ABSTRACTS.

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The numbers refer to Abstract Numbers.

Oilfield Exploration and Exploitation.

Geology.

1345. Geological Masks and Prejudices. E. B. Noble. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1109–1117. (*Presidential address, 32nd Annual Meeting of Amer. Assoc. Petrol. Geol., Los Angeles*, March 25, 1947.)—The American petroleum industry has grown tremendously in the last 10 years. During this period, exploration has resulted in discoveries that have increased the net reserves of crude oil by 38%. Nevertheless, during the last half of this period there has been a gradual decline in the rate of finding new high-quality fields.

In order to maintain the United States' reserves, nearly 2000 million brl of new oil must be found each year. Until research can provide a new method of discovery, exploration will consist of reworking previously explored areas in greater detail. Many new oilfields undoubtedly lie hidden under geological masks—that is to say, in sediments hidden by overthrust older rocks, volcanics, thick deposits of drift, multiple unconformities, and shallow seas.

Drilling costs have always been a major problem in exploration, and the present high cost of water operations and of prospecting in remote or difficult areas on land suggests that we are entering an era of million dollar wildcats. The designing of cheaper drilling equipment for deep geological investigations should be one of the major objectives in applied research. Increasing opportunities will exist for applying geological principles in oil exploration, and more geologists will be needed for this purpose. More senior geologists should be relieved of routine duties and allowed to concentrate on the problem of finding new oil provinces. E. N. T.

1346. Whither Exploration? J. J. Jakovsky. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1118–1124. (*Presidential address, Society of Exploration Geophysicists, Los Angeles*, March 25, 1947.)—The author presents data showing the relative increases during the past decade of lease operating costs, drilling or development costs, and exploration costs.

In the past 10 years in the United States petroleum industry, which is the second largest industry in the United States, the lease operating costs have increased by only 17%. There has been an increase of about 70% in basic wages and other costs during this time, but better operating efficiency has held the lease operating costs below the value which might be expected in view of the general price rises during this period. The development costs have increased by 80% during the past decade, and the percentage of dry holes has risen from 13·5 to 27%. During the past 10 years, however, exploration costs have increased by more than 400%. The reason for these greatly increased exploration costs is chiefly due to the decrease in effectiveness in both geological and geophysical techniques as old areas are reworked.

Exploration activities have been stimulated by the price increases of crude oil during the past few months. New technological developments are needed and can be stimulated by clarifying the patent situation, thereby allowing earlier publication of new fundamental and applied research. On the basis of geologic probability much oil still exists to be discovered in the subsurface. E. N. T.

1347. Highlights of Domestic (U.S.A.) Development in 1946. K. C. Heald. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1125–1134.—The author reviews developments in the United States oil industry during 1946. On January 1, 1947, the United States proved oil reserves amounted to more than 21 million brl, a figure higher than a year previously. Nevertheless, in some districts proved reserves declined.

More wildcat wells were drilled in 1946 than in any preceding year, but fewer fields were found than in 1945 or 1944. The previously known reserves were increased by the discovery of extensions to older fields and of new pay horizons in those fields.

In Louisiana the world's deepest oil-producing well was completed, giving 530 brl/day at 13,753 ft. Unlike many deep wells, it gives oil of moderately low gravity (33° A.P.I.).

A review of geological and drilling progress in the different states of the U.S.A. is given. E. N. T.

1348. Discoveries : Industry Ends Greatest Wildcatting Year. H. David. *Oil Gas J.*, 25.1.47, **45** (38), 148.—The 4518 exploratory wells drilled in U.S.A. in 1946 led to the discovery of 491 new oil reservoirs and new pays in existing fields, and there were 144 extensions. 150,000,000 brl of oil were added to the reserves, but 2 years or more may elapse before the real significance of these discoveries can be determined. 247 of Texas wildcats were successful. Illinois had 96 successes out of 635 tests.

Diagrams summarize the wildcat drilling activity and results during the past 5 years in the leading states. G. D. H.

1349. Poorer Reserves Increase Despite Record Output. C. J. Deegan. *Oil Gas J.*, 25.1.47, **45** (38), 154.—United States oil reserves at the beginning of 1947 were estimated to be 21,345,138,000 brl, an increase of 267,114,000 brl during 1946. 1946 discoveries added 147,110,000 brl to reserves, and extensions and revisions 1,868,772,000 brl. The 1946 production was 1,748,772,000 brl. A table gives United States reserve data by states and districts. G. D. H.

1350. New Reserves. Anon. *Oil Gas J.*, 25.1.47, **45** (38), 170.—Nearly 500 new oil pools were found in the U.S.A. in 1946, adding about 150,000,000 brl to proved reserves. The 1946 discoveries are listed according to states and districts, the following information being given : name, county, producing formation, proved acreage, formation thickness, and estimated reserves. A series of maps show the locations of the discoveries, and whether they are new fields, new pays, or extensions. G. D. H.

1351. Field Name, County, Location, and Initial Production of Discovery Wells. Anon. *Oil Gas J.*, 25.1.47, **45** (38), 200.—The U.S.A. 1946 discoveries are listed according to States, brief notes being given in each case. G. D. H.

1352. Wildcat Drilling in 1946. F. H. Lahee. *Oil Gas J.*, 29.3.47, **45** (47), 75.—During 1946 5752 exploratory wells were drilled in the U.S.A. and of these 1137 were producers. The total footage was 22,167,561 ft, the producers accounting for 5,286,711 ft.

Tables summarize the wildcat drilling results, and give numbers, depths, and results. 3795 wells were located on geological data, 615 on geophysics, and 470 on a combination of these techniques. These data also are subdivided according to States and results. G. D. H.

1353. New Kettleman Hills Producing Zone Found. Anon. *Oil Gas J.*, 1.2.47, **45** (39), 27.—Flowing production of 500–1000 brl/day of 35° gravity oil has been obtained from the Eocene sands in well 73–30V on the Kettleman Hills (California) Middle Dome. G. D. H.

1354. Middle Ordovician Limestones in Central Kansas. H. Taylor. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1242–1282.—The Middle Ordovician Viola limestones in the subsurface of north central Kansas can be separated into six member zones which are lithologically distinct. Numbered downwards, these zones are : (1) Upper limestone ; (2) Upper cherty member ; (3) Middle limestone ; (4) Middle cherty member ; (5) Lower limestone ; (6) Lower cherty or basal clastic member. The Viola is over 250 ft thick in the north, but thins to the south. Tentative correlations indicate that zones (1), (2), and (3) may be equivalent to the Stewartville, zones (4) and (5) to the Prosser and zone (6) to the Lower Prosser or Decorah formations of Iowa.

E. N. T.

1355. Sohio Discloses Oklahoma Wildcat Flowing 33 brl per hour. C. J. Deegan. *Oil Gas J.*, 1.1.47, **45** (39), 32.—1 Howard, SE SE NW 17-1n-2w, near Eola has flowed 33 brl/hr through $\frac{5}{16}$-in choke on $2\frac{1}{2}$-in tubing from a sand in the Basal Bromide (Ordovician). The tubing pressure is 1100 p.s.i. and the G.O.R. 800 cu. ft./brl. The top of the Basal Bromide is at 10,060 ft, and the formation is 140 ft thick. There are thin oil-bearing stringers above the Basal Bromide. A test of the Pennsylvanian at 6018–6040 ft gave gas-cut mud and oil, and the Hunton at 8545–8598 ft gave similar results. G. D. H.

1356. Lindsay Play Gets Good Wells. Anon. *Oil Gas J.*, 15.3.47, **45** (45), 125.—East of the Lindsay pool in southwestern McClain County, Oklahoma, Carlock *et al* 1 Harrison, N/2 S.E. 25-5n-4w has flowed 100 brl/hr of 44° oil from the Ordovician Bromide formation at 10,430–10,440 ft and 10,445–10,485 ft. R. L. Bauman 1 Ainsworth NE NW SE 26-5n-4w gave 662 brl/day from the Hunton at 9892–9940 ft. Magnolia Petroleum Co. 1 Martin, NW NE 1-4n-5w had a commercial show at 7655–7690 ft.

The area east from Lindsay towards Pauls Valley is gradually filling up with oil-fields. G. D. H.

1357. Major Pool Looms in Oklahoma. Anon. *Oil Gas J.*, 22.3.47, **45** (46), 311.—Anderson–Prichard *et al* 1 Seaton, SE SE NW 14-2n-2w, in Garvin County, Oklahoma, has flowed 50–100 brl/hr of 42° oil from a Pennsylvanian sand at 6411–6418 ft. The well lies 3½ miles southeast of the Southwest Antioch pool and 4½ miles northwest of the Katie pool, both of which produce from the Pennsylvanian at about the same horizon. Thus there is a prospect of these two pools being connected. The Pauls Valley uplift gives a northwest nose on the flanks of which is a belt of oil-bearing Pennsylvanian sand. The width of this belt may be small, but it may continue for 10–12 miles in length. The oils of the two fields show some difference, but this may not preclude continuity of the stratigraphic type oil belt. G. D. H.

1358. Southwest Antioch–New Oklahoma Pool. R. M. Swesnik. *Oil Gas J.*, 19.4.47, **45** (50), 82.—Southwest Antioch is in southwestern Garvin County, on the west flank of the Pauls Valley uplift in the southeastern extension of the Anadarko basin. Leasing was based on the presence of a westward plunging anticlinal nose and some seismic and magnetic data. A well drilled in the centre of the SE NW 30-3n-2w found saturated sandstone at 6525–6541 ft, and was continued to the Bromide which contained water. The well was later completed in the Pennsylvanian sand zone giving about 60 brl/hr. Within a year 41 wells had been drilled, only one being dry.

The Permian and Pennsylvanian beds include red shales with occasional sand lenses and limestones which grade laterally into sandstones and shales. The producing sand, known as the Gibson, is medium grained and highly porous and permeable. Towards the base of the series is a conglomerate with pebbles possibly of Arbuckle, Hunton, and Viola limestones, and cores have shown good oil saturation in places.

Below the Pennsylvanian wells have found beds of Mississippian " Mayes " to Sylvan age. On the west side of the fault the Woodford is frequently met. In most cases the Hunton has low porosity, but bears gas.

The pre-Pennsylvanian structure is monoclinal to the west, and cut by a northwest–southeast fault downthrown by 450 ft to the west. On the east is a 100-ft fault downthrown to the east. The beds dip at about 560 ft/mile and the unconformity at 218 ft/mile. The Pennsylvanian and younger beds dip west at about 170 ft/mile and are also faulted. The Gibson sand must wedge out to the east.

The producing sand has a porosity of 15·7% and its permeability averages 300 mD. The connate water is under 15%. Gas/oil ratios are 700–1400 and the shrinkage factor is 1·6. Wells have initial potentials of 30–100 brl/hr. G. D. H.

1359. Developments in Rocky Mountain Region in 1946. E. W. Krampert. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1283–1288.—The total well footage drilled in the Rocky Mountain region increased in 1946 as compared with 1945, due to the active development of the Rangely field in northwestern Colorado. Footage drilled in Wyoming and Montana in 1946 was less than that drilled in 1945.

Oil production increased in Montana, Wyoming, and Colorado in 1946 as compared with 1945. The production increase in Colorado was 235% due to the rapid development in the Rangely field.

There were more discoveries in 1946 than in 1945 and several of them were of considerable importance. E. N. T.

1360. New East Texas Condensate Discovery. Anon. *Oil Gas J.*, 3.5.47, **45** (52), 121.—An important gas-condensate strike has been made 8 miles southwest of Jackson, in Cherokee County, Texas. The open-flow potential is 147,000,000–170,000,000 cu. ft./day with 500 brl of condensate. Production is from the Rodessa zone of the Glenrose at 8608–8630 ft. The tops of the Pettit and Travis Peak were respectively 8783 ft and 9128 ft subsea. Tests of possible pays in the James and Pettit limestones, and the Travis Peak sands gave no oil or gas. The closed-in bottom hole pressure is 4223 p.s.i. G. D. H.

1361. Seeligson May Extend Across Fault. Anon. *Oil Gas J.*, 24.5.47, **46** (3), 133.—Magnolia Petroleum Co. 1 David Clark, Section 62, R. P. Haldeman Subdivision of Seeligson Ranch (South Texas) has been completed at 4502–4510 ft in the equivalent of Zone 16 of the Seeligson field. A second well 1320 ft north missed this zone, but obtained production in Zone 22 at 5563–5572 ft. Production is 900–1000 ft higher than at the equivalent horizons in the main field to the east, and a large fault intervenes. The fault trends northeast–southwest. A further fault occurs 2 miles west of the first, possibly giving a horst. A third fault exists still farther west. Cross faults may exist in the horst.

Production is almost continuous from Agua Dulce in the north to La Gloria in the south. Recently a new pay was found at 6598 ft in the La Gloria field. G. D. H.

1362. Discovery of Rich Bitumen Deposit in Northern Canada Reported. Anon. *Oil Gas J.*, 25.1.47, **45** (38), 130.—The Mildred–Ruth Lakes area, opposite the mouth of the Steepbank River, is reported to have bituminous sands possibly containing 500,000,000 brl of liquid bitumen. The bitumen saturation ranges 12–18% by weight. The sands vary in richness, and there is inter-fingering of clay and shale bands with the sands. Thicknesses range up to 220 ft. 2 square miles of territory has been drilled on $\frac{1}{4}$–$\frac{1}{8}$-mile spacing, and a larger area on $\frac{1}{2}$-mile spacing. Beds of liquid bitumen up to 21 ft thick have been met. G. D. H.

1363. Important Canadian Discovery. Anon. *Oil Gas J.*, 22.2.47, **45** (42), 190.—Imperial–Leduc No. 1, LSD 5, 22-50-6w4 has flowed about 40 brl/hr from a porous zone at 5029–5066 ft in Devonian limestone. The well is about 20 miles south of Edmonton. Previous production in east-central Alberta has been from the Cretaceous at depths of about 2000 ft. The test is about 200 miles northwest of the Steveville–Princess field where there is shallower Devonian production. There was also a gas flow and oil showings at 4000–4400 ft, and Leduc No. 2 in LSD 1, 16-50-26w4 is to be drilled because of these. G. D. H.

1364. Canada's Leduc Field Looks Good. Anon. *Oil Gas J.*, 7.6.47, **46** (5), 121.—The third well in the Leduc field, 20 miles south of Edmonton, is about to be completed. It is $1\frac{1}{4}$ miles north and $1\frac{1}{2}$ miles east of the discovery well. The three wells embrace an area $2\frac{1}{2}$ miles from north to south, and $1\frac{3}{4}$ miles from east to west. 39° oil is obtained from a Devonian limestone at 5000–5400 ft, and the wells have open-flow capacities of about 1000 brl/day.

A well on the Jumping Pound structure is to be deepened to test the Devonian. Madison distillate production occurs at 10,000–11,000 ft on this structure.

Leduc is the most important discovery in the Alberta syncline, and the first area in the northern plains where the Devonian has been tested. 200 miles to the southeast the Devonian produces in the Steveville–Princess area at much shallower depths.

The Devonian seems to have at least two porous horizons at Leduc; the discovery well produces from the shallower and the other two from the deeper zone.

G. D. H.

1365. Highlights of Developments in Foreign Petroleum Fields. L. G. Weeks. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1135–1193.—This paper consists of a report to the annual meeting of the Amer. Assoc. Petrol. Geol. on the more important recent developments in each foreign petroleum field. The account of recent developments in most countries is prefaced by a brief statement of historic background interest.

Activity in the search for and development of petroleum has been carried on in no less than seventy countries outside the United States within recent years. The scale of these activities ranges from that of Venezuela with her more than 1,000,000 brl of daily production in 1946, to that of countries like Sweden where in a programme of oil search in the southern part of the country, the Government completed 2 wells in the past 2 years, in one of which a showing of oil was reported.

A set of maps is given showing the sedimentary areas and the more important fields; and there are appended tables of cumulative world oil production by countries, the average daily yield for each country for 1946 and 1939, and the number of geophysical crews in operation in 1946 by countries. E. N. T.

1366. Palæogeography of South America. L. G. Weeks. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 1194–1241.—The major features of the geological framework are outlined. Attention is called to the many similarities in the continental framework and geological history of South and North America. The change in palæogeography and facies from Cambrian to Pliocene times inclusive is pictured on fifteen palæogeographic facies maps, selected to show the principal sedimentary overlaps. Intervening changes and conditions, the progress of transgressions and the fundamental transitions in the architecture of the continent that caused or conditioned the palæogeographic and facies changes are briefly reviewed. E. N. T.

1367. Fourth Spring Hill Test Gets Negative Results. Anon. *Oil Gas J.*, 15.2.47, **45** (41), 61.—The fourth Spring Hill, Chile, test has been drilled to 7500 ft, 60 ft deeper than the discovery well. The results are said to be negative, although the electric log indications were good. G. D. H.

1368. Chile's Fifth Spring Hill Field Test Nears Completion. Anon. *Oil Gas J.*, 5.4.47, **45** (48), 42.—The Spring Hill producing horizon is a medium grained Cretaceous or Jurassic sand, 60–100 ft thick and lying 7350–7500 ft deep. The paraffin base oil has a gravity of 43° A.P.I. Bottom-hole pressures are 3200–3400 p.s.i.

The fifth test is expected to be completed shortly. G. D. H.

1369. Chile's Fifth Test is Big Wet-Gas Producer. Anon. *Oil Gas J.*, 12.4.47, **45** (49), 61.—The fifth Spring Hill well has been completed with a large production of wet gas. It is on the northeastern side of the structure and at a higher level structurally than the other wells. G. D. H.

1370. Sixth Spring Hill Test Down to About 5000 ft. Anon. *Oil Gas J.*, 24.5.47, **46** (3), 65.—Spring Hill, Chile, No. 6 lies about 1200 ft south of No. 3, which gave high-grade oil after first giving gas alone. G. D. H.

1371. Sixth Spring Hill Test Completed as Producer. Anon. *Oil Gas J.*, 21.6.47, **46** (7), 65.—Chile's sixth well at Spring Hill is reported to be a producer at about 7500 ft. G. D. H.

1372. Junta Petroleum Tests Deeper Sands in Wildcat. Anon. *Oil Gas J.*, 7.6.47, **46** (5), 43.—180 miles south of Barranquila, Colombia, on the west side of the Magdalena, Junta Petroleum Co's wildcat has given gas at the rate of 18,000 M.c.f. Deeper sands are being tested, and a further well is planned. G. D. H.

1373. Union Oil Stepping Up Exploration Work in Paraguay's Chaco. Anon. *Oil Gas J.*, 4.1.47, **45** (35), 32.—Union Oil Co. 1 Santa Rosa is drilling below 7348 ft in beds tentatively identified as Devonian. This well lies 255 miles west of Puerto Casada on the Paraguayan River. The site for a second well is under consideration.

