed rises the fuel is directed through the pintle hole in the normal manner for optimum engine performance. To achieve this effect the auxiliary hole is in communication with an annular space between the seating and the main nozzle; when starting the needle is not lifted sufficiently to clear the pintle hole and the fuel is therefore discharged through the auxiliary hole. At higher pump speeds the needle is withdrawn completely and normal injection occurs.

High-speed photographs of the starting and running sprays of the Pintaux nozzle are given. H. C. E.

1918. Harland and Wolff 4-Stroke Engines. Anon. *Gas Oil Pwr*, 1947, **42** (504), 273.—Specifications and construction of the three basic types of 4-stroke engines are described. A feature of these engines is that they may be run on town or sludge gas when required; in one case the change from oil to gas can be made with the engine on load. H. C. E.

1919. High-Power Ruston 4-Stroke Engine. Anon. *Gas Oil Pwr*, 1947, **42** (504), 282–284.—These 4-stroke vertical engines have from five to nine cylinders, with a standard pressure-charged output of 268 b.h.p. per cylinder. Cylinders have 17-in bore and 18-in stroke; the top speed is 435 r.p.m., b.m.p. is 119 p.s.i., and specific fuel consumption at full load 0·37 lb/b.h.p.hr.

General construction of the engine is described, the cylinders, crankshaft, pistons, and valve gear being treated separately. Each cylinder is provided with a fuel pump, and the quantity of fuel injected is varied by a governor control on a by-pass system. Fuel injectors are of the spring-loaded multi-hole type with a self-centring nozzle. Duplex fuel filters are fitted on the suction side of the fuel pumps. The exhaust manifolds are connected to an exhaust turbo-driven pressure charger consisting of a single-stage centrifugal blower driven by the exhaust gas turbine.

Forced feed lubrication is provided for all the main working parts of the engine except the valve gear, which has wick-feed lubricators, and the cylinder liners. Lubrication is on the dry-sump principle with independent pumps and tank in which cooling coils are fitted. H. C. E.

1920. First Marine Gas Turbine in Service. Anon. *Motor Ship*, Oct. 1947, 28, 256.—Information is obtained for the first time of the installation of a 2500 b.h.p. Metropolitan–Vickers gas turbine in an Admiralty motor ship. Installation details are given, together with technical information on their performance. The gas generator unit produces gas at 1250° F for consumption in the power turbine, which is geared to the propeller shaft coupling. The engine is situated centrally and supplements the power of the wing engines which are Packard petrol engines, each capable of an output of 1250 b.h.p.

The fuel used on trials was Pool gasoil and this is converted into heat in the annular upstream injection Metropolitan–Vickers design combustion chamber. I. G. B.

1921. Some Economics of Gas Turbine Locomotives. Anon. *Ingenieur*, 29.9.47, **59** (39), V25–26.—Gas turbine locomotives were put into operation on to one of the Swiss lines and have run for 50,000 Km without overhaul, the combustion chambers having had 1614 hr continuous service. It has been found that the ratio of lubricating oil cost to fuel cost for a diesel motor is 10–30%, the ratio of the two costs for a gas turbine being so small as to be negligible. With the price of fuel twice the cost of lubricating oil for a diesel engine, then the energy cost of a gas turbine having a thermal efficiency of 19% is equal to that of a diesel engine having a thermal efficiency of 38%. N. C.

1922. Jet-Engine Efficiency Test Devised by Shell. Anon. *Oil Gas J.*, 20.9.47, **46** (20), 322.—Some brief notes are given of several important advances relating to jet-engine performance made by the Wood River, Ill., U.S.A. research staff of the Shell Oil Co. An improved method of determining the efficiency of jet-engine performance is due to a new technique of analysing exhaust gases, and means for running continuous tests have also been devised. The major causes of carbon deposition in jet-engines have been discovered. The chief factors are : (1) fuel composition, (2) fuel volatility, (3) intake temperature, (4) method of introducing the fuel, and (5) conformation of the combustion chamber. The investigations have shown that carbon deposition can be reduced by altering these factors. A new type jet burner has ben devised that produces 250 times as much heat as a residential-type oil burner. It creates a stream of hot gases at extremely high velocity. A 1000-h.p. compressor supplies the air for combustion. W. H. C.

Miscellaneous.

1923. Controlled Furnace-Atmospheres. Anon. *Aircr. Prod.*, Oct. 1947, **9** (108), 380.—Messrs Wild–Barfield have introduced a kerosine burner for use in controlled furnace atmospheres. The kerosine is fed at a predetermined pressure via a pump to the vaporizers. Resulting atmosphere is suitable for a range of steels from low to high carbon types, maintaining its effectiveness over a furnace temperature range of from 700° C to 1400° C. Examples of test reports are given in a table. I. G. B.

1924. Natural Gas for the North-Eastern Seaboard. L. F. Ferry. *Min. & Metall.*, July 1947, **28**, 326.—This article reviews the expansion of the marketed production of natural gas, and the extension of pipelines as markets increased. New pipeline projects to meet the increasing demand are mentioned. The basic reasons for the increasing demand are : (1) Increasing known reserves. (2) Larger diameter pipelines reduce transportation costs. (3) Better pipes and better compressors permit higher pressures. (4) Recognition of the dependability of gas reserves. (5) Reduction in transportation costs has opened new markets and increased the demand in existing markets. Transportation costs of natural gas are compared with those of coal :

Gas 1·25–1·35 cents/million B.Th.U/100 miles.
Coal (by rail) 2·35 cents/million B.Th.U./100 miles.

Proved reserves of natural gas on December 31, 1946, are estimated at 160 trillion cu. ft., 28% larger than crude oil reserves in terms of B.Th.U. content. The source of supply for the northeastern seaboard will be the Texas and Louisiana Gulf Coast. An alternative market for the gas is the Appalachian area. C. G. W.

1925. German Oil Seal Moulding : Technical Evaluation. J. Forrest. *India-Rubber J.*, 1947, **113** 155–158.—The design and raw materials used in the manufacture of German oil seals are described in comparison with those of the Allies during the recent war. The preparation of blanks, and questions of conomics and quality of production are dealt with, some technical details of production being given. Inspection standards and testing methods are compared. C. N. T.

1926. Kuwait Comes into Production. Anon. *Pipe Line News*, June 1947, **19** (6), 9.—This article outlines the geography, climate, industries, and living conditions of Kuwait. The development of the oil industry from 1934 up to the suspension of activities in 1942 and future plans for development are very briefly indicated. C. G. W.

1927. United Kingdom Petroleum Trade in 1947 : Details for June and the Six Months. Anon. *Petrol. Times*, 2.8.47, **51**, 754.—Details are given of U.K. imports and exports of crude oil and refined products for June and the first 6 months of 1947. Comparatives figures of 1946 are also given. R. B. S.

1928. United Kingdom Petroleum Trade in 1947. Details for July and the Seven Months Anon. *Petrol. Times*, 30.8.47, **51**, 845.—Tables are presented of U.K. imports and exports of crude oil and refined products during July and the first 7 months of 1947 together with comparative figures for the corresponding periods of 1946. R. B. S.

1929. United States Petroleum Industry in the First Quarter of 1947. Anon. *Petrol. Times*, 19.7.47, **51**, 702.—Details are given of U.S. crude production by States and principal fields. A table is also given showing production, imports, exports, stocks, and demand of refined products. R. B. S.

BOOK REVIEW.

American Petroleum Refining. H. S. Bell. New York : D. Van Nostrand ; London : Constable & Co. ; 1945. 3rd Edn. Pp. 619 + xii. 32*s*. 6*d*.

The third edition of Bell has been largely rewritten and gives an account of a number of the newer refining processes which have come into use in the last few years which are otherwise unavailable except in the petroleum journal literature.

The first two chapters, Historical Development and Crude Oil and their Characteristics, have been considerably improved, but the chapters dealing with chemical and physical properties are apparently unaltered, and data of the hydrocarbons in the various series, paraffins, olefins, etc, are still taken from old German publications instead of from the more recent information available in the literature.

However, a new Chapter, V, on Physical and Engineering Data, provides satisfactory data for the hydrocarbons (not in agreement with those in the two preceding chapters), and data necessary for refinery engineering. The subjects of distillation, fractionating, and heat transfer are considered in fairly adequate detail (the McCabe–Thiele diagram is not included). An improvement is made in the section on condensers which, formerly containing a number of tables of relatively little value, has been entirely rewritten in the new edition. Many illustrations of condensers of various types are included.

A chapter on Cracking—Theory and Development, gives an interesting history of the cracking process, and it is in the next section dealing with Cracking that most alterations have been made. There is now a chapter on Thermal Cracking and another dealing with Catalytic Cracking which covers the Houdry process, the Thermofor Cracking process, and the Fluid Catalytic process, although the plant illustrated is the older form of this latter process. A chapter has been inserted in the new edition dealing with Motor Fuels and Their Requirements, although there is no corresponding chapter on other primary petroleum products. The chapters dealing with Chemical Treatment and De-waxing Operations have been largely rewritten. The subjects discussed include Refrigeration, Solvent Extraction, and Clay Treatment and are well illustrated with photographs and line diagrams.

There are also sections dealing with storage, pumping, transportation, blending, packaging, and fire protection.

The literature references again show that the revision has not always been sufficiently drastic, as a large proportion date back to 1920 and there are few beyond 1941.

As already mentioned, this edition represents a very marked improvement over the earlier editions which are out of date. One could have wished, however, that the pruning knife had eliminated even more of some of the older material, although it is perhaps unfortunate that, for example, the question of water supply to refineries, described in earlier editions, has been overlooked in this third edition.

F. H. G.

BOOKS RECEIVED.

A New Notation and Enumeration System for Organic Compounds. G. Malcolm Dyson. London: Longmans, Green and Co., 1947. Pp. 53 + iv. 7*s*. 6*d*.

The author suggests that his new notation may go far towards solving those difficulties of chemical nomenclature that became more apparent as chemistry advances, particularly in classification and indexing.

American Oil Operations Abroad. L. M. Fanning. New York and London: McGraw-Hill Book Co. Inc., 1947. Pp. 270 + vii. $5.00.

The purpose of this volume is to survey the search for oil and the development of markets by Americans in foreign countries.

An Introduction to the Chemistry of the Silicones. Eugene G. Rochow. New York: John Wiley and Sons Inc. London: Chapman and Hall Ltd., 1946. Pp. 137 + x. 16*s*. 6*d*.

The first few chapters review the silanes and their derivatives in order to provide an understanding of the chemistry of the nonsilicate compounds of silicon. The later chapters emphasize the silicone polymers of commercial importance and deal with their preparation, properties, and uses.

Adsorption. C. L. Mantell. New York and London: McGraw-Hill Book Co. Inc., 1945. Pp. 386 + viii.

A correlation of the practical, commercial, and engineering aspects of adsorption.

Practical Emulsions. H. Bennett. New York: Chemical Publishing Co. Inc., 1947. Pp. 568 + xvi. $8.50.

Part I gives general information on emulsions and emulsification; Part II presents papers on emulsifying agents and emulsions; Part III gives formulas for emulsions for various uses.

APPLICATIONS FOR MEMBERSHIP OR TRANSFER.

DECEMBER, 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.

ANDREWS, Douglas, Petroleum & Explosives Inspector, London County Council. (*J. A. Ainsworth ; S. G. Burgess*).

BANDFIELD, Charles Alfred, Chief Engineer, The Woodfield Hoisting & Manufacturing Co., Ltd. (*H. de Wilde ; H. J. Wilkinson*).

BUCK, Frank Raymond, Research Chemist, Trinidad Leaseholds Ltd. (*F. Morton ; T. K. Hanson*).

BURGESS, James Rawson, Lieut.-Colonel, A.D.S.T. (Petroleum Engineering). (*O. A. Bell ; D. S. Pidgeon*).

COATS, Wilfred Lennox, Engineer, The Petroleum Board. (*H. Hyams ; F. Tipler*).

DRURY, Gordon Newton, Deputy Assistant Director of Supplies & Transport, The War Office. (*O. A. Bell ; H. F. Jones*).

ENGEL, Stefan, Petroleum Engineer, Polish Resettlement Corps. (*S. Sulimirski ; R. K. Oswald*).

GIBSON, Peter Douglas, Technical Lecturer, Shell-Mex and B.P. Ltd. (*F. N. Harrap ; G. L. Coles*).

GRIFFITHS, Thomas Haydn, Apprentice Fitter and Turner, National Oil Refineries Ltd. (*R. B. Southall ; E. Thornton*).

HOGARTH, William Gloag, Secretary and Chief Accountant, Eagle Oil & Shipping Co. Ltd. (*R. G. Mitchell ; R. I. Lewis*).

JACKSON, Charles Frederick, Chemist, Shell Petroleum Co. Ltd. (*R. I. Lewis ; H. W. Stevenson*).

KENNEDY, Gordon Telford, Research Chemist, Trinidad Leaseholds Ltd. (*F. Morton ; T. F. Brown*).

MERRICK, Cecil Morriss, Managing Director, Shell-Mex and B.P. Ltd. (*J. A. Oriel ; G. H. Coxon*).

OKE, Eric Percy Cooper, Assistant Chemist, Anglo-Iranian Oil Co. Ltd. (*P. Docksey ; D. A. Howes*).

PALMER, John Simpson, Student, Chemical Engineering, Birmingham University. (*F. H. Garner*).

PLATT, James Westlake, Managing Director, Eagle Oil & Shipping Co. Ltd. (*R. G. Mitchell ; R. I. Lewis*).

PLOWMAN, Henry Lush, Works Chemist, T. H. Newsome & Co. Ltd. (*E. G. Ellis ; V. M. Farrant*).

POHL, Wilfred, Chemist, "Shell" Refining & Marketing Co. Ltd. (*N. L. Anfilogoff ; W. R. P. Hodgson*).

RICHARDS, Thomas Charles, Development Chemist, National Oil Refineries Ltd. (*R. B. Southall ; J. A. Green*).

RINTOUL, Charles Jeffrey Vere, Student, Chemical Engineering, Birmingham University. (*F. H. Garner*).

Roberts, David Lewis, Senior Laboratory Assistant, "Shell" Refining & Marketing Co. Ltd. (*R. G. Kenzie ; N. Cohen*).

Sansom, Henry William, Manager of Shipping Dept., Eagle Oil & Shipping Co. Ltd. (*R. I. Lewis ; H. N. Short*).

Scriven, Arthur Edward, Manager, Sales Division, Eagle Oil & Shipping Co. Ltd. (*R. G. Mitchell ; S. Hunn*).

Singh, Narain, Sales Engineer, Caltex (India) Ltd., Bombay.

Street, Ralph Hope, Chief Technical Officer, Shell Company of Australia Ltd. (*R. I. Lewis ; H. Hyams*).

Thorley, Brian, Student, Birmingham University. (*F. H. Garner*).

Trawford, Alfred John, Laboratory Assistant, Lobitos Oilfields Ltd. (*V. Biske ; W. A. Mitchell*).

Walmsley, Peter James, Student, Oil Technology, Royal School of Mines. (*V. C. Illing*).

Transfer.

Hazzard, Geoffrey Francis, Chief Chemist, "Shell" Refining & Marketing Co. Ltd., Shell Haven. (*F. Morton ; F. Mackley*). (*Member to Fellow*).

NEW MEMBERS.

The following elections have been made by the Council in accordance with the By-Laws.

Elections are subject to confirmation in accordance with the By-Laws.

As Members.

Branch, A. C.
Dutton-Forshaw, R.
Nash, R. L.
Pollock, J. L. N.
Rocke, H. W.
Sinclair, L.
Veulle, P. M. de

Transfer to Member.

Blanc-Smith, W. L. le
Simkins, C. R. P.

As Fellows.

Bagnold, R. A.
Bird, T. R.
Blundell, L. W.
Bootman, E. J.
Dawson, L. S.
Gill, F.
Hill, J. I.
Raigorodsky, P. M.
Townend, D. T. A.

Transfer to Fellow.

Clegg, N. A.
Cragg, J. C.
Henry, J.
Levis, R.

As Associate Members.

Barnes, K. J. U.
Blackmore, D. S.
Box, J. S.
Brooks, F. L.
Burningham, J.
Caird, K. C.
Charlton, D. C.
Cooper, H. C.
Gershon, J. C.
Govindakrishnayya, P.
Manly, F. C.
Papworth, S. J.
Preston, F. C.
Watkins, F. F. C.

Transfer to Associate Member.

Baskin, L.
Deller, A. W.
Lehner, H. P. E.

As Associate Fellows.

Astley, R. A.
Campbell, D.
Crabbe, E. A.
Crawshaw, S. J.
Davies, H. M.
Deen, A. N. el
Dodd, R. H.
El-Sherif, I. M. I.
Leach, R. F.
Murray, G. F. J.
Ratcliffe, D. H.
Romaszkan, K. J.
Schmeidler, J.
Vickers, G. A. T.
Watson E. S.

Transfer to Associate Fellows.

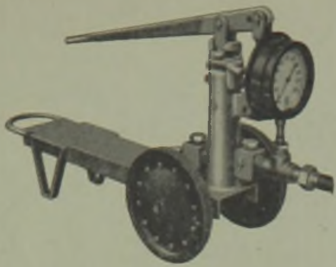
Brunner, D. G.
George, H. R.
McDermott, L. R.

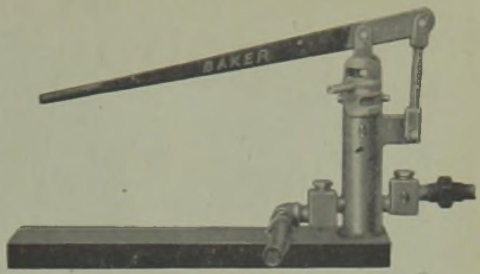
As Student Members.

Bilton, N. F.
Cullingham, E. K.
Davies, W. D.
Dutton, T. E.
Garde-Hanson, H.
Mehta, R. S.
Selwood, P.
Stephinson, P. H.
Winterbottom, J. E.

LIST OF ADVERTISERS

BAKER Hydraulic HAND PUMP





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Additional details will be found on page 240 of the 1947 Baker (or Composite) Catalogue. Prices and deliveries can be secured from:

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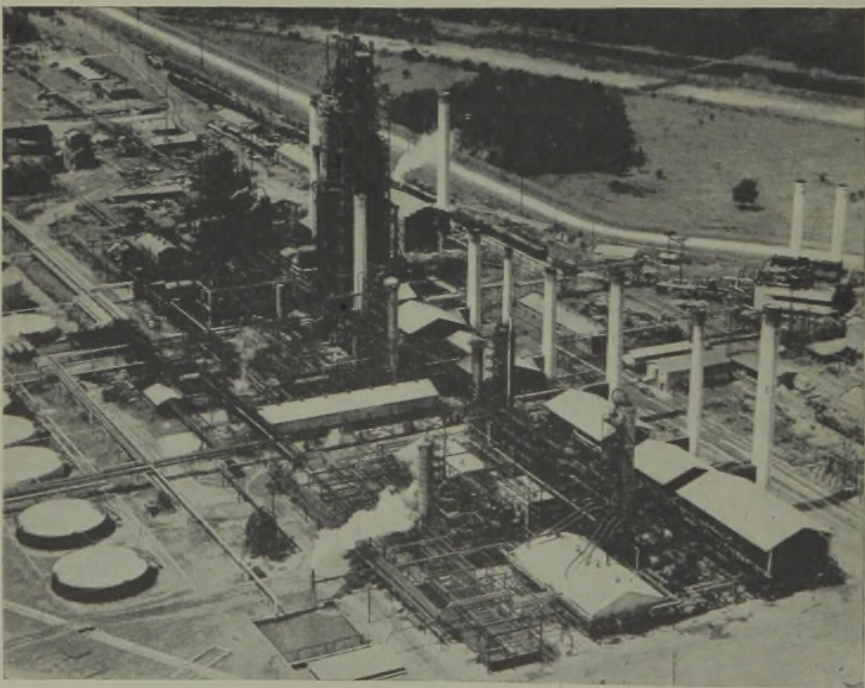

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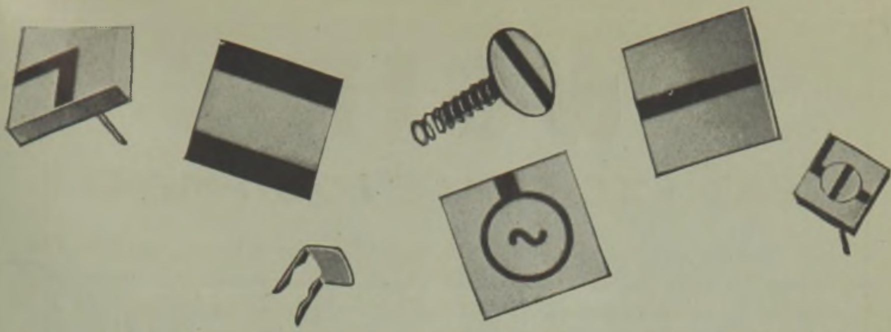

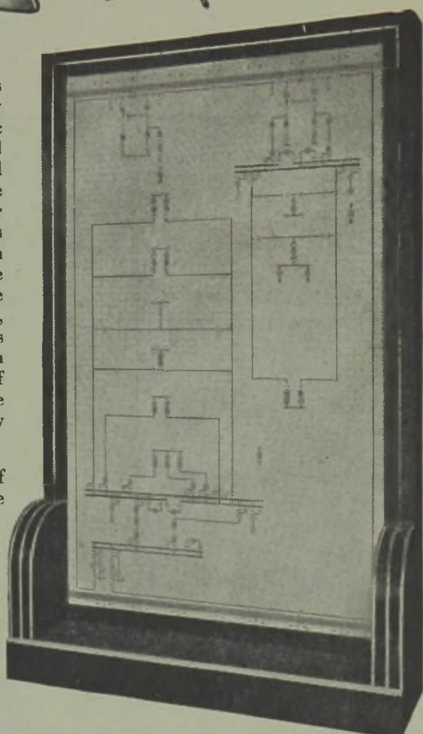

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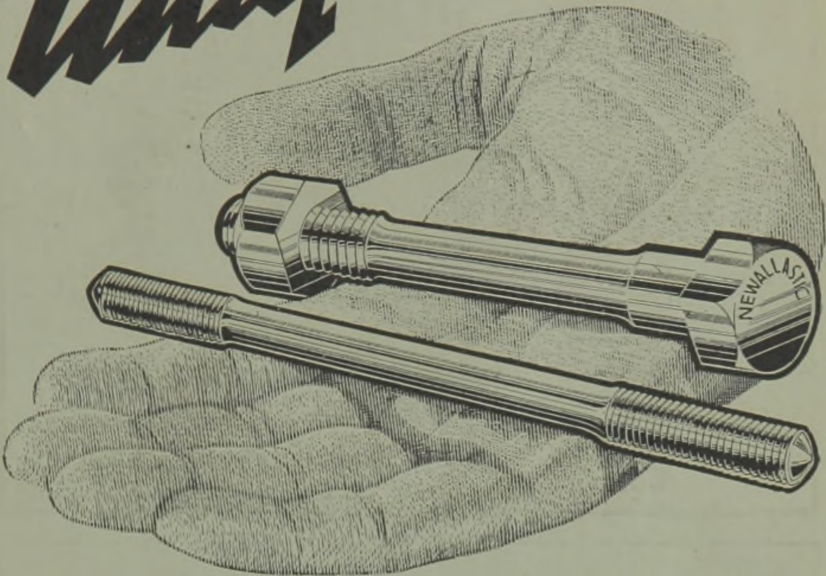

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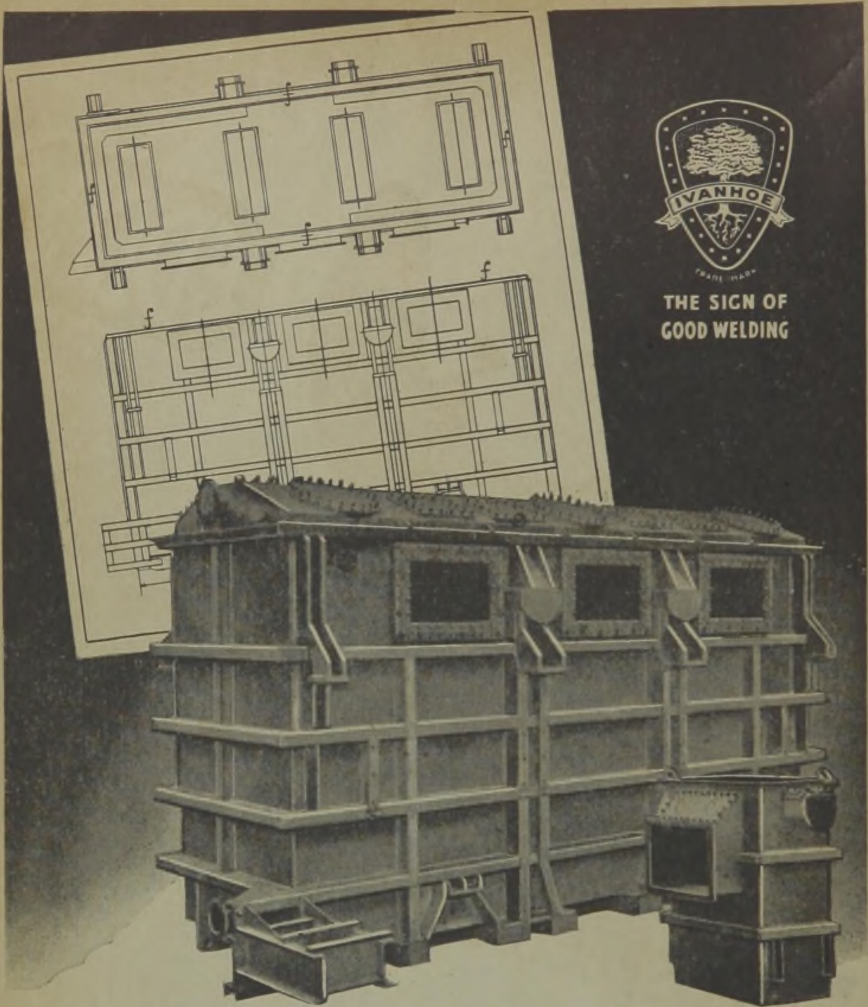
TELEPHONES: LONDON WALL 1991 & 1992
TELEGRAMS: BULLWHEEL, AVE, LONDON


IVANHOE
THE SIGN OF
GOOD WELDING