ABSTRACTS.

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION.	
Geology	269 A
Geophysics and Geochemical Prospecting	280 A
Drilling	280 A
Production	282 A
Oilfield Development	288 A
TRANSPORT AND STORAGE ...	289 A
REFINERY OPERATIONS.	
Refineries and Auxiliary Refinery Plant	290 A
Solvent Refining and Dewaxing	292 A
Cracking	293 A
Safety Precautions	294 A
PRODUCTS.	
Chemistry and Physics ...	295 A
Analysis and Testing	295 A
Engine Fuels	297 A
Lubricants	297 A
Coal, Shale and Peat	298 A
Miscellaneous Products ...	298 A
MISCELLANEOUS	299 A
BOOKS RECEIVED	300 A

AUTHOR INDEX.

The numbers refer to the Abstract Number.

The original papers referred to in the abstracts marked with an asterisk may be borrowed by members from the Institute Library.

Acree, S. F., 955
Adams, J. E., 881
Albert, W. C., 969
Andrews, F. M., 901
Applin, E. R., 873
Applin, P. L., 873

Baldwin, H. L., 884
Barnes, K. B., 870, 913
Beltz, E. W., 893
Berlin, C. J., 925
Blodgett, R., 956
Bolton, E. K., 966
Bray, G. T., 961
Bruce, J., 941

Calhoun, J. C., 917, 918
Cauley, S. P., 947
Clark, C. L., 945
Clark, G. L., 958
Clason, C. E., 912
Clifton, R. L., 861
Cooper, G. A., 874
Corrin, J. B., 914
Cram, J. H., 867
Culmer, T. W., 958

Dalton, S. D., 947
Davies, R. K., 967
De Golyer, E., 934
Deegan, C. J., 877
Denison, A. R., 863
Dunbar, R. O., 882

Egloff, G., 946
Ellisor, A. C., 878

Fagin, K. M., 903
Fash, R. H., 858
Finn, F. H., 914
Freeman, J. W., 945

Gester, G. C., 864
Gill, F. X., 939
Gordon, M., 871
Gough, H. C., 962

Haywood, P. J. C., 954
Heiland, C. A., 899
Heese, C. J., 879
Horton, C. W., 880

Imlay, R. W., 883

Jencks, P. J., 955
Johnson, J. H., 862
Johnson, N., 910
Jones, P. J., 919, 920

Karge, F., 936, 937
Kay, J., 954
Kettenburg, R. J., 906
Kunkel, J. H., 943

Labee, F. H., 866
Lawrence, J. S., 948
Lees, G. M., 890
Logan, D. M., 915

McGivern, P. V., 904
Maclean, M. E., 955
MacNeil, F. S., 865
Mellors, J. W., 951
Merryman, L. R., 911

Nelson, D. M., 956

Oppenheim, V., 888
Ospina-Racines, E., 930

Parks, T. D., 958
Pitzer, K. S., 949, 952
Pratt, W. E., 860
Prosen, E. J., 949, 950, 952

Romanoff, M., 935
Rossini, F. D., 949, 950, 952
Rust, W. M., 897

Sanders, V., 964
Schmidt, J. J., 914
Schmieder, F. R., 906
Scott, R. B., 951
Sheppard, C. W., 896
Showalte, H. J., 938
Short, E. H., 905
Stenzel, H. B., 879
Stuart, A. H., 942

Taylor, F. B., 923
Thompson, P. K., 965
Thornton, D. P., 959
Timmis, L. B., 953
Turner, F. E., 879

Van Wingen, H., 910

Wallace, W. E., 875
Warthin, A. S., 874
Weil, B. H., 968
Weller, G. M., 894, 895
Wells, N. C., 925
Willcox, O. W., 859
Williams, N., 876, 909, 922
Withey, S. H., 972
Wyckoff, R. D., 898

Yuster, S. T., 917, 918

Zimmerman, J., 872

OILFIELD EXPLORATION AND EXPLOITATION.

Geology.

858. Theory of Origin and Accumulation of Petroleum. R. H. Fash. *Bull. Amer. Ass. Petrol. Geol.*, Oct. 1944, **28** (10), 1510–1518.—Current opinion supports the idea that petroleum is formed from organic matter. Both animal and plant material, when deposited in sediments under saline conditions, is converted by bacterial action into relatively stable neokerogen or under slightly different conditions into the kerogen of oil shales. Final composition of neokerogen seems to be affected by: (1) composition of organic debris, (2) composition and concentration of salts in the brine, which affects the types of bacteria, and (3) composition of sediments, which affect pH and surface phenomena.

Next stage in conversion of neokerogen to oil is brought about by compaction of the sediments. This generates heat, which is practically confined to surface molecules of the particles, and in turn this heat brings about conversion of neokerogen into gas films.

These films of condensed gases then migrate into more porous zones, where increased vapour pressure occasioned by increase in diameter of the capillaries liberates gases. Since these gases are largely unsaturated, and hence reactive, they may then be converted into petroleum by catalytic effect of surfaces of sedimentary particles.

Such a porous zone may be in a syncline, and so it follows that oil can be formed in synclines. Moreover, this theory eliminates the problem of oil migration and suggests that oil does not move into, but forms in, a trap. W. H.

859. Source-beds and the Search for Oil. O. W. Willcox. *World Petrol.*, April 1945, **16** (4), 50.—Summarized results of a questionnaire on oil migration and accumulation show that it is generally agreed that oil was formed from plant and animal remains accumulated in sediments. The sedimentary basins gradually filled up, and so the older deposits, now containing hydrocarbons, were squeezed, causing their fluids to move upwards, downwards, or laterally into any adjacent porous formation which could hold them. All oil is not squeezed out of the mud, and some, mostly of high molecular weight and possibly loosely combined with the mud, remains after squeezing, thus forming an oil shale. Sands that have acted as source-beds cannot be squeezed, and in them cementation causes the expulsion. Again, some oil may remain, indicating that the sand has acted as a source-bed, or has at least afforded passage to migrating oil.

Oil will find a temporary if not a permanent place in any unconsolidated sand or porous limestone near at hand.

Large-scale palæogeographic and palæogeologic studies must be undertaken to increase knowledge of time of origin and accumulation, and of the nature of source-beds and their relations to reservoirs. Barren as well as productive structures should be studied. Regional as well as local treatment is essential. G. D. H.

860. Distribution of Petroleum in the Earth's Crust. W. E. Pratt. *Bull. Amer. Ass. Petrol. Geol.*, Oct. 1944, **28** (10), 1506–1509.—It is generally accepted that the most likely environment for the generation of petroleum is a thick series of sediments, rich in organic matter, which have formed in shallow land-locked seas. Other important factors include degree of induration and tectonic history, while such factors as unconformities, overlaps, strand lines, reefs, and bars are often concerned.

Some present "mediterraneans" mark sites of former unstable land-locked seas that had environments favourable to petroleum formation. Here isostatic adjustments allowed great thicknesses of clastic sediments to accumulate in relatively shallow water, while marine life was abundant and yielded rich organic residues. At times local emergence caused barriers to arise, which restricted tidal flow and, during periods of aridity, caused extensive desiccation.

Today there are four principal areas of land-locked seas, each coinciding with proved oil areas. They are the environs of: (1) Mediterranean, Red, Black and Caspian Seas, and the Persian Gulf, (2) Gulf of Mexico and Carribean Sea, (3) the shallow island-studded seas between Asia and Australia, and (4) Arctic Sea. W. H.

861. Paleœcology and Environments Inferred for Some Marginal Middle Permian Marine Strata. R. L. Clifton. *Bull. Amer. Ass. Petrol. Geol.*, July 1944, **28** (7), 1012–1031.—Environment of ancient seas may be reconstructed partly from evidence still existing in deposits, and partly by comparisons with environments in seas of to-day. Thus using both lithological and palæontological evidence, conditions of formation of Blaine and Dog Creek deposits (Middle Permian) have been inferred.

The rocks include limestones, dolomitic limestones, together with gypsum and anhydrite interbedded with red shales. Their occurrence and relations suggest sedimentation in partly enclosed basins, where oscillations of the floor caused variations in salinity from brackish to highly saline waters. Such conditions naturally influenced the fauna, which is remarkable for exceptional occurrence of some species, and for limited occurrence, or absence, of other species, that are normally abundant in Permian deposits. Thus bryozoans, brachiopods, and gastropods are scarce, while sponges, corals, and echinoids are absent. On the other hand, several species of the exclusively marine nautiloids and ammonoids, and many pelecypods, suggest that these associations resulted from specialized factors of environment. A thallophyte flora of three or four species is responsible for pseudo-pisolitic aggregates in the oölitic strata.

W. H.

882. Palaeontology, Petroleum and the Search for Oil. J. H. Johnson. *Bull. Amer. Ass. Petrol. Geol.*, July 1944, **28** (7), 902–908.—Until quite recently chief work of the oil-company palaeontologist has been recognition and correlation of structural traps, but now that oil search is turning towards stratigraphical traps his work has come to include exploration as well as routine development. Whatever the nature of the trap, whether it results from unconformity and overlap or from lenticular beds or reef limestones with their varied associated depositional facies, the palaeontologist can usually interpret complexities of lithologic changes where geophysics fails. There are limitations, as in the Mesozoic of the northern Rocky Mountain region, where fossils are so scarce and so poorly preserved, that other methods are used, particularly micropetrology, electric, and gamma-ray logging.

Suggestions for overcoming the grave problem of the inability to find sufficient new reserves to keep pace with accelerated war-time consumption are made, and include : (1) thinking on a wider, bolder scale, (2) placing greater emphasis on discovery, (3) overhauling of procedures, (4) much research, and (5) closer integration and co-operation of all groups.

W. H.

883. A Challenge to Geology. A. B. Denison. *Bull. Amer. Ass. Petrol. Geol.*, July 1944, **28** (7), 897–901.—See Abstract No. 922, 1944.

W. H.

884. World Petroleum Reserves and Petroleum Statistics. G. C. Gester. *Bull. Amer. Ass. Petrol. Geol.*, Oct. 1944, **28** (10), 1485–1505.—A statistical review of the oil production and reserves of the world. The United States has under half the known world petroleum reserves, and yet for many years has been producing approximately 65%. Cumulative U.S. production is 28 billion brl., against 15½ billion for rest of the world, while proved reserves total 20 billion brl., against 31–41 billions.

Indicated world crude-oil reserves are 51–61 billion brl., with uneven geographical distribution, 95% being distributed between two similar-sized areas on opposite sides of the world, the Persian Gulf and Caspian Basin in the Old World, and Venezuela, Colombia, Mexico, and the U.S. in the New World. World-wide distribution is mapped with reserve figures.

W. H.

885. Oligocene Stratigraphy of Southeastern United States. F. S. MacNeil. *Bull. Amer. Ass. Petrol. Geol.*, Sept. 1944, **28** (9), 1313–1354.—A preliminary account of the eastern Gulf Oligocene, containing a fair amount of lithological and palaeontological detail and eight measured sections, with a useful correlation table for Mississippi, Alabama, and Florida.

The author differs slightly from the Geological Survey, for he restricts the term "Vicksburg group" to the middle part of the Oligocene—namely, Marianna limestone and Byram formation. This excludes the Forest Hill sand and Red Bluff clay (Lower Oligocene), also the younger Chickasawhay limestone, together with its lateral equivalents, the Flint River formation, and Suwanee limestone (Upper Oligocene). The "Upper Chickasawhay" of previous accounts is definitely regarded to be lower Miocene on faunal evidence, and has therefore been renamed Paynes Hammock sand.

W. H.

886. Review of Exploratory Drilling in 1944. F. H. Lahee. *Oil Gas J.*, 28.4.45, **43** (51), 108.—4778 exploratory holes were drilled in U.S.A. in 1944, average depth being 4217 ft. 3843 were drilled in 1943, with an average depth of 3935 ft. 21·9% of the holes located on technical advice were producers; 10% of the others were successful. Exploratory well results in 1944 are summarized by States, and further tables give the basis for locating the tests, and distribution of different types of exploratory tests.

G. D. H.

867. Resources and Resourcefulness. J. H. Cram. *Oil Gas J.*, 31.3.45, **43** (47), 166; *Oil Wkly*, 2.4.45, **117** (5), 34.—U.S.A. oil- and gas-field areas cover about 26,000 sq. ml., about one-third giving oil. These fields have yielded 29,750 million brl. of oil, and about 61 million million cu. ft. of gas. Proved reserves are estimated at 20,000 million brl. of oil and 114 million million cu. ft. of gas. Crude oil reserve not recoverable at present prices and with existing production methods may be 25,000 million brl.

Undiscovered reserves may lie below known fields, or in 1,600,000 sq. ml. outside present fields. Only structurally or stratigraphically well-located dry holes that have been drilled through all known producing formations or through entire sedimentary column or to 15,000 ft. can be considered as truly significant; and only the second category can be taken as truly condemning. In a prospective area of about 150,000 sq. ml., mainly in the Gulf Coast States, the sedimentary column is over 15,000 ft. thick, and in this area only five wells have exceeded 15,000 ft. In the area with less than 15,000 ft. of sediments test wells to the basement are rare except where the column is less than 5000 ft. thick. In an area of 850,000 sq. ml. only 325 wells have reached basement in the depth range 5000–15,000 ft.; about half of these are in a few Californian fields, two of which produce from the basement.

Even if all dry holes reaching basement below 5000 ft. were well located, the truly condemning testing is small. Number of test wells reaching basement above 5000 ft. is inadequate in an area of about 600,000 sq. ml.

There will be no nearly conclusive evidence that the end of discovery is in sight until well-located dry holes have been drilled through the entire sedimentary column, or to limits of drilling equipment, on a high percentage of the geological anomalies that could be traps, and on traps already producing from shallower depths.

During past 25 years precision of geological investigations has been increased by use of new geological tools. Immense amounts of information have been acquired, and great additions are being made, but geologists have by no means exhausted all possibilities of making better use of this information in unravelling the geology. There is need of more geologists who can interpret, correlate, and reconcile all earth data in preparation of a single interpretation of geology of a given area. Controlled imagination is needed to bridge gaps in the information. Controlled imagination is imagination tempered by experience, knowledge, and sound reasoning.

There is need of more wildcats in wide open spaces where geological information is scarce but where much-needed new provinces may be waiting to be tapped. There is also need for deeper drilling in producing provinces. The drill is a geological tool as well as a production tool, for it acquires geological information. G. D. H.

868. Wildcat Completions and Discoveries. Anon. *Oil Gas J.*, 31.3.45, **43** (47), 345; 7.4.45, **43** (48), 135; 14.4.45, **43** (49), 170; 21.4.45, **43** (50), 164; 28.4.45, **43** (51), 182; 5.5.45, **43** (52), 145; 12.5.45, **44** (1), 165; 19.5.45, **44** (2), 181; 26.5.45, **44** (3), 193; 2.6.45, **44** (4), 129.

Week ended:	U.S. Wildcat Completions and Discoveries.			
	Oil.	Distillate.	Gas.	Total.
24th March, 1945	11	0	3	71
31st March, 1945	8	1	1	57
7th April, 1945	9	0	3	52
14th April, 1945	12	1	2	77
21st April, 1945	4	1	1	67
28th April, 1945	9	0	2	90
5th May, 1945	7	0	1	81
12th May, 1945	9	0	4	72
19th May, 1945	16	0	4	85
26th May, 1945	9	1	0	71

Tables summarize completion results by States and districts for each week.

G. D. H.

869. U.S. Reserves Gained 389,000,000 Barrels in 1944. Anon. *World Petrol.*, April 1945, **16** (4), 58.—A.P.I. committee on reserves estimates that new pools found

511,308,000 brl. of oil in 1944, while extensions and revisions to existing fields added 1,556,192,000 brl. 1944 production is estimated at 1,678,421,000 brl. At end of 1944 total reserves were 20,453,231,000 brl.

Texas added 747,790,000 brl. to reserves, Mississippi discoveries accounted for 179,533,000 brl., Louisiana discoveries 112,055,000 brl., California 76,925,000 brl., and Texas 58,103,000 brl. Texas has 55·6% of the reserves and, together with California, Louisiana, Oklahoma, Kansas, Wyoming, and New Mexico, accounts for 90% of total reserve. Tables give estimated reserves by States at end of 1943 and 1944 with make-up of the changes. Similar yearly data are presented for U.S.A. as a whole from 1936. G. D. H.

870. Arkansas is Proving Ground for Many New Practices over Past Eight Years. K. B. Barnes. *Oil Gas J.*, 21.4.45, **43** (50), 102.—An impressive amount of oil, condensate, and gas reserves has been found in the Lower Cretaceous and Jurassic of the four southernmost counties of Arkansas. During the past eight years about 325,000,000 brl. of reserves has been proved.

El Dorado pool was found in 1920 and has produced 49,346,784 brl. from the Nacatoch (Upper Cretaceous). In 1922 Smackover was opened, also in Upper Cretaceous. It has produced 402,638,352 brl. Ten other pools, mainly in Upper Cretaceous, were developed up to 1937. Starting in 1937, the Cotton Valley and Smackover pays have provided the pays of newer discoveries.

In southern Arkansas the Lower Cretaceous and Jurassic dip south and southwest, with local uplifts on the general monocline. Most uplifts have been located by seismograph. Formations are near-shore shallow-water deposits. Magnolia and Midway are main Smackover limestone pools, while principal Cotton Valley sand production is at Schuler, Dorcheat-Macedonia, and New London.

Gas-cap injection has been carried out at Schuler, where prior to this treatment pressure declined 1950 lb./sq. in. for a production of 19,000,000 brl., but in 1944 under this treatment the pressure fell only 4 lb./sq. in. for a production of 3,567,489 brl. Under gas return the recovery is expected to be 54,000,000 brl., 20,000,000 brl. more than expectation under primary production methods.

At Midway pressure has been maintained by fresh-water injection. Without injection recovery was expected to be 28,000,000 brl., but with injection it may be 67,000,000 brl. All Smackover lime-pools show edge-water advance, although there is no known outcrop of this formation. Water injection is to take place at Magnolia also.

Data are tabulated concerning subsurface conditions, reservoir character, and performance for Arkansas fields, and computed water influxes are given for Smackover limestone pools. Pressure-production data are shown for several pools. G. D. H.

871. Moorefield Formation and Ruddell Shale, Batesville District, Arkansas. M. Gordon, Jr. *Bull. Amer. Ass. Petrol. Geol.*, Nov. 1944, **28** (11), 1626–1634.—In the Batesville district there is a considerable sequence of black calcareous shale, limestone, and fissile clay shale, overlying Boone formation and underlying Batesville Sandstone. Originally this constituted the Moorefield formation, the calcareous members being called the Spring Creek Limestone. It is now proposed to restrict the name Moorefield formation to the lower calcareous member, and to call the upper clay member the Ruddell shale.

Moorefield formation is locally very fossiliferous, and is equivalent to the British P1 (G1) or *Goniatites crenistria* zone. Although there is no direct evidence, it may be the same age as the St. Louis limestone. Ruddell shale is rather sparsely fossiliferous, but locally individuals are abundant, though species are few. Together with overlying Batesville sandstone it can be correlated with the British P2 (G2) or *Goniatites striatus* zone. Tentatively the Ruddell shale is correlated with Ste. Genevieve limestone of the Mississippi valley. W. H.

872. Tumey Sandstone (Tertiary), Fresno County, California. J. Zimmerman, Jr. *Bull. Amer. Ass. Petrol. Geol.*, July 1944, **28** (7), 953–976.—After a brief historical review, the author gives a lithological and palæontological description of the Kreyenhagen formation, with particular reference to the Tumey Sandstone. This sandstone occurs as a large lens in the shale of the lower and upper Kreyenhagen formation. Its contact with the upper Kreyenhagen shale is gradational, and therefore conformable, but its basal relations are not so simple. Some geologists favour an unconformity, because of the uneven junction and presence of a conglomerate near the base of the sandstone, but nevertheless there are several features that militate against this. For instance, in some places junction is gradational, and what might be considered as an angular unconformity may be explained as sandstone dykes.

The sandstone is considered to be a deposit formed in a narrow strait connecting the open sea with a large inland body of water, analogous to the present Golden Gate. Heavy and light mineral examination suggests that source is in the Sierra Nevada, while rainfall must have been plentiful to have supplied the necessary river transportation of the coarse detritus. Biological evidence favours marine deposition in the neritic zone, during Refugian time (Eocene-Oligocene). W. H.

873. Regional Subsurface Stratigraphy and Structure of Florida and Southern Georgia. P. L. Applin and E. R. Applin. *Bull. Amer. Ass. Petrol. Geol.*, Dec. 1944, **28** (12), 1673–1753.—See Abstract No. 857, 1944. W. H.

874. Middle Devonian Subsurface Formations in Illinois. A. S. Warthin, Jr., and G. A. Cooper. *Bull. Amer. Ass. Petrol Geol.*, Oct. 1944, **28** (10), 1519–1527.—Subsurface Middle Devonian in Illinois is correlated and illustrated by 14 well log sections.

Grand Tower limestone and Dutch Creek sandstone are together considered the equivalent of the Geneva dolomite. Limestones of Hamilton age are only equivalent to part of the New York State Hamilton formations, for the Moscow and upper part of the Ludlowville is absent. The Alto formation is thought to be post-Hamilton in age, and partly equivalent to, but chiefly younger than, the Cedar Valley limestone in Illinois. W. H.

875. Structure of South Louisiana Deep-Seated Domes. W. E. Wallace. *Bull. Amer. Ass. Petrol. Geol.*, Sept. 1944, **28** (9), 1249–1312.—All the structures mentioned lie within a 75 ml. wide coastal belt, and are part of the north flank of the Gulf Coast geosyncline. They occur at varying depths, but particular reference is made to deep-seated domes in which salt has not been reached. Examples are cited from 14 oilfields, and each is fully illustrated with a structional map and electric log sections.

The domes are seen to contain one or more normal faults with dips ranging from 45° to 63°, and throws up to more than 900 ft. These faults characteristically form grabens, and probably in every case a graben overlies a salt plug. In a few cases, however, strikes and dips are all similar, giving an offset dome, but further exploration will probably reveal other faults with opposing dips, to complete a graben.

Deep-seated domes are the direct result of the upward movement of a salt plug. At first gentle doming occurs, and then, with continued uprise of the plug, faults are developed in a definite sequence.

Present distribution of oil and gas has a two-fold cause, related to the various stages of formation of the dome, and general location of oil and gas depends on position of original gentle dome, while specific location is dependent on segmentation of the dome by faulting. W. H.

876. Mississippi Drilling Activity at New High with 80 Rigs now Running in State. N. Williams. *Oil Gas J.*, 21.4.45, **43** (50), 92.—80 rigs are now running in Mississippi, 30 being in so far unproductive areas scattered over 22 counties. 200 wells were drilled in 1944; 85 have been completed this year, 45 being producers. 18 fields have been discovered, including 3 dry gas areas. There are 26 shallow and medium-depth piercement-type salt domes. Geophysics has indicated the presence of further salt domes. Although almost all the present fields are believed to be associated with salt domes, only one of the known domes (Bruinsburg, Claiborne County) has so far proved productive. This gives gas, while others have had oil and gas showings, but no extensive drilling has been done round them.

Excepting Amory, all known fields and domes are in a belt extending across the central and southern part of the State. All but two fields and two salt domes have been discovered since 1939, and 13 fields and 18 domes have been found in the last two years. Most of the fields which have been appreciably developed show highly complex faulting. Producing horizons generally contain numerous thin, irregular stringers of sand. Drill-stem testing is most important. Core and electrical log evidence is frequently misleading.

Tinsley appears to be the largest field so far developed. It has produced 77,000,000 brl. and has an estimated remaining reserve of 35,000,000–40,000,000 brl. A deep test is now being drilled at Tinsley. The Pickens field also is drilled up in its present producing sands. Its ultimate recovery is expected to be about 16,000,000 brl. Cranfield, Heidelburg, and Eucutta are the only other fields which have been appreciably developed. Cranfield seems to be the most important from point of view of productivity. The other two are of relatively large areal extent, but wells are comparatively small and give low-gravity oil under low pressure conditions. Gas-condensate production has been found in several areas (Cranfield, Gwinville, Baxterville, Carthage, Hub, Soso).

The fields are listed, with discovery date, producing formation, depth, number of wells, and cumulative production. A map shows fields and salt domes. G. D. H.

877. **Electrical Logging Widely Employed in Rocky Mountain Exploratory Tests.** C. J. Deegan. *Oil Gas J.*, 7.4.45, **43** (48), 60.—Nearly all wells now drilled in Rocky Mountain area are electrically logged for purposes of correlation and interpretation of fluid content. Log patterns are unusual, due to fresh formation waters, low permeability, and rapid lithological changes. The first feature leads to small self-potentials unless mud water is very fresh. On the other hand, fresh water in formations often gives high resistivities, and low porosity leads to very large resistivities, especially in the Palæozoic beds. Thus producing formations give a lower resistivity than adjacent low-porosity beds. Computational methods have been developed for evaluating water-saturation of the beds, and such methods are widely used.

Low permeabilities give comparatively high water-saturations, even in producing horizons, and thus there may be no sharp line of demarcation between oil- and water-bearing zones. Low permeability and heavy oils give fairly thick oil–water transition zones from which wells produce both oil and water, for a water shut-off is impossible.

Some geologists maintain that the present tectonic picture is largely post-Cretaceous development; only by going back to the major positives of Palæozoic time can the general pattern of favourable structures be discerned. Structures formed in shelf area of relatively shallow Palæozoic seas could contain Palæozoic oil. It is also claimed that chances of finding Jurassic, Cretaceous, and possibly Tertiary oil are much better in structures formed in Palæozoic times.

A map shows the major Palæozoic positive areas, and shelf areas. G. D. H.

878. **Anahuac Formation.** A. C. Ellisor. *Bull. Amer. Ass. Petrol. Geol.*, Sept. 1944, **28** (9), 1355–1375.—Subsurface Middle Oligocene of Texas, consisting of three zones, Discorbis, Heterostegina, and Marginula, has now been designated as the Anahuac formation. Diagnostic foraminifera of the Anahuac are listed and illustrated by seven full-page plates.

History of the elucidation of the stratigraphy is discussed, beginning with the first finding of characteristic fossils in 1921. Emphasis is laid on various interpretations of palæontological evidence with reference to lateral correlations. A short lithological description is supported by an electric log of the type section, and a vertical section across Texas. W. H.

879. **Brackish and Non-Marine Miocene in Texas.** H. B. Stenzel, F. E. Turner, and C. J. Hesse. *Bull. Amer. Ass. Petrol. Geol.*, July 1944, **28** (7), 977–1011.—Subsurface zone of Potamides matsoni reaches the surface near Burkeville, Newton County, Texas, and here fossil assemblage is of great interest. In addition to zonal fossil and several other invertebrates, there are also vertebrate remains, which include beaver, camel, horse, and rhinoceros. Thus it is possible to correlate both surface and subsurface strata, and moreover to determine their age as undoubted Miocene.

As the beds are characteristically highly irregular or lenticular, it is not possible to trace any one bed throughout all exposures. Their lithology is described, and illustrated with several measured sections. Essentially they consist of light-coloured, greenish-grey shales and silts, with thin layers of roundish calcareous concretions, and occasional layers of conglomerates, apparently derived from earlier formed concretionary clay beds. Much rarer, however, are some large, flat, calcareous nodules, and although mostly unfossiliferous, they have yielded vertebrate remains. At one locality the silts, which are frequently cross-bedded, show evidence of subaqueous slipping during Miocene times.

A detailed study is then made of the mixed assemblage of fossils. Together with lithological evidence, it is concluded that the beds were deposited near the mouth of a river system, emptying into a brackish-water lagoon, along the Miocene coast of Texas.

W. H.

880. Salt Diffusion in Woodbine Sand Waters, East Texas. C. W. Horton. *Bull. Amer. Ass. Petrol. Geol.*, Nov. 1944, **28** (11), 1635–1641.—A mathematical treatment of the problem with results stated simply in words and illustrated with an isosalinity contour map of the area. It appears that salt distribution in Woodbine sand waters west of Mexia fault-zone may be explained by diffusion, if effective coefficient of diffusion is 250–300 times its normal value. Elsewhere in this formation convection currents have been demonstrated, and in this case their presence would explain the greatly increased rate of distribution. Although water analysis data are scanty, it appears that the Boggy Creek salt-dome figures can be explained on the basis of diffusion from a cylindrical source. W. H.

881. Upper Permian Ochoa Series of Delaware Basin, West Texas, and Southeastern New Mexico. J. E. Adams. *Bull. Amer. Ass. Petrol. Geol.*, Nov. 1944, **28** (11), 1596–1625.—Permian rocks of the Delaware basin and its bordering uplifts have been selected as the standard section for North America. The system is divided into four series—namely, Wolfcamp, Leonard, Guadalupe, and Ochoa. The Ochoa contrasts strongly with the others in being very poorly exposed, and practically non-fossiliferous, in consequence of which it has been inadequately described. For these reasons the subsurface section has been taken as the type, and this paper gives a comprehensive account of available information, illustrated with diagrammatic sections.

Early Ochoa sediments are limited to the Delaware basin depression, but later beds are more widespread and rest unconformably on the Guadalupe. Consisting of light-coloured evaporites, they contrast strongly with the marine sands, dark shales, and limestones of the underlying series, and constitute the most easily recognized stratigraphic break in the Permian section.

The series is divisible into four formations : Castile, Salado, Rustler, and Dewey Lake. Fletcher anhydrite is taken as basal member of Salado, and so restricts Castile to the Delaware basin, but unfortunately this dividing horizon cannot everywhere be recognized.

Castile has an average thickness of 1500–1850 ft., being mainly composed of calcite-banded anhydrite, salt, and limestone, but no potash salts have been recorded. The characteristic calcite-banded anhydrite shows many variations in nature of banding, and these are discussed with consideration of their origin. As in all other Permian formations of the area, the calcium sulphate of outcrops and of subsurface sections to a depth of about 500 ft. tends to be gypsum, while in deeper beds it is almost everywhere anhydrite.

Salado is a thick formation that follows unconformably, accompanied by marked changes in distribution and lithology. In spite of these differences, it is often a matter of difficulty to determine its base. Salt is more abundant than gypsum, while potash minerals increase towards the top. Red and grey sands and silts are encountered in many parts of the Salado, but one sandstone, called the Vaca Triste, is a useful stratigraphical marker. Outside the salt areas, dolomite becomes more prominent, and some beds can be correlated from well to well.

Rustler, which consists largely of evaporites, was laid down after a period of uplift and erosion. Oldest deposits are clastics, consisting of coarse siliceous conglomerates, coarse grey sandstones, coarse dolomite conglomerates, and bedded grey and buff dolomite. Along the southwestern limits of Rustler area, the lower anhydrites grade into dolomites and the dolomites into limestones, while towards the northeast edge of the basin much of the anhydrite grades into salt. Unlike Salado, the Rustler crops out over widely scattered areas, and a measured section is given for a locality east of Pocos River.

Contact of Rustler and overlying Dewey Lake appears to be conformable. Its redbeds, which reach a maximum thickness of about 350 ft., contrast strongly with underlying Ochoa evaporites. They are distinguished from overlying Trias by such characters as their less red colour, small gypsum content, and rather greater compactness.

Origin of the various evaporites in the Ochoa series is discussed. W. H.

882. Como Bluff Anticline, Albany and Carbon Counties, Wyoming. Robert O. Dunbar. *Bull. Amer. Ass. Petrol. Geol.*, 1944, **28**, 1196–1216.—Como Bluff anticline is a westward-plunging transverse fold in central part of Laramie basin. It is strongly asymmetric, being formed by an approximate northwest-southeast compression, and is faulted on its steep northern flank by the North Como thrust.

Stratigraphy of the Laramie basin is discussed with an accompanying map and two sections of the anticline. Strata exposed range from Chugwater formation (Permian) to Frontier formation (Cretaceous); of these Morrison formation is the most interesting, as it has yielded many reptilian remains. W. H.

883. Cretaceous Formations of Central America and Mexico. Ralph W. Imlay. *Bull. Amer. Ass. Petrol. Geol.*, 1944, **28**, 1077–1195.—Correlates existing knowledge concerning the Cretaceous of Central America and Mexico, with addition of straigraphy of Santa Elena area of E. Chihuahua, which is described for the first time. It emphasizes spacial rather than time relations, treating much of the information in sections under locality headings. Nevertheless there is a clear summary of stratigraphy of the area as a unit, illustrated by several palæogeographical maps, and a bibliography with over 150 references.

Geology of the Santa Elena area is illustrated by a horizontal section representing 11,063 ft. of strata. It is noteworthy for tremendous thickness of the late Coumache, and for considerable lithological differences from the section in Sierra de Mojado only 50 ml. south. W. H.

884. Tupungato Oil Field, Mendoza, Argentina. H. L. Baldwin. *Bull. Amer. Ass. Petrol. Geol.*, Oct. 1944, **28** (10), 1455–1484.—First well on Tupungato oilfield was begun in 1934 and struck oil in a sand at 250 metres. 17 wells were later drilled to depths between 400 and 550 metres, nearly all of which found oil with strong flows of salt water at varying stratigraphical levels. To the middle of 1941, 63,000 brl. had been produced. Oil was similar to that of the Cacheuta field, with an average sp. gr. of 0·88 (29·5° A.P.I.), and a very high viscosity at average atmospheric pressure.

It was soon recognized that the chief prospects lay in possibilities of deeper production from sands of the Potrerillos formation. After several technical boring difficulties had been overcome, the discovery well of the Victor zone of Upper Triassic age was completed in 1938 at a depth of 1796 metres. This zone gave a peak production of 9400 brl. per day in Oct. 1941 from 17 wells. By Aug. 1942 26 wells had been drilled to this zone, of which 24 were productive.

Stratigraphy is exemplified by a small-scale geological map, together with a correlation table of pre-Tertiary sections of 6 oilfields in northern Mendoza. Quaternary deposits, which include loess, rest with a marked angular unconformity of great magnitude on Tertiary deposits. These latter, which possibly include some Pleistocene, reach a thickness of at least 3000 metres, and are characterized by very poor sorting and stratification. Conglomerates containing pebbles and boulders of earlier Tertiary andesites are common, as well as a large percentage of tuffs, ashes, and lapilli. A number of unconformities have been reported, but their nature is not always clear.

Below the Tertiary is a second great unconformity, for the next system is the Trias, or possibly early Jurassic. Trias lithology is varied, and includes a red conglomerate, base of which is a useful marker, sandstones, bituminous shales, and a variety of volcanic material.

Of particular interest is the oil-producing Dark Victor, which consists of about 300 metres of highly altered and intensely fractured tuffs with interbedded shales. Potrerillos sandstones, although of low average permeability due to their tuffaceous character, have produced some oil, but their importance has not yet been definitely proved. Existence of other oil-bearing formations at greater depths is considered possible.

Principal tectonic features of the region are low-angle thrust faults, undoubtedly

formed by compressive stresses from the west during late Tertiary or early Quaternary. Two major lines of folding are present, and the Tupungato field is located on the more westerly. Structure of the Tupungato field is discussed with several contoured maps and a cross section, and is shown to be a closed dome with a faulted west flank.
W. H.

885.* Northern Ecuador Wildcat Abandoned at 5118 Feet. Anon. *Oil Wkly*, 9.4.45, **117** (6), 82.—Camarones 1 wildcat southwest of Esmeraldas was abandoned at 5118 ft. No shows were encountered.
G. D. H.

886.* Colombian Firm has Three Tests Under Way in Barco. Anon. *Oil Wkly*, 26.3.45, **117** (4), 62.—Two Cretaceous wells have been drilled in the Tibu field, 1 on the Socuavo structure and 1 on the Tres Bocas structure. Both blew in as distillate producers and are shut in. All commercial production at Tibu so far is from the Eocene. A more conclusive test of the Cretaceous is under way.
G. D. H.

887.* Shell Mara Strike Revives Interest in Northwestern Zulia, Venezuela. Anon. *Oil Wkly*, 23.4.45, **117** (8), 82.—In March 1945 a wildcat was successfully completed 23 ml. north of the La Paz field, District of Mara, Zulia. Output of 28-gravity oil is said to be about 10,000 brl./day. This is classed as a major strike and is first important discovery since the La Paz and Concepcion fields were opened in 1925. Production is from Cretaceous, which rises to the west, and may be the source of many seeps and asphalt lakes which inspired early exploration in western Mara. 6 km. to the south-east, on a parallel structure, a gas-well was completed in a shallower horizon in 1944.
G. D. H.

888.* Brazil's Oil. V. Oppenheim. *Oil Wkly*, 9.4.45, **117** (6), 60.—Brazil's oil consumption is about 10,000,000 brl./year.

The greater part of Brazil comprises an old shield covered by mainly flat-lying or metamorphosed sediments of early Palæozoic to Mesozoic age. There are 4 prospective oil-bearing areas. The Parana basin lies west of the shield and is the eastern extension of the great Chaco depression. It contains Permo-Triassic sediments. There are patches of continental Tertiary in the west. Beneath the Permian or Permo-Carboniferous there are areas of Lower Devonian sandstones and shales. Generally the sediments of the Parana basin are continental. There are many igneous intrusions and flows. The basin is extensively faulted. There are numerous outcrops of the highly bituminous Iraty shales, and the Triassic Botucatu sandstones are oil-impregnated, but no active oil-seep is known in southern Brazil. Oil-shows found in borings originated in the Iraty formation. As a whole the conditions are not favourable.

The coastal strip of sediments from Victoria to Maranao are mostly continental Tertiary and Cretaceous deposits. The strip is narrow, and flat-lying on the edge of the shield. Sedimentary cover is thicker and wider in the Bahia and Alagoas basins, where seeps and oil-shales are known. Bahia basin has Tertiary beds resting on Cretaceous. At least 8000 ft. of beds occur, the Tertiary being continental, and Cretaceous mostly marine. A non-commercial accumulation of heavy paraffinic oil was found near Bahia in 1939. Up to middle of 1944 about 60 wells were drilled in the basin, and 16 produce small amounts of oil. Prospects do not seem very favourable. Oil-shales occur in Alagoas area, probably in Eocene rocks. Oil-shows have been found in borings.

In the Lower Amazon basin borings not exceeding 500 ft. in depth have been made, and traces of oil and gas have been found. Formations drilled were Lower Devonian shales and limestones.

In the Upper Amazon basin and Acre there is a blanket of Upper Tertiary and Quaternary formations. Drilling or geophysical work will be needed to determine depth of the basin. Some borings have been made in unsuitable localities. It is apparent that the Andean folding has affected the western edge of the Acre Territory and may have created favourable structures. Further field work is needed.
G. D. H.

889.* Haitian and Dominican Tests are Abandoned. Anon. *Oil Wkly*, 9.4.45, **117** (6), 82.—Commendador wildcat of the Dominican Republic has been abandoned, and second Maissade test, 30 ml. northeast of Port au Prince Haiti, is to be abandoned. G. D. H.

890.* Oilfields in Great Britain. G. M. Lees. *Nature*, 1945, **155**, 567.—During the last ten years intensive geological and geophysical prospecting by d'Arcy Exploration Co. has yielded over 300,000 tons of good-quality crude oil. Structure and location of the British fields are described. Drilling of nearly 100 exploration borings and use of seismic arc surveys have also revealed substantial coal-seams and deposits of potash salts in certain areas. Rural spoliation has been negligible. S. J. L.

891.* Russian Turkestan has New Gas-distillate Field. Anon. *Oil Wkly*, 23.4.45, **117** (8), 82.—At Palvan Tash, near Tashkent, a new gas-distillate field has been discovered. Production is from a Triassic pay corresponding with that which produced but was abandoned at Wu Su, Sinkiang Province, China. 130 ml. east of Tashkent a similar high-gravity field was opened at Andijan in 1942, and now has 12 producing wells. G. D. H.

892.* Second Producer Complete in Punjab, India, Field. Anon. *Oil Wkly*, 23.4.45, **117** (8), 82.—A second well has been completed in the Joya Mair field. Both wells are shut in pending special arrangements being made for refining the heavy black oil. G. D. H.

893. Principal Sedimentary Basins in the East Indies. E. W. Beltz. *Bull. Amer. Ass. Petrol. Geol.*, Oct. 1944, **28** (10), 1440–1454.—Interpretation of the general geology of the East Indies to aid oil discovery is not easy because of large gaps in areal geology between the islands. To some extent the problem is simplified because the oil possibilities lie almost entirely in the Tertiary.

A number of islands, particularly those along the island arc, are geoanticlines with exposed cores of pre-Tertiary rocks, and are flanked by Tertiary geosynclines. Tertiary is nearly everywhere unconformable on older rocks, with basal strata ranging in age from Eocene to Pliocene. Locally the succession is almost complete, and reaches a thickness of 10,000–12,000 metres, but where only Miocene and Pliocene are present it is reduced to between 5000 and 9000 metres.

Geosynclines reached their greatest extent in late Oligocene and lower Miocene, when marine sedimentation was widespread, but in upper Miocene times gentle warping and erosion affected some areas, and in other areas there was an intermingling of marine, brackish-water, and fresh-water deposits. In Pliocene times the geosynclines were broken into a number of local basins in which, over much of Sumatra, Borneo, New Guinea, and part of Java, terrestrial sedimentation was predominant, while elsewhere marine sediments, including foraminiferal marls and clays, with some limestones, were laid down. A late Pliocene orogeny then affected some areas, but was followed by a late Pleistocene transgression, especially around the old landmasses of Asia and Australia.

Oil production in the East Indies to 1940 totalled nearly 1 billion brl., and is tabulated with age of producing formations. Most likely and more accessible structures in the Miocene and Pliocene have been tested, except in New Guinea, and remaining structural prospects lie in less attractive, complicated structures. In Borneo the Eocene yielded over 30,000 brl. in 1939, so all areas where this system is within easy reach of the drill should be explored. The Triassic of Timor and Boeton and Cretaceous of New Guinea have some oil indications, but this is only of subordinate interest at present.

Stratigraphic traps are present, particularly at the sub-Tertiary unconformity, but they have received attention only in Sumatra and Borneo. W. H.

894. Outline of Chinese Geology. J. M. Weller. *Bull. Amer. Ass. Petrol. Geol.*, Oct. 1944, **28** (10), 1417–1429.—See Abstract No. 924, 1944. W. H.

895. Petroleum Possibilities of Red Basin of Szechuan Province, China. J. M. Weller. *Bull. Amer. Ass. Petrol. Geol.*, Oct. 1944, **28** (10), 1430–1439.—See Abstract 927, 1944. W. H.

Geophysics and Geochemical Prospecting.

896. Radioactivity and Petroleum Genesis. C. W. Sheppard. *Bull. Amer. Ass. Petrol. Geol.*, July 1944, **28** (7), 924–952.—Consideration of source materials, their deposition and later environment, leads to a discussion of thermodynamics and kinetic aspects of possible formation of petroleum through the agency of radioactive radiations, especially the alpha-particles. It is concluded that it is not possible to say to what extent radioactive processes are significant in petroleum genesis, but it is clear that several branches of science are involved simultaneously, as is the case in all natural processes. W. H.

897.* How to Judge Geophysical Methods. W. M. Rust. *Oil Wkly*, 9.4.45, **117** (6), 56; *Oil Gas J.*, 7.4.45, **43** (48), 62.—Geophysical methods must involve physical measurements of some property of the earth, and measurements must give reproducible results. The methods must be able to compete, on the basis of economics, with existing techniques. They must have a significant relation to the occurrence of oil, and must have a teachable mode of interpretation.

The physical property used should be identifiable, or at least should be capable of giving data in accordance with some definite manipulative technique. Repeatable secondary data should be obtained from reproducible primary data by straightforward means with a minimum of personal judgment. For a new method to be acceptable it is not necessary that it should make all existing methods obsolete. Suitable tests are needed for evaluating the matter of significant relationship to oil occurrence. These may at times be difficult and expensive. Because of limitations of present methods, a new method could prove very useful and yet have a fairly high ratio of failures. A new method which gave one discovery among five wildcats would be a serious competitor of the seismograph.

It should be possible for a trained interpreter to derive from the primary data information which is usable in the search for oil, and the process used in this derivation must be one which may require intelligence, experience, and judgment, but not guesses or arbitrary choices. Two skilled interpreters should usually arrive at very similar answers. G. D. H.

898. Geophysics Looks Forward. R. D. Wyckoff. *Bull. Amer. Ass. Petrol. Geol.*, July 1944, **28** (7), 909–918.—See Abstract No. 861, 1944. W. H.

899.* Geophysical Prospecting Increased 30% in 1944. C. A. Heiland. *World Petroleum*, March 1945, **16** (6), 46.—During 1944 the average number of geophysical oil prospecting crews in the field in U.S.A. was 451, 111 more than in 1943. Seismic operations represented 67% of total, and gravimeter 28%. Seismic work was 18·5% above 1943 average, and gravimeter operations 73% above. Electrical logging operations have risen from about 12,000 in 1941 to 15,600 in 1944. Total expenditure on geophysical work and electrical logging in 1944 may have been $40,000,000, 28% more than in 1943.

About 55% of geophysical activity was in Texas, Louisiana, Mississippi, Alabama, and Arkansas. A number of 1943 discoveries in which geophysics played a part are mentioned, with brief comments. During 1944 Canadian geophysical activity was mainly in Alberta and Saskatchewan, and activities in South America increased. G. D. H.

900. Expansion of Foreign Exploration Calls for More Geophysical Activity, S. E. G. is Told. Anon. *Oil Gas J.*, 14.4.45, **43** (49), 94.—65 geophysical crews were engaged in foreign operations in last quarter of 1944. A 50% increase is expected in 1945. 94% of the foreign geophysical crews operated in the Western Hemisphere in 1944, and a similar proportion is expected in 1945. Two-thirds of the parties will be in the Caribbean area. A table summarizes the foreign geophysical operations by areas and methods, and gives estimates for 1945. G. D. H.

Drilling.

901.* Synthetic Rubber's Contribution to Oil-Field Operations. F. M. Andrews. *Oil Wkly*, 26.3.45, **117** (4), 33.—Use of synthetic rubber in drilling for, and producing oil, where rubber of special properties of resistance to oil and other agents is required, is discussed and illustrated. A. H. N.

902. Portable Drilling Unit is Developed for Slim Holes in Exploration Work. Anon. *Oil Gas J.*, 14.4.45, **43** (49), 108.—A portable rig, specially designed, with a total weight of about 800 lb. which can be assembled in 30 min. by a crew of 4, and dismantled in 20 min., is described. It is used for drilling exploratory and shot holes. A. H. N.

903. Casing Shoe is Designed to Protect Open Pay-Zone. K. M. Fagin. *Petrol Engr.*, April 1945, **16** (7), 93–94.—A new casing-shoe design is described. Its purpose is to assure maximum initial and ultimate oil and gas production by preventing accidental blocking-off of saturated strata when cementing the production string. It combines a regular drillable guide and float-valve assembly with a double rubber full-hole packer. A bridging ball is used to expand the packer and open upper side ports that direct cement flow outward and upward around casing. When set against firm formation, the packer is designed to prevent any cement from entering or sheathing any permeable layers of the pay-zone that were drilled and left exposed below the shoe. Thus, employment of this device is intended to provide mechanical insurance that cement will not interfere with successful completion of new oil and gas wells. Lower part of shoe contains a regular bakelite guide and back pressure-valve. Above, on the outside, are two packer rubbers separated by a sliding steel wedge-ring. Immediately above are four keyhole-shaped slots in the shoe. These are covered internally with a bakelite sliding sleeve-type valve consisting of an inverted valve seat fastened with shear pins to a sliding metal outer sleeve resting on top of the packer rubber. Fluid cannot pass through these four keyhole-shaped ports so long as the sleeve valve remains pinned in original position. Rubber gaskets are inserted in the bakelite sleeve to prevent mud or cement from by-passing the sleeve. A slip-type lock inside the upper steel sleeve prevents it from sliding back up, partly closing the ports and relaxing the rubber packing, after the packers have once been set. Bakelite valve sleeve has a seat for the bridging ball, which is dropped or pumped in from derrick floor when the shoe is in position to be set at casing point. Setting and use of the shoe are described. A. H. N.

904.* Coring with Cable Tools. P. V. McGivern. *Oil Wkly*, 16.4.45, **117** (7), 40.—The need for cable-tool coring is explained. To obtain maximum and satisfactory results, the barrel must be run in on a wire line with a stiff socket. Should only a swivel socket be available, it should be locked to make it stiff. This may be done by inserting a short piece of hard wood in the joint between the pin of the jars and the socket mandrel before the joint is made up. The piece should be long enough to prevent the swivel mandrel from working. Use of a " cracker " will seldom result in any recovery. Jars should be regular drilling jars, not fishing-jars, and should be run between the socket and stem, or sinker. A stem ordinarily used in the size hole being drilled should be used, for as much steel as would normally be used in drilling is preferable to less weight. The barrel itself should be screwed into the stem and should be inspected carefully and washed out after each run, to insure valves being in proper working order. Stroke of the barrel is limited to approximately 5½ ft.

Since the barrel depends on the fluid-actuated valves for its proper operation, it is necessary to keep it submerged in the drilling fluid at all times, necessitating carrying at least 35 ft. of fluid—either oil, water, or drilling mud of light weight—in the hole while coring. Speed with which the barrel may be run varies with amount of fluid in the hole, its density, and formation being cored. Speed should be such as will allow the barrel to drop freely and travel the full stroke. This can usually be done by running from 28 to 35 strokes/min. with a fairly slack line. Too tight a line will cause the barrel to lift the core tube off bottom each time, breaking the core. Core tube or inner tube should never leave bottom while the core is being taken. Since capacity of the tube is approximately 6 ft., it is advisable to run a sand pump or bailer after each run, to obviate the tube being partly filled with cavings and cuttings on the next run. If formation is one that quickly wears drill shoes out of gauge, it is a good idea to round ream the hole frequently. In any event a new drill shoe should not be run before reaming, as it is very apt to stick. Precautions to be taken are discussed. A. H. N.

905. World's Longest String of 7-in. Casing is Set in Gulf Coast Well. E. H. Short, Jr. *Oil Gas J.*, 14.4.45, **43** (49), 113.—Operations and precautions taken in cementing more than 2½ miles of 7-in. casing with 1000 sacks of cement are briefly described. A. H. N.

906. Oil-Well Casing Failures. R. J. Kettenburg and F. R. Schmieder. *Oil Gas J.*, 14.4.45, **43** (49), 116. (*Paper Presented before American Petroleum Institute.*)—Cases of failure are discussed in detail in an attempt to analyze the causes and mechanisms of casing failure. Casing testing is discussed. A. H. N.

907. Texas Regains Depth Record. Anon. *Petrol Engr.*, April 1945, **16** (7), 192.—For at least the fourth time in history, the State of Texas can claim title to the deepest well in the world. Phillips Petroleum Co.'s. Fannie Schoeppe No. 3, near Millican in Brazos County, Texas, is reported to be about 400 ft. deeper than the Standard of California's K-C-L 20-13 well in Kern County, California, which reached 16,246 ft. in Dec. 1944. A. H. N.

908.* Diesel Power Oil Drilling in California. Anon. *Oil Wkly*, 9.4.45, **117** (6), 50–51.—Use of two 6-cyl. diesel engines in a heavy-duty rig, where the engines can be either compounded or operated singly, is described. Some details of engines, fuel system, draw-works, and controls are given. Engines are completely enclosed with dustproof and oil-tight covers. Working parts are accessible, as covers can be removed from large frame openings to permit easy inspection and adjustment. Parts normally requiring service are light enough in weight to permit easy handling by one man, and conventional design makes the service of a skilled diesel engineer unnecessary. H.p. ratings are reportedly conservative, and permit a large overload capacity for temporary emergencies and for quickly starting out of the hole with a long drill-pipe load. A. H. N.

909. Precautions in Drilling Control Aid Deep Development at Cranfield. N. Williams. *Oil Gas J.*, 14.4.45, **43** (49), 102–105.—Deals mainly with practices followed by California Co., in Mississippi fields. Precautions necessary in drilling and developing this gas-distillate field are outlined. The reservoir is characterized by a large, well-defined gas-distillate cap overlying the top of the structure. This, so far as indicated to date, is roughly circular in shape and from 2½ to 3 ml. in diameter. Current field development is being directed exclusively to the oil column in down-structure phases of the reservoir around the rim of the gas-cap. This oil runs 39°–40° A.P.I. gravity, and is produced with a gas ratio of from 1000 to 1100 cu. ft./brl. Preservation of the gas cap so that its energy can be utilized in production of the reservoir, and conservation of its condensate reserves pending investigation of proposed gas-cycling operations by which condensate gas can be effectively and efficiently recovered are primary objectives of development and production programme now being carried out. For this reason, intentional drilling of gas-cap area is being avoided for time being. In case of structurally high wells drilled in course of development of the oil column which tap the edge of the gas-cap, with resultant high gas ratios, production is being restricted to field demands for gas use. Special attention to mud problem is necessary. A. H. N.

Production.

910.* Reservoir Fluid Flow Research. N. Johnson and H. Van Wingen. *Oil Wkly*, 9.4.45, **117** (6), 64. (*Paper Presented before American Petroleum Institute.*)—The paper summarizes what is known on flow through porous media. The authors emphasize the importance of two-phase flow systems, as compared with the single-phase homogeneous systems usually used in laboratory experiments. 28 principles and corollaries are propounded as being definitely proved and 7 others as being partly proved to be correct, but which require further justifications. On the basis of these, certain precautions and controls are recommended for future experiments. These are: (1) Reservoir sands or comparable materials should be used; (2) Interstitial water should be used in all experiments involving water-wet sands. Water should be similar in analysis to formation waters; (3) In problems involving a gas phase, the gas should be soluble in the oil to be produced rather than in the interstitial water;

(4) Refined oils may be used to avoid the gradual change of properties with time as will occur generally with crude oils, but attention should be paid to fair duplication of viscosity, interfacial tension, content of polar bodies that may absorb on sand, and gas solubility of the type of crude in the reservoir being studied ; (5) Leakage of fluids along outer surface of sand sample should be avoided in the case of loose sands as well as of consolidated samples—this involves packing the sand in some container which can be made to yield so as to interlock with the outer grains ; (6) Experiments should be so arranged as to avoid end effect, or so that results can be so analysed as to eliminate end effect. One logical analytical method is to run several experiments with different lengths of similar core material, and eliminate the effect by analysis of data ; (7) Permeabilities should be kept within the range of values found in reservoirs of the type being studied. This will generally involve permeabilities within the range 1 to 20,000 millidarcys, with emphasis on the range 10 to 3000 ; (8) Flow rates and pressure gradients should be kept within practical limits. A number of different gradients or rates will be needed for duplicating radial flow conditions and for covering water flooding of low gravity crudes, or high rate production of high pressure, high gravity crudes. Practical range of linear rates of advance of the fluid front might be met at 0·02–5 ft./day. Gradients may well vary from 0·001 to 2 lb./sq. in. ; (9) Applicability of electrical analogy experiments should be considered for all but the simplest flow tests, as this technique is versatile and powerful. Problems which need study are many and complex ; they involve oil migration into sand, internal gas drive, gas drive, water drive, and gravity drainage. Chief problem may well be the effect of rate on recovery. Others are concerned with interpretation of core analysis, specifically reconstruction of formation fluid content from core fluid content ; studies of by-passing in non-uniform sand ; transient and steady states ; vaporizing and condensing systems ; pressure maintenance or cycling *vs.* primary recovery ; secondary recovery processes.

Certain tests are recommended. A. H. N.

911. Application of Alignment Chart to Solving Rapidly Production Forecasting Problems. L. R. Merryman. *Petrol. Engr*, April 1945, **16** (7), 151.—Nomographs for estimating future production of wells, based on formula giving the sum of a finite number of terms of a geometrical progression. A. H. N.

912. How to Obtain Greater Increases from Use of Acid. C. E. Clason. *Petrol Engr*, April 1945, **16** (7), 159.—Effects of increasing pumping rate on results obtained with acid treating are discussed in detail. The aim is to obtain uniform increase in channel diameter for as far from the well as possible. High rates of pumping help towards this objective ; but, at too high rates of flow, there may be bottleneck effect near the well. A. H. N.

913. Six Different Engineering Methods Compared in Study of Pay Formations. K. B. Barnes. *Oil Gas J.*, 7.4.45, **43** (48), 70–73.—This article describes results obtained in one well where nearly every kind of survey or pay-formation test method now available was used, other than those of strictly geological character. The data gathered were : (1) drilling and coring time ; (2) complete core analysis ; (3) electric log ; (4) gamma-ray log ; (5) neutron log ; and (6) electric pilot survey. General scope and limitations of these different methods are fairly well established. However, it is also well recognized that field trials and experience are necessary to find, for each, the adaptability and proper interpretations as to specific formations and given pools. To determine these, to serve as guidance in beginning a drilling campaign in the West Edmond field, was the purpose of the case presented here. The six different tests, in the main, accomplished the following : (1) Drilling and coring time—obtained, inexpensively and at time pay formation was first opened, depth location of four " soft spots." The rate-of-penetration data were used in conjunction with the core analysis, and in making deductions as to character of core losses ; (2) Complete core analysis—this work furnished numerical values of porosity and permeability for parts of the pay zones ; the saturation data showed the pays tested all to be of oil-productive character (conversely, that none were water bearing) ; (3) Electric log—the self-potential curve delineated the overall permeable section ; the resistivity curves indicated that all the permeable intervals would be oil productive (with no portions being " water pays "), and the normal resistivity curve also gave indications reflecting changes in permeability; (4–5) Combination radioactivity survey—made up of the gamma-ray and neutron curves; this showed the location and thickness of all four zones of porosity. These data were obtained after the pipe had been set through the zones and cemented; (6) Electric-pilot survey and selective acidization—done after the three lower zones had been exposed for production by gun perforating, the electric pilot permeability survey, in particular, showed that for some reason, possibly drilling-fluid contamination or mud sheathing, the bottom zone had much the less effective permeable capacity. Consequently, a selective acid treatment was made of the bottom zone alone to increase the capacity, this time by using the interface locator for control purposes. The other two exposed zones thereafter were given a separate acid treatment, also with the use of the electric pilot. A. H. N.

914. Problems of Underground Gas Storage in Ohio, West Virginia, and Pennsylvania. F. H. Finn, J. J. Schmidt, and J. B. Corrin, Jr. *Bull. Amer. Ass. Petrol. Geol.*, Nov. 1944, **28** (11), 1561–1595.—Underground storage of natural gas has been known for many years, but since 1937 there has been a phenomenal increase in the number of storage areas utilized. The war has been responsible for many storage projects, but without the technical information previously collected such a large-scale expansion would hardly have been possible.

Storage projects of the Consolidated Natural Gas Company are illustrated, with plans and sections of a number of pools, and statistics of size and location of pools, number of wells, capacity of reservoir, geological type, deliverability and other significant data.

Problem of underground storage is considered under nine headings, and the following observations made:—Principal purpose for which any pool is to be used governs choice of the pool. For instance, when storage is for use in peak periods, small pools with sands of good porosity and high permeability are most convenient, as they give a high proportion of deliverability for the amount of gas stored, whereas storage of large amounts of excess gas for purely market reasons involving costs is satisfied by use of larger pools.

Selection of storage areas is strictly a geological problem, involving a choice of either a " sand lens " (or " porosity lens ") type, a structural type or a multi-sand type. After storage rights of a worked-out pool have been obtained, the next problem is to recondition, and this involves renewal of all lines, well fixtures, and casings, so that they will withstand pressures materially in excess of contemplated highest restored pressures of storage pool. Good delivery of gas is ensured by injecting only dehydrated and clean gas into the pool, while it is essential that a certain minimum amount of gas, known as " cushion," is left in a storage pool from year to year. A large, rather than a small number of wells in any pool is advantageous.

Gas storage has largely provided a balance between supply and demand. Cost is high, and so storage should be adopted only when absolutely necessary. W. H.

915.* Water-Flooding in Oklahoma. D. M. Logan. *Oil Wkly*, 2.4.45, **117** (5), 40.—Systematic water-flooding as practised to-day requires such close spacing of wells that certain important factors must be considered in order to achieve economically satisfactory results. In Oklahoma, where water-flooding was first started in 1931, operators have confined the method to a more or less restricted area where sand conditions are suitable and where shallow depths prevail. This area comprises the Delaware–Nowata–Chelsea district of northeast Oklahoma, where the Bartlesville sand is at depths ranging from 350 to 750 ft. and has afforded an opportunity for the development of water-flooding at reasonable cost. Of the 73 flooding projects in Oklahoma, 58 are in this general area.

Spacing and well patterns are discussed—the 5-spot arrangement is used with 330-ft. spacing. Where there is a wide range in sand permeability and operators are financially able to do so, they use the " delayed-drilling " principle in water-flooding. Setting out a unit pattern, intake wells are drilled first, and water is forced through the sands for from two to six months before producing wells in the pattern are drilled. By this method voids in more permeable sections of producing sands are filled with fluid forcing oil to centre of the pattern. Production practices are described. A. H. N.

916.* Controlling Movement in Water-Flooding. Anon. *Oil Wkly*, 5.3.45, **117** (1), 46.—Principles of water-flooding and its control are briefly explained, special emphasis being laid on control of water movement in the sand. This is due, it is explained, to the fact that efficiency, and as a rule profit, of any potentially successful water-flood project depends to no small degree on verticality of the flood front and whether the wall advances in a true radial pattern. These two factors determine how much recoverable oil is actually flooded. Since fluid conductivity is in ratio to permeability, the flood front will nearly parallel the permeability profile, obtained from core analyses, from input to producers if vertical values remain constant. Highly permeable sections are flooded out first, since they accept water more readily than tighter or lower permeability sections. These loose sections, which may compose only a very small percentage of the floodable sand, then have most of their floodable oil produced, but continue to have water pass through them from input to producer, while the tighter sections have produced very little if any oil, since the flood is advancing through them comparatively slowly, due to their tightness and friction to flow. From this point on large quantities of water may be handled daily at considerable expense. A certain percentage of the plant's capacity, producing equipment capacity, supervision, and operation are henceforth dedicated to cycling water through these thief zones barren of oil from a water-flooding viewpoint. In some cases handling of this water becomes so costly that projects must be abandoned before oil from tighter sections is produced. If these tight sections compose a high percentage of the total sand body the results are easily evident. Methods of selective shooting and plugging are discussed. A. H. N.

917.* Pressure Parting of Formations in Water-Flood Operations. Part I. S. T. Yuster and J. C. Calhourn, Jr. *Oil Wkly*, 12.3.45, **117** (2), 38.—Phenomenon of wells on water input duty suddenly appearing to take an increased quantity of water, out of proportion with the increase of pressure of input when a certain optimum input pressure is passed, is discussed. One of the generally accepted explanations of this phenomenon is that the overburden has been lifted or formations parted due to the fact that upward pressure exerted by the water is greater than downward pressure of the overburden. In other words, it would appear as if the overburden were acting as a safety-valve for the sand-face flooding pressure. While such a simple mechanism is very helpful in understanding this phenomenon, it is not adequate to explain some phases of this problem, as will be indicated later. For example, there is at least one known instance where an excessive amount of water was pouring into a producing well from an input well 1000 ft. away, and this across a lease in which there were other wells closer to the input. Examination of core data showed that it could not be explained by a freak loose streak. Such observations are briefly explained. An analysis of flow in porous media is given. Part I ends with estimation on theoretical grounds of limiting pressures due to overburden lifting. Overburden is considered as a fluid exerting pressure, with sp. gr. of the solid of 2·65 being reduced by 15% pore space filled water to 2·40. On this basis, a limiting pressure of 1·04 lb./sq. in./ft. of depth is obtained. The work of Grebe is quoted as checking this calculation by obtaining average sp. gr. of 2·2 for the overburden. A. H. N.

918.* Pressure Parting of Formations in Water-Flood Operations. Part 2. S. T. Yuster and J. C. Calhoun, Jr. *Oil Wkly*, 19.3.45, **117** (3), 34.—Methods of detecting lift of formations due to excess pressure—using a graphical method of plotting rate of flow *vs.* sand face pressure and observing sudden changes in the slope of the line—are discussed. The two papers are summarized : (1) Formations can be parted by application of excess pressures ; (2) This pressure in lb./sq. in. is about equal to thickness of overburden in feet. Tensile strength of formation should be added for the initial parting ; (3) When formed because of excess pressure application, conductivity of these horizontal fissures is extremely high. With a separation of 0·01 in. permeability capacity is equivalent to 4540 millidarcy ft. A uniform radial fissure having an outer to inner radius ratio of 10 and a separation of 0·001 in. will conduct 47·3 brl. water/day at 1000 p.s.i. ; (4) These fissures may account for some of the excessive by-passing and loss of production in certain water-flooding projects ; (5) A method is described which has been used in the field for some time for experimentally determining parting pressure. This involves plotting of input rate *vs.* pressure data and observing the break in linearity of the graph ; (6) Analysis of field data indicates that average depth in an area instead of absolute well depth should be used in calculating a parting pressure; (7) Since shooting a well creates horizontal fissures and planes of weakness, the factor of tensile strength of the formations would be minimized under such conditions; (8) Shooting may be necessary prior to acidizing and squeeze cementing for more efficient well treatment. The same holds true for a water disposal well in order to increase its capacity by use of high pressures; (9) It is indicated that cemented casing may act as a clamp on a formation, thus minimizing formation parting, and reducing effectiveness of acidizing and squeeze cementing. If this is true, consideration might be given to cutting the casing opposite the formation in question prior to treatment in order to reduce clamping effect; (10) Application of a clamp such as mentioned under 9 or something similar is suggested as a possible method to increase upper safe pressure limit in water flooding of low permeability and shallow sands; (11) Pressure parting considerations indicate that for safe operations, especially in a wildcat area where conditions are unknown, casing should be cemented at least to a depth of 0·455 times total depth of a well as continually as possible during its drilling, so as to prevent formations parts from forming higher up if and when fluid production is encountered. This will prevent possible loss of fluid and cratering. A. H. N.

919. Mechanics of Producing Oil, Condensate, and Natural Gas. Part 22. P. J. Jones. *Oil Gas J.*, 7.4.45, **43** (48), 91.—The displacement of oil by gas from a point is discussed in this part. Oil is displaced daily by gas in hundreds of reservoirs. The source of the gas may be gas-caps, solutions gas or injected gas. Oil can be displaced because of pressure differences. It also can be displayed by gravity. But the effect of gravity, which can be the principal cause of oil displacement in some reservoirs, is not considered. Oil recovery by gas displacement from limestones and dolomites having secondary porosity is influenced by secondary structures. Solution gas and injected gas tend to bypass the oil in the comparaively smaller openings under certain conditions. Pays having secondary porosity are excluded from this article. Relative permeabilities and interstitial water are used in estimating displacment of oil and gas–oil ratios. Curves are derived for oil recovery *vs.* produced gas–oil ratio from a point in a reservoir. Effect of variable pressure on oil recovery is not discussed.
A. H. N.

920. Mechanics of Producing Oil, Condensate, and Natural Gas. Part 23. P. J. Jones. *Oil Gas J.*, 14.4.45, **43** (49), 123.—Curves on displacement of oil by gas from a point in a reservoir were derived in the preceding article. Oil recovery was expressed in terms of gas–oil ratios. The curves may be used directly in estimating oil recovery from 1 brl. of reservoir space. Aside from gravity, and secondary porosity, the curves may also be used to obtain gas–oil ratios at a given pressure. Oil recovery from reservoirs may be by evolution and expansion of solution gas on reduction of reservoir pressure and by injection of gas. Aside from the possible effects of gravity, oil recovery by solution gas is significantly less than by gas injection. Differences of the order of 100% are not uncommon relative to the same final gas–oil ratios. Oil recovery from reservoirs by gas displacement is equal to the sum of recoveries from individual points. Recovery from individual points by expansion of solution gas can range from 10 to 60%. The latter figure is for very short distances from a well-bore only. Oil recovery from individual points by expansion of a gas-cap and by gas injection can range from zero up to 90%. The latter figure is for favourable conditions only with respect to help from gravity and small retention by capillary. Point recovery, and therefore oil recovery, from reservoirs is influenced by several factors, including: (1) location and number of wells; (2) rate of production; (3) permeability and variation in permeability; (4) effect of gravity; (5) effect of pressure; (6) economic limit in brl. of oil/day/well; and (7) economic limit in 1000 cu. ft. gas/brl. of oil. Consequently, curves derived in preceding article cannot be applied directly to oil recovery from entire reservoirs. Nevertheless, there are some types of production problems for which a reasonable estimate can be made directly from curves for point data, *e.g.*, upper limit of oil recovery by injected gas can be estimated in terms of economic limits and approximate pressure differences. The latter depends on distances, distribution of area, and distribution of reservoir liquid saturation. Problems involving foregoing restrictions are illustrated by examples and graphs. A. H. N.

921.* Soundness of Schoch Gas Plan Questioned. Anon. *Oil Wkly*, 5.3.45, **117** (1), 30.—Prof. Schoch's plan is summarized as : (1) To exclude from estimates of market demand gas to be used in large quantities (such as 100 million cu. ft., or more, per annum) for purposes where lignite or other cheap fuels can be obtained, but this provision should not be used to decrease the total volume allowed for existing gas lines below amounts they now carry ; (2) Increase in prices for gas at well to a figure at or near 10 cents, in accordance with market demand ; (3) Increase in market demand by an effective programme of industrialization aided by specific provisions for new industries, particularly those using clays, cotton, and natural gas itself as a material for manufacture ; (4) Special technical study of gas, such as used for carbon black and for lifting, which is now disposed of through other means than " common carriers," with view to reducing unprofitable or wasteful output of gas. The plan is studied critically and adverse views of operators are discussed. A. H. N.

922. Lake St. John Field Served by Central High-Pressure Gas System. N. Williams. *Oil Gas J.*, 7.4.45, **43** (48), 74.—Lake St. John field in Concordia and Tensas parishes, eastern Louisiana, is being served by a central high-pressure gas system. Designed to supply fuel for drilling rigs and other operational requirements, the system functions to provide utilization of all gas production. Its operation is controlled to meet field fuel needs so far as possible from vent gas recovered in production of low-ratio oil wells. High-ratio and gas wells are tied into the system to insure an adequate volume of gas and uniformly maintained pressures, but withdrawals from such wells are restricted automatically for conservation of reservoir resources and energy. The system is described in some detail. A. H. N.

923. Hot Oil from Portable Heater Recirculated to Control Paraffin. F. B. Taylor. *Oil Gas J.*, 14.4.45, **43** (49), 134.—Wells in Bornholdt are pumping and producing considerable volumes of water with the crude. Paraffin trouble is generally confined to that part of the well above the water level, and to surface equipment. Allowables given the wells of the field require only periodic production, leaving them inactive a great part of the time. It is during this period that treatment is made with a portable heater. The unit is made of 6-ft. of 10-in. pipe enclosing a centred piece of 6-in., of equal length constituting the firebox, while the crude circulates between the 6- and 10-in. pipes. The unit is heated with gas from the well, regulated and fed through a simple burner. A stack is provided to carry fumes off at a desirable height. The entire piece of equipment is mounted on 2-in. skids, and is sufficiently light in weight so that it can be moved from well to well. The heater is set up 60–100 ft. from the well, and connected into the lead line. Outlet from the heater is returned to the well through a second 2-in. line to tubing-casing annulus. Connection for gas as fuel is made at casinghead. The well is then put on the beam and produced. Well fluid is lifted into the lead line, pumped into the heater, and returned, hot, into the well. This recirculation action is carried on for from 1 to 3 days, depending on well condition. At conclusion of such period, rods and tubing have been flushed clean of paraffin by hot oil returned to the well, and a reservoir of warm oil is present in the annulus. Heat of this crude can be utilized in cleaning surface and lead lines of sludge and paraffin obstruction. A. H. N.

924. Oil-Well Cleaning. N. C. Wells. *Petrol. Engr*, April 1945, **16** (7), 98.—Various methods of cleaning wells are defined and described. These are use of mechanical washer, acidizing, string shooting, solvents, knife cleaner, wire brush, and of caustic. Well cleaning jobs are classified as follows :—

Condition.	Method of Cleaning.
1. Mud :	
(*a*) Loose.	Mechanical washer.
(*b*) Tight.	Acidizing and mechanical washer.
	String shooting and mechanical washer.
2. Sand :	
(*a*) Loose.	Mechanical washer.
(*b*) Tight.	Knife cleaner and mechanical washer.

Condition.	Method of Cleaning.
3. Paraffin.	Solvent. Caustic. Wire brush.
4. Scale.	String shooting. Acidizing. Knife cleaning. Wire brush.
5. Mud, sand and paraffin gumbo.	Caustic, knife cleaner and mechanical washer.

A. H. N.

925.* Retainer Production Packers Used in Corroded Casing String Repair. C. J. Berlin. *Oil Wkly*, 26.3.45, **117** (4), 38.—Use of Baker-type retainers to pack off casing from corrosive fluids in 82 wells is discussed. These packers have the following advantages in use: (1) They are anchored against upward and downward movement by means of two full sets of slip segments; (2) Tubing is independent of packer and may be easily removed from the well; (3) Set down weight is not required, so tubing hangs freely, and straight, in tension; (4) Being made of cast iron, they are more resistant to corrosion than the steel casing in which they are set; (5) They are drillable, providing positive removal without the hazard of long and costly packer fishing jobs; (6) They are adaptable to all well conditions and operating procedures. A. H. N.

926. Salt-Water Disposal in East Texas. Part 7. Anon. *Petrol. Engr*, April 1945, **16** (7), 103.—This paper of the series deals with practices followed by Stanolind Oil and Gas Co., the Tide Water Associated Oil Co., the Gulf Oil Corpn., and the Texas Co. A. H. N.

Oilfield Development.

927. Expanded Development Programme in Prospect for Colorado's Rangely Field. Anon. *Oil Gas J.*, 14.4.45, **43** (49), 96.—Rangely covers an area some 20 ml. long and 6 ml. wide. On a 40-acre spacing 800 wells will be required. Average cost of wells is $100,000, and completion of 50–60 wells per year would require 10–15 years for drilling up the pool. Some geologists have estimated the field's life to be 50 years. Over a 25-year period recovery may be 365,000,000 brl. G. D. H.

928.* Well Completions in 1944. Anon. *World Petrol.*, April 1945, **16** (4), 60.—3881 exploratory wells and 20,273 development wells were drilled in U.S.A. during 1944. 526 of the former and 12,691 of the latter found oil, and 200 of the former and 3193 of the latter found gas. The completion data are summarized by States. G. D. H.

929.* Wells Completed in United States. Anon. *Oil Wkly*, 26.3.45, **117** (4), 64; 2.4.45, **117** (5), 71; 9.4.45, **117** (6), 83; 16.4.45, **117** (7), 73; 23.4.45, **117** (8), 84; 30.4.45, **117** (9), 66; 7.5.45, **117** (10), 77; 14.5.45, **117** (11), 69; 21.5.45, **117** (12), 85; 28.5.45, **117** (13), 69.

Week ended:	Field.			Wildcat.		
	Oil.	Gas.	Total.	Oil.	Gas.	Total.
24th March, 1945	255	18	354	10	5	58
31st March, 1945	244	29	356	9	2	52
7th April, 1945	222	44	356	13	1	71
14th April, 1945	281	38	425	16	3	81
21st April, 1945	249	38	366	11	1	67
28th April, 1945	241	41	391	6	1	66
5th May, 1945	236	28	354	6	2	53
12th May, 1945	219	48	346	6	1	74
19th May, 1945	241	34	373	6	1	82
26th May, 1945	283	30	403	15	4	67

Tables summarize completion results by States and districts for each week.

G. D. H.

930.* Results of Oil Exploration in Colombia. E. Ospina-Racines. *World Petrol.*, April 1945, **16** (4), 52.—The possible oil-zones of Colombia are covered by Tertiary and Quaternary deposits, and half the total area of 20,000,000 hectares is at least 1000 km. from tide-water. In recent years contracts for exploratory work have covered 7,287,284 hectares.

Drilling for oil began in 1907, and up to middle of 1944 some 1492 wells had been drilled, 1314 being producers. Up to 1931, 81 wells were drilled, all on private lands, and all without success. From 1931 to beginning of 1944 58 wells were drilled outside the De Mares and Barco concessions, 16 being producers. All except 2 were on Government lands. Commercial possibilities of the Los Monas, Cantagallo, and Dificil discoveries have not yet been determined. The Casabe discovery has proved commercially productive.

Experience has shown that from the time of filing an application for an oil concession it takes about 4½ years to get through all the administrative and technical preliminaries for drilling the first 10,000-ft. well.

Since 1916, 1147 producing wells have been completed among 1189 holes drilled on the De Mares concession. Commercial production began in the Infantas and La Cira fields about mid-1926 and to end of 1944 production was 331,392,152 brl.

152 producing wells have been drilled on the Barco concession since 1933, and to end of 1944 cumulative production was 17,047,678 brl., mostly from Petrolea and Tibu fields. Commercial production on the Barco concession began in 1938. The Casabe field has 25 producers among 26 wells, the potentials ranging 106–1200 brl./well/day. Its reserves are estimated as 190,000,000 brl. of producible oil. Three wells have been drilled in the Dificil field. The third has a potential of 750–1000 brl./day.

Data on drilling and on concessions are tabulated, and a map shows positions of fields. G. D. H.

931.* Colombia has Produced 350 Million Barrels. Anon. *Oil Wkly*, 12.3.45, **117** (2), 73.—At end of Feb. Colombia was producing at rate of 1,850,000 brl./month, and had on aggregate production of 350 million brl. of oil. 95% of the total has come from the La Cira and Infantas fields in the past twelve years. G. D. H.

932.* Ecuador's Production up 25% in 1944. Anon. *Oil Wkly*, 23.4.45, **117** (8), 82.—In 1944 Ecuador produced 2,892,112 brl. of oil, 590,812 brl. more than in 1943. G. D. H.

933.* Venezuelan Output Drops After mid-February Spurt. Anon. *Oil Wkly*, 26.3.45, **117** (4), 62.—In the week ended 19th Feb., 1945, the Venezuelan oil output averaged 818,489 brl./day. Production fell below 800,000 brl./day during the following fortnight. The mid-Feb. spurt may have resulted from the opening of the new Jusepin-Puerto la Cruz pipe-line. Shipments of Eastern Venezuelan fields now average 300,000 brl./day. G. D. H.

934. Preliminary Report of the Technical Oil Mission to the Middle East. E. De Golyer. *Bull. Amer. Ass. Petrol. Geol.*, July 1944, **28** (7), 919–923.—A review of reserves and prospects of the Middle East, with a brief survey of the four chief companies which control all the important fields and prospective territories. Illustrated with two maps, one showing concessions, and the other oilfields and refineries. W. H.

Transport and Storage.

935. Effect of Aeration on Hydrogen-ion Concentration of Soils in Relation to Identification of Corrosive Soils. M. Romanoff. *Nat. Bur. Stand. J. Res. Wash.*, March 1945, **34** (3), 227.—In a study of the pH values of 62 samples of soil from the Bureau of Standards soil-corrosion test sites, it was shown that air drying of the soil, normally carried out to obtain comparable figures, results in many cases in appreciable fall in pH value. On saturation with water in the absence of air, the pH value returns to its normal value. The fall in pH is attributed to oxidation of ferric sulphides, produced by anærobic sulphate-reducing bacteria, to ferric sulphate, which hydrolyses to the basic sulphate and sulphuric acid. This applies mainly to poorly drained, unærated soils, whereas with soils containing replaceable bases less change is apparent, owing to buffer action. While determination of pH value of the soil after complete saturation would represent conditions obtaining in completely deærated soils, such treatment is abnormal for well-drained soils, and may give misleading results in corrosion testing. It is recommended that samples of soil for pH testing should be preserved in their natural condition. C. L. G.

936. Design of Oil Pipelines. Part 1. F. Karge. *Petrol Engr*, March 1945, **16** (6), 119.—A brief outline is given of the most important factors required in pipeline design, and two graphs : (1) " Friction factors for commercial pipe," based on the paper " The Flow of Fluids in Closed Conduits," by R. J. S. Pigott, and (2) " Friction factor chart for fluid flow in pipes," which accepts Pigott's work, but presents formulas more conveniently manipulated on the slide rule. Mechanism of fluid motion and important flow formulas are reviewed and their accuracy and application discussed. W. H. C.

937. Design of Oil Pipelines. Part 2. F. Karge. *Petrol. Engr*, April 1945, **16** (7), 184.—Factors required in designing light oil pipelines are : maximum capacity and probable life of the field ; viscosity, and sp. gr. or A.P.I. gravity of the oil ; profile of the route ; physical features along the route ; pumping and flowing temperatures. These factors are discussed ; selection of pumps and drivers, costs of the pipeline and data of yearly operating costs are outlined. Design of heavy oil pipelines is discussed as affected by heat loss, viscosity, streamline or turbulent flow conditions. Heat losses are reviewed, and various heat resistances are described and discussed. Coefficients of heat transfer are given for pipelines in dry, moist and soaked, sandy soil, 8 in. and 24 in. covered ; for dry, moist, and moist to wet clay soil, 24 in. covered ; and a pipeline in water, 60 in. covered. Eight references to papers on the subject are given. W. H. C.

Refinery Operations.

Refineries and Auxiliary Refinery Plant.

938. Preventive Maintenance Reduces Repairs and Premature Shutdowns. H. J. Showalte. *Nat. Petrol. News, Technical Sect.*, 6.12.44, **36** (49), R. 868–9.—Preventive maintenance at a large refinery is described. The inspection department, which developed as the refinery grew, has planned to assure that plant equipment would operate safely and have satisfactory length runs and quick return to operation after any shutdown. Its aim is broadly as follows : (1) Arrange and schedule all units and certain plant equipment for inspection and test at regular periods ; (2) arrange to check specific equipment and keep adequate records ; (3) set up an organization to determine the cause of all failures and develop preventive measures ; (4) arrange for instruction of refinery personnel in preventive maintenance. Inspection and test schedules are described and discussed under sections covering high-pressure–high-temperature plant, medium-pressure units, crude distillation and shell stills, lubricating oil units, and miscellaneous equipment. A test and records section employing trained workers investigates the rates of corrosion by test-pieces, and failures of equipment due either to corrosion or physical damage are examined metallurgically to ascertain the cause. The section also keeps abreast of any new materials marketed and investigates their utility. Cathodic protection to pipelines and the use of many types of protective liners and corrosion inhibitors have been investigated. The whole activities afford information of value in forestalling repairs by foreseeing what materials and methods can be used to advantage. W. H. C.

939. Boiler Maintenance in Refineries. F. X. Gill. *Petrol. Engr*, April 1945, **16** (7), 141.—A wide variety of poor-quality fuel materials are used as refinery fuels, ranging from waste gases to heavy oils and pulverized petroleum coke. These materials impose more severe conditions in burning systems than are usually met with in industrial undertakings. Such fuels and various types of burners and combinations, and auxiliary equipment needed for their proper combustion, are described and shown in diagrams, and the influence of impurities—corrosive and abrasive—is discussed.

Two typical water-cooled tube boiler installations are shown. Ash, slag, and scale deposits as they affect the outsides of tubes and brickwork, scale and sludge accumulations inside tubes, removal of scale, tube failures, repair of tubes, preventive methods and feed-water treatment, are discussed, and two types of cyclone steam separators are illustrated. Maintenance of economisers, superheaters, blow-off and safety relief valves, soot blowers, etc., are outlined. W. H. C.

940. Metal Inspection Plays Important Rôle in War-time Maintenance Program. Anon. *Nat. Petrol News, Technical Sect.*, 6.12.44, **36** (49), R. 863.—Inspection of plant as practised by Philipps Petroleum Co. is reviewed. A special inspectorate comprises a chief with experience in safety practise and sufficient engineering experience to enable him to evaluate condition of equipment; an assistant chief inspector, and a number of field inspectors who perform the actual work. Their respective training and qualifications are discussed. The department is independent of operations and maintenance departments, and is responsible only to the plant manager. Shut downs are controlled by operating department, but the inspector may order one should an emergency arise.

Scope of inspection is discussed, and records and reports described. Methods of inspection are given; hammering is used as a gross indication of thin spots, rather than final determinant. Most reliance is placed on visual examination and calipering. "Tell-tale holes" are widely used to obtain information as to high corrosion, or at points where high corrosion is expected. Special clamps are used to plug them, when corrosion has developed, until a convenient shut-down. Metal tags for many uses are described. Emphasis is made on tube inspection, and these are calipered inside over their entire length. Special calipers for tubes are described and method of procedure given. Visual examination and calipering outside of tubes are also done. Auxiliary equipment is surveyed and methods of testing described. Valves and pumps are checked as to their suitability, wall thickness, etc. Lines, flanges, and tanks are also discussed. W. H. C.

941. Electrostatic Precipitation of Dust from Boiler-Plant Flue Gases. J. Bruce. *J. Inst. elec. Engrs*, 1945, **92** (Pt. II), 58–72.—A description of field experiments and results on pilot-scale electrostatic precipitator operating on flue gases produced from combustion of anthracite in pulverized form. Salient features of a large-scale commercial installation are described and operating results discussed. C. F. M.

942.* Corrosion Problems in the Petroleum Industry. I. Some Causes of Corrosion. A. H. Stuart. *Petroleum*, May 1945, **8** (4), 73.—Most metals will combine with atmospheric oxygen to form oxide films, although at different rates. Ratio of volume of a metallic oxide to volume of metal oxidized is important. If ratio is less than unity the oxide film cannot cover the metal, cracks, or becomes porous, and thus admits oxygen for further action. For ratios greater than unity the film may be impervious to oxygen, and the metallic surface is protected from further attack. Magnesium illustrates the first case, aluminium the second.

Iron is a special case, temperature conditions being important. When bright steel is "blued," the film produced is protective provided it remains continuous. Black scale and red rust are not protective. Formation of red rust is a complex phenomenon depending on the presence of moisture. Ironwork has rusting conditions always at hand. The patches of rust are porous and admit water, differences in oxygen content arise, and an electric cell is formed by one type of metal in two types of electrolyte.

Other elements embedded in a metal may produce electrolytic phenomena. Graphite embedded in cast iron can form a short-circuited cell when an electrolyte, salt water, enters. The iron is the anode, and will be attacked. Rust formed excludes air when the cell breaks down, and another form of cell is set up, producing further rust.

Non-oxidizing acids produce corrosion, but oxidizing acids such as nitric and chromic produce a "passive" state in iron, due to a non-porous film of oxide having been formed. Certain atmospheric conditions can produce this effect, the Delhi Pillar being an example; the protective oxide coat formed in the hot, dry atmosphere has prevented further oxidation for sixteen centuries.

This passive state can only be relied on when produced and maintained by chemical means, and is never developed by red rust. G. A. C.

943. Engineering Aspects of New Utah Oil Refining Company 100-Octane Plant. J. H. Kunkel. Part I. *Petrol Engr*, Jan. 1945, **16** (4), 59–66.—The Utah 100-octane plant consists of the Company's units and extensions (Plant No. 1) supplemented by the following Defence Plant Corporation units : fluid catalytic cracking ; vapour recovery ; vapour-phase butane isomerization ; sulphuric acid alkylation ; naphtha fractionation ; naphtha isomerization ; hydrogen ; anhydrous HCl ; sulphuric acid recovery and ethylizing units (Plant No. 2). Dimensions, capacities, and operating conditions of the units are described and flow diagrams given.

No. 1 Plant processes Wyoming and Colorado crudes with 12- and 25-lb. casinghead gasolines and imported BB products together, at the rate of 15,000 brl./day, and with Plant No. 2 produces 5200 brl./day 100-octane aviation gasoline.

Fluid catalytic cracking unit uses a synthetic powdered catalyst and receives as feed 6500-brl./day virgin gas oils and gas oil from the coking operations from Plant No. 1. Space velocity is adjusted by raising or lowering the level of the " boiling " fluid catalyst in the reactor. Catalyst/oil ratio may be altered as desired : (1) by changing the feed preheat temperature ; or (2) by raising or lowering regenerator temperature—*i.e.*, by increasing or decreasing the rate of catalyst circulating through waste heat boiler.

Feed procedure at the Utah refinery does not follow the conventional method ; instead of all the light and heavy cycle gas oil from their strippers going to storage, only a portion goes, the balance being recycled to the reactor, joining the virgin feed stream just before it enters the furnace. Feed-stream from the furnace is joined by some slurry oil, the bottoms from the fractionator and, enroute to the reactor, it receives the hot catalyst from the regenerator, dispersion steam being injected just as the stream enters the reactor. Overhead from the reactor go to vapour and gasoline fractionation unit for recovery. Spent catalyst in reactor is continuously withdrawn through a rate-controlled slide valve, automatically operated by pressure drop across the reactor, and is air transported to the regenerator, where, after passing through a distribution grid, the carbon on the catalyst is burned off by the air. Hot regenerated catalyst flows down through a standpipe and a slide valve, hand controlled to maintain constant temperature of the regenerator, and out of the regenerator to meet the feed-stream to the reactor. Flue gas from the regenerator passes through a waste heat boiler, is further cooled and " conditioned " by water, steam, and ammonia, then passing to the Cottrell precipitator, which eliminates any entrained catalyst and returns it to the reactor, the gas flowing to a stack. Vapour recovery and gasoline fractionation unit is conventional in design and flow, the main columns being : absorber, lean oil still, prefractionator, depropanizer, debutanizer, and two re-run towers. Feed to this section is vapour and liquid from the catalytic cracking unit fractionator reflux drum, plus propane from the alkylation unit. Products are : an aviation cut, two motor gasoline cuts, a butane-butene cut, a C_5 through 150° F. E.P. fraction, propane, and propylene for the alkylation and butane isomerization units, and gas for burning.

W. H. C.

Solvent Refining and Dewaxing.

944. Processing of Lubes Modernized. Anon. *Nat. Petrol News, Technical Sect.*, 6.12.44, **36** (44), 830.—A group of solvent refining processes for lubricating oils is surveyed. Joint research activities of several companies has enabled equipment to be revamped and operating costs lowered and product quality improved. (1) Propane tower deasphalting ; (2) Propane dewaxing ; (3) acid and (4) clay, treating in propane solution ; (5) phenol extractions are described and combinations of them discussed—*e.g.*, (1), (3), (4) with or without propane dewaxing. Another combination consists of propane tower deasphalting, with phenol extraction and propane dewaxing, clay treatment may also be given after dewaxing.

Flow-sheets are given for various processes or combinations, and yields from processing and properties of products are shown.

Propane-tower fractionation is a logical outcome of tower deasphalting, but is still undergoing laboratory investigation before commercial release. With a tower designed for the purpose and controlled operation, feed-stock could be fractionated into various cuts simultaneously with deasphalting, and so eliminate vacuum distillation.

Propane dewaxing may precede or follow solvent extraction ; by making dewaxing the last operation, lower costs result and better test results are obtained.

Phenol extraction is particularly useful for removing naphthenic acids, and for high sulphur stocks. New developments in phenol extraction are: (1) design of baffles which cause the phenol stream to flow at 90° counter-current to feed stream and at same time effect a phase separation; (2) successful application of a continuous water-rejection for improvement of treating efficiency.

Latest plants are planned for sequence vacuum distillation into several distillates and a short reduced crude, deasphaltization of part or all the reduced crude, and phenol extraction the deasphalted oil and the cuts. The raffinates are separately dewaxed and clay treated. This sequence gives the following advantages: (1) amount of bright stock made is controlled at outset; (2) tower deasphalting as a method of preparing stock for solvent refining permits use of a single solvent such as phenol; (3) dewaxing after solvent extracting permits reduction of overall investment since the equipment is most expensive of the processes per barrel of capacity both to instal and operate. Direct operating costs are discussed, and approximate yields and costs in processing 1000 brl./day of finished lubricating oil are shown for different operations described. W. H. C.

Cracking.

945. Mechanism of Failure of 18 Cr-8 Ni Cracking Still Tubes. C. L. Clark and J. W. Freeman. *Nat. Petrol. News, Technical Sect.*, 6.12.44, **36** (49), R854.—A wide investigation has been carried out on 18 Cr-8 Ni furnace tubes which had been in use for periods from 36,000 to 92,500 hours at approximately 1200–1250° F. Experimental results are given for examinations and tests performed; chemical composition of tubes, visual and macroscopic examinations, tensile strength, hardness, rupture characteristics at 1200° F., flattening characteristics—*i.e.*, the comparative ductility before and after heat treatments—magnetic characteristics and strauss corrosion tests. Microstructure are shown in 20 photomicrographs. Some tubes were still ductile, as demonstrated by the flattening test, others were brittle, but their ductility could be restored by heat treatment; some were permanently embrittled.

Deterioration and possible failure of tubes under service conditions is thought to be due to gradual precipitation and growth of particles at grain boundaries. The particles are believed to be caused by decomposition of the austenite into highly alloyed ferrite which is brittle at certain temperatures. Carbide precipitation may result from decreased solubility of the carbon. When these precipitated areas attain a certan size, submicroscopic cracks will occur; once these are present the alloy becomes brittle and its ductility cannot be restored by heat treatment. Benefits of heat treatment of tubes are discussed. W. H. C.

946. Cracking of Latin American Crude Oils. No. 8. Reforming Argentine Gasoline and Naphtha. G. Egloff. *Oil Gas J.*, 10.2.45, **43** (40), 107.—Reforming of straight-run and cracked low-octane gasolines and naphthas brings about two advantages: (1) a large increase in octane number; (2) larger amounts of propylene and butylenes which can form polymer gasolines, or by alkylation give aviation gasoline components. The results of reforming operations made in a pilot plant with once-through operation on Argentine (1) gasoline, (2) straight-run naphtha, (3) cracked naphtha, (4) a blended naphtha, obtained from a Comodoro Rivadavia crude oil of paraffinic origin, and (5) a blended naphtha from another field made up of 52·8% of straight-run naphtha and 47·2% cracked naphtha are given. The properties of the stocks, operating conditions, yields of products, and properties of reformed materials are given, together with analysis of propylene and butylenes in gases produced, calculated as yields of polymer gasoline or alkylate producible therefrom.

Products 1–5 had A.S.T.M. octane numbers of 36, 38, 48, 40, and 51. Reforming (1) at 770 and 775 p.s.i. and 985° and 1020° F. and 1·38 and 1·26 relative charging rates, gave 85·6% reformed gasoline with A.S.T.M. octane value 65 and 69·5% with octane value 73, respectively. More severe operating gave olefins which would produce 5·3% polymer gasoline of 83 octane number, or 9·5% C3 and C4 alkylate of octane rating 91–93.

A mixture of reformed gasoline and a gasoline produced by cracking a straight-run residue was sweetened (1) by plumbite; (2) by liquid phase clay treatment; (3) by vapour phase clay treatment. Only the clay treatments gave satisfactory gasolines (68 O.N.), the liquid phase giving considerably better gum-test and induction period, with 0·025% inhibitor, 775 min. The straight-run naphtha (2) reformed under 750 p.s.i. and 1020° and 1030° F. and 1·64 and 1·2 rates, yielded 87·7% and 74·6% of R.V.P. 11·9 and 11·1 p.s.i. gasoline of 65–71 O.N. respectively. More severe cracking gave olefines which would give 5·8% polymer gasoline or 6·2% butylene alkylate.

The cracked naphtha (3) reformed at 500 p.s.i. and 1020° F. and 1·68 and 1·36 rates produced 83·2% and 80·4% gasoline of R.V.P. 9·2 and 12·1 p.s.i. with octane values of 63 and 65, respectively. The run at 1·36 relative rate gave olefins which would form 2·8% polymer gasoline or 5% butylene alkylate. The 65 octane product (not sweetened) had a gum content of 127 mg. with 0·025% inhibitor, and an induction period, with 0·025% inhibitor of 360 min.

The blended naphtha (4) composed of 4 parts No. (2) and 3 parts No. (3) when reformed at 600 p.s.i. and 1020° and 1025° F. at 1·56 and 1·02 rates yielded 82·8% and 73·5% gasoline of R.V.P. 8·9 and 10·9 p.s.i., having octane ratings of 66 and 69 respectively. The first run gave olefins which would give 4% polymer gasoline or 4·4% butylene alkylate. Results of cracking this blend were substantially intermediate to those obtained in the separate cracking of the blend components.

One reforming operation on the blend (5) at 750 p.s.i. and 980° F. with relative charging rate of 1·51 yielded 73·3% of R.V.P. 9·9 p.s.i. gasoline of 70 octane value, and olefins to afford 2·4% polymer gasoline and 4·4% C_3 or C_4 alkylates by calculation. This gasoline was treated (1) by plumbite solution and (2) by vapour-phase clay treatment. Sweetening alone gave a product of fair inhibitor susceptibility, and the vapour-phase clay treatment gave a product which required no inhibitor for gum, its induction period without inhibitor was 570 min., with 0·025% inhibitor 900 min.

W. H. C.

947. Production of Distillate Fuel Oils by Thermofor and Houdry Catalytic Cracking. S. D. Dalton and S. P. Cauley. *Oil Gas J.*, 10.2.45, **43** (40), 80.—The importance of aviation gasoline components from catalytic cracking has tended to obscure the fact that under the right operating conditions large quantities of excellent distillate fuels can be produced at the same time. Mild operating conditions employed in both Houdry and Thermofor processes allows production of distillates having boiling points predominantly in gasoline and No. 2 fuel range, the lighter fuel oils having a far greater stability than the equivalent distillate fuel oils obtained by thermal cracking. Flow diagrams of both processes are given, and tables show yields and properties of products obtained under various operating conditions. Yields and qualities of products from catalytic cracking are influenced by many variables, the most important are discussed :

(1) *Nature of Crude Oil from which Feed-stock is Obtained.* Paraffinic-type stocks generally give fuel-oil distillates of higher gravity and stability, higher hydrogen contents, better burning characteristics, and higher cetane numbers (40–50), and also lower carbon residues (0·05–0·12%) than fuels produced from naphthenic charge stocks. Amount of sulphur in the feed-stock governs sulphur content of the fuels, but as catalytic cracking effects some desulphurizing, the products generally have sulphur contents lower than the feed-stocks.

(2) *Boiling Range of Feed-stock.* High boiling stocks in once-through operations usually give larger amounts of products boiling above 650° F., the light fuel-oil range, and the quality is not so good as those from lower-boiling charge stocks.

(3) *Type of Catalyst Employed.* Catalysts may be chosen to offset disadvantages of poor-quality feed-stocks—*e.g.*, Houdry process can use either clay or synthetic catalysts, and for Thermofor process either natural clay or Socony-Vacuum synthetic bead catalyst are available. Houdry synthetic and T.C.C. clay catalysts produce distillate fuels of about the same quality ; the Thermofor synthetic catalyst gives superior products, synthetic catalysts are better desulphurising agents.

(4) *Operating Conditions.* The two processes considered normally operate at fairly low temperatures ; some of the advantages have already been mentioned. Another factor which assists in production of good distillate fuel oils is that the catalyst is regenerated to a low carbon content.

W. H. C.

Safety Precautions.

948. Acute Poisoning Due to Petrol Vapour. J. S. Lawrence. *Brit. Med. J.*, 1945, i, 871–873.—Two cases of poisoning by inhalation of aviation gasoline fumes are described in detail. In one case the cause was failure (possibly due to vapour permeation) of an oxygen breathing-mask. Symptomatic treatment led to recovery. Literature of gasoline poisoning is reviewed and clinical features and pathology are dealt with. Immediate treatment consists in artificial respiration, O_2 (+ 5% CO_2) inhalation, and sedatives if called for; supervision should be maintained for not less than 4 days. Where exposure to gasoline vapour is prolonged a concentration of 1000 p.p.m. should not be exceeded. V. B.

Products.

Chemistry and Physics.

949. Heats and Free Energies of Formation of the Paraffin Hydrocarbons in the Gaseous State to 1500° K. E. J. Prosen, K. S. Pitzer, and F. D. Rossini. *Nat. Bur. Stand. J. Res. Wash.*, April 1945, **34** (4), 403.—New values are given for the heats of formation and free energies of formation from solid carbon (graphite) and gaseous hydrogen, of the normal paraffin hydrocarbons from methane to eicosane, and of the isomeric paraffins from butanes to octanes in the gaseous state to 1500° K. C. L. G.

950. Heats of Combustion and Formation of the Paraffin Hydrocarbons at 25° C. E. J. Prosen and F. D. Rossini. *Nat. Bur. Stand. J. Res. Wash.*, March 1945, **34** (3), 263.—Data are tabulated showing the selected "best" values for the heats of combustion (in oxygen, to form gaseous carbon dioxide and liquid water) and the heats of formation (from the elements solid carbon, graphite, and gaseous hydrogen) for methane and ethane in the gaseous state, and for all paraffin hydrocarbons from propane through the octanes and the normal paraffins through eicosane, in both the liquid (except for one solid octane) and gaseous states, all at 25° C. Equations are given for calculating values for all the normal paraffins above eicosane. C. L. G.

951. Specific Heats of Gaseous 1 : 3-Butadiene, *iso*Butene, Styrene, and Ethylbenzene. R. B. Scott and J. W. Mellors. *Nat. Bur. Stand. J. Res. Wash.*, March 1945, **34** (3), 243.—Using a constant-flow, adiabatic-type calorimeter (details of construction and operation given), the specific heats of gaseous 1 : 3-butadiene and *iso*butene over the range −35° to +80° C. and of styrene vapour and ethylbenzene vapour at 100° C. have been determined. The values obtained have been corrected, and differ to some extent from those of previous investigators. They are, however, believed to be accurate to within 0·5%. C. L. G.

952. Free Energies and Equilibria of Isomerization of the 18 Octanes. E. J. Prosen, K. S. Pitzer, and F. D. Rossini. *Nat. Bur. Stand. J. Res. Wash.*, March 1945, **34** (3), 255.—Values are presented in tabular and graphical form of (*a*) the standard free energy of isomerization divided by the absolute temperature $\Delta F^{\circ}/T$ of the 18 octanes in the ideal gaseous state for the range 298–1000° K., and (*b*) the relative amounts of the isomers presented in equilibrium with each other. The work confirms previous conclusions on the stability of the lower paraffin isomers—*i.e.*, that at 25° C., 2 : 2-dimethylhexane is among the most stable, and *n*-octane among those of lesser stability, whereas at 1000° K. the reverse holds. In general the more highly branched isomers are among the least stable at higher temperatures. C. L. G.

Analysis and Testing.

953. Apparatus for Detection and Estimation of Chlorinated Hydrocarbon Vapours in Air. L. B. Timmis. *J. Soc. chem. Ind.*, 1944, **63**, 380–382.—Air to be tested for chlorinated hydrocarbon vapour is drawn over a heated filament, and decomposition products are contacted with a *p*-dimethylaminobenzaldehyde and diphenylamine-impregnated paper, with a resulting yellow stain. The test paper is specified in H.M.S.O. Leaflet No. 8 in the Series "Methods for the Detection of Toxic Gases in Industry."

Figures are given indicating amount of air contaminated with varying amounts of trichloroethylene, carbon tetrachloride, tetrachloroethane, and "Freon" (CCl_2F_2) required to give standard intensity of staining. Some examples are 180 ml. of air containing 1 part trichloroethylene or tetrachloroethane per 40,000; 30 ml. of air containing 1 part carbon tetrachloride per 100,000; and 720 ml. of air containing

1 part "Freon" per 20,000. Rate of air throughput during the determination is 60 ml. per minute. T. C. G. T.

954. Determination of Chlorine in Chlorinated Phenols. J. Kay and P. J. C. Haywood. *J. Soc. chem. Ind.*, 1944, **63**, 382–384.—Stepanow's method for the determination of chlorine in organic substances has given unreliable results when applied to chlorinated phenols. Inaccuracies found are attributed to variations in quality of ethyl alcohol used and it is shown that extraction of the alcohol with *m*-phenylenediamine effects a considerable improvement in accuracy. Nature of the interfering factor has not been established but aldehydes or ketones are suspected.

It is claimed that a more reliable procedure is treatment of the chlorinated phenol with strong sodium hydroxide solution, ignition with sodium carbonate to remove organic matter and estimation of chloride by Volhard's method. T. C. G. T.

955. Comparison of the Purity of Samples of Organic Solvents by Ultra-violet Spectrophotometry. M. E. Maclean, P. J. Jencks, and S. F. Acree. *Nat. Bur. Stand. J. Res. Wash.*, March 1945, **34** (3), 271.—A technique is described for the ultra-violet absorption spectrophotometry of organic solvents for determining (*a*) the presence of impurities and (*b*) the efficiency of different methods of purification. Absorption curves are given for *n*-heptane, 2 2 : 4-trimethylpentane, *cyclo*hexane, methyl*cyclo*hexane, decahydronaphthalene, benzene, carbon tetrachloride, methyl alcohol, ethyl alcohol, ethylacetate, and dioxane in two or more grades of purity. Absorption curves of tetrahydronaphthelene, toluene, xylene, chlorbenzene, ethylene dichloride, trichloroethylene, acetone, dimethyldioxane, and carbon bisulphide are briefly discussed. Effect of filtration through silica gel on the ultra-violet absorption of several commercial solvents is shown. C. L. G.

956. Analysis of Crankcase Oil in Gas Engines. R. Blodgett and D. M. Nelson. *Petrol. Engr*, April 1945, **16** (7), 114.—An oil analysis and interpretation service instituted a few years ago by the Faber Laboratories and the Long Beach Oil Development Co. for maintenance of automobile fleets is now available for natural gas engine operation. The service is described, and a typical report is shown which includes all information as to maker's recommendations, maintenance, history, oil consumption, etc., as well as tests made on the oil, periodically every 60 days, or each 30 days when an engine is under close observation, until conditions are improved. A special oil sampler is described which takes 3½ oz. through two points in its stem. Tests conducted are : (1) Sludge Index, a new development, which affords a quantitative evaluation of oil deterioration and its relationship to "solids volume," which determines whether the detergent or dispersive characteristics of the oil remain, either as natural or additive detergency. Sludge index is based on a volumetric measurement of the initial oxidation and polymerization products, which, as they are in the form of colloidal particles, have until recently escaped detection. These are coagulated by a solution of aniline containing a little water, and are thrown down by centrifugal action, and, when measured, give the "solids volume". (2) Their presence in small to large amounts, together with a small to large sludge index, indicate whether a clean engine can be expected, the start of sludge deposition has begun, or a badly sludged engine will be found. (3) Faber viscosity—a specialized viscosity determination which does not require the removal of suspended matter before its determination—the results are converted into S.A.E. numbers, and are therefore comparable with the original oil viscosity. (4) Foreign matter ; this includes all the crankcase contaminants and is divided into (*a*) metal ; (*b*) water ; (*c*) gums, tars, residues ; (*d*) fuel soot ; (*e*) free carbon ; (*f*) dirt, sand. (5) Operating S.A.E. number. (6) Abbreviations and numerical key referring to descriptive material on the reverse of the form. (7) Period of oil run. (8) Period of oil set. (9) Date of next test. (10) Oil added.

In most columns each group result is expressed as degrees of oil contamination or deterioration based on established norms developed from thousands of analyses. On the report, comment is made on each test and recommendations relative to oil change, flushes, purges, filter changes, are given, and prescribing such tune-up and minor corrective work that is considered advisable.

The results of tests (1) to (4) are discussed and their interpretation is given. By considering all the tests together the important causes of controllable operating faults usually become apparent. When all data are fully correlated the result is an excellent basis for preventative maintenance achieved at minimum expense. W. H. C.

Engine Fuels.

957. British Wartime Aviation Fuel Production. Anon. *Engineer*, 1945, **179**, 411.—A new refinery, constructed in Britain since war broke out has been made possible by the collaboration of three British firms, I.C.I., the Shell group, and Trinidad Leaseholds, Ltd. Project involved 70,000 tons of steelwork and equipment and spreads over an area of 300 acres. Virgin oil for processing into aviation fuel is imported into underground storage holding 75,000 tons, and annual consumption of coke for the process is 200,000 tons.

Aviation-fuel production in Britain is now more than 150 million gal. a year, and the British West Indies contribute another 45 million gal. a year. Fuels include *iso*-octane itself, " Victane " (made from benzol) which gives better performance at high power outputs than *iso*-octane, and a newer material more powerful than Victane. Major part of aviation fuel output was at times a super-fuel which gave fighter aircraft engines 20% more power than 100 octane fuel.

Mention is also made of home production of sufficient tetra-ethyl lead, and chemicals used in conjunction with it, to blend with the aviation fuel. A. C.

Lubricants.

958. Measurement of Residual Lubricating Oil-Film Thickness on Vertical Metal Surfaces. G. L. Clark, T. D. Parks, and T. W. Culmer. *Nat. Petrol. News, Technical Sect.*, 6.12.44, **36** (49), R. 875.—A method has been devised, and is described, for measuring film thickness of lubricating oil on vertical metal surfaces corresponding to cylinder walls and bearings of motors. Results of tests are shown in graphs, as a function of time of drainage, temperature, type of metal, and the oil itself, and as it is conditioned by the addition of polar strengtheners, and other agents for stabilizing or improving lubricants. Oil used was an S.A.E. 30 motor oil; two commercial additives were also mixed with the base. Plots, thickness of film/time, show three characteristic types of curves: (1) with the base oil the thickness of the film diminishes, rapidly and continuously to a boundary or nearly monomolecular film; (2) with additive 2 the curve diminishes even more rapidly for a few hours, and then becomes constant for 72 hr. and remains almost indefinitely thereafter; (3) with additive 1 the film diminishes more gradually, and then becomes constant at appreciably greater thickness than with additive 2.

Effect of different metals on film thickness is shown in another graph, the curves film thickness/time are shown for the S.A.E. oil 30, without additives, on copper, steel, aluminium, and brass. They show that both oil and metal are factors in the behaviour. Capacity for holding films for longer periods and of greater thickness is in the order: steel, copper, aluminium, and brass. The two last materials are generally more active in catalytically forming sludge.

Corroborative evidence of the measurements has been obtained by a modification of the radio-active tracer of Clark and Gallo, which evaluates the screening afforded by films of varying thickness to a radioactive source in the metal surface by the Geiger–Mueller counter. W. H. C.

959. Practical Tests for Evaluating Lubricating Greases Described. D. P. Thornton. *Nat. Petrol. News, Technical Sect.*, 6.12.44, **36** (49), R. 878.—A review of eleven papers presented at meetings of the National Lubricating Grease Institute, Chicago, on 23rd to 25th Oct., 1944. Three papers relate to the development of tests for evaluating greases: (1) " Some Methods Used in the Practical Evaluation of Lubricating Greases," by L. W. Sproule. The results of tests to evaluate greases from wheel bearing service, block type, water-resistant, and chassis lubricants; (2) " A Machine for Performance Tests of Anti-Friction Bearing Greases," by P. F. Exline and S. A. Flesher. Describes a machine capable of testing four samples simultaneously for effectiveness in lubricating anti-friction bearings, making two to four simultaneous check runs on a single sample or two check runs on two samples; (3) " Naval Gun Factory Performance Grease Test," by J. R. Reynolds. For evaluating starting and running torque of greases in bearings used on electrically-powered Ordnance mounts with temperatures of 70° F. and 0° F. The test is also used at 0° F. to evaluate torque for greases saturated with water.

Eight papers relate to the fundamental characteristics of lubricating greases: (4) " Torque-Viscosity Characteristics of Lubricating Grease," by Adams, Brunstrum, and Ziegler; (5) " Notes on the Operation and Application of the S.O.D. (Standard

Oil Development) Pressure-Viscometer," by Patberg and Zimmer. There are a great number of factors which affect the lubricating properties of a grease that are not revealed by the consistency tests now used. While analysis of all these factors is extremely difficult, it is felt that the viscosity-shear diagram gives a sufficiently complete picture which is a composite of all these factors; (6) "Effect of Mineral Oil Pour Point on Flow Characteristics of Lubricating Greases," by Georgi and O'Connell. It is shown that the pour test of the oil—with or without pour depressant—had no appreciable effect on the low-temperature characteristics of a soda-base grease; (7) "Separability Characteristics of Greases," by Roehner and Robinson. It is concluded that separability of a grease is governed by: (a) grease structure—that is, type of soap additives present, presence of mutual solvents, and manufacturing procedure; (b) amount of soap in the grease; (c) viscosity of mineral oil used; (d) time sample was under conditions enhancing separability; (e) pressure on sample, and (f) design of retaining agency—cup, gun or central greasing system; (8) "Centralized Lubrication for Blast Furnaces," by A. J. Jennings; (9) "Grease Lubrication of Aluminium Rolling Mills," by E. M. Kipp; (10) "Greases for the Bureau of Ships."

W. H. C.

Coal, Shale and Peat.

960.* New South Wales Output Gains 18% in 1944. Anon. *Oil Wkly*, 26.3.45, **117** (4), 62.—During 1944 operations on the Glen Davis shales, New South Wales gave 97,600 brl. of crude, from which 25,000 brl of gasoline was obtained. Output is expected to be expanded to 250,000 brl. of shale oil per year. G. D. H.

Miscellaneous Products.

961. Relationship of Diameter of Derris Roots to Rotenone Content. G. T. Bray. *J. Soc. chem. Ind.*, 1944, **63**, 384.—Experimental evidence is presented giving support to the general belief that the thin derris roots (2–5 mm. diam.) are richer in rotenone than are the thicker roots, but that extremely fine rootlets may contain less rotenone.

T. C. G. T.

962. Soil Insecticides. H. C. Gough. *Chem. and Ind.*, 1945, 50–53.—Present-day knowledge of soil insecticides is reviewed. Carbon disulphide is still the most reliable substance. Chloropicrin and paradichloro-benzene are also successful, but results with coal-tar products have been variable. Naphthalene is not reliable, possibly because the generally recommended rate of application is sufficient only as a deterrent, and not as an insecticide. Cyanides are good, but their danger to mammals is a considerable disadvantage. Dichloroethyl ether and methyl bromide are in favour in America and might well be tried in Britain. Kerosine has been tried, but the results have been approximately as variable as have the experiments with coal-tar oils.

T. C. G. T.

963. Properties and Uses of Some New U.S. Paint Materials. Part 1. Anon. *Paint Manufacture*, June 1945, **15** (6), 170.—A review of extracts from circulars of the scientific section of the National Paint, Varnish, and Lacquer Association, Wash., D.C., on recently developed paint materials. These include: (a) Hexachlorethane, C_2Cl_6, a white solid which sublimes at 186° C., is soluble in most organic solvents, but not in water, and has insecticidal value. It should be of value in insect-repelling paints and impregnating agents; (b) chlorinated propanes. These include a waxy material (C_3Cl_8) which melts between 110° and 135° C. and is compatible with most synthetic rubbers and resins. It might be used as a chemically resistant lubricant, dielectric wax, ingredient of pyrotechnic compositions, or plasticizers. Another chlorinated propane is a liquid containing 40–50% each of $C_3H_2Cl_6$ and C_3HCl_7, and 0–5% each of $C_3H_3Cl_5$ and C_3Cl_8. It boils from 160° to 260° C. and is non-inflammable, compatible with synthetic resins and rubbers, and resistant. It has possibilities as paint softener, insecticide, plasticizer, or preferential solvent for mixed fatty acids, etc.; (c) Hexachlorbutadiene, C_4Cl_6, a liquid of boiling range 210–220° C., is an excellent solvent for synthetic rubber; (d) Benzylcellulose has a lower melting point, moisture absorption, and tensile strength than other cellulose derivatives, and is more flexible, requiring little or no plasticizer. It is soluble in the stronger organic solvents and compatible with a number of synthetic and natural resins. It should be of value in cable and similar lacquers, which possess satisfactory adhesion and resistance. C. L. G.

964. New Glass Product is Used by Oil Industry. V. Sanders. *Petrol. Engr*, April 1945, **16** (7), 123.—The new glass product "Foamglas" is produced from powdered glass and pure carbon by high-temperature baking, in which carbon gases evolved cause cellulation to extent of over five million hermetically sealed cells per sq. ft. of the product. Its physical properties are tabulated. Foamglas has a coefficient of conduction in B.T.U./hr./sq. ft./°F./in. of 0·45 at 50° and 0·75 at 300°; it weighs 10½ lb. per cu. ft., and is made in blocks 2 to 6 in. thick by 12 by 18 in. It is unattacked by all acids, except H.F. and glacial phosphoric acids. A test-piece has withstood a temperature of 1200° F. for 24 hr. without loss in weight. Many uses of Foamglas in the petroleum industry are outlined; it has been used with satisfaction for insulating walls of by-product process rooms, heat exchangers, large hot storage tanks and reaction and other towers. It is quite satisfactory with temperatures as high as 900° F.

Photographs of some applications are shown. W. H. C.

Miscellaneous.

965. Trends in Liquefied Petroleum Gas Industry as Reflected by Special Survey. P. K. Thompson. *Petrol. Engr*, February 1945, **16** (5), 176.—A survey of a report on supply and demand of petroleum liquefied gases for 1933, 1944, and first half of 1945, submitted by the investigating committee to the Petroleum Administration for War. The information was obtained from replies to a questionnaire from 110 companies controlling 201 plants. Data received were in respect of (1) propane, (2) *n*-butane, (3) *iso*butane, (4) butane–propane mixtures, (5) *n*-butane–*iso*butane–butylene mixtures, in relation to: fuel for heating, chemical manufacture, refinery use, isomerization feed, synthetic rubber components, and potential excess production. Charts show the amounts of liquefiable petroleum gases used for: (1) chemical manufacture; (2) refinery use; (3) synthetic rubber components for 1943 and January to March 1944, and the quantities estimated for April to December 1944, and January to June 1945.

(1) Liquefiable petroleum gases used in chemical manufacture were mainly propane and butane–butylene mixtures. Amount of L.P. gas *as a liquid* is shown to have increased 44% in 1944 over 1943. Far greater quantities, however, of L.P. gas, *as gas*, are pipe transported for chemical manufacture; a recent estimate for gaseous and liquid materials, so used, gave the figure 389,127,500 gals. for 1945 and the 1944 figure (nine months estimated) was set at 478,022,000 gals.—an increase of 23%.

(2) For security reasons the L.P. gases for refinery use are not segregated; the total includes figures for conventional refining demands with those used in various processes for aviation gasoline manufacture. Figures given show an increase of 50% for 1944 over 1943.

(3) Under synthetic rubber components the figures show an increase of 270% for 1944 over 1943.

In November 1944 butane was short by 4,000,000–7,000,000 gals. per month. It would appear that in the post-war era large quantities of butanes at present being converted into war materials will be available, and as catalytic cracking gradually displaces thermal cracking operations, the butanes now used for propylene manufacture will be released, as propylene will be made by catalytic dehydrogenation of propane when a satisfactory process for the separation is completed. From present viewpoint the trend is towards use of acetylene, ethylene, and propylene as starting point for chemicals, and increasing amounts of ethane and propane are indicated on the completion of processes now under investigation. Although butanes will still be required for some part of the chemical programme, the demand may not be so large. It is anticipated that the post-war era will find a balanced demand for L.P. gas products and allow the industry to expand and progress in a stable manner. W. H. C.

966. Du Pont Research. E. K. Bolton. *Chem. and Ind.*, 1945, 122–127.—The Chemical Director of E. I. du Pont de Nemours and Company gives an account of the history, growth and organisation of the company's research. C. F. M.

967. Petroleum Developments Dominated by Demands of War. R. K. Davies, *Chem. Eng. News*, 1945, **23**, 144.—During 1944 construction work for the 100-octane programme cost $760,000,000, whilst army gasoline and the synthetic rubber programme imposed immense strains on the petroleum industry. The opening of new fields brought U.S.A. oil production to a record figure of 5,000,000 brl. per day, and transport problems multiplied. The U.S.A. system of allocating petroleum products is discussed, as also the effects of the invasion of Europe and the increased activity in the Pacific. The Anglo-American Agreement on petroleum should form a basis for an international petroleum conference. S. J. L.

968.* Economic Factors to Determine Fuels of the Future. B. H. Weil, *World Petroleum*, 1945, **16** (2), 49.—In man's choice of fuel the greatest problem is abundance of supply. At present rates of production, U.S.A. known reserves of petroleum would last 14 years, coal 3000 years, and natural gas 30 years. Synthesis of gasoline is at present uneconomic, but the author advocates fundamental research in case of future emergencies. Processes discussed are the Fischer–Tropsch, the pyrolysis of oil-shale and oil-sands, the carbonization and hydrogenation of coal, of which the first seems the most attractive. No future shortage of gaseous fuels is visualized. Looking to the immediate future, it is believed that 110-octane aviation gasolines will not be required for post-war automotive purposes. Gasolines of 85–90 octane number will be produced and probable improvements in car design are described. Diesel fuels are increasing rapidly in importance, but prediction is difficult in the case of heavy fuel oil and natural gas. S. J. L.

969.* Design for Efficiency in a Routine Control Laboratory. W. C. Albert. *Refiner*, March 1945, **24** (3), 104–107.—The laboratory at Baton Rouge Refinery and its practices are described. A. H. N.

970. Coal Statistics. Anon. *Chem. Tr. J.*, 8.6.45, **116** (3029), 628.—Statistical Digest, 1944 (CMD 6639. H.M.S.O.) published by the Ministry of Fuel and Power gives data on the production of coal in 1944 and earlier years, and on its consumption in different industries, including carbonization and coal tar distillation plants. C. L. G.

971. Hydrocarbon Oil Duties. Anon. *Chem. Age*, 1945, **52**, 343.—A *résumé* of the Ayre Committee's proposals shows the adverse effects of the hydrocarbon-oil duties on British industry. Their removal would encourage home refining to supply raw materials for a synthetic chemical industry and to develop new processes. Production of detergents, turpentine, and pinene suffer indirectly under present duty, and taxing of benzol used for chemical intermediates raises cost of products with detriment to the export market. Annual cost of removing the duties would be £400,000, but development of chemicals from petroleum would cease to be dictated by fiscal considerations. It is not anticipated that the coal-tar industry would suffer under the proposals. S. J. L.

972. Oil Company Finance. S. H. Withey. *Chem. Age*, 1945, **52**, 380.—New legislation in U.S. may cause increased drilling costs and hence a decline in number of wells drilled. Figures are given for production, gross and net profits, taxes and dividends for Apex (Trinidad), Anglo-Iranian, and Lobitos Oilfields from 1939 to 1944. Anglo-Iranian stock has declined. Lobitos are about to embark on an ambitious drilling programme, whilst Apex intend to extend their proven acreage. S. J. L.

BOOKS RECEIVED.

Micromeritics—The Technology of Fine Particles. By J. M. Dallavalle. Pp. xiv + 428. Pitman, New York and Chicago. Extensive bibliography covering 40 pages. 1943. Price $8.50.

Deals with the properties of particles of macroscopic and microscopic dimensions and their applications to soil physics, chemical engineering, geology, etc. Particle-measurement, size-distribution, packing, and industrial applications are discussed. Particularly useful for road research.

Chemical Engineer's Manual. By D. B. Keyes and A. G. Deem. Pp. v + 221. John Wiley and Sons, New York; Chapman and Hall, London. 1942. Price 15*s*.

A handbook containing information of use to the chemical engineer. It contains formulæ and charts dealing with fluid flow, heat transfer, absorption, drying, distillation, filtration, and settling. There are tables of logarithms, integrals, critical constants, safe loads, conversion factors, and also dealing with such subjects as steam, specific heat, thermal conductivity, viscosity, and vapour pressure.

A very useful and handy volume for the chemical engineer. Its size, making it really a pocket edition, should be much appreciated.

INSTITUTE NOTES

August, 1945.

APPLICATIONS FOR MEMBERSHIP OR TRANSFER.

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

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

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

Membership.

Bugge, Erasmus Thomas, Chief Chemist, Bugge's Insecticides, Ltd. (*F. Dakin ; W. Kay.*)

Etherington, Harold Leslie, Bitumen Superintendent. (*H. W. F. Sanders ; V. L. Hope*).

Gray, Bruce Alexander Cuthill, Deputy Manager, Lubricating Oil Pool. (*E. J. Dunstan ; H. Paton.*)

Green, Oskar Daniel, Chemist, D. Green & Son. (*T. W. Ranson ; L. Ivanovsky.*)

McCoy, John T., General Supervisor of Research & Development, Tide Water Associated Oil Co. (*J. V. Delves ; W. H. Huxley.*)

Morris, Glyn Vincent, Chemist, Trimpell Ltd. (*P. M. Griffiths ; R. J. Smith.*)

Ogden, Alick, General Manager, Garth & Brown, Ltd. (*J. E. M. Haslam ; E. J. Dunstan.*)

Wemyss, William Donald, Plant Supt., Anglo-Iranian Oil Co., Ltd. (*J. T Guthrie ; R. B. Southall.*)

Wilkinson, Harold George Lawrence, Engineer, M.A.P., A.I.D. (*J. Mason ; H. Sprake.*)

Transfers.

Ellis, Stephen Mercer, Chemical Engineer, British Diesel Oil & Petrol Co., Ltd. (*G. S. Pound ; William F. Murray.*) (Associate Member to Member).

Higgins, George Esmond, Geologist, Trinidad Leaseholds Ltd. (*S. E. Coomber ; G. D. Hobson.*) (Student to Associate Member.)

Macdonald, Hector Goring, Chemist, Anglo-American Oil Co., Ltd. (*C. Chilvers ; W. A. Woodrow.*) (Associate Member to Member.)

Tait, Edward James Morrow, Chief Inspection Engineer, Trinidad Leaseholds Ltd. (*B. G. Banks ; J. B. Christian.*) (Member to Fellow.)

PERSONAL NOTES.

Sir Frank Smith has been elected President of the Institute of Physics.

HONOURS.

Mr. H. W. Rigden (Associate Member) has been awarded the O.B.E.

MEETINGS OF COUNCIL.

An Ordinary Meeting of Council was held at 26, Portland Place, W.1, on Wednesday, 13th June, 1945, with Professor F. H. Garner in the Chair.

There were also present: Messrs. M. A. L. Banks, G. H. Coxon, T. Dewhurst, A. E. Dunstan, E. J. Dunstan, A. C. Hartley, J. H. Haslam, H. Hyams, J. S. Jackson, R. I. Lewis, J. A. Oriel, J. S. Parker, H. E. F. Pracy, E. R. Redgrove, H. C. Tett, F. B. Thole, E. Thornton, R. R. Tweed, W. J. Wilson, C. W. Wood.

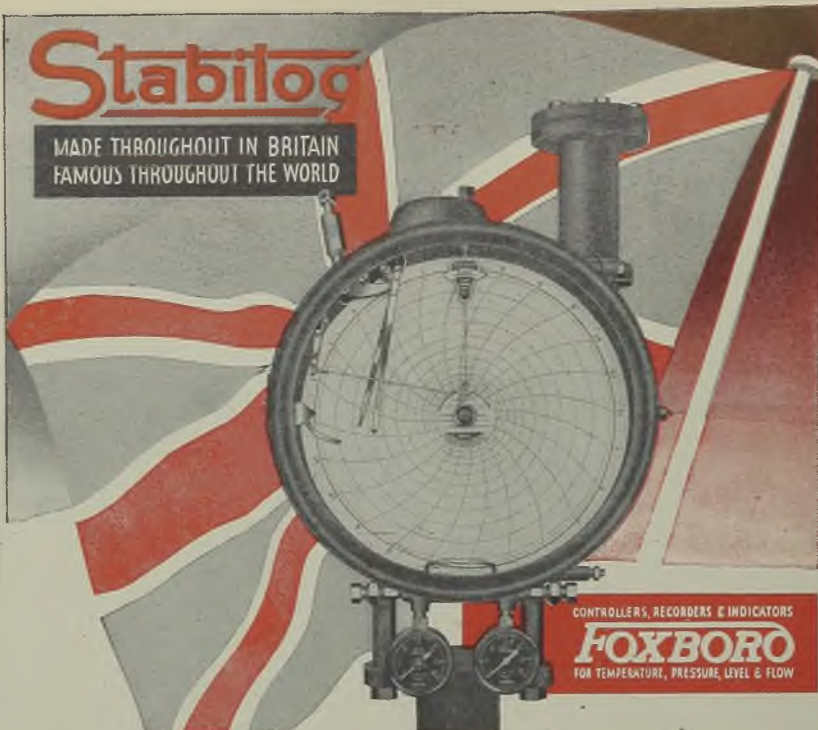
Reports were received from the Branches, House, Standardization and Ad Hoc Committees.

An Ordinary Meeting of Council was held at 26, Portland Place, W.1, on Wednesday, 4th July, 1945, with Professor F. H. Garner in the Chair.

There were also present: S. J. M. Auld, T. Dewhurst, F. H. Evans, A. C. Hartley, J. E. Haslam, H. Hyams, R. I. Lewis, J. A. Oriel, J. S. Parker, H. E. F. Pracy, E. R. Redgrove, C. A. P. Southwell, H. G. Tett, G. H. Thornley, E. Thornton, W. J. Wilson, C. W. Wood.

Reports were received from the Election, Publication and Ad Hoc Committees.

Two Fellows, three Members and seven Associate Members were elected, and one transfer to Fellow approved. One re-instatement as Member was agreed.



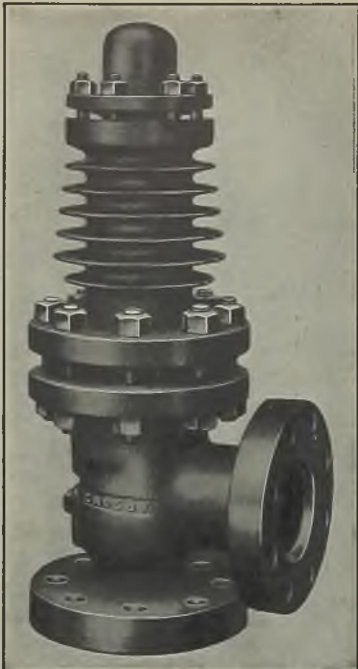
The Stabilog Control system has made possible the uniform control and stabilisation of entire processes. It has been designed especially for use on continuous processes in petroleum refining and will control the critical temperature, pressure, flow and liquid level applications with the highest precision.

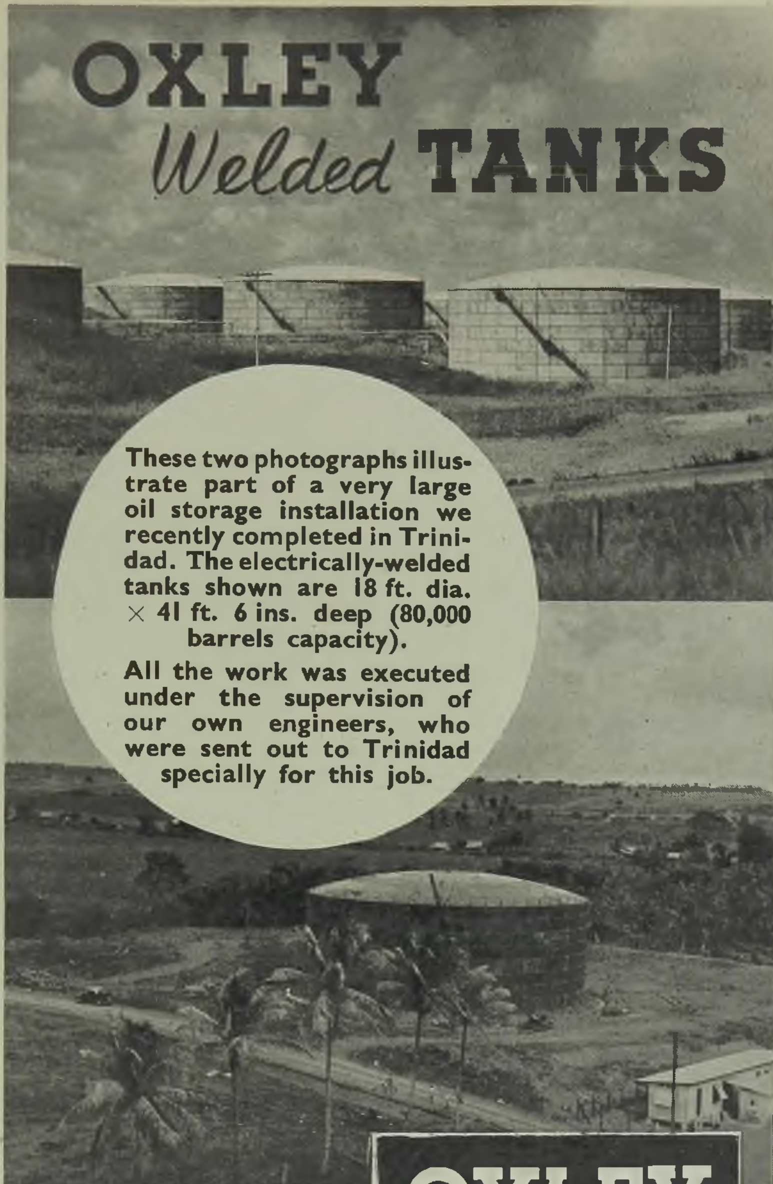
Stabilog and other Foxboro products are manufactured in our factory at Merton, England, from which a complete technical and engineering service is available to refinery engineers.

★

FOXBORO-YOXALL, LIMITED

MORDEN ROAD, MERTON, LONDON, S.W.19

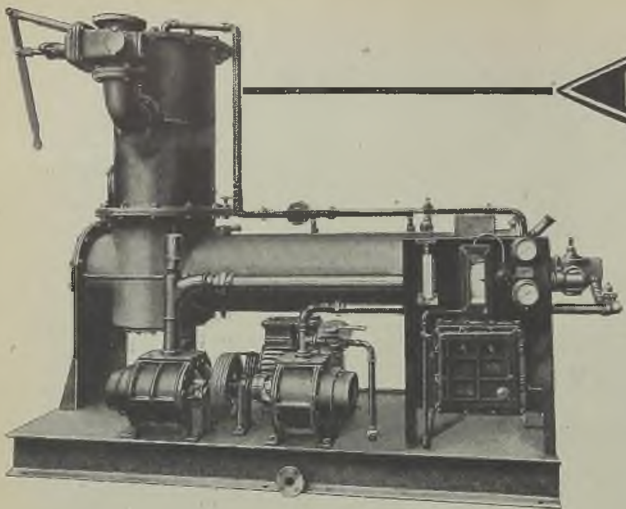



OXLEY
Welded TANKS
These two photographs illustrate part of a very large oil storage installation we recently completed in Trinidad. The electrically-welded tanks shown are 18 ft. dia. × 41 ft. 6 ins. deep (80,000 barrels capacity).
All the work was executed under the supervision of our own engineers, who were sent out to Trinidad specially for this job.

FOUNDED 1850

HOLMES

HUDDERSFIELD



The 'HARRISON' PURGING MACHINE

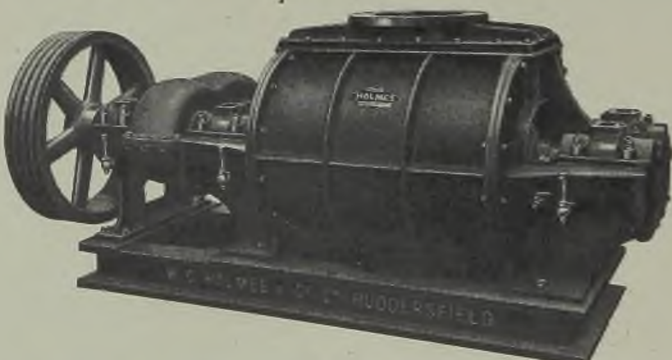
gives a supply of Inert Gas consistent in quality and at low cost for the purging of Oil Stills, Tanks, Pipe Lines and Hydrogen Producers.

Inert Gas from these machines is also extensively used for blanketing Oil Storage Tanks and Vacuum Filters in solvent de-waxing processes.

SAFER & CHEAPER THAN STEAM

CONNERSVILLE BLOWERS

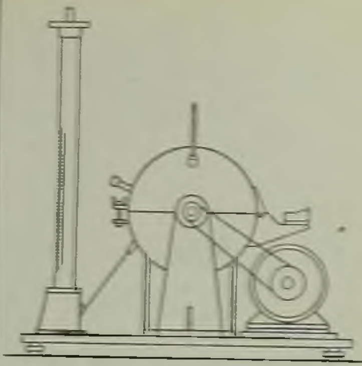
deliver a positive reliable and oil free supply of Air or Gas economically and efficiently. Absence of internal contact ensures long life, low maintenance and continuous operation over long periods.



HEAD OFFICE • TURNBRIDGE • HUDDERSFIELD

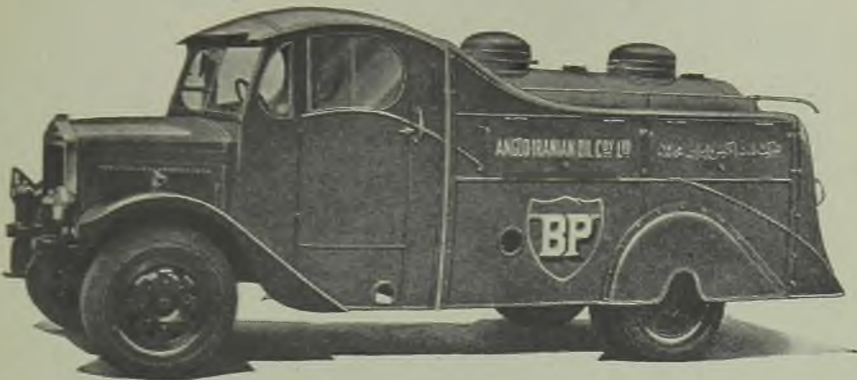
LONDON OFFICE · 119 VICTORIA ST. S.W.1 – MIDLANDS OFFICE · 21, BENNETT'S HILL BIRMINGHAM 2

Telephones: Huddersfield, 5280 : LONDON, Victoria, 9971 : BIRMINGHAM, Midland, 6830



Kindly mention this Journal when communicating with Advertisers.

'fillerupp!'



--- BASIC ENGLISH DEMAND FOR NON-BASIC PETROL

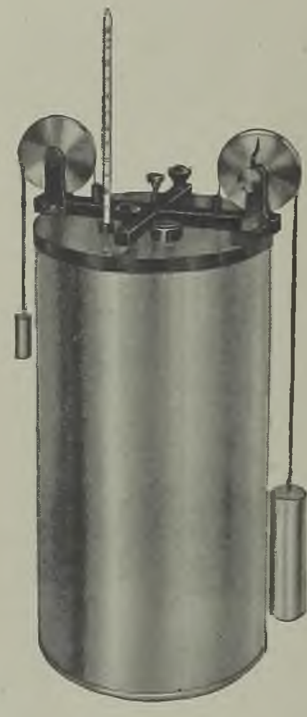
As military needs become less urgent, production of Butterfield Road Tanks will once more be available for peacetime industry.

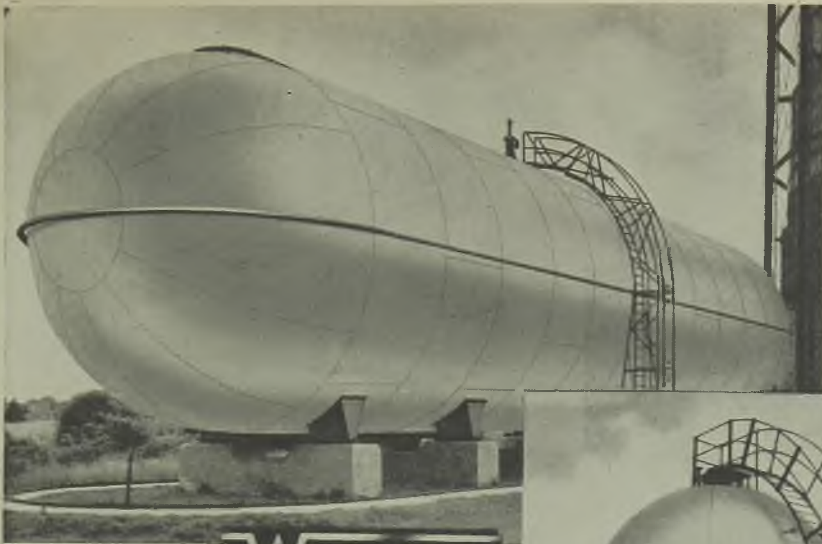
MAYBE 'fillerupp' will again be standard English usage at the petrol pump before many months are out. The availability of Road Tanks and crews to distribute supplies is bound to be something of a problem, but those Butterfield vehicles which can be spared for the job may be relied on to do it with the utmost speed and efficiency.

Butterfields
ENGINEERS · SHIPLEY
Builders of Tanks for 50 Years

W. P. BUTTERFIELD LTD.
Head Office and Works: SHIPLEY, YORKS.
Telephone: Shipley 851 (5 lines)
London: Africa House, Kingsway, W.C.2
Telephone: HOLborn 1449. AND BRANCHES

Butterfield ROAD TANKS




WHESSOE