A considerable amount of geophysical work has been carried out. G. D. H.

1374. On the Problem of the Geological Structure and Oil Possibilities of the Near-Caspian Depression. N. V. Nevolin. *Compt. Rend. (Doklady) Acad. Sci. URSS*, 1947, **55**, 739–741 (in English).—An analysis of new seismic data and a revision of the older geological and geophysical information are used to derive new conceptions of the geological structure and oil-bearing possibilities of the near-Caspian depression. The most promising areas for oil production are considered to be the salt-domes and the underlying structures. A map of the region, which includes Long. 45–55° E., Lat. 50° N., and contains Stalingrad, Astrakhan, the Caspian Sea, Orsk, Uralsk, and Saratow, is given with the salt domes indicated. G. H. B.

1375. Deep Test to be Spudded Soon in Northeastern Spain. Anon. *Oil Gas J.*, 19.4.47, **45** (50), 69.—A well is expected to be drilled on the Oliana structure, 15 miles east of Solsona in northeastern Spain. Eocene beds outcrop on this anticline. G. D. H.

1376. Three Companies Press Widespread Search for Oil in Egypt. W. W. Burns. *Oil Gas J.*, 8.2.47, **45** (4), 46.—Oil exploration in Egypt began in 1885, but only three commercially important fields have been found. Of these Ras Gharib, with reserves of about 100,000,000 brl, is the most important.

Anglo-Egyptian Oilfields Ltd. obtains 24,000 brl/day from Ras Gharib and 1000 brl/day from Hurghada. Ras Gharib has produced 55,000,000 brl of 25–26° oil from basal Miocene limestone and pre-Miocene sands at depths of 1500–2400 ft. It lies on an easterly-dipping monocline broken by faults in the west and below an unconformity. Hurghada has given about 40,000,000 brl of 22–24° oil from Nubian sands unconformably underlying the Miocene at depths of 1700–2200 ft.

Gemsah, discovered in 1908, has given a little oil from a basal Miocene limestone at depths of 1240–1310 ft.

The S.U.D.R. wildcat on the east coast of the Sinai Peninsula has a potential of 275 brl/day of 22° oil. It was drilled jointly by Anglo-Egyptian Oilfields and Socony-Vacuum. Oil is in a basal Miocene sandstone at 2675–2826 ft. There is a surface structure. A test at Wadi Baba was abandoned in schist at 4538 ft. The Ras Abu Radeis wildcat was in the Miocene at 6425 ft. A well is under way at Hamra, 20 miles northeast of Suez. Egyptian Standard's 1 El Khabra has reached a depth of 9981 ft.

Northern Sinai is characterized by the presence of Jurassic beds, and large asymmetric anticlines. In the Gulf of Suez area there are asymmetrical fault blocks.

In the Western Desert the Abu Roash wildcat, 4 miles west of the Pyramids, entered granite at 6250 ft. 2 Abu Roash was in limestone at a depth of 2430 ft. There are extensive outcrops of Oligocene, Miocene, and Pliocene beds. Near the Pyramids Lower Eocene, Upper Cretaceous, and Cretaceous Nubian beds come to the surface. In the desert geophysical work is necessary.

718 exploration permits each covering 100 sq. km. have been issued. G. D. H.

1377. Results Thus Far Slight in Egyptian Standard Test. Anon. *Oil Gas J.*, 12.4.47, **45** (49), 61.—The Wadi Baba test has yielded only a barrel of 8–10° oil in a drill-stem test. The well started on the downthrown side of a fault, but has unfortunately gone through the fault. G. D. H.

1378. Drilling to Begin Soon on Gaza Well, First Test in Palestine. Anon. *Oil Gas J.*, 15.3.47, **45** (45), 58.—The first well in Palestine will be drilled near Iraq Suweidan in the community of Huleiquat, 15 miles northeast of Gaza. Torsion balance and gravity meter surveys indicated a subsurface structure and this was confirmed by a seismic survey in 1946. The possibility of drilling to 10,000 ft is visualized.

A second well will be drilled in the Kurnub area in the Negev, 20 miles west of the southern end of the Dead Sea. There is a well-defined surface structure with older beds than at Huleiquat. G. D. H.

1379. New Guinea Exploration Programmes Under Way. Anon. *Oil Gas J.*, 22.2.47, **45** (42), 105.—Australian Petroleum Co. Ltd., is said to have a test in Papua which has reached 5000 ft. G. D. H.

Geophysics and Geochemical Prospecting.

1380. Exploration and the Gravity Meter. L. L. Logue and F. K. Fisk. *Oil Gas J.*, 22.2.47, **45** (42), 122.—The application of the gravity meter in the search for possible oil bearing structures is illustrated by a series of diagrams together with some descriptive text. G. D. H.

1381. Magnetic Surveys with Helicopters. H. Lundberg. *Bull. Inst. Min. Met.*, July 1947, 21–27.—The U.S. Navy's magnetic airborne detector is usually towed 100–200 ft from the aeroplane. The equipment is rather elaborate and weighs some 600 lb. Its sensitivity is ± 1–2 gamma, and the total intensity is measured. If the airborne magnetometer is to duplicate as closely as possible results obtained on the ground, the instrument must be near the ground.

In the present work the magnetometer was flown by helicopter over known ore-bodies in the Sudbury area which had been magnetically surveyed on the ground. The magnetic detector consisted of a rotor, a stationary coil, and a compensating unit. The compensating unit neutralizes most of the earth's field and serves as a datum. The magnetic intensity variations are recorded continuously. Instrument orientation was manual, and sufficiently accurate for the experimental survey. Ground correlation was by a fully automatic timing device. The vertical intensity was measured, since this occurs directly over the magnetic body. The flying height was 150–200 ft above the ground. 28 miles of line were flown and recorded in 1 hr ; the ground survey took 70 days to prepare and execute.

Comparison with the ground survey shows the same features with rather less detail, but the flying data are a satisfactory guide for exploration.

If the helicopter is taken to the point of maximum intensity and then moved sideways to a point where the intensity has fallen to a given value, a marker can be dropped at the latter point. The procedure can be repeated in the opposite direction and another marker dropped. After rising to 2000 ft above the point of maximum intensity a vertical photograph is taken showing the markers and ground features, and on this photograph the magnetic data can be plotted.

Maps and profiles show the magnetic data obtained in the ground and aerial surveys in Clermont Township, Quebec. G. D. H.

1382. Helicopter Aids Oil Search. C. J. Deegan. *Oil Gas J.*, 7.6.47, **46** (5), 61.—Gravitymeter work is being successfully executed by a helicopter in marshy areas in Louisiana, because marsh buggies were forbidden. It is believed that 600 stations per month could be covered for $15,000. Average costs per station with a marsh buggy might be $65–75.

Photographs show the helicopter in use, and the method of surveying is described. G. D. H.

1383. Airborne Magnetometer Surveys of Bahamas Soon to Start. W. W. Burns. *Oil Gas J.*, 26.4.47, **45** (51), 92.—The 50,000–80,000 square miles airborne magnetometer survey of the Bahamas will cost about $650,000. Flying lines at 2 mile intervals, the survey will occupy 6–8 months. About fifty people will be actively engaged.

A series of photographs and diagrams show some of the features of the airborne magnetometer. G. D. H.

Drilling.

1384. Discovery Well Improvement Justifies High Testing Costs. W. P. Sterne. *Oil Wkly*, 2.6.47, **126** (1), 50.—The completion of the Carter Oil Company's Eskridge No. 1 Well in Garvin County, Oklahoma, is briefly described. The data obtained by testing this well is outlined, and the importance of testing wells, especially discovery wells, is stressed. R. B. S.

1385. Workover Barges. E. H. Short, Jr. *Oil Gas J.*, 10.5.47, **46** (1), 62.—The layout and construction of specially designed workover barges for marine operations is described. These barges are being used for : (1) fishing out and resetting liners ; (2) squeezing ; (3) plugging back ; (4) cleaning out and recompleting ; and (5) placing wells on artificial lift. R. B. S.

1386. Rebuilding Worn Drag Bits. E. Sterrett. *Oil Wkly*, 12.5.47, **125** (11), 55.—Two methods of reconditioning drag bit cutting edges and the hard facing of bits are briefly discussed. R. B. S.

1387. Locating the Critical Point of Stuck Pipe or Casing. G. M. Wilson. *Oil Wkly*, 2.6.47, **126** (1), 39.—A brief description is given of a new instrument for locating the point at which a drill-pipe or casing string is stuck. The instrument employs an electronic device called a Magna-Tector, which gives an accurate indication of the amount of stretch at any point in a string of pipe. If the instrument is located above the stuck point, the elongation of the pipe, caused by a strain being taken on the string from the surface, will be indicated by the instrument and vice versa. The complete set-up is designed so that the elongation can be read directly at the surface and as many settings or tests as desired can be made without bringing the instrument out of the hole. R. B. S.

1388. Casing Standards and Design. J. Wais, Jr. *Oil Wkly*, 9.6.47, **125** (2), 37; *Petrol. Engr*, June 1947, **18** (9), 106. (*Paper presented before Pacific Coast District Division of Production, A.P.I., Los Angeles,* Spring 1947.)—The development of new standards and the possible effect of these on casing and coupling thread design is discussed. The primary objectives of the changes under consideration by the A.P.I. are: (1) to provide more effective resistance to joint leakage at higher pressures; and (2) to obtain higher joint strength. Owing to the increasing prevalence of wash-outs and thread leaks in deep wells it has been proposed that three turns of thread may be specified instead of the nominal two to two and a half turns, and that tools and procedure be changed to permit this increase. The additional stresses involved as a result of the increased make-up and suggested improvements in the methods of testing are also discussed in this connexion. Various formulæ applicable to casing design are appended and two references are given. R. B. S.

1389. Combating Corrosion Fatigue by Plastic Coating of Drill-Pipe. L. E. Trishman. *World Petrol.*, 1947, **18** (6), 56–59.—It has been established that corrosion fatigue of drill-pipes usually starts at the inside surface. A theory is advanced to explain this; plastic coatings have been developed to reduce such corrosion. Experimental work on corrosion fatigue is described, and illustrated by photographs. F. S. A.

1390. Muffled Derricks for Residential Areas. G. M. Wilson. *Oil Wkly*, 19.5.47, **125** (12), 37.—A method of muffling derricks by the use of portable multi-layer panels is described. R. B. S.

1391. Diamond Core Drilling Methods and Problems. C. Deely. *Petrol. Engr*, June 1947, **18** (9), 98.—The development of diamond drilling methods and their adaptation to coring operations is reviewed. Two references are appended. R. B. S.

1392. Torque Converter Drives for Oil Well Drilling Rigs. Part II. C. M. O'Leary. *Oil Wkly*, 28.4.47, **125** (9), 40.—The proper gear ratios for use in connexion with torque converters are discussed: they should be so chosen that all operations can be kept within the 80% efficiency range of the converter. Automatic shifting, which can be accomplished by using a differential drive between the input and output shafts of the converter, is being developed to automatically select the proper gear ratios within the 80% efficiency range as the torque loads on the converter vary.

Overheating of the torque converter fluid gives rise to many troubles owing to gasification of the liquid: the operating efficiency of the converter, however, increases with temperature of the converter fluid until this begins to gasify, at which point the efficiency suddenly decreases. Cooling is usually achieved by radiators and cooling fans, and various combinations of these are being developed to provide automatically variable cooling in order to maintain maximum efficiency.

Although torque converters are often used for braking they are not usually designed for this purpose. For successful use as a brake, the converters should be of heavier construction and be provided with greater cooling capacity. Some systems have been developed for using converters to control the weight on the bit and for automatic drilling control: these systems have met with varying degrees of success.

A numeral example is given and the calculations necessary for selecting torque converter drives are shown. The use of torque converters in compounding pumps with maximum efficiency of operation is also discussed. R. B. S.

1393. Fishing and Cutting Technique. E. H. Short, Jr. *Oil Gas J.*, 17.5.47, **46** (2), 80.—The technique used in cutting and fishing drill-pipe from the Superior Oil Company's 51·11 Weller Well (at present the deepest well in the world) is described. R. B. S.

1394. Formation Logging. R. E. Gile. *Petrol. Engr*, June 1947, **18** (9), 93.—New methods of determining gas, oil, and water saturations in formation samples filtered from the mud stream are briefly described. This information can be continually logged, and in combination with (1) microscopic examinations of lithology and porosity, (2) records of drilling rate, (3) correlation of formation samples with depth drilled, (4) titration of solubles in the drilling fluid filtrate, and (5) routine mud tests, the nature of the formations being drilled through can be continuously studied. The use of this information is briefly discussed. R. B. S.

1395. On Neutron Well Logging by Gamma-Rays. G. V. Gorshkov and N. M. Liatkovskaya. *Compt. Rend.* (*Doklady*) *Acad. Sci. URSS*, 1947, **55**, 601–604 (in English). —Continuing previous theoretical work on this subject, the possibility of detecting and measuring gamma-rays produced in rock formations by neutrons emitted from a well-logging device has been studied experimentally. The results of work with gamma-ray and mixed neutron plus gamma-ray sources in an artificial bore-hole show that it is practically feasible to detect the gamma-rays generated in rocks by a neutron source without serious interference from scattered gamma-rays direct from the neutron source and the gamma-ray background arising from the natural radioactivity of granite-type rocks. The characteristics of the Geiger counter used, its response to lead screening and equations giving its response to various sources of gamma-rays involved in the present application, are described. G. H. B.

1396. Thermal Surveys Applied to Oilfield Problems. H. G. Abadie. *Petrol. Engr*, June 1947, **18** (9), 47.—Two applications of thermal logging methods are briefly described. They are : (1) a means of locating leaks in casing or tubing in a well, and (2) a means of determining a point of lost circulation in a drilling well. R. B. S.

1397. Developments in Drilling Mud Control. G. E. Cannon. *Oil Gas J.*, 3.5.47, **45** (52), 101.—Some recent developments in the filtration control of drilling muds are reviewed. R. B. S.

1398. Controlled Mud Programme at Rangely. W. B. Kimbrell. *Oil Wkly*, 2.6.47, **126** (1), 35.—The mud problems encountered in drilling in the Rangely field in Colorado are reviewed and the mud treatment programme selected to combat them is outlined. R. B. S.

1399. Oil-Base Drilling Fluid. F. M. Anderson. *Oil Wkly*, 30.6.47, **126** (5), 43.—The constitution and applications of both oil-base muds and emulsion drilling fluids are described.

Most oil-base muds consist essentially of diesel oil and asphalt blended together and compounded with a soap. The composition of the soap can be made to control the viscosity of the mud. The most suitable soap is formed by reacting sodium hydroxide, sodium silicate, and tall oil (which is a by-product obtained in the sodium sulphate process of manufacturing kraft paper from the jack pine) within the diesel oil–asphalt medium. The mud viscosity can be lowered by increasing the amount of tall oil, and can be raised by increasing the amount of sodium silicate. Oil-base muds are especially advantageous for completing low pressure or highly impermeable sands and in obtaining better core data owing to its zero water content. In many cases they prevent heaving shale from entering the hole and aid in improving cement jobs. Also they are not seriously affected by drilling salt sections and zones where hot salt water is encountered.

Emulsion drilling fluids, which are an emulsion of an oil-base mud and an ordinary bentonic water-base drilling fluid, are being increasingly used. This type of drilling fluid has similar applications to the oil-base muds with the exception of drilling salt sections. In addition it is electrically conductive and good electric logs can be obtained when using ordinary electric logging instruments in emulsion drilling fluid. R. B. S.

1400. Selection of Mud Fluid for Completion of Wells. H. E. Radford. *Petrol. Engr*, June 1947, **18** (9), 72. (*Paper presented before Pacific Coast District, Division of Production A.P.I., Los Angeles*, May 1947.)—The selection of a drilling mud for completion work is based on considerations to obtain the maximum productivity for the particular well. Each of the several special muds available have certain advantages that may result in their selection for a particular well completion. The characteristic advantages of several types of muds are reviewed, and examples are given of their use under appropriate circumstances.

Eight references are appended. R. B. S.

1401. Movement of Water–Oil Interface and Water Encroachment into Wells under Hydrostatic Head. B. E. Kazarnovskaya. *Compt. Rend.* (*Doklady*) *Acad. Sci. URSS*, 1947, **55**, 689–692 (in English).—This paper is a theoretical treatment of the hydrodynamics of a system comprising an oil reservoir extending ribbon-wise to a great length with arrays of wells following the same direction and with a parallel supply boundary. The oil-bearing stratum is supposed to be plane, slightly inclined to the horizon and the wells drilled at right angles to it. Each well is supposed to have its production rate distributed uniformly along its height. Equations are derived which describe the encroachment of an oil–water interface into the array of wells from below the reservoir, the rate of water production, and the shape of the oil–water boundary. G. H. B.

Production.

1402. Organization Elements : Their Relation to Oil and Gas-Producing Operations. J. E. Toussaint. *Oil Wkly*, 9.6.47, **126** (2), 41. (*Paper presented before Pacific Coast District Division of Production A.P.I., Los Angeles*, May 1947.)—The fundamentals of organization of oil- and gas-producing operations are discussed. R. B. S.

1403. Doubling Shaft Operating Life by Metallizing and Truing. E. Sterrett. *Oil Wkly*, 19.5.47, **125** (12), 44.—The procedure to be followed in metallizing and truing compressor shafts for repressuring and recycling plants is outlined. R. B. S.

1404. Case Histories of Mud Acidization. (Engineering Fundamentals No. 284.) Anon. *Oil Gas J.*, 3.5.47, **48** (52), 109.—Details are given of mud acidization operations in : (1) a gas injection well in the Slick sand, South Texas, (2) a pumping well in the Miocene sand, South Texas, and (3) a salt water disposal well in the Gulf Coast area.

This article concludes a series of seven instalments on " Mud Acidizing " (see Abstracts Nos. 1016, 1029, 1027, 1265, 1266, and 1267 (1947)). R. B. S.

1405. Control of Unconsolidated Sands in Wilmington Oilfield. R. Winterburn. *Petrol. Engr*, June 1947, **18** (9), 80. (*Paper presented before Pacific Coast District Division of Production, A.P.I., Los Angeles*, May 1947.)—Details are given of the performance and economics of several wells in the Tar, Ranger, and Upper Terminal Zones in the Wilmington field, which were completed in various ways. The comparative advantages and disadvantages of these various completion methods are also discussed. Six references are appended. R. B. S.

1406. Secondary Recovery in the Delaware–Childers Area. K. H. Johnston and C. H. Riggs. *Oil Wkly*, 12.5.47, **125** (11), 57. (*Abridged version of U.S. Bur. Mines, Rep. Invest. No.* 4019.)—The discovery and development of the Delaware–Childers field in Nowata County, Oklahoma, is briefly reviewed. The air and gas injection practices and the production methods employed are also discussed. R. B. S.

1407. New Deep Well Cementing Unit. W. D. Owsley. *Oil Wkly*, 9.6.47, **126** (2), 31.—A description is given of a new oil well cementing unit which is specially designed so as to obtain greater pumping pressures and quicker mixing and displacement of the cement slurry. R. B. S.

1408. Corrosion. B. J. Cotey. *Oil Gas J.*, 10.5.47, **46** (1), 68.—The use of a new chemical method of treating wells for corrosion inhibition is described. The inhibitor builds up a protective film on the surfaces with which it comes in contact ; after this

film is once established the inhibitor can be used intermittently, once every few days. Three examples are given of wells in which the method was used successfully.
R. B. S.

1409. Economics of Dual Wells in Waskom Field. K. M. Fagin. *Petrol. Engr*, June 1947, **18** (9), 120.—Data are presented on the development and production of the Waskom gas field in Harrison County, Texas. The method of making the dual completions and the advantages gained thereby are also discussed. R. B. S.

1410. Application to Cycling of Gas Injection Below Normal Gas Water Contact. H. L. Hensley. *Oil Gas J.*, 3.5.47, **45** (52), 84.—Details are given of several cycling projects in which recycled gas is injected through edge wells completed below the normal gas–water contact. The method has been found equally successful for sands of varying permeability. R. B. S.

1411. Thermodynamics of Gas-Lift Oil Production. W. C. Edmister and R. J. McGarry. *Oil Wkly*, 30.6.47, **126** (5), 61.—The fundamental concepts of gas-lift production are discussed and examples are given of calculations for the design of gas-lift equipment. R. B. S.

1412. Carthage Field Gas Proration. S. Smith. *Oil Wkly*, 2.6.47, **126** (1), 42.—Proration in the Carthage Field, Texas, is discussed. R. B. S.

1413. A Study of Some Factors Affecting Gun Perforating. S. C. Oliphant. *Petrol. Tech.*, Jan. 1947, **10** (1); *A.I.M.M.E. Tech. Pub. No.* 2115, 1–13.—In the subsurface tests 65 ft of 5-in casing centred inside 7-in casing and cemented with neat cement was lowered to 6000 ft on 5½-in casing, the hole being filled with drilling mud. Perforating companies were asked to check the total depth to cross-pins at the bottom of the test section, and to place shots at given distances above this point. Appreciable errors in the amount of pick-up were found, even though the greatest pick-up distance was only 50 ft. The total depths measured ranged 6593·5 ft to 6599 ft, the casing tally being 6600 ft. The test section after recovery was also examined for penetration. Few of the standard shots penetrated both strings. Similar results were obtained at the surface when perforating guns were used on blank portions of the test section taken from the well.

In laboratory tests the effects of the following factors were studied: powder charge, wet powder, gun size, the use of shear discs, bullet shape and size, gun wear, and bullet sleeves or bushings. The best penetrations were obtained with the largest gun that could be safely run inside the pipe to be perforated. The optimum bullet size was usually 0·3–0·5 in diameter, but penetration depended on the type of formation. Standard conical and ogival bullets had similar penetrations. Worn gun barrels gave lower penetrations than new barrels.

It is not certain that all bullets fired by existing perforating services will completely penetrate even one string of casing and the surrounding cement. Those fired through casing and neat cement into various formations showed deep striations on both nose and base. Bullets giving reduced casing burring seem to sacrifice penetration. It appears that most cases of split casing in perforating may be due to poor cement jobs, perforating under fluid, and using large bullets.

Cement perforated too soon gives a large hole, and that perforated after prolonged ageing suffers much cracking and shattering. Mineral grains adjacent to the bullet's path are crushed and compacted, and the permeability was reduced by 40–80% of its original value, the greater reduction taking place in the less permeable formations.
G. D. H.

1414. New Method for Measurement of Oil Saturation in Cores. R. L. Boyer, F. Morgan, and M. Muskat. *Petrol. Tech.*, Jan. 1947, **10** (1), *A.I.M.M.E. Tech. Pub. No.* 2124, 1–19.—A technique is described for measuring the oil saturation in cores through which two fluids are flowing. A substance, such as iodobenzene, is dissolved in the oil, and this substance causes appreciable absorption of X-rays passing through the core. The experimental arrangement makes use of an X-ray source and a saturated core in addition to that under test, together with ionization chambers to permit the measurement of the intensities of the X-ray beams after passage through the tubes.

In order to explore the possibilities of the method experiments were carried out on the effect of gas-flow reversal on oil distribution in cores without interstitial water, on oil- and water-flooding of saturated cores, and on gas-drive in horizontal cores. The results of these experiments are described, and the method is discussed in considerable detail. G. D. H.

1415. Extending the Application of Electric Analogy in Oil Reservoir Studies. H. Schaefer. *Petrol. Tech.*, Jan. 1947, **10** (1), *A.I.M.M.E. Tech. Pub. No.* 2125, 1–7.—The solution by electrical analogy of performance problems of reservoirs containing oil and gas has hitherto depended on a process of successive approximations based on material balance calculations, because of variation in fluid compressibility. By adding or subtracting electrical condenser capacity the electrical analogy network can be adjusted automatically to allow for changes in compressibility caused by evolution of gas.

A description is given of the electronic circuit required for adding a condenser. The subtraction of a condenser is achieved simply by opening an electrical circuit by means of a relay.

The performance curves of several fields are given, together with the pressure curves predicted by the electrical analogy technique. G. D. H.

1416. Estimating Interstitial Water by the Capillary Pressure Method. O. F. Thornton and D. L. Marshall. *Petrol. Tech.*, Jan. 1947, **10** (1), *A.I.M.M.E. Tech. Pub. No.* 2126, 1–9.—The interstitial water content of cores can be measured by the capillary pressure method, and data so obtained are compared with water saturations measured in cores cut with oil-base muds, and with values computed from the electrical resistivity of the formation. The general agreement of the values obtained by capillary pressure and other methods indicates that the method can yield results which are sufficiently accurate for most oilfield engineering purposes. In some instances it may be possible to extend the utility of data obtained by the capillary pressure method by correlation of interstitial water saturation with more easily measured properties of the media such as permeability or electrical resistivity. G. D. H.

1417. Use of Plastics in Consolidating Loose Sands in Wells. R. H. Smith and A. C. Polk. *Petrol. Tech.*, March 1947, **10** (2), *A.I.M.M.E. Tech. Pub. No.* 2147, 1–7.—The production of oil from loose sands presents many problems, and recently plastics have been applied to bind the sand without seriously reducing the permeability. In this way " sanding up " and excessive wear of equipment are reduced.

The plastic must penetrate the sand under a low pressure differential. It must have adequate compressive and tensile strength. When set the plastic must be permeable.

The operation of injecting sand consolidating-plastic is carried out by the squeeze technique. For 30-in penetration with 30% sand porosity in a well with 7-in casing about 170 gal of plastic is needed for each 10 ft of sand thickness.

Some 150 wells have been treated with plastic, and 80% have been successful. Bottom-hole temperatures have ranged 105–350° F. G. D. H.

1418. Plastic Used to Consolidate Incompetent Formations. P. H. Cardwell. *Petrol. Tech.*, March 1947, **10** (2), *A.I.M.M.E. Tech. Pub. No.* 2148, 1–6.—To ensure permeability after treating a sand with plastic for consolidation purposes it has been suggested that excess plastic should be flushed back into the formation or it should be flushed into the well by producing the well before the plastic has set. At times it is difficult to remove excess plastic in these ways.

An alternative method of ensuring permeability is to use a plastic which shrinks considerably in setting. The shrinkage should be at least 30% and preferably more. The most successful plastics have liquid volumes 1·4–2·5 times greater than the volume of the resultant solid.

Plastics used in sand consolidation are of the thermo-setting type, the heat being supplied by the well. The setting time depends on the nature of the plastic, the temperature and other factors. Catalysts may be used to increase the rate of polymerization. The plastics used are inert and not affected in any way by water, oil, or gas. The viscosities of the liquid plastics are only slightly above that of water. The interfacial tension between the liquid plastics and brines or crude oils is about 1–3 dynes/cm.

Most producing unconsolidated sands have high permeabilities and hence a permeability reduction of 50–70% is not prohibitive. The plastic displaces oil and water from the sand, giving a good bond. G. D. H.

1419. Volumetric Behaviour of Oil and Gas from Several San Joaquin Valley Fields. B. H. Sage and R. H. Olds. *Petrol. Tech.*, March 1947, **10** (2), *A.I.M.M.E. Tech. Pub. No.* 2153, 1–18.—The formation volume and volume of the liquid phase and gas obtained from four fields in the San Joaquin Valley have been determined at pressures, temperatures, and gas–oil ratios comparable with those met in the reservoir rocks. The produced gas–oil ratio in each case exceeds 5000 cu. ft./brl, and the gravity of the tank oil ranges 52° to 63° A.P.I. Tables give the results obtained, together with analytical data on the oil and gas composition. Rough correlations between formation volume and pressure, temperature and gas–oil ratio, and between retrograde dew-point pressure, gas–oil ratio, temperature, and tank oil gravity are presented. No simple correlations were found between the formation volume of the liquid phase and one of the other variables. The correlations are considered to be applicable only over the range of conditions used in the experimental work, and for systems of similar nature and composition. G. D. H.

1420. Calculated Recoveries by Cycling from a Retrograde Reservoir of Variable Permeability. M. B. Standing, E. N. Lindblad, and R. L. Parsons. *Petrol. Tech.*, May 1947, **10** (3), *A.I.M.M.E. Tech. Pub. No.* 2200, 1–26.—The recovery of the heavier components from a gas cap or retrograde pool is shown to be greatest when dry gas at a low pressure is reinjected into the sand. This conclusion is directly opposed to the usual belief that the most efficient production technique is one of pressure maintenance and cycling at or near the dew-point.

In making calculations the following data were employed: (*a*) constant volume, variable composition pressure–volume–temperature tests on a mixture of trap gas and liquid from a producing well; (*b*) published equilibrium constant data and the measured composition of the dew-point material; (*c*) the fact that in a sand section of uniform permeability injected gas displaces reservoir gas nearly completely.

The results are derived by making the simplifying assumption that variable permeability systems may be defined by the ratio of two statistical parameters, and that gas injected into an actual sand will behave as though the sand were composed of many layers, each of constant permeability. G. D. H.

1421. Some Theoretical Aspects of Well Drainage and Economic Ultimate Recovery. V. Moyer. *Petrol. Tech.*, May 1947, **10** (3), *A.I.M.M.E. Tech. Pub. No.* 2201, 1–14.—A method of studying reservoir behaviour is presented in which well-bore pressure drawdown effects are incorporated. Examples are given indicating the use of this factor for relating sand thickness and permeability to economically producible reserves, determining the effect of well-bore permeability damage on economic ultimate recovery and productivity index, investigation of well-spacing in simple reservoirs, and for indicating the long-range variation of productivity index with rate.

The study is not without its limitations, and further investigations may possibly reveal other factors and invalidate some of the assumptions made, thereby rendering incorrect some of the conclusions now drawn. G. D. H.

1422. Some Aspects of High Pressures in the D-7 Zone of the Ventura Avenue Field. E. V. Watts. *Petrol. Tech.*, May 1947, **10** (3), *A.I.M.M.E. Tech. Pub. No.* 2204, 1–15.—The original reservoir pressure in the D-7 zone of the Ventura Avenue field at 9200 ft was nearly equal to the pressure of the overburden. This is the first case of this type observed in California, although this phenomenon has been met elsewhere. Various hypotheses have been put forward to explain these high pressures: (1) the inability of the reservoir rock to support the overburden; (2) sealing of the reservoir at a time of substantially deeper burial; (3) tectonic forces; (4) compaction of shales interbedded with sandstones. Compaction seems to be the most likely source of the high pressure in the D-7 zone.

The oil in the D-7 zone is undersaturated with gas. At pressures above the bubble-point oil is driven out of the reservoir through wells by the slight expansibility of the reservoir framework and its liquid contents. It has been calculated that this mechanism will provide 110 brl/acre-ft.

The principal production problems are concerned with the handling of asphaltenes, paraffin wax, and sand produced with the oil. These bridge the tubing or plug the surface bean.

Due to low permeabilities and high pressures big pressure differentials are set up in producing at rates which tend to reduce certain troubles. Frequent cases of pipe failure are known, and these are attributed to the high pressure conditions and compaction of the sediments. G. D. H.

1423. New Electrical Logging Techniques in California. J. C. Stick, J. S. Baker, and R. G. Norelius. *Oil Gas J.*, 17.5.47, **46** (2), 82.—In California certain fields have relatively high resistivity formation waters, and hence small salinity changes lead to wide resistivity variations. Some freshwater sands may show higher resistivities than associated oil sands. This has rendered interpretation difficult, and attempts to solve the problem by varying the mud salinity in order to give changes in the S.P. curve have been helpful, though not conclusive.

A water sand has higher permeability to water invasion than an equivalent sand with low interstitial water content. Drilling mud filtrate invades formations in an amount and to a depth which seem to be related to the water permeability. The depth of invasion is determined by making a series of shallow penetration resistivity curves. The hole effect is dependent on hole size and the ratio of formation and mud resistivities. The hole effect is also indirectly dependent on water permeability since filtration alters the formation resistivity. Graphical methods have been developed for correcting for the borehole effect. The change in resistivity will be proportional to the ability of the formation to take filtrate. The method is discussed in detail.

Logging in oil-base muds is complicated by oil invasion and the presence of an insulating filter-cake. Electrodes in the form of a circular wire brush have been used, but spring-loaded cutting blades may be superior. However, early oil-base logs were made up of an S.P. curve, and a resistance curve on which were superimposed the effects of random contact resistances. Intermittent electrode contact also interfered. Improvements have been made by increasing the number of cutters and their sharpness. This has given more uniform current, and so the curves more nearly resemble those obtained with ordinary mud. The jaggedness of the logs has been reduced by electrical filters. Some features associated with the interpretation of oil-base logs are described. G. D. H.

1424. Oilfield X-Ray. Anon. *Petrol. Engr*, June 1947, **18** (9), 53.—The applications of a new X-ray apparatus for determining permeability–saturation data are briefly discussed. No technical information is given on the apparatus itself. R. B. S.

1425. The Flow of Homogeneous Fluids Through Ideal Porous Media. Part I. J. C. Calhoun, Jr., and S. T. Yuster. *Producer's Monthly*, May 1947, **11** (7), 31. (*Paper presented before A.P.I., Chicago*, Nov. 1946.)—The purpose of the authors' research is (1) to investigate the flow of gases at various mean pressures, at various temperature gradients, and at various temperatures; (2) to investigate the flow of pure liquids at various total pressures, at various pressure gradients, and at various temperatures; (3) to correlate the flow of gases with that of liquids; (4) to investigate the flow of solutions containing solutes of varying molecular complexity, absorbability, surface energy, ionizability, and similar such properties which are known to give rise to anomalous behaviour; and (5) to correlate the flow of these various solutions with that of pure liquids. During the work attempts were made to use only such porous media as were inert as possible to any effects (*e.g.*, clay swelling due to an imbibition of water) which would change the structure of the media during the experiments.

In this part the author discusses previous work on the subject and also shows that equivalent permeability values should exist for the same gas at two different temperatures T_1 and T_2 provided that $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ where P_1 and P_2 are the pressures in the first and second cases respectively. R. B. S.

1426. Selective Plugging by Chemical Methods. H. C. Lawton. *Oil Wkly*, 19.5.47, **125** (12), 46.—See Abstract No. 225 (1947).

1427. Pressure Maintenance in Rincon Field. N. Williams. *Oil Gas J.*, 24.5.47, **46** (3), 80.—A description is given of the Continental Oil Company's pressure maintenance plant in Rincon Field, Starr County, Texas. One reference is appended. R. B. S.

1428. Crude Stabilization for Production Gain. J. G. Coultrup. *Oil Wkly*, 16.6.47, **126** (3), 36.—The author discusses the advantages and disadvantages of crude stabilization as an alternative to natural gasoline production : the term " crude stabilization " infers the separation (at relatively higher separator pressures) of a " dry " gas and a crude of high (A.P.I.) gravity (*i.e.*, low S.G.). Among the advantages of crude stabilization are : (1) the higher separator pressures and more fluid crude enable small diameter lines to be used with consequent savings ; (2) reduction of gas compressor horse-power requirements due to the higher separator pressures ; and (3) the production of a higher quality oil. The disadvantages are : (1) increased lifting costs on artificial lift wells due to higher separator pressures ; (2) the restrictions imposed on artificially flowing wells (particularly evident in low-pressure fields) ; and (3) the increased cost of segregating wet oil or alternatively treating the entire crude stream. Another consideration is the fact that the lower separator pressures associated with gasoline extraction do effectively reduce subsequent evaporation losses in treating, storage, and transportation of the crude. R. B. S.

1429. Advantages of Brines in Secondary Recovery of Petroleum by Water-Flooding. R. V. Hughes and R. J. Pfister. *Petrol. Tech.*, March 1947, **10** (2), *A.I.M.M.E. Tech. Pub. No.* 2127, 1–15.—In order to obtain good oil recoveries from low permeability sands by water-flooding adequate water-input rates are necessary. In the early days of water-flooding the addition of soda ash and caustic soda to fresh input waters was recommended and tried without success in the Bradford field. One of the commonest difficulties was plugging of the sand, and laboratory work has shown decreasing fresh-water permeabilities for sand cores with time of flooding. It was believed that this phenomenon might be partly explained by swelling of clays in the sands. Accordingly, the use of natural or artificial brines for water-flooding has been suggested.

The literature bearing on the above problem is reviewed and the results of laboratory work are presented. These studies show that soda ash and caustic soda are not good additives, and indicate that the physical and chemical properties of input-water in secondary recovery operations should be such as to keep the clay content of the sand permanently flocculated. Produced brines satisfy this requirement, and their use is recommended as a means of increasing intake rates and oil recoveries in tight sands. Moreover, this affords a solution of the brine-disposal problem and conserves a natural resource. G. D. H.

1430. Designs for Oilfield Tools to Aid in Water-Flooding. F. Squires. *Oil Wkly*, 5.5.47, **125** (10), 50.—A description is given of three new oilfield tools to solve the problems encountered in water-flooding. These are (1) the shot-hole caliper, (2) the shot-hole core-drill, and (3) the rotor valve.

The shot-hole caliper is an improved tool for determining shot-hole profiles : this information is needed in developing the permeability profiles of old wells required for water injection purposes. The shot-hole core drill has been designed to enable cores to be taken from the sides of shot-holes in old wells and is so designed that it is possible to cut several cores without withdrawing the tool from the well. The tool can be run on a standard pulling machine and the cores are cut by a high speed diamond drill operated by an electric, air driven, or turbine motor. The rotor valve is a device for measuring and regulating the amount of water entering an oil sand from a top water sand. R. B. S.

1431. Oil Production by Water. Part 19. An Elongated Reservoir. P. J. Jones. *Oil Gas J.*, 3.5.47, **45** (52), 90.—The characteristics of a hypothetical elongated reservoir, termed the E-1 reservoir, are mapped out in detail : methods are then shown for estimating the productive capacity and cumulative recovery by water encroachment of the E-1 reservoir. R. B. S.

1432. Oil Production by Water. Part 20. Location and Spacing of Wells on Elongated Reservoirs. P. J. Jones. *Oil Gas J.*, 10.5.47, **46** (1), 87.—A method is shown for determining the optimum location and spacing of producing and injection wells on elongated reservoirs : an example of the method is given based upon the characteristics of the E-1 reservoir described in Part 19. The theoretical results lead to the general conclusion that the smaller the ratio of minor to major axes, the greater the tendency for water to reach the producing wells via minor semi-axes, unless offset by gravity and the proper location of producing and injection wells. This article concludes the series on " Oil Production by Water " (see Abstracts Nos. 232, 359, 372, 559, 560, 561, 562, 563, 564, 1039, 1040, 565, 1041, 1042, 1166, 1167, 1168, 1274, 1431 (1947)). R. B. S.

1433. Water Treating for Secondary Recovery. P. DeLozier. *Oil Wkly*, 26.5.47, **125** (13), 53.—The importance of treating raw water for flooding operations is stressed. The water-treating plant should be properly designed on the basis of water analyses, and a constant supply of raw water should be available so as to avoid the necessity of altering the treating plant and procedure. Tests should be made at intervals to ensure that the water is stable and suitable for injection. R. B. S.

1434. Water Flooding Research is Essential. D. Scott, Jr. *Producer's Monthly*, May 1947, **11** (7), 27. (*Paper presented before Eastern District Division of Production, A.P.I., Pittsburg*, April 1947.)—The development of secondary recovery operations in the Bradford Field and the salient features of progress in water-flooding research are outlined. R. B. S.

1435. Chemical Agents in Water-Flooding. P. L. Terwilliger and S. T. Yuster. *Oil Wkly*, 2.6.47, **126** (1), 54. (*Paper presented at 10th Annual Secondary Recovery Conference, School of Mineral Industries, Pennsylvania State College.*)—See Abstract No. 819 (1947).

1436. Effect of Dissolved Iron in Oilfield Water-Flood. Anon. *Oil Wkly*, 9.6.47, **126** (2), 48.—The deleterious effects of dissolved iron in flood waters are discussed and the methods of removing iron depositions and of reducing iron content are briefly reviewed. R. B. S.

1437. Hazards of Experimental Water-Flooding. F. R. Cozzens. *Oil Wkly*, 23.6.47, **125** (4), 45.—Among the undesirable effects of water-flooding are : (1) bypassing and channeling ; and (2) conveyance into the sand of silt, mineral salts, oxides, and bacterial growth. These are each discussed and methods of overcoming them are briefly reviewed. R. B. S.

1438. Phase Relations of Hydrocarbon–Water Systems. J. J. McKetta and D. L. Katz. *Petrol. Tech.*, Jan. 1947, **10** (1), *A.I.M.M.E. Tech. Pub. No.* 223, 1–9.—Recent experimental data on the methane-*n*-butane–water system have been combined with published information to give the water vapour content of natural gases, the solubility of water in hydrocarbon liquids, and the solubility of natural gases in water. Dissolved salts reduce the concentration of water in the equilibrium gas phase below that for pure water. Water dissolved in hydrocarbon condensate may be a vital factor in tubing corrosion. G. D. H.

Oilfield Development.

1439. World Productions. W. W. Burns. *Oil Gas J.*, 25.1.47, **45** (38), 157.—At the end of 1946 crude oil production outside the U.S.A. averaged 3,169,000 brl/day, about 50% more than in 1938. A table gives the daily output in 1938 and 1946 for countries other than the U.S.A., and the oil position in various countries is discussed. G. D. H.

1440. 1947 Drilling Footage Will Establish All-Time Record. Anon. *Oil Gas J.*, 25.1.47, **45** (38), 136.—Over 30,000 wells and nearly 107,000,000 ft of drilling are planned in the U.S.A. for 1947. 11·4% more exploratory wells are expected to be drilled than in 1946, and 1·2% more development wells.

The 1947 forecasted drilling in each State and district is given, together with the change from the 1946 drilling. G. D. H.

1441. 29,000 Wells Drilled in 1946 Despite Post-war Maladjustments. Anon. *Oil Gas J.*, 25.1.47, **45** (38), 138.—During 1946 29,228 wells were completed in the U.S.A., 24,710 being development wells and 4518 wildcats. Of the development wells 15,126 found oil, and 2963 found gas. 635 wildcats found oil and 127 found gas.

Tables summarize the wildcat and development well completion results by States and districts. The numbers of service wells are given. Further tabulations give the drilling and producing depth records in each State. G. D. H.

1442. Depth Trends Showed Wide Variation by Districts. Anon. *Oil Gas J.*, 25.1.47, **45** (38), 142.—97,068,000 ft was drilled in the U.S.A. in 1946 in oil and gas fields. The average footage per well was 3321 ft. Average depth and footage trends in leading States are shown graphically for the past 6 years. G. D. H.

1443. Peacetime Production Exceeds That at Peak of War. C. J. Deegan. *Oil Gas J.*, 25.1.47, **45** (38), 150.—1,748,772,000 brl of oil were produced in the U.S.A. in 1946, 37,669,000 brl more than 1945. Louisiana had the biggest rise in production (21,042,000 brl). The leading States in order of decreasing output were Texas (764,593,000 brl), California (316,606,000 brl), Louisiana (151,608,000 brl), Oklahoma (137,228,000 brl), Kansas (96,579,000 brl), and Illinois (74,613,000 brl).

Nearly 51% of the Texas output comes from 20 pools, and 8 pools accounted for nearly half of California's output.

A table gives the yearly output from 1941 by States. G. D. H.

1444. Production and Reserves of U.S. Major Fields. Anon. *Oil Gas J.*, 25.1.47, **45** (38), 152.—A table gives the yearly output from 1942, the cumulative production to the end of 1946, and the remaining and ultimate reserves for the U.S. oilfields estimated to have ultimate yields of 100,000,000 brl or more. These fields gave 50·4% of the 1946 output, have given 54·5% of the output to the end of 1946, and are thought to possess 64·7% of the remaining U.S. reserves. G. D. H.

1445. Annual and Cumulative Production, Remaining Reserves by Fields. Anon. *Oil Gas J.*, 25.1.47, **45** (38), 191.—The following data are tabulated by fields grouped according to districts within States: 1946 production, cumulative production, number of wells, and estimated reserves at January 1, 1947. G. D. H.

1446. Exploratory and Development Drilling—Where it Occurred and the Results. Anon. *Oil Gas J.*, 25.1.47, **45** (38), 241.—Tables summarize 1946 drilling results, by months and fields, grouped according to States, and whether wildcat or development. The total completions and footage are listed, as well as the numbers of oil, gas, and dry wells. G. D. H.

1447. Southeastern States Total Reserves Nearing Half Billion Brl Mark. A. M. Crowell. *Oil Gas J.*, 24.5.47, **43** (3), 96.—In the southeastern States reserves have been estimated as follows: Alabama 9,000,000 brl oil, 200,000,000 cu. ft. gas; Florida 13,000,000 brl oil, 1,000,000,000 cu. ft. gas; Mississippi 401,000,000 brl oil, 3,074,300,000,000 cu. ft. gas. Currently Mississippi produces 88,000 brl/day, although the maximum efficient rate is under 59,000 brl/day.

Tables give the estimated producible reserves and daily availability by fields, as well as the basic reservoir data and cumulative production to the beginning of 1947. G. D. H.

1448. The Delhi Field To-day. O. W. Willcox. *World Petrol.*, 1947, **18** (7), 41–45.—General knowledge of the regional geological structure led to drilling in the Delhi field (northeast Louisiana). The area is divisible into the Delhi, West Delhi, and Big Creek fields. Some geological data and sketches are given. Murphy–Sun interests are constructing, 2 miles west of Delhi, a natural gasoline plant of which a brief description is given. Production from the area to the end of 1946 was over 7 million brl. The eventual total yield is estimated as 200 million brl. F. S. A.

1449. Production Outside U.S. Due to Reach 3,211,000 brl in 1947. W. W. Burns. *Oil Gas J.*, 22.3.47, **45** (46), 140.—Oil output outside Russia is expected to reach 2,610,000 brl/day in 1947, compared with an average of 2,345,000 brl/day in 1946.

Last year Middle East production was 604,500 brl/day compared with 538,800 brl/day in 1945. In 1946 Iran gave 403,100 brl/day, Saudi Arabia 164,400 brl/day, Iraq 96,700 brl/day. Venezuela gave 1,064,900 brl/day in 1946 and 885,921 brl/day in 1945. During 1946 Colombia produced 60,600 brl/day and Mexico 35,000 brl/day. Russia's 1946 output is thought to have been 450,000 brl/day, and the Dutch East Indies with British Borneo provided 35,000 brl/day.

The 1946 daily outputs and the 1947 estimated outputs are tabulated for the various producing areas. G. D. H.

1450. Petroleum Supply Problem is World Wide : Nearby Markets to Take Middle East Oil. L. F. McCollum. *Oil Gas J.*, 17.5.47, **46** (2), 62.—Possible areas of important future oil development outside the U.S.A. include the Caribbean fringe, east of the Andes in Colombia, Peru, and Ecuador, the Middle East, Oceania, and Russia. At present the western hemisphere supplies 82% of the world oil output.

Currently Venezuela produces 1,174,000 brl/day, which is an annual rate of 5·7% of the reserves. The Middle East gave 702,000 brl/day in 1946, and in 1947 the rate will probably be 806,000 brl/day. The reservoirs are predominantly limestones, and potentials are high. The Kirkuk field is 60 miles long and 2¼ miles wide. Some 50 wells have been drilled, but only 16 are used for production. It is possible that in the Middle East annual output does not exceed 3½% of the reserve.

The islands of the Far East gave 180,000 brl/day before the war, but at present yield only 35,000 brl/day. The Far East reserves amount to 1,300,000,000 brl, and the output could be raised to 180,000 brl/day with safety.

It is not considered that any substantial volume of Middle East crude could find a market in the U.S.A. under present conditions. Excluding Russia it is estimated that world supplies of oil in 1947 will be 7,895,000, and they will rise to 9,429,000 brl/day in 1951. No important excess producing capacity seems likely to exist during the next 5 years.

Tables give data on production, reserves, and availability of oil. G. D. H.

1451. Pemex Steps up Output from Isthmus Fields. Anon. *Oil Gas J.*, 15.3.47, **45** (45), 61.—The daily output of the fifteen small fields around Minatitlan has risen from 12,000 to 17,000 brl/day. Only 25 wells flow there, and that is the only area of Mexico where artificial lift is undertaken. Nine wildcats are to be drilled in the Isthmus area in 1947. G. D. H.

1452. Argentina's 1946 Crude Output Down, Imports Up. Anon. *Oil Gas J.*, 7.6.47, **46** (5), 43.—During 1946 Argentina produced about 21,000,000 brl of oil. The 1945 figure was 23,300,000 brl. In 1946 Comodoro Rivadavia gave 14,592,000 brl, Plaza Huincul 2,266,000 brl, Mendoza 3,049,000 brl, and Salta 1,017,000 brl. G. D. H.

1453. Bolivia Planning 22 Development Wells in Camiri Field. Anon. *Oil Gas J.*, 3.5.47, **45** (52), 44.—In deepening a well abandoned as dry in 1931, a new oil-bearing horizon was struck at 1643 ft. This well lies 2 miles from producing wells at Camiri and is generally regarded as proving an extension of the Camiri producing area. 22 wells are expected to be spudded at Camiri during 1947, and a further 28 are planned for 1948.

It is expected that a wildcat will be drilled in the Guayruy area near Camiri. G. D. H.

1454. Brazil's December Crude Output Set at 6233 Brl. Anon. *Oil Gas J.*, 15.3.47, **45** (45), 61.—In December Brazil produced 6223 brl of oil, 5862 brl coming from the Candeias field. G. D. H.

1455. Colombia's 1946 Output Down Due to Strike. Anon. *Oil Gas J.*, 1.3.47, **45** (43), 45.—Colombia's daily output averaged 61,434 brl in 1946 and 62,600 brl in 1945. In 1946 the De Mares concession exported 8,970,487 brl, Barco 6,153,533 brl, and Yondo 2,897,427 brl.

The Sardinata test was abandoned at 8250 ft in January, and a second test is to be drilled 7 km south. The Zahino wildcat was coring at 5992 ft in February.
G. D. H.

1456. Decline Shown in Peru's 1946 Crude Production. Anon. *Oil Gas J.*, 5.4.47, **45** (48), 43.—During 1946 Peru produced 12,455,991 brl of oil, and in 1945 13,748,228 brl. The 1946 natural gasoline production was 1,041,536 brl. G. D. H.

1457. Peruvian Production at 34,400 brl Daily. Anon. *Oil Gas J.*, 21.6.47, **46** (7), 65.—Peru produced 3,104,593 brl of oil in the first quarter of 1947. For the same period in 1946 the output was 3,181,457 brl. G. D. H.

1458. Peru Looks to Extensive Oil Development. J. E. Rassemuss. *World Petrol.*, 1947, **18** (8), 52–53.—In 1946 crude oil production in Peru amounted to 12,468,126 brl; of this 80·38% was produced by International, 17·92% by Lobitos Oilfields, and 0·98% by government exploitation. In addition natural gasoline production amounted to 1,041,407 brl, of which International and Lobitos produced 90% and 10% respectively. It is estimated that Peru contains larger reserves than other South American countries. The Montaña (basin of the Amazon river) covers 63 million ha. Of this International has been granted a concession of 166,546 ha. and Lobitos 56,544 ha. International has applied for a further 2,240,000 ha. Construction of a pipeline from the Montaña to the Pacific coast has to be considered for economic reasons, as the only transport at present is by river. F. S. A.

1459. Production in Venezuela Shows 20% Gain. Anon. *Oil Gas J.*, 15.3.47, **45** (45), 58.—Preliminary figures indicate that Venezuela produced 388,000,000 brl of oil in 1946. 562 oil wells, 7 gas wells, and 82 dry holes were drilled in 1946, and the average daily output rose from 979,094 brl in January to 1,120,051 brl in November.
G. D. H.

1460. Venezuela Reserves Gain 500,000,000 Brl. Anon. *Oil Gas J.*, 19.4.47, **45** (50), 68.—During 1946 Venezuela produced 388,491,000 brl of oil, and during that year the reserves were raised by 901,304,000 to 1,337,707,000 brl, to give a total reserve of 7,547,600,000 to 7,987,900,000 brl.

At the end of 1946, 11,589,793 acres were in exploration and development concessions, and 13,994,764 acres in development grants. G. D. H.

1461. Decline Predicted for Austrian Production. Anon. *Oil Gas J.*, 17.5.47, **46** (2), 61.—During 1946 Austria produced 846,000 tons of oil; the 1945 figure was 454,000 tons. Due to the removal of equipment it is expected that output will fall this year.
G. D. H.

1462. Hungary's 1946 Production 5,145,342 brl : Down 1·3 Million From 1943 High. Anon. *Oil Gas J.*, 24.5.47, **46** (3), 66.—Hungary's production attained a peak of 6,426,074 brl in 1943, but declined later in spite of the development of the Hahot field.

After Hungary declared war, a concession in the southern part of the Great Hungarian plain was granted to a German concern which carried out geophysical surveys. A wildcat at Totkomlos, 110 miles southeast of Budapesth, blew out from the Pliocene at 5092–5312 ft, flowing 20,000,000 cu. ft. of gas/day. The gas had 51% of CO_2 and 48% of hydrocarbons. A second well gave some gas, much salt water, and a little oil from fractures in a hard shale. A well at Korosszegapati, 125 miles east-southeast of Budapesth, gives 1,750,000 cu. ft. of wet gas/day from the Pliocene at 2500 ft. This gas has 60% of CO_2 and 40% of hydrocarbons.

By the end of 1943, 119 wells had been drilled at Lispe and 60 at Lovaszi, and the Lovaszi output reached 3,838,363 brl. The Ujfalu field was opened at the Yugoslav border on a small dome on the Peklenicza–Budafapuszta anticline. Oil was found in the Pliocene and gas in the Miocene. Hahot lies 10 miles northeast of Lispe. This structure is a buried Triassic limestone ridge covered by Miocene and Pliocene. Oil is produced from the contact zone between the Pliocene and Triassic, probably from porous limestones. Similar subsurface conditions were found in a well at

Salomvar to the northwest, and there were good oil shows. The return of part of Transylvania to Hungary led to search for gas. Nyaradsereda No. 2 gave about 5,000,000 cu. ft. of gas/day from the Sarmatian at 550–633 ft and 729–755 ft. Rava No. 1 (Near Edoszentgyorgy) had an initial output of 6,500,000 cu. ft./day from 607 ft. Both wells are on anticlines.

Traces of oil were found in a 5015 ft test at Izaszacaal abandoned in the Cretaceous. In 1943 drilling activity ceased at Peklenicza and Szelnicze, and the outputs fell to 20 brl/day and 18 brl/day, respectively.

Wildcats at Peteshaza, southwest of Lovaszi, found oil at two horizons between 5472 and 5600 ft, and gave a small output. Six wildcats were drilled near Alsolendva, west of Lovaszi, and these gave some oil and gas from the same horizons as at Lovaszi.

G. D. H.

1463. Natural-Gas Development Under Way in Poland. Anon. *Oil Gas J.*, 17.5.47, **46** (2), 60.—During 1946, 117,085,000 cu. m. of gas were produced in Poland at Sadkowa–Roztoki and Strachocina. Daszawa, now within the Russian area, gave 83,097,000 cu. m.

A well completed at Debowiec, southwest of Oswiecim, late in 1946, had an initial output of 97 cu. m. from a depth of 397 m.

In 1945 Poland's oil output was about 2500 brl/day compared with 24,000 brl/day pre-war.

G. D. H.

1464. Continued Drop is Seen in Roumanian Production. Anon. *Oil Gas J.*, 22.2.47, **45** (42), 105.—The Roumanian oil output in 1946 was less than 31,000,000 brl, a decline of 25,700,000 brl from the peak of 1938. A further drop is expected.

G. D. H.

1465. Joint Russian Company Dominates Post-war Roumanian Operations. W. W. Burns. *Oil Gas J.*, 5.4.47, **45** (48), 44.—Hungarian oil production began in 1937 and in 1943 attained a peak of 17,600 brl/day. Current production is about 13,000 brl/day. The production rate has been substantially above the maximum efficient level.

The Soviet–Roumanian Oil Co. in 1946 produced about 24,000 brl/day. Natural gas production averaged 18,700,000,000 cu. ft. in 1943–45. During the war, development of gas fields in Transylvania continued, new fields being opened at Roua, Zau, and Cetatea De Balta to give a total of nine. Roumania's oil production in 1946 averaged 86,000 brl/day; it was 114,000 brl/day in 1941. Basically the decline results from lack of new discoveries. A further decline in output may ensue if more drilling equipment is not obtained. The probable reserves have been estimated at about 700,000,000 brl.

In Italy numerous shallow wells (900–1280 ft deep) have been drilled for natural gas mainly in the eastern Po plains and at Podelta. The A.G.I.P. developed the Podenzano gas field near Piacenza and this is now nearly exhausted. To the east the San Girogio–Podenzano field was discovered. Wet gas has been found on the Lodi structure at 4480 ft. The S.P.I. found two new gas fields in Ferrara province by gravity surveys. Bando was abandoned in 1946 because of poor development of the Quaternary producing sands. Malalbergo is still active. Small pockets of light oil have been found in developing the Pietramala gas field where the structure is complex.

A.G.I.P. drilled three dry holes in the Tertiary Bradanic trough north of Taranto. Wildcatting in Sicily has been unsuccessful.

In 1946 Brazil produced 61,466 brl of oil from Cretaceous or Jurassic beds. In 1946 some wells drilled at Candeias had initial outputs exceeding 1000 brl/day. The current Brazilian production is said to be about 5000 brl/day.

Geological and geophysical work has been carried out near the mouth of the Amazon, in the Parana basin, and in Sao Paulo. The Aragua–Lima wildcat has been deepened to the granite basement at 4918 ft.

In Sergipe a well drilled for salt encountered oil and gas shows in the Cretaceous.

G. D. H.

1466. Anglo-Iranian Output Shows Gain in September. Anon. *Oil Gas J.*, 4.1.47, **45** (35), 28.—Iran oil production in September 1946 was 11,004,000 brl, giving 100,072,000 brl for the period January–September.

G. D. H.

1467. November Anglo-Iranian Production Increases. Anon. *Oil Gas J.*, 15.3.47, **45** (45), 61.—In November Iran produced 12,498,600 brl of oil, giving a total of 129,537,000 brl for the first 11 months of 1946. G. D. H.

1468. Iranian Output Averages 394,500 brl Daily in 1946. Anon. *Oil Gas J.*, 24.5.47, **46** (3), 65.—Iranian oil output in 1946 was 19,200,000 tons, compared with 16,839,490 tons in 1945. G. D. H.

1469. Iranian Production Down. Anon. *Oil Gas J.*, 14.6.47, **46** (6), 74.—Iran produced 1,378,000 tons of oil in February and 1,640,000 tons in January 1947. G. D. H.

1470. Foreign Oil Production Reviewed in Sixteen A.I.M.E. Papers. W. W. Burns. *Oil Gas J.*, 29.3.47, **45** (47), 66.—The Agha Jari proved area is 12 miles long and 3 miles wide. White Oil Springs is to be developed further to augment the Haft Kel output. The Lali structure, 25 miles northeast of Masjid-i-Sulaiman, seems to have commercial possibilities.

The Dammam field yielded 94,753 brl/day in 1946, and Abqaiq gave 67,900 brl/day. Edgewater in the latter area has not yet been found; the oil column exceeds 1500 ft.

Extensive geological and geophysical work was carried out in Iraq in 1946. At the end of the year there were 17 producing wells. 6 wells were drilled in Bahrein in 1946.

The Sudr well found oil in the basal Miocene of the Gulf of Suez in 1946. Ras Gharib's average daily output was 23,055 brl, and Hurghada's 879 brl. Ras Gharib has 81 active producers and 14 producers shut in.

It is certain that after rehabilitation Burma's main fields will have considerably smaller outputs than before the war. During the early part of the war the Punjab output reached 2465 brl/day, but declined later. Geophysical work and drilling have been re-started.

India's oil output in 1946 was 6000 brl/day, compared with about 7100 brl/day in 1945. G. D. H.

1471. Chinese Hold Meagre Production Despite Patchwork Equipment. H. Forman. *Oil Gas J.*, 10.5.47, **46** (1), 48.—The Yenchang field of Shensi province was discovered in 1906. There was little activity for many years, but recently work has been going on with makeshift equipment, some of which is described. Production rose continuously from 1938, and in 1943 amounted to 4708 brl.

Oil is also produced in Kansu province to the west. By 1944 18 wells had been drilled in this area. Transport has hindered development. G. D. H.

Transport and Storage.

1472. Cathodic Protection of Steel Tank Bottoms by the Use of Magnesium Anodes. J. R. James and R. L. Featherly. *Petrol. Tech.*, May 1947, **10** (3), *A.I.M.M.E. Tech. Pub. No.* 2202, 1–7.—Replacement or repair of storage-tank bottoms damaged by external corrosion represents an expensive maintenance item. Cathodic protection as a means of reducing this trouble has been very successful in recent years. The cathodic protection of a 55,000 brl and two 20,000-brl tanks is described.

In the case of a 20,000-brl tank twelve 60-lb anodes were placed about 2½ ft from the periphery at approximately 17½ ft centres. Tests have shown that sufficient protection is afforded if the tank-to-soil potential, using a copper–copper sulphate half-cell as a reference electrode, is − 0·9 volt at the edge of the tank.

Potential measurements made a few months after installing the electrodes showed that the potentials were higher than needed for protection. Resistors were then inserted in the individual anode circuits. These increased the life of the anode installation and still provided adequate protection for the tank, giving yet greater tank protection and an even longer anode life.

The installation cost less than $300 for the 20,000-brl tank and the life of the installation was estimated to be 15 years. G. D. H.

1473. Cell-Type Underground Storage for Gas. Anon. *Oil Wkly*, 2.6.47, **126** (1), 33.—The use of molybdenum steel cells for the storage of gas is briefly described. The cells are buried in the ground below the frost line in order to secure more uniform temperature conditions. R. B. S.

1474. Centrifugal Compressors for Gas Trunk Pipelines. M. C. Shaw and E. T. Neubauer. *Oil Wkly*, 26.5.47, **125** (13), 37.—See Abstract No. 1060 (1947).

Refinery Operations.

Refineries and Auxiliary Refinery Plant.

1475. Plastic Insulation. Provides Protection Against Stray-Current Corrosion in Wells and Piping Systems.—Oil and Gas Wells. J. A. Clay, Jr. *Oil Gas J.*, 26.7.47, **46** (12), 245.—Instances of corrosion of oilwell and other structures due to "stray-currents" of various origins are described. Protection from such corrosion is obtainable by the use of laminated plastic insulating materials in the form of: (*a*) pipe nipples; (*b*) ring or gasket-type insulators for use with steel flanges. The flanges, holding the gasket or ring insulator, are coupled together with steel bolts insulated with plastic sleeves, and a plastic washer in addition to the steel washer. Plastic pipe nipples are manufactured for two working pressures, viz. 500 and 1000 p.s.i. Their physical properties are given in a table showing: external and internal diameters, wall thicknesses, threads/in., and tensile strengths, for sizes 2, 2½, 3, and 4 in. Any length can be obtained, the standard lengths being 4 and 6 in. For operating pressures over 1000 p.s.i., or where equipment is of large size, insulated flanges must be used. A table shows the material list, per flange union. This gives the items of "make-up," number required, and description and measurements of the plastic materials; *i.e.*, plastic bolt sleeves, plastic washers, flange gasket (flat, or ring). Examples for ordering and some approximate prices are given. Plastic materials should be handled in a manner similar to copper or brass fittings. Extreme tightness in a joint is not necessary to effect a pressure seal, and if a joint is made too tight the material may be ruptured or so damaged that a failure may result. Recommendations are given for the installing of plastic materials on field and refinery jobs, and the precautions to be taken in insulated pipeline laying are discussed. W. H. C.

1476. Constructional Materials and Corrosion in Petroleum Refineries. H. Van Der Hoeven. *Ingenieur*, 25.7.47, (30) M23–25.—Due to the high losses experienced through corrosion the use of steels containing varying amounts of Chromium, Molybdenum, Silicon, and Niobium, is recommended, *e.g.*, 28% Cr steel for centrifugal pumps, 5% Cr steel for temperatures between 360–430° C, 25% Cr 20% Ni steel for asphalt stills and cracking, 0·5% Mo steel for temperatures above 600° C, 1·0% Nb steel for carbide formation and the non-separation of carbon in cracking coils. D. H. J.

1477. Volume of Liquid at High Temperatures. W. L. Nelson. *Oil Gas J.*, 12.7.47, **46** (10), 105.—No. 152 in the *Refiners' Notebook* Series gives a chart showing factors derived from temperatures (° F) and A.P.I. specific gravity at 60° F, by which the volume at 60° F should be multiplied to obtain volume at the high temperature. G. A. C.

1478. Modern Lubricating Oil Manufacture. E. R. Sinoley and D. Fulton. *World Petrol.*, 1947, **18** (Ann. Refinery issue), 62–68.—The world position for lubricating oil manufacture is reviewed and a brief description and flow diagrams are given of the main refining processes. The plant capacity of the major companies is listed. F. S. A.

Solvent Extraction and Dewaxing.

1479. Quality of Lubricating Oils Improved by New Furfural Plant in Kansas Refinery. L. C. Brown and C. F. Tears. *Oil Gas J.*, 12.7.47, **46** (10), 58.—The new Furfural refining unit at the Coffeyville, Kans., plant of the Co-operative Refining Association for solvent extraction of lubricating oils is described.

The unit will process 2200 brl/day of dewaxed neutral or 1050 brl dewaxed acid-treated bright stock in four separate operations: treating, solvent recovery from raffinate mix, solvent recovery from extract mix, and removal of water from solvent.

The treating tower operates under a pressure of 75 p.s.i.g. (surge tanks with attendant controls and pumps have been eliminated), and this pressure is automatically controlled. New controls have been devised for regulation of temperature gradient through the treating tower.

The raffinate recovery system omits the usual dry solvent flash section, the total raffinate mix being charged directly to the raffinate stripper. Dry solvent from the extract mix is recovered in an atmospheric exchange heated flash tower.

Liquid-level alarms are provided, motor- and turbine-driven centrifugal pumps are used where possible, and care has been taken to reduce loss of solvent to a minimum.

The new unit utilizes a slip stream containing 93% water from the " B " fractionator charge pump for reflux to recovery system towers instead of dry furfural. Daily loss of solvent averages 42 gal.

Treating conditions and laboratory analysis are given in two tables, and a flow-sheet is shown. G. A. C.

Cracking.

1480. An Investigation into the Kinetics of the Disproportionation of Hydrogen in Gasolines as Depending on the Composition of Aluminium Silicate Catalysts. K. V. Topchieva and G. M. Panchenkov. *Compt. Rend. (Doklady) Acad. Sci. URSS*, 1947, **55**, 505.—The effect of catalyst composition and method of preparation on its activity with respect to hydrogen disproportionation in a thermally cracked gasoline of boiling range 100–150° C was studied with a group of six catalysts varying in composition from 100% SiO_2 to 100% Al_2O_3. Catalyst activities were evaluated from the iodine values of the products, from which rate constants were evaluated for each temperature and feed space velocity (F.S.V.). The 100% SiO_2 catalyst was inactive; the results for the other five were expressed as graphs of (*a*) product iodine value *v.* F.S.V., (*b*) log. rate constant *v.* reciprocal temperature, (*c*) rate constant *v.* catalyst composition. From (*a*) it was found that the behaviour of the 100% Al_2O_3 catalyst was anomalous, the product iodine value remaining constant over a wide range of F.S.V. From (*b*) the activation energy of the reaction was found to be 4·3 k. cal/mol independent of catalyst composition, except in the case of 100% Al_2O_3 which gave a value of *ca.* 7. From (*c*) the most active catalyst had the composition 30% Al_2O_3, 70% SiO_2 corresponding to $Al_2O_3.4SiO_2$ which is close to the composition of a mineral of the montmorillonite type, to which the catalytic activity was ascribed. An explanation was also advanced for the similar manner in which catalyst activity varied with composition on both sides of the optimum value. G. H. B.

1481. Design and Operation of Leonard TCC Unit. G. Kelso, C. C. Peavy, G. D. Myers, and A. W. Hoge. *World Petrol.*, 1947, **18** (8), 48–51.—The paper is abridged from one read recently before the Western Petroleum Refiners Assoc'n. The plant, which commenced operation in March this year, was designed to process 4500 brl/day of reduced Michigan crude to give a reactor charge of 3000 brl/day. Catalytic equipment has been oversized to permit a reactor charge of 6500 brl/day. Catalyst circulation is maintained by a bucket-type elevator capable of removing 75 tons/hr of spent catalyst to the kiln and feeding to the reactor at the same rate. Operating data and a flow diagram of the catalytic section are given. F. S. A.

Polymerization.

1482. Converted Isomerization Unit Now Makes Polymer Gasoline. L. C. Brown. *World Petrol.*, 1947, **18** (6), 42–44.—See Abstract No. 1189 (1947).

Special Processes.

1483. Organic Chemicals from Petroleum. Anon. *World Petrol.*, 1947, **18** (8), 40–45.—The major part of the paper describes the development and present organization of Shell Chemical Corp. This is preceded by a general review of the U.S. petroleum-derived organic chemical industry. Graphs indicating the increase in production of major compounds from 1933 are given, and the economics of the industry are briefly reviewed. The war did not greatly influence production except in the cases of toluene and butadiene where this was increased. During 1945 industry used 3·3 million lb of petroleum derived organic chemicals. F. S. A.

1484. The Manufacture of Synthetic Gasoline. G. Roberts and J. A. Phinney. *World Petrol.*, 1947, **18** (7), 46–49.—This is an abridgement of a paper recently read before the American Society of Mechanical Engineers. An outline of the Synthol process, for the production of gasoline from natural gas, is given. Development in the U.S. started in 1938 and the process is approaching the commercial stage. A simplified flow diagram is presented together with a description of some of the engineering problems involved. F. S. A.

Products.

Chemistry and Physics.

1485. Hydrocarbons of *cyclo*Hexylindane Series. E. S. Pokrovskaya and T. G. Stepantzeva. *Compt. Rend.* (*Doklady*) *Acad. Sci URSS*, 1947, **55**, 829–831 (in English). —Previous to the present work, no hydrocarbons of the indane series with naphthene groups substituted in the aromatic ring had been described. Mono-, di-, and tri-*cyclo*hexylindanes of this type have been synthesized by the alkylation of indane with *cyclo*hexene using aluminium chloride catalyst. Viscosity data for the mono- and di-*cyclo*hexyl derivatives over the range 20–100° C are given, and their densities and refractive indices compared with those of mono- and di-*cyclo*pentyltetralins, in which the positions of the *cyclo*hexyl and *cyclo*pentyl rings are reversed. G. H. B.

1486. Method for Measuring the Heat of Wetting of Decolorizing Charcoals. M. Pesez and R. Berret. *Chim. et Ind.*, 1947, **58**, 28–30.—A calorimeter is described in which the heat of wetting of activated charcoals, when dispersed in benzene, can be measured. The instrument is calibrated by means of a known amount of heat developed electrically, the results being plotted graphically. The exact amount of heat developed when a pellet of charcoal is substituted for the electric heating element can thus be calculated. Results on seven grades of activated charcoals, having heats of wetting ranging from 8–17·1 g. cal./g., show that this method rates the adsorbents in the same order as the methylene-blue test. V. B.

1487. Measurements of Ethylene Viscosity at Pressures up to 1000 Atm by the Oscillating Disc Method. M. G. Gonikberg and L. F. Vereshchagin. *Compt. Rend.* (*Doklady*) *Acad. Sci. URSS*, 1947, **55**, 801–804 (in English).—Previous work on the viscosities of gases at high pressures is briefly reviewed and the present apparatus, intended for pressures up to 3000 atm, described. Data for ethylene at 24° C over the pressure range 100–1000 atm are tabulated. G. H. B.

Analysis and Testing.

1488. Analyses of Alkylates and Hydrocodimers. A. R. Glasgow, Jr., A. J. Streiff, C. B. Willingham, and F. D. Rossini. *Bur. Stand. J. Res., Wash.*, May 1947, **38** (5), 537–581.—Results are presented for the analyses, with respect to individual hydrocarbon components, of twenty-eight alkylates and hydrocodimers, including fifteen sulphuric-acid alkylates (one C_3, six C_4, one C_4–C_5, four C_5, one hot-acid dimer, one hot-acid trimer, and one cold-acid trimer), five hydrofluoric-acid alkylates (one C_3, one C_3–C_4, one C_4, one C_4–C_5, and one C_5), and eight hydrocodimers.

The analytical procedure is described for one sample, a C_4 alkylate. Extended distillations were performed at high efficiency, with high reflux ratio, and using accurately measured values of boiling point (to $\pm$ 0·01° C), obtained during the distillations, and refractive index (to $\pm$ 0·0001), obtained on fractions after distillation. Results are shown graphically.

A C_4 alkylate was also analyzed spectrographically by six laboratories, and results are given for one Raman, one mass, and four infra-red spectrometers.

A list of five references is appended. W. M. H.

1489. Analysis of Benzol Forerunnings. E. Saito. *Rev. Inst. Franç. Pétrole*, 1947, **2**, 227–234.—A detailed analysis was made of the forerunnings of a coal-tar benzol. The raw material was derived from a crude benzol which had been obtained by the stripping of absorber oil and had then been refined in the usual way with sulphuric acid followed by caustic soda. The forerunnings amounted to 6% of the crude benzol and had d_4^{15} 0·869, n_D^{14} 1·4942. Two batches were fractionated, the first into twenty-six cuts boiling between 23° and 76° C and the second into thirteen cuts in the range 30–75° C. The second batch had, previous to fractionation, been treated with potassium hydroxide and amyl alcohol to remove carbon disulphide and with sodium bisulphite to remove acetone and acetaldehyde. The fractions were subjected to examination by physical (Raman spectra, density, refractive index, specific dispersion, critical solution temperature) and chemical (bromine number, sulphuric acid treatment) methods. In addition to compounds previously reported as being present in material of this type the following were identified : *n*-butane (2%); butene-2 (2%); acetaldehyde (Trace); pentene-2, *trans* and *cis*; *cyclo*pentene; pentyne-2 (total pentenes 20%); *cyclo*pentane (total pentanes 23%); *iso*hexane (total hexanes 24%); *cyclo*hexane; methyl*cyclo*pentane (total *cyclo*hexane and methyl*cyclo*pentane 6%). The proportions are calculated on the total of non-benzene compounds boiling lower than benzene. Of all the analytical methods mentioned, most attention is devoted to the Raman spectra, the experimental results being quoted in some detail.

V. B.

1490. Determination of Iron Pentacarbonyl in Gasoline. Anon. *Chim. e Industria*, 1947, **29** (2), 35–36.—Existing methods for the determination of iron pentacarbonyl are reviewed. A new method, depending on the decomposition of iron pentacarbonyl to ferric oxide in ultra-violet light, is proposed for the conversion of the carbonyl group and this is applied to the photometric determination of iron. D. H. McL.

1491. Stage Estimation in Lubricating Distillate Extraction. V. G. Skogan and M. C. Rogers. *Oil Gas J.*, 2.8.47, **46** (13), 70, 73–75.—Methods have been presented by several workers for the estimation of the number of equilibrium stages needed to complete a liquid–liquid counter-current extraction with a given solvent. The authors describe investigations using two solvents, chlorex and furfural, and a wax-free distillate from a Winkler County, Texas, crude with a viscosity index of 42·5 and A.P.I. gravity 18·6°. Extractions were single and multi-stage, using different solvent–oil ratios, and details of apparatus and method of extraction are given.

The Hunter and Nash method, using triangular diagram and equilibrium data for single-stage extractions, is discussed and shown to be inapplicable without making empirical adjustments. The authors suggest a means whereby the method may be used for problems of design, providing single-stage data for a wide range of solvent–oil ratios are known, and multi-stage data for at least one oil–solvent ratio on any given oil and solvent and number of stages, are determined. W. M. H.

1492. Co-operative Analysis of a Standard Sample of Natural Gas with the Mass Spectrometer. M. Shepherd. *Bur. Stand. J. Res., Wash.*, May 1947, **38** (5), 491–498.—The analysis of the third sample of natural gas in the A.S.T.M. series of co-operative analyses was carried out using the mass spectrometer. Preparation of standard sample was as described in *Bur. Stand. J. Res.*, 1947, **38**, 19, and procedures for operating, calibrating, and computing were as prescribed by the manufacturers of the instruments. Results showed the apparatus to be capable of reproducibility, and, to some extent, accuracy.

Analytical data are presented as frequency–distribution plots. Heating values and specific gravities have been calculated from the results, and compared with the known values. W. M. H.

1493. The "Octabenzene," *cyclo*-Octatetraene. O. Bastiansen, O. Hassel, and A. Langseth. *Nature*, 1947, **160** (4056), 128.—Electron diffraction analysis of *cyclo*-octatetraene (C_8H_8) vapour indicates that all the C bonds are equivalent and the

C–C–C angles are 120°, leading to the conclusion that the molecule exists as a puckered ring with equivalent bonds. The nature of the bonding forces is such that the molecule would be more unsaturated than benzene, and this is in accord with experiments.

The Raman spectrum below 2000 cm^{-1} has been investigated, and the lines are listed together with their intensities. H. C. E.

1494. Application of Radiography by Means of Secondary Electrons. The Study of Thin Organic and Inorganic Layers. J. J. Trillat and C. Legrand. *Rev. Inst. Franç. Pétrole*, 1947, **2**, 250–251.—Use of radiography by secondary electrons, for the detection of thin layers of lubricants on metals, is described. A sheet of polished steel, on which is deposited a thin layer of lubricant, serves as the emitter of secondary electrons. A fine-grained photographic film is laid on the steel, the sensitized side being against the lubricant layer. Excitation is by means of X-rays from a 180 Kv tube, filtered through 3 mm of copper. The thickness of the lubricating layer at any point can be determined from the photographs obtained, by measuring photometrically the darkening of the film. The method, which is also applicable to films of inorganic materials, can be used for film thicknesses ranging from 1 to about 50 microns. V. B.

1495. Study of Methods for the Selective Coloration of Calcite on Polished Surfaces. P. Canal. *Rev. Inst. Franç. Pétrole*, 1947, **2**, 235–243.—A detailed petrographic study of dolomites from the Aquitaine basin was undertaken, involving an examination of the methods available for differentiating calcite from dolomite. Selective coloration is favoured, the published methods are critically reviewed and that first described by Lemberg, over 50 years ago, is recommended. The procedure followed is to immerse the sample, the polished face downwards, for 3 min in N silver nitrate at 65° C, water washing and then immersing for ½ min in 10% potassium chromate, washing and allowing to dry. The colour film thus obtained is highly stable; on viewing by transmitted light, calcite is reddish whilst dolomite remains colourless. The limits of the method and precautions to be observed are described. An X-ray study of the coloured films obtained with various reagents gives a theoretical basis for the validity of the method selected and explains the tenacity of the film. V. B.

Gas.

1496. Liquid Gas and Coal. A. E. Coburn. *Fuel Oil and Oil Heat*, May 1947, **6** (1), 57.—Synthetic oil was first obtained from coal by the Bergius process, in which hydrogen is forced at 3000 lb pressure through a paste of pulverized coal at 850° F. This has given way to the Fischer–Tropsch process, in which gas (either natural or manufactured) when heated to about 650° F at 250 lb pressure in the presence of a catalyst, liquefies to oil. Oil from natural gas is produced by a modified Fischer–Tropsch process, the gas being converted to liquids of varying molecular weights, ranging from gasoline to wax.

Natural gas, which is the cheapest to use, is rich in both hydrogen and carbon. The principal manufactured gas is water gas (carbon monoxide and hydrogen), but by using higher pressures in the manufacture, some of the carbon combines with the hydrogen to form methane. This gas has a higher calorific value than either hydrogen or carbon monoxide.

The cost of natural gas is only about one-third as much as the equivalent amount of coal; when the latter is used for oil-making it need not be clean, so the chief element in cost is its bulk handling. One major development now being studied with regard to saving this cost is the collection of the gas by setting fire to underground coal seams.

It is cheaper to use gasified coal as fuel, rather than as raw material for the manufacture of oil, so synthetic oil is more likely to be made from natural gas at present.

C. D. B.

Engine Fuels.

1497. New Method of Interpreting Analyses of Internal Combustion Engine Exhaust Gases. M. Serruys. *Compt. Rend.*, 1947, **225**, 104–106.—The approximations and assumptions involved in the methods hitherto used to calculate mixture strength from exhaust gas analyses are critically discussed and an alternative procedure described, based only on the assumption that the exhaust gases do not contain solid carbon.

The richness of the mixture is for this purpose redefined as : the ratio of combined carbon in the exhaust gases to the nitrogen derived from the air involved in the combustion, as compared with the total quantity of carbon which would have been associated with the same amount of nitrogen derived from the air required for theoretical complete combustion. This definition is used to derive an equation from which the mixture richness can be calculated from exhaust gas analyses for carbon dioxide, carbon monoxide, methane, hydrocarbons, and nitrogen. The precision obtained is high because the most important terms in the equations involve the major constituents of the exhaust gases which can be determined with the least error. The calculation requires a knowledge of the elementary composition of the fuel, but provided that it does not contain combined nitrogen, the value of the coefficient derived from its composition can also be estimated from exhaust gas analyses on weak mixtures, by making certain simplifying assumptions regarding the products of combustion under these conditions. G. H. B.

1498. More Efficient Utilization of Fuels Provided by New High-Compression Automobile Engines. C. F. Kettering. *Oil Gas J.*, 12.7.47, **46** (10), 73.—An abridged version of a paper presented at Society of Automotive Engineers in French Lick, Ind., in June 1947, is given.

The discovery of the relation of molecular structure of hydrocarbons to the knocking characteristics of a fuel led to the development of high-octane fuels. Triptane, with tetraethyl lead added, may have a performance number of 500 under some engine conditions, compared with 100 for octane. The practical compression range was studied on a special 30 cu. in. single-cylinder engine on a range of compression ratios from 6 to 1 up to 15 to 1. Figures show improvement in efficiency with increased compression ratio ; also compression and firing pressures of the single-cylinder high-compression engine.

A 1946 production car was chosen on the basis of the single-cylinder engine tests, and studies of engine performance made. A comparison of full-throttle corrected power, brake mean effective pressure, and volumetric efficiency for the high compression and 1946 stock engine is given on figures. Road tests were made, and data shows that the high-compression car gives from 35 to 40% better fuel economy than the standard car.

Three widely different fuels were tested in the 6-cylinder engine with 12·5 compression ratio, and it is shown that with 99/87 O.N. gasoline the engine can be satisfactorily operated. A diagram indicates flexibility in balancing engine design with available fuels, concerning the conception of " mechanical " O.N. in addition to the conventional " chemical " octane figure. G. A. C.

1499. Carbon–Hydrogen Ratios of Distillate Fuel Oils. S. P. Cauley and E. B. Delgass. *Oil Gas J.*, 19.7.47, **46** (11), 83.—In an earlier paper (Abstract No. 1132/1946), the authors gave a correlation of carbon–hydrogen ratios of pure hydrocarbons with their properties of A.P.I. gravity, aniline point, and boiling point, and discussed its application to the study of catalytically cracked distillate fuel oils. As the correlation, however, was not sufficiently accurate for such distillate fuels, further work was carried out on twenty-two fuel oils, representative of refinery production of distillate fuels, having distillation slopes (using 10 and 90% points) ranging from 0·2 to 4·56, and 50% points ranging from 430° to 671° F. The results are shown in a table, and graphs have been constructed and are reproduced. These show : (*a*) that the " A " factor used in the pure hydrocarbon C/H ratio correlation [A = diesel index—(0·05 × A.S.T.M. 50% point)] when plotted against actual C/H ratios gave good correlation ; (*b*) that the comparison of calculated and experimental C/H ratios, showed an average deviation of 0·67%, and a probable error of 0·58%. It is concluded that the experimental C/H ratios obtained by this substitution of A.S.T.M. 50% point for the boiling point of pure hydrocarbons, are sufficiently close to the true C/H ratios to justify the use of the correlation in comparative fuel studies. A nomogram for the purpose is given.
W. H. C.

Gas and Fuel Oil.

1500. Diesel Fuel Situation. E. F. Miller and F. L. Nelson. *Oil Gas J.*, 21.6.47, **46** (7), 82–89.—The future demand and supply position for petroleum products (particularly diesel fuel) in the U.S.A. is discussed. It is estimated that the total consumption of petroleum products in 1960 will have increased by half a million brl (*i.e.*, 10%) over the 1945 figure, though the ratio of demands for the various products will probably remain more or less constant.

For diesel fuel, total consumption will be about 135,000 brl/day in 1948, compared with 65,000 brl in 1939, the increase being due to railroad applications, armed services, gas and electric companies, manufacturing, mines, trucks, and buses. Tables are given which show the typical properties, source and uses of diesel fuels to-day, those discussed being distillate fuels (*i.e.*, Fuel Oils Nos. 1, 2, and 3), and residual fuels (*i.e.*, Fuel Oils Nos. 5 and 6). As a general rule, catalytic processes produce higher quality fuel oil than thermal processes, and for greatest efficiency the heaviest fuel should be used, providing its other properties are not detrimental to engine operation. A high sulphur content in diesel fuels results in wear and engine deposits, particularly in medium- and high-speed engines. In the past, the use of sour crudes has been avoided, but shortage of low sulphur crudes and increased demands will necessitate greater use of high sulphur products. The result will be a future diesel fuel supply of lower cetane number and higher sulphur content, with an increase in the cost of distillate fuels. It is hoped that low cetane number fuels will not greatly increase maintenance difficulties, but high sulphur content is likely to lead to extra wear and deposits, and the cost of this must be balanced against the premium cost of low sulphur fuels. W. M. H.

1501. Railroad Dieselization Points to Important New Fuel Market. J. E. Boice. *Oil Gas J.*, 21.6.47, **46** (7), 66–68.—The Inter-State Commerce Commission's Bureau of Transport Economics and Statistics has recently published figures which emphasize the shift from coal to oil on American railroads. An analysis has been made to determine the effect of this changeover on the petroleum industry.

During the years 1935–45 the number of steam locomotives in the United States fell from 45,614 to 38,853, while diesel-electrics rose from 113 to 3816, and oil-burning locomotives from 6632 to 6921. In many places the trend in 1947 seems to be towards complete dieselization.

Factors responsible for the change are the need for modernization, labour troubles in the coal-mines, and general operating economy. Under this last heading are included lower per-mile cost of diesel-electrics, higher utilization, and high-speed hauling capacity. Their smooth motion cuts down track maintenance costs, they require less time for repairs than steam locomotives, and electrical equipment takes only a short time to replace. Their horse-power per unit of fuel is also greater than that of the old steam engines.

Since 1918 the tonnage of coal used by the railroads in the United States has steadily decreased, while fuel and diesel oils have shown a corresponding increase. In 1918, coal accounted for 93% of the total fuel used for locomotives, and fuel oil for the remaining 7%; in 1945, coal had dropped to 80%, while fuel oil had risen to 20%, and it is estimated that in 1947 the railroads will certainly use more diesel fuel than in any preceding year.

Four tables give details of types of engine, consumption, and costs. W. M. H.

Lubricants.

1502. Scoring and Burnishing in Bearings. V. H. Brise. *Airc. Engng*, July 1947, **19** (221), 218.—A drawing is shown of a thrust-bearing machine which produces "boundary" lubrication conditions. The rotor (with four test-pieces) is rotated on a steel disc and results are quoted for speeds of about 600 r.p.m. for thrust pressures between 0 and 2000 lb/in. The whole is immersed in an oil-bath maintained at a controllable temperature. Results include the use of Aero DTD 472 B, S.A.E. motor oils, medicinal paraffin, and light anti-freeze oil. I. G. B.

1503. Reduction of Mechanical Friction in Rotating Bearings. P. Gerard. *Compt. Rend.*, 1947, **225**, 94–96.—A new type of bearing is described based on the formation of a region of pressure between the spindle and the bearing, which does not depend for its existence on relative movement of the two components. The pressure is applied from an independent source to a fluid contained in a system of interconnected chambers and grooves cut into the surface of the bearing; the viscosity and oiliness of the fluid

used are not important and its selection can be based on its other properties. When the bearing is rotating any force tending to move it from its equilibrium position in the symmetrical pressure field established by the fluid disturbs the symmetrical transfer of fluid from the chambers to the grooves in such a manner that a modified pressure distribution is developed which balances the force tending to displace the journal. The latter thus floats suspended in the fluid, and the energy dissipated in the latter is small, because of its low viscosity. Two practical applications of this bearing design are described : (*a*) a 30 mm diam. spindle in two such bearings supplied with water at 5 kg/cm^2 and operating at 18,000 r.p.m., (*b*) a bearing to support a spindle subjected to a constant force such as a weight load supplied with water at 2 kg/cm^2. The reduction in friction can be demonstrated electrically by the absence of metallic contact between the rotating and fixed members, and also by measuring the frictional torque of the undriven rotor oscillating about its equilibrium position. For a 50 kg rotor this is 3·45 cm-g, compared with about 20 cm-g for the same rotor in special ball bearings, and this residual friction in the new bearing is due only to mechanical imperfections. It is hoped to apply the principle of the new bearing design to the compensation of errors due to play in the assembly and elasticity of the constructional materials.
G. H. B.

1504. Modern Trends in Bearing Metals. Part III. P. T. Holligan. *Oil Engine and Gas Turbine*, July 1947, **15** (171), 82.—Indium plating of the bearing to inhibit corrosion by oil products is effective in the case of lead-plated copper–lead bearings, as well as with cadmium-base alloys. A coating of lead–tin alloy is equally resistant to oil corrosion.

The material used for the bearing metal is largely dependent upon crankshaft hardness. With copper–lead-lined bearings, graphitic cast iron crankshafts give a good performance.

The advantages claimed for the silver bearings are its high thermal conductivity, and the precision of production control which can be achieved. A lead–indium coating on the silver gives the best results ; if this plating is removed, by wear or corrosion, the bearing properties of the silver thus exposed are not altogether satisfactory. Steel or bronze are used for bearing shell materials. If the latter is used, it should be gun-metal, which gives better results than phosphor–bronze. Steel is most generally used for big-end shells.

The thermal conductivity of the complete bearing assembly, as distinct from local heat-dissipation, is dependent upon such factors as intimacy of contact between shell and housing, and available radiating and conducting surface. When the crankcase is made of aluminium, there is a tendency for steel shells to lose interference fit owing to the higher expansion of the aluminium when the engine is heated up. This may be remedied by changing to bronze shells, but there may then be a permanent yield of the shell when tightening up in the cold owing to its lower elastic limit. C. D. B.

Derived Chemical Products.

1505. Interaction of Styrene with Magnesium Perchlorate and Other Salts. H. S. Lilley and G. L. Foster. *Nature*, 1947, **160** (4056), 131.—During an attempt to dry styrene with magnesium perchlorate a highly viscous polymer was formed after 3 weeks. It was subsequently found that after 48 hr magnesium perchlorate and styrene dried over sodium sulphate showed 13% polymerization ; styrene saturated with water showed 6%. With magnesium chloride the effect was slower, but the " dry " olefin was converted to a viscous polymer in 2 months, whilst the " wet " olefin was unaffected. Anhydrous calcium sulphate also promoted polymerization after long periods.

It is therefore unsafe to use magnesium perchlorate for drying styrene, and probably other olefins, too. H. C. E.

Coal, Shale and Peat.

1506. Investigation on the Working of Certain Shale-Oils. V. Berti and G. Salvi. *Chim. e Industria*, 1947, **29** (3), 67–70.—A practical method is described for the evaluation of certain ichthyolic shale oils from the point of view of yield and of the quality of the ammonium salt of sulphonated ichthyol produced. The oils of S.

Romedir and Besano, already employed for the production of therapeutic substances similar to the original Cordes Ichthyol, are taken as examples. After reviewing the industrial methods for production of shale oil, the sulphonation of ichthyol and separation of ammonium sulphoichthyolate in the pure state is described. The sulphonation takes place with H_2SO_4,H_2O at 70–80° C on the fraction of oil distilling between 200–300° C. Extraction of the sulphonated oil is almost quantitative using a solvent comprising 90 parts benzene and 10 parts *iso*butyl alcohol. On neutralization of the extract with ammonia, the crude ammonium salt is obtained. Acidification and repetition of the extraction treatment followed by neutralization yields the pure substance, except that some ammonium sulphate remains. The analysis of the products is reported, together with figures on commercial products. Finally, the economic expediency is discussed of blending other oils with the ichthyols in order to produce combustible materials. D. H. McL.

Miscellaneous Products.

1507. Industrial Synthesis of Dichloro-Diphenyl-Trichloroethane (D.D.T.), and Ancillary Operations at the Chemical Defence Factory, Northrand. W. Bleloch. *J. chem. metall. min. Soc. S. Africa*, 1947, **47**, 353.—A complete account of the manufacture of D.D.T. at Northrand, South Africa, is given.

After a pilot plant had produced D.D.T., full-scale units to produce 600 tons/annum were constructed and put into operation in July 1945.

The raw materials for the synthesis are salt, alcohol, and benzene; the process being a complex electro-chemical one entailing electrolysis of sodium chloride to chlorine gas and caustic soda, which latter is sold as a by-product. Alcohol is chlorinated by the chlorine to give chloryl, and benzene to give mono-chlorbenzene, and these two products are reacted in the presence of sulphuric acid to give D.D.T.

The benzene is chlorinated in a reaction system equipped with scrubbers to recover maximum benzene vapour; benzene is stripped from the chlorinated product and the mono-product separated from the dichlorbenzenes by distillation; the catalyst used in the plant being ferric chloride.

After design difficulties had been successfully overcome, a unit for the chlorination of alcohol to produce chloral was erected. This comprises a chlorinator with absorption system and a chloral still.

The condensation of chloral and mono-chlorbenzene to give D.D.T. is complicated by the problem of removing water of reaction with strong sulphuric acid and the process is continually being improved. The product is batch produced, as are the two intermediates. Crude D.D.T. is formed in the condensation reactor by adding a fixed amount of sulphur trioxide to the fixed charge of intermediates. The mode of acid disposal is described, and the chemistry of the D.D.T. synthesis and its analytical control is discussed. The specification requirements of technical D.D.T. as produced in Britain are quoted. Operating efficiencies, plant capacities, and salient chemical engineering aspects of the industrial synthesis of D.D.T. and effluent disposal are fully given. G. A. C.

1508. Chemical Reactions of Fatty Oils. III. Drying, Gelatinization, and Rancification. A. Paleni. *Chim. e Industria*, 1947, **29** (4–5), 100–110.—The article discusses thermal gelling of drying oils, molecular distillation in the study of gelled fish and linseed oils and effect of oxygen on these oils. (According to Kappelmeier's theory, gelatinization depends on polymerization as a result of a Diels–Alder type reaction.) Positive and negative catalysts for the oxidation of oils and aldehydic and ketonic rancification are also discussed. It is suggested that thermal gelling of drying oils may be due to the activation of oxide and peroxide compounds and to their consequent isomerization to hydrocarboxylic groups, ketones, and, following on a rupture of the oxidized chains, to carboxylic acids. The activity of the latter in causing viscosity increase depends on the radicle to which the polar group is attached. D. H. McL.

Engines and Automotive Equipment.

1509. Development of the Goblin Engine. E. S. Moult. *J. R. aero. Soc.*, 1947, **51**, 655.—The author traces the history and stages in the development of the engine; in particular the following components are described: Compressor (giving the test curves), descriptions of Rig and production of Impellors, Turbine, Combustion Chambers, Fuel System and Starting, and Testing. I. G. B.

1510. The Apollo. Anon. *Flight*, 21.8.47, **52**, 187.—This is an Armstrong-Whitworth turbine driven civil aircraft with a high safety factor. Power units are to be four Mamba II turbines driving reversible-pitch airscrews. I. G. B.

1511. The "Ghost" Lancastrian. Anon. *Aeroplane*, 22.8.47, **73** (1889), 217.—In addition to being tested in Vampires, "Ghost" turbines are now being fitted to Lancastrians for the purpose of fuel consumption and endurance tests on an aircraft which has space available for test instruments and automatic observer equipment. The "Ghost" is mounted in a similar way to that adopted for the Rolls-Royce Nene engines. Details are given of the turbine fuel system and of the structural installation. I. G. B.

1512. American Jet Experiments. Anon. *Aeroplane*, 8.8.47, **72** (1887), 162.—Power plant data are given for the Convair XP-81 and the Bell XP-3. The former has one G.E.C. axial flow gas turbine driving a four-bladed airscrew and one G.E.C. centrifugal compressor jet unit. Maximum power output 2300 b.h.p. at 13,100 r.p.m. at sea-level, and 4000 lb static thrust at 11,500 r.p.m. at sea-level. Maximum fuel capacity is 1193 Imp. gall.

The second aircraft is powered by two G.E.C. centrifugal compressor jet units; maximum power output for each engine is 4000 lb at 11,500 r.p.m. at sea-level. I. G. B.

1513. Photography in Engine Research. H. D. Goulding. *Airc. Prod.*, Aug. 1947, **9** (106), 283.—Photography in its various applications can be a very valuable instrument in research, but special studies of a specific problem in adaptation of the equipment are necessary in order to obtain successful results. In this and succeeding articles the author reviews a number of examples of work actually carried out in engine research showing how both still and ciné photography can be applied to the investigation of different phenomena. I. G. B.

1514. Loop-Scavenge Two-Stroke. H. D. Carter. *Gas Oil Pwr.*, 1947, **52** (502), 209.—The advantages of a loop-scavenge two-stroke engine, compared with an exhaust poppet valve two-stroke unit, are: (1) The mechanism is simpler; (2) Exhaust temperatures are much lower at all b.m.p., whilst fuel consumption is approximately the same. Recent criticisms concerning the relative performances of the two types of engine are answered. H. C. E.

1515. Polar Two-Stroke Vertical Engines. Anon. *Gas Oil Pwr.*, 1947, **42** (503), 249–251.—These engines have two to eight cylinders of dimensions 18 by 30 cm and operate at 600 r.p.m., giving a power range of 110 to 464 b.h.p. Scavenge air pressure at 2 p.s.i. is delivered by a centrifugal pump, and in order to maintain the engine temperature whilst the engine is idling a patented valve is inserted between the pump and the scavenging air receiver.

The engine can use low cetane fuel, for the injection commences at low pressure with a small amount of fuel, which later in the stroke blends into a normal main injection. Fuel consumption is 0·375 lb per b.h.p.hr. H. C. E.

1516. Low Cooling Water Temperatures [for I.C. Engines]. Anon. *Gas Oil Pwr.*, 1947, **52** (502), 206.—To obtain the best results from cooling water a number of factors must be considered. Inlet water at too low temperatures induces stresses in the jackets, which thereby tend to crack. The water surfaces must be free from scale, or the heat transfer to the water may be so small that insufficient cooling is obtained. Cooling water temperatures also affect fuel consumption; in a test the consumption fell from 0·469 to 0·430 lb per b.h.p.hr when the jacket temperature was increased from 77 to 185° F.

It is recommended that the quantity and temperature of the water supplied should be such that inlet and outlet temperatures are 110–120 and 140–150° F respectively. H. C. E.

1517. Causes of Smoky Exhaust. P. H. Schweitzer. *Oil Engine and Gas Turbine*, Aug. 1947, **15** (172), 139.—A normal engine burning normal fuel should only smoke at full load (" hot " smoke) or at very light load (" cold " smoke). Hot smoke can be remedied by lowering the compression ratio, and by improving the fuel/air mixture, which becomes over-rich in parts at full load. Cold smoke can be corrected by a higher compression ratio, and by advancing the injection timing, thus giving the fuel more time to burn and providing conditions favourable to turbulence.

The effect of the cetane number of the fuel varies according to whether the engine is running hot or cold, but in either case the cetane number is without effect in a range of values between 44·3 and 59·7.

The amount of fuel supplied to the engine is limited by the " smoke stop " on the jerk pump; if this stop is set correctly to prevent smoke at high speeds, the engine will fail to give its optimum torque at low speeds. To eliminate smoke without cutting down the power, therefore, the desideratum is a fuel injector pump which has declining delivery characteristics. C. D. B.

1518. The Graphical Study of Forced Oscillations in a Tube Coupled to Oscillating Systems. R. Kling. *Compt. Rend.*, 1947, **225**, 46–48.—The system considered is the fuel injection equipment of an internal combustion engine and the tube is that connecting the fuel pump and injector. This tube is most frequently of such a length that it is not possible to neglect pressure wave propagation phenomena in the system. The equation describing the pump delivery is not of a sinusoidal character, making a complete analytical solution of the problem impossible, but a graphical approximation method due to Bergeron has been successfully applied to determine, with the aid of a delivery *v* pressure graph, the behaviour of the fluid being pumped at various points along the tube. An expression is given for the volume delivered by the pump over a small time interval, which contains the coefficient of adiabatic compression of the fluid, the combined pump and pump-valve volumes, and the pressure–time characteristics of the pump as parameters. A differential equation describing the movement of the injector needle as a function of time is developed, involving the needle mass and displacement, the force exerted by its return spring, the coefficient of friction of the valve, etc. The two expressions are treated graphically to determine the pressure wave phenomena in the connecting tube and the valve return spring and other characteristics of the system. G. H. B.

1519. Diesel Engine Testing. Anon. *Gas Oil Pwr.*, 1947, **42** (503), 237–240.—In testing prototype and experimental engines studies of engine conditions and pressure variations in the fuel and exhaust systems are essential. With rotational speeds up to 350 r.p.m., cylinder pressure diagrams may be taken with a conventional indicator, but at higher speeds inertia of the moving parts causes distortion of the diagrams. The Farnborough Indicator used in such circumstances comprises a floating disc electrically insulated and screwed to the cylinder-head; pressure variations in the cylinder distort the disc, which makes and breaks electrical contacts and so registers differences on a revolving drum.

The Standard–Sunbury Indicator is a further refinement, and consists of a mechanism which converts mechanical movements into electrical potentials which are then amplified and supplied to a cathode-ray oscillograph. For pressure diagrams the pick-up unit is a steel diaphragm 0·03 in thick with a natural frequency of 40,000 cycles per second. Its deflection varies the air gap in a magnetic field and produces in the surrounding coil a varying potential which after amplification is supplied to the vertical plates of the cathode-ray oscillograph. The voltage is proportional to the velocity of the diaphragm's vibrations and the diagram therefore shows the rate of change of pressure in the apparatus being tested. The horizontal plates of the oscillograph are controlled through condenser and resistance by the engine, and enable as little of the engine cycle as desired to be spread over the whole width of the screen. Movement of the fuel injection valves can be similarly studied by placing a magnetic field round the injector needle, which then acts in the same way as the diaphragm described above. H. C. E.

1520. New Thornycroft Marine Diesels. Anon. *Gas Oil Pwr.*, 1947, **42** (503), 252–254.—Two new types of six-cylinder engine develop 50–65 and 90 b.h.p. The first has cylinders $3\frac{5}{16}$ in bore by $4\frac{1}{2}$ in stroke, with a compression ratio of 18·2 : 1, and the second has cylinders 4½ in by 6 in with a compression ratio of 16 : 1. The ancillary equipment, comprising fuel pump unit, starting gear, lubrication and cooling systems, are described. Two photographs and a line diagram are given. H. C. E.

1521. New Ruston Engine. Anon. *Motor Ship*, Aug. 1947, **28**, 177.—Details are given of a new engine for coasters and trawlers with an output ranging from 1340 b.h.p. to 2410 b.h.p. The speed is 435 r.p.m. and the engine is built in a range having five to nine cylinders with a rated output of 268 b.h.p. per cylinder. Exhaust gas turbo pressure charging is employed and the b.m.e.p. is 119·2 p.s.i. at full load. It is stated that the fuel consumption of the engine is 0·37 lb per b.h.p.hr. I. G. B.

1522. Fuel-oil Burners for Locomotives. Anon. *Energie*, May 1947, **31** (34), 139.—A description of a typical oil burner used by locomotives on French railways. (Translated from *Railway Gazette*, 15.11.46, **85**, 553–556.) G. P. K.

1523. General Survey of Gas Turbine Problems. M. Serruys. *Energie*, May 1947, **31** (34), 134.—Part II of a study of the thermodynamic theory of gas turbines. G. P. K.

1524. New Cylinder Liner. Anon. *Gas Oil Pwr.*, 1947, **42** (503), 248.—Chromium plating 5–6 thousandth in. thick is laid on a solid-drawn "40 carbon" steel liner, and the deposit is "lattice etched" to give uniform mottling with depressions ⅛-in diameter and ¼-in apart, thus producing a good oil-retaining surface of great hardness. Piston friction is said to be reduced and cylinder wear is about one-eighth of normal; when wear does occur the liner can be re-plated and re-etched. H. C. E.

1525. Protective Treatment of Ferrous Springs. Anon. *Oil Engine and Gas Turbine*, Aug. 1947, **15** (172), 109.—Springs needed for heavy duties can be protected against corrosion during storage by means of superficial coatings, such as paint or enamel. These coatings, however, are ineffective during the operation of the spring, as they then become porous.

Protection against corrosive fatigue in service is given by electro-plating the surface of the spring with metals such as zinc, cadmium, etc., or by diffusion processes, in which the coating element is made to combine with the surface layers of the steel springs.

When zinc or cadmium are electro-deposited on springs, slight porosity of the coating is not harmful, as the anodic zinc or cadmium is corroded in preference to the cathodic steel of the spring. Corrosion of the spring is therefore only deferred by this method, as the coating itself is attacked at an appreciable rate.

With the deposition of metals, such as nickel and chromium, a surface layer is provided which is completely impervious to the penetration of the corrosive medium. In time, however, localized corrosion occurs, which is more harmful than the gradual overall corrosion which takes place with an unprotected spring. Zinc or cadmium coating, where possible, is therefore preferable to this method.

Diffusion processes are similar to electro-plating, but the method of deposition is different in that the springs are heated in protective atmospheres surrounded by metallic powders. This obviates the harmful effects associated with electro-plating, viz., the penetration of atomic hydrogen generated in the electro processes into the grain boundaries of the steel, thus causing loss of fatigue resistance. C. D. B.

Miscellaneous.

1526. One Hundred Years of Progress in the Petroleum Industry. D. A. Howes. *Industr. Chem.*, 1947, **23**, 435–442.—Petroleum development from 1859 to the present day is outlined. An account of Young's work and of the birth and growth of some of the more important phases of the industry is given. F. S. A.

1527. Marketing of Oil Products. Anon. *Times Rev. Ind.*, 1947, Sept., 6–7.—A summary survey is given of the activities of the bigger oil companies who provide most of the million tons/day of petroleum products that the world requires. The chain of distribution of petroleum products is briefly outlined and a sketch map indicates the trend of inter-continental oil movements. The principal factors governing the rôle of Middle East oil are shortly listed. V. B.

1528. Gasoline Plant Building Activity. Anon. *World Petrol.*, 1947, **18** (6), 46–49.—It is anticipated that in future (in the U.S.A.) it will be profitable to build natural gasoline plants for gas supplies which were previously considered uneconomic. A search for suitable sources of gas is being made. The paper contains a discussion on the economics of this trend. F. S. A.

1529. Bolivia Undertaking Broad Expansion of Petroleum Industry. Anon. *World Petrol.*, 1947, **18** (6), 40–41.—The paper is partly based on a report by the U.S. embassy in La Paz. The principal features of the proposed expansion consist of the adoption of a new law to permit mixed companies with foreign capital; new drilling and exploration and the construction of new pipelines and two refineries. Terrain surveys for new pipelines have been made and some of the problems in this connexion and with regard to the new refineries are discussed. F. S. A.

1530. British Refining in Interim Period. Anon. *World Petrol.*, 1947, **18** (Ann Refinery issue), 75–77.—The major developments and aspirations of the British petroleum industry are described. Developments within the Anglo-American Oil Co., Shell Chemical Manufacturing Co., Manchester Oil Refinery, Ltd., and Anglo-Iranian Oil Co. are discussed. The Socony-Vacuum plant in Birkenhead, which was damaged during the war, is now producing 10 to 12 million brl of grease and 350,000 brl of compounded oils annually. F. S. A.

1531. Restoration of French Refineries Progresses. H. M. Ballande. *World Petrol.*, 1947, **18** (Ann. Refinery issue), 60–61.—The present position of the industry in France is described. During the war installations suffered damage equivalent to 30% of their cost. 75% of the total French refining capacity was in the main battle zones. It is hoped to restore treating capacity to the 1938 level by the end of 1948, with considerable subsequent expansion. F. S. A.

BOOKS RECEIVED.

Twentieth Century Petroleum Statistics, 1947. Dallas, Texas: De Golyer and MacNaughton, 1947. Pp. 62 + xix + 62 charts. $7.50.

Although the statistics are mainly concerned with the petroleum industry of the United States, some information as to world production (1900 to 1946) and reserves (1.1.47) is given. As regards the U.S.A. the data included is remarkably complete and provides a ready source of economic information on the petroleum industry. A noteworthy feature of the publication is that each of the 62 tables is provided with a graph which gives a clear indication of the general trend of the particular aspect under survey.

Supplement to Lewis's Library Catalogue, 1944–1946. London: H. K. Lewis & Co., Ltd., 1947. Pp. 176 + iv. 5*s*. net (to Library Subscribers, 2*s*. 6*d*.).

This supplement to the 1944 edition of the catalogue of Lewis's Medical, Scientific, and Technical Lending Library brings the catalogue up-to-date to the end of 1946. The number of titles in the supplement is upwards of 3300, which are listed under authors and titles. A subject index of 526 headings is provided. The book provides a useful and convenient means of tracing current scientific and technical literature.

Proceedings of the Institution of Mechnical Engineers. Vol. 154, 1946. London: The Institution of Mechanical Engineers, 1947. Pp. 488 + xi.

Papers of interest to the petroleum technologist included in this volume are: "Some Considerations in the Design of Class I Pressure Vessels," by E. J. Heeley (10 pp.); "Notes of Design Stresses in Class I Welded Pressure Vessels," by S. F. Dorey (1½ pp.); "The Loop Scavenge Diesel Engine," by H. Desmond Carter (10 pp.); "Operation Pluto," by A. C. Hartley (6 pp.).

Journal of the Imperial College Chemical Engineering Society. Vol. 2, 1946. London : Imperial College Chemical Engineering Society, 1947. Pp. 81.

This volume of dissertations from past or present members of the Department of Chemical Engineering at Imperial College, as presented at a meeting of the Society, is a useful addition in the field of informative literature. Mainly intended for the student it is obvious that that term must be interpreted in the widest sense, and the contents of the present volume serve as an indication of the wide scope of interests covered : "The Packing of Spheres," Dr. H. Heywood ; "The Use of Silver in the Construction of Chemical Plant," Dr. J. M. Pirie ; "Working Conditions in Sweden," C. R. Black ; "Impressions of the Swedish Wood Industry," D. H. Eastland ; "Pneumatic Transport of Granular Materials," G. Hillyar-Russ ; "Steam Consumption in Distillation," Dr H. E. Eduljee ; "The Theory of Crystal Growth and its Application to the Design of Industrial Crystallisers," N. R. Mukherjee. Throughout, the text matter is illustrated with diagrams and photographs.

Proceedings of the A.S.T.M. Vol. 46, 1946. Philadelphia, Pa. : American Society for Testing Materials, 1947. Pp. 1629 + ix.

Among the 1946 committee reports are those for D-2 (Petroleum Products and Lubricants), D-3 (Gaseous Fuels), D-4 (Road and Paving Materials), D-8 (Bituminous Waterproofing and Roofing Materials), D-9 (Electrical Insulating Materials), and D-16 (Industrial Aromatic Hydrocarbons).

The Technical Papers section includes : "Laboratory Investigation of Anti-stripping Admixtures Used for Promoting Wetting Power and Adhesion between Bitumens and Aggregates" (J. C. Sprague), "Development of a Method of Test for Soil Bituminous Mixtures" (E. O. Rhodes and P. F. Phelan), "Water Determination in New and Used Insulating Oils by Doble Method" (F. C. Doble), "The Comprehensive Laboratory Testing of Instrument Lubricants" (G. E. Barker, G. E. Alter, C. E. McKnight, J. R. McKlveen, and D. M. Wood), and "Grease Analysis—An Analysis of the A.S.T.M. Method and Suggestions for Improvement" (R. S. Barnett, W. S. Palmer, and H. Levin).

Index to A.S.T.M. Standards. Philadelphia, Pa. : American Society for Testing Materials, 1947. Pp. 221 + viii.

Provides a ready reference to all A.S.T.M. standards in existence at December 1946. The 845 A.S.T.M. standards and 544 tentative standards are subject indexed under appropriate keywords. A numerical index is also provided.

Technical Missions to Germany and Japan.

Further official reports have been received as follows :

B.I.O.S. REPORTS.

1221. Würtemberg Shale Fields. Pp. 16.
1222. Mersol and Hostapon Processes, I.G. Farbenindustrie, Hochst. Pp. 14.
1253. A Photoelectric Colorimeter (Photoelectric Absorptionmeter) designed by Prof. R. Havemann. Pp. 13.
1274. Investigation of German Printing Ink Industry. Pp. 28.
1311. Design and Performance of the Tatra V-12 Air-cooled 14·8 litre Oil Engine. Pp. 47.
1317. Oilfield Equipment Manufactured in Germany. Pp. 11.

B.I.O.S. Evaluation Report No. 10. "Deutsche Bohrmeisterschule" (The German Drillers' School), Celle, North of Hamburg. Pp. 4.

B.I.O.S./J.A.P. REPORTS.

P.R.675. Oilfields of Hokkaido, Japan. Pp. 13.

P.R.833. Japanese Fuels and Lubricants : Fuel and Lubricant Technology. Pp. 79.

C.I.O.S. REPORTS.

XXXIII-41. Research on Preparation and Reactions of Nitroparaffins. Pp. 17.

APPLICATIONS FOR MEMBERSHIP OR TRANSFER.

October, 1947.

The following have applied to the Institute for admission or transfer. In accordance with the By-laws, any Corporate Member may communicate by letter to the Secretary, for the confidential information of the Council, his opinion on the qualifications or suitability of any 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.

Billingham, William Frederick, District Manager, Petroleum Board. (*F. N. S. Evans ; J. F. F. McQueen.*)

Clarke, Reginald Arthur, Senior Chemist, Skefko Ball Bearing Co. Ltd. (*H. W. Hutton ; P. H. Snow.*)

Dawson, Lloyd Spurden, Technical Sales Adviser, Shell Petroleum Co. Ltd. (*R. I. Lewis ; G. D. Thacker.*)

Holloway, Francis Edward, Chief Examiner, Aeronautical Inspection Services (Air Ministry). (*J. Mason ; L. Bevan.*)

Paget, Roger, Technical Adviser, Shell Petroleum Co. Ltd. (*R. I. Lewis ; G. D. Thacker.*)

Pearce, Thomas Charles, Assistant Chemist, Ragosine Oil Co. Ltd. (*G. J. Vineall ; V. M. Farrant.*)

Rigby, John Allen, Depot Superintendent, Indo-Burma Petroleum Co. Ltd., Lucknow.

Scallan, John Frederick Pratt, Operator, Industrial Lubricants Section, " Shell " Refining & Marketing Co. Ltd. (*C. D. Brewer ; D. Morten.*)

Tyrrell, Edward, Assistant Inspector, Fuel & Lubricants Section, Engineer-in-Chief's Dept., Admiralty. (*H. F. Jones ; W. E. J. Broom.*)

Application for Transfer.

Dryer, Stanley Raymond Collins, Assistant Chemist, Anglo-Iranian Oil Co. Ltd. (*G. T. Raine ; A. E. Hicks.*) (*Student Member to Associate Member.*)

ELECTION TO COUNCIL.

The attention of members of the Institute is directed to the following extracts from the By-Laws governing election to the Council of the Institute :—

72. Each and every Corporate Member may nominate in writing a Corporate Member for election as a member of Council. . . . A nomination to be valid must be signed by at least six other Corporate Members and must be received by the Secretary not later than the thirty-first day of December in any year. No member may sign more than one such Nomination Paper at any one election. . . .

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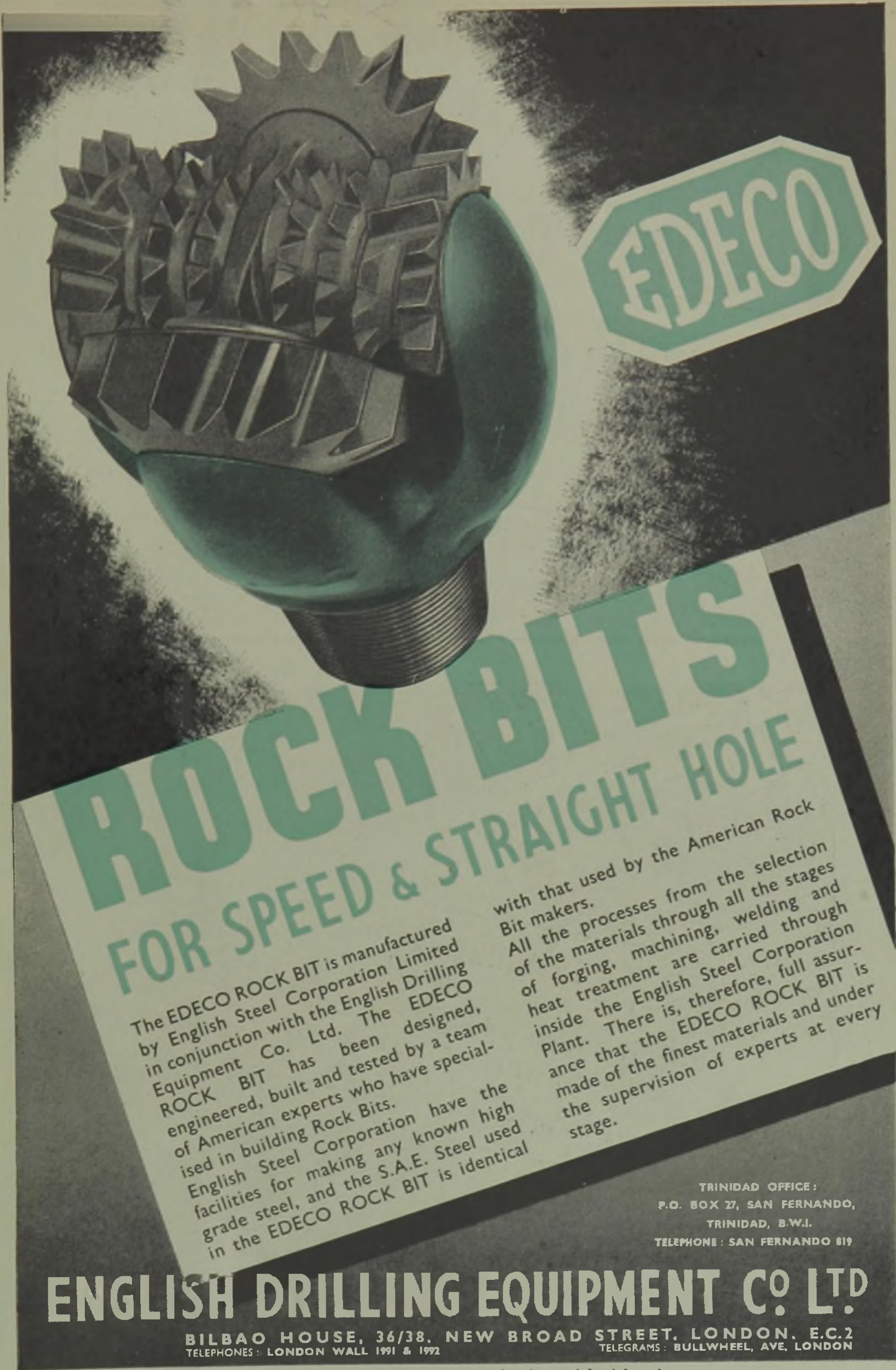

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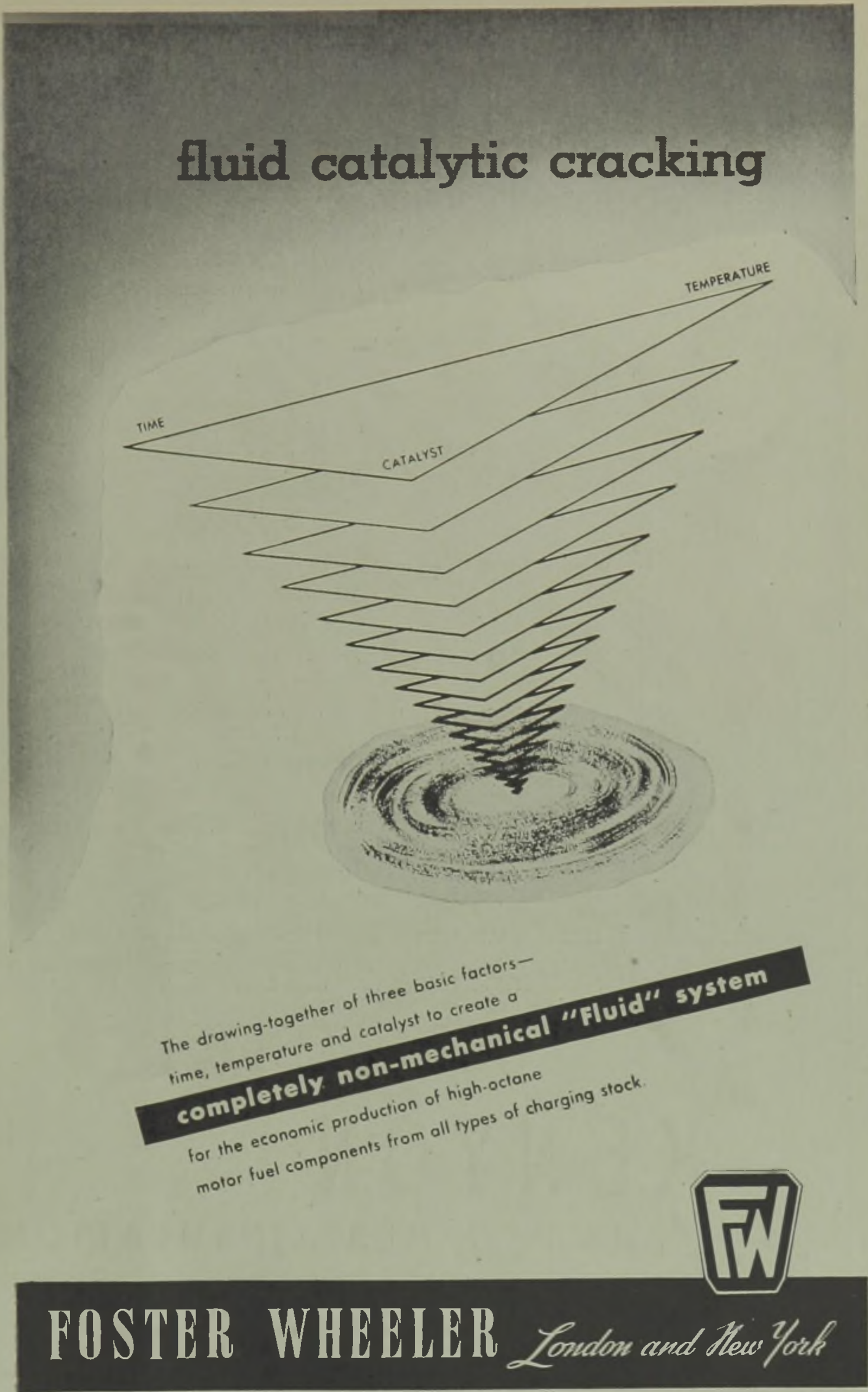

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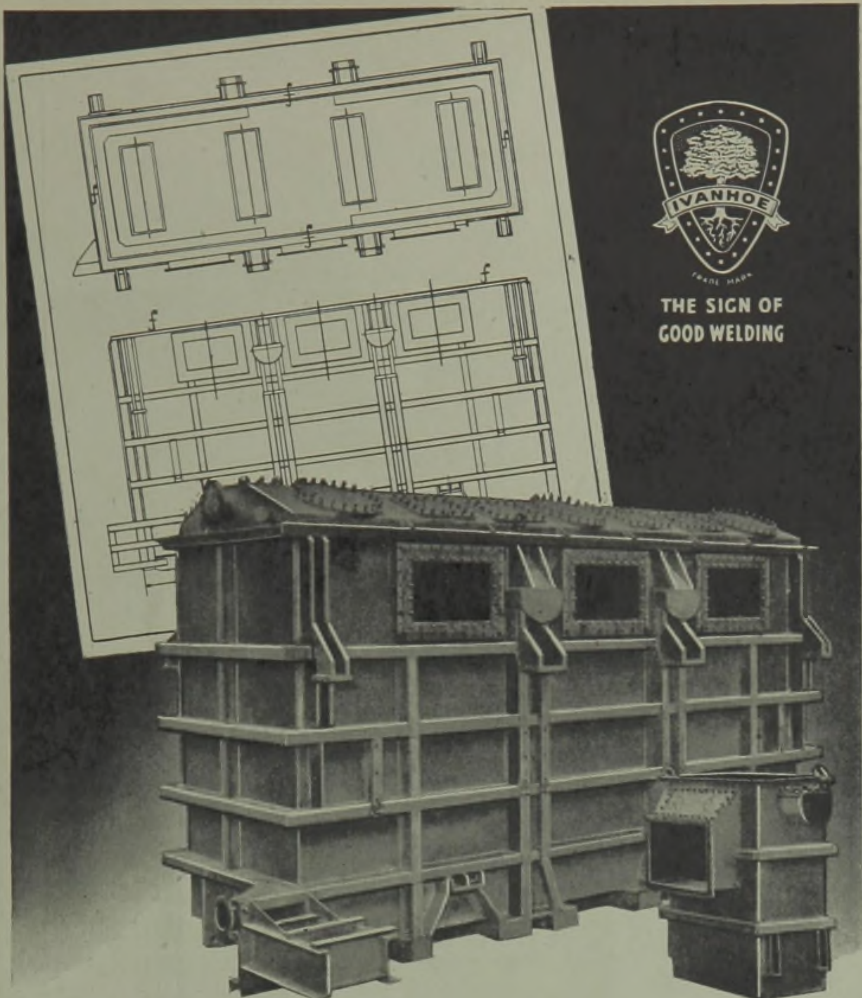

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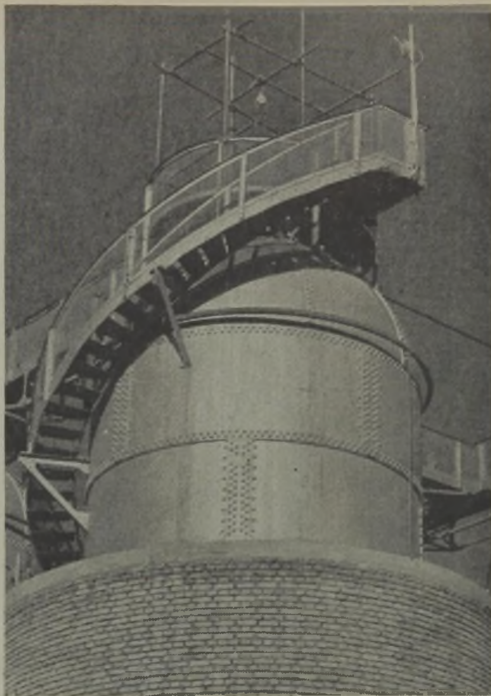

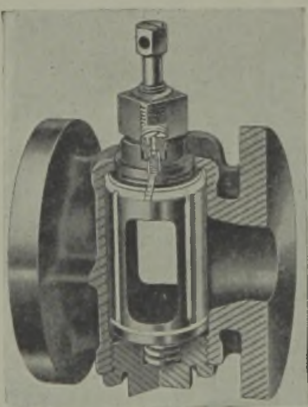

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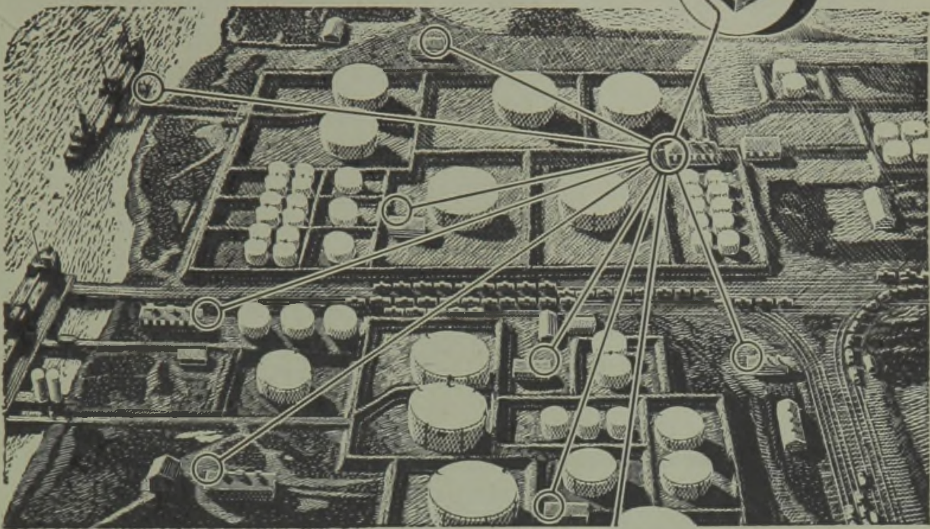

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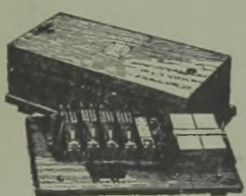

